



DTV Monitoring Receiver R&S ETX-T

Realtime monitoring, demodulation and analysis of DVB-T signals via LAN

- ◆ Cost-effective DVB-T monitoring receiver
- ◆ Frequency scan mode
- ◆ Realtime remote monitoring
- ◆ Easy integration into SNMP management systems
- ◆ High reliability
- ◆ Optional realtime MPEG2 analysis
- ◆ Remote control via SNMP, HTTP or COM server



ROHDE & SCHWARZ

R&S ETX-T – for reliable digital television



Typical day in the headquarters (HQ) of a transmitter operator where all relevant parameters of various transmitters are monitored

Time: 20:00:00

TV shows clear picture
In HQ:

MER warning message from the remote management system:
Value has decreased significantly.
Interrogation from operator -> decision to look at the ETX-T HTTP server

With R&S ETX-T

Time 21:00:00

TV shows clear picture
In HQ:

Operator is about to leave for the faulty Tx site. Investigation of possible problem already completed, remotely with the help of the R&S ETX-T.

Time 22:00:00

TV shows clear picture
On faulty Tx site:

Operator found and fixed the problem. Returns to HQ.

Time 23:00:00

TV shows clear picture
In HQ:

No warning from the remote management system. MER value from the ETX-T HTTP server good again.

Summary

Good quality of service: excellent service during operation!

Time: 20:00:00

TV shows clear picture
In HQ:

No specific action – operator is not aware that a problem has occurred...

Without R&S ETX-T

Time: 21:00:00

TV shows clear picture
In HQ:

No specific action – operator is not aware that a problem has occurred...

Time 22:00:00

TV shows clear picture
In HQ:

No specific action – operator is still not aware that a problem has occurred...

Time 23:00:00

TV shows blocking effects
In HQ:

Panic! Something is going wrong – somebody has to be sent to transmitter site for evaluation and repair !!!
... too late – service is lost!

Summary

Poor quality of service: service has failed!

All operating parameters under control

General

The R&S ETX-T is a cost-effective monitoring receiver in compliance with the DVB-T standard. It is designed to help broadcasters to maintain the quality level of their networks. The R&S ETX-T performs realtime monitoring of the most sensitive parameters of digital transmitters such as output level, MER or BER. Optionally, the demodulated MPEG2 transport stream is analyzed to check the syntax integrity (1st, 2nd and 3rd priority errors as defined in ETSI TR 101 290) as well as to monitor data rates and MIP consistency in single frequency networks.

The embedded SNMP agent allows broadcasters to directly integrate the R&S ETX-T into their network management system. For further analysis, any web browser can be used to access the embedded HTTP server. The R&S ETX-T can also be used in conjunction with the Stream Explorer™ R&S DVMD-B1 software package for in-depth MPEG2 analysis.

Realtime RF analysis

The frontend of the R&S ETX-T has been designed to cover the entire TV frequency range from 48 MHz to 862 MHz – at an input level range from –75 dBm to +20 dBm.

SAW filter selection chart	6 MHz SAW Filter R&S ETX-B11	7 MHz SAW Filter R&S ETX-B12	8 MHz SAW Filter R&S ETX-B13
R&S ETX-T 40 DVB-T / OFDM	+ (North America)	+ (Europe, VHF; Australia)	+ (Europe, UHF)

+ recommended

The R&S ETX-T covers the digital TV standard DVB-T for terrestrial broadcasting. Additional ETX models for other standards are in preparation.

The MPEG2 TS signal is available on the rear panel via a serial ASI or parallel SPI connection.

Simultaneously with demodulation, the R&S ETX-T can measure the key parameters of the RF modulation: RF level, MER and BER. RF and MPEG2 synchronization flags are also available. The measurement results are then shared by the SNMP agent and the HTTP server for remote administration, and by the USER port for signalling.

Optional SAW Filters R&S ETX-B11, R&S ETX-B12, R&S ETX-B13

A SAW filter is required to suppress adjacent channels. Each SAW filter is optimized for specific applications. An 8 MHz SAW filter, a 7 MHz SAW filter and a 6 MHz SAW filter for the DVB-T bandwidths are available.

Optional MPEG2 Realtime Analysis R&S ETX-B2

This option for the R&S ETX-T is fully compliant to the ETSI TR 101 290 Measurement Guideline. It analyzes the protocol of the demodulated MPEG2 transport stream in realtime. As specified in the ETSI TR 101 290 Measurement Guideline, the MPEG2 error conditions are sorted according to three different priorities:

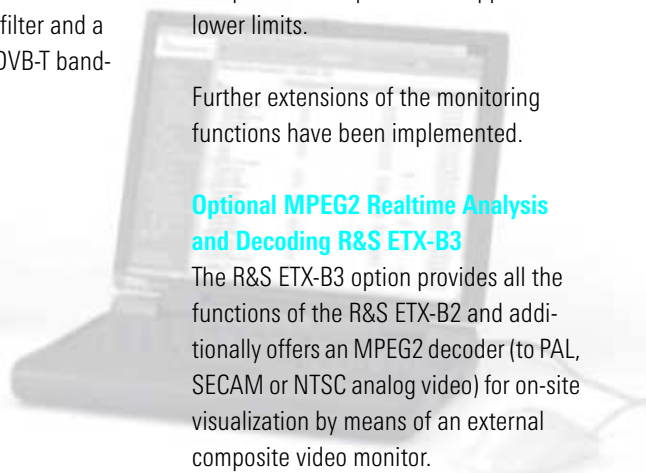
- ◆ Error of 1st priority – no decodability of MPEG2 transport stream
- ◆ Error of 2nd priority – decodability of MPEG2 transport stream may be affected
- ◆ Error of 3rd priority – decodability of MPEG2 transport stream is not affected

In addition to those errors, the repetition rates of EIT/SDT/NIT "other" tables are measured in realtime and checked for compliance with predefined upper and lower limits.

Further extensions of the monitoring functions have been implemented.

Optional MPEG2 Realtime Analysis and Decoding R&S ETX-B3

The R&S ETX-B3 option provides all the functions of the R&S ETX-B2 and additionally offers an MPEG2 decoder (to PAL, SECAM or NTSC analog video) for on-site visualization by means of an external composite video monitor.



Remote monitoring via network management system

Via SNMP

The R&S ETX-T supports connection to an existing network management system. The embedded SNMP agent enables the R&S ETX-T to send all error messages (traps) referred to the RF channel under survey through the network. Thus, RF and MPEG2 synchronization, level measurement, MER measurement and BER measurement are continuously monitored in realtime using the fixed thresholds. If the R&S ETX-B2 or the R&S ETX-B3 is installed, MPEG2 errors of the first, second and third priority as well as further extensions of ETSI TR 101 290 are monitored. In addition, all settings of the R&S ETX-T can be configured via the SNMP agent using the MIB tree (supplied as standard).

Via HTTP

Server structure and access rights

For in-depth RF and MPEG2 analysis, the user can access the embedded HTTP server by entering the TCP/IP address of the R&S ETX-T. The user then has access to the R&S ETX-T according to the rights defined by the administrator. The access rights to the R&S ETX-T are classified as follows:

- ◆ Super User: administration rights only. Highest right access. Can define/modify/delete rights of administrators, maintenance users, operators, query users and cancel active sessions.
- ◆ Administrator: administrator rights only. Can define/modify/delete rights of maintenance users, operators and query users.
- ◆ Maintenance User: has access to all settings, thresholds, measurements and monitoring functions (error reports and history function). Only one maintenance user at a time has full access.
- ◆ Operator: has access to measurements and monitoring functions (error reports and history function) of the R&S ETX-T. Cannot alter or vary instrument settings.
- ◆ Query User: has access to restricted measurements (main measurement window and MPEG2 tree structure) and all monitoring functions (error reports and history function) of the R&S ETX-T. Cannot alter or vary instrument settings.

Graphical user interface

The graphical user interface (GUI) of the HTML page of the R&S ETX-T has been optimized to include the latest web browser functions (Internet Explorer V4.0 or higher recommended). The GUI can be customized to each site (site name, input RF frequencies, TS names) if at least maintenance user rights are available.

The examples on page 5 show possible HTML pages of the R&S ETX-T.

Enhanced features

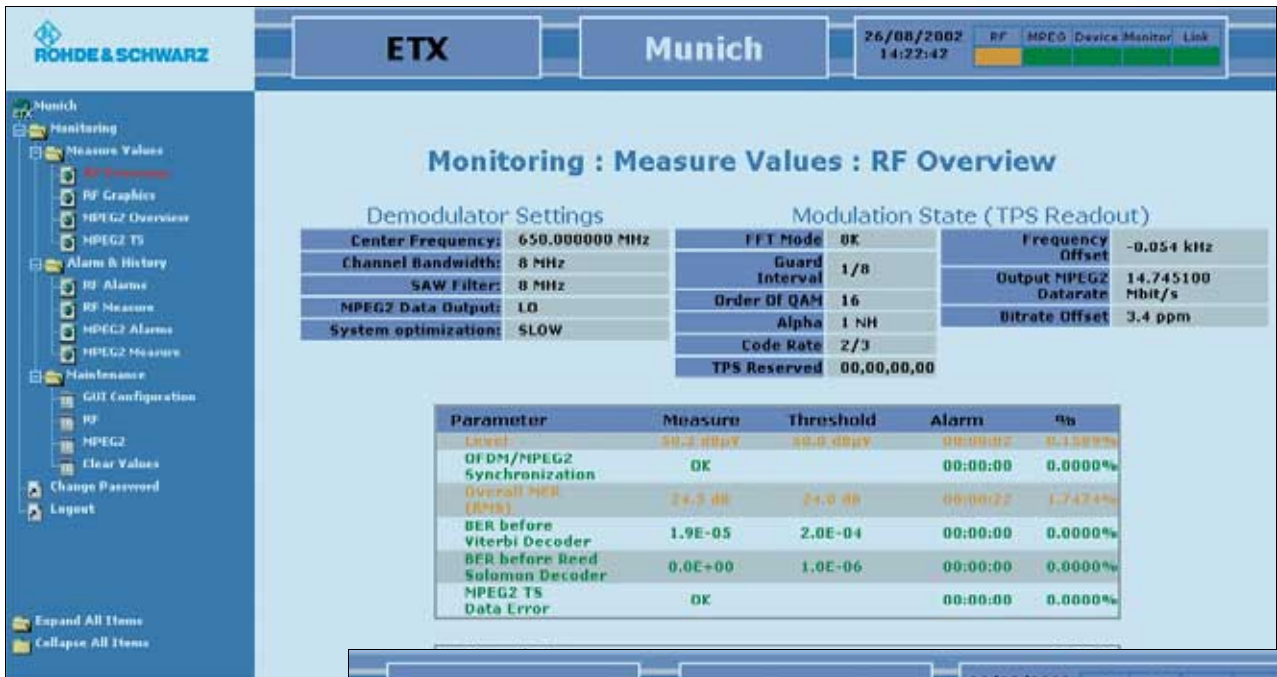
The *Scan mode* allows the R&S ETX-T to go through (scan) a user-defined frequency list. This frequency list defines a separate parameter set for each scanned frequency, e.g. duration of monitoring, receiver settings and thresholds of measured parameters.

The *History function* graphically displays the selected parameters (synchronization, level, MER and BER measurements), as shown in example 3. This function can be used in conjunction with the *Scan mode* to obtain a global site overview at a glance.

Via Com server

For in-depth analysis, the Com server provides direct access to the hardware of the receiver/analyzer section or the MPEG2 analyzer if the R&S ETX-B2 or R&S ETX-B3 option is installed. Proprietary applications can be developed by using the SCPI commands. One possible application is the remote use of Stream Explorer™ R&S DVMD-B1 and its five operating modes:

- ◆ DUMP: for comprehensive analysis of transport stream contents
- ◆ TRIGGER ON ERROR: for detailed investigation of errors in transport streams
- ◆ MEASURE: for graphical display of transport stream parameters in realtime
- ◆ MONITORING: for transport stream monitoring and data rate measurement with realtime graphical display
- ◆ OFFLINE: for saving and subsequently restoring any measurement scenarios (can be used with all four operating modes described above)

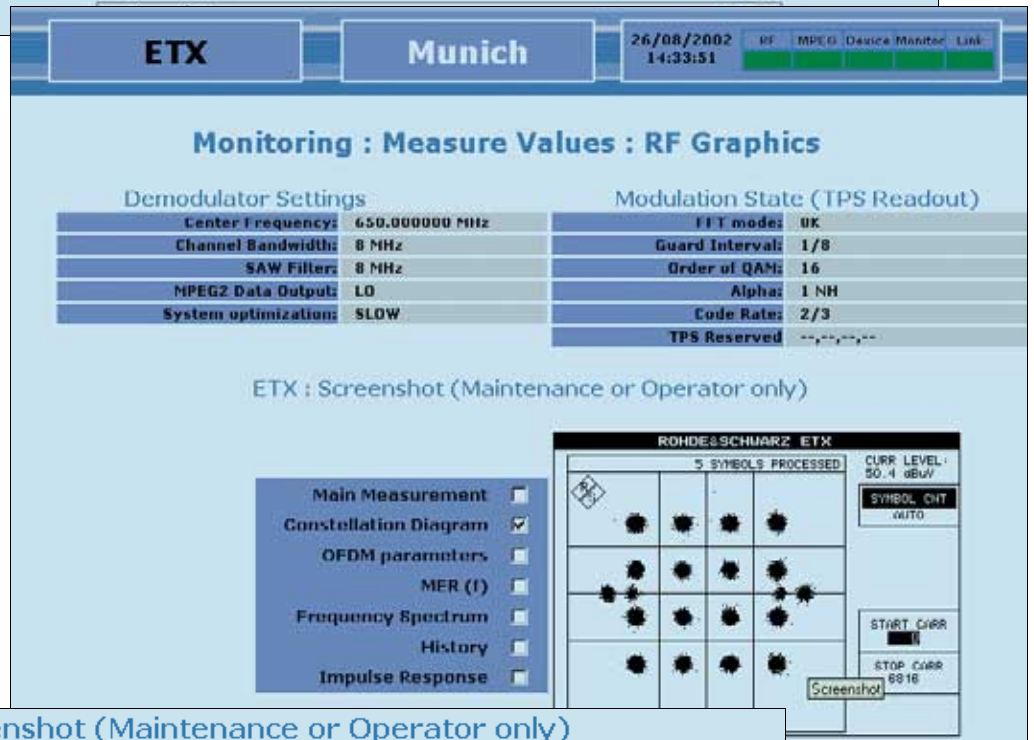


1

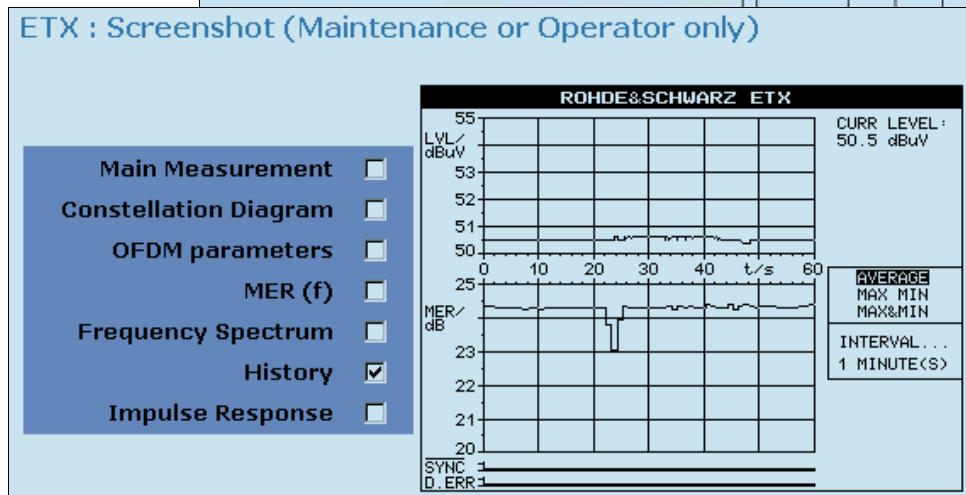
Example 1:
RF measurement window
(RF overview)

Example 2:
RF graphics window
(constellation diagram)

Example 3:
History function display



2



3

Specifications

RF input	selective
Connector	50 Ω, N female, rear panel
Return loss	≥14 dB in channel and input attenuation ≥10 dB
Frequency range	48 MHz to 862 MHz
Level range ¹⁾	-75 dBm to +20 dBm -80 dBm to +13 dBm (preamplifier on)
Noise figure	12 dB typ. 7 dB typ.(preamplifier on)
Image frequency rejection	≥70 dB (VHF) and ≥50 dB (UHF)
Local oscillator	
Resolution	1 Hz
Frequency error	≤±1 Hz (external reference), ≤2 x 10 ⁻⁶ (internal reference)
SSB phase noise (RF = 860 MHz)	-82 dBc/Hz typ. at 1 kHz -90 dBc/Hz typ. at 10 kHz
System performance	
MER ²⁾	≥38 dB
SNR ²⁾	≥39 dB
IF input	50 Ω, BNC female, rear panel
Return loss	≥20 dB in channel
Center frequency	36 MHz
Level range	-30 dBm to -5 dBm
IF output	50 Ω, BNC female, rear panel
Return loss	≥20 dB in channel
Center frequency	36 MHz
Level, regulated	-17 dBm
MPEG2 TS parallel output	LVDS (188 bytes)
MPEG2 TS ASI output	serial MPEG2 transport stream (ASI); 75 Ω
Characteristics	
Channel bandwidth	6 MHz, 7 MHz, 8 MHz (all code rates, all hierarchical modes, 4/16/64QAM and 2K/8K FFT according to EN 300 744 supported)
Bandwidth (SAW filter, options)	6 MHz, 7 MHz, 8 MHz or SAW filter OFF
Measurements	signal power carrier frequency offset symbol rate offset MPEG2 TS bit rate BER (bit error ratio) before and after Reed-Solomon decoder BER (bit error ratio) before Viterbi decoder MER (modulation error ratio) SNR (signal/noise ratio) phase jitter shoulder attenuation (referred to ETR290)
Graphical displays	constellation diagram frequency spectrum MER(f) impulse response (ghost pattern) history (MER, level, BER, sync, data error)
Alarm messages	signal power, MPEG2 synchronization, MER, BER before Viterbi decoder, BER before Reed-Solomon decoder, MPEG2 data error
Alarm storage	alarm message with date and time, more than 10000 messages

¹⁾ For quasi-error-free MPEG2 transport stream.

²⁾ Signal power >-40 dBm.

Test parameters	Range	Resolution	Error
Signal power	corresponding to level range	0.1 dB	<3 dB, <1 dB typ.
MER dB (modulation error ratio in dB)	18 dB to 30 dB 30 dB to 35 dB	0.1 dB 0.1 dB	≤0.8 dB ≤1.0 dB
MER % (modulation error ratio in %)	1.9 % to 3.2 % 3.2 % to 12.5 %	0.01 % 0.01 %	≤12 % of actual value ≤10 % of actual value
SNR (signal/noise ratio)	18 dB to 30 dB 30 dB to 35 dB	0.1 dB 0.1 dB	≤0.5 dB ≤0.8 dB
Center frequency offset	±100 kHz	1 Hz	≤280 Hz + 2 ppm x RF (internal reference) ≤1 Hz (external reference)
Bit rate offset	±30 ppm (8K FFT) ±120 ppm (2K FFT)	0.1 ppm	≤10 ppm, <3 ppm typ. (internal reference) ≤0.5 ppm (external reference)
BER before Viterbi decoder	1.0×10^{-2} to 0.1×10^{-15}	$0.1 \times 10^{-\text{exponent}}$	-
BER before Reed-Solomon decoder	1.0×10^{-3} to 0.1×10^{-15}	$0.1 \times 10^{-\text{exponent}}$	-
BER after Reed-Solomon decoder	1.0×10^{-5} to 0.1×10^{-14}	$0.1 \times 10^{-\text{exponent}}$	-

General data

Interfaces	Ethernet 10/100 Mbit, RS-232-C
Temperature range	to EN 60068-2-1/-2
Operating temperature range	+5 °C to +45 °C
Permissible temperature range	0 °C to +50 °C
Power supply	100 V to 120 V / 220 V to 240 V +10%/-15% (autoranging), 50 Hz to 60 Hz
Power consumption	70 W
Dimensions (W x H x D)	435 mm x 147 mm x 460 mm
Weight	approx. 12 kg, depending on options

Options R&S ETX-B2 and R&S ETX-B3

Simultaneous monitoring of all features throughout the entire transport stream. Realtime monitoring of parameters in compliance with specifications for DVB systems (ETSI TR 101 290).

Measurement	Priority	Error display			PID info	TR 101 290
		LED	OSD (only with R&S ETX-B3)	Error condition		
TS_sync_loss	1	TS	TS-Sync	Loss OK		5.2.1 - 1.1
Sync_byte_error	1	SYNC	Sync Byte	Single Burst		5.2.1 - 1.2
PAT_error	1	PAT	PAT	Upper Distance Table ID Scrambled	• • •	5.2.1 - 1.3
Continuity_count_error	1	CONT	Cont. Cnt	Packet Order More Than Twice Lost Packet	• • •	5.2.1 - 1.4
PMT_error	1	PMT	PMT	Upper Distance Scrambled	• •	5.2.1 - 1.5
PID_error	1	PID	PID Missing	Video+Audio Data+Other	•	5.2.1 - 1.6
Transport_error	2	TRANS	Transport		•	5.2.2 - 2.1
CRC_error	2	CRC	CRC	PAT CAT PMT NIT EIT BAT SDT TOT MIP	• • • • • • • •	5.2.2 - 2.2

PCR_error	2	OTHER	PCR	Discontinuity Upper/Lower Distance	• •	5.2.2 - 2.3
PCR_accuracy_error	2	OTHER	PCR Accuracy		•	5.2.2 - 2.4
PTS_error	2	OTHER	PTS		•	5.2.2 - 2.5
CAT_error	2	OTHER	CAT	Table ID Missing	• •	5.2.2 - 2.6
SI_repetition_error	3	OTHER	SI REP	PAT Upper/Lower Distance CAT Upper/Lower Distance PMT Upper/Lower Distance NIT Upper/Lower Distance SDT Upper/Lower Distance BAT Upper/Lower Distance EIT Upper/Lower Distance RST Lower Distance TDT Upper/Lower Distance TOT Upper/Lower Distance	• • • • • • • • • •	5.2.2 - 3.2
NIT_error	3	OTHER	NIT	Table ID Upper Distance	• •	5.2.3 - 3.1
SDT_error	3	OTHER	SDT	Table ID Upper Distance.	• •	5.2.3 - 3.5
EIT_error	3	OTHER	EIT	Table ID Upper Distance	• •	5.2.3 - 3.6
RST_error	3	OTHER	RST	Table ID	•	5.2.3 - 3.7
TDT_error	3	OTHER	TDT	Table ID Upper Distance	• •	5.2.3 - 3.8
Unreferenced_PID	3	OTHER	Unref. PID		•	5.2.3 - 3.4
Multiplex_error	-	OTHER	MULTIPLEX	TS ID		
Datarate_error	-	OTHER	DRATE	Null Upper/Lower Limit	•	
SI_other_error	-	OTHER	SI OTHER	NIT Upper/Lower Distance SDT Upper/Lower Distance EIT Upper/Lower Distance	•	
NIT_other_error	-	OTHER	NIT OTHER	Upper Distance	•	
SDT_other_error	-	OTHER	SDT OTHER	Upper Distance	•	
EIT_other_error	-	OTHER	EIT OTHER	Upper Distance	•	
MIP_error	-	MIP	MIP	Present Extra Present Missing Struct TS Head Struct Length Struct Max Dly Struct STS Struct CRC Pointer Period Pointer Period MF Size Timing TS Rate	•	9.20



MPEG monitoring	
Transport stream	according to ISO/IEC 1-13818
Data rate of transport stream	max. 54 Mbit/s
Length of data packets	188/204 byte
Signal inputs	
Internal	via demodulated / decoded RF signal
External	2 * MPEG2 transport stream asynchronous (TS-ASI, according to DVB-A010 and EN 50083-9) (two independent inputs, selectable) serial 270 Mbit/s, BNC connector on rear panel, 200 mV to 1 V (V_{pp}), 75 Ω
Signal outputs (only R&S ETX-B3)	
Video	CCVS (PAL, SECAM, NTSC, selectable), BNC connector on rear panel, 1 V \pm 1% (V_{pp}), 75 Ω
C/L gain	\pm 2%
C/L delay	\pm 30 ns
Frequency response (typical values)	
0 MHz to 3 MHz	+1%/-2%
<4 MHz	+1%/-5%
<5 MHz	+1%/-15%
Video serial digital (ITU-R 601)	BNC connector on rear panel, 800 mV (V_{pp}), 75 Ω
Audio	
Audio left, audio right	LEMO Triax connector on rear panel, <50 Ω , balanced
Level (full scale)	6 dBm \pm 0.5 dB into 600 Ω
Frequency response (40 Hz to 15 kHz)	\pm 0.5 dB relative to 1 kHz
S/N ratio	>70 dB, unweighted
Total harmonic distortion	>70 dB
Decoding (only R&S ETX-B3)	
Video	Main Profile and Main Level (SDTV)
Audio	MPEG1 Layer 2 MPEG2 Layer 182, low sampling rate
Monitoring	
Number of differing PMT PIDs	max. 25
Number of programs	max. 6



Ordering information

Designation	Type	Order No.
DTV Monitoring Receiver DVB Realtime Demodulation and Analysis (SNMP + HTTP)	R&S ETX-T	2068.0109.40
Options		
MPEG2 Realtime Analysis	R&S ETX-B2	2068.0415.02
MPEG2 Realtime Analysis with Decoder Output	R&S ETX-B3	2068.0450.02
6 MHz SAW Filter	R&S ETX-B11	2068.0421.02
7 MHz SAW Filter	R&S ETX-B12	2068.0438.02
8 MHz SAW Filter	R&S ETX-B13	2068.0444.02
Documentation of R&S ETX-T Calibration Values	R&S ETX-DCV	2082.0490.28

Abbreviations			
ATSC	Advanced Television Systems Committee	PCR	Program clock reference
BAT	Bouquet association table	PES	Packetized elementary stream
BER	Bit error ratio	PID	Packet identification
CAT	Conditional access table	PIT	Program identification table
CETT	Channel extended text table	PMT	Program map table
CVCT	Cable virtual channel table	PSI	Program-specific information
DIT	Discontinuity information table	PSIP	Program and system information protocol
DTS	Decoding time stamp	PT	Private table
DVB	Digital video broadcast	PTS	Presentation time stamp
EIT	Event information table	RRT	Rating region table
EPG	Electronic program guide	RST	Running status table
ETT	Extended text table	SCPI	Standard commands for programmable instruments
LAN	Local area network	SDT	Service description table
MER	Modulation error ratio	SI	Service information
MIP	Megaframe initialization packet	SIT	Selection information table
MGT	Master guide table	SNMP	Simple network management protocol
MPEG	Motion Picture Experts Group	TCP/IP	Transfer control protocol / Internet protocol
NIT	Network information table	TS	Transport stream
PAT	Program association table	VSB	Vestigial sideband

