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ROHDE&SCHWARZ

Instruments
Division

Operating Manual

TV TEST RECEIVER
TV TEST DEMODULATOR
TV CHANNEL RECEIVER

EMFT Std. M
EMFD Std. M
EMFK Std. M

838.6010...

838.6032...

838.6055.50	Band I
838.6055.53	Band III
838.6055.54	Band IV/V

EMFD/EMFK MANUAL FOLLOWS BLUE DIVISION

Printed in the Federal
Republic of Germany

838.6010.19-02-

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REG. NR. 1954-02

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Subject
Sujet

Anlieferfehler
Dead on Arrival
Défaut constaté a l'arrivée

Absender
Sender
Expéditeur

Telefon
Telephone
Téléphone

Telefax
Téléfax

Anzahl der Seiten inkl. dieser Seite
Number of pages incl. this page
Nombre de pages incluant cette page

Beanstandung / Shortcomings / Défauts

Gerätetype:
Type:
Type d'appareil: _____

Sach-Nr.:
Stock No.:
N° de référence: _____

Serien-Nr.:
Serial No.:
N° de série: _____

R&S-Auftrags-Nr.:
R&S Order No.:
N° de commande R&S: _____

Kurze Beschreibung der Beanstandung / Short description of shortcoming / Description de défaut:

_____

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R

EC Certificate of Conformity

(to EMC Directive 89/336/EEC)

CE

This is to certify that

TV Test Receiver

EMFT

0821.4019. . / 0821.5580. . / 0821.5650. . / 0838.6010. . / 1037.6044. .

(equipment, type, designation)

complies with the provisions of the Directive of the Council of the European Communities on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 89/336/EEC).

This declaration of conformity of the European Communities is the result of an examination carried out by the quality assurance of **ROHDE & SCHWARZ** in accordance with European Standards EN 50081-1 and EN 50082-1, as laid down in Article 10 of the Directive.

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1 Technical Information

- Real synchronous detection with quadratur signal output for measurement of incidental phase modulation of vision carrier
- Switchover to envelope detection
- Audio broadband output for multichannel TV sound
- RF input voltage indication
- Turnable in all TV bands including ultraband up to 470 MHz (EMFT)

The equipment family EMF. is capable of solving all problems in the field of TV reception and demodulation through its modular design. Advanced techniques such as synthesizer, double superheterodyning, SAW filter afford great operating convenience and outstandig transmission quality.

There are three units available for the different measurements and transmission requirements:

- EMFT - continously turnable test receiver
- EMFK - selective, crystal-controlled channel receiver
- EMFD - TV demodulator with AFC and crystal-controlled operation

All units of the EMF. series are provided with two isolated video outputs and two outputs for the Q signal. These outputs enable the measurement of the incidental phase modulation of the vision carrier which in turn determines the intercarrier S/N ratio of the sound channel.

In addition, the adjustment of linearity and phase equalizing circuits is facilitated through the use of the Q signal.

In addition to the normal audio mono output, the EMF. is fitted with an audio broadband output which delivers a multiplex signal for driving an MTS decoder. Moreover, a 4.5-MHz intercarrier input and output are provided.

A front-panel switch permits selection of envelope or synchronous detection. The RF input voltage and the frequency deviation of the sound carriers are indicated on the analog meter. The sound level is monitored by means of a built-in loudspeaker.

Secial features

EMFT

- Channel selection with digital entry of channel number either in manual or in remote mode
- Control of frequency offset up to ± 100 kHz
- Continuously turnable in all TV bands, also in special channels up to 470 MHz
- Sound trap can be switched off
- IEC/IEEE-bus control (option)
- Reduction of IF gain enables operation at high input levels providing increased video S/N ratio (high level mode)

EMFD

- Test demodulator for VHF, UHF and IF
- Crystal-controlled operation at a fixed frequency and continously turned AFC mode
- Disconnectible SAW filter
- Sound trap can be switched off
- Selectable input sensitivily

EMFK

- Same as EMFD; however, additional input via selective filter and preamplifier
- Suitable as a relay receiver for transmission and measurements

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EMFT-Std. M

EMFD-Std. M
EMFK-Std. M

Fig. 1-1: Front Panel EMFT, EMFD/EMFK

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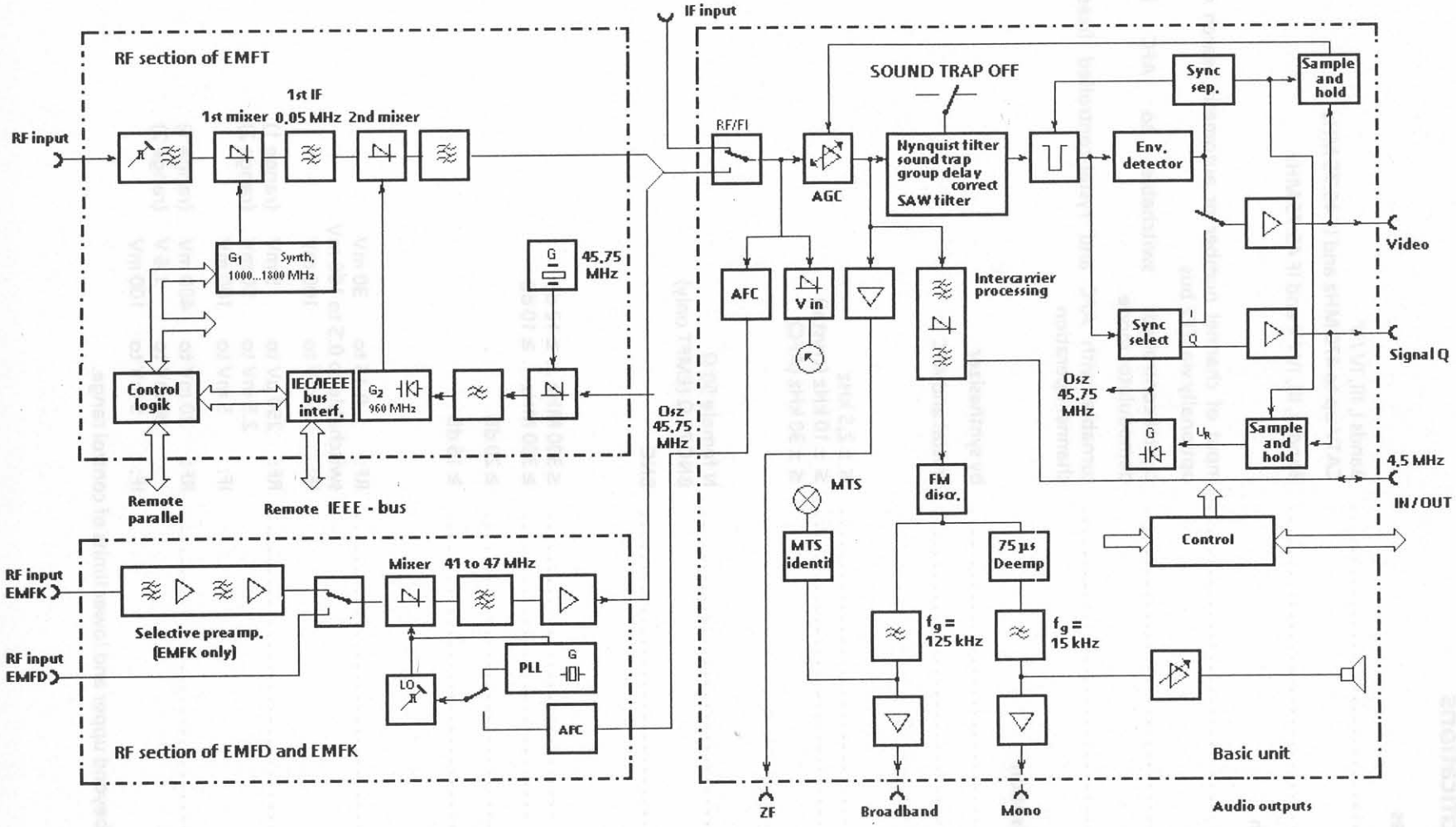


Fig. 1-2: Block diagramm of EMF. System

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1.1 Specifications

Frequency Ranges

EMFT	Bands I, III, IV / V CATV up to 470 MHz and IF 45.75 MHz
EMFK/EMFD	Bands I, III, IV / V and IF 45.75 MHz

Channel selection

EMFT	input of channel number or automatic search or optionally via IEEE bus
EMFK	crystal-controlled, switchable to AFC in demodulator mode
EMFD	turnable with AFC and rystal-controlled fixed-channel operation

Frequency stabilisation

EMFT	by synthesizer
EMFK/EMFD	crystal and AFC

Frequency error

EMFT	≤ ± 2,5 kHz
EMFK/EMFD	≤ ± 10 kHz (crystal) ≤ ± 30 kHz (AFC)

Inputs

RF	N female 50 Ω BNC 75 Ω (EMFT only)
IF	BNC

Return loss

EMFT	50 Ω	≤ 300 MHz ... ≥ 12 dB
	75 Ω	≥ 300 MHz ... ≥ 10 dB
EMFD		≥ 20 dB
EMFK		≥ 16 dB

Input level

EMFT	RF:	0.15 to	30 mV	
	switchable to 0.5 to 100 mV			
	IF:	5 mV to	100 mV	
EMFK	RF:	250 µV to	5 mV	(range 1)
		2.5 mV to	50 mV	(range 2)
	IF:	5 mV to	100 mV	
EMFD	RF:	20 mV to	400 mV	(range 1)
		80 mV to	1.6 V	(range 2)
	IF:	5 mV to	100 mV	

Additionally 6 dB beyond upper and lower limits of control range.

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RF-input attenuation

EMFT	0/10/20 dB, manual or automatic setting
EMFK	0/20 dB (internal link)
EMFD	17/29 dB

Noise figure

EMFT RF input attenuation 0 dB	≤ 12 dB
EMFK	typ. 8 dB

4.5-MHz intercarrier input

BNC female, rear panel	Z_{in} = 50 Ω
Input level	30 mV to 200 mV

Outputs

Video outputs

In-phase signal	1 output each on front and on rear panel, BNC, Z_{out} = 75 Ω
Quadrature signal	1 output each on front and on rear panel, BNC, Z_{out} = 75 Ω

Output level

In-phase output	1.0 V_{pp}, CCVS, with standard modulation
Quadrature output	corresponding to 1.0 V_{pp} with standard modulation and internal shift of switching carrier by 90 °
Incidental carrier phase modulation	≤ ± 1 degree

IF output

BNC female, rear panel	Z_{out} = 50 Ω
Output level (AGC)	100 mV_{rms} ± 3 dB
Amplitude/frequency response 41 to 47 MHz	≤ 1.5 dB

4.5-MHz intercarrier output

BNC female, rear panel	Z_{out} = 50 Ω
Output level with vision/sound ratio of 13 dB	100 mV_{rms} ± 3 dB

Audio broadband output

Front panel	BNC, unbalanced, Z_{out} = 75 Ω
Rear panel	BNC, unbalanced, Z_{out} = 75 Ω
Output level	10 mV/kHz of deviation
± 25 kHz deviation, f_{mod} = 500 Hz	0.25 V into 75 Ω ± 3 dB adjustable

Audio mono output

Front panel	BNC, unbalanced, Z_{out} = 600 Ω
Rear panel	XLR male connector, balanced, Z_{out} = 600 Ω
Deemphasis	75 µs
Output level	50 mV/kHz of deviation
± 25 kHz deviation, f_{mod} = 500 Hz	1.25 V into 600 Ω ± 3 dB adjustable

Additional headphones socket for audio mono signal with switching contact for internal loudspeaker. Loudspeaker and headphones socket with built-in volume control.

It is possible to contact an external loudspeaker.

The speaker and headphone outputs are 8 Ω impedance outputs and filtered and deemphasized to provide only monophonic main channel.

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1.2 Transmission Characteristics in Video Channel

Amplitude / frequency response

(RF + IF + VF) ..... see Figs. 1-3 and 1-4

Group-delay characteristics

(SAW filter switched off) ..... see Fig. 1-5

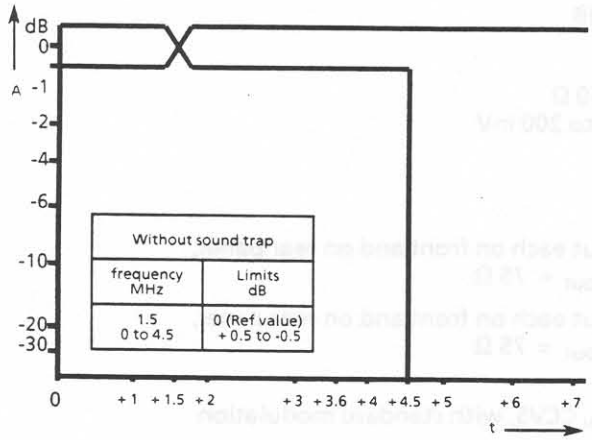


Fig. 1-3 Tolerance of overall amplitude characteristic (RF, IF, VF) without sound trap

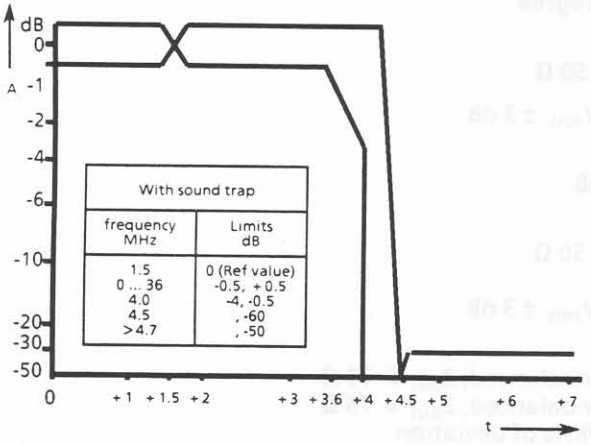


Fig. 1-4 Tolerance of overall amplitude characteristic (RF, IF, VF) with sound trap
Additional ripple with SAW filter ≤ ± 0.2 dB

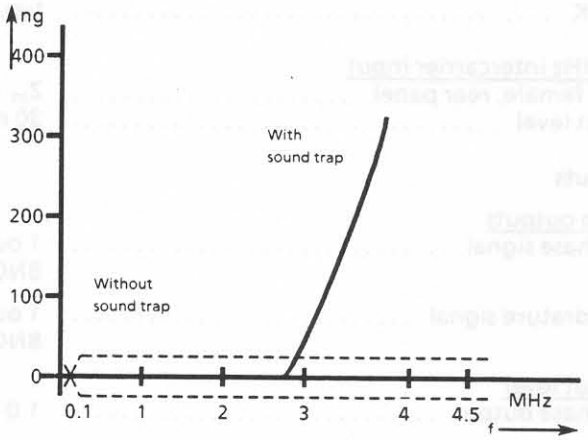


Fig. 1-5 Group-delay characteristics

With sound trap, SAW filter "off"				
Frequency MHz	Standard curve ns	Tolerance ns		
		RF input		IF input
		EMFD	EMFK EMFT	EMFD EMFK EMFT
	Reference value			
0.1	0	± 25	± 30	± 25
1	0	± 25	± 30	± 25
2	25	± 25	± 30	± 25
3	170	± 25	± 30	± 25
3.58	230	± 40	± 45	± 40
Without sound trap				
0 to 4.5	0	± 15	± 20	± 15

Fig. 1.6 Group-delay characteristic of EMF.:

Curve with sound trap, SAW filter off.
Dashed line for operation without sound trap

Additional ripple with SAW filter ≤ ± 50 ns

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Nonlinearity

Modulation depth 12.5 to 75 %
(synchronous detection)

Differential gain	≤ 3 %
Differential phase	≤ ± 2 °
Tilt (50 Hz)	≤ 1 %

Video S/N ratio

CCIR-weighted, rms measurements
referred to black-to-white transition

EMFT

Input level 3 mV	≥ 58 dB
Input level 10 mV and reduced IF gain	≥ 62 dB

EMFK

Input level 5 mV	≥ 62 dB

EMFD
Input level 1.5 V or 400 mV

VHF	≥ 67 dB
UHF	≥ 64 dB

Gain control	manual /automatic, switch-selected
Dynamic range	≥ 38 dB additional 2 x 10 dB auatomatic input attenuation for EMFT

Transmission Characteristics in Audio Channel

Audio broadband output

Amplitude / frequency response flatness

30 Hz to 47 Hz	≤ ± 0.05 dB
47 Hz to 120 Hz	≤ ± 0.5 dB

Phase / frequency response flatness

30 Hz to 47 Hz	≤ ± 0.5 °

Harmonic distortion

± 25 kHz deviation, f_{mod} = 30 Hz to 15 kHz	≤ ± 0.1 %
± 25 kHz deviation, f_{mod} = 16 kHz to 50 kHz	≤ ± 0.5 %

Gain control

Deemphasis	75 µs

Frequency response flatness
without line-frequency trap

30 Hz to 15 kHz	≤ ± 0.3 dB

with line-frequency trap

30 Hz to 14 kHz	≤ ± 0.3 dB
15 kHz	0 to -3 dB

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Harmonic distortion
± 25 kHz deviation,
f_{mod} = 30 Hz to 15 kHz ..... ≤ ± 0.1 %

Intercarrier S/N ratio
Measurement to DIN 45405 (quasi peak)
feferred to nominal output level,
weighting to CCIR 468-3

without vision modulation ..... ≥ 54 dB

without sinusoidal vision
modulation (0 to 4.2 MHz ..... ≥ 46 dB

Indication

Analog meter for ..... a) input level with marking of optimum input level range

b) sound deviation
(switch-selected measurement range with FSD 50 kHz or 100 kHz)

c) marker for correct video output level

LED indication for ..... - selected channel
- no vision carrier
- no sound carrier
- MTS signal

Miscellaneous

Zero-reference pulse ..... for checking of residual carrier; field-repetitive can be enabled into field blanking interval (lines 10 to 20 adjustable, default line 14) or triggered by external pulse

Error referred to CVS
in case of synchronous detection ..... ≤ 1.5 %

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1.3 General Data

Rated temperature range	+ 5 to + 45 °C
Operating temperature range	0 to + 70 °C
Power supply	110/120/220/240 V ± 10 % 47 to 63 Hz/110 VA
Dimensions (W x H x D), weight 19" bench model	450 mm x 345 mm x 525 mm, 16 kg

Ordering information

Order designation - Standard M

- TV Test Receiver EMFT
  838.6010.50
- TV Test Demodulator EMFD
  838.6032.50
- TV Channel Receiver EMFK
  838.6055.50 Band I
  838.6055.53 Band III
  838.6055.54 Band IV/V

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2 Preparation for Use

refer to sections 3.1 and 3.2 "Legend for Front and Rear Panels"

2.1 Putting into Operation

Before putting the test receiver into operation, make sure that

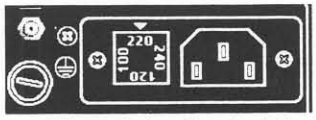
- the correct AC supply voltage has been selected,
- no inadmissibly high voltage is applied to the inputs,
- the unit is operated in the permissible temperature range (+ 5° to + 45°C),
- the blower on the rear panel is not covered (to avoid overheating of the unit),
- the outputs are not overloaded or wrongly connected.

Caution: *Damage may be caused to the equipment if the limits specified for the input voltages or the output load impedances (see data sheet) are exceeded.*

2.1.1 Setting to Local AC Supply

Check the setting of the AC supply voltage and the power fuse on the rear panel before putting the equipment into operation.

The power connector is on the rear panel. The unit is factory-set to 220/230 V. A deviation of + 10/-15 % from the preset voltage value is permissible. If the setting is to be changed, take out the voltage selector next to the power connector and reinsert it according to the new value.



To this end, screw off the cap of the fuse holder using a screwdriver and change the position of the fuseholder in the line filter so that the white arrow points to the desired voltage value.

With AC supplies of 100 to 120 V, the 1-A slow-blow fuse must be replaced by a 2-A slow-blow fuse.

2.1.2 Electromagnetic Screening

To avoid impairment from electromagnetic interference, the unit must be completely closed and fitted with all shielding covers. If it is to be opened for calibration, appropriate protective measures must be taken. Use only screened cables for the IEC/IEEE bus. Unimpaired results of measurement are only obtained if the RF and video connections are made by means of screened coaxial cables with matched impedance. Use a standard European power cable for the AC supply connection.

2.2 Positioning the Unit

When the test receiver is used as a bench unit, ensure that the ventilation is unobstructed to prevent overheating of the unit, especially in continuous operation. Sufficient ventilation must also be provided if the unit is rackmounted.

2.2.1 Switching On



Switch on the test receiver by pressing the power key. The green LED indicates the ON status.

The red LED comes on if a power supply failure has occurred, eg shortcircuit or overvoltage. Flashing during switch-on or switch-off is normal.

2.2.2 Battery Back-up

When the lithium battery is exhausted, nonvolatile storage of the device functions is no longer possible. Replace the battery as described in section 4.4.

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2.3 Internal Coding Links

The settings of the coding links should only be changed when servicing the unit. The various coding options are described in the following table.

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2.3.1 Coding Options

Link	Module	Position	Function
X240 and X245	RF section	1-2 2-3	Normal operation 100-MHz trap OFF
X15	Synthesizer	1-2 2-3	Not to Standard M Standard M
X25	Synthesizer	1-2 2-3	EPROM, range 1 EPROM, range 2
X557	IF section	1-2 1-2 open	Normal operation (local control) Zero reference disabled
X645	IF section	1-2 1-2 open 2-3	Normal operation Synchronous detection Envelope detection
X765	IF section	1-2 2-3	Normal operation Inphase signal and quadrature signal interchanged
X760	IF section	NOT SAM SAMPLED	Q-Signal not sampled (Normal operation) Q-Signal sampled
X121	Motherboard	1-2 2-3 open	Normal operation Sound trap OFF Sound trap ON
X137	Motherboard	1-2 2-3	EMFT EMFD/EMFK
X139	Motherboard	1-2 2-3	Normal operation SAW filter OFF
X251	Motherboard	1-2 2-3	Normal operation, inverter for external zero-reference pulse ON External zero reference pulse not inverted
X327	Motherboard	1-2 2-3 open	Normal operation Squelch always active Squelch inactive
X407	Motherboard	1-2 2-3	Normal operation Monophonic output without deemphasis
X411	Motherboard	1-2 2-3	Normal operation Internal loudspeaker and headphone output switched off, AF output to X2.20 (37-contact connector X2)
X413	Motherboard	1-2 2-3	Normal operation SYNCHR/ENVELOPE and ZERO REFERENCE ON only possible in external mode, front-panel operation blocked, REMOTE LED on
X20	Power supply	1-2 2-3	Normal operation + 5-V back-up battery disconnected
X40	Power supply	1-2 2-3	Normal operation Blower switched off
X125/X126	IEEE 488 Interface	1-2 2-3	Normal operation: EPROMs D125 and D130 RAMs D125 and D130
X135	IEEE 488 Interface	1-2 2-3	Normal operation: 8K x 8 RAMs D135 and D140 32K x 8 RAMs D135 and D140

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3 Legend for Front and Rear Panels

3.1 Front Panel

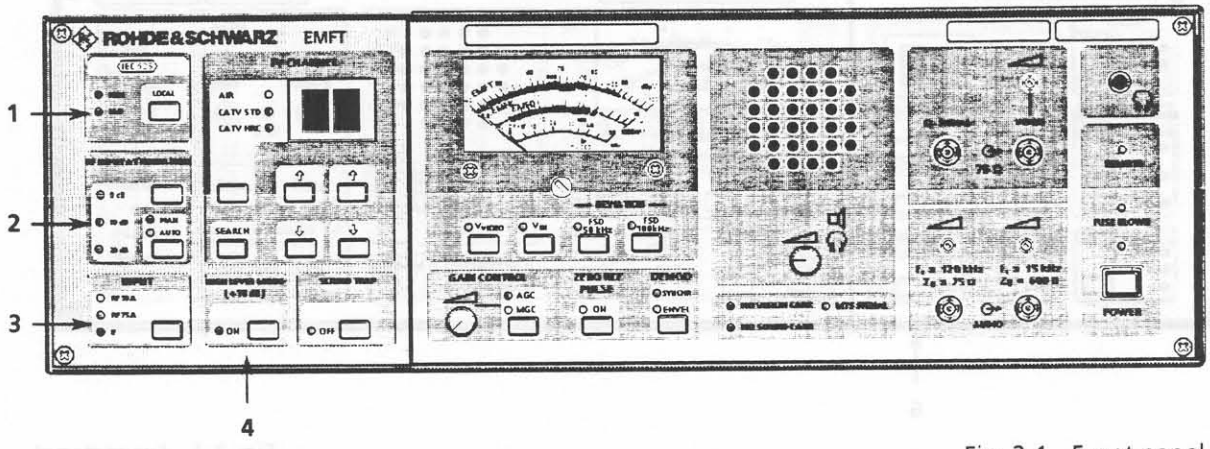
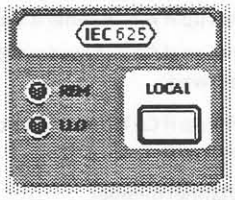
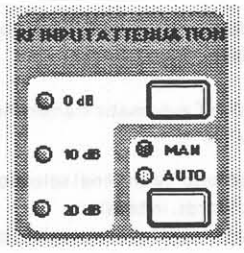
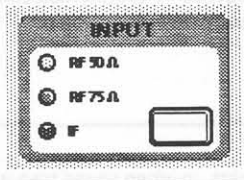


Fig. 3-1 Front panel

Item	Inscription	Function		
1		**REM**	Yellow LED	Lights up during remote control (only with IEC/IEEE 488 bus option)
		LLO	Yellow LED	Lights up with local lock-out (only with IEC/IEEE 488 bus option)
		LOCAL	Key	Local/remote switchover (only with IEC/IEEE 488 bus option)
2		**0 dB**	Green LED	Lights up at 0-dB input attenuation
		10 dB	Green LED	Lights up at 10-dB input attenuation
		20 dB	Green LED	Lights up at 20-dB input attenuation
		MAN	Yellow LED	Lights up when manual RF input attenuation has been selected
			Key	Manual selection of RF input attenuation attenuation has been selected (0/10/20 dB)
		AUTO	Green LED	Lights up when automatic RF input attenuation has been selected
			Key	Selection of automatic RF input attenuation
3		**RF 50 Ω**	Green LED	Lights up when 50-Ω RF input has been selected
		RF 75 Ω	Green LED	Lights up when 75-Ω RF input has been selected
		IF	Yellow LED	Lights up when IF input has been selected
			Key	Selection of test input (RF 50Ω/RF 75 Ω/IF)
4		**HIGH LEVEL MODE (+ 10 dB)**		
		ON	Yellow LED	Lights up if reduced IF amplification is selected (demodulator mode)
			Key	Selection of reduced IF amplification

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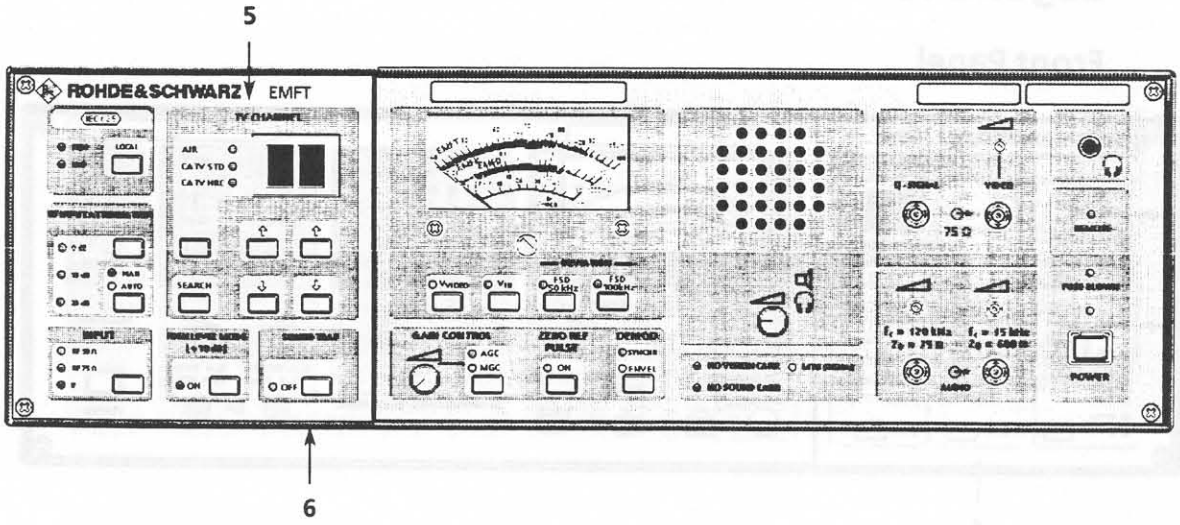
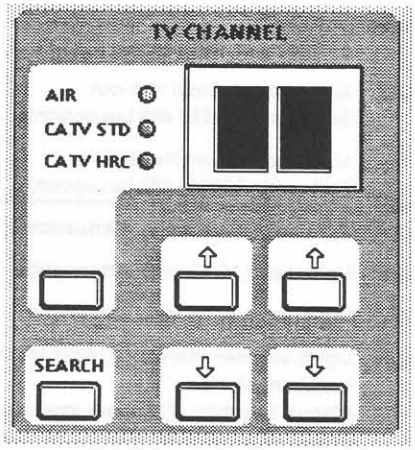


Fig. 3-1 Front panel

Item	Inscription	Function		
5		**AIR**	Green LED	Lights up if AIR channel is received
		CATV STD	Green LED	Lights up if CATV Standard channel is received
		CATV HRC	Green LED	Lights up if CATV Harmonic channel is received
			Digital display of channel number	
			Key	Selection of AIR, CATV STD or CATV HRC receive mode
		SEARCH	Key	Start of automatic transmitter search
		⇧ (left)	Key	Stepwise TV channel selection (upwards, in tens)
		⇧ (right)	Key	Stepwise TV channel selection (upwards, in units)
		⇩ (left)	Key	Stepwise TV channel selection (downwards, in tens)
		⇩ (right)	Key	Stepwise TV channel selection (downwards, in units)
6		**SOUND TRAP ON**	Green LED	Lights up when sound trap is switched on
			Key	Switch-on of sound trap

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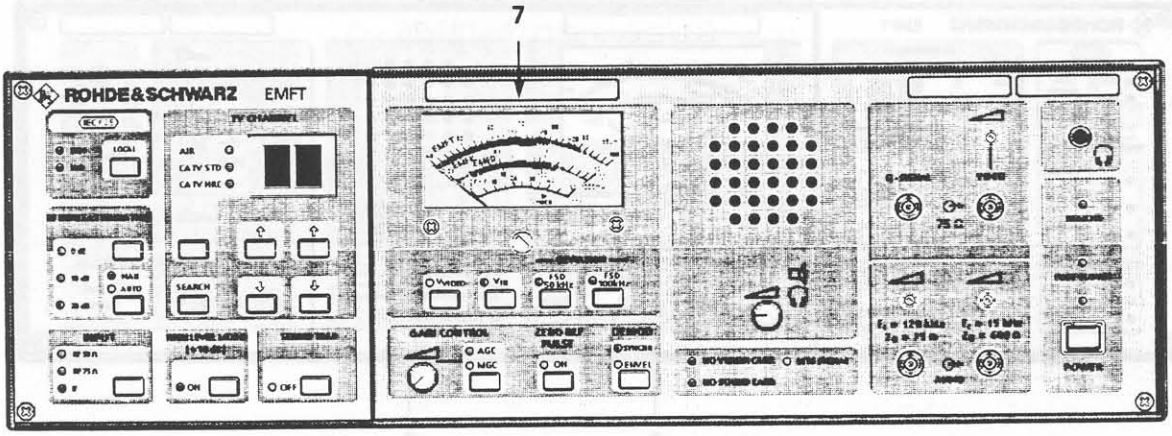
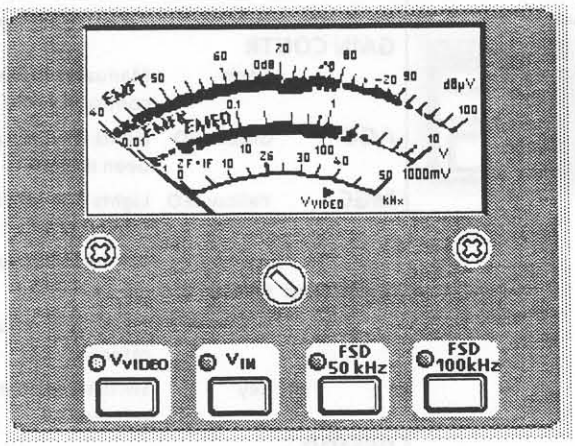


Fig. 3-1 Front panel

Item	Inscription	Function
7		**Meter** (calibrated scale) Indication of input level, video, frequency deviation of sound signals Zeroing screw Zero adjustment of pointer (with unit switched off) **V_{VIDEO}** Green LED Lights up when "V_{VIDEO}" measurement range has been selected Key Selection of "V_{VIDEO}" measurement range **V_{IN}** Green LED Lights up when "V_{IN}" measurement range has been selected Key Selection of "V_{IN}" measurement range **DEVIATION** **FSD 50 kHz** Green LED Lights up when measurement range "50 kHz" has been selected Key Selection of measurement range "50 kHz" **FSD 100 kHz** Green LED Lights up when measurement range "100 kHz" has been selected Key Selection of measurement range "100 kHz"

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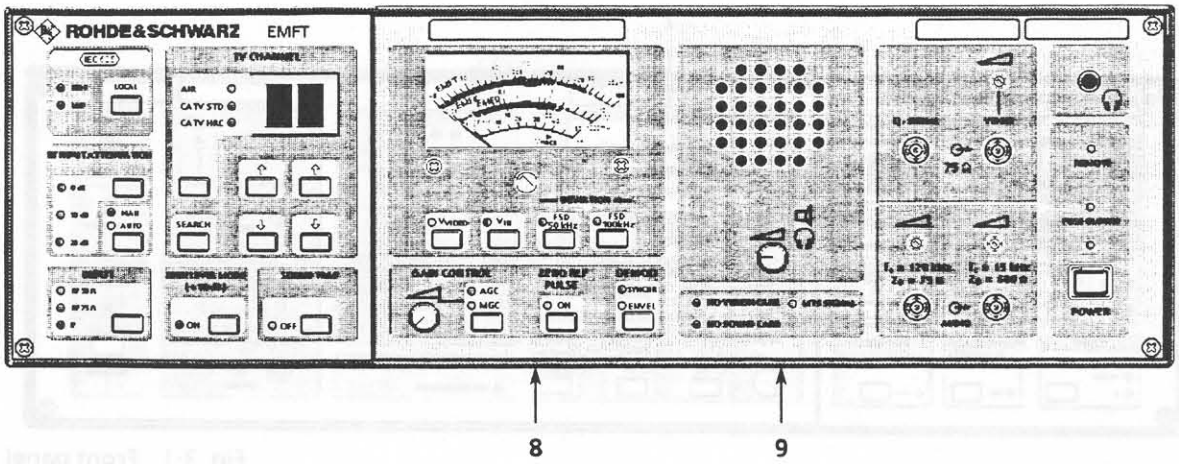
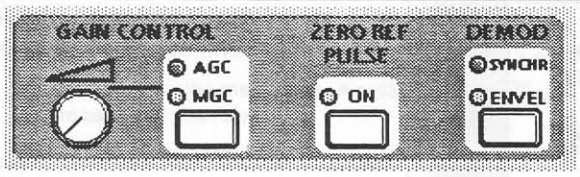


Fig. 3-1 Front panel

Item	Inscription	Function		
8		**GAIN CONTR**	Knob	Manual adjustment of control voltage
		AGC	Green LED	Lights up when AGC has been selected
		MGC	Yellow LED	Lights up when MGC has been selected
			Key	AGC/MGC switchover
		ZERO REF PULSE		
			Yellow LED	Lights up with zero reference ON
			Key	Switch-on of zero reference
		DEMOD SYNCHR	Green LED	Lights up when synchronous detector has been selected
		ENVEL	Yellow LED	Lights up when envelope detector has been selected
			Key	Selection of demodulation mode
9		**NO VISION CARR**	Red LED	Lights up if vision carrier is not available
		NO SOUND CARR	Red LED	Lights up if sound carrier is not available
		MTS SIGNAL	Green LED	Lights up in MTS mode

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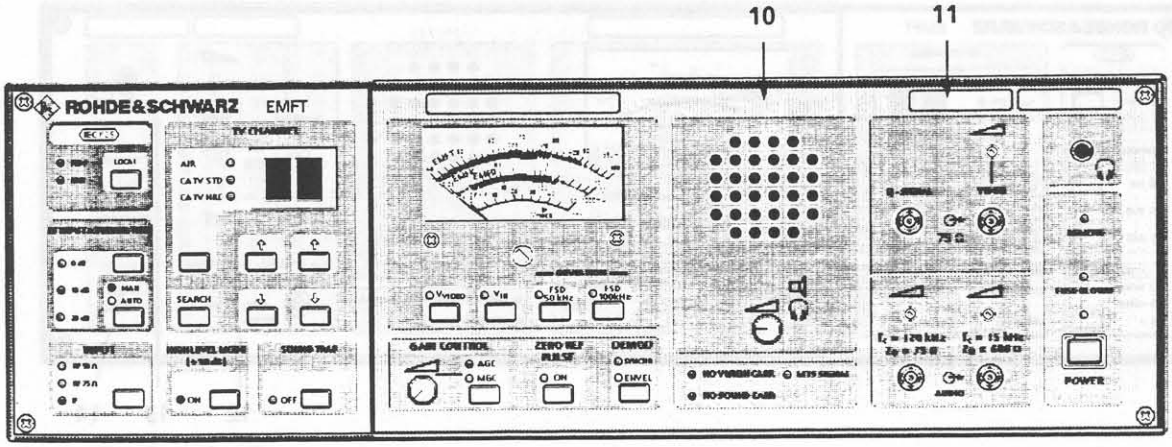
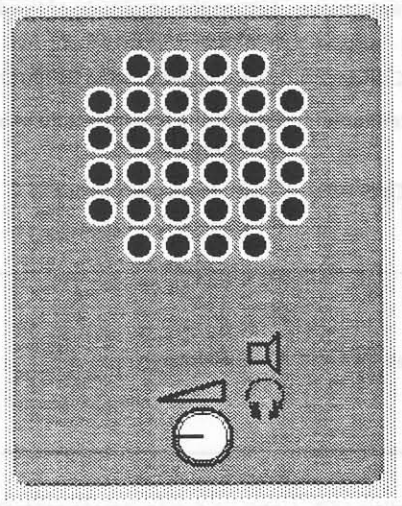
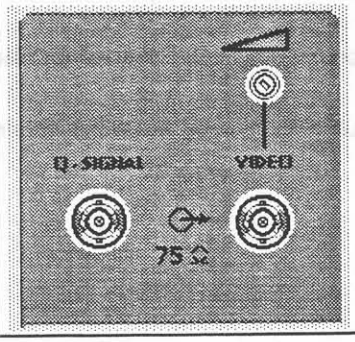


Fig. 3-1 Front panel

Item	Inscription	Function		
10		**Loudspeaker** Knob		Volume control loudspeaker or headphone
11		**Q SIGNAL**	BNC socket	Q signal output (75 Ω)
		VIDEO	BNC socket	Video output (75 Ω)
			Potentiometer	Setting the amplitude of the video output signal

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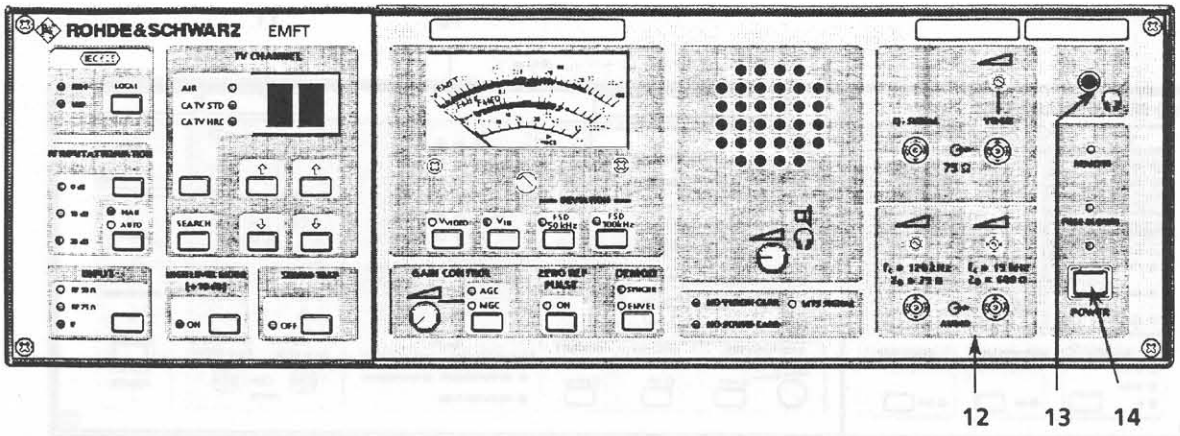
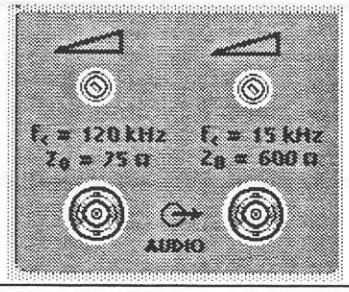
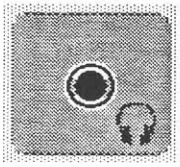


Fig. 3-1 Front panel

Item	Inscription	Function		
12		f_c = 120 kHz Z_0 = 75 Ω	Potentiometer	Setting the amplitude of the audio wideband output
		AUDIO	BNC socket	Audio Wideband Output 75 Ω
		f_c = 15 kHz Z0 = 600 Ω	Potentiometer	Setting the amplitude of the audio mono output
		AUDIO	BNC socket	Audio Mono Output 75 Ω
13			Socket 6,3 mm	Headphone output
14		**REMOTE**	Yellow LED	Lights up during remote control
		FUSE BLOWN	Red LED	Lights up if primary fuse has blown
		POWER	Green LED	Indicates the ON status of the unit
			Key	Power switch

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3.2 Rear Panel

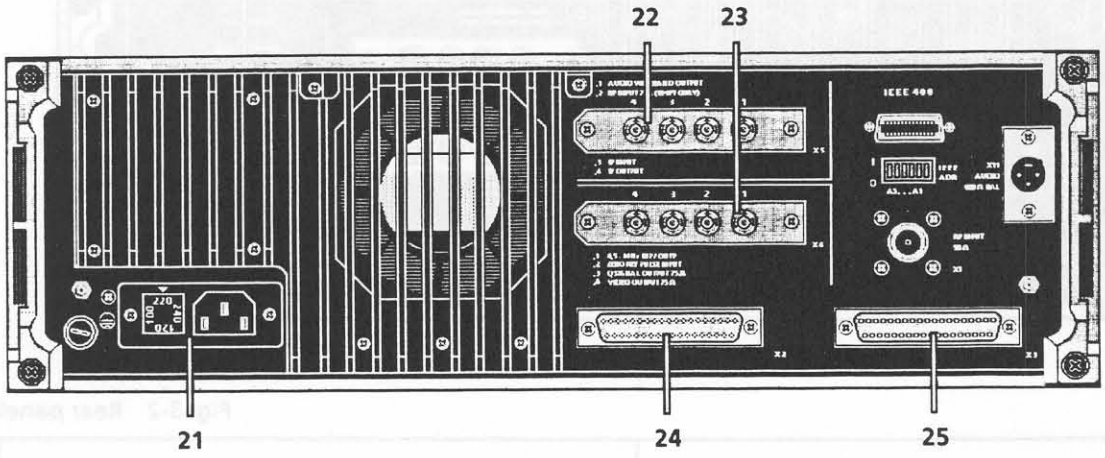
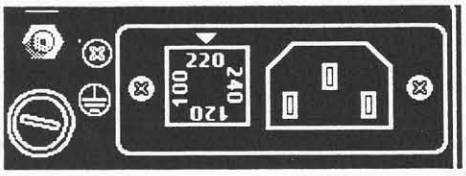
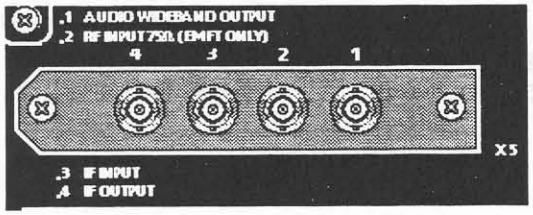
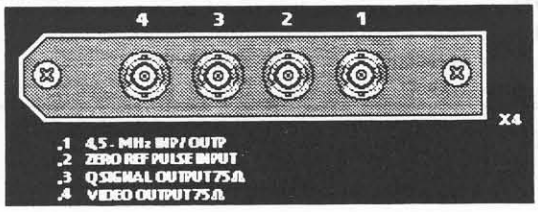
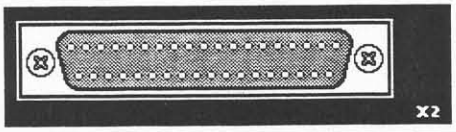
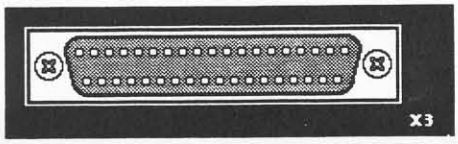


Fig. 3-2 Rear panel

Item	Inscription	Function	
21		**F1** **100/120/220/240** **47 to 63 Hz**	Primary fuse Voltage selector Power connector
22		**X5.1** **AUDIO WIDEBAND OUTPUT** BNC socket 75 Ω **X5.2** **RF INPUT 75Ω (EMFT ONLY)** BNC socket 75 Ω **X5.3** **IF INPUT** BNC socket 50 Ω **X5.4** **IF OUTPUT** BNC socket 50 Ω	
23		**X4.1** **4.5 - MHz INP / OUTP** BNC socket 75 Ω **X4.2** **ZERO REF PULSE INPUT** BNC socket 75 Ω **X4.3** **Q-SIGNAL OUTPUT** BNC socket 75 Ω **X4.4** **VIDEO OUTPUT 75 Ω** BNC socket 75 Ω	
24		**X2** 37-contact connector	Remote-control connector: commands, messages, audio outputs, loudspeaker output (motherboard)
25		**X3** 37-contact connector	Remote-control connector: commands, messages, power supply for remote-control equipment (RF section)

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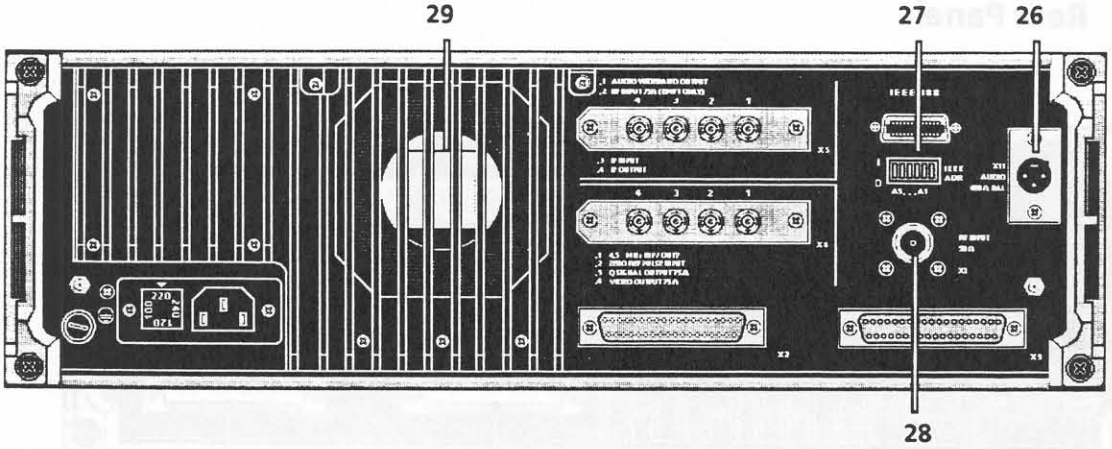
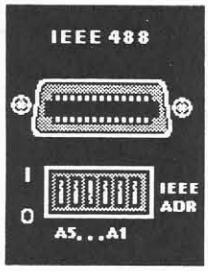
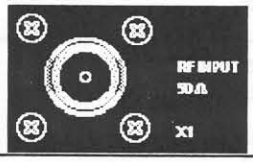


Fig. 3-2 Rear panel

Item	Inscription	Function
26		**X11 AUDIO 600 Ω BAL** XLR socket — AUDIO output 600 Ω
27		**IEEE 488** 24-contact socket — Connection of IEC/IEEE bus, X10 **IEEE ADR** DIL switch — Setting of device address, S10
28		**RF INPUT 50 Ω X1** N - connector — RF Input 50 Ω
29		**Blower** — **Note:** *do not cover!*

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3.3 Operation

See sections 3.1 and 3.2 "Legend for Front and Rear Panels"

3.3.1 Switching On



The Test Receiver EMFT is switched on by pressing the POWER key at the bottom right on the front panel. The green LED above the key indicates the ON status. The red LED comes on if the power fuse has blown. If the fuse blows again following replacement, either the voltage selector has been set to the wrong value or a fault is present in the unit.

3.3.2 Checking the Blower

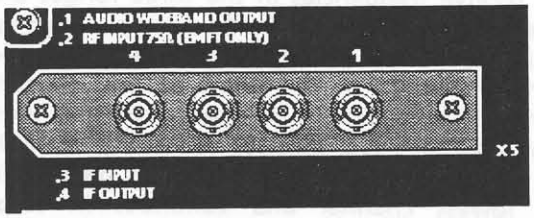


The blower protects the components from overheating. If it fails, check whether link X40 on the power supply board is in position 1-2. If the blower does not work although X40 is correctly set, it needs to be repaired.

3.3.3 Signal Input

The RF input level range extends from 0.1 to 50 mV (40 to 94 dBµV). If the EMFT is used as a demodulator, it is also possible to select the range 0.3 to 150 mV (50 to 104 dBµV, see 3.3.8). If the RF input level is over the limit, an appropriate input attenuator must be switched in.

Note: *60 dBµV ≙ U_{rms} = 1 mV.*

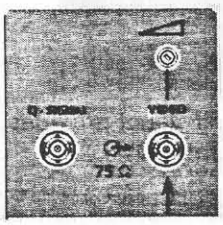


The characteristic impedance is 50 Ω (X5.1) or 75 Ω (X5.2). The IF signal can also be applied directly to the IF section via X5.3.



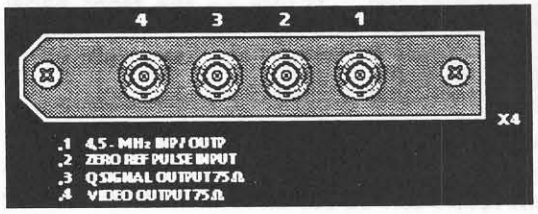
The level should be in the range 5 to 100 mV_{rms}. The selected input is indicated by the associated LED (RF 50 Ω/ RF 75 Ω/IF) and stored in case of AC supply failure.

3.3.4 Signal Outputs

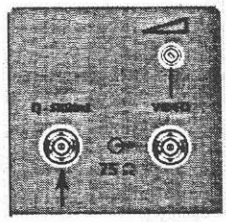


The EMFT has two video outputs (BNC connectors), one on the front panel (VIDEO)...

...and the other on the rear panel (X4.4).

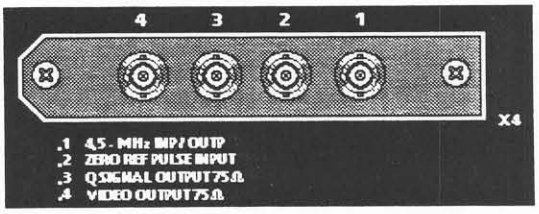


The outputs are isolated and factory-set to 1.11 V_{pp} into 75 Ω. They are used for connecting equipment such as video analyzer, monitor, oscilloscope or special measuring instruments for signal evaluation.



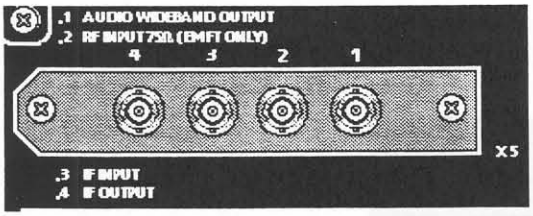
The quadrature output (Q signal) of the synchronous detector too is located on both front panel ...

... and rear panel (X4.3).

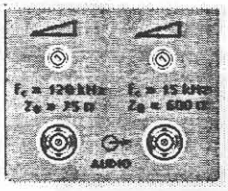


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In normal operation, ie with a correct phase of the vision carrier, this output does not provide any video signal. However, the video amplitude increases with increasing phase shift; if the phase shift is 90°, the Q signal is equal to the I signal but has a reduced bandwidth. The quadrature output, for example, is designed for measuring the incidental carrier phase modulation (ICPM) of a transmitter. The Q signal is useful for adjusting linearity compensating circuits and the modulator balance of transmitters.



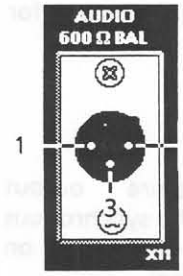
The IF output (X5.4) on the rear panel provides a regulated IF signal (100 mV_{rms} into 50 Ω).



The BNC connectors AUDIO f_c = 120 kHz and AUDIO f_c = 15 kHz on the front panel provide the audio signals which are band-limited to 120/15 kHz.

These are also available at the 5-contact connector (X11) on the rear panel. The audio output levels can be set to the standard level by means of the potentiometers on the front panel.

Contact assignment of X11:



1 = ground
2 + 3 = balanced output

Fig. 3-3 Contact assignment of X11

3.3.5 Range Selection

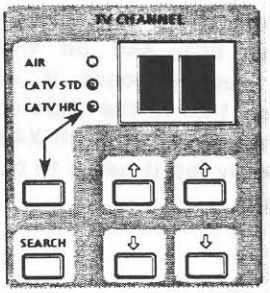
The EMFT can be used for three different channel assignments. To select the range, press key:

AIR:
LOW VHF Band
HIGH VHF Band
UHF VHF Band

CATV STANDARD:
LOW VHF Band — SUPER Band
HIGH VHF Band — HYPER Band
MID Band

CATV HARMONIC:
LOW VHF Band — SUPER Band
HIGH VHF Band — HYPER Band
MID Band

The programmed receive frequencies of this range are the same as those of the normal range. Customized programming of the EPROM can be carried out, if required - e.g. offset channels, channels outside television standard.



The range selected with the key is indicated by the associated LED (AIR, CATV STD, CATV HRC). The selection is stored in the event of power failure.

The channel and vision carrier frequencies for different standards are listed in Table 3.3.18.2. The various EMFT models are specified in Technical Information.

3.3.6 Tuning

The receive frequencies in the three ranges are tuned at the standardized channel spacing. Tuning is carried out either in the automatic search mode or by the entry of the channel number. The readout of the channel number is on two 7-segment LED displays. When the SEARCH key is pressed, the automatic search starts with the lowest channel and continues in steps upwards. As soon as a receivable transmitter has been found (the threshold is adjustable with R39 on the synthesizer module), the search stops. The search can also be stopped by pressing one of the TV CHANNEL (up/down) keys and restarted with the lowest channel number on pressing the SEARCH key again (also applies when the test

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receiver is switched on again). The search is automatically terminated on the highest channel.

The channel number can be directly selected in units and tens steps by means of the TV CHANNEL keys. The selected receive channel is stored automatically on an AC supply failure.

3.3.7 RF Attenuation



If the RF input level exceeds a value of approx. 70 dBµV, an integrated 10-dB attenuator is automatically switched in. The attenuation is increased to 20 dB with an RF level above 80 dBµV. The RF input attenuation can also be set manually on pressing the MAN key.

The selected attenuation is automatically added to the measured value, i.e. the value displayed corresponds to the input voltage applied. The switching thresholds are set for optimum operation (compromise between S/N ratio and linearity) in the ranges 65 and 90 dBµV. The LEDs (0 dB, 10 dB and 20 dB) indicate the selected attenuation, which is stored in a nonvolatile memory.

3.3.8 Demodulation

To improve the S/N ratio (from 56 to 60 dB), a higher input level (10 mV instead of 3 mV) can be applied. This is particularly desirable if the EMFT is used as a test demodulator.



To improve the S/N ratio (from 56 to 60 dB), a higher input level (10 mV instead of 3 mV) can be applied. This is particularly desirable if the EMFT is used as a test demodulator. To this end, reduce the IF gain by 10 dB using the DEMOD key.

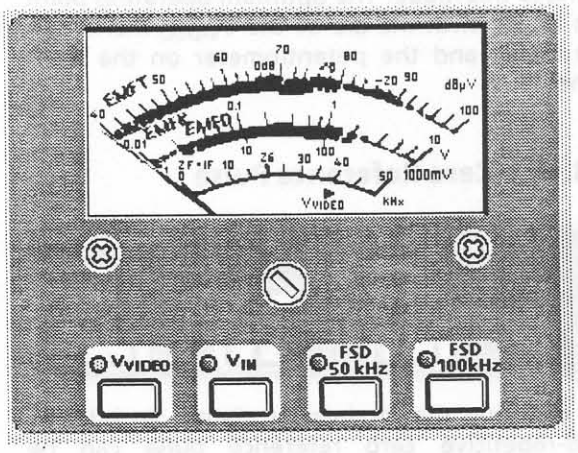
The additional attenuation is automatically taken into account in the readout, i.e. the value displayed corresponds to the input voltage. The demodulation mode is indicated by the LED (10 dB ON).

3.3.9 SAW Filter



A higher adjacent-channel suppression can be achieved by connecting a SAW filter. When the filter is activated with the SAW key, the green LED next to the key lights up. The filter is recommended for cable TV but should not be used for relay reception because of the high ripple.

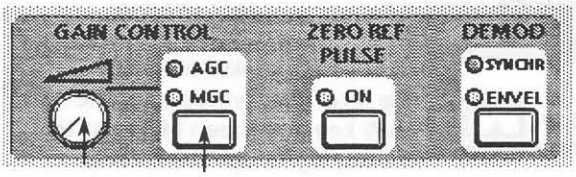
3.3.10 Panel Meter



The RF input level (dBµV), the IF input level (mV) and the deviation of sound carrier (kHz) can be read from the panel meter. The RF or IF input signal is levelled to line up with the V_{VIDEO} marker (corresponding to the standard level 1.12 V_{pp} into 75 Ω at the video output). When the measurement range is selected with the key V_{VIDEO} or V_{IN}, the corresponding green LED comes on. The thick bars on the meter indicate the optimum operating range of the unit.

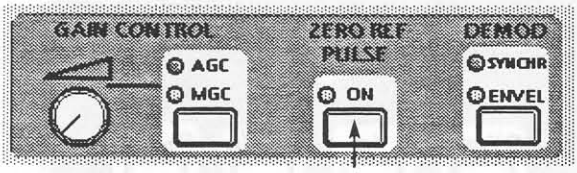
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3.3.11 IF Gain Control

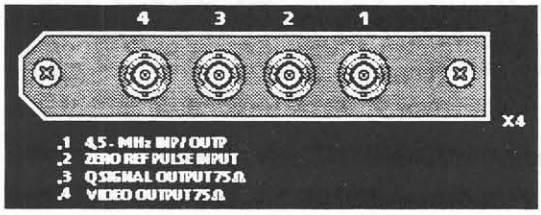


The IF gain control compensates for RF input voltage variations of min. 34 dB, typ. 40 dB. The performance data are guaranteed up to 34 dB. The typical AGC range is 60 dB, taking into account the automatic RF attenuation. The MGC key allows the control voltage to be set manually. The yellow LED next to the key lights up to indicate this mode. The optimum operating point can be set with the aid of the V_{VIDEO} marker on the meter and the potentiometer on the front panel.

3.3.12 Zero Reference Pulse

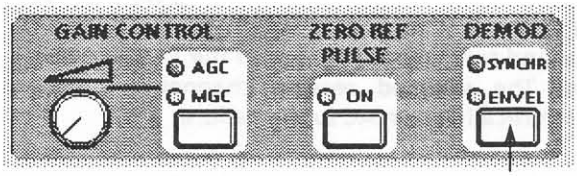


For checking the modulation depth, an internal field-repetitive zero reference pulse can be inserted by pressing the ZERO REF key. In this way, the carrier is blanked in a particular line of the field. The position can be set using R243 (motherboard).



It is also possible to apply an external zero reference pulse (rear connector X4.2). The pulse amplitude should be at least 1.5 V_{pp} into 75 Ω. A built-in inverter can be set for an external pulse of inverse phase with link X251 in position 1-2 (motherboard).

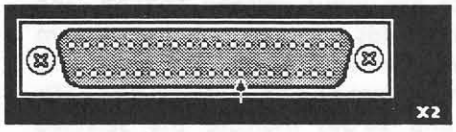
3.3.13 Selection of Detector



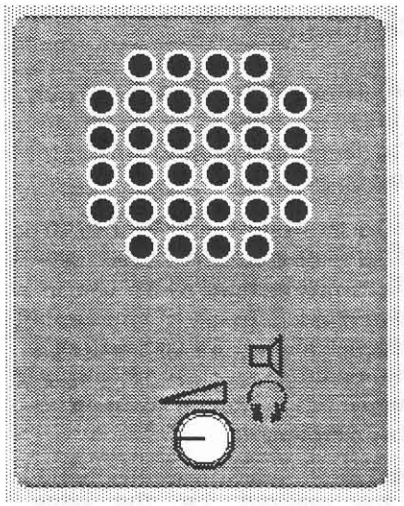
The EMFT has an envelope detector and a synchronous detector with Q signal output (see section 3.3.4). Compared to envelope detection, synchronous detection provides maximum signal quality in relay reception and measurements. The detector selected with the DEMOD key is indicated by the corresponding green LED.

3.3.14 Sound Trap

The sound trap in the IF amplifier can be switched off by setting link X139 to 2-3 (motherboard). It can also be switched off via remote connector X3.10 (0 V).

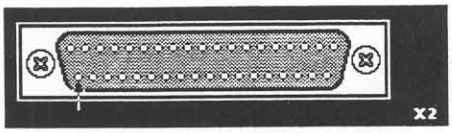


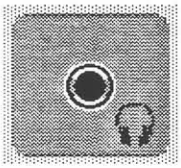
3.3.15 Loudspeaker



A small loudspeaker is fitted on the front panel for checking the sound.

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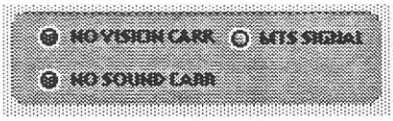




The loudspeaker output can also be made available at connector X2.20 if link X411 is set to 1-3 (motherboard). The knob below the loudspeaker is for volume control of loudspeaker or headphone.

The selected sound carrier is indicated by the corresponding green LED.

3.3.16 Indication of Carrier and Pilot Frequencies



The following LEDs provide further information on the received signal with respect to the vision and sound carrier applied to the EMFT are of adequate level. LED indicates whether the sound carrier is modulated with a multichannel TV sound signal (MTS).

- NO VISION CARR
- NO SOUND CARR
- MTS SIGNAL

The assignment of the various LEDs can be looked up in section 3.1.

3.3.17 Vision / Sound Ratio Measuring Output

The vision/sound ratio of the RF input signal can be determined by measuring the voltage at X2.33 and using the following diagram.

$$Vision/Sound - Ratio\,(dB) = 20log\,\frac{2.5\,V}{U_{X2.33}\,(V)} + 10\,dB$$

3.3.18 EPROM for Channel/Frequency Assignment

An EPROM (D55) on the synthesizer PCB determines the receive frequency setting when the type of channel (normal, special, offset) is selected. An EPROM is able to store the frequencies of two tables (selectable with link X25: position 1-2 for Table 1, position 2-3 for Table 2). Normally, the EMFT is fitted with a country-specific EPROM (see Tables 3.3.18.2). Customized EPROMs can also be supplied. In this case, it is necessary to fill in the form PD 756.9645.51 stated in 3.3.18.1 by specifying 100 frequencies (maximum resolution 1 kHz) for each channel type (normal, special, offset). For the customized EPROM, link X25 must be set to position 1-2.

If more than 300 frequencies are required, further frequencies can be selected using IEC-bus option 821.4254.02.

Note: *With the EMFT, frequencies may also be entered via the front panel.*

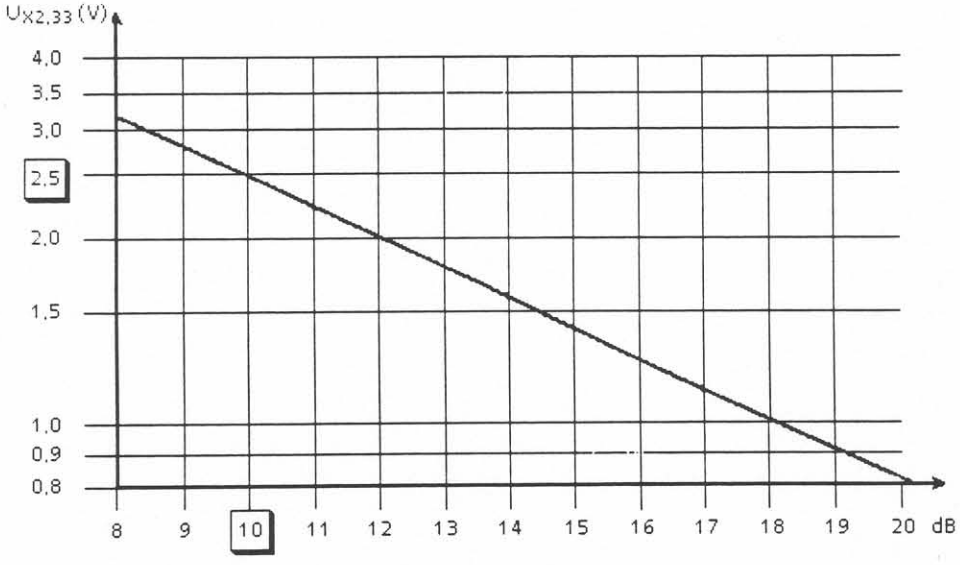


Fig. 3-4 Vision / Sound Ratio Measuring Output

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3.3.18.1 Form PD 756.9645.51

(see following four pages)

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3.3.18.2 Tables of Channel/Vision Carrier Frequencies

Table 1	Standard M (USA)		
Display	AIR	Frequency (MHz)	Filter
02	A2	55.25	0
03	A3	61.25	0
04	A4	67.25	0
05	A5	77.25	0
06	A6	83.25	0
07	A7	175.25	2
08	A8	181.25	2
09	A9	187.25	2
10	A10	193.25	2
11	A11	199.25	2
12	A12	205.25	2
13	A13	211.25	2
14	A14	471.25	6
15	A15	477.25	6
16	A16	483.25	6
17	A17	489.25	6
18	A18	495.25	6
19	A19	501.25	6
20	A20	507.25	6
21	A21	513.25	6
22	A22	519.25	6
23	A23	525.25	6
24	A24	531.25	6
25	A25	537.25	6
26	A26	543.25	6
27	A27	549.25	6
28	A28	555.25	6
29	A29	561.25	6
30	A30	567.25	6
31	A31	573.25	6
32	A32	579.25	6
33	A33	585.25	6
34	A34	591.25	6
35	A35	597.25	6
36	A36	603.25	6
37	A37	609.25	6
38	A38	615.25	6
39	A39	621.25	6
40	A40	627.25	7
41	A41	633.25	7
42	A42	639.25	7
43	A43	645.25	7
44	A44	651.25	7

Table 2	Standard M (USA)		
Display	CATV STD	Frequency (MHz)	Filter
02	C2	55.25	0
03	C3	61.25	0
04	C4	67.25	0
05	C5	77.25	0
06	C6	83.25	0
07	C7	175.25	2
08	C8	181.25	2
09	C9	187.25	2
10	C10	193.25	2
11	C11	199.25	2
12	C12	205.25	2
13	C13	211.25	2
14	C14	121.25	1
15	C15	127.25	1
16	C16	133.25	1
17	C17	139.25	1
18	C18	145.25	1
19	C19	151.25	1
20	C20	157.25	1
21	C21	163.25	1
22	C22	169.25	1
23	C23	217.25	2
24	C24	223.25	2
25	C25	229.25	3
26	C26	235.25	3
27	C27	241.25	3
28	C28	247.25	3
29	C29	253.25	3
30	C30	259.25	3
31	C31	265.25	3
32	C32	271.25	3
33	C33	277.25	3
34	C34	283.25	3
35	C35	289.25	3
36	C36	295.25	3
37	C37	301.25	4
38	C38	307.25	4
39	C39	313.25	4
40	C40	319.25	4
41	C41	325.25	4
42	C42	331.25	4
43	C43	337.25	4
44	C44	343.25	4

Table 3	Standard M (USA)		
Display	CATV HRC	Frequency (MHz)	Filter
02	H2	54	0
03	H3	60	0
04	H4	66	0
05	H5	78	0
06	H6	84	0
07	H7	174	2
08	H8	180	2
09	H9	186	2
10	H10	192	2
11	H11	198	2
12	H12	204	2
13	H13	210	2
14	H14	120	1
15	H15	126	1
16	H16	132	1
17	H17	138	1
18	H18	144	1
19	H19	150	1
20	H20	156	1
21	H21	162	1
22	H22	168	1
23	H23	216	2
24	H24	222	2
25	H25	228	3
26	H26	234	3
27	H27	240	3
28	H28	246	3
29	H29	252	3
30	H30	258	3
31	H31	264	3
32	H32	270	3
33	H33	276	3
34	H34	282	3
35	H35	288	3
36	H36	294	3
37	H37	300	4
38	H38	306	4
39	H39	312	4
40	H40	318	4
41	H41	324	4
42	H42	333	4
43	H43	336	4
44	H44	342	4

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Table 4	Standard M (USA)		
Display	AIR	Frequency (MHz)	Filter
45	A45	657.25	7
46	A46	663.25	7
47	A47	669.25	7
48	A48	675.25	7
49	A49	681.25	7
50	A50	687.25	7
51	A51	693.25	7
52	A52	699.25	7
53	A53	705.25	7
54	A54	711.25	7
55	A55	717.25	7
56	A56	723.25	7
57	A57	729.25	7
58	A58	735.25	7
59	A59	741.25	7
60	A60	747.25	7
61	A61	753.25	7
62	A62	759.25	7
63	A63	765.25	7
64	A64	771.25	7
65	A65	777.25	7
66	A66	783.25	7
67	A67	789.25	7
68	A68	795.25	7
69	A69	801.25	7
70	A70	807.25	7
71	A71	813.25	7
72	A72	819.25	7
73	A73	825.25	7
74	A74	831.25	7
75	A75	837.25	7
76	A76	843.25	7
77	A77	849.25	7
78	A78	855.25	7
79	A79	861.25	7
80	A80	867.25	7
81	A81	873.25	7
82	A82	879.25	7
83	A83	885.25	7
84	---		
85	---		
86	---		
87	---		
88 to 99	not used		

Table 5	Standard M (USA)		
Display	CATV STD	Frequency (MHz)	Filter
45	C45	349.25	4
46	C46	355.25	4
47	C47	361.25	4
48	C48	367.25	4
49	C49	373.25	5
50	C50	379.25	5
51	C51	385.25	5
52	C52	391.25	5
53	C53	397.25	5
54	C54	73.25	0
55	C55	79.25	0
56	C56	85.25	0
57	C57	91.25	0
58	C58	97.25	0
59	C59	103.25	1
60	C60	109.25	1
61	C61	115.25	1
62	C62	403.25	5
63	C63	409.25	5
64	C64	415.25	5
65	C65	421.25	5
66	C66	427.25	5
67	C67	433.25	5
68	C68	439.25	5
69	C69	445.25	5
70	C70	451.25	5
71	C71	457.25	5
72	C72	463.25	5
73	C73	469.25	6
74	C74	475.25	6
75	C75	481.25	6
76	C76	487.25	6
77	C77	493.25	6
78	C78	499.25	6
79	C79	505.25	6
80	C80	511.25	6
81	C81	517.25	6
82	C82	523.25	6
83	C83	529.25	6
84	C84	535.25	6
85	C85	541.25	6
86	C86	547.25	6
87	C87	553.25	6
88 to 99	C88	559.25	6

Table 6	Standard M (USA)		
Display	CATV HRC	Frequency (MHz)	Filter
45	H45	348	4
46	H46	354	4
47	H47	360	4
48	H48	366	4
49	H49	372	5
50	H50	378	5
51	H51	384	5
52	H52	390	5
53	H53	396	5
54	H54	72	0
55	H55	78	0
56	H56	84	0
57	H57	90	0
58	H58	96	0
59	H59	102	1
60	H60	108	1
61	H61	114	1
62	H62	403	5
63	H63	409	5
64	H64	415	5
65	H65	421	5
66	H66	427	5
67	H67	433	5
68	H68	429	5
69	H69	445	5

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Table 7	Standard M (CANADA)		
Display	AIR	Frequency (MHz)	Filter
00	---	---	---
01	---	---	---
02	A2	55.25	0
03	A3	61.25	0
04	A4	67.25	0
05	A5	77.25	0
06	A6	83.25	0
07	A7	175.25	2
08	A8	181.25	2
09	A9	187.25	2
10	A10	193.25	2
11	A11	199.25	2
12	A12	205.25	2
13	A13	211.25	2
14	A14	471.25	6
15	A15	477.25	6
16	A16	483.25	6
17	A17	489.25	6
18	A18	495.25	6
19	A19	501.25	6
20	A20	507.25	6
21	A21	513.25	6
22	A22	519.25	6
23	A23	525.25	6
24	A24	531.25	6
25	A25	537.25	6
26	A26	543.25	6
27	A27	549.25	6
28	A28	555.25	6
29	A29	561.25	6
30	A30	567.25	6
31	A31	573.25	6
32	A32	579.25	6
33	A33	585.25	6
34	A34	591.25	6
35	A35	597.25	6
36	A36	603.25	6
37	A37	609.25	6
38	A38	615.25	6
39	A39	621.25	7

Table 8	Standard M (CANADA)		
Display	CATV STD	Frequency (MHz)	Filter
00	---	---	---
01	---	---	---
02	C2	55.25	0
03	C3	61.25	0
04	C4	67.25	0
05	C5	77.25	0
06	C6	83.25	0
07	C7	175.25	2
08	C8	181.25	2
09	C9	187.25	2
10	C10	193.25	2
11	C11	199.25	2
12	C12	205.25	2
13	C13	211.25	2
14	C14	121.25	1
15	C15	127.25	1
16	C16	133.25	1
17	C17	139.25	1
18	C18	145.25	1
19	C19	151.25	1
20	C20	157.25	1
21	C21	163.25	1
22	C22	169.25	1
23	C23	217.25	2
24	C24	223.25	2
25	C25	229.25	3
26	C26	235.25	3
27	C27	241.25	3
28	C28	247.25	3
29	C29	253.25	3
30	C30	259.25	3
31	C31	265.25	3
32	C32	271.25	3
33	C33	277.25	3
34	C34	283.25	3
35	C35	289.25	3
36	C36	295.25	3
37	C37	301.25	4
38	C38	307.25	4
39	C39	313.25	4

Table 9	Standard M (CANADA)		
Display	CATV HRC	Frequency (MHz)	Filter
00	---	---	---
01	---	---	---
02	H2	54	0
03	H3	60	0
04	H4	66	0
05	H5	78	0
06	H6	84	0
07	H7	174	2
08	H8	180	2
09	H9	186	2
10	H10	192	2
11	H11	198	2
12	H12	204	2
13	H13	210	2
14	H14	120	1
15	H15	126	1
16	H16	132	1
17	H17	138	1
18	H18	144	1
19	H19	150	1
20	H20	156	1
21	H21	162	1
22	H22	168	1
23	H23	216	2
24	H24	222	2
25	H25	228	3
26	H26	234	3
27	H27	240	3
28	H28	246	3
29	H29	252	3
30	H30	258	3
31	H31	264	3
32	H32	270	3
33	H33	276	3
34	H34	282	3
35	H35	288	3
36	H36	294	3
37	H37	300	4
38	H38	306	4
39	H39	312	4

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Table 10	Standard M (CANADA)		
Display	AIR	Frequency (MHz)	Filter
40	A40	627.25	7
41	A41	633.25	7
42	A42	639.25	7
43	A43	645.25	7
44	A44	651.25	7
45	A45	657.25	7
46	A46	663.25	7
47	A47	669.25	7
48	A48	675.25	7
49	A49	681.25	7
50	A50	687.25	7
51	A51	693.25	7
52	A52	699.25	7
53	A53	705.25	7
54	A54	711.25	7
55	A55	717.25	7
56	A56	723.25	7
57	A57	729.25	7
58	A58	735.25	7
59	A59	741.25	7
60	A60	747.25	7
61	A61	753.25	7
62	A62	759.25	7
63	A63	765.25	7
64	A64	771.25	7
65	A65	777.25	7
66	A66	783.25	7
67	A67	789.25	7
68	A68	795.25	7
69	A69	801.25	7
70	A70	807.25	7
71	A71	813.25	7
72	A72	819.25	7
73	A73	825.25	7
74	A74	831.25	7
75	A75	837.25	7
76	A76	843.25	7
77	A77	849.25	7
78	A78	855.25	7
79	A79	861.25	7
80	A80	867.25	7
81	A81	873.25	7
82	A82	879.25	7
83	A83	885.25	7
84 to 97	not used		
98	---		
99	---		

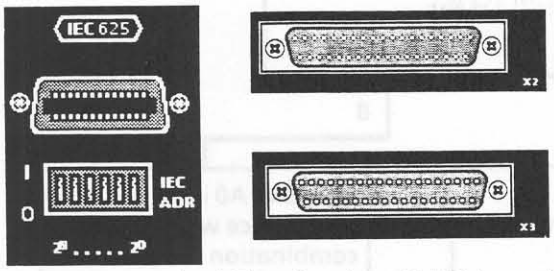
Table 11	Standard M (CANADA)		
Display	CATV STD	Frequency (MHz)	Filter
40	C45	319.25	4
41	C46	325.25	4
42	C47	331.25	4
43	C48	337.25	4
44	C49	343.25	4
45	C45	349.25	4
46	C46	355.25	4
47	C47	361.25	4
48	C48	367.25	4
49	C49	373.25	5
50	C50	379.25	5
51	C51	385.25	5
52	C52	931.25	5
53	C53	397.25	5
54	C54	403.25	5
55	C55	409.25	5
56	C56	415.25	5
57	C57	427.25	5
58	C58	427.25	5
59	C59	433.25	5
60	C60	439.25	5
61	C61	445.25	5
62	C62	451.25	5
63	C63	457.25	5
64	C64	463.25	5
65	C65	469.25	6
66	C66	475.25	6
67	C67	481.25	6
68	C68	487.25	6
69	C69	493.25	6
70	C70	499.25	6
71	C71	505.25	6
72	C72	511.25	6
73	C73	517.25	6
74	C74	523.25	6
75	C75	529.25	6
76	C76	535.25	6
77	C77	541.25	6
78	C78	547.25	6
79	C79	553.25	6
80	C80	559.25	6
81	---		
82	---		
83	---		
84 to 97			
98	C98	109.25	1
99	C99	115.25	1

Table 12	Standard M (CANADA)		
Display	CATV HRC	Frequency (MHz)	Filter
40	H40	318	4
41	H41	324	4
42	H42	330	4
43	H43	336	4
44	H44	342	4
45	H45	348	4
46	H46	354	4
47	H47	360	4
48	H48	366	4
49	H49	372	5
50	H50	378	5
51	H51	384	5
52	H52	390	5
53	H53	396	5
54	H54	72	0
55	H55	78	0
56	H56	84	0
57	H57	90	0
58	H58	96	0
59	H59	102	1
60	H60	108	1
61	H61	114	1
62	H62	403	5
63	H63	409	5
64	H64	415	5
65	H65	421	5
66	H66	427	5
67	H67	433	5
68	H68	429	5
69	H69	445	5

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3.4 Remote Control

3.4.1 Basic Information



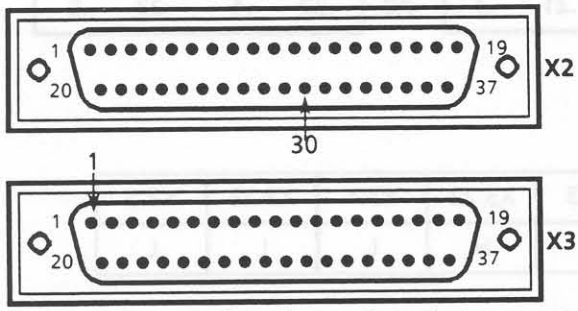
Remote control of Test Receiver EMFT is carried out via an optional IEC-625/IEEE-488-bus interface or the connectors X2 and X3 (parallel remote control) on the rear panel.

In the drawings and parts lists, REMOTE and LOCAL are also defined as EXTERNAL and INTERNAL.

REMOTE	LOCAL
EXTERNAL	INTERNAL

3.4.2 Remote Control via Connectors X2 and X3

3.4.2.1 Static Inputs



The EMFT must first be switched to remote control with a low level applied to X2.30 and X3.1. Except for some functions such as loudspeaker switchover (FSD 50kHz/ FSD 100kHz), measurement range selection (V_{IN}, V_{VIDEO}, DEV_{SOUND}) and switching on/off of sound trap, all front-panel settings are brought to an initial state which is fixed by pull-up resistors (5 V).

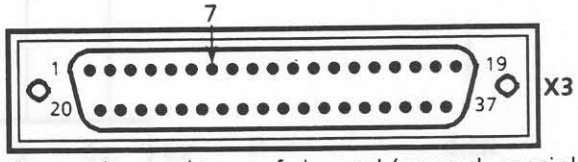
Initial state:
SYNCHRONOUS DETECTION
ZERO REFERENCE OFF
RF OPERATION
50-Ω RF INPUT
AUTOMATIC RF ATTENUATION
SAW FILTER OFF
DEMOD MODE OFF

If some of the desired settings deviate from the initial parameters, the settings must be entered via the remote-control connectors (0 V).

The last channel number selected is maintained, ie if functions other than remote selection are required, no new channel number need be entered. When the EMFT is reset to local control, the last front-panel settings selected and stored by a buffer battery become effective.

For the contact assignment of X2 and X3, see sections 3.4.2.5 and 3.4.2.6.

3.4.2.2 Clocked Inputs



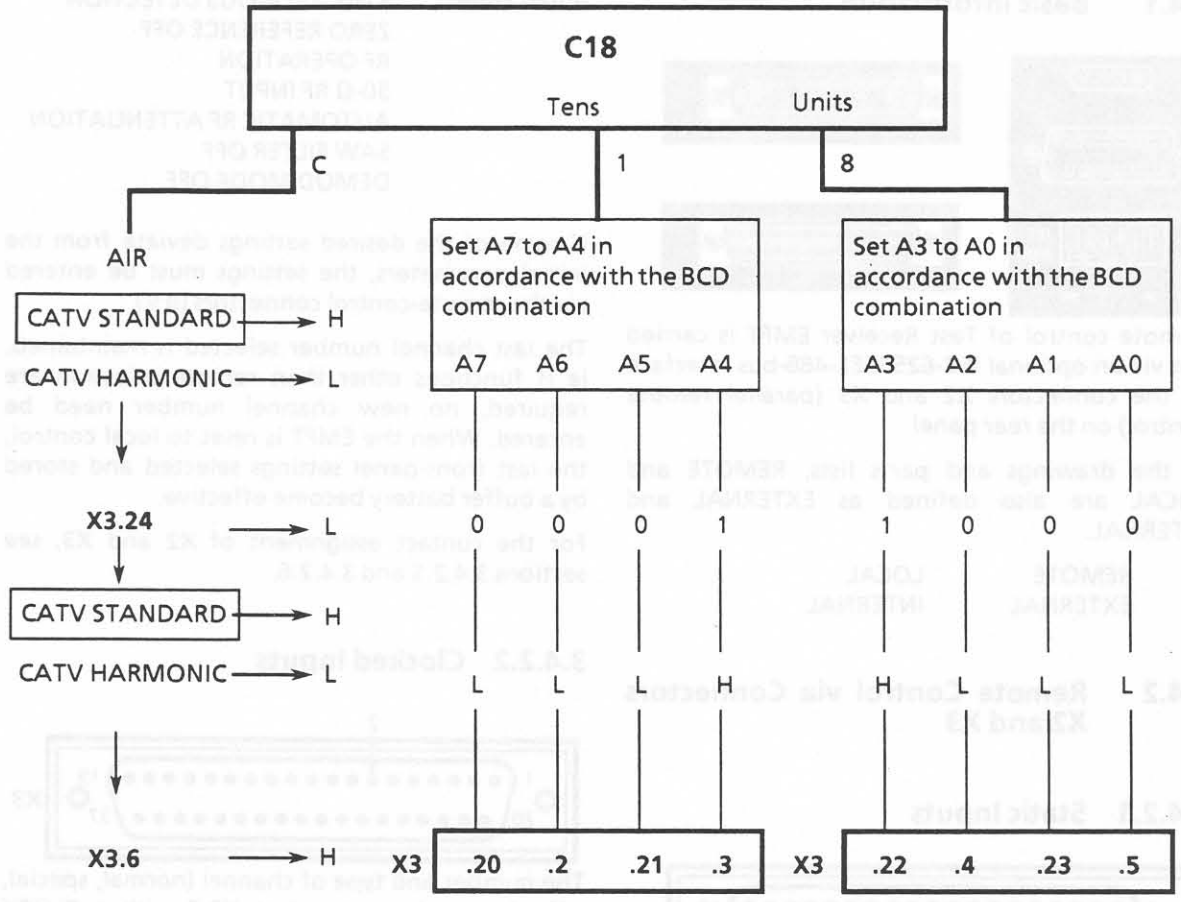
The number and type of channel (normal, special, offset) must be entered at X3.7 with a CLOCK (1-0-1 sequence, 5-V CMOS level). The information is transferred with the 1/0 edge of the clock.

Example: Setting of special channel 18 (S18)

- Set the EMFT to remote control via X2.30 or X3.1.
- Apply static signals in BCD code to connector X3 as shown in the example on the following page.
- The clock triggers the read-in of the information.

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Setting of CATV STANDARD Channel C18:



C18:

X3.24	X3.6	X3.20	X3.2	X3.21	X3.3	X3.22	X3.4	X3.23	X3.5
L	H	L	L	L	H	H	L	L	L

Note: *Any other channel can be selected by way of this example.*

3.4.2.3 Outputs

The outputs provide all messages with a high signal (5-V CMOS level). The permissible load is 1 mA with a high level and 3 mA with a low level. For the contact assignment, see sections 3.4.2.5 and 3.4.2.6.

3.4.2.4 Power Supply for Remote Control Equipment

The supply voltages available at connectors X2 and X3 are -12 V, + 12 V and + 5 V at approx. 200 mA.

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3.4.2.5 Contact Assignment of Connector X2

	Input/-output	(H: active high) (L : active low)
X2.1 to 4		unused
5	O	ground
6	O	unused
7	O	ground
8		unused
9	I/O	ground
10	I	SYNCHRONOUS (H)/ENVELOPE (L) DETECTION (see 3.4.2.7)
11	I/O	ground
12 to 14		unused
15	O	+ 5 V, max. 200 mA power supply for telecontrol system
16	O	unused
17	O	-12 V, max. 200 mA power supply for telecontrol system
18		unused
19	O	+ 12 V, max. 200 mA power supply for telecontrol system
20	O	loudspeaker output is only active if X411 is set to 2-3 (motherboard)
21	O	MTS signal (Multichannel TV Sound) (L)
22	O	STEREO signal (H)
23	O	V_{IN}, for external indication of RF input voltage Typical values:

Voltage in V at X2.23	0	0.83	1.66	2.49	3.32	4.16	5.0
Indication in dBµV	40	50	60	70	80	90	100

24	O	ground for 23	
25	O	unused	
26	O	NO SOUND CARRIER (H)	
27	O	unused	
28	O	NO VISION CARRIER (H)	
29	I	ZERO REFERENCE ON (L)/OFF (H)	(see 3.4.2.7)
30	I	LOCAL (H)/REMOTE (L); corresponds to X3.1	(see 3.4.2.7)
31	I	Vision / sound ratio output for external indication	

Voltage in V at X2.23	3.1	2.5	2.0	1.6	1.3	1.05	0.83
Vision/sound ratio in dB	8	10	12	14	16	18	20

34 to 37	I	unused

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3.4.2.6 Contact Assignment of Connector X3

	Input/-output	(H: active high) (L : active low)
X3.1	I	LOCAL (H)/REMOTE (L): the REMOTE LED is on - corresponds to X2.30.
20	I	Z3 → A7 tens (BCD)
2	I	Z2 → A6 "
21	I	Z1 → A5 "
3	I	Z0 → A4 "
22	I	E3 → A3 units (BCD)
4	I	E2 → A2 "
23	I	E1 → A1 "
5	I	E0 → A0 "
24	I	AIR - CATV - CATV HARMONIC switschover command in conjunction with X3.6, CATV - CATV HARMONIC (L) and additional clock
6	I	CATV - CATV HARMONIC switschover command in conjunction with X3.24, CATV HARMONIC (L) and additional clock
25	I/O	ground
7	I	CLOCK (L) (1-0-1); transfer of data with 0-1 edge
26	I	ground
8	O	ACKNOWLEDGEMENT after approx. 0.2 ms (H) The SEL signal (read command for synthesizer) is aviable as the acknowledgement, i. e. a change in channel number has taken place
27	I	RF (H)/IF (L)
9	I	50 Ω (H)/75 Ω (L)
28	I	AUTOMATIC RF ATTENUATION switschover command Automatic RF attenuation OFF (L)
10	I	SOUND TRAP switschover command OFF (L)
29	I	OPERATION WITH INCREASED LEVEL switschover command ON (L)
11	I	RF ATTENUATION 20 dB (L)
30	I	" 10 dB (L)
12	I	" 0 dB (L)
31	O	RF ATTENUATION 20 dB (H)
13	O	" 10 dB (H)
32	O	" 0 dB (H)
14	I	SYNCHRONOUS (H)/ENVELOPE (L) DETECTION (see 3.4.2.7)
33	I	ZERO REFERENCE ON (L)/OFF (H) (see 3.4.2.7)
15		unused
34		"
16		"
35		"
17	O	-12 V supply for remote control equipment (max. 200 mA)
36		unused
18	O	+ 5 V supply for remote control equipment (max. 200 mA)
37		unused
19	O	+ 12 V supply for remote control equipment (max. 200 mA)

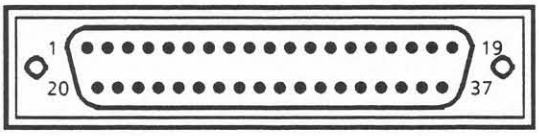
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3.4.2.7 Inputs Common to X2 and X3

(linked inputs)

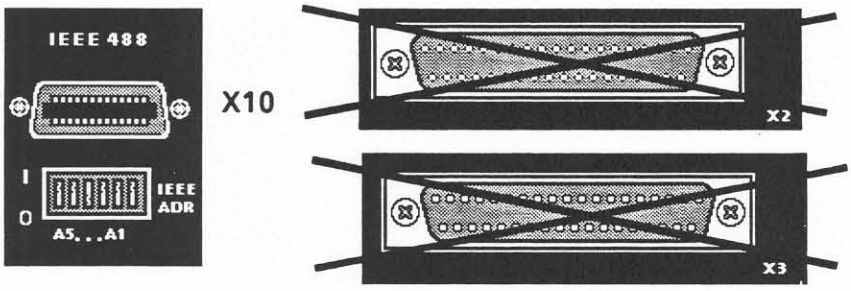
- LOCAL (H)/REMOTE (L) X2.30 and X3.1
- ZERO REF ON (L)/OFF (H) X2.29 and X3.33
- SYNCHR (H)/ENVEL (L) X2.10 and X3.14

View of X2 and X3



View of pins

3.4.3 Remote Control via IEC-625/IEEE-488-bus Interface (Option)



Note: *If remote control is carried out via the optional IEC-625/IEEE-488-bus interface, the inputs of connectors X2 and X3 must be left open. However, should these inputs be used even though the bus option is fitted, connector X10 (interface between bus and EMFT) must be unplugged.*

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3.5 Remote Control via IEC-625/IEEE-488-bus Interface

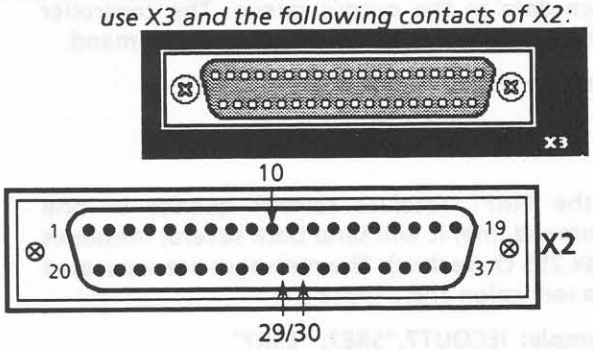
(Option No.821.4254.02)

3.5.1 Description

The EMFT fitted with the IEC-bus interface can be remote- controlled via a 24-contact connector to IEC-625-1/IEEE-488 standard. The stipulations of standard IEEE 488.2 have been taken into account.

All functions, except functions associated with the panel meter and the loudspeaker, can be remote-controlled. The frequency can also be entered directly. Measured values and messages indicated by LEDs cannot be queried, only the RF attenuator setting is available (in automatic mode).

Note: *When the IEC-bus option is fitted, do not use X3 and the following contacts of X2:*



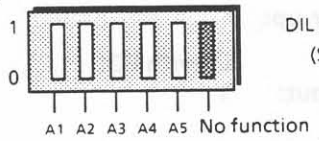
The parallel remote control connector X3 and contacts .10, .29 and .30 of connector X2 must not be connected if the option is fitted.

3.5.2 Operation

The syntax applies to Process Controllers PCA 2 and PCA 5 from Rohde & Schwarz.

3.5.2.1 Setting of Device Address

The device address can be set using the DIL switch (S10) at the rear. The address setting is stored on power-up.



DIL switch (S10)

For the following program examples the device address 7 has been used.

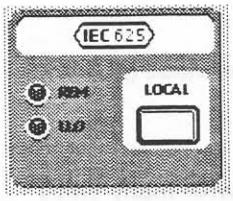
3.5.2.2 LOCAL/REMOTE Switchover

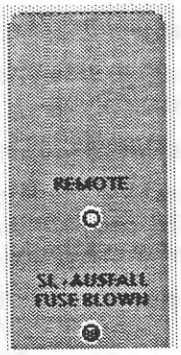
The instrument is always in the LOCAL state (manual operation) directly following power-up.

There are two independent device settings:

- LOCAL: setting via front panel with battery back-up
- REMOTE: setting via IEC/IEEE bus without battery back-up.

So the device setting is changed when switching between the local and remote state.





The state is indicated by the yellow **REM** LED on the top left and by the yellow **REMOTE** LED on the right-hand side of the front panel.

If the EMFT is addressed by a controller as a listener (eg by IECLAD), it normally enters the REMOTE state and also remains in this state at the end of data transmission. With the exception of the LOCAL key, the four keys below the meter and the sound 1/sound 2 key, the controls on the front panel are disabled.

There are two ways of going back to the LOCAL state:

- By the addressed command IECGTL (GO TO LOCAL)
- By pressing the LOCAL key.
  The function of the LOCAL key can be disabled by the controller by sending the universal command IECLLO (LOCAL LOCKOUT). This is indicated by the LLO LED on the front panel.

Data output from the controller to the EMFT should be stopped before pressing the LOCAL key since otherwise the EMFT assumes the REMOTE state again. If this feature (in line with the standard) is not desired, the following response can be achieved by setting link X145 to position 2-3 (normal setting of all links on IEC-bus board: 1-2):

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The device enters the LOCAL state by pressing the LOCAL key in the REMOTE state and so it can no longer be addressed via the IEC/IEEE bus. The yellow REM LED flashes. Pressing the LOCAL key again restores the REMOTE state and thus enables IEC/IEEE-bus addressing.

3.5.2.3 EMFT as Listener

A command consists of a header (eg LEVEL, FREQUENCY, INPUT) and

- either an extension,

  example: LOW

- a numerical value (possibly with unit),

  example: 210250 KHZ

- or an extension and a numerical value (possibly with unit),

  example: RF 50 OHM

It is possible to omit the header with many EMFT IEC/IEEE commands or with an abbreviated version of the commands.

Example: DEMODULATION: SYNCHRONOUS
or: SYNCHRONOUS
or: SY

Within a command, the header can be separated from the following input by a colon and/or space.

Example: LEVEL: LOW
or: LEVEL LOW

Leading and trailing spaces are ignored.

Example: IECOUT7," FREQUENCY 210.25 MHZ ;
LEVEL : LOW "

Numbers can be entered without spaces.

Example: IECOUT7,"FREQ210.25MHZ"

Upper-case or lower-case letters are permissible.

Example: LEVEL: LOW
or: level: low

Certain commands to IEEE 488.2 are initiated by a * character.

Examples: *OPC *ESE 32 * IDN ?

A command line may comprise several individual commands separated by a semicolon (;) or a comma (,) (max. 256 characters).

Example: IECOUT7,"F210.25; SY, LEVEL: LOW"

Individual commands or a sequence of commands can be terminated with delimiters LF or CR + LF or the EOI line (automatically with the IEC command IECOUT7,"...").

3.5.2.4 EMFT as Talker

A data request command causes the EMFT to place data in the output queue. The controller can then read the data using an IECIN command.

Example: IECOUT7,"ATTENUATION?"
IECIN7,A$
PRINT A$ ATT: X DB

If the EMFT receives several queries in one command line, it will send back several messages (max.255 characters). The messages are separated by a semicolon and a space (;).

Example: IECOUT7,"SRE?; *ESR?"
IECIN7, B$
PRINT B$ *SRE X; *ESE X; *ESR X

If data are requested again in a new command line without the output queue having been read by IECIN..., the command is aborted due to a query error.

Numerical values are output in decimal form as ASCII characters. The command "*HDR 0" should be entered if only numerical values without a header are to be output.

The talker delimiter is preset to LF with EOI and can be changed if required. It is also possible to set the controller to the delimiter LF with EOI using the command "IECTERM 10".

Default on power-up:

Talker delimiter: LF with EOI
Header with output: 1

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3.5.2.5 Line Messages

IECIFC (Interface Clear)	Line IFC
IECREN (Remote Enable)	Line REN active
IECNREN (Not Remote Enable)	Line REN passive
IECATN (Attention)	Line ATN active
IECNATN (Not Attention)	Line ATN passive
IECEOI (End or Identify)	Line EOI active with last data byte
IECNEOI (Not EOI)	Line EOI passive with last data byte

3.5.2.6 Interface Messages

Interface messages (to IEC-625-1/IEEE-488 standard) are transmitted on data lines, the ATN line being active (low).

Common commands:
Common commands affect all devices on the bus without any addressing being required.

IECDCL (Device Clear)	Clears output queue, MAV and OPC and thus also SRQ if only effected by MAV or OPC
IECLLO (Local Lockout)	Inhibits the LOCAL key
IECUNL (Unlisten)	Unaddressing of all listeners
IECUNT (Untalk)	Unaddressing of talker
IECSPE (Serial Poll Enable)	Ready for serial poll
IECSPD (Serial Poll Disable)	End of serial poll

Addressed Commands:

The addressed commands only affect devices addressed as a listener (with "IECLAD 7").

IECSDC (Selected Device Clear)	same as IECDCL
IECGTL (Go to Local)	Switches to local mode

3.5.2.7 Error Handling

All errors identified by the EMFT during command execution are signalled by setting a bit (bit 2, 4 or 5) in the event status register. The bit remains set until the event status register is read out or cleared with command "*RST" or "*CLS". This permits triggering of a service request and program-controlled error identification.

Command Error (ESR, bit 5):
error in command entry (eg syntax error)

Execution Error (ESR, bit 4):
numerical value outside permissible range

Query Error (ESR, bit 2):
attempt to write the output queue without reading previous contents

The command execution is aborted if an error occurs in a command line containing several commands.

In the case of a command error, execution error or query error, a plain-text error message is available in the error-text buffer for the last error occurred and can be displayed on the screen via the output queue using

IECOUT7,"*ERR?"
IECIN7,A$ and PRINT A$

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Error message format:

Command Error: COMMAND ERROR IN COMMAND #X, NEAR SIGN #Y

Execution Error: EXECUTION ERROR IN COMMAND #X

Query Error: QUERY ERROR IN COMMAND #X

X is the number of the command in the command line and Y the position of the faulty character (counting started with 1).

3.5.2.8 IEC/IEEE-bus Commands

Characters in brackets may be omitted or abbreviated as desired.

```
CH(ANNEL: )X                          with X = 0 ... 99
SP(ECIAL CHANNEL: )X                        "
OF(FSET CHANNEL: )X                         "

SA(W: ON)
SA(W:) OF(F)

F(REQUENCY: )X( MHZ)                  with X =  7(.000)  ...  900(.000)
F(REQUENCY: )X( )K(HZ)                with X =  7000     ...  900000

AT(TENUATION:) A(UTOMATIC)
abbreviated:          AU(TOMATIC)
AT(TENUATION: )X( DB)                 with X = 0, 10, 20
AT(TENUATION )?                       Query Attenuation

D(EMODULATION:) S(YNCHRONOUS)
abbreviated:           SY(NCHRONOUS)
D(EMODULATION:) E(NVELOPE)
abbreviated:           E(NVELOPE)

IN(PUT:) R(F )X( OHM)                 with X = 50, 75;
abbreviated:    R(F )X( OHM);
IN(PUT:) I(F)

LE(VEL:) L(OW)
abbreviated:    LO(W)
LE(VEL:) H(IGH)
abbreviated:    HI(GH)

Z(ERO REFERENCE PULSE: ON)
Z(ERO REFERENCE PULSE:) OF(F)
```

Default (on power-up and addressing or on "*RST"):

```
CH2
SAW OFF
AUTO
SY
RF50
LOW
ZERO OFF
```

With `NORMAL CHANNEL`, `SPECIAL CHANNEL` and `OFFSET CHANNEL` the frequencies stored in synthesizer EPROM (D55) are activated.

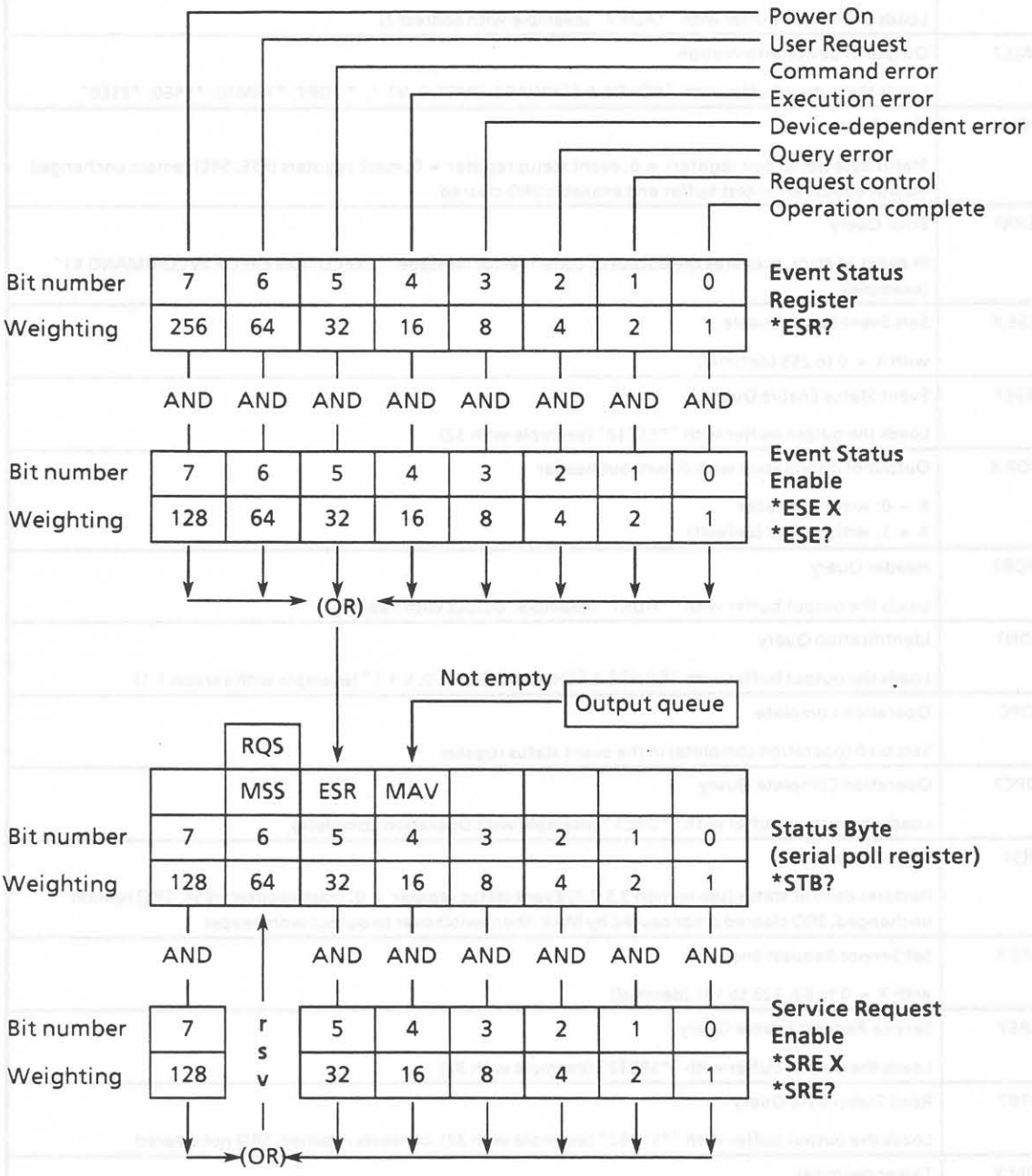
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3.5.2.9 IEC-bus Commands to IEEE 488.2

*ADR?	Query of IEC/IEEE-bus address Loads the output buffer with "*ADR 7" (example with address 7)
*ALL?	Output of device information Loads the output buffer with "ROHDE & SCHWARZ, EMFT, 0, V1.1; *ADR7; *TRM10; *SRE0; *ESE0"
*CLS	Clear Status Status byte (serial poll register) = 0, event status register = 0, mask registers (ESE, SRE) remain unchanged, output queue, error-test buffer and available SRQ cleared.
*ERR?	Error Query In event of error, prepares the output of current error message: "EXECUTION ERROR IN COMMAND §1" (example)
*ESE X	Sets Event Status Enable with X = 0 to 255 (decimal)
*ESE?	Event Status Enable Query Loads the output buffer with "*ESE32" (example with 32)
*HDR X	Output of information with or without header X = 0: without header X = 1: with header (default)
*HDR?	Header Query Loads the output buffer with "*HDR1" (example: output with header)
*IDN?	Identification Query Loads the output buffer with "ROHDE & SCHWARZ, EMFT, 0, V 1.1" (example with version 1.1)
*OPC	Operation Complete Sets bit 0 (operation complete) in the event status register
*OPC?	Operation Complete Query Loads the output buffer with "*OPC1" (example with Operation Complete)
*RST	Reset Command Restores default status (see section 3.5.2.8) Event status register = 0, mask registers (ESE, SRE) remain unchanged, SRQ cleared if not caused by MAV, then switchover to output with header.
*SRE X	Set Service Request Enable with X = 0 to 63, 128 to 191 (decimal)
*SRE?	Service Request Enable Query Loads the output buffer with "*SRE32" (example with 32)
*STB?	Read Status Byte Query Loads the output buffer with "*STB32" (example with 32), contents retained, SRQ not cleared.
*TRM X	Talker delimiter Delimiters: with X = 0 CR + LF with EOI X = 1 last character with EOI X > 1 X with EOI (X < 128) Default: X = 10 LF with EOI Example: X = 13 CR with EOI
*TST?	Selftest Query Loads the output buffer with "*TST0"
*WAI	Wait To Continue Allows command processing only after all preceding commands have been executed.

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3.5.2.10 Service Request (Organization to IEEE 488.2)



An event (command error, execution error, query error, operation complete) is written into the event status register and, if permitted by the event status enable register (ESE), is transferred into the status byte as an event summary bit (ESB) and consequently into the serial poll register which can be read by the controller using a serial poll. The message MAV (message available) indicates that information is available in the output queue.

If the bits in the status byte are to trigger a service request, the mask of the service request enable register must be set accordingly.

The default setting of the masks is 0 (on power-up), ie a service request is not carried out.

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Setting of ESE and SRE masks:

	*ESE X with X:		*SRE X with X:
Command error	32	Event message	32
Execution error	16	Message in output queue (MAV)	16
Query error	4		
Operation complete	1		

If several messages are to be sent, the value in the register is the sum of all status bits.

Example: Command error and operation complete are to set the event summary bit (ESB) in the status byte.

The ESE mask must be set to 32 + 1 = 33 --> *ESE 33

ESB and MAV are to trigger an SRQ:

The SRE mask must be set to 16 + 32 = 48 --> *SRE 48

Serial Poll: The origin of the message can be determined by polling the serial poll register.

```
IECSPL7,V% and PRINT V%
V% = 96 ---> ESB
V% = 80 ---> MAV
V% = 112 ---> MAV and ESB
```

Note: *The service request bit in the status byte (serial poll register) is set to zero by a serial poll. A new serial poll results in:*

V% = 32 or V% = 16 or V% = 48.

Assuming that the MAV bit is set, a message is written into the output queue which can be displayed on the controller screen using IECIN7, A$ and Print A$.

Note: *The MAV bit is cleared when reading in with* IECIN...

If the ESB is set, the origin of the message can be determined by polling the event status register.

```
IECOUT7,"*ESR?"
IECIN7,A$ and PRINT A$
*ESR = 1   --> operation complete
*ESR = 32  --> command error
*ESR = 33  --> command error and operation complete
```

Note: *Following this query the contents of the event status register are set to zero and any unread SRQ in the status byte (serial poll register), which has been set by the ESB, is cleared.*

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In the case of a command error, execution error or query error, the error message available in the error-text buffer in plain text can be displayed via the output queue using

```
IECOUT7,"*ERR?"
IECIN7,C$ and PRINT C$
```

Note: *If a message is already available in the output queue, a query error is triggered by* *ERR?. (*Exception: If* MAV *has been triggered by a preceding command in the same command line an error message is appended to the message in the output queue.)*

3.5.2.11 Program Example

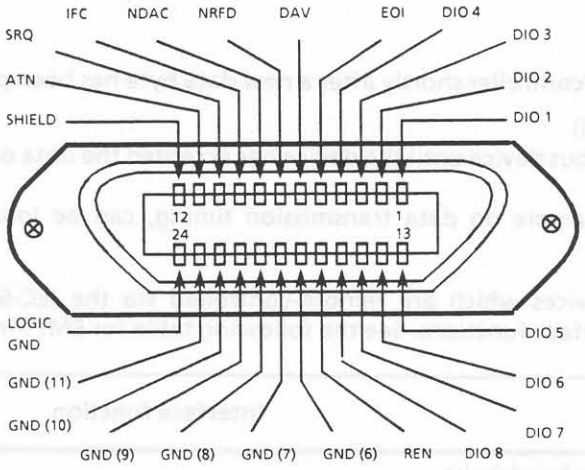
IEC/IEEE-bus control of EMFT:
Simplified command entry, display of queried information as well as error message

```
100 IEC TERM 10                                  Controller: talker delimiter
                                                 identification: LF with EOI

110 IEC OUT 7,"*RST; *CLS; *ESE 52; *SRE 48"     Reset, clear status, event transfer by error,
                                                 RSQ by event and MAV
120 REM MAIN PROGRAM
130 INPUT "IEC EMFT> ";A$                        IEC command entry
140 IEC OUT 7,A$
150 IEC OUT 7," "                                Dummy command for SRQ query
160 ON SRQ1 GOSUB 200                            SRQ query
170 ON SRQ1 RETURN                               Stop SRQ
180 GOTO 130
190 REM SERVICE REQUEST ROUTINE
200 IEC SPL 7,V%                                 Serial poll
210 IF (V% AND 16)>0 THEN GOSUB 270              MAV
220 IF (V% AND 32)>0 THEN GOSUB 260              Error
230 IEC OUT 7,"*CLS"                             Clear status
240 RETURN
250 REM ROUTINE
260 IEC OUT 7,"*ERR?"
270 IEC IN 7,A$
280 PRINT "          ";A$                        Message or error message
290 RETURN
```


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3.5.3 Contact Assignment of IEC/IEEE-bus connector (X10)



The standard interface includes three groups of bus lines:

1. **Data bus with 8 lines DIO1 to DIO 8**
   Data transmission is bit parallel and byte serial, the characters being transmitted in the ISO 7-bit code (ASCII code).

   DIO 1 represents the least significant and DIO 8 the most significant bit.

2. **Control bus with 5 lines**
   The control bus is used to manage the information flow:

   ATN (attention)
   goes active low during transmission of addresses, common or addressed commands to the devices on the bus.

   REN (remote enable)
   for switching the device to remote control mode.

   SRQ (service request)
   asserting SRQ enables a device to send a service request to the controller.

   IFC (interface clear)
   is activated by the controller to place the IEC/IEEE-bus interfaces of the devices to a defined initial state.

   EOI (end or identify)
   identifies the end of a data transmission and is used in parallel poll.

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3. **Handshake bus with 3 lines**
It controls the timing of data transmissions.

NRFD (not ready for data)
in the active low state signals to the talker/controller that one of the devices on the bus is not ready to accept data.

DAV (data valid)
is activated by the talker/controller shortly after a new data byte has been put on the data bus.

NDAC (not data accepted)
is kept active low by the bus device until the device has accepted the data on the bus.

Further information, for example on data transmission timing, can be looked up in the IEC-625-1 standard specifications.

According to IEC 625-1, devices which are remote-controlled via the IEC-625/IEEE-488 bus may be provided with different interface functions. See the following table for EMFT interface functions.

Identification	Interface function
SH1	Source handshake, complete capability
AH1	Acceptor handshake, complete capability
L4	Listener, complete capability, unaddress if MTA
T6	Talker, complete capability, capability to answer serial poll, unaddress if MLA
SR1	Service request, complete capability
PP0	Parallel poll, no capability
DT0	Device trigger, no capability
RL1	Remote/local function, complete capability
DC1	Device clear, complete capability

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4 Maintenance and Troubleshooting

Note: *This section deals with troubleshooting down to the PCB level. For more details, refer to the service manual* (Order No. 821.4019.24).

4.1 Maintenance

Test Receiver EMFT does not require regular maintenance. Cleaning is basically all the maintenance the instrument requires.

Cleaning the outside

It is recommended that a soft, lint-free duster or a brush be used for cleaning the unit on the outside. If the instrument is soiled, meths or mild detergents may be employed. Do not use any nitro thinners, acetone, etc. since these solvents may damage the front-panel labelling or plastic parts.

To ensure satisfactory cooling, remove the dust inside the unit (every year or every other year, depending on the length of operation of the EMFT and the amount of dust at the place of use).

Cleaning the inside

For cleaning the interior, withdraw the unit from the cabinet or rack. Remove dust by means of a brush or grease-free compressed air. Parts that carry high tension and the areas around them should be cleaned very thoroughly to prevent sparcover and thus irregular functioning of the unit.

Storage

The EMFT can be stored at temperatures between

-40 and + 70°C.

If stored for a longer period, the unit should be protected against dust.

4.2 Performance Check

The rated specifications of the EMFT should be checked from time to time. The specifications and tolerances are stated in the data sheet. Slight deviations can be compensated for by means of trimmers.

4.3 Troubleshooting

When the unit is opened, for example for cleaning, check whether the PCBs are plugged in properly.

Check the mechanical functioning of the controls such as potentiometers and switches.

4.4 Replacing a Module

Opening the unit

- Switch off the unit and disconnnect the power cable.
- Disconnect all other cables.
- Unscrew the two supporting feet from the rear panel (2 screws each).
- Use a small screwdriver to lift off the upper cover. To do this, insert the screwdriver in the recess on the side near the supporting feet and pull the cover backwards.

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Replacing Lithium Batteries

CAUTION:



The instrument is fitted with high-power lithium batteries. Under no circumstances should the cells be short-circuited or charged. Do not open up old cells; treat them as TOXIC WASTE.

The instrument contains a lithium battery which is used for the back-up storage of the instrument status. The service life of the battery depends on how the battery is used. The battery should be replaced after an appropriate period of time (eg after storage at high temperatures). A flat battery should be replaced by one of the same type. To do this open the instrument. The battery should then be replaced by soldering the tags and fastening with cable ties.

Dismantling the Power Supply

To dismantle the power supply, remove the four screws on the unit for the two feet at the rear of the instrument and then remove the upper and lower panels.

Closing the unit

To close the unit, proceed in the reverse order. When sliding the cover onto the unit, make sure that the cover is properly fitted in the grooves. When screwing down the feet, press the cover to the unit so that the back of the cover locks into the metal studs.

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