R&S®DVMS
DIGITAL TV MONITORING SYSTEM FAMILY

Specifications

3 year warranty

Data Sheet
Version 06.00

#1 : Input 1 [ASI]   > Sync Ok
#2 : Input 2 [SMPTE]   > Sync Loss
#3 : Input 3 [DVB-S2]   > Sync Ok
#4 : Input 4 [DVB-T]   > Sync Ok

DVMS4 · DTV MONITORING SYSTEM

R&S DVMS4

ROHDE&SCHWARZ

POWER
REMOTE
FAULT

BACK   OK

DVMS1 · DTV MONITORING SYSTEM

ROHDE&SCHWARZ

AF OUT
● POWER
● INSTRUMENT READY
● REMOTE

## ROHDE&SCHWARZ

Make ideas real

CONTENTS

Definitions

General

Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

Specifications with limits

Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.
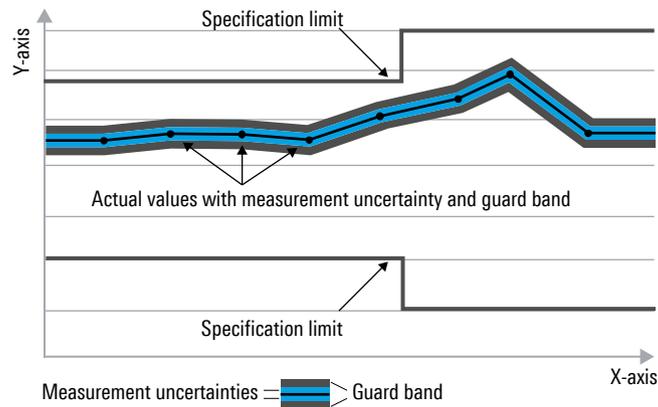
Specifications without limits

Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)

Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)

Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)

Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties

Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are indicated as follows: "parameter: value".

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

Performance comparison

	R&S®DVMS1	R&S®DVMS4
Number of module slots	1	4
Maximum number of simultaneously monitored inputs	4 (1 × TS and/or 1 × RF or 4 × TS IP)	4 (TS, RF and TS IP in any combination)
Signal interfaces integrated in base unit	–	4 × TS
Total maximum input bit rates across all inputs [1]	360 Mbit/s (IP), 86 Mbit/s (ASI + RF)	360 Mbit/s (IP + ASI + RF)
Integrated display	–	yes
Width	½ 19" rack	19" rack

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[1] Depending on complexity of content.

Features, functions and options

Feature	Function	Option
Monitoring(simultaneous and uninterrupted real-time measurements)		
RF monitoring	monitoring of various RF characteristics, including MER, BER and level	R&S®DVMS-B55/-B51
RF transmission parameter monitoring	comparison of the transmission parameters with predefined settings	
Shoulder attenuation monitoring	monitoring of upper and lower shoulder (DVB-T and DVB-T2) (every second)	R&S®DVMS-K57
Echo pattern monitoring	monitoring of level and timing of up to 16 impulses (DVB-T and DVB-T2) (every 10 s to 25 s)	R&S®DVMS-K58
IP monitoring	monitoring of various IP characteristics, including MDI, bit rate and jitter	R&S®DVMS-B40
TR 101 290 priority 1, 2 and 3 monitoring	monitoring of all TR 101 290 priority 1, 2 and 3 parameters [2]	R&S®DVMS-K1
DVB-H monitoring	monitoring of time slicing and MPE FEC	R&S®DVMS-K11
Bit rate monitoring	monitoring of bit rates	
MIP monitoring	complete monitoring of the MIP as specified in TR 101 290	
SFN delay monitoring	monitoring of the delay of the MIP (DVB-T)	
Encryption monitoring	monitoring of the status and the CA alternation	
TS modification	detection of changes in the transport stream	
EPG/EIT monitoring	monitoring of the presence of EIT tables according to the signaling in the SDT tables and the template definitions	R&S®DVMS-K1/-K12
TS template monitoring	comparison of TS characteristics with predefined values	R&S®DVMS-K12
Analysis		
Spectrum	display of spectrum (DVB-T and DVB-T2)	R&S®DVMS-K57
Echo pattern	display of up to 16 impulses (DVB-T and DVB-T2)	R&S®DVMS-K58
IP flow meter	display of MDI-DF and MDI-LR over time	R&S®DVMS-B40
IP flow list	display of IP measurement results for up to 4 flows in tabular form	
EPG display	display of the electronic program guide based on all EIT tables received	R&S®DVMS-K16
Thumbnail display	display of small videos with lower frame rate for all unencrypted services and additional program details of one selected TS	R&S®DVMS-K17
PCR analysis	analysis of PCR accuracy, overall jitter, drift, offset and distance	R&S®DVMS-K19
PTS analysis	analysis of PTS to PCR difference and PTS distance	
Interpreter	display of original and interpreted content of tables, TS packet headers and PES headers	R&S®DVMS-K20
qPSNR analysis	analysis of the video coding quality of MPEG-2 or MPEG-4/AVC/H.264 SDTV and HDTV video	R&S®DVMS-K21
Carousel and MPE analysis	analysis of DVB broadcast protocols	R&S®DVMS-K22
DVB-H analysis	analysis of time slicing, MPE FEC and electronic service guide (ESG)	R&S®DVMS-K23
Buffer analysis	analysis of according to the buffer model of MPEG-2 or MPEG-4/AVC/H.264 SDTV and HDTV or HEVC/H.265 single layer HDTV video ES and MPEG-1/2 (mono, stereo) audio ES	R&S®DVMS-K24

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[2] Buffer-related measurements are excluded. They can be performed for a selected video or audio element.

Feature	Function	Option
Additional views and displays		
Site tree	status overview of all inputs, input selection	basic functions for RF inputs and active TS inputs
TS tree	display of transport stream elements in tree structure, error indication, element selection	
Statistics and log	error second counters for top-level monitoring parameters, detailed report entries for monitoring results	
Bit rate	display of bit rates (bargraph displays)	
Table repetition	display of table repetition (bargraph displays)	
PID utilization	visualization of TS packet distribution within TS	
PID list	list of all transport stream elements with detailed description	
Constellation diagram	visualization of constellation	R&S®DVMS-B55/-B51
Operation		
Context-sensitive help	access to the appropriate part in the manual from any position in the R&S®DVMS GUI	base unit
View selector	convenient selection of measurement displays using one window	basic functions for RF inputs and active TS inputs
User rights management	protection against unauthorized use by defining user-specific operation rights	
Event navigator	point and click based filtering of monitoring report	R&S®DVMS-K11
Hiding of events	time-limited or unlimited suppression of monitoring results for specific measurements or PIDs	
Scheduler suite	round robin monitoring for a predefined set of frequencies/channels using one input	R&S®DVMS-B55/-B51/-B40
Network functions		
Remote display	remote access to R&S®DVMS GUI	basic functions for RF inputs and active TS inputs
Viewer application	Java based remote access to monitoring results from different locations, multiple user access	
SNMP	simple network management protocol for integration into network management systems	
FTP server	password-protected FTP server for simple file exchange	
Streaming	streaming of one selected PID or service to any point in the network (to any IP address)	
Miscellaneous		
High MER measurement	increases the MER measurement for DVB-T and DVB-T2 to 38 dB (typ.)	R&S®DVMS-K59
TS capture	event-controlled recording of TS segments to hard disk	R&S®DVMS-K18
Logging to file	logging of report entries to hard disk	basic functions for RF inputs and active TS inputs
Video decode	software decoder (VLC for decoding MPEG-2 or MPEG-4/AVC/H.264 SDTV and HDTV video/audio streams)	

General data of the R&S®DVMS1 base unit

Local operation requires an external monitor, keyboard and mouse, or by remote control via a PC/laptop. Requires one module.

Number of module slots		1
Integrated controller		
CPU		AMD Kabini APU, 4 cores, 1.5 GHz
System memory		4 Gbyte
System hard drive	solid-state drive	min. 250 Gbyte (min. 128 Gbyte available for user data)
Operating system		Windows 7 Embedded
Interfaces		
Universal serial bus		2 × USB 3.0
Headphone output (AF out)	front panel	3.5 mm stereo connector (f)
Remote control		
Connector		RJ-45
Interface		Ethernet 10/100/1000BASE-T
Protocols		• SNMP • FTP (file transfer via integrated FTP server)
Remote operation		• Windows remote desktop • web browser
Display		
Connector		DVI-D
Resolution		1024 × 768 pixel to 1600 × 1200 pixel
Reference clock		
External reference clock input		
Clock frequency		10 MHz
Level		0.1 V to 2 V (RMS)
Connector		75 Ω, BNC (female)
Application		• TS analysis • RF frontends
Internal reference clock accuracy	10 MHz oscillator	±1 ppm over temperature, ±1 ppm aging per year
External 1 PPS clock input		
Clock frequency	asymmetrical clock pulse	1 Hz (pulse width: min. 1 µs)
Level		TTL
Input impedance		1 kΩ
Connector		BNC female (rear)
Application		SFN network delay measurement
Mechanical resistance		
Vibration	sinusoidal	5 Hz to 50 Hz, max. 1.8 g at 55 Hz, max. 0.5 g from 55 Hz to 150 Hz, in line with EN 60068-2-6
	random	10 Hz to 300 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with EN 60068-2-27, MIL-STD-810E
Environmental conditions		
Temperature	operating temperature range	+5 °C to +40 °C
	permissible temperature range	+5 °C to +40 °C
	storage temperature range	–40 °C to +65 °C
Climatic resistance		+25 °C/+40 °C at 85 % relative humidity, in line with EN 60068-2-30
Product conformity		
Electromagnetic compatibility		in line with EN 55011 class B
Electrical safety		in line with IEC 61010-1, EN 61010-1 and UL 61010-1, CSA C22.2 No. 61010-1
Power rating		
Power supply	input voltage range, AC, nominal	100 V to 240 V ± 10 %
	AC supply frequency	50 Hz to 60 Hz ± 5 %
	input current, AC	1.6 A (max.)
Power consumption		50 VA (typ.)
Power factor correction (PFC)		in line with EN 61000-3-2
Dimensions	W × H × D	210 mm × 44 mm × 227 mm (1 HU) (8.27 in × 1.73 in × 8.94 in)
Weight	fully equipped	1.9 kg (4.20 lb)

General data of the R&S®DVMS4 base unit

Local operation requires an external monitor, keyboard and mouse, or by remote control via a PC/laptop. Requires at least one R&S®DVMS-K1 or one module.

Number of module slots	any combination allowed	4
Signal inputs/outputs		
TS input/output (user-selectable)		
Number		4
Connector		BNC, 75 Ω
Mode		
Input	ASI or SMPTE	packet length: 188/204/208 byte,
Output	ASI only, loop output of TS from other TS input	ASI: in line with EN 50083-9 (2002), SMPTE: in line with BP 400 SMPTE, 19.392658 Mbit/s, 188 byte
Total maximum bit rates of all inputs used		360 Mbit/s
Maximum cable length		180 m
Integrated controller		
CPU		AMD Kabini APU, 4 cores, 1.5 GHz
System memory		4 Gbyte
System hard drive	solid-state drive	min. 250 Gbyte (min. 128 Gbyte available for user data)
Operating system		Windows 7 Embedded
Interfaces		
Universal serial bus		2 × USB 3.0
Headphone output (AF out)	rear panel	3.5 mm stereo connector (f)
Remote control		
Connector		RJ-45
Interface		Ethernet 10/100/1000BASE-T
Protocols		• SNMP • FTP (file transfer via integrated FTP server)
Remote operation		• Windows remote desktop • web browser
Display		
External display		
Connector		DVI-D
Resolution		1024 × 768 pixel to 1600 × 1200 pixel
Front-panel display and keyboard	display of base instrument information	200 × 48 pixel, monochrome white/blue LED backlight, 4 arrow keys (up/down, left/right), BACK key and OK key
Reference clock		
External reference clock input		
Clock frequency		10 MHz
Level		0.1 V to 2 V (RMS)
Connector		75 Ω, BNC (female)
Application		• TS analysis • RF frontends
Internal reference clock accuracy	10 MHz oscillator	±1 ppm over temperature, ±1 ppm aging per year
External 1 PPS clock input		
Clock frequency	asymmetrical clock pulse	1 Hz (pulse width: min. 1 µs)
Level		TTL
Input impedance		1 kΩ
Connector		BNC female (rear)
Application		SFN network delay measurement
Mechanical resistance		
Vibration	sinusoidal	5 Hz to 50 Hz, max. 1.8 g at 55 Hz, max. 0.5 g from 55 Hz to 150 Hz, in line with EN 60068-2-6
	random	10 Hz to 300 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with EN 60068-2-27, MIL-STD-810E

Environmental conditions		
Temperature	operating temperature range	+5 °C to +40 °C
	permissible temperature range	+5 °C to +40 °C
	storage temperature range	–40 °C to +65 °C
Climatic resistance		+25 °C/+40 °C at 85 % relative humidity, in line with EN 60068-2-30
Product conformity		
Electromagnetic compatibility		in line with EN 55011 class B
Electrical safety		in line with IEC 61010-1, EN 61010-1 and UL 61010-1, CSA C22.2 No. 61010-1
Power rating		
Power supply	input voltage range, AC, nominal	100 V to 240 V ± 10 %
	AC supply frequency	50 Hz to 60 Hz ± 5 %
	input current, AC	3.8 A (max.)
Power consumption		55 VA (typ.) + 15 VA per module
Power factor correction (PFC)		in line with EN 61000-3-2
Dimensions	W × H × D	438 mm × 44 mm × 328 mm (1 HU) (17.24 in × 1.73 in × 12.91 in)
Weight	fully equipped	5.6 kg (12.35 lb)

Basic functions for RF inputs and active TS inputs

Supported TS characteristics		• DVB • ATSC • SCTE • ISDB-T • ISDB-T$_B$
Display elements		
Site tree		• status overview of all inputs • definable site name • definable input name
TS tree		tree display of TS structure with event indication in TS tree element
Views		
Input signal views	constellation (only available for RF inputs)	• constellation diagram • RF measurement values
"TS Elements" view	services	selectable background display (topology map) with status display (to be positioned as required) for all enabled signal inputs available
	background image format	GIF
	recommended image size (W × H) for 1024 × 768 pixel viewing area	• 740 × 550 pixel, without pie chart • 740 × 345 pixel, with pie chart
		pie chart diagram for all services in the transport stream can be added
	PID list	list of all TS elements with sorter function in mode: stop
	shown details for each element	group, content, ID, CA, ECM PID, PID, PCR PID, rate (in Mbit/s), % bandwidth (continuously updated)
	PID utilization	• shows PID distribution within TS snapshot of up to 262 000 packets • highlighted script for TS packets with corresponding PID by means of selecting any element of the TS tree
	selectable indication of TS packets	TS packet header (up to 3000 packets) or PID (up to 6000 packets) or symbol (up to 262 000 packets)

"Monitoring" view	statistics and log	• statistics counter showing error seconds of top-level monitoring parameters, up to 9999 error seconds per counter
		• monitoring log showing detailed description of all monitoring events:
		  − date/time
		  − class (event, alarm, info, system)
		  − detailed information
		  − PID number
		  − service number
		(for more details, see next section "Monitoring")

	bit rate	list of bargraph displays with peak hold for bit rate values of all TS elements
	table repetition	list of bargraph displays with peak hold for table repetition intervals of all PSI/SI/PSIP tables
"Audio/Video" view	video player	
	software decoding (VLC)	• MPEG-2 or MPEG-4/AVC/H.264 SDTV and HDTV video • MPEG-1/2 audio (mono, stereo), presented on AF OUT connector
	audio/video PID streaming to external PC	original bit rates of elementary streams

Monitoring			
Monitoring configuration	definable standards	- DVB - ATSC - SCTE - ISDB-T - ISDB-T$_B$	
	limits	configurable for each monitoring parameter	
	virtual alarm lines (for SNMP and TS capture)	configurable for each monitoring parameter	
	event class	- configurable for each monitoring parameter − alarm − warning − info - for system events only:system	
	features	- unlimited number of different configurations - import/export feature for quick exchange - global assignment (one setting for some or all inputs) - single assignment (different settings for each input)	
Display of real-time monitoring test results	site tree	status indication for all inputs	
	input tree	status indication for all TS elements	
	statistics counter	error seconds of top-level test parameter	
	log	detailed event description with: - date/time - class (event, alarm, info, system) - detailed information - PID number - service number	
Size of event log	real-time view	1000 lines	
	deferred view (log to file)	limited only by space on hard drive	
Log to file scheduling		- new log file every day - new log file every hour - new log file after 1 min to 1000 min - new log file after 1000 events to 100 000 events	
Log type		- transition (new entry by change of status only) - continuous (new entry every second in case of event)	
Log filter	real-time log display	- system plus alarm - system plus warning - system plus info	

Modules and module options

DVB-T/DVB-T2 receiver module (R&S®DVMS-B55)

Requires R&S®DVMS-K53 or R&S®DVMS-K54 option. Provides an RF input, a TS input and a TS output. The TS received via RF or via the TS input is present at the TS output. In its basic version, the R&S®DVMS-B55 module supports monitoring of the RF signal. R&S®DVMS-K1 adds capability for monitoring of TS characteristics. R&S®DVMS-K1 is also required for using the TS input.

Standard	R&S®DVMS-B55 model .02 or model .03, with R&S®DVMS-K53 option	DVB-T (ETSI EN 300744)	
	R&S®DVMS-B55 model .02, with R&S®DVMS-K54 option	DVB-T2 (ETSI EN 302755 V1.1.1, compatible with V1.2.1)	
	R&S®DVMS-B55 model .03, with R&S®DVMS-K54 option	DVB-T2 (ETSI EN 302755 V1.3.1)	
Signal inputs			
RF input			
Number		1	
Connector		BNC, 50 Ω	
VSWR		1.5	
DC voltage		80 V	
Maximum CW RF power	no damage	20 dBm	
Input level range	DVB-T, preselector on, QPSK, code rate: ½	–93 dBm to 0 dBm (typ.)	
	DVB-T2, preselector on, QPSK, code rate: ½	–94 dBm to 0 dBm (typ.)	
Frequency range	preselector off	30 MHz to 1000 MHz	
Frequency resolution		1 Hz	
TS input			
Number		1	
Connector		BNC, 75 Ω	
Mode		ASI, SMPTE 310M (user-selectable)	
ASI		packet length: 188/204/208 byte, in line with EN 50083-9 (2002)	
SMPTE 310M		19.392658 Mbit/s, 188 byte, in line with BP 400 SMPTE	
Maximum cable length		180 m	
Signal output			
TS output			
Number		1	
Connector		BNC, 75 Ω	
Mode	loop output of TS from RF or TS input	ASI, in line with EN 50083-9 (2002)	
Preselector			
Mode		auto on, off	
Frequency range		150 MHz to 300 MHz and 450 MHz to 900 MHz	
Bandwidth (–3 dB)	VHF	40 MHz	
	UHF	100 MHz	
Gain		13 dB	
RF parameters			
IF rejection			
1st IF (1219.5 MHz)	preselector on, RF attenuation = 0 dB	100 dB (typ.)	
2nd IF (36.125 MHz)	preselector on, RF attenuation = 0 dB	100 dB (typ.)	
Image rejection			
1st image (RF + 2439 MHz)	preselector on, RF attenuation = 0 dB	90 dB (typ.)	
2nd image (RF + 72.25 MHz)	preselector on, RF attenuation = 0 dB	100 dB (typ.)	
Noise figure	preselector on, RF attenuation = 0 dB	8 dB (typ.)	
	preselector off, RF attenuation = 0 dB	15 dB (typ.)	
Third-order intercept (TOI)	preselector on, RF attenuation = 0 dB, 2 CW signals (–30 dBm, RF + 16 MHz / RF + 32 MHz)	–2 dBm (typ.)	
	preselector off, RF attenuation = 0 dB, 2 CW signals (–20 dBm, RF + 16 MHz / RF + 32 MHz)	12 dBm (typ.)	
Immunity to signals in other channels	preselector on	in line with D-book, version 7.0	
SAW filter bandwidth	in line with channel bandwidth	6 MHz, 7 MHz, 8 MHz	

DVB-T2 demodulator (R&S®DVMS-K54)

DVB-T2 activation for R&S®DVMS-B55.

Standard	with R&S®DVMS-B55 model .02	DVB-T2 (ETSI EN 302755, V1.1.1, compatible with V1.2.1)
	with R&S®DVMS-B55 model .03	DVB-T2 (ETSI EN 302755 V1.3.1)
Modulation parameters		
Modulation		COFDM
FFT mode	automatic detection	1k, 2k, 4k, 8k, 16k, 32k, 8k ext., 16k ext., 32k ext.
Pilot pattern	automatic detection	PP1, PP2, PP3, PP4, PP5, PP6, PP7, PP8
QAM order	automatic detection	QPSK, 16QAM, 64QAM, 256QAM
Layers	single physical layer pipe (SPLP)	automatic selection
	multiple physical layer pipe (MPLP)	manual selection of layer to be decoded
Guard interval	automatic detection	1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128
Code rate	automatic detection	1/2, 3/5, 2/3, 3/4, 4/5, 5/6
FEC type	automatic detection	short (16k LDPC), normal (64k LDPC)
Interleaver type	automatic detection	in line with standard
Channel bandwidth		5 MHz, 6 MHz, 7 MHz, 8 MHz
Measurements		
RF input level		
Range	preselector on	–97 dBm to 0 dBm (typ.)
	preselector off	–90 dBm to 0 dBm (typ.)
Resolution		0.1 dB
Uncertainty	C/N ≥ 20 dB	≤ 1.5 dB
Modulation error ratio (MER), transmitter measurement application (echo-free reception)		
Range	standard	10 dB to 31 dB
	with R&S®DVMS-K59 option, except for PP8 with MISO	10 dB to 35 dB (typ. 38 dB)
Resolution		0.1 dB
Uncertainty	10 dB ≤ MER ≤ 30 dB, except for PP8 with MISO	≤ 1.0 dB
	30 dB < MER ≤ 35 dB, except for PP8 with MISO	≤ 2.0 dB
	10 dB ≤ MER ≤ 31 dB, only PP8 with MISO	≤ 2.0 dB
Modulation error ratio (MER), antenna/repeater measurement application [3]		
Range	standard	10 dB [4] to 31 dB
	with R&S®DVMS-K59 option	10 dB [4] to 35 dB (typ. 36 dB)
Resolution		0.1 dB
Uncertainty	20 dB ≤ MER ≤ 30 dB	1.0 dB (nom.)
	30 dB < MER ≤ 35 dB	2.0 dB (nom.)
BER before LDPC	R&S®DVMS-B55 model .02	
	QPSK, 16QAM	$0.0; 1.0 \times 10^{-7}$ to 1.0×10^{-1}
	64QAM	5.0×10^{-6} to 1.0×10^{-1}
	256QAM	2.0×10^{-4} to 1.0×10^{-1}
	DVMS-B55 model .03	
	QPSK, 16QAM, SISO	$0.0; 1.0 \times 10^{-7}$ to 1.0×10^{-1}
	QPSK, MISO	$0.0; 1.0 \times 10^{-7}$ to 1.0×10^{-1}
	16QAM, MISO	1.0×10^{-5} to 1.0×10^{-1}
	64QAM, SISO	1.0×10^{-5} to 1.0×10^{-1}
	64QAM, MISO	1.0×10^{-4} to 1.0×10^{-1}
	256QAM	5.0×10^{-4} to 1.0×10^{-1}
LDPC iterations		1 to 255
BER before BCH		$0.0; 1.0 \times 10^{-6}$ to 1.0×10^{-3}
BB frames after BCH		OK, errored

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[3] Not available for QPSK modulation.

[4] 20 dB for 256QAM.

Frequency offset		
Range		±200 kHz
Resolution		1 Hz
Uncertainty		uncertainty of reference frequency $\pm 10^{-4}$ of reading ± 1 digit
Bit rate offset		
Range		±50 ppm
Resolution		0.01 ppm
Uncertainty		uncertainty of reference frequency $\pm 10^{-3}$ of reading ± 1 digit
Constellation diagram		with standard-specific grid and signal-dependent rotation
L1 presignaling		
T2 version	R&S®DVMS-B55 model .02	1.1.1, 1.2.1, reserved
	R&S®DVMS-B55 model .03	1.1.1, 1.2.1, reserved, 1.3.1
Transmission system	R&S®DVMS-B55 model .02	SISO, MISO, non-T2, reserved
	R&S®DVMS-B55 model .03	SISO, MISO, non-T2, reserved LITE SISO, LITE MISO
FFT		1k, 2k, 4k, 8k, 16k, 32k
Bandwidth extension		on, off
Guard interval		1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128, reserved
Pilot pattern		PP1, PP2, PP3, PP4, PP5, PP6, PP7, PP8, reserved
Data symbols/frame		0 to 4095
Frames/superframe		2 to 255
PAPR		NONE, ACE, TR, ACE & TR, reserved
System ID		0x0000 to 0xFFFF
Cell ID		0x0000 to 0xFFFF
Network ID		0x0000 to 0xFFFF
S1		3 bit
S2		4 bit
L1 post constellation		BPSK, QPSK, 16QAM, 64QAM, reserved
L1 post code rate		1/2, reserved
L1 post FEC type		short (16k LDPC), reserved
L1 post extension		on, off
L1 post size		0 to 262143
L1 post info size		0 to 262143
L1 post scrambled	R&S®DVMS-B55 model .03	on, off
L1 repetition		on, off
Stream type		TS only, generic stream, TS and generic stream, reserved
TX ID availability		0x00 to 0xFF
Regeneration flag		0 to 7
Frequencies		0 to 7
RF index		0 to 7
T2 base lite	R&S®DVMS-B55 model .03	on, off
Reserved		0x00 to 0x3F
CRC32		0x00000000 to 0xFFFFFFFF
Detected PLP IDs		
Display and selection	combo box in the settings menu	1 to 255
PLP parameters (data PLP, common PLP)		
Number of PLPs	only data PLPs	1 to 255
PLP ID		0 to 255
Group ID		0 to 255
PLP type		common, type 1, type 2, reserved
PLP constellation		QPSK, QAM16, QAM64, QAM256
PLP rotation		on, off
PLP FEC type		short, normal, reserved
PLP code rate	R&S®DVMS-B55 model .02	1/2, 3/5, 2/3, 3/4, 4/5, 5/6, reserved
	R&S®DVMS-B55 model .03	1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 1/3, 2/5
PLP payload type		GFPS, GCS, GSE, TS, reserved
Time interleaver type		single, multiple
Time interleaver length		0 to 255
Maximum number of blocks		0 to 1023
PLP mode	valid for T2 version 1.2.1, decoded also with T2 version 1.1.1	NM, HEM, not specified

Static flag	valid for T2 version 1.2.1, decoded also with T2 version 1.1.1	on, off
Static padding flag	valid for T2 version 1.2.1, decoded also with T2 version 1.1.1	on, off
Fixed freq flag	TFS not supported	on, off
First RF index	TFS not supported	0 to 7
In-band signaling A		on, off
In-band signaling B	valid for T2 version 1.2.1, decoded also with T2 version 1.1.1	on, off
Reserved_1	11 bits for T2 version 1.2.1, masked also with T2 version 1.1.1	0x000 to 0x7FF
First frame index		0 to 255
Frame interval		0 to 255
Synchronization		
RF attenuation		0 dB to 50 dB
Automatic gain control (AGC)		OK, unlocked
Sideband position		normal, inverse, unlocked
Carrier		OK, unlocked
MPEG		OK, unlocked
Reference frequency		OK, unlocked
Monitoring		
Measurements		
Input level		lower, upper limit
Modulation error ratio (MER)		lower limit
BER before LDPC		upper limit
LDPC iterations		upper limit
BER before BCH		upper limit
BB frames after BCH		OK, errored
Frequency offset		lower, upper limit
Bit rate offset		lower, upper limit
Synchronization		
RF attenuation		lower, upper limit
Automatic gain control (AGC)		OK, unlocked
Sideband position		normal, inverse, unlocked
Carrier		OK, unlocked
MPEG		OK, unlocked
Reference frequency		OK, unlocked
Signal template		
Number of PLPs		OK, failed
L1 presignaling		
T2 version		OK, failed
Transmission system		OK, failed
FFT		OK, failed
Bandwidth extension		OK, failed
Guard interval		OK, failed
Pilot pattern		OK, failed
Data symbols/frame		OK, failed
Frames/superframe		OK, failed
PAPR		OK, failed
System ID		OK, failed
Cell ID		OK, failed
Network ID		OK, failed
S1		OK, failed
S2		OK, failed
L1 post constellation		OK, failed
L1 post code rate		OK, failed
L1 post FEC type		OK, failed
L1 post extension		OK, failed
L1 post size		OK, failed
L1 post info size		OK, failed
L1 repetition		OK, failed
Stream type		OK, failed
TX ID availability		OK, failed
Regeneration flag		OK, failed
Frequencies		OK, failed
RF index		OK, failed

Reserved		OK, failed
CRC32		OK, failed
PLP parameters (data PLP, common PLP)		
PLP ID		OK, failed
Group ID		OK, failed
PLP type		OK, failed
PLP constellation		OK, failed
PLP rotation		OK, failed
PLP FEC type		OK, failed
PLP code rate		OK, failed
PLP payload type		OK, failed
Time interleaver type		OK, failed
Time interleaver length		OK, failed
Maximum number of blocks		OK, failed
PLP mode		OK, failed
Static flag		OK, failed
Static padding flag		OK, failed
Fixed frequency flag		OK, failed
First RF index		OK, failed
In-band signaling A		OK, failed
In-band signaling B		OK, failed
Reserved_1		OK, failed
First frame index		OK, failed
Frame interval		OK, failed

DVB-T demodulator (R&S®DVMS-K53)

DVB-T activation for R&S®DVMS-B55.

Standard		DVB-T (ETSI EN 300744)
Modulation parameters		
Modulation		COFDM
FFT mode	automatic detection	2k, 8k
QAM order	automatic detection	4QAM, 16QAM, 64QAM
QAM hierarchy	automatic detection	none, α = 1, 2, 4
Guard interval	automatic detection	1/4, 1/8, 1/16, 1/32
Code rate	automatic detection	1/2, 2/3, 3/4, 5/6, 7/8
Channel bandwidth		6 MHz, 7 MHz, 8 MHz
Measurements		
RF input level		
Range	preselector on	–97 dBm to 0 dBm (typ.)
	preselector off	–90 dBm to 0 dBm (typ.)
Resolution		0.1 dB
Uncertainty	C/N ≥ 20 dB	≤ 1.5 dB
Modulation error ratio (MER)		
Range	standard	10 dB to 31 dB
	with R&S®DVMS-K59 option	10 dB to 35 dB (typ. 38 dB)
Resolution		0.1 dB
Uncertainty	10 dB ≤ MER ≤ 30 dB, echo-free reception	≤ 1.0 dB
	30 dB < MER ≤ 35 dB, echo-free reception	≤ 2.0 dB
BER before Viterbi	QPSK	$0.0; 1.2 \times 10^{-5}$ to 1.0×10^{-2}
	16QAM, non-hierarchical	$0.0; 1.2 \times 10^{-5}$ to 1.0×10^{-2}
	64QAM, non-hierarchical	$0.0; 1.2 \times 10^{-5}$ to 1.0×10^{-2}
BER before Reed-Solomon		$0.0; 1.1 \times 10^{-7}$ to 4.0×10^{-3}
Errored packets	number of errored TS packets per second	0 to 20001
Frequency offset		
Range		±200 kHz
Resolution		1 Hz
Uncertainty		uncertainty of reference freq. ± 1 digit
Bit rate offset		
Range		±50 ppm
Resolution		0.01 ppm
Uncertainty		uncertainty of reference freq. ± 1 digit
Constellation diagram		with standard-specific grid

TPS information		
FFT mode		value of FFT mode
Constellation		order of constellation
Guard interval		value of guard interval
Hierarchy		use of hierarchical transmission
Code rate		value of code rate
Cell ID		0x0000 to 0xFFFF
Time slicing	signaling only, DVB-H not supported	use of time slicing
MPE FEC	signaling only, DVB-H not supported	use of MPE FEC
In-depth interleaver	signaling only, DVB-H not supported	use of in-depth interleaving
Synchronization		
RF attenuation		0 dB to 50 dB
Automatic gain control (AGC)		OK, unlocked
Sideband position		normal, inverse, unlocked
Carrier		OK, unlocked
MPEG		OK, unlocked
Reference frequency		OK, unlocked
Monitoring		
Measurements		
Input level		lower, upper limit
Modulation error ratio (MER)		lower limit
BER before Viterbi		upper limit
BER before Reed-Solomon		upper limit
Errored packets	number of errored TS packets per second	upper limit
Frequency offset		lower, upper limit
Bit rate offset		lower, upper limit
Synchronization		
RF attenuation		lower, upper limit
Automatic gain control (AGC)		OK, unlocked
Sideband position		normal, inverse, unlocked
Carrier		OK, unlocked
MPEG		OK, unlocked
Reference frequency		OK, unlocked
Signal template		
FFT		OK, failed
Constellation		OK, failed
Guard interval		OK, failed
Hierarchy		OK, failed
Code rate		OK, failed
Cell ID		OK, failed
Time slicing	DVB-H	OK, failed
MPE FEC	DVB-H	OK, failed
In-depth interleaver	DVB-H	OK, failed

Spectrum and shoulder attenuation for R&S®DVMS-B55 (R&S®DVMS-K57)

Displays and monitors the channel spectrum.

Spectrum		
Measurements		graphical display of RF spectrum
Center frequency		channel center frequency
Span		12 MHz
Resolution bandwidth		10 kHz (equivalent noise bandwidth)
Displayed level		relative to channel level
Display range		+10 dB to −90 dB
Average		10 FFTs per reading, RMS averaged, additional moving average over 6 readings
Detector		max. peak, applied to averaged FFTs
Refresh rate		1 reading per second

Shoulder attenuation		
Measurements		attenuation of lower and upper shoulder in line with ETSI TR 101290
Resolution bandwidth		10 kHz (equivalent noise bandwidth)
Measurement range		10 dB to 52 dB
Resolution		0.1 dB
Uncertainty	10 dB ≤ shoulder attenuation ≤ 45 dB	≤ 2.0 dB
	45 dB ≤ shoulder attenuation ≤ 50 dB	≤ 3.0 dB
Monitoring		lower limits, separately selectable
Shoulder attenuation limits	lower and upper shoulder	0.0 dB to 60.0 dB

Echo pattern for R&S®DVMS-B55 (R&S®DVMS-K58)

Displays and monitors up to 16 impulses.

Measurements		graphical display and result chart of echo pattern
Processing time	depending on FFT size and pilot pattern	10 s to 25 s
Number of detected echoes		max. 16
Displayed level and delay/distance		relative to main echo
Detection threshold		–40 dB
Level		
Resolution		0.1 dB
Uncertainty	echo within guard interval	≤ 1.0 dB
Delay/distance		
Units		µs, km, miles
Range	DVB-T, 8 MHz channel bandwidth, 2k/k FFT size	70 µs/280 µs
	DVB-T2, depending on pilot pattern	up to guard interval/2 + symbol duration/6
Difference between two discernible echoes	DVB-T, 8 MHz channel bandwidth, echo pair with –20 dB	≥ 0.5 µs
	DVB-T2, 8 MHz channel bandwidth, echo pair with –20 dB	depending on SISO/MISO transmission system, FFT size and pilot pattern
	SISO	≥ 0.8 µs/0.4 µs/0.25 µs
	MISO	≥ 0.4 µs/0.25 µs
Resolution		0.01 µs/0.001 km/0.01 miles
Granularity		0.01 µs/0.003 km/0.002 miles
Uncertainty		≤ 0.05 µs/0.015 km/0.009 miles
Graphical display		
Markings		distance range, limits
Scaling of distance axis		automatically or manually selectable
Result chart		
Sorting		by level, delay, distance or number
Monitoring		
Level limits		0 dB to ±25 dB referenced to center position
Distance limits		0 s to ±50 µs referenced to center position
Center positions		–40 dB to +2 dB, –800 µs to 800 µs

High-quality MER measurements for R&S®DVMS-B55 (R&S®DVMS-K59)

Increases the modulation error ratio (MER) measurement range.

Modulation error ratio (MER) measurement [5]		
Range	standard (without R&S®DVMS-K59 option)	10 dB to 31 dB
	with R&S®DVMS-K59 option, except for PP8 with MISO	10 dB to 35 dB (typ. 38 dB)
	with R&S®DVMS-K59 option, only PP8 with MISO	10 dB to 31 dB

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[5] Valid for R&S®DVMS-K53 and R&S®DVMS-K54 in transmitter measurement application.

DVB-S/DVB-S2 receiver module (R&S®DVMS-B51)

Provides an RF input, a TS input and a TS output. The TS received via RF or via the TS input is present at the TS output.
In its basic version, the R&S®DVMS-B51 module supports monitoring of the RF signal. R&S®DVMS-K1 adds capability for
monitoring of TS characteristics. R&S®DVMS-K1 is also required for using the TS input.

Standard		• DVB-S (EN 300421) • DVB-S2 (EN 302307 broadcast services) • DIRECTV Legacy Modulation
Signal inputs		
RF input		
Number		1
Connector		type F (female), 75 Ω
Maximum RF input power	(32 channels at –23 dBm and 2 channels at –13 dBm)	–5 dBm
Frequency range		950 MHz to 2150 MHz
Frequency resolution		1 kHz
Rolloff	automatic selection in line with the selected standard	
DVB-S		0.35
DVB-S2		automatic selection
DIRECTV		0.20
Input level range		–60 dBm to –15 dBm
Modulation		QPSK, 8PSK, 16APSK, 32APSK
Code rate	DVB-S and DIRECTV	1/2, 2/3, 3/4, 5/6, 6/7, 7/8
	DVB-S2	1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
Symbol rate	DVB-S and DIRECTV	up to 45 Msymbol/s
	DVB-S2	up to 40 Msymbol/s
TS input		
Number		1
Connector		BNC, 75 Ω
Mode		ASI, SMPTE 310M (user-selectable)
ASI		packet length: 188/204/208 byte, in line with EN 50083-9 (2002)
SMPTE 310M		19.392658 Mbit/s, 188 byte, in line with BP 400 SMPTE
Maximum cable length		180 m
LNB control		detachable
Output voltage	vertical or horizontal polarization	13 V or 18 V
Output current limit		max. 700 mA
Mode		universal/DiSEqC1.0
Signal output		
TS output		
Number		1
Connector		BNC, 75 Ω
Mode	loop output of TS from RF or TS input	ASI, in line with EN 50083-9 (2002)
Measurements		
RF input level		±2 dB
Synchronization		OK, unlocked
Modulation error ratio (MER)		
Range		1.6 dB to 29.6 dB
Uncertainty		±2 dB
Carrier to noise (C/N)	derived from in-band measurement	
Range		2.0 dB to 30.0 dB
Uncertainty		±2 dB
E_b/N_o	derived from in-band measurement	
Range		1.0 dB to 27.0 dB
Uncertainty		±2 dB
BER before LDPC	DVB-S2	0.0; 4.0×10^{-7} to 5.8×10^{-2}
BER after LDPC	DVB-S2	0.0; 2.9×10^{-6} to 1.9×10^{-4}
BER before Viterbi	DVB-S/DIRECTV	0.0; 3.5×10^{-7} to 7.9×10^{-2}
BER after Viterbi	DVB-S/DIRECTV	0.0; 3.5×10^{-7} to 1.0×10^{-2}
PER		0 to 20000×10^{-6}
Constellation		order of constellation
Pilots	DVB-S2	on, off
Code rate		number of code rate

Spectrum		normal, inverted
Constellation diagram		with standard-specific grid
FEC frame	DVB-S2	normal, short
Monitoring		
Input level		lower/upper limit
Synchronization		
Carrier		OK, unlocked
Modulation error ratio (MER)		lower limit
Carrier to noise (C/N)		lower limit
E_b/N_o		lower limit
BER before LDPC	DVB-S2	upper limit
BER after LDPC	DVB-S2	upper limit
BER before Viterbi	DVB-S/DIRECTV	upper limit
BER after Viterbi	DVB-S/DIRECTV	upper limit
Packet error rate		upper limit
Signal template		
Constellation		OK, failed
Pilots	DVB-S2	OK, failed
Code rate		OK, failed
Spectrum		OK, failed
FEC frame		OK, failed

IP module (R&S®DVMS-B40)

The R&S®DVMS-B40 IP module provides two IP inputs/outputs and two TS inputs/outputs.
In its basic version, the R&S®DVMS-B40 IP module supports streaming of any internally available TS. The R&S®DVMS-K1 option adds capability for monitoring TS and IP characteristics. One R&S®DVMS-K1 option is required for each simultaneously monitored TS. The R&S®DVMS-K1 option is also required to use the TS inputs.

Incoming IP flows and outgoing IP flows cannot be operated simultaneously on the same interface.
The IP input on both interfaces should not contain flows other than those used for IP/TS analysis.

General interface data		
Number of IP interfaces		1 × RJ-45 (1000BASE-T) and 1 × SFP (SFP module not included)
Number of TS interfaces		2 × TS inputs/outputs, user-selectable
Maximum bit rate of all inputs used	sum of IP and TS inputs	up to 360 Mbit/s
IP interface 1000BASE-T		
Physical layer		IEEE 802.3 (1000BASE-T)
Data rate		10/100/1000 Mbit/s
Connector		RJ-45
IP interface SFP		
Physical layer		IEEE 802.3 (1000BASE-X)
Data rate		1000 Mbit/s
Connector		SFP module port
IP transmission protocols		
Version		IPv4
TS over IP encapsulation		in line with Pro-MPEG Code of Practice Release 2 and SMPTE 2022-1/2
Signaling		unicast, multicast
Transport of TS packets		UDP and UDP/RTP
Multicast		IGMPv3
TS inputs/outputs (user-selectable)		
Number		2
Connector		BNC, 75 Ω
TS input	ASI or SMPTE	packet length: 188/204/208 byte, ASI: in line with EN 50083-9 (2002), 19.392658 Mbit/s, 188 byte, SMPTE: in line with BP 400 SMPTE
Maximum cable length		180 m (590.55 ft)
Maximum bit rate of a single input		214 Mbit/s
TS output	ASI only	packet length: 188/204/208 byte, ASI: in line with EN 50083-9 (2002)
TS source		Incoming IP flow from 1000BASE-T, SFP or any TS input of R&S®DVMS
Maximum bit rate of a single output		214 Mbit/s

IP flows incoming		
Maximum number of incoming IP flows		4
Maximum bit rate of all incoming IP flows used		up to 360 Mbit/s
IP interface		1000BASE-T and/or SFP
Forward error correction (FEC)	2DFEC, L×D ≤ 100; FEC L: incoming IP flow port number + 2; FEC D: incoming IP flow port number + 4	FEC is automatically applied to incoming IP flow if FEC streams are available
IP flows outgoing		
Direction		TS → IP or IP → IP
Number of simultaneous outgoing IP flows		4
TS source		any TS applied to R&S®DVMS (ASI, RF, IP)
IP interface		1000BASE-T and/or SFP
Maximum bit rate of all outgoing IP flows used		up to 150 Mbit/s
Number of TS per IP packet		1 to 7
Forward error correction (FEC)	2D FEC in line with Pro-MPEG Code of Practice Release 2 and SMPTE 2022-1	off, L from 1 to 5, D from 1 to 20
Protocol		UDP or UDP/RTP
Time to live (TTL)		1 to 255
IP measurements		
Synchronization		loss after number of seconds, lock after number of seconds
IP bit rate		lower, upper limit
TS bit rate		lower, upper limit
Nominal TS bit rate	Derived from PCR	lower, upper limit
IP bandwidth utilization	percentage of maximum link speed	–
MDI-DF (delay factor)	according to RFC 4445	upper limit
MDI-MLR (media loss rate)	according to RFC 4445	upper limit
RTP inter-arrival jitter	according to RFC 3550	upper limit
IP channel information		
Source IP address		–
Destination IP address		–
Destination port		–
Protocol and data type		MPEG-2 TS UDP, MPEG-2 TS UDP/RTP
Forward error correction (FEC)	FEC is applied to IP input stream if available (on)	on, off
Number of TS packets		specified number of TS packets
Data length		lower, upper limit

Single TS input module (R&S®DVMS-B11), R&S®DVMS1 only

Provides TS input and TS output. The TS received via a TS input is present at the TS output. R&S®DVMS-K1 is required for using the TS input module.

Signal inputs		
TS input		
Number		1
Connector		BNC, 75 Ω
Mode		ASI, SMPTE 310M (user-selectable)
ASI		packet length: 188/204/208 byte, in line with EN 50083-9 (2002)
SMPTE 310M		19.392658 Mbit/s, 188 byte, in line with BP 400 SMPTE
Maximum cable length		180 m (590.55 ft)
Maximum bit rate		82 Mbit/s
Signal output		
TS output		
Number		1
Connector		BNC, 75 Ω
Mode	loop output of TS input	ASI only, in line with EN 50083-9 (2002)
Monitoring		
TS monitoring	R&S®DVMS-K1	one R&S®DVMS-K1 option required

Monitoring options

TS monitoring (R&S®DVMS-K1)

Supports TS monitoring for one TS received via RF or via a TS input.

Supported standards and additional views

Supported standards	independently selectable for every activated signal input	• DVB • ATSC • SCTE • ISDB-T • ISDB-T$_B$
Additional view	transport stream	• TS packet size (in byte) • cable equalizer status

DVB monitoring

TR 101 290 V1.2.1 – first priority monitoring		
TS synchronization	1 packet to 7 packets	loss after packets
	1 packet to 31 packets	lock after packets
Sync byte		• single byte invalid • successive bytes invalid
PAT	0.1 s to 9999.9 s	• upper repetition period • table ID • scrambled
Continuity count		• discontinuous packet order • packet occurs more than twice • packet lost • incorrect use of discontinuity flag
PMT	0.1 s to 9999.9 s	• upper repetition period • scrambled
PID distance	0.1 s to 9999.9 s	video – upper period
	0.1 s to 9999.9 s	audio – upper period
	0.1 s to 9999.9 s	data – upper period
	"excluding of PID" feature	up to 10 PID numbers

TR 101 290 V1.2.1 – second priority monitoring		
Transport		error indicator
CRC		CRC error in PSI/SI tables: PAT, CAT, PMT, NIT, BAT, SDT, EIT, TOT, SIT,TSDT, MIP, AIT
PCR discontinuity	1 ms to 99999 ms	upper limit
PCR repetition	1 ms to 99999 ms	lower period
	1 ms to 99999 ms	upper period
PCR jitter	10 ns to 999999 ns	upper limit
	profiles	• MGF1 (10 mHz) • MGF2 (100 mHz) • MGF3 (1 Hz)
	test mode	accuracy [6] overall jitter – including packet arrival time
PTS repetition	1 ms to 99999 ms	upper period
CAT	0.1 s to 9999.9 s	• missing • table ID

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[6] Recommended by TR 101 290 for monitoring.

TR 101 290 V1.2.1 – third priority monitoring		
SI repetition	1 ms to 9999 ms	PAT lower period
	limit is equal to limit of 1st priority PAT	PAT upper period
	1 ms to 9999 ms	CAT lower period
	limit is equal to limit of 1st priority CAT	CAT upper period
	1 ms to 9999 ms	PMT lower period
	limit is equal to limit of 1st priority PMT	PMT upper period
	1 ms to 9999 ms	NIT ACTUAL lower period
	0.1 s to 9999.9 s	NIT ACTUAL upper period
	1 ms to 9999 ms	NIT OTHER lower period
	0.1 s to 9999.9 s	NIT OTHER upper period
	1 ms to 9999 ms	SDT ACTUAL lower period
	0.1 s to 9999.9 s	SDT ACTUAL upper period
	1 ms to 9999 ms	SDT OTHER lower period
	0.1 s to 9999.9 s	SDT OTHER upper period
	1 ms to 9999 ms	BAT lower period
	0.1 s to 9999.9 s	BAT upper period
	1 ms to 9999 ms	EIT ACTUAL PF lower period
	0.1 s to 9999.9 s	EIT ACTUAL PRESENT upper period
	0.1 s to 9999.9 s	EIT ACTUAL FOLLOWING upper period
	1 ms to 9999 ms	EIT OTHER PF lower period
	0.1 s to 9999.9 s	EIT OTHER PRESENT upper period
	0.1 s to 9999.9 s	EIT OTHER FOLLOWING upper period
	1 ms to 9999 ms	RST lower period
	0.1 s to 9999.9 s	RST upper period
	1 ms to 9999 ms	TDT lower period
	0.1 s to 9999.9 s	TDT upper period
	1 ms to 9999 ms	TOT lower period
	0.1 s to 9999.9 s	TOT upper period
	1 ms to 9999 ms	AIT lower period
	0.1 s to 9999.9 s	AIT upper period
NIT ACTUAL	limit is equal to limit of SI repetition	repetition – lower period
	limit is equal to limit of SI repetition	repetition – upper period
		table ID
NIT OTHER	limit is equal to limit of SI repetition	repetition – lower period
	limit is equal to limit of SI repetition	repetition – upper period
SDT ACTUAL	limit is equal to limit of SI repetition	repetition – lower period
	limit is equal to limit of SI repetition	repetition – upper period
		table ID
SDT OTHER	limit is equal to limit of SI repetition	repetition – lower period
	limit is equal to limit of SI repetition	repetition – upper period
EIT ACTUAL	limit is equal to limit of SI repetition	PF repetition – lower period
	limit is equal to limit of SI repetition	present repetition – upper period
		following repetition – upper period
		table ID
EIT OTHER	limit is equal to limit of SI repetition	PF repetition – lower period
	limit is equal to limit of SI repetition	present repetition – upper period
		following repetition – upper period
EIT PRESENT/FOLLOWING		section missing
RST	limit is equal to limit of SI repetition	lower period
	limit is equal to limit of SI repetition	table ID
TDT	limit is equal to limit of SI repetition	lower period
	limit is equal to limit of SI repetition	upper period
		table ID
Unreferenced PID	0.1 s to 9999.9 s	waiting period after change in PMT or CAT
	"excluding of PID" feature	up to 10 PID numbers

ATSC and SCTE monitoring

MPEG/TS monitoring		
TS synchronization	1 packet to 7 packets	loss after packets
	1 packet to 31 packets	lock after packets
Sync byte		• single byte invalid • successive bytes invalid
Continuity count		• discontinuous packet order • packet occurs more than twice • packet lost • incorrect use of discontinuity flag
Transport		error indicator
CRC		• error in PAT • error in CAT • error in PMT • error in MGT • error in VCT • error in STT • error in RRT • error in EIT • error in ETT • error in CETT • error in DET • error in LTST • error in DCCT • error in DCCSCT
PID distance	0.1 s to 9999.9 s	video – upper period
	0.1 s to 9999.9 s	audio – upper period
	0.1 s to 9999.9 s	data – upper period
	"excluding of PID" feature	up to 10 PID numbers
Unreferenced PID	0.1 s to 9999.9 s	waiting period after change in PMT or CAT
	"excluding of PID" feature	up to 10 PID numbers

ATSC/PSIP monitoring		
PSIP basics		base PID
MGT	1 ms to 9999 ms	repetition – lower period
	1 ms to 9999 ms	repetition – upper period
VCT	1 ms to 9999 ms	CVCT repetition – lower period
	0.1 s to 9999.9 s	CVCT repetition – upper period
	1 ms to 9999 ms	TVCT repetition – lower period
	0.1 s to 9999.9 s	TVCT repetition – upper period
STT	1 ms to 9999 ms	repetition – lower period
	0.1 s to 9999.9 s	repetition – upper period
RRT	1 ms to 9999 ms	repetition – lower period
	0.1 s to 9999.9 s	repetition – upper period
ETI	1 ms to 9999 ms	EIT-0 repetition – lower period
	0.1 s to 9999.9 s	EIT-0 repetition – upper period
	1 ms to 9999 ms	EIT-1 repetition – lower period
	0.1 s to 9999.9 s	EIT-1 repetition – upper period
	1 ms to 9999 ms	EIT-2 repetition – lower period
	0.1 s to 9999.9 s	EIT-2 repetition – upper period
	1 ms to 9999 ms	EIT-3 repetition – lower period
	0.1 s to 9999.9 s	EIT-3 repetition – upper period
	1 ms to 9999 ms	EIT-4 to 127 repetition – lower period
	0.1 s to 9999.9 s	EIT-4 to 127 repetition – upper period
ETT	1 ms to 9999 ms	ETT-0 to 127 repetition – lower period
	0.1 s to 9999.9 s	ETT-0 to 127 repetition – upper period
CETT	1 ms to 9999 ms	repetition – lower period
	0.1 s to 9999.9 s	repetition – upper period
DET	1 ms to 9999 ms	DET-0 repetition – lower period
	0.1 s to 9999.9 s	DET-0 repetition – upper period
	1 ms to 9999 ms	DET-1 repetition – lower period
	0.1 s to 9999.9 s	DET-1 repetition – upper period
	1 ms to 9999 ms	DET-2 to 127 repetition – lower period
	0.1 s to 9999.9 s	DET-2 to 127 repetition – upper period

LTST	1 ms to 9999 ms	repetition – lower period
	0.1 s to 9999.9 s	repetition – upper period
DCCT	1 ms to 9999 ms	repetition – lower period
	0.1 s to 9999.9 s	repetition – upper period
DCCSCT	1 ms to 9999 ms	repetition – lower period
	0.1 s to 9999.9 s	repetition – upper period
PAT	0.1 s to 9999.9 s	• repetition – upper period • table ID • scrambled
CAT	0.1 s to 9999.9 s	• missing • table ID

Services I – monitoring		
PCR repetition	1 ms to 99999 ms	lower period
	1 ms to 99999 ms	upper period
PCR discontinuity	1 ms to 99999 ms	upper limit
PCR jitter	10 ns to 999999 ns	upper limit
	profiles	• MGF1 (10 mHz) • MGF2 (100 mHz) • MGF3 (1 Hz)
	test mode	• accuracy • overall jitter – including packet arrival time
PTS repetition	1 ms to 99999 ms (700 ms)	upper period
PMT	0.1 s to 9999.9 s	• upper period • scrambled

ISDB-T/ISDB-T$_B$ monitoring

TR 101 290 V1.2.1 – first priority monitoring		
TS synchronization	1 packet to 7 packets	loss after packets
	1 packet to 31 packets	lock after packets
Sync byte		• single byte invalid • successive bytes invalid
PAT	0.1 s to 9999.9 s	• upper repetition period • table ID • scrambled
Continuity count		• discontinuous packet order • packet occurs more than twice • packet lost • incorrect use of discontinuity flag
PMT	0.1 s to 9999.9 s	• upper repetition period • scrambled
PID distance	0.1 s to 9999.9 s	video – upper period
	0.1 s to 9999.9 s	audio – upper period
	0.1 s to 9999.9 s	data – upper period
	"excluding of PID" feature	up to 10 PID numbers

TR 101 290 V1.2.1 – second priority monitoring		
Transport		error indicator
CRC		CRC error in PSI/SI tables: PAT, CAT, PMT, NIT, BAT, SDT, H-EIT, M-EIT, L-EIT, TOT, SIT, AIT, DCT, PCAT, BIT, NBIT, LDT, CDT, LIT, ERT
PCR discontinuity	1 ms to 99999 ms	upper limit
PCR repetition	1 ms to 99999 ms	lower period
	1 ms to 99999 ms	upper period

PCR jitter	10 ns to 999999 ns	upper limit
	profiles	• MGF1 (10 mHz) • MGF2 (100 mHz) • MGF3 (1 Hz)
	test mode	• accuracy [7] • overall jitter – including packet arrival time
PTS repetition	1 ms to 99999 ms	upper period
CAT	0.1 s to 9999.9 s	missing
		table ID

TR 101 290 V1.2.1 – third priority monitoring		
SI repetition	1 ms to 9999 ms	PAT lower period
	limit is equal to limit of 1st priority PAT	PAT upper period
	1 ms to 9999 ms	CAT lower period
	limit is equal to limit of 1st priority CAT	CAT upper period
	1 ms to 9999 ms	PMT lower period
	limit is equal to limit of 1st priority PMT	PMT upper period
	1 ms to 9999 ms	NIT ACTUAL lower period
	0.1 s to 9999.9 s	NIT ACTUAL upper period
	1 ms to 9999 ms	NIT OTHER lower period
	0.1 s to 9999.9 s	NIT OTHER upper period
	1 ms to 9999 ms	SDT ACTUAL lower period
	0.1 s to 9999.9 s	SDT ACTUAL upper period
	1 ms to 9999 ms	SDT OTHER lower period
	0.1 s to 9999.9 s	SDT OTHER upper period
	1 ms to 9999 ms	BAT lower period
	0.1 s to 9999.9 s	BAT upper period
	1 ms to 9999 ms	H-EIT ACTUAL PF lower period
	0.1 s to 9999.9 s	H-EIT ACTUAL PRESENT upper period
	0.1 s to 9999.9 s	H-EIT ACTUAL FOLLOWING upper period
	1 ms to 9999 ms	H-EIT OTHER PF lower period
	0.1 s to 9999.9 s	H-EIT OTHER PRESENT upper period
	0.1 s to 9999.9 s	H-EIT OTHER FOLLOWING upper period
	1 ms to 9999 ms	M-EIT lower period
	0.1 s to 9999.9 s	M-EIT upper period
	1 ms to 9999 ms	L-EIT lower period
	0.1 s to 9999.9 s	L-EIT upper period
	1 ms to 9999 ms	RST lower period
	0.1 s to 9999.9 s	RST upper period
	1 ms to 9999 ms	TDT lower period
	0.1 s to 9999.9 s	TDT upper period
	1 ms to 9999 ms	TOT lower period
	0.1 s to 9999.9 s	TOT upper period
	1 ms to 9999 ms	AIT lower period
	0.1 s to 9999.9 s	AIT upper period
	0.1 s to 9999.9 s	PCAT lower period
	1 ms to 9999 ms	PCAT upper period
	0.1 s to 9999.9 s	BIT lower period
	1 ms to 9999 ms	BIT upper period
	0.1 s to 9999.9 s	NBIT(body) lower period
	1 ms to 9999 ms	NBIT(body) upper period
	0.1 s to 9999.9 s	NBIT(ref) lower period
	1 ms to 9999 ms	NBIT(ref) upper period
NIT ACTUAL	limit is equal to limit of SI repetition	repetition – lower period
	limit is equal to limit of SI repetition	repetition – upper period
		table ID
NIT OTHER	limit is equal to limit of SI repetition	repetition – lower period
	limit is equal to limit of SI repetition	repetition – upper period

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[7] Recommended by TR 101 290 for monitoring.

SDT ACTUAL	limit is equal to limit of SI repetition	repetition – lower period
	limit is equal to limit of SI repetition	repetition – upper period
		table ID
SDT OTHER	limit is equal to limit of SI repetition	repetition – lower period
	limit is equal to limit of SI repetition	repetition – upper period
H-EIT ACTUAL	limit is equal to limit of SI repetition	PF repetition – lower period
	limit is equal to limit of SI repetition	present repetition – upper period
		following repetition – upper period
		table ID
H-EIT OTHER	limit is equal to limit of SI repetition	PF repetition – lower period
	limit is equal to limit of SI repetition	present repetition – upper period
		following repetition – upper period
H-EIT PRESENT/FOLLOWING		section missing
M-EIT	limit is equal to limit of SI repetition	PF repetition – lower period
	limit is equal to limit of SI repetition	present repetition – upper period
		following repetition – upper period
L-EIT	limit is equal to limit of SI repetition	PF repetition – lower period
	limit is equal to limit of SI repetition	present repetition – upper period
		following repetition – upper period
RST	limit is equal to limit of SI repetition	lower period
	limit is equal to limit of SI repetition	table ID
TDT	limit is equal to limit of SI repetition	lower period
	limit is equal to limit of SI repetition	upper period
		table ID
Unreferenced PID	0.1 s to 9999.9 s	waiting period after change in PMT or CAT
	"excluding of PID" feature	up to 10 PID numbers

Advanced TS monitoring (R&S®DVMS-K11)

Enhances R&S®DVMS-K1 by adding further measurements and log functions.

Supported standards and additional functions

Supported standards		• DVB • ATSC • SCTE • ISDB-T • ISDB-T$_B$
Monitoring log functions		
Hiding of events	number of hidden event definitions	up to 200
	event filter	• top-level monitoring parameter • PID
	hiding time	• 0 s to 99999999 s • infinite
Event log navigator	log filter	• top-level monitoring parameter • PID • service

DVB monitoring

Extended checks I – bit rate monitoring		
TS	0 bit/s to 216 Mbit/s	lower/upper bit rate
Service	0 bit/s to 200 Mbit/s	lower/upper bit rate
Video	0 bit/s to 200 Mbit/s	lower/upper bit rate
Audio	0 bit/s to 200 Mbit/s	lower/upper bit rate
Other	0 bit/s to 200 Mbit/s	lower/upper bit rate
Null packet	0 bit/s to 200 Mbit/s	lower/upper bit rate
PAT	0 bit/s to 200 Mbit/s	lower/upper bit rate
PMT	0 bit/s to 200 Mbit/s	lower/upper bit rate
CAT	0 bit/s to 200 Mbit/s	lower/upper bit rate
NIT ACTUAL	0 bit/s to 200 Mbit/s	lower/upper bit rate
NIT OTHER	0 bit/s to 200 Mbit/s	lower/upper bit rate
BAT	0 bit/s to 200 Mbit/s	lower/upper bit rate
SDT ACTUAL	0 bit/s to 200 Mbit/s	lower/upper bit rate
SDT OTHER	0 bit/s to 200 Mbit/s	lower/upper bit rate
EIT ACTUAL PF	0 bit/s to 200 Mbit/s	lower/upper bit rate
EIT ACTUAL schedule	0 bit/s to 200 Mbit/s	lower/upper bit rate

EIT OTHER PF	0 bit/s to 200 Mbit/s	lower/upper bit rate
EIT OTHER schedule	0 bit/s to 200 Mbit/s	lower/upper bit rate
TDT	0 bit/s to 200 Mbit/s	lower/upper bit rate
TOT	0 bit/s to 200 Mbit/s	lower/upper bit rate
RST	0 bit/s to 200 Mbit/s	lower/upper bit rate
MIP	0 bit/s to 200 Mbit/s	lower/upper bit rate
AIT	0 bit/s to 200 Mbit/s	lower/upper bit rate
For all bit rate measurements	"excluding of PID" feature	10 PIDs
	individual measurement profiles for each measurement	for available profiles, see section "Bit rate measurement profiles" (page 40)

Extended checks II – monitoring		
SFN synchronization (in line with TR 101 290 chapter 9.2.1)		- presence – more than one MIP - presence – megaframe without MIP - structure – invalid MIP TS header - structure – inconsistent length field - structure – setting of max. delay out of range - structure – synchronization time stamp - structure – CRC error in MIP - pointer – does not match location of MIP - periodicity – unperiodic MIP insertion - periodicity – MIP pointer not constant
	0 µs to 500000.0 µs	timing – max. deviation
	0 bit/s to 1000000 bit/s	bit rate – inconsistency
SFN synchronization (extended to TR 101 290 chapter 9.2.1)	0 µs to 1000000.0 µs	network delay – upper limit
	0 µs to 1000000.0 µs	network delay – lower limit
		network delay – loss of 1PPS reference
TS ID match	0 to 65535	specified TS ID
TS modification		- change of TS ID - additional service - service disappeared - additional element - element disappeared - change of element stream type - change of PCR PID
CA alternation		- CA flag on - CA flag off - alternation of key
PTS/PCR delay	0 ms to +999999 ms	lower limit
	0 ms to +999999 ms	upper limit
DVB-H	0 bit/s to 200 Mbit/s	constant bit rate lower than specified
	0 bit/s to 200 Mbit/s	constant bit rate higher than specified
	0 bit/s to 200 Mbit/s	burst peak bit rate lower than specified
	0 bit/s to 200 Mbit/s	burst peak bit rate higher than specified
	0 µs to 99.9 s	burst off-time longer than specified
	0 % to 99 %	estimated power saving lower than specified
	–9999 ms to +9999 ms	min. delta-T margin lower than specified
	–9999 ms to +9999 ms	max. delta-T margin higher than specified
		IP packet error before MPE FEC

ATSC and SCTE monitoring

Services II – bit rate monitoring		
TS	0 bit/s to 216 Mbit/s	lower/upper bit rate
Service	0 bit/s to 200 Mbit/s	lower/upper bit rate
Video	0 bit/s to 200 Mbit/s	lower/upper bit rate
Audio	0 bit/s to 200 Mbit/s	lower/upper bit rate
Other	0 bit/s to 200 Mbit/s	lower/upper bit rate
Null packet	0 bit/s to 200 Mbit/s	lower/upper bit rate
PAT	0 bit/s to 200 Mbit/s	lower/upper bit rate
PMT	0 bit/s to 200 Mbit/s	lower/upper bit rate
CAT	0 bit/s to 200 Mbit/s	lower/upper bit rate
MGT	0 bit/s to 200 Mbit/s	lower/upper bit rate
CVCT	0 bit/s to 200 Mbit/s	lower/upper bit rate
TVCT	0 bit/s to 200 Mbit/s	lower/upper bit rate
STT	0 bit/s to 200 Mbit/s	lower/upper bit rate
RRT	0 bit/s to 200 Mbit/s	lower/upper bit rate
EIT	0 bit/s to 200 Mbit/s	lower/upper bit rate
ETT	0 bit/s to 200 Mbit/s	lower/upper bit rate
CETT	0 bit/s to 200 Mbit/s	lower/upper bit rate
DET	0 bit/s to 200 Mbit/s	lower/upper bit rate
LTST	0 bit/s to 200 Mbit/s	lower/upper bit rate
DCCT	0 bit/s to 200 Mbit/s	lower/upper bit rate
DCCSCT	0 bit/s to 200 Mbit/s	lower/upper bit rate
For any bit rate monitoring	"excluding of PID" feature	10 PIDs
	separate measurement profiles for each measurement	for available profiles, see section "Bit rate measurement profiles" (page 40)
Extended monitoring		
TS modification		• change of TS ID • additional service • service disappeared • additional element • element disappeared • change of element stream type • change of PCR PID
TS ID match	0 to 65535	specified TS ID
CA alternation		• CA flag on • CA flag off

ISDB-T/ISDB-T$_B$ monitoring

Extended checks I – bit rate monitoring		
TS	0 bit/s to 216 Mbit/s	lower/upper bit rate
Service	0 bit/s to 200 Mbit/s	lower/upper bit rate
Video	0 bit/s to 200 Mbit/s	lower/upper bit rate
Audio	0 bit/s to 200 Mbit/s	lower/upper bit rate
Other	0 bit/s to 200 Mbit/s	lower/upper bit rate
Null packet	0 bit/s to 200 Mbit/s	lower/upper bit rate
PAT	0 bit/s to 200 Mbit/s	lower/upper bit rate
PMT	0 bit/s to 200 Mbit/s	lower/upper bit rate
CAT	0 bit/s to 200 Mbit/s	lower/upper bit rate
NIT ACTUAL	0 bit/s to 200 Mbit/s	lower/upper bit rate
NIT OTHER	0 bit/s to 200 Mbit/s	lower/upper bit rate
BAT	0 bit/s to 200 Mbit/s	lower/upper bit rate
SDT ACTUAL	0 bit/s to 200 Mbit/s	lower/upper bit rate
SDT OTHER	0 bit/s to 200 Mbit/s	lower/upper bit rate
H-EIT ACTUAL PF	0 bit/s to 128 Mbit/s	lower/upper bit rate
H-EIT ACTUAL schedule basic	0 bit/s to 128 Mbit/s	lower/upper bit rate
H-EIT ACTUAL schedule extended	0 bit/s to 128 Mbit/s	lower/upper bit rate
H-EIT OTHER PF	0 bit/s to 128 Mbit/s	lower/upper bit rate
H-EIT OTHER schedule basic	0 bit/s to 128 Mbit/s	lower/upper bit rate
H-EIT OTHER schedule extended	0 bit/s to 128 Mbit/s	lower/upper bit rate
M-EIT	0 bit/s to 128 Mbit/s	lower/upper bit rate
L-EIT	0 bit/s to 128 Mbit/s	lower/upper bit rate
TDT	0 bit/s to 200 Mbit/s	lower/upper bit rate
TOT	0 bit/s to 200 Mbit/s	lower/upper bit rate
RST	0 bit/s to 200 Mbit/s	lower/upper bit rate
AIT	0 bit/s to 200 Mbit/s	lower/upper bit rate
DCT	0 bit/s to 128 Mbit/s	lower/upper bit rate
PCAT	0 bit/s to 128 Mbit/s	lower/upper bit rate
BIT	0 bit/s to 128 Mbit/s	lower/upper bit rate
NBIT(body)	0 bit/s to 128 Mbit/s	lower/upper bit rate
NBIT(reference)	0 bit/s to 128 Mbit/s	lower/upper bit rate
LDT	0 bit/s to 128 Mbit/s	lower/upper bit rate
CDT	0 bit/s to 128 Mbit/s	lower/upper bit rate
LIT	0 bit/s to 128 Mbit/s	lower/upper bit rate
ERT	0 bit/s to 128 Mbit/s	lower/upper bit rate
DCT	0 bit/s to 128 Mbit/s	lower/upper bit rate
LIT	0 bit/s to 128 Mbit/s	lower/upper bit rate
ERT	0 bit/s to 128 Mbit/s	lower/upper bit rate
For all bit rate measurements	"excluding of PID" feature	10 PIDs
	individual measurement profiles for each measurement	for available profiles, see section "Bit rate measurement profiles" (page 40)

Extended checks II – monitoring		
TS ID match	0 to 65535	specified TS ID
TS modification		• change of TS ID • additional service • service disappeared • additional element • element disappeared • change of element stream type • change of PCR PID
CA alternation		• CA flag on • CA flag off • alternation of key

T2-MI extension(R&S®DVMS-K3)

The R&S®DVMS-K3 option extends the R&S®DVMS to include transport streams containing T2-MI streams. The demultiplexing of the T2-MI packets enables measurements and analysis on all three layers (TS, T2-MI, PLP). The measurement parameters on the T2-MI layer are in line with DVB Document A14-1.

Features, functions and options applicable to T2-MI streams

Feature	Function	Option
T2-MI monitoring		
Amendment to ETSI TR 101290 for T2-MI (DVB Document A14-1)	T2-MI: monitoring of recommended parameters	R&S®DVMS-K1
T2-MI, TS and PLP monitoring		
Bit rate monitoring	monitoring of bit rates	R&S®DVMS-K11
TS/PLP monitoring		
TR 101290 priority 1, 2 and 3 monitoring	TS/PLP: monitoring of all TR 101290 priority 1, 2 and 3 parameters	R&S®DVMS-K1
Encryption monitoring	monitoring of status and CA alternation	
TS modification	detection of changes in transport stream	
EIT monitoring	monitoring of presence of EIT tables according to the signaling in SDT tables and template definitions	R&S®DVMS-K1/-K12
TS template monitoring	comparison of TS characteristics with predefined values	R&S®DVMS-K12
T2-MI, TS and PLP analysis		
Interpreter	display of original and interpreted header information and content of T2-MI packets	R&S®DVMS-K20
PLP analysis		
Thumbnail display	display of small videos with low frame rate for all unencrypted services and additional program details of the selected data PLP	R&S®DVMS-K17
PCR analysis	analysis of PCR accuracy, overall jitter, drift, offset and distance	R&S®DVMS-K19
PTS analysis	analysis of PTS to PCR difference and PTS distance	
Buffer	analysis of video and audio ES according to the T-STD buffer model	R&S®DVMS-K24
qPSNR analysis	analysis of the video coding quality of MPEG-2 or MPEG-4/AVC/H.264 SDTV and HDTV video	R&S®DVMS-K21
Carousel and MPE analysis	analysis of DVB broadcast protocols	R&S®DVMS-K22

Feature	Function	Option
Views and displays		
Site tree	status overview of all inputs, input selection	basic functions
T2-MI tree	display of T2-MI elements in tree structure	
	error indication	
	PLP selection	
PLP tree	display of transport stream elements of selected PLP	
	error indication	
	element selection	
Statistics and log	error second counters for top-level monitoring parameters; detailed report entries for monitoring results	
Bit rate	display of bit rates (bargraph displays)	
Table repetition	display of table repetition (bargraph displays)	
PID utilization	visualization of TS packet distribution within TS or selected PLP	
Miscellaneous		
TS capture	event-controlled recording of TS segments or PLPs to hard disk (null packets are not recorded in the case of PLP)	R&S®DVMS-K18
Logging to file	logging of report entries to hard disk (for T2-MI layer or PLP layer)	basic functions
Video decode	software decoder (VLC for decoding MPEG-2 or MPEG-4/AVC/H.264 SDTV and HDTV video/audio streams)	

Monitoring functions

TS layer

Defined in the amendment to ETSI TR 101290 for T2-MI (DVB Document A14-1: 11.2.5).

TS synchronization	TS synchronization 1 packet to 7 packets	loss after packets
	1 packet to 31 packets	lock after packets
Sync byte		• single byte invalid • successive bytes invalid
PAT	0.1 s to 9999.9 s	upper repetition period
		table ID
		scrambled
Continuity count		• discontinuous packet order • packet occurs more than twice • packet lost • incorrect use of discontinuity flag
PMT	0.1 s to 9999.9 s	upper repetition period
		scrambled
Transport		error indicator
CRC		CRC error in PSI/SI tables PAT, PMT, CAT
PCR discontinuity	1 ms to 99999 ms	upper limit
PCR repetition	1 ms to 99999 ms	lower period
	1 ms to 99999 ms	upper period
PCR jitter	10 ns to 999999 ns	upper limit
	profiles	• MGF1 (10 mHz) • MGF2 (100 mHz) • MGF3 (1 Hz)
	test mode	• accuracy • overall jitter – including packet arrival time
Unreferenced PID	0.1 s to 9999.9 s	waiting period after change in PMT

Bit rate	0 bit/s to 216 Mbit/s	TS lower/upper bit rate
	0 bit/s to 216 Mbit/s	T2-MI TS lower/upper bit rate
	0 bit/s to 216 Mbit/s	PID lower/upper bit rate
	0 bit/s to 216 Mbit/s	null packet lower/upper bit rate
	0 bit/s to 216 Mbit/s	PAT lower/upper bit rate
	0 bit/s to 216 Mbit/s	PMT lower/upper bit rate

T2-MI packet layer

Defined in the amendment to ETSI TR 101290 for T2-MI (DVB Document A14-1).

Packet type	DVB Document A14-1: 11.2.2.1	missing
	DVB Document A14-1: 11.2.2.2	wrong number of BB frames
Packet count	DVB Document A14-1: 11.2.2.3	packet order discontinuity
CRC	DVB Document A14-1: 11.2.2.4	content of T2-MI packet corrupted
Payload	DVB Document A14-1: 11.2.2.5	wrong PLP ID
PLP num blocks	DVB Document A14-1: 11.2.2.6	wrong number of BB frame packets
Transmission order	DVB Document A14-1: 11.2.2.7	wrong order
Timestamp	DVB Document A14-1: 11.2.2.8	different timestamp within superframe
	DVB Document A14-1: 11.2.2.9	discontinuity
Frame length	DVB Document A14-1: 11.2.2.10	longer than 250 ms
Consistency	DVB Document A14-1: 11.2.4.1	bit rate too high for configured parameters
	DVB Document A14-1: 11.2.4.2	wrong leap second value

PLP layer

Depending on the type of PLP (dataPLP in multiple PLP stream, commonPLP, data PLP in single PLP stream), all applicable baseband parameters are monitored. See description of R&S®DVMS-K1, R&S®DVMS-K11 and R&S®DVMS-K12 in R&S®DVMS data sheet.

TS template monitoring (R&S®DVMS-K12)

Enhances R&S®DVMS-K1 by adding the capability to compare the characteristics of the received TS with locally stored definitions.

Supported standards		• DVB • ATSC • SCTE • ISDB-T • ISDB-T$_B$
Definable characteristics		
Transport stream	0 to 65535	TS ID
	0 to 65535	network ID
	0 to 65535	original network ID
	0 bit/s to 214 Mbit/s	lower bit rate
	0 bit/s to 214 Mbit/s	upper bit rate
EMM	0 to 8191	PID
	mandatory, optional, not allowed	constraint
	0 bit/s to 214 Mbit/s	lower bit rate
	0 bit/s to 214 Mbit/s	upper bit rate
User private data	0 to 8191	PID
	optional, not allowed	constraint
	0 bit/s to 214 Mbit/s	lower bit rate
	0 bit/s to 214 Mbit/s	upper bit rate
Unreferenced PIDs	0 to 8191	PID
	optional, not allowed	constraint
	0 bit/s to 214 Mbit/s	lower bit rate
	0 bit/s to 214 Mbit/s	upper bit rate
Null packets	0 bit/s to 214 Mbit/s	lower bit rate
	0 bit/s to 214 Mbit/s	upper bit rate
Table	0 to 8191	PID
	0 to 255	table ID
	0 bit/s to 214 Mbit/s	lower bit rate
	0 bit/s to 214 Mbit/s	upper bit rate

Services	0 to 65535	service ID
	mandatory, optional, not allowed	• constraint • service name
	0 to 8191	PCR PID
	0 to 8191	PMT PID
	0 bit/s to 214 Mbit/s	lower bit rate
	0 bit/s to 214 Mbit/s	upper bit rate
Elementary stream	0 to 8191	PID
	mandatory, optional, not allowed	constraint
	about 50 different types (see below)	type
	yes, no	conditional access
	0 bit/s to 214 Mbit/s	lower bit rate
	0 bit/s to 214 Mbit/s	upper bit rate
Parental rating [8]	3 letters	country code
	undefined, age (4 to 18), user-defined (16 to 256)	rating
ECMs	0 to 8191	PID
	mandatory, optional, not allowed	constraint
	0 bit/s to 214 Mbit/s	lower bit rate
	0 bit/s to 214 Mbit/s	upper bit rate
EIT present/following [9]	1 to 999999	upper repetition period
EIT scheduled (1 to 16) [9]	1 to 999999	upper repetition period
H-EIT present/following [10]	1 to 999999	upper repetition period
H-EIT scheduled basic (1 to 8) [10]	1 to 999999	upper repetition period
H-EIT scheduled extended (1 to 8) [10]	1 to 999999	upper repetition period
M-EIT present/following [10]	1 to 999999	upper repetition period
L-EIT present/following [10]	1 to 999999	upper repetition period
Bit rate monitoring	selection of individual profile for each element	for available profiles, see section "Bit rate measurement profiles" (page 40)

Supported elementary stream types:
Video MPEG-1, Video MPEG-2, Audio MPEG-1, Audio MPEG-2, Private Data, PES Private Data, MHEG ISO/IEC13 522, DMS ISO/IEC 13818-1, ATM Specific ITU-T Rec. H.222.1, DMS_CC ISO/IEC 13818-6 type A, DMS_CC ISO/IEC 13818-6 type B, DMS_CC ISO/IEC 13818-6 type C, DMS_CC ISO/IEC 13818-6 type D, Auxiliary ISO/IEC 13818-1, Audio ADTS ISO/IEC 13818-1, Visual ISO/IEC 14496-2, Audio LATM ISO/IEC 14496-3, PES Flex. Mux. ISO/IEC 14496-1, Section Flex. Mux. ISO/IEC 14496-1, Synchr. Download Protocol ISO/IEC 13818, PES Metadata, Section Metadata, Data Carousel Metadata, Object Carousel Metadata, Synchr. Download Protocol Metadata, IPMP Stream ISO/IEC 13818-11, Video AVC ISO/IEC14496-10, User Private Stream, VBI Data, VBI Teletext, Subtitling, Audio AC3, Audio Enhanced AC3, AIT, Audio DTS, Audio AAC, Data Piping, Data Asynchronous Streaming, Data Synchronized Streaming, Data Multiprotocol Encapsulation, Data Carousel, Data Object Carousel, Data DVB ATM Stream, Data Higher Protocol, Data System Software Update (UNT), Data IP/MAC Notification (INT), Data MHP Object Carousel, Data MHP Multiprotocol Encapsulation, Data DVB-H

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[8] Applicable with DVB, ISDB-T, ISDB-T$_B$ only.

[9] Applicable with DVB only.

[10] Applicable with ISDB-T, ISDB-T$_B$ only.

TS capture (R&S®DVMS-K18)

Supports TS recording with user-definable trigger functionality.

Supported TS packet length		188 byte, 204 byte or 208 byte per packet
Capture modes		• recording of a transport stream at a single TS input • simultaneous recording of multiple transport streams at up to 2 inputs • recording of a complete transport stream or individual PIDs or services • triggered recording (trigger on error) with extensive trigger capabilities
Size	capture of single TS input	up to 384 Mbyte per TS file
	simultaneous capture of multiple TS inputs	up to 96 Mbyte per TS file
Capture trigger		• trigger once or repeatedly (up to 1000 times) • manual • monitoring event (parameter) • event class • virtual alarm line
File formats		• TS packet raw data • TS packet with packet counter • TS packet with 90 MHz reference clock

Examples of recording times of selected data rates (file format: TS packet raw data).

	TS bit rate			
Memory	10 Mbit/s	14 Mbit/s	39 Mbit/s	54 Mbit/s
96 Mbyte	81 s	57 s	21 s	15 s
384 Mbyte	322 s	230 s	83 s	60 s

Analysis

EPG display (R&S®DVMS-K16)

Adds an electronic program guide showing all signaled events of the actual and other TS.

Supported standards		• DVB • ATSC
Evaluated tables	all transmitted EIT tables	• actual and other TS • present/following and scheduled
Displays		• EPG tree for actual and other TS • timeline display of all EPG services • detailed event information on single service

Thumbnail display (R&S®DVMS-K17)

Adds a thumbnail display showing a small video with lower frame rate for all clear services and additional program details of one selected TS.

Supported formats	video	• MPEG-2 SDTV and HDTV • MPEG-4/AVC/H.264 SDTV and HDTV
	audio	• MPEG-1/2 (mono, stereo) • Dolby Digital™
Displays	mosaic	video displays
	EPG	video displays with current program information
	detail	video displays with video and audio stream info, including graphic audio level indication

PCR/PTS analysis (R&S®DVMS-K19)

Adds detailed analysis of PCR and PTS values.

Supported standards		• DVB • ATSC • SCTE • ISDB-T • ISDB-T_B
PCR analysis	applicable profiles: • MGF1 (10 mHz) • MGF2 (100 mHz) • MGF3 (1 Hz)	graphic display of PCR overall jitter, PCR accuracy, PCR frequency drift or PCR offset (up to 10 minutes), graphic display of PCR repetition (up to 10 minutes), long-term determination of min./max. peak values
PTS analysis		graphic display of PTS/PCR delay (up to 10 minutes), graphic display of PTS repetition (up to 10 minutes), long-term determination of min./max. peak values

Interpreter (R&S®DVMS-K20)

Displays the next packet/table received with manual (snapshot) or automatic update (continuous).

Supported standards		• DVB • ATSC • SCTE • ISDB-T • ISDB-T$_B$
Transport stream packet		
Supported standards		ISO/IEC 13818-1 (TS packet layer, chapter 2.4.3.2)
Applicable filter	combinations possible	• any element of the TS tree • payload unit start indicator • adaptation field control
Function		display of TS packet in hex and ASCII interpretation of TS header
PES packet		
Supported standards	video, audio or data content	ISO/IEC 13818-1 (PES packet, chapter 2.4.3.6)
Applicable filter		any element of the TS tree
Function		display of PES packet in hex and ASCII interpretation of PES packet header
Table section		
Supported standards	MPEG	ISO/IEC 13818-1 (program-specific information, chapter 2.4.4)
	DVB	ETSI 300 468 (DVB service information)
	ATSC	ATSC A/65 (program and system information protocol)
	ISDB-T	ARIB STD-B10 version 4.6
	ISDB-T$_B$	ABNT NBR 15603-2/-3
Applicable filter		• any element of the TS tree • table ID, table ID extension, section number
Function		display of table section in hex/bin and ASCII, interpretation of table section

qPSNR analysis (R&S®DVMS-K21)

Measures the quasi-peak signal-to-noise ratio (qPSNR) of video streams. This single-ended measurement is performed in order to analyze the video coding quality.

Supported streams (PES)		• MPEG-2 SDTV and HDTV • MPEG-4/AVC/H.264 SDTV and HDTV
Data display		graphic display of qPSNR values over time histogram
Video recording		automatic if defined qPSNR limit is violated
Replay of recorded video streams		integrated software player
Save and load of qPSNR analysis data		• qPSNR values over time • limit violation descriptions • recorded video streams

Carousel and MPE analysis (R&S®DVMS-K22)

Adds detailed analysis of DVB data broadcast protocols.

Supported DVB data broadcast protocols					
	Data piping	**Data streaming**	**MPE**	**Data carousel**	**Object carousel**
Overview	display of descriptors used and name of tables containing the descriptors				
Interpreter	TS header	PES header	section	section (DSI, DII and DDB header)	
Raw data	content of TS packet	content of PES packet	content of section	content of DDB section	
Timing measurements	bit rate of ES; repetition time of payload unit start indicators	bit rate of PES; repetition time of PES header	bit rate of selected section; repetition time of selected section	bit rate of selected module, DSI, DII section; repetition time of selected DII, DSI section; loading time of selected module	

DVB-H analysis (R&S®DVMS-K23)

Adds detailed analysis of DVB-H services.

Supported standards		DVB-H
ESG service view	supported ESG types: IPDC in line with DVB (ETSI TS 102471/ encapsulated textual ESGXML fragment) BCAST in line with OMA (service guide for mobile broadcast services)	• ESG type • name of network provider • DVB-H services • current transmissions • planned transmissions

ESG transport analysis	supported ESG types: IPDC in line with DVB (ETSI TS 102471/ encapsulated textual ESGXML fragment) BCAST in line with OMA (service guide for mobile broadcast services)	• bootstrap FLUTE session
		• ESG FLUTE sessions with
		  − containers
		  − pictures
		  − SDP files
		  − saving of extracted ESG files to hard drive

Burst timing		• burst duration • burst cycle time • maximum and minimum of signaled delta-T margin • burst bit rate • burst peak bit rate • constant bit rate • burst total size • burst IP payload
FEC analysis		• FEC usage • number of rows • number of padding columns • number of puncturing bytes • burst FEC code rate • receiver on-time and off-time • power saving from start • DVB-H encapsulation overhead • erroneous rows before and after FEC decoding • frame error rate (FER) • MPE frame error rate (MFER) • correct IP packets before and after FEC • erroneous IP packets before and after FEC • IP packet error rate before and after FEC • IP packet error rate before FEC from start
Decoding		• display of DVB-H content via VLC • zoom function (50 % to 200 %) • data cache from 0.3 s to 15 s

Buffer analysis (R&S®DVMS-K24)

Adds video and audio ES analysis according to the T-STD buffer model as defined in ISO/IEC 13818-1.

Supported streams (PES)	video	• MPEG-2 SDTV and HDTV • MPEG-4/AVC/H.264 SDTV and HDTV • HEVC/H.265 HDTV (single layer)
	audio	MPEG-1/2 (mono, stereo)
Supported methods		• leak method • VBV/HRD method
Data display	graphs	• display of transport buffer, multiplex buffer and elementary buffer values over time (up to 10 minutes) • long-term determination of min./max. peak values
	buffer model info	summarized information of buffer fullness, bit rates, data delay and elementary stream info

Appendix

Bit rate measurement profiles

Profiles from the following list can be selected for bit rate measurements.

Profile name	Referenced data per TS packet	Measurement interval	Averaging time
MGB1	payload	1 s	1 s
MGB1A	payload	1 s	10 s
MGB1B	payload	1 s	30 s
MGB2	payload	100 ms	1 s
MGB2A	payload	100 ms	100 ms
MGB2B	payload	100 ms	500 ms
MGB5	payload	1 s	5 s
MGB5A	payload	2 s	60 s
MGB5B	payload	3 s	90 s
MGB5C	payload	4 s	120 s
MGB5D	payload	5 s	150 s
MGB5E	payload	10 s	300 s
MGB1	188	1 s	1 s
MGB1A	188	1 s	10 s
MGB1B	188	1 s	30 s
MGB2	188	100 ms	1 s
MGB2A	188	100 ms	100 ms
MGB2B	188	100 ms	500 ms
MGB5	188	1 s	5 s
MGB5A	188	2 s	60 s
MGB5B	188	3 s	90 s
MGB5C	188	4 s	120 s
MGB5D	188	5 s	150 s
MGB5E	188	10 s	300 s

Channel switching times (scheduler suite)

Channel switching time		
DVB-T	R&S®DVMS-B55	11 s
DVB-T2	R&S®DVMS-B55	14 s
DVB-S/DVB-S2	R&S®DVMS-B51	10 s
Minimal settable measurement time		3 s

License information

The firmware of this device contains open source software. Details on the open source software packages used and the license agreements are provided in the release notes.

Ordering information

Designation	Type	Order No.
Base units		
Digital TV monitoring system	R&S®DVMS1	2113.9305.02
Digital TV monitoring system	R&S®DVMS4	2113.7560.02
Scope of delivery: power cord; printed getting started manual		
Modules and module options		
DVB-T/DVB-T2 receiver module	R&S®DVMS-B55	2113.8850.03
DVB-T2 demodulator	R&S®DVMS-K54	2113.9292.02
DVB-T demodulator	R&S®DVMS-K53	2113.9286.02
Spectrum and shoulder attenuation	R&S®DVMS-K57	2113.9228.02
Echo pattern	R&S®DVMS-K58	2113.9192.02
High-quality MER measurement	R&S®DVMS-K59	2113.9205.02
DVB-S/DVB-S2 receiver module	R&S®DVMS-B51	2113.8950.02
IP module	R&S®DVMS-B40	2113.8938.02
Single TS input module	R&S®DVMS-B11	2113.8896.02
Monitoring options		
TS monitoring	R&S®DVMS-K1	2113.9028.02
T2-MI extension	R&S®DVMS-K3	2113.9234.02
Advanced TS monitoring	R&S®DVMS-K11	2113.9034.02
TS template monitoring	R&S®DVMS-K12	2113.9040.02
TS capture	R&S®DVMS-K18	2113.9086.02
Analysis		
EPG display	R&S®DVMS-K16	2113.9063.02
Thumbnail display	R&S®DVMS-K17	2113.9070.02
PCR/PTS analysis	R&S®DVMS-K19	2113.9092.02
Interpreter	R&S®DVMS-K20	2113.9105.02
qPSNR analysis	R&S®DVMS-K21	2113.9111.02
Carousel and MPE analysis	R&S®DVMS-K22	2113.9128.02
DVB-H analysis	R&S®DVMS-K23	2113.9134.02
Buffer analysis	R&S®DVMS-K24	2113.9140.02
Miscellaneous		
Calibration documentation	R&S®DVMS-DCV	2082.0490.35
Printout of DCV	R&S®DCV-ZP	1173.6506.02
19" adapter for 1 × R&S®DVMS1 in 1 HU	R&S®ZZA-DVMS1	2113.9886.00
19" adapter for 2 × R&S®DVMS1 in 1 HU	R&S®ZZA-DVMS1	2113.9805.00
Option packages		
Monitoring option package (including R&S®DVMS-K11, R&S®DVMS-K12 and R&S®DVMS-K18)	R&S®DVMS-PK01	2113.9240.02
Analysis option package (including R&S®DVMS-K16, R&S®DVMS-K17, R&S®DVMS-K19 and R&S®DVMS-K20)	R&S®DVMS-PK02	2113.9257.02

Warranty		
Base unit		3 years
All other items [11]		1 year
Service options		
Extended warranty, one year	R&S®WE1	Please contact your local
Extended warranty, two years	R&S®WE2	Rohde & Schwarz sales office.
Extended warranty with calibration coverage, one year	R&S®CW1	
Extended warranty with calibration coverage, two years	R&S®CW2	

Extended warranty with a term of one and two years (WE1 and WE2)
Repairs carried out during the contract term are free of charge [12]. Necessary calibration and adjustments carried out during repairs are also covered.

Extended warranty with calibration coverage (CW1 and CW2)
Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs [12] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

See also the product configurator on the R&S®DVMS1 and the R&S®DVMS4 web pages.

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[11] For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

[12] Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

Rohde & Schwarz

The Rohde & Schwarz technology group is among the trailblazers when it comes to paving the way for a safer and connected world with its leading solutions in test and measurement, technology systems, and networks and cybersecurity. Founded more than 85 years ago, the group is a reliable partner for industry and government customers around the globe. The independent company is headquartered in Munich, Germany and has an extensive sales and service network with locations in more than 70 countries.

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