ROHDE&SCHWARZ
Broadcasting Division

Operating Manual

PORTABLE SAT/TV/FM TEST RECEIVER

R&S® EFL100

2111.2055...

Printed in Germany

Data sheet

Version 02.00

August 2003

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

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

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

ROHDE&SCHWARZ

Description

A cost-efficient, mobile solution for installing, checking and maintaining transmitters, antennas and signal distribution equipment is needed. The Test Receiver R&S EFL100 from Rohde & Schwarz meets all requirements. In many cases, the R&S EFL100 is also the ideal complement to a high-end TV test receiver used for more in-depth signal analysis.

Depending on the specific requirements, users can choose between three models. With the fully equipped model 04 of the R&S EFL100, detailed quality measurements of DVB-C, DVB-S and DVB-T signals can be carried out along with level measurements of analog and digital TV, FM radio and satellite reception signals.

The R&S EFL100 comes with a built-in battery. The battery is rechargeable via the integrated power supply unit (110 V AC to 240 V AC).

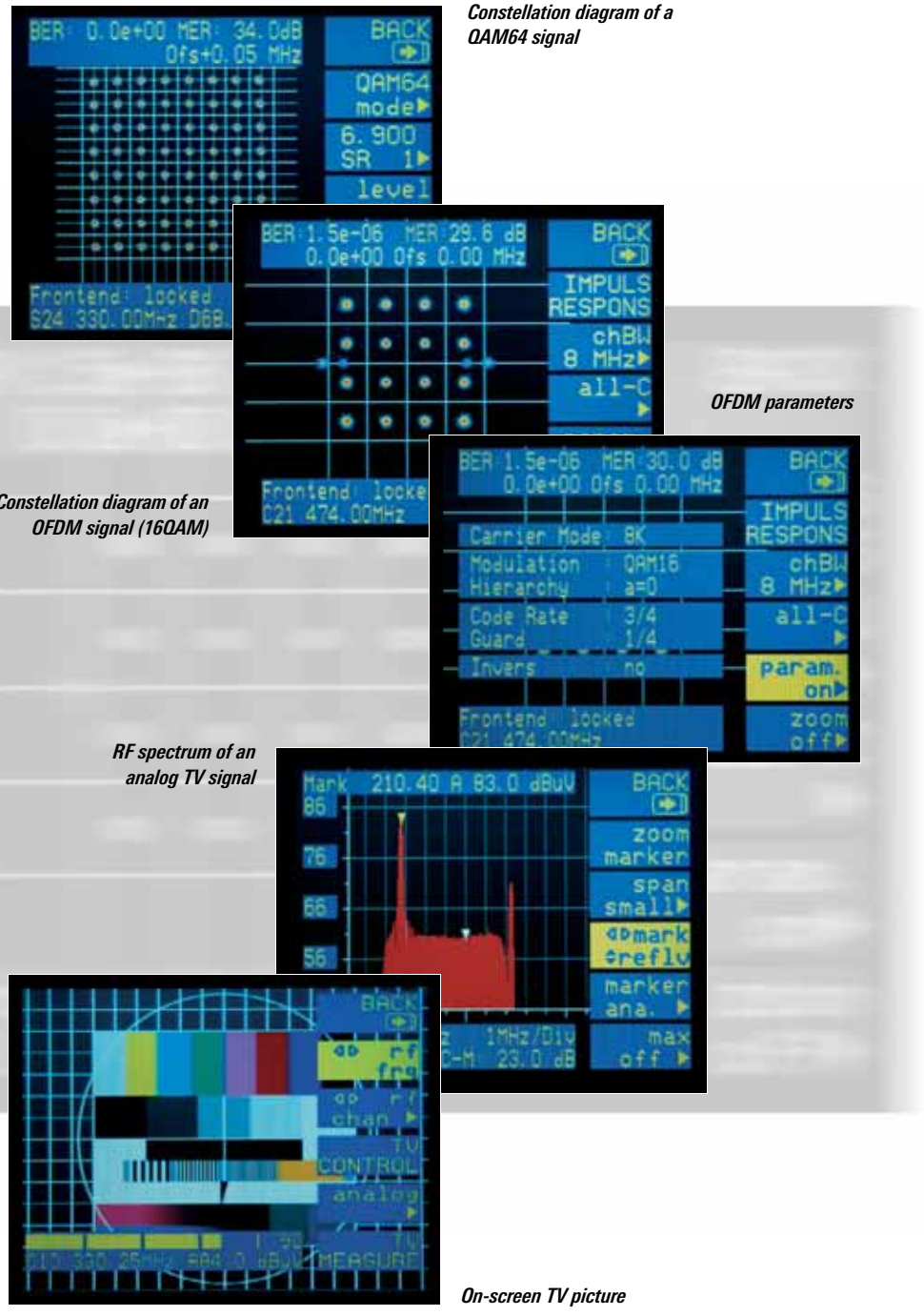
Four different detectors for peak, average, maximum and minimum values are available for level measurements of analog and digital signals. Correction values are determined by the level calibration of the R&S EFL100 and stored in a memory. This allows precise level measurements to be performed with the R&S EFL100.

The R&S EFL100 has been developed for the standards B/G, D/K, I, L, M, N, M Korea, M Japan and NICAM. The video signal can be processed and reproduced in line with the colour TV standards PAL, SECAM and NTSC.

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

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

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



Constellation diagram of a QAM64 signal

OFDM parameters

Constellation diagram of an OFDM signal (16QAM)

RF spectrum of an analog TV signal

On-screen TV picture

Specifications of base unit

Frequency range	SAT – analog, digital TV DVB-T FM IF – analog, digital RP	920 MHz to 2150 MHz 44.75 MHz to 867.20 MHz 178 MHz to 227 MHz / 474 MHz to 858 MHz 88 MHz to 108 MHz (45.75 MHz to 867.20 MHz) 38.9 MHz 4 MHz to 80 MHz
Channel plan	TV	standard B, 7 MHz standard D/G/I/K, 8 MHz standard M, 6 MHz
Frequency setting	SAT – analog, digital TV/FM RP	in 0.125 MHz steps in 50 kHz steps in 50 kHz steps
Test error/level	SAT – analog, digital TV/FM RP	max. ±2 dB max. ±2 dB max. ±2 dB
Slope	TV (BT/TT)	≤1.5 dB except S41 (461.25 MHz) ≤4 dB C70 (863.25 MHz) ≤2.5 dB
RF input		coaxial BNC 75 Ω
RF input attenuation		0 dB to –60 dB in 4 dB steps
RF level range	SAT/TV/FM IF/RP	30 dBµV to 130 dBµV 70 dBµV to 130 dBµV / 30 dBµV to 130 dBµV
Level measurement bandwidth	SAT – analog, digital TV – analog, digital FM RP RP DVB	8 MHz 1 MHz 200 kHz 1 MHz 1 MHz / 200 kHz (depending on system rate setting)
Measurement detector	SAT – analog TV – analog FM DVB-C/S/T RP analog RP digital	mean value display peak value display mean value display mean value display (corrected) peak value display mean value display (corrected)
Return loss	TV SAT – analog, digital	≥10 dB (typ. 15 dB) ≥8 dB
Audio IF bandwidth	SAT TV FM	130 kHz / 280 kHz 200 kHz 200 kHz
Audio de-emphasis	SAT TV/FM	50 µs / DNR 75 µs / J17 50 µs
Audio carrier measurement and demodulation	SAT	FM audio processing 4.99 MHz to 9.01 MHz in 10 kHz steps
	TV	standard B/G TT1 = 5.5 MHz, TT2 = 5.74 MHz standard D/K TT1 = 6.5 MHz, TT2 = 6.26 MHz standard I TT1 = 6 MHz standard M/M_{Korea} TT1 = 4.5 MHz, TT2 = 4.72 MHz standard L AM = 6.5 MHz, NICAM = 5.85 MHz standard B/G NICAM = 5.85 MHz standard I NICAM = 6.552 MHz
	FM	FM audio processing 45 MHz to 867 MHz
NICAM audio BER	TV	0 to 1.5 x 10^{-2}
Video output	SAT	1 V pp / 75 Ω ≤±3 dB
	TV	1 V pp / 75 Ω ≤±1 dB
LNB supply voltage	SAT	0.10 V to 20 V, max. 500 mA
LNB control	SAT	22 kHz, DiSEqC, simple DiSEqC, tone burst, V-SEC, UFOµ-DiSEqC
SAT analog measurements	LNB current	0 mA to 500 mA ±10 mA
	LNB voltage	0 V to 30 V DC ±100 mV
	C/N	0 dB to 35 dB ±2 dB
	S/N	35 dB to 50 dB ±2 dB (weighted)
	cross-polarization	0 dB to 30 dB ±2 dB

TV analog measurements	remote feed current	0 mA to 500 mA ±10 mA
	remote feed voltage	0 V to 30 V DC ±100 mV
	S/N	35 dB to 47 dB ±2 dB (weighted)
DVB-S measurements (QPSK)	MER	up to 12 dB
	BER	1 x 10^{-2} to 1 x 10^{-8} (0), before Viterbi
DVB-C measurements (QAM64, QAM128)	MER	up to 32 dB at QAM64
	BER	1 x 10^{-2} to 1 x 10^{-8} (0) at QAM64 (BER better than 1 x 10^{-8} for level >57 dBµV), before Reed-Solomon
DVB-T measurements (2k/8k mode)	MER	up to 32 dB
	BER	5 x 10^{-2} to 1 x 10^{-8} (0), before Viterbi and Reed-Solomon
Display		5.5" TFT screen 320 x 240 pixel pixel error max. ≤6 with a distance of ≥6.5 mm ∅
Remote control interface		RS-232-C (25-pin connector, female)
Power supply Mains operation Battery operation Power consumption DCP_{max} Power consumption ACP_{max}		 100 V AC to 250 V AC / 50 Hz to 400 Hz lead battery 12 V DC / 3.5 Ah 50 W 62 W
Dimensions (W x H x D)		275 mm x 130 mm x 350 mm
Safety standards		CE symbol protection class I VDE EN 61010
Operating temperature range		+5 °C to +45 °C
Storage temperature range		–20 °C to +70 °C
Weight		approx. 7 kg

RP = return path; BT = vision carrier; TT1, TT2 = sound carrier 1, 2

Measuring Amplifier with FM Filter R&S EFL 100-Z3

Specifications of Options EFL100-Z3 and EFL100-Z4

Preamplifier for level increase with weak DVB-T signals. Suppression of FM range when special channels S02 und S03 are measured in broadband communication systems (109 MHz to 125 MHz).

	R&S EFL100-Z3	**R&S EFL100-Z4**
Frequency range	109 MHz to 1 GHz	40 MHz to 1 GHz
Gain	19 dB	
Measurement uncertainty	±1,5 dB	
Noise figure	<3 dB	
Stopband attenuation	at 87 MHz: 35 dB ± 3 dB at 95 MHz: 22 dB ± 3 dB	–
Supply voltage	10 V to 20 V via RF output	
Connectors	BNC male/female	

All models at a glance

	R&S EFL100 model 02	R&S EFL100 model 03	R&S EFL100 model 04
Equipment	Basic model, analog	Model 02 + QAM/QPSK	Model 03 + DVB-T
Analog TV/ FM basic module	✓	✓	✓
QPSK/QAM module		✓	✓
DVB-T module			✓
MPEG-2 decoder module		✓	✓
Return path module		✓	✓
MPEG-2 TS parallel output		✓	✓
SCART connector	✓	✓	✓
Modem connector	✓	✓	✓
Earphone connector	✓	✓	✓
12 V DC input		✓	✓
Features			
Signal level min./max.	✓	✓	✓
S/N measurement (video)	✓	✓	✓
NICAM audio	✓	✓	✓
Spectrum representation via monitor and printer	✓	✓	✓
Scope function	✓	✓	✓
DVB carrier level	✓	✓	✓
BER		✓	✓
MER		✓	✓
Constellation diagram		✓	✓
Analog TV program on screen	✓	✓	✓
DVB program on screen (free TV)		✓	✓
Memory for 100 settings	✓	✓	✓
Teletext	✓	✓	✓
Date and time	✓	✓	✓

Certified Quality System ISO 9001 DQS REG. NO 1954 QM

Certified Environmental System ISO 14001 DQS REG. NO 1954 UM

Ordering information

Portable SAT/TV/FM Test Receiver ANALOG	R&S EFL100	2111.2055.02
Portable SAT/TV/FM Test Receiver ANALOG, DVB-C, DVB-S, MPEG-2, RETURN PATH	R&S EFL100	2111.2055.03
Portable SAT/TV/FM Test Receiver ANALOG, DVB-C, DVB-S, DVB-T, MPEG-2, RETURN PATH	R&S EFL100	2111.2055.04

Options

Measuring Amplifier with FM Filter	R&S EFL100-Z3	2111.2132.02
Measuring Amplifier	R&S EFL100-Z4	2111.2149.22

Recommended extras

Leather Bag	R&S EFL100-Z1	2111.2103.00
Antiglare Device	R&S EFL100-Z2	2111.2110.00

Printed in Germany (Pe we)

PD 0758.0551.32 · Portable SAT/TV/FM Test Receiver R&S®EFL100 · Version 02.00 · August 2003 · Data without tolerance limits is not binding · Subject to change

ROHDE&SCHWARZ

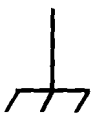
Rohde&Schwarz GmbH&Co. KG · Mühldorfstraße 15 · 81671 München · Germany · P.O.B. 80 14 69 · 81614 München · Germany · Telephone +49 89 4129-0
www.rohde-schwarz.com · Customer Support: Telephone +49 1805124242, Fax +49 89 4129-13777, E-mail: CustomerSupport@rohde-schwarz.com

Safety Instructions

This unit has been designed and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards.

To maintain this condition and to ensure safe operation, the user must observe all instructions and warnings given in this operating manual.

Safety-related symbols used on equipment and documentation from R&S:

							
Observe operating instructions	Weight indication for units >18 kg	PE terminal	Ground terminal	Danger! Shock hazard	Warning! Hot surfaces	Ground	Attention! Electrostatic sensitive devices require special care

1. The unit may be used only in the operating conditions and positions specified by the manufacturer. Unless otherwise agreed, the following applies to R&S products:

   IP degree of protection 2X, pollution severity 2 overvoltage category 2, only for indoor use, altitude max. 2000 m.

   The unit may be operated only from supply networks fused with max. 16 A.

   Unless specified otherwise in the data sheet, a tolerance of ±10% shall apply to the nominal voltage and of ±5% to the nominal frequency.

2. For measurements in circuits with voltages V_{rms} > 30 V, suitable measures should be taken to avoid any hazards.

   (using, for example, appropriate measuring equipment, fusing, current limiting, electrical separation, insulation).

3. If the unit is to be permanently wired, the PE terminal of the unit must first be connected to the PE conductor on site before any other connections are made. Installation and cabling of the unit to be performed only by qualified technical personnel.

4. For permanently installed units without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused such as to provide suitable protection for the users and equipment.

5. Prior to switching on the unit, it must be ensured that the nominal voltage set on the unit matches the nominal voltage of the AC supply network.

   If a different voltage is to be set, the power fuse of the unit may have to be changed accordingly.

6. Units of protection class I with disconnectible AC supply cable and appliance connector may be operated only from a power socket with earthing contact and with the PE conductor connected.

7. It is not permissible to interrupt the PE conductor intentionally, neither in the incoming cable nor on the unit itself as this may cause the unit to become electrically hazardous.

   Any extension lines or multiple socket outlets used must be checked for compliance with relevant safety standards at regular intervals.

8. If the unit has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases it must be ensured that the power plug is easily reachable and accessible at all times (length of connecting cable approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply.

   If units without power switches are integrated in racks or systems, a disconnecting device must be provided at system level.

9. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

   Prior to performing any work on the unit or opening the unit, the latter must be disconnected from the supply network.

   Any adjustments, replacements of parts, maintenance or repair may be carried out only by authorized R&S technical personnel.

   Only original parts may be used for replacing parts relevant to safety (eg power switches, power transformers, fuses). A safety test must be performed after each replacement of parts relevant to safety.

   (visual inspection, PE conductor test, insulation-resistance, leakage-current measurement, functional test).

continued overleaf

Safety Instructions

10. Ensure that the connections with information technology equipment comply with IEC950 / EN60950.
11. Lithium batteries must not be exposed to high temperatures or fire.

    Keep batteries away from children.

    If the battery is replaced improperly, there is danger of explosion. Only replace the battery by R&S type (see spare part list).

    Lithium batteries are suitable for environmentally-friendly disposal or specialized recycling. Dispose them into appropriate containers, only.

    Do not short-circuit the battery.
12. Equipment returned or sent in for repair must be packed in the original packing or in packing with electrostatic and mechanical protection.
13. Electrostatics via the connectors may damage the equipment. For the safe handling and operation of the equipment, appropriate measures against electrostatics should be implemented.
14. The outside of the instrument is suitably cleaned using a soft, lint-free dustcloth. Never use solvents such as thinners, acetone and similar things, as they may damage the front panel labeling or plastic parts.
15. Any additional safety instructions given in this manual are also to be observed.

Kundeninformation zur Batterieverordnung (BattV)
Dieses Gerät enthält eine schadstoffhaltige Batterie.
Diese darf nicht mit dem Hausmüll entsorgt werden.

Nach Ende der Lebensdauer darf die Entsorgung nur über eine Rohde&Schwarz-Kundendienststelle oder eine geeignete Sammelstelle erfolgen.

Safety Regulations for Batteries (according to BattV)
This equipment houses a battery containing harmful substances that must not be disposed of as normal household waste.
After its useful life, the battery may only be disposed of at a Rohde & Schwarz service center or at a suitable depot.

Consignes de sécurité pour batteries (selon BattV)
Cet appareil est équipé d'une pile comprenant des substances nocives. Ne jamais la jeter dans une poubelle pour ordures ménagéres.
Une pile usagée doit uniquement être éliminée par un centre de service client de Rohde & Schwarz ou peut être collectée pour être traitée spécialement comme déchets dangereux.

Adressen/Addresses

FIRMENSITZ/HEADQUARTERS

	Phone Fax E-mail
Rohde & Schwarz GmbH & Co. KG Mühldorfstraße 15 · D-81671 München Postfach 80 14 69 · D-81614 München	+49 (89) 41 29-0 +49 89 4129-121 64 -

WERKE/PLANTS

Rohde & Schwarz Messgerätebau GmbH Riedbachstraße 58 · D-87700 Memmingen Postfach 1652 · D-87686 Memmingen	+49 (8331) 108-0 +49 (8331) 108-11 24 -
Rohde & Schwarz GmbH & Co. KG Werk Teisnach Kaikenrieder Straße 27 · D-94244 Teisnach Postfach 1149 · D-94240 Teisnach	+49 (9923) 857-0 +49 (9923) 857-11 74 -
Rohde & Schwarz GmbH & Co. KG Dienstleistungszentrum Köln Graf-Zeppelin-Straße 18 · D-51147 Köln Postfach 98 02 60 · D-51130 Köln	+49 (2203) 49-0 +49 (2203) 49 51-308 info@rsdc.rohde-schwarz.com service@rsdc.rohde-schwarz.com

TOCHTERUNTERNEHMEN/SUBSIDIARIES

Rohde & Schwarz Vertriebs-GmbH Mühldorfstraße 15 · D-81671 München Postfach 80 14 69 · D-81614 München	+49 (89) 41 29-137 74 +49 (89) 41 29-137 77 -
Rohde & Schwarz International GmbH Mühldorfstraße 15 · D-81671 München Postfach 80 14 60 · D-81614 München	+49 (89) 41 29-129 84 +49 (89) 41 29-120 50 -
Rohde & Schwarz Engineering and Sales GmbH Mühldorfstraße 15 · D-81671 München Postfach 80 14 29 · D-81614 München	+49 (89) 41 29-137 11 +49 (89) 41 29-137 23 -
R&S BICK Mobilfunk GmbH Fritz-Hahne-Str. 7 · D-31848 Bad Münder Postfach 2062 · D-31844 Bad Münder	+49 (5042) 998-0 +49 (5042) 998-105 -
Rohde & Schwarz FTK GmbH Wendenschlossstraße 168, Haus 28 D-12557 Berlin	+49 (30) 658 91-122 +49 (30) 655 50-221 -
Rohde & Schwarz SIT GmbH Agastraße 3 D-12489 Berlin	+49 (30) 658 84-0 +49 (30) 658 84-183

ADRESSEN DEUTSCHLAND/ADDRESSES GERMANY

Rohde & Schwarz Vertriebs-GmbH Mühldorfstraße 15 · D-81671 München Postfach 80 14 69 · D-81614 München	+49 89 4129-133 74 +4989 4129-133 77 -

Zweigniederlassungen der Rohde & Schwarz Vertriebs-GmbH/Branch offices of Rohde & Schwarz Vertriebs-GmbH

Zweigniederlassung Nord, Geschäftsstelle Berlin Ernst-Reuter-Platz 10 · D-10587 Berlin Postfach 100620 · D-10566 Berlin	+49 (30) 34 79 48-0 +49 (30) 34 79 48 48 -
Zweigniederlassung Büro Bonn Josef-Wirmer-Straße 1-3 · D-53123 Bonn Postfach 140264 · D-53057 Bonn	+49 (228) 918 90-0 +49 (228) 25 50 87 -
Zweigniederlassung Nord, Geschäftsstelle Hamburg Steilshooper Alle 47 · D-22309 Hamburg Postfach 60 22 40 · D-22232 Hamburg	+49 (40) 63 29 00-0 +49 (40) 630 78 70 -
Zweigniederlassung Mitte, Geschäftsstelle Köln Niederkasseler Straße 33 · D-51147 Köln Postfach 900 149 · D-51111 Köln	+49 (2203) 807-0 +49 (2203) 807-650 -
Zweigniederlassung Süd, Geschäftsstelle München Mühldorfstraße 15 · D-81671 München Postfach 80 14 69 · D-81614 München	+49 (89) 41 86 95-0 +49 (89) 40 47 64 -
Zweigniederlassung Süd, Geschäftsstelle Nürnberg Donaustraße 36 D-90451 Nürnberg	+49 (911) 642 03-0 +49 (911) 642 03-33 -
Zweigniederlassung Mitte, Geschäftsstelle Neu-Isenburg Siemensstraße 20 D-63263 Neu-Isenburg	+49 (6102) 20 07-0 +49 (6102) 20 07 12 -

ADRESSEN WELTWEIT/ADDRESSES WORLDWIDE

Albania	siehe / see Austria
Algeria	ROHDE & SCHWARZ Bureau d'Alger 5B Place de Laperrine 16035 Hydra-Alger +213 (21) 48 20 18 +213 (21) 69 46 08
Argentina	PRECISION ELECTRONICA S.R.L. Av. Pde Julio A. Roca 710 - 6° Piso (C1067ABP) Buenos Aires +541 (14) 331 41 99 +541 (14) 334 51 11 alberto_lombardi@prec-elec.com.ar
Australia	ROHDE & SCHWARZ (AUSTRALIA) Pty. Ltd. Sales Support Unit 6 2-8 South Street Rydalmere, N.S.W. 2116 +61 (2) 88 45 41 00 +61 (2) 96 38 39 88 lyndell.james@rsaus.rohde-schwarz.com
Austria	ROHDE & SCHWARZ-ÖSTERREICH Ges.m.b.H. Am Euro Platz 3 Gebäude B 1120 Wien +43 (1) 602 61 41-0 +43 (1) 602 61 41-14 office@rsoe.rohde-schwarz.com
Azerbaijan	ROHDE & SCHWARZ Azerbaijan Liaison Office Baku ISR Plaza 340 Nizami Str. 370000 Baku +994 (12) 93 31 38 +994 (12) 93 03 14 RS-Azerbaijan@RUS.Rohde-Schwarz.com
Baltic Countries	siehe / see Denmark
Bangladesh	BIL Consortium Ltd. Corporation Office House No: 95/A, Block - 'F' Road No. 4, Banani Dhaka-1213 +880 (2) 881 06 53 +880 (2) 882 82 91
Belgium	ROHDE & SCHWARZ BELGIUM N.V. Excelsiorlaan 31 Bus 1 1930 Zaventem +32 (2) 721 50 02 +32 (2) 725 09 36 info@rsb.rohde-schwarz.com
Brasil	ROHDE & SCHWARZ DO BRASIL LTDA. Av. Alfredo Egidio de Souza Aranha n° 177, 1° andar - Santo Amaro 04726-170 Sao Paulo - SP +55 (11) 56 44 86 11 (general) +55 (11) 56 44 86 25 (sales) +55 (11) 56 44 86 36 sales-brazil@rsdb.rohde-schwarz.com
Brunei	GKL Equipment PTE. Ltd. Jurong Point Post Office P.O.Box 141 Singapore 916405 +65 (6) 276 06 26 +65 (6) 276 06 29 gkleqpt@singnet.com.sg
Bulgaria	ROHDE & SCHWARZ ÖSTERREICH Representation Office Bulgaria 39, Fridtjof Nansen Blvd. 1000 Sofia +359 (2) 963 43 34 +359 (2) 963 21 97 rohdebg@rsoe.rohde-schwarz.com
Bosnia-Herzegovina	siehe / see Slovenia

Adressen/Addresses

Canada
ROHDE & SCHWARZ CANADA Inc.
555 March Rd.
Kanata, Ontario K2K 2M5
+1 (613) 592 80 00
+1 (613) 592 80 09
cgirwarnauth@rscanada.ca

Canada
TEKTRONIX CANADA Inc.
Test and Measurement
4929 Place Olivia
Saint-Laurent, Pq

Montreal H4R 2V6
+1 (514) 331 43 34
+1 (514) 331 59 91

Chile
DYMEQ Ltda.
Av. Larrain 6666
Santiago
+56 (2) 339 20 00
+56 (2) 339 20 10
dnussbaum@dymeq.com

China
ROHDE & SCHWARZ China Ltd.
Representative Office Shanghai
Central Plaza
227 Huangpi North Road
RM 807/809
Shanghai 200003
+86 (21) 63 75 00 18
+86 (21) 63 75 91 70

China
ROHDE & SCHWARZ China Ltd.
Representative Office Beijing
Room 602, Parkview Center
2 Jiangtai Road
Chao Yang District
Beijing 100016
+86 (10) 64 31 28 28
+86 (10) 64 37 98 88
info.rschina@rsbp.rohde-schwarz.com

China
ROHDE & SCHWARZ China Ltd.
Representative Office Guangzhou
Room 2903, Metro Plaza
183 Tianhe North Road
Guangzhou 510075
+86 (20) 87 55 47 58
+86 (20) 87 55 47 59

China
ROHDE & SCHWARZ China Ltd.
Representative Office Chengdu
Unit G, 28/F, First City Plaza
308 Shuncheng Avenue
Chengdu 610017
+86 (28) 86 52 76 05 to 09
+86 (28) 86 52 76 10
rsbpc@mail.sc.cninfo.net

China
ROHDE & SCHWARZ China Ltd.
Unit 3115
31/F Entertainment Building
30 Queen's Road Central
Hongkong
+85 (2) 21 68 06 70
+85 (2) 21 68 08 99

China
ROHDE & SCHWARZ China Ltd.
Representative Office Xi'an
Room 10125, Jianguo Hotel Xi'an
No. 2, Huzhu Road
Xi'an 710048
+86 (29) 321 82 33
+86 (29) 329 60 15
sherry.yu@rsbp.rohde-schwarz.com

China
Shanghai ROHDE & SCHWARZ
Communication Technology Co.Ltd.
Central Plaza, Unit 809
227 Huangpi North Road
Shanghai 200003

China
Beijing ROHDE & SCHWARZ Communication
Technology Co.Ltd.
Room 106, Parkview Centre
No. 2, Jiangtai Road
Chao Yang District
Beijing 100016
+86 (10) 64 38 80 80
+86 (10) 64 38 97 06

Croatia
siehe / see Slovenia

Cyprus
HINIS TELECAST LTD.
Agiou Thoma 18
Kiti

Larnaca 7550
+357 (24) 42 51 78
+357 (24) 42 46 21
hinis@logos.cy.net

Czech Republic
ROHDE & SCHWARZ - Praha s.r.o.
Hadovka Office Park
Evropská 33c
16000 Praha 6
+420 (2) 24 31 12 32
+420 (2) 24 31 70 43
office@rscz.rohde-schwarz.com

Denmark
ROHDE & SCHWARZ DANMARK A/S
Ejby Industrivej 40
2600 Glostrup
+45 (43) 43 66 99
+45 (43) 43 77 44

Ecuador
REPRESENTACIONES MANFRED WEINZIERL
Vía Láctea No. 4 y Via Sta. Inés
P.O.Box 17-22-20309
1722 Cumbayá-Quito
+593 (22) 89 65 97
+593 (22) 89 65 97
mweinzierl@accessinter.net

Egypt
U.A.S. Universal Advanced Systems
31 Manshiet El-Bakry Street
Heliopolis
11341 Cairo
+20 (2) 455 67 44
+20 (2) 256 17 40
an_uas@link.net

El Salvador
siehe / see Mexico

Estonia
ROHDE & SCHWARZ DANMARK A/S
Estonian Branch Office
Narva mnt. 13
10151 Tallinn
+372 (6) 14 31 23
+372 (6) 14 31 21
margo.fingling@rsdk.rohde-schwarz.com

Finland
Orbis Oy
P.O.Box 15
00421 Helsinski 42
+358 (9) 47 88 30
+358 (9) 53 16 04
info@orbis.fi

France
ROHDE & SCHWARZ FRANCE
Immeuble "Le Newton"
9-11, rue Jeanne Braconnier
92366 Meudon La Forêt Cédex
+33 (1) 41 36 10 00
+33 (1) 41 36 11 73

France
Niederlassung/Subsidiary Rennes
37 Rue du Bignon
Bât. A
F-35510 Cesson Sevigne
+33 (0) 299 51 97 00
+33 (0) 299 51 98 77
-

France
Niederlassung/Subsidiary Toulouse
Technoparc 3
B.P. 501
F-31674 Labège Cédex
+33 (0) 561 39 10 69
+33 (0) 561 39 99 10
-

France
Aix-en-Provence
+33 (0) 494 07 39 94
+33 (0) 494 07 55 11
-

France
Office Lyon
+33 (0) 478 29 88 10
+33 (0) 478 79 18 57

France
Office Nancy
+33 (0) 383 54 51 29
+33 (0) 383 54 82 09

Ghana
KOP Engineering Ltd.
P.O. Box 11012
3rd Floor Akai House, Osu
Accra North
+233 (21) 77 89 13
+233 (21) 701 06 20

Greece
MERCURY S.A.
6, Loukianou Str.
10675 Athens
+302 (10) 722 92 13
+302 (10) 721 51 98
mercury@hol.gr

Guatemala
siehe / see Mexico

Honduras
siehe / see Mexico

Hongkong
Electronic Scientific Engineering
36/F Dorset House, Taikoo Place
979 King's Road
Quarry Bay
Hong Kong
+852 (25) 07 03 33
+852 (25) 07 09 25
stephenchau@ese.com.hk

Hungary
ROHDE & SCHWARZ
Budapesti Iroda
Váci út 169
1138 Budapest
+36 (1) 412 44 60
+36 (1) 412 44 61
rohdehu@rsoe.rohde-schwarz.com

Iceland
siehe / see Denmark

Adressen/Addresses

India
ROHDE & SCHWARZ India Pvt. Ltd.
Bangalore Office
No. 24, Service Road, Domlur
2nd Stage Extension
Bangalore - 560 071
+91 (80) 535 23 62
+91 (80) 535 03 61
rsindiab@rsnl.net

India
ROHDE & SCHWARZ India Pvt. Ltd.
Hyderabad Office
302 & 303, Millenium Centre
6-3-1099/1100, Somajiguda
Hyderabad - 500 016
+91 (40) 23 32 24 16
+91 (40) 23 32 27 32
rsindiah@nd2.dot.net.in

India
ROHDE & SCHWARZ India Pvt. Ltd.
244, Okhla Industrial Estate, Phase-III
New Delhi 110020
+91 (11) 26 32 63 81
+91 (11) 26 32 63 73
sales@rsindia.rohde-schwarz
services@rsindia.rohde-schwarz.com

India
ROHDE & SCHWARZ India Pvt. Ltd.
RS India Mumbai Office
B-603, Remi Bizcourt, Shah Industrial
Estate, Off Veera Desai Road
Mumbai - 400 058
+91 (22) 26 30 18 10
+91 (22) 26 32 63 73
rsindiam@rsnl.net

Indonesia
PT ROHDE & SCHWARZ Indonesia
Graha Paramita 5th Floor
Jln. Denpasar Raya Blok D-2
Jakarta 12940
+62 (21) 252 36 08
+62 (21) 252 36 07
sales@rsbj.rohde-schwarz.com
services@rsbj.rohde-schwarz.com

Iran
ROHDE & SCHWARZ IRAN
Groundfloor No. 1, 14th Street
Khaled Eslamboli (Vozara) Ave.
15117 Tehran
+98 (21) 872 42 96
+98 (21) 871 90 12
rs-tehran@neda.net

Ireland siehe / see United Kingdom

Israel
EASTRONICS LTD.
Messtechnik / T&M Equipment
11 Rozanis St.
P.O.Box 39300
Tel Aviv 61392
+972 (3) 645 87 77
+972 (3) 645 86 66
david_hasky@easx.co.il

Israel
J.M. Moss (Engineering) Ltd.
Kommunikationstechnik/ Communications
Equipment
9 Oded Street
P.O.Box 967
52109 Ramat Gan
+972 (3) 631 20 57
+972 (3) 631 40 58
jmmoss@zahav.net.il

Italy
ROHDE & SCHWARZ ITALIA S.p.a.
Centro Direzionale Lombardo
Via Roma 108
20060 Cassina de Pecchi (MI)
+39 (02) 95 70 42 03
+39 (02) 95 30 27 72
ornella.crippa@rsi.rohde-schwarz.com

Italy
ROHDE & SCHWARZ ITALIA S.p.a.
Via Tiburtina 1182
00156 Roma
+39 (06) 41 59 82 18
+39 (06) 41 59 82 70

Japan
ADVANTEST Corporation
RS Sales Department
1-32-1, Asahi-cho
Nerima-ku
Tokyo 179-0071
+81 (3) 39 30 41 90
+81 (3) 39 30 41 86
RSSales@advantest.co.jp

Jordan
Jordan Crown Engineering & Trading Co.
Jabal Amman, Second Circle
Youssef Ezzideen Street
P.O.Box 830414
Amman, 11183
+962 (6) 462 17 29
+962 (6) 465 96 72
jocrown@go.com.jo

Kazakhstan
ROHDE & SCHWARZ Kazakhstan
Representative Office Almaty
Pl. Respubliki 15
480013 Almaty
+7 (32) 72 63 55 55
+7 (32) 72 63 46 33
RS-Kazakhstan@RUS-Rohde-Schwarz.com

Kenya
Excel Enterprises Ltd
Dunga Road
P.O.Box 42 788
Nairobi
+254 (2) 55 80 88
+254 (2) 54 46 79

Korea
ROHDE & SCHWARZ Korea Ltd.
83-29 Nonhyun-Dong, Kangnam-Ku
Seoul 135-010
+82 (2) 514 45 46
+82 (2) 514 45 49
sales@rskor.rohde-schwarz.com
service@rskor.rohde-schwarz.com

Kuwait
Group Five Trading & Contracting Co.
Mezanine Floor
Al-Bana Towers
Ahmad Al Jaber Street
Sharq
+965 (244) 91 72/73/74
+965 (244) 95 28
jk_agarwal@yahoo.com

Latvia
ROHDE & SCHWARZ DANMARK A/S
Latvian Branch Office
Merkela iela 21-301
1050 Riga
+371 (7) 50 23 55
+371 (7) 50 23 60
rsdk@rsdk.rohde-schwarz.com

Lebanon
ROHDE & SCHWARZ Liaison Office
c/o Haji Abdullah Alireza Co. Ltd.
P.O.Box 361
Riyadh 11411
+966 (1) 465 64 28 Ext. 303
+966 (1) 465 64 28 Ext. 229
chris.porzky@rsd.rohde-schwarz.com

Lebanon Netcom

Liechtenstein siehe / see Switzerland

Lithuania
ROHDE & SCHWARZ DANMARK A/S
Lithuanian Office
Lukiskiu 5-228
2600 Vilnius
+370 (5) 239 50 10
+370 (5) 239 50 11

Luxembourg siehe / see Belgium

Macedonia siehe / see Slovenia

Malaysia
DAGANG TEKNIK SDN. BHD.
No. 9, Jalan SS 4D/2
Selangor Darul Ehsan
47301 Petaling Jaya
+60 (3) 27 03 55 68
+60 (3) 27 03 34 39
mey.nara@danik.com.my

Malta
ITEC International Technology Ltd
B'Kara Road
San Gwann SGN 08
+356 (21) 37 43 00 or 37 43 29
+356 (21) 37 43 53
sales@itec.com.mt

Mexico
Rohde & Schwarz de Mexico (RSMX)
S. de R.L. de C.V.
German Centre Oficina 4-2-2
Av. Santa Fé 170
Col. Lomas de Santa Fé
01210 Mexico D.F.
+52 (55) 85 03 99 13
+52 (55) 85 03 99 16
latinoamerica@rsd.rohde-schwarz.com

Mexico
Rohde & Schwarz de Mexico (RSMX)
Av. Prol. Americas No. 1600, 2° Piso
Col. Country Club
Guadalajara, Jal.
Mexico CP, 44610
+52 (33) 36 78 91 70
+52 (33) 36 78 92 00

Moldavia siehe / see Romania

Netherlands
ROHDE & SCHWARZ NEDERLAND B.V.
Perkinsbaan 1
3439 ND Nieuwegein
+31 (30) 600 17 00
+31 (30) 600 17 99
info@rsn.rohde-schwarz.com

New Zealand
Nichecom
1 Lincoln Ave.
Tawa, Wellington
+64 (4) 232 32 33
+64 (4) 232 32 30
rob@nichecom.co.nz

Nicaragua siehe / see Mexico

Nigeria
Ferrostaal Abuja
Plot 3323, Barada Close
P.O.Box 8513, Wuse
Off Amazon Street
Maitama, Abuja
+234 (9) 413 52 51
+234 (9) 413 52 50
fsabuja@rosecom.net

Adressen/Addresses

Norway
ROHDE & SCHWARZ NORGE AS
Enebakkveien 302 B
1188 Oslo
+47 (23) 38 66 00
+47 (23) 38 66 01

Oman
Mustafa Sultan Science & Industry Co.LLC.
For Test & Measurement ONLY
Way No. 3503
Building No. 241
Postal Code 112
Al Khuwair, Muscat
+968 636 000
+968 607 066
m-aziz@mustafasultan.com

Pakistan
Siemens Pakistan
23, West Jinnah Avenue
Islamabad
+92 (51) 227 22 00
+92 (51) 227 54 98
reza.bokhary@siemens.com.pk

Panama
siehe / see Mexico

Papua-New Guinea
siehe / see Australia

Philippines
MARCOM INDUSTRIAL EQUIPMENT, Inc.
6-L Vernida I Condominium
120 Amorsolo St.
Legaspi Village
Makati City/ Philippines 1229
+63 (2) 813 29 31
+63 (2) 810 58 07
marcom@i-next.net

Poland
ROHDE & SCHWARZ Österreich SP.z o.o.
Przedstawicielstwo w Polsce
ul. Stawki 2, Pietro 28
00-193 Warszawa
+48 (22) 860 64 94
+48 (22) 860 64 99
rohdepl@rsoe.rohde-schwarz.com

Portugal
Rohde & Schwarz Portugal, Lda.
Alameda Antonio Sergio, n° 7
R/C, Sala A
2795-023 Linda-a-Velha
+351 (21) 415 57 00
+351 (21) 415 57 10
telerus@mail.telepac.pt

Romania
ROHDE & SCHWARZ
Representation Office Bucharest
Str. Uranus 98
Sc. 2, Et. 5, Ap. 36
76102 Bucuresti, Sector 5
+40 (21) 410 68 46
+40 (21) 411 20 13
rohdero@rsoe.rohde-schwarz.com

Russian Federation
ROHDE & SCHWARZ
Representative Office Moscow
119180, Yakimanskaya nab., 2
Moscow
+7 (095) 745 88 50 to 53
+7 (095) 745 88 54
rs-russia@rsru.rohde-schwarz.com

Saudi Arabia
Mr. Chris Porzky
ROHDE & SCHWARZ International GmbH
c/o Haji Abdullah Alireza Co. Ltd.
P.O.Box 361
Riyadh 11411
+966 (1) 465 64 28 Ext. 303
+966 (1) 465 6428 Ext. 229
chris.porzky@rsd.rohde-schwarz.com

Saudi Arabia
GENTEC

Serbia-Montenegro
Representative Office Belgrade
Tose Jovanovica 7
11030 Beograd
+381 (11) 305 50 25
+381 (11) 305 50 24

Slovak Republic
Specialne systemy a software, a.s.
Svrcia ul.
841 04 Bratislava
+421 (2) 65 42 24 88
+421 (2) 65 42 07 68
stefan.lozek@special.sk

Slovenia
ROHDE & SCHWARZ
Representation Ljubljana
Tbilisijska 89
1000 Ljubljana
+386 (1) 423 46 51
+386 (1) 423 46 11
rohdesi@rsoe.rohde-schwarz.com

South Africa
Protea Data Systems (Pty.) Ltd.
Communications and Measurement Division
Private Bag X19
Bramley 2018
+27 (11) 719 57 00
+27 (11) 786 58 91
unicm@protea.co.za

South Africa
Protea Data Systems (Pty.) Ltd.
Cape Town Branch
Unit G9, Centurion Business Park
Bosmandam Road
Milnerton
Cape Town, 7441
+27 (21) 555 36 32
+27 (21) 555 42 67
unicm@protea.co.za

Spain
ROHDE & SCHWARZ ESPANA S.A.
Salcedo, 11
28034 Madrid
+34 (91) 334 10 70
+34 (91) 329 05 06
rses@rses-rohde-schwarz.com

Sri Lanka
LANKA AVIONICS
658/1/1, Negombo Road
Mattumagala
Ragama
+94 (1) 95 66 78
+94 (1) 95 83 11
lankavio@sltnet.lk

Sudan
SolarMan Co. Ltd.
P.O.Box 11 545
North of Fraouq Cementry 6/7/9 Bldg. 16
Karthoum
+249 (11) 47 31 08
+249 (11) 47 31 38
solarman29@hotmail.com

Sweden
ROHDE & SCHWARZ SVERIGE AB
Marketing Div.
Flygfältsgatan 15
128 30 Skarpnäck
+46 (8) 605 19 00
+46 (8) 605 19 80
info@rss.se

Switzerland
Roschi Rohde & Schwarz AG
Mühlestr. 7
3063 Ittigen
+41 (31) 922 15 22
+41 (31) 921 81 01
sales@roschi.rohde-schwarz.com

Syria
Electro Scientific Office
Baghdad Street
Dawara Clinical Lab. Bldg
P.O.Box 8162
Damascus
+963 (11) 231 59 74
+963 (11) 231 88 75
memo@hamshointl.com

Taiwan
Lancer Communication Co. Ltd.
for Div. 1 and 7
16F, No. 30, Pei-Ping East Road
Taipei
+886 (2) 23 91 10 02
+886 (2) 23 95 82 82
info@lancercomm.com.tw

Taiwan
System Communication Co. Ltd.
for Div. 2 and 8
16F, No. 30, Pei-Ping East Road
Taipei
+886 (2) 23 91 10 02
+886 (2) 23 95 82 82
info@lancercomm.com.tw

Tanzania
SSTL Group
P.O. Box 7512
Dunga Street Plot 343/345
Dar es Salaam
+255 (22) 276 00 37
+255 (22) 276 02 93
sstl@twiga.com

Thailand
Schmidt Electronics (Thailand) Ltd.
63 Government Housing Bank Bldg.
Tower II, 19th floor, Rama 9 Rd.
Huaykwang, Bangkapi
Bangkok 10320
+66 (2) 643 13 30 to 39
+66 (2) 643 13 40
kamthoninthuyot@schmidtthailand.com

Thailand
TPP Operation Co., Ltd.
41/5 Mooban Tarinee
Boromrajchonnee Road
Talingchan, Bangkok 10170
+66 (2) 880 93 47
+66 (2) 880 93 47
thipsukon@tpp-operation.com

Trinidad &Tobago
siehe / see Mexico

Tunisia
TELETEK
71, Rue Alain Savary
Residence Alain Savary (C64)
1003 Tunis

Turkey
ROHDE & SCHWARZ International GmbH
Liaison Office Istanbul
Bagdad Cad. 191/3, Arda Apt. B-Blok
81030 Selamicesme-Istanbul
+90 (216) 385 19 17
+90 (216) 385 19 18
rsturk@superonline.com

Ukraine
ROHDE & SCHWARZ
Representative Office Kiev
4, Patris Loumoumba ul
01042 Kiev
+38 (044) 268 60 55
+38 (044) 268 83 64
rohdeukr@rsoe.rohde-schwarz.com

United Arab Emirates
ROHDE & SCHWARZ International GmbH
Liaison Office Abu Dhabi
P.O. Box 31156
Abu Dhabi
+971 (2) 633 56 70
+971 (2) 633 56 71
michael.rogler@rsd.rohde-schwarz.com

Adressen/Addresses

United Arab Emirates	ROHDE & SCHWARZ Bick Mobile Communication P.O.Box 17466 Dubai	+971 (4) 883 71 35 +971 (4) 883 71 36 www.rsbick.de
United Arab Emirates	ROHDE & SCHWARZ Emirates L.L.C. Ahmed Al Nasri Building, Mezzanine Floor, P.O.Box 31156 Off old Airport Road Behind new GEMACO Furniture Abu Dhabi	+971 (2) 631 20 40 +971 (2) 631 30 40 rsuaeam@emirates.net.ae
United Kingdom	ROHDE & SCHWARZ UK Ltd. Ancells Business Park Fleet Hampshire GU 51 2UZ England	+44 (1252) 81 88 88 (sales) +44 (1252) 81 88 18 (service) +44 (1252) 81 14 47 sales@rsuk.rohde-schwarz.com
Uruguay	AEROMARINE S.A. Cerro Largo 1497 11200 Montevideo	+598 (2) 400 39 62 +598 (2) 401 85 97 mjn@aeromarine.com.uy
USA	ROHDE & SCHWARZ, Inc. Broadcast & Comm. Equipment (US Headquarters) 7150-K Riverwood Drive Columbia, MD 21046	+1 (410) 910 78 00 +1 (410) 910 78 01 rsatv@rsa.rohde-schwarz.com rsacomms@rsa.rohde-schwarz.com
USA	Rohde & Schwarz Inc. Marketing & Support Center / T&M Equipment 2540 SW Alan Blumlein Way M/S 58-925 Beaverton, OR 97077-0001	+1 (503) 627 26 84 +1 (503) 627 25 65 info@rsa.rohde-schwarz.com
USA	Rohde & Schwarz Inc. Systems & EMI Products 8080 Tristar Drive Suite 120 Irving, Texas 75063	+1 (469) 713 53 00 +1 (469) 713 53 01 info@rsa.rohde-schwarz.com
Venezuela	EQUILAB TELECOM C.A. Centro Seguros La Paz Piso 6, Local E-61 Ava. Francisco de Miranda Boleita, Caracas 1070	+58 (2) 12 34 46 26 +58 (2) 122 39 52 05 r_ramirez@equilabtelecom.com
Venezuela	REPRESENTACIONES BOPIC S.A. Calle C-4 Qta. San Jose Urb. Caurimare Caracas 1061	+58 (2) 129 85 21 29 +58 (2) 129 85 39 94 incotr@cantv.net
Vietnam	Schmidt Vietnam Co., (H.K.) Ltd., Representative Office in Hanoi Intern. Technology Centre 8/F, HITC Building 239 Xuan Thuy Road Cau Giay, Tu Liem Hanoi	+84 (4) 834 61 86 +84 (4) 834 61 88 svnhn@schmidtgroup.com
West Indies	siehe / see Mexico	
	GEDIS GmbH Sophienblatt 100 Postfach 22 01 24021 Kiel	+49 (431) 600 51-0 +49 (431) 600 51-11 sales@gedis-online.de

1 Description of Functions 1.1

1.1 Functions at a Glance 1.2

2 Display, Controls and Connections 2.1

2.1 Front Panel 2.1
2.2 Rear Panel 2.3
2.2.1 Screen Viewing Angle 2.5

3 Operating Concept 3.1

3.1 Display 3.1
3.1.1 Frequently Used Softkeys 3.1
3.2 Basic Operating Methods 3.2
3.2.1 Menu Selection 3.2
3.2.2 Main Menu 3.2

4 Startup 4.1

4.1 Installing the R&S® EFL100 ..... 4.1
4.2 AC Supply Voltage / Main Power Switch 4.2
4.2.1 On/Off Switch 4.2
4.2.2 Changing the fuse 4.2
4.3 Internal and External Battery Operating Mode 4.3
4.3.1 Internal Battery Operating Mode 4.3
4.3.2 DC Connector (Models .03 and .04) 4.3
4.4 Connections 4.4
4.4.1 RF Input 4.4
4.4.2 Headphone socket 4.4
4.4.3 Modem / RS-232-C Interface 4.4
4.4.4 SCART Connection 4.4
4.4.5 TS PARALLEL Socket (Models .03 and .04) 4.4

5 Level Measurement 5.1

5.1 Test Functions 5.1
5.2 Maximum Input Level 5.2

6 SAT Mode 6.1

6.1 SAT Menu 6.1
6.1.1 Entering a Transponder Frequency from 00000 MHz to 16000 MHz 6.1
6.1.2 Setting the LNB Supply Voltage 6.2
6.1.3 Selecting the LO frequency 6.2
6.1.4 Entering the Transponder Frequency 6.3

6.2 SCAN 6.4
6.2.1 Calling the CNTRL. SAT Menu 6.4
6.2.2 Switching ANALOG / DIGIT. DVBS 6.4
6.2.3 Calling the MEASUR SAT Menu 6.4

6.3 CNTRL.-SAT Menu 6.5
6.3.1 22-kHz Control Signal 6.5
6.3.2 14-V LNB Supply Voltage 6.5
6.3.3 18-V LNB Supply Voltage 6.6
6.3.4 LNB Current Drain 6.6
6.3.5 Checking the LNB Supply Voltage of a Satellite Receiver 6.6
6.3.6 Calling the DiSEqC/VSEC Menu 6.6

6.4 DiSEqC Menu 6.7
6.4.1 RX Analysis 6.7
6.4.2 Transmitting and Receiving a DiSEqC Command (TX + RX) 6.7
6.4.3 Sending a DiSEqC Command (TX) 6.7
6.4.4 Entering Hexadecimal Numbers 6.7
6.4.5 RX Display Field 6.8
6.4.6 Submenu for Entering DiSEqC Commands 6.8
6.4.6.1 Entry 6.8
6.4.7 TX Display Field 6.9
6.4.8 Display Field A 6.9
6.4.9 Display Field B 6.9
6.4.9.1 Entering and Sending a DiSEqC Command 6.9
6.4.10 Simple DiSEqC 6.10

6.5 UFOmicro DiSEqC Menu 6.11
6.5.1 Background 6.11
6.5.2 Display Fields 6.11
6.5.2.1 RX Field 6.11
6.5.2.2 Status Field 6.12
6.5.2.3 Receiver Field 6.12
6.5.2.4 TX Field 6.12
6.5.3 Menu Operation 6.13

6.6 VSEC Menu 6.14
6.6.1 Entering Hexadecimal Numbers 6.14
6.6.2 Sending a VSEC Command (TX) 6.14

6.7 First ANALOG Menu 6.15
6.7.1 Calling the Sound Carrier Menu 6.15
6.7.2 Level-Dependent Acoustic Tracking Signal 6.15
6.7.3 ANALOG Level Measurement 6.16

6.8 Second ANALOG Menu 6.17
6.8.1 Selecting the Colour Standards PAL, SECAM and NTSC 6.17
6.8.2 Selecting the Video Deviation 6.17
6.8.3 Video Polarity 6.17

6.9 Satellite Sound Carrier Menu 6.18
6.9.1 Selecting the Sound Carrier Receive Mode (see sound carrier table) 6.18
6.9.2 Sound Carrier Frequency 6.18
6.9.3 Sound Carrier Setting 6.18
6.9.4 Setting the Deemphasis 6.18

6.9.5 Sound Carrier Tables for Satellite Reception 6.9.19
6.10 SAT DIGITAL Menu 6.20
6.10.1 Level-Dependent Acoustic Tracking Signal 6.20
6.10.2 Convolution Code in SAT Measurement 6.20
6.10.3 Entering the Symbol Rate 6.20
6.10.4 MPEG Decoder Menu (Model .03 or .04) 6.21
6.10.4.1 DIGITAL Level Measurement (Min/Max Level) 6.21

7 TV Mode 7.1

7.1 TV Menu 7.1
7.1.1 Entering a Frequency from 44.75-867.2 MHz / DVB-T / BIII / UHF 7.1
7.1.2 Channel Center Display 7.1
7.1.3 Entering a Channel 7.2
7.1.4 Entering a Special Channel 7.2
7.1.5 Selecting Analog, DVB-C and DVB-T-Measurement 7.2
7.1.6 Calling the TV Control Menu 7.2
7.2 TV Control Menu 7.3
7.2.1 22-kHz Control Signal 7.3
7.2.2 14-V Remote Supply Voltage 7.3
7.2.3 18-V Remote Supply Voltage 7.3
7.2.4 Checking the Supply Voltage in a Remotely Fed System 7.4
7.2.5 Calling the DiSEqC / VSEC Menu 7.4
7.3 TV ANALOG Menu 7.5
7.3.1 Selecting the Standard 7.5
7.3.2 Selecting the Sound Carrier 7.6
7.3.3 Level-Dependent Acoustic Tracking Signal 7.6
7.3.4 Carrying out Measurements 7.6
7.3.4.1 Measuring the Sound Carrier Separation 7.6
7.3.4.2 Measuring the NICAM Sound Carrier Separation and Bit Error Rate 7.6
7.3.5 Measuring the Min/Max Level 7.7
7.3.6 Measuring the Instantaneous Level 7.7
7.3.7 Selecting the Colour Standards PAL, SECAM and NTSC 7.7
7.4 TV DIGITAL Menu 7.8
7.4.1 DVB-C (Model .03 and .04) 7.8
7.4.1.1 Level-Dependent Acoustic Tracking Signal 7.8
7.4.1.2 Selecting Demodulation in the case of DVB-C Measurement 7.8
7.4.1.3 Entering a Symbol Rate 7.8
7.4.2 DVB-T (Model .04) 7.9
7.4.2.1 Level-Dependent Acoustic Tracking Signal 7.9
7.4.2.2 Selecting Channel Bandwidths 7.9
7.4.3 MPEG Decoder Menu (Models .03 and .04) 7.9
7.5 Return Path IF Mode 7.10
7.5.1 Return Path IF Menu 7.10
7.5.2 Entering a Frequency from 4.00 MHz to 80.00 MHz* 7.10
7.5.3 Inverting the RF Spectrum* 7.10
7.5.4 ANALOG Menu 7.11
7.5.5 DIGITAL Menu 7.11
7.5.6 IF CONTROL Menu (RP CONTROL*) 7.11

8 FM Mode 8.1

8.1 FM Menu 8.1
8.1.1 Entering a Frequency from 44.75 MHz to 867.20 MHz 8.1
8.2 CONTROL FM Menu 8.2
8.2.1 22-kHz Control Signal 8.2
8.2.2 14-V Remote Supply Voltage 8.2
8.2.3 18-V Remote Supply Voltage 8.2
8.2.4 Checking the Supply Voltage in a Remotely Fed System 8.3
8.2.5 Caling the DiSEqC / VSEC Menu 8.3
8.3 Measure Menu 8.4
8.3.1 Level-Dependent Acoustic Tracking Signal 8.4
8.3.2 Carrying out measurements 8.4
8.3.3 Measuring the Min/Max Levels 8.4
8.3.4 Measuring the Instantaneous Level 8.4

9 AV Mode 9.1

9.1 Decoder Mode 9.1
9.2 Decoder Mode - Baseband 9.1
9.3 Video input 9.1
9.4 Video output 9.1
9.5 Switching voltage 9.2
9.6 RGB Mode 9.2
9.7 MPEG Transport Stream Interface TS Parallel, LVDS (Models .03 and .04) 9.2
9.8 MPEG DECODER Menu (Models .03 and .04) 9.3

10 SETUP Menu 10.1

10.1 Unit of measure 10.1
10.2 Modem Menu 10.1
10.3 Entering the Level Offset 10.1
10.4 Screen Menu 10.2
10.4.1 Setting the brightness 10.2
10.4.2 Setting the Contrast 10.2
10.4.3 Setting the Colour Saturation 10.2
10.4.4 Setting the Backlighting 10.2
10.4.5 Factory Defaults 10.2
10.5 SYSTEM Menu 10.3
10.5.1 Setting the Date 10.3
10.5.2 Setting the Time 10.3
10.5.3 Key Click 10.3
10.5.4 Factory Defaults 10.3

11 Copy Menu 11.1

11.1 Saving and Calling Instrument Settings 11.1
11.1.1 Storing Instrument Settings 11.1
11.1.2 Calling Stored Instrument Settings 11.2
11.2 Printing Measurement Results 11.2
11.2.1 Printout of all Measurements in TV Mode 11.2
11.2.2 Printout of all Measurements in SAT Mode 11.3
11.2.3 Line Feed 11.3

12 Meas Menu 12.1

12.1 Measure Auto Menu 12.2
12.1.1 Display of the Measurement Point 12.2
12.1.2 Display of the Entry Field for the Measurement Task Concerned 12.2
12.2 TRACK Menu 12.3
12.2.1 Measurement Principle 12.4
12.2.2 Convenient Measurements: 4.0 to 80 MHz Upstream and 47 to 860 MHz Downstream 12.5
12.2.3 Upstream Measurement 12.6
12.2.4 Downstream Measurement 12.7
12.3 Spectrum Menu 12.8
12.3.1 Measuring the Levels of Analog Signals 12.8
12.3.2 Measuring the Levels of Digital Signals 12.9
12.3.3 Choosing the Spectrum Display 12.9
12.3.4 ANALOG Marker 12.9
12.3.5 DIGITAL Marker 12.10
12.3.6 C/N Measurement of Analog Signals in SAT Mode 12.10
12.3.7 C/N Measurement of Digital Signals in SAT Mode 12.10
12.3.8 Cross-Polarization Measurement on Signals in SAT Mode 12.11
12.4 CONST Menu 12.12
12.4.1 Colour Display of I/Q Value Pairs 12.12
12.4.2 Constellation Diagram in QPSK (DVB-S) 12.13
12.4.2.1 Measuring the Bit Error Rate (BER) 12.13
12.4.2.2 Measuring the Modulation Error Rate (MER) 12.13
12.4.2.3 Carrier Offset 12.13
12.4.2.4 Frontend: locked 12.14
12.4.2.5 Selecting the Symbol Rate (Symbol Clock) 12.14
12.4.2.6 Selec ting the Code Rate 12.14
12.4.2.7 Constellation Diagram Inverted/Not Inverted 12.15
12.4.2.8 LEVEL AUTO 12.15
12.4.2.9 Examples of QPSK Constellation Diagrams 12.16
12.4.3 Constellation Diagram for QAM (DVB-C) 12.17
12.4.3.1 Measuring the Bit Error Rate (BER) 12.17
12.4.3.2 Measuring the Modulation Error Rate (MER) 12.18
12.4.3.3 Carrier Offset 12.18
12.4.3.4 Frontend: locked 12.18
12.4.3.5 Selecting the Symbol Rate (Symbol Clock) 12.18
12.4.3.6 Constellation Diagram Inverted/Not Inverted 12.18
12.4.3.7 Zoom 12.19
12.4.3.8 Examples of QAM Constellation Diagrams 12.20
12.4.4 Constellation Diagram for DVB-T (Model .04) 12.22
12.4.4.1 Measuring the Bit Error Rate (BER) 12.22
12.4.4.2 Measuring the Modulation Error Rate (MER) 12.23
12.4.4.3 Carrier Offset 12.23
12.4.4.4 Carrier Mode 12.23

12.4.4.5 Modulation 12.23
12.4.4.6 Hierarchy 12.24
12.4.4.7 Code Rate 12.24
12.4.4.8 Guard 12.24
12.4.4.9 Inverse 12.25
12.4.4.10 Frontend: locked 12.25
12.4.4.11 Channel Display 12.25
12.4.4.12 Channel Bandwidth 12.25
12.4.4.13 Selecting the Carrier Range 12.25
12.4.4.14 Zoom 12.26
12.4.4.15 Pulse Response Display (Echo Display) 12.27

12.5 Text Menu 12.28
12.5.1 Hold Teletext Page 12.28
12.5.2 Enlarge Teletext Page 12.28
12.5.3 Normal Teletext Size 12.28
12.5.4 Text Only 12.28

12.6 SCOPE Menu 12.29
12.6.1 Video Scope Menu 12.29
12.6.1.1 Horizontal Zoom - Video Signal In/Out 12.29
12.6.1.2 S/N Measurement 12.30
12.6.1.3 Insertion Loss 12.30
12.6.1.4 Measuring the Video Signal Amplitude 12.30
12.6.1.5 Selecting the Video Line 12.30
12.6.1.6 Measuring a Video Signal via the AV Connector (SCART) 12.31
12.6.2 AUDIO Scope Menu 12.32
12.6.2.1 Time/Unit - Zoom In/Out 12.32
12.6.2.2 Position of the Audio Signal 12.32
12.6.2.3 Measuring the FM Deviation 12.32
12.6.2.4 Measuring an Audio Signal via the AV Connector (SCART) 12.33
12.6.3 DiSEqC Scope 12.34
12.6.3.1 Time/Unit - Zoom In/Out 12.34
12.6.3.2 Record function 12.34
12.6.3.3 Positioning and Triggering the DiSEqC Signal 12.34

13 Modem / RS-232-C Interface 13.1

13.1 Connection Cable for Modem / RS-232-C 13.1

13.2 Modem/RS-232-C Menu 13.2
13.2.1 Setting the Baud Rate 13.2
13.2.2 Setting Local Echo 13.2
13.2.3 Setting the Hardware Handshake 13.3
13.2.4 Init (Initialisation String) for the R&S® EFL100 Modem 13.3
13.2.5 Code (Password) 13.3
13.2.6 PIN 13.4

13.3 Operating the R&S® EFL100 via Modem 13.5
13.3.1 TTY Mode 13.5
13.3.2 ANSI Mode 13.5
13.3.3 The Logging-In Procedure 13.5
13.3.4 Requesting Help 13.6

13.4 List of Command Abbreviations 13.8

14 Maintenance 14.1

14.1 Calibrating the Instrument 14.1
14.2 Cleaning the Exterior 14.1
14.3 Cleaning the Interior 14.1
14.4 Function Testing 14.1
14.5 Storage 14.1
14.6 Changing the Printer Paper and Ink Ribbon 14.2

Appendix A 1

A.1 Overview of DiSEqC commands 1
A.1.1 Command Overview - Framing Byte 1
A.1.2 Command Overview - Address Byte 1
A.1.3 Command Overview - Command Byte 2
A.2 DiSEqC commands for Kathrein Matrixes 4
A.2.1 Command Set for Kathrein Matrix 9xx-Series 4
A.2.2 Command Set for Kathrein Matrix EXR 20 4
A.2.3 Command Set for Kathrein Matrix EXR 22 4
A.3 Channel Tables 5
A.3.1 Channel and Frequency Table - Standard B/G General and Italy 5
A.3.2 Channel and Frequency Table - Standard L and Standard K1. 6
A.3.3 Channel and Frequency Table - Standard D/K to OIRT 7
A.3.4 Channel and Frequency Table - Standard I 8
A.3.5 Channel and Frequency Table - Standard M/N (AIR) 9
A.3.6 Channel and Frequency Table - Standard M/N (CATV) 10

Appendix B 11

B.1 Specifications 11
B.2 Scope of deliveries and services 13
B.3 Pin assignment - SCART connector 14
B.4 Pin assignment - RS-232-C connector 15
B.5 Pin assignment - TS PARALLEL connector (models .03 and .04) 16

1 Description of Functions

The R&S® EFL100 portable Sat/TV/FM test receiver can be used to carry out detailed quality measurements of DVB-C, DVB-T and DVB-S signals along with level measurements of analog and digital TV and satellite reception signals. The instrument is modular in design and construction, allowing future enhancements to be quite simply installed with the aid of plug-in cards.

The R&S® EFL100 can be powered by either its built-in lead battery or its integrated power supply unit (110 to 240 V AC). At the heart of the instrument is its microcontroller, handling everything from keypad queries via hard keys and softkeys to on-screen representation of level and frequency. The built-in colour TFT display provides on-screen analysis.

Four different detectors for peak, average, maximum and minimum values are available for level measurement of analog and digital signals. Correction values are determined during level calibration of the R&S® EFL100 and stored in an EEPROM. This allows precise level measurements to be performed with the aid of the R&S® EFL100.

The EFL100 has been developed for the standards B/G, D/K, I, L, M, M Japan and NICAM. The video signal can be processed and reproduced in line with the PAL, SECAM and NTSC colour TV standards.

The front-panel display provides a bargraph for locating transmitters. In addition, a level-dependent acoustic tracking signal simplifies antenna alignment by making it unnecessary to watch the screen.

The LNB (low-noise block) supply voltage is 10 V DC to 20 V DC at max. 500 mA in increments of 0.1 V. The 22 kHz signal and the commands for DiSEqC 2.0, UFOμ-DiSEqC, Simple DiSEqC or V-SEC can be produced for the purpose of controlling the receiving system.

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

1.1 Functions at a Glance

Function	SAT		TV		Return path (RP)		FM
	Digital	Analog	Digital	Analog	Digital	Analog	
Mains and battery operation	X	X	X	X	X	X	X
External battery supply	X*	X*	X*	X*	X*	X*	X*
On-screen analysis	X*	X	X*	X	X*	X*	-
DVB level measurement (DVB-S/C/T)	DVB-S		DVB-T/C		DVB-T/C		-
Level measurement via frequency input	X	X	X	X	X*	X*	X
Level measurement via channel input			X	X			
IF level measurement IF = 4 to 80 MHz*			36.15 MHz X*	38.9 MHz X*	X*	X*	
Constellation analysis	X*		X*		X*		
Level-dependent acoustic tracking signal	X	X	X	X	X*	X*	X
Loudspeaker for audio control	X*	X	X*	X	X*	X*	X
Multi-standard reception (B/G, D/K, I, L, M, M Japan)				X		X*	
Sound carrier setting		X		X		X*	
Sound carrier measurement				X		X*	
NICAM audio reception and bit error rate measurement				X		X*	
Peak level measurement	X	X	X	X	X*	X*	X
Frequency spectrum display	X	X	X	X	X*	X*	X*
Frequency spectrum printout	X	X	X	X	X*	X*	X
Frequency range	920 to 2150 MHz		47 to 867 MHz		4 to 80 MHz		88 to 108 MHz
Choice of colour standard (PAL/NTSC/SECAM)		X		X		X*	
Remote control via modem	X	X	X	X	X*	X*	X
Remote supply voltage 10 to 20 V / 500 mA	X	X	X	X	X*	X*	X
22 kHz switching	X	X	X	X	X*	X*	X
DiSEqC 2.0, Simple DiSEqC, V-SEC, UFOμ-DiSEqC	X	X	X	X	X*	X*	X
Baseband output decoder operation		X					
Video input/output (SCART)	X	X	X	X	X*	X*	
Video output (BNC)	X*	X*	X*	X*	X*	X*	

X* = models .03 or .04 only

2 Display, Controls and Connections

2.1 Front Panel

The front panel of the R&S® EFL100 contains all the controls together with the screen and the RF input.

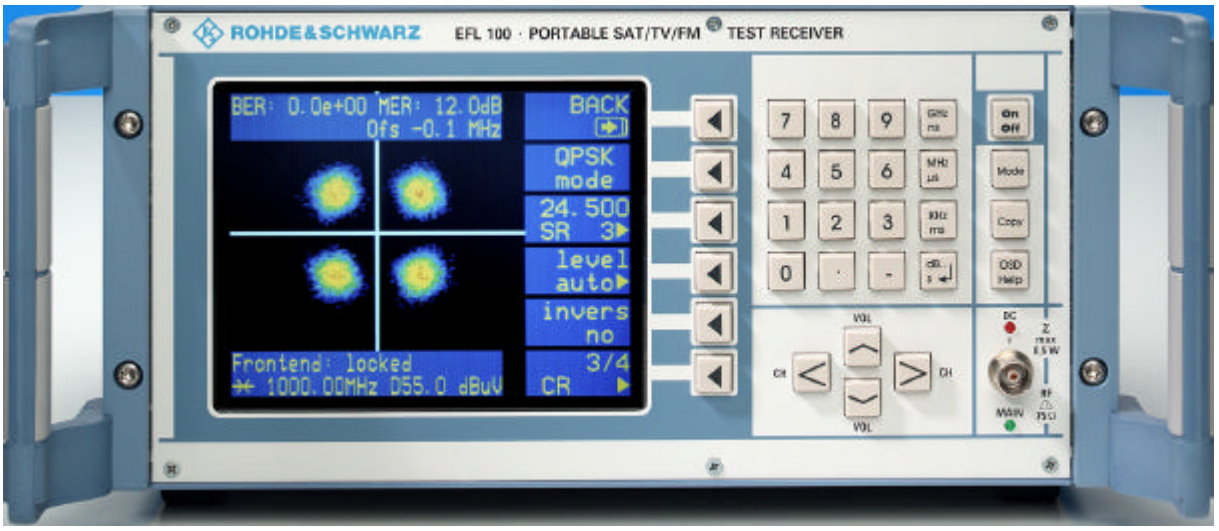
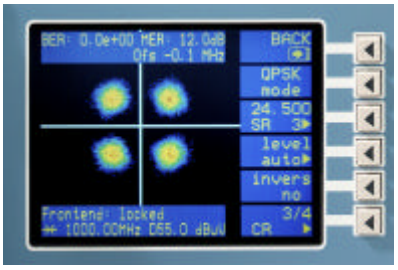


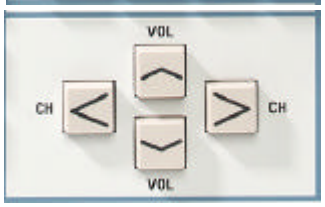
Fig. 2-1



TFT display

Softkeys
The functions of the individual softkeys are displayed on the right hand side of the screen.

Numerical keypad and selection keys
Units and confirmation of input



Vol- and Vol+: Volume setting
Ch- and Ch+: Move to next channel position
In a number of instrument functions these four keys act as cursor controls.

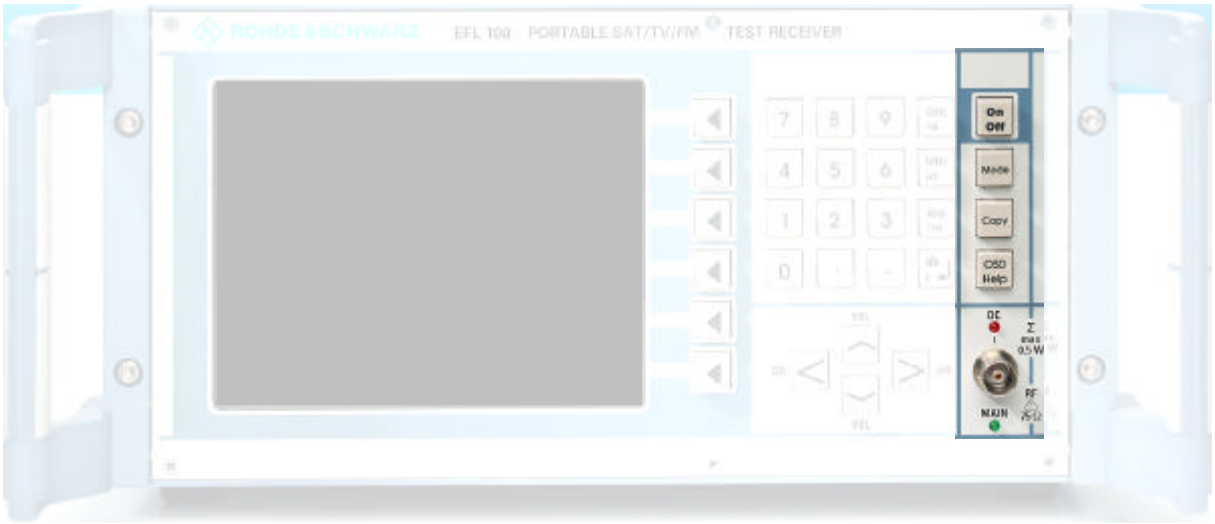


Fig. 2-2 Front Panel

On/off switch (standby)
Press the key briefly to switch on or off. If you just press the key briefly when you switch the R&S® EFL100 off, the most recent instrument setting is saved. When you switch the instrument back on, you will find it is in the operating mode you last used. To switch off finally, hold the key down for about 4 seconds (processor reset).

Meas menu
Instrument settings such as Teletext, Spectrum Analysis, Constellation Analysis, Auto-Measure, Scope and Tracking can be entered here.

Copy menu
This menu is used to enter all instrument settings for the printer, memory and data output.

OSD/Help key
For showing and hiding screen overlays.

DC LED
The red LED lights when the remote supply voltage is switched on or DC voltage is present on the antenna landline.

BNC RF input connector

Mains LED
The green LED lights when the R&S® EFL100 is connected to the mains and the power switch on the rear panel is turned to the On position.

2.2 Rear Panel

The rear panel of the R&S® EFL100 contains interfaces, I/O connectors and the AC supply.

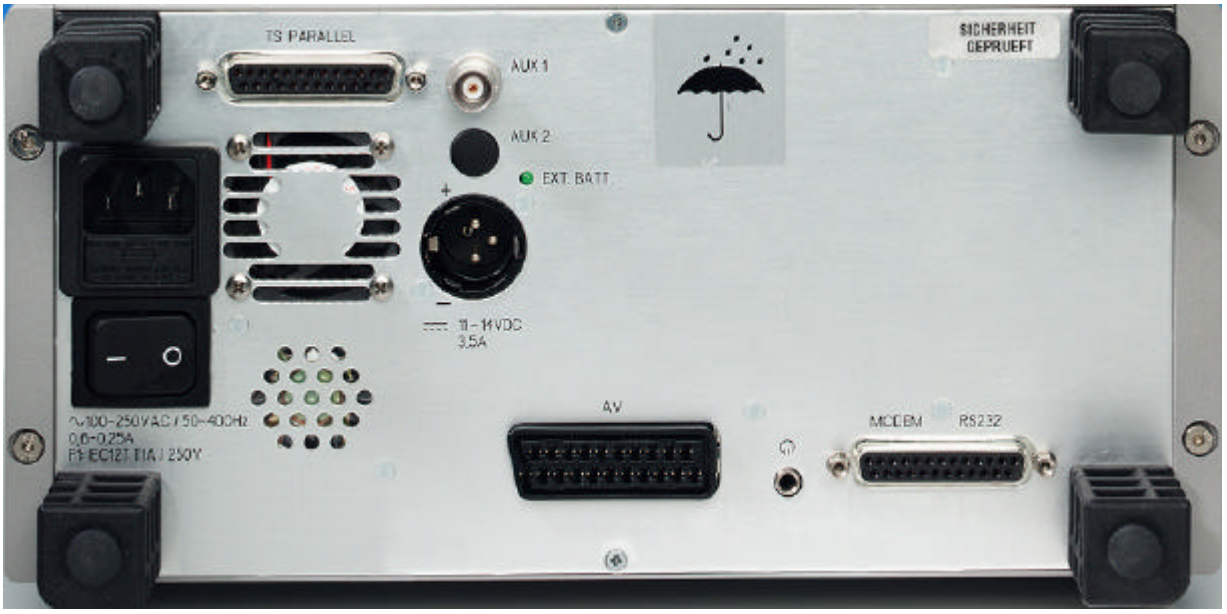
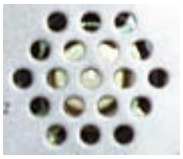


Fig. 2-1 Rear Panel

AC supply

Fuse

Power switch



Loudspeaker

DC connector (models .03 and .04 **/** XLR connector only)
For operating on an external DC voltage of 10.8 to 14 V and for charging the battery.

Scart socket

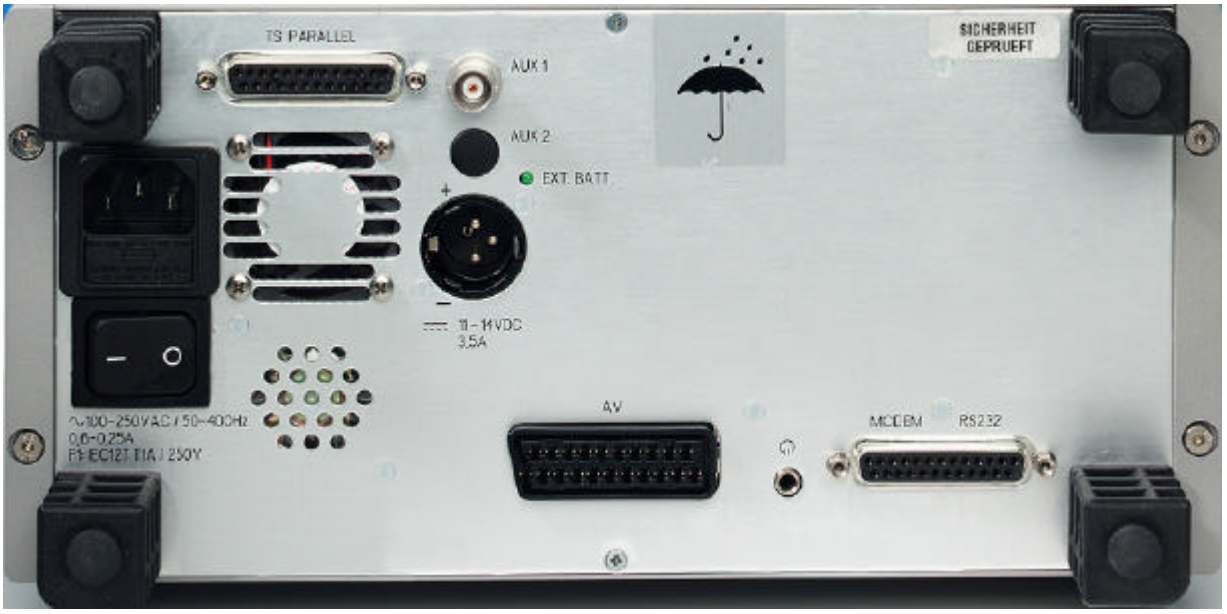


Fig. 2-1 Rear Panel

Headphone socket
3.5 mm jack plug for stereo headphones

RS-232-C interface / modem
For modems to operate the R&S® EFL100 by remote control and for downloading software

TS Parallel
(models .03 and .04 only)

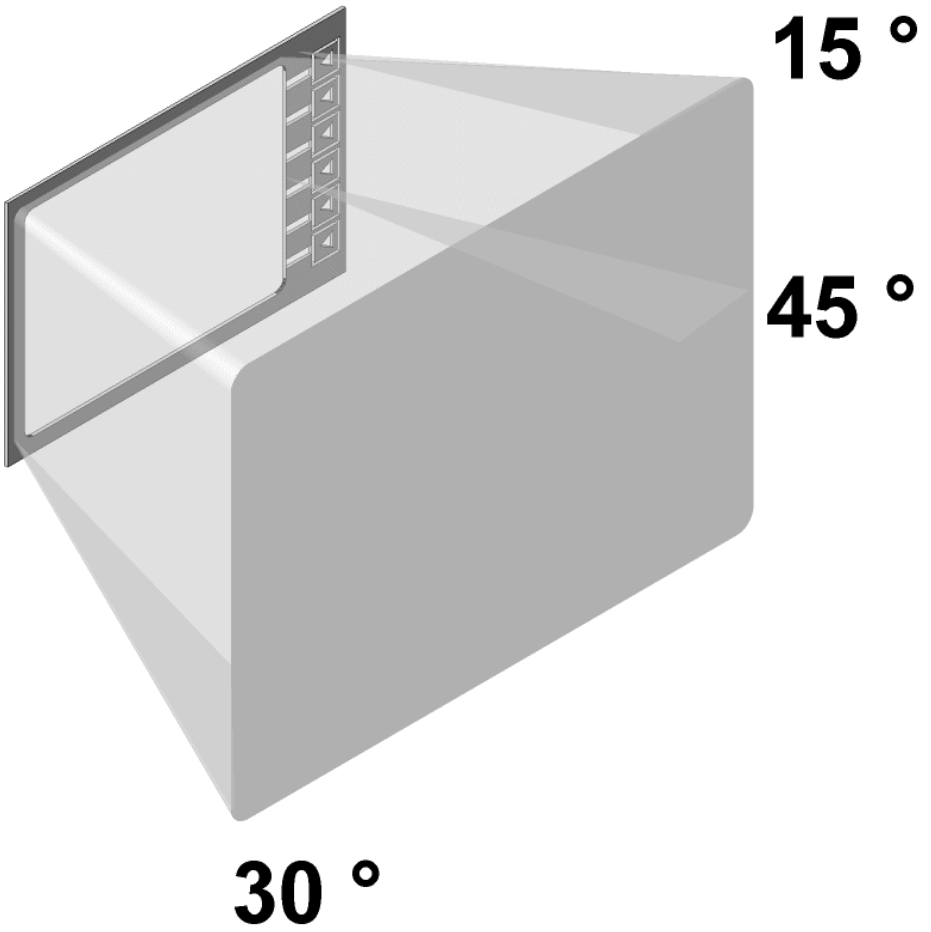
Fan
Important: *To avoid temperature build-up this grille must not be covered.*

AUX 1
BNC connector for video output (models .03 and .04 only)

AUX 2
Not in use

2.2.1 Screen Viewing Angle

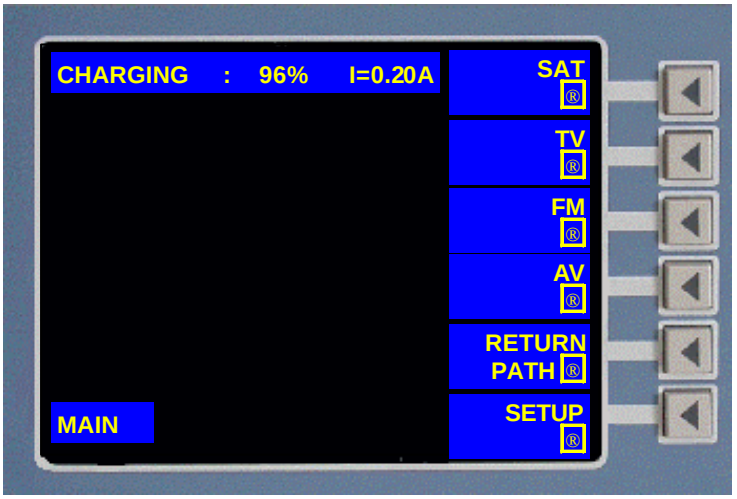
The TFT screen can be viewed from above at an angle of up to 15° and from below at an angle of up to 30°. It can be viewed from either side at an angle of ±45°.



If the R&S® EFL100 is used in unfavourable lighting conditions which cause reflections on the display, an antiglare device can be obtained as an accessory (Id. No.: 211.2110.00) and will help to prevent this problem.

3 Operating Concept

3.1 Display



Softkeys

The R&S® EFL100 is operated from a menu-driven screen display which has main menus and submenus. The six softkeys are used to call the commands displayed on the right hand side of the TFT screen. The OSD/Help key can be used to hide these screen overlays so that the whole screen image can be viewed.

3.1.1 Frequently Used Softkeys

This softkey always takes you back to the previous menu.

Level-dependent acoustic tracking signal

The "level beep" function generates an acoustic signal. The pitch of the tone is proportional to the received signal level. This can be used to ensure that a receiving antenna is optimally aligned on a transmitter. The sound volume can be set.

3.2 Basic Operating Methods

Note:	*The following explanations are important for understanding the logic of the R&S® EFL100 menu structure. Please take the time to study the following paragraphs, since no further explanations will be given for the sake of readability.*

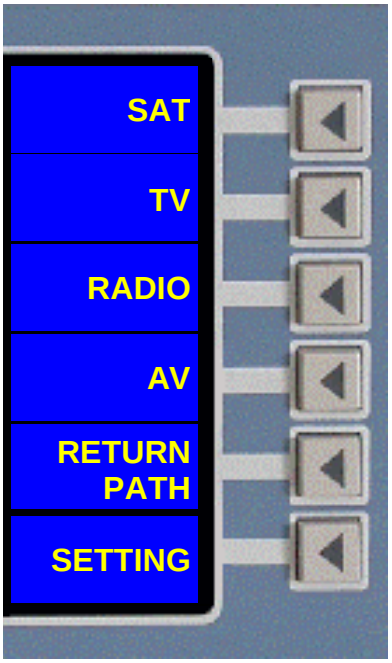
3.2.1 Menu Selection

The R&S® EFL100 is operated via the keys and various menus displayed on the screen. Menu items are selected by using the softkeys on the right of the screen. Submenus are called when the appropriate softkey is pressed. When a function is active, fields alongside the keys are shown in yellow. Keys which have a multiple function are identified by a right-facing arrow ▸ and are also shown in yellow when they are active. Pressing the same softkey a number of times then enables various functions or parameters to be called and displayed.

Softkeys with arrows ▲▼ or ◂ ▸ are concerned with operation via the cursor keys.

3.2.2 Main Menu

In the main menu, the following submenus can be called by pressing the associated softkey:



SAT Settings for the measurement of satellite signals

TV Settings for the measurement of television signals

RADIO Settings for the measurement of radio signals

AV Settings for operating the instruments via the SCART connector or the optional TS PARALLEL interface in the case of digital signals

RETURN PATH Settings for measurements in the return path from 4 to 80 MHz. If the Return Path option is not shown, the softkey caption is "IF" and IF level measurements can be performed at 38.9 MHz (analog) and 36.15 MHz (digital).

SETTING Settings for the RS232 interface, screen, date and time.

The battery charge status and the charging or discharge current are shown at top left in the main menu.

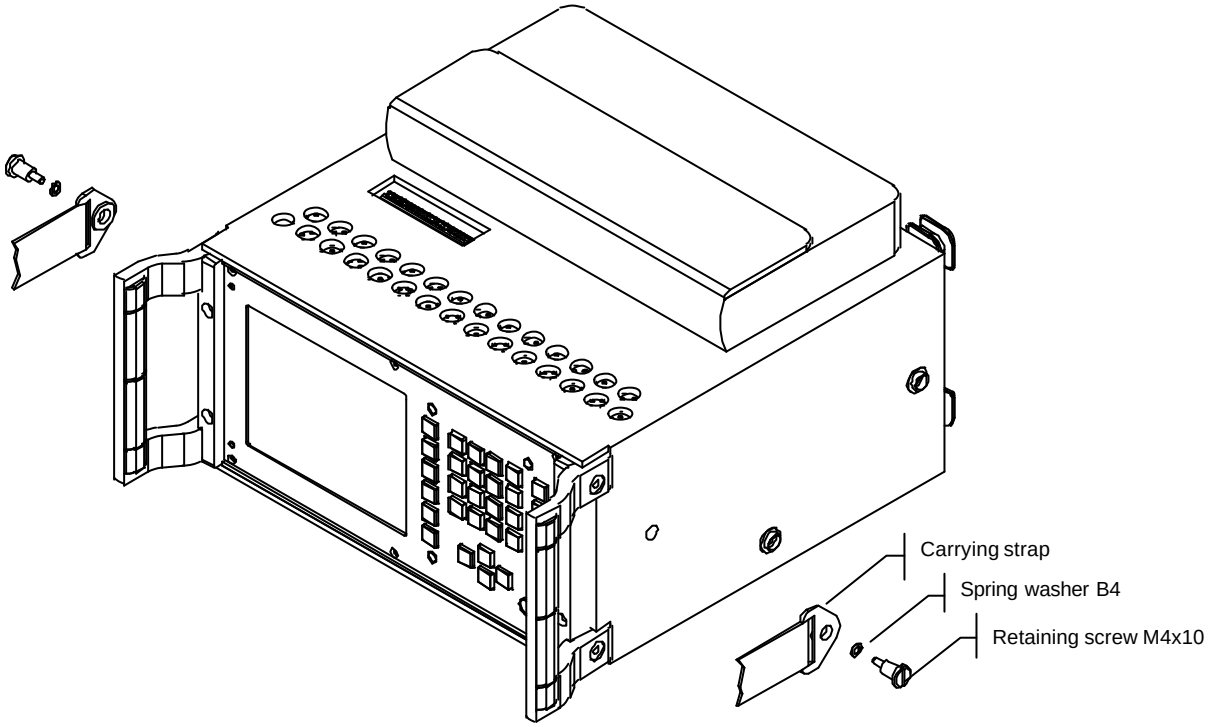
4 Startup

4.1 Installing the R&S® EFL100

When installing the instrument, make sure it is adequately ventilated.

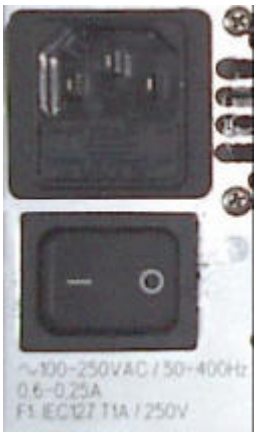
To prevent heat build-up it is important to keep the fan openings and ventilation slits clear of obstructions at all times.

For use as a portable instrument, it should be placed in the carry-case which is available as accessory number 2111.2110.00.



Caution: When assembling the R&S® EFL100 leather case numbered 2111.2103.00, fit the long screws (2x M4x10) and spring washers (2x B4) as shown in the illustration. It is important to check from time to time that the screws are still firmly in place.

4.2 AC Supply Voltage / Main Power Switch



The instrument can be operated on 110-240 V alternating current supplies with a power frequency of 50 to 400 Hz. The instrument automatically adjusts itself to any applied voltage within the permitted voltage range.

The AC supply connector is located on the rear panel and the main power switch is below the AC supply connector.

Whilst the electrical supply is switched on, the green LED on the front panel stays alight and the internal battery is charged.

4.2.1 On/Off Switch

The ON/OFF button on the front panel switches the R&S® EFL100 on and off. When you use this button to switch off the R&S® EFL100, the most recent instrument setting is stored and then reactivated next time you switch the instrument on.

4.2.2 Changing the fuse

To change a fuse proceed as follows:

- *Before changing the fuse switch the instrument off and make sure there is no voltage.*
- *Then remove the fuse holder by inserting a screwdriver in the recess provided and levering the fuse holder out.*
- *Change the fuse and replace the fuse holder in the instrument.*

Use only the following type of fuse for the R&S® *EFL100:*

F1: **IEC 127 T1 A / 250 V**

Important: Even when the instrument is disconnected from the mains there can be a voltage present due to the battery.

4.3 Internal and External Battery Operating Mode

4.3.1 Internal Battery Operating Mode

The battery in the R&S® EFL100 is not charged when delivered and must therefore be charged before the instrument is brought into use for the first time. To do this connect the instrument to the mains and switch the electrical supply on by pressing the main power switch on the rear panel. When the green LED on the front panel lights up the battery is being charged. It takes around 6 or 7 hours to charge an empty battery.

The battery should be recharged as soon as possible after being fully discharged and also if the instrument has not been operated for a considerable time, otherwise the battery may be damaged or even rendered unusable.

Charging starts automatically when the instrument is connected to the mains and switched on. It is not possible to overload the battery.

An internal over-discharging protection switch automatically turns the instrument off when capacity reaches 0 %.

Maximum operating time with a charged battery is around 80 minutes (without LNB supply voltage). With a 200-mA LNB supply current, battery operating time is about 1 hour.

If the instrument is not used for any considerable length of time, it should occasionally be connected to the mains and switched on in order to keep the battery charged.

Handling the battery incorrectly could cause the instrument to be ***damaged beyond repair.***

The charge level in the built-in lead battery can be checked in the main menu. The following information is displayed:

Operating mode	Charge level charging-discharging current
Mains	CHARGING : 53 % I = 0.76 A
Battery	ACCU CAP. : 90 % I = -1.30 A

4.3.2 DC Connector (Models .03 and .04)

The DC connector (XLR connector) is located on the rear panel of the R&S® EFL100. The instrument can be operated via this connector on an 11-14 V DC supply (car battery or AC to DC power supply). It is also possible to charge the internal battery via this connector.

For this purpose the LNB supply voltage must be turned off.

If this is not done the R&S® *EFL100 will still work, but the internal battery may not be charged.*

Use only the cables provided, together with their original plugs.

If the external DC supply voltage drops below 11 V, the R&S® *EFL100 automatically stops internal battery charging and can no longer be operated via the external supply. Once the applied voltage reaches 13.5 V, the* R&S® *EFL100 switches over to external DC operation again and internal battery charging resumes. The green LED on the front panel shows that this function is working.*

4.4 Connections

4.4.1 RF Input

The receive signal is applied to the RF input connector (BNC connector). This also delivers the remote supply voltage. The remote supply voltage is in the range 10 to 20 V. It can be set and switched off. For checking purposes the red LED above the RF input connector lights up when the LNB voltage is on. The green LED below the output connector lights up when the R&S® EFL100 is connected to the mains electricity supply.

Please note that

- *no voltage level over 130 dBµV,*
- *no positive DC voltage over 30 $V_{DC,}$*
- *no negative DC voltage and*
- *no AC voltage over 70 V_{AC} may be present on the RF input connector.*

If these values are exceeded, the frontends and the instrument itself may be destroyed.

4.4.2 Headphone socket

Stereo headphones can be connected to the 3.5-mm jack in order to judge the sound quality better. The R&S® EFL100 makes a stereo signal available on the headphone socket in SAT and TV modes and a mono signal in FM mode, depending on the transmission mode.

4.4.3 Modem / RS-232-C Interface

The RS-232-C serial interface is supplied as a 25-pin D subminiature connection. It is needed for controlling the R&S® EFL100 and for loading new software. The pin assignment of the socket is documented in the appendix, chapter "Specifications".

4.4.4 SCART Connection

A monitor or TV set (video or RGB) can be connected to the SCART socket. It is also possible to apply a video signal via the SCART socket and view the picture on the R&S® EFL100. The SCART socket can also be configured as a decoder socket (AV menu) for connecting a decoder so that encrypted signals can be received. The pin assignment of the socket is documented in the appendix, chapter "Specifications".

4.4.5 TS PARALLEL Socket (Models .03 and .04)

This socket can be used to connect an MPEG decoder or the MPEG data stream in order to assess the picture. The pin assignment of the socket is documented in the appendix, chapter "Specifications".

5 Level Measurement

5.1 Test Functions

The R&S® EFL100 is suitable for measuring the level on receiving systems in the measurement range 30 to 130 dBµV. Once the instrument has been connected and the frequency has been set, the level is measured automatically and displayed on the screen. The table below gives a brief overview of the test functions available in the R&S® EFL100.

Test function	Operating mode	Menu for settings
DiSEqC 2.0	SAT	SAT, LNB-CONTROL, DiSEqC
DiSEqC 2.0	TV	TV, TV-CONTROL, DiSEqC
DiSEqC 2.0	FM	RADIO, RADIO-CONTROL
UFOµ	SAT	SAT, LNB-CONTROL, DiSEqC
LNB current drain	SAT	SAT, LNB-CONTROL
Level measurement: SAT analog	SAT	SAT MENU - analog
Level measurement: TV analog	TV	TV MENU - analog
Level measurement: RADIO analog	FM	RADIO MENU
Level measurement: SAT digital	SAT	SAT, digital DVB-S
Level measurement: TV digital	TV	TV, digital DVB-C or DVB-T
Peak level measurement	SAT	SAT, SAT MEASURE
Peak level measurement	TV	TV, TV MEASURE
Peak level measurement	FM	RADIO
Current drain of an externally supplied instrument	TV	TV, TV CONTROL
Current drain of an externally supplied instrument	FM	RADIO, RADIO CONTROL
Sound carrier measurement NICAM bit error rate measurement Peak level measurement	TV	TV, analog, TV MEASURE
IF level	IF	IF

5.2 Maximum Input Level

The maximum input level *of a single carrier* that can be measured with the aid of an R&S® EFL100 is 130 dBµV. If measurements are performed on a system with *multiple carriers* or programmes, the cumulative power of all carriers must not exceed the maximum permitted input level. The cumulative power applied to the RF connector on the R&S® EFL100 must not exceed 0.5 W.

The following table provides an approximate guide to maximum cumulative power. It only applies if all carriers are at the same level. Doubling the number of carriers means the maximum input level of the R&S® EFL100 must be reduced by 3 dB every time (see table below).

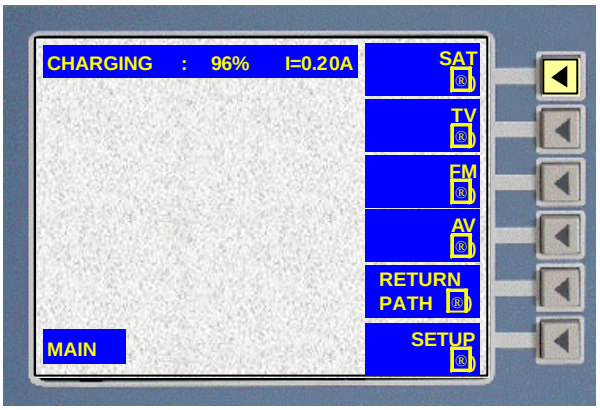
Number of carriers applied	Reduction	Maximum input level when all carriers at same level
4 TV programmes		129 dBµV
9 TV programmes	-3 dB	126 dBµV
18 TV programmes	-6 dB	123 dBµV
36 TV programmes	-9 dB	120 dBµV

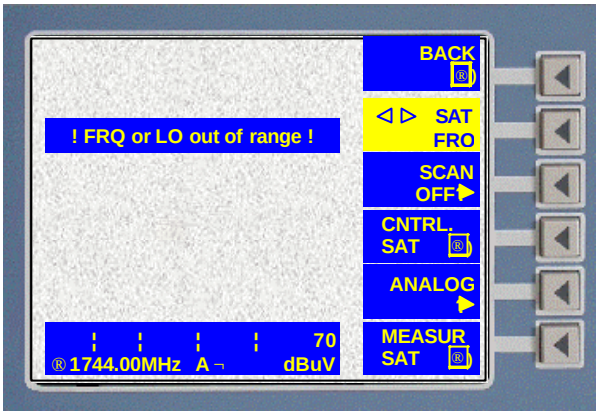
If maximum input level is exceeded, the frontends or the instrument itself may be destroyed.

Intermodulation and overload effects may occur once maximum permitted occupancy is reached.

6 SAT Mode

6.1 SAT Menu

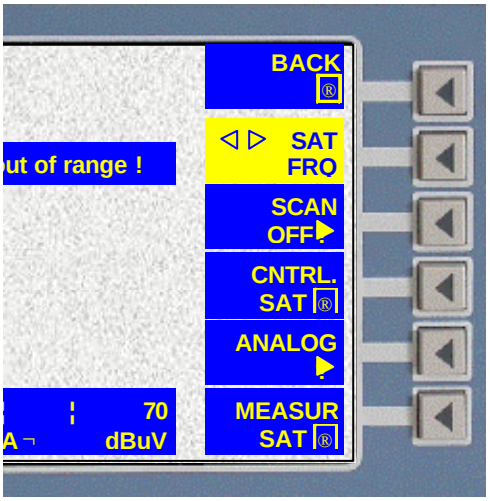




BACK Calls the main menu

Example:
Receiving a SAT program and measuring the level:
Transponder frequency is 11299 MHz vertical and the LO frequency of the associated LNB is 9750 MHz.
Press the SAT softkey in the main menu and the instrument switches to satellite reception. Then continue as described in the following sections.

6.1.1 Entering a Transponder Frequency from 00000 MHz to 16000 MHz



The field is highlighted in yellow when the softkey is pressed. You can then use the numeric keys "0 to 9" and "MHz" to enter the transponder frequency or you can use the cursor keys marked ◂ ▸ to change it. The transponder frequency is displayed to the lower left of the screen.

The receive frequency is dependent on the selected LO frequency. The LO frequency is set in the CNTRL.-SAT menu.

The first SAT IF can only be entered if the LO frequency has been set to LO-0 (00000).

! FRQ or LO out of range !

If the oscillator frequency (LO-0 to LO-9) has been set so that the resulting receive frequency is outside the SAT receive range of the R&S® EFL100 (920 to 2150 MHz), the message shown here is displayed. If you see this error message, correct the LO frequency or the frequency you entered.

6.1.2 Setting the LNB Supply Voltage

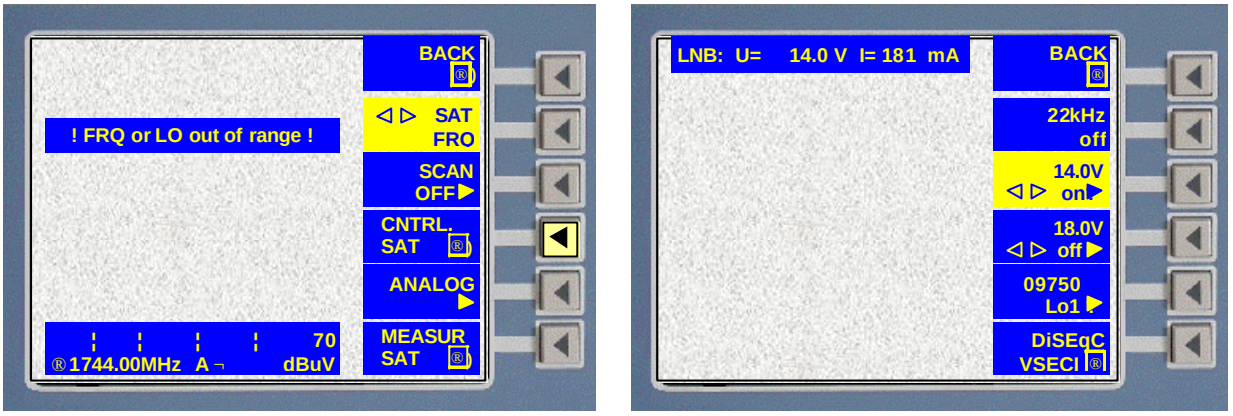
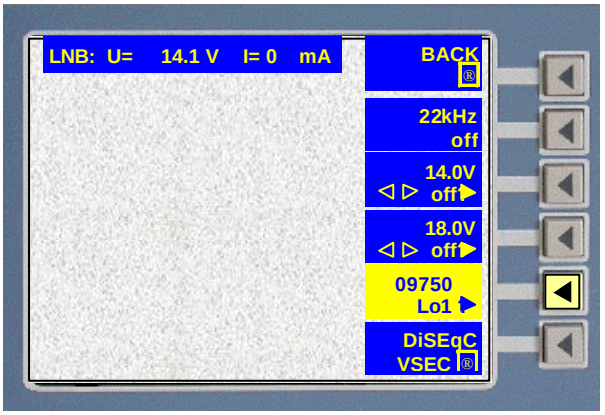


Fig. 6-1 CNTRL.-SAT menu

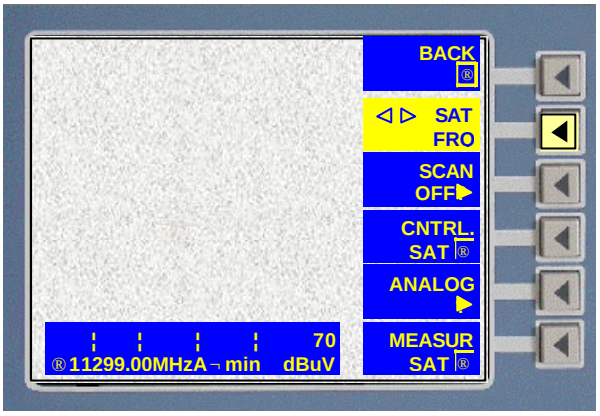
Open the CNTRL.-SAT-Menü and enable the 14.0 V supply voltage for vertical polarization. The upper display field now shows the supply voltage (14.0 V) and the current drain of the LNB (181 mA). Use the BACK key to return to the SAT menu.

6.1.3 Selecting the LO frequency



To do this, press the CNTRL. SAT key in the SAT menu. You can use the LO key to query and change nine preset LO frequencies. Set field LO1 to 09750. Use the BACK key to return to the SAT menu.

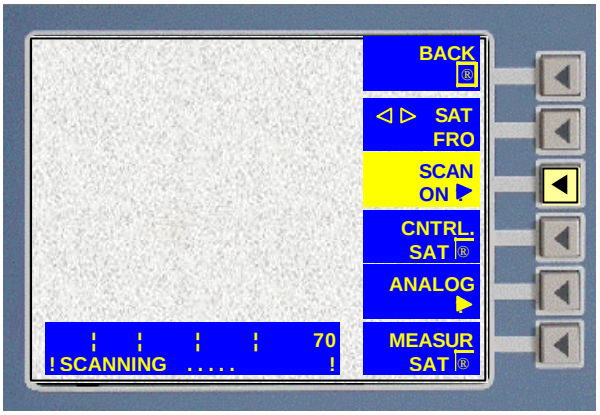
6.1.4 Entering the Transponder Frequency



Press the **SAT FRQ** key and use the numeric keys to enter the transponder frequency 11299 MHz. Confirm your entry with the MHz/µs key. You will then see the frequency and level in the lower display field.

Fig. 6-2 SAT menu

6.2 SCAN



You can use the **SCAN** function to search for satellites when you do not know their exact transponder frequencies. The function continuously samples the frequency range 920 to 2150 MHz for receive signals.

If receive signals are present, the receive level is displayed as a bar graph. Four measurement ranges with dynamics of 40 dB each are available for the bar graph display.

The measurement range is automatically preselected.

Bar graph display	Level range	Note
I	30 to 70 dBµV	Range changes automatically at 70 dBµV
II	50 to 90 dBµV	Range changes automatically at 50 and 90 dBµV
III	70 to 110 dBµV	Range changes automatically at 70 and 110 dBµV
IV	90 to 130 dBµV	Range changes automatically at 90 dBµV

The level can be checked using an acoustic tracking signal, the frequency of which varies in proportion to the level of the signal being received. The loudness of the acoustic signal can be altered.

The screen displays the bar graph, which changes in proportion to the input level.

The SCAN field is highlighted in yellow when the softkey is pressed. The whole SAT frequency range is then sampled. When you press the key again the procedure stops and the softkey display changes to "SCAN OFF".

6.2.1 Calling the CNTRL. SAT Menu

All the LNB control parameters can be set in this menu, including the remote supply voltage H/V, 22-kHz, DiSEqC, V-SEC signal, UFOµ DiSEqC and LO frequency.

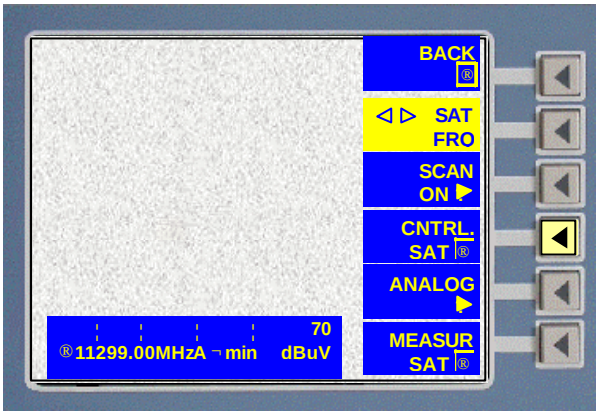
6.2.2 Switching ANALOG / DIGIT. DVBS

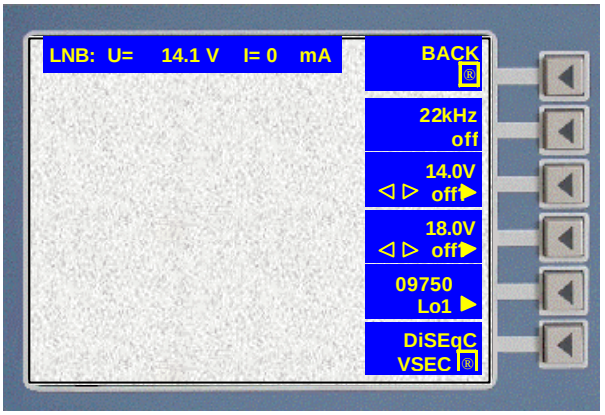
See chapter 6.10 SAT-DIGITAL-Menü

6.2.3 Calling the MEASUR SAT Menu

In this menu all the SAT parameters for receiving digital or analog signals can be set and measurements can be carried out. Call the MPEG decoder in DIGIT. DVB-S.

6.3 CNTRL.-SAT Menu





The LNB supply voltage, 22-kHz control signal, DiSEqC commands and VSEC commands can be set in the CNTRL.-SAT-Menü (CONTROL). The voltage or signals are available on the RF connector.

If the LNB voltage supply has been activated, the red LED above the RF connector lights up.

To select menu points: See chapter 3 "Operating Concept".

6.3.1 22-kHz Control Signal

22kHz ON

The field is highlighted in yellow when the softkey is pressed. The switchable 22-kHz signal is superposed on the LNB voltage. Press the key again to switch off the 22-kHz signal.

6.3.2 14-V LNB Supply Voltage

14.0V ◁ ▷ on ▶

The field is highlighted in yellow when the softkey is pressed. The LNB 14.0 V supply voltage for ***vertical*** polarization is now switched on.

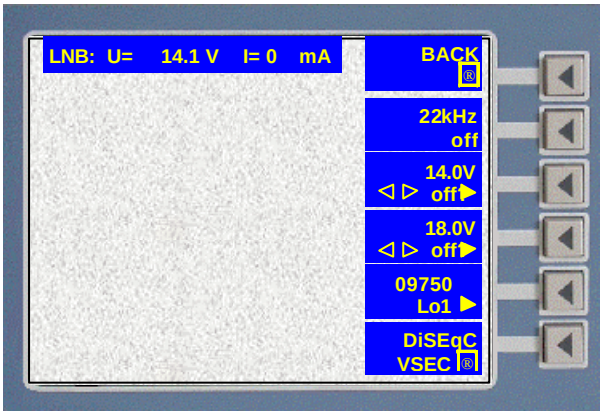
For checking purposes the red LED above the RF input connector lights up.

Use the numeric keys 1 to 9 or the cursor keys marked **? ?** to change the voltage in the range 10 to 20 V. Numeric input must be confirmed by pressing the "Enter" key. Press the softkey again to switch off the LNB supply voltage.

6.3.3 18-V LNB Supply Voltage

The field is highlighted in yellow when the softkey is pressed. The LNB 18.0 V supply voltage for ***horizontal*** polarization is now available at the input connector. Use the numeric keys 0 to 9 to enter the voltage or the cursor keys marked **?** **?** to change the voltage in the range 10 to 20 V. Numeric input must be confirmed by pressing the "Enter" key. Press the softkey again to switch off the LNB supply voltage.

Note:	*The LNB voltage:* *- can be switched off = 0 V* *- can be changed from 10 to 20 V in increments of 0.1 V* *- is short-circuit-proof up to a current of 500 mA*



Vertical polarization

Horizontal polarization

6.3.4 LNB Current Drain

This field shows the current drain (I = 181 mA) and supply voltage (14.6 V) of the LNB.

6.3.5 Checking the LNB Supply Voltage of a Satellite Receiver

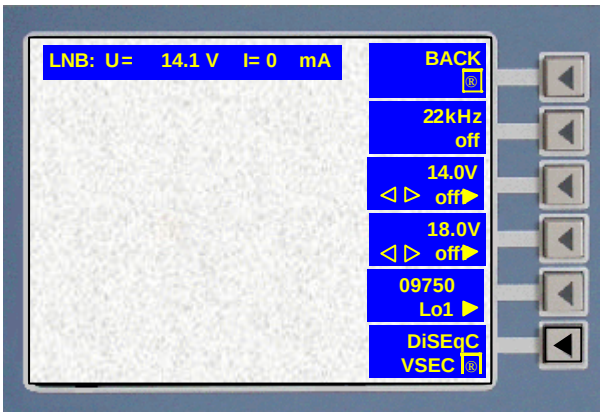
Connect the satellite receiver (IF input) to the R&S® EFL100 (RF input connector). Switch the supply voltage of the R&S® EFL100 "OFF" and that of the receiver "ON". You can now read off the output voltage from the screen.

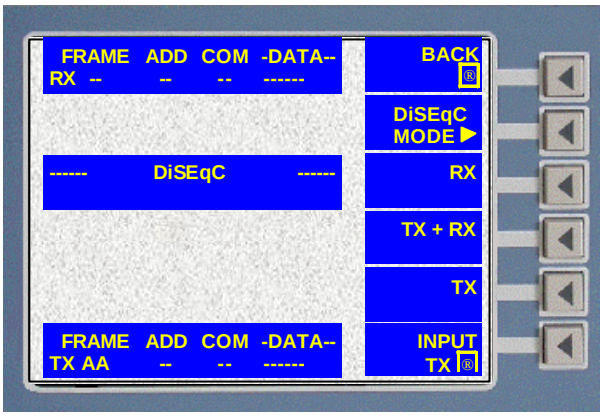
6.3.6 Calling the DiSEqC/VSEC Menu

You can use this menu to set any of the DiSEqC/VSEC control options (see chapter 6.4 DiSEqC-Menü).

Important:	*If the R&S® EFL100 is fitted with the external DC option (models .03 and .04), the LNB voltage must be switched off in order to charge the internal battery via this connector. Otherwise the internal battery will not be charged when in LNB mode.*

6.4 DiSEqC Menu





The R&S® EFL100 can be used to transmit (TX) and receive (RX) DiSEqC commands. The code words (Framing, Address, Command, Data) appear in the upper RX display field of the screen for received DiSEqC commands, and in the lower TX display field for transmitted DiSEqC commands. Two further display fields are available for explanations of the DiSEqC commands. The DiSEqC code words can be entered and edited in hexadecimal code.

6.4.1 RX Analysis

RX

When you press the appropriate softkey, the field is highlighted in yellow for about three seconds. During this time DiSEqC commands can be received and analyzed. When a DiSEqC command is received it appears in the RX display field.

6.4.2 Transmitting and Receiving a DiSEqC Command (TX + RX)

TX + RX

The DiSEqC command set in the TX display field is sent when you press this key. The R&S® EFL100 then switches to receive mode and awaits a return DiSEqC command. The RX field is highlighted in yellow (DiSEqC 2.0 systems only). In DiSEqC 1.0 systems no acknowledgement is returned.

6.4.3 Sending a DiSEqC Command (TX)

TX

The DiSEqC command set in the TX display field is sent when you press this key.

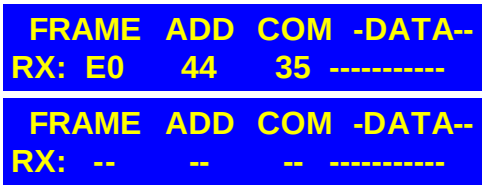
Note:	*In the COPY menu you can use "recall 85…90" to call a number of pre-programmed DiSEqC commands.*

6.4.4 Entering Hexadecimal Numbers

INPUT TX

Calls a submenu where you can enter your DiSEqC command.

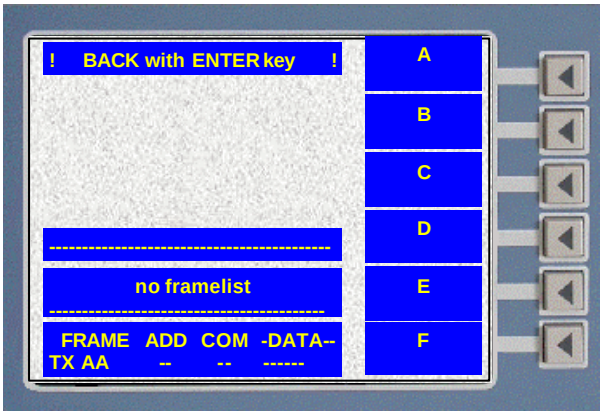
6.4.5 RX Display Field



A DiSEqC command appears in the RX display field on receipt.

If no DiSEqC command has been received, the display appears as shown on the left.

6.4.6 Submenu for Entering DiSEqC Commands



To call this submenu, press the "TX INPUT" key in the DiSEqC menu.

6.4.6.1 Entry

The hexadecimal number is shown in flashing mode at the cursor position.

You can then use the numeric keypad (hexadecimal number 0 to 9), one of the softkeys (hexadecimal number A to F) or the keys marked ? and ? to edit the hexadecimal number.

Then use the cursor keys marked ◂ ▸ to choose the next hexadecimal number. The four code words - Framing (FRAME), Address (ADD), Command (COM) and Data (DATA) - are produced in abbreviated form via the associated hexadecimal codes.

Press the ENTER key to exit the menu.

Note: *The appendix to this operating manual contains an overview of the DiSEqC commands.*

6.4.7 TX Display Field

The TX display field lets you edit DiSEqC commands that the R&S® EFL100 sends to other DiSEqC instruments. The keys marked ◂ and ▸ are used as cursor keys for this purpose. You can use the keys marked ▲▼ to increase or decrease the hexadecimal code in increments.

6.4.8 Display Field A

This display field shows the DiSEqC command set entered in the TX display field.

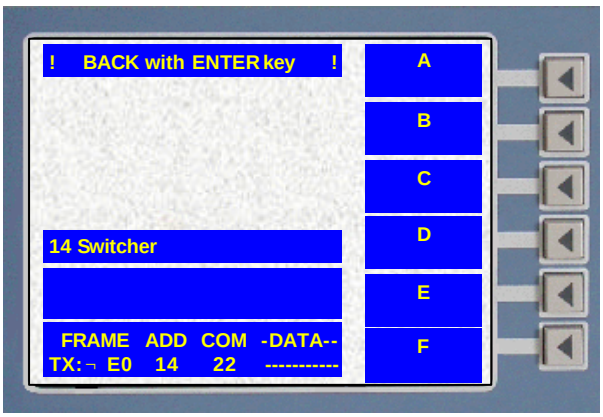
6.4.9 Display Field B

This display field contains a short explanation about the chosen DiSEqC command set.

The message shown on the left is displayed if you enter a DiSEqC command that is not listed in the R&S® EFL100.

6.4.9.1 Entering and Sending a DiSEqC Command

Example:
Assume you want to enter and send DiSEqC command E0 14 22:



Open the DiSEqC menu.

Press the "TX INPUT" key.

The cursor then flashes in the TX field lower left.

Use the "E" softkey to enter the first character of the hexadecimal number.

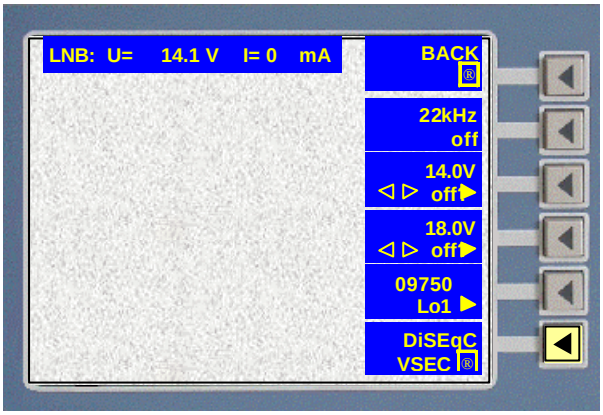
Enter the digits 0 14 22 on the numeric keys.

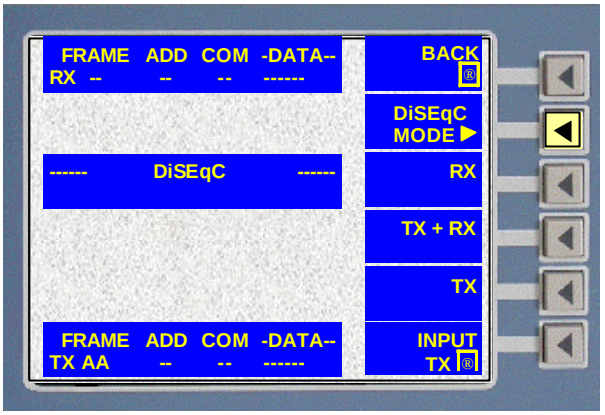
The illustration shows how the menu should then look.

Press ENTER to return to the DiSEqC menu.

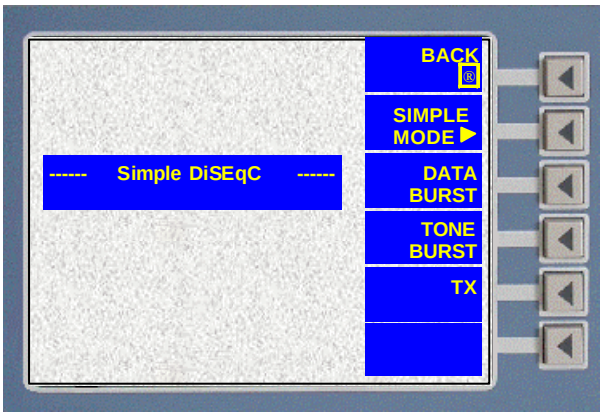
Use the "TX" key to send the DiSEqC command you entered.

6.4.10 Simple DiSEqC





Press the second softkey repeatedly to access the Simple DiSEqC menu. This menu too can be used to send its associated commands.

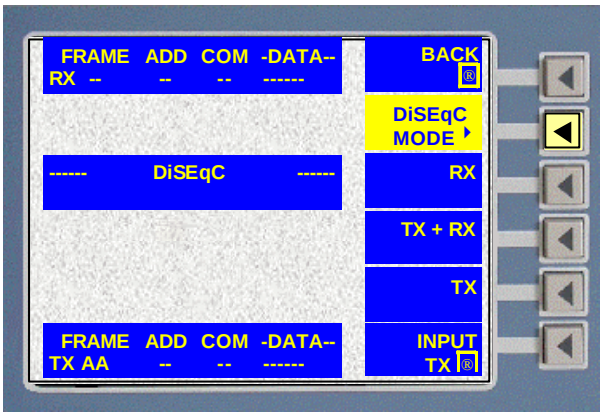


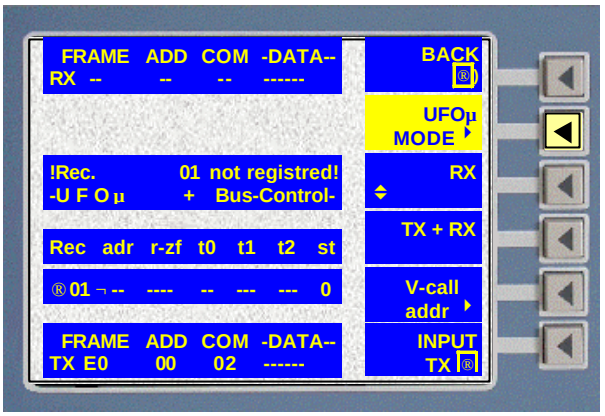
Simple DiSEqC provides two control options:

- a continuous 22 kHz tone burst and
- an intermittent 22 kHz data burst.

DATA BURST	Selects data burst
TONE BURST	Selects tone burst
TX	Sends the selected burst

6.5 UFOmicro DiSEqC Menu





6.5.1 Background

UFOmicro mode enables one or more headends in a company system to be tested. The test can be carried out with or without SAT receivers.

The following functions and special features are available:

1. Simulating the default function of a SAT receiver. Sending "virgin call for address", "call for address", "program command", "power on/off" - taking account of the allocated collision protection times.

2. Simulating a maximum of 12 receivers in conjunction with the installed UFOμ headends. Up to 12 pre-programmed factory defaults can be called.

3. Monitoring and recording the DiSEqC commands sent between the UFOmicro headends and the UFD receivers in a specified period of time (maximum 5 commands).

4. Displaying the receiver 01 to 12 concerned, together with the headend response, receiver address, remote IF and collision protection times (t0, t1, t2 in ms). Analog on-screen analysis of the remote IF allocated by the headend or in conjunction with the spectrum display in the spectrum menu.

5. Antenna socket testing (checking the disconnection function).

6.5.2 Display Fields

6.5.2.1 RX Field

FRAME	ADD	COM	-DATA--
RX0:E2	10	33	----------

This field displays the messages received from the current headend.

When monitoring is activated, a maximum of five messages will be displayed. The message displayed in each case is labelled RX: 0 to RX:4. The start of recording is marked by flashing and the end by displaying the last message recorded.

6.5.2.2 Status Field

The status of the headend and connected receiver is displayed in the middle of the screen together with transmission errors and the transmission status.

The following messages are possible:

!no acknowledge EXU544!	R&S® EFL100 transmission error
! acknowledge EXU544 !	No transmission error
!Rec. -- not registered!	Receiver is not logged into the headend
Rec. -- - registered -!	Receiver is logged into the headend
!Rec. -- -- Stand-by --!	Receiver is logged in but on standby
UFOu + Bus-Control	R&S® EFL100 is taking account of collision protection, INT33 is in use
UFOu without Bus-Control	R&S® EFL100 is not taking account of collision protection, INT33 is not in use

6.5.2.3 Receiver Field

REC	ADR	R-ZF	T0	T1	T2	ST
>02<	244	1200	20	12	4	2

The receiver field displays the settings status of the receiver 01 to 12 simulated by the R&S® EFL100.

Example:

Receiver 2 is logged into the headend which has the address 244. The remote IF is 1200 MHz.
The collision times are t0 = 20 ms, t1 = 12 ms and t2 = 4 ms. The status of receiver 2 is "registered".

6.5.2.4 TX Field

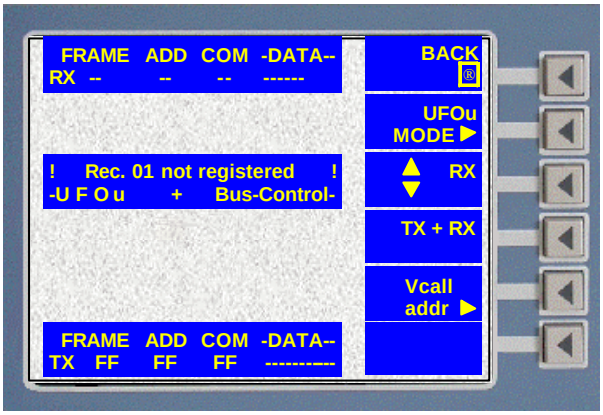
FRAME	ADD	COM	-DATA--
TX: E2	00	F2	1390---

The TX field displays the currently selected message from the receiver 01 to 12 concerned together with the individual DiSEqC bytes and the make-up of the individual DiSEqC commands.

Example:

FRAME is E0 corresponding to Program Command (PrgCom). Address ADD is 00 (reserved). Polarization byte COM F2 corresponds to the chosen polarization and SAT level. DATA corresponds to the set SAT IF in MHz.

6.5.3 Menu Operation



BACK

This softkey exits the DiSEqC menu.

UFOu MODE ▶

In the set UFOµ DiSEqC mode the existing remote IF frequency is adopted. In this event the R&S® EFL100 stays in UFOµ DiSEqC mode when you exit from this menu, and stays connected to the headend. This enables standard measurements to be performed. Select the UFOµ DiSEqC menu by pressing this key a number of times (ring counter).

▲▼ RX

Press this softkey briefly to switch on the monitoring function, in which the transmitted DiSEqC commands are recorded for a period of up to 20 s. The function records up to 5 events (RX0 to RX4) each consisting of up to 6 bytes (Frame, Add, Com, Dat1, Dat2, Dat3) between the headend and the existing SAT receivers. The commands displayed in the second line of the RX field flash whilst recording is in progress.

Recording stops automatically or may be broken off by holding down this softkey.

You van use the keys marked ▲▼ to call the individual messages RX0 to RX4 in the second line.

TX + RX

Use this softkey to send the message selected in the lower TX field. If a message is received from the headend, the acknowledgement is displayed in the RX field. The remote IF may well be adopted into the receiver field, depending on the acknowledgement.

COMMAND ▶

You can select the DiSEqC message Virgin-Call-For-Address, Call-For-Address, Program-Command or Switch-Off by pressing this key a number of times (ring counter).

The corresponding message code is displayed in the TX field.

Using this softkey means that the cursor keys marked ▲▼ and ◀ ▶ do not have to be used.

Depending on the message selected, the keys marked ◀ or ▶ can be used to select various edit fields. The selected fields are then framed with arrows.

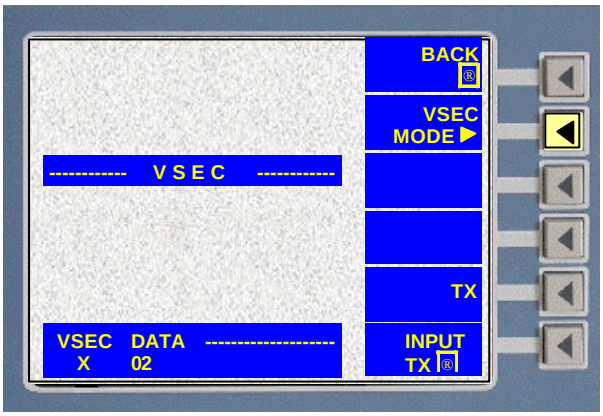
In the case of a program command the corresponding DiSEqC command COM or DATA can be edited. Use the cursor keys marked ▲▼ to select the edit field concerned.

In the COM field the polarization byte F0 to FF (horizontal/ vertical/high/low) is selected with the aid of the cursor keys marked ▲▼ and displayed in the softkey.

In the DATA field the SAT IF can be changed by entering a numeric value in MHz.

To edit the receiver number use the ◀ ▶ keys to select the Receiver No. field and then the keys marked ▲▼ to carry out the editing.

6.6 VSEC Menu



Press the second softkey repeatedly to access the VSEC menu. VSEC only allows you to send a Daten word. There is no answerback.

6.6.1 Entering Hexadecimal Numbers

INPUT TX

Calls a submenu where you can enter hexadecimal numbers.

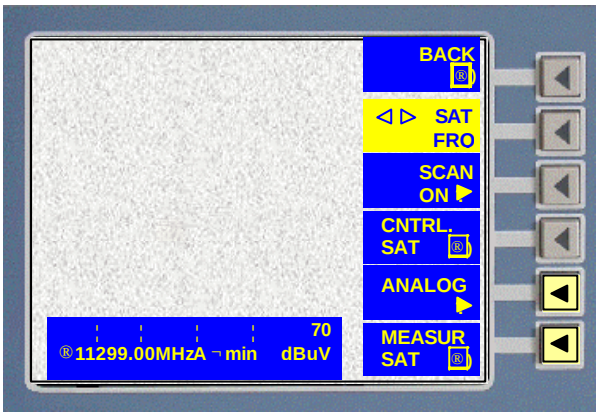
You can then use the numeric keypad (hexadecimal number 0 to 9) or one of the softkeys (hexadecimal number A to F) to set the hexadecimal number.

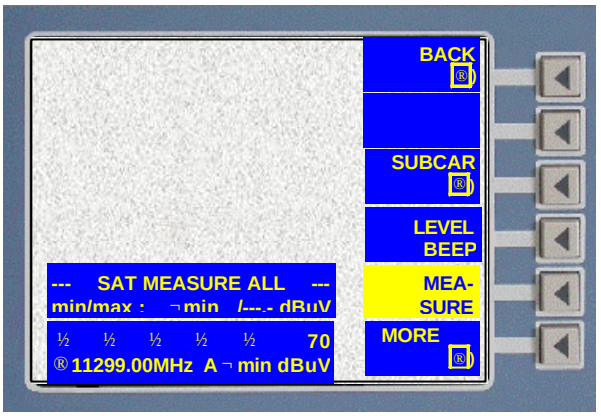
6.6.2 Sending a VSEC Command (TX)

TX

The VSEC command set in the TX display field is sent when you press this key.

6.7 First ANALOG Menu





BACK

Use this softkey to call the SAT menu again.

6.7.1 Calling the Sound Carrier Menu

SUBCAR

See chapter 6.9 Sat-Tonträger-Menü

6.7.2 Level-Dependent Acoustic Tracking Signal

LEVEL BEEP

The "LEVEL BEEP" function generates an acoustic signal. The pitch of the tone is proportional to the received signal level. This can be used to ensure that a receiving antenna is optimally aligned on a transmitter.

In this menu the cursor keys marked ◂ ▸ can be used to change the receive frequency.

6.7.3 ANALOG Level Measurement

Calls ANALOG level measurement along with minimum and maximum level measurement.

MEA-SURE

You can then measure the level of analog satellite signals. The R&S® EFL100 measures minimum and maximum levels whilst this measurement function is called. This measurement function is useful for monitoring measurement points for level fluctuations. The R&S® EFL100 stays on ANALOG reception even after you have exited the menu.

When you press the "MEASURE" key the screen overlay looks like this:

Display showing the minimum level as 78.0 dBµV and the maximum level as 82.5 dBµV.

Display showing satellite frequency, "A" for analog reception, and level.

The two arrows in front of the transponder frequency display make it easier to tune precisely to the center frequency.

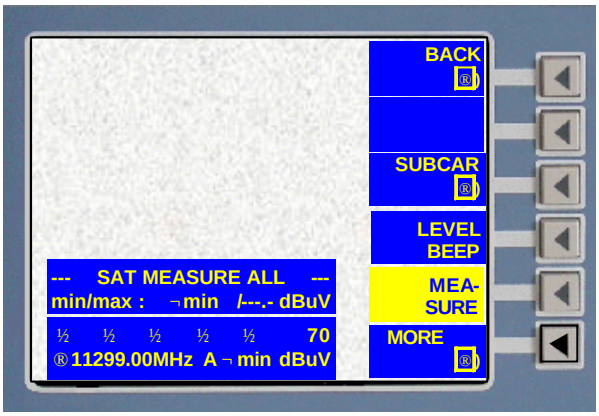
Note: *An "A" in front of the level display means that the R&S® EFL100 has been set to analog reception. The R&S® EFL100 stays on ANALOG reception even after you have exited the menu.*

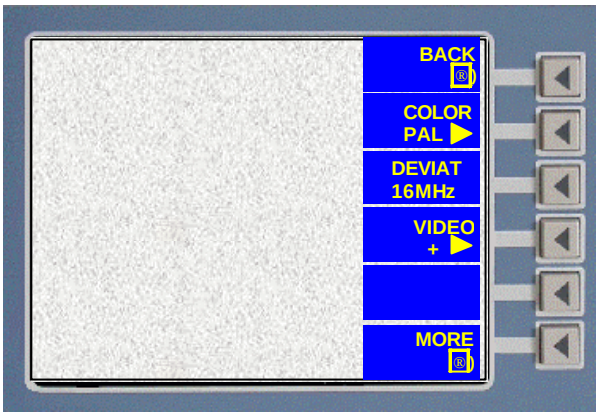
When you wish to measure the level of digital satellite signals you can switch the R&S® EFL100 over in the Digital menu. Please refer to the appropriate section.

MORE

Calls the second ANALOG menu.

6.8 Second ANALOG Menu





BACK ®

This returns you to the Satellite menu.

6.8.1 Selecting the Colour Standards PAL, SECAM and NTSC

COLOR PAL ▶

6.8.2 Selecting the Video Deviation

DEVIAT 16MHz

16 MHz for ASTRA reception, 25 MHz for EutelSat reception.

6.8.3 Video Polarity

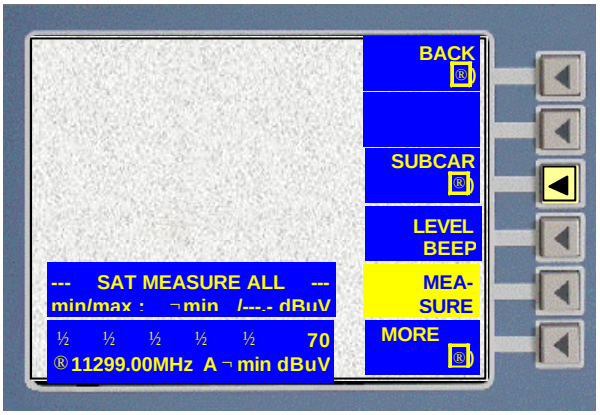
VIDEO + ▶

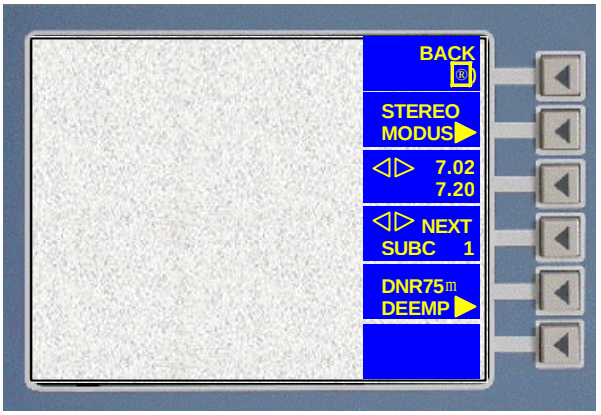
Switches the video polarity between positive and negative.
A **"+"** stands for a positive video signal.
A **"-"** stands for a negative video signal.

MORE ®

Returns you to the first ANALOG menu.

6.9 Satellite Sound Carrier Menu





BACK ®

Calls the first ANALOG menu.

6.9.1 Selecting the Sound Carrier Receive Mode

(see sound carrier table)

STEREO MODUS ▶

MONO N MODUS ▶ Sound subcarrier reception (narrow bandwidth)

MONO W MODUS Main sound carrier reception (wide bandwidth)

STEREO MODUS Both the sound carriers set up in the sound carrier frequency field are demodulated. The frequency separation between the two sound carriers is always 180 kHz. The selected sound signal is always present on the SCART connection and headphone connection.

6.9.2 Sound Carrier Frequency

◁▷ 7.02 7.20

The display shows the sound carriers that have been set. You may also change the sound carriers from 5.8 MHz up to 8.64 MHz in 10-kHz increments.
Use the cursor keys marked ◂ ▸ to do this.

6.9.3 Sound Carrier Setting

◁▷ NEXT SUBC 1

You may choose from 13 different preset sound carrier frequencies (see sound carrier table.)

6.9.4 Setting the Deemphasis

DNR75µ DEEMP ▶

Three settings are possible: 50 µsec, 75 µsec and J17 (see sound carrier table).

6.9.5 Sound Carrier Tables for Satellite Reception

The reception parameters, i.e. sound carrier frequency, sound carrier bandwidth and deemphasis, are interlinked by the instrument software to prevent any possibility of faulty operation due to selecting incorrect parameters.

Sound carrier table for reception mode: *MODUS STEREO*

	↔next subc 1	↔next subc 2	↔next subc 3	↔next subc
Sound carrier frequency	7.02 MHz 7.20 MHz	7.38 MHz 7.56 MHz	7.74 MHz 7.92 MHz	8.10 MHz 8.28 MHz
Deem-phasis	75 µsec	75 µsec	75 µsec	75 µsec

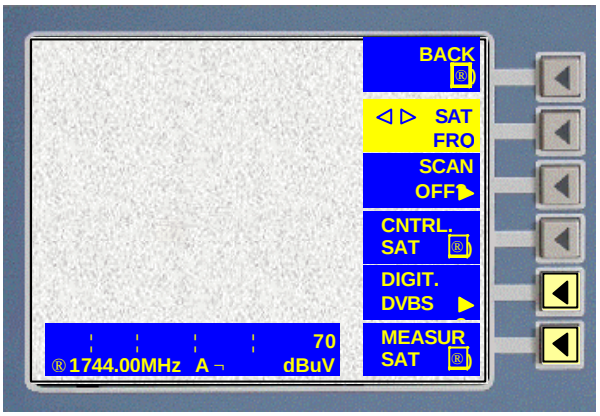
Sound carrier table for reception mode: *MODUS MONO N*

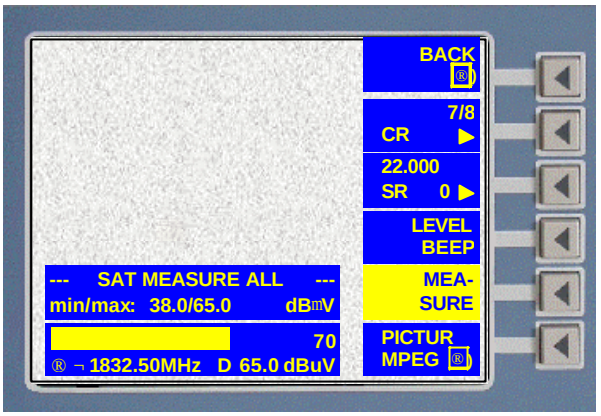
	Sound carrier frequency	Deemphasis
↔next subc 1	5.8 MHz	75 µsec
↔next subc 2	6.5 MHz	75 µsec
↔next subc 3	6.55 MHz	75 µsec
↔next subc 4	7.02 MHz	75 µsec
↔next subc 5	7.20 MHz	75 µsec
↔next subc 6	7.38 MHz	75 µsec
↔next subc 7	7.56 MHz	75 µsec
↔next subc 8	7.74 MHz	75 µsec
↔next subc 9	7.92 MHz	75 µsec
↔next subc 10	8.10 MHz	75 µsec
↔next subc 11	8.28 MHz	75 µsec
↔next subc 12	8.46 MHz	75 µsec
↔next subc 13	8.64 MHz	75 µsec

Sound carrier table for reception mode: *MODUS MONO W*

	Sound carrier frequency	Choice of deemphasis
↔next subc 1	5.8 MHz	J17 or 50 µsec
↔next subc 2	6.5 MHz	J17 or 50 µsec
↔next subc 3	6.65 MHz	J17 or 50 µsec
↔next subc 4	7.02 MHz	J17 or 50 µsec
↔next subc 5	7.20 MHz	J17 or 50 µsec
↔next subc 6	7.38 MHz	J17 or 50 µsec
↔next subc 7	7.56 MHz	J17 or 50 µsec
↔next subc 8	7.74 MHz	J17 or 50 µsec
↔next subc 9	7.92 MHz	J17 or 50 µsec
↔next subc 10	8.10 MHz	J17 or 50 µsec
↔next subc 11	8.28 MHz	J17 or 50 µsec
↔next subc 12	8.46 MHz	J17 or 50 µsec
↔next subc 13	8.64 MHz	J17 or 50 µsec

6.10 SAT DIGITAL Menu





BACK

Calls the previous menu.

6.10.1 Level-Dependent Acoustic Tracking Signal

LEVEL BEEP

The LEVEL BEEP function generates an acoustic signal. The pitch of the tone is proportional to the received signal level. This can be used to ensure that a receiving antenna is optimally aligned on a transmitter.

In this menu the cursor keys marked ◂ ▸ can be used to change the receive frequency.

6.10.2 Convolution Code in SAT Measurement

7/8 CR ▶

Using this key you can change the convolution code setting for demodulating the QPSK signals from 1/2 to 8/9. The setting will then be adopted during constellation analysis.

6.10.3 Entering the Symbol Rate

22.000 SR 0 ▶

For correct level measurement of digital signals you can choose between 4 preset symbol rates (in SAT mode: 22.000, 27.500, 20.000 and 24.500). You can also change the preset symbol rates by entering a numeric value. Symbol rates from 0.5 to 32 MS (MSymbols/second) can be programmed in the SAT range. This programming will then be adopted during constellation analysis. Press the [MHz] key on completing your entry.

Caution: *For correct signal level measurement it is essential to set the correct symbol rate.*

6.10.4 MPEG Decoder Menu (Model .03 or .04)

PICTUR MPEG ®

This function displays the PAT (program association table) and the associated PIDs (packet identifiers) of the transport stream. The programs required can be selected in this menu and displayed on the screen (see "MPEG Decoder").

6.10.4.1 DIGITAL Level Measurement (Min/Max Level)

MEA-SURE

Calls DIGITAL level measurement and MIN/MAX. When this function is called, minimum and maximum levels are measured. This function is useful for monitoring measurement points for level fluctuations. The R&S® EFL100 stays on DIGITAL reception even after you have exited the menu.

Example:
When you press the "MEASURE" key the screen overlay looks like this:

--- SAT MEASURE ALL ---
min/max: 38.0/65.0 dBmV

Display showing the minimum level as *78.0 dBµV* and the maximum level as *82.5 dBµV*.

70
® ¬ 1832.50MHz D 65.0 dBuV

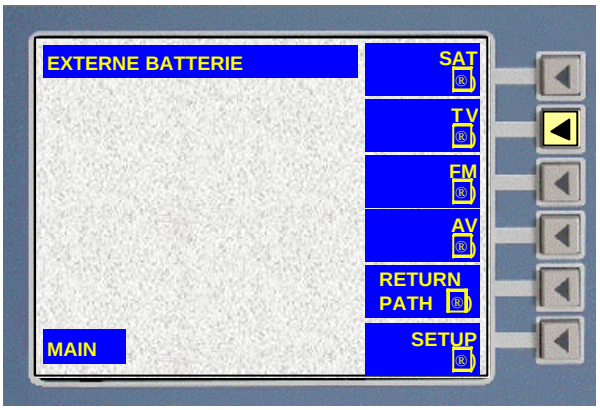
Display showing the SAT frequency, the level and a note "D" indicating that reception is digital.

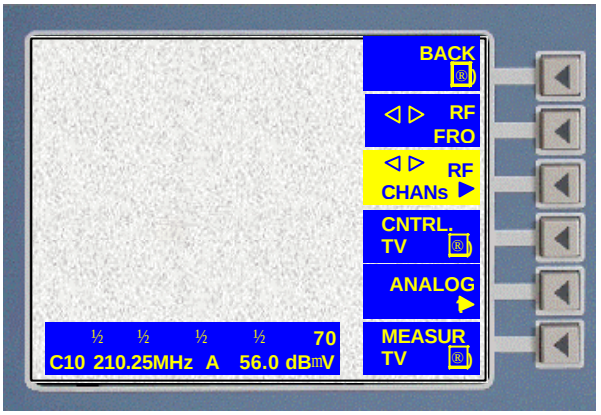
The R&S® EFL100 measures minimum and maximum levels whilst this measurement function is called. This measurement function is useful for monitoring measurement points for level fluctuations.

Note:	*A "D" in front of the level display means that the R&S® EFL100 has been set to digital reception. The R&S® EFL100 stays on DIGITAL reception even after you have exited the menu.* *When you wish to measure the analog level you can switch the R&S® EFL100 over in the ANALOG menu (see appropriate section).*

7 TV Mode

7.1 TV Menu





BACK

Calls the main menu

7.1.1 Entering a Frequency from 44.75-867.2 MHz / DVB-T / BIII / UHF

◁ ▷ RF FRQ

The field is highlighted in yellow when the softkey is pressed. You can then use the numeric keys "0 to 9" and "MHz" to enter the frequency or you can use the cursor keys marked ◀ ▶ to change it in 50-kHz increments. The frequency is displayed to the lower left of the screen.

7.1.2 Channel Center Display

½ ½ ½ ½ 70
C10 210.25MHz A 56.0 dBmV

If the screen shows a capital "C" or "S", the frequency is set at the channel center.

Receive frequency set to optimum

½ ½ ½ ½ 70
c10 210.20MHz A 56.0 dBmV

The frequency entered is not at the channel center of the RF standard concerned if a small "c" or "s" is showing.

Frequency not set to optimum

7.1.3 Entering a Channel

This field is highlighted in yellow when the softkey is pressed. You can then use the numeric keys "0 to 9" to enter a two-figure value for the channel, or use the cursor keys marked ? ? to change it.

A capital "C" is shown in front of the channel display when a channel is tuned to optimum.

7.1.4 Entering a Special Channel

When you press the softkey again, "CHANs" appears in the menu field. You can then enter a value for a special channel.

When a special channel is properly tuned a capital "S" appears in front of the channel display.

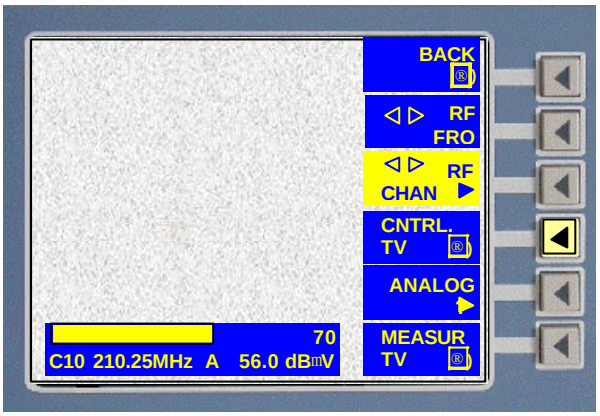
7.1.5 Selecting Analog, DVB-C and DVB-T-Measurement

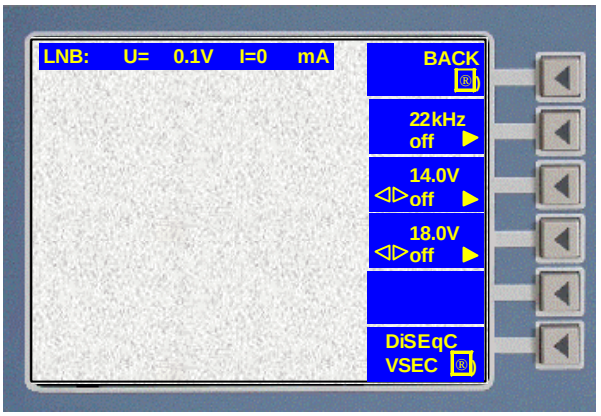
7.1.6 Calling the TV Control Menu

You can use this menu to set all the remote control parameters such as remote supply voltage, 22 kHz, DiSEqC, Tone Burst (Simple DiSEqC) and VSEC.

7.2 TV Control Menu

7.2.1 22-kHz Control Signal





22kHz off ▶

The field is highlighted in yellow when the softkey is pressed. The switchable 22-kHz signal is superposed on the supply voltage. Press the key again to switch off the 22-kHz signal.

7.2.2 14-V Remote Supply Voltage

14.0V ◁▷ off ▶

The field is highlighted in yellow when the softkey is pressed. The 14.0 V supply voltage for ***vertical*** polarization is now switched on. For checking purposes the LED above the RF input connector lights up. Use the numeric keys 0 to 9 to enter a value for the voltage or the cursor keys marked **?** **?** to change the voltage in the range 10 to 20 V. This numeric input must be confirmed by pressing the "Enter" key. Press the softkey again to switch off the LNB supply voltage (remote supply).

7.2.3 18-V Remote Supply Voltage

18.0V ◁▷ on ▶

The field is highlighted in yellow when the softkey is pressed. The 18.0 V supply voltage for vertical polarization is now switched on. For checking purposes the LED above the RF input connector lights up. Use the numeric keys "0 to 9" to enter a value for the voltage or the cursor keys marked **?** **?** to change the voltage in the range 10 V to 20 V. This numeric input must be confirmed by pressing the "Enter" key. Press the softkey again to switch off the LNB supply voltage (remote supply).

Note: *The remote supply voltage:*
- can be switched off = 0 V
- can be changed from 10 to 20 V in increments of 0.1 V
- is short-circuit-proof up to a current of 500 mA

LNB: U= 14.6V I=181 mA

This field shows the current drain (I = 181 mA) and supply voltage (14.6 V) of the LNB.

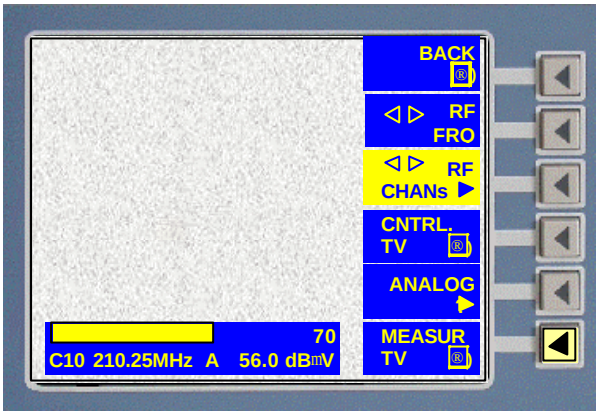
7.2.4 Checking the Supply Voltage in a Remotely Fed System

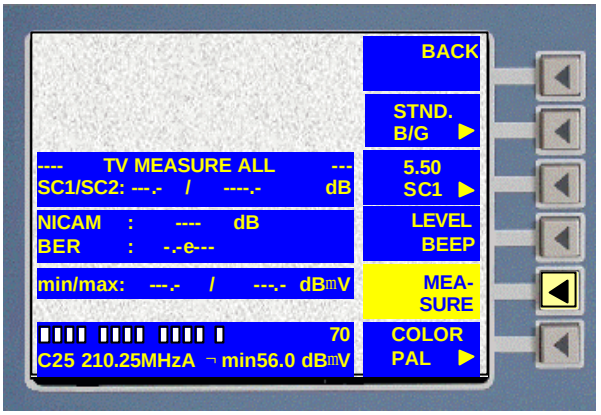
Switch the remote supply voltage of the R&S® EFL100 "OFF". Connect the system to the R&S® EFL100 (RF input connector to antenna connector). From the screen you can then read off the output voltage of the remotely fed instrument in the system you are checking.

7.2.5 Calling the DiSEqC / VSEC Menu

You can use this menu to set up all the DiSEqC control options (see chapter 6.4).

7.3 TV ANALOG Menu





BACK Calls the TV menu.

7.3.1 Selecting the Standard

STND. B/G You can use this softkey to choose from the following standards:
B/G, D/K, I, L, M, M – Jap (Japan) and N (see sound carrier table).

In this menu the cursor keys marked ◂ ▸ can be used to change the channel setting. You can use the RP menu in the same way to change the receive frequency.

Sound carrier table for TV reception

The sound carrier frequencies mentioned refer to the sound and vision carrier separation

Standard	Sound carrier 1 (SC1)	Sound carrier 2 (SC2)	Sound carrier (SC1/SC2)	NICAM
B/G	5.50 MHz	5.74 MHz	SC1: 5.50 MHz SC2: 5.74 MHz	5.85 MHz
L	6.50 MHz (AM)			5.85 MHz
D/K	6.50 MHz	6.26 MHz	SC1: 6.50 MHz SC2: 6.26 MHz	5.85 MHz
D/K China	6.50 MHz	6.26 MHz	SC1: 6.50 MHz SC2: 6.74 MHz	5.85 MHz
I	6.00 MHz			6.552 MHz
M	4.50 MHz	4.72 MHz	SC1: 4.50 MHz SC2: 4.72 MHz	
M (Japan)	4.50 MHz			
N	4.50 MHz			

7.3.2 Selecting the Sound Carrier

5.50 SC1 ▶

Press this key to set the R&S® EFL100 to any of the following reception modes:

- Sound carrier 1 (SC1)
- Sound carrier 2 (SC2)
- Stereo (SC1/SC2)
- NICAM

7.3.3 Level-Dependent Acoustic Tracking Signal

LEVEL BEEP

The "LEVEL BEEP" function generates an acoustic signal. The pitch of the tone is proportional to the received signal level. This can be used to ensure that a receiving antenna is optimally aligned on a transmitter.

7.3.4 Carrying out Measurements

MEA-SURE

When you press this key the R&S® EFL100 is set to analog reception and measures the following values:

- Sound carrier separation between SC1 and SC2
- NICAM sound carrier separation (if present)
- Nicam bit error rate (BER)
- Minimum and maximum levels (min/max)
- ANALOG level measurement

The screen overlays displayed when you press the "MEASURE" key in each case are illustrated below:

7.3.4.1 Measuring the Sound Carrier Separation

Sound carrier 1: -13.5 dB
Sound carrier 2: -19.5 dB

7.3.4.2 Measuring the NICAM Sound Carrier Separation and Bit Error Rate

NICAM sound carrier separation 1: -18.5 dB
NICAM bit error rate: 5.6E-06 ($5.6x10^{-6}$)

7.3.5 Measuring the Min/Max Level

The following values are displayed:

- *Minimum level: 77.5 dBµV*
- *Maximum level: 82.5 dBµV*

In this function the R&S® EFL100 measures the minimum and maximum levels so that you can monitor measurement points for level fluctuations.

7.3.6 Measuring the Instantaneous Level

The following values are displayed:

- Channel: *S16* (special channel)
- Frequency: *266.25 MHz*
- Analog reception: *A*
- Instantaneous level: *79.5 dBµV*

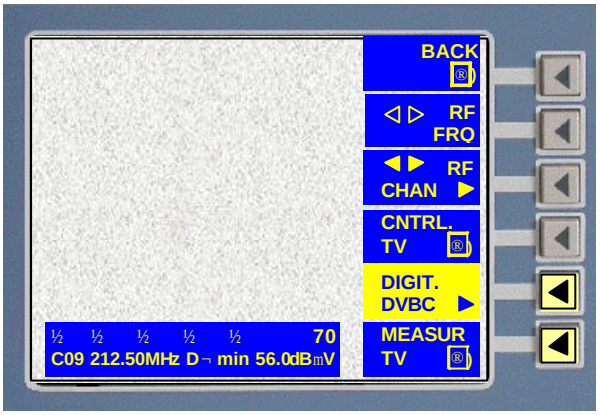
Note:	*An "A" in front of the level display means that the R&S® EFL100 has been set to analog level measurement. The R&S® EFL100 stays on ANALOG reception even after you have exited the menu.* *When you wish to measure the level of TV signals you can switch over in the DIGITAL menu (see appropriate section).*

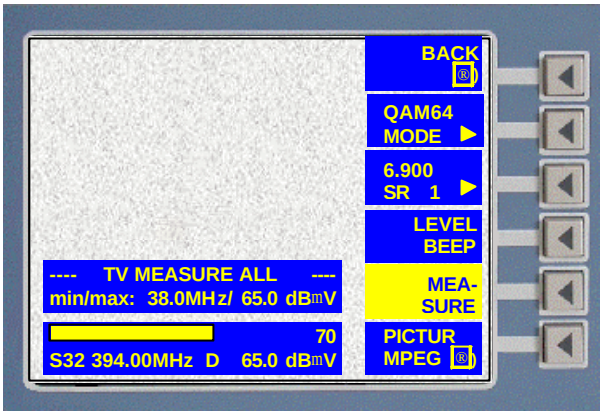
7.3.7 Selecting the Colour Standards PAL, SECAM and NTSC

Important:	*When you wish to display a digital MPEG picture (models .03 and .04 only), you should choose the PAL colour standard. Otherwise it will not be possible to display a perfect MPEG picture.*

7.4 TV DIGITAL Menu

7.4.1 DVB-C (Model .03 and .04)





BACK Calls the previous menu.

7.4.1.1 Level-Dependent Acoustic Tracking Signal

LEVEL BEEP The "LEVEL BEEP" function generates an acoustic signal. The pitch of the tone is proportional to the received signal level. This can be used to ensure that a receiving antenna is optimally aligned on a transmitter.

In this menu the cursor keys marked ◂ ▸ can be used to change the channel setting. You can use the RP menu in the same way to change the receive frequency.

7.4.1.2 Selecting Demodulation in the case of DVB-C Measurement

QAM64 MODE Use this key to select between demodulation modes DVB-C QAM64, QAM128 or DOCSISQAM64 (softkey name = DOC64 mode). The setting will then be adopted during constellation analysis.

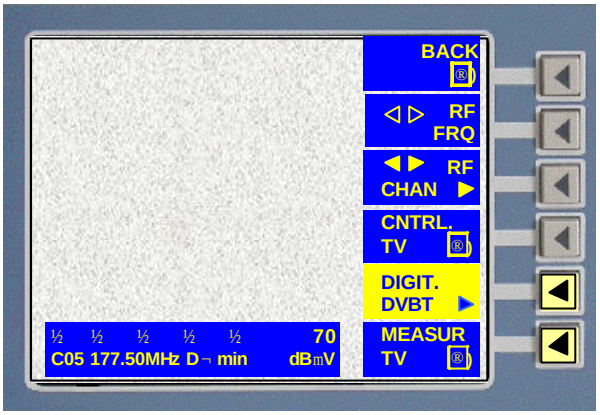
7.4.1.3 Entering a Symbol Rate

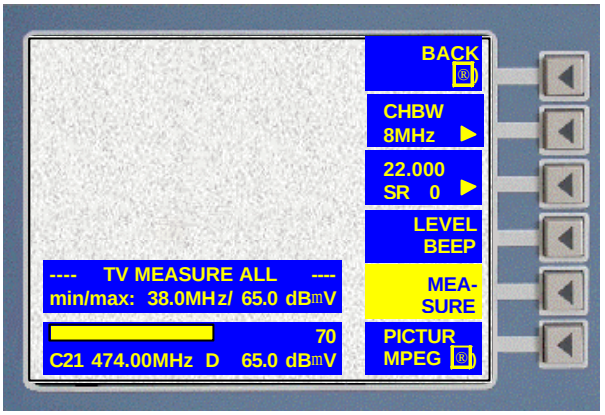
6.900 SR 1 ▶ For correct level measurement of digital signals you can choose between 4 preset symbol rates (in DVB-C mode: 6.900, 6.111, 6.952 and 6.875). You can also change the preset symbol rates by entering a numeric value.

Symbol rates from 0.5 to 7.2 MS (MSymbols/second) can be programmed in the DVB-C range. This programming will then be adopted during constellation analysis. Press the [MHz] key on completing your entry.

For correct signal level measurement it is essential to set the correct symbol rate.

7.4.2 DVB-T (Model .04)





BACK Calls the previous menu.

7.4.2.1 Level-Dependent Acoustic Tracking Signal

LEVEL BEEP The "LEVEL BEEP" function generates an acoustic signal. The pitch of the tone is proportional to the received signal level. This can be used to ensure that a receiving antenna is optimally aligned on a transmitter.

In this menu the cursor keys marked ◀ ▶ can be used to change the channel setting.

7.4.2.2 Selecting Channel Bandwidths

CHBW 8MHz ▶ For correct level measurement of digital signals you can choose between 3 channel bandwidths (6, 7 and 8 MHz). This programming will then be adopted during constellation analysis.

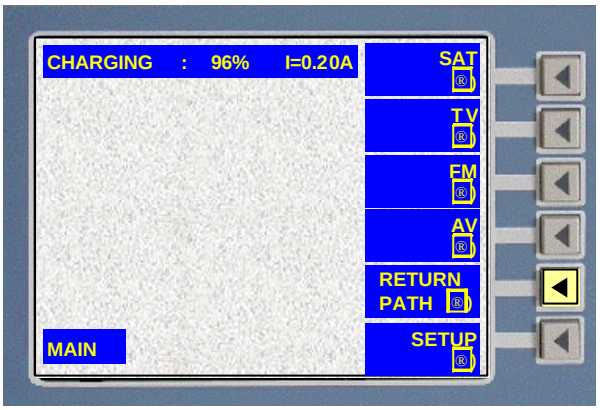
For correct signal level measurement it is essential to set the correct bandwidth.

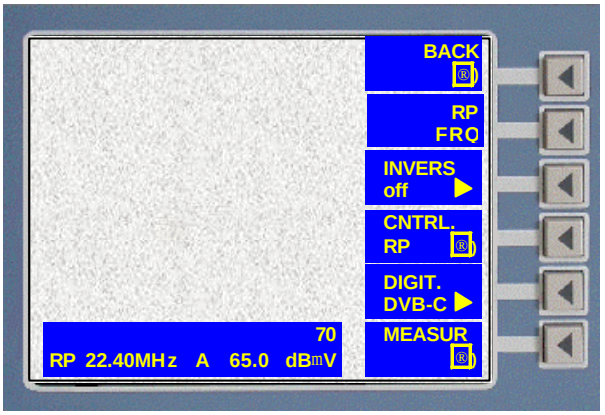
7.4.3 MPEG Decoder Menu (Models .03 and .04)

PICTUR MPEG This function displays the PAT (program association table) and the associated PIDs (packet identifiers) of the transport stream. The programs required can be selected in this menu and displayed on the screen [see 6.10.4 MPEG-Decoder-Menü (Modell .03 und .04)].

7.5 Return Path IF Mode

7.5.1 Return Path IF Menu





In this menu you can measure either the vision carrier at the IF level (38.9 MHz analog and 36.15 MHz digital) or the whole return path range (models .03 and .04) from 4 MHz to 80 MHz, depending on the model.

Important: *Depending on the instrument version, the EFL100 logs on with the IF menu or the Return Path menu (see sections below marked with an asterisk).*

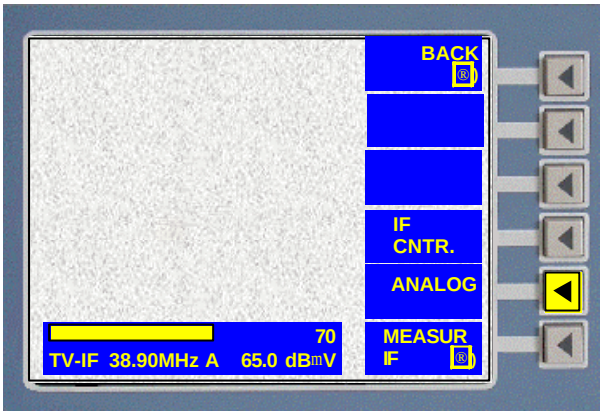
7.5.2 Entering a Frequency from 4.00 MHz to 80.00 MHz*

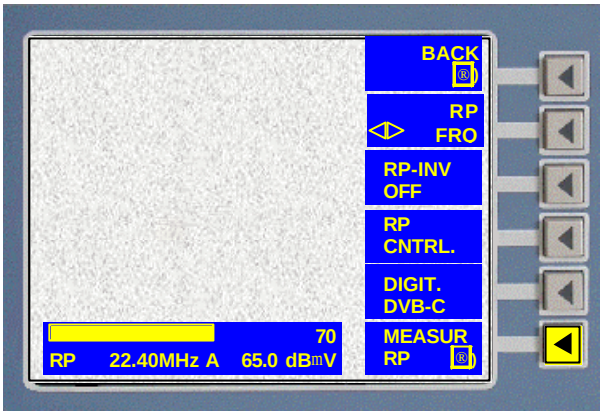
You can use the numeric keys "0 to 9" and "MHz" to enter the return path frequency or use the cursor keys marked ◂ ▸ to enter it in 50-kHz increments. The frequency is displayed to the lower left of the screen.

7.5.3 Inverting the RF Spectrum*

Press this key to invert the RF spectrum. This means that the vision and sound carriers, or in the case of digital modulation the I and Q vectors, are swapped.

7.5.4 ANALOG Menu





ANALOG **MEASUR RP**

To access the Analog menu use the "ANALOG" and "MEASURE RP" keys. You can use this menu to set and measure analog signals. For further information see chapter 7.3 TV-ANALOG-Menü.

7.5.5 DIGITAL Menu

DIGIT. DVB-C **MEASUR RP**

To access the Digital menu use the "DIGIT. DVB-C" and "MEASURE RP" keys. You can use this menu to set and measure DVB-C signals. IF demodulation of DVB-T signals is not possible. For further information see chapter 7.4 TV-DIGITAL-Menü.

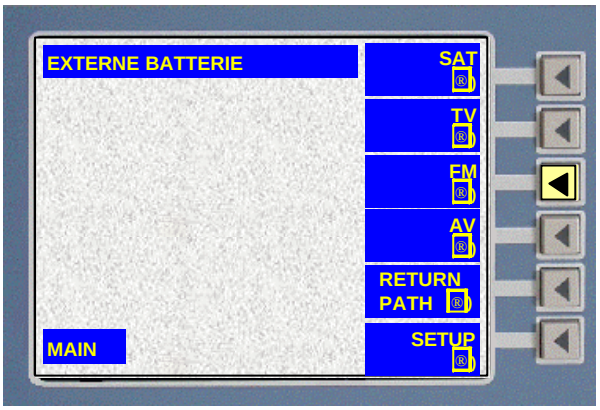
7.5.6 IF CONTROL Menu (RP CONTROL*)

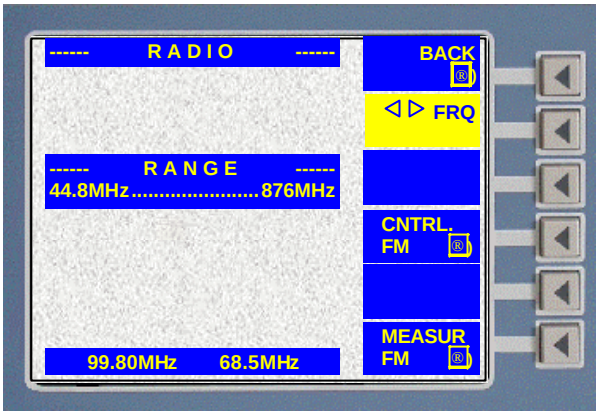
RP CNTRL.

You can use this menu to set all the remote control parameters such as remote supply voltage, 22 kHz, DiSEqC, Tone Burst (Simple DiSEqC) and VSEC. Weitere For further information see chapter 7.3 TV-ANALOG-Menü.

8 FM Mode

8.1 FM Menu



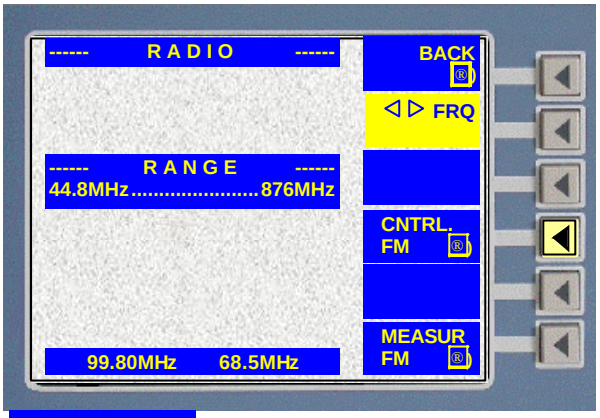


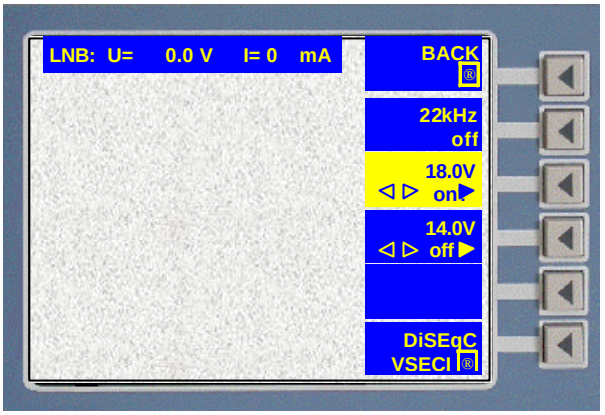
Back to the main menu.

8.1.1 Entering a Frequency from 44.75 MHz to 867.20 MHz

The field is highlighted in yellow when the softkey is pressed. You can then use the numeric keys "0 to 9" and "MHz" to enter the frequency or you can use the cursor keys marked ◂ ▸ to change it. The frequency is displayed to the lower left of the screen.

8.2 CONTROL FM Menu





CNTRL. FM

You can use this menu to set all the remote control parameters such as remote supply voltage, 22 kHz, DiSEqC, Tone Burst (Simple DiSEqC) and VSEC.

The R&S® EFL100 measures minimum and maximum levels whilst this measurement function is called. This measurement function is useful for monitoring measurement points for level fluctuations.

BACK

Back to the Radio menu.

8.2.1 22-kHz Control Signal

22kHz on ▶

The field is highlighted in yellow when the softkey is pressed. The switchable 22-kHz signal is superposed on the supply voltage. Press the key again to switch off the 22-kHz signal.

8.2.2 14-V Remote Supply Voltage

14.0V ◁▷ on ▶

The field is highlighted in yellow when the softkey is pressed. The 14.0 V supply voltage for ***vertical*** polarization is now switched on. For checking purposes the LED above the RF input connector lights up. Use the numeric keys "0 to 9" to enter a value for the voltage or the cursor keys marked ◂ ▸ to change the voltage in the range 10.1 V to 20.0 V.

This numeric input must be confirmed by pressing the "Enter" key. Press the 14-V key again to switch off the LNB supply voltage (remote supply).

8.2.3 18-V Remote Supply Voltage

18.0V ◁▷ off ▶

The field is highlighted in yellow when the softkey is pressed. The 18.0 V supply voltage for ***horizontal*** polarization is now switched on. For checking purposes the LED above the RF input connector lights up. Use the numeric keys "0 to 9" to enter a value for the voltage or the cursor keys marked ◂ ▸ to change the voltage in the range 10.1 V to 20.0 V.

This numeric input must be confirmed by pressing the "Enter" key. Press the softkey again to switch off the LNB supply voltage (remote supply).

Note:	*The remote supply voltage:* *- can be switched off = 0 V* *- can be changed from 10 to 20 V in increments of 0.1 V* *- is short-circuit-proof up to a current of 500 mA*

LNB: U= 14.6V I=181 mA This field shows the current drain (I = 181 mA) and supply voltage (14.6 V) of the LNB.

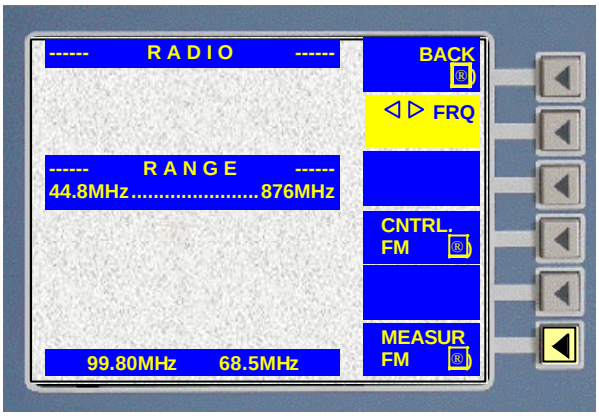
8.2.4 Checking the Supply Voltage in a Remotely Fed System

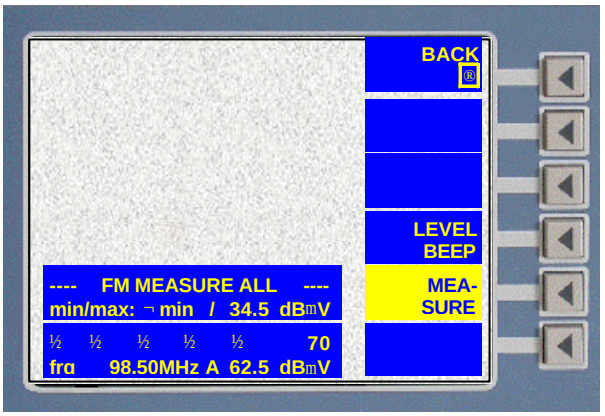
Switch the remote supply voltage of the R&S® EFL100 "OFF". Connect the system to the R&S® EFL100 (RF input connector to antenna connector). From the screen you can then read off the output voltage of the remotely fed instrument in the system you are checking.

8.2.5 Caling the DiSEqC / VSEC Menu

DiSEqC VSEC® You can use this menu to set up all the DiSEqC control options (see chapter 6.4).

8.3 Measure Menu





BACK Back to the Radio menu.

8.3.1 Level-Dependent Acoustic Tracking Signal

LEVEL BEEP The "LEVEL BEEP" function generates an acoustic signal. The pitch of the tone is proportional to the received signal level. This can be used to ensure that a receiving antenna is optimally aligned on the transmitter.

8.3.2 Carrying out measurements

MEA-SURE The following values are measured when you press this key:

- Minimum and maximum levels (min/max)
- Level Measurement

The cursor keys marked ◂ ▸ can be used to change the receive frequency.

8.3.3 Measuring the Min/Max Levels

---- FM MEASURE ALL ----
min/max: 61.5 / 64.5 dBmV

The following values are displayed:

- *Minimum level:* *61.5 dBmV*
- *Maximum level:* *64.5 dBmV*

8.3.4 Measuring the Instantaneous Level

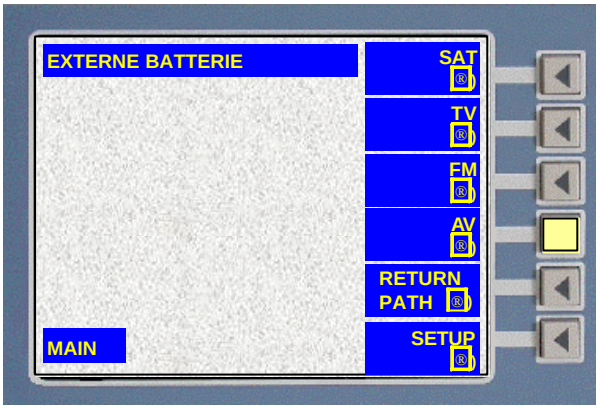
½ ½ ½ ½ ½ 70
fra 98.50MHz A 62.5 dBmV

The following are displayed:

- *Frequency:* *98.50 MHz*
- *Analog reception:* *A*
- *Instantaneous level:* *62.5 dBmV*

The R&S® EFL100 measures minimum and maximum levels whilst this measurement function is called. This measurement function is useful for monitoring measurement points for level fluctuations.

9 AV Mode



Calls the main menu

Selects colour standards PAL, SECAM and NTSC

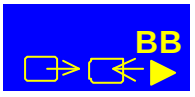
Note: *You can use the softkey* 

to set the following four operating modes on the SCART connector:

9.1 Decoder Mode

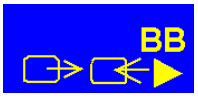
In this operating mode a decoder for decrypting coded signals (such as Premiere) can be connected to the SCART socket.

9.2 Decoder Mode - Baseband



In this operating mode a decoder that needs a baseband signal can be connected to the SCART socket (possible in SAT reception only).

9.3 Video input



When you press this key the video signal can be applied to the SCART connection and displayed on the TFT screen.

9.4 Video output

When you press this key the video signal is available on the SCART connection.

9.5 Switching voltage

This function is used for providing a switching voltage on the SCART connector in order to control external instruments. When you press this key the switching voltage can be turned ON or OFF.

9.6 RGB Mode

When you use this softkey an RGB signal is made available on the SCART connection, or an RGB signal can be applied to the SCART connection. Note also the function of the Fast Blank key in the same menu.

The Fast Blank signal can be switched on and off. If you switch this function on, the Fast Blank from the external instrument can be applied and the external RGB signal can be viewed on the R&S® EFL100 screen.

Note:	*When you exit from the AV menu the AV operating mode that was last set is retained. The video signal can be displayed in RGB operating mode on an external monitor (TV set) complete with the softkey overlay fields.*

9.7 MPEG Transport Stream Interface TS Parallel, LVDS (Models .03 and .04)

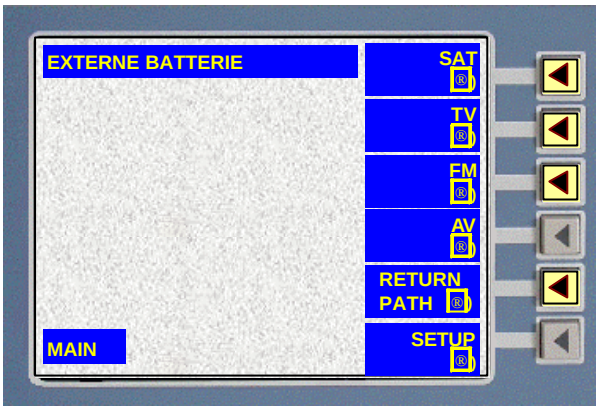
If the last softkey looks like this, the input and output are locked.

If it looks like this, the MPEG transport stream is present on the TS Parallel interface (rear panel).

In this function, an MPEG transport stream can be applied to the TS Parallel interface (rear panel).

In order to input or output an MPEG transport stream, it is a prerequisite to switch on the MPEG decoder in the TV Digital or SAT Digital menu (last softkey - MPEG PICTURE). At this point the up-to-date status is also displayed on the second line of the screen overlay.

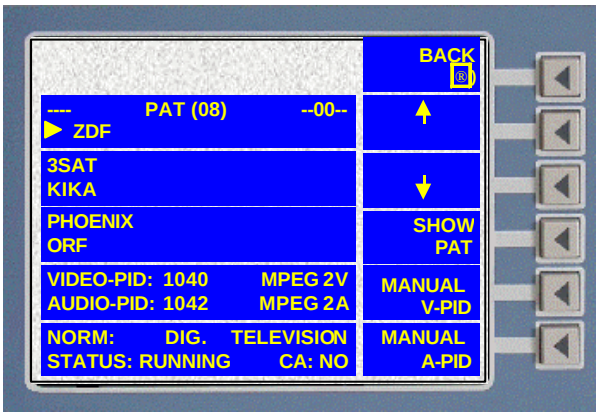
9.8 MPEG DECODER Menu (Models .03 and .04)



MEASUR

PICTUR MPEG

When you call the MPEG menu from the digital measurement in the case of SAT, TV, IF or RETURN PATH, the PAT is listed so that you can select the video or audio program of your choice. The PID numbers of the programs selected are also displayed.



The bottom two lines are for messages from the MPEG decoder.

Please make sure that the symbol rate and code rate are correctly set up in the Digital menu. Otherwise you will receive the message "FRONTEND NOT LOCKED". If necessary check this in constellation analysis. You will receive the message "NO PAT" whenever no program list can be found.

The Program Access Table shows the video and audio channels present in the MPEG transport stream.

There are eight programs, and five of these are displayed. Program 00 is being decoded and its picture is being displayed.

You can use the arrow softkeys to select the program of your choice.

This is where the video and audio Program Identify codes for the selected program are displayed. If you press the "MANUAL V-PID" and 'MANUAL A-PID" keys you can enter the four-figure PIDs manually.

SHOW PAT

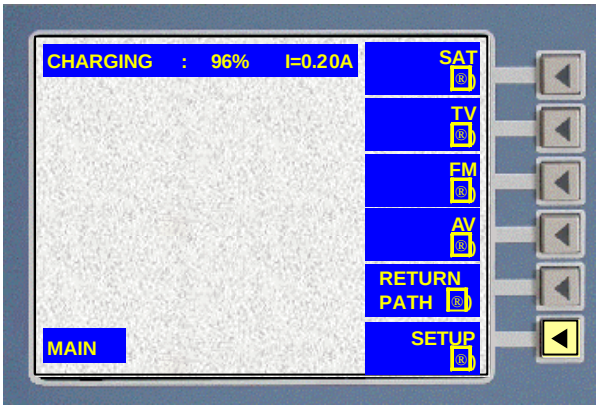
Press the "SHOW PAT" key to restart the search for the program list.

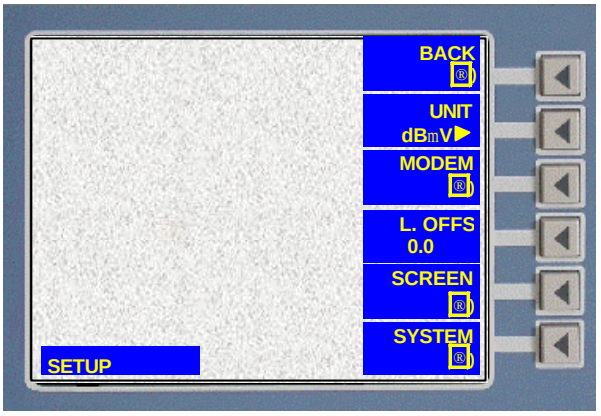
MPEG decoder status display:

STANDARD:	DIG. TELEVISION, DIG. AUDIO, DATA BROADCAST or RESERVED
STATUS:	RUNNING, NOT RUN, WAIT SEC, PAUSING, UNDEFINED or RESERVED
CA:	CONDITIONAL ACCESS YES /NO = encryption yes / no

Important: *If you return from the CONST menu (Constellation Analysis) straight back to the MPEG menu previously selected, the level settings you selected in the CONST menu will be adopted (LEVEL AUTO, LEVEL - 4 dB, LEVEL -8 dB, LEVEL +8 dB, LEVEL +4 dB).*

10 SETUP Menu





BACK

Calls the main menu

10.1 Unit of measure

UNIT dBµV

Softkey for switching from dBµV to dBmV and back.

10.2 Modem Menu

MODEM

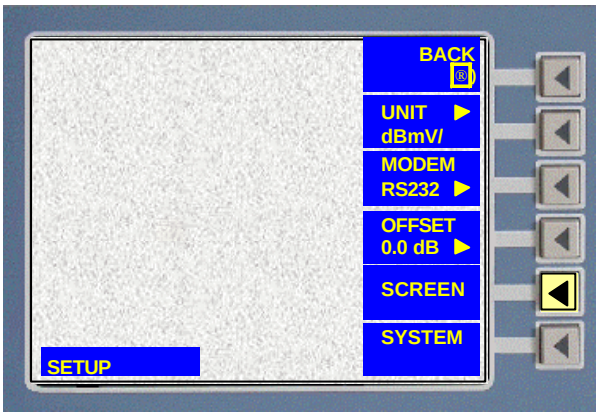
In this menu you can enter all the settings for controlling the R&S® EFL100 remotely via the RS-232-C interface (see chapter 13 MODEM/RS-232-C).

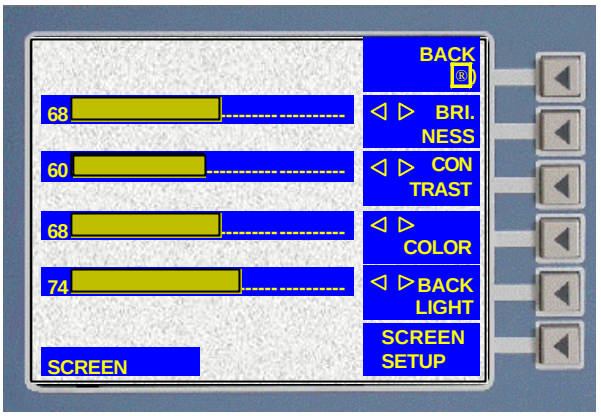
10.3 Entering the Level Offset

L. OFFS 0.0

Use this softkey to enter a level offset of up to 9.5 dB in increments of 0.5 dB. An offset that has been entered can be recognized by the exclamation mark following the level display.

10.4 Screen Menu





This menu is used to set the brightness, contrast, colour and backlighting for the TFT screen.

BACK

Returns to the SETUP menu.

10.4.1 Setting the brightness

◁ ▷ BRI. NESS

When you press this key you can use the cursor keys marked ◂ ▸ to set the screen brightness. The value that you set is automatically saved.

10.4.2 Setting the Contrast

◁ ▷ CON TRAST

By pressing this key you can use the cursor keys marked ◂ ▸ to set the contrast. The value that you set is automatically saved.

10.4.3 Setting the Colour Saturation

◁ ▷ COLOR

By pressing this key you can use the cursor keys marked ◂ ▸ to set the colour saturation. The value that you set is automatically saved.

10.4.4 Setting the Backlighting

◁ ▷ BACK LIGHT

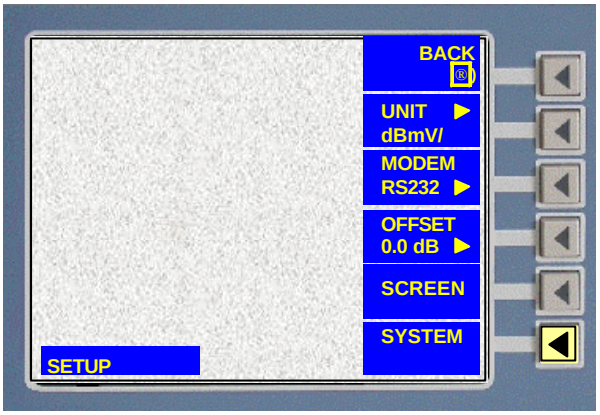
By pressing this key you can use the cursor keys marked ◂ ▸ to set the backlighting. The value that you set is automatically saved.

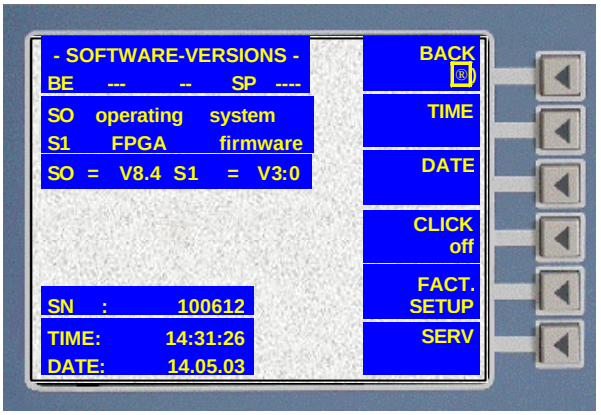
10.4.5 Factory Defaults

SCREEN SETUP

When you press this key, all the screen settings are reset to the factory defaults.

10.5 SYSTEM Menu





This menu is used to set the date and time and also to display the software version and the instrument number.

BACK Calls the SYSTEM menu.

The individual fields on the screen show:
The software versions of the modules (S0 gives information about the operating software, and S7 about the graphics card software). This information is followed by the serial number plus the time and date.

10.5.1 Setting the Date

DATE Press the softkey. The "DATE" field is then highlighted in yellow, and flashes. The date can now be entered using the numeric keys.

10.5.2 Setting the Time

TIME When you press this key the "TIME" field is highlighted in yellow, and flashes. The time can now be entered using the numeric keys.

10.5.3 Key Click

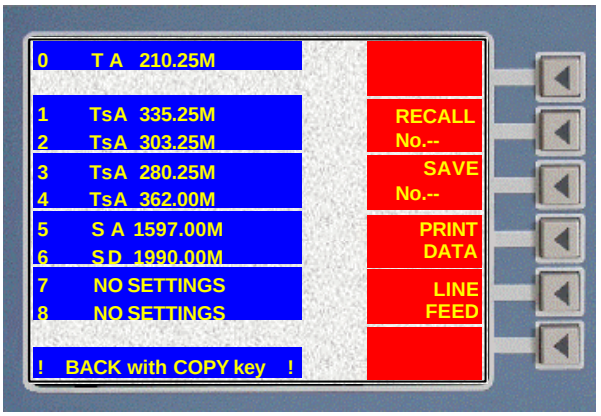
CLICK off Pressing this key causes a beep to be generated when a key is pressed or disables the beep setting.

10.5.4 Factory Defaults

FACT. SETUP Pressing this key resets the instrument to the factory defaults.

SERV This key has no user function. Required for service purposes only.

11 Copy Menu



Call the Copy menu by pressing the **Copy** key and press it again to exit the menu.

11.1 Saving and Calling Instrument Settings

11.1.1 Storing Instrument Settings

There are 100 memory positions available (00 to 99) for storing instrument settings. First select the instrument setting you want to save and then call the COPY menu.

SAVE No.--

Press the "SAVE No.--" softkey and enter a two-digit number on the numeric keys. The instrument setting you just selected is then stored under this memory position number.

The stored instrument setting is displayed in a shortened form:

No.	Operating mode	Frequency (MHz)	Meaning		
0	T A	210.25M	TV	analog	
1	Ts A	319.25M	TV	special channel	analog
2	T D	213.00M	TV	digital	
3	Ts D	338.00M	TV	special channel	digital
4	S A	1597.00M	SAT	analog	
5	S D	1990.00M	SAT	digital	
6	R A	98.00M	FM	analog	

Use the cursor keys marked [-] [¯] to scroll through the settings list.

11.1.2 Calling Stored Instrument Settings

RECALL No.--

You can recall stored instrument settings by entering the memory location. When you press this key the "RECALL No. --" field is highlighted in yellow. You can then use the numeric keys to type in the position of the desired memory location. If the memory location you specify does not contain an instrument setting, the overlay displays the message "NO SETTINGS FOUND".

Memory locations are not cleared even when the software is updated, but can be overwritten by new settings. Memory positions 80 to 95 are manufacturer defaults containing the main DiSEqC commands.

11.2 Printing Measurement Results

PRINT DATA

Press this softkey to print out the instantaneous measurement result complete with date and time.

29.04.03 15:32
C10 210.25MHz A 56.0dBmV

Printout of a measurement result in TV mode with:
- *Date and time*
- *Channel number, frequency*
- *Analog measurement (A), level.*

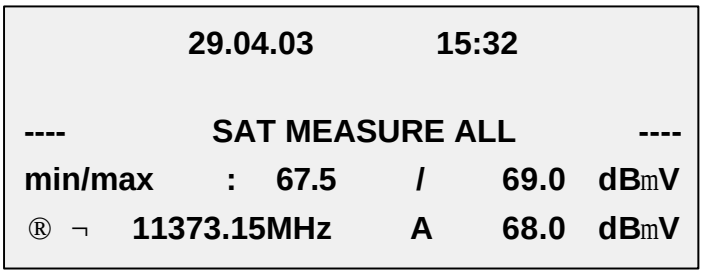
If the "MEASURE" function is called from the TV, SAT or FM menu, all measurements are printed out.

11.2.1 Printout of all Measurements in TV Mode

	29.04.03	15:32		
----	TV MEASURE ALL			----
SC1/SC2:	-13.0	/	--.-	dB
NICAM	:		-20.0	dB
BER	:		8,20E-06	
min/max	: 52.5	/	59.0	dBmV
C10	210.25MHz	A	56.0	dBmV

The printout thus contains the following measurement results:
- *Date and time*
- *Sound carrier separation TT1: - 1 dB*
- *Sound carrier separation TT2: not present*
- *Sound carrier separation NICAM: - 20 dB*
- *Bit error rate NICAM: 8.20E -06*
- *Minimum level: 52.5 dBµV*
- *Maximum level: 59 dBµV*
- *Channel: 10*
- *Vision carrier frequency: 210.25 MHz*
- *Analog measurement: A*
- *Instantaneous level: 56 dBµV*

11.2.2 Printout of all Measurements in SAT Mode



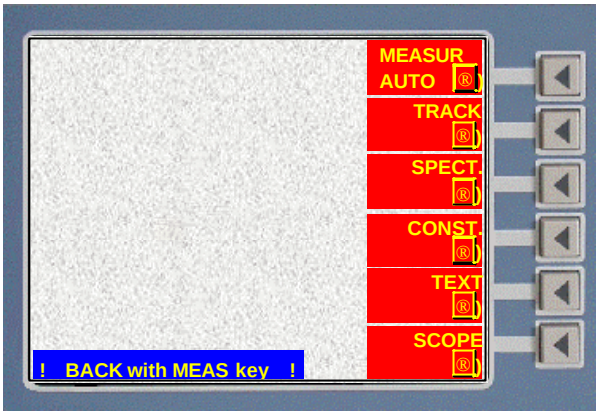
The printout contains the following measurement results:

- *Minimum level: 67.5 dBµV*
- *Maximum level: 69 dBµV*
- *Transponder frequency: 11373.15 MHz*
- *Analog measurement: A*
- *Instantaneous level: 68 dBµV*

11.2.3 Line Feed

LINE FEED Line feed

12 Meas Menu



MEASUR AUTO Calls the automatic measurement sequence (see chapter 12.1 Measure Auto-Menü).

TRACK Tracking function using the MVG10 sweep generator (see chapter 12.2 TRACK-Menü).

SPECT. Calls the spectrum analyzer (models .03 and .04, see chapter 12.3 Spektrum-Menü).

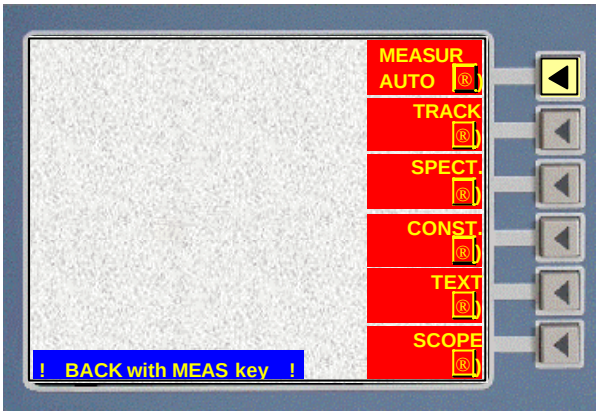
CONST. Calls the Constellation menu (models .03 and .04, see chapter 12.4 CONST-Menü).

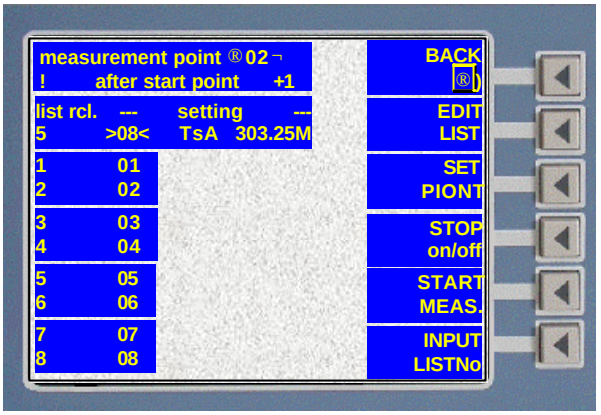
TEXT Calls the TEXT menu (see chapter 12.5 Text-Menü).

SCOPE Calls the SCOPE menu (models .03 and .04, see chapter 12.6 SCOPE-Menü).

To exit the Meas menu press the **"Meas"** key again.

12.1 Measure Auto Menu





The MEASURE AUTO setting enables the measuring instrument settings saved in the Copy menu to be executed and printed out.

The instrument settings saved in the **Copy** menu (SAVE No.-- / RECALL No.--) are used for the automatic measurement sequence (see chapter 11 COPY menu). Up to 100 (00-99) different series of measurements can be stored. You can assign a specific measurement point (e.g. cell 1) to every measurement sequence, with memory positions 80-95 being manufacturer defaults for DiSEqC functions.

12.1.1 Display of the Measurement Point

measurement point ®02¬
! after start point +1

The upper bar in the screen overlay shows which is the selected measurement sequence assigned to a measurement point. It can be reprogrammed by using the SET POINT softkey and entering numerical input from 00 to 99. The measurement point number is automatically increased by one when a new measurement is started.

SET PIONT

Press "SET POINT" to start entering numerical input for the measurement point via the keypad.

12.1.2 Display of the Entry Field for the Measurement Task Concerned

list rcl. --- setting ---
5 >08< TsA 303.25M

list 5 = measurement sequence number
rcl.>08< = the entry for the memory position number of the measurement setting after pressing the 'EDIT LIST" setting key
TsA 303.25M = TV Special Channel Analog 303.25 MHz

EDIT LIST

When you press this softkey the memory position number of the measurement you wish to perform can be entered for the measurement sequence number concerned.

STOP on/off

This softkey indicates the end of the measurement sequence.

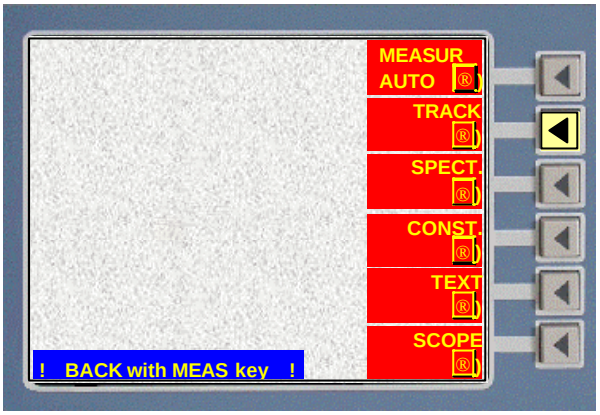
START MEAS.

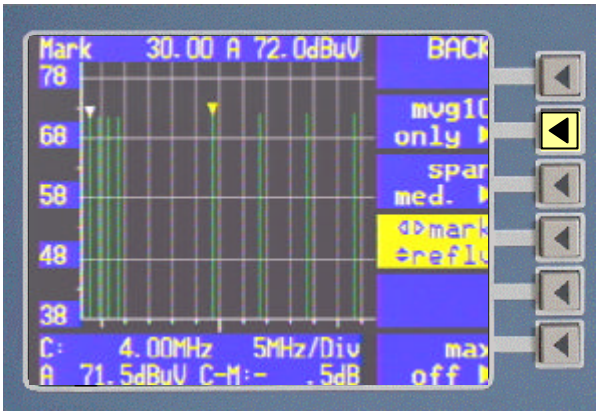
When you press this key the automatic measurement sequence starts. All measurement settings between measurement sequence 00 and the next STOP or between two STOP settings are run through and the measurement results are then printed out on the built-in printer.

INPUT LISTNo

When you activate this softkey you can enter a list number or use the cursor keys ⬍ to select the entry point (list number).

12.2 TRACK Menu





R&S® EFL100 measurement system for broadband cable analysis / MVG10 from the Kathrein company

The broadband cable analysis system consists of an R&S® EFL100 portable Sat/TV/FM test receiver (incl. return path option) and an MVG10 sweep signal generator from the Kathrein company. Both instruments operate in the 4.0 MHz to 860 MHz frequency range.

This makes it possible to take both downstream and upstream measurements of cable systems. Measurements can also be performed in cable which is carrying signals.

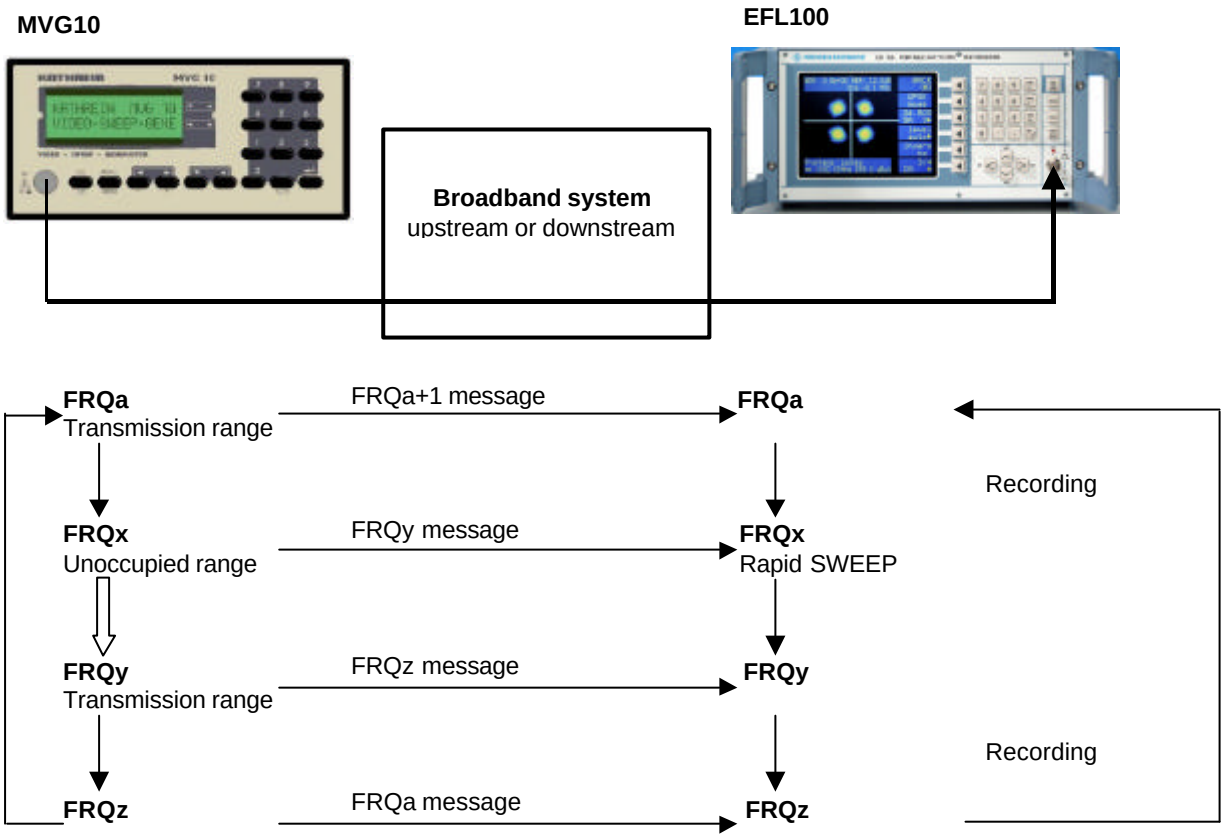
The MVG10 signal generator can sweep multiple subranges, that is to say, the sweep generator can skip ranges that are carrying signals in order not to interfere with TV reception.

It is therefore essential to plan your frequencies and levels before taking measurements.

The MVG10 needs a bandwidth of approx. 500 kHz in order to transmit the telemetry data on each RF signal being transmitted, that is the set frequency points must have a separation of at least 250 kHz from any useful signal on the cable system, provided the useful signal and the MVG10 signal have the same amplitude.

Before every change of frequency the MVG10 sends the R&S® EFL100 the next receive frequency by means of a telemetry signal. In the case of occupied ranges which must not be swept, the R&S® EFL100 can perform measurements at maximum scan speed in the same raster. The MVG10 is on standby during this time. The R&S® EFL100 measures the transmitted level and displays it in the spectrum. The measurement can be printed out on the built-in printer.

12.2.1 Measurement Principle



First go to the TV or RP menu on the receiver and select the receive frequency at which you want the MVG10 to begin its SWEEP measurement.

MVG10 only ▸ From the MODE menu you can use the second softkey Track, MVG10 to access the spectrum display in MVG10 tracking mode.

In this mode the frequencies and levels of all MVG10 signals from the starting frequency to the displayable finishing frequency are recorded. Signals between these ranges are not recorded. This mode can reach the fastest measurement speeds (approx. 160 ms per displayed spectrum line).

Note: *The fewer frequency points (spectrum lines) you define on the MVG10, the faster the spectrum display operates on the R&S® EFL100 in "MVG10 only mode". You should therefore enter only the frequency points you need in the MVG10.*

◂ ▸ mark ▴▾ reflv The cursor keys marked ◂ ▸ can be used to set the position of the yellow marker for frequency and level measurement. The frequency and level of the yellow marker are displayed. The cursor keys marked ▴▾ can be used to change the reference level in 4 dB increments. The spectrum is moved up or down (see 12.5 Spektrum-Menü).

SPAN large ▸ Press this key to define the displayed frequency range per scale division (see 12.5 Spektrum-Menü).

MAX off ▸ Pressing this key switches the spectrum to MAX HOLD. Pressing it again switches it back to CLEAR WRITE.

The reaction to key depressions in this menu is sometimes rather slow, since the R&S® EFL100 always has to wait for data messages from the MVG10 in this mode. You should therefore hold keys down until the R&S® EFL100 reacts.

The red LED over the RF input lights in MVG10 tracking mode. This has no significance. There is no voltage present on the RF input.

In this mode the frequencies and levels of all MVG10 signals from the starting frequency to the displayable finishing frequency are recorded.

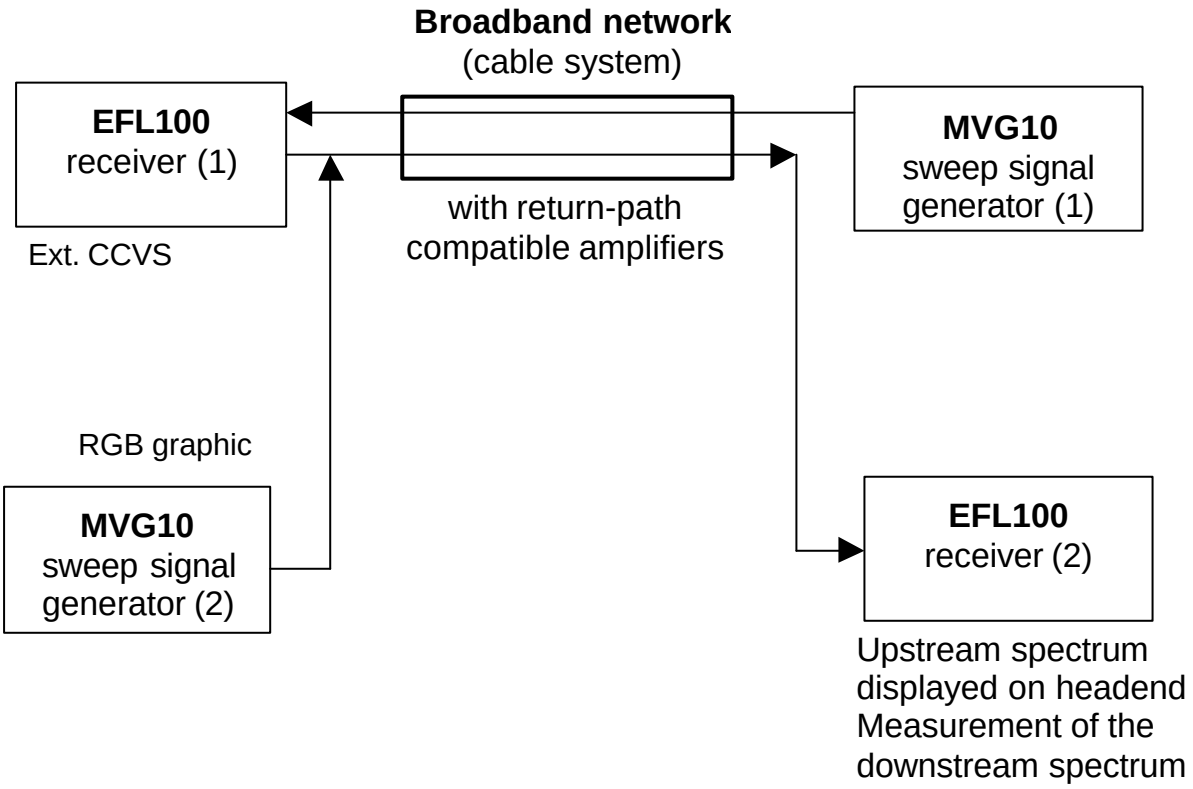
Signals between these ranges are also recorded. The signals sent by the MVG10 are displayed in green (due to the green/red measurement bandwidth). The spectrum between the MVG10 signals is displayed in red.

In this mode STEP TIME on the MVG10 must be increased approx. 700 ms to 5000 ms per displayed spectrum line, depending on the set span (see also MVG10 operating manual).

The measured spectra can be printed out via the function COPY - print data.

Certain functions such as "Clear Display" (clear) or "Print Spectrum" (prt 123) and certain switching functions can be controlled remotely via the MVG10 (see MVG10 operating manual).

12.2.2 Convenient Measurements: 4.0 to 80 MHz Upstream and 47 to 860 MHz Downstream



12.2.3 Upstream Measurement

The MVG10 (1) sweeps the free frequency ranges in the return path.

The R&S® EFL100 (1) receives the signals in MVG10 tracking mode.

The graphic from the R&S® EFL100 (1) is sent via a SCART cable to the MVG10 (2) in RGB (60 Hz) and transmitted to the R&S® EFL100 (2) on a free downstream channel.

Caution: *Double sideband modulation!*

By using the "Prt 999" print command on the MVG10 (1) the spectrum can be printed out on the R&S® EFL100 (1) headend.

The "Clear" command deletes the spectrum display from the R&S® EFL100 (1).

12.2.4 Downstream Measurement

Preparation
First save the signal generator to memory position "0" on the MVG10 (2) complete with external RGB modulation and save the channel sweeper to memory position "1" together with the desired channel sweep ranges.

The "Fct A 1"command from the MVG10 (1) switches the MVG10 (2) via the R&S® EFL100 (1) from signal generator mode to downstream sweep generator mode.

The MVG10 (2) sweeps the free frequency ranges in the forward path.

The R&S® EFL100 (2) receives the signals in MVG10 tracking mode.

The "Fct A 0"command from the MVG10 (1) resets the MVG10 (2) to signal generator mode. This is done via the switching voltage in the SCART lead.

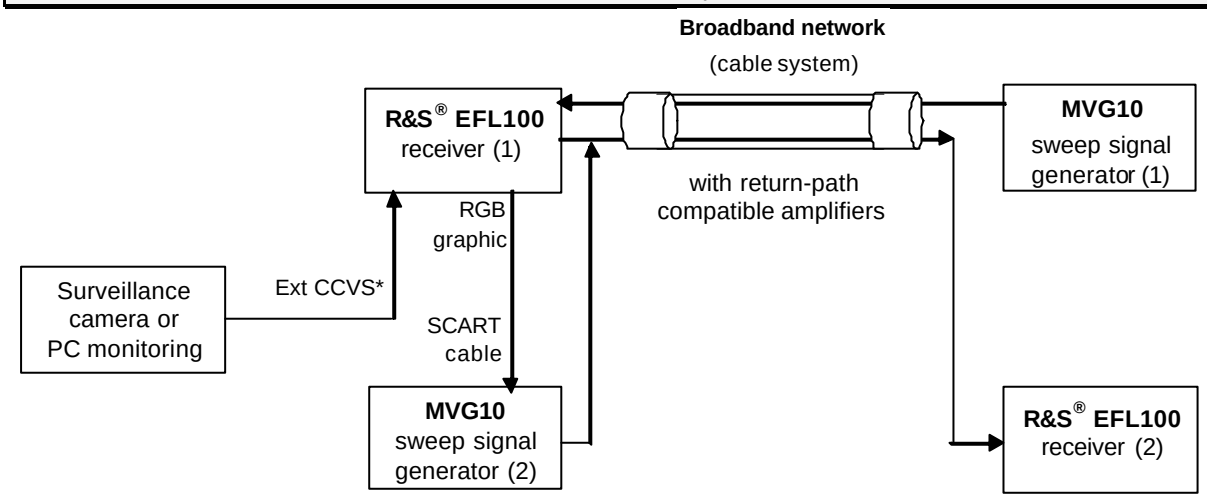
Uscart = 12 V causes Recall No. 1 on the MVG10.

Uscart = 0 V causes Recall No. 0 on the MVG10.

Using an MVG10 (2) for backward transmission of the spectrum received by the R&S® EFL100(1)

It is possible to use free CATV channels to transmit the spectrum received at the headend or a CCVS signal from an external device (camera, headend computer, etc.) via the MVG10 (2). For this purpose a fully-equipped SCART cable is used to connect the R&S® EFL100 to the MVG10.

Important: *Please note that the MVG10 double sideband is modulated.*
You therefore need two free RF channels for picture transmission.



Upstream spectrum displayed on the headend

Measurement of downstream spectrum

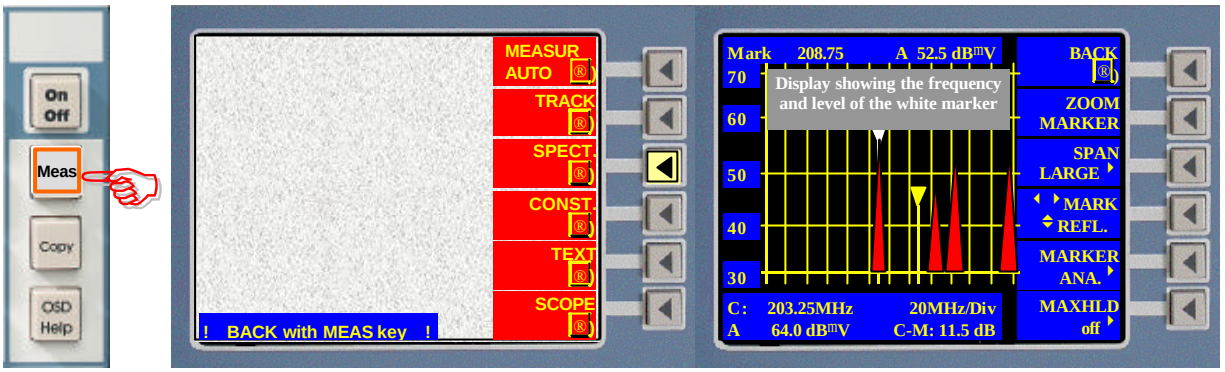
* If you also want to use this measurement layout to transmit a CVBS signal via the MVG10 (2), you will need to change the SCART cable between the R&S® EFL100(1) and the MVG10 (2) as follows:

- Remove the lead from pin 20 (video in) of the SCART cable connector linked to the R&S® EFL100.
- Connect a shielded 75-Ohm cable with a phono-type connector at the other end to pin 20 (video in).
- Connect the shield from this cable to pin 17 (video ground).

The R&S® EFL100 (1) converts the applied video signal into an RGB signal and sends this signal to the MVG10 (2) for modulation.

The switching operation is carried out via the MVG10 (1) function Fct B 0/1
Graphic transmission = Fct B 1
Ext. CCVS = Fct B 0
See MVG10 operating manual.

12.3 Spectrum Menu



Display showing the frequency and level of the yellow marker

The Spectrum function can be called in the SAT, TV, RADIO and RETURN PATH operating modes. This function works in much the same way in all these operating modes. Any differences are explained below.

The set spectrum is sampled every three seconds or so and the screen display is refreshed. A marker indicated by a yellow triangle is available for level measurements of analog and digital signals. The difference in level measurements can be compared by using a delta marker function.

The center frequency is always defined by the last channel that was set in TV mode or by the last frequency that was set in SAT mode and is indicated by a white triangle.

The screen is displaying the following values:

- *Frequency of the yellow marker: 208.75 MHz*
- *Level of the yellow marker: 52.5 dBµV*
- *Carrier frequency: 203.25 MHz*
- *Resolution per scale division: 20 MHz*
- *Analog measurement (A)*
- *Level of the white marker: 64.0 dBµV*
- *Delta level (C-M): 11.5 dB*

12.3.1 Measuring the Levels of Analog Signals

When you call Spectrum Analysis from the analog TV or SAT menu the analog level at the white marker is measured and displayed in the bottom line of the screen overlay. The analog measured value is identified by the prefix "A".

12.3.2 Measuring the Levels of Digital Signals

When you call Spectrum Analysis from the digital TV or SAT menu the digital level at the white marker is measured and displayed in the bottom line of the screen overlay. The digital measured value is identified by the prefix "D".

In order to determine the digital level the R&S® EFL100 *calculates a correction value which is represented by a thin line below the white marker. This value is affected by the spectrum measurement bandwidth set up in each case (see below) and by the symbol rate.*

You should therefore ensure that the symbol rate is correctly set in the TV or SAT menu.

In the case of DVB-T the appropriate channel bandwidth (6, 7 or 8 MHz) must be set in the TV menu.

◂ ▸ MARK
▴▾ REFL.

The cursor keys marked ◂ ▸ can be used to set the position of the yellow marker. The frequency and level of the yellow marker are displayed.

The cursor keys marked ▴▾ can be used to change the reference level in 4 dB increments (the spectrum is moved up or down).

12.3.3 Choosing the Spectrum Display

SPAN
LARGE ▸

Press this key to define the displayed frequency range per scale division.

The following settings are possible:

Setting	SAT mode		TV mode		Return Path mode		RADIO mode
	Span/DIV	BW	Span/DIV	BW	Span/DIV	BW	
large	100 MHz	8 MHz	20 MHz	1 MHz	-------	-----	2 MHz No choice available BW 200 kHz
med.	20 MHz	1 MHz	5 MHz	1 MHz	5 MHz	1 MHz	
small	5 MHz	1 MHz	1 MHz	200 kHz	1 MHz	200 kHz	
full	--------	-------	100 MHz	8 MHz	-----	-----	

12.3.4 ANALOG Marker

MARKER
ANA. ▸

The marker can be used to measure the level of analog carriers in the displayed spectrum. For this purpose the marker is set on the carrier. A yellow triangle on the screen indicates the position of the marker. The cursor keys marked ◂ ▸ can be used to position the marker. The frequency and level of this marker are displayed at the top edge of the screen. The level difference (C-M) compared to the white marker (carrier) is displayed at the bottom edge of the screen.

12.3.5 DIGITAL Marker

MARKER DIG. ▸

Press the same softkey. The upper display changes from A to D (digital measurement). The cursor keys marked ◂ ▸ can be used to position the marker. The frequency and level of this marker are displayed at the top edge of the screen. The level difference (C-M) compared to the white marker (carrier) is displayed at the bottom edge of the screen.

In order to determine the digital level the R&S® EFL100 calculates a correction value which is represented by a thin line below the yellow marker. This value is affected by the spectrum measurement bandwidth set up in each case (see below) and by the symbol rate.

You should therefore ensure that the symbol rate is correctly set in the TV or SAT menu.

In the case of DVB-T the appropriate channel bandwidth (6, 7 or 8 MHz) must be set in the TV menu.

Note:	*In digital mode the scaling on the left hand edge of the screen is for guidance only. The level of a digital carrier can only be determined from the white or yellow marker.*

12.3.6 C/N Measurement of Analog Signals in SAT Mode

MARKER DIG. ▸

Open the Spectrum menu in the Receive Analog setting. Position the yellow marker between two carriers or into a frequency gap. The C/N measurement may be performed in medium or small span.

The softkey (yellow marker) must display the setting "DIG.".

The symbol rate set in the SAT or TV menu is used to define the power (chBW is used for DVB-T). It must be set at 27.5 MS for C/N measurement in the SAT range and at 6.9 MS in the TV range (but at 7 or 8 MHz in the case of DVB-T).

In the case of satellite reception carry out C/N measurement immediately after the LNB. In systems where the cable shows departure from flat frequency response, a false measurement result may be given if the C/N measurement is carried out at the user-network connection.

C:	1845.00 MHz		20MHz/Div
A	78.0dBmV	C-M:	19.0dB

The C/N value is then displayed at bottom right of the TFT screen (C-M).

12.3.7 C/N Measurement of Digital Signals in SAT Mode

MARKER DIG. ▸

Open the Spectrum menu in the Receive Digital setting. Position the yellow marker between two carriers or into a frequency gap. The C/N measurement may be performed in medium or small span.

The softkey (yellow marker) must display the setting "DIG.".

The symbol rate set in the SAT or TV menu is used to define the power (chBW is used for DVB-T). It must be set at 27.5 MS for C/N measurement in the SAT range and at 6.9 MS in the TV range (but at 7 or 8 MHz in the case of DVB-T).

Important:	*In the case of satellite reception carry out C/N measurement immediately after the LNB. In systems where the cable shows departure from flat frequency response, a false measurement result may be given if the C/N measurement is carried out at the user-network connection.*

For analog or digital C/N measurements the symbol rate must be set to 27.5 MS in the SAT MEASURE menu. The noise measurement bandwidth is then given in relation to 27.5 MHz.

12.3.8 Cross-Polarization Measurement on Signals in SAT Mode

In the case of a poorly aligned LNB, a transponder from the other polarization plane may possibly show up as a small peak between two transponders. Place the yellow marker on this peak. The C-M display represents the cross-polarization separation. For digital carriers measure in Receive Digital mode and for analog carriers use Receive Analog mode. The marker must also be set to analog or digital depending on the receive mode.

ZOOM MARKER

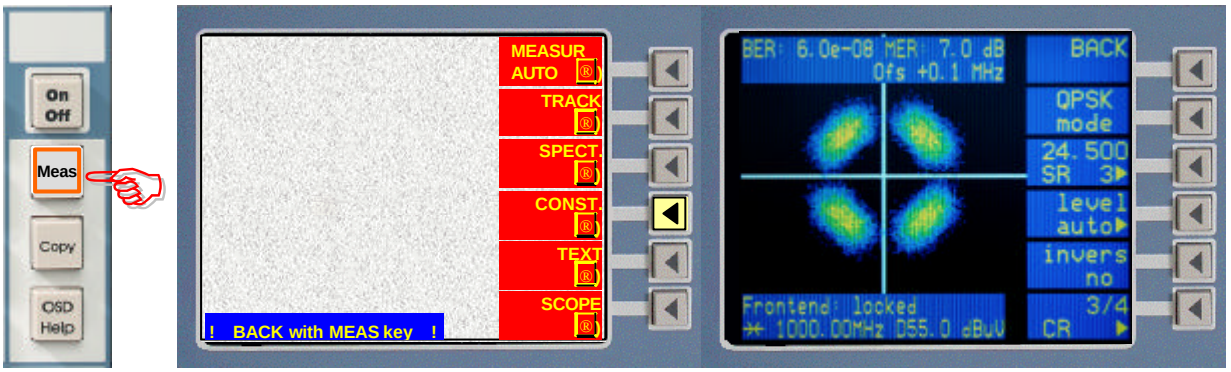
This function is for enlarging the spectrum at the position of the yellow marker. When you press this key the frequency of the yellow marker is transferred to the white carrier marker and zoomed to SPAN SMALL. On exiting spectrum analysis this frequency is also adopted in the screen display.

MAXHLD off ▸

Pressing this key switches the spectrum to "maximum hold" (MAXHLD). Pressing it again switches it back to CLEAR WRITE.

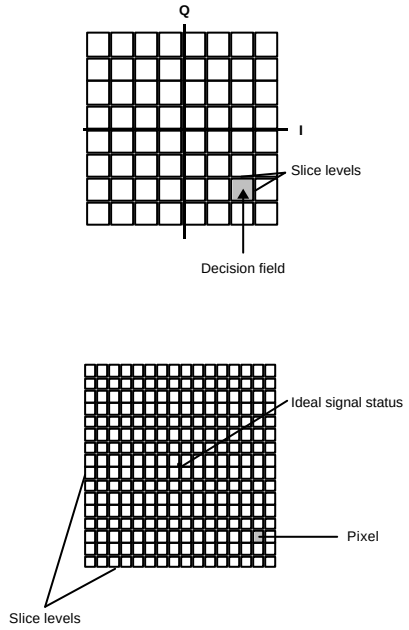
Note: *You can also print out a spectrum produced in spectrum analysis. To do this, press the "COPY" key whilst in spectrum analysis and then press the "print data" softkey. After the printout, return to your original measurement task by pressing the "COPY" key again.*

12.4 CONST Menu



The Constellation Diagram function can be called in the SAT (DVB-S), TV (DVB-C and DVB-T), TV-IF or Return Path (DVB-C) operating modes. This Constellation function works in much the same way in all these operating modes. Any differences are explained below.

12.4.1 Colour Display of I/Q Value Pairs

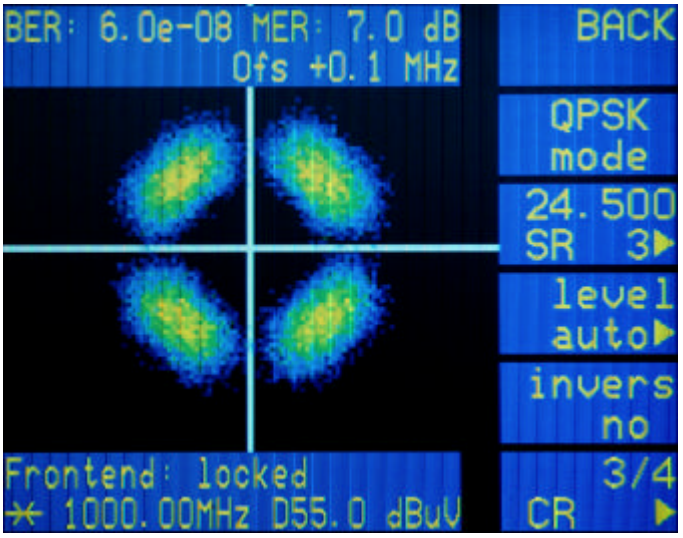


The colour display of the I/Q value pairs is intended to simplify analysis of the constellation diagram when faults occur. The colour of the I/Q value pairs changes according to the number of occurrences at a given point inside the decision field. In the ideal case the I/Q value pairs always occur at the center of a decision field. However, interference on the transmission paths or in the modulator at the transmitter itself will have an effect on the I/Q value pairs. Provided the I/Q value pairs are within the slice levels it is possible to assign unambiguous weighting in the receiver. The decision field is divided into individual subareas known as pixels. A black/white display would not be able to represent how frequently a given I/Q value pair occurs within the area of a pixel. The colour display on the R&S® EFL100, however, is able to describe how frequently a given I/Q value pair occurs within the area of a pixel by changing the colour. If a pixel contains large numbers of I/Q value pairs it is displayed in RED, but a pixel containing only very few I/Q value pairs is displayed in BLUE.

Four colours are available for assessing the "hit ratio":

RED = very many occurrences
YELLOW = many occurrences
GREEN = few occurrences
BLUE = very few occurrences

12.4.2 Constellation Diagram in QPSK (DVB-S)



The modulation mode which is used for digital transmission via satellite is QPSK (quadrature phase shift keying). Two information bits are combined in a symbol and modulate the phase of a carrier. This means there are four possible statuses that a receiver must recognize.

The colour display shows crossed hairs with four clouds representing the symbols that can occur in each quadrant, or rather the frequency with which they occur.

12.4.2.1 Measuring the Bit Error Rate (BER)

Since DVB-S involves the transmission of binary data, the bit error rate may be considered a measure of the transmission errors occurring in the data stream. In the R&S® EFL100 the BER is measured ahead of the Viterbi decoder and displayed on the screen. The bit error rate is the ratio of the number of incorrect bits received to the number of bits received in total. The smallest bit error rate that the R&S® EFL100 can measure is 1.0 e-8. If the rate falls below this value, the BER display drops to zero "0" (no further bit errors). The largest BER that can be displayed is 1 e-2. It can generally be assumed that picture interference will occur at a BER of approx. 1 e-3.

12.4.2.2 Measuring the Modulation Error Rate (MER)

The R&S® EFL100 is designed so that it can be used not only to perform C/N measurements on digital carriers in the Const menu, but also to display the MER ratio of the I and Q data stream. The measurement is carried out after the QPSK demodulation and can be used as an indicator of the noise on the I/Q signals. Differences in the results of C/N measurement in the spectrum menu can occur due to the multilayered interference effects on the digital signal or due to differences in the input level. The MER value is displayed at the top edge of the TFT screen.

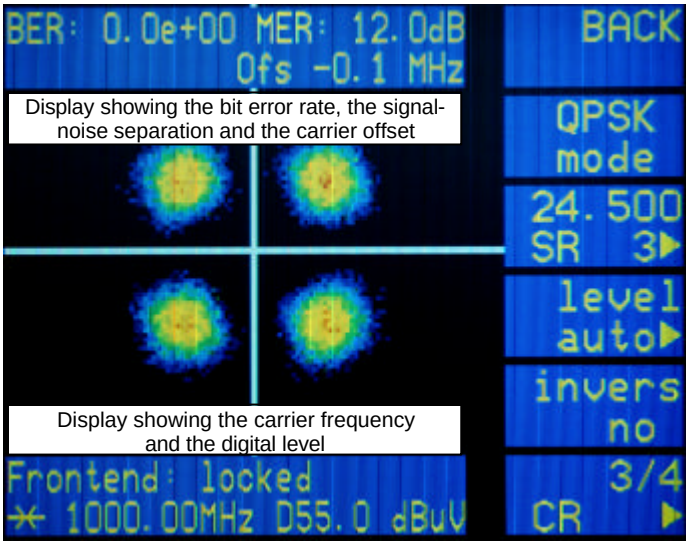
The best value that the R&S® EFL100 can measure is 14 dB. If the value is better than 14 dB, this is indicated by an arrow in front of the measured value.

12.4.2.3 Carrier Offset

The carrier offset display represents the difference between the receive frequency that has been set up in the R&S® EFL100 and the transmission frequency of the digital signal in MHz. The carrier offset is displayed at the top edge of the TFT screen.

The cursor keys marked ◄ ► can be used to change the receive frequency of the R&S® EFL100 and set the frequency offset to zero. The carrier offset indicates the frequency offset of the LO associated with the LNB that is in use.

12.4.2.4 Frontend: locked



If the R&S® EFL100 frontend is locked into the carrier frequency of the receive signal, the screen displays the message "Frontend locked". If it is not possible to display the constellation diagram, the message reads "not locked". The constellation diagram or measurement results cannot be analyzed until the receive signal is locked in.

For this purpose the symbol rate and code rate must be set to the necessary values. Spectrum inversion (INVERS/yes) is set automatically to YES.

The screen shows the following values:

- *BER = bit error rate: 0.0 e-0*
- *MER = modulation error rate: 12.0 dB*
- *Carrier offset: -0.1 MHz*
- *Frontend locked = receive signal locked in*
- *Carrier frequency: 1000 MHz*
- *Digital measurement (D)*
- *Carrier level: 55.0 dBµV*

BACK ®

The menu that was last active is called.

12.4.2.5 Selecting the Symbol Rate (Symbol Clock)

27.500 SR 1

27.5 MS, 20 MS, 24.5 MS or 22 MS – or an entry in the range 0.5 to 32 MS (MS = megasymbols per second).

12.4.2.6 Selec ting the Code Rate

3/4 CR

(1/2, 2/3, 3/4, 4/5, 5/6, 6/7, 7/8, 8/9)

12.4.2.7 Constellation Diagram Inverted/Not Inverted

INVERS (NO) Indicates the situation of the frequency spectrum or constellation diagram. This is set automatically.

QPSK MODE Without function.

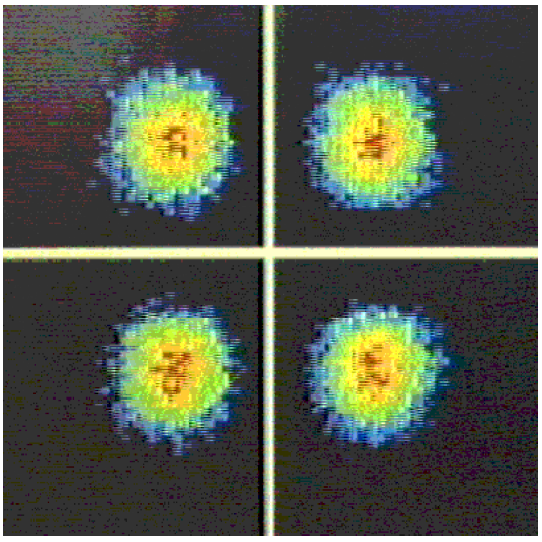
12.4.2.8 LEVEL AUTO

LEVEL AUTO ▸ This softkey enables the insertion loss to be reduced by +4 dB and +8 dB or to be increased by -4 dB and -8 dB. This makes it possible to increase the measurement dynamics or prevent an overload.

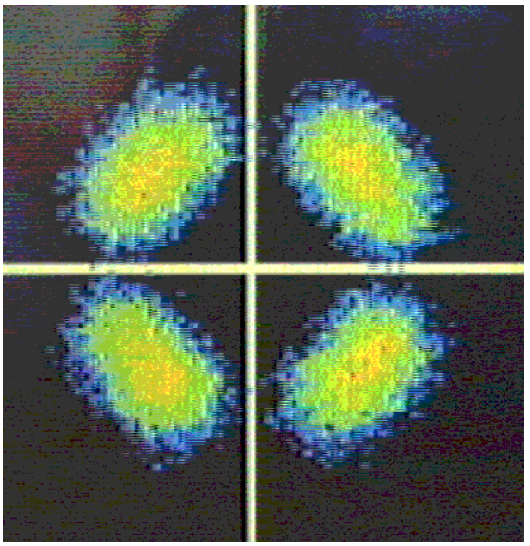
In the event of low RF levels at around 65 dBµV, it may be possible to take out only one attenuator pad or even none, in which case this function cannot be executed.

At RF levels around 130 dBµV it may be possible to switch on only one attenuator pad or even none, in which case this function likewise cannot be executed.

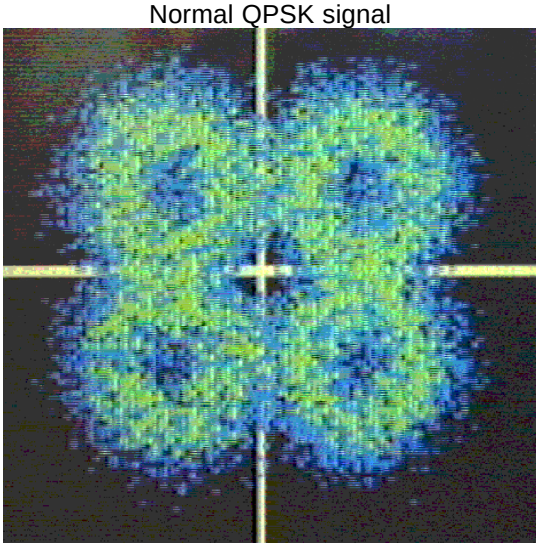
12.4.2.9 Examples of QPSK Constellation Diagrams



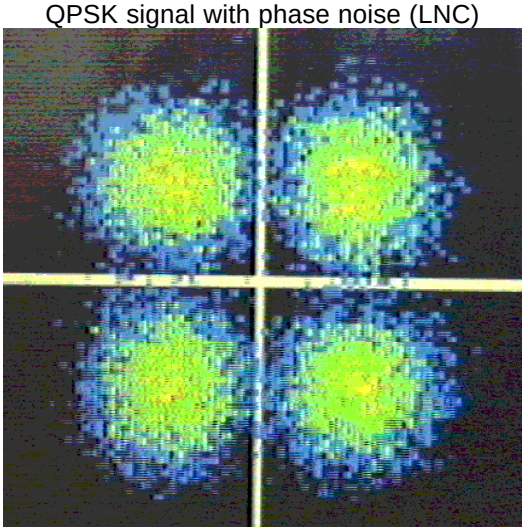
Normal QPSK signal



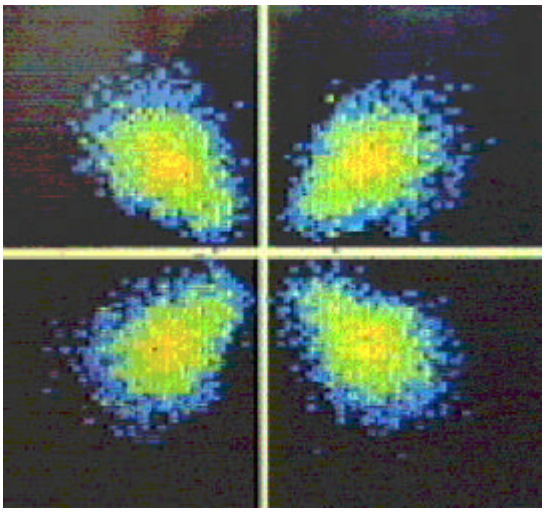
QPSK signal with phase noise (LNC)



QPSK signal with intermodulation interference

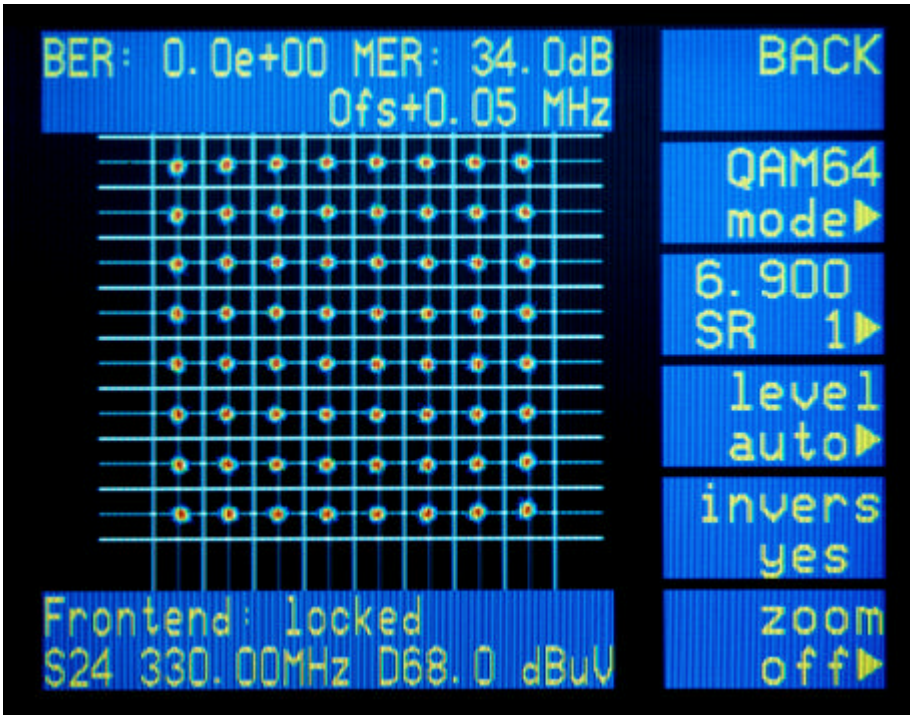


QPSK signal with superposed broadband noise. Possible cause: Defective amplifier or excessive cable attenuation.



QPSK signal with amplitude hum from an amplifier

12.4.3 Constellation Diagram for QAM (DVB-C)



The modulation mode which is used for digital transmission via cable is QAM (quadrature amplitude modulation). The R&S® EFL100 can display the constellation for modulation modes QAM64 and QAM128. In the case of QAM64 six information bits are combined in a symbol and modulate the amplitude and phase of a carrier. This means there are 64 possible statuses that a receiver must recognize in order to analyze a QAM signal correctly.

The colour display shows a chequer-board with 64 or 128 clouds representing the possible symbols or rather the frequency with which the symbols occur.

Menu items are selected by using the softkeys on the right of the screen. Submenus are called when the appropriate softkey is pressed. The keys for active functions are shown in yellow. Keys which have a multiple function are identified by a right-facing arrow and are also shown in yellow when they are active. Pressing the same softkey a number of times then enables various functions or parameters to be called and displayed.

12.4.3.1 Measuring the Bit Error Rate (BER)

Since DVB-C involves the transmission of binary data, the bit error rate may be considered a measure of the transmission errors occurring in the data stream. In the R&S® EFL100 the BER is measured ahead of the error correction and displayed on the screen. The bit error rate is the ratio of the number of incorrect bits received to the number of bits received in total. The smallest bit error rate that the R&S® EFL100 can measure is 1 e-8. If the rate goes outside this value, the BER display drops to zero "0" (no bit errors present). The largest BER that can be displayed is 1 e-2. It can generally be assumed that picture interference will occur at a BER of approx. 1 e-3.

12.4.3.2 Measuring the Modulation Error Rate (MER)

The DVB test guidelines define a measured quantity that combines the multiple interference effects on a digital signal into a unique weighting number. The MER is calculated in order to acquire the entire signal interference in a measured value which is likely to be present at the input to a receiver. The rate also gives an indication of the ability of the receiver concerned to decode a signal correctly. The MER is the ratio of the average signal power to the average incorrect power in dB. The higher the MER value, the better the received signal. The R&S® EFL100 can take MER measurements in the range 18 dB to 34 dB. The MER is displayed at the top edge of the screen.

12.4.3.3 Carrier Offset

The carrier offset display represents the difference between the receive frequency that has been set up in the R&S® EFL100 and the transmission frequency of the digital signal in MHz.

The cursor keys ◂ ▸ can be used to switch to the next channel.

12.4.3.4 Frontend: locked

If the R&S® EFL100 frontend is locked into the carrier frequency of the receive signal, the screen displays the message "Frontend locked". If it is not possible to display the constellation diagram, the message reads "not locked".

The constellation diagram or measurement results can only be analyzed when the receive signal is locked in.

For this purpose the correct modulation mode and symbol rate must be set. The spectrum inversion (INVERS/NO) is set automatically.

BACK ®) The menu that was last active is called.

QAM64 MODE ▷ For switching between modulation modes QAM 64, QAM 128 or DOC64.

Important: *No BER can be displayed for DOCSIS 64.*

12.4.3.5 Selecting the Symbol Rate (Symbol Clock)

6.900M S-CLK ▷ Pressing this key lets you choose between the symbol rates 6.900 MS, 6.111 MS, 6.952 MS or 6.875 MS. The numeric keys can be used to enter a value in the range 0.5 to 7.2 MS.

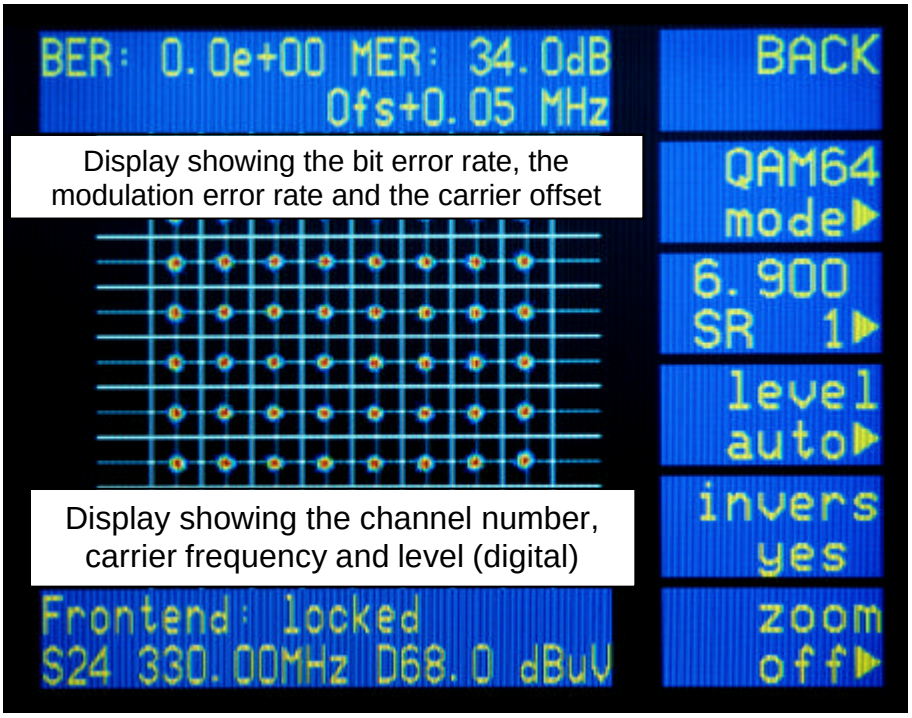
12.4.3.6 Constellation Diagram Inverted/Not Inverted

INVERS (NO) Indicates the situation of the frequency spectrum or constellation diagram. This is set automatically.

12.4.3.7 Zoom

ZOOM off ▷

Press this key to enlarge the constellation diagram. The upper left part of the constellation diagram is then displayed so that you can inspect individual symbols more precisely. Press the key again to display the whole of the constellation diagram.



The screen shows the following values:

- *BER = bit error rate: 1.4 e-06*
- *MER = modulation error rate: 27.6 dB*
- *Carrier offset: 0.25 MHz*
- *Frontend locked = receive signal locked in*
- *Carrier frequency: S24 330.00 MHz*
- *Digital measurement (D)*
- *Carrier level: 49.0 dBµV*

LEVEL AUTO ▸

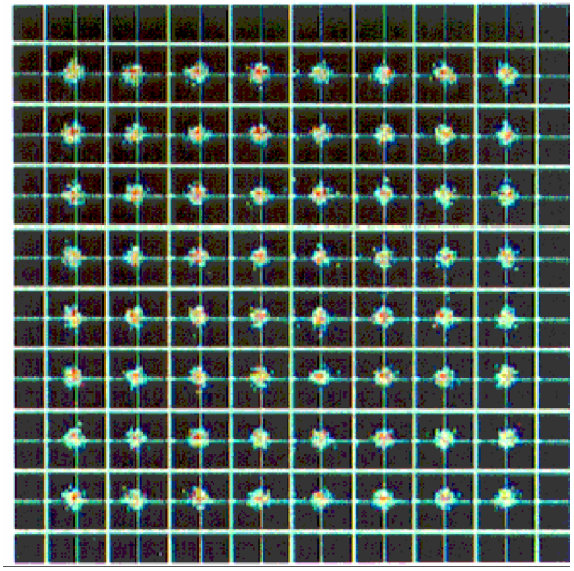
This softkey enables the insertion loss to be reduced by +4 dB and +8 dB or to be increased by -4 dB and -8 dB. This makes it possible to increase the measurement dynamics or prevent an overload.

In the event of low RF levels at around 65 dBµV, it may be possible to take out only one attenuator pad or even none, in which case this function cannot be executed.

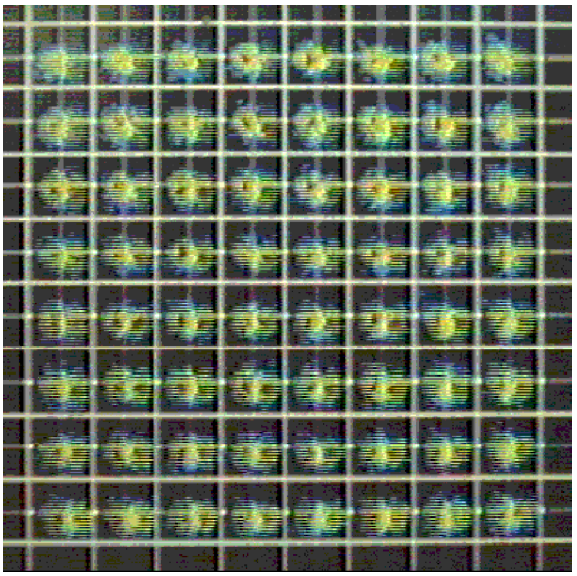
At RF levels around 130 dBµV it may be possible to switch on only one attenuator pad or even none, in which case this function likewise cannot be executed.

12.4.3.8 Examples of QAM Constellation Diagrams

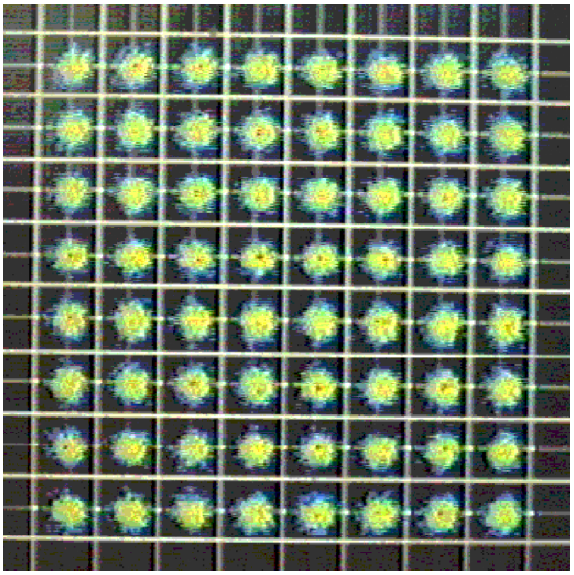
The following examples show how a number of possible errors are displayed in a constellation diagram.



Normal 64-QAM signal

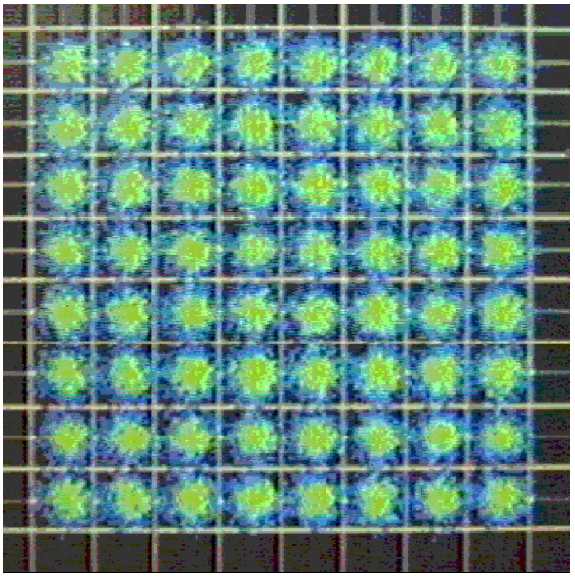


64-QAM signal with intermodulation from narrow band interference



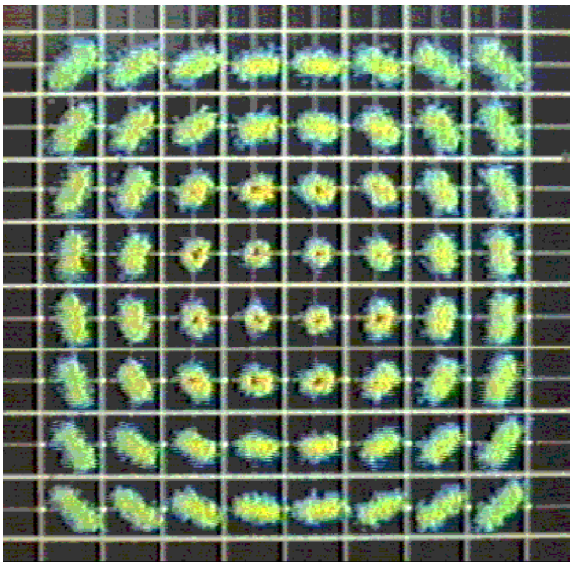
64-QAM signal with slight broadband noise.

Possible cause: Defective amplifier or inadequate input level on an amplifier in the transmission chain.

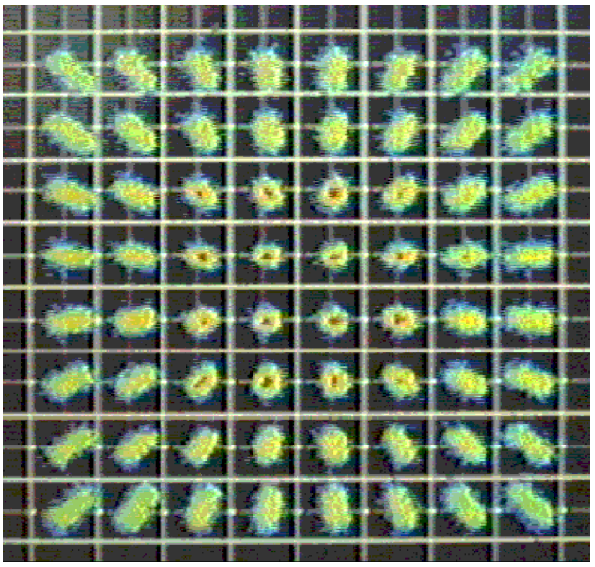


64-QAM signal with strong broadband noise.

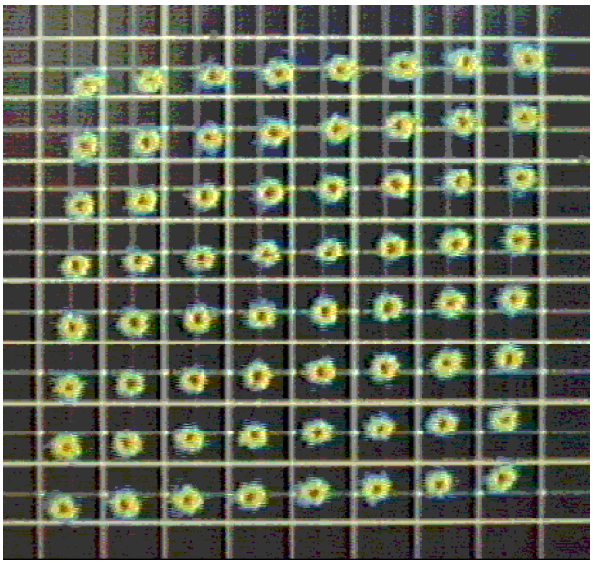
Possible cause: Excessive cable attenuation or defective amplifier.



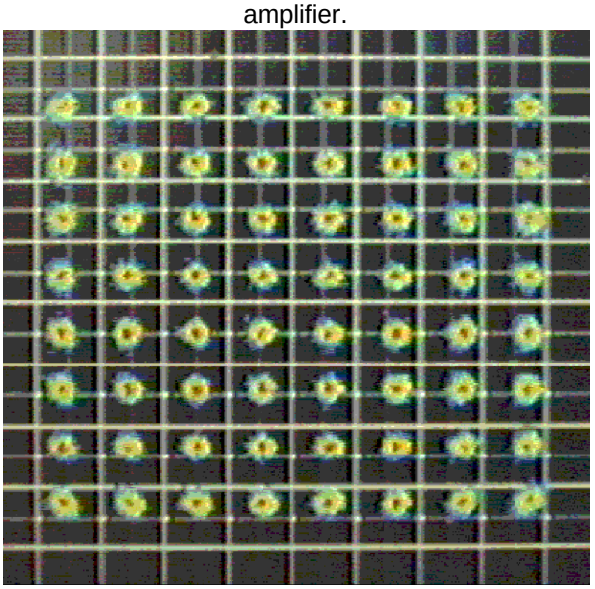
64-QAM signal with phase noise from a converter.



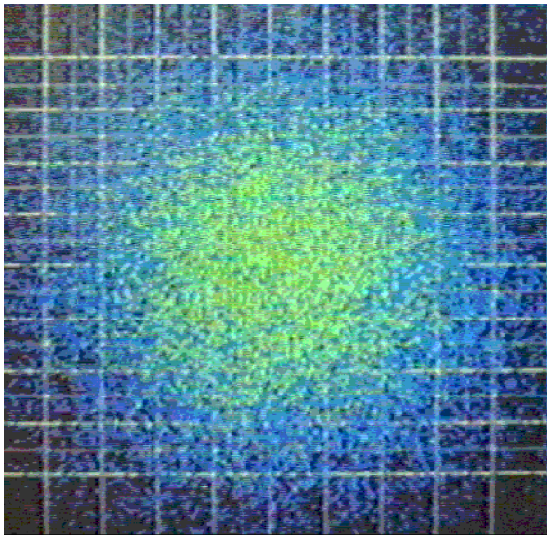
64-QAM signal with amplitude hum from an amplifier.



64-QAM signal with I/Q phase error in the converter.



64-QAM signal with I/Q amplitude error in the converter.



Unsynchronized demodulator – no input signal.

12.4.4 Constellation Diagram for DVB-T (Model .04)

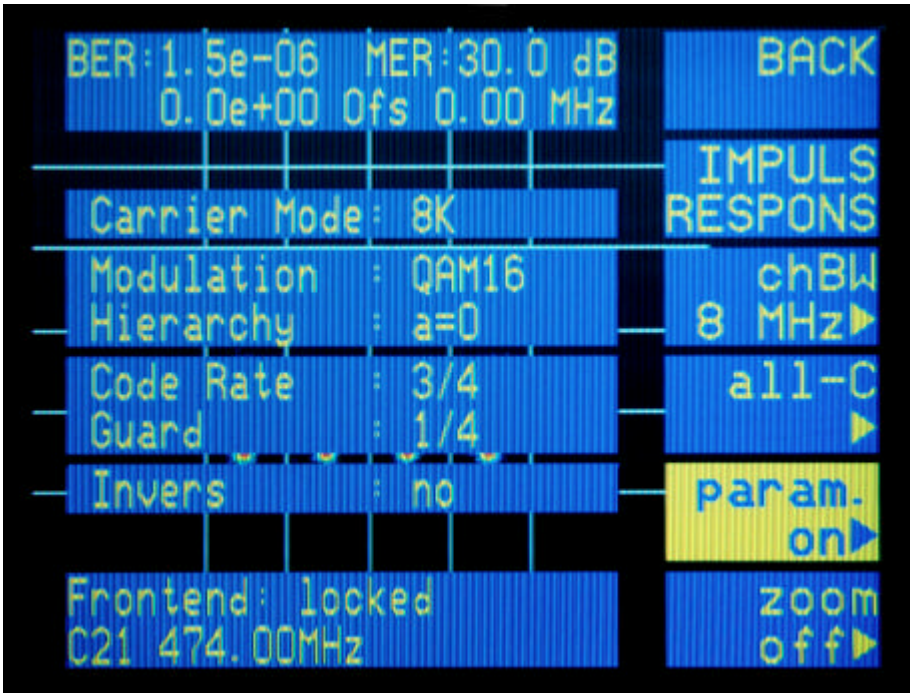
The modulation mode used for the terrestrial digital transmission of television signals (DVB-T) is OFDM (orthogonal frequency division multiplex).

In 2k mode 1705 carriers are modulated in either QPSK, QAM16 or QAM64, and 6817 carriers are similarly modulated in 8k mode.

DVB-T signals are also transmitted in a number of other systems including one known as hierarchical modulation. In this two MPEG transport streams are transmitted simultaneously with different priorities.

The demodulated QPSK signals are decoded in the MPEG decoder and their constellation is displayed on the screen of the R&S® EFL100.

The R&S® EFL100 can automatically display the constellations of all possible modulation modes together with their associated values.



PARAM on When you press this softkey you receive all the data about the DVB-T signal (see illustration above).

12.4.4.1 Measuring the Bit Error Rate (BER)

Since DVB-T involves the transmission of binary data, the bit error rate may be considered a measure of the transmission errors occurring in the data stream. The BER is measured before and after the Viterbi decoder and displayed on the screen. The bit error rate is the ratio of the number of incorrect bits received to the number of bits received in total. The smallest bit error rate that the R&S® EFL100 can measure is 1.0 e-8. If the rate falls below this value, the BER display drops to zero "0" (no bit errors present). The largest BER displayed is 1 e-2. It can generally be assumed that picture interference will occur at a BER of approx. 2.2 e-2 ahead of the Viterbi (for CR=3/4).

12.4.4.2 Measuring the Modulation Error Rate (MER)

The R&S® EFL100 is designed so that it can be used not only to perform C/N measurements on digital carriers in the Const menu, but also to display the MER ratio of the I and Q data stream. Measurement is carried out after demodulation and can be used as an indicator of the noise on the I/Q signals. Differences in the results of C/N measurement in the spectrum menu can occur due to the multilayered interference effects on the digital signal or due to differences in the input level. The MER value is displayed at the top edge of the TFT screen.

The best value that the R&S® EFL100 can measure is 32 dB.

12.4.4.3 Carrier Offset

The carrier offset display represents the difference between the receive frequency that has been set up in the EFL100 and the transmission frequency of the digital signal in MHz. The cursor keys ◂ ▸ can be used to switch to the next channel.

12.4.4.4 Carrier Mode

Indicates how many carriers in the DVB-T signal are being modulated. A differentiation is made between the 2k mode (1705 carriers) and the 8k mode (6817 carriers).

12.4.4.5 Modulation

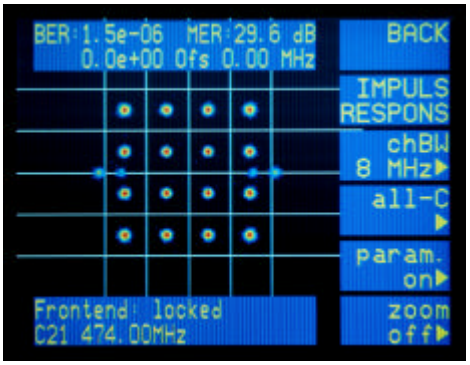
Indicates the modulation mode with which the DVB-T carriers are being modulated. The possible modulation modes are QPSK, QAM16 and QAM64.

12.4.4.6 Hierarchy

Meaning: Two transport streams are transmitted simultaneously; the transport stream with higher priority is modulated QPSK.

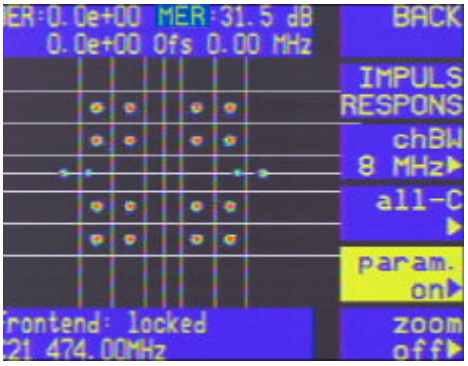
There are four hierarchy levels (0, 1, 2 and 4).

Hierarchy = 0 means that the signal is not modulated hierarchically.



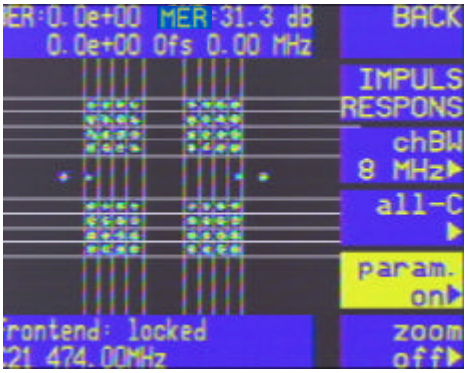
Hierarchy = 1 means the signal is modulated hierarchically.

Two transport streams are transmitted simultaneously, the one with higher priority in QPSK.



Hierarchy = 2 means the signal is modulated hierarchically.

The QPSK modulation is one level more secure compared to the QAM modulation.



Hierarchy = 4 means the signal is modulated hierarchically.

The QPSK modulation is two levels more secure compared to the QAM modulation.

12.4.4.7 Code Rate

Indicates the measured code rate: ½, 2/3, ¾, 5/6 or 7/8.

12.4.4.8 Guard

Indicates the ratio between the guard interval and the symbol duration: 1/4, 1/8, 1/16 or 1/32.

12.4.4.9 Inverse

Indicates the situation of the frequency spectrum or constellation diagram. This is set automatically.

12.4.4.10 Frontend: locked

If the R&S® EFL100 frontend is locked into the carrier frequency of the receive signal, the screen displays the message "Frontend locked". Otherwise it displays "not locked".

The constellation diagram or measurement results can only be analyzed when the receive signal is locked in.

The bandwidth of the DVB-T channel (chBW = 6, 7 or 8 MHz) must be set to the correct value manually with the appropriate softkey.

12.4.4.11 Channel Display

The channel currently being received and the associated receive frequency are displayed. The cursor keys marked ◂ ▸ can be used to change the reference level in 4 dB increments.

Important: *The receive level cannot be displayed in the DVB-T CONST menu.*

12.4.4.12 Channel Bandwidth

chBW 8MHz ▸ The choice of channel bandwidth is 6 MHz, 7 MHz or 8 MHz.

12.4.4.13 Selecting the Carrier Range

ALL-C ▸ Selects the display of all available OFDM carriers.

Strt-C 34 ▸ If you press the "All-C" key again you can enter the starting carrier. Press this key again to enter the finishing carrier.

Stop-C 34 ▸ You can select a carrier range in this way or enter the same value for the starting and finishing information and display an individual carrier.

Continuous pilot carrier in 2k mode:

34, 50, 209, 346, 413, 569, 595, 688, 790, 901, 1073, 1219, 1262, 1286, 1469, 1594, 1687

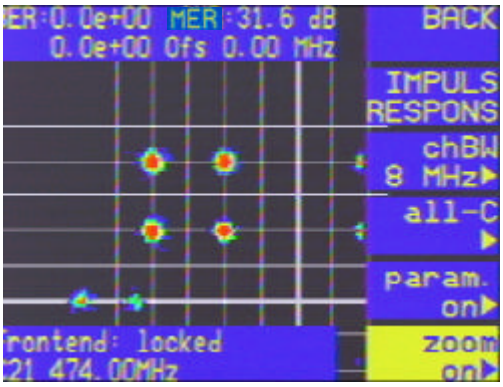
Central carrier in 2k mode: 852

Continuous pilot carrier in 8k mode:

34, 50, 209, 346, 413, 569, 595, 688, 790, 901, 1073, 1219, 1262, 1286, 1469, 1594, 1687, 1783, 1754, 1913, 2050, 2117, 2273, 2299, 2392, 2494, 2605, 2777, 2923, 2966, 2990, 3173, 3298, 3391, 3442, 3458, 3617, 3754, 3821, 3977, 4003, 4096, 4198, 4309, 4481, 4627, 4670, 4694, 4877, 5002, 5095, 5146, 5162, 5321, 5458, 5525, 5681, 5707, 5800, 5902, 6013, 6185, 6331, 6374, 6398, 6581, 6706, 6799

Central carrier in 8k mode: 3408

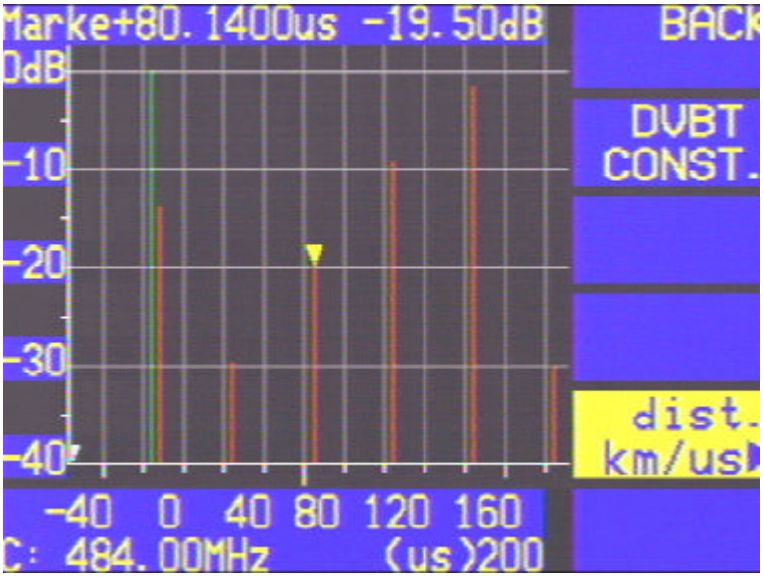
12.4.4.14 Zoom



ZOOM on

Press this key to enlarge the constellation diagram. The upper left part of the constellation diagram is then displayed so that you can inspect individual symbols more precisely. Press the key again to display the whole of the constellation diagram.

12.4.4.15 Pulse Response Display (Echo Display)



Echo display: Marker displayed in µs

The pulse response display can be used to measure echoes in the transmission path or in multipath reception.

The green line (on the left of the screen near 0 dB) represents the received signal carrier.

The other lines (red) are echoes. In the case of multipath reception, pre-echoes can also occur if an unwanted transmitter is closer to the receiver than the required one.

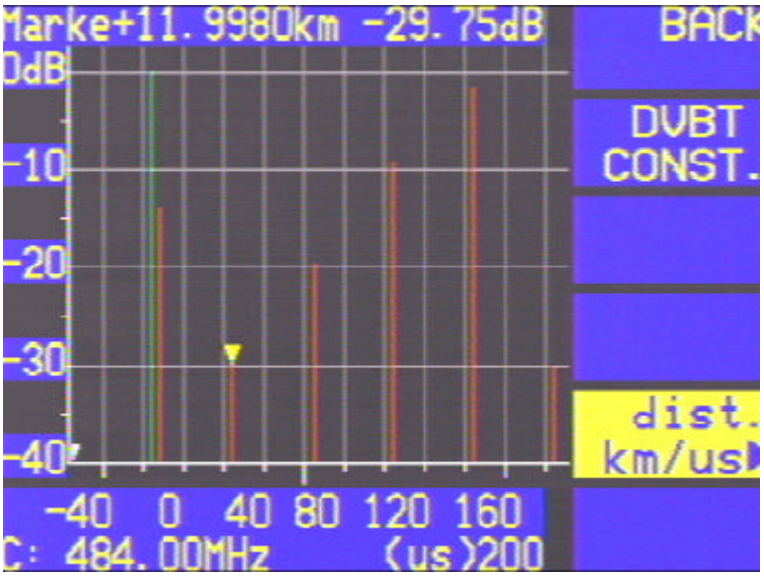
DVBT CONST.

The "DVBT CONST." key returns you to the constellation display.

dist. km/µs

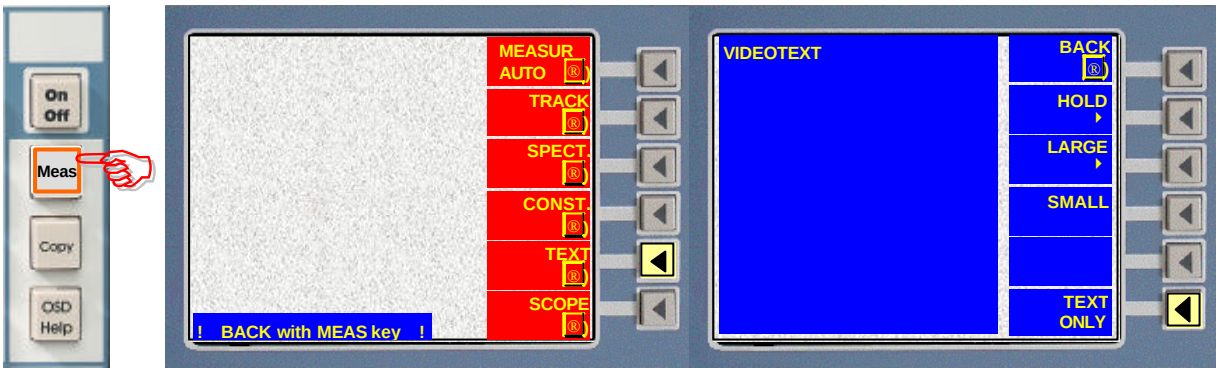
You can use the "dist. km/µs" key to switch measurement between delay and distance. Switching affects the value of the marker.

You can use the cursor keys marked ◂ ▸ to move the yellow marker in order to measure the distance or time and the reflection level.



Echo display: Marker displayed in km

12.5 Text Menu



You can use the numeric keys to enter teletext page numbers. Page numbers are shown upper left.

BACK Back to the main menu.

12.5.1 Hold Teletext Page

HOLD Press this key once to freeze the current teletext page. The field is then highlighted in yellow. Press the key again to release the teletext page.

12.5.2 Enlarge Teletext Page

LARGE Press this key to enlarge the upper or lower section of the text page.

12.5.3 Normal Teletext Size

SMALL Press this key to cancel the LARGE function. The page is then displayed normal size.

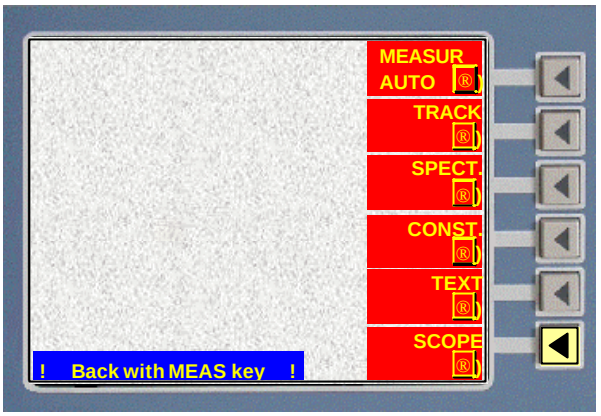
12.5.4 Text Only

TEXT ONLY

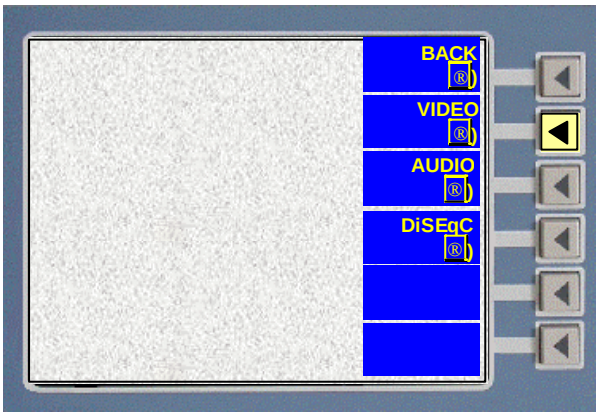
Press this key or the "OSD Help" key to hide the softkey captions. You can still input teletext page numbers via the keyboard.

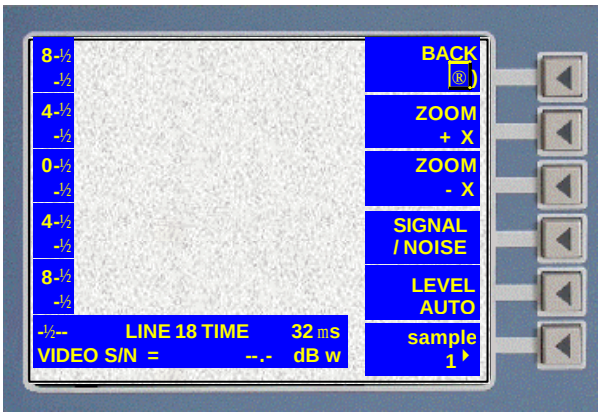
Press this key or the "OSD Help" key once more to show the softkey captions again.

12.6 SCOPE Menu



12.6.1 Video Scope Menu





BACK

The menu that was last active is called.

12.6.1.1 Horizontal Zoom - Video Signal In/Out

ZOOM + X

ZOOM - X

Press these keys to zoom in or out of the video signal on the screen. There are eight zoom levels available. Pressing one of the keys takes you to the next zoom level above or below.

When the field is no longer yellow, you have reached the highest zoom level.

12.6.1.2 S/N Measurement

SIGNAL / NOISE

S/N measurement is carried out in order to measure the signal-to-noise ratio of TV and satellite signals. S/N measurements are weighted using CCIR filters. The noise level is measured on a blank line; the line must be set manually. The "ZOOM X" key sets the video signal so that no sync pulse or picture contents can be seen on the TFT screen. Press the softkey to start the S/N measurement. The screen shows the following values:

- The line (LINE 6).
- The specified time - TIME 38 µs - refers to the line and is measured in mid-screen.
- The weighted signal-to-noise ratio:
  VIDEO S/N = 37.5 dBw (weighted)

12.6.1.3 Insertion Loss

LEVEL AUTO ▸

This softkey enables the insertion loss to be reduced by +4 dB or +8 dB. This makes it possible to increase the measurement dynamics.

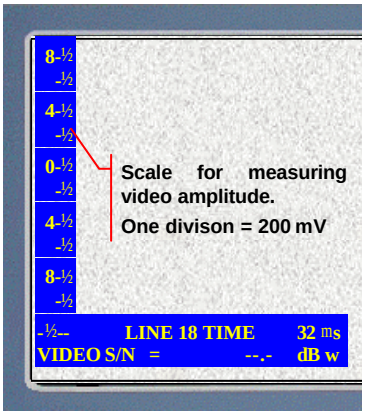
Beware of intermodulation!

In the event of low RF levels it may be possible to take out only one attenuator pad or even none, in which case this function cannot be executed.

sample 1 ▸

Number of measurement cycles for the S/N measurement with averaging (1 to 5 measurement cycles).

12.6.1.4 Measuring the Video Signal Amplitude



The video level of the applied RF signal can also be measured in the SCOPE menu.

The video level can be read off from the scale on the left hand edge of the screen. The scale is divided into increments of 200 mV (one division). The position of the video signal can be altered with the cursor keys.

12.6.1.5 Selecting the Video Line

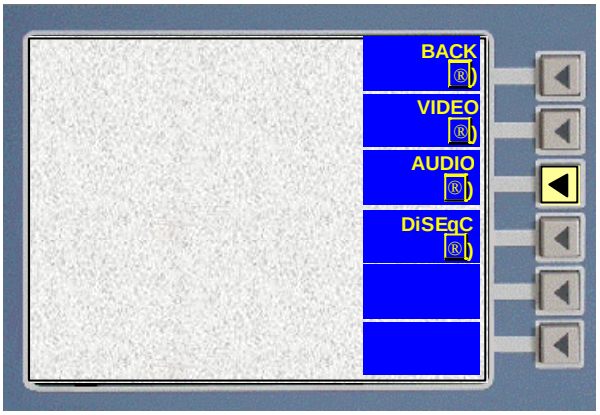
The video line can be selected using the numeric keys "0 to 9". Enter a three-figure line number and the line is set up automatically. If you enter a single-figure or two-figure line number, the line is set up when you press the Enter key. The cursor keys marked ◂ ▸ can be used to scroll the video line. We recommend that you switch off the zoom function or set zoom to a minimum.

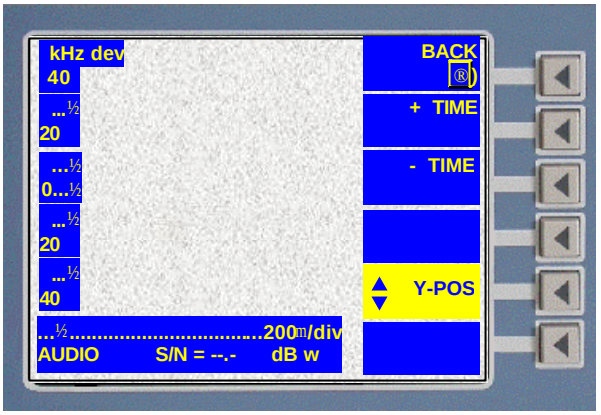
12.6.1.6 Measuring a Video Signal via the AV Connector (SCART)

A video signal can be applied via the AV connector (SCART) and displayed on the oscilloscope.

To do this select the CVBS function from the AV menu. The maximum input voltage is 2 V_{pp}. The scale is divided into 0.2 V/unit.

12.6.2 AUDIO Scope Menu





BACK

The menu that was last active is called.

12.6.2.1 Time/Unit - Zoom In/Out

+ TIME

- TIME

You can use this function to shrink or expand the audio signal in the display. There are eight deviation time levels available.

Pressing the key again switches the instrument to the next deviation time level above or below.

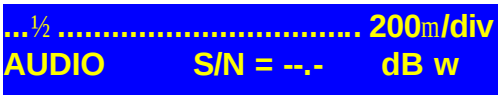
If the softkey field stops changing colour, you have reached the highest deviation time level.

12.6.2.2 Position of the Audio Signal

Y-POS

You can use the cursor keys to change the vertical position of the audio signal. This action also serves to set or change the trigger point, which is normally 0 V.

12.6.2.3 Measuring the FM Deviation



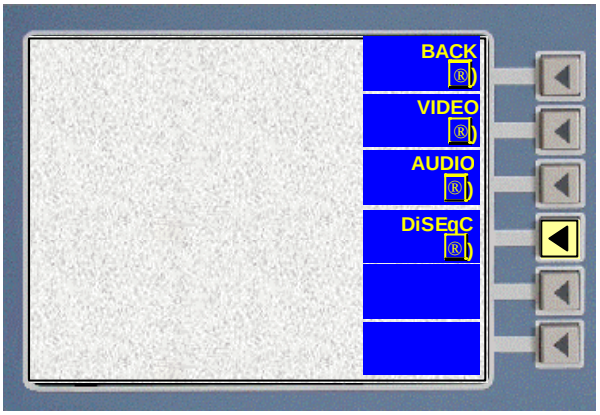
The FM deviation of the applied sound carrier can be measured in the SCOPE menu. The scale on the left hand side of the screen is used to measure the audio FM deviation. In the case of TV and radio reception the scale is divided into increments of 10 kHz (one division) and into 20 kHz increments in the case of SAT reception. The position of the audio signal can be altered with the cursor keys.

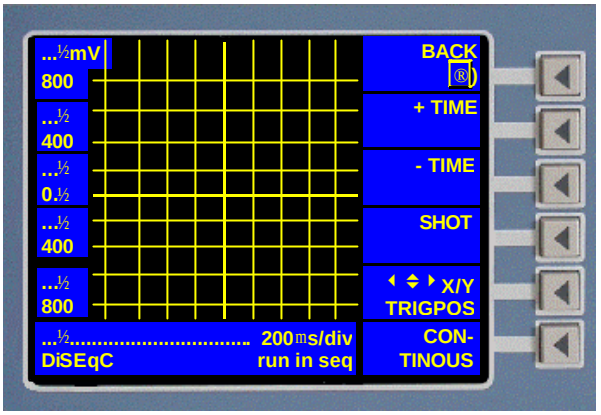
12.6.2.4 Measuring an Audio Signal via the AV Connector (SCART)

An audio signal can be applied via the AV connector (SCART) and displayed on the oscilloscope.

To do this select the CVBS function from the AV menu. The maximum input voltage is 2 V_{pp}. The scale is divided into 0.25 V/unit.

12.6.3 DiSEqC Scope





BACK The menu that was last active is called.

12.6.3.1 Time/Unit - Zoom In/Out

+ TIME

- TIME

You can use this function to shrink or expand the DiSEqC signal in the display. There are eight deviation time levels available.

Pressing one of these keys switches the instrument to the next level above or below.

If the softkey field stops changing colour, you have reached the highest level.

12.6.3.2 Record function

SHOT

CON-TINOUS

Press this key to enable the storage oscilloscope. As soon as a DiSEqC signal is present on the R&S® EFL100 antenna connector it is recorded and stored until you either press the same key again or return to continuous recording by pressing the "CONT" key. The CONTINOUS key switches the oscilloscope back to continuous recording.

12.6.3.3 Positioning and Triggering the DiSEqC Signal

You can use the cursor keys marked ⬍ to change the vertical position of the DiSEqC signal. This action also serves to set or change the trigger point, which is normally 14 or 18 V.

◀ ⬍ ▶ X/Y TRIGPOS

Use the horizontal cursor keys marked ◀ ▶ to choose between the modes for displaying the DiSEqC signal.

- run in seq = build-up sequence
- run out seq = release sequence
- carrier = 22-kHz carrier
- modulation = carrier modulation

13 Modem / RS-232-C Interface

The RS-232-C serial interface is supplied as a 25-pin D subminiature connection. It is required for controlling the instrument via modem or PC.

13.1 Connection Cable for Modem / RS-232-C

So that the R&S® EFL100 can be operated remotely via RS-232-C, a connection must be set up between the test receiver and a PC or external modem. If a modem is used, this connection takes the form of an RS-232-C interface cable that links the modem to the 25-pin RS-232-C socket on the rear panel of the instrument on a 1:1 basis.

A direct link to a PC requires a connection known as a null modem cable with 25-pin plugs. In this case the send and receive lines are crossed, but so too are all the handshake lines.

Note:	*When deactivating the handshake mode on the R&S® EFL100 (see below) simply use a null modem cable in which only the TXD line is crossed with the RXD line. However, the operating software of the R&S® EFL100 works faster when handshake mode is active (especially if no modem is connected). The R&S® EFL100 will not log in without a handshake until RETURN is entered on the PC.*

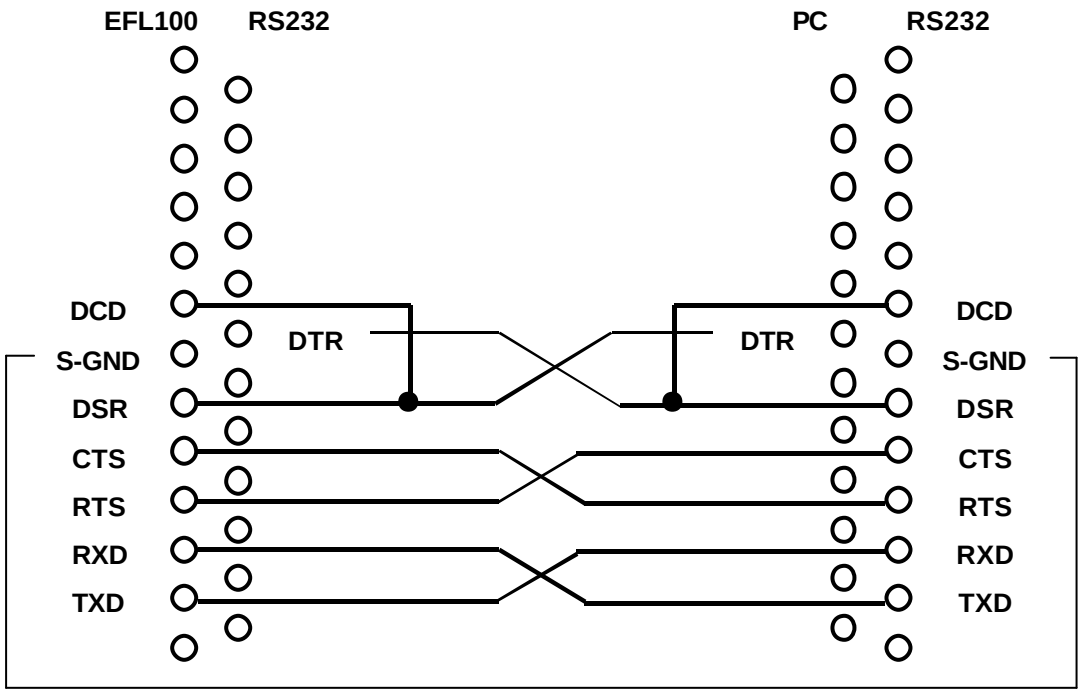
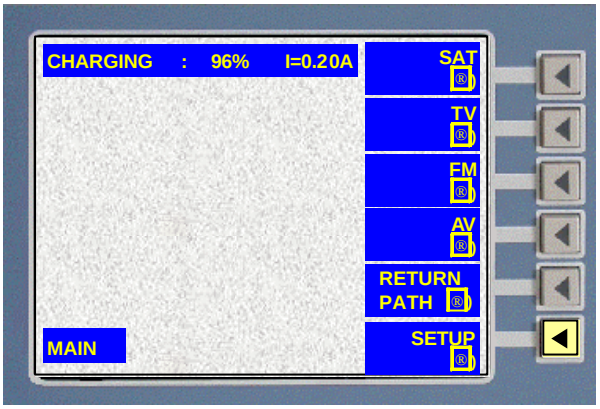


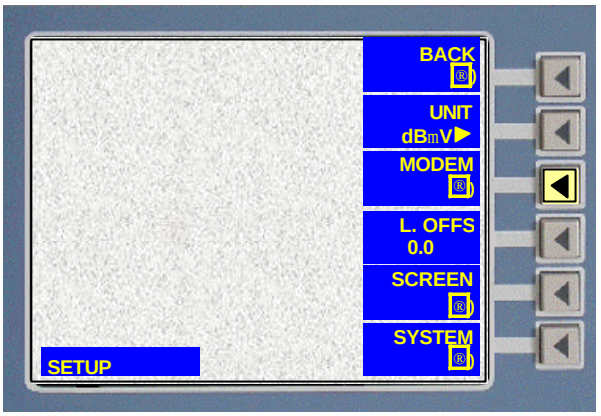
Fig. 13.1-1 Wiring assignment of null modem cable with 25-pin plugs for remote control of R&S® EFL100 via PC

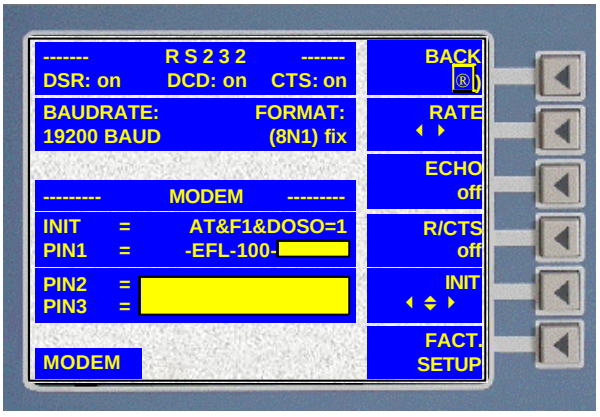
If the R&S® EFL100 is linked directly to a PC, the uppermost display field of the Modem menu shows whether the null modem cable is correctly connected. All three displays (DSR, DCD and CTS) must carry the message "ON". Many null modem cables have no link to the DCD connection on the RS-232-C plug. The display then shows OFF when DCD is in use. In this event a bridge from DSR to DCD must be provided in the plug on the null modem cable (see drawing) or handshake mode must be switched off.

Display in the MODEM menu

13.2 Modem/RS-232-C Menu







The MODEM/RS-232-C menu lets you configure the main aspects of the RS-232-C interface on the R&S® EFL100.

BACK Returns to the SETUP menu.

13.2.1 Setting the Baud Rate

RATE ◀ ▶

The field is highlighted in yellow when the softkey is pressed. The cursor keys marked ◀ ▶ can then be used to set the interface speed within the range 2400 to 115200 baud (in each case 8 bits / no parity / 1 stop bit). This setting refers only to the interface traffic between the modem and the R&S® EFL100, and has no effect on the transmission characteristics of the modem.

13.2.2 Setting Local Echo

ECHO off

Normally all characters received via the modem are returned by the R&S® EFL100. This means that a character entered on the terminal via the PC keyboard is not displayed at once on the screen, but is sent via the local modem (on the PC) to the remote modem (on the R&S® EFL100). The R&S® EFL100 then evaluates the character and sends it back (echo function).

Important: *If local echo is activated on the terminal, characters are displayed in duplicate and one of the two echoes must be switched off.*

13.2.3 Setting the Hardware Handshake

R/CTS off

Press the R/CTS key to enable or disable hardware handshake. When handshake mode is disabled it is impossible for the R&S® EFL100 to detect when a connected PC or modem has assumed control. In this case the R&S® EFL100 will not log in until RETURN is entered in the terminal program.

With handshake mode enabled this happens automatically as soon as the terminal program is called or the modem is successfully invoked. If the R&S® EFL100 is off during this routine, it switches itself on of its own accord and turns itself off again when the terminal program is exited or the modem carrier is lost.

13.2.4 Init (Initialisation String) for the R&S® EFL100 Modem

INIT

This lets you read off the currently valid initialisation string for the R&S® EFL100 modem. When the R&S® EFL100 is switched on, the initialisation string is used once to make a connection to the R&S® EFL100 modem. This changes the modem defaults, for instance by setting a common baud rate. You can change the initialisation string by pressing the INIT key. When you do this you can use the cursor keys to select either the characters or the positions you wish to edit. The character string as far as the first blank character is then sent once when you deactivate the INIT key.

FACT. SETUP

Pressing this key resets the R&S® EFL100 to the factory defaults.

13.2.5 Code (Password)

INIT= This lets you read off the currently valid password that the user must know in order to query or control the R&S® EFL100 remotely via modem. The password can only be changed during modem operating mode.

13.2.6 PIN

PIN1= This is the master PIN and gives access to all the functions of the R&S® EFL100 (which include downloading the instrument software). For the sake of safety and security you should not log in using this PIN, in order to prevent overwriting the program software (though there are other built-in safeguards). PIN1 is "-EFL-100-" by manufacturer's default.

PIN2= This gives access to all the functions of the R&S® EFL100 except unlocking the program memory and reprogramming the program memory. It can be used to control the main R&S® EFL100 settings remotely.

PIN3= This allows read-only access to measured values from the R&S® EFL100. Important settings cannot be changed when you use this PIN to log in.

Note: *When changing the PIN (possible via RS-232-C only) the PIN that you used when logging in is always adopted.*

13.3 Operating the R&S® EFL100 via Modem

The R&S® EFL100 can be remote-controlled in either of two terminal modes. You can choose between TTY mode and ANSI mode.

13.3.1 TTY Mode

TTY mode is line-oriented and is the most usual method of operating via a serial interface or modem. It means that command abbreviations are entered via the keyboard and interpreted by the R&S® EFL100 which then executes the corresponding command. The R&S® EFL100 issues textual information to confirm that commands have been executed. After every command the screen is scrolled upward line by line. This method is generally set for the automation of measurement tasks. For this purpose a user-defined measurement program calls certain R&S® EFL100 commands on a cyclic basis and analyzes the measured values sent by the R&S® EFL100.

13.3.2 ANSI Mode

In ANSI mode, by using simple control characters on the controlling side the R&S® EFL100 can create an intuitive, easily handled user interface which follows the example of the SAA standard under DOS. The advantage of this method is that any kind of terminal program can be used to control the R&S® EFL100 (e.g. Term95, Telemate, Hyperterminal etc.). There is no need to install your own control software on your PC, and other types of control computers can also be used. It has therefore been deliberate policy to rely on a subset of the ANSI standard control characters which are understood by the majority of terminal programs.

13.3.3 The Logging-In Procedure

The R&S® EFL100 logs in after detecting a carrier on the modem when the user answers the password question with a PIN, or when deactivating the handshake after RETURN has been entered in the terminal program. If no PIN has been issued (all characters in the appropriate PIN are highlighted in yellow in the Modem menu on the R&S® EFL100), simply confirm by entering another RETURN here.

13.3.4 Requesting Help

In TTY mode, entering a question mark requests a list of the available commands. In this list the first three letters are capitals. This is intended to make clear that these are abbreviated command names. It is therefore enough to enter the first three characters of a command (followed by RETURN) for that command to be triggered. In the case of commands without parameters (for instance calling for measured values or switching between modes etc.), the command is then complete. In the case of commands requiring parameters, such as FRE (for entering the receive frequency) the R&S® EFL100 prompts for the frequency after receiving the command abbreviation. It is also possible for the parameter (in this case the frequency) to be appended to the command abbreviation (separated by a blank character). For example FRE 266.25 MHz.

Decimal places must be entered after a point. Units are suggested by default and need only be entered if they differ. For example FRE 10.7 G means 10700 MHz, whereas FRE 10.7 means 10.7 MHz. It is enough to type in the first letter of the unit.

In ANSI mode, context-sensitive help is called. This means that you can select a command from the pulldown menu and receive information about it at the bottom of the screen.

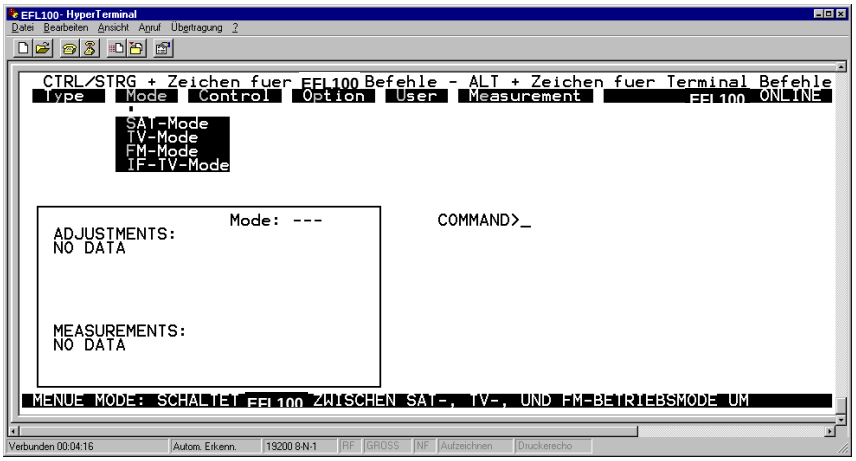


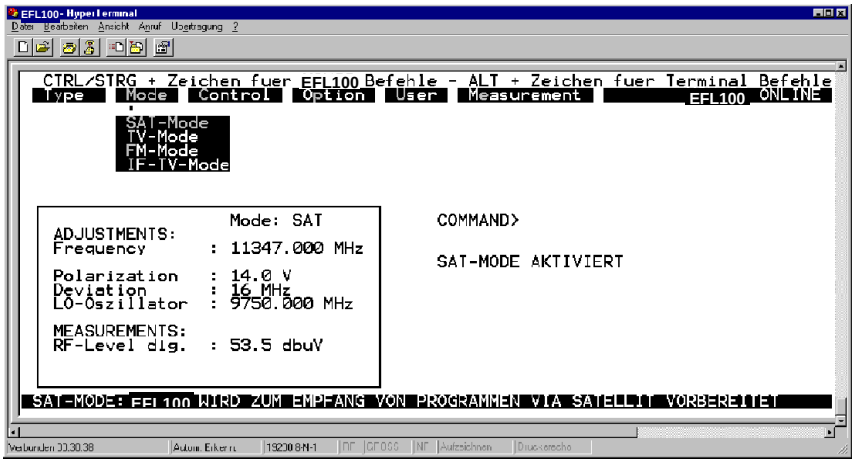
Fig. 13.3-1 Example of logging in when in ANSI mode

In ANSI mode you can type in commands as abbreviations, just as in TTY mode, or use the cursor keys to select commands from the pulldown menus, or call commands via key combinations.

To select from the pulldown menus just press any cursor key. Then select a menu with the left-right cursor keys or select a command from a menu with the up-down cursor keys and press RETURN to confirm. You can also use CONTROL + highlighted command letters to open the pulldown menu and call a command with the highlighted letters.

For example to enter a frequency use CONTROL + C and then press F.

Note: *Alt + command letter generally refers to functions of the terminal program concerned.*



The figure shows an example of a pulldown menu. On the left of the screen is a frame for entering commands which require parameters. It also constitutes a summary of the present instrument settings.

Example: Entry concerning the LNB oscillator frequency

13.4 List of Command Abbreviations

General commands	
TTY	Switches from ANSI terminal mode (menu-driven operation to SAA standard) to TTY terminal mode (line-oriented operation).
ANS	Switches from TTY terminal mode (line-oriented operation) to ANSI terminal mode (menu-driven operation to SAA standard).
?	Requests a list of the command abbreviations (in TTY mode only).
VER	Requests a list of the version numbers for the individual hardware and software components of the R&S® EFL100.
PAS	The password that was used for logging in can be reissued (max. 16 characters).
LAN	The language for the help guide can be switched between English and German via modem.

Switching the R&S® EFL100 operating mode	
SAT	Switches the R&S® EFL100 to satellite reception operating mode.
TV-	Switches the R&S® EFL100 to cable reception operating mode.
FM-	Switches the R&S® EFL100 to FM reception operating mode.

Measurements with the R&S® EFL100	
RF-	Measures the carrier level of the receive signal.
BIA	Measures the supply current from the antenna socket for the satellite LNB or the cable head amplifier.

Changing the R&S® EFL100 settings		
FRE	Enter the frequency of the desired transmitter.	
	Entry method:	Action:
	FRE <RET>	You are prompted for the frequency.
	FRE 266 <RET>	266 MHz is set by default.
	FRE 10.7 G <RET>	10700 MHz is set.
	Note: The decimal separator is entered as a point.	
CHA	Enter the channel of the desired transmitter (in TV mode only).	
	Entry method:	Action:
	CHA<RET>	You are prompted for the channel.
	CHA 14 <RET>	Channel 14 is set.
	CHA s 16 <RET>	Special channel 16 is set.
LO-	Set the LNB oscillator on the satellite system (in SAT mode only).	
	Entry method:	Action:
	LO-<RET>	You are prompted for the frequency.
	LO-9750 <RET>	9750 MHz is set by default.
	LO-10.7 G <RET>	10700 MHz is set.
	Note: *The decimal separator is entered as a point. If LO-0 is entered, this frequency is interpreted as 1.IF.*	
22 k	the 22 KHz switching signal on the antenna connection is activated or deactivated.	

Changing the R&S® EFL100 settings		
SUP	Activates the voltage supply for the LNB or cable headend and sets it to a voltage, or deactivates it.	
	Entry method:	Action:
	SUP <RET>	You are prompted for the voltage.
	SUP 14.5 <RET>	14.5 V is set. Volt need not be specified as the unit.
	SUP 0 V	The voltage supply is deactivated.
	Note: *The set voltage is managed separately for the individual R&S® EFL100 operating modes.*	

Create digital control		
DIS	The DiSEqC control signal is edited and sent.	
	Entry method:	Action:
	DIS <RET>	You are prompted for the hexadecimal byte(s) that have to be sent.
	DIS E0 12 01 12 34 <RET>	The combination FRAME byte, ADDRESS byte, COMMAND byte + max. 3 DATA bytes is sent.
VSE	The VSEQ control signal is edited and sent.	
	Entry method:	Action:
	VSE <RET>	You are prompted for the hexadecimal byte that has to be sent.
	VSE E0 <RE>	The byte entered is sent.

Load or save predefined settings		
STU	Saves the present instrument settings under a user-defined program location number from 00 – 99.	
	Entry method:	Action:
	STU <RET>	You are prompted for the program location where the instrument setting is to be stored.
	STU 34 <RET>	The present instrument setting is saved to program location 34.
LDU	Loads the instrument setting referenced by program location numbers 00-99.	
	Entry method:	Action:
	LDU <RET>	You are prompted for the program location from which the instrument setting is to be loaded.
	LDU 34 <RET>	The instrument setting from program location 34 is loaded.

14 Maintenance

Maintenance of the instrument is mainly limited to internal and external cleaning.

14.1 Calibrating the Instrument

The calibration interval reflects the amount of use and workload, and should be between 1 and 2 years. Calibration can be carried out by R&S Central Customer Services (see below).

14.2 Cleaning the Exterior

The outside of the instrument should be carefully cleaned with a soft, lint-free duster or brush. If the outside is particularly dirty, spirit or mild soap suds may be used. Never use solvents such as nitrous thinners, acetone etc., since these could damage the front panel captions or even some of the plastic components.

14.3 Cleaning the Interior

Caution: *Since internal cleaning requires the instrument to be opened, this work should be carried out by authorized service personnel only.*

To keep the instrument properly ventilated, the inside should be cleared of accumulated dust at regular intervals, say every 1 to 2 years. The cleaning interval depends on the daily operating time and the dust conditions on site. The top cover of the cabinet has to be removed for internal cleaning. Accumulated dust can be removed with a brush or with grease-free compressed air.

14.4 Function Testing

It is recommended that the specified nominal data should be checked at appropriate intervals. The data and tolerances concerned can be ascertained from the data sheet.

Test equipment required:

- TV/SAT test transmitter such as Rohde & Schwarz SFQ (DVB-S and FM)
- DVB test transmitter such as Rohde & Schwarz SFL
- Analog TV test transmitter such as Rohde & Schwarz SFM

14.5 Storage

The storage temperature range for the instrument is: -40 to +70°C.

For lengthy storage the instrument must be protected from dust.

14.6 Changing the Printer Paper and Ink Ribbon

Caution: *Before opening the instrument, disconnect it from the voltage supply.*

Since internal cleaning requires the instrument to be opened, this work should be carried out by authorized service personnel only.

Changing the printer paper

Remove the upper cabinet cover from the R&S® EFL100. The cabinet cover is secured by four screws. Having opened the cover, remove the spindle complete with the empty paper roll. Feed the leading edge of the new paper roll into the paper uptake on the printer (between the plastic and the metal). Then hold down the "LINE FEED" key in the Copy menu until the paper appears at the top of the printer. Now place the paper roll onto the spindle and position both in the paper-holder. Feed the leading edge of the paper through the tear-off slot in the cover and screw the cover back into place.

Changing the ink ribbon

Remove the cabinet cover. Lift out and remove the ink ribbon cassette by pressing on the spot marked PUSH. Insert the new ink ribbon cassette so that the paper runs between the taut ink ribbon and the ink ribbon cassette. Feed the leading edge of the paper through the tear-off slot in the cover and screw the cover back into place.

Appendix A

A.1 Overview of DiSEqC commands

A.1.1 Command Overview - Framing Byte

Hex byte	Description
E0	Command from master, once-only transmission
E1	Command from master, repeated transmission
E2	Command from master, response expected, first transmission
E3	Command from master, response expected, repeated transmission
E4	Response from slave, "OK", no error detected
E5	Response from slave, command not supported by slave
E6	Response from slave, parity error detected
E7	Response from slave, command not recognized

A.1.2 Command Overview - Address Byte

Hex byte	Description
00	All instruments
10	Every LNB, matrix or SMATV
11	LNB
12	LNB with loop-through
14	Matrix (switcher)
15	Matrix (switcher) with loop-through
18	SMATV
20	Every polarizer
21	Full skew on linear polarization
22	Set polarizer incrementally
30	Every positioner
31	Polar / azimuth positioner
32	Elevation positioner
33	Combined positioner
34	LNB positioner
40	Setup utility
41	Signal strength setup utility
60	Reserved for allocated addresses
70	Intelligent slave interface for proprietary multi-master bus
71	Interface for users and checked headends
Fx	CEM upgrade

A.1.3 Command Overview - Command Byte

Hex byte	Command name	Description	Amount of data / byte
00	***Reset***	***Reset DiSEqC minicontroller***	**-**
01	Clr. Reset	Clear reset flag	-
02	Standby	Switch off AC supply to peripherals	-
03	Power on	Switch on AC supply to peripherals	-
04	Set Contend	Set contention flag	-
05	Contend	Acknowledge only when contention flag set	-
06	Clr. Contend	Clear contention flag	-
07	Address	Acknowledge only when contention flag not set	-
08	Move C	Change address when contention flag set	1
09	Move	Change address when contention flag not set	1
10	Status	Read status register flags	-
11	Config.	Read configuration flags	-
14	**Switch 0**	**Read switching status flags (committed port)**	-
15	Switch 1	Read switching status flags (uncommitted port)	-
16	Switch 2	Expansion option	-
17	Switch 3	Expansion option	-
20	***Set LO***	***Call low local oscillator frequency***	-
21	SET VR	Call vertical polarization or circular polarization clockwise	-
22	***Set Pos A***	***Select satellite position A***	-
23	Set S0A	Select switch option A	-
24	***Set Hi***	***Call high local oscillator frequency***	-
25	Set HL	Call horizontal polarization or circular polarization counterclockwise	-
26	***Set Pos B***	***Select satellite position B***	-
27	Set S0B	Select switch option B	-
28	Set S1A	Call matrix S1 input A (input B inactive)	-
29	Set S2A	Call matrix S2 input A (input B inactive)	-
2 A	Set S3A	Call matrix S3 input A (input B inactive)	-
2 B	Set S4A	Call matrix S4 input A (input B inactive)	-
2C	Set S1B	Call matrix S1 input B (input A inactive)	-
2D	Set S2B	Call matrix S2 input B (input A inactive)	-
2E	Set S3B	Call matrix S3 input B (input A inactive)	-
2F	Set S4B	Call matrix S4 input B (input A inactive)	-
30	Sleep	All bus commands ignored except "Awake"	-
31	Awake	Bus commands accepted again	-
38	Write N0	Set port group 0	1
39	Write N1	Set port group 1	1
3A	Write N2	Expansion option	
3B	Write N3	Expansion option	1
40	Read A0	Read analog value A0	-
41	Read A1	Read analog value A1	-
48	Write A0	Set analog value A0	1
49	Write A1	Set analog value A1	1
4F	Write A7	Set analog value A7	1

Hex byte	Command name	Description	Amount of data / byte
50	LO string	Read instantaneous frequency	-
51	LO now	Read instantaneous frequency (table entry number)	-
52	LO Lo	Read low frequency table entry number	-
53	LO Hi	Read high frequency table entry number	-
58	Write Freq	Write channel frequency	2 or 3
59	Ch.No.	Set selected channel number (receiver)	2
60	Halt	Stop positioner	-
61	Go E	Move positioner eastward	-
	Go W	Move positioner westward	62
64	P Status	Read status register positioner	-
65	Read Pos	Read counter positioner	-
6C	Goto	Move motor positioner to value counter, high, low	2
6D	Write Pos	Set counter positioner, high, low	2

Two different DiSEqC modes have been incorporated into the R&S® EFL100. **DiSEqC 1.0:** With this system DiSEqC commands can sent but not received. **DiSEqC 2.0:** With this system DiSEqC commands can sent and received (shown with a **gray** background in the table).

Command Overview - Data Byte

A corresponding data byte need only be sent if the command byte requests a data byte or bytes. You can infer this from the command byte table. To find out which data byte must be sent in response to each command byte, please refer to the data sheets for the instrument concerned.

Orbit position	Switch position H/V	Switch position LNB	Data byte	Recall
1	V	Lo	F0	80
	V	Hi	F1	81
	H	Lo	F2	82
	H	Hi	F3	83
2	V	Lo	F4	84
	V	Hi	F5	85
	H	Lo	F6	86
	H	Hi	F7	87
3	V	Lo	F8	88
	V	Hi	F9	89
	H	Lo	FA	90
	H	Hi	FB	91
4	V	Lo	FC	92
	V	Hi	FD	93
	H	Lo	FE	94
	H	Hi	FF	95

A.2 DiSEqC commands for Kathrein Matrixes

These commands are stored as manufacturer defaults at recall addresses 80 to 95.

A.2.1 Command Set for Kathrein Matrix 9xx-Series

Range	POS. A (Satellite 1)			
	Low band		High band	
	Vert.	Hor.	Vert.	Hor.
DiSEqC command	F0 00 38 F0	F0 00 38 F2	F0 00 38 F1	F0 00 38 F3

Range	POS. B (Satellite 2)			
	Low band		High band	
	Vert.	Hor.	Vert.	Hor.
DiSEqC command	F0 00 38 F4	F0 00 38 F6	F0 00 38 F5	F0 00 38 F7

A.2.2 Command Set for Kathrein Matrix EXR 20

Range	EXR 20	
	POS. A	POS. B
DiSEqC command	E0 00 22	E0 00 26

A.2.3 Command Set for Kathrein Matrix EXR 22

Range	EXR 22	
	High-band	Low-band
DiSEqC command	E0 00 24	E0 00 20

A.3 Channel Tables

A.3.1 Channel and Frequency Table - Standard B/G General and Italy

The table shows: Channel name, EFL100 display and associated vision carrier frequency.

VHF			UHF			UHF		
Channel name	Channel display	Vision carrier frequency in MHz	Channel name	Channel display	Vision carrier frequency in MHz	Channel name	Channel display	Vision carrier frequency in MHz
B/G general			21	C21	471.25	46	C46	671.25
Pilot freq.	01	80.15	22	C22	479.25	47	C47	679.25
E2	C02	48.25	23	C23	487.25	48	C48	687.25
E3	C03	55.25	24	C24	495.25	49	C49	695.25
E4	C04	62.25	25	C25	503.25	50	C50	703.25
E5	C05	175.25	26	C26	511.25	51	C51	711.25
E6	C06	182.25	27	C27	519.25	52	C52	719.25
E7	C07	189.25	28	C28	527.25	53	C53	727.25
E8	C08	196.25	29	C29	535.25	54	C54	735.25
E9	C09	203.25	30	C30	543.25	55	C55	743.25
E10	C10	210.25	31	C31	551.25	56	C56	751.25
E11	C11	217.25	32	C32	559.25	57	C57	759.25
E12	C12	224.25	33	C33	567.25	58	C58	767.25
			34	C34	575.25	59	C59	775.25
B/G Italy			35	C35	583.25	60	C60	783.25
A	C13	53.75	36	C36	591.25	61	C61	791.25
B	C14	62.25	37	C37	599.25	62	C62	799.25
C	C15	82.25	38	C38	607.25	63	C63	807.25
D	C16	175.25	39	C39	615.25	64	C64	815.25
E	C17	183.75	40	C40	623.25	65	C65	823.25
F	C18	192.25	41	C41	631.25	66	C66	831.25
G	C19	201.25	42	C42	639.25	67	C67	839.25
H	C20	210.25	43	C43	647.25	68	C68	847.25
			44	C44	655.25	69	C69	855.25
			45	C45	663.25	70	C70	863.25
CATV			**CATV**			**Digital transmission method**		
Channel name	Channel display	Vision carrier frequency in MHz	Channel name	Channel display	Vision carrier frequency in MHz	Channel name	Channel display	Channel center frequency in MHz
S01	S01	105.25	ES21	S21	303.25	Digital	S02	113.00
S02	S02	112.25	ES22	S22	311.25	Digital	S03	121.00
S03	S03	119.25	ES23	S23	319.25			
S04	S04	126.25	ES24	S24	327.25			
S05	S05	133.25	ES25	S25	335.25			
S06	S06	140.25	ES26	S26	343.25			
S07	S07	147.25	ES27	S27	351.25			
S08	S08	154.25	ES28	S28	359.25			
S09	S09	161.25	ES29	S29	367.25			
S10	S10	168.25	ES30	S30	375.25			
S11	S11	231.25	ES31	S31	383.25			
S12	S12	238.25	ES32	S32	391.25			
S13	S13	245.25	ES33	S33	399.25			
S14	S14	252.25	ES34	S34	407.25			
S15	S15	259.25	ES35	S35	415.25			
S16	S16	266.25	ES36	S36	423.25			
S17	S17	273.25	ES37	S37	431.25			
S18	S18	280.25	ES38	S38	439.25			
S19	S19	287.25	ES39	S39	447.25			
S20	S20	294.25	ES40	S40	455.25			
			ES41	S41	463.25			

A.3.2 Channel and Frequency Table - Standard L and Standard K1.

The table shows: Channel name, EFL100 display and associated vision carrier frequency.

VHF			UHF			UHF		
Channel name	Channel display	Vision carrier frequency in MHz	Channel name	Channel display	Vision carrier frequency in MHz	Channel name	Channel display	Vision carrier frequency in MHz
	C01	80.75	21	C21	471.25	46	C46	671.25
*LB	C02	55.75	22	C22	479.25	47	C47	679.25
*LC1	C03	60.50	23	C23	487.25	48	C48	687.25
*LC	C04	63.75	24	C24	495.25	49	C49	695.25
L1	C05	176.00	25	C25	503.25	50	C50	703.25
L2	C06	184.00	26	C26	511.25	51	C51	711.25
L3	C07	192.00	27	C27	519.25	52	C52	719.25
L4	C08	200.00	28	C28	527.25	53	C53	727.25
L5	C09	208.00	29	C29	535.25	54	C54	735.25
L6	C10	216.00	30	C30	543.25	55	C55	743.25
	C11	308.75	31	C31	551.25	56	C56	751.25
	C12		32	C32	559.25	57	C57	759.25
	C13	861.75	33	C33	567.25	58	C58	767.25
K14	C14	175.25	34	C34	575.25	59	C59	775.25
K15	C15	183.25	35	C35	583.25	60	C60	783.25
K16	C16	191.25	36	C36	591.25	61	C61	791.25
K17	C17	199.25	37	C37	599.25	62	C62	799.25
K18	C18	207.25	38	C38	607.25	63	C63	807.25
K19	C19	215.25	39	C39	615.25	64	C64	815.25
	C20	223.25	40	C40	623.25	65	C65	823.25
			41	C41	631.25	66	C66	831.25
			42	C42	639.25	67	C67	839.25
			43	C43	647.25	68	C68	847.25
			44	C44	655.25	69	C69	855.25
			45	C45	663.25	70	C70	863.25
			CATV			**CATV**		
			S01	S01	120.00	S21	S21	280.00
			S02	S02	128.00	S22	S22	288.00
			S03	S03	136.00	S23	S23	303.25
			S04	S04	144.00	S24	S24	315.25
			S05	S05	152.00	S25	S25	327.25
			S06	?		S26	S26	339.25
			S07	S07	168.00	S27	S27	351.25
			S08	S08	176.00	S28	S29	363.25
			S09	S09	184.00	S29	S29	375.25
			S10	S10	192.00	S30	S30	387.25
			S11		200.00	S31	S31	399.25
			S12	S12	208.00	S32	S32	411.25
			S13	S13	216.00	S33	S33	423.25
			S14	S14	224.00	S34	S34	435.25
			S15	S15	232.00	S35	S35	447.25
			S16	S16	240.00	S36	S36	459.25
			S17	S17	248.00			
			S18	S18	256.00			
			S19	S19	264.00			
			S20	S20	272.00			

A.3.3 Channel and Frequency Table - Standard D/K to OIRT

The table shows: Channel name, EFL100 display and associated vision carrier frequency.

VHF			UHF			UHF		
Channel name	Channel display	Vision carrier frequency in MHz	Channel name	Channel display	Vision carrier frequency in MHz	Channel name	Channel display	Vision carrier frequency in MHz
R-I	C01	49.75	21	C21	471.25	46	C46	671.25
R-II	C02	59.75	22	C22	479.25	47	C47	679.25
R-III	C03	77.25	23	C23	487.25	48	C48	687.25
R-IV	C04	85.25	24	C24	495.25	49	C49	695.25
R-V	C05	93.25	25	C25	503.25	50	C50	703.25
R-VI	C06	175.25	26	C26	511.25	51	C51	711.25
R-VII	C07	183.25	27	C27	519.25	52	C52	719.25
R-VIII	C08	191.25	28	C28	527.25	53	C53	727.25
R-IX	C09	199.25	29	C29	535.25	54	C54	735.25
R-X	C10	207.25	30	C30	543.25	55	C55	743.25
R-XI	C11	215.25	31	C31	551.25	56	C56	751.25
R-XII	C12	223.25	32	C32	559.25	57	C57	759.25
	C13	50.00	33	C33	567.25	58	C58	767.25
	C14	60.00	34	C34	575.25	59	C59	775.25
	C15	70.00	35	C35	583.25	60	C60	783.25
	C16	75.00	36	C36	591.25	61	C61	791.25
	C17	80.00	37	C37	599.25	62	C62	799.25
	C18	90.00	38	C38	607.25	63	C63	807.25
	C19	175.00	39	C39	615.25	64	C64	815.25
	C20	200.00	40	C40	623.25	65	C65	823.25
			41	C41	631.25	66	C66	831.25
			42	C42	639.25	67	C67	839.25
			43	C43	647.25	68	C68	847.25
			44	C44	655.25	69	C69	855.25
			45	C45	663.25	70	C70	863.25
			CATV			CATV		
			S01	S01	111.25	S21	S21	311.25
			S02	S02	119.25	S22	S22	319.25
			S03	S03	127.25	S23	S23	327.25
			S04		135.25	S24	S24	335.25
			S05	S05	143.25	S25	S25	343.25
			S06	S06	151.75	S26	S26	351.25
			S07	S07	159.25	S27	S27	359.25
			S08	S08	167.25	S28	S29	367.25
			S09	S09	100.25	S29	S29	375.25
			S10	S10	105.25	S30	S30	383.25
			S11	S11	231.25	S31	S31	391.25
			S12	S12	239.25	S32	S32	399.25
			S13	S13	247.25	S33	S33	407.25
			S14	S14	255.25	S34	S34	415.25
			S15	S15	263.25	S35	S35	423.25
			S16	S16	271.25	S36	S36	431.25
			S17	S17	279.25	S37	S37	439.25
			S18	S18	287.25	S38	S38	447.25
			S19	S19	295.25	S39	S39	455.25
			S20	S20	303.25	S40	S40	463.25

A.3.4 Channel and Frequency Table - Standard I

The table shows: Channel name, EFL100 display and associated vision carrier frequency.

VHF			UHF			UHF		
Channel name	Channel display	Vision carrier frequency in MHz	Channel name	Channel display	Vision carrier frequency in MHz	Channel name	Channel display	Vision carrier frequency in MHz
IA	C01	45.75	21	C21	471.25	46	C46	671.25
IB	C02	53.75	22	C22	479.25	47	C47	679.25
IC	C03	61.75	23	C23	487.25	48	C48	687.25
ID	C04	175.25	24	C24	495.25	49	C49	695.25
IE	C05	183.25	25	C25	503.25	50	C50	703.25
IF	C06	191.25	26	C26	511.25	51	C51	711.25
IG	C07	199.25	27	C27	519.25	52	C52	719.25
IH	C08	207.25	28	C28	527.25	53	C53	727.25
IJ	C09	215.25	29	C29	535.25	54	C54	735.25
	C10	223.25	30	C30	543.25	55	C55	743.25
	C11	231.25	31	C31	551.25	56	C56	751.25
	C12	239.25	32	C32	559.25	57	C57	759.25
	C13	247.45	33	C33	567.25	58	C58	767.25
	C14	50.00	34	C34	575.25	59	C59	775.25
	C15	60.00	35	C35	583.25	60	C60	783.25
	C16	70.00	36	C36	591.25	61	C61	791.25
	C17	75.00	37	C37	599.25	62	C62	799.25
	C18	80.00	38	C38	607.25	63	C63	807.25
	C19	90.00	39	C39	615.25	64	C64	815.25
	C20	175.00	40	C40	623.25	65	C65	823.25
			41	C41	631.25	66	C66	831.25
			42	C42	639.25	67	C67	839.25
			43	C43	647.25	68	C68	847.25
			44	C44	655.25	69	C69	855.25
			45	C45	663.25	70	C70	863.25
			CATV			CATV		
			S01	S01	111.25	S21	S21	311.25
			S02		119.25	S22	S22	319.25
			S03	S03	127.25	S23	S23	327.25
			S04	S04	135.25	S24	S24	335.25
			S05	S05	143.25	S25	S25	343.25
			S06	S06	151.75	S26	S26	351.25
			S07	S07	159.25	S27	S27	359.25
			S08	S08	167.25	S28	S29	367.25
			S09	S09	100.25	S29	S29	375.25
			S10	S10	105.25	S30	S30	383.25
			S11	S11	231.25	S31	S31	391.25
			S12	S12	239.25	S32	S32	399.25
			S13	S13	247.25	S33	S33	407.25
			S14	S14	255.25	S34	S34	415.25
			S15	S15	263.25	S35	S35	423.25
			S16	S16	271.25	S36	S36	431.25
			S17	S17	279.25	S37	S37	439.25
			S18	S18	287.25	S38	S38	447.25
			S19	S19	295.25	S39	S39	455.25
			S20	S20	303.25	S40	S40	463.25

A.3.5 Channel and Frequency Table - Standard M/N (AIR)

The table shows: Channel name, EFL100 display and associated vision carrier frequency.

VHF			UHF			UHF		
Channel name	Channel display	Vision carrier frequency in MHz	Channel name	Channel display	Vision carrier frequency in MHz	Channel name	Channel display	Vision carrier frequency in MHz
	01	C72.00	14	C14	471.25	47	C47	669.25
A02	02	C55.25	15	C15	477.25	48	C48	675.25
A03	03	C61.25	16	C16	483.25	49	C49	681.25
A04	04	C67.25	17	C17	489.25	50	C50	687.25
A05	05	C77.25	18	C18	495.25	51	C51	693.25
A06	06	C83.25	19	C19	501.25	52	C52	699.25
A07	07	C175.25	20	C20	507.25	53	C53	705.25
A08	08	C181.25	21	C21	513.25	54	C54	711.25
A09	09	C187.25	22	C22	519.25	55	C55	717.25
A10	10	C193.25	23	C23	525.25	56	C56	723.25
A11	11	C199.25	24	C24	531.25	57	C57	729.25
A12	12	C205.25	25	C25	537.25	58	C58	735.25
A13	13	C211.25	26	C26	543.25	59	C59	741.25
			27	C27	549.25	60	C60	747.25
			28	C28	555.25	61	C61	753.25
			29	C29	561.25	62	C62	759.25
			30	C30	567.25	63	C63	765.25
			31	C31	573.25	64	C64	771.25
			32	C32	579.25	65	C65	777.25
			33	C33	585.25	66	C66	783.25
			34	C34	591.25	67	C67	789.25
			35	C35	597.25	68	C68	795.25
			36	C36	603.25	69	C69	801.25
			37	C37	609.25	70	C70	807.25
			38	C38	615.25	71	C71	813.25
			39	C39	621.25	72	C72	819.25
			40	C40	627.25	73	C73	825.25
			41	C41	633.25	74	C74	831.25
			42	C42	639.25	75	C75	837.25
			43	C43	645.25	76	C76	843.25
			44	C44	651.25	77	C77	849.25
			45	C45	657.25	78	C78	855.25
			46	C46	663.25	79	C79	861.25

A.3.6 Channel and Frequency Table - Standard M/N (CATV)

The table shows: Channel name, EFL100 display and associated vision carrier frequency.

Channel name	Channel display	Vision carrier frequency in MHz	Channel name	Channel display	Vision carrier frequency in MHz
A 4 96	S02	97.25	PP 52	S44	391.25
A-3 97	S03	103.25	QQ 53	S45	397.25
A-2 98	S04	109.25	RR 54	S46	403.25
A-1 99	S05	115.25	SS 55	S47	409.25
A 14	S06	121.25	TT 56	S48	415.25
B 15	S07	127.25	UU 57	S49	421.25
C 16	S08	133.25	VV 58	S50	427.25
D 17	S09	139.25	WW 59	S51	433.25
E 18	S10	145.25	AAA 60	S52	439.25
F 19	S11	151.25	BBB 61	S53	445.25
G 20	S12	157.25	CCC 62	S54	451.25
H 21	S13	163.25	DDD 63	S55	457.25
I 22	S14	169.25	EEE 64	S56	463.25
J 23	S15	217.25	65	S57	469.25
K 24	S16	223.25	66	S58	475.25
L 25	S17	229.25	67	S59	481.25
M 26	S18	235.25	68	S60	487.25
N 27	S19	241.25	69	S61	493.25
O 28	S20	247.25	70	S62	499.25
P 29	S21	253.25	71	S63	505.25
Q 30	S22	259.25	72	S64	511.25
R 31	S23	265.25	73	S65	517.25
S 32	S24	271.25	74	S66	523.25
T 33	S25	277.25	75	S67	529.25
U 34	S26	283.25	76	S68	535.25
V 35	S27	289.25	77	S69	541.25
W 36	S28	295.25	78	S70	547.25
AA 37	S29	301.25	79	S71	553.25
BB 38	S30	307.25	80	S72	559.25
CC 39	S31	313.25	81	S73	565.25
DD 40	S32	319.25	82	S74	571.25
EE 41	S33	325.25	83	S75	577.25
FF 42	S34	331.25	84	S76	583.25
GG 43	S35	337.25	85	S77	589.25
HH 44	S36	343.25	86	S78	595.25
II 45	S37	349.25	87	S79	601.25
JJ 46	S38	355.25	88	S80	607.25
KK 47	S39	361.25	89	S81	613.25
LL 48	S40	367.25	90	S82	619.25
MM 49	S41	373.25	91	S83	625.25
NN 50	S42	379.25	92	S84	631.25
			93	S85	637.25

Appendix B

B.1 Specifications

Electrical supply

AC supply		100 to 250 V~/50 to 400 Hz
Battery supply		Lead battery 12 V/3.5 Ah
Power consumption DCP_{max}		50 W
Power consumption ACP_{max}		62 W
Dimensions		Width 275 mm, height 130 mm, depth 317 mm
Safety standards		CE mark
		Protection class I
		VDE EN 61010
Display		5.5“ TFT screen 320 x 240 pixels
		Max. pixel error ≤6 at a distance of ≥6.5 mm ∅
Temperature range		+5 °C to +45 °C
Storage temperature		-20 °C to + 70 °C
Frequency range	SAT	920 MHz to 2150 MHz
	TV	44.75 MHz to 867.20 MHz
	DVB-T	178 MHz to 227 MHz / 474 MHz to 858 MHz
	FM	88 MHz to 108 MHz (45.75 MHz to 867.20 MHz)
	IF	
	RP	38.9 MHz
		4 to 80 MHz return path
Channel spacing	TV	Standard B 7 MHz
		Standard D/G/I/K 8 MHz
		Standard M 6 MHz
Frequency setting	SAT	in increments of 0.125 MHz
	TV/FM	in increments of 50 kHz
	RP	in increments of 50 kHz
Measurement error/level	SAT	max. ±2 dB
	TV/FM	max. ±2 dB
	RP	max. ±2 dB
Departure from flat frequency response	TV (BT/TT)	≤1.5 dB except S41 (461.25 MHz) ≤4 dB
		C70 (863.25 MHz) ≤2.5 dB
RF input		Coaxial connector BNC 75 Ω
RF attenuator		0-60 dB in increments of 4 dB
Level measurement range	SAT/TV/FM	30 dBµV – 130 dBµV
	DVB-C	40 dBµV – 130 dBµV
	DVB-T	30 dBµV – 130 dBµV
	DVB-S	37 dBµV – 130 dBµV
	IF/RP	70 dBµV – 130 dBµV (30 dBµV – 130 dBµV)

Measurement bandwidth	SAT	8 MHz
	SAT DVB	8 MHz
	TV	1 MHz
	TV DVB	1 MHz
	FM	200 kHz
	RP	1 MHz
	RP DVB	1 MHz / 200 kHz (abhängig v. Symbolrateneinst.)
Monitoring detector	SAT	Average value display
	TV	Peak value display
	FM	Average value display
	DVB-C/S/T	Average value display (corrected)
	RP analog	Peak value display
	RP digital	Mittelwertanzeige (korrigiert)
Return loss	TV	≥10 dB
	SAT	≥8 dB
Sound IF bandwidth	SAT	130 kHz /280 kHz
	TV	200 kHz
	FM	200 kHz
Sound deemphasis	SAT	50 µs /DNR 75 µs / J17
	TV/FM	50 µs
Sound carrier measurement and demodulation	SAT	FM sound conversion 4.99 to 9.01 MHz in increments of 10 kHz
	TV	Standard B/G TT1=5.5 MHz, TT2=5.74 MHz Standard D/K TT1=6.5 MHz, TT2=6.26 MHz Standard I TT1=6.0 MHz Standard $M/M_{jap.}$ TT1=4.5 MHz, TT2=4.72 MHz Standard L AM 6.5 MHz, NICAM=5.85 MHz Standard B/G NICAM=5.85 MHz Standard I NICAM=6.552 MHz
	FM	FM sound conversion 45 MHz to 867 MHz
NICAM sound bit error rate	TV	$0 – 1.5 \times 10^{-2}$
Video output (SCART)	SAT	1 V_{pp} / 75 Ω ≤±3 dB
	TV	1 V_{pp} / 75 Ω ≤±1 dB
Video output (BNC)	SAT	1 V_{pp} / 75 Ω ≤±3 dB
	TV	1 V_{pp} / 75 Ω ≤±1 dB
LNB voltage supply	SAT	0.10 V to 20 V, max. 500 mA
LNB control	SAT	22 kHz, DiSEqC, Simple DiSEqC, (Tone Burst), V-SEC, UFOµ DiSEqC

SAT analog measurements	LNB current	0 to 500 mA ±10 mA
	LNB voltage	0 to 30 V ±100 mV
	C/N	0 to 35 dB ±2 dB
	S/N	35 to 50 dB ±2 dB (weighted)
	Cross-polarization	0 to 30 dB ±2 dB
TV analog measurements	Rem. supp. current	0 to 500 mA ±10 mA
	Rem. supp. vltage	0 to 30 V ±100 mV
	S/N	35 to 47 dB ±2 dB (weighted)
DVB-S measurements	MER	to 12 dB
QPSK	BER	$1x10^{-2}$...$1x10^{-8}$ (0)
DVB-C measurements	MER	to 32 dB for QAM64
QAM64, QAM128	BER	$1x10^{-2}$ to $1x10^{-8}$ (0) for QAM64
		(BER better than $1x10^{-8}$ for level > 57 dBµV)
DVB-T measurements	MER	to 32 dB
2k / 8k mode	BER	Before and after Viterbi Decoder
		$5x10^{-2}$ to $1x10^{-8}$ (0)
Weight		approx. 7 kg

B.2 Scope of deliveries and services

1 power cable

1 measurement cable - BNC connector - BNC connector

1 adapter - BNC connector - F connector

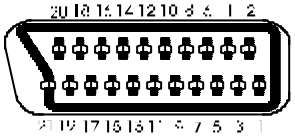
1 adapter - BNC connector - F plug

1 adapter - BNC connector - IEC plug

1 adapter - BNC connector - IEC connector

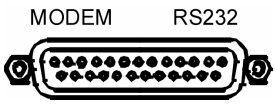
1 operating manual

B.3 Pin assignment - SCART connector



Connection	Signal	Note
1	Audio right output	
2	Audio right input	
3	Audio left output	
4	Audio ground	
5	Blue ground	
6	Audio left input	
7	Blue signal	
8	Switching voltage	
9	Green ground	
10	Data signal	
11	Green signal	
12	Data signal	
13	Red ground	
14	Data ground	
15	Red signal	
16	Blanking signal (fast blank)	
17	Video ground	
18	Blanking signal ground	
19	Video output	Baseband output for decoder operation
20	Video input	Baseband input for decoder operation
21	Shielding	

B.4 Pin assignment - RS-232-C connector



Connection	Signal	Note
1		
2	TXD	
3	RXD	
4	RTS	
5	CTS	
6	DSR	
7	S-GND	
8	DCD	
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20	DTR	
21		
22		
23		
24		
25		

B.5 Pin assignment - TS PARALLEL connector (models .03 and .04)

TS PARALLEL

Connection	Signal	Abbreviation
1	Data word clock	CLOCK A
2	Ground	GND
3	Data bit 7 (most significant data bit)	DATA BIT 7 A (MSB)
4	Data bit 6	DATA BIT 6 A
5	Data bit 5	DATA BIT 5 A
6	Data bit 4	DATA BIT 4 A
7	Data bit 3	DATA BIT 3 A
8	Data bit 2	DATA BIT 2 A
9	Data bit 1	DATA BIT 1 A
10	Data bit 0 (least significant bit)	DATA BIT 0 A (LSB)
11	Data word valid	DVALID A
12	Packet sync	PSYNC A
13	Ground	GND
14	Data word clock inverted	CLÖCK B
15	Ground	GND
16	Data bit 7 inverted (most significant bit)	DATA BIT 7 B (MSB)
17	Data bit 6 inverted	DATA BIT 6 B
18	Data bit 5 inverted	DATA BIT 5 B
19	Data bit 4 inverted	DATA BIT 4 B
20	Data bit 3 inverted	DATA BIT 3 B
21	Data bit 2 inverted	DATA BIT 2 B
22	Data bit 1 inverted	DATA BIT 1 B
23	Data bit 0 inverted	DATA BIT 0 B
24	Data word valid inverted	DVALID B
25	Packet sync inverted	PSYNC B