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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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**Addressee**
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Betreff
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:

Datum / Date / Date

Unterschrift / Signature / Signature

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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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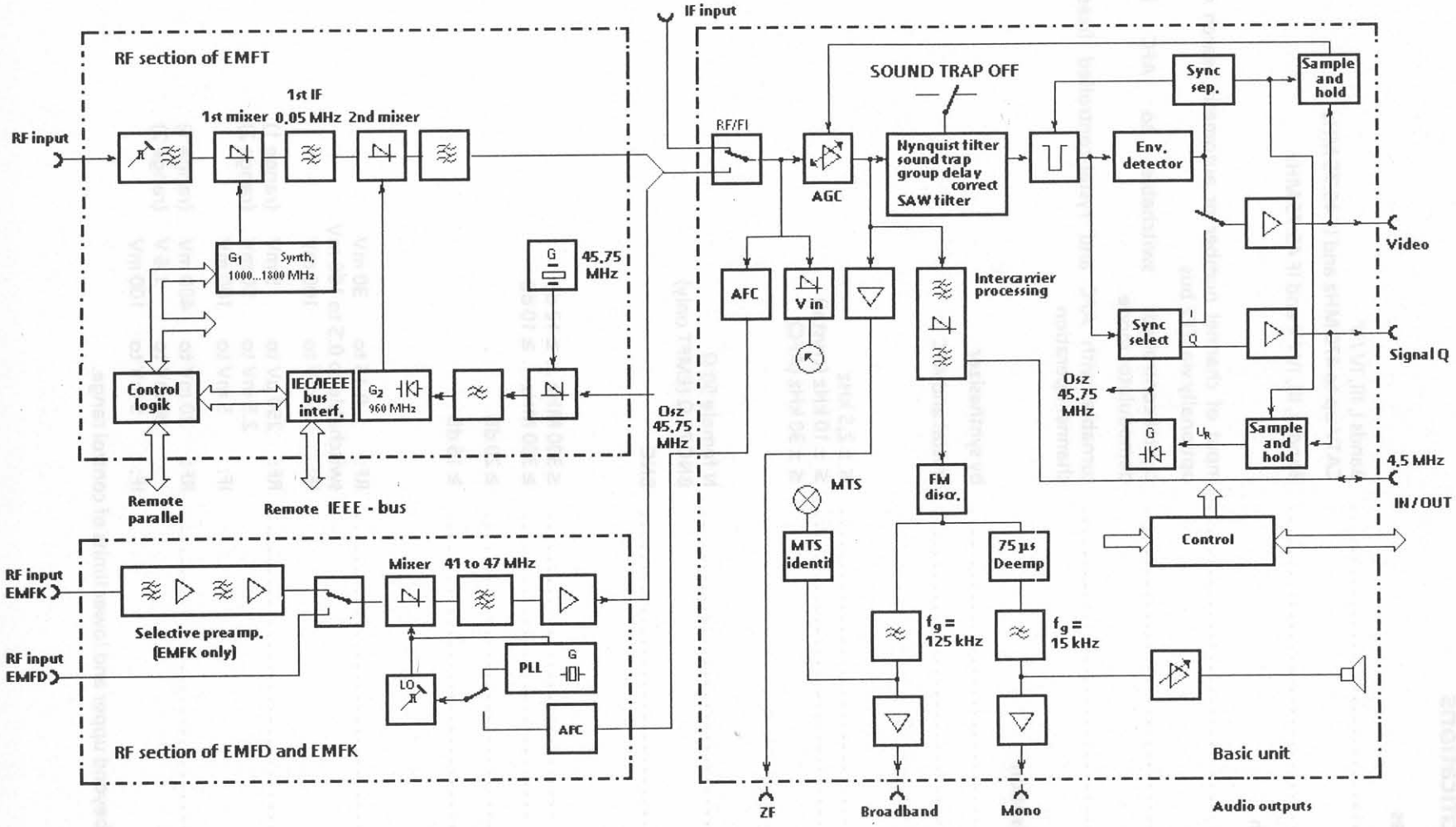



Fig. 1-2: Block diagramm of EMF. System



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## 1.1 Specifications

**Frequency Ranges**

| | |
|---|---|
| EMFT | Bands I, III, IV / V<br>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)<br>≤ ± 30 kHz (AFC) |

**Inputs**

| | |
|---|---|
| RF | N female 50 Ω<br>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<br>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<br>41 to 47 MHz | ≤ 1.5 dB |

4.5-MHz intercarrier output

| | |
|---|---|
| BNC female, rear panel | $Z_{out}$ = 50 Ω |
| Output level<br>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,<br>$f_{mod}$ = 500 Hz | 0.25 V into 75 Ω<br>± 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

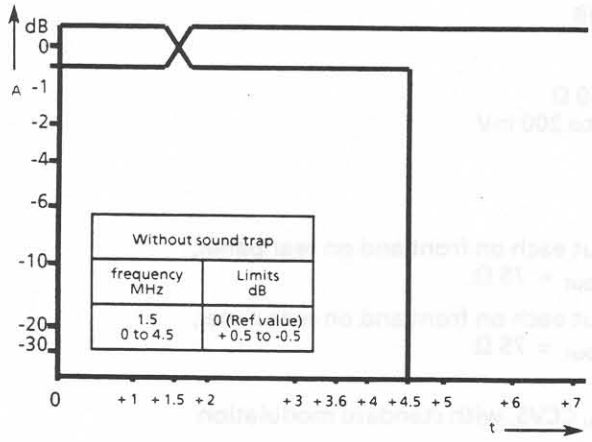



Fig. 1-3 Tolerance of overall amplitude characteristic (RF, IF, VF) without sound trap

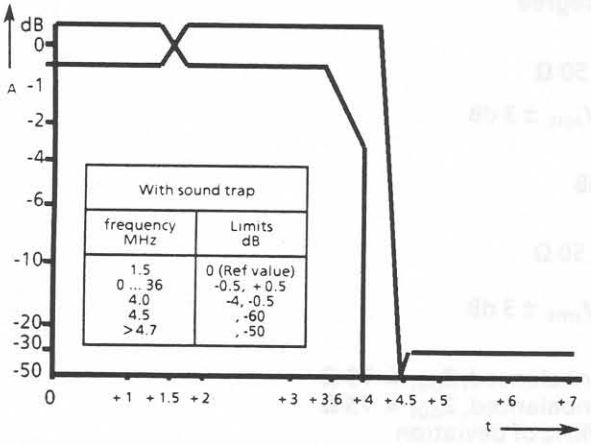



Fig. 1-4 Tolerance of overall amplitude characteristic (RF, IF, VF) with sound trap
Additional ripple with SAW filter ≤ ± 0.2 dB

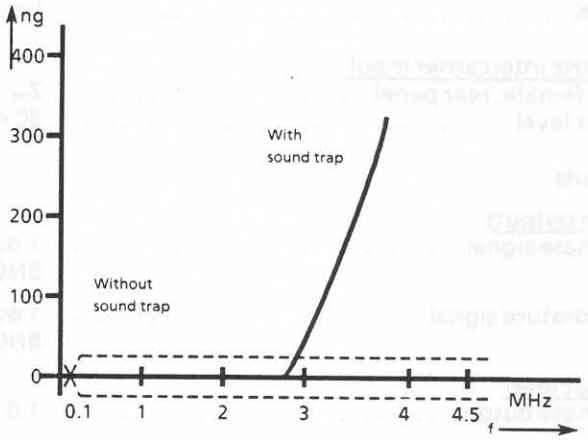



Fig. 1-5 Group-delay characteristics

| 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 %<br>47 to 63 Hz/110 VA |
| Dimensions (W x H x D), weight<br>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

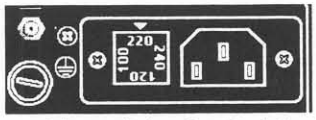
- the correct AC supply voltage has been selected,
- no inadmissibly high voltage is applied to the inputs,
- the unit is operated in the permissible temperature range ( + 5° to + 45°C),
- the blower on the rear panel is not covered (to avoid overheating of the unit),
- the outputs are not overloaded 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<br>2-3 | Normal operation<br>100-MHz trap OFF |
| X15 | Synthesizer | 1-2<br>2-3 | Not to Standard M<br>Standard M |
| X25 | Synthesizer | 1-2<br>2-3 | EPROM, range 1<br>EPROM, range 2 |
| X557 | IF section | 1-2<br>1-2 open | Normal operation (local control)<br>Zero reference disabled |
| X645 | IF section | 1-2<br>1-2 open<br>2-3 | Normal operation<br>Synchronous detection<br>Envelope detection |
| X765 | IF section | 1-2<br>2-3 | Normal operation<br>Inphase signal and quadrature signal interchanged |
| X760 | IF section | NOT SAM<br>SAMPLED | Q-Signal not sampled (Normal operation)<br>Q-Signal sampled |
| X121 | Motherboard | 1-2<br>2-3<br>open | Normal operation<br>Sound trap OFF<br>Sound trap ON |
| X137 | Motherboard | 1-2<br>2-3 | EMFT<br>EMFD/EMFK |
| X139 | Motherboard | 1-2<br>2-3 | Normal operation<br>SAW filter OFF |
| X251 | Motherboard | 1-2<br>2-3 | Normal operation, inverter for external zero-reference pulse ON<br>External zero reference pulse not inverted |
| X327 | Motherboard | 1-2<br>2-3<br>open | Normal operation<br>Squelch always active<br>Squelch inactive |
| X407 | Motherboard | 1-2<br>2-3 | Normal operation<br>Monophonic output without deemphasis |
| X411 | Motherboard | 1-2<br>2-3 | Normal operation<br>Internal loudspeaker and headphone output switched off, AF output to X2.20 (37-contact connector X2) |
| X413 | Motherboard | 1-2<br>2-3 | Normal operation<br>SYNCHR/ENVELOPE and ZERO REFERENCE ON only possible in external mode, front-panel operation blocked, REMOTE LED on |
| X20 | Power supply | 1-2<br>2-3 | Normal operation<br>+ 5-V back-up battery disconnected |
| X40 | Power supply | 1-2<br>2-3 | Normal operation<br>Blower switched off |
| X125/X126 | IEEE 488 Interface | 1-2<br>2-3 | Normal operation: EPROMs D125 and D130<br>RAMs D125 and D130 |
| X135 | IEEE 488 Interface | 1-2<br>2-3 | Normal operation: 8K x 8 RAMs D135 and D140<br>32K x 8 RAMs D135 and D140 |



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# 3 Legend for Front and Rear Panels

## 3.1 Front Panel

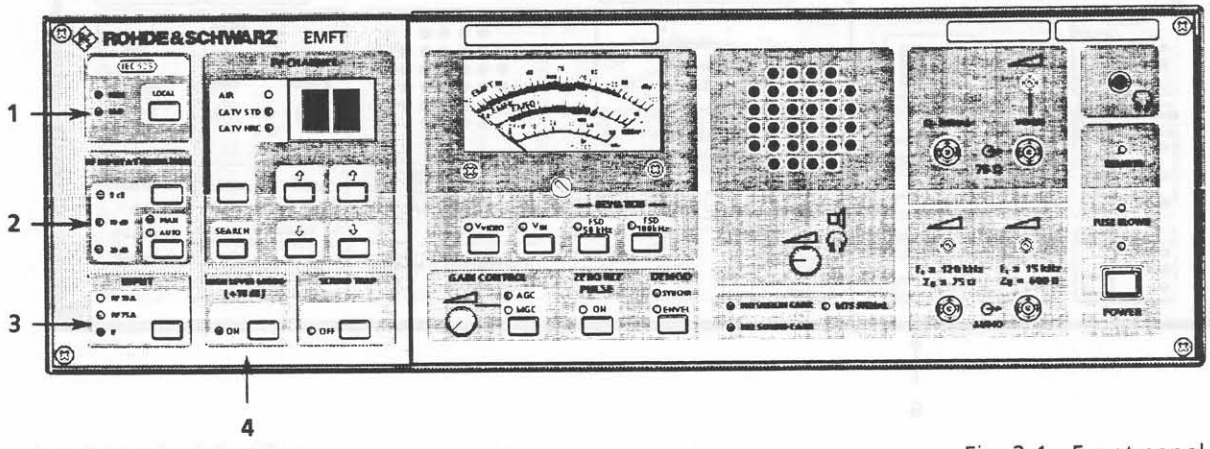
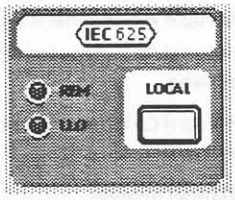
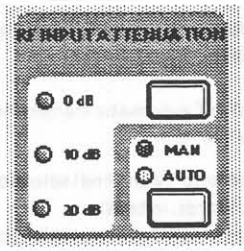
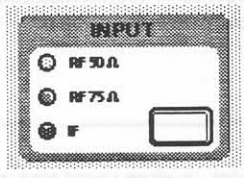



Fig. 3-1 Front panel

| 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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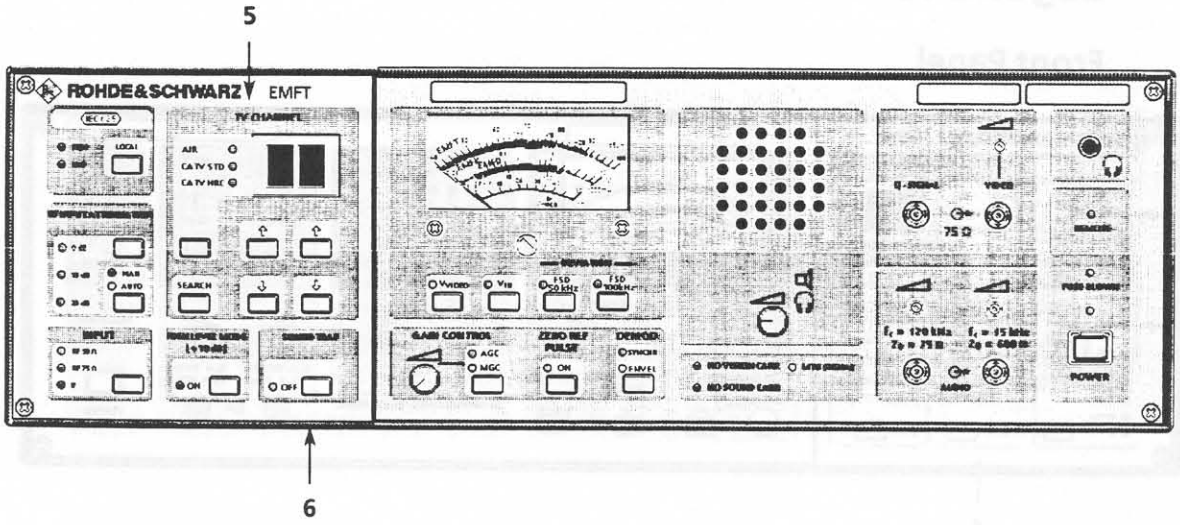
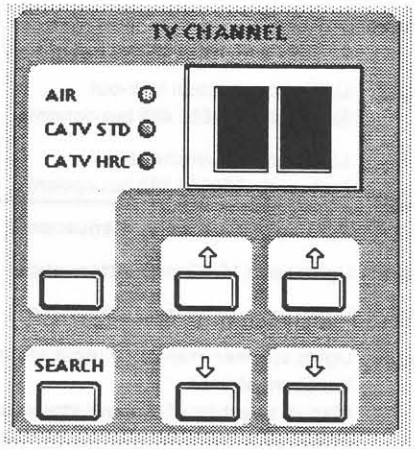



Fig. 3-1 Front panel

| 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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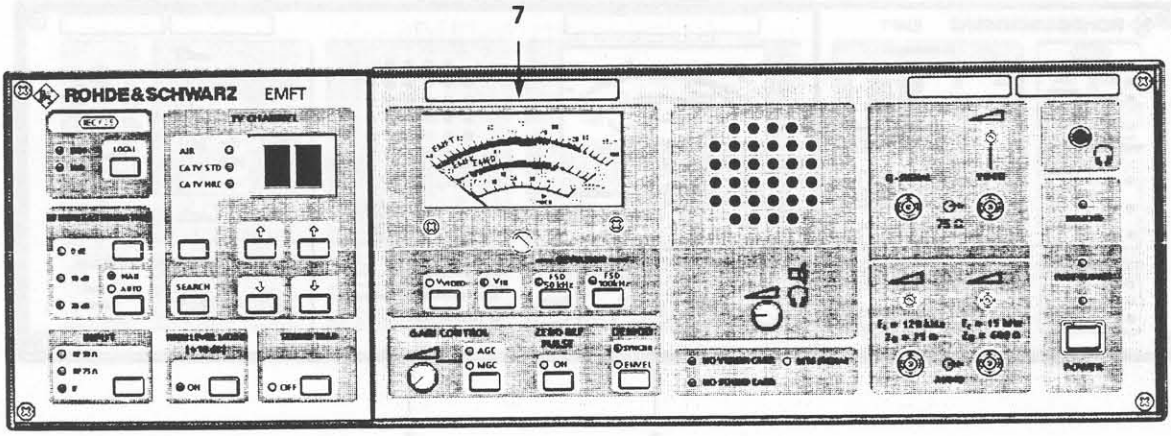
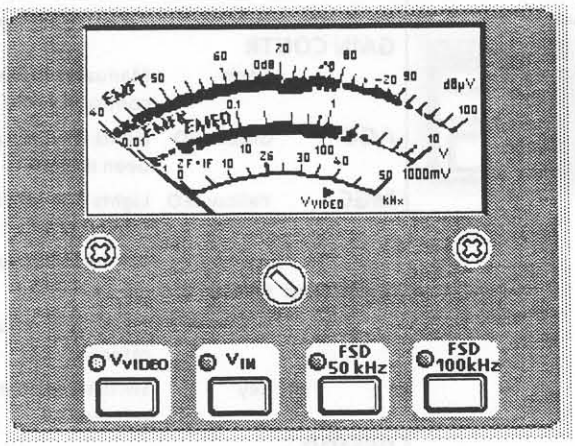



Fig. 3-1 Front panel

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





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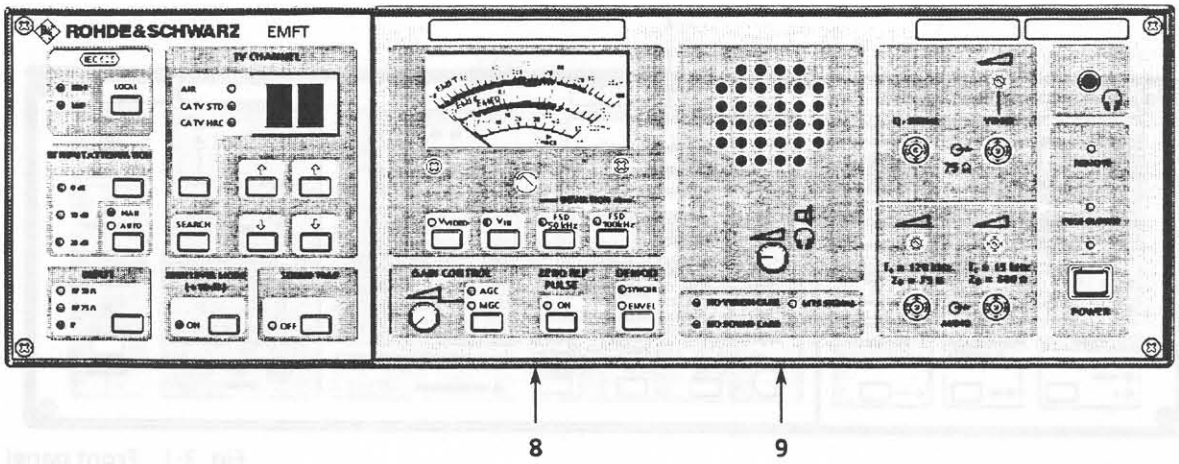
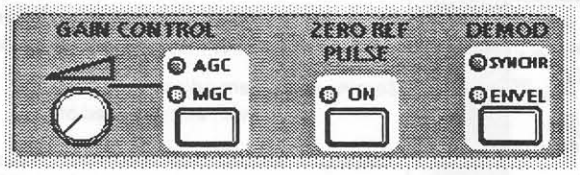



Fig. 3-1 Front panel

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



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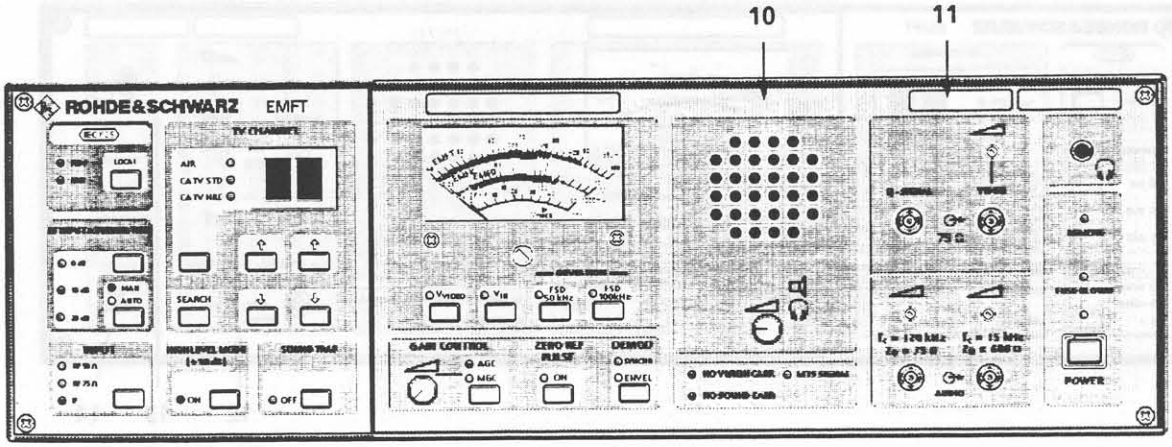
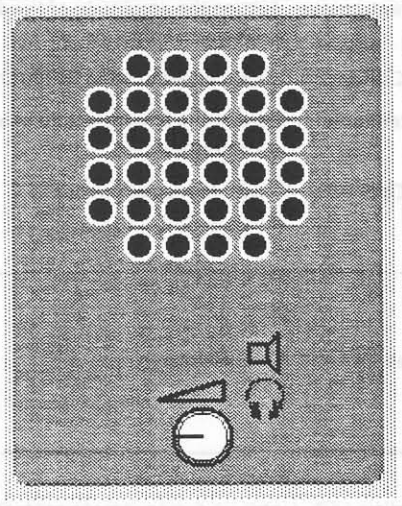
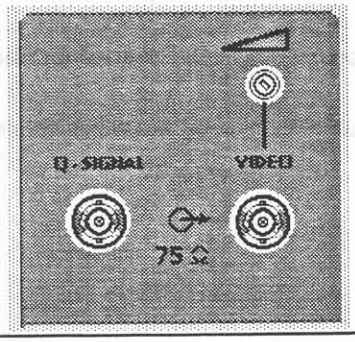



Fig. 3-1 Front panel

| 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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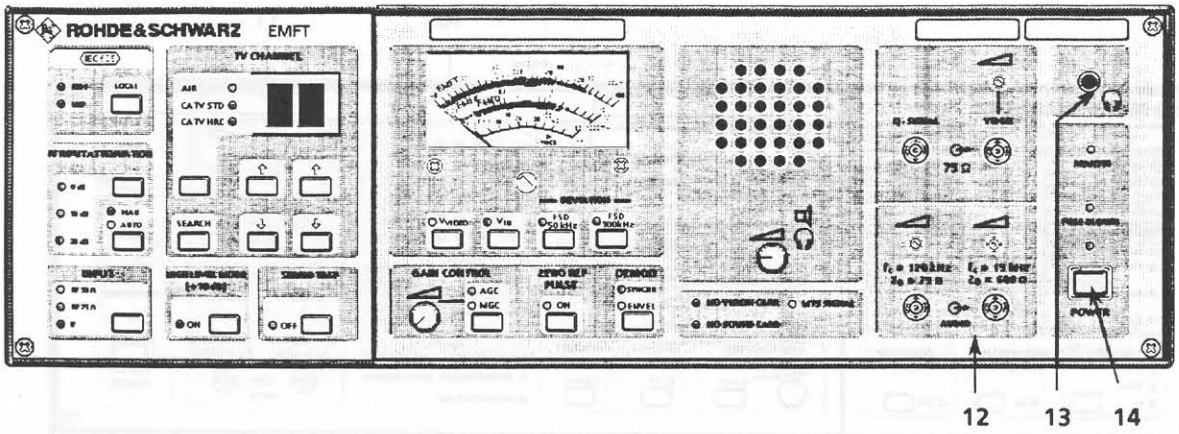
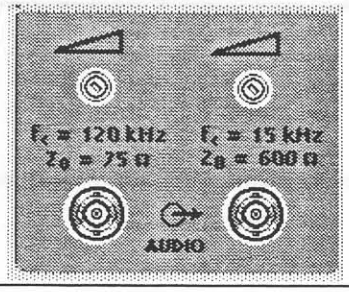
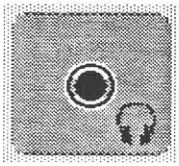



Fig. 3-1 Front panel

| Item | Inscription | Function | | |
|---|---|---|---|---|
| 12 |   | $f_c$ = 120 kHz<br>$Z_0$ = 75 Ω | Potentiometer | Setting the amplitude of the audio wideband output |
| | | AUDIO | BNC socket | Audio Wideband Output 75 Ω |
| | | $f_c$ = 15 kHz<br>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

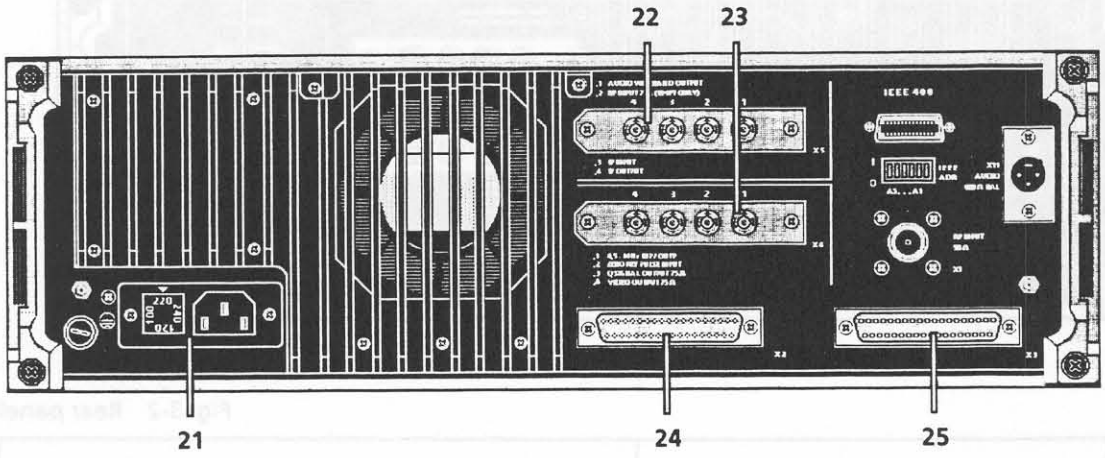
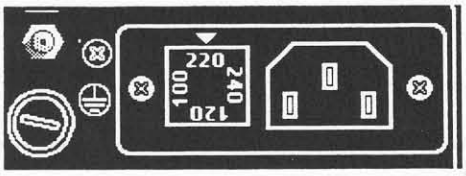
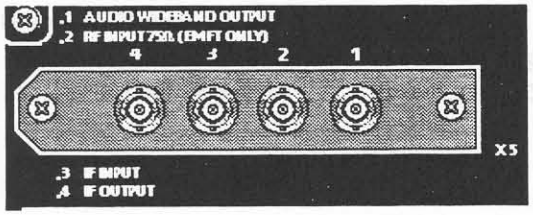
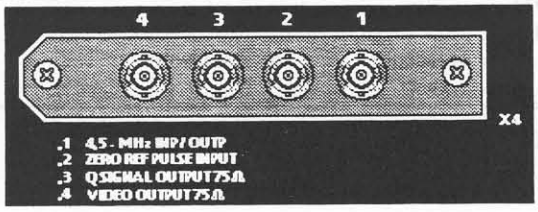
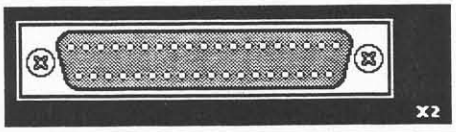
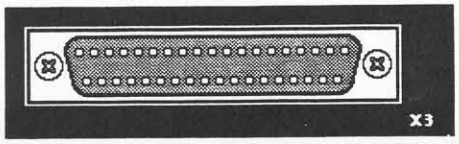



Fig. 3-2 Rear panel

| Item | Inscription | Function | |
|---|---|---|---|
| 21 |   | **F1**<br>**100/120/220/240**<br>**47 to 63 Hz** | Primary fuse<br>Voltage selector<br>Power connector |
| 22 |   | **X5.1** **AUDIO WIDEBAND OUTPUT**<br>BNC socket 75 Ω<br>**X5.2** **RF INPUT 75Ω (EMFT ONLY)**<br>BNC socket 75 Ω<br>**X5.3** **IF INPUT**<br>BNC socket 50 Ω<br>**X5.4** **IF OUTPUT**<br>BNC socket 50 Ω | |
| 23 |   | **X4.1** **4.5 - MHz INP / OUTP**<br>BNC socket 75 Ω<br>**X4.2** **ZERO REF PULSE INPUT**<br>BNC socket 75 Ω<br>**X4.3** **Q-SIGNAL OUTPUT**<br>BNC socket 75 Ω<br>**X4.4** **VIDEO OUTPUT 75 Ω**<br>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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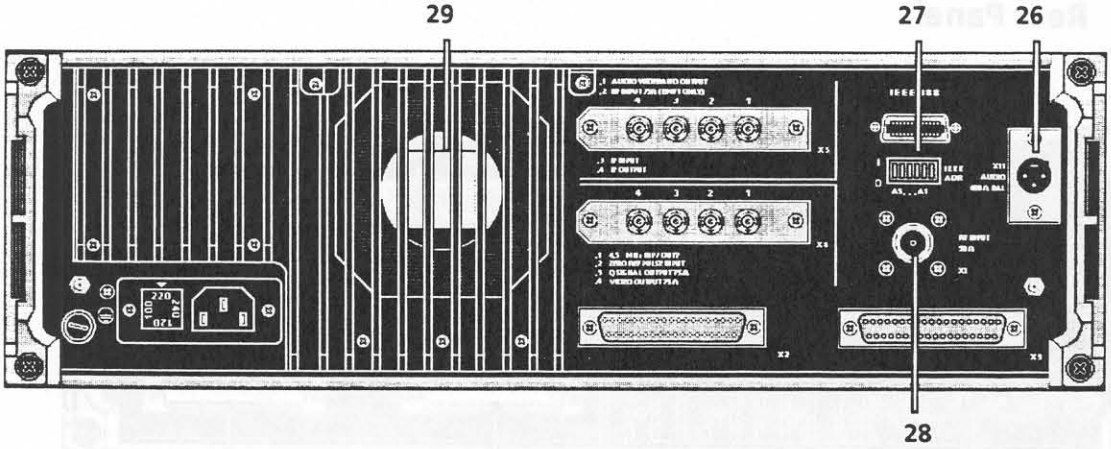
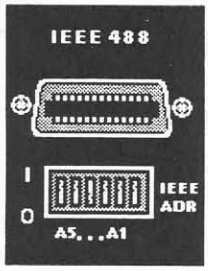
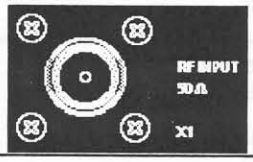



Fig. 3-2 Rear panel

| Item | Inscription | Function |
|---|---|---|
| 26 |   | **X11 AUDIO 600 Ω BAL**<br>XLR socket — AUDIO output 600 Ω |
| 27 |   | **IEEE 488**<br>24-contact socket — Connection of IEC/IEEE bus, X10<br>**IEEE ADR** DIL switch — Setting of device address, S10 |
| 28 |   | **RF INPUT 50 Ω X1**<br>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

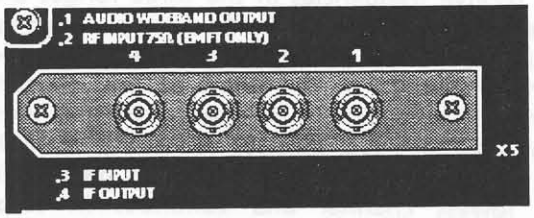


The blower protects the components from overheating. If it fails, check whether link X40 on the power supply board is in position 1-2. If the blower does not work although X40 is correctly set, it needs to be repaired.

## 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.*

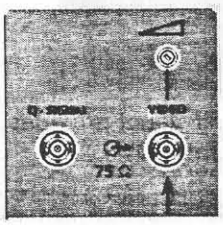



The characteristic impedance is 50 Ω (X5.1) or 75 Ω (X5.2). The IF signal can also be applied directly to the IF section via X5.3.



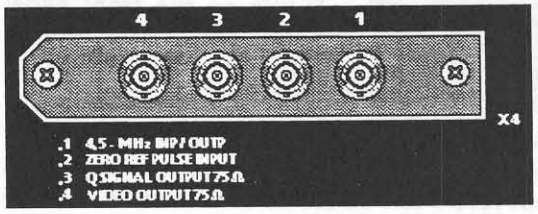

The level should be in the range 5 to 100 $mV_{rms}$. The selected input is indicated by the associated LED (RF 50 Ω/ RF 75 Ω/IF) and stored in case of AC supply failure.

## 3.3.4 Signal Outputs

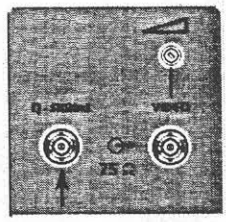



The EMFT has two video outputs (BNC connectors), one on the front panel (VIDEO)...

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

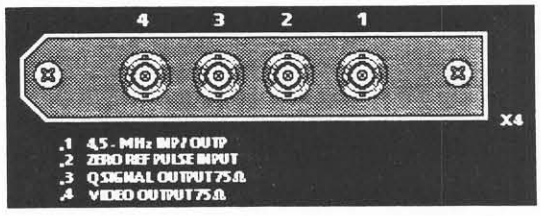



The outputs are isolated and factory-set to 1.11 $V_{pp}$ into 75 Ω. They are used for connecting equipment such as video analyzer, monitor, oscilloscope or special measuring instruments for signal evaluation.




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

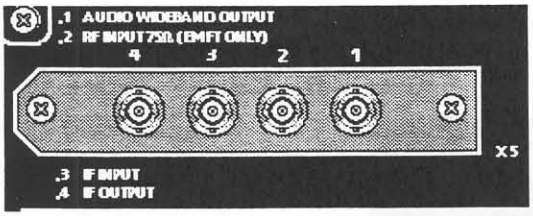
... and rear panel (X4.3).



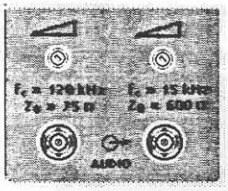



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In normal operation, ie with a correct phase of the vision carrier, this output does not provide any video signal. However, the video amplitude increases with increasing phase shift; if the phase shift is 90°, the Q signal is equal to the I signal 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.



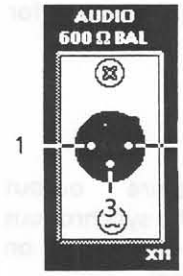

The IF output (X5.4) on the rear panel provides a regulated IF signal (100 $mV_{rms}$ into 50 Ω).



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

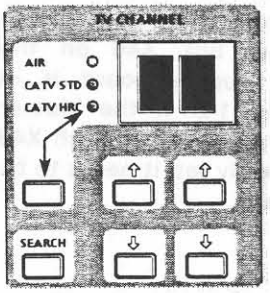
The EMFT can be used for three different channel assignments. To select the range, press key:

**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.

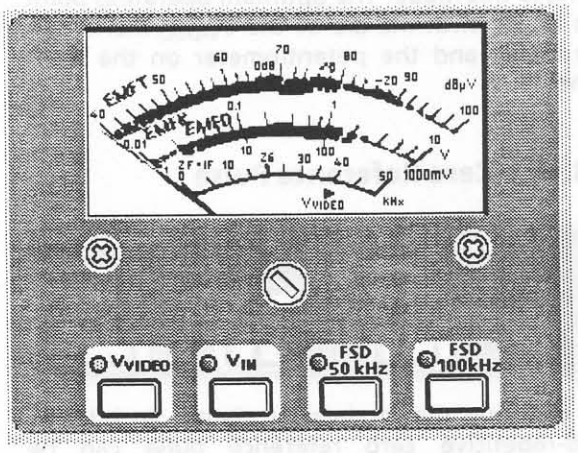
The additional attenuation is automatically taken into account in the readout, i.e. the value displayed corresponds to the input voltage. The demodulation mode is indicated by the LED (10 dB ON).

### 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

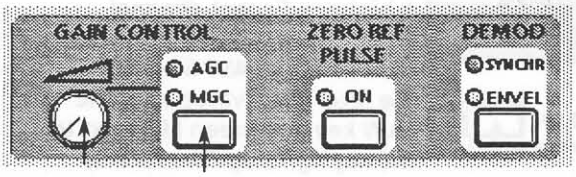



The RF input level (dBµV), the IF input level (mV) and the deviation of sound carrier (kHz) can be read from the panel meter. The RF or IF input signal is levelled to line up with the $V_{VIDEO}$ marker (corresponding to the standard level 1.12 $V_{pp}$ into 75 Ω at the video output). When the measurement 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.



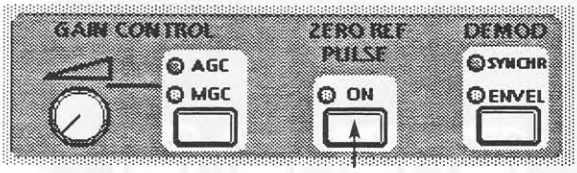
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### 3.3.11 IF Gain Control

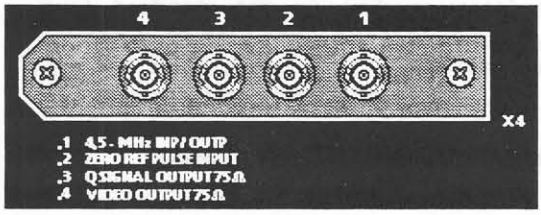



The IF gain control compensates for RF input voltage variations of min. 34 dB, typ. 40 dB. The performance data are guaranteed up to 34 dB. The typical AGC range is 60 dB, taking into account the automatic RF attenuation. The MGC key allows the control voltage to be set manually. The yellow LED next 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

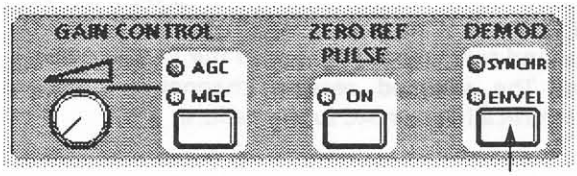



For checking the modulation depth, an internal field-repetitive zero reference pulse can be inserted by pressing the ZERO REF key. In this way, the carrier is blanked in a particular line of the field. The position can be set using R243 (motherboard).




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).

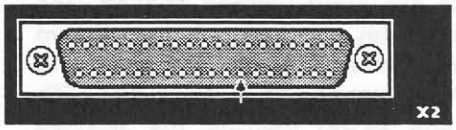
### 3.3.13 Selection of Detector



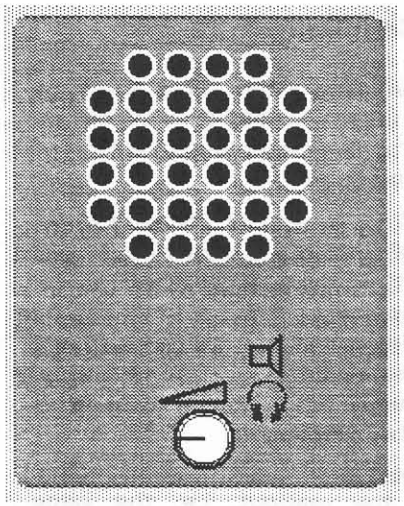

The EMFT has an envelope detector and a synchronous detector with Q signal output (see section 3.3.4). Compared to envelope detection, synchronous detection provides maximum signal quality in relay reception and measurements. The detector selected with the DEMOD key is indicated by the corresponding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



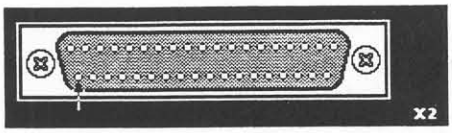

### 3.3.15 Loudspeaker

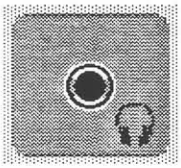


A small loudspeaker is fitted on the front panel for checking the sound.



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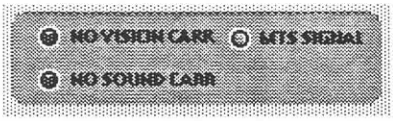


The loudspeaker output can also be made available at connector X2.20 if link X411 is set to 1-3 (motherboard). The knob below the loudspeaker is for volume control of loudspeaker or headphone.

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.*

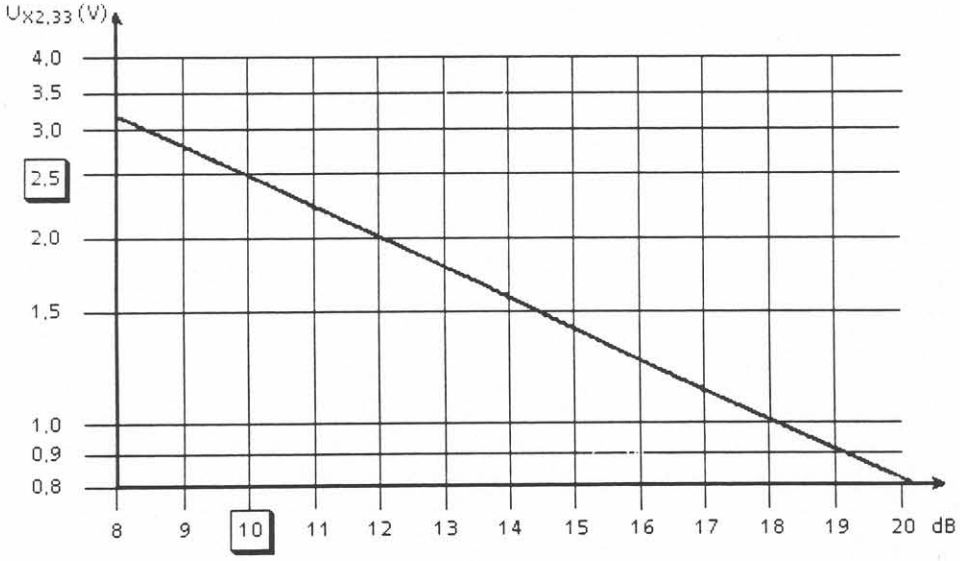



Fig. 3-4 Vision / Sound Ratio Measuring Output



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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 |

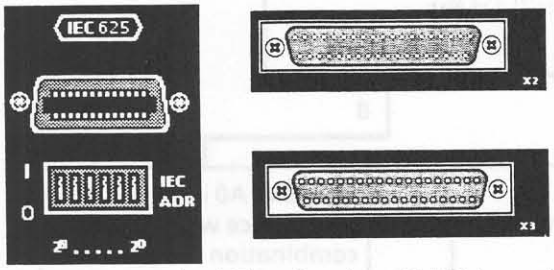
| Table 12 | Standard M (CANADA) | | |
|---|---|---|---|
| Display | CATV HRC | Frequency (MHz) | Filter |
| 40 | H40 | 318 | 4 |
| 41 | H41 | 324 | 4 |
| 42 | H42 | 330 | 4 |
| 43 | H43 | 336 | 4 |
| 44 | H44 | 342 | 4 |
| 45 | H45 | 348 | 4 |
| 46 | H46 | 354 | 4 |
| 47 | H47 | 360 | 4 |
| 48 | H48 | 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



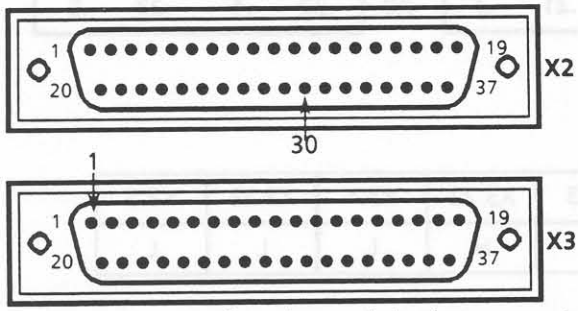

Remote control of Test Receiver EMFT is carried out via an optional IEC-625/IEEE-488-bus interface or the connectors X2 and X3 (parallel remote control) on the rear panel.

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).

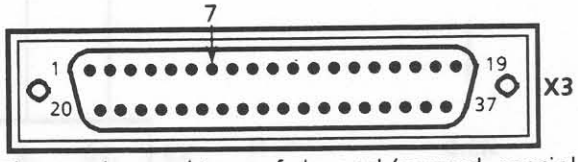
***Initial state:***
SYNCHRONOUS DETECTION
ZERO REFERENCE OFF
RF OPERATION
50-Ω RF INPUT
AUTOMATIC RF ATTENUATION
SAW FILTER OFF
DEMOD MODE OFF

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.

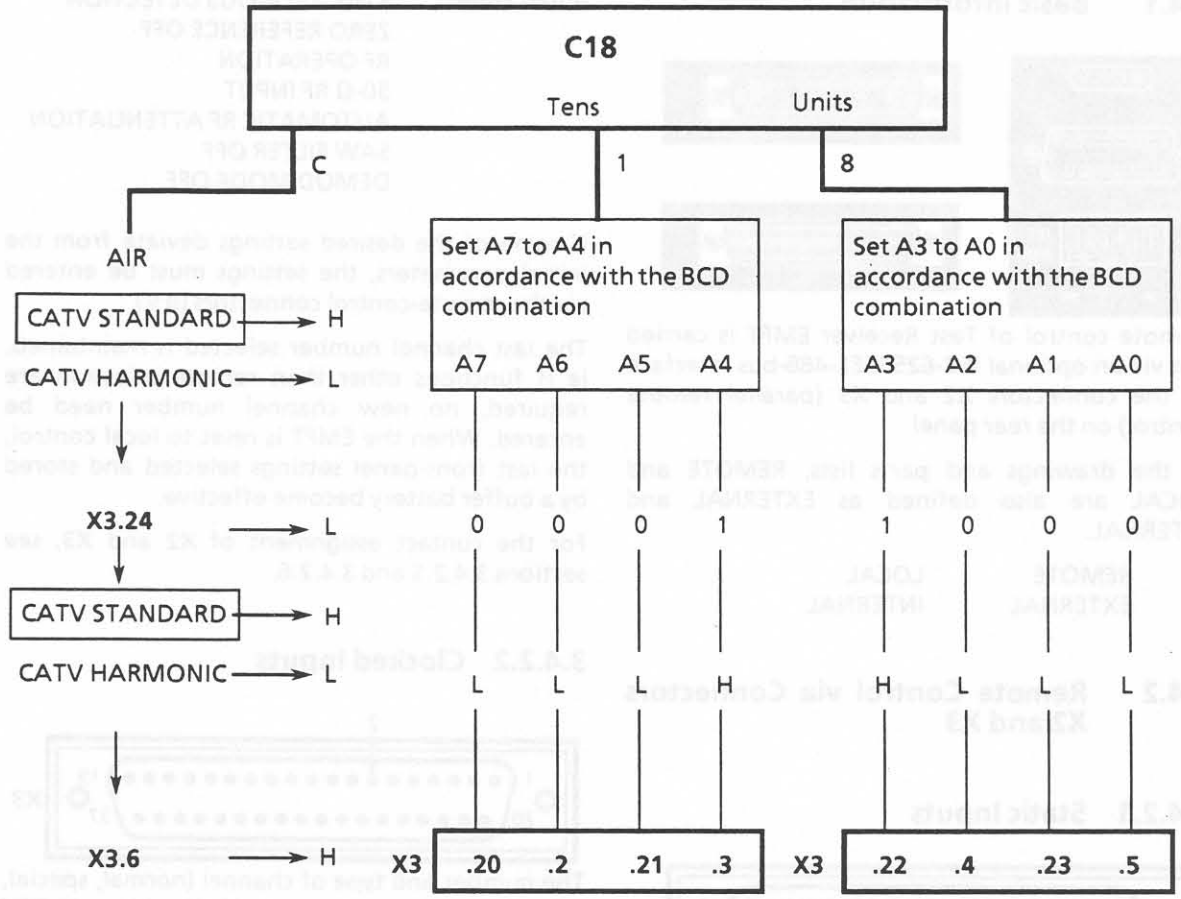
***Example:*** Setting of special channel 18 (S18)

- 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<br>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) |



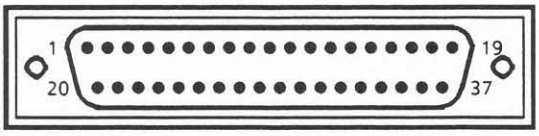
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### 3.4.2.7 Inputs Common to X2 and X3

(linked inputs)

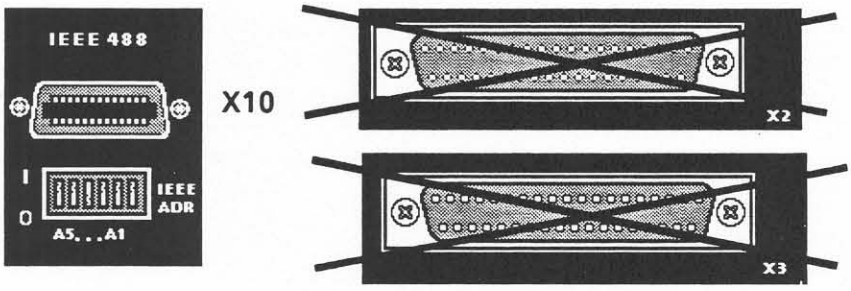
- LOCAL (H)/REMOTE (L) X2.30 and X3.1
- ZERO REF ON (L)/OFF (H) X2.29 and X3.33
- SYNCHR (H)/ENVEL (L) X2.10 and X3.14

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

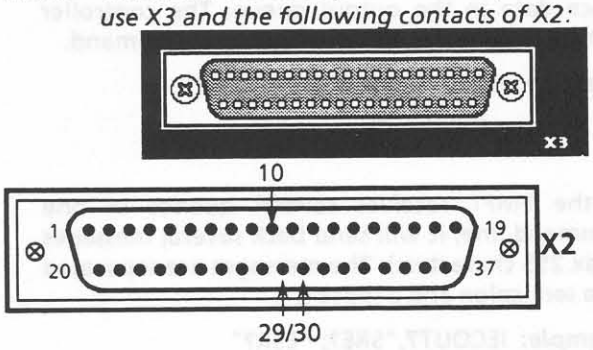
(Option No.821.4254.02)

## 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:*



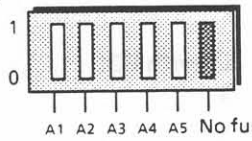

The parallel remote control connector X3 and contacts .10, .29 and .30 of connector X2 must not be connected if the option is fitted.

## 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.

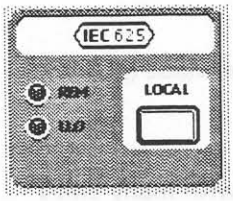
### 3.5.2.2 LOCAL/REMOTE Switchover

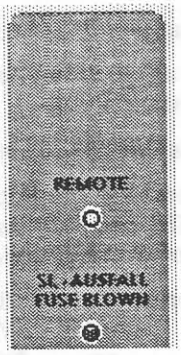
The instrument is always in the LOCAL state (manual operation) directly following power-up.

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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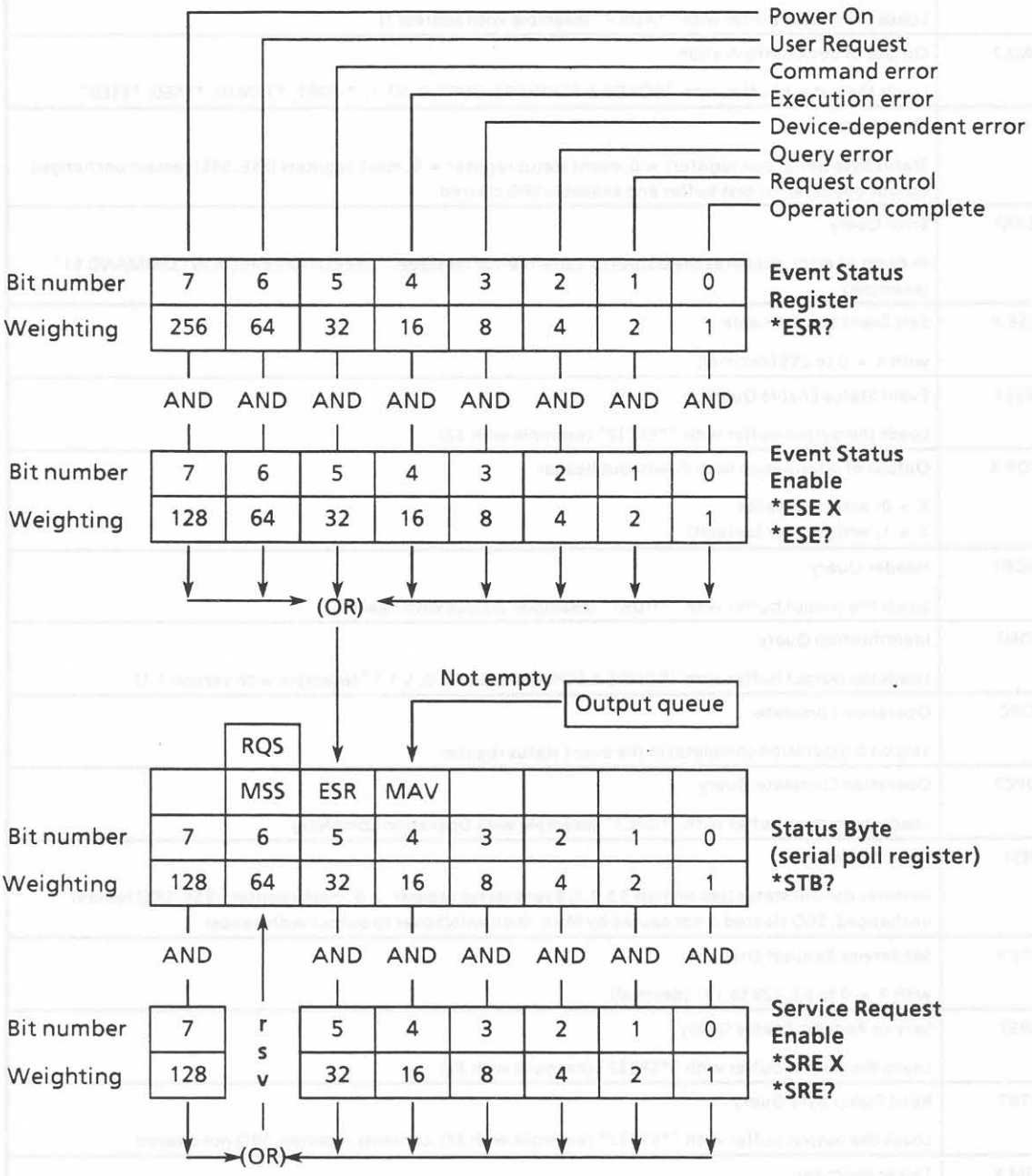
### 3.5.2.9 IEC-bus Commands to IEEE 488.2

| | |
|---|---|
| *ADR? | Query of IEC/IEEE-bus address<br>Loads the output buffer with "*ADR 7" (example with address 7) |
| *ALL? | Output of device information<br>Loads the output buffer with "ROHDE & SCHWARZ, EMFT, 0, V1.1; *ADR7; *TRM10; *SRE0; *ESE0" |
| *CLS | Clear Status<br>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<br>In event of error, prepares the output of current error message: "EXECUTION ERROR IN COMMAND §1" (example) |
| *ESE X | Sets Event Status Enable<br>with X = 0 to 255 (decimal) |
| *ESE? | Event Status Enable Query<br>Loads the output buffer with "*ESE32" (example with 32) |
| *HDR X | Output of information with or without header<br>X = 0: without header<br>X = 1: with header (default) |
| *HDR? | Header Query<br>Loads the output buffer with "*HDR1" (example: output with header) |
| *IDN? | Identification Query<br>Loads the output buffer with "ROHDE & SCHWARZ, EMFT, 0, V 1.1" (example with version 1.1) |
| *OPC | Operation Complete<br>Sets bit 0 (operation complete) in the event status register |
| *OPC? | Operation Complete Query<br>Loads the output buffer with "*OPC1" (example with Operation Complete) |
| *RST | Reset Command<br>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<br>with X = 0 to 63, 128 to 191 (decimal) |
| *SRE? | Service Request Enable Query<br>Loads the output buffer with "*SRE32" (example with 32) |
| *STB? | Read Status Byte Query<br>Loads the output buffer with "*STB32" (example with 32), contents retained, SRQ not cleared. |
| *TRM X | Talker delimiter<br>Delimiters: with X = 0 CR + LF with EOI<br>X = 1 last character with EOI<br>X > 1 X with EOI (X < 128)<br>Default: X = 10 LF with EOI<br>Example: X = 13 CR with EOI |
| *TST? | Selftest Query<br>Loads the output buffer with "*TST0" |
| *WAI | Wait To Continue<br>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

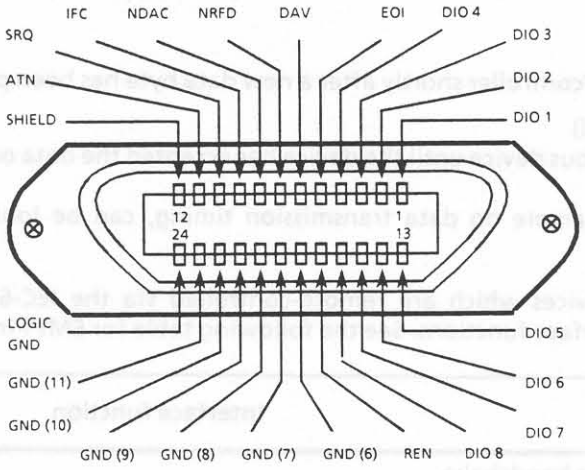
110 IEC OUT 7,"*RST; *CLS; *ESE 52; *SRE 48"     Reset, clear status, event transfer by error,
                                                 RSQ by event and MAV

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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