Test Receiver R&S EFA
DVB-C – B/G Analog TV – D/K or I Analog TV

Comprehensive analysis/demodulation/monitoring of digital and analog TV signals

- Standard test receiver
- High-end test receiver
- High-end demodulator
- Multistandard digital and analog platform for terrestrial and CATV applications
- Application areas: production, monitoring, coverage, service, research and development
- Comprehensive measurement and monitoring functions
- Modular design — easy retrofitting of options
- MPEG2 analyzer/decoder option
- IEC/IEEE-bus and RS-232-C interface
- Simple, user-friendly operation

ROHDE&SCHWARZ

The EFA Family

The TV Test Receiver and Demodulator Family EFA offers outstanding performance features and excellent transmission characteristics. The instruments provide high-precision reception and demodulation of vestigial sideband AM signals (analog TV signals) as well as quadrature amplitude modulated DVB signals. They measure a comprehensive range of transmission parameters and are therefore ideal for measurement and monitoring applications in cable networks, TV transmitter stations and development labs.

The complete EFA family at a glance

Standard test receivers
- Model 60: digital TV, DVB-C
- Model 12: analog TV, standard B/G
- Model 78: analog TV, standard D/K or I

High-end test receivers
- Model 63 incl. option EFA-B3: digital TV, DVB-C
- Model 33 incl. option EFA-B3: analog TV, standard B/G
- Model 89 incl. option EFA-B3: analog TV, standard D/K or I

High-end demodulators
- Model 63: digital TV, DVB-C
- Model 33: analog TV, standard B/G
- Model 89: analog TV, standard D/K or I

Standard test receiver
- Model 40: digital TV, DVB-T

High-end test receiver
- Model 43 incl. option EFA-B3: digital TV, DVB-T

High-end demodulator
- Model 43: digital TV, DVB-T

Data sheet No. PD 0757.5514.xx

Standard test receivers
- Model 50: digital TV, ATSC/8VSB
- Model 70: digital TV, ITU-T J.83/B
- Model 90: analog TV, standard M/N

High-end test receivers
- Model 53 incl. option EFA-B3: digital TV, ATSC/8VSB
- Model 73 incl. option EFA-B3: digital TV, ITU-T J.83/B
- Model 93 incl. option EFA-B3: analog TV, standard M/N

High-end demodulators
- Model 53: digital TV, ATSC/8VSB
- Model 73: digital TV, ITU-T J.83/B
- Model 93: analog TV, standard M/N

Data sheet No. PD 0757.7017.xx

Wide variety of models

The TV Test Receiver Family EFA from Rohde & Schwarz is a versatile and high-performance TV test receiver and demodulator platform, which can be optimally configured for any application, whether digital or analog.
Three frontends are available:

standard selective,
high-end selective and
high-end non-selective.

The high-end models have a better signal-to-noise ratio than the standard models and offer excellent intermodulation characteristics. This, coupled with minimum inherent frequency response, guarantees extremely accurate measurements.

The family concept described in the following will help you to find the right EFA model for your application:

- If the application mainly concerns measurements in cable networks or on terrestrial signals, a receiver model that selects the channel to be measured is the appropriate choice. Adjacent-channel signals, which impair measurement results, are filtered out by high suppression.
  Then, a choice has to be made between the standard selective and the high-end selective version. As with the other criteria, this choice depends on the application.
- Measurements on modulators or TV transmitters, where only one TV signal is involved, are performed with one of the demodulator models with the high-end non-selective frontend, which guarantees extremely low measurement uncertainty without preselection.

The last selection criterion is the TV standard used, and whether it is analog or digital:

- The EFA test receivers can be configured for digital signals to the DVB-C, ATSC/8VSB, ITU-T J.83/B standard or for virtually all analog TV standards. A wide range of options including a NICAM demodulator (option EFA-B2) and an MPEG2 decoder (option EFA-B4) round off the EFA product line.
- Operation involving a mix of analog and digital channels is becoming more widespread especially in cable networks. This kind of operation is handled by the QAM demodulator option for

  DVB-C (EFA-B20 + EFA-K21) or
  ITU-T J.83/B (EFA-B20 + EFA-K23)

  which adds complete digital measurement functionality to the analog models.
- It is even possible to update to digital terrestrial applications according to the ATSC/8VSB standard using the

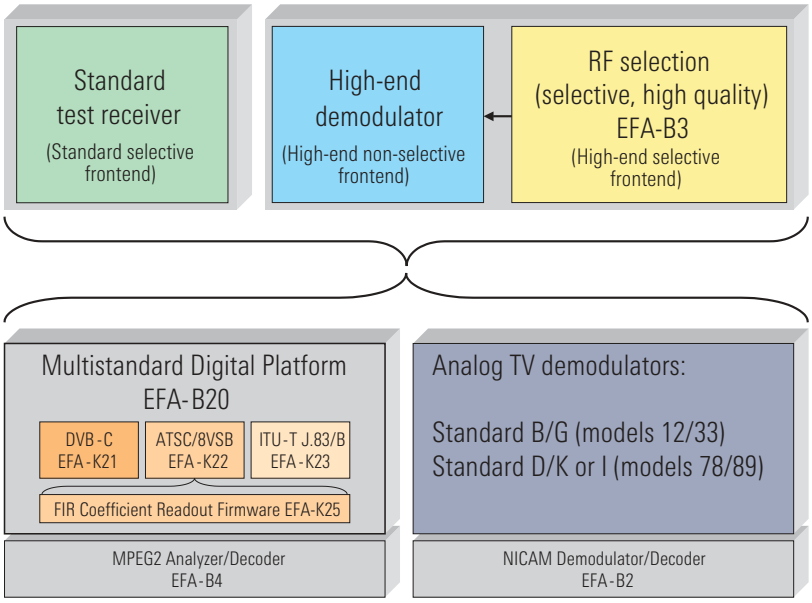
  ATSC/8VSB demodulator option
  (EFA-B20 + EFA-K22)

EFA – realtime signal analysis of DVB-C signals

EFA's powerful digital signal processing provides fast and thorough analysis of the received DVB-C signal. Analysis is performed simultaneously with, but independently of, demodulation and decoding. The MPEG2 transport stream is permanently available for decoding as well as for video and audio reproduction.

Due to its realtime analysis capability, the high number of measured values necessary for the complex calculation and display processes are made available for subsequent mathematical/statistical processing in an extremely short and as yet unequalled time. Because of its high-speed data acquisition, the TV Test Receiver EFA is the ideal choice, not only for R&D but also for production environments where short measurement cycles are essential.

EFA model selection concept



The EFA Family

Common to all models

- In-depth measurement capabilities
- Simple, user-friendly operation
- Modular design — easy retrofitting of options
- Alarm messages for measurement functions, internal storage
- IEC/IEEE-bus and RS-232-C interface

Digital options

MPEG2 analyzer/decoder (option EFA-B4)

- MPEG2 syntax analysis according to DVB standard
- SDTV decoding, 625L or 525L supported, SDI output, PAL / SECAM / NTSC video out
- Error report

Standard test receiver (EFA models 12/60/78)

- Selective receiver
- Typical use in the field where adjacent channels need to be filtered
- High-end synthesizer with low phase noise
- Excellent price/performance ratio

High-end demodulator (EFA models 33/63/89)

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

High-end test receiver (EFA models 33/63/89 + option EFA-B3)

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

6 MHz SAW filter (option EFA-B11)

- Adjacent-channel rejection
- Meets US requirements

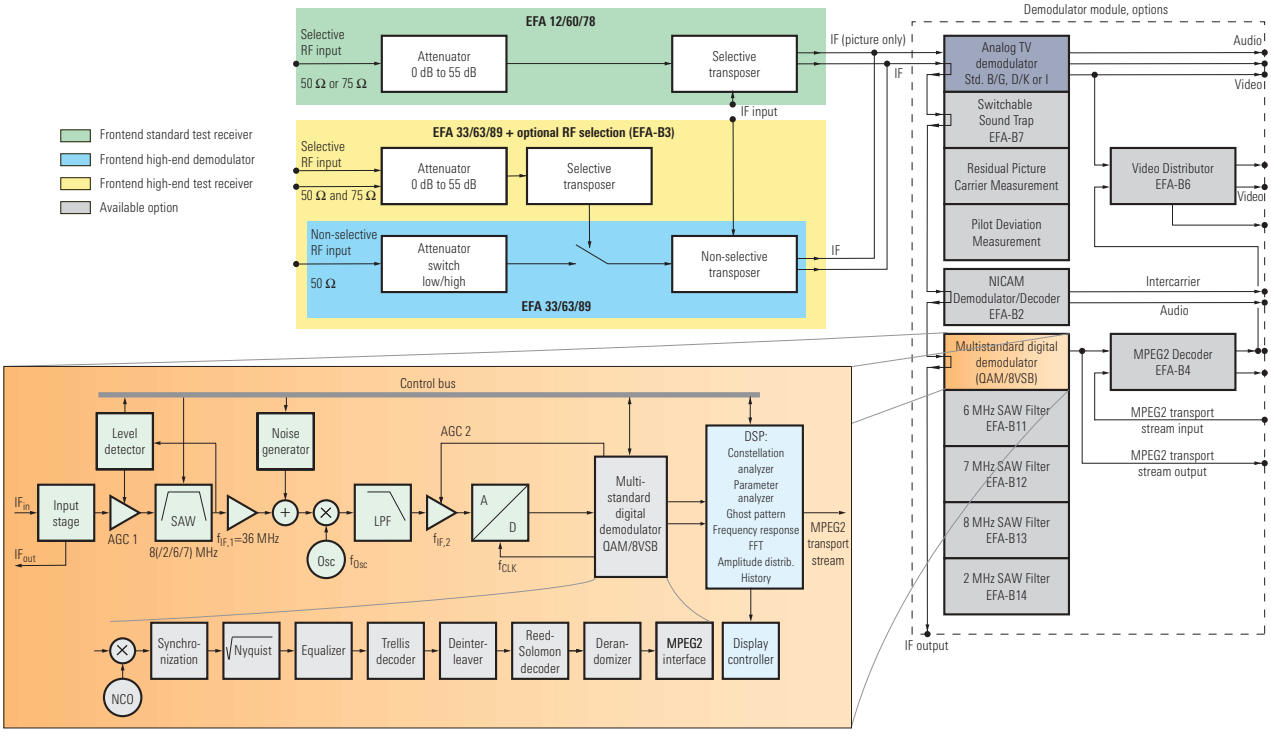
7 MHz SAW filter (option EFA-B12)

- Adjacent-channel rejection
- Meets Cable Australian requirements

8 MHz SAW filter (option EFA-B13)

- Adjacent-channel rejection
- Meets European and US standards, recommended for spectrum measurements

Block diagram of TV Test Receiver EFA



2 MHz SAW filter (option EFA-B14)

- Adjacent-channel rejection
- Meets channel return requirements (in cable applications)

Digital demodulator platform (option EFA-B20)

- Retrofit of analog instruments
- Multistandard demodulator platform supporting DVB-C demodulation (with EFA-K21), ATSC/8VSB demodulation (with EFA-K22), ITU-T J.83/B demodulation (with EFA-K23)
- Included in basic EFA 50/53/60/63/70/73 models
- MPEG2 transport stream output (serial or parallel)
- General measurement functions for
  - RF input level
  - carrier frequency offset
  - bit rate offset
  - BER (before and after Reed-Solomon)

DVB-C firmware (option EFA-K21)

- Analysis, demodulation and monitoring of DVB-C signals according to ETS 300 429 standard
- Included in basic EFA 60/63 models

ATSC/8VSB firmware (option EFA-K22)

- Analysis, demodulation and monitoring of ATSC/8VSB signals according to ATSC Doc. A/53
- Included in basic EFA 50/53 models
- Additional SMPTE310M MPEG2 transport stream output

ITU-T J.83/B firmware (option EFA-K23)

- Analysis, demodulation and monitoring of American digital cable signals according to ITU-T J.83/B standard
- Included in basic EFA 70/73 models

FIR coefficient readout firmware (option EFA-K25)

- Calculation of FIR filter coefficients for linear precorrection of digital signals
- Only available for the ATSC/8VSB models

Analog options

NICAM demodulator/decoder (option EFA-B2)

- Demodulation and decoding of signals to NICAM-728 standard
- I and Q signal output
- Switchable deemphasis
- Balanced audio outputs
- Measurement parameters: bit error ratio, eye height, clock and data jitter

Video distributor (option EFA-B6)

- 2 video outputs on front panel
- 2 video outputs on rear panel
- 1 additional Q output on front panel

Switchable sound trap (option EFA-B7)

- Only available for standard B/G (EFA models 12/33)
- Allows video bandwidth switchover to 6 MHz

Table of available EFA models & options

			Standard test receivers			High-end demodulators			High-end test receivers			
		Models	12	60	78	33	63	89	33	63	89	Slot needed
Option	Designation	Order No.	B/G	DVB-C	D/K or I	B/G	DVB-C	D/K or I	B/G	DVB-C	D/K or I	
EFA-B2	NICAM Demodulator/Decoder (B/G or D/K)	2067.3610.02	❍	–	❍	❍	–	❍	❍	–	❍	1
EFA-B2	NICAM Demodulator/Decoder (I)	2067.3610.04	–	–	❍	–	–	❍	–	–	❍	1
EFA-B3	RF Selection	2067.3627.02	–	–	–	❍	❍	❍	◆	◆	◆	1
EFA-B4	MPEG2 Decoder	2067.3633.02	❍ [1]	❍	❍ [1]	❍ [1]	❍	❍ [1]	–	❍	–	1
EFA-B6	Video Distributor	2067.3656.02	–	–	–	❍	❍ [2]	❍	❍	❍ [2]	❍	0
EFA-B7	Switchable Sound Trap	2067.3710.02	❍	–	–	❍	–	–	❍	–	–	1
EFA-B11	6 MHz SAW Filter	2067.3691.00	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	0
EFA-B12	7 MHz SAW Filter	2067.3591.00	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	0
EFA-B13	8 MHz SAW Filter	2067.3579.03	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	0
EFA-B14	2 MHz SAW Filter	2067.2562.00	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	❍ [1] [3]	0
EFA-B20	Digital Demodulator Platform	2067.3585.02	❍ [2]	✔	❍ [2]	❍ [2]	✔	❍ [2]	❍ [2]	✔	❍ [2]	1
EFA-K21	DVB-C / J.83/A/C (QAM) Firmware	2067.4000.02	❍ [1]	✔	❍ [1]	❍ [1]	✔	❍ [1]	❍ [1]	✔	❍ [1]	1
EFA-K22	ATSC/8VSB Firmware	2067.4017.02	❍ [1]	❍ [1]	❍ [1]	❍ [1]	❍ [1]	❍ [1]	❍ [1]	❍ [1]	❍ [1]	0
EFA-K23	J.83/B Firmware	2067.4023.02	❍ [1]	❍ [1]	❍ [1]	❍ [1]	❍ [1]	❍ [1]	❍ [1]	❍ [1]	❍ [1]	0
EFA-K25	FIR Coefficient Readout Firmware	2067.4046.02	❍ [5]	❍ [5]	❍ [5]	❍ [5]	❍ [5]	❍ [5]	❍ [5]	❍ [5]	❍ [5]	0
ZZT-314	Carrying Bag for 19" units, 3 HU	1001.0523.00	❍	❍	❍	❍	❍	❍	❍	❍	❍	0

Each basic unit has three free slots to take up options.

✔ included in basic unit ◆ must be ordered with basic unit ❍ available – not applicable

[1] Can be retrofitted if option EFA-B20 is built in.

[2] Requires EFA-B4.

[3] Max. 3 SAW filters.

[4] Must be ordered with min. one firmware option (EFA-K21 or EFA-K22 or EFA-K23).

[5] Can be retrofitted if options EFA-B20 and EFA-K22 are built in.

DVB-C

EFA models 60/63 – all measurement functions for DVB-C digital CATV standard

Besides the deployment of the worldwide digital terrestrial TV network and the already established digital video broadcasting over satellite, digital cable TV still represents an alternative for many consumers worldwide. Additionally, cable technology provides a return channel within the same physical layer (coax cable), allowing the consumer to send back information to the cable headend for versatile applications (full Internet access, video-on-demand and more). The boundary between data communications and TV networks has never been so narrow!

EFA 60/63 characteristics

Fully compatible with the DVB-C standard (EN 300 429), the EFA 60/63 models receive, demodulate, decode and analyze all orders of QAM (quadrature amplitude modulated) signals. All key parameters for demodulating the received signal can be automatically or manually selected:

- 4, 16, 32, 64, 128 or 256 QAM modulation
- Variable symbol rate for special modulator tests and lab analysis (1 Msymbol/s to 6.999 Msymbol/s)
- Reed-Solomon error correction
- Optional SAW filter bandwidths: 6 MHz, 7 MHz, 8 MHz and 2 MHz
- Input of any IF frequency with the aid of the EFA-B3 option: frequency range continuously tunable from 5 MHz to 1000 MHz
- Special function: invert spectrum
- Bit error ratio measurement (before and after Reed-Solomon decoder)
- Integrated noise generator for measurement of noise margin

Features

The new test receiver, even the basic version, features a wide range of innovative measurement functions, allowing comprehensive, in-depth signal analysis. In addition to measuring general parameters (Fig. 1) such as bit error ratio (BER), more thorough analysis includes:

- I/Q constellation diagrams (Fig. 2) with user-selectable number of symbols to be displayed, range: 1 to 999 999 999 symbols
- Histogram I (Fig. 3) and Q (Fig. 4) with user-selectable number of symbols to be displayed, range: 1 to 999 999 999 symbols
- I/Q parameters, modulation error ratio (MER), error vector magnitude (EVM), phase jitter and signal-to-noise ratio (Fig. 5)
- Frequency spectrum (Fig. 6)
- Complex channel transmission function (Fig. 7)
- Received echo signals (Fig. 8)
- Linearity analysis from amplitude distribution histogram and CCDF referred to the RF signal (Figs 9 and 10)
- History function: long-term monitoring of transmission parameters (Fig. 11)
- Monitoring window (Fig. 12)
- Permanent MPEG2 transport stream demodulation (independent from the selected measurement task)
- Integrated noise generator

Any failures and degradations are immediately visible in the constellation diagram. Effects of interest can be located more precisely by varying the number of symbols represented. The integrated spectral analysis function enables easy examination of the signal type and its spectrum.

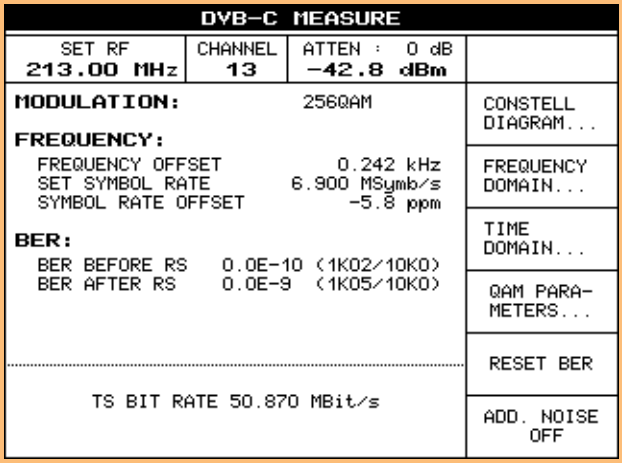


Fig. 1: Measurement menu

All parameters for the demodulated DVB-C channel are displayed on a single screen and can be checked at a glance:

- Level of the input signal
- Two BERs (bit error ratio) — before and after Reed-Solomon decoder — provide a fast quality overview of the demodulated signal
- Demodulated symbol rate
- Symbol rate offset

Hint: When required, the internal noise generator can be activated to perform END (equivalent noise degradation) or noise margin measurements which are based on the BER measurement.

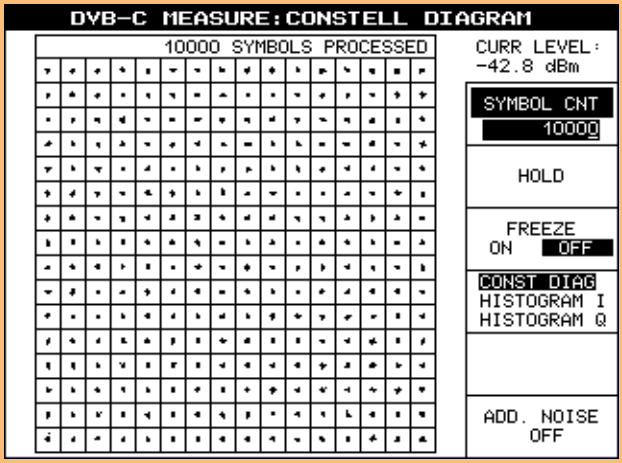


Fig. 2: Constellation diagram

The constellation diagram is always the best way to represent digital modulation. It is also the best visual tool for interpreting measurement results such as I/Q amplitude imbalance or carrier suppression. For in-depth analysis, adjustment of the displayed number of symbols is possible (10 000 symbols are shown in this example).

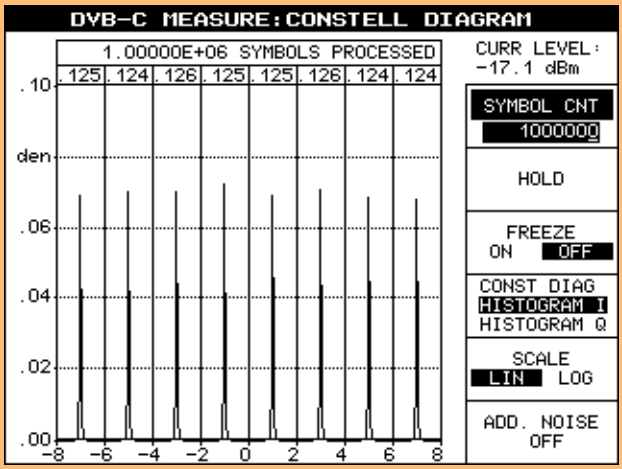


Fig. 3: Histogram I

Histogram I represents the distribution of the quadrature amplitude modulated (QAM) signal on the X axis (I for inphase), and can be expressed in a linear or logarithmic scale.
It allows an estimate of the interferer's origin (interferer, Gaussian noise, etc).
Linear scaling is used in this plot.

Fig. 4: Histogram Q

Same representation as Fig. 15 — but referring to the distribution of the Q component projected on the X axis (Q for quadrature).

Logarithmic scaling is used in this plot.

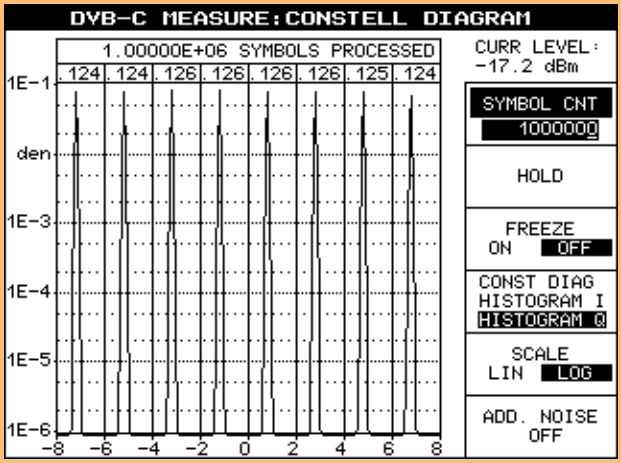


Fig. 5: QAM modulation parameters

All QAM parameters are calculated from the constellation diagram:

- I/Q amplitude imbalance
- I/Q phase error
- Carrier suppression
- Phase jitter
- Signal-to-noise ratio
- MER (modulation error ratio), RMS and Min
- EVM (error vector magnitude), RMS and Max

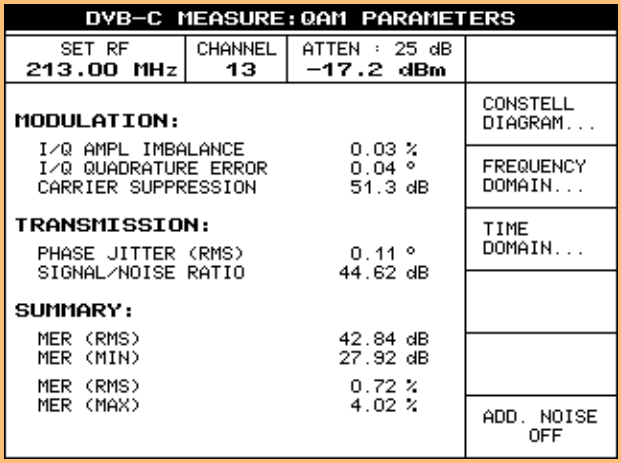
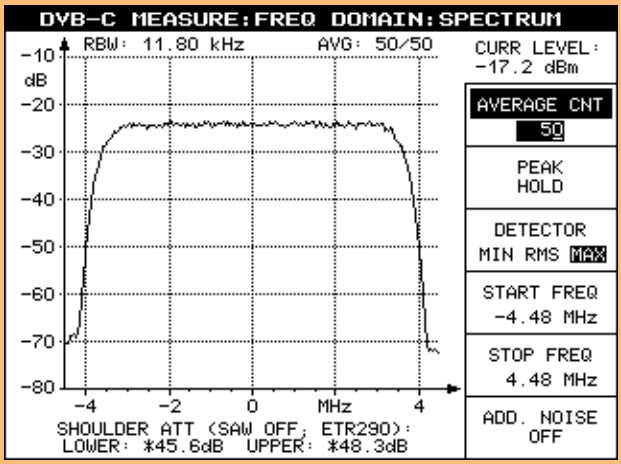


Fig. 6: Spectrum analysis

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

Basic spectrum analyzer functions are provided. For example, the start/stop frequency (or center/span) and several detection and averaging modes can be selected.



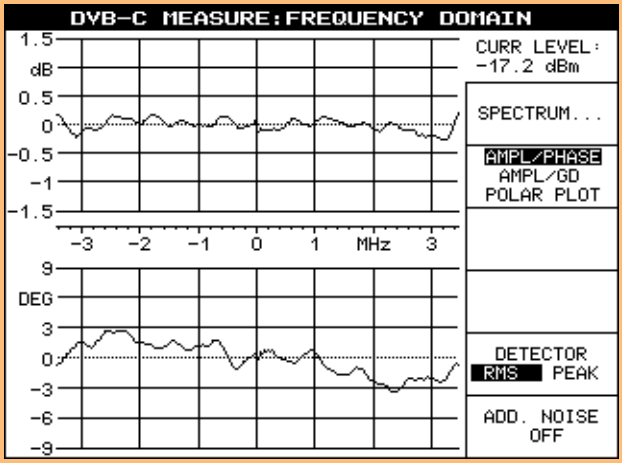


Fig. 7: Amplitude and phase frequency response

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

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

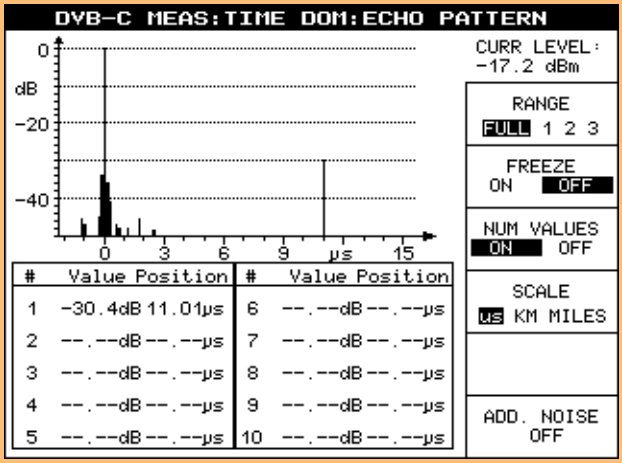


Fig. 8: Echo pattern

The echo pattern measurement allows the main QAM signal (0 dB relative), echoes and pre-echoes to be visualized and measured (numeric values).

The units of the X axis and of the numeric values can be changed from µs to km or even miles, depending on the application.

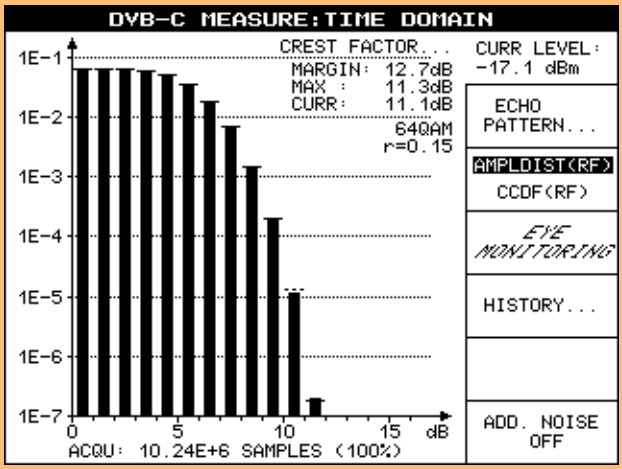


Fig. 9: Amplitude distribution

The measurement function for displaying the amplitude distribution or the CCDF (complementary cumulative distribution function) is used to detect nonlinear distortion.

The frequency distribution of the QAM signal is divided into several 1 dB windows to determine the amplitude distribution. Information on the crest factor is obtained from the frequency distribution and displayed in the upper right-hand corner of the graph. The reference values are marked by short horizontal lines.

Fig. 10: Complementary cumulative distribution function (CCDF)
In contrast to the amplitude distribution, each trace point indicates how often a certain voltage level is attained or exceeded. The ideal frequencies are displayed as short, horizontal lines at 1 dB intervals (reference values) so that the amplitude distribution of the applied signal can be compared with that of an ideal QAM signal. Any deviation from the ideal distribution is then identified by the deviations of the column heights and the value of the crest factor, for example due to clipping in the modulator output stage.

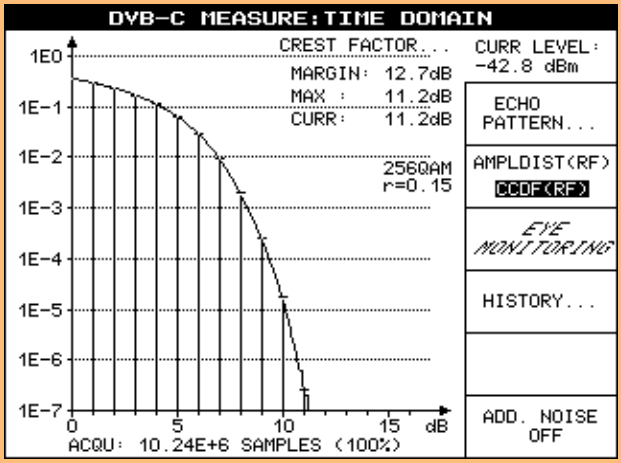


Fig. 11: History function
This measurement is just what is required for long-term monitoring of modulators in cable headends.
The key parameters (level, synchronization information, MER/dB, MER/%, EVM/%, BER before and after Reed-Solomon decoder, synchronization and MPEG2 transport stream data error) are, therefore, displayed in graphical form. This mode can also display all values numerically (average, max, min, current). BER and level measurements run continuously and are independent of other measurements. The user can configure a monitoring interval from 60 seconds (shown here) to 1000 days.

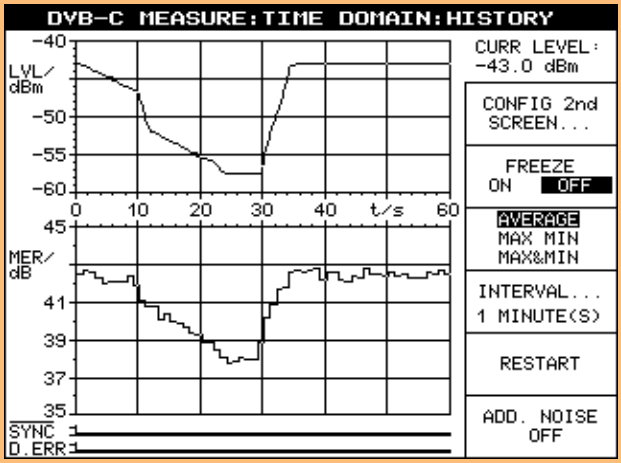
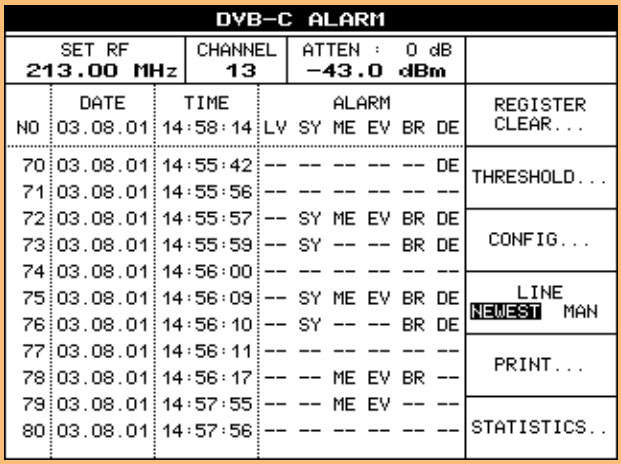


Fig. 12: Monitoring/Alarm register
The EFA checks the input level (LV), QAM synchronization (SY), modulation error ratio (ME), error vector magnitude (EV), bit error ratio before Reed-Solomon decoder (BR) and MPEG2 data errors (DE) of the DVB-C signal at a rate of once per second.
All alarm messages are stored in the alarm register together with the date and time.
Up to 1000 entries can be stored.



EFA for production of modulators

The EFA's analysis capabilities permit in-depth testing of the cable modulator's performance thanks to the outstanding MER/EVM dynamic range, amplitude distribution measurement and spectrum analysis. Another feature is the Equalizer ON/FREEZE/OFF function, which is mandatory during the alignment phase of modulators. Finally, the high accuracy and repeatability of the measurements makes the EFA ideally suited for the production of QAM modulators.

Cable headend monitoring

The capability of the EFA to handle multichannel reception with the spectrum measurement and the history functions (graphical measurement representation versus time) permits the unit to monitor cable headends. In addition, an alarm is triggered if one of the selected parameters exceeds the set threshold (all thresholds can be individually configured). Incident level, QAM synchronization, MER (modulation error ratio), EVM (error vector magnitude), BER before Reed-Solomon decoder and MPEG2 TS data error can be checked in realtime independently of other measurements and decoding. If an error occurs, a 1000-line register is available for recording the date, time and description of the event.

EFA in research and development laboratories

Thanks to the high-quality frontend design, the dynamic range of the modulation error ratio measurement (MER dynamic range better than 41 dB) allows the unit to be used as a reference demodulator in research and development laboratories.

EFA as a multistandard digital and analog platform

Since the analog standards B/G, D/K and I are still used in cable networks, and cable operators need a future-proof solution for their short- and long-term investment, the digital DVB-C demodulator option can be implemented in the analog units. It covers all application areas from R&D to cable headend measurements. Furthermore, to protect your investment, the unit can be updated by means of options to demodulate and analyze the ITU-T J.83/B cable and ATSC/8VSB digital terrestrial standards. These unique features make the new EFA family members THE measurement devices for the present and the future.

Summary of measurements required for the various DVB-C applications

DVB-C application	Level	BER	I/Q parameters	SNR	Phase jitter	MER/EVM	Constellation diagram Histograms	Frequency spectrum	Amplitude (f) - phase (f) - group delay (f)	Amplitude distribution - CCDF	Echo pattern	History	Alarm	Statistics
Production of modulators	✔	✔	✔	✔	✔	!	✔	✔	✔	✔				
Cable headend monitoring	✔	✔				✔	✔	✔			✔	!	✔	✔
Research and development	✔	✔	✔	✔	✔	✔	!	✔	✔	✔	✔	✔		
Service	✔	✔	✔			✔	!	✔				✔	✔	✔

! most important measurement ✔ required measurement

Analog TV

EFA models 12/33/78/89 – analog TV test receivers

Since the analog terrestrial standards B/G, D/K and I are still commonly in use, and broadcasters need a future-proof solution for their short- and long-term investment, Rohde & Schwarz provides a high-end measurement device that can cover all application areas from R&D to field measurements. This EFA model was created to offer the best performance and the most useful features to test standard B/G, D/K and I transmitters under optimal conditions.

To further protect your investment, the unit can be updated by means of options to demodulate and analyze the digital CATV standards DVB-C (option EFA-K21) and ITU-T J.83/B (option EFA K-23) as well as the ATSC/8VSB digital terrestrial standard (option EFA K-22). These unique features make the new EFA family members THE measurement devices for the present and the future!

Characteristics of analog EFA models 12/33/78/89

Fully compatible with analog standards, the analog EFA models receive and demodulate most analog TV standards (B/G, D/K and I). All key parameters for demodulating the received signal can be automatically or manually selected:

- Switchable group delay correction
- Switchable synchronous detector (5 different modes)
- Demodulation using intercarrier method
- Balanced audio outputs
- Measurement functions for
  - vision/sound carrier spacing (level and frequency)
  - FM sound carrier and pilot deviation
  - Residual Picture Carrier (RPC) or video modulation depth
- Input of any IF frequency with the aid of the EFA-B3 option: frequency range continuously tunable from 5 MHz to 1000 MHz

Features

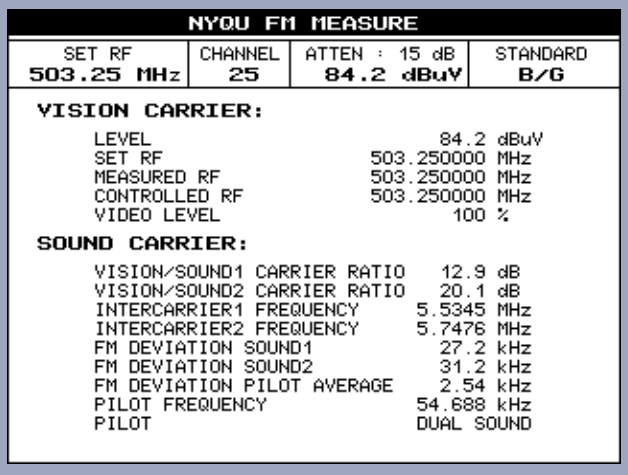
The analog EFA models provide high-precision demodulated baseband signals (vision and sound) for measurements in various applications (TV transmitters, cable headends, coverage measurements, R&D). At the same time, all relevant RF parameters are monitored at high speed and represented in a logical manner (Fig. 13). User-configurable alarm messages permit unattended monitoring of the received signals as well as switchover to alternative links in the event of a failure.

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

Fig. 13: Measurement window

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

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



Specification of intermodulation

In-channel distortion

In-channel distortion is determined by means of a modulated TV signal with a vision carrier (f_{VC}), a colour subcarrier (f_{SB}) and a sound carrier (f_{SC}). Modulation is chosen such that the vision carrier is lowered by 6 dB, the colour subcarrier by 14 dB and the sound carrier by 10 dB relative to the sync pulse level. The level of the intermodulation product is measured at the video output relative to the black-to-white transition of the video signal. Fig. 14 shows the signals involved and the reference level at the RF.

Out-of-channel distortion

The effect of signals outside the received channel is described by the 3rd-order intercept point (TOI). For the EFA family, this parameter is specified on the basis of a three-tone measurement with the following signals: a wanted carrier at the receive frequency f_{VC} and two unwanted carriers 14 MHz and 15 MHz above the receive frequency.

The unwanted frequencies are chosen to be within the bandwidth of the RF selection but outside the bandwidth of the first IF filter. The effect of out-of-channel interference on the receiver can thus reliably be determined. It is assumed that each of the three signals has a level P = –33 dBm. The level of the intermodulation product ΔIM 1 MHz relative to the wanted carrier is measured (see Fig. 15, measurement at the RF). The 3rd-order intercept point is::

$$TOI/dBm = P/dBm + \frac{\Delta IM/dB}{2} + 3$$

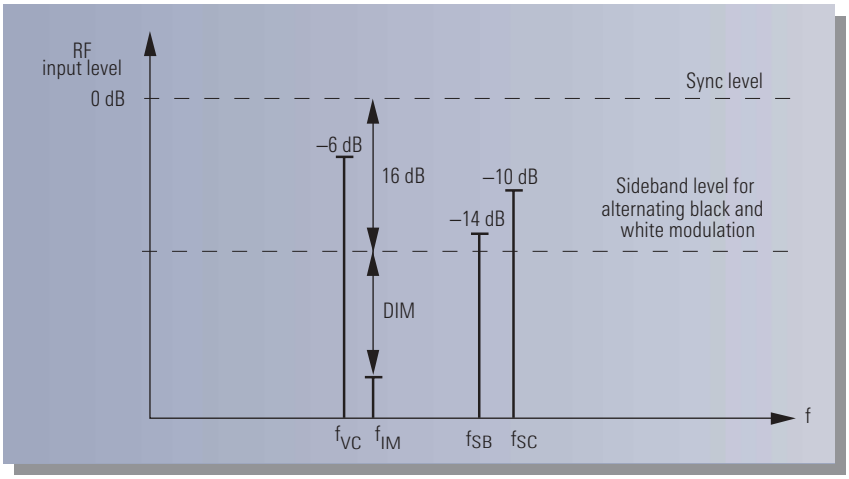


Fig. 14

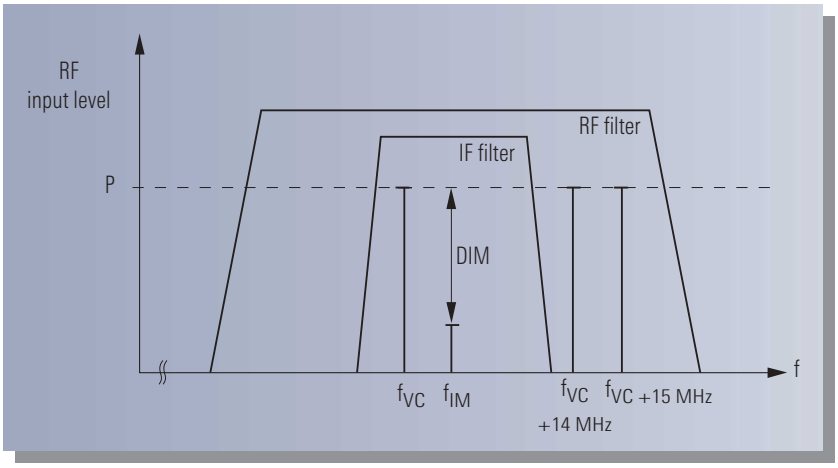


Fig. 15

Ordering information

DVB-C Test Receiver, selective 4/16/32/64/128/256 QAM, MPEG data stream output, constellation diagram	EFA 60	2067.3004.60
DVB-C Test Demodulator, broadband 4/16/32/64/128/256 QAM, MPEG data stream output, constellation diagram	EFA 63	2067.3004.63

TV Test Receiver, Std. B/G, dual sound IF 38,9 MHz, RF 45 MHz to 860 MHz, IEEE bus	EFA 12	2067.3004.12
TV Demodulator, Std. B/G, dual sound IF 38.9 MHz, RF 45 MHz to 1000 MHz, IEEE bus	EFA 33	2067.3004.33
TV Test Receiver, Std. D/K or I (mono) IF 38.9 MHz, RF 45 MHz to 860 MHz,, IEEE bus	EFA 78	2067.3004.78
TV Demodulator, Std. D/K or I (mono) IF 38.9 MHz, RF 45 MHz to 1000 MHz	EFA 89	2067.3004.89

Options

NICAM Demodulator for TV standard B/G - D/K	EFA-B2	2067.3610.02
NICAM Demodulator for TV standard I	EFA-B2	2067.3610.04
RF Selection for demodulators (models 33/43/53/63/73/89/93)	EFA-B3	2067.3627.02
MPEG2 Decoder	EFA-B4	2067.3633.02
Video Distributor (four video outputs, only models 33/89/93)	EFA-B6	2067.3656.02
Switchable Sound Trap (for models 12/33)	EFA-B7	2067.3710.02
6 MHz SAW Filter (for digital EFA models or EFA-B10, EFA-B20)	EFA-B11	2067.3691.00
7 MHz SAW Filter (for digital EFA models or EFA-B10, EFA-B20)	EFA-B12	2067.3556.02
8 MHz SAW Filter (for EFA 5x,/6x/7x or EFA-B20)	EFA-B13	2067.3579.03
2 MHz SAW Filter (for EFA 5x,/6x/7x or EFA-B20)	EFA-B14	2067.3562.00
Digital Demodulator Platform	EFA-B20	2067.3585.02

Firmware options

DVB-C /J83/A/C (QAM) Firmware (for models 50/53/70/73 or option EFA-B20)	EFA-K21	2067.4000.02
ATSC/8VSB Firmware (for models 60/63/70/73 or option EFA-B20)	EFA-K22	2067.4017.02
J.83/B (QAM) Firmware (for models 50/53/60/63 or option EFA-B20)	EFA-K23	2067.4023.02
FIR Coefficient Readout Firmware (only for EFA 5x or EFA-B20 + EFA-K22)	EFA-K25	2067.4046.02

Recommended extras

EFA Calibration Values	EFA-DCV	2082.0490.09
EFA-B4 Calibration Values	EFA-DCV	2082.0490.15
19" Adapter	ZZA-93	0396.4892.00
Lemo Triax connector (mono) with connecting cable (open)		2067.7451.00
Service manual		2068.0950.24
Carrying Bag for 19" units, 3 HU, depth 460 mm	ZZT-314	1001.0523.00

Printed in Germany 0102 (U bb/kr)

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