PHILIPS

Data handbook

PHILIPS Electronic components and materials

Components and materials

Part 2 June 1981

FM tuners

Television tuners

Video modulators

Surface acoustic wave filters

COMPONENTS AND MATERIALS

PART 2 - JUNE 1981

TUNERS

DATA HANDBOOK SYSTEM

Our Data Handbook System is a comprehensive source of information on electronic components, sub-assemblies and materials; it is made up of four series of handbooks each comprising several parts.

ELECTRON TUBES	BLUE
SEMICONDUCTORS	RED
INTEGRATED CIRCUITS	PURPLE
COMPONENTS AND MATERIALS	GREEN

The several parts contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

Where ratings or specifications differ from those published in the preceding edition they are pointed out by arrows. Where application information is given it is advisory and does not form part of the product specification.

If you need confirmation that the published data about any of our products are the latest available, please contact our representative. He is at your service and will be glad to answer your inquiries.

ELECTRON TUBES (BLUE SERIES)

Starting in 1980, new part numbers and corresponding codes are being introduced. The former code of the preceding issue is given in brackets under the new code.

Part 1	**February 1980**	**T1 02-80** **(ET1a 12-75)**	**Tubes for r.f. heating**
Part 2	**April 1980**	**T2 04-80** **(ET1b 08-77)**	**Transmitting tubes for communications**
Part 2b	**May 1978**	**ET2b 05-78**	**Microwave semiconductors and components** Gunn, Impatt and noise diodes, mixer and detector diodes, backward diodes, varactor diodes, Gunn oscillators, sub-assemblies, circulators and isolators.
Part 3	**June 1980**	**T3 06-80** **(ET2a 11-77)**	**Klystrons, travelling-wave tubes, microwave diodes**
Part 3	**January 1975**	**ET3 01-75**	**Special Quality tubes, miscellaneous devices**
Part 4	**September 1980**	**T4 09-80** **(ET2a 11-77)**	**Magnetrons**
Part 5a	**October 1979**	**ET5a 10-79**	**Cathode-ray tubes** Instrument tubes, monitor and display tubes, C.R. tubes for special applications.
Part 6	**July 1980**	**T6 07-80** **(ET6 01-77)**	**Geiger-Müller tubes**
Part 7a	**March 1977**	**ET7a 03-77**	**Gas-filled tubes** Thyratrons, industrial rectifying tubes, ignitrons, high-voltage rectifying tubes.
Part 7b	**May 1979**	**ET7b 05-79**	**Gas-filled tubes** Segment indicator tubes, indicator tubes, switching diodes, dry reed contact units.
Part 8	**July 1979**	**ET8 07-79**	**Picture tubes and components** Colour TV picture tubes, black and white TV picture tubes, monitor tubes, components for colour television, components for black and white television.
Part 9	**June 1980**	**T9 06-80** **(ET9 03-78)**	**Photo and electron multipliers** Photomultiplier tubes, phototubes, single channel electron multipliers, channel electron multiplier plates.
Part 10	**May 1981**	**T10 05-81** **(ET5b 12-78)**	**Camera tubes and accessories, image intensifiers**

SEMICONDUCTORS (RED SERIES)

Starting in 1980, new part numbers and corresponding codes are being introduced. The former code of the preceding issue is given in brackets under the new code.

Part 1	March 1980	S1 03-80 (SC1b 05-77)	**Diodes** Small-signal germanium diodes, small-signal silicon diodes, special diodes, voltage regulator diodes (< 1,5 W), voltage reference diodes, tuner diodes, rectifier diodes
Part 2	May 1980	S2 05-80 (SC1a 08-78)	**Power diodes, thyristors, triacs** Rectifier diodes, voltage regulator diodes (> 1,5 W), rectifier stacks, thyristors, triacs
Part 2	June 1979	SC2 06-79	**Low-frequency power transistors**
Part 3	January 1978	SC3 01-78	**High-frequency, switching and field-effect transistors***
Part 3	April 1980	S3 04-80 (SC2 11-77, partly) (SC3 01-78, partly)	**Small-signal transistors**
Part 4a	December 1978	SC4a 12-78	**Transmitting transistors and modules**
Part 5	October 1980	S5 10-80 (SC3 01-78)	**Field-effect transistors**
Part 7	December 1980	S7 12-80 (SC4c 07-78)	**Discrete semiconductors for hybrid circuits**
Part 8	April 1980	S8 06-81 (SC4b 09-78)	**Devices for optoelectronics** Photosensitive diodes and transistors, light-emitting diodes, displays, photocouplers, infrared sensitive devices, photoconductive devices

* Wideband transistors will be transferred to S10. The old book SC3 01-78 should be kept until then.

INTEGRATED CIRCUITS (PURPLE SERIES)

Starting in 1980, new part numbers and corresponding codes are being introduced. The former code of the preceding issue is given in brackets under the new code. Books with the purple cover will replace existing red covered editions as each is revised.

Part 1	**May 1980**	**IC1 05-80** **(SC5b 03-77)**	**Bipolar ICs for radio and audio equipment**
Part 2	**May 1980**	**IC2 05-80** **(SC5b 03-77)**	**Bipolar ICs for video equipment**
Part 5a	**November 1976**	**SC5a 11-76**	**Professional analogue integrated circuits**
Part 4	**October 1980**	**IC4 10-80** **(SC6 10-77)**	**Digital integrated circuits** LOCMOS HE4000B family
Part 6b	**August 1979**	**SC6b 08-79**	**ICs for digital systems in radio and television receivers**
Signetics integrated circuits			Bipolar and MOS memories 1979 Bipolar and MOS microprocessors 1978 Analogue circuits 1979 Logic - TTL 1978

COMPONENTS AND MATERIALS (GREEN SERIES)

Starting in 1980, new part numbers and corresponding codes are being introduced. The former code of the preceding issue is given in brackets under the new code.

Part 1	July 1979	CM1 07-79	**Assemblies for industrial use** PLC modules, high noise immunity logic FZ/30 series, NORbits 60-series, 61-series, 90-series, input devices, hybrid integrated circuits, peripheral devices.
Part 2	June 1981	C2 06-81 (CM3a 09-78)	**FM tuners, television tuners, video modulators, surface acoustic wave filters**
Part 3	January 1981	C3 01-81 (CM3b 10-78)	**Loudspeakers**
Part 4a	November 1978	CM4a 11-78	**Soft Ferrites** Ferrites for radio, audio and television, beads and chokes, Ferroxcube potcores and square cores, Ferroxcube transformer cores
Part 4b	February 1979	CM4b 02-79	**Piezoelectric ceramics, permanent magnet materials**
Part 6	May 1981	C6 05-81 (CM6 04-77)	**Electric motors and accessories** Permanent magnet synchronous motors, stepping motors, direct current motors
Part 7a	January 1979	CM7a 01-79	**Assemblies** Circuit blocks 40-series and CSA70 (L), counter modules 50-series, input/output devices
Part 8	June 1979	CM8 06-79	**Variable mains transformers**
Part 9	August 1979	CM9 08-79	**Piezoelectric quartz devices** Quartz crystal units, temperature compensated crystal oscillators
Part 10	October 1980	C10 10-80	**Connectors**
Part 11	December 1979	CM11 12-79	**Non-linear resistors** Voltage dependent resistors (VDR), light dependent resistors (LDR), negative temperature coefficient thermistors (NTC), positive temperature coefficient thermistors (PTC)
Part 12	November 1979	CM12 11-79	**Variable resistors and test switches**
Part 13	December 1979	CM13 12-79	**Fixed resistors**
Part 14	April 1980	C14 04-80 (CM2b 02-78)	**Electrolytic and solid capacitors**
Part 15	May 1980	C15 05-80 (CM2b 02-78)	**Film capacitors, ceramic capacitors, variable capacitors**

FM TUNERS

F.M. TUNERS
with diode tuning

QUICK REFERENCE DATA	
F.M. tuners for European and American band Tuner FD1 without a.f.c. Tuner FD1A with a.f.c.	
Supply voltage (d.c.)	12 V
Frequency range	87,5 to 108 MHz

GENERAL

These tuners are intended for use in hi-fi radio sets. The advantage of these tuners is the excellent big signal handling.
The wanted range can be obtained by limiting the tuning voltage.
The tuners are equipped with silicon transistors and silicon variable capacitance diodes.

MECHANICAL DATA

Dimensions in mm

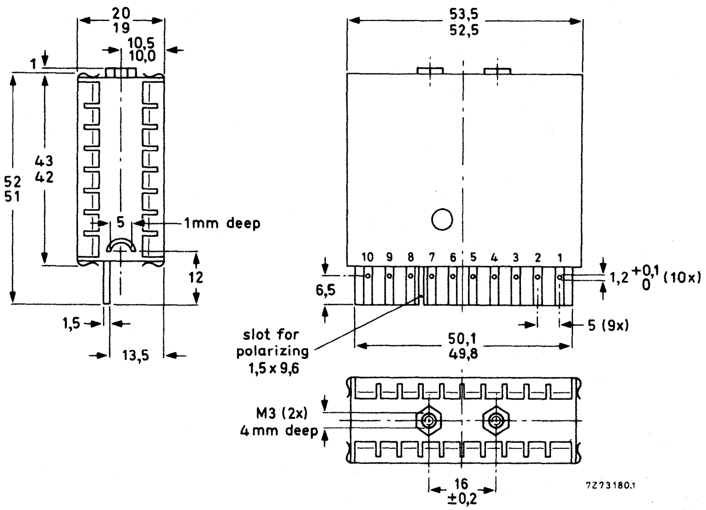


Fig. 1

The tuner can be fixed in a connector or soldered directly to a printed-wiring board.

ELECTRICAL DATA

Semiconductors	2 x BF324 1 x BF451 4 x BB204 1 x BB106 (only for FD1A)
Ambient temperature range, operating	0 to +50 °C
storage	-20 to +60 °C
Supply voltage	+12 ± 1 V
Current drawn from + 12 V supply	9 mA
Tuning voltage range (Fig. 2)	+3,8 to +28 V
Frequency range	87,5 to 108 MHz
Intermediate frequency	10,7 MHz The oscillator frequency is higher than the signal frequency
I.F. bandwidth	270 kHz
Input impedance, asymmetrical	75 Ω
symmetrical	300 Ω
Output impedance for critical coupling	470 Ω
Gain at 98 MHz	min. 27 dB (typ. 30 dB)
Noise figure at 98 MHz	max. 7,5 dB (typ. 6 dB)
Reflection factor at 98 MHz	0,35
I.F. suppression at 98 MHz	min. 76 dB (typ. 83 dB)
Image rejection at 98 MHz	min. 64 dB (typ. 72 dB)
Repeat spot suppression (RSS, Fig. 3) 1)	min. 70 dB (typ. 82 dB)
Double beat suppression (DBS, Fig. 3) 2)	min. 70 dB (typ. 80 dB)
Continuous beat suppression (CBS, Fig. 4) 3)	62 dB
Minimum input signal (e.m.f.) at a shift of the oscillator frequency of max. 20 kHz	1 V
Shift of the oscillator frequency at a change of the supply voltage of 1 V	max. 30 kHz

1) Suppression of a signal arising by conversion of harmonics of the oscillator signal and those of a strong aerial signal.

2) Suppression of a signal arising from two strong aerial signals.

3) Suppression of a signal arising from the harmonic of two strong aerial signals with a frequency difference equal to the intermediate frequency.

Temperature coefficient of the oscillator	see Fig. 5
Oscillator radiation	according to VDE 0872.7 and 0872.8
A.F.C. sensitivity (only for FD1A)	see Figs. 6 and 7

Graphs

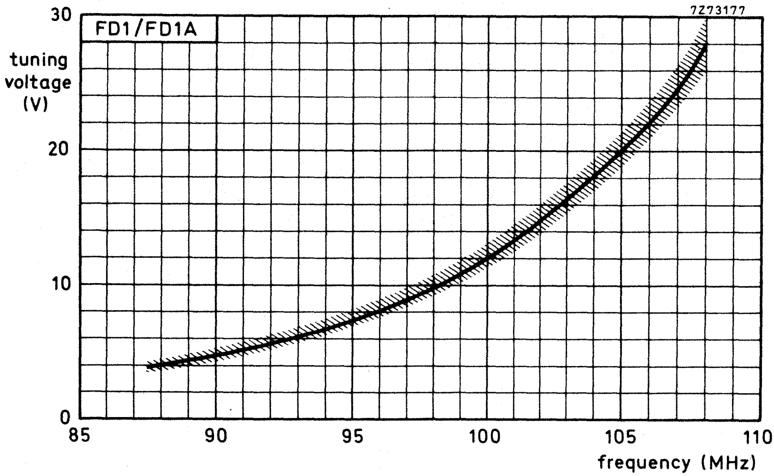


Fig. 2. Tuning voltage as a function of signal frequency.

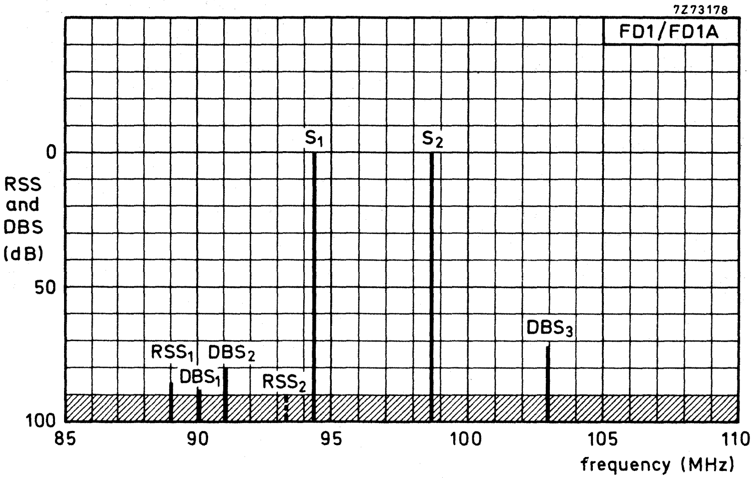


Fig. 3. Location of transmitter frequencies, repeat spots and double beats. Reference signals S_1 and S_2: 10 μV.

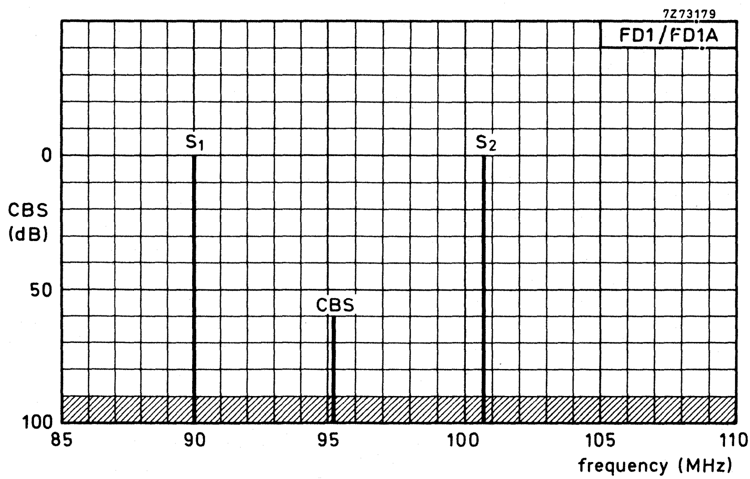


Fig. 4. Location of transmitter frequencies and measuring frequency for measuring the continuous beat suppression (CBS).

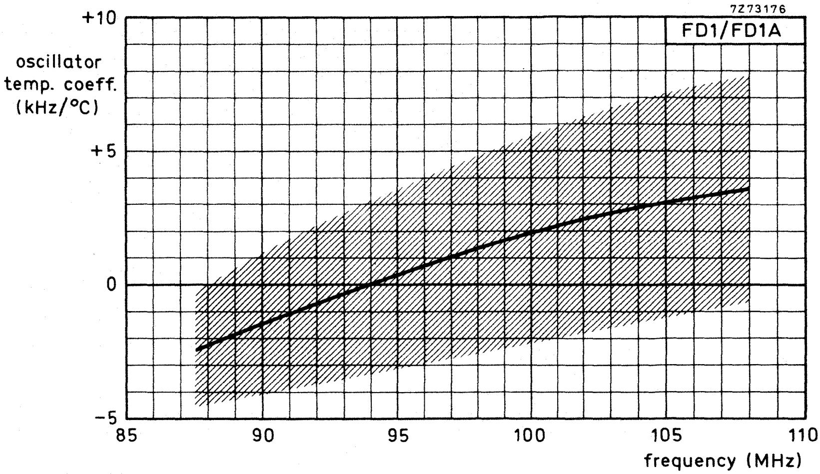


Fig. 5 Oscillator temperature coefficient as a function of signal frequency, measured in the temperature range 15 to 25 °C.

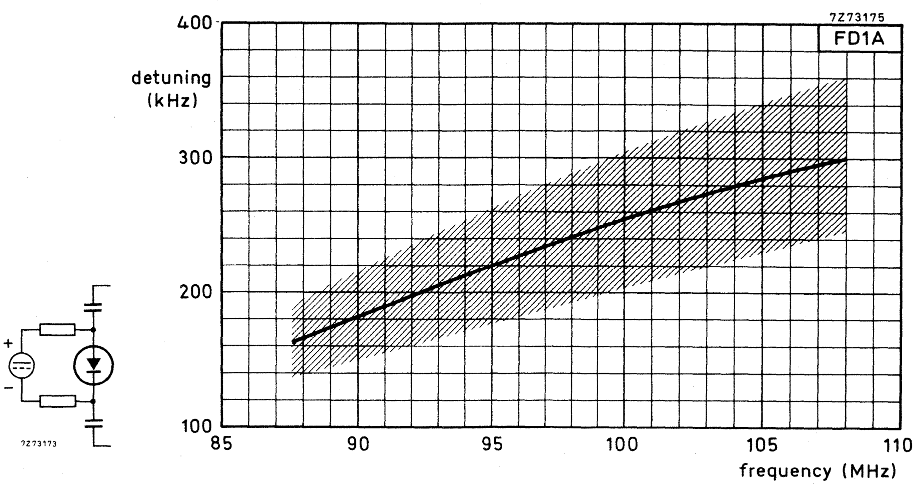
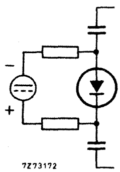


Fig. 6 Detuning as a function of signal frequency at a control voltage change from 0 to +400 mV.



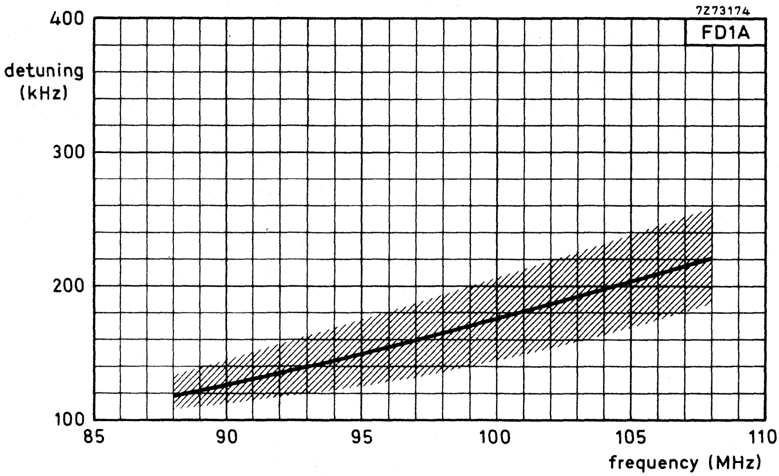
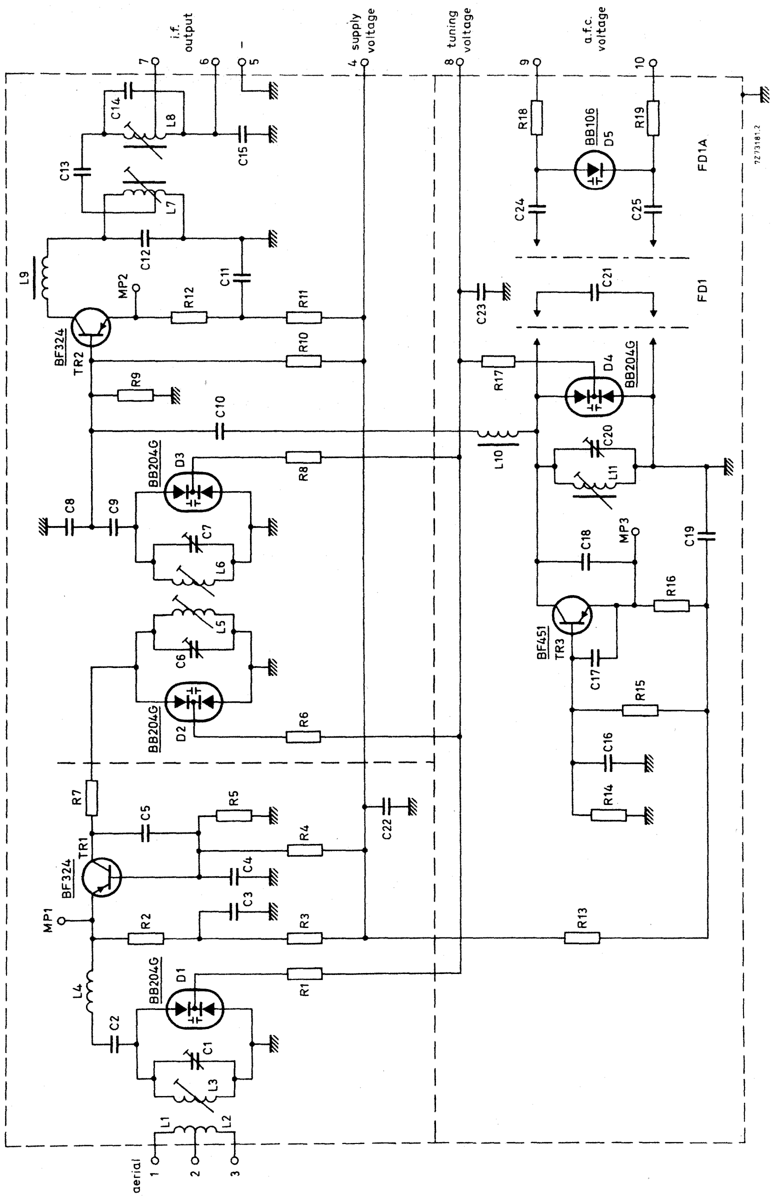


Fig. 7 Detuning as a function of signal frequency at a control voltage change from 0 to −400 mV.


i.f. output
supply voltage
tuning voltage
a.f.c. voltage
aerial
1
2
3
4
5
6
7
8
9
10
BF324
TR1
BF324
TR2
BF451
TR3
BB204G
D1
BB204G
D2
BB204G
D3
BB204G
D4
BB106
D5
MP1
MP2
MP3
FD1
FD1A
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
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C18
C19
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C22
C23
C24
C25
L1
L2
L3
L4
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L7
L8
L9
L10
L11
7Z73181.2

Fig. 8.

F.M. TUNER

- With diode tuning
- For European and American band
- With automatic frequency control
- Suited for digital tuning systems

QUICK REFERENCE DATA

Supply voltage (d.c.)	12	V
Frequency range	87,5 to 108	MHz
Intermediate frequency	10,7	MHz

APPLICATION

This f.m. tuner is designed for use in hi-fi radio receivers. An output voltage from the local oscillator is made available for driving digital frequency displays and tuning systems. Apart from this the tuner is compatible with tuner FD1A.

DESCRIPTION

The FD1B is an f.m. tuner with electronic tuning, covering the v.h.f. band II (frequency range 87,5 to 108 MHz).

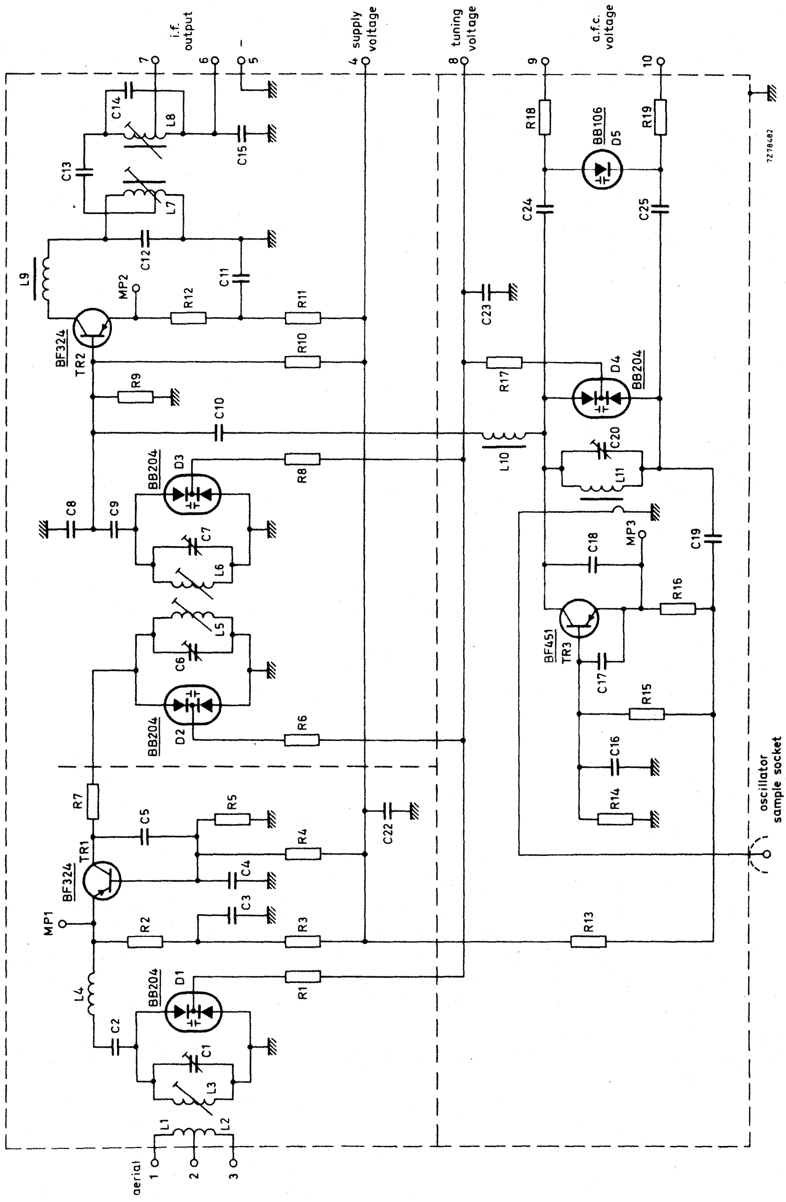
Mechanically the tuner is built on a low-loss printed board, carrying all components, in a metal housing of a rectangular frame, and front and rear cover (Fig. 2). All contacts are on a board edge at the underside, which can be inserted into a mounting socket, facilitating set repair. Connections to the tuner can also be directly soldered to the contacts.

The tuner has a coaxial socket at the side of the frame for coupling out the oscillator sample.

The tuner is equipped with silicon transistors and silicon variable capacitance diodes.

The aerial signal is fed via an input filter to the r.f. amplifier stage, which is equipped with a high-current transistor BF324 operating in common base mode. Due to the high operating current of this transistor its gain is so high that the coupling to the tuned input circuit can be loose, resulting in good signal handling capability, low noise and good repeat-spot suppression. At the output the r.f. amplifier is provided with a tunable band-pass filter, whose secondary circuit is loosely coupled via capacitors to the base of mixer transistor BF324, operating in common emitter mode, contributing to good signal handling capability of the mixer stage. The oscillator is equipped with a transistor BF451 in common base mode and coupled to the mixer via a low-pass filter, which effectively suppresses harmonics of the oscillator frequency.

The a.f.c. circuit is provided with variable capacitance diode BB106, which controls the oscillator frequency directly.


i.f. output
supply voltage
tuning voltage
a.f.c. voltage
aerial
oscillator sample socket
7Z78482
1
2
3
4
5
6
7
8
9
10
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
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C22
C23
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R1
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R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
BB204
D1
D2
D3
D4
BB106
D5
BF324
TR1
TR2
BF451
TR3
MP1
MP2
MP3

Fig. 1.

MECHANICAL DATA

Dimensions in mm

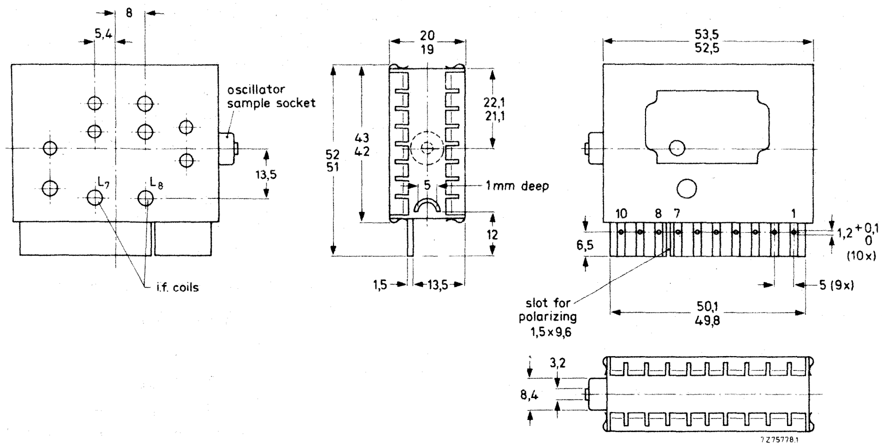


Fig. 2.

Terminals 1 and 2 = aerial, 75 Ω, asymmetrical
1 and 3 = aerial, 300 Ω, symmetrical
4 = supply voltage, +12 V
5 = earth
6 and 7 = i.f. output
8 = tuning voltage, +3,8 to +28 V
9 and 10 = a.f.c. voltage

Mounting

The tuner can be inserted into a mounting socket* or soldered directly to a printed board. The tuner may be mounted anywhere in the receiver and there are no restrictions on orientation.

For connection to the oscillator sample socket a coaxial plug has to be used; type 3/2-50 (manufacturer: Daut und Rietz) is recommended.

Marking

The f.m. tuners are marked with the type number, the 12-digit catalogue number, and the production code.

* Type 3/6 — 178.01 or type 3/6 — 178.02 (manufacturer: Daut und Rietz) is recommended.

ELECTRICAL DATA

Unless otherwise specified all electrical values apply at an ambient temperature of 25 °C, a relative humidity of 60 ± 15%, a supply voltage of 12 V and a signal frequency of 98 MHz.

Semiconductors	
r.f. amplifier	BF324
mixer	BF324
oscillator	BF451
tuning diodes	4 x BB204; 1 x BB106
Ambient temperature range	
operating	0 to +50 °C
storage	−20 to +60 °C
Supply voltage (d.c.)	+12 ± 1 V
Current drawn from +12 V supply	max. 10 mA; typ. 9 mA
Tuning voltage range (Fig. 3)	+3,8 to +28 V
Frequency range	87,5 to 108 MHz
Intermediate frequency	10,7 MHz ± 30 kHz The oscillator frequency is higher than the signal frequency
I.F. bandwidth (3 dB)	270 ± 30 kHz

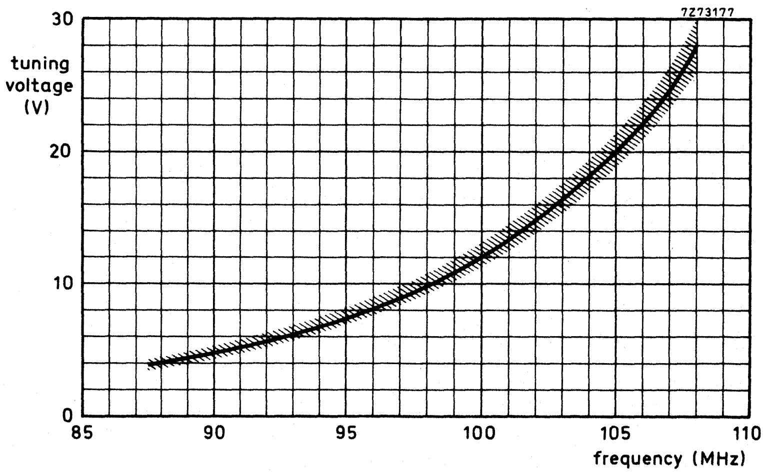


Fig. 3 Tuning voltage as a function of signal frequency.

Input impedance	
asymmetrical	75 Ω
symmetrical	300 Ω
Output impedance	470 Ω
Gain	min. 27 dB; typ. 30 dB
Noise figure	max. 7,5 dB; typ. 6,5 dB
Reflection factor	max. 0,5; typ. 0,35
I.F. suppression	min. 76 dB; typ. 83 dB
Image rejection	min. 64 dB; typ. 72 dB
Repeat spot suppression (RSS)* (Fig. 4)	min. 70 dB; typ. 82 dB
Double beat suppression (DBS)** (Fig. 4)	
DBS_1	min. 70 dB; typ. 80 dB
DBS_2	min. 64 dB; typ. 75 dB
DBS_3	min. 64 dB; typ. 72 dB
Continuous beat suppression (CBS)▲ (Fig. 5)	min. 56 dB; typ. 62 dB
Minimum input signal (e.m.f.) producing a shift of the oscillator frequency of 20 kHz (75 Ω input impedance)	1 V
Shift of oscillator frequency at a change of the supply voltage of 1 V	max. 30 kHz
Temperature coefficient of the oscillator	see Fig. 6
Oscillator radiation	according to VDE 0872.7 and 0872.8
A.F.C. sensitivity	see Figs 7 and 8
Oscillator sample voltage over 60 Ω	min. 15 mV; typ. 20 mV
Oscillator sample frequency	equal to oscillator frequency

* Suppression of a signal arising by conversion of harmonics of the oscillator signal and those of a strong aerial signal.

** Suppression of a signal arising from two strong aerial signals.

▲ Suppression of a signal arising from the harmonic of two strong aerial signals with a frequency difference equal to the intermediate frequency.

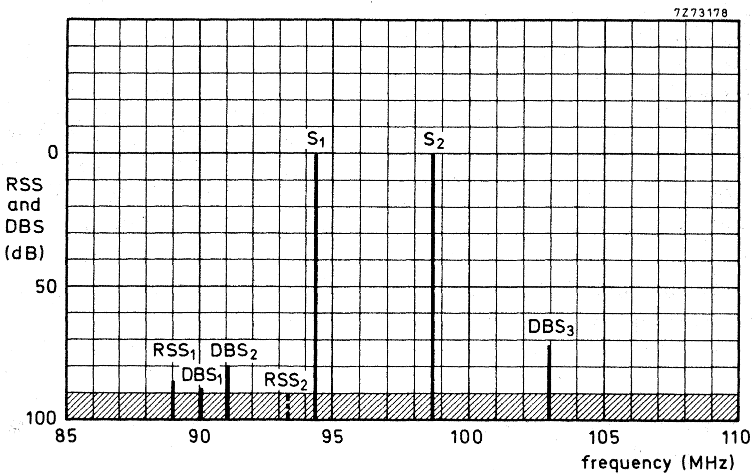


Fig. 4 Location of transmitter frequencies, repeat spots and double beats. Reference signals S1 and S2: 10 μV.

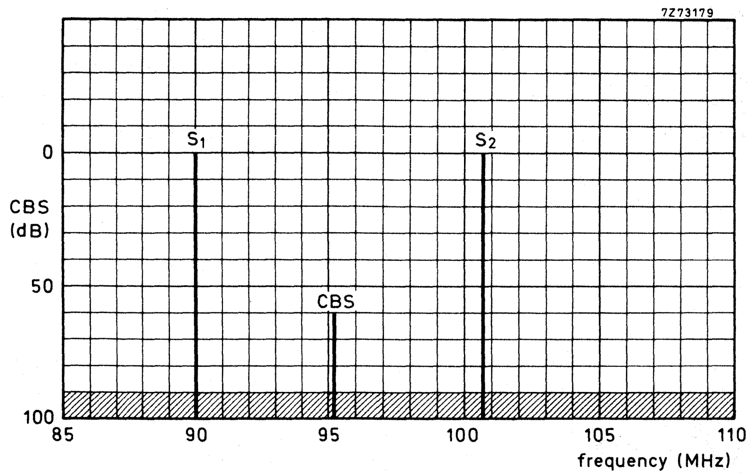


Fig. 5 Location of transmitter frequencies and measuring frequency for measuring the continuous beat suppression (CBS).

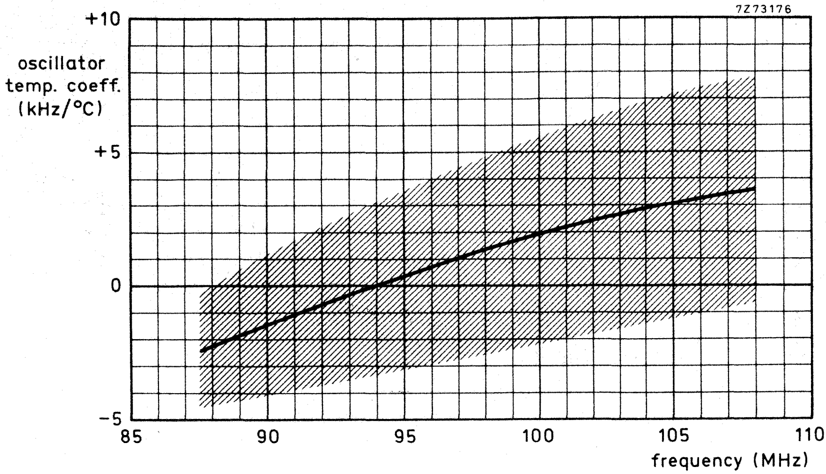


Fig. 6 Oscillator temperature coefficienct as a function of signal frequency, measured in the temperature range 15 to 25 °C.

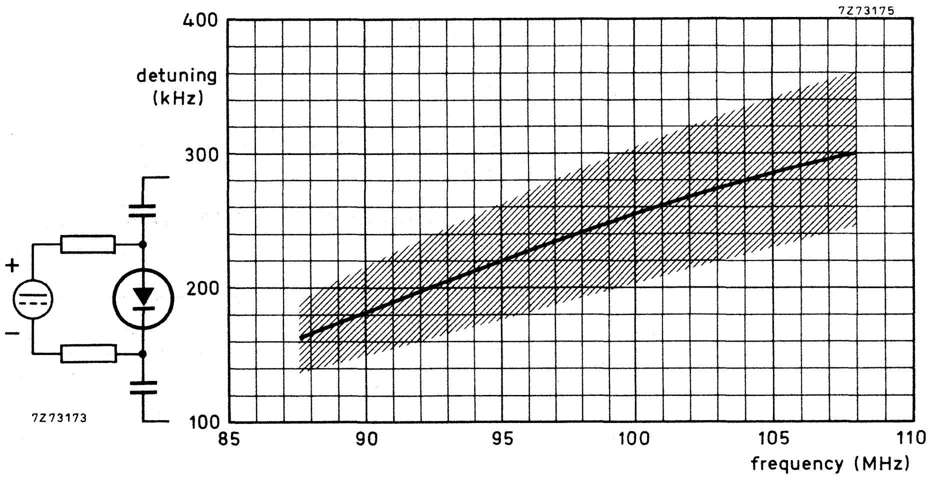
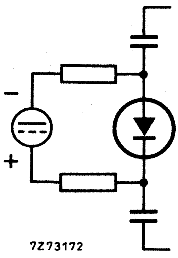


Fig. 7 Detuning as a function of signal frequency at a control voltage change from 0 to +400 mV.



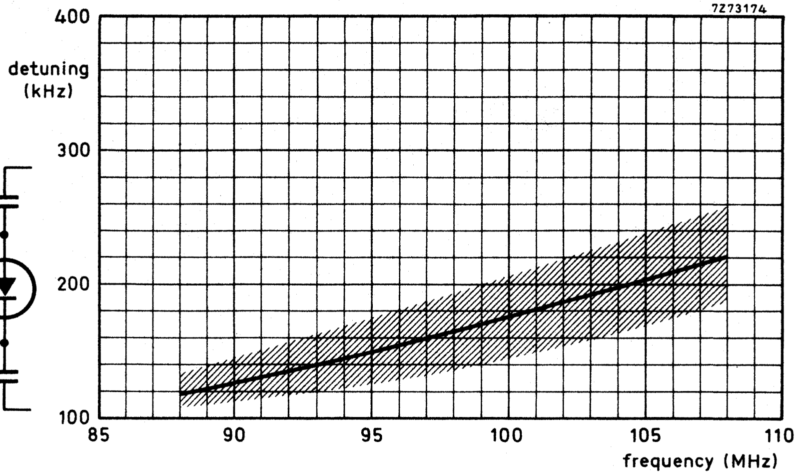
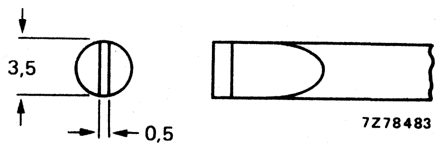


Fig. 8 Detuning as a function of signal frequency at a control voltage change from 0 to –400 mV.

Note: For aligning the i.f. coils, a screwdriver with dimensions as shown in Fig. 9 is recommended.

Fig. 9.



APPLICATION INFORMATION

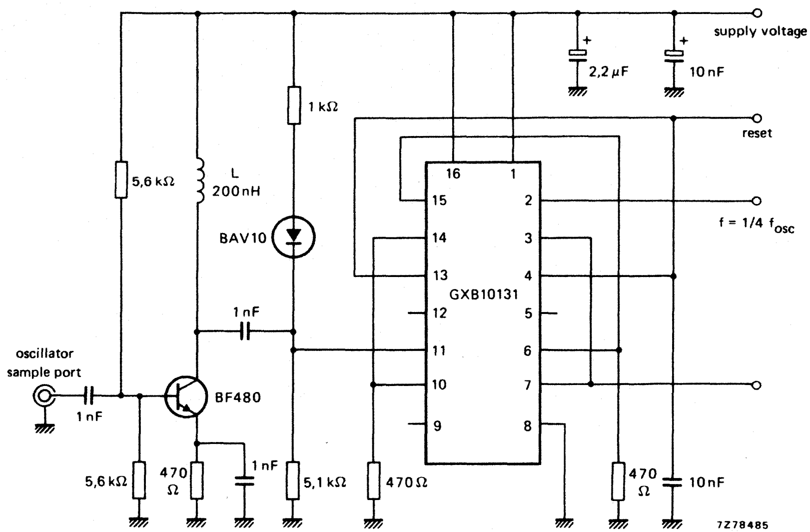


Fig. 10 Recommended circuit of a 4-to-1 divider with preamplifier for connection to the oscillator sample port.

F.M. TUNER

- With diode tuning
- For European and American band
- With automatic frequency control

QUICK REFERENCE DATA

Supply voltage (d.c.)	12 V
Frequency range	87,5 to 108 MHz
Intermediate frequency	10,7 MHz

APPLICATION

This f.m. tuner is designed for use in hi-fi radio receivers.

DESCRIPTION

The FD1B is an f.m. tuner with electronic tuning, covering the v.h.f. band II (frequency range 87,5 to 108 MHz).

Mechanically the tuner is built on a low-loss printed board, carrying all components, in a metal housing of a rectangular frame, and front and rear cover (Fig. 2). All contacts are on a board edge at the underside, which can be inserted into a mounting socket, facilitating set repair. Connections to the tuner can also be directly soldered to the contacts.

The tuner is equipped with silicon transistors and silicon variable capacitance diodes. Thanks to the application of high-current transistors, the tuner has sufficient large-signal properties within the whole frequency range.

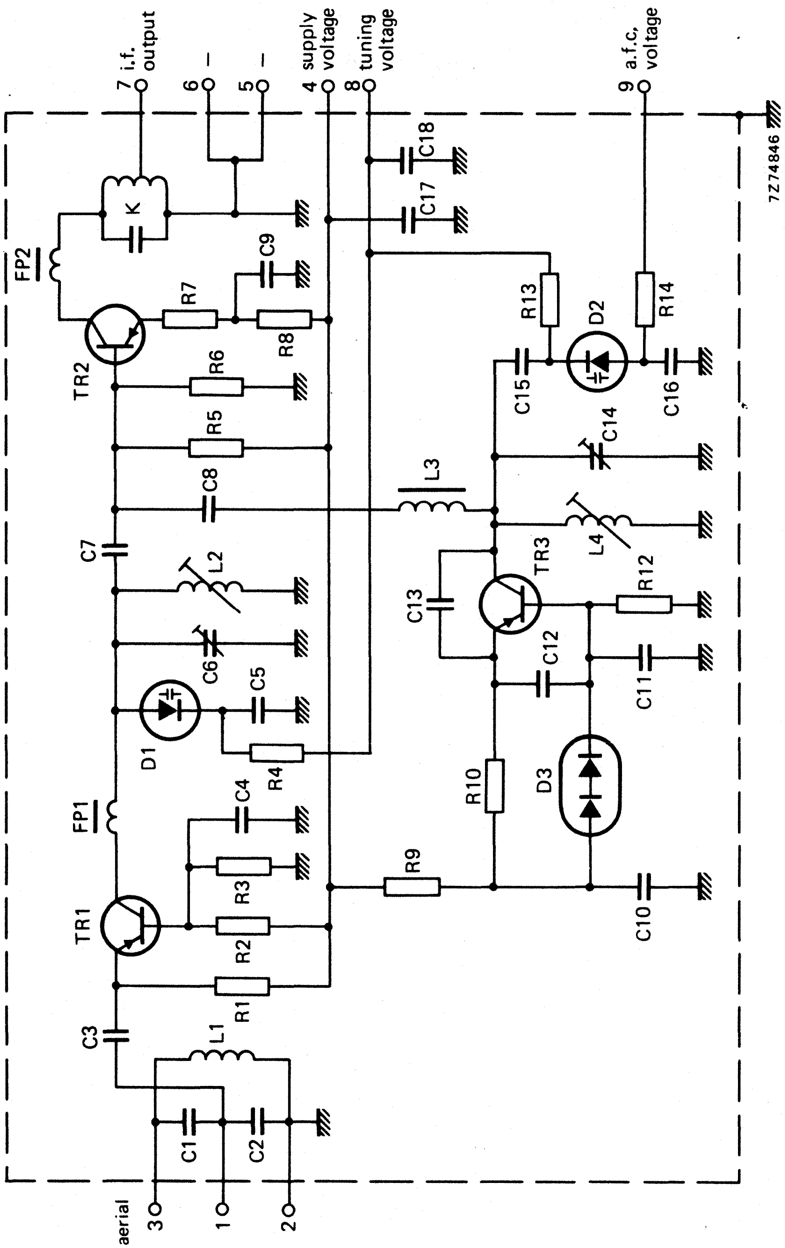

7 i.f. output
6 –
5 –
4 supply voltage
8 tuning voltage
9 a.f.c. voltage
aerial
3
1
2
7Z74846
FP2
K
C9
R7
R8
TR2
R6
R5
C8
C7
L2
C6
C5
D1
R4
FP1
C4
TR1
R3
R2
R1
C3
L1
C1
C2
C18
C17
R13
R14
D2
C15
C16
C14
L3
L4
TR3
C13
R12
C12
C11
R10
D3
R9
C10

Fig. 1.

MECHANICAL DATA

Dimensions in mm

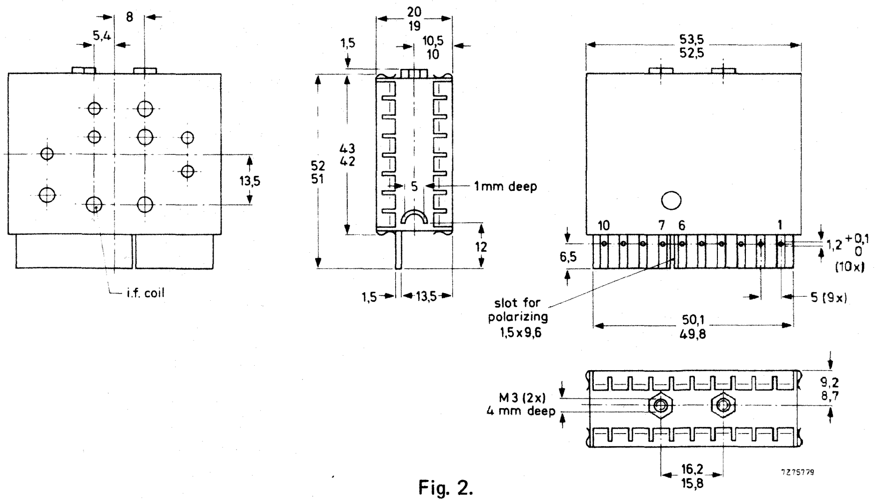


Fig. 2.

Terminals 1 and 2 = aerial, 75 Ω, asymmetrical
2 and 3 = aerial, 300 Ω, symmetrical
4 = supply voltage, + 12 V
5 and 6 = earth
7 = i.f. output
8 = tuning voltage, + 2 to + 12 V
9 = a.f.c. voltage

Mounting

The tuner can be inserted into a mounting socket* or soldered directly to a printed board. The tuner may be mounted anywhere in the receiver and there are no restrictions on orientation.

Marking

The f.m. tuners are marked with the type number, the 12-digit catalogue number, and the production code.

* Type 3/6–178.03 for print connection or type 3/6–178.04 for solder connection (manufacturer: Daut und Rietz) is recommended.

ELECTRICAL DATA

Unless otherwise specified all electrical values apply at an ambient temperature of 25 °C, a relative humidity of 60 ± 15%, a supply voltage of 12 V and a signal frequency of 98 MHz.

Semiconductors	
r.f. amplifier	BF324
mixer	BF324
oscillator	BF451
tuning diodes	2 x BB110G
Ambient temperature range	
operating	0 to + 50 °C
storage	−20 to + 60 °C
Supply voltage (d.c.)	+ 12 ± 1 V
Current drawn from + 12 V supply	6,4 ± 0,5 mA
Tuning voltage range (Fig. 3)	+ 2 to + 12 V
Frequency range	87,5 to 108 MHz
Intermediate frequency	10,7 MHz ± 30 kHz The oscillator frequency is higher than the signal frequency
I.F. bandwidth (3 dB)	230 ± 60 kHz

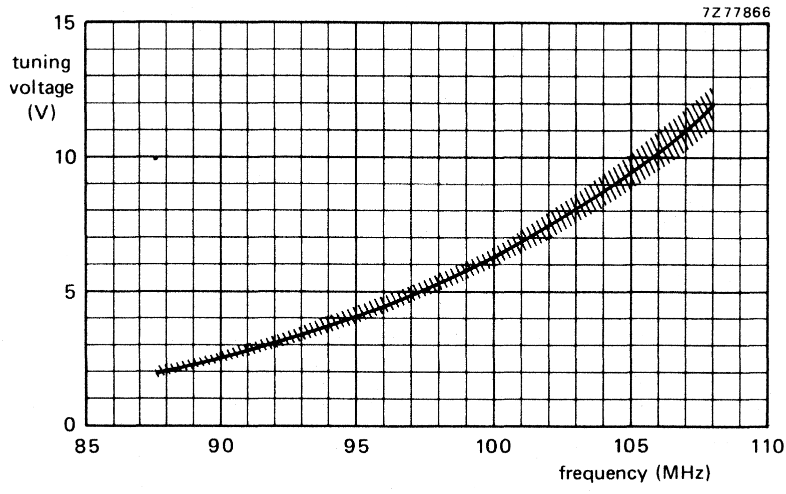


Fig. 3 Tuning voltage as a function of signal frequency.

Input impedance	
asymmetrical	75 Ω
symmetrical	300 Ω
Output impedance	470 Ω
Gain at 89 and 102 MHz	min. 34 dB; typ. 38 dB
Noise figure	max. 7,5 dB; typ. 4 dB
I.F. suppression	52 dB
Image rejection	min. 26 dB; typ. 30 dB
Minimum input signal (e.m.f.) producing a shift of the oscillator frequency of 20 kHz (75 Ω input impedance)	1 V
Shift of oscillator frequency at a change of the supply voltage of 1 V	max. 30 kHz
Temperature coefficient of the oscillator	max. 7 kHz/°C; typ. 3 kHz/°C
Oscillator radiation	according to VDE 0872.7 and 0872.8
A.F.C. sensitivity	see Fig. 4

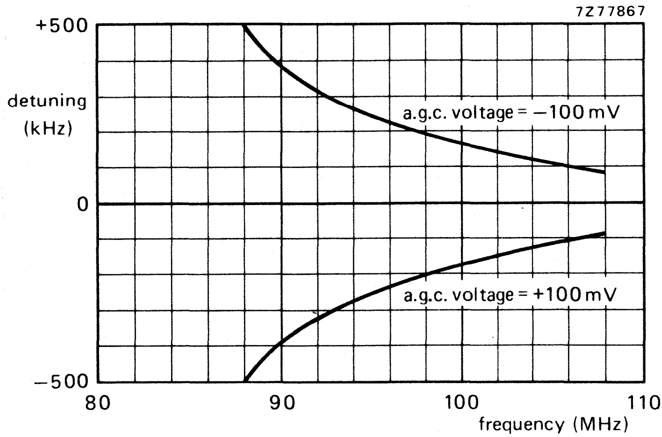


Fig. 4 Detuning as a function of signal frequency.

Note: For aligning the i.f. coil, a screwdriver with dimensions as shown in Fig. 5 is recommended.

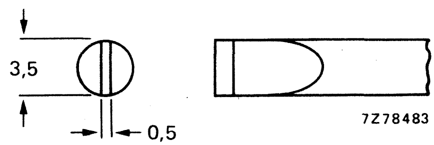


Fig. 5.

F.M. TUNER

- With diode tuning
- For European and American band
- With automatic frequency control
- Suited for digital tuning systems

QUICK REFERENCE DATA

Supply voltage (d.c.)	12	V
Frequency range	87,5 to 108	MHz
Intermediate frequency	10,7	MHz

APPLICATION

This f.m. tuner is designed for use in hi-fi radio receivers. An output voltage from the local oscillator is made available for driving digital frequency displays and tuning systems.

DESCRIPTION

The FD1W is an f.m. tuner with electronic tuning, covering the v.h.f. band II (frequency range 87,5 to 108 MHz).

Mechanically the tuner is built on a low-loss printed board, carrying all components, in a metal housing of a rectangular frame, and front and rear cover (Fig. 2). All contacts are on a board edge at the underside, which can be inserted into a mounting socket, facilitating set repair. Connections to the tuner can also be directly soldered to the contacts.

The tuner has a coaxial socket at the side of the frame for coupling out the oscillator sample.

The tuner is equipped with silicon transistors and silicon variable capacitance diodes.

The aerial signal is fed via a tuned input filter to the r.f. amplifier stage, which is equipped with a high-current transistor BF324 operating in common base mode. Due to the high operating current of this transistor its gain is so high that the coupling to the tuned input circuit can be loose, resulting in good signal handling capability, low noise and good repeat-spot suppression. At the output the r.f. amplifier is provided with a tunable band-pass filter, whose secondary circuit is loosely coupled via capacitors to the base of mixer transistor BF936, operating in common emitter mode, contributing to good signal handling capability of the mixer stage. The oscillator is equipped with a transistor BF451 in common base mode and coupled to the mixer via a low-pass filter, which effectively suppresses harmonics of the oscillator frequency.

The a.f.c. circuit is provided with variable capacitance diode BB106, which controls the oscillator frequency directly.

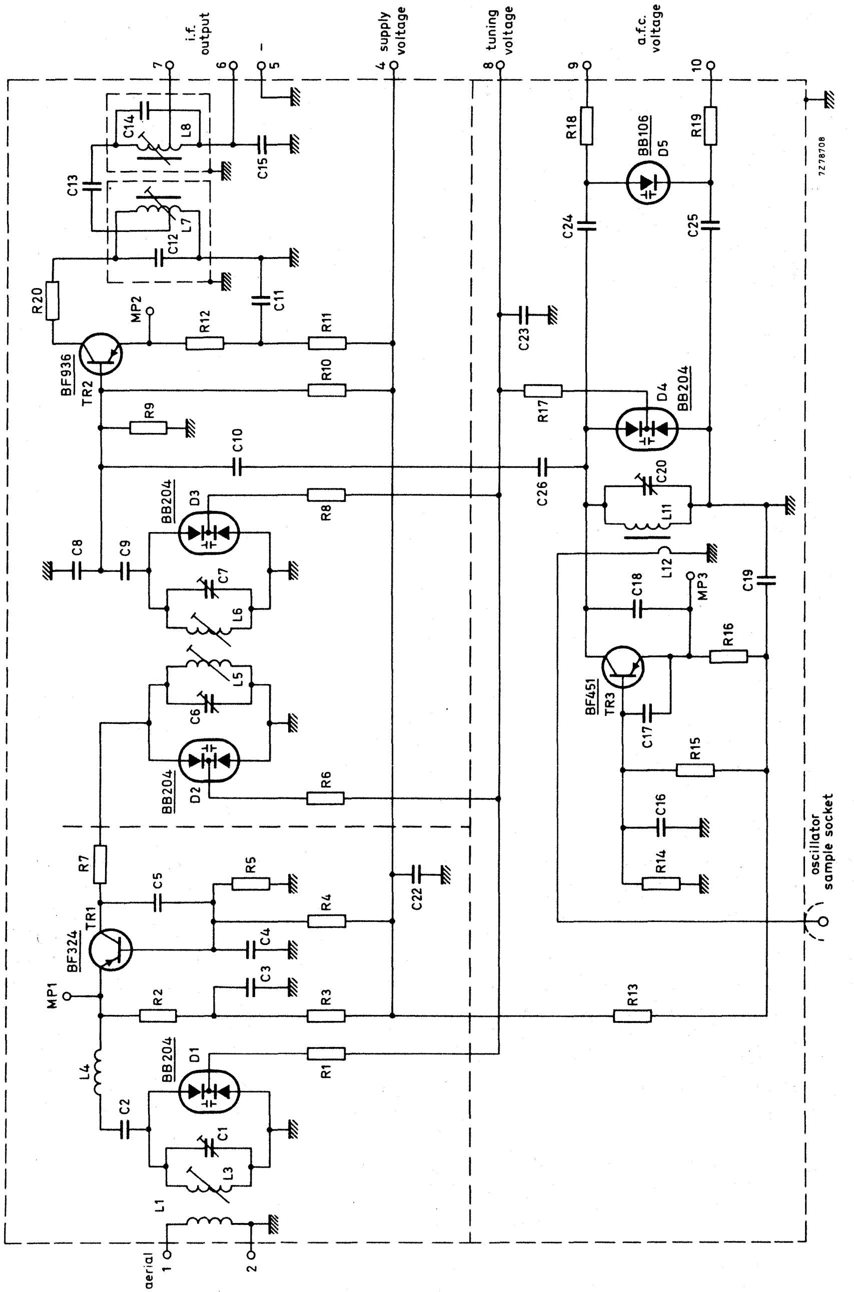

i.f. output
supply voltage
tuning voltage
a.f.c. voltage
aerial
oscillator sample socket
BF936
TR2
BF324
TR1
BF451
TR3
BB204
D1
D2
D3
D4
BB106
D5
MP1
MP2
MP3
7Z78708

Fig. 1.

MECHANICAL DATA

Dimensions in mm

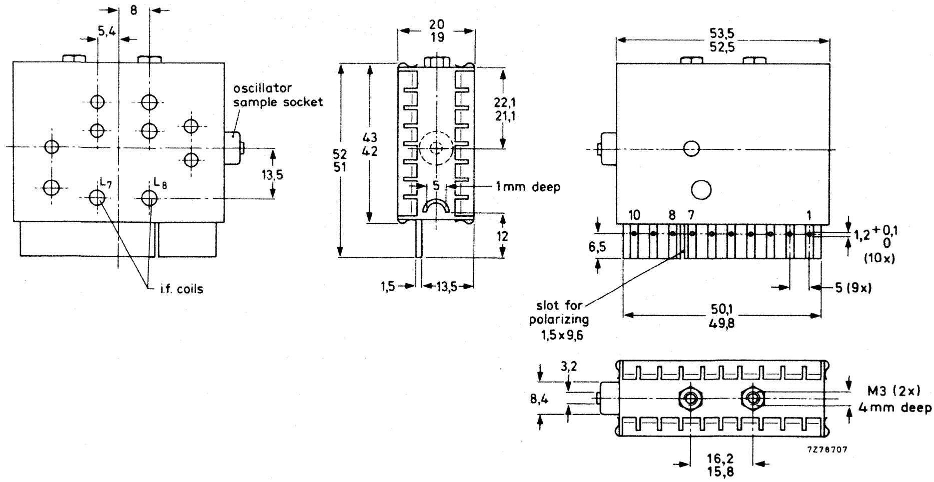


Fig. 2.

Terminals 1 and 2 = aerial, 75 Ω
3 = not connected
4 = supply voltage, +12 V
5 = earth
6 and 7 = i.f. output
8 = tuning voltage, +3,8 to +28 V
9 and 10 = a.f.c. voltage

Mounting

The tuner can be inserted into a mounting socket* or soldered directly to a printed board. It can be fitted by means of two screws M3. The tuner may be mounted anywhere in the receiver and there are no restrictions on orientation.

For connection to the oscillator sample socket a coaxial plug has to be used; type 3/2-50 (manufacturer: Daut und Rietz) is recommended.

Marking

The f.m. tuners are marked with the type number, the 12-digit catalogue number, and the production code.

* Type 3/6 — 178.01 (manufacturer: Daut und Rietz) is recommended.

ELECTRICAL DATA

Unless otherwise specified all electrical values apply at an ambient temperature of 25 °C, a relative humidity of 60 ± 15%, a supply voltage of 12 V and a signal frequency of 98 MHz.

Semiconductors	
r.f. amplifier	BF324
mixer	BF936
oscillator	BF451
tuning diodes	4 x BB204; 1 x BB106
Ambient temperature range	
operating	0 to +50 °C
storage	−20 to +60 °C
Supply voltage (d.c.)	+12 ± 1 V
Current drawn from +12 V supply	max. 16 mA; typ. 14 mA
Tuning voltage range (Fig. 3)	+3,8 to +28 V
Frequency range	87,5 to 108 MHz
Intermediate frequency	10,7 MHz ± 30 kHz The oscillator frequency is higher than the signal frequency
I.F. bandwidth (3 dB)	300 ± 40 kHz

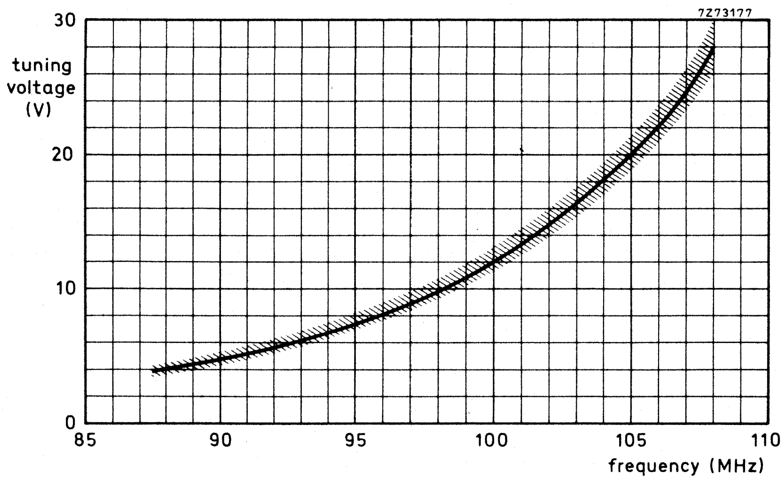


Fig. 3 Tuning voltage as a function of signal frequency.

Input impedance, asymmetrical	75 Ω
Recommended load resistance	330 Ω
Gain	min. 24 dB; typ. 28 dB
Noise figure	max. 7,5 dB; typ. 6 dB
Reflection factor	max. 0,5; typ. 0,35
I.F. suppression	min. 70 dB; typ. 80 dB
Image rejection	min. 64 dB; typ. 72 dB
Repeat spot suppression (RSS)* (Fig. 4)	min. 87 dB; typ. 93 dB
Double beat suppression (DBS)** (Fig. 4)	
DBS_1	min. 70 dB; typ. 80 dB
DBS_2	min. 70 dB; typ. 85 dB
DBS_3	min. 70 dB; typ. 80 dB
Continuous beat suppression (CBS)▲ (Fig. 5)	min. 70 dB; typ. 76 dB
Minimum input signal (e.m.f.) producing a shift of the oscillator frequency of 20 kHz (75 Ω input impedance)	1 V
Shift of oscillator frequency at a change of the supply voltage of 1 V	max. 30 kHz
Temperature coefficient of the oscillator	see Fig. 6
Oscillator radiation	according to VDE 0872.7 and 0872.8
A.F.C. sensitivity	see Figs 7 and 8
Oscillator sample voltage over 60 Ω	min. 15 mV; typ. 30 mV
Oscillator sample frequency	equal to oscillator frequency

* Suppression of a signal arising by conversion of harmonics of the oscillator signal and those of a strong aerial signal.

** Suppression of a signal arising from two strong aerial signals.

▲ Suppression of a signal arising from the harmonic of two strong aerial signals with a frequency difference equal to the intermediate frequency.

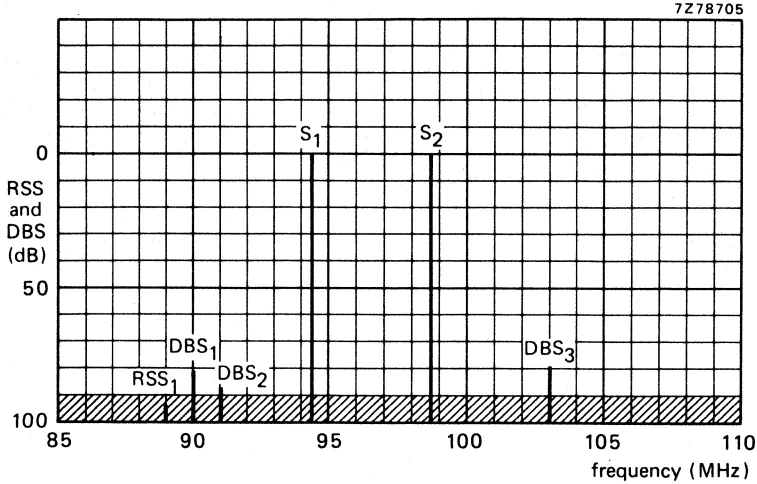


Fig. 4 Location of transmitter frequencies, repeat spots and double beats. Reference signals S1 and S2: 10 μV.

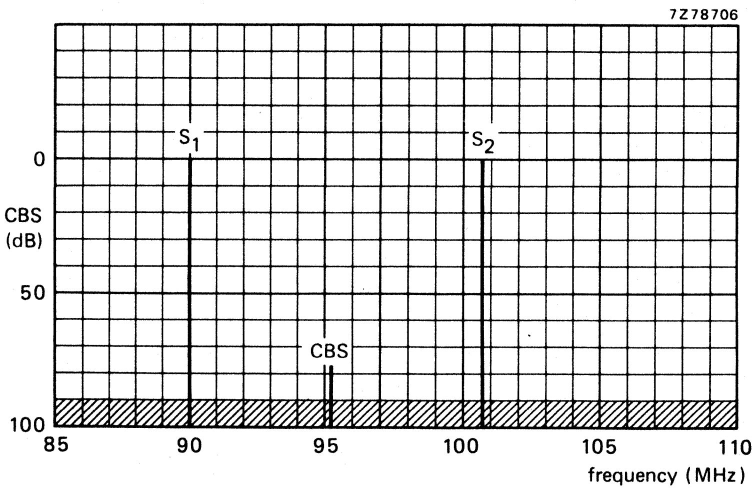


Fig. 5 Location of transmitter frequencies and measuring frequency for measuring the continuous beat suppression (CBS).

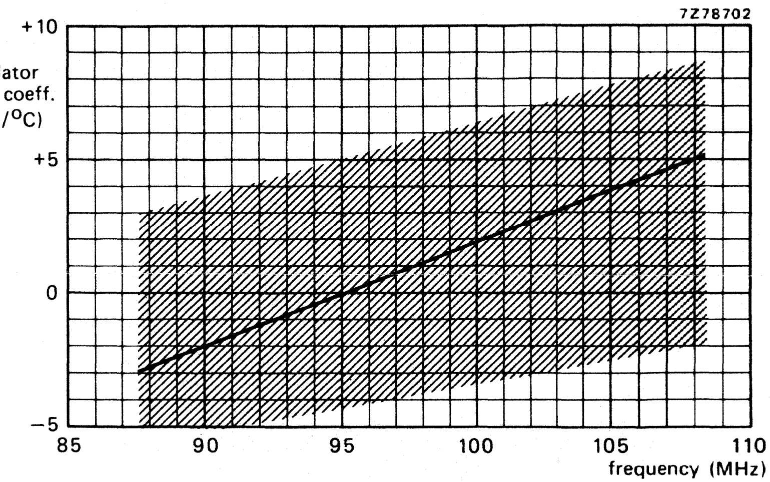
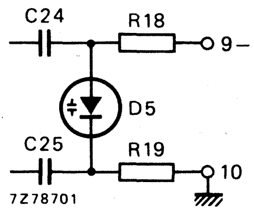


Fig. 6 Oscillator temperature coefficient as a function of signal frequency, measured in the temperature range 15 to 25 °C.



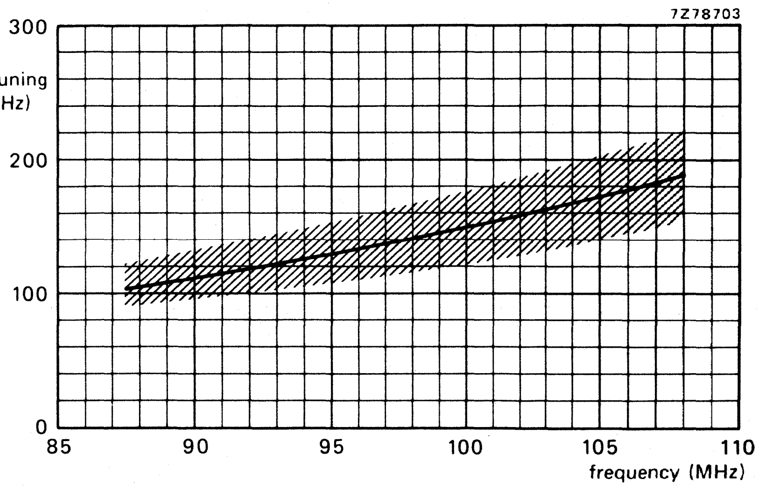
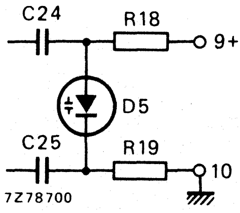


Fig. 7 Detuning as a function of signal frequency at a control voltage change from 0 to + 400 mV.



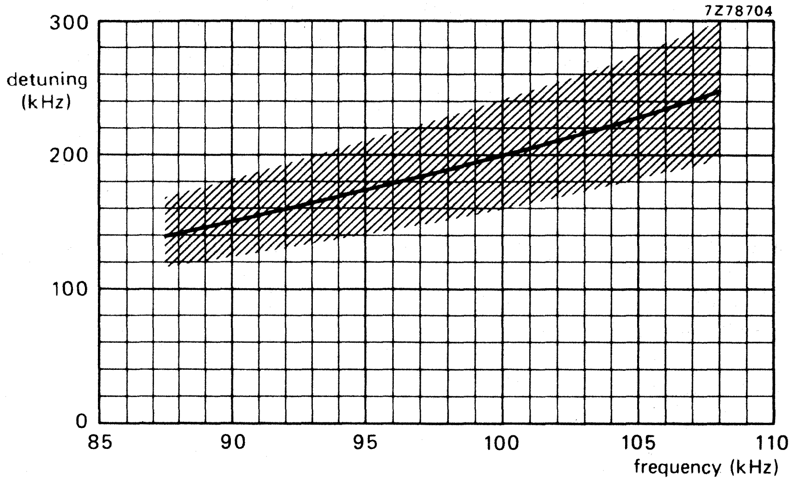


Fig. 8 Detuning as a function of signal frequency at a control voltage change from 0 to −400 mV.

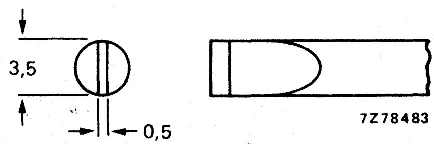


Fig. 9 For aligning the i.f. coils, a screwdriver with dimensions as shown above is recommended.

F.M. TUNER

- With diode tuning
- For European and American band
- Suited for digital tuning systems

QUICK REFERENCE DATA

Supply voltages (d.c.)	20 V and 30 V
Frequency range	87,5 to 108 MHz
Intermediate frequency	10,7 MHz

APPLICATION

This f.m. tuner is designed for use in high-quality, hi-fi radio receivers. An output voltage from the local oscillator is made available for driving digital frequency displays and tuning systems.

DESCRIPTION

The FD12/1 is an f.m. tuner with electronic tuning, covering the v.h.f. band II (frequency range 87,5 to 108 MHz).

Mechanically the tuner is built on a low-loss printed board, carrying all components, in a metal housing of a rectangular frame, and front and rear cover (Fig. 2). All contacts are on a board edge at the bottom, which can be inserted into a mounting socket, facilitating set repair. Connections to the tuner can also be directly soldered to the contacts.
The tuner has a coaxial socket at the side of the frame for coupling out the oscillator sample.

The tuner is equipped with silicon semiconductors. The aerial signal is fed via a double-tuned input filter to the r.f. amplifier stage. This stage is equipped with a dual-gate MOS field-effect transistor BF900, the gain of which can be controlled by an a.g.c. voltage. At the output the r.f. amplifier is provided with a double-tuned band filter, transferring the signal to the mixer stage, which is built-up with the integrated circuit TCA240. At the output the mixer has a 10,7 MHz band filter (L8, K1), which can be aligned if adaptation to the receiver is necessary.

The oscillator is equipped with a transistor BF451. The stability of the oscillator frequency has been increased to a high degree by special means. The influence of supply voltage variations has been reduced by stabilizing of the oscillator transistor, while temperature influences on coils, transistors, board material and trimmers are compensated by the careful choice of the temperature coefficients of the capacitors of the tuned circuit and of the feedback capacitors. Moreover the influence of drift of the capacitance diodes is compensated by travelling the tuning-voltage signal via an emitter follower. By loosely coupling the oscillator to the mixer, the pulling is very small.

A rectifier circuit, which is connected to the secondary of the i.f. output filter, provides an internal a.g.c. (terminals 1 and 7 interconnected). If in the case of weak signal reception, the controlling is disturbed by neighbouring carriers, the a.g.c. can be switched off, or be provided by an external a.g.c. voltage, generated in the receiver. Without a.g.c. the power gain is maximum.

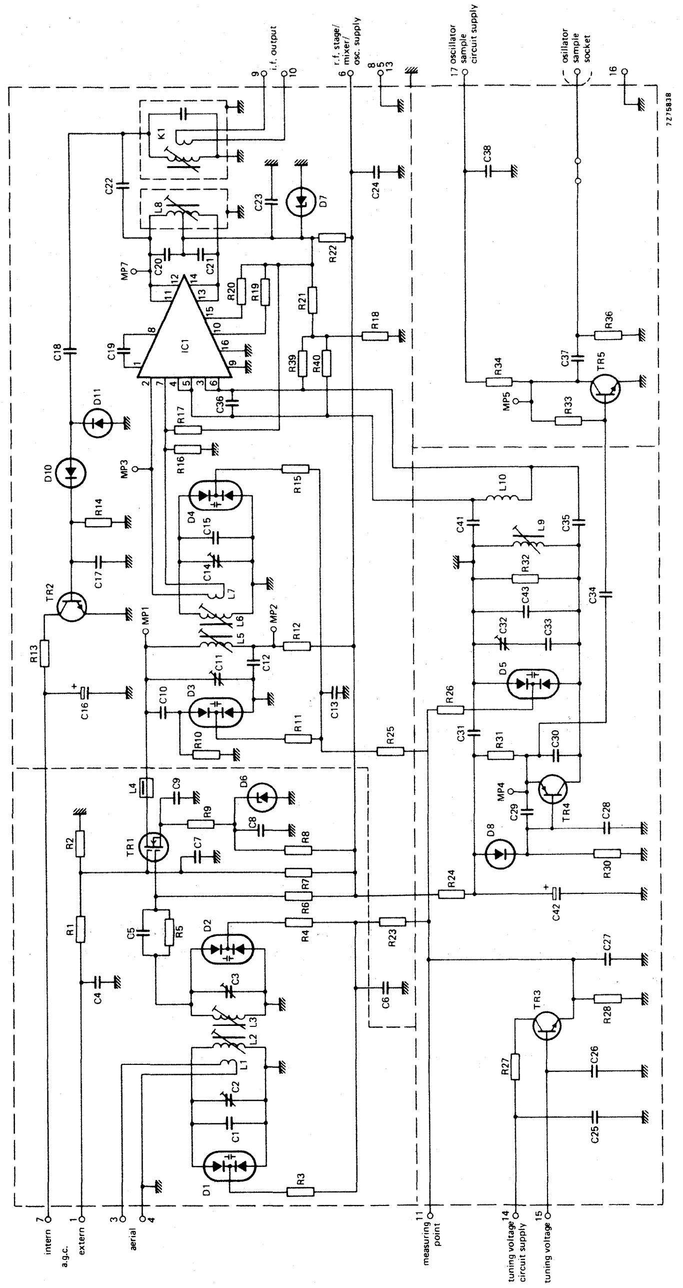

i.f. output
r.f. stage/
mixer/
osc. supply
oscillator
sample
circuit supply
oscillator
sample
socket
7275838
intern
a.g.c.
extern
aerial
measuring
point
tuning voltage
circuit supply
tuning voltage

Fig. 1.

MECHANICAL DATA

Dimensions in mm

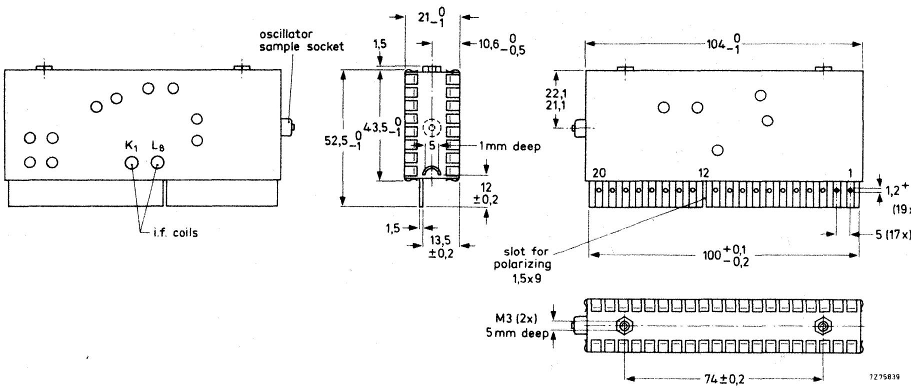


Fig. 2.

Terminals: 1 = a.g.c. voltage, 10 to 0 V
3 and 4 = aerial, 75 Ω
5, 8, 13, 16 = earth
6 = r.f. stage, mixer and oscillator supply
7 = internal a.g.c. voltage
9 and 10 = i.f. output
11 = measuring point
14 = tuning voltage circuit supply
15 = tuning voltage, + 3,8 to + 28 V
17 = oscillator sample circuit supply
18, 19 and 20 = not connected

Mounting

The tuner can be inserted into a mounting socket or soldered directly to a printed board. It can be fitted by means of two screws M3. The tuner may be mounted anywhere in the receiver and there are no restrictions on orientation.

Marking

The f.m. tuners are marked with the type number, the 12-digit catalogue number and the production code.

ELECTRICAL DATA

Unless otherwise specified all electrical values apply at an ambient temperature from 20 to 25 °C, a relative humidity of 60 ± 15% and supply voltages as given below.

Semiconductors	BF451, BC547B, BC548C, BF199, BF900, 2 x BAV10, BZX75-C2V1, BZX79-C12, BZX79-C5V1, 4 x BB204B, BB204G
Ambient temperature range	
operating	+ 10 to + 50 °C
storage	−25 to + 60 °C
Supply voltage (d.c.)	
r.f. amplifier, mixer, oscillator and oscillator sample circuit	+ 20 ± 1 V
tuning circuit	+ 30 ± 1 V
Current drawn from	
r.f. amplifier, mixer, oscillator and oscillator sample circuit supply	21 to 31 mA
tuning circuit supply	0,15 to 1,4 mA
Tuning voltage range (Fig. 3)	+ 3,8 to + 27 V
Frequency range	87,5 to 108 MHz
Intermediate frequency	10,7 MHz ± 30 kHz The oscillator frequency is higher than the signal frequency

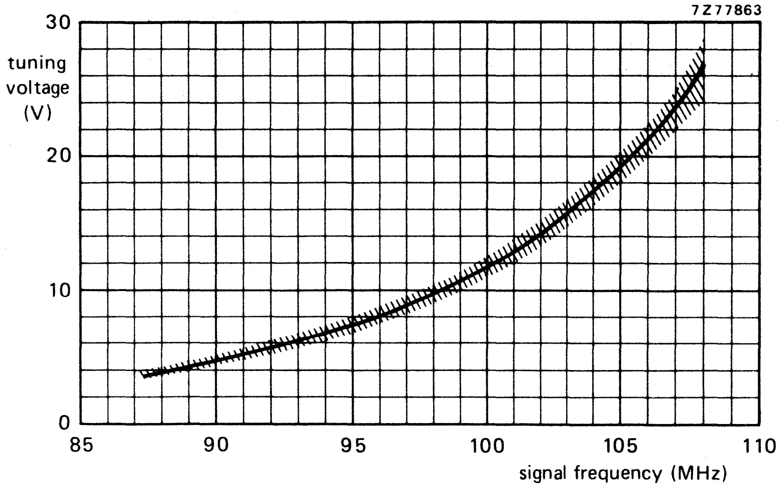


Fig. 3 Tuning voltage as a function of signal frequency.

I.F. bandwidth (3 dB)	300 ± 30 kHz
Input impedance, asymmetrical	75 Ω
Output impedance	330 Ω
Gain	min. 36 dB; typ. 40 dB
Noise figure	max. 6 dB; typ. 5 dB
Reflection factor	max. 0,3
A.G.C. voltage	10 to 0 V
A.G.C. current	100 to 0 μA
A.G.C. range	50 dB
Minimum input signal (e.m.f.) for internal a.g.c.	3 mV
I.F. suppression	100 dB
Image rejection	min. 90 dB
Repeat spot suppression * (RSS, Fig. 4)	min. 100 dB
Double beat suppression ** (Fig. 4)	
DBS1	80 dB
DBS2	100 dB
DBS3	80 dB
Continuous beat suppression ▲ (CBS)	min. 100 dB
Pulling	
Input signal of tuned frequency producing a shift of the oscillator frequency of 5 kHz	min. 2 V
Shift of oscillator frequency at a change of the supply voltage of 1 V	max. 30 kHz
Drift of oscillator frequency at a change of the ambient temperature from + 15 to + 35 °C	max. 2 kHz/°C

* Suppression of a signal arising by conversion of harmonics of the oscillator signal and those of a strong aerial signal; reference level 14 dB (μV).

** Suppression of a signal arising from two strong aerial signals; reference level 14 dB (μV).

▲ Suppression of a signal arising from the harmonic of two strong aerial signals with a frequency difference equal to the intermediate frequency; reference level 14 dB (μV).

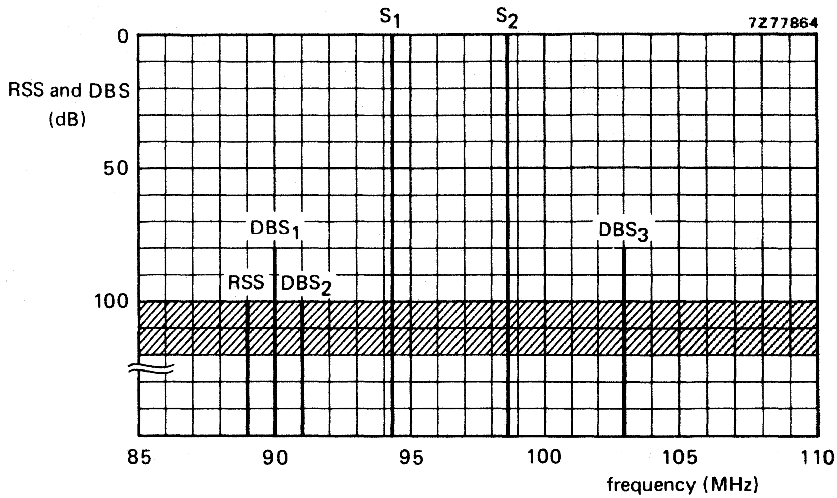


Fig. 4 Location of transmitter frequencies, repeat spots and double beats.

Note: For aligning the i.f. coils, a screwdriver with dimensions as shown in Fig. 5 is recommended.

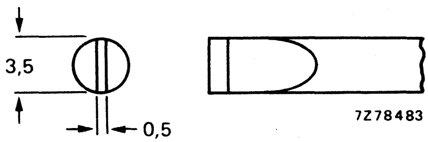


Fig. 5.

TELEVISION TUNERS AND AERIAL INPUT ASSEMBLIES

V.H.F./U.H.F. TELEVISION TUNER

QUICK REFERENCE DATA

Systems	C.C.I.R. systems B and G
Channels	New Zealand 1 to R4 (band I)
	M4 to E12 (band III)
	E21 to E69 (bands IV and V)
Intermediate frequencies	
picture	38,9 MHz
sound	33,4 MHz

APPLICATION

Designed to cover the v.h.f. and u.h.f. channels of C.C.I.R. systems B and G, with extended v.h.f. frequency ranges. This tuner is basically interchangeable with the ELC2000.

DESCRIPTION

The ELC2004 is a combined v.h.f./u.h.f. tuner with electronic tuning and band switching, covering the v.h.f. band I including the New Zealand channel 1, the Italian channel C and the OIRT channel R4 (frequency range 44 to 92 MHz), the v.h.f. band III including the Morocco channel M4 (frequency range 162 to 230 MHz), and the u.h.f. band (frequency range 470 to 861 MHz).

Mechanically, the tuner is built on a low-loss printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear cover (see Fig. 2). The two aerial connections (v.h.f. and u.h.f.) are on the two frame sides, all other connections (supply voltages, a.g.c. voltage, tuning and switching voltages) are made via feed-through capacitors in the underside. The mounting method is shown in Figs 3 and 4.

Electrically, the tuner consists of v.h.f. and u.h.f. parts. The v.h.f. aerial signal is fed via an i.f. trap, combined with a high-pass filter and switchable bandpass filters, to the emitter of the input transistor BF200. The collector load of this transistor is formed by a double tuned circuit, transferring the signal to the base of the mixer transistor BF199. The oscillator is equipped with a transistor BF494. The three r.f. circuits are tuned by three capacitance diodes BB109G. Switching between v.h.f. I and III is achieved by five switching diodes BA243/244/182.

The collector circuit of the mixer transistor is a single tuned i.f. resonant circuit, at the low end of which the i.f. signal is capacitively coupled out of the tuner. A test point at the collector of the mixer can be used for i.f. injection to align the i.f. output circuit of the tuner together with the i.f. amplifier of the television receiver.

The u.h.f. part of the tuner consists of a high-pass input circuit, connected to the emitter of the amplifier transistor BF180. The interstage network between this transistor and the self-oscillating mixer stage is formed by a double tuned circuit. A transistor BF181 acts as a self-oscillating mixer. The three tuned u.h.f. circuits are tuned by three capacitance diodes BB105B. The output of the self-oscillating mixer is fed to a double tuned i.f. circuit which is connected to the base of the v.h.f. mixer transistor BF199, now operating as an i.f. amplifier.

The tuner requires transistor supply voltages of + 11 V, a switching voltage of + 11 V, a.g.c. voltages, variable from + 2,4 V (normal operating point) to about + 9 V (maximum a.g.c.) and a tuning voltage, variable from + 0,5 V to + 28 V.

The aerial inputs of the tuner are asymmetrical. For use in symmetrical aerial systems, aerial transformers (baluns) are available (see Accessories).

The ELC2004 tuner is basically interchangeable with the ELC2000. Small modifications in the receiver with respect to a.g.c. and supply voltages may be necessary.

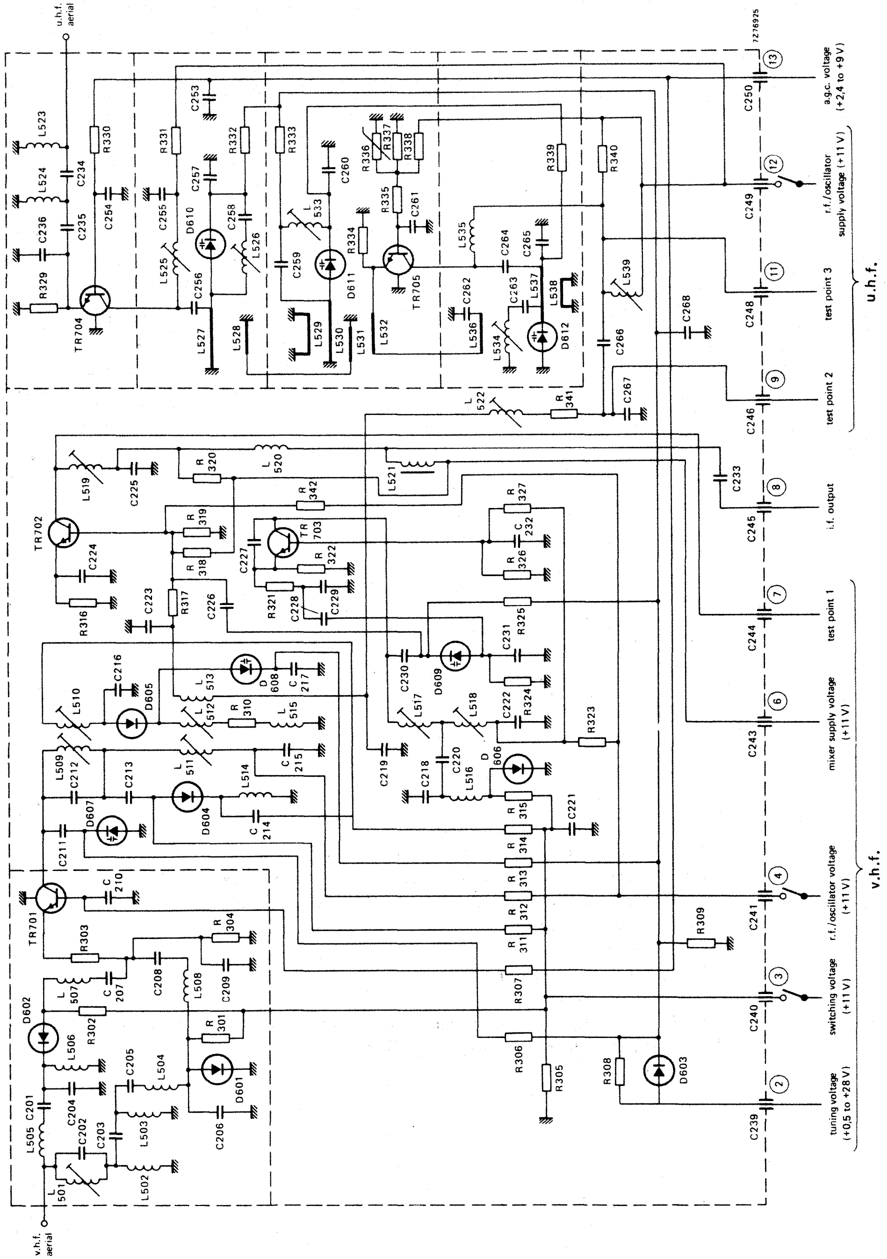
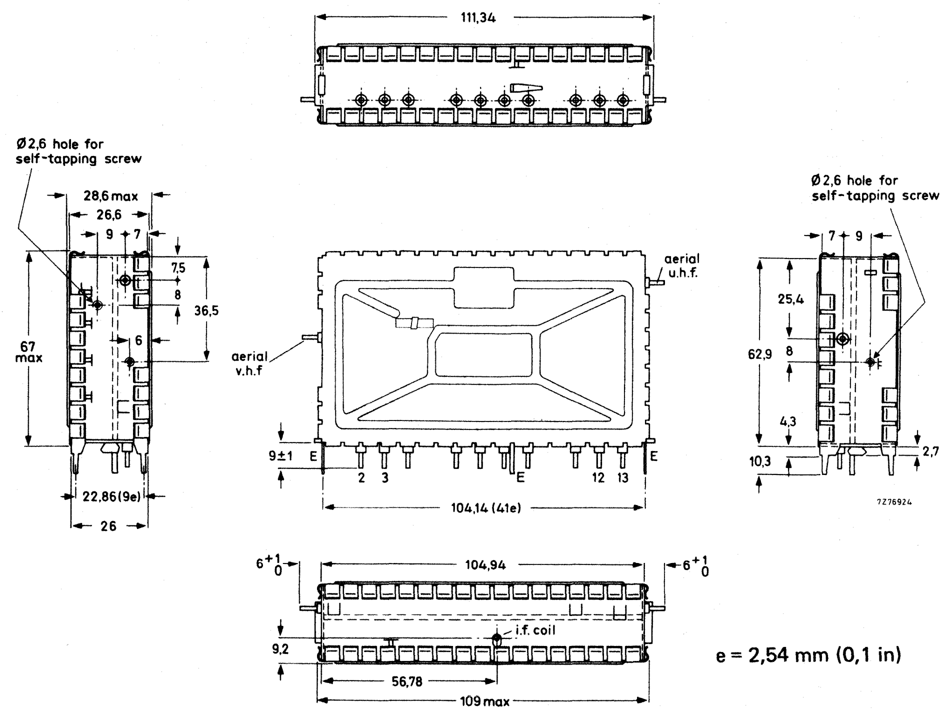

u.h.f. aerial
v.h.f. aerial
a.g.c. voltage (+2,4 to +9 V)
r.f./oscillator supply voltage (+11 V)
test point 3
test point 2
u.h.f.
i.f. output
test point 1
mixer supply voltage (+11 V)
r.f./oscillator voltage (+11 V)
switching voltage (+11 V)
tuning voltage (+0,5 to +28 V)
v.h.f.
7Z76925

Fig. 1.

MECHANICAL DATA

Dimensions in mm



e = 2,54 mm (0,1 in)

Fig. 2.

Terminal 2 = tuning voltage, + 0,5 to + 28 V
3 = switching voltage, + 11 V (approx. 20 mA)
4 = r.f./oscillator supply voltage, v.h.f., + 11 V (approx. 6 to 13 mA)
6 = mixer supply voltage, v.h.f., + 11 V (approx. 5 mA)
7 = test point 1, v.h.f.
8 = i.f. output
9 = test point 2 (alignment short)
11 = test point 3, u.h.f.
12 = r.f./oscillator supply voltage, u.h.f., + 11 V (approx. 6 to 13 mA)
13 = a.g.c. voltage, + 2,4 to + 9 V (3,5 mA)
E = earth

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, using the piercing diagram shown in Fig. 3. (The tuner may also be mounted by means of a bracket. Information will be supplied upon request.) The tuner may be mounted anywhere in the receiver and there are no restrictions on orientation.

The solderability of the terminals and mounting tabs is according to IEC 68-2, test Ta (230 ± 10 °C, 2 ± 0,5 s). The resistance to soldering heat is according to IEC 68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

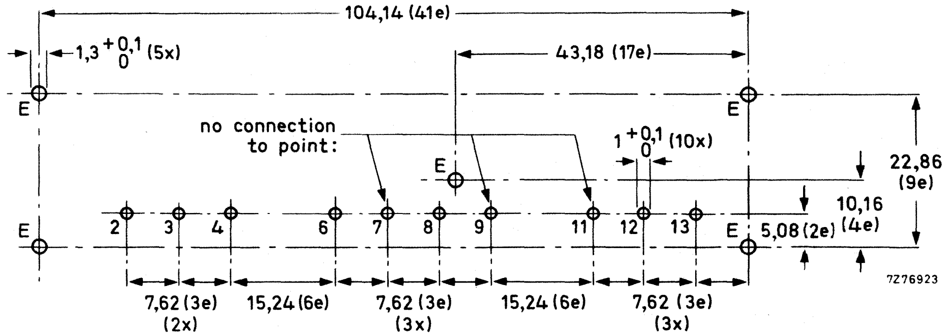


Fig. 3 Piercing diagram viewed from solder side of board; e = 2,54 mm (0,1 in). No connection must be made to the points 7, 9 and 11, as otherwise the oscillator radiation would increase.

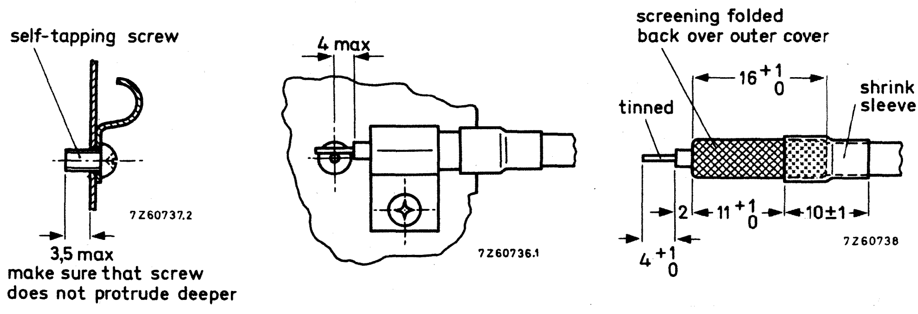


Fig. 4 Recommended fixing method of the aerial cables. Use a self-tapping screw.

ELECTRICAL DATA

Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C, a relative humidity of 60 ± 15%, a supply voltage of 11 ± 0,3 V and an a.g.c. voltage of 2,4 ± 0,2 V.

Semiconductors, bands I and III	
r.f. amplifier	BF200
mixer	BF199
oscillator	BF494
tuning diodes	3 x BB109G
switching diodes	5 x BA243/244/182
Semiconductors, bands IV and V	
r.f. amplifier	BF180
mixer/oscillator	BF181
tuning diodes	3 x BB105B
drift compensating diode	BAW62
Ambient temperature range	
operating	+ 5 to + 55 °C
storage	−25 to + 85 °C
Relative humidity	max. 90%
Supply voltage	**+ 11 V** ± 10%
Current drawn from + 11 V supply	
band I	11 to 18 mA } depending on a.g.c. voltage
band III	31 to 38 mA
bands IV and V	11 to 18 mA
A.G.C. voltage (Figs 5, 6 and 7)	
band I, at nominal gain	+ 2,4 V
band I, at 40 dB gain reduction	+ 6,0 V (typical)
band III, at nominal gain	+ 2,4 V
band III, at 40 dB gain reduction	+ 5,0 V (typical)
bands IV and V, at nominal gain	+ 2,4 V
bands IV and V, at 40 dB gain reduction	+ 5,5 V (typical)

Note: A.G.C. voltages between 0 and + 10 V may be applied without risk of damage.

A.G.C. current	max. 3,5 mA
Tuning voltage range (Figs 8, 9 and 10)	+ 0,5 to + 28 V
Current drawn from 28 V tuning voltage supply	max. 35 μA

Note: The source impedance of the tuning voltage offered to terminal 2 must be maximum 30 kΩ at tuning voltages below 2 V.

Switching voltage	
band I	open circuit
band III	+ 11 V ± 10%
bands IV and V	open circuit

Note: In the band I position, the tuner produces a negative voltage (1 to 5 V) at terminal 3; this terminal must not be loaded with an external resistance below 10 MΩ.

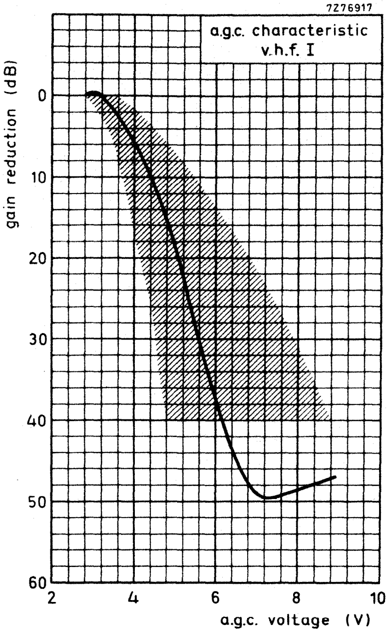


Fig. 5.

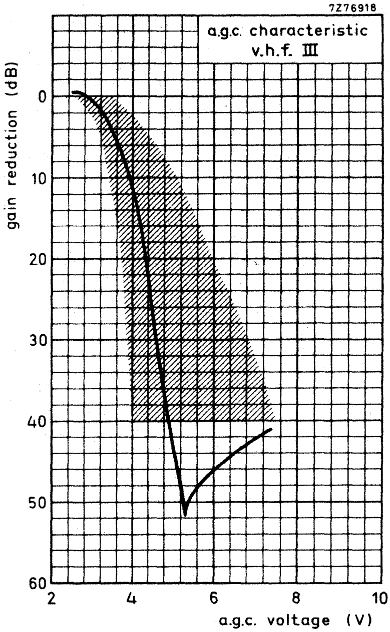


Fig. 6.

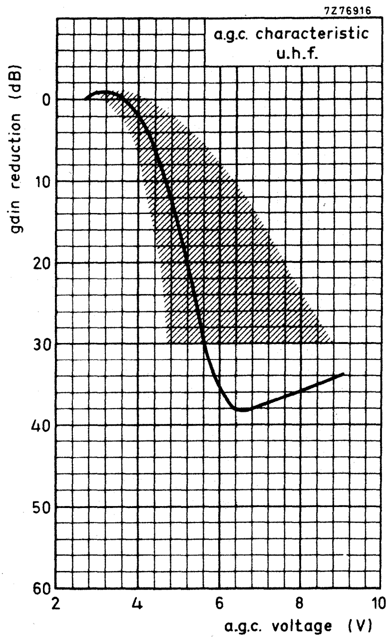


Fig. 7.

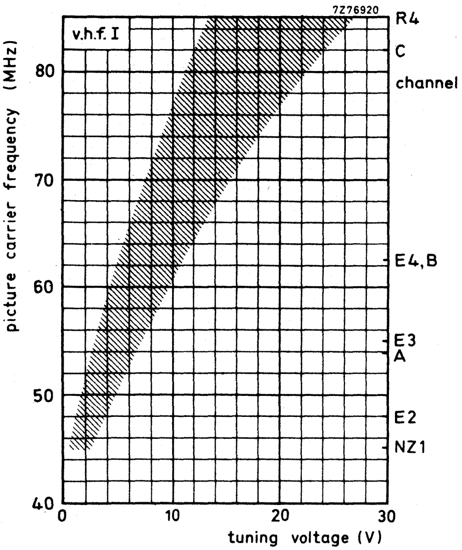


Fig. 8.

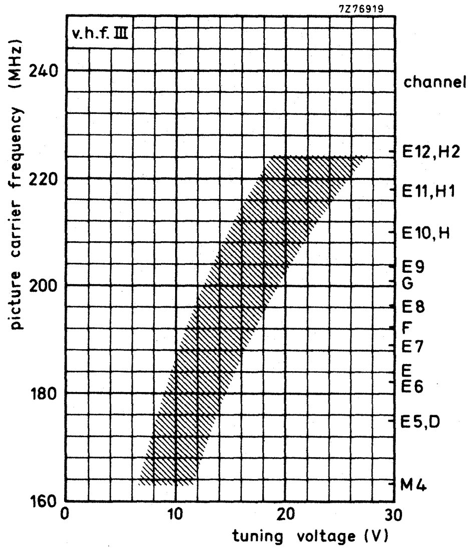


Fig. 9.

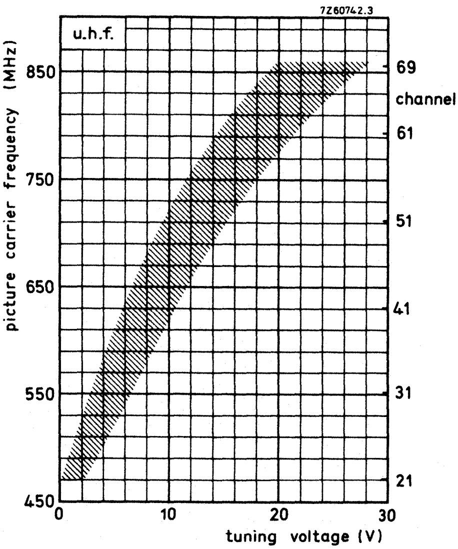


Fig. 10.

Frequency ranges	
band I	– Channel NZ1 (picture carrier 45,25 MHz) to channel R4 (picture carrier 85,25 MHz). Margin at the extreme channels: min. 1,2 MHz.
band III	– Channel M4 (picture carrier 163,25 MHz) to channel E12 (picture carrier 224,25 MHz). Margin at the extreme channels: min. 2 MHz.
bands IV and V	– Channel E21 (picture carrier 471,25 MHz) to channel E69 (picture carrier 855,25 MHz). Margin at the extreme channels: min. 3 MHz.
Intermediate frequencies	
picture	38,9 MHz
sound	33,4 MHz
Input impedance	
asymmetrical	75 Ω
symmetrical	300 Ω (see Accessories)

V.S.W.R. (between picture carrier and sound carrier)	v.s.w.r. at nom. gain	max. v.s.w.r. during gain control
band I, except channel NZ1	max. 4	max. 5
band I, channel NZ1	max. 5	max. 5
band III	max. 4	max. 5
bands IV and V	max. 5	max. 5

A.G.C. range	
band I	min. 40 dB
band III	min. 40 dB
bands IV and V	min. 30 dB
R.F. curves, bandwidth	
band I	typ. 10 to 15 MHz
band III	typ. 10 to 17 MHz
bands IV and V	typ. 15 to 25 MHz
R.F. curves, tilt	
band I	max. 3 dB
band III	max. 3 dB
bands IV and V, channels E21 to E60	max. 3 dB
bands IV and V, channels E61 to E69	max. 4 dB
Power gain (see also Measuring method of power gain)	
band I, except channel NZ1	min. 25 dB
band I, channel NZ1	min. 24 dB
band I, channel E2	typ. 28 dB
band I, channel C	typ. 30 dB
band III, except channel M4	min. 25 dB
band III, channel M4	min. 24 dB
band III, channel E5	typ. 27 dB
band III, channel E11	typ. 29 dB
bands IV and V	min. 25 dB
bands IV and V, channel E21	typ. 30 dB
bands IV and V, channel E31	typ. 28 dB
bands IV and V, channel E69	typ. 32 dB

Noise figure

band I, except channel NZ1	max. 8 dB	
band I, channel NZ1	max. 9 dB	
band I, channel E4	typ. 5,5 dB	
band III, except channel M4	max. 8 dB	
band III, channel M4	max. 10 dB	
band III, channel E9	typ. 6 dB	
bands IV and V	max. 11 dB	
bands IV and V, channel E21	typ. 7 dB	
bands IV and V, channel E51	typ. 8,5 dB	
bands IV and V, channel E69	typ. 9 dB	

I.F. rejection

band I, channel NZ1	min. 34 dB
band I, channel E2	min. 40 dB
band I, channel C	min. 60 dB
band III	min. 60 dB
bands IV and V	min. 60 dB

Image rejection

band I	min. 40 dB
band III	min. 60 dB
bands IV and V	min. 40 dB

Signal handling (see also Figs 12 and 13)

Minimum input signal (e.m.f.) producing cross-modulation (1%) at nominal gain **in channel** (wanted signal: picture carrier frequency; interfering signal: sound carrier frequency)

v.h.f. I	typ.	4 mV	notes 1 and 2
v.h.f. III	typ.	4 mV	
u.h.f.	typ.	5 to 10 mV	

Minimum input signal (e.m.f.) producing cross-modulation (1%) at nominal gain **in band** (wanted signal: picture carrier frequency of channel X; interfering signal: picture carrier of v.h.f. channel X-2, u.h.f. channel X-5)

v.h.f. I	typ.	20 to 40 mV	notes 1 and 2
v.h.f. III	typ.	10 to 20 mV	
u.h.f.	typ.	10 to 20 mV	

Minimum input signal (e.m.f.) producing overloading

at nominal gain	typ.	30 mV	notes 1 and 3
at maximum a.g.c.	typ.	> 200 mV	

Minimum input signal (e.m.f.) at nominal gain producing a shift of oscillator frequency of 10 kHz

band I	typ.	> 25 mV	note 1
band III	typ.	> 25 mV	
band IV and V	typ.	6 to 10 mV	

Detuning of the i.f. output circuit as a result of band switching and tuning with respect to channel E8 — max. 400 kHz

Shift of oscillator frequency at a change of supply voltage of 10%

band I	max.	300 kHz
band III	max.	300 kHz
band IV and V	max.	600 kHz

Shift of oscillator frequency at a gain reduction of 30 dB — max. 100 kHz

Notes see next page.

Drift of oscillator frequency during warm-up time
(measured between 5 s and 15 min after switching on)

band I	max. 100 kHz
band III	max. 100 kHz
bands IV and V	max. 250 kHz

Drift of oscillator frequency at a change of ambient temperature from 25 to 40 °C

band I	max. 300 kHz
band III	max. 300 kHz
bands IV and V	max. 500 kHz

Oscillator radiation
The tuner is in conformity with the radiation requirements of C.I.S.P.R. publication No. 13, provided the following conditions are fulfilled.

- A low-pass filter (Fig. 11) with a cut-off frequency of about 300 MHz has to be inserted between the v.h.f. aerial terminal of the tuner and the aerial terminal of the receiver.
  Television receivers with a common v.h.f./u.h.f. connector in combination with a low-pass/high-pass splitter do not need this additional filter.

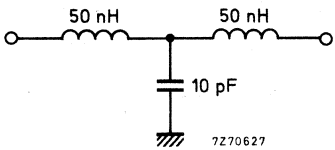


Fig. 11.

- No connections must be made to terminals 7, 9 and 11.
- Earthing of the tuner and connections to the i.f. amplifier has to be done in such a way, that additional radiation is prevented.

Microphonics
If the tuner is installed in a professional manner, there will be no microphonics.

Surge protection

Protection against voltages	max. 8 kV

Note: Three discharges of a 470 pF capacitor into the aerial terminal.

Protection against flashes	max. 30 kV, 400 mWs

Note: A flash-over circuit producing flashes with frequencies of 1 to 20 Hz for 30 s is connected to the aerial terminal.

Notes
1. Referred to an impedance of 75 Ω.
2. 1% cross-modulation means that 1% of the modulation depth of the interfering signal is transferred to the wanted signal.
3. Criterion of overloading: 30% compression of the synchronization pulses of a standard television signal or a noticeable deterioration of the picture quality.

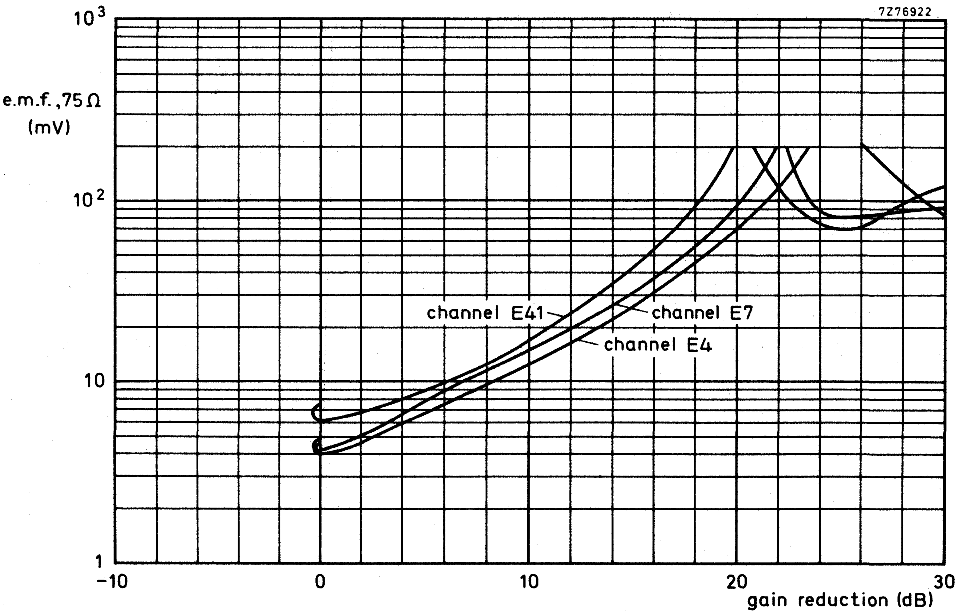


Fig. 12 Cross-modulation, in channel.

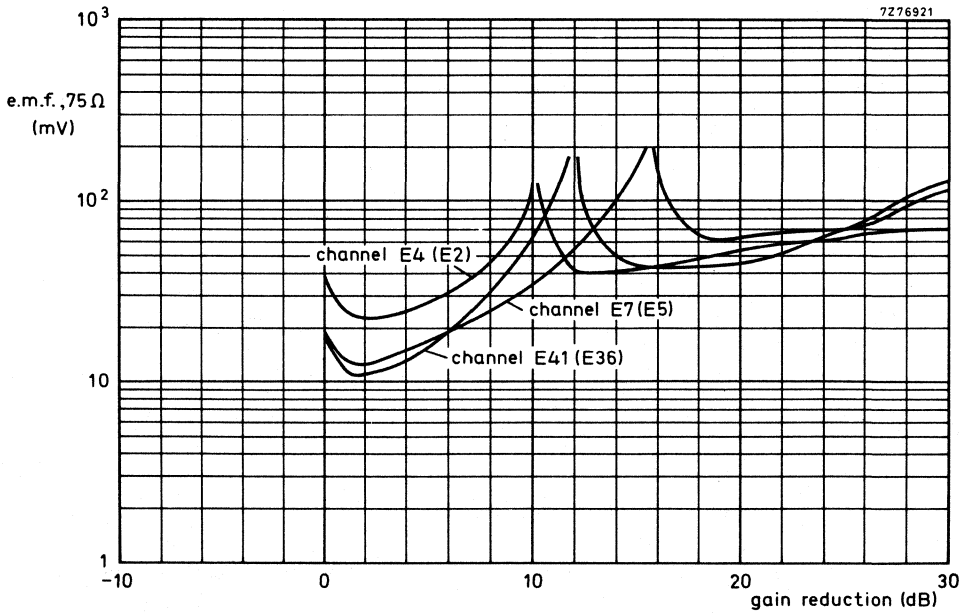


Fig. 13 Cross-modulation, in band; the interfering channels are given between brackets.

APPLICATION INFORMATION

Connection of the tuner

For connection of the tuner the terminal location, Fig. 2, should be consulted. If the tuner is used in receivers the chassis of which is connected to the mains, isolating capacitors according to the safety rules have to be inserted in the aerial leads. A convenient way of connecting is given below.

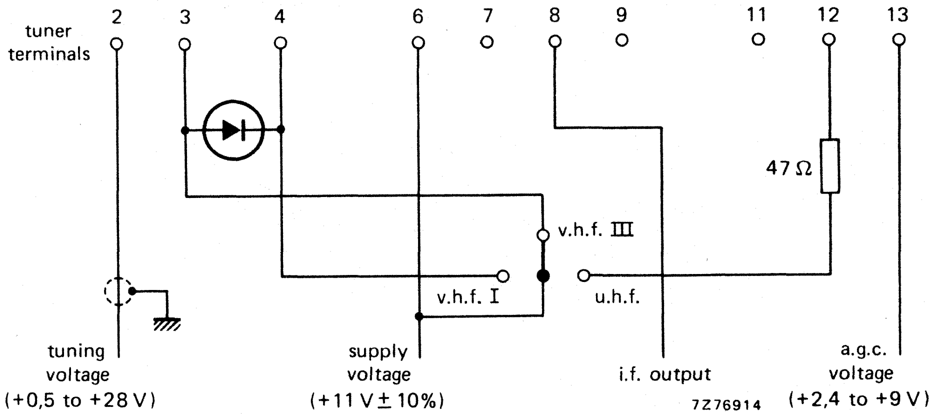


Fig. 14 Connection diagram; diode: BAX13, BA217 or comparable silicon diode.

Alignment of the i.f. circuit

The tuner is provided with a test point at the collector of the v.h.f. mixer, which can be used for i.f. injection to align the i.f. output circuit. The i.f. signal should be fed to test point 1 (terminal 7) via a capacitor of 0,5 to 1 pF (Fig. 15). This capacitor should have short leads to avoid oscillator radiation. After alignment it should be soldered to earth, to avoid detuning of the i.f. circuit (Fig. 16).

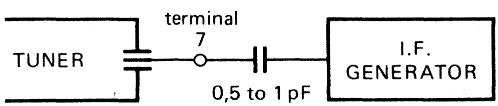


Fig. 15.

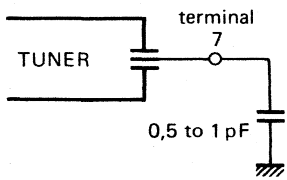


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Fig. 16.

In receivers where the tuner is soldered into a printed-wiring board, the capacitor can be printed as shown in Figs 17 and 18.

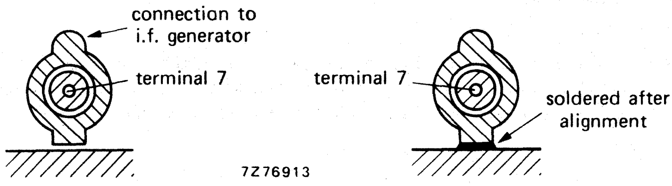


Fig. 17. Fig. 18.

The aligning should be done with the v.h.f. III band tuned. The tuning voltage should be 15 to 20 V.

If this injection method cannot be employed in the television receiver (e.g. there is not enough i.f. signal available) the i.f. signal can be fed to test point 3 (terminal 11) via a capacitor of 0,82 to 1 pF. The tuner must be switched to the u.h.f. position; the tuning voltage should be approx. 10 V. This injection method requires approx. 14 dB less signal than the first method. The capacitor has to be removed after alignment. No permanent connection must be made to test point 3, otherwise the tuner may exceed the oscillator radiation limits.

MEASURING METHOD OF POWER GAIN

The i.f. output of the tuner should be terminated with the circuit given in Fig. 19. The terminals 7, 9 and 11 should be not connected.

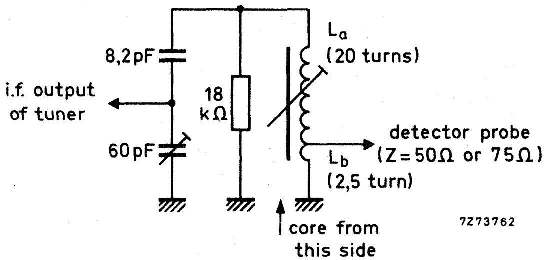


Fig. 19.

Switch the tuner to the v.h.f. III band; the tuning voltage should be 15 to 20 V. Feed an i.f. sweep signal (e.m.f. 500 to 1000 mV) to test point 1 as given in Alignment of the i.f. circuit. Adjust the trimmer (Fig. 19), tunable coil (L_a/L_b), i.f. output coil of the tuner L519 (Fig. 1) and the coupling between L_a and L_b to get the resonant curve as given in Fig. 20.

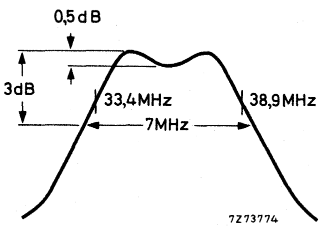


Fig. 20.

Then display the r.f. + i.f. curve of the tuner at 190 MHz (picture carrier frequency) and make small corrections in the alignment of the i.f. coils (L_a/L_b and L519), if necessary, to get the 38,9 MHz and 33,4 MHz markers symmetrically on the slopes of the curve and the peaks at equal amplitude.

Because the output impedance of the dummy circuit is 50 to 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and dummy circuit between a 75 Ω source and a 75 Ω detector (or between a 50 Ω source and matching pad 50/75 Ω and a 50 Ω detector).

ACCESSORIES

Aerial input transformer ELC1094, v.h.f., catalogue number: 2422 542 10941.
Aerial input transformer ELC2092, u.h.f., catalogue number: 2422 542 12921.
Coaxial aerial input assembly, with safety capacitors, catalogue number: 3122 127 10450.
Coaxial aerial input assembly, without safety capacitors, catalogue number: 3122 128 57720.

V.H.F./U.H.F. TELEVISION TUNER

QUICK REFERENCE DATA

Systems	C.C.I.R. systems B and G
Channels	
low v.h.f. band	E2 to R4
high v.h.f. band	S2 to S19
u.h.f. band	E21 to E69
Intermediate frequencies	
picture	38,9 MHz
sound	33,4 MHz

APPLICATION

This tuner is designed to cover the v.h.f. and u.h.f. channels of C.C.I.R. systems B and G, including the S channels for cable television. It is interchangeable with tuner ELC2004.

The tuner complies with the requirements of radiation, signal handling capability, and immunity from radiated interference of Amtsblatt DBP68/1979.

DESCRIPTION

The ELC2006 is a combined v.h.f./u.h.f. tuner with electronic tuning and band switching, covering the low v.h.f. band with the channels E2 to R4 (frequency range 47 to 92 MHz), the high v.h.f. band with the channels S2 to S19 (frequency range 111 to 293 MHz), and the u.h.f. band with the channels E21 to E69 (frequency range 470 to 861 MHz).

Mechanically, the tuner is built on a low-loss printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear covers (see Fig. 2). The two aerial connections (v.h.f. and u.h.f.) are on the two frame sides, all other connections (supply voltages, a.g.c. voltage, tuning and switching voltages) are made via feed-through capacitors in the under side. The mounting method is shown in Figs 3 and 4.

Electrically, the tuner consists of v.h.f. and u.h.f. parts. The v.h.f. aerial signal is fed via an i.f. trap, combined with a high-pass filter, to a tuned input circuit, which is connected to the emitter of the input transistor BF200. The collector load of this transistor is formed by a double tuned circuit, transferring the signal to the base of the mixer transistor BF183. The oscillator is equipped with a transistor BF494. The four r.f. circuits are tuned by four capacitance diodes BB909B. A capacitance diode BB809 provides a frequency-dependent coupling of the r.f. input signal to the tuned input circuit. Switching between the low and high v.h.f. bands is done by four switching diodes (BA243/244 and BA482/483). Three switching diodes BA317 are used to make the tuner interchangeable with the ELC2004.

The collector circuit of the mixer transistor is a single tuned i.f. resonant circuit, at the low end of which the i.f. signal is capacitively coupled out of the tuner (low capacitance coupling). An i.f. injection point is provided at the collector of the mixer, for aligning this circuit together with the i.f. amplifier of the television receiver.

The u.h.f. part of the tuner consists of a high-pass input circuit, connected to the emitter of the amplifier transistor BF180. The inter-stage network between this transistor and the self-oscillating mixer stage is formed by a double tuned circuit. A transistor BF181 acts as a self-oscillating mixer. The three tuned u.h.f. circuits are tuned by three capacitance diodes BB105B.

The output of the self-oscillating mixer is fed to a double tuned i.f. circuit which is connected to the emitter of the v.h.f. mixer transistor BF183, now operating as an i.f. amplifier in grounded-base configuration. Band switching between v.h.f. and u.h.f. is achieved by a diode BA243.

The tuner requires transistor supply voltages of + 11 V, a switching voltage of + 11 V, a.g.c. voltages, variable from + 2,4 V (normal operating point) to about + 9 V (maximum a.g.c.) and a tuning voltage, variable from + 0,5 V to + 28 V.

The aerial inputs of the tuner are asymmetrical. For use in symmetrical aerial systems, aerial transformers (baluns) are available (see ACCESSORIES).

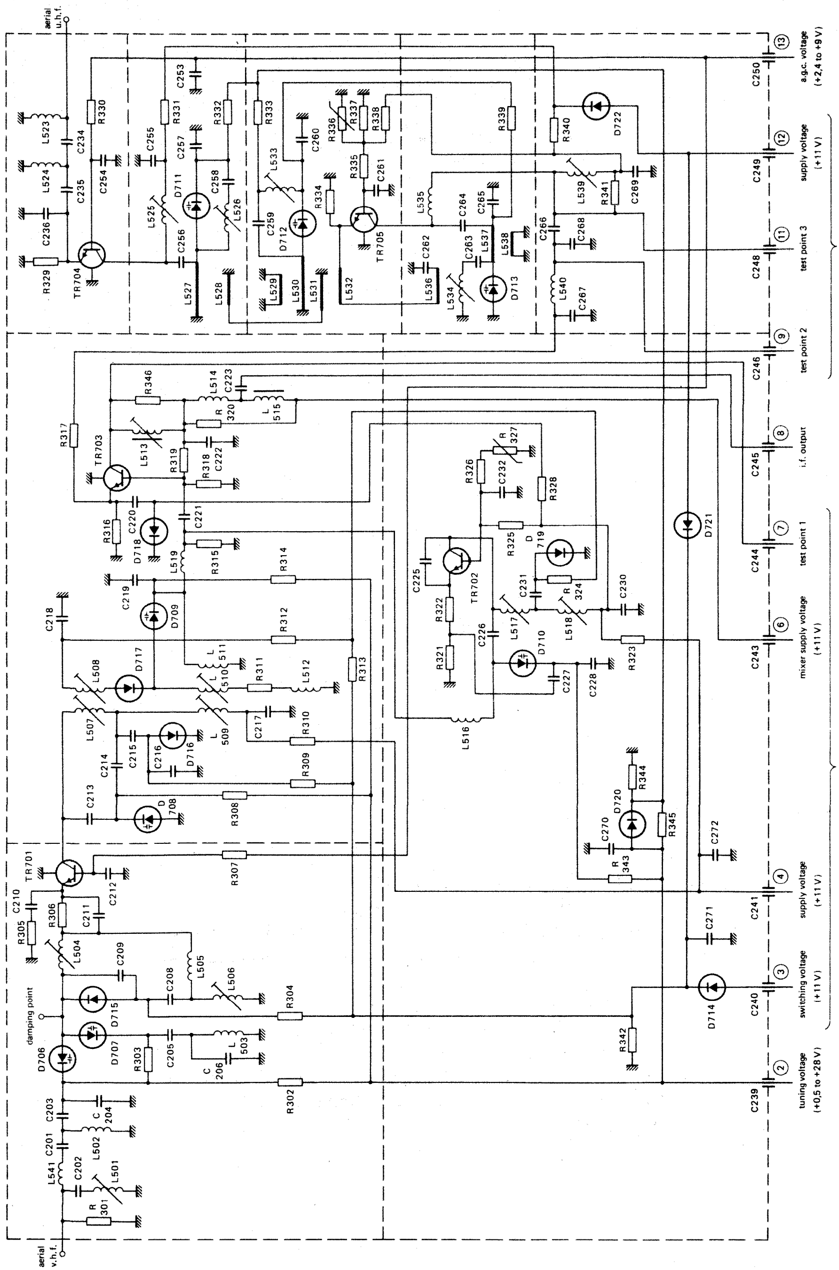
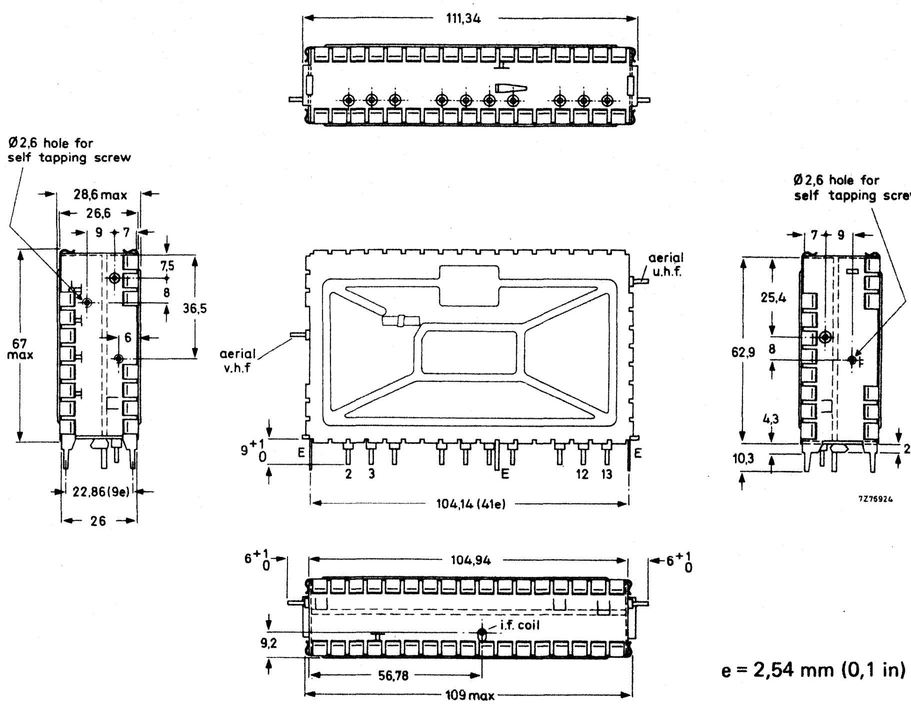

aerial u.h.f.
aerial v.h.f.
damping point
a.g.c. voltage (+2,4 to +9 V)
supply voltage (+11 V)
test point 3
test point 2
u.h.f.
i.f. output
test point 1
mixer supply voltage (+11 V)
supply voltage (+11 V)
switching voltage (+11 V)
v.h.f.
tuning voltage (+0,5 to +28 V)
7Z83741.1

Fig. 1.

MECHANICAL DATA

Dimensions in mm



e = 2,54 mm (0,1 in)

Fig. 2.

Terminal 2 = tuning voltage, + 0,5 to + 28 V
3 = switching voltage, + 11 V (approx. 12 mA)
4 = supply voltage, v.h.f., + 11 V (approx. 9 to 16 mA)
6 = mixer supply voltage, v.h.f., + 11 V (approx. 5 mA)
7 = test point 1, v.h.f.
8 = i.f. output
9 = test point 2 (alignment short)
11 = test point 3, u.h.f.
12 = supply voltage, u.h.f., + 11 V (approx. 17 to 24 mA)
13 = a.g.c. voltage, + 2,4 to + 9 V (max. 3,5 mA)
E = earth

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, using the piercing diagram shown in Fig. 3. (The tuner may also be mounted by means of a bracket. Information will be supplied upon request.) The tuner may be mounted anywhere in the receiver and there are no restrictions on orientation.

The solderability of the terminals and mounting tabs is according to IEC 68-2, test Ta (230 ± 10 °C, 2 ± 0,5 s). The resistance to soldering heat is according to IEC 68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

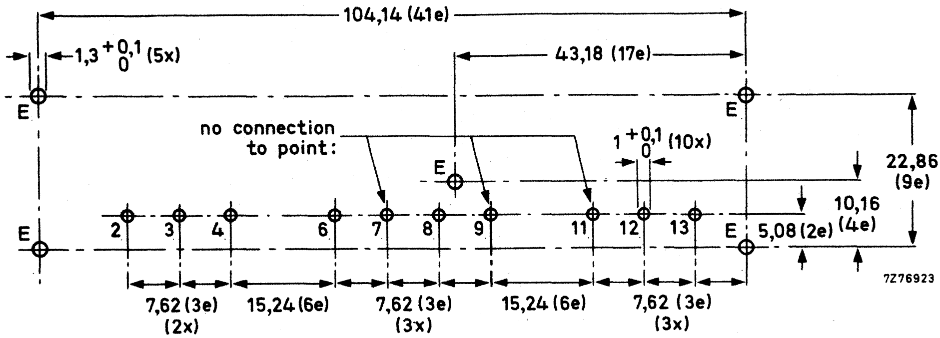


Fig. 3 Piercing diagram viewed from solder side of board; e = 2,54 mm (0,1 in). No connection must be made to the points 7, 9 and 11, as otherwise the oscillator radiation would increase.

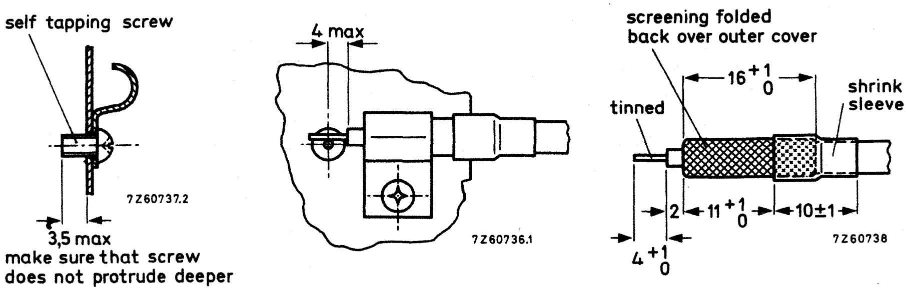


Fig. 4 Recommended fixing method of the aerial cables. Use a self-tapping screw, e.g. 5N x 3/16.

ELECTRICAL DATA

Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C, a relative humidity of 60 ± 15%, a supply voltage of 11 ± 0,3 V and an a.g.c. voltage of 2,4 ± 0,2 V.

General

Semiconductors	
v.h.f. bands: r.f. amplifier	BF200
mixer	BF183
oscillator	BF494
tuning diodes	4 x BB909B
coupling diode	BB809
switching diodes	2 x BA482; 1 x BA483; 1 x BA243; 1 x BA244; 3 x BA317
u.h.f. band: r.f. amplifier	BF180
mixer/oscillator	BF181
tuning diodes	3 x BB105B
drift compensating diode	BAW62
Ambient temperature range	
operating	+ 5 to + 55 °C
storage	−25 to + 85 °C
Relative humidity (during operation)	max. 90%

Voltages and currents

Supply voltage	+ 11 V ± 10%	
Current drawn from + 11 V supply		
low v.h.f. band	9 to 16 mA	depending on a.g.c. voltage
high v.h.f. band	21 to 28 mA	depending on a.g.c. voltage
u.h.f. band	17 to 24 mA	depending on a.g.c. voltage
A.G.C. voltage (Figs 5, 6 and 7)		
low v.h.f. band, at nominal gain	+ 2,4 V	
at 40 dB gain reduction	typ. + 5,5 V	
high v.h.f. band, at nominal gain	+ 2,4 V	
at 40 dB gain reduction	typ. + 4,5 V	
u.h.f. band, at nominal gain	+ 2,4 V	
at 30 dB gain reduction	typ. + 5,0 V	

Note: A.G.C. voltages between 0 and + 10 V may be applied without risk of damage.

A.G.C. current	max. 3,5 mA
Tuning voltage range (Figs 8, 9 and 10)	+ 0,5 to + 28 V
Current drawn from 28 V tuning voltage supply	max. 35 μA

Note: The source impedance of the tuning voltage offered to terminal 2, must be max. 30 kΩ at tuning voltages below 2 V.

Switching voltage	
low v.h.f. band	open circuit
high v.h.f. band	+ 11 V ± 10%
u.h.f. band	open circuit

Note: In the low v.h.f. band position, the tuner produces a negative voltage (1 to 5 V) at terminal 3; this terminal must not be loaded with an external resistance below 10 MΩ.

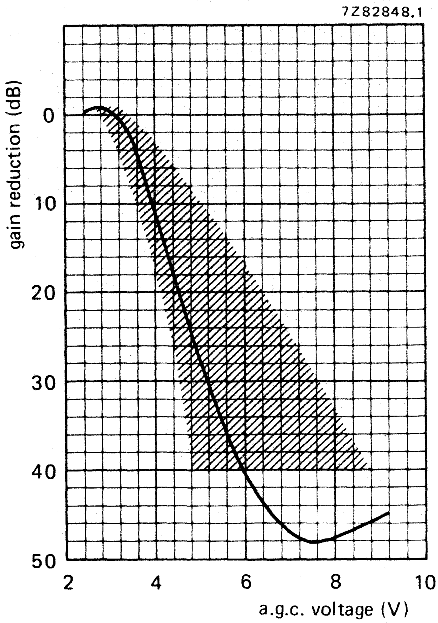


Fig. 5 Low v.h.f. band.

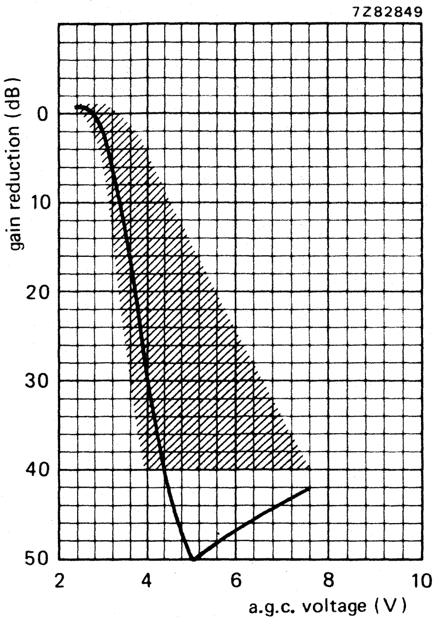


Fig. 6 High v.h.f. band.

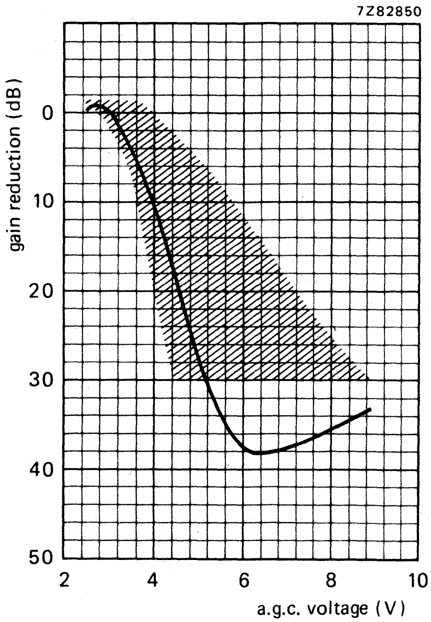


Fig. 7 U.H.F. band.

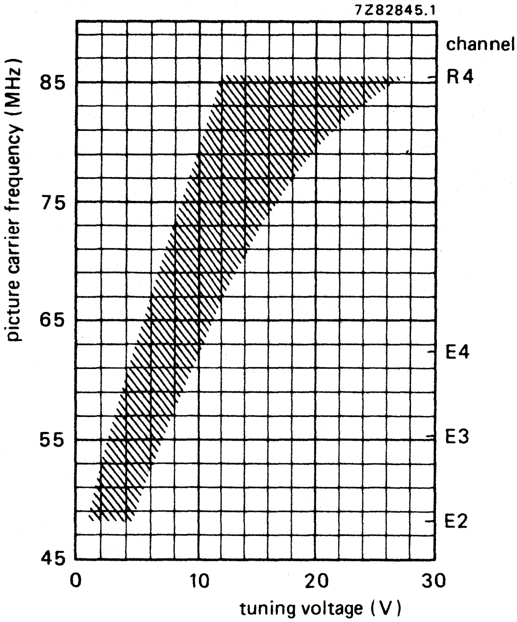


Fig. 8 Low v.h.f. band.

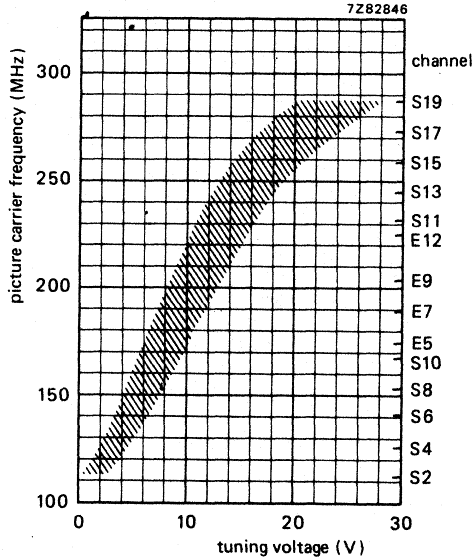


Fig. 9 High v.h.f. band.

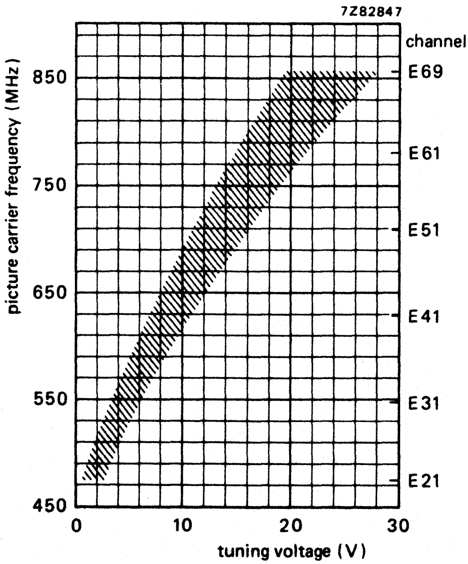


Fig. 10 U.H.F. band.

Frequencies

Frequency ranges	
low v.h.f. band	channel E2 (picture carrier 48,25 MHz) to channel R4 (picture carrier 85,25 MHz). Margin at the extreme channels: min. 1,2 MHz.
high v.h.f. band	channel S2 (picture carrier 112,25 MHz) to channel S19 (picture carrier 287,25 MHz). Margin at the extreme channels: min. 2 MHz.
u.h.f. band	channel E21 (picture carrier 471,25 MHz) to channel E69 (picture carrier 855,25 MHz). Margin at the extreme channels: min. 3 MHz.
Intermediate frequencies	
picture	38,9 MHz
sound	33,4 MHz
	The oscillator frequency is higher than the input-signal frequency.

Wanted signal characteristics

Input impedance		
asymmetrical	75 Ω	
symmetrical	300 Ω (see ACCESSORIES)	
V.S.W.R. (measured at picture carrier frequency of 38,9 MHz)	at nom. gain	during gain control
low v.h.f. band	max. 5	max. 5,5
high v.h.f. band	max. 5	max. 5,5
u.h.f. band	max. 5	max. 5
A.G.C. range		
low v.h.f. band	min. 40 dB	
high v.h.f. band	min. 40 dB	
u.h.f. band	min. 30 dB	
R.F. curves, bandwidth		
low v.h.f. band	typ. 10 MHz	
high v.h.f. band	typ. 12 MHz	
u.h.f. band	typ. 16 MHz	
R.F. curves, tilt		
low v.h.f. band	max. 3,5 dB	
high v.h.f. band	max. 4 dB	
u.h.f. band, channels E21 to E60	max. 3 dB	
channels E61 to E69	max. 4 dB	

Power gain (see also MEASURING METHODS)			
low v.h.f. band		min.	20 dB
	channel E2	typ.	25 dB
	channel R4	typ.	28 dB
high v.h.f. band,	channels S2 to S3	min.	17 dB
	channels S4 to S6	min.	19 dB
	channels S7 to S10	min.	20 dB
	channel S8	typ.	22 dB
	channels E5 to E12	min.	20 dB
	channel E8	typ.	24 dB
	channels S11 to S19	min.	20 dB
	channel S16	typ.	24 dB
u.h.f. band		min.	20 dB
	channel E21	typ.	26 dB
	channel E31	typ.	23 dB
	channel E69	typ.	28 dB
Gain difference			
between any two v.h.f. channels, except channels S2 to S5		typ.	7 dB
between any two u.h.f. channels		typ.	5 dB
between any v.h.f. and u.h.f. channel, except channels S2 to S5		typ.	7 dB
Noise figure			
low v.h.f. band		max.	9 dB
	channel E4	typ.	7,5 dB
high v.h.f. band,	channels S2 to S3	max.	12 dB
	channel S4	max.	11 dB
	channel S5	max.	10 dB
	channels S6 to S10	max.	9 dB
	channel S8	typ.	6,5 dB
	channels E5 to E12	max.	9 dB
	channel E8	typ.	6 dB
	channels S11 to S19	max.	9 dB
	channel S16	typ.	6,5 dB
u.h.f. band,	channels E21 to E60	max.	11 dB
	channels E61 to E69	max.	12 dB
	channel E21	typ.	7 dB
	channel E51	typ.	9 dB
	channel E69	typ.	9,5 dB

Unwanted signal characteristics

I.F. rejection		
low v.h.f. band, channel E2	min. 40 dB	
channel E3	min. 50 dB	
channels E4 to R4	min. 60 dB	
high v.h.f. band, channels S2 to S10	min. 60 dB	
channels E5 to E12	min. 60 dB	
channels S11 to S19	min. 60 dB	
u.h.f. band	min. 60 dB	
Image rejection, at picture carrier frequency		
low v.h.f. band	min. 57 dB	
high v.h.f. band, channels S2 to S10	min. 60 dB	
channels E5 to E12	min. 60 dB	
channels S11 to S19	min. 53 dB	
u.h.f. band	min. 40 dB	
Signal handling (see also Figs 11 and 12)		
Minimum input signal (e.m.f.) producing cross-modulation (1%) at nominal gain,		
in channel (wanted signal: picture carrier frequency, interfering signal: sound carrier frequency),		
low v.h.f. band	typ. 4 mV	note 1
high v.h.f. band	typ. 4 mV	note 1
u.h.f. band	typ. 5 to 10 mV	note 1
in band (wanted signal: picture carrier frequency of channel N, interfering signal: picture carrier of channel N−2 (low v.h.f.), N−3 (high v.h.f.), N−5 (u.h.f.))		
low v.h.f. band	typ. 20 to 40 mV	note 1
high v.h.f. band	typ. 10 to 20 mV	note 1
u.h.f. band	typ. 10 to 20 mV	note 1
Minimum input signal (e.m.f.) producing overloading		
at nominal gain	typ. 30 mV	note 2
at maximum a.g.c.	typ. > 200 mV	note 2
Minimum input signal (e.m.f.) at nominal gain producing a shift of the oscillator frequency of 10 kHz,		
low v.h.f. band	typ. > 25 mV	note 3
high v.h.f. band	typ. > 25 mV	note 3
u.h.f. band	typ. 6 to 10 mV	note 3

Notes

1. This e.m.f. (open voltage) is referred to an impedance of 75 Ω.
   1% cross-modulation means that 1% of the modulation depth of the interfering signal is transferred to the wanted signal.
2. This e.m.f. (open voltage) is referred to an impedance of 75 Ω.
   Criterion of overloading: 30% compression of the synchronization pulses of a standard television signal or a noticeable deterioration of the picture quality.
3. This e.m.f. (open voltage) is referred to an impedance of 75 Ω.

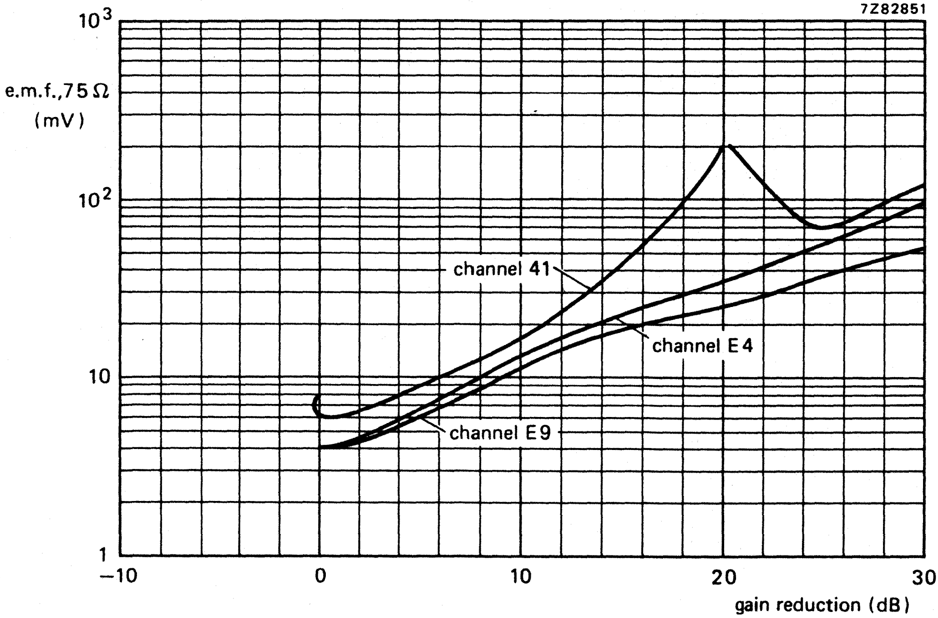


Fig. 11 Cross-modulation, in channel.

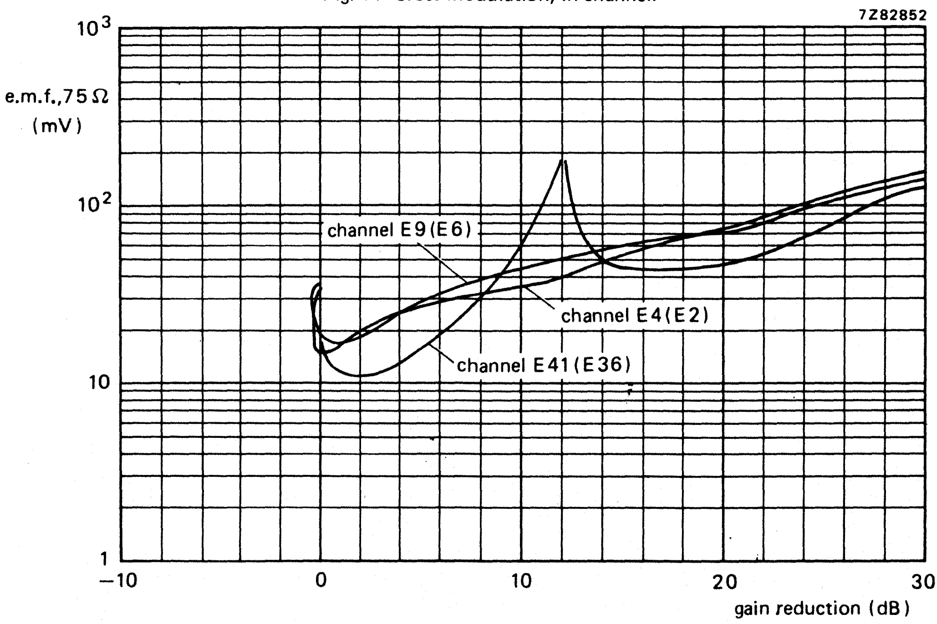


Fig. 12 Cross-modulation, in band; the interfering channels are given between brackets.

Unwanted signal handling capability (visibility test) for channel combinations v.h.f.: N ± 1, N ± 5, N + 11, and u.h.f.: N ± 1, N ± 5, N + 9	according to the requirements of Amtsblatt DBP68/1979, item 5. 1. 2.

Oscillator characteristics

Shift of oscillator frequency	
at a change of the supply voltage of 10%	
low v.h.f. band	max. 500 kHz
high v.h.f. band	max. 600 kHz
u.h.f. band	max. 600 kHz
at a gain reduction of 30 dB	max. 100 kHz
Drift of oscillator frequency during warm-up time (measured between 5 s and 15 min after switching on)	
low v.h.f. band	max. 250 kHz
high v.h.f. band	max. 250 kHz
u.h.f. band	max. 250 kHz
Drift of oscillator frequency at a change of ambient temperature from 25 to 40 °C	
low v.h.f. band	max. 400 kHz
high v.h.f. band	max. 400 kHz
u.h.f. band	max. 500 kHz

I.F. circuit characteristics

Detuning of the i.f. output circuit as a result of r.f. tuning and band switching (reference: channel E8), except channel E2	max. 400 kHz
channel E2	max. 550 kHz

Miscellaneous

Oscillator radiation and oscillator voltage at the aerial terminal.
The tuner is in conformity with the radiation requirements of C.I.S.P.R. 13 (1975), VDE0872/7.72 and Amtsblatt DBP68/1979, provided the following conditions are fulfilled:

— A low-pass filter (Fig. 13) with a cut-off frequency of about 300 MHz has to be inserted between the v.h.f. aerial terminal of the tuner and the aerial terminal of the receiver, and a high-pass filter (Fig. 14) with a cut-off frequency of 350 MHz between the u.h.f. aerial terminal of the tuner and the aerial terminal of the receiver.
  Television receivers with a common v.h.f./u.h.f. connector in combination with a low-pass/high-pass splitter do not need these additional filters.

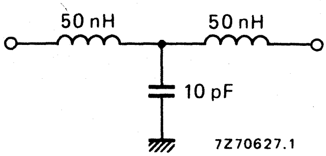


Fig. 13.

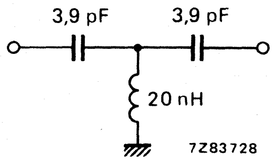


Fig. 14.

- No connections must be made to terminals 7, 9 and 11.
- Earthing of the tuner and connections to the i.f. amplifier has to be done in such a way, that additional radiation is prevented.

Immunity from radiated interference.
The tuner meets the requirements of Amtsblatt DBP68/1979, item 5. 3. 2., provided the aerial terminals are shielded with immunity shields, see Accessories.

Microphonics
If the tuner is installed in a professional manner, there will be no microphonics.

Surge protection

Protection against voltages	max. 5 kV

Note: Three discharges of a 470 pF capacitor into the aerial terminal.

Protection against flashes	max. 30 kV, 400 mWs

Note: A flash-over circuit producing flashes with frequencies of 1 to 20 Hz for 30 s is connected to the aerial terminal.

APPLICATION INFORMATION

Connection of the tuner

For connection of the tuner the terminal location, Fig. 2, should be consulted. If the tuner is used in receivers the chassis of which is connected to the mains, isolating capacitors according to the safety rules have to be inserted in the aerial leads. A convenient way of connecting is given below.

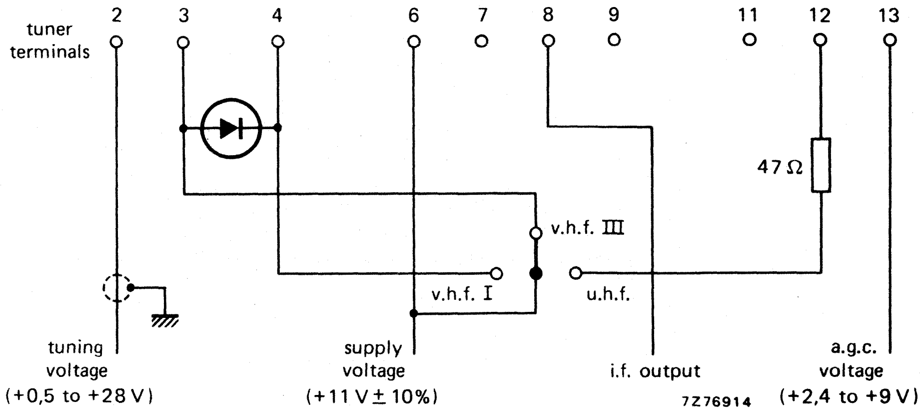


Fig. 15 Connection diagram; diode BAX13, BA217 or comparable silicon diode is used.

Alignment of the i.f. circuit

The tuner is provided with a test point at the collector of the v.h.f. mixer, which can be used for i.f. injection to align the i.f. output circuit. The i.f. signal should be fed to test point 1 (terminal 7) via a capacitor of 0,5 to 1 pF (Fig. 16). This capacitor should have short leads to avoid oscillator radiation. After alignment it should be soldered to earth, to avoid detuning of the i.f. circuit (Fig. 17).

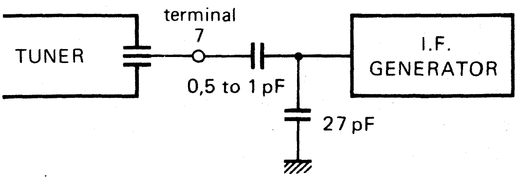


Fig. 16.

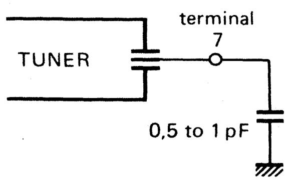


Fig. 17.

In receivers where the tuner is soldered into a printed-wiring board, the capacitor can be printed as shown in Figs 18 and 19.

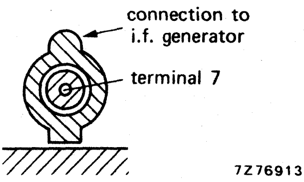


Fig. 18.

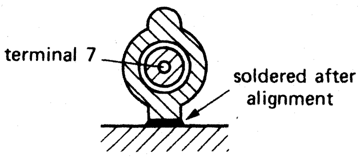


Fig. 19.

The aligning should be done with the v.h.f. III band tuned. The tuning voltage should be 15 to 20 V.

If this injection method cannot be employed in the television receiver (e.g. there is not enough i.f. signal available) the i.f. signal can be fed to test point 3 (terminal 11) via a capacitor of 0,82 to 1 pF. The tuner must be switched to the u.h.f. position; the tuning voltage should be approx. 10 V. This injection method requires approx. 14 dB less signal than the first method. The capacitor has to be removed after alignment. No permanent connection must be made to test point 3, otherwise the tuner may exceed the oscillator radiation limits.

MEASURING METHOD OF POWER GAIN

The i.f. output of the tuner should be terminated with the circuit given in Fig. 20. The terminals 7, 9 and 11 should be not connected.

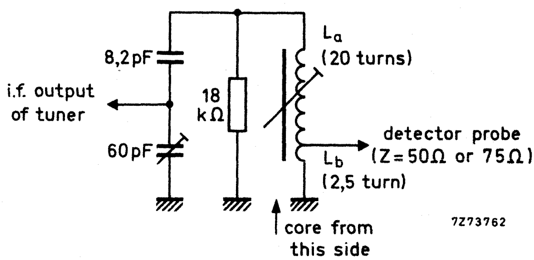


Fig. 20.

Alignment of this circuit inconnection with the tuner is done as follows.
Switch the tuner to the v.h.f. III band; the tuning voltage should be 15 to 20 V. Feed an i.f. sweep signal (e.m.f. 500 to 1000 mV) to test point 1 as given in Alignment of the i.f. circuit. Adjust the trimmer (Fig. 20), tunable coil (L_a/L_b), i.f. output coil of the tuner L519 (Fig. 1) and the coupling between L_a and L_b to get the resonant curve as given in Fig. 21.

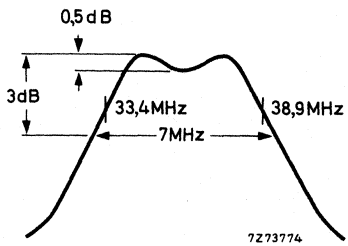


Fig. 21.

Then display the r.f. + i.f. curve of the tuner at 190 MHz (picture carrier frequency) and make small corrections in the alignment of the i.f. coils (L_a/L_b and L519), if necessary, to get the 38,9 MHz and 33,4 MHz markers symmetrically on the slopes of the curve and the peaks at equal amplitude.

Because the output impedance of the dummy circuit is 50 to 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and dummy circuit between a 75 Ω source and a 75 Ω detector (or between a 50 Ω source and matching pad 50/75 Ω and a 50 Ω detector).

ACCESSORIES

Aerial input transformer ELC1094, v.h.f., catalogue number: 2422 542 10941.
Aerial input transformer ELC2092, u.h.f., catalogue number: 2422 542 12921.
Coaxial aerial input assembly, with safety capacitors, catalogue number: 3122 127 10450.
Coaxial aerial input assembly, without safety capacitors, catalogue number: 3122 128 57720.
Immunity shield, v.h.f., catalogue number 3122 121 28830.
Immunity shield, u.h.f., catalogue number 3122 121 28840.

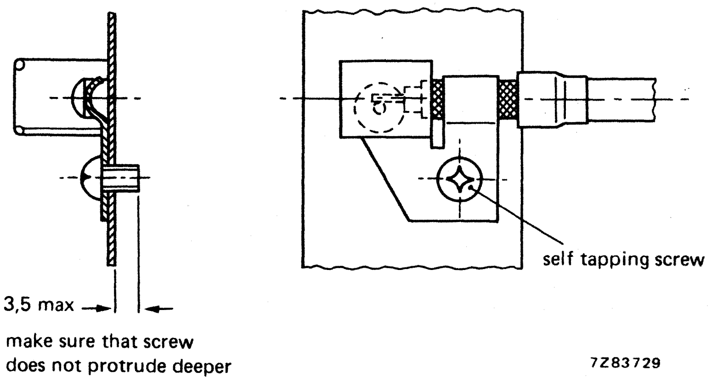


Fig. 22 Fixing method of immunity shield; see Fig. 4 for cable cut.

V.H.F./U.H.F. TELEVISION TUNER

with diode tuning

QUICK REFERENCE DATA	
Systems	C.C.I.R. systems B and G
Channels [1]	0 to 4 (low v.h.f. band)
	5 to 11 (high v.h.f. band)
	28 to 63 (u.h.f. band)
Intermediate frequencies	
picture	36,875 MHz
sound	31,375 MHz

APPLICATION

Designed to cover the Australian v.h.f. and u.h.f. channels of C.C.I.R. systems B and G.

[1]) In accordance with the publications of the Australian Broadcasting Control Board (ABCB).

DESCRIPTION

The ELC2060 is a combined v.h.f./u.h.f. tuner with electronic tuning and band switching, covering the low v.h.f. band with the channels 0 to 4 (frequency range 45 to 101 MHz), the high v.h.f. band with the channels 5 to 11 (frequency range 101 to 222 MHz), and the u.h.f. band with the channels 28 to 63 (frequency range 526 to 814 MHz).

Mechanically, the tuner is built on a low-loss printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear cover (see Fig. 2). The two aerial connections (v.h.f. and u.h.f.) are on the two frame sides, all other connections (supply voltages, a.g.c. voltage, tuning and switching voltages) are made via feed-through capacitors in the under side. The mounting method is shown in Figs. 3 and 4.

Electrically, the tuner consists of v.h.f. and u.h.f. parts. The v.h.f. aerial signal is fed via an i.f. trap, combined with a high-pass filter, to a tuned input circuit, which is connected to the emitter of the input transistor BF200. The collector load of this transistor is formed by a double tuned circuit, transferring the signal to the base of the mixer transistor BF183. The oscillator is equipped with a transistor BF494. The four r.f. circuits are tuned by four capacitance diodes BB109G. A capacitance diode BB106 provides a frequency-dependent coupling of the r.f. input signal to the tuned input circuit. Switching between the low and high v.h.f. bands is done by four switching diodes (BA182, BA243, and BA244).

The collector circuit of the mixer transistor is a single tuned i.f. resonant circuit, at the low end of which the i.f. signal is capacitively coupled out of the tuner (low capacitance coupling). An i.f. injection point is provided at the collector of the mixer, for aligning this circuit together with the i.f. amplifier of the television receiver.

The u.h.f. part of the tuner consists of a tuned input circuit, connected to the emitter of the amplifier transistor BF183. The inter-stage network between this transistor and the self-oscillating mixer stage is formed by a double tuned circuit. A transistor BF181 acts as a self-oscillating mixer. The four tuned u.h.f. circuits are tuned by four capacitance diodes BB105B.
The output of the self-oscillating mixer is fed to a double tuned i.f. circuit which is connected to the emitter of the v.h.f. mixer transistor BF183, now operating as an i.f. amplifier in grounded-base configuration. Band switching between v.h.f. and u.h.f. is achieved by a diode BA243.
The tuner requires transistor supply voltages of +12 V, a switching voltage of +12 V, a.g.c. voltages, variable from +2,4 V (normal operating point) to about +7,5 V (maximum a.g.c.) and a tuning voltage, variable from +0,5 V to +28 V.

The aerial inputs of the tuner are asymmetrical. For use in symmetrical aerial systems, aerial transformers (baluns) are available (see ACCESSORIES).

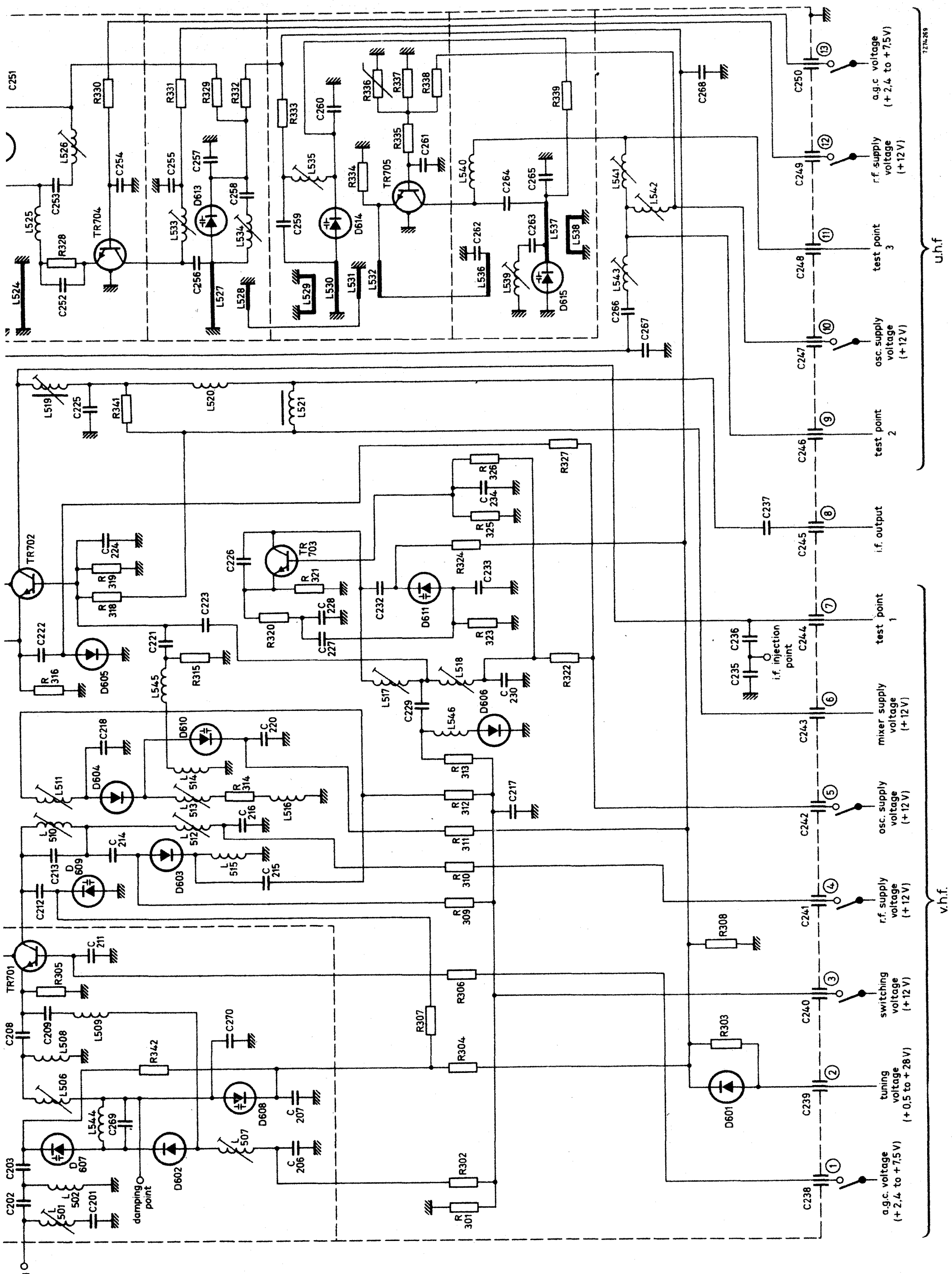
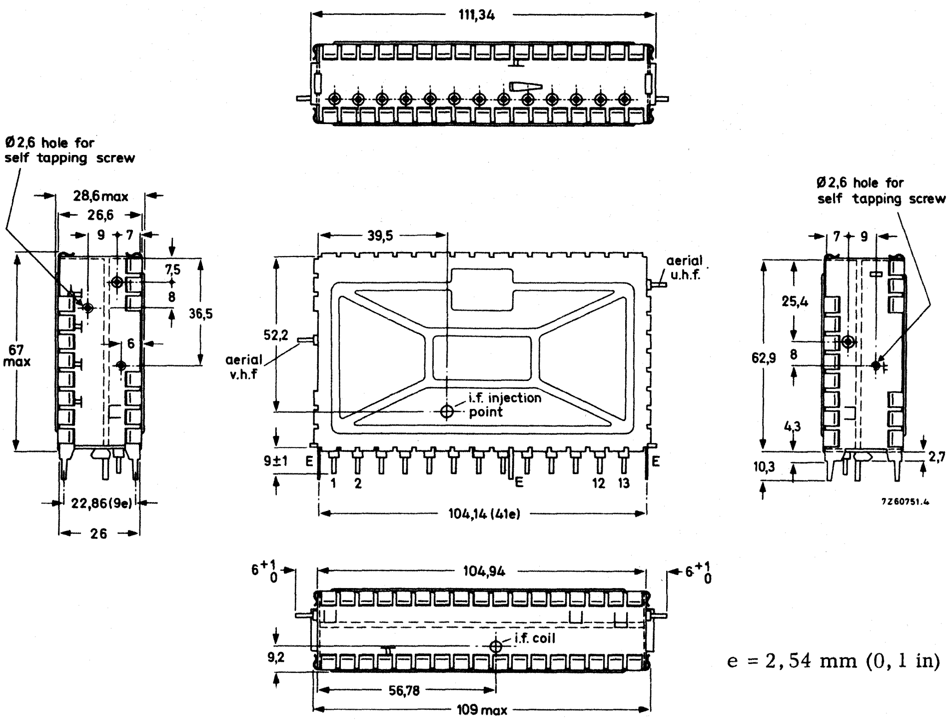

a.g.c voltage (+2,4 to +7,5 V)
r.f. supply voltage (+12 V)
test point 3
osc. supply voltage (+12 V)
test point 2
u.h.f
i.f. output
test point 1
i.f. injection point
mixer supply voltage (+12 V)
osc. supply voltage (+12 V)
r.f. supply voltage (+12 V)
switching voltage (+12 V)
tuning voltage (+0,5 to +28 V)
a.g.c. voltage (+2,4 to +7,5 V)
v.h.f.
damping point
v.h.f. aerial

Fig. 1

MECHANICAL DATA

Dimensions in mm



e = 2,54 mm (0,1 in)

Fig.2.

Terminal 1 = a.g.c. voltage, v.h.f., +2,4 to +7,5 V
2 = tuning voltage, +0,5 to +28 V
3 = switching voltage, +12 V (approx. 22 mA)
4 = r.f. supply voltage, v.h.f., +12 V (approx. 3 to 10 mA)
5 = oscillator supply voltage, v.h.f., +12 V (approx. 6 mA)
6 = mixer supply voltage, v.h.f., +12 V (approx. 5 mA)
7 = test point 1, v.h.f.
8 = i.f. output
9 = test point 2 (alignment short)
10 = oscillator supply voltage, u.h.f., +12 V (approx. 4,8 mA)
11 = test point 3, u.h.f.
12 = r.f. supply voltage, u.h.f., +12 V (approx. 2,5 to 9,5 mA)
13 = a.g.c. voltage, u.h.f., +2,4 to +7,5 V
E = earth

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, using the piercing diagram shown in Fig. 3. (The tuner may also be mounted by means of a snap-in mount or a bracket. Information will be supplied upon request.)
The tuner may be mounted anywhere in the receiver and there are no restrictions on orientation.

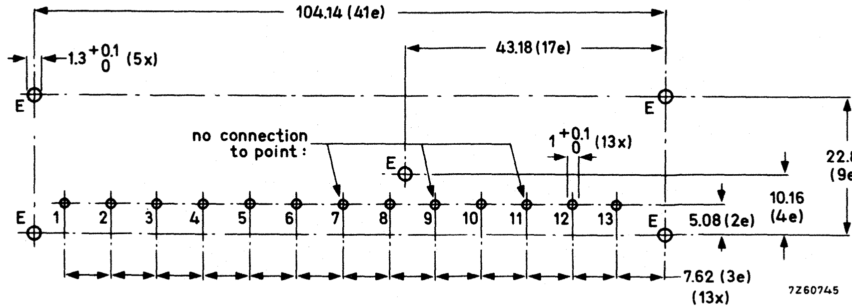


Fig. 3. Piercing diagram viewed from solder side of board; e = 2,54 mm (0,1 in).
No connection must be made to the points 7,9 and 11, otherwise the oscillator radiation may increase.

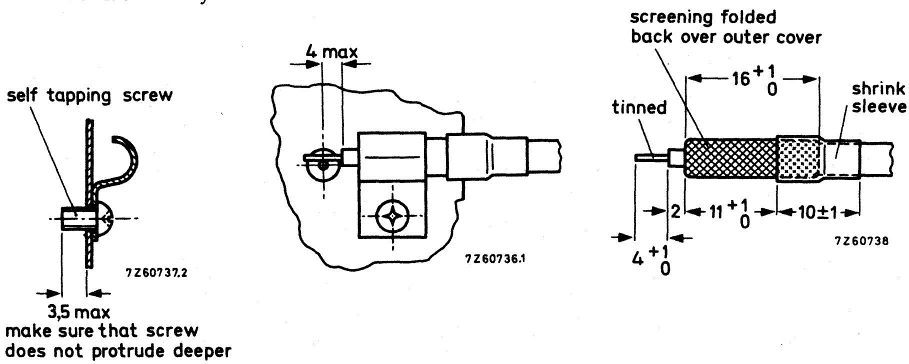


Fig. 4. Recommended fixing method of the aerial cables. Use a self-tapping screw.

ELECTRICAL DATA

Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C and a supply voltage of 12 ± 0,3 V.

Semiconductors		
v.h.f. bands, r.f. amplifier	BF200	
mixer	BF183	
oscillator	BF494	
tuning diodes	4 x BB109G	
coupling diode	BB106	
switching diodes	2 x BA182; 1 x BA243; 2 x BA244	
u.h.f. band, r.f. amplifier	BF180	
mixer/oscillator	BF181	
tuning diodes	4 x BB105B	
drift compensating diode	BAW62	
Ambient temperature range		
operating	+5 to +55 °C	
storage	−25 to +85 °C	
Relative humidity	max. 90%	
Supply voltage	+12 V +10%, −15%	
Current drawn from +12 V supply		
low v.h.f. band	14 to 21 mA	depending on a.g.c. voltage
high v.h.f. band	36 to 43 mA	
u.h.f. band	33,5 to 40 mA	
A.G.C. voltage (Figs.5, 6 and 7)		
low v.h.f. band, at nominal gain	2,4 V	
at 40 dB gain reduction	typ. 5,5 V	
high v.h.f. band, at nominal gain	2,4 V	
at 40 dB gain reduction	typ. 4,5 V	
u.h.f. band, at nominal gain	2,4 V	
at 30 dB gain reduction	typ. 5,0 V	
A.G.C. current		
low v.h.f. band at 40 dB gain reduction	max. 0,8 mA	
high v.h.f. band at 40 dB gain reduction	max. 0,6 mA	
u.h.f. band, at 30 dB gain reduction	max. 0,7 mA	
Tuning voltage range (Figs. 8, 9 and 10)	+0,5 to +28 V	
Current drawn from 28 V tuning voltage supply	max. 36 μA	

Note: The source impedance of the tuning voltage offered to terminal 2, must be max. 30 kΩ at tuning voltages below 2 V.

Switching voltage	
low v.h.f. band	open circuit
high v.h.f. band	+12 V
u.h.f. band	+12 V

Note: In the low v.h.f. band position, the tuner produces a negative voltage (1 to 5 V) at terminal 3; this terminal must not be loaded with an external resistance below 20 MΩ.

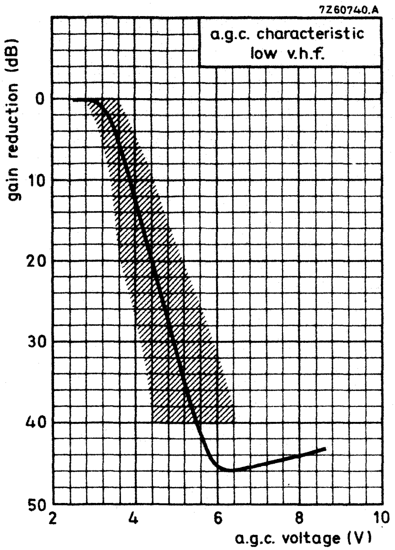


Fig. 5

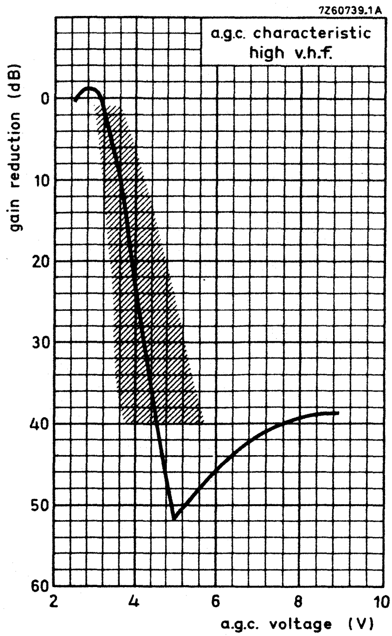


Fig. 6.

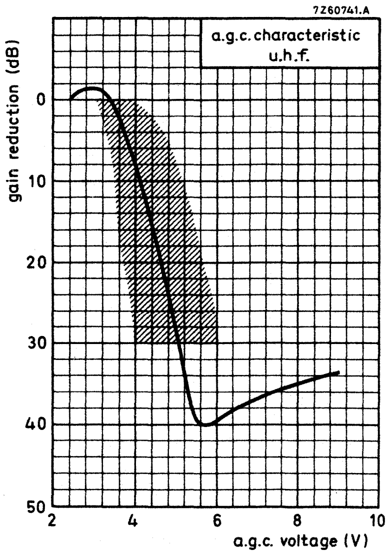


Fig. 7.

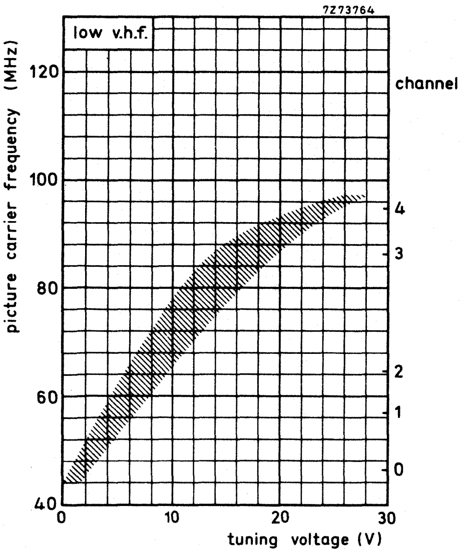


Fig. 8.

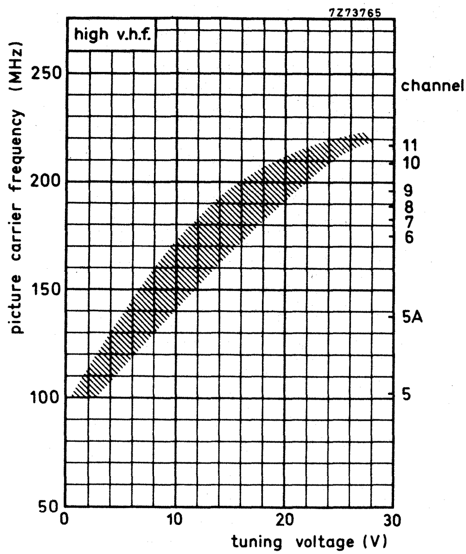


Fig. 9.

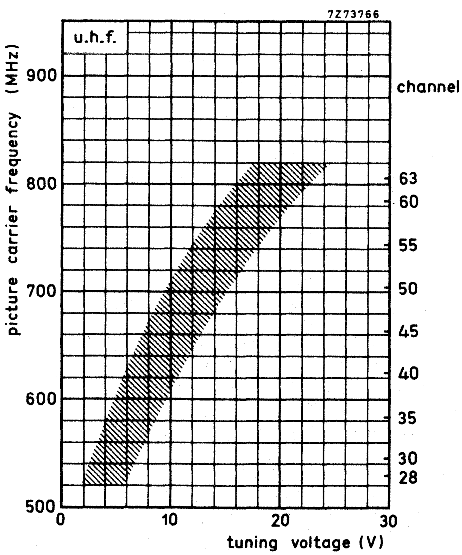


Fig. 10.

Frequency ranges

low v.h.f. band	channel 0 (picture carrier 46,25 MHz) to channel 4 (picture carrier 95,25 MHz). Margin at the extreme channels : min. 1,5 MHz.
high v.h.f. band	channel 5 (picture carrier 102,25 MHz) to channel 11 (picture carrier 216,25 MHz). Margin at the extreme channels : min. 2 MHz.
u.h.f. band	channel 28 (picture carrier 527,25 MHz) to channel 63 (picture carrier 807,25 MHz). Margin at the extreme channels : min. 3 MHz.

Intermediate frequencies

picture	36,875 MHz
sound	31,375 MHz

The oscillator frequency is higher than the input-signal frequency.

Input impedance

asymmetrical	75 Ω
symmetrical	300 Ω (see ACCESSORIES)

V.S.W.R. (between picture carrier and sound carrier)	v.s.w.r. at nom. gain		max. v.s.w.r. during gain control	
	min. 1)	max. 2)	min. 1	max. 2)
low v.h.f. band	max. 3	max. 5	max. 4	max. 5,5
high v.h.f. band, channels 5A to 11	max. 4	max. 5	max. 4,5	max. 5,5
channel 5	max. 4	max. 6	max. 4,5	max. 6
u.h.f. band		max. 4		max. 5

A.G.C. range

low v.h.f. band	min. 40 dB
high v.h.f. band	min. 40 dB
u.h.f. band	min. 30 dB

1) Best value of V.S.W.R. between picture carrier and sound carrier.
2) Worst value of V.S.W.R, between picture carrier and sound carrier.

R.F. curves at nominal gain		
bandwidth, low v.h.f. band	typ.	9 to 13 MHz
high v.h.f. band	typ.	9 to 14 MHz
u.h.f. band	typ.	13 to 18 MHz
tilt, low v.h.f. band	max.	3 dB
high v.h.f. band, channels 5 and 5A	max.	3,5 dB
channels 6 to 11	max.	3 dB
u.h.f. band	max.	3 dB
Power gain (see also MEASURING METHODS)		
v.h.f. bands, except channel 5	min.	25 dB
channel 5	min.	21 dB
channel 0	typ.	31 dB
channel 4	typ.	29 dB
channel 5	typ.	24 dB
channel 8	typ.	29 dB
u.h.f. band	min.	25 dB
channel 28	typ.	30 dB
channel 63	typ.	32 dB
Noise figure		
low v.h.f. band	max.	9 dB
channel 0	typ.	7 dB
channel 4	typ.	7 dB
high v.h.f. band		
channel 5	max.	11 dB
	typ.	9 dB
channel 5A	max.	8,5 dB
	typ.	6,5 dB
channels 6 to 11	max.	8 dB
	typ.	5 dB
u.h.f. band	max.	12 dB
channel 28	typ.	8,5 dB
channel 63	typ.	9,5 dB
I.F. rejection		
v.h.f. bands, channel 0	min.	40 dB
channels 1 and 2	min.	50 dB
channels 3 to 11	min.	60 dB
u.h.f. band	min.	60 dB
Image rejection		
low v.h.f. band	min.	50 dB
high v.h.f. band	min.	60 dB
u.h.f. band	min.	40 dB

Signal handling (see also Figs. 12 and 13)		
Minimum input signal (e.m.f.) producing cross-modulation (1%) at nominal gain, in channel		
(wanted signal: picture carrier frequency, interfering signal: sound carrier frequency), low v.h.f. band	typ. 4 mV	[1]
high v.h.f. band	typ. 4 mV	[1]
u.h.f. band	typ. 5 to 10 mV	[1]
in band (wanted signal: picture carrier frequency of channel N, interfering signal: picture carrier of channel N-2 (v.h.f.), N-5 (u.h.f.))		
low v.h.f. band	typ. 15 to 60 mV	[1]
high v.h.f. band	typ. 10 to 50 mV	[1]
u.h.f. band	typ. 15 to 50 mV	[1]
Minimum input signal (e.m.f.) producing overloading, at nominal gain	typ. 10 mV	[2]
at maximum a.g.c.	typ. >200 mV	[2]
Minimum input signal (e.m.f.) at nominal gain producing a shift of the oscillator frequency of 10 kHz, low v.h.f. band	typ. 25 mV	[3]
high v.h.f. band	typ. 25 mV	[3]
u.h.f. band	typ. 10 to 20 mV	[3]
Tuning range of the i.f. output circuit (see also MEASURING METHODS)	max. 31,5 to min. 37,5 MHz	
Detuning of the i.f. output circuit as a result of band switching and tuning with respect of channel 8	max. 400 kHz	
Shift of oscillator frequency at a change of the supply voltage of 10%		
v.h.f. bands, channels 0 to 4	max. 500 kHz	
channels 5 to 11	max. 300 kHz	
u.h.f. band	max. 600 kHz	
at a gain reduction of 30 dB	max. 100 kHz	

[1] This e.m.f. (open voltage) is referred to an impedance of 75 Ω.
1% cross-modulation means that 1% of the modulation depth of the interfering signal is transferred to the wanted signal.

[2] This e.m.f. (open voltage) is referred to an impedance of 75 Ω.
Criterion of overloading: 30% compression of the synchronization pulses of a standard television signal or a noticeable deterioration of the picture quality.

[3] This e.m.f. (open voltage) is referred to an impedance of 75 Ω.

Drift of oscillator frequency

during warm-up time (measured between 5 s and 15 min after switching on)

v.h.f. bands	max. 200 kHz
u.h.f. band	max. 250 kHz

at a change of the ambient temperature from 25 to 50 °C

v.h.f. bands	max. 500 kHz
u.h.f. band	max. 1000 kHz

Oscillator radiation

The tuner is in conformity with the radiation requirements of the Australian Standard AS 1053-1973 and of C.I.S.P.R. Recommendation No. 24/3, provided the following conditions are fulfilled:

- A low-pass filter (Fig. 11) with a cut-off frequency of about 300 MHz has to be inserted between the v.h.f. aerial terminal of the tuner and the aerial terminal of the receiver. Television receivers with a common v.h.f./u.h.f. connector in combination with a low-pass/high-pass splitter [1]) may not need this additional filter.

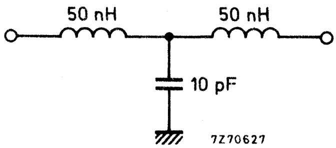


Fig. 11.

- No connections must be made to the terminals 7, 9 and 11.
- Earthing of the tuner and connections to the i.f. amplifier have to be made in such a way, that additional radiation is prevented.

Microphonics

If the tuner is installed in a professional manner, there will be no microphonics.

1) E.g. coaxial aerial input assembly 3122 127 10450.

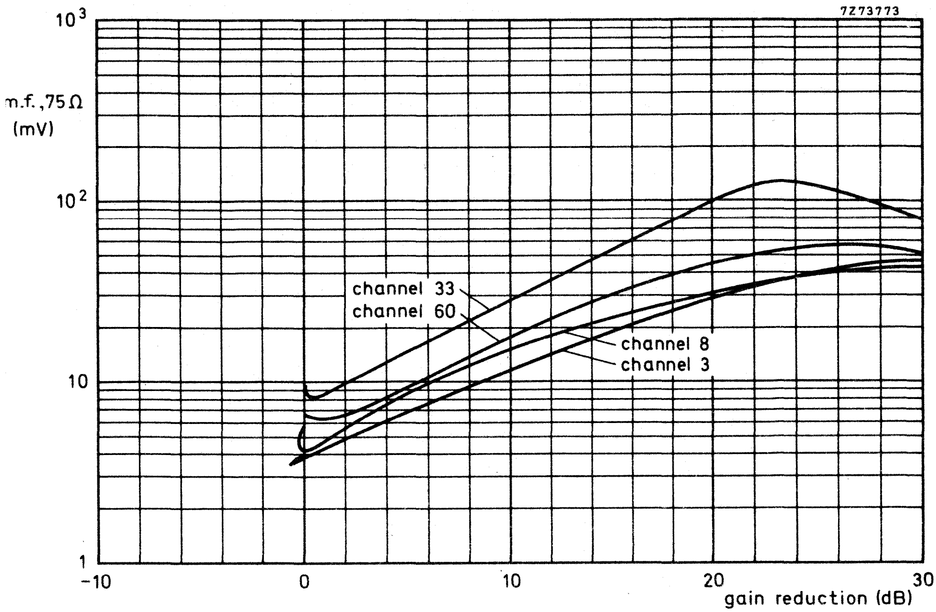


Fig. 12. Cross-modulation, in channel.

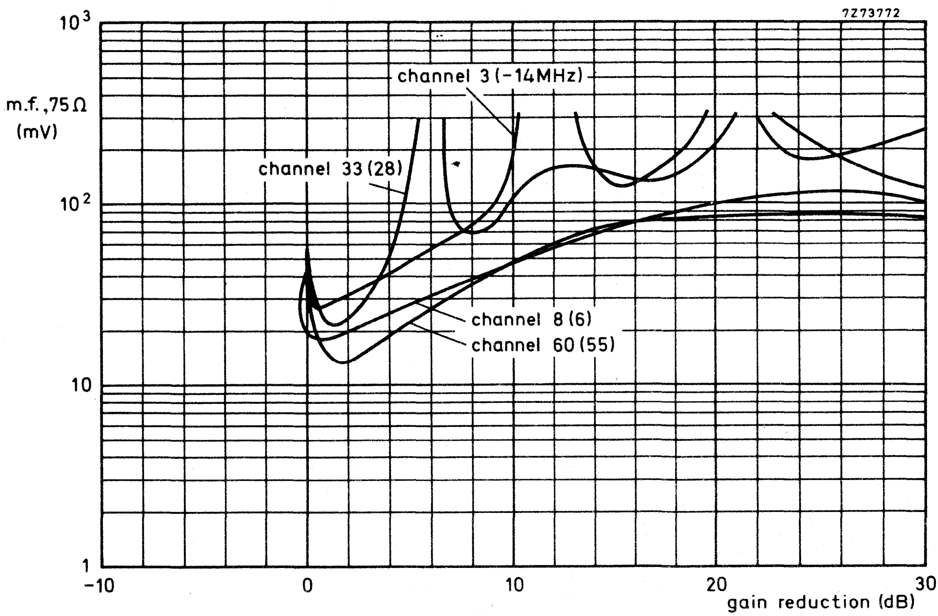


Fig. 13. Cross-modulation, in band; the interfering channels are given between brackets.

APPLICATION INFORMATION

Connection of the tuner

For connection of the tuner the terminal location, Fig. 2, should be consulted.
If the tuner is used in receivers the chassis of which is connected to the mains, isolating capacitors according to the safety rules have to be inserted in the aerial leads.
Five ways of connecting, depending on the number of switches available, are given below.

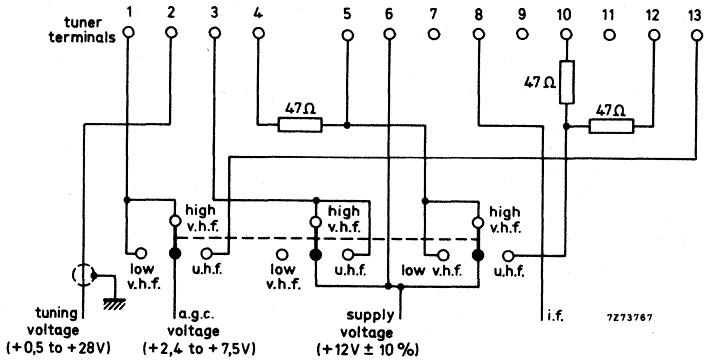


Fig. 14. Connection diagram with three switches.

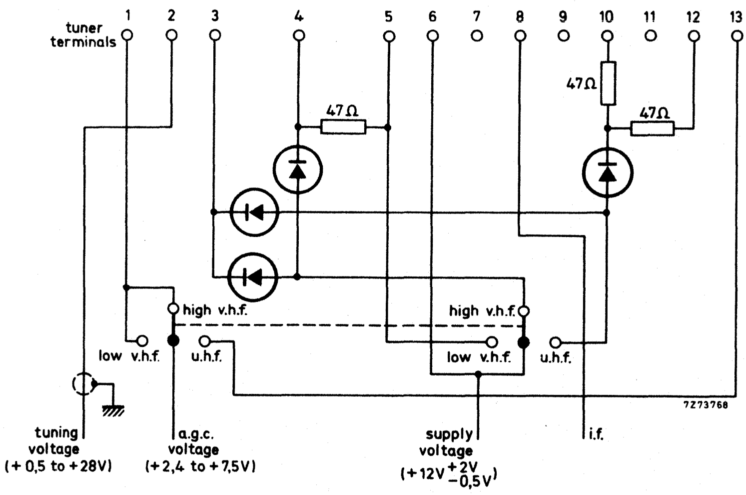


Fig. 15. Connection diagram with two switches.
All diodes : BAX13, BA217 or comparable silicon diodes.

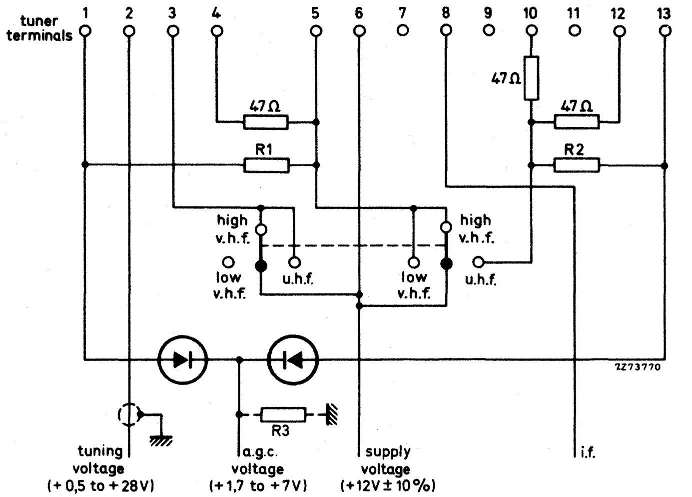


Fig. 16. Connection diagram with two switches.
All diodes: BAX13, BA217 or comparable silicon diodes.
The values of R_1, R_2 and R_3 depend on a.g.c. circuit.

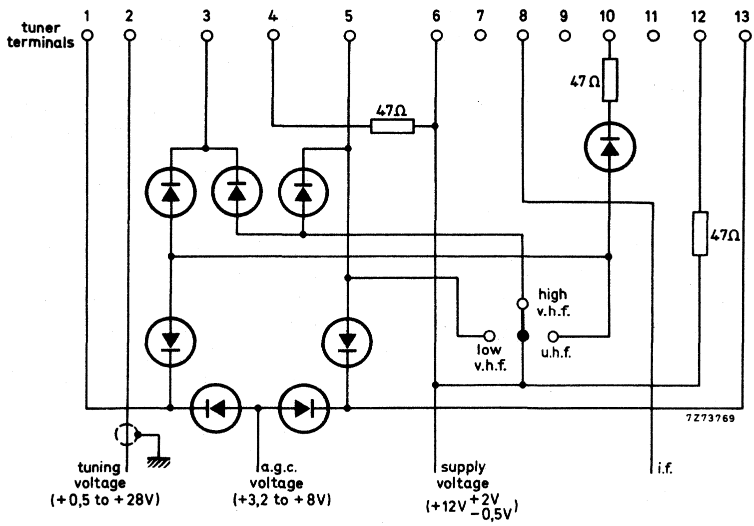


Fig. 17. Connection diagram with one switch.
All diodes: BAX13, BA217 or comparable silicon diodes.

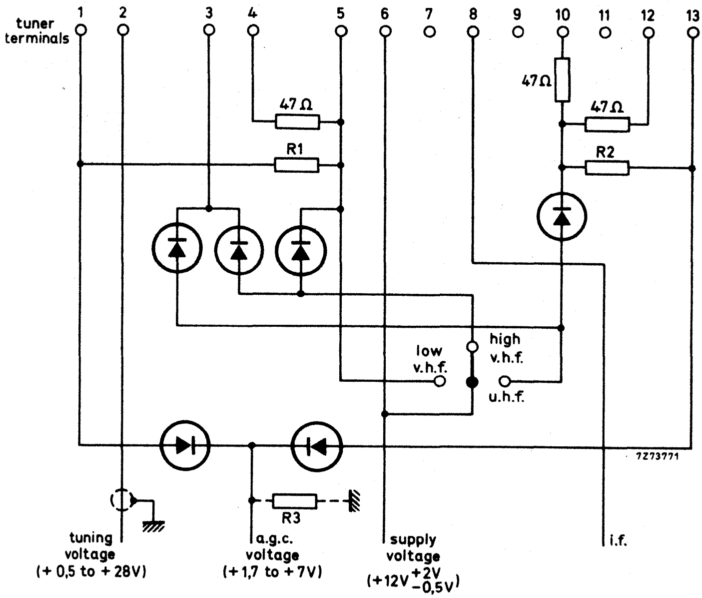


Fig. 18. Connection diagram with one switch.
All diodes : BAX13, BA217 or comparable silicon diodes.
The values of R_1, R_2 and R_3 depend on a.g.c. circuit.

Alignment of the i.f. circuit

The tuner is provided with an i.f. injection point at the collector of the mixer for aligning the i.f. circuit together with the i.f. amplifier of the television receiver (for the position of the i.f. injection point see Fig. 2).
The alignment should be done with the high v.h.f. band tuned. The tuning voltage should be 15 to 20 V.

If this injection method cannot be employed in the television receiver (e.g. because the injection point is not accessible or there is not enough i.f. signal available), the i.f. signal can be fed to test point 3 (terminal 11) via a capacitor of 0,82 to 1 pF. The tuner must be switched to the u.h.f. position; the tuning voltage should be approx. 10 V. This injection method requires approx. 14 dB less signal than the first method. No permanent connection must be made to test point 3, otherwise the tuner may exceed the oscillator radiation limits.

MEASURING METHODS

Power gain

The i.f. output of the tuner should be terminated with the dummy circuit given below.
The terminals 7, 9 and 11 should be not connected.

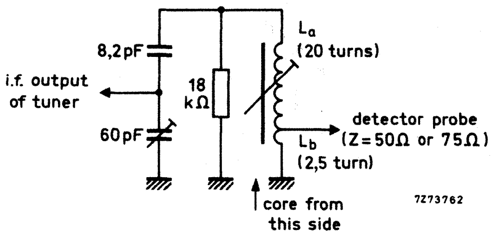


Fig. 19.

The dummy circuit should be aligned as follows.
Switch the tuner to the high v.h.f. band; the tuning voltage should be 15 to 20 V.
Feed an i.f. sweep signal (500 to 1000 mV) to the i.f. injection point.
Adjust the trimmer (Fig. 19), tunable coil (L_a/L_b), i.f. output coil of the tuner L519 (Fig. 1) and the coupling between L_a and L_b to get the resonant curve as given below.

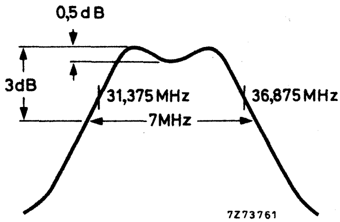


Fig. 20.

Then display the r.f. + i.f. curve of the tuner at 190 MHz (picture carrier frequency) and make small corrections in the alignment of the i.f. coils (L_a/L_b and L519), if necessary, to get the markers 36,875 MHz and 31,375 MHz symmetrically on the slopes of the curve, and the peaks at equal amplitude.

Because the output impedance of the dummy circuit is 50 to 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and dummy circuit between a 75 Ω source and a 75 Ω detector (or between a 50 Ω source and matching pad 50/75 Ω and a 50 Ω detector).

Tuning range of i.f. output circuit

The i.f. output of the tuner should be terminated with the circuit given in Fig. 21. The terminals 7, 9 and 11 should not be connected.

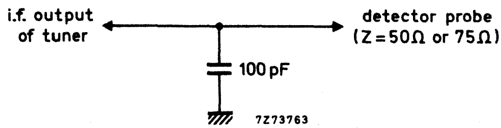


Fig. 21.

ACCESSORIES

Aerial input transformer ELC1094, v.h.f., catalogue number: 2422 542 10941;
aerial input transformer ELC2092, u.h.f., catalogue number: 2422 542 12921;
coaxial aerial input assembly, catalogue number: 3122 127 10450.

V.H.F./U.H.F. TELEVISION TUNER
with diode tuning

QUICK REFERENCE DATA	
System	C.C.I.R. system I
Channels (South African channel distribution)	4 to 13 (v.h.f. band)
	21 to 69 (u.h.f. band)
Intermediate frequencies	
picture	38,9 MHz
sound	32,9 MHz

APPLICATION

Designed to cover the South African v.h.f. and u.h.f. channels of C.C.I.R. system I.

DESCRIPTION

The ELC2070 is a combined v.h.f./u.h.f. tuner with electronic tuning and band switching, covering the South African v.h.f. band (frequency range 174 to 254 MHz) and the u.h.f. band (frequency range 470 to 860 MHz).

Mechanically, the tuner is built on a low-loss printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear cover (see Fig. 2). The two aerial connections (v.h.f. and u.h.f.) are on the two frame sides, all other connections (supply voltages, a.g.c. voltage and tuning voltage) are made via feed-through capacitors in the under side. The mounting method is shown in Figs. 3 and 4.

Electrically, the tuner consists of v.h.f. and u.h.f. parts. The v.h.f. aerial signal is fed via an i.f. trap, combined with a high-pass filter, to a tuned input circuit, which is connected to the emitter of the input transistor BF200. The collector load of this transistor is formed by a double tuned circuit, transferring the signal to the base of the mixer transistor BF182. The oscillator is equipped with a transistor BF494. The four r.f. circuits are tuned by four capacitance diodes BB106.

The collector circuit of the mixer transistor is a single tuned i.f. resonant circuit, at the low end of which the i.f. signal is capacitively coupled out of the tuner.
An i.f. injection point is provided at the collector of the mixer, for aligning this circuit together with the i.f. amplifier of the television receiver.

The u.h.f. part of the tuner consists of a tuned input circuit, connected to the emitter of the amplifier transistor BF180. The inter-stage network between this transistor and the self-oscillating mixer stage is formed by a double tuned circuit. A transistor BF181 acts as a self-oscillating mixer. The four tuned u.h.f. circuits are tuned by four capacitance diodes BB105B.
The output of the self-oscillating mixer is fed to a double tuned i.f. circuit which is connected to the emitter of the v.h.f. mixer transistor BF182, now operating as an i.f. amplifier in grounded-base configuration. Band switching between v.h.f. and u.h.f. is achieved by a diode BA243.
The tuner requires transistor supply voltages of +12 V, a.g.c. voltages, variable from +2,4 V (normal operating point) to about +7,5 V (maximum a.g.c.), and a tuning voltage, variable from +0,5 V to +28 V.

The aerial inputs of the tuner are asymmetrical. For use in symmetrical aerial systems, aerial transformers (baluns) are available (see ACCESSORIES).

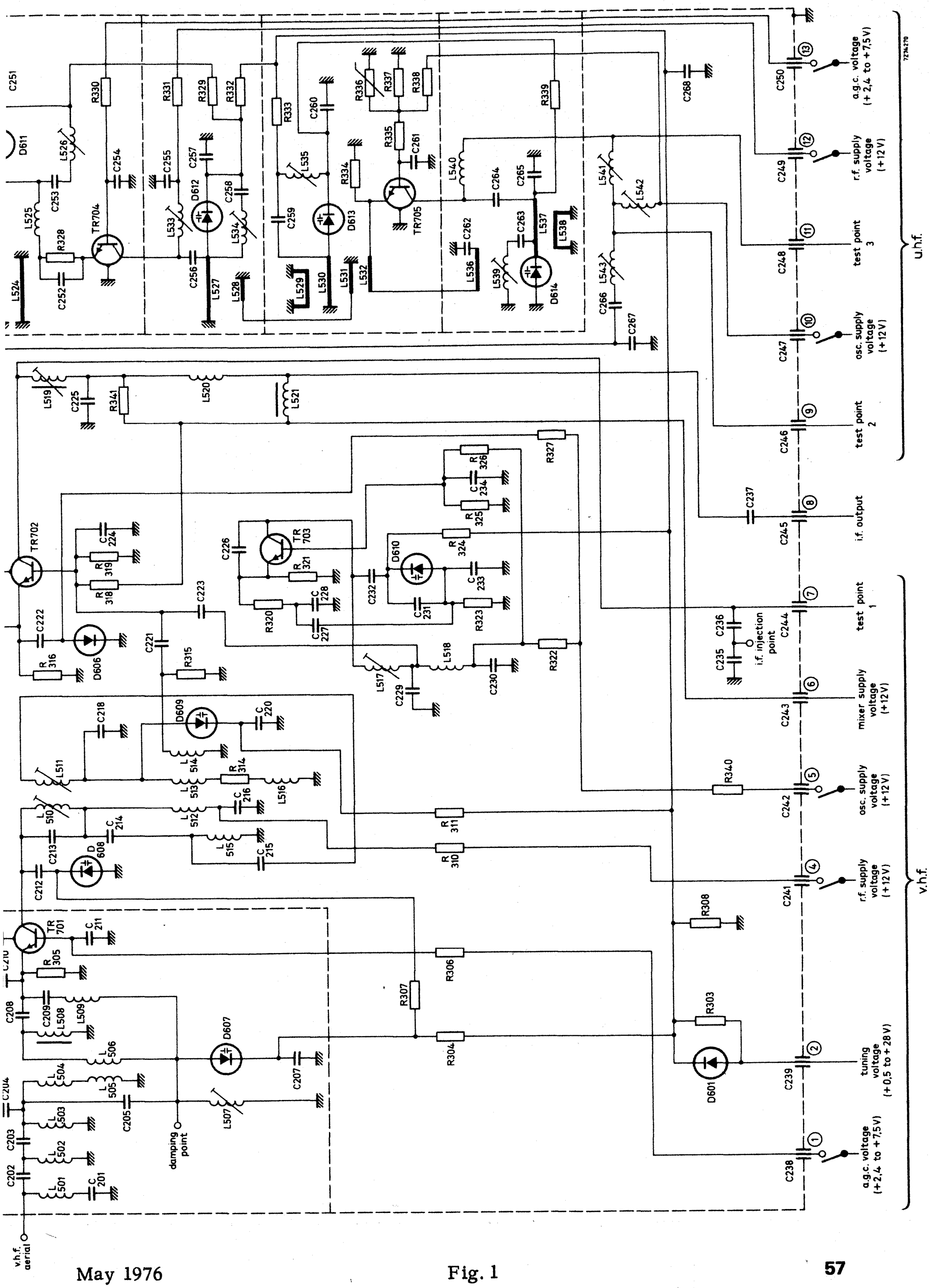
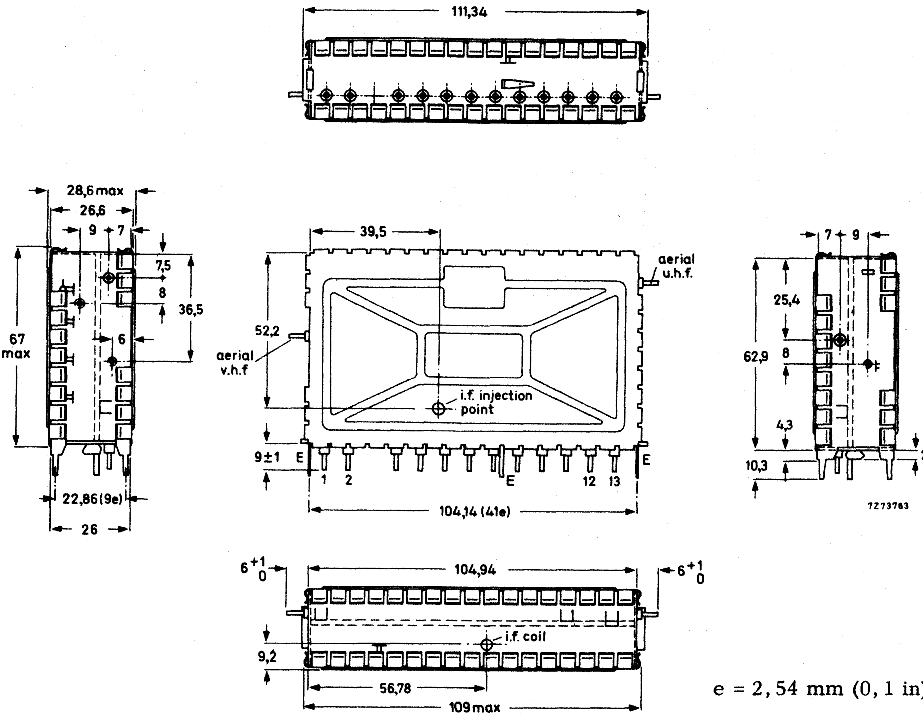

u.h.f.
v.h.f.
a.g.c. voltage (+2,4 to +7,5 V)
r.f. supply voltage (+12 V)
test point 3
osc. supply voltage (+12 V)
test point 2
i.f. output
test point 1
i.f. injection point
mixer supply voltage (+12 V)
osc. supply voltage (+12 V)
r.f. supply voltage (+12 V)
tuning voltage (+0,5 to +28 V)
a.g.c. voltage (+2,4 to +7,5 V)
damping point
v.h.f. aerial

Fig. 1

MECHANICAL DATA

Dimensions in mm



e = 2,54 mm (0,1 in)

Fig. 2

Terminal 1 = a.g.c. voltage, v.h.f., +2,4 to +7,5 V
2 = tuning voltage, +0,5 to +28 V
4 = r.f. supply voltage, v.h.f., +12 V (approx. 3 to 10 mA)
5 = oscillator supply voltage, v.h.f., +12 V (approx. 6 mA)
6 = mixer supply voltage, v.h.f., +12 V (approx. 5 mA)
7 = test point 1, v.h.f.
8 = i.f. output
9 = test point 2 (alignment short)
10 = oscillator supply voltage, u.h.f., +12 V (approx. 4,1 mA)
11 = test point 3, u.h.f.
12 = r.f. supply voltage, u.h.f., +12 V (approx. 2,5 to 9,5 mA)
13 = a.g.c. voltage, u.h.f., +2,4 to +7,5 V
E = earth

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, using the piercing diagram shown in Fig. 3. (The tuner may also be mounted by means of a snap-in mount or a bracket. Information will be supplied upon request.)
The tuner may be mounted anywhere in the receiver and there are no restrictions on orientation.

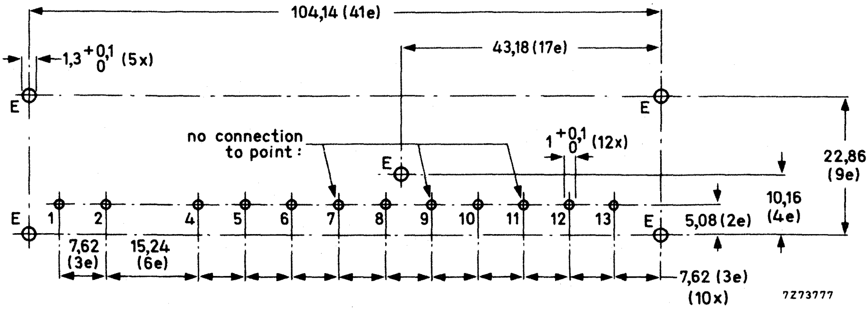


Fig. 3. Piercing diagram viewed from solder side of board; e = 2,54 mm (0,1 in).
No connection must be made to the points 7,9 and 11, otherwise the oscillator radiation may increase.

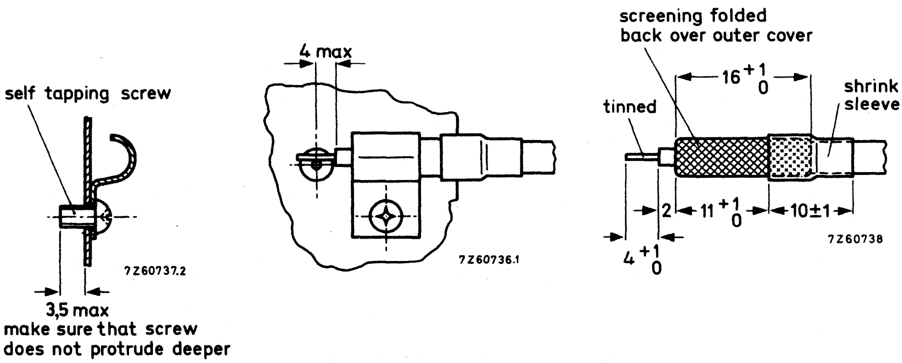


Fig. 4. Recommended fixing method of the aerial cables. Use a self-tapping screw.

ELECTRICAL DATA

Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C and a supply voltage of 12 ± 0,3 V.

Semiconductors	
v.h.f. band, r.f. amplifier	BF200
mixer	BF182
oscillator	BF494
tuning diodes	4 x BB106
switching diode	BA243
u.h.f. band, r.f. amplifier	BF180
mixer/oscillator	BF181
tuning diodes	4 x BB105B
drift compensating diode	BAW62
Ambient temperature range	
operating	+5 to +55 °C
storage	−25 to +85 °C
Supply voltage	+12 V
Current drawn from +12 V supply	
v.h.f. band	14 to 21 mA (depending on a.g.c. voltage)
u.h.f. band	11,5 to 18 mA (depending on a.g.c. voltage)
A.G.C. voltage (Figs. 5 and 6)	
v.h.f. band, at nominal gain	2,4 V
at 40 dB gain reduction	typ. 4,5 V
u.h.f. band, at nominal gain	2,4 V
at 30 dB gain reduction	typ. 5,0 V
A.G.C. current	
v.h.f. band, at 40 dB gain reduction	max. 0,6 mA
u.h.f. band, at 30 dB gain reduction	max. 0,7 mA
Tuning voltage range (Fig. 7 and 8)	+0,5 to +28 V
Current drawn from 28 V tuning voltage supply	max. 36 μA
Frequency ranges	
v.h.f. band	South African channel 4 (picture carrier 175,25 MHz) to channel 13 (picture carrier 247,43 MHz). Margin at the extreme channels: min. 2 MHz.
u.h.f. band	channel 21 (picture carrier 471,25 MHz) to channel 69 (picture carrier 855,25 MHz). Margin at the extreme channels: min. 3 MHz.

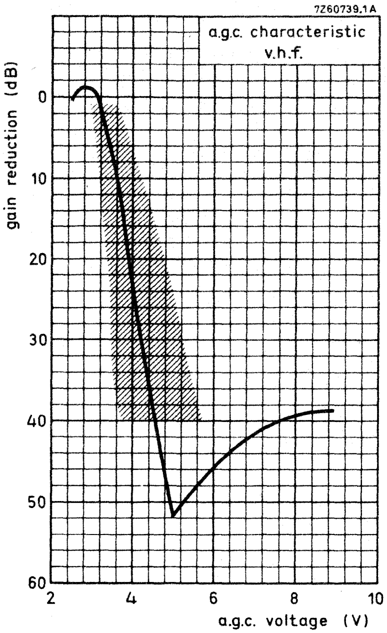


Fig. 5

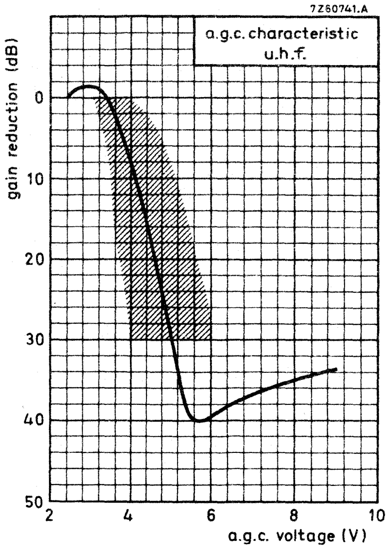


Fig. 6

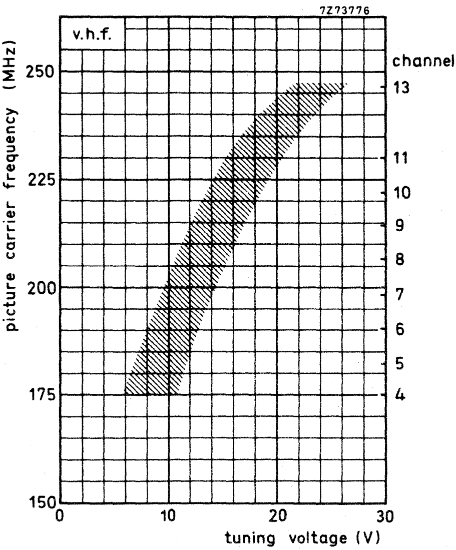


Fig. 7

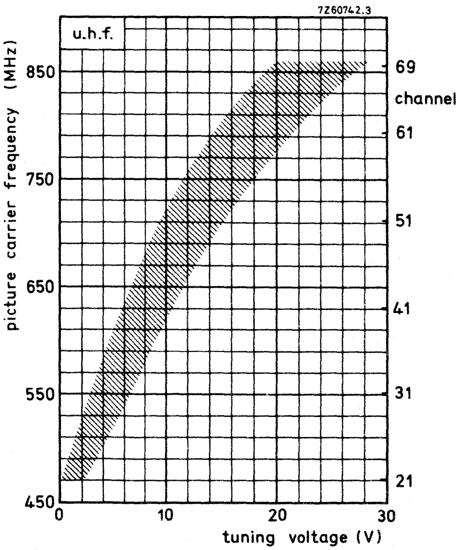


Fig. 8

Intermediate frequencies	
picture	38,9 MHz
sound	32,9 MHz
Input impedance	
asymmetrical	75 Ω
symmetrical	300 Ω (see ACCESSORIES)

V.S.W.R. (between picture carrier and sound carrier)	v.s.w.r. at nom. gain		max. v.s.w.r. during gain control	
	min. 1)	max. 2)	min. 1)	max. 2)
v.h.f. band, channels 4 to 9	max. 3,5	max. 5	max. 4	max. 5
channels 10 to 13	max. 3,5	max. 6	max. 4	max. 6
u.h.f. band		max. 4		max. 5

A.G.C. range	
v.h.f. band	min. 40 dB
u.h.f. band	min. 30 dB
R.F. curves	
bandwidth, v.h.f. band	typ. 8 to 15 MHz
u.h.f. band	typ. 15 to 25 MHz
tilt, v.h.f. band	max. 3 dB
u.h.f. band, channels 21 to 60	max. 3 dB
channels 61 to 69	max. 4 dB
Power gain (see also MEASURING METHOD OF POWER GAIN)	
v.h.f. band	min. 24 dB
channel 4	typ. 28 dB
channel 13	typ. 27 dB
u.h.f. band	min. 25 dB
channel 21	typ. 32 dB
channel 31	typ. 29 dB
channel 69	typ. 33 dB
Noise figure	
v.h.f. band	max. 9 dB
channel 9	typ. 6,5 dB
u.h.f. band	max. 12 dB
channel 21	typ. 8,0 dB
channel 51	typ. 9,5 dB
channel 69	typ. 10,5 dB

1) Best value of V.S.W.R. between picture carrier and sound carrier.
2) Worst value of V.S.W.R. between picture carrier and sound carrier.

I.F. rejection		
v.h.f. band	min. 60 dB	
u.h.f. band	min. 60 dB	
Image rejection		
v.h.f. band	min. 60 dB	
u.h.f. band	min. 40 dB	
Signal handling (see also Figs. 10 and 11)		
Minimum input signal (e.m.f.) producing cross-modulation (1%) at nominal gain, in channel (wanted signal: picture carrier frequency, interfering signal: sound carrier frequency), v.h.f. band	typ. 4 mV	1)
u.h.f. band	typ. 5 to 10 mV	1)
in band (wanted signal: signal carrier frequency of channel N, interfering signal: picture carrier of channel N-2 (v.h.f.), N-5 (u.h.f.) v.h.f. band	typ. 10 to 50 mV	1)
u.h.f. band	typ. 15 to 50 mV	1)
Minimum input signal (e.m.f.) producing overloading, at nominal gain	typ. 10 mV	2)
at maximum a.g.c.	typ. >200 mV	2)
Minimum input signal (e.m.f.) at nominal gain producing a shift of the oscillator frequency of 10 kHz, v.h.f. band	typ. >25 mV	3)
u.h.f. band	typ. 10 to 20 mV	3)
Detuning of the i.f. output circuit as a result of band switching and tuning with respect of channel 7	max. 400 kHz	

1) This e.m.f. (open voltage) is referred to an impedance of 75 Ω.
1% cross-modulation means that 1% of the modulation depth of the interfering signal is transferred to the wanted signal.

2) This e.m.f. (open voltage) is referred to an impedance of 75 Ω.
Criterion of overloading: 30% compression of the synchronization pulses of a standard television signal or a noticeable deterioration of the picture quality.

3) This e.m.f. (open voltage) is referred to an impedance of 75 Ω.

Shift of oscillator frequency

at a change of the supply voltage of 10%

v.h.f. band	max. 300 kHz
u.h.f. band	max. 600 kHz

during warm-up time (measured between 5 s and 15 min after switching on)

v.h.f. band	max. 100 kHz
u.h.f. band	max. 250 kHz

at a gain reduction of 30 dB	max. 100 kHz

Drift of oscillator frequency

at a change of the ambient temperature from 25 to 40 °C

v.h.f. band	max. 400 kHz
u.h.f. band	max. 500 kHz

Oscillator radiation

The tuner is in conformity with the radiation requirements of C.I.S.P.R. Recommendation No. 24/3, provided the following conditions are fulfilled:

- A low-pass filter (Fig. 9) with a cut-off frequency of about 300 MHz has to be inserted between the v.h.f. aerial terminal of the tuner and the aerial terminal of the receiver. Television receivers with a common v.h.f./u.h.f. connector in combination with a low-pass/high-pass splitter [1] may not need this additional filter.

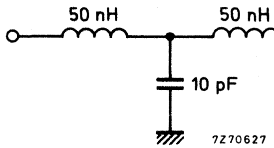


Fig. 9

- No connections must be made to the terminals 7, 9 and 11.
- Earthing of the tuner and connections to the i.f. amplifier have to be made in such a way, that additional radiation is prevented.

Microphonics

If the tuner is installed in a professional manner, there will be no microphonics.

[1] E.g. coaxial aerial input assembly 3122 127 10450.

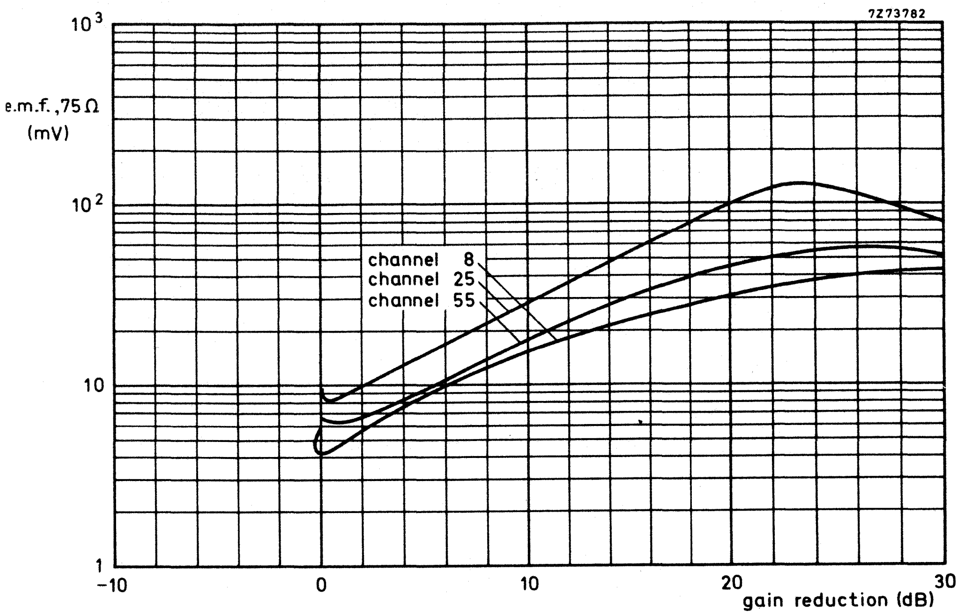


Fig. 10. Cross-modulation, in channel.

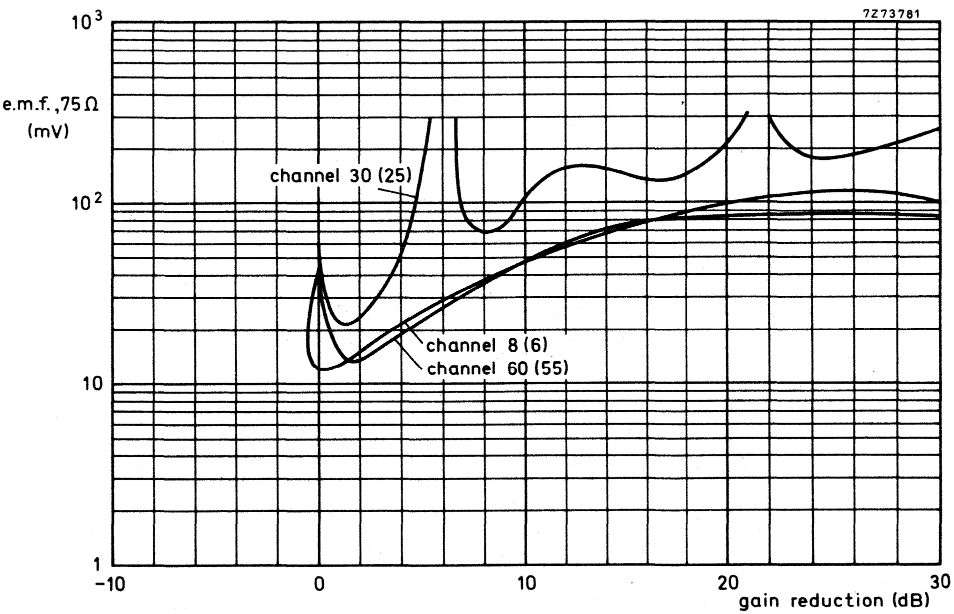


Fig. 11. Cross-modulation, in band; the interfering channels are given between brackets.

APPLICATION INFORMATION

Connection of the tuner

For connection of the tuner the terminal location, Fig. 2, should be consulted.
If the tuner is used in receivers the chassis of which is connected to the mains, isolating capacitors according to the safety rules have to be inserted in the aerial leads.
Three ways of connecting, depending on the number of switches available, are given below.

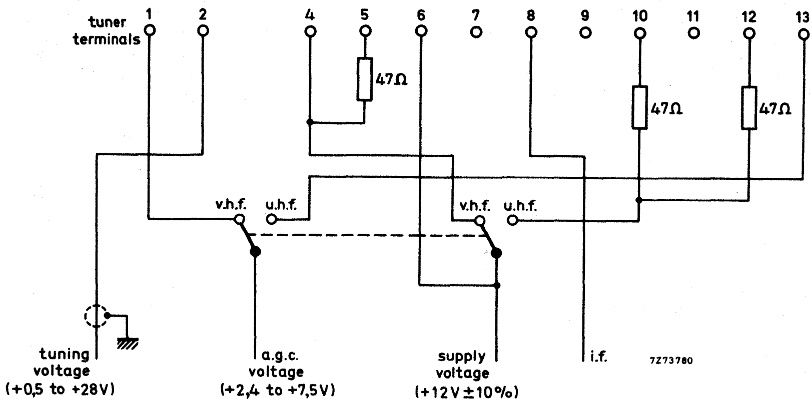


Fig. 12. Connection diagram with two switches.

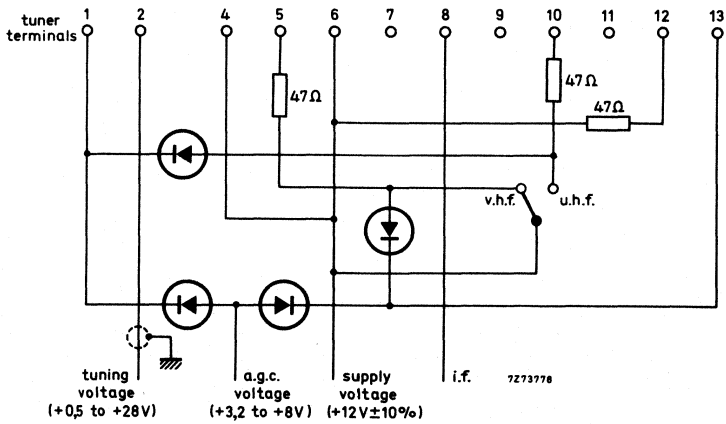


Fig. 13. Connection diagram with one switch.
All diodes : BAX13, BA217 or comparable silicon diodes.

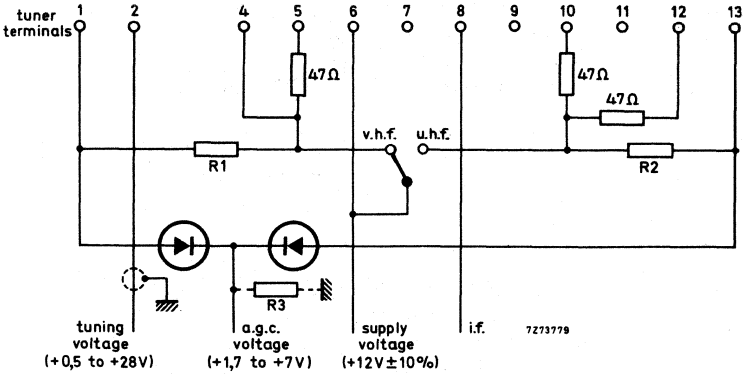


Fig. 14. Connection diagram with one switch.
All diodes : BAX13, BA217 or comparable silicon diodes.
The values of R_1, R_2 and R_3 depend on a.g.c. circuit.

Alignment of the i.f. circuit

The tuner is provided with an i.f. injection point at the collector of the mixer for aligning the i.f. circuit together with the i.f. amplifier of the television receiver (for the position of the i.f. injection point see Fig. 2).
The aligning should be done with the v.h.f. band tuned. The tuning voltage should be 15 to 20 V.

If this injection method cannot be employed in the television receiver (e.g. because the injection point is not accessible or there is not enough i.f. signal available), the i.f. signal can be fed to test point 3 (terminal 11) via a capacitor of 0,82 to 1 pF. The tuner must be switched to the u.h.f. position; the tuning voltage should be approx. 10 V.
This injection method requires approx. 14 dB less signal than the first method.
No permanent connection must be made to test point 3, otherwise the tuner may exceed the oscillator radiation limits.

MEASURING METHOD OF POWER GAIN

The i.f. output of the tuner should be terminated with the circuit given below.
The terminals 7,9 and 11 should be not connected.

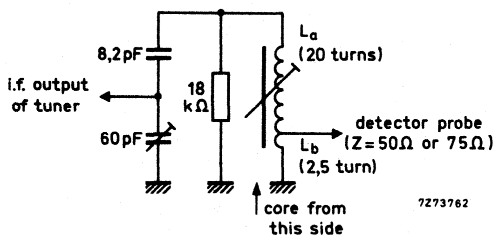


Fig. 15

Switch the tuner to the v.h.f. band; the tuning voltage should be 15 to 20 V.
Feed an i.f. sweep signal (500 to 1000 mV) to the i.f. injection point.
Adjust the trimmer (Fig. 15), tunable coil (L_a/L_b), i.f. output coil of the tuner L519 (Fig. 1) and the coupling between L_a and L_b to get the resonant curve as given below.

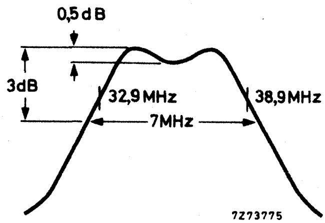


Fig. 16

Then display the r.f. + i.f. curve of the tuner at 190 MHz (picture carrier frequency) and make small corrections in the alignment of the i.f. coils (L_a/L_b and L519), if necessary, to get the markers 38,9 MHz and 32,9 MHz symmetrically on the slopes of the curve, and the peaks at equal amplitude.

Because the output impedance of the dummy circuit is 50 to 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and dummy circuit between a 75 Ω source and a 75 Ω detector (or between a 50 Ω source and matching pad 50/75 Ω and a 50 Ω detector).

ACCESSORIES

Aerial input transformer ELC1094, v.h.f., catalogue number: 2422 542 10941;
aerial input transformer ELC2092, u.h.f., catalogue number: 2422 542 12921;
coaxial aerial input assembly, catalogue number 3122 127 10450.

V.H.F. TELEVISION TUNER

with diode tuning

QUICK REFERENCE DATA

Systems	C.C.I.R. systems M and N (R.T.M.A.)
Channels	A2 to A6 (low v.h.f. band) A7 to A13 (high v.h.f. band)
Intermediate frequencies	
picture	45,75 MHz
sound	41,25 MHz

APPLICATION

Designed to cover the v.h.f. channels of C.C.I.R. systems M and N (R.T.M.A.).
Thanks to its good signal-handling properties, the tuner is especially suited for strong signal areas.

DESCRIPTION

The ELC3082 is a v.h.f. tuner with electronic tuning and band switching, covering the low v.h.f. band (frequency range 54 to 88 MHz) and the high v.h.f. band (frequency range 174 to 216 MHz).

Mechanically, the tuner is built on a low-loss printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear covers (see Fig. 2). The aerial connection is on one of the frame sides, all other connections (supply voltages, a.g.c. voltage, tuning and switching voltages) are made via feed-through capacitors in the under side. The mounting method is shown in Figs 3 and 4.

Electrically, the tuner consists of v.h.f. and i.f. parts. The aerial signal is fed to the input filters, providing i.f. rejection and band selection. The filters are followed by a P-I-N diode attenuator, equipped with two diodes BA379. The output of the attenuator is connected to the emitter of the input transistor BF480, operating as r.f. amplifier in grounded base configuration. The same transistor also delivers the current drive for the P-I-N diode attenuator, controlled by an a.g.c. voltage fed to the transistor base. The combination of the diode attenuator with this high current transistor (I_E at normal gain about 10 mA) has excellent signal-handling properties within the whole a.g.c. range.

The collector load of the input transistor is formed by a double tuned circuit, transferring the signal to the emitter of the mixer transistor BF324. Good signal-handling properties of this stage are achieved by high osillator injection. The oscillator is equipped with a transistor BF324. In the low v.h.f. position, self-detection of the oscillator signal is used to back-bias the five switching diodes BA243/244, required for band switching between low and high v.h.f. channels. Three capacitance diodes BB109 provide tuning of the r.f. circuits. The collector of the mixer transistor is connected to a single tuned i.f. resonant circuit (about 20 MHz bandwidth), the output of which is fed to the i.f. output stage, equipped with another transistor BF324 in grounded base configuration. This stage has also been designed especially for good signal-handling properties. The collector load of the i.f. output transistor is formed by a single tuned i.f. circuit, at the low end of which the i.f. signal is capacitively coupled out of the tuner.

The tuner can be used in combination with a u.h.f. tuner. In this case the u.h.f. i.f. signal is fed to the emitter of the i.f. output transistor, which acts as i.f. amplifier for u.h.f. as well as for v.h.f.

The u.h.f. i.f. input terminal can be used as an i.f. injection point for aligning the i.f. output circuit together with the i.f. amplifier of the television receiver. For the same purpose a separate i.f. injection point has been provided at the collector of the mixer.

The tuner requires transistor supply voltages of +12 V, a switching voltage of +12 V, a.g.c. voltages, variable from +5 V (normal operating point) to about +2,5 V (maximum a.g.c.) and a tuning voltage, variable from +0,5 V to +28 V.

The aerial input of the tuner is asymmetrical. For use in symmetrical aerial systems, aerial transformers (baluns) are available (see ACCESSORY).

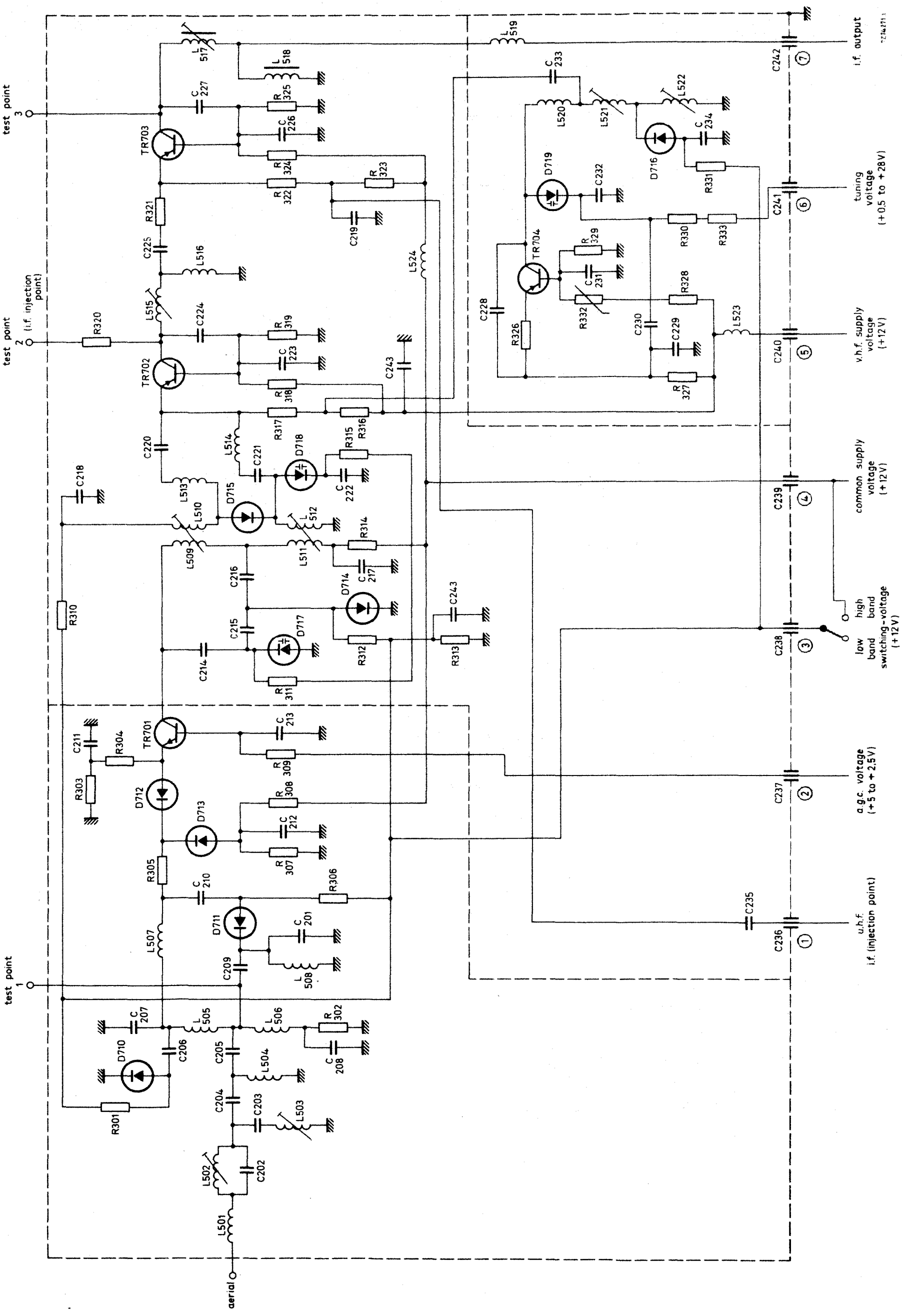

test point 3
test point 2 (i.f. injection point)
test point 1
aerial
i.f. output
tuning voltage (+0.5 to +28V)
v.h.f. supply voltage (+12V)
common supply voltage (+12V)
high band
low band
switching-voltage (+12V)
a.g.c. voltage (+5 to +2.5V)
u.h.f. i.f. (injection point)

Fig. 1.

MECHANICAL DATA

Dimensions in mm

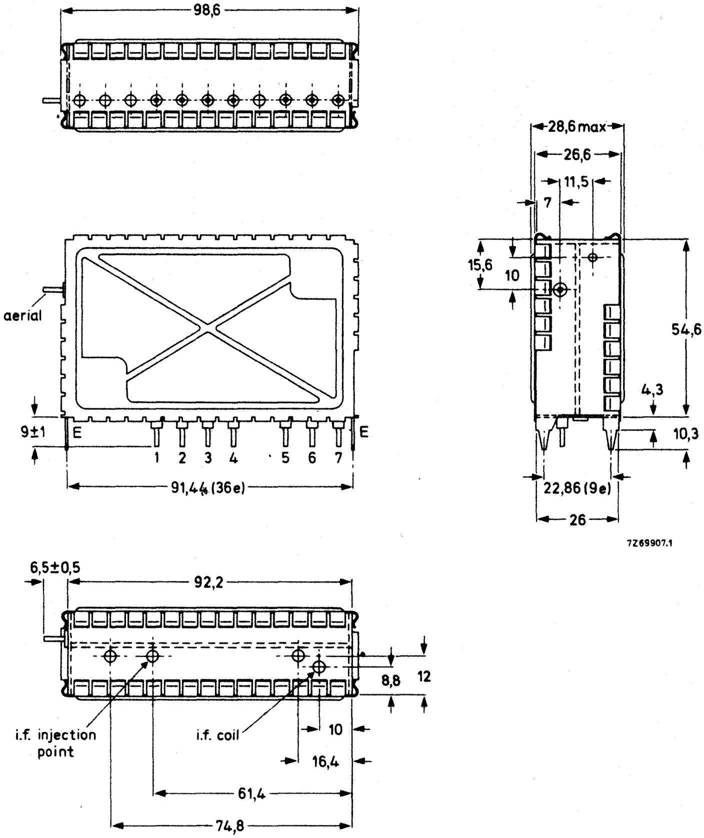


Fig. 2.

Terminal 1 = u.h.f. i.f. input
2 = a.g.c. voltage, +5 to +2,5 V
3 = switching voltage, +12 V
4 = common supply voltage, +12 V
5 = v.h.f. supply voltage, +12 V
6 = tuning voltage, +0,5 to +28 V
7 = i.f. output
E = earth

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, using the piercing diagram shown in Fig. 3. (The tuner may also be mounted by means of a bracket. Information will be supplied upon request.)
The tuner may be mounted anywhere in the receiver and there are no restrictions on orientation.

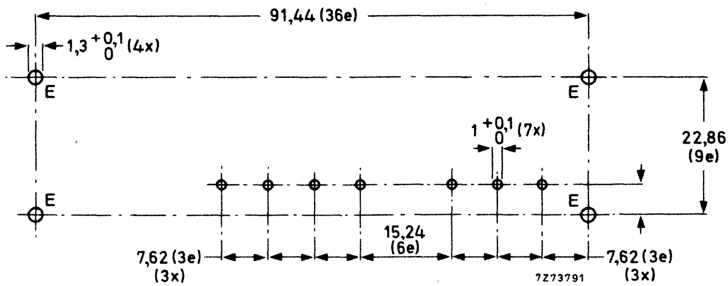


Fig. 3 Piercing diagram viewed from solder side of board: e = 2,54 mm (0,1 in).

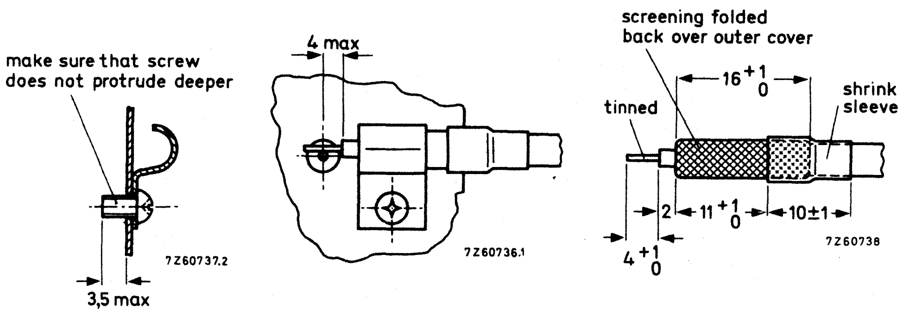


Fig. 4 Recommended fixing method of the aerial cable. Use a self-tapping screw.

ELECTRICAL DATA

Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C and a supply voltage of 12 ± 0,3 V.

Semiconductors	
P-I-N attenuator	2 x BA379
r.f. amplifier	BF480
mixer	BF324
oscillator	BF324
tuning diodes	3 x BB109G
switching diodes	5 x BA243/244
i.f. amplifier	BF324
Ambient temperature range	
operating	+5 to +55 °C
storage	−25 to +85 °C
Supply voltage	+12 V ± 10%
Current drawn from +12 V supply at nominal gain	
low band	46,5 mA ± 10%
high band	63,5 mA ± 10%

Notes — At 40 dB gain reduction the currents decrease about 5 mA.
— The supply voltage at terminal 4 should be carefully filtered to avoid hum modulation in one of the P-I-N diodes when the attenuator is biased to higher attenuation ratios. Under most unfavourable conditions a ripple voltage of 3 mV (p-p) may produce a disturbance which is just visible.

A.G.C. voltage (Figs 5 and 6)	
low band, at nominal gain	+5 ± 0,2 V *
at 40 dB gain reduction	+3,3 V (typical)
high band, at nominal gain	+5 ± 0,2 V *
at 40 dB gain reduction	+3,3 V (typical)
A.G.C. current	
at nominal gain	max. 1 mA
with a.g.c.	max. 1 mA
Tuning voltage range (Figs 7 and 8)	+0,5 to +28 V
Current drawn from 28 V tuning voltage supply	max. 0,5 μA

Note — The source impedance of the tuning voltage, offered to terminal 6, must be max. 100 kΩ at tuning voltages below 5 V.

Switching voltage	
low band	open circuit
high band	+12 V ± 10%

Note — In the low band position the tuner produces a negative voltage (1 to 5 V) at terminal 3; this terminal must not be loaded with an external resistance below 50 MΩ.

* This value may be increased to 5,5 V if a certain deterioration of signal handling is accepted. At voltages above 5,5 V the cross-modulation in band may deteriorate rapidly.

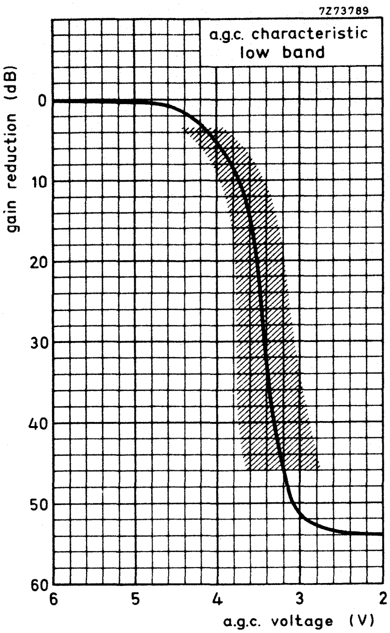


Fig. 5.

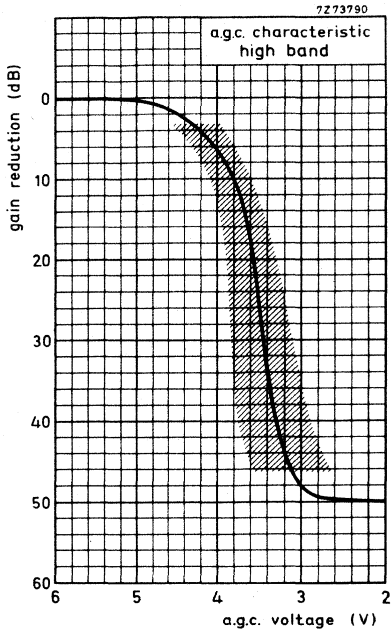


Fig. 6.

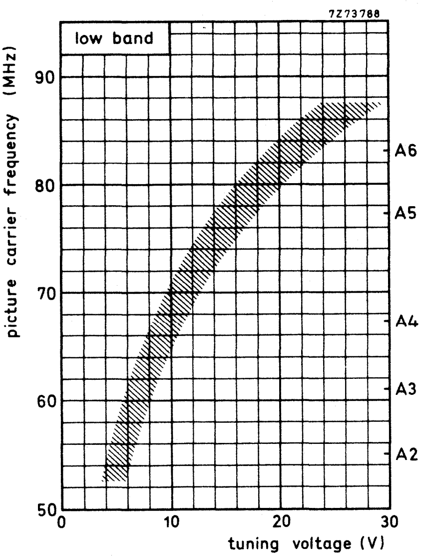


Fig. 7.

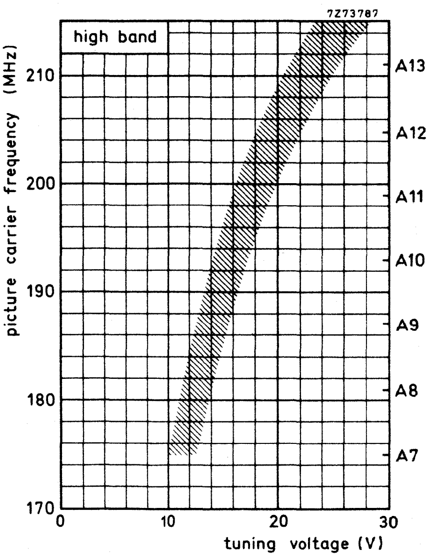


Fig. 8.

Frequency ranges		
low band	channel A2 (picture carrier 55,25 MHz) to channel A6 (picture carrier 83,25 MHz). Margin at the extreme channels: min. 2 MHz.	
high band	channel A7 (picture carrier 175,25 MHz) to channel A13 (picture carrier 211,25 MHz). Margin at the extreme channels: min. 3 MHz.	
Intermediate frequencies		
picture	45,75 MHz	
sound	41,25 MHz	
Input impedance		
asymmetrical	75 Ω	
symmetrical *	300 Ω (see ACCESSORY)	
V.S.W.R. (between picture carrier and sound carrier)	v.s.w.r. at nom. gain	max. v.s.w.r. during gain control
low band	max. 3,5	max. 3,5
high band	max. 4	max. 4
A.G.C. range		
low band	min. 40 dB (typ. 54 dB)	
high band	min. 40 dB (typ. 50 dB)	
R.F. curves		
bandwidth, low band	typ. 7 to 10 MHz	
high band	typ. 8 to 10 MHz	
tilt, low band	max. 3 dB	
high band	max. 3 dB	
Power gain (see also MEASURING METHOD OF POWER GAIN)		
low band	min. 24 dB	
channel A2	typ. 27 dB	
channel A6	typ. 29 dB	
high band	min. 25 dB	
channel A7	typ. 28 dB	
channel A13	typ. 31 dB	
Noise figure		
low band	max. 9,5 dB (typ. 7 dB)	
high band	max. 9,5 dB (typ. 7,5 dB)	
I.F. rejection		
low band, channel A2	min. 54 dB	
channel A3	min. 57 dB	
channels A4 to A6	min. 60 dB	
high band	min. 60 dB	

* With aerial input transformer ELC1094.

Image rejection		
low band	min. 56 dB	
high band	min. 50 dB	
Signal handling		
Minimum input signal (e.m.f.) producing cross-modulation (1%)	max. gain	with a.g.c.
in channel wanted signal: picture carrier frequency, interfering signal: sound carrier frequency	typ. 20 mV	typ. > 500 mV *
in band wanted signal: picture carrier frequency of channel N. interfering signal: picture carrier of channel N ± 2	typ. 100 mV	typ. > 500 mV *
interfering signal: picture carrier of channel ⩾ N ± 3	typ. 250 mV	typ. > 500 mV *
Minimum input signal (e.m.f.) producing overloading,		
at nominal gain	typ. 50 mV **	
at maximum a.g.c.	typ. > 500 mV **	
Minimum input signal (e.m.f.) at nominal gain producing a shift of the oscillator frequency of 10 kHz,		
low band	typ. 50 mV ▲	
high band	typ. 30 mV ▲	
Detuning of the i.f. output circuit as a result of band switching and tuning	max. 150 kHz	
Shift of oscillator frequency at a change of the supply voltage of 5%		
low band	max. 300 kHz	
high band	max. 300 kHz	
during warm-up time (measured between 5 s and 15 min after switching on)		
low band	max. 150 kHz	
high band	max. 150 kHz	

* This e.m.f. (open voltage) is referred to an impedance of 75 Ω.
1% cross-modulation means that 1% of the modulation depth of the interfering signal is transferred to the wanted signal.

** This e.m.f. (open voltage) is referred to an impedance of 75 Ω.
Criterion of overloading: 30% compression of the synchronization pulses of a standard television signal or a noticeable deterioration of the picture quality.

▲ This e.m.f. (open voltage) is referred to an impedance of 75 Ω.

Drift of oscillator frequency
at a change of the ambient temperature from 25 to 50 °C
25 to 50 °C

low band	max. 500 kHz
high band	max. 500 kHz

Oscillator radiation
The tuner is in conformity with the radiation requirements of C.I.S.P.R. Recommendation No. 24/2 and the corresponding F.C.C. rules , provided the tuner is installed in a professional manner.

Microphonics
If the tuner is installed in a professional manner, there will be no microphonics.

→ Surge protection

Protection against voltages	max. 5 kV

Note: Three discharges of a 470 pF capacitor into the aerial terminal.

ALIGNMENT OF THE I.F. CIRCUIT

For i.f. injection the u.h.f. i.f. input (terminal 1) or the i.f. injection point at the collector of the mixer transistor (at the top of the tuner, Fig. 2) can be used.
The aligning can be done with any channel tuned. A probe as shown in Fig. 9 should be used.

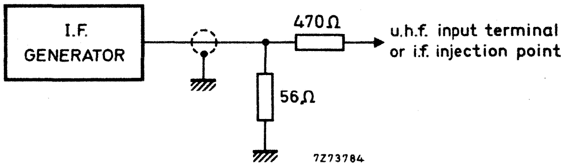


Fig. 9.

The signal attenuation between the i.f. generator and the i.f. output of the tuner is about 4 dB when injection is done via the injection point, and about 8,5 dB in the case of injection via the u.h.f. i.f. input.

The i.f. output circuit is detuned about +300 kHz * or −150 kHz* when injection is done via the injection point or via the u.h.f. i.f. input respectively.

MEASURING METHOD OF POWER GAIN

The i.f. output of the tuner should be terminated with the RC-circuit given in Fig. 10.

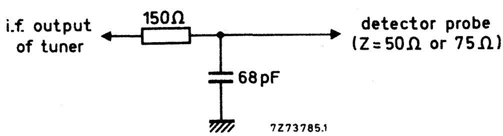


Fig. 10.

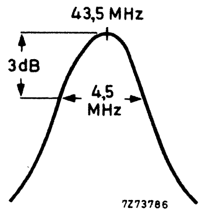


Fig. 11.

The RC-circuit roughly matches the i.f. output impedance to 75 Ω at the resonant frequency of the i.f. output circuit, which should be tuned to 43,5 MHz. The bandwidth should be approx. 4,5 MHz.

Because the input and output impedances of the tuner are now 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and RC-circuit between a 75 Ω source and a 75 Ω detector (or between a 50 Ω source and matching pad 50/75 Ω and a 50 Ω detector).

ACCESSORY

Aerial input transformer ELC1094, v.h.f., catalogue number: 2422 542 10941.

* Reference: normal operation with r.f. signal via aerial input.

U.H.F. TELEVISION TUNERS

QUICK REFERENCE DATA

Systems	C.C.I.R. systems I (United Kingdom), G, H and K	
Channels	E21 to E69	
	systems I and K	systems G and H
Intermediate frequencies		
picture	39,5 MHz	38,9 MHz
sound	33,5 MHz	33,4 MHz

APPLICATION

These tuners are designed to be used in u.h.f. single standard receivers. In combination with v.h.f. tuner V311, V314 or V315 they can also be used in v.h.f./u.h.f. receivers.

The tuners meet the special requirements of the United Kingdom.

The U321LO is a special version of the U321: an output voltage from the local oscillator is made available for driving digital tuning systems. Apart from this the tuners are identical.

DESCRIPTION

The tuners are u.h.f. tuners with electronic tuning, covering the u.h.f. band from 470 to 860 MHz.

Mechanically, the tuner is built on a printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear cover (see Fig. 2). The shielded aerial connection is on one of the frame sides, all other connections (supply voltages, a.g.c., tuning voltage, i.f. injection, i.f. output) are made via terminals on the bottom. The mounting method is shown in Figs 3 and 4.

Tuner U321LO has a coaxial socket on the top of the frame for coupling out the oscillator sample.

Electrically, the tuner consists of an input circuit with a high-pass characteristic, followed by a p-i-n diode attenuator (2 diodes BA379) and the input transistor BF480 in grounded-base configuration. This transistor operates at an emitter current of about 5 to 8 mA, featuring good noise figures and good signal handling properties. The a.g.c. current for driving the p-i-n diode attenuator is directly controlled by the a.g.c. system of the receiver.

The collector load of the input transistor is formed by a double tuned circuit, transferring the signal to the mixer diode BA280. The selectivity of this circuit at the image frequency has been improved. The mixer diode BA280 is driven by an oscillator, equipped with a transistor BF480. At the U321LO the oscillator sample is coupled out of the mixer via a small capacitor in series with a resistor.

The i.f. signal, originated in the mixer, is amplified by a transistor BF324 in grounded-base configuration. The combination of the Schottky-barrier diode BA280 and the i.f. transistor BF324 also features good noise figures and good signal handling properties. Three capacitance diodes BB205B tune the double tuned circuit and the oscillator.

The i.f. output circuit of the tuner is a single tuned one, at the low end of which the i.f. signal is coupled out of the tuner. A d.c. path to earth for the collector current of the i.f. transistor BF324 has to be provided outside the tuner, preferably by a choke of about 5 μH. Damping of the i.f. output circuit and matching of the i.f. output to the i.f. circuit of the receiver can be achieved by connecting a series resistor and a parallel capacitor outside the tuner.

An i.f. injection point has been provided at the collector of the i.f. transistor, connected to terminal 7.

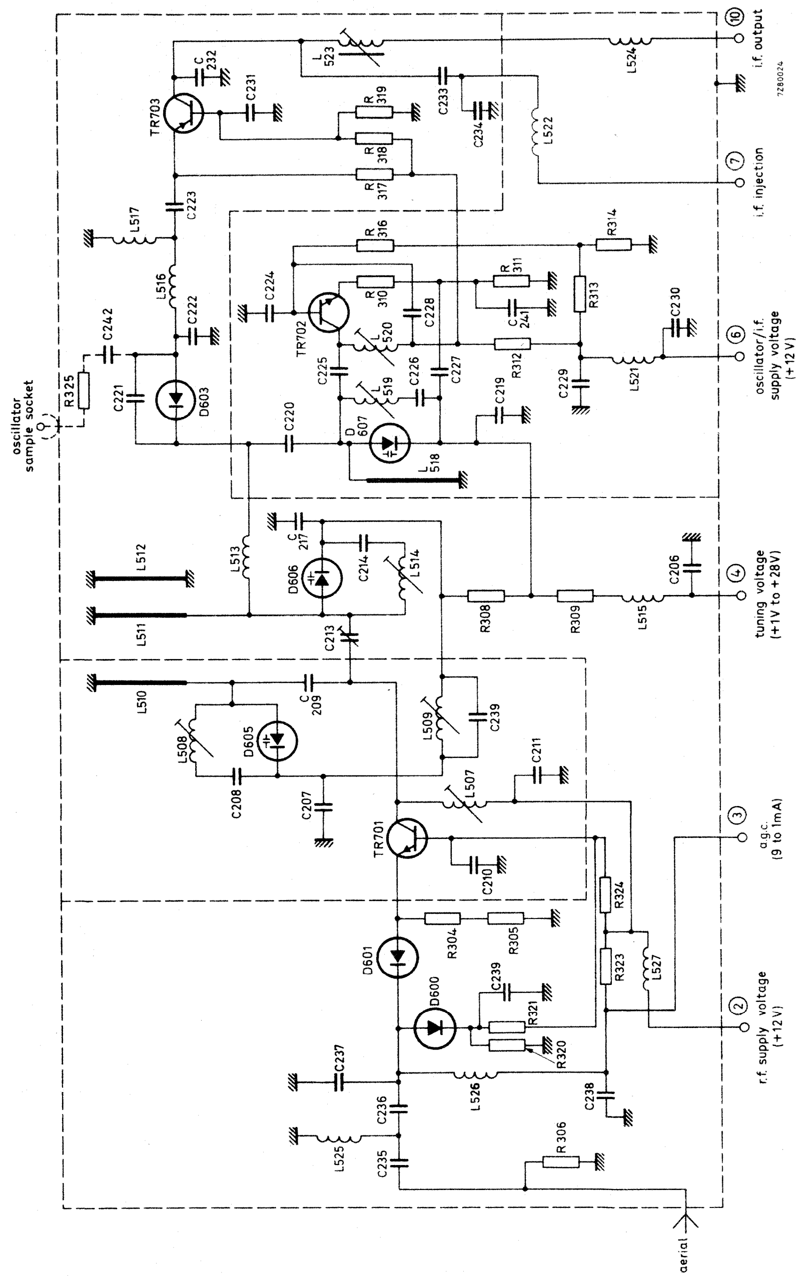

i.f. output
i.f. injection
oscillator/i.f. supply voltage (+12 V)
tuning voltage (+1V to +28V)
a.g.c. (9 to 1mA)
r.f. supply voltage (+12 V)
aerial
oscillator sample socket
7Z80024

Fig. 1.

MECHANICAL DATA

Dimensions in mm

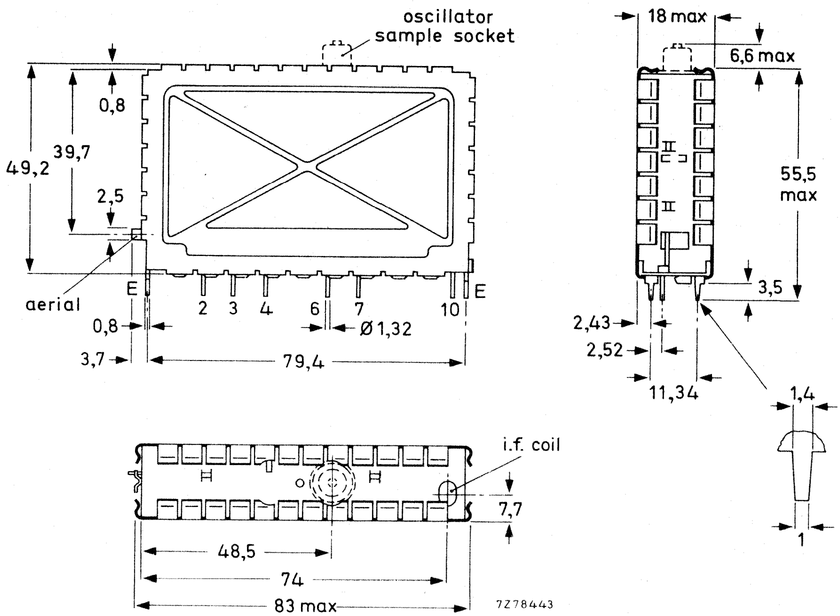


Fig. 2a The oscillator sample socket, drawn with dotted lines, applies only to tuner U321LO.

Terminal

2 = r.f. supply voltage, +12 V
3 = a.g.c. current, −9 to −1 mA
4 = tuning voltage, +1 to +28 V
6 = oscillator/i.f. supply voltage, +12 V
7 = i.f. injection point
10 = i.f. output

Note: When the tuner is operated together with a v.h.f. tuner, only the supply voltage at terminal 6 should be switched off during v.h.f. operation.

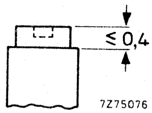


Fig. 2b I.F. output coil.
Torque for alignment: 2 to 15 mNm
Press-through force: ≥ 10 N

Mass approx. 75 g

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, using the piercing diagram shown in Fig. 3. (The tuner may also be mounted by means of a socket. Information will be supplied upon request.)

It is recommended that the tuner be installed in the cool part of the receiver cabinet and not exposed to the vibrations of the loudspeaker. There are no restrictions on orientation.

The solderability of the terminals and mounting tabs is according to IEC68-2, test Ta (230 ± 10 °C, 2 ± 0,5 s). The resistance to soldering heat is according to IEC68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

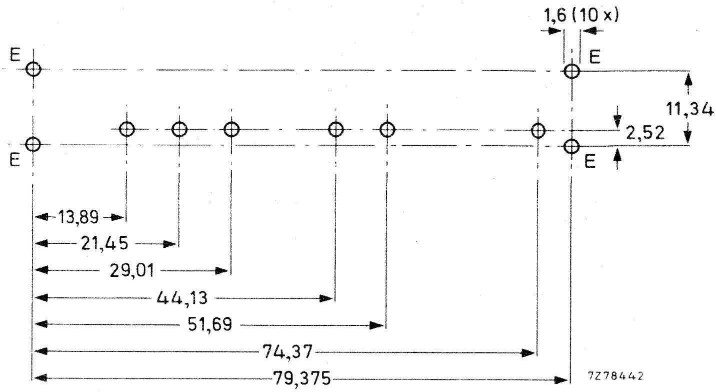


Fig. 3 Piercing diagram viewed from solder side of board.

For connection to the socket on the top of tuner U322LO a coaxial plug has to be used; type 3/2-50 (manufacturer: Daut und Rietz) is recommended.

The aerial cable should be connected as follows:

- strip the cable according to Fig. 4B;
- fix the cable as indicated in Fig. 4C and solder the inner conductor on the aerial tag;
- insert lugs on immunity shield under the tabs on tuner body, push the shield into position so that the locating tags snap into place in the tuner body.

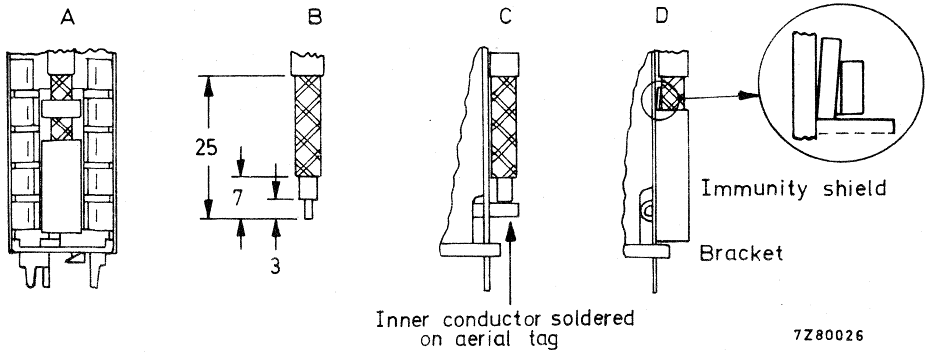


Fig. 4 Fixing of the aerial cable.
Recommended cable: DAVU wire CX4004 (outer sheath diameter 5,32 mm).

ELECTRICAL DATA

The electrical values are measured on the u.h.f. tuner alone, but they are also valid for the u.h.f. tuner in combination with a v.h.f. tuner V311, V314 or V315. Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C, a relative humidity of 60 ± 15%, a supply voltage of 12 ± 0,3 V and an a.g.c. current of −9 ± 0,2 mA.

Within the given tolerance range of supply voltage and a.g.c. current only insignificant deviations from the specified values can be expected. Under the extreme conditions of temperature and humidity as given below, the tuner will function normally, but some specified limits may be exceeded.

General

Semiconductors	
p-i-n diode	2 x BA379
r.f. amplifier	BF480
mixer	BA280
oscillator	BF480
tuning diodes	3 x BB205B
i.f. amplifier	BF324
Ambient temperature range	
operating	+5 to +55 °C
storage	−25 to +85 °C
Relative humidity	max. 90%

Voltages and currents

Supply voltage	+12 V ± 10%

Note: The supply voltage at terminal 2 (input stage) should be filtered to avoid hum modulation in one of the p-i-n diodes when the attenuator is biased to higher attenuation ratios.

Current drawn from +12 V supply			
r.f. amplifier, at nominal gain	typ.	16	mA
r.f. amplifier, at 26 dB gain reduction	typ.	13	mA
oscillator/i.f. amplifier	max.	16	mA
A.G.C. current (Fig. 5)			
at nominal gain		−9 ± 0,5	mA
at 26 dB gain reduction	typ.	−5,6	mA
Tuning voltage range (Fig. 6)		+1 to +28	V
Current drawn from +28 V tuning voltage supply	max.	0,5	μA
Slope of tuning characteristic	min.	5	MHz/V

Note: The source impedance of the tuning voltage offered to terminal 4 must be maximum 47 kΩ at tuning voltages below 3 V.

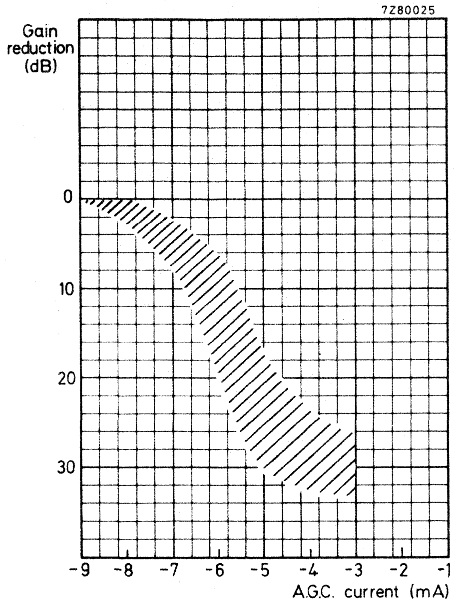


Fig. 5.

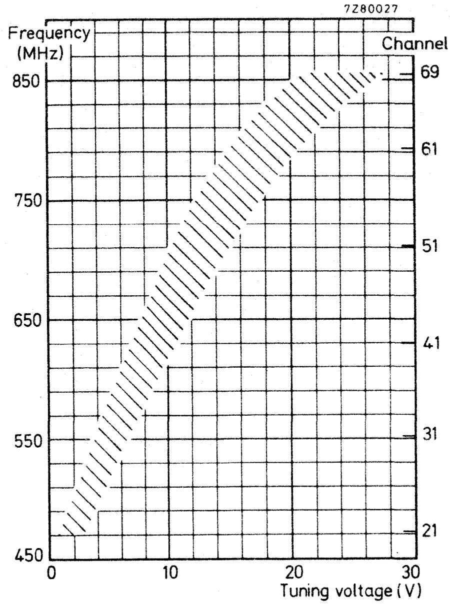


Fig. 6.

Oscillator sample voltage; **only valid for U321LO** at +12 V supply voltage and T_{amb} = +25 °C	typ.	33 mV
within the given tolerance range of supply voltage and given operating temperature range, and within the tuning voltage range +0,5 to +28 V	min.	13 mV
	max.	100 mV

Note: A tuning voltage higher than +28 V will not be harmful for the tuner and may be applied at the user's own risk. Under this condition the published reverse voltage limit of the oscillator tuning diode will be exceeded; the oscillator frequency will never decrease with increasing tuning voltage.

Frequencies

Frequency range: channel E21 (picture carrier 471,25 MHz) to channel E69 (picture carrier 855, 25 MHz). Margin at the extreme channels: min. 3 MHz.

Intermediate frequencies	systems I, K	systems G, H
picture	39,5 MHz	38,9 MHz
sound	33,5 MHz	33,4 MHz

The oscillator frequency is higher than the aerial signal frequency.

Note: The tuner is aligned in such a way that the i.f. frequencies of the four systems can be applied.

Wanted signal characteristics

Input impedance	
asymmetrical	75 Ω
Output impedance at the oscillator sample socket; **only valid for U321LO**	
asymmetrical	75 Ω
V.S.W.R. and reflection coefficient at picture carrier frequency, at nominal gain	
v.s.w.r.	max. 5
reflection coefficient	max. 66%
V.S.W.R. and reflection coefficient at oscillator sample socket; **only valid for U321LO**	
v.s.w.r at $f_{osc} < 600$ MHz	max. 4 (typ. 3)
v.s.w.r at $f_{osc} > 600$ MHz	max. 3 (typ. 2)
reflection coefficient at $f_{osc} < 600$ MHz	max. 60% (typ. 50%)
reflection coefficient at $f_{osc} > 600$ MHz	max. 50% (typ. 33%)
R.F. curves, bandwidth	typ. 18 MHz
R.F. curves, tilt (only for i.f. 39,5/33,5 MHz)	on any channel the amplitude difference between the top of the r.f. resonant curve and the picture carrier marker, the sound carrier marker, or any frequency between them will not exceed 3 dB at nominal gain, and 4 dB in the a.g.c. range between nominal gain and 20 dB gain reduction.
A.G.C. range (Fig. 5)	min. 26 dB (typ. 31 dB)
Power gain (see also Measuring method of power gain)	min. 18 dB
channel E21	typ. 23 dB
channel E40	typ. 22 dB
channel E69	typ. 24 dB
Gain difference between any two channels	typ. 3 dB
Noise figure	max. 10 dB
channel E21	typ. 6,5 dB
channel E40	typ. 7,5 dB
channel E69	typ. 8 dB
Overloading	
Input signal producing 1 dB gain compression at nominal gain	typ. 88 dB (μV) into 75 Ω
Input signal producing either a detuning of the oscillator of +300 kHz or −1000 kHz or stopping of the oscillations at nominal gain	typ. 100 dB (μV) into 75 Ω

Unwanted signal characteristics

Image rejection (measured at picture carrier frequency)	
channels E21 to E60	min. 53 dB
I.F. rejection (measured at picture carrier and colour sub-carrier frequency)	min. 60 dB
Harmonic content of oscillator sample; **only valid for U321LO**	
Suppression of harmonics which fall into the frequency range below 1000 MHz (second harmonics of fundamentals below 500 MHz)	min. 15 dB (typ. 20 dB) below oscillator fundamental
R.F. rejection at oscillator sample socket; **only valid for U321LO**	
Signal voltage at oscillator sample socket (input signals of wanted frequency 70 dB (μV) into 75 Ω; tuner operating at nominal gain)	min. 17 dB (typ. 24 to 34 dB) below oscillator fundamental
I.F. rejection at oscillator sample socket; **only valid for U321LO**	
I.F. signals at oscillator sample socket (converted from input signals of wanted frequency 70 dB (μV) into 75 Ω; tuner operating at nominal gain)	min. 20 dB (typ. 35 dB) below oscillator fundamental
N ± 4 rejection	
Interference signal for an interference ratio of 53 dB referred to wanted picture carrier (picture to sound carrier ratio of 7 dB; wanted signal 60 dB (μV); tuner operating at nominal gain)	typ. 80 dB (μV) into 75 Ω

Cross modulation
Input signal producing 1% cross modulation, i.e. 1% of the modulation depth of the interfering signal is transferred to the wanted signal.

In channel cross modulation (wanted signal: picture carrier frequency; interfering signal: sound carrier frequency)

at nominal gain (wanted input level 60 dB (μV))	typ. 84 dB (μV) into 75 Ω
at 26 dB gain reduction (wanted input level 86 dB (μV))	typ. 100 dB (μV) into 75 Ω

In band cross modulation (wanted signal: picture carrier channel N; interfering signal: picture carrier of channel N ± 5)

at nominal gain (wanted input level 60 dB (μV))	typ. 90 dB (μV) into 75 Ω
at 26 dB gain reduction (wanted input level 86 dB (μV))	typ. 100 dB (μV) into 75 Ω

Out of band cross modulation, at nominal gain

v.h.f. I	min. 108 dB (μV) into 75 Ω
v.h.f. III	min. 94 dB (μV) into 75 Ω

Oscillator characteristics

Pulling Input signal of tuned frequency producing a shift of the oscillator frequency of 10 kHz, at nominal gain	typ.	84 dB (μV) into 75 Ω
Shift of oscillator frequency at a change of the supply voltage of 5%	max.	500 kHz
Drift of oscillator frequency during warm-up time (after the tuner has been completely out of operation for 15 min, measured between 5 s and 15 min after switching on)	max.	250 kHz
during warm-up time (after the input stage is in operation for 15 min, measured between 2 s and 15 min after switching on the oscillator/i.f. stage)	max.	250 kHz
at a change of the ambient temperature from +25 to +50 °C (measured after 3 cycles from +25 to +55 °C)	max.	1000 kHz

I.F. circuit characteristics

Bandwidth of i.f. output circuit	5 MHz ± 500 kHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 7; tuning voltage 15 V.

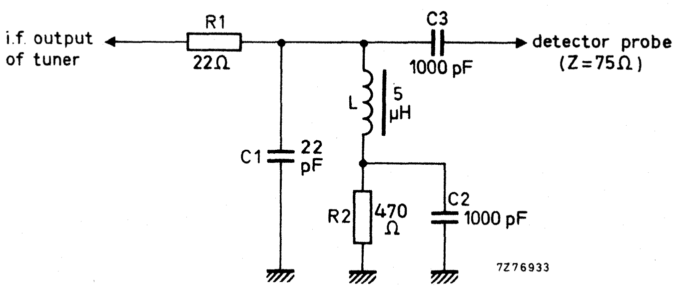


Fig. 7.

Bandwidth variation of i.f. output circuit as a result of r.f. tuning	max.	350 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 7, i.e. a 100 pF capacitor is connected in parallel with C1 and R1 is short-circuited; tuning voltage 15 V.

Detuning of the i.f. output circuit as a result of r.f. tuning	max.	350 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 7, i.e. a 100 pF capacitor is connected in parallel with C1 and R1 is short-circuited; tuning voltage 15 V.

Minimum tuning range of i.f. output coil	33 to 40 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 6; tuning voltage 15 V.

Attenuation between i.f. injection point and i.f. output of the tuner	typ.	23 dB

Miscellaneous

Radio interference

Oscillator radiation and oscillator voltage at the aerial terminal	Within the limits of C.I.S.P.R. 13 (1975) and VDE 0872/7.72.* For the oscillator radiation use is made of the relaxed limit of 3 mV/m (70 dBμV/m).
Microphonics	There will be no microphonics, provided the tuner is installed in a professional manner.

Surge protection

Protection against voltages	max.	8 kV

Note: Three discharges of a 470 pF capacitor into the aerial terminal.

Protection against flashes	max.	30 kV, 400 mWs

Note: A flashover circuit producing flashes with frequencies of 1 to 20 Hz for 30 s is connected to the aerial terminal.

* For U321LO: when the oscillator sample socket is either open or terminated with a shielded resistor of 75 Ω.

ADDITIONAL INFORMATION

I.F. injection

The tuner is provided with an i.f. injection point at the collector of the i.f. transistor (coupled via a capacitor to terminal 7). The i.f. generator can be connected directly to this point (Fig. 8).
The tuner needs normal supply voltages and a tuning voltage of 15 V; the i.f. output should be loaded with the circuit shown in Fig. 7.

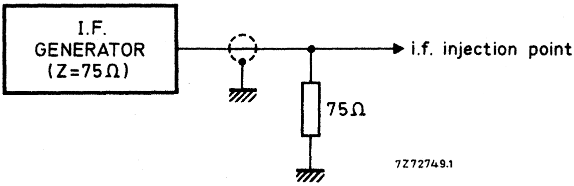


Fig. 8.

Connection of the i.f. amplifier

The tuner needs a d.c. path from the i.f. output terminal (10) to earth, preferably via a choke of approx. 5 μH outside the tuner (Fig. 9). Where the tuner is used in combination with a v.h.f. tuner, this choke can be common for both tuners; a resistor in series with the choke can make ineffective the i.f. output circuit of the switched-off tuner. For damping the i.f. output circuit and matching the i.f. output impedance of the tuner to the i.f. amplifier, a series resistor and a parallel capacitor as shown in Fig. 9 should be used.

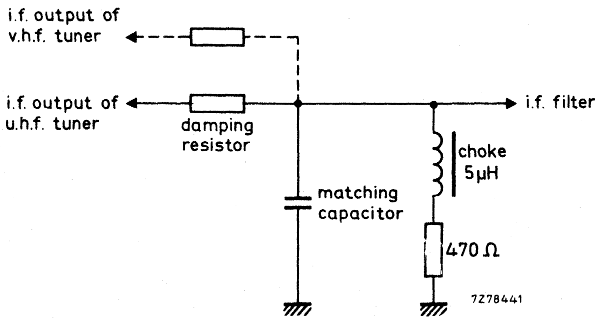


Fig. 9.

Measuring method of power gain

The i.f. output of the tuner should be terminated with the RC-circuit given in Fig. 7.

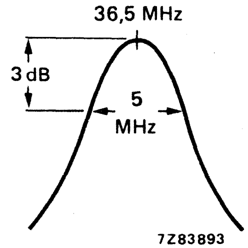


Fig. 10.

The RC-circuit roughly matches the i.f. output impedance to 75 Ω at the resonant frequency of the i.f. output circuit, which should be tuned to 36,5 MHz; the bandwidth should be approx. 5 MHz (Fig. 10).

Because the input and output impedances of the tuner are now 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and RC-circuit between a 75 Ω source and a 75 Ω detector.

Alignment of the i.f. output coil

The i.f. output coil should be adjusted with a brass tool with a blade as shown in Fig. 11. A suitable tool is available under catalogue number 7122 005 47680.

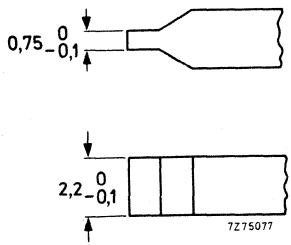


Fig. 11.

ACCESSORIES

Connector assembly for use of tuner U321 or U321LO in combination with v.h.f. tuner V311, V314 or V315: connector, catalogue number 3112 200 20720;
washer, catalogue number 3112 221 01220;
clamp, catalogue number 3112 274 13220.

U.H.F. TELEVISION TUNERS

QUICK REFERENCE DATA

Systems	C.C.I.R. systems G, H, I and K	
Channels	E21 to E69	
Intermediate frequencies	systems G and H	systems I and K
picture	38,9 MHz	39,5 MHz
sound	33,4 MHz	33,5 MHz

APPLICATION

These tuners are designed to cover the u.h.f. channels E21 to E69 of C.C.I.R. systems G, H, I and K.

In combination with a suitable v.h.f. tuner, e.g. V311, V314 or V315 they can be used in v.h.f./u.h.f. receivers. The aerial inputs and i.f. outputs of both tuners can then be connected in parallel without additional circuitry.

The U322LO is a special version of the U322: an output voltage from the local oscillator is made available for driving digital tuning systems. Apart from this the tuners are identical.

DESCRIPTION

The tuners are u.h.f. tuners with electronic tuning, covering the u.h.f. band from 470 to 860 MHz.

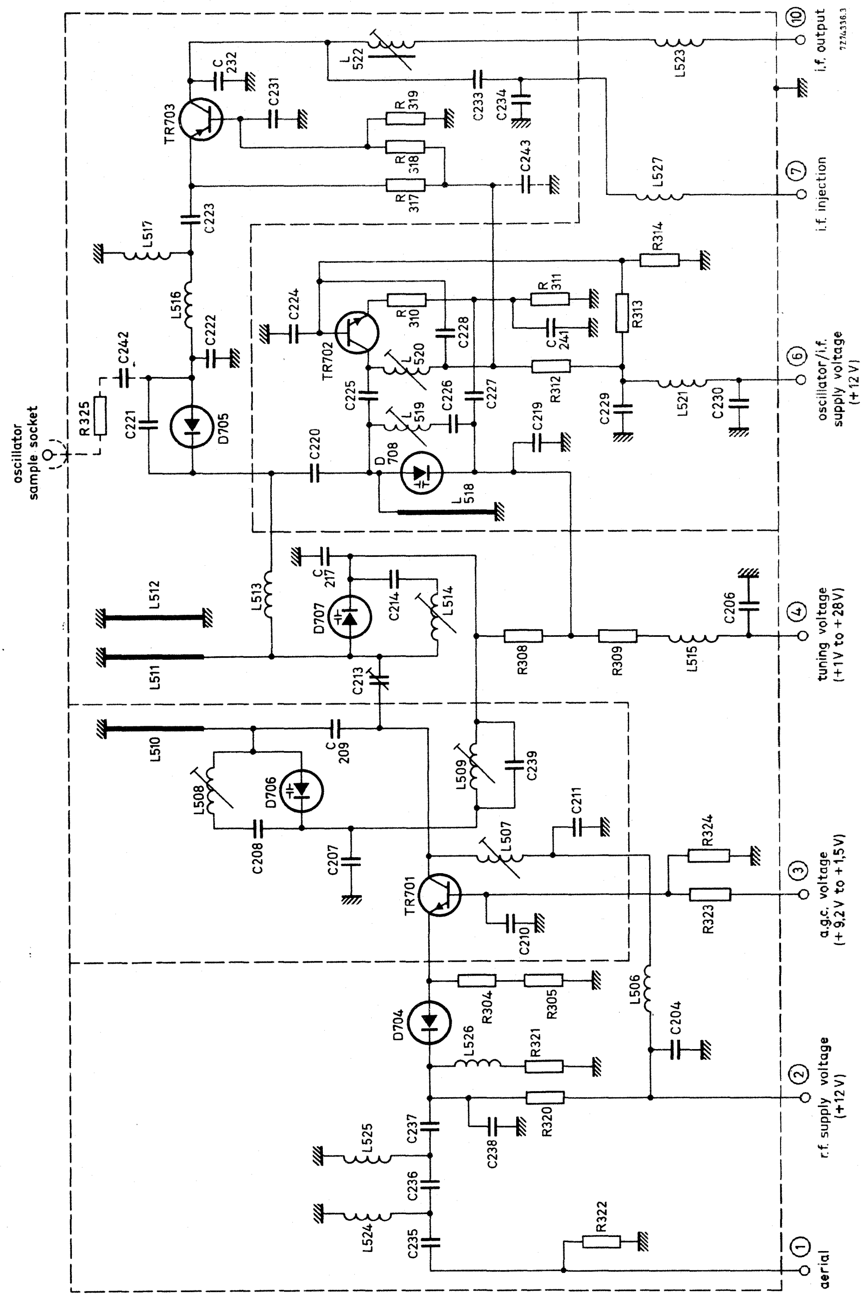
Mechanically, the tuners are built on a printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear cover (see Fig. 2a). All connections (aerial, supply voltages, a.g.c. voltage, tuning voltage, i.f. injection, i.f. output) are made via terminals on the underside. The mounting method is shown in Fig. 3. Tuner U322LO has a coaxial socket on the top of the frame for coupling out the oscillator sample.

Electrically, the tuner consists of an input circuit with a high-pass characteristic, followed by a P-I-N diode attenuator (1 diode BA379) and the input transistor BF480 in grounded-base configuration. This transistor operates at an emitter current of about 8 to 10 mA, featuring good noise figures and good signal handling properties. It also supplies the current drive for the P-I-N diode attenuator, controlled by an a.g.c. voltage fed to the transistor's base. This combination has good signal handling properties throughout the a.g.c. range. The collector load of the input transistor is formed by a double tuned circuit, transferring the signal to the mixer diode BA280 (or MBD102). The selectivity of this circuit at the image frequency has been improved by special means. The mixer diode BA280 (or MBD102) is driven by an oscillator, equipped with a transistor BF480. At the U322LO the oscillator sample is coupled out of the mixer via a small capacitor in series with a resistor.

The i.f. signal, originated in the mixer, is amplified by a transistor BF324 in grounded-base configuration. The combination of the Schottky-barrier diode BA280 (or MBD102) and the i.f. transistor BF324 also features good noise figures and good signal handling properties. Three capacitance diodes BB105B tune the double tuned circuit and the oscillator.

The i.f. output circuit of the tuner is a single tuned one, at the low end of which the i.f. signal is coupled out of the tuner. A d.c. path to earth for the collector current of the i.f. transistor BF324 has to be provided outside the tuner, preferably by a choke of about 5 μH. Damping of the i.f. output circuit and matching of the i.f. output to the i.f. circuit of the receiver can be achieved by connecting a series resistance and a parallel capacitance outside the tuner.

An i.f. injection point has been provided at the collector of the i.f. transistor, connected to terminal 7.


oscillator sample socket
i.f. output
i.f. injection
oscillator/i.f. supply voltage (+12 V)
tuning voltage (+1 V to +28 V)
a.g.c. voltage (+9,2 V to +1,5 V)
r.f. supply voltage (+12 V)
aerial
TR701
TR702
TR703
D704
D705
D706
D707
D708
L506
L507
L508
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C239
C241
C242
C243
R304
R305
R308
R309
R310
R311
R312
R313
R314
R317
R318
R319
R320
R321
R322
R323
R324
R325
7Z74336.3

Fig. 1.

MECHANICAL DATA

Dimensions in mm

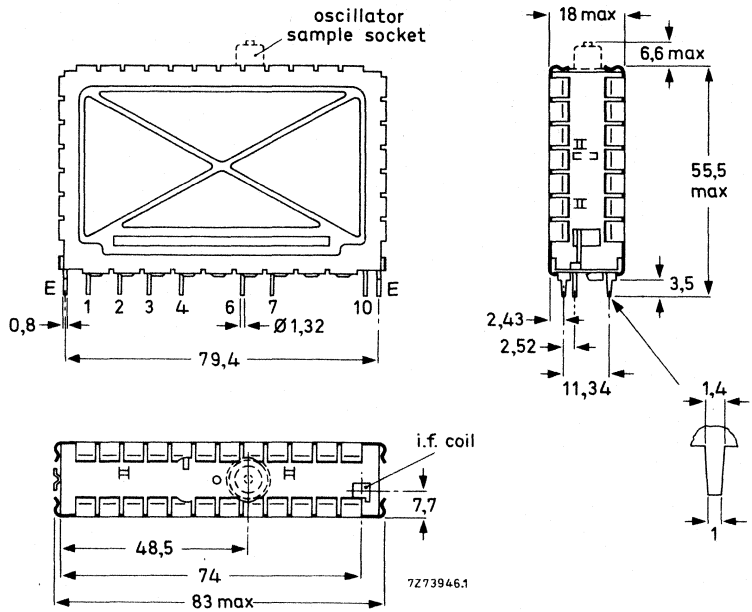


Fig. 2a The oscillator sample socket, drawn with dotted lines, applies only to tuner U322LO.

Terminal 1 = aerial
2 = r.f. supply voltage, + 12 V
3 = a.g.c. voltage, + 9,2 to + 1,5 V
4 = tuning voltage, + 1 to + 28 V
6 = oscillator/i.f. supply voltage, + 12 V
7 = i.f. injection point
10 = i.f. output

Note: When the tuner is operated together with a v.h.f. tuner, only the supply voltage at terminal 6 should be switched off during v.h.f. operation.

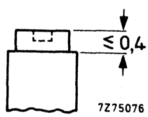


Fig. 2b I.F. output coil.
Torque for alignment : 2 to 15 mNm
Press-through force : ⩾ 10 N

Mass approx. 75 g

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, using the **piercing** diagram shown in Fig. 3. (The tuner may also be mounted by means of a socket. Information will be supplied upon request.)

It is recommended that the tuner be installed in the cool part of the receiver cabinet and not exposed to the vibrations of the loudspeaker. There are no restrictions on orientation.

The solderability of the terminals and mounting tabs is according to IEC 68-2, test Ta (230 ± 10 °C, 2 ± 0,5 s). The resistance to soldering heat is according to IEC 68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

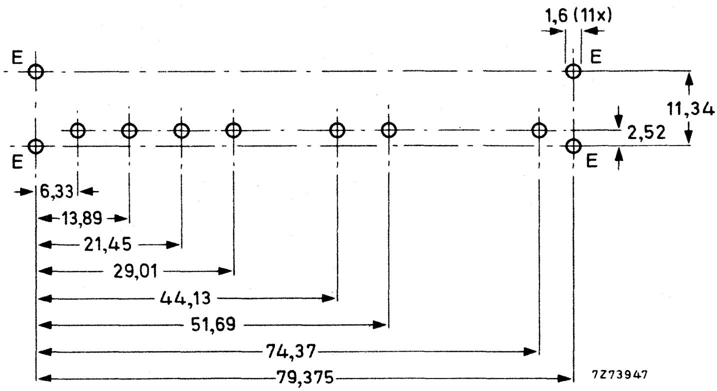


Fig. 3 Piercing diagram viewed from solder side of board.

For connection to the socket on the top of tuner U322LO a coaxial plug has to be used; type 3/2-50 (manufacturer: Daut und Rietz) is recommended.

ELECTRICAL DATA

The electrical values are measured on the u.h.f. tuner alone, but they are also valid for the u.h.f. tuner in combination with a v.h.f. tuner V311, V314 or V315. Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C, a relative humidity of 60 ± 15%, a supply voltage of 12 ± 0,3 V and an a.g.c. voltage of 9,2 ± 0,2 V.

Within the given tolerance range of supply voltage and a.g.c. voltage only insignificant deviations from the specified values can be expected. Under the extreme conditions of temperature and humidity as given below, the tuner will function normally, but some specified limits may be exceeded.

General

Semiconductors	
P-I-N diode	BA379
r.f. amplifier	BF480
mixer	BA280 (or MBD102)
oscillator	BF480
tuning diodes	3 x BB105B
i.f. amplifier	BF324
Ambient temperature range	
operating	+ 5 to + 55 °C
storage	−25 to + 85 °C
Relative humidity	max. 90%

Voltages and currents

Supply voltage	+ 12 V ± 10%

Note: The supply voltage at terminal 2 (input stage) should be filtered to avoid hum modulation in the P-I-N diode when the attenuator is biased to higher attenuation ratios.

Current drawn from + 12 V supply		
r.f. amplifier, at nominal gain	typ.	13 mA
r.f. amplifier, at 30 dB gain reduction	typ.	4,5 mA
oscillator/i.f. amplifier	max.	16 mA
A.G.C. voltage (Fig. 4), at nominal gain		+ 9,2 ± 0,5 V
A.G.C. voltage, at 30 dB gain reduction	min.	+ 1,5 V

Note: A.G.C. voltages between 0 and + 10 V may be applied without risk of damage.

A.G.C. current (Fig. 4)		
during gain control (0 to 30 dB)	max.	+ 1 mA
at nominal gain	typ.	+ 0,76 to + 0,97 mA
at 30 dB gain reduction	typ.	+ 0,20 mA

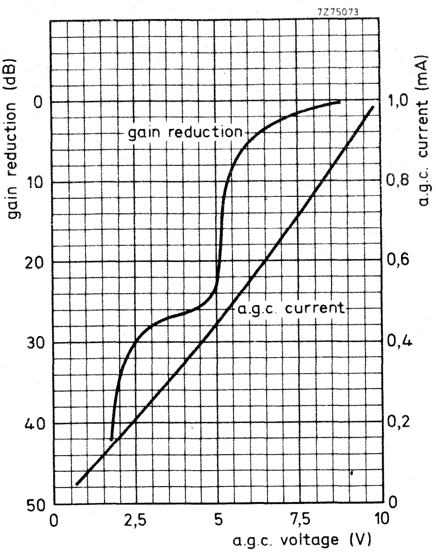


Fig. 4.

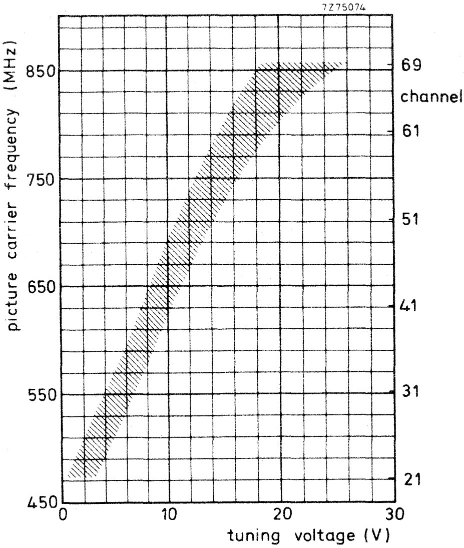


Fig. 5.

Tuning voltage range (Fig. 5)	+ 1 to + 28 V
Current drawn from + 28 V tuning voltage supply	
at 25 °C	max. 0,25 μA
at 55 °C	max. 1 μA
Slope of tuning characteristic	min. 4 MHz/V

Note: The source impedance of the tuning voltage offered to terminal 4 must be maximum 47 kΩ at tuning voltages below 3 V.

Oscillator sample signal; **only valid for U322LO**

at + 12 V supply voltage and T_{amb} = + 25 °C	typ. 90 dB (μV) into 75 Ω
within the given tolerance range of supply voltage and given operating temperature range, and within the tuning voltage range + 0,5 to + 30 V	min. 80 dB (μV) into 75 Ω max. 100 dB (μV) into 75 Ω

Note: A tuning voltage higher than + 28 V will not be harmful for the tuner and may be applied at the user's own risk. Under this condition the published reverse voltage limit of the oscillator tuning diode will be exceeded; the oscillator frequency will never decrease with increasing tuning voltage.

Frequencies

Frequency range	channel E21 (picture carrier 471, 25 MHz) to channel E69 (picture carrier 855, 25 MHz). Margin at the extreme channels: min. 3 MHz.	
Intermediate frequencies	systems G, H	systems I, K
picture	38,9 MHz	39,5 MHz
sound	33,4 MHz	33,5 MHz

The oscillator frequency is higher than the aerial signal frequency.

Note: The tuner is aligned in such a way that the i.f. frequencies of the four systems can be applied.

Wanted signal characteristics

Input impedance
- asymmetrical: 75 Ω

Output impedance at the oscillator sample socket; **only valid for U322LO**
- asymmetrical: 75 Ω

V.S.W.R. and reflection coefficient at picture carrier frequency, at nominal gain
- v.s.w.r.: max. 5
- reflection coefficient: max. 66%

V.S.W.R. and reflection coefficient at oscillator sample socket; **only valid for U322LO**

v.s.w.r. at $f_{osc} < 600$ MHz	max. 4	(typ. 3)
v.s.w.r. at $f_{osc} > 600$ MHz	max. 3	(typ. 2)
reflection coefficient at $f_{osc} < 600$ MHz	max. 60%	(typ. 50%)
reflection coefficient at $f_{osc} > 600$ MHz	max. 50%	(typ. 33%)

R.F. curves, bandwidth: typ. 18 MHz

R.F. curves, tilt (only for i.f. 38,9/33,4 MHz): on any channel the amplitude difference between the top of the r.f. resonant curve and the picture carrier marker, the sound carrier marker, or any frequency between them will not exceed 3 dB at nominal gain, and 4 dB in the a.g.c. range between nominal gain and 20 dB gain reduction.

A.G.C. range: min. 30 dB

Power gain (see also Measuring method of power gain)	min. 19 dB
channel E21	typ. 24 dB
channel E40	typ. 22 dB
channel E69	typ. 25 dB
Gain difference between any two channels	typ. 4 dB
Noise figure	max. 10 dB
channel E21	typ. 7 dB
channel E40	typ. 7,5 dB
channel E69	typ. 8 dB
Overloading	
Input signal producing 1 dB gain compression at nominal gain	typ. 90 dB (μV) into 75 Ω
Input signal producing either a detuning of the oscillator of + 300 kHz or −1000 kHz or stopping of the oscillations at nominal gain	typ. 100 dB (μV) into 75 Ω

Unwanted signal characteristics

Image rejection (measured at picture carrier frequency)	
channels E21 to E60	min. 46 dB; typ. 53 dB
Harmonic content of oscillator sample; **only valid for U322LO**	
Suppression of harmonics which fall into the frequency range below 1200 MHz (second harmonics of fundamentals below 600 MHz)	min. 15 dB (typ. 20 dB) below oscillator fundamental
R.F. rejection at oscillator sample socket; **only valid for U322LO**	
Signal voltage at oscillator sample socket (input signals of wanted frequency 70 dB (μV) into 75 Ω; tuner operating at nominal gain)	min. 17 dB (typ. 24 to 34 dB) below oscillator fundamental
I.F. rejection (measured at picture carrier and colour sub-carrier frequency)	min. 60 dB
I.F. rejection at oscillator sample socket; **only valid for U322LO**	
I.F. signals at oscillator sample socket (converted from input signals of wanted frequency 70 dB (μV) into 75 Ω; tuner operating at nominal gain)	min. 20 dB (typ. 35 dB) below oscillator fundamental

N ± 4 rejection
Interference signal for an interference ratio of 53 dB referred to wanted picture carrier (picture to sound carrier ratio of 10 dB; wanted signal 60 dB (μV); tuner operating at nominal gain) — max. 92 dB (μV) into 75 Ω

Cross modulation
Input signal producing 1% cross modulation, i.e. 1% of the modulation depth of the interfering signal is transferred to the wanted signal.

In channel cross modulation (wanted signal: picture carrier frequency; interfering signal: sound carrier frequency)

at nominal gain (wanted input level 60 dB (μV))	typ. 80 dB (μV) into 75 Ω
at 26 dB gain reduction (wanted input level 86 dB (μV)	typ. 100 dB (μV) into 75 Ω

In band cross modulation (wanted signal: picture carrier of channel N; interfering signal: picture carrier of channel N ± 5)

at nominal gain (wanted input level 60 dB (μV))	typ. 92 dB (μV) into 75 Ω
at 26 dB gain reduction (wanted input level 86 dB (μV))	typ. 100 dB (μV) into 75 Ω

Out of band cross modulation, at nominal gain

v.h.f. I	min. 108 dB (μV) into 75 Ω
v.h.f. III	min. 108 dB (μV) into 75 Ω

Oscillator characteristics

Pulling
Input signal of tuned frequency producing a shift of the oscillator frequency of 10 kHz, at nominal gain — typ. 84 dB (μV) into 75 Ω

Shift of oscillator frequency
at a change of the supply voltage of 5% — max. 500 kHz

Drift of oscillator frequency	
during warm-up time (after the tuner has been completely out of operation for 15 min, measured between 5 s and 15 min after switching on)	max. 250 kHz
during warm-up time (after the input stage is in operation for 15 min, measured between 2 s and 15 min after switching on the oscillator/i.f. stage)	max. 250 kHz
at a change of the ambient temperature from + 25 to + 40 °C (measured after 3 cycles from + 25 to + 55 °C)	
470 to 790 MHz	max. 500 kHz
790 to 860 MHz	max. 650 kHz

I.F. circuit characteristics

Bandwidth of i.f. output circuit	5 ± 1 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 6; tuning voltage 15 V.

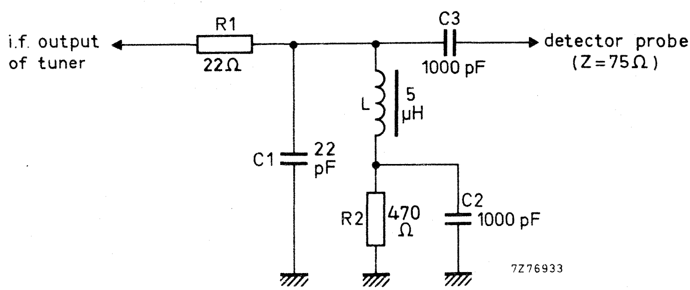


Fig. 6.

Bandwidth variation of i.f. output circuit as a result of r.f. tuning	max. 500 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 6, i.e. a 100 pF capacitor is connected in parallel with C1 and R1 is short-circuited; tuning voltage 15 V.

Detuning of the i.f. output circuit as a result of r.f. tuning	max. 500 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 6, i.e. a 100 pF capacitor is connected in parallel with C1 and R1 is short-circuited; tuning voltage 15 V.

Minimum tuning range of i.f. output coil	33 to 40 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 6; tuning voltage 15 V.

Attenuation between i.f. injection point and i.f. output of the tuner	typ. 23 dB

Miscellaneous

Radio interference Oscillator radiation and oscillator voltage at the aerial terminal	Within the limits of C.I.S.P.R. 13 (1975) and VDE 0872/7.72.* For the oscillator radiation use is made of the relaxed limit of 3 mV/m (70 dBμV/m).
Microphonics	There will be no microphonics, provided the tuner is installed in a professional manner.
Surge protection Protection against voltages	max. 8 kV

Note: Three discharges of a 470 pF capacitor into the aerial terminal.

Protection against flashes	max. 30 kV, 400 mWs

Note: A flashover circuit producing flashes with frequencies of 1 to 20 Hz for 30 s is connected to the aerial terminal.

* For U322LO: when the oscillator sample socket is either open or terminated with a shielded resistor of 75 Ω.

ADDITIONAL INFORMATION

I.F. injection

The tuner is provided with an i.f. injection point at the collector of the i.f. transistor (coupled via a capacitor to terminal 7). The i.f. generator can be connected directly to this point (Fig. 7).
The tuner needs normal supply voltages and a tuning voltage of 15 V; the i.f. output should be loaded with the circuit shown in Fig. 6.

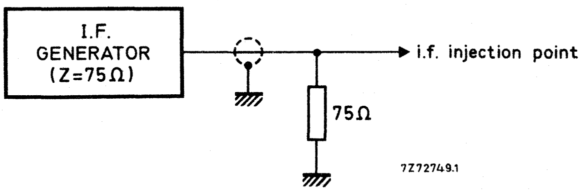


Fig. 7.

Connection of the i.f. amplifier

The tuner needs a d.c. path from the i.f. output terminal (10) to earth, preferably via a choke of approx. 5 μH outside the tuner (Fig. 8). Where the tuner is used in combination with a v.h.f. tuner, this choke can be common for both tuners; a resistor in series with the choke can make ineffective the i.f. output circuit of the switched-off tuner. For damping the i.f. output circuit and matching the i.f. output impedance of the tuner to the i.f. amplifier, a series resistor and a parallel capacitor as shown in Fig. 8 should be used.

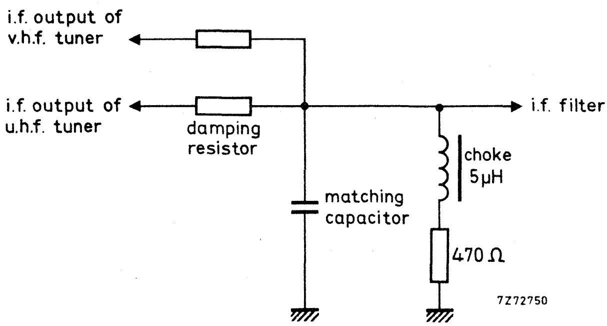


Fig. 8.

Measuring method of power gain

The i.f. output of the tuner should be terminated with the RC-circuit given in Fig. 6.

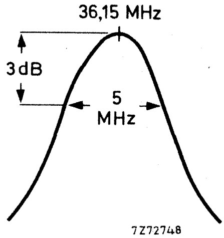


Fig. 9.

The RC-circuit roughly matches the i.f. output impedance to 75 Ω at the resonant frequency of the i.f. output circuit, which should be tuned to 36,15 MHz; the bandwidth should be approx. 5 MHz (Fig. 9).

Because the input and output impedances of the tuner are now 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and RC-circuit between a 75 Ω source and a 75 Ω detector.

Alignment of the i.f. output coil

The i.f. output coil should be adjusted with a brass tool with a blade as shown in Fig. 10. A suitable tool is available under catalogue number 7122 005 47680.

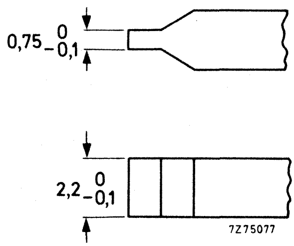


Fig. 10.

ACCESSORIES

Connector assembly for use of tuner U322 or U322LO in combination with v.h.f. tuner V311 (or VD1), V314 or V315: connector, catalogue number 3112 200 20720;
washer, catalogue number 3112 221 01220;
clamp, catalogue number 3112 274 13220.

U.H.F. TELEVISION TUNER

QUICK REFERENCE DATA

System	C.C.I.R. system M (R.T.M.A.)
Channels	A14 to A78
Intermediate frequencies	
picture	45,75 MHz
sound	41,25 MHz

APPLICATION

This tuner is designed to cover the u.h.f. channels A14 to A78 of C.C.I.R. system M (R.T.M.A.).
In combination with a suitable v.h.f. tuner, e.g. ELC3082 it can be used in v.h.f./u.h.f. receivers. Small adaptations in the receiver may be necessary, depending on the receiver type.

DESCRIPTION

The U323 is a u.h.f. tuner with electronic tuning, covering the u.h.f. band from 470 to 860 MHz.

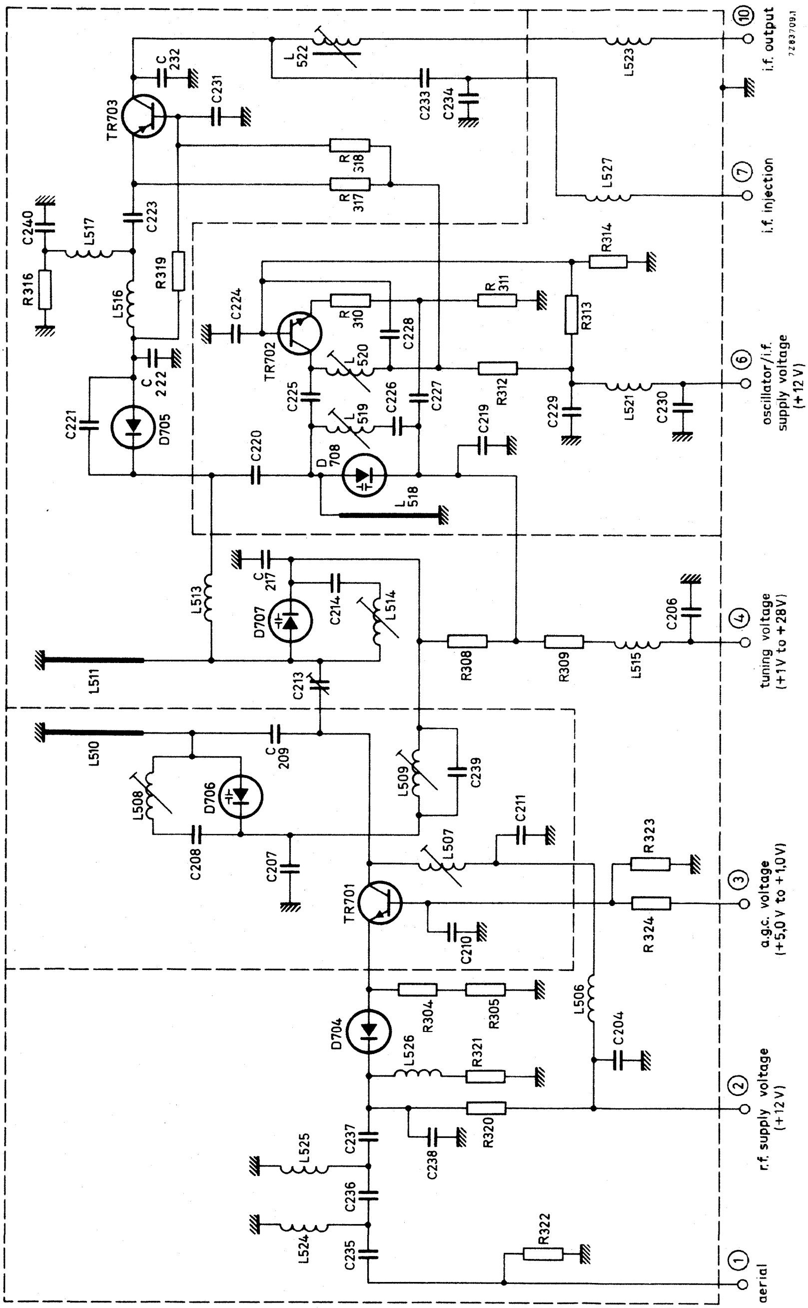
Mechanically, the tuner is built on a printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear cover (see Fig. 2a). All connections (aerial, supply voltages, a.g.c. voltage, tuning voltage, i.f. injection, i.f. output) are made via terminals on the underside. The mounting method is shown in Fig. 3.

Electrically, the tuner consists of an input circuit with a high-pass characteristic, followed by a P-I-N diode attenuator (1 diode BA379) and the input transistor BF480 in grounded-base configuration. This transistor operates at an emitter current of about 8 to 10 mA, featuring good noise figures and good signal handling properties. It also supplies the current drive for the P-I-N diode attenuator, controlled by an a.g.c. voltage fed to the transistor's base. This combination has good signal handling properties throughout the a.g.c. range. The collector load of the input transistor is formed by a double tuned circuit, transferring the signal to the mixer diode BA280 (or MBD102). The selectivity of this circuit at the image frequency has been improved by special means. The mixer diode is driven by an oscillator, equipped with a transistor BF480.

The i.f. signal, originated in the mixer, is amplified by a transistor BF324 in grounded-base configuration. The combination of the Schottky-barrier diode BA280 (or MBD102) and the i.f. transistor BF324 also features good noise figures and good signal handling proprties. Three capacitance diodes BB105B tune the double tuned circuit and the oscillator.

The i.f. output circuit of the tuner is a single tuned one, at the low end of which the i.f. signal is coupled out of the tuner. A d.c. path to earth for the collector current of the i.f. transistor BF324 has to be provided outside the tuner, preferably by a choke of about 5 μH. Damping of the i.f. output circuit and matching of the i.f. output to the i.f. circuit of the receiver can be achieved by connecting a series resistance and a parallel capacitance outside the tuner.

An i.f. injection point has been provided at the collector of the i.f. transistor, connected to terminal 7.


i.f. output
i.f. injection
oscillator/i.f. supply voltage (+12 V)
tuning voltage (+1V to +28V)
a.g.c. voltage (+5,0 V to +1,0V)
r.f. supply voltage (+12 V)
aerial
7Z83709.1
TR701
TR702
TR703
D704
D705
D706
D707
D708
L506
L507
L508
L509
L510
L511
L513
L514
L515
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C208
C209
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C211
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C217
C219
C220
C221
C222
C223
C224
C225
C226
C227
C228
C229
C230
C231
C232
C233
C234
C235
C236
C237
C238
C239
C240

Fig. 1.

MECHANICAL DATA

Dimensions in mm

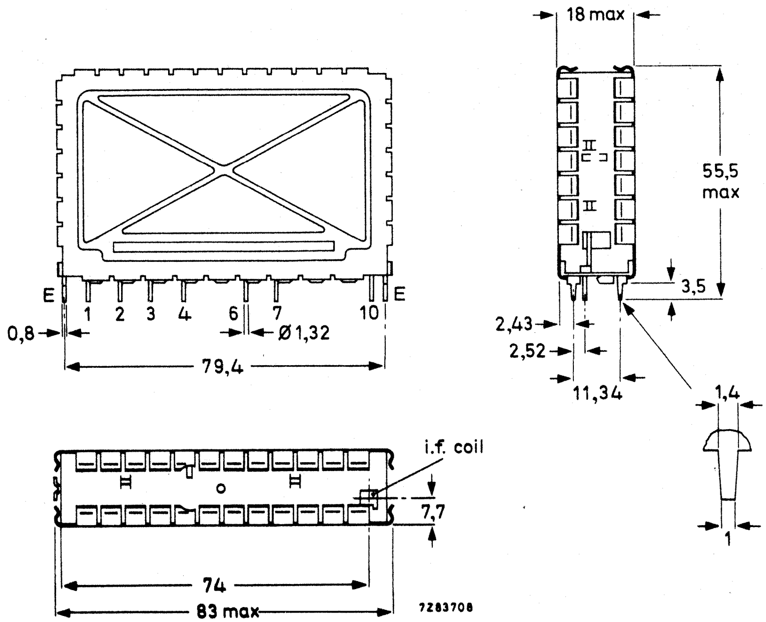


Fig. 2a Terminal 1 = aerial
2 = r.f. supply voltage, + 12 V
3 = a.g.c. voltage, + 5,0 to + 1,0 V
4 = tuning voltage, + 1 to + 28 V
6 = oscillator/i.f. supply voltage, + 12 V
7 = i.f. injection point
10 = i.f. output

Note: When the tuner is operated together with a v.h.f. tuner, only the supply voltage at terminal 6 should be switched off during v.h.f. operation.

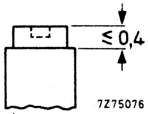


Fig. 2b I.F. output coil.
Torque for alignment: 2 to 15 mNm
Press-through force: ≥ 10 N

Mass approx. 75 g

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, using the piercing diagram shown in Fig. 3. (The tuner may also be mounted by means of a socket. Information will be supplied upon request.)

It is recommended that the tuner be installed in the cool part of the receiver cabinet and not exposed to the vibrations of the loudspeaker. There are no restrictions on orientation.

The solderability of the terminals and mounting tabs is according to IEC 68-2, test Ta (230 ± 10 °C, 2 ± 0,5 s). The resistance to soldering heat is according to IEC 68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

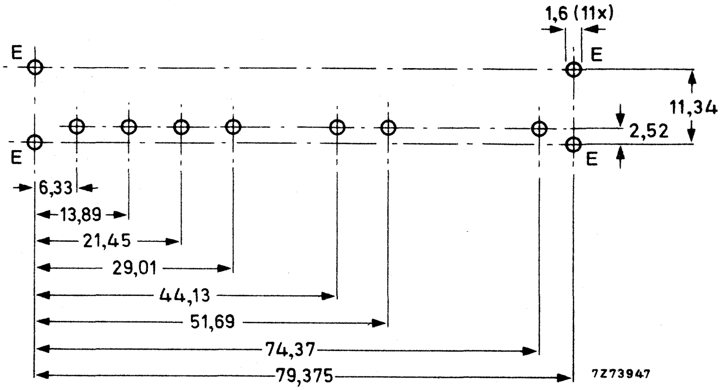


Fig. 3 Piercing diagram viewed from solder side of board.

ELECTRICAL DATA

Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C, a relative humidity of 60 ± 15%, a supply voltage of 12 ± 0,3 V and an a.g.c. voltage of 5,0 ± 0,2 V.

Within the given tolerance range of supply voltage and a.g.c. voltage only insignificant deviations from the specified values can be expected. Under the extreme conditions of temperature and humidity as given below, the tuner will function normally, but some specified limits may be exceeded.

General

Semiconductors	
P-I-N diode	BA379
r.f. amplifier	BF480
mixer	BA280 (or MBD102)
oscillator	BF480
tuning diodes	3 x BB105B
i.f. amplifier	BF324
Ambient temperature range	
operating	+ 5 to + 55 °C
storage	−25 to + 85 °C
Relative humidity	max. 95%

Voltages and currents

Supply voltage	+ 12 V ± 10%

Note: The supply voltage at terminal 2 (input stage) should be filtered to avoid hum modulation in the P-I-N diode when the attenuator is biased to higher attenuation ratios.

Current drawn from + 12 V supply	
r.f. amplifier, at nominal gain	typ. 13 mA
r.f. amplifier, at 30 dB gain reduction	typ. 4,5 mA
oscillator/i.f. amplifier	max. 16 mA
A.G.C. voltage (Fig. 4), at nominal gain	+ 5,0 ± 0,2 V
A.G.C. voltage, at 30 dB gain reduction	min. + 0,8 V
A.G.C. current (Fig. 4)	
during gain control (0 to 30 dB)	max. + 1 mA
at nominal gain	typ. + 0,85 mA
at 30 dB gain reduction	typ. + 0,2 mA

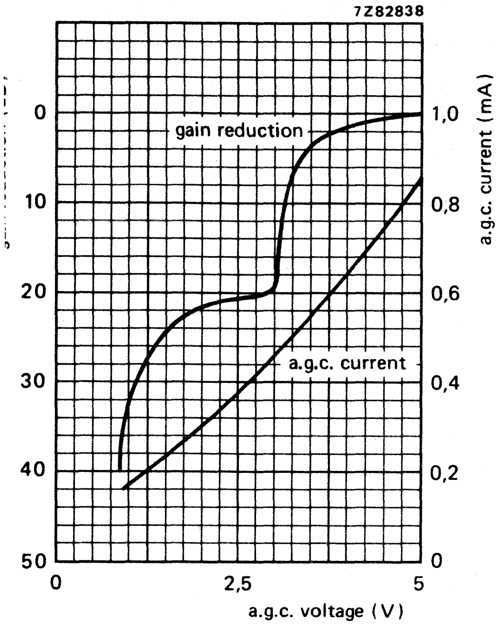


Fig. 4.

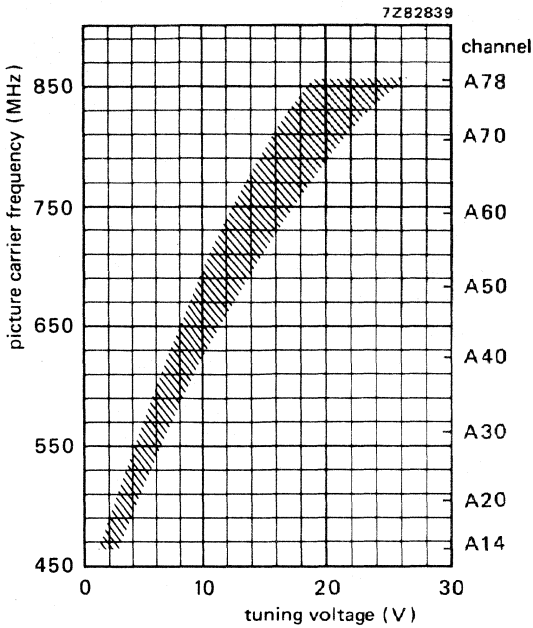


Fig. 5.

Tuning voltage range (Fig. 5)		+1 to +28 V
Current drawn from +28 V tuning voltage supply		
at T_{amb} = 25 °C	max.	0,15 μA
at T_{amb} = 55 °C	max.	0,6 μA
Slope of tuning characteristic	min.	4 MHz/V
at 471 MHz	typ.	24 MHz/V
at 855 MHz	typ.	8 MHz/V

Note: The source impedance of the tuning voltage offered to terminal 4 must be maximum 47 kΩ at tuning voltages below 3 V.

Frequencies

Frequency range	channel A14 (picture carrier 471,25 MHz) to channnel A78 (picture carrier 855,25 MHz). Margin at the extreme channels: min. 3 MHz.
Intermediate frequencies	
picture	45,75 MHz
sound	41,25 MHz The oscillator frequency is higher than the aerial signal frequency.

Wanted signal characteristics

Input impedance	
asymmetrical	75 Ω
V.S.W.R. and reflection coefficient at picture carrier frequency, at nominal gain	
v.s.w.r.	max. 5
reflection coefficient	max. 66%
R.F. curves, bandwidth	typ. 18 MHz
R.F. curves, tilt	on any channel the amplitude difference between the top of the r.f. resonant curve and the picture carrier marker, the sound carrier marker, or any frequency between them will not exceed 3 dB at nominal gain, and 4 dB in the a.g.c. range between nominal gain and 20 dB gain reduction.
A.G.C. range	min. 30 dB
Power gain (see also Measuring method of power gain)	min. 18 dB
channel A14	typ. 24 dB
channel A40	typ. 21 dB
channel A78	typ. 25 dB
Gain difference between any two channels	typ. 4 dB
Noise figure	max. 10 dB
channel A14	typ. 7,5 dB
channel A40	typ. 8 dB
channel A78	typ. 8,5 dB
Overloading	
Input signal producing 1 dB gain compression at nominal gain	typ. 92 dB (μV) into 75 Ω
Input signal producing either a detuning of the oscillator of +300 kHz or −1000 kHz or stopping of the oscillations at nominal gain	typ. 100 dB (μV) into 75 Ω

Unwanted signal characteristics

Image rejection (measured at picture carrier frequency)	
channels A14 to A63	min. 46 dB; typ. 57 dB
I.F. rejection (measured at picture carrier and colour sub-carrier frequency)	min. 60 dB

N + 4 rejection
Interference signal of picture carrier of channel N + 4, which produces a 43,5 MHz i.f. signal that is 46 dB below the picture carrier of wanted channel N (input level 60 dB (μV), tuner operating at maximal gain) typ. 76 dB (μV)

N ± 7 rejection
Interference signal for an interference ratio of 46 dB referred to wanted picture carrier (wanted signal 60 dB (μV); tuner operating at nominal gain) typ. 80 dB (μV) into 75 Ω

Cross modulation
Input signal producing 1% cross modulation, i.e. 1% of the modulation depth of the interfering signal is transferred to the wanted signal.

In channel cross modulation (wanted signal): picture carrier frequency; interfering signal: sound carrier frequency)

at nominal (wanted input level 60 dB (μV))	typ. 80 dB (μV) into 75 Ω
at 26 dB gain reduction (wanted input level 86 dB (μV))	typ. 100 dB (μV) into 75 Ω

In band cross modulation (wanted signal: picture carrier of channel N; interfering signal: picture carrier of channel N + 7)

at nominal gain (wanted input level 60 (μV))	typ. 90 dB (μV) into 75 Ω
at 26 dB gain reduction (wanted input level 86 dB (μV))	typ. 100 dB (μV) into 75 Ω

Out of band cross modulation, at nominal gain

v.h.f. I	min. 110 dB (μV) into 75 Ω
v.h.f. III	min. 110 dB (μV) into 75 Ω

Oscillator characteristics

Pulling
Input signal of tuned frequency producing a shift of the oscillator frequency of 10 kHz, at nominal gain typ. 80 dB (μV) into 75 Ω

Shift of oscillator frequency
at a change of the supply voltage of 5% max. 550 kHz

Drift of oscillator frequency

during warm-up time (after the tuner has been completely out of operation for 15 min, measured between 5 s and 15 min after switching on)	max. 250 kHz
during warm-up time (after the input stage is in operation for 15 min, measured between 2 s and 15 min after switching on the oscillator/i.f. stage)	max. 250 kHz
at a change of the ambient temperature from + 25 to + 40 °C (measured after 3 cycles from + 25 to + 55 °C)	
channels A14 to A66	max. 500 kHz
channels A67 to A73	max. 650 kHz
channels A74 to A78	max. 750 kHz

I.F. circuit characteristics

Bandwidth of i.f. output circuit 7,5 ± 1 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 6; tuning voltage 15 V.

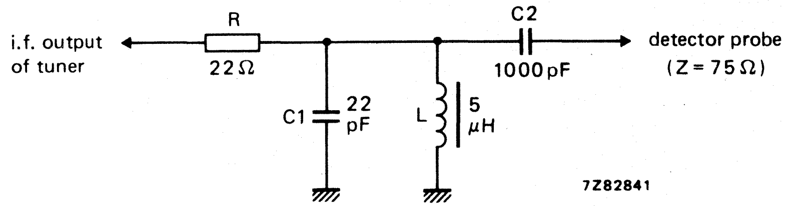


Fig. 6.

Bandwidth variation of i.f. output circuit as a result of r.f. tuning	max. 500 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 6, i.e. a 100 pF capacitor is connected in parallel with C1 and R is short-circuited; tuning voltage 15 V.

Detuning of the i.f. output circuit as a result of r.f. tuning	max. 500 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 6, i.e. a 100 pF capacitor is connected in parallel with C1 and R is short-circuited; tuning voltage 15 V.

Minimum tuning range of i.f. output coil	41 to 47 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 6; tuning voltage 15 V.

Attenuation between i.f. injection point and i.f. output of the tuner	23 ± 3 dB

Miscellaneous

Radio interference

Oscillator radiation and oscillator voltage at the aerial terminal	Within the limits of C.I.S.P.R. 13 (1975). For the oscillator radiation use is made of the relaxed limit of 3 mV/m (70 dBμV/m).
Microphonics	Therefore will be no microphones, provided the tuner is installed in a professional manner.

Surge protection

Protection against voltages	max. 8 kV

Note: Three discharges of a 470 pF capacitor into the aerial terminal.

Protection against flashes	max. 30 kV, 400 mWs

Note: A flashover circuit producing flashes with frequencies of 1 to 20 Hz for 30 s is connected to the aerial terminal.

ADDITIONAL INFORMATION

I.F. injection

The tuner is provided with an i.f. injection point at the collector of the i.f. transistor (coupled via a capacitor to terminal 7). The i.f. generator can be connected directly to this point (Fig. 7).
The tuner needs normal supply voltages and a tuning voltage of 15 V; the i.f. output should be loaded with the circuit shown in Fig. 6.

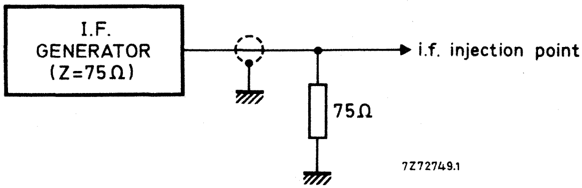


Fig. 7.

Connection of the i.f. amplifier

The tuner needs a d.c. path from the i.f. output terminal (10) to earth, preferably via a choke of approx. 5 μH outside the tuner (Fig. 8). For damping the i.f. output circuit and matching the i.f. output impedance of the tuner to the i.f. amplifier, a series resistor and a parallel capacitor as shown in Fig. 8 should be used.

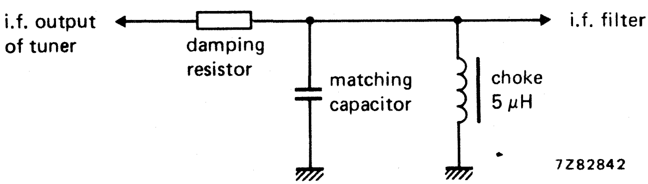


Fig. 8.

Measuring method of power gain

The i.f. output of the tuner should be terminated with the RC-circuit given in Fig. 6.

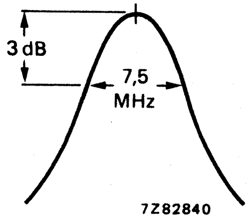


Fig. 9.

The RC-circuit roughly matches the i.f. output impedance to 75 Ω at the resonant frequency of the i.f. output circuit, which should be tuned to 43,5 MHz; the bandwidth should be approx. 7,5 MHz (Fig. 9).

Because the input and output impedances of the tuner are now 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and RC-circuit between a 75 Ω source and a 75 Ω detector.

Alignment of the i.f. output coil

The i.f. output coil should be adjusted with a brass tool with a blade as shown in Fig. 10. A suitable tool is available under catalogue number 7122 005 47680.

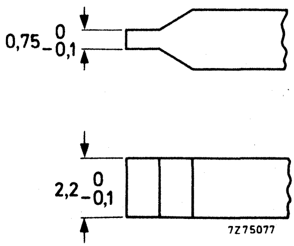


Fig. 10.

ACCESSORIES

Aerial input transformer, catalogue number 3122 127 24330.

U.H.F. TELEVISION TUNERS

QUICK REFERENCE DATA

Systems	C.C.I.R. systems I (United Kingdom), G, H and K	
Channels	E21 to E69	
	systems I and K	systems G and H
Intermediate frequencies		
picture	39,5 MHz	38,9 MHz
sound	33,5 MHz	33,4 MHz

APPLICATION

These tuners are for use in u.h.f. single-standard receivers. In combination with v.h.f. tuner V317 or V334 they can also be used in v.h.f./u.h.f. receivers.

The tuners meet the special requirements of the United Kingdom.

The U341 LO is a special version of the U341; an output voltage sample from the local oscillator is available for driving digital tuning systems. Apart from this the tuners are identical.

The tuners are pin-compatible with tuners U321 and U321LO; the a.g.c. circuit is voltage driven, unlike the U321, where the a.g.c. circuit is current driven.

DESCRIPTION

These are u.h.f. tuners with electronic tuning, covering the u.h.f. band from 470 to 860 MHz. The tuner circuit is built on a printed-wiring board and enclosed in a metal housing comprising a rectangular frame and front and rear covers (see Fig. 2). The shielded aerial connection is on one of the frame sides, all other connections (supply voltages, a.g.c., tuning voltage, i.f. injection, i.f. output) are made via terminals on the underside. The mounting method is shown in Figs 3 and 4.

Tuner U341LO has a coaxial socket on the top of the frame for the oscillator output sample.

Electrically, the tuners consist of an input circuit with a high-pass characteristic and a MOS-FET tetrode 3SK87. This tetrode operates at a drain current of about 10 mA, and has good noise figures and signal handling properties. It also acts as an a.g.c. device, controlled by an a.g.c. voltage fed to gate 2. This combination has good signal handling properties throughout the a.g.c. range. The drain load of the MOS-FET tetrode is formed by a double tuned circuit which transfers the signal to the mixer diode 1SS99. The selectivity of this circuit at the image frequency has been improved by special means. The mixer diode is driven by an oscillator transistor BF480. At the U341LO the oscillator sample is fed out of the mixer via a small capacitor in series with a resistor.

The i.f. signal, from the mixer, is amplified by a transistor BF324 in grounded-base configuration. The combination of the Schottky-barrier diode 1SS99 and the i.f. transistor BF324 ensures good noise figures and signal handling properties. Three capacitance diodes BB405B tune the double tuned circuit and the oscillator.

The i.f. output circuit is single tuned with output coupling from the low impedance side. A d.c. path to earth for the collector current of the i.f. transistor BF324 must be provided outside the tuner, preferably by a choke of about 5 μH. Damping of the i.f. output circuit and matching to the i.f. circuit of the receiver can be achieved by connecting a series resistance and a parallel capacitance outside the tuner.

An i.f. injection point is provided at the collector of the i.f. transistor, connected to terminal 7.

DEVELOPMENT SAMPLE DATA

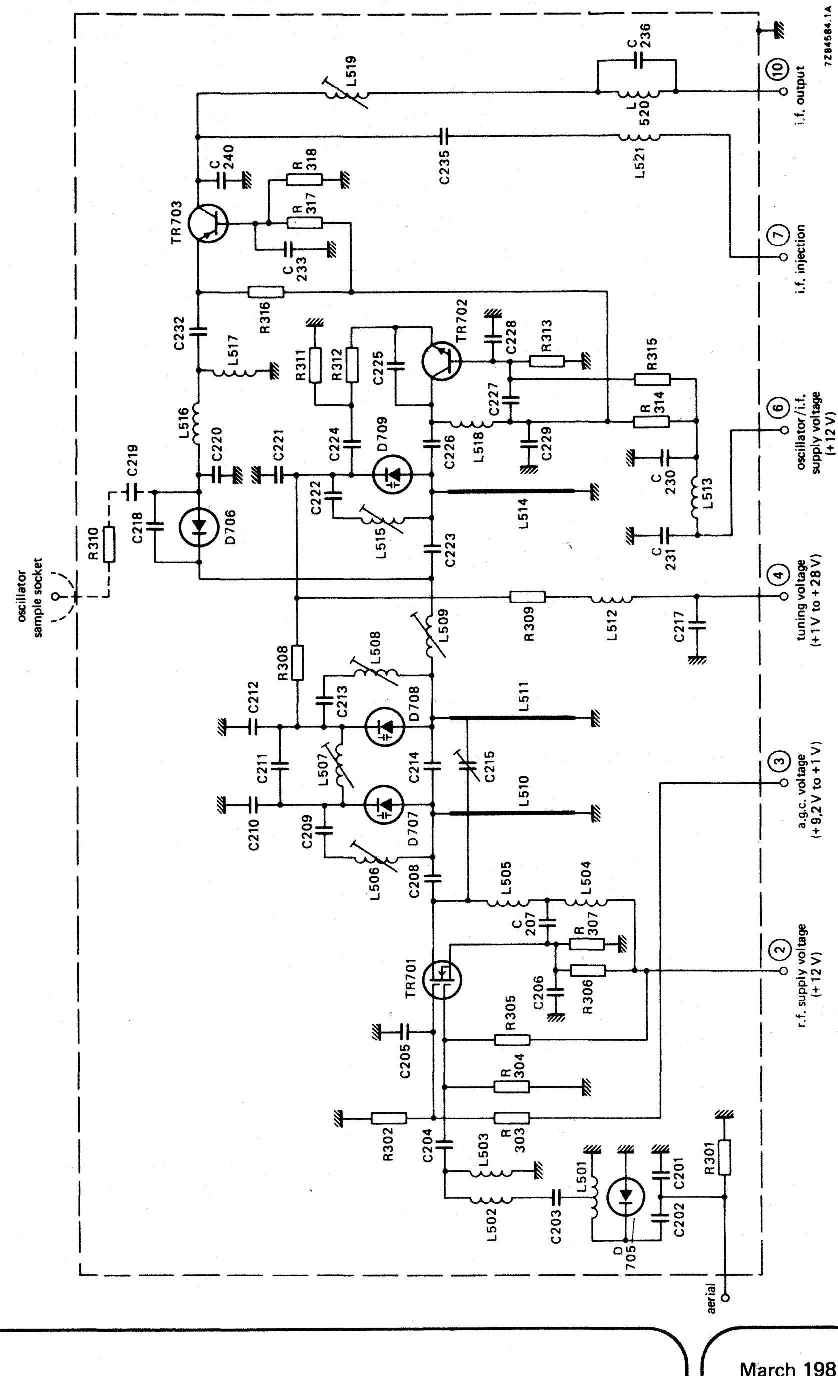


Fig. 1.

MECHANICAL DATA

Dimensions in mm

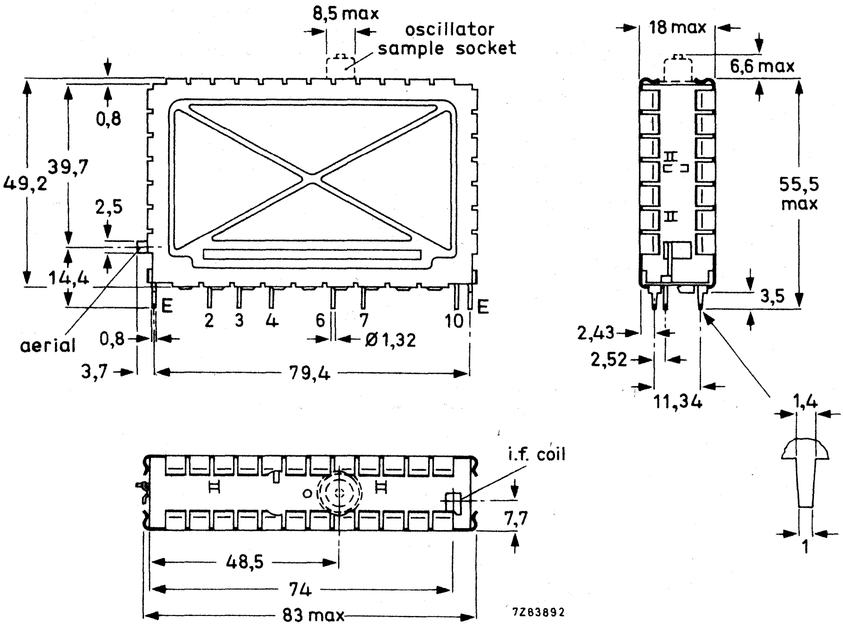


Fig. 2a The oscillator sample socket, drawn with dotted lines, applies only to tuner U341LO.

Terminal

2 = r.f. supply voltage, + 12 V
3 = a.g.c. voltage + 9,2 to + 1 V
4 = tuning voltage, + 1 to + 28 V
6 = oscillator/i.f. supply voltage, + 12 V
7 = i.f. injection point
10 = i.f. output

Note: When the tuner is operated together with a v.h.f. tuner, only the supply voltage at terminal 6 should be switched off during v.h.f. operation.

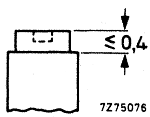


Fig. 2b I.F. output coil.
Torque for alignment: 2 to 15 mNm
Press-through force: ⩾ 10 N

Mass approx. 75 g

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board with connections as shown by the piercing diagram in Fig. 3. (The tuner may also be mounted in a socket. Information will be supplied upon request.)

It is recommended that the tuner be installed in a cool part of the receiver cabinet and not exposed to the vibrations of the loudspeaker. There are no restrictions on orientation.

The solderability of the terminals and mounting tabs is according to IEC 68-2, test Ta (230 ± 10 °C, 2 ± 0,5 s). The resistance to soldering heat is according to IEC 68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

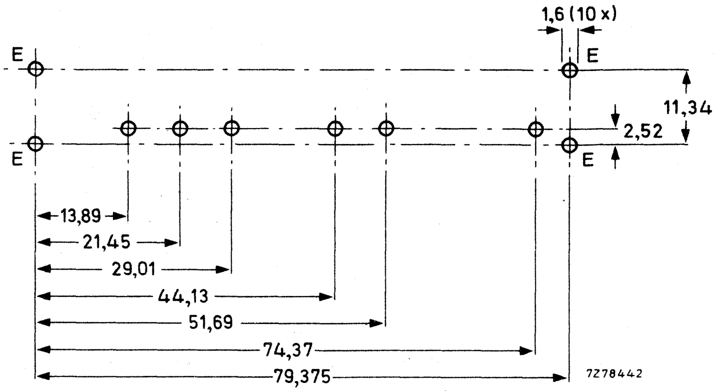


Fig. 3 Piercing diagram viewed from solder side of board.

A coaxial plug has to be used for connection to the socket on the top of tuner U341LO; type 3/2-50 (manufacturer: Daut und Rietz) is recommended.

The aerial cable should be connected as follows:

- strip the cable according to Fig. 4B;
- fix the cable as indicated in Fig. 4C and solder the inner conductor on the aerial tag;
- insert lugs on immunity shield under the tabs on tuner body, push the shield into position so that the locating tags snap into place in the tuner body.

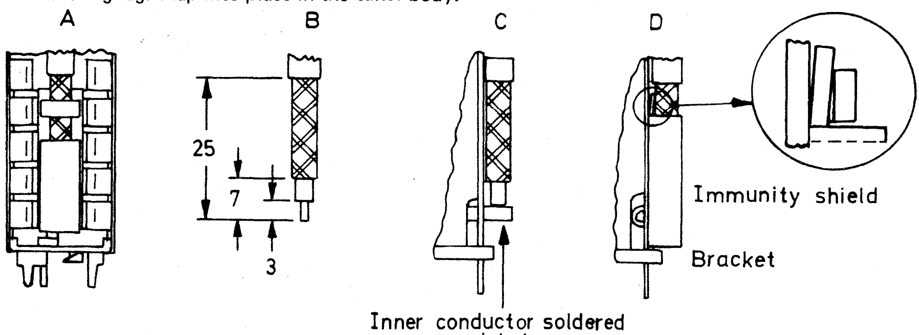


Fig. 4 Fixing of the aerial cable.
Recommended cable: DAVU wire CX4004 (outer sheath diameter 5,32 mm).

ELECTRICAL DATA

The electrical values are measured on the u.h.f. tuner alone, but they are also valid for the u.h.f. tuner when used with a v.h.f. tuner V317 or V334. Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C, a relative humidity of 60 ± 15%, a supply voltage of 12 ± 0,3 V and an a.g.c. voltage of 9,2 ± 0,2 V.

Within the given tolerance range of supply voltage and a.g.c. voltage only insignificant deviations from the specified values can be expected. Under the extreme conditions of temperature and humidity as given below, the tuner will function normally, but some specified limits may be exceeded.

General

Semiconductors	
r.f. amplifier	3SK87
mixer diode	1SS99
oscillator	BF480
tuning diodes	3 x BB405B
i.f. amplifier	BF324
Ambient temperature range	
operating	+5 to +55 °C
storage	−25 to +85 °C
Relative humidity	max. 90%

Voltages and currents

Supply voltage		+12 V ± 10%

Note: The supply voltage at terminal 2 (input stage) should be filtered to avoid hum modulation.

Current drawn from +12 V supply		
r.f. amplifier, at nominal gain	typ.	21 mA
r.f. amplifier, at 30 dB gain reduction	typ.	10 mA
oscillator/i.f. amplifier	max.	16 mA
A.G.C. voltage (Fig. 5), at nominal gain		+9,2 ± 0,5 V
A.G.C. voltage, at 30 dB gain reduction	min.	+1 V

Note: A.G.C. voltages between 0 and +10 V may be applied without risk of damage.

A.G.C. current (Fig. 5)		
during gain control (0 to 30 dB)	max.	+1 mA
at nominal gain	typ.	+0,9 mA
at 30 dB gain reduction	typ.	+0,1 mA

DEVELOPMENT SAMPLE DATA

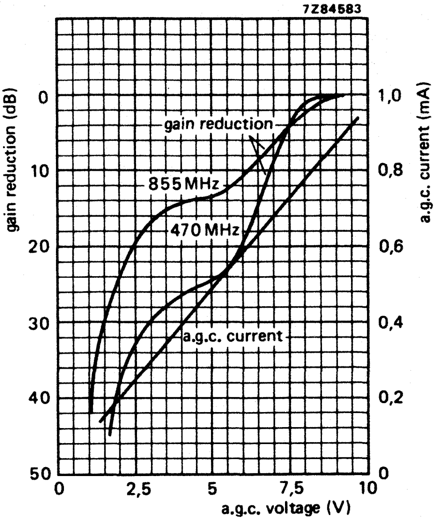


Fig. 5.

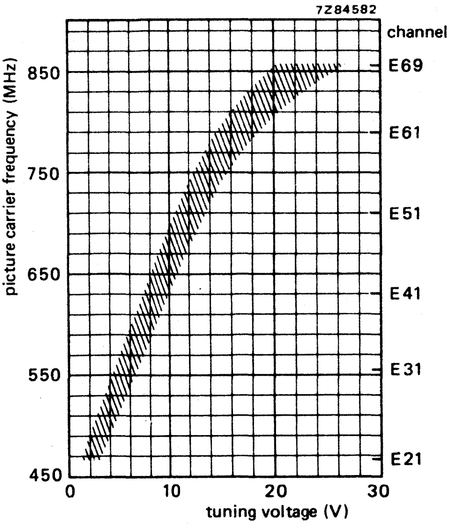


Fig. 6.

Tuning voltage range (Fig. 6)	+1 to +28 V
Current drawn from +28 V tuning voltage supply	
at 25 °C	max. 0,15 μA
at 55 °C	max. 0,6 μA
Slope of tuning characteristic	min. 4 MHz/V

Note: The source impedance of the tuning voltage offered to terminal 4 must be maximum 47 kΩ at tuning voltages below 3 V.

Oscillator sample signal; **only valid for U341LO**
at + 12 V supply voltage and
T_{amb} = ±25 °C — typ. 90 dB (μV) into 75 Ω
within the given tolerance range of supply voltage and given operating temperature range, and within the tuning voltage range +0,5 to +30 V — min. 80 dB (μV) into 75 Ω; max. 100 dB (μV) into 75 Ω

Note: A tuning voltage higher than +28 V will not damage the tuner and may be applied at the user's own risk. Under this condition the published reverse voltage limit of the oscillator tuning diode will be exceeded; the oscillator frequency will never decrease with increasing tuning voltage.

Frequencies

Frequency range	channel E21 (picture carrier 471,25 MHz) to channel E69 (picture carrier 855,25 MHz). Margin at the extreme channels: min. 3 MHz.	
	systems I, K	systems G, H
Intermediate frequencies		
picture	39,5 MHz	38,9 MHz
sound	33,5 MHz	33,4 MHz

The oscillator frequency is higher than the aerial signal frequency.

Note: The tuner is aligned in such a way that the i.f. frequencies of the four systems can be applied.

Wanted signal characteristics

Input impedance
asymmetrical — 75 Ω

Output impedance at the oscillator sample socket; **only valid for U341LO**
asymmetrical — 75 Ω

V.S.W.R. and reflection coefficient at picture carrier frequency, at nominal gain and at 30 dB gain reduction
- v.s.w.r. — max. 6
- reflection coefficient — max. 71%

V.S.W.R. and reflection coefficient* at oscillator sample socket: **only valid for U341LO**
- v.s.w.r. at $f_{osc} < 600$ MHz — max. 4 (typ. 3)
- v.s.w.r. at $f_{osc} > 600$ MHz — max. 3 (typ. 2)
- reflection coefficient at $f_{osc} < 600$ MHz — max. 60% (typ. 50%)
- reflection coefficient at $f_{osc} > 600$ MHz — max. 50% (typ. 33%)

R.F. curves, bandwidth — typ. 18 MHz

R.F. curves, tilt (only for i.f. 39,5/33,5 MHz) — on any channel the amplitude difference between the top of the r.f. resonant curve and the picture carrier marker, the sound carrier marker, or any frequency between them will not exceed 3 dB at nominal gain, and 4 dB in the a.g.c. range between nominal gain and 20 dB gain reduction.

A.G.C. range — min. 30 dB

* Measured in operational and non-operational condition of the tuner.

Power gain (see also Measuring method of power gain)	min.	19 dB
channel E21	typ.	25 dB
channel E40	typ.	23 dB
channel E69	typ.	25 dB
Gain difference between any two channels	typ.	4 dB
Noise figure	max.	10 dB
channel E21	typ.	6,5 dB
channel E40	typ.	6,5 dB
channel E69	typ.	7 dB

Overloading

Input signal producing 1 dB gain compression at nominal gain	typ.	90 dB (μV) into 75 Ω
Input signal producing either a detuning of the oscillator of +300 kHz or −1000 kHz or stopping of the oscillations at nominal gain	typ.	100 dB (μV) into 75 Ω

Unwanted signal characteristics

Image rejection (measured at picture carrier frequency)

at nominal gain, channels E21 to E60	min.	53 dB; typ. 60 dB
at 20 dB gain reduction, channels E21 to E60	min.	50 dB

Harmonic content of oscillator sample; **only valid for U341LO**

Suppression of harmonics which fall into the frequency range below 1200 MHz (second harmonics of fundamentals below 600 MHz)	min.	15 dB (typ. 20 dB) below oscillator fundamental

R.F. rejection at oscillator sample socket; **only valid for U341LO**

Signal voltage at oscillator sample socket (input signals of wanted frequency 70 dB (μV) into 75 Ω; tuner operating at nominal gain)	min.	17 dB (typ.24 to 34 dB) below oscillator fundamental
I.F. rejection (measured at picture carrier and colour sub-carrier frequency)	min.	60 dB

I.F. rejection at oscillator sample socket; **only valid for U341LO**

I.F. signals at oscillator sample socket (converted from input signals of wanted frequency 70 dB (μV) into 75 Ω; tuner operating at nominal gain)	min.	20 dB (typ. 35 dB) below oscillator fundamental

N ± 4 rejection
Interference signal for an interference ratio of 53 dB referred to wanted picture carrier (picture to sound carrier ratio of 7 dB; wanted signal 60 dB (μV); tuner operating at nominal gain)

N + 4 rejection	typ.	80 dB (μV) into 75 Ω
N −4 rejection	typ.	73 dB (μV) into 75 Ω

Cross modulation
Input signal producing 1% cross modulation, i.e. 1% of the modulation depth of the interfering signal is transferred to the wanted signal.

In channel cross modulation (wanted signal: picture carrier frequency; interfering signal: sound carrier frequency)

at nominal gain (wanted input level 60 dB (μV))	typ.	80 dB (μV) into 75 Ω
at 26 dB gain reduction (wanted input level 86 dB (μV))	typ.	100 dB (μV) into 75 Ω

In band cross modulation (wanted signal: picture carrier of channel N; interfering signal: picture carrier of channel N ± 3 and N ± 5)

at nominal gain (wanted input level 60 dB (μV))	typ.	92 dB (μV) into 75 Ω
at 26 dB gain reduction (wanted input level 86 dB (μV))	typ.	100 dB (μV) into 75 Ω

Out of band cross modulation, at nominal gain

v.h.f. I	min.	108 dB (μV) into 75 Ω
v.h.f. III	min.	108 dB (μV) into 75 Ω

Oscillator characteristics

Pulling
Input signal of tuned frequency producing a shift of the oscillator frequency of 10 kHz, at nominal gain — typ. 80 dB (μV) into 75 Ω

Shift of oscillator frequency
at a change of the supply voltage of 5% — max. 550 kHz

Drift of oscillator frequency

during warm-up time (after the tuner has been completely out of operation for 15 min, measured between 5 s and 15 min after switching on) — max. 250 kHz

during warm-up time (after the input stage is in operation for 15 min, measured between 2 s and 15 min after switching on the oscillator/i.f. stage) — max. 250 kHz

	U341	U341LO
at a change of the ambient temperature from + 25 to + 50 °C (measured after 3 cycles from + 25 to + 55 °C)		
channels E21 to E60	max. 1000 kHz	
channels E61 to E69	max. 1200 kHz	
at a change of the ambient temperature from + 25 to + 40 °C (measured after 3 cycles from + 25 to + 55 °C		
channels E21 to E60	max. 500 kHz	max. 500 kHz
channels E61 to E65	max. 650 kHz	max. 800 kHz
channels E66 to E69	max. 750 kHz	max. 1000 kHz

I.F. characteristics

Bandwidth of i.f. output circuit — $5^{+1}_{-0,5}$ MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 7 tuning voltage 15 V.

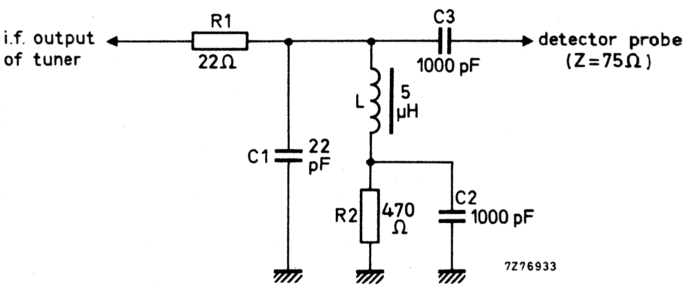


Fig. 7.

Bandwidth variation of i.f. output circuit as a result of r.f. tuning — max. 500 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 7, i.e. a 100 pF capacitor is connected in parallel with C1; tuning voltage 15 V.

Detuning of the i.f. output circuit as a result of r.f. tuning — max. 500 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 7, i.e. a 100 pF capacitor is connected in parallel with C1; tuning voltage 15 V.

Minimum tuning range of i.f. output coil	33 to 40 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 7; tuning voltage 15 V.

Attenuation between i.f. injection point and i.f. output of the tuner	23 ± 3 dB

Miscellaneous

Radio interference

Oscillator radiation and oscillator voltage at the aerial terminal	Within the limits of C.I.S.P.R. 13 (1975), VDE 0872/7.72 and BS 905*.
Immunity from radiated interference	Aerial terminal meets requirements of BS 905, provided the tuner is installed in a professional manner.
Microphonics	There will be no microphonics, provided the tuner is installed in a professional manner.

Surge protection

Protection against voltages	max. 5 kV

Note: Three discharges of a 470 pF capacitor into the aerial terminal.

Protection against flashes	max. 30 kV, 400 mWs

Note: A flashover circuit producing flashes with frequencies of 1 to 20 Hz for 30 s is connected to the aerial terminal.

* For U341LO: when the oscillator sample socket is either open or terminated with a coaxial plug (75 Ω impedance, e.g. type 3/2-50, Daut und Rietz).

ADDITIONAL INFORMATION

I.F. injection

The tuner has an i.f. injection point at the collector of the i.f. transistor (coupled via a small capacitor to terminal 7). The i.f. generator can be connected directly to this point (Fig. 8).
The tuner needs normal supply voltages and a tuning voltage of 15 V; the i.f. output should be loaded with the circuit shown in Fig. 7.

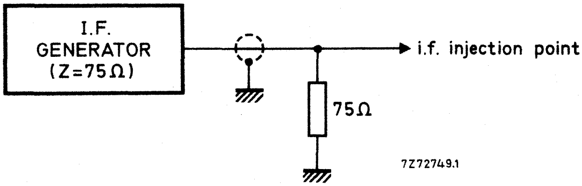


Fig. 8.

Connection of the i.f. amplifier

The tuner needs a d.c. path from the i.f. output terminal (10) to earth, preferably via a choke of approx. 5 μH outside the tuner (Fig. 9). Where the tuner is used in combination with a v.h.f. tuner, this choke can be common for both tuners; a resistor in series with the choke can inhibit the i.f. output circuit of the switched-off tuner. For damping the i.f. output circuit and matching the i.f. output impedance of the tuner to the receiver i.f. amplifier, a series resistor and a parallel capacitor as shown in Fig. 9 should be used.

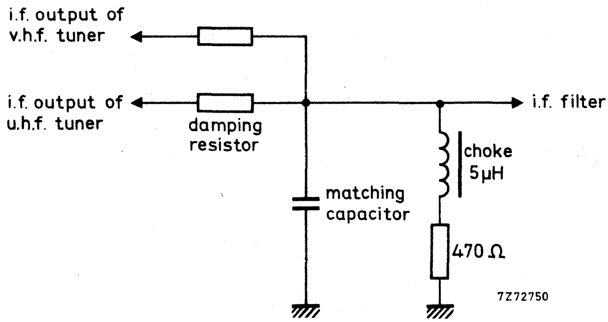


Fig. 9.

Measuring method of power gain

The i.f. output of the tuner should be terminated with the RC-circuit given in Fig. 7.

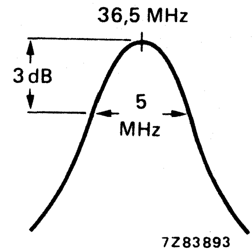


Fig. 10.

The RC-circuit roughly matches the i.f. output impedance to 75 Ω at the resonant frequency of the i.f. output circuit, which should be tuned to 36,5 MHz; the bandwidth should be approx. 5 MHz (Fig. 10).

Because the input and output impedances of the tuner are now 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and RC-circuit between a 75 Ω source and a 75 Ω detector.

Alignment of the i.f. output coil

The i.f. output coil should be adjusted with a brass tool with a blade as shown in Fig. 11. A suitable tool is available under catalogue number 7122 005 47680.

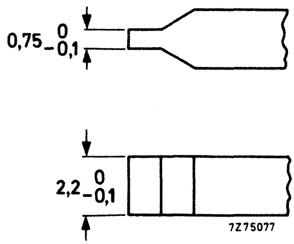


Fig. 11.

ACCESSORIES

Immunity shield, catalogue number 3122 121 24910

Connector assembly for use of tuner U341 or U341LO in combination with v.h.f. tuner V317 or V334:
connector, catalogue number 3112 200 20720;
clamp holder, catalogue number 3122 121 29260;
clamp, catalogue number 3112 274 13220.

U.H.F. TELEVISION TUNERS

QUICK REFERENCE DATA

Systems	C.C.I.R. systems G, H, I and K	
Channels	E21 to E69	
	systems G and H	systems I and K
Intermediate frequencies		
picture	38,9 MHz	39,5 MHz
sound	33,4 MHz	33,5 MHz

APPLICATION

These tuners are designed to cover the u.h.f. channels E21 to E69 of C.C.I.R. systems G, H, I and K.

In combination with a suitable v.h.f. tuner, e.g. V317 or V334, they can be used in v.h.f./u.h.f. receivers. The aerial inputs and i.f. outputs of both tuners can then be connected in parallel.

The tuners comply with the requirements of radiation and signal handling capability of Amtsblatt DBP68/1979.

The U342LO is a special version of the U342; an output voltage from the local oscillator is made available for driving digital tuning systems. Apart from this the tuners are identical.

DESCRIPTION

The tuners are u.h.f. tuners with electronic tuning, covering the u.h.f. band from 470 to 860 MHz.

Mechanically, the tuners are built on a printed-wiring board, carrying all components, in a metal housing made of a rectangular frame, and front and rear covers (see Fig. 2a). All connections (aerial, supply voltages, a.g.c. voltage, tuning voltage, i.f. injection, i.f. output) are made via terminals on the underside. The mounting method is shown in Fig. 3. Tuner U342LO has a coaxial socket on the top of the frame for coupling out the oscillator sample.

Electrically, the tuners consist of an input circuit with a high-pass characteristic and a MOS-FET tetrode 3SK87. This tetrode operates at a drain current of about 10 mA, featuring good noise figures and good signal handling properties. It also acts as an a.g.c. device, controlled by an a.g.c. voltage fed to gate 2. This combination has good signal handling properties throughout the a.g.c. range. The drain load of the MOS-FET tetrode is formed by a double tuned circuit, transferring the signal to the mixer diode 1SS99. The selectivity of this circuit at the image frequency has been improved by special means. The mixer diode is driven by an oscillator, equipped with a transistor BF480. At the U342LO the oscillator sample is coupled out of the mixer via a small capacitor in series with a resistor.

The i.f. signal, originated in the mixer, is amplified by a transistor BF324 in grounded-base configuration. The combination of the Schottky-barrier diode 1SS99 and the i.f. transistor BF324 also features good noise figures and good signal handling properties. Three capacitance diodes BB405B tune the double tuned circuit and the oscillator.

The i.f. output circuit of the tuner is a single tuned one, at the low end of which the i.f. signal is coupled out of the tuner. A d.c. path to earth for the collector current of the i.f. transistor BF324 has to be provided outside the tuner, preferably by a choke of about 5 μH. Damping of the i.f. output circuit and matching of the i.f. output to the i.f. circuit of the receiver can be achieved by connecting a series resistance and a parallel capacitance outside the tuner.

An i.f. injection point has been provided at the collector of the i.f. transistor, connected to terminal 7.

DEVELOPMENT SAMPLE DATA

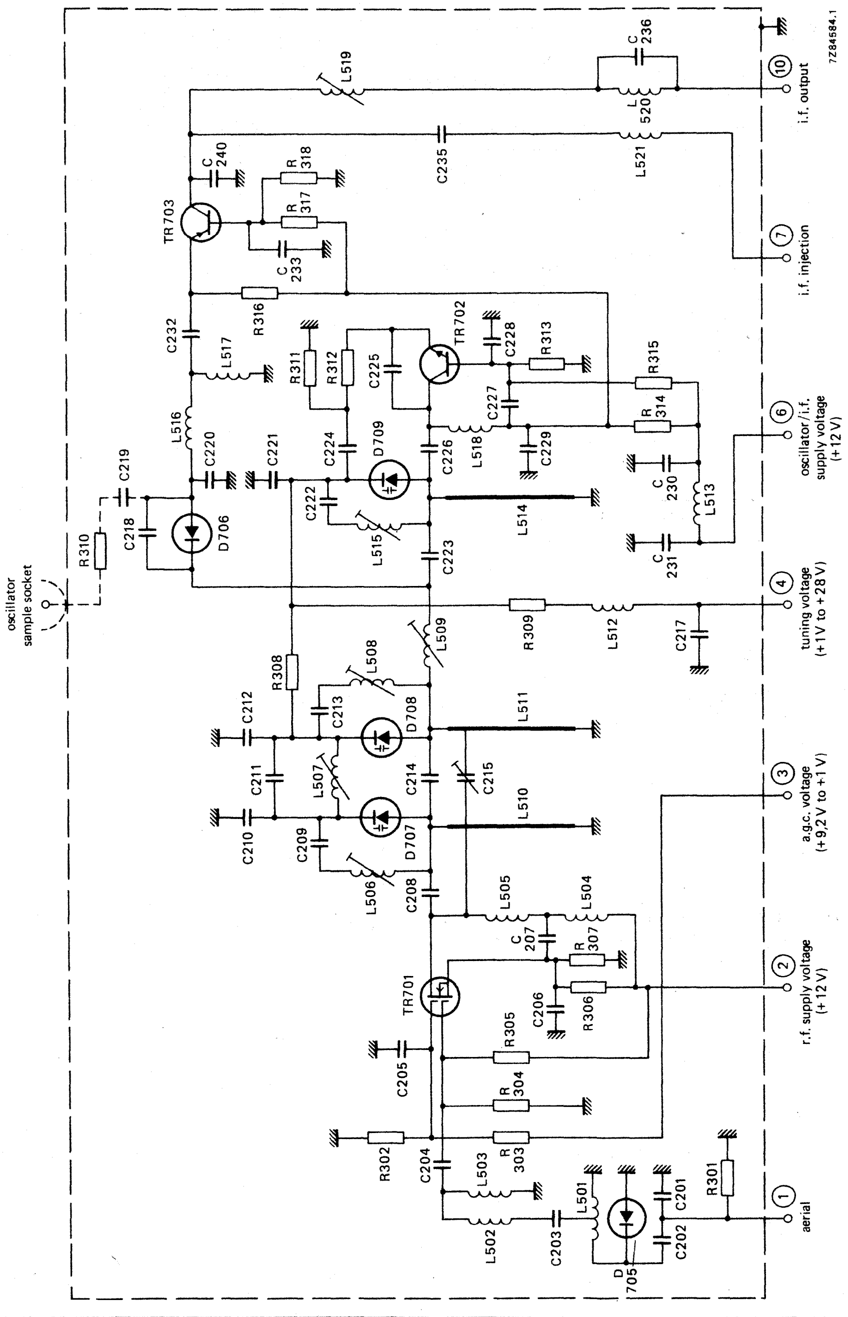


Fig. 1.

MECHANICAL DATA

Dimensions in mm

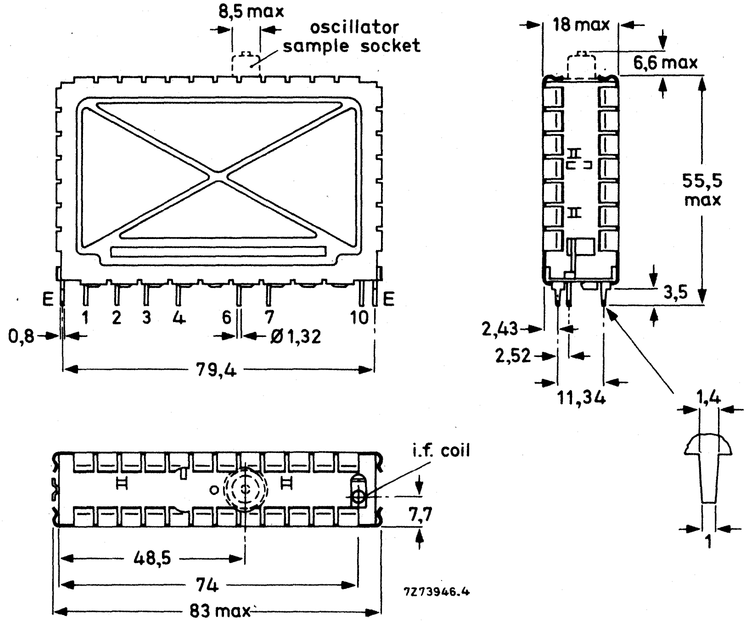


Fig. 2a The oscillator sample socket, drawn with dotted lines, applies only to tuner U342LO.

Terminal 1 = aerial
2 = r.f. supply voltage, + 12 V
3 = a.g.c. voltage, + 9,2 to + 1 V
4 = tuning voltage, + 1 to + 28 V
6 = oscillator/i.f. supply voltage, + 12 V
7 = i.f. injection point
10 = i.f. output

Note: When the tuner is operated together with a v.h.f. tuner, only the supply voltage at terminal 6 should be switched off during v.h.f. operation.

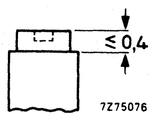


Fig. 2b I.F. output coil.
Torque for alignment: 2 to 15 mNm
Press-through force: ⩾ 10 N

Mass approx. 75 g

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, using the piercing diagram shown in Fig. 3. (The tuner may also be mounted into a socket. Information will be supplied upon request.)

It is recommended that the tuner be installed in the cool part of the receiver cabinet and not exposed to the vibrations of the loudspeaker. There are no restrictions on orientation.

The solderability of the terminals and mounting tabs is according to IEC 68-2, test Ta (230 ± 10 °C, 2 ± 0,5 s). The resistance to soldering heat is according to IEC 68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

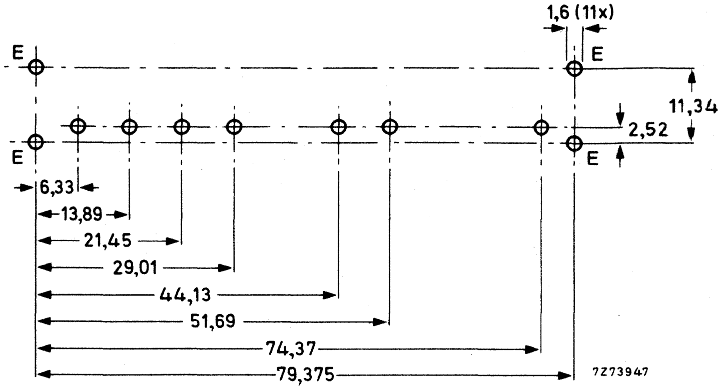


Fig. 3 Piercing diagram viewed from solder side of board.

For connection to the socket on the top of tuner U342LO a coaxial plug has to be used; type 3/2-50 (manufacturer: Daut und Rietz) is recommended.

DEVELOPMENT SAMPLE DATA

ELECTRICAL DATA

The electrical values are measured on the u.h.f. tuner alone, but they are also valid for the u.h.f. tuner in combination with a v.h.f. tuner V317 or V334. Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C, a relative humidity of 60 ± 15%, a supply voltage of 12 ± 0,3 V and an a.g.c. voltage of 9,2 ± 0,2 V.

Within the given tolerance range of supply voltage and a.g.c. voltage only insignificant deviations from the specified values can be expected. Under the extreme conditions of temperature and humidity as given below, the tuner will function normally, but some specified limits may be exceeded.

General

Semiconductors	
r.f. amplifier	3SK87
mixer diode	1SS99
oscillator	BF480
tuning diodes	3 x BB405B
i.f. amplifier	BF324
Ambient temperature range	
operating	+ 5 to + 55 °C
storage	−25 to + 85 °C
Relative humidity	max. 90%

Voltages and currents

Supply voltage	+ 12 V ± 10%

Note: The supply voltage at terminal 2 (input stage) should be filtered to avoid hum modulation.

Current drawn from + 12 V supply		
r.f. amplifier, at nominal gain	typ.	21 mA
r.f. amplifier, at 30 dB gain reduction	typ.	10 mA
oscillator/i.f. amplifier	max.	16 mA
A.G.C. voltage (Fig. 4), at nominal gain		+ 9,2 ±0,5 V
A.G.C. voltage, at 30 dB gain reduction	min.	+ 1 V

Note: A.G.C. voltages between 0 and + 10 V may be applied without risk of damage.

A.G.C. current (Fig. 4)		
during gain control (0 to 30 dB)	max.	+ 1 mA
at nominal gain	typ.	+ 0,9 mA
at 30 dB gain reduction	typ.	+ 0,1 mA

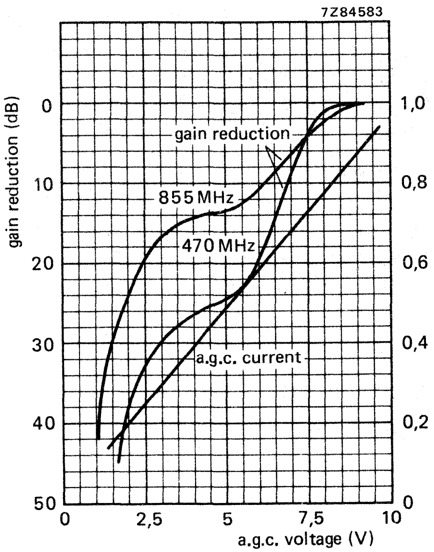


Fig. 4.

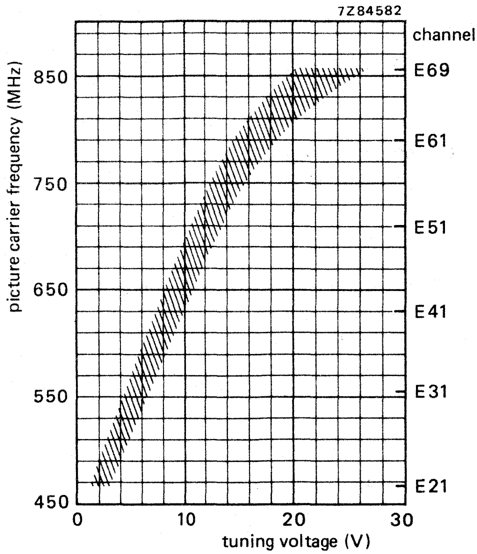


Fig. 5.

DEVELOPMENT SAMPLE DATA

Tuning voltage range (Fig. 5)	+ 1 to + 28 V
Current drawn from + 28 V tuning voltage supply	
at 25 °C	max. 0,15 μA
at 55 °C	max. 0,6 μA
Slope of tuning characteristic	min. 4 MHz/V

Note: The source impedance of the tuning voltage offered to terminal 4 must be maximum 47 kΩ at tuning voltages below 3 V.

Oscillator sample signal; **only valid for U342LO**	
at + 12 V supply voltage and	
T_{amb} = + 25 °C	typ. 90 dB (μV) into 75 Ω
within the given tolerance range of supply voltage and given operating temperature range, and within the tuning voltage range + 0,5 to + 30 V	min. 80 dB (μV) into 75 Ω max. 100 dB (μV) into 75 Ω

Note: A tuning voltage higher than + 28 V will not be harmful for the tuner and may be applied at the user's own risk. Under this condition the published reverse voltage limit of the oscillator tuning diode will be exceeded; the oscillator frequency will never decrease with increasing tuning voltage.

Frequencies

Frequency range — channel E21 (picture carrier 471,25 MHz) to channel E69 (picture carrier 855,25 MHz). Margin at the extreme channels: min. 3 MHz.

	systems G, H	systems I, K
Intermediate frequencies		
picture	38,9 MHz	39,5 MHz
sound	33,4 MHz	33,5 MHz

The oscillator frequency is higher than the aerial signal frequency.

Note: The tuner is aligned in such a way that the i.f. frequencies of the four systems can be applied.

Wanted signal characteristics

Input impedance	
asymmetrical	75 Ω
Output impedance at the oscillator sample socket; **only valid for U342LO**	
asymmetrical	75 Ω
V.S.W.R. and reflection coefficient at picture carrier frequency, at nominal gain and at 30 dB gain reduction	
v.s.w.r.	max. 6
reflection coefficient	max. 71%
V.S.W.R. and reflection coefficient* at oscillator sample socket: **only valid for U342LO**	
v.s.w.r. at $f_{osc} < 600$ MHz	max. 4 (typ. 3)
v.s.w.r. at $f_{osc} > 600$ MHz	max. 4 (typ. 2)
reflection coefficient at $f_{osc} < 600$ MHz	max. 60% (typ. 50%)
reflection coefficient at $f_{osc} > 600$ MHz	max. 50% (typ. 33%)
R.F. curves, bandwidth	typ. 18 MHz
R.F. curves, tilt (only for i.f. 38,9/33,4 MHz)	on any channel the amplitude difference between the top of the r.f. resonant curve and the picture frequency, the sound frequency, or any frequency between them will not exceed 3 dB at nominal gain, and 4 dB in the a.g.c. range between nominal gain and 20 dB gain reduction.
A.G.C. range	min. 30 dB

* Measured in operational and non-operational condition of the tuner.

Power gain (see also Measuring method of power gain)	min.	20 dB
channel E21	typ.	25 dB
channel E40	typ.	24 dB
channel E69	typ.	27 dB
Gain difference between any two channels	typ.	4 dB
Noise figure	max.	10 dB
channel E21	typ.	6 dB
channel E40	typ.	6 dB
channel E69	typ.	6,5 dB

Overloading

Input signal producing 1 dB gain compression at nominal gain	typ.	90 dB (μV) into 75 Ω
Input signal producing either a detuning of the oscillator of +300 kHz or −1000 kHz or stopping of the oscillations at nominal gain	typ.	100 dB (μV) into 75 Ω

Unwanted signal characteristics

Image rejection (measured at picture carrier frequency) channels E21 to E60	min.	46 dB; typ. 53 dB
Harmonic content of oscillator sample; **only valid for U342LO** Suppression of harmonics which fall into the frequency range below 1200 MHz (second harmonics of fundamentals below 600 MHz)	min.	15 dB (typ. 20 dB) below oscillator fundamental
R.F. rejection at oscillator sample socket; **only valid for U342LO** Signal voltage at oscillator sample socket (input signals of wanted frequency 70 dB (μV) into 75 Ω; tuner operating at nominal gain)	min.	17 dB (typ. 24 to 34 dB) below oscillator fundamental
I.F. rejection (measured at picture carrier and colour sub-carrier frequency)	min.	60 dB
I.F. rejection at oscillator sample socket; **only valid for U342LO** I.F. signals at oscillator sample socket (converted from input signals of wanted frequency 70 db (μV) into 75 Ω; tuner operating at nominal gain)	min.	20 dB (typ. 35 dB) below oscillator fundamental

N ± 4 rejection Interference signal for an interference ratio of 53 dB referred to wanted picture carrier (picture to sound carrier ratio of 10 dB; wanted signal 60 dB(μV); tuner operating at nominal gain)	typ. 80 dB (μV) into 75 Ω

Cross modulation
Input signal producing 1% cross modulation, i.e. 1% of the modulation depth of the interfering signal is transferred to the wanted signal.

In channel cross modulation (wanted signal: picture carrier frequency; interfering signal: sound carrier frequency)

at nominal gain (wanted input level 60 dB (μV))	typ. 80 dB (μV) into 75 Ω
at 26 dB gain reduction (wanted input level 86 dB (μV)	typ. 100 dB (μV) into 75 Ω

In band cross modulation (wanted signal: picture carrier of channel N; interfering signal: picture carrier of channel N ± 5)

at nominal gain (wanted input level 60 dB (μV))	typ. 92 dB (μV) into 75 Ω
at 26 dB gain reduction (wanted input level 86 dB (μV))	typ. 100 dB (μV) into 75 Ω

Out of band cross modulation, at nominal gain

v.h.f. I	min. 108 dB (μV) into 75 Ω
v.h.f. III	min. 108 dB (μV) into 75 Ω

Unwanted signal handling capability (visibility test) for channel combinations

v.h.f.: N ± 1, N ± 5, N + 11 u.h.f.: N ± 1, N ± 5, N + 9	according to the requirements of Amtsblatt DBP68/1979, item 5.1.2.

Oscillator characteristics

Pulling Input signal of tuned frequency producing a shift of the oscillator frequency of 10 kHz, at nominal gain	typ. 80 dB (μV) into 75 Ω
Shift of oscillator frequency at a change of the supply voltage of 5%	max. 550 kHz

Drift of oscillator frequency

during warm-up time (after the tuner has been completely out of operation for 15 min, measured between 5 s and 15 min after switching on) — max. 250 kHz

during warm-up time (after the input stage is in operation for 15 min, measured between 2 s and 15 min after switching on the oscillator/i.f. stage) — max. 250 kHz

at a change of the ambient temperature from + 25 to + 40 °C (measured after 3 cycles from + 25 to + 55 °C)

	U342	U342LO
channels E21 to E60	max. 500 kHz	max. 500 kHz
channels E61 to E65	max. 650 kHz	max. 800 kHz
channels E66 to E69	max. 750 kHz	max. 1000 kHz

I.F. characteristics

Bandwidth of i.f. output circuit — $5^{+1}_{-0,5}$ MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 6; tuning voltage 15 V.

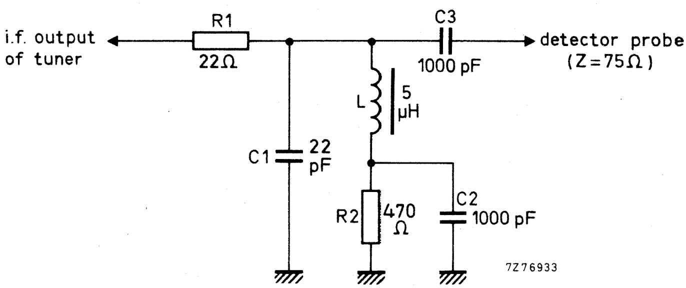


Fig. 6.

Bandwidth variation of i.f. output circuit as a result of r.f. tuning — max. 500 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 6, i.e. a 100 pF capacitor is connected in parallel with C1; tuning voltage 15 V.

Detuning of the i.f. output circuit as a result of r.f. tuning — max. 500 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 6, i.e. a 100 pF capacitor is connected in parallel with C1; tuning voltage 15 V.

Minimum tuning range of i.f. output coil	33 to 40 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 6; tuning voltage 15 V.

Attenuation between i.f. injection point and i.f. output of the tuner	typ. 23 ± 3 dB

Miscellaneous

Radio interference Oscillator radiation and oscillator voltage at the aerial terminal	Within the limits of C.I.S.P.R. 13 (1975), VDE 0872/7.72 and Amtsblatt DBP68/ 1979*
Microphonics	There will be no microphonics, provided the tuner is installed in a professional manner.
Surge protection Protection against voltages	max. 5 kV

Note: Three discharges of a 470 pF capacitor into the aerial terminal.

Protection against flashes	max. 30 kV, 400 mWs

Note: A flashover circuit producing flashes with frequencies of 1 to 20 Hz for 30 s is connected to the aerial terminal.

* For U342LO: when the oscillator sample socket is either open or terminated with a coaxial plug (75 Ω impedance, e.g. type 3/2-50, Daut und Rietz).

ADDITIONAL INFORMATION

I.F. injection

The tuner is provided with an i.f. injection point at the collector of the i.f. transistor (coupled via a small capacitor to terminal 7). The i.f. generator can be connected directly to this point (Fig. 7).
The tuner needs normal supply voltages and a tuning voltage of 15 V; the i.f. output should be loaded with the circuit shown in Fig. 6.

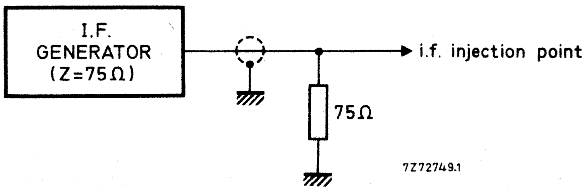


Fig. 7.

Connection of the i.f. amplifier

The tuner needs a d.c. path from the i.f. output terminal (10) to earth, preferably via a choke of approx. 5 μH outside the tuner (Fig. 8). Where the tuner is used in combination with a v.h.f. tuner, this choke can be common for both tuners; a resistor in series with the choke can make ineffective the i.f. output circuit of the switched-off tuner. For damping the i.f. output circuit and matching the i.f. output impedance of the tuner to the i.f. amplifier, a series resistor and a parallel capacitor as shown in Fig. 8 should be used.

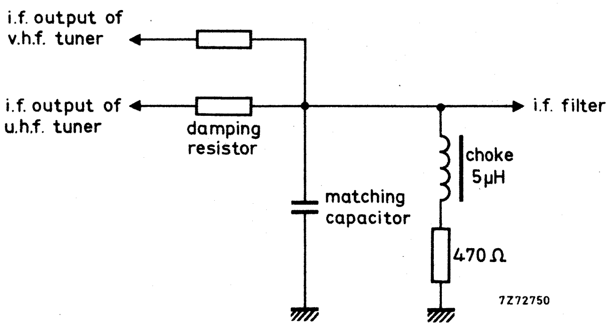


Fig. 8.

Measuring method of power gain

The i.f. output of the tuner should be terminated with the RC-circuit given in Fig. 6.

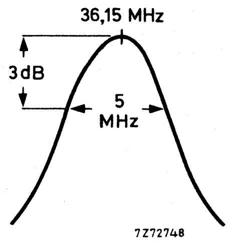


Fig. 9.

The RC-circuit roughly matches the i.f. output impedance to 75 Ω at the resonant frequency of the i.f. output circuit, which should be tuned to 36,15 MHz; the bandwidth should be approx. 5 MHz (Fig. 9).

Because the input and output impedances of the tuner are now 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and RC-circuit between a 75 Ω source and a 75 Ω detector.

Alignment of the i.f. output coil

The i.f. output coil should be adjusted with a brass tool with a blade as shown in Fig. 10. A suitable tool is available under catalogue number 7122 005 47680.

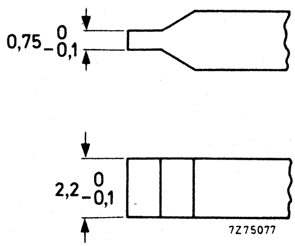


Fig. 10.

ACCESSORIES

Connector assembly for use of tuner U342 or U342LO in combination with v.h.f. tuner V317 or V334:
connector, catalogue number 3112 200 20720;
washer, catalogue number 3112 221 01220;
clamp, catalogue number 3112 274 13220.

U.H.F. TELEVISION TUNER

with diode tuning

QUICK REFERENCE DATA

Systems	L (standard)
Channels	E21 to E69
Intermediate frequencies	
picture	32.7 MHz
sound	39.2 MHz

APPLICATION

This tuner covers u.h.f. channels E21 to E69 to meet the special requirements of television sets in France.

DESCRIPTION

The UF5 is a u.h.f. tuner with electronic tuning, covering the u.h.f. band from 470 to 860 MHz (channels E21 to E69).
The tuner circuit is built on a printed wiring board, and enclosed in a metal housing comprising a rectangular frame with front and rear covers. (See Fig. 2).
A shielded aerial lead is fitted to one of the shorter sides of the frame, all the other terminals (supply-input stage, a.g.c., tuning voltage, supply for oscillator and i.f. stage, i.f. injection and i.f. output) are made via connecting pins in the underside. Mounting is as shown in Figs 2 and 3.
Electrically, the tuner consists of an input circuit with high pass characteristic, followed by a transistor in grounded base configuration (see Fig. 1). The collector load of the input transistor is formed by a double tuned circuit with inductive bottom end coupling to the mixer stage. The i.f. signal, originated in the mixer stage, is amplified by a second transistor in grounded base configuration.
3-variable capacitance diodes tune the double tuned circuit and the oscillator.
The i.f. output signal is extracted from the low end of the double-tuned output circuit.
A d.c. path to ground for the collector current of the i.f. transistor is provided inside the tuner.
The sound i.f. frequency is 39,2 MHz and the vision i.f. frequency is 32,7 MHz.

CIRCUIT DIAGRAM

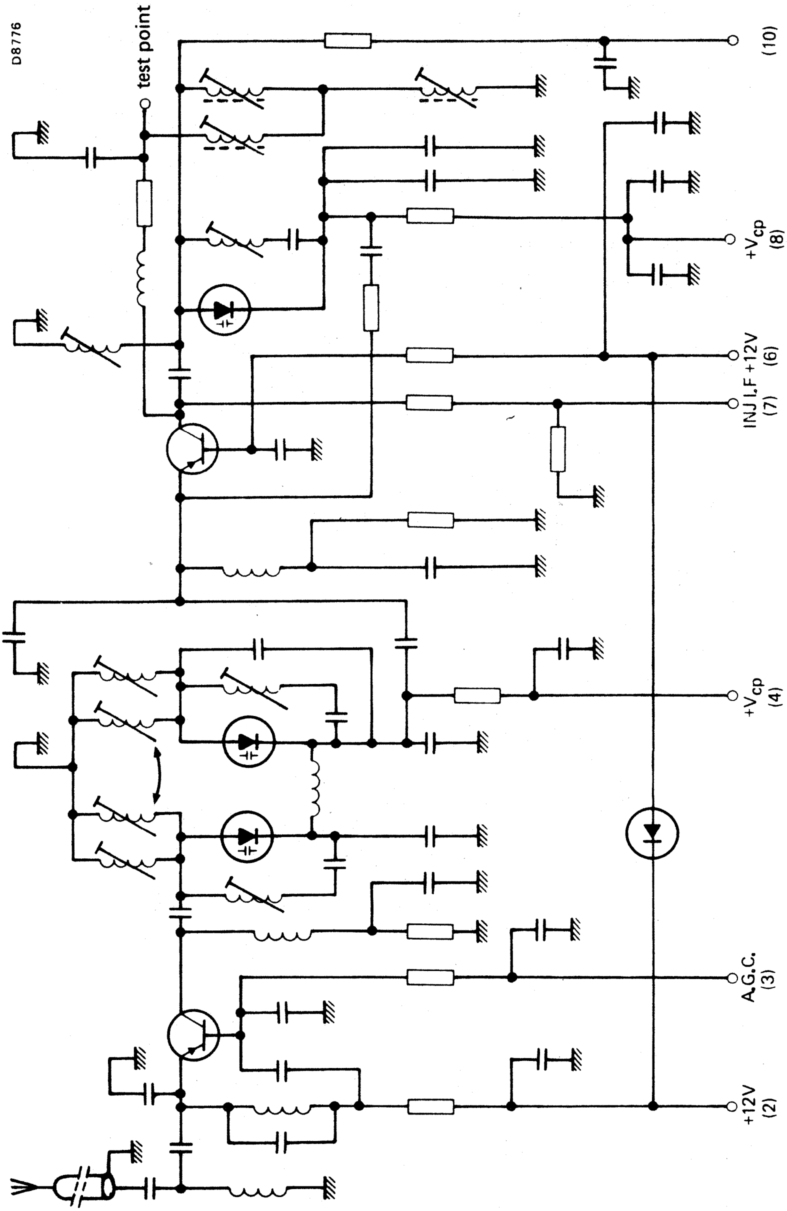


Fig. 1.

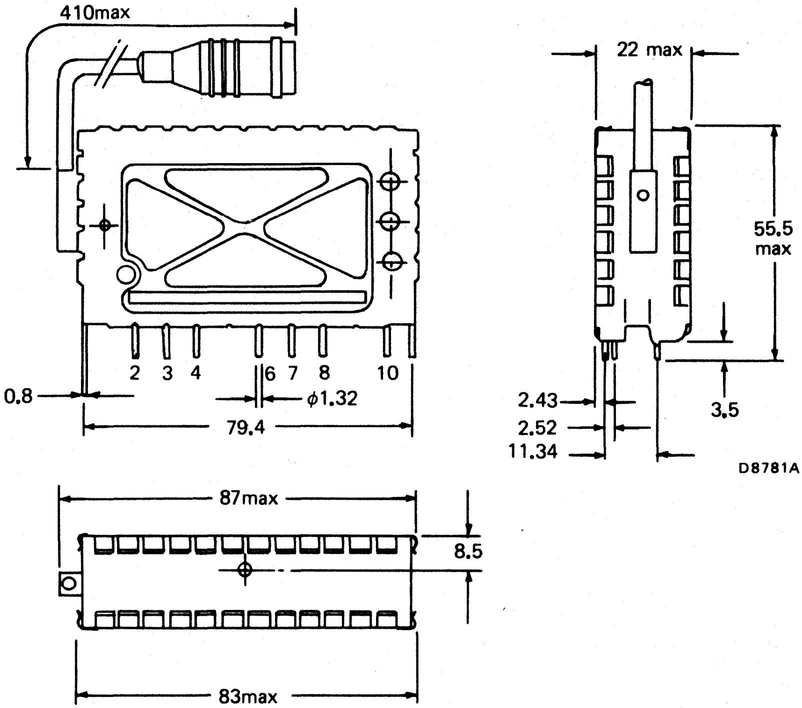


Fig. 2.

2 = r.f. supply voltage +12 V
3 = a.g.c. voltage +3.7 V to +8.5 V.
4 = tuning voltage r.f. +1 to +28 V
6 = oscillator/i.f. supply voltage, +12 V.
7 = i.f. injection point.
8 = tuning voltage oscillator +1 to +28 V.
10 = i.f. output

Mass approx. 75 g

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, with connections as shown by the piercing diagram in Fig. 3. (The tuner may also be mounted in a socket. Information will be supplied upon request).
It is recommended that the tuner be installed in a cool part of the receiver cabinet and not exposed to the vibrations of the loudspeaker. There are no restrictions on orientation.
The solderability of the terminals and mounting tabs is according to IEC 68-2, test Ta (230 ± 10 °C, 2 ± 0.5 s). The resistance to soldering heat is according to IEC 68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

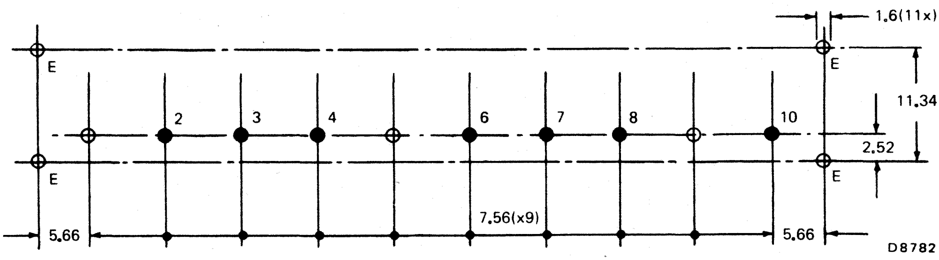


Fig. 3.

ELECTRICAL DATA

The electrical values are measured on the u.h.f. tuner alone. Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C, a relative humidity of 60 ± 15%, a supply voltage of 12 ± 0.3 V and an a.g.c. current of −9 mA ± 0.2 mA.
Within the given tolerance range of supply voltage and a.g.c. current, only insignificant deviations from the specified values can be expected.
Under the extreme conditions of temperature and humidity as given below, the tuner will function normally, but some specified limits may be exceeded.

Voltages and currents

Supply voltage	+12 V ± 1 V
Current drawn from 12 V supply	
current at nominal gain	typ. 8 mA
current at 30 dB gain reduction	typ. 13 mA
A.G.C. voltage	
at nominal gain	8.5 V
at 30 dB gain reduction	5.8 V
For a.g.c. characteristics see Fig.4	
Tuning voltage range	+0.3 to +28 V
Current drawn from +28 V tuning voltage supply	max. 0.5 μA
Slope of tuning characteristics see Fig.5	

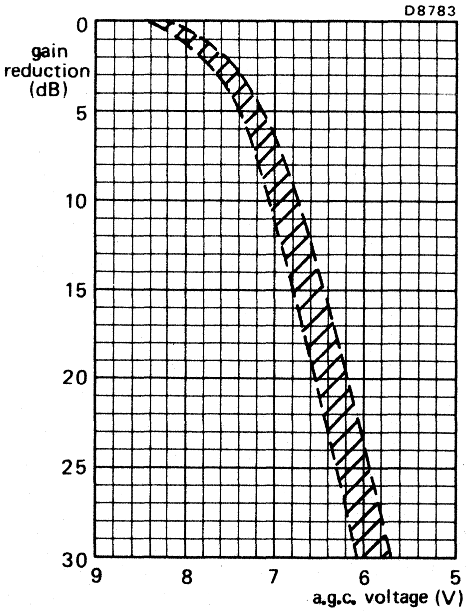


Fig. 4.

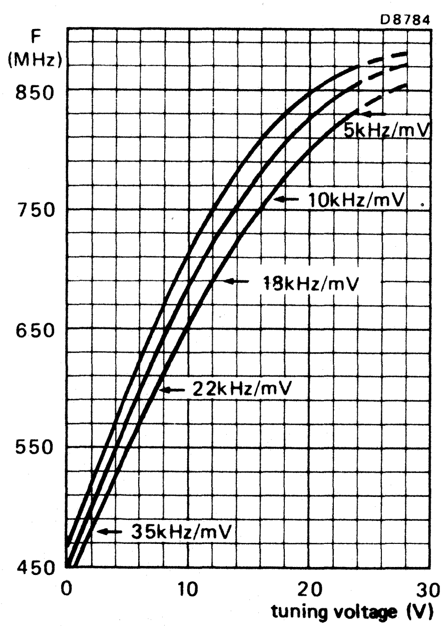


Fig. 5.

Frequencies

Frequency range	Channel 21 (vision 471.25 MHz, sound 477.75 MHz) Channel 69 (vision 855.25 MHz, sound 861.75 MHz).
Margin at extreme channels	min. 3 MHz
Intermediate frequency	
picture	32.7 MHz
sound	39.2 MHz

Wanted signal characteristics

Input impedance	
asymmetrical	75 Ω
V.S.W.R. at picture carrier frequency at nominal gain	⩾ 4 dB
R.F. bandwidth	typ. 15 dB
R.F. tilt (only for i.f. 39.2/32.7 MHz)	On any channel the amplitude difference will not exceed ± 2 dB
A.G.C. dynamic range	⩾ 30 dB
Reflection coefficient at picture carrier frequency at nominal gain	max. 66%
Power gain all channels	typ. 17 dB ⩾ 14 dB
Noise figure all channels	⩽ 9 dB typ. 6.5 dB

Unwanted signal characteristics

Image rejection (measured at picture frequency) channels 21 to 69	⩾ 32 dB typ. 43 dB
I.F. rejection (measured at picture carrier and colour sub-carrier frequency)	min. 60 dB
N ± 3 rejection	
Interference signal for an interference ratio of 53 dB referred to wanted signal (picture to sound carrier ratio of 7 dB, wanted signal 60 dB (μV): tuner operating at nominal gain)	10 dB mV

Oscillator

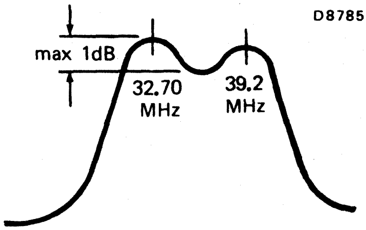
Shift of oscillator frequency at a change of the supply voltage of 1 V.	typ. 400 kHz
Shift of oscillator frequency for a change in ambient temperature of 15 ^{o}C	⩽ 550 kHz

ELECTRICAL DATA (continued)

I.F. circuit characteristics

The curve shows two peaks on the frequency characteristic curve, these peaks occur at the tuning point of the sound and vision carriers.

Vision peak at 32.7 MHz	0 dB
Sound peak at 39.2 MHz	0 ± 0.2 dB
Deviation	⩽ 1 dB



Miscellaneous

Radio interference
Oscillator radiation and oscillator voltage at aerial terminal — Within the limits of C.I.S.P.R. 24/3 (1970) and VDE 0872/7.72
For the oscillator radiation use is made of the relaxed limit of 3 mV/m (70 dBμV/m).

Microphonics

Microphony will not occur if the tuner is professionally installed.

V.H.F. TELEVISION TUNER

- with diode tuning

QUICK REFERENCE DATA

Systems	C.C.I.R. systems B and I	
Channels	system B	system I
v.h.f. I	NZ1 to E4	IA to IC
v.h.f. III	E5 to E12	ID to IJ
Intermediate frequencies		
picture	38,9 MHz	39,5 MHz
sound	33,4 MHz	33,5 MHz

APPLICATION

This tuner is designed to cover the v.h.f. channels of C.C.I.R. systems B and I. In combination with the u.h.f. tuner U322 it can be used in v.h.f./u.h.f. receivers. The aerial inputs and i.f. outputs of both tuners can then be connected in parallel without additional circuitry.

DESCRIPTION

The V311 is a v.h.f. tuner with electronic tuning, covering the v.h.f. band I (44 to 68 MHz) and the v.h.f. band III (174 to 230 MHz). Switching between the bands is done automatically by a built-in comparator circuit.

Mechanically, the tuner is built on a printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear cover (see Fig. 2). All connections (aerial, supply voltage, a.g.c. voltage, tuning voltage, i.f. injection, i.f. output) are made via terminals on the under side. The mounting method is shown in Fig. 3.

Electrically the tuner consists of two input circuits in parallel (bands I and III) with band-pass characteristics, followed by a p-i-n diode attenuator (2 diodes BA379) and the input transistor AF379 in grounded-base configuration. This transistor operates at an emitter current of about 4 to 12 mA, featuring good noise figures and good signal handling properties. It also supplies the current drive for the p-i-n diode attenuator, controlled by an a.g.c. voltage fed to the transistor's base. This combination has good signal handling properties throughout the a.g.c. range.

The collector load of the input transistor is formed by a double tuned circuit, transferring the signal to the self-oscillating mixer AF367. The selectivity of this circuit at the intermediate frequency has been improved.

Four capacitance diodes BB106 tune the double-tuned circuit and the oscillator.

The i.f. output circuit of the tuner is a single tuned one, at the low end of which the i.f. signal is coupled out of the tuner. A d.c. path to earth for the collector current of the mixer has to be provided outside the tuner, preferably by a choke of about 5 μH. Damping of the i.f. output circuit and matching of the i.f. output to the i.f. circuit of the receiver can be achieved by connecting a series resistance and a parallel capacitance outside the tuner.

An i.f. injection point has been provided at the collector of the mixer transistor, connected to terminal S.

A comparator circuit supplying the automatic switching-over between bands I and III consists of two p-n-p transistors, the emitters of which have the same stabilized 5,6 V reference voltage, thereby supplying a very good temperature and supply voltage dependence. The voltage divider at the input of the circuit consists of two high-ohmic resistors to prevent unacceptable loading of the tuning voltage.

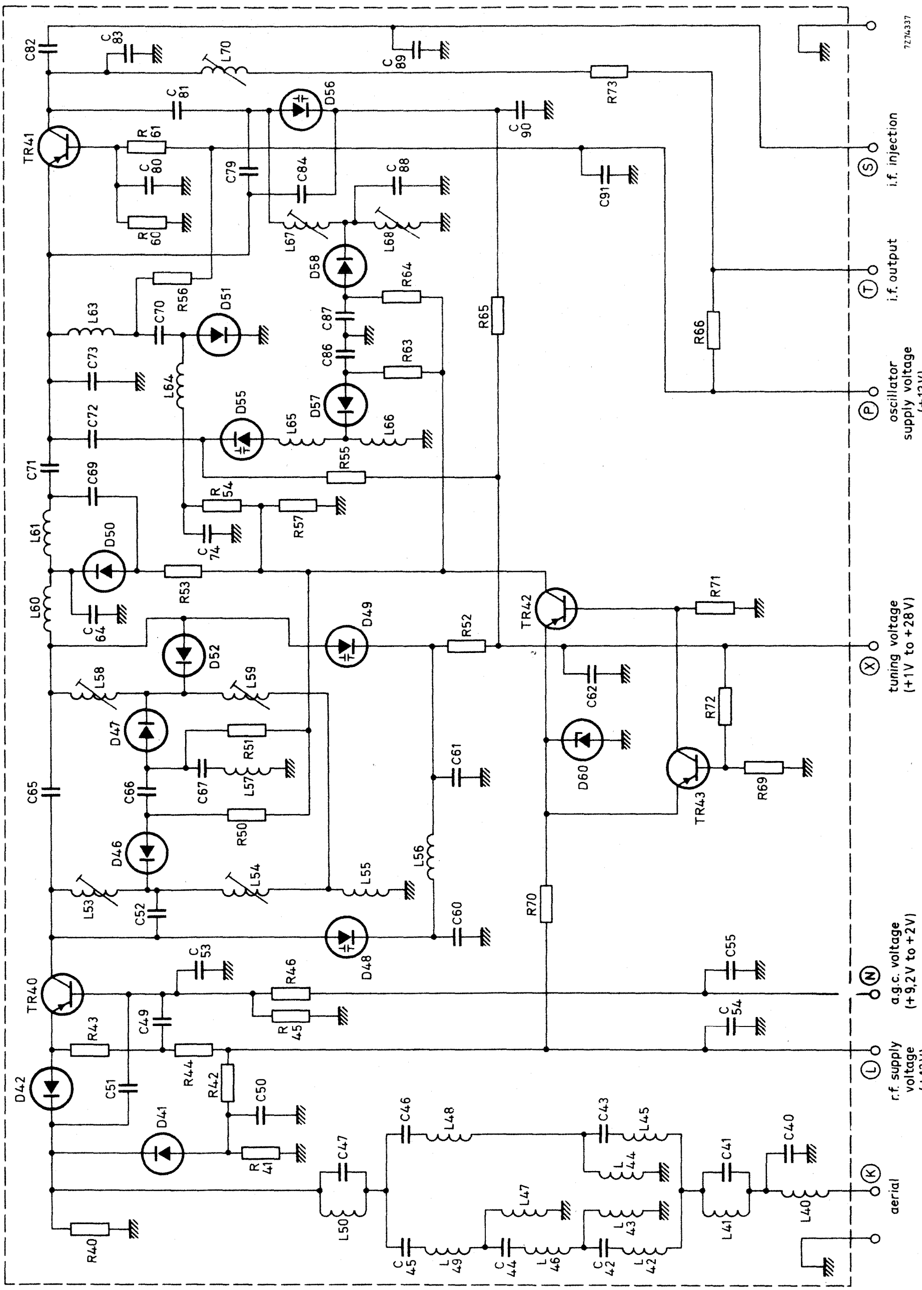

7Z74337
Ⓢ i.f. injection
Ⓣ i.f. output
Ⓟ oscillator supply voltage (+12V)
Ⓧ tuning voltage (+1V to +28V)
Ⓝ a.g.c. voltage (+9,2V to +2V)
Ⓛ r.f. supply voltage (+12V)
Ⓚ aerial

Fig. 1.

MECHANICAL DATA

Dimensions in mm

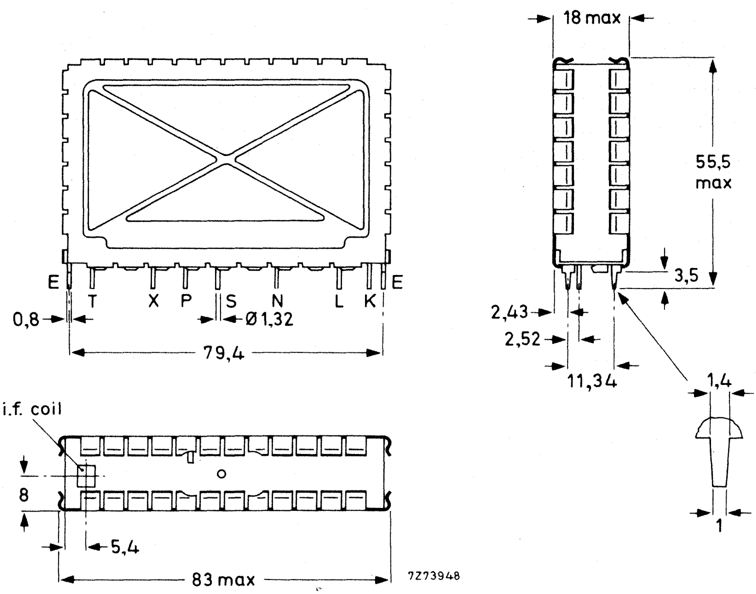


Fig. 2a.

Terminal T = i.f. output
X = tuning voltage, + 1 to + 28 V
P = self-oscillating mixer supply voltage, + 12 V
S = i.f. injection point
N = a.g.c. voltage, + 9,2 to + 2 V
L = r.f. supply voltage, + 12 V
K = aerial

Note
When the tuner is operated together with a u.h.f. tuner, only the supply voltage at terminal P should be switched off during u.h.f. operation.

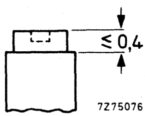


Fig. 2b I.F. output coil.
Torque for alignment: 2 to 15 mNm
Press-through force: ≥ 10 N

Mass approx. 80 g

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, using the piercing diagram shown in Fig. 3. (The tuner may also be mounted by means of a socket. Information will be supplied upon request).

It is recommended that the tuner be installed in the cool part of the receiver cabinet and not exposed to the vibrations of the loudspeaker. There are no restrictions on orientation.

The solderability of the terminals and mounting tabs is according to IEC 68-2, test Ta (230 ± 10 °C, 2 ± 0,5 s). The resistance to soldering heat is according to IEC 68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

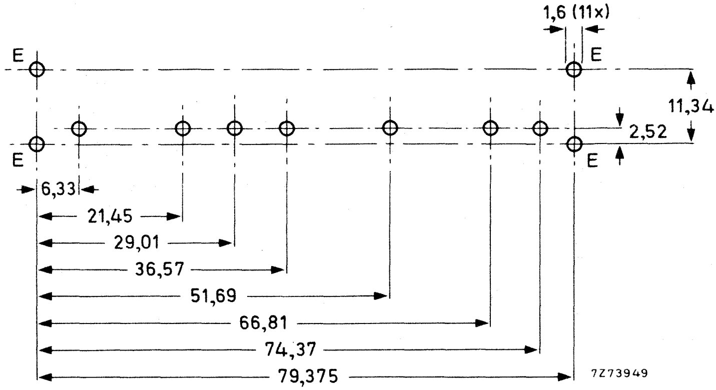


Fig. 3 Piercing diagram viewed from solder side of board.

ELECTRICAL DATA

The electrical values are measured on the v.h.f. tuner alone, but they are also valid for the v.h.f. tuner in combination with a u.h.f. tuner U322.

Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C, a relative humidity of 60 ± 15%, a supply voltage of 12 ± 0,3 V and an a.g.c. voltage of 9,2 ± 0,2 V.

Within the given tolerance range of supply voltage and a.g.c. voltage only insignificant deviations from the specified values can be expected.

Under the extreme conditions of temperature and humidity as given below, the tuner will function normally, but some specified limits may be exceeded.

General

Semiconductors	
p-i-n diodes	2 x BA379
r.f. amplifier	AF379
self-oscillating mixer	AF367
tuning diodes	4 x BB106
switching diodes	BA220; 6 x BA243
bandswitch comparator	BZX79; 2 x BC558
Ambient temperature range	
operating	+ 5 to + 55 °C
storage	–25 to + 85 °C
Relative humidity	max. 90%

Voltages and currents

Supply voltage	+ 12 V ± 10%

Note
The supply voltage at terminal L (input stage) should be filtered to avoid hum modulation in one of the p-i-n diodes when the attenuator is biased to higher attenuation ratios.

Current drawn from + 12 V supply	
r.f. amplifier + bandswitch circuit	
v.h.f. I, at nominal gain	typ. 40 mA
at 40 dB gain reduction	typ. 42 mA
v.h.f. III, at nominal gain	typ. 40 mA
at 40 dB gain reduction	typ. 42 mA
self-oscillating mixer	typ. 4,5 mA

Bandswitching

Switching between v.h.f. I and v.h.f. III is done automatically within the tuner. If the tuner operates together with a u.h.f. tuner only the supply voltage at terminal P should be switched off during u.h.f. operation.

A.G.C. voltage (Figs 4, 5 and 6)	
at nominal gain	+ 9,2 ± 0,5 V
at 40 dB gain reduction	min. + 2 V

Note
A.G.C. voltages between 0 and + 10 V may be applied without risk of damage.

A.G.C. current (Fig. 7), during gain control	
(0 to 40 dB)	max. + 1 mA
at nominal gain	typ. + 0,8 mA
at 40 dB gain reduction	typ. + 0,2 mA
Tuning voltage range (Fig. 8)	+ 1 to + 28 V
Current drawn from + 28 V tuning voltage supply (Fig. 9)	–4 to + 11 μA

Note
The source impedance of the tuning voltage offered to terminal X must be max. 47 kΩ.

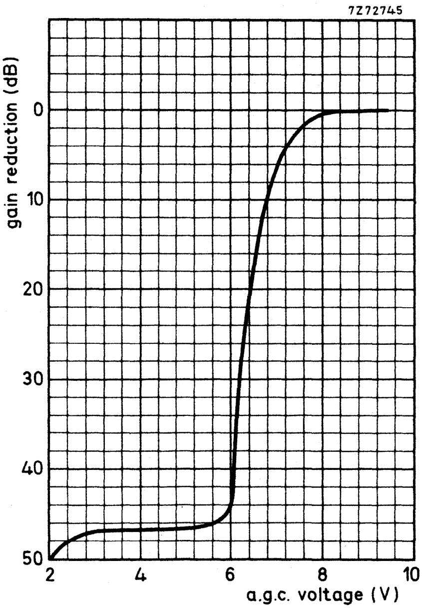


Fig. 4 A.G.C. voltage characteristic, channel E2; typical curve.

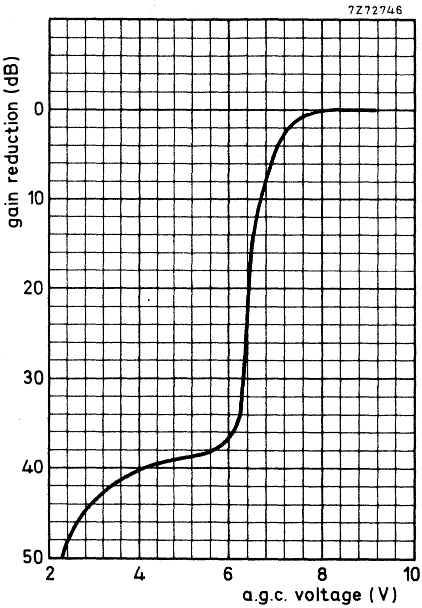


Fig. 5 A.G.C. voltage characteristic, channel E5; typical curve.

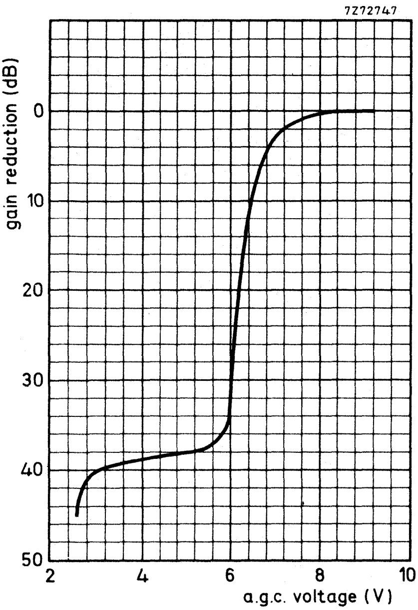


Fig. 6 A.G.C. voltage characteristic, channel E12; typical curve.

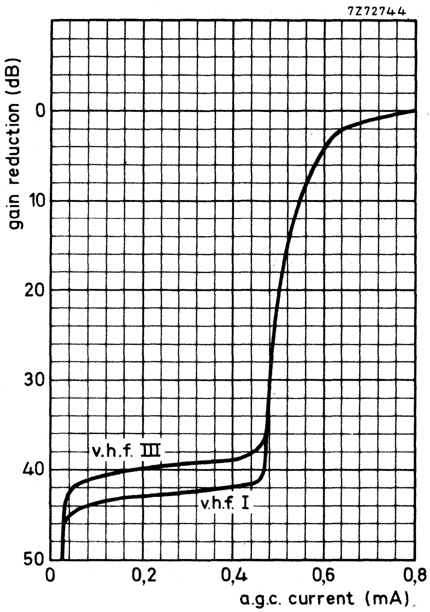


Fig. 7 A.G.C. current characteristic; typical curves.

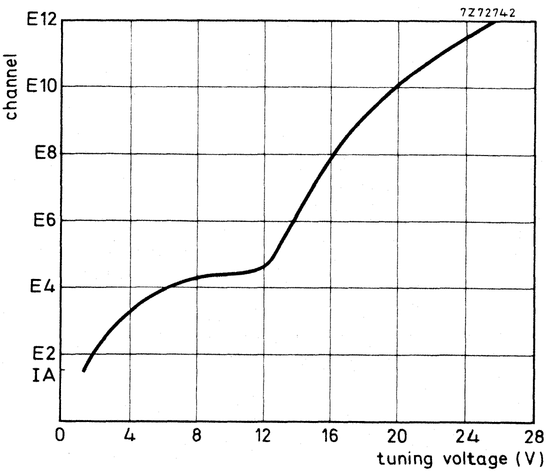


Fig. 8 Tuning voltage characteristic; typical curve.

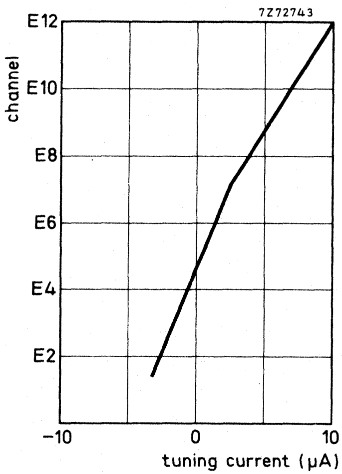


Fig. 9 Tuning current characteristic; typical curve.

Frequencies

Frequency ranges		
v.h.f. I	channel NZ1 (picture carrier 45,25 MHz) to channel E4 (picture carrier 62,25 MHz). Margin at the extreme channels: min. 1 MHz.	
v.h.f. III	channel E5 (picture carrier 175,25 MHz) to channel E12 (picture carrier 224,25 MHz). Margin at the extreme channels: min. 1,5 MHz.	
Intermediate frequencies	system B	system I
picture	38,9 MHz	39,5 MHz
sound	33,4 MHz	33,5 MHz

The oscillator frequency is higher than the aerial signal frequency.

Note
The tuner is aligned in such a way that the i.f. frequencies of both systems can be applied.

Wanted signal characteristics

Input impedance, asymmetrical	75 Ω	
	minimum value between picture carrier and sound carrier frequency	maximum value at picture carrier frequency
V.S.W.R.	max. 4	max. 4
Reflection coefficient	max. 60%	max. 60%
A.G.C. range	min. 40 dB	
R.F. curves		
bandwidth	typ. 10 MHz	
tilt (only for i.f. 38,9/33,4 MHz)	on any channel the amplitude difference between the top of the r.f. resonant curve and the picture carrier marker, the sound carrier marker, or any frequency between them will not exceed 3 dB at nominal gain, and 4 dB in the a.g.c. range between nominal gain and 20 dB gain reduction.	
Power gain (see also 'Measuring method of power gain')	min. 20 dB	
channel E3	typ. 25 dB	
channel E5	typ. 25 dB	
channel E12	typ. 26 dB	
Gain difference between any two channels	typ. 4 dB	
Noise figure	max. 9 dB	
channel E3	typ. 5 dB	
channel E5	typ. 6,5 dB	
channel E12	typ. 7 dB	

Overloading

Input signal producing 1 dB gain compression at nomianl gain	typ. 88 dB (μV) into 75 Ω
Input signal producing either a detuning of the oscillator of + 300 kHz or −1000 kHz or stopping of the oscillations at nominal gain	typ. 90 dB (μV) into 75 Ω

Unwanted signal characteristics

Image rejection (measured at picture carrier frequency)	min. 53 dB
I.F. rejection (measured at picture carrier frequency) channel IA to E12	min. 60 dB

Note
At colour sub-carrier frequency max. 6 dB less rejection.

Cross-modulation
Input signal producing 1% cross-modulation, i.e. 1% of the modulation depth of the interfering signal is transferred to the wanted signal.

In channel cross-modulation (wanted signal: picture carrier frequency; interfering signal: sound carrier frequency)	
at nominal gain (wanted input level 60 dB (μV)	typ. 70 dB (μV) into 75 Ω
at 40 dB gain reduction (wanted input level 100 dB (μV)	typ. 106 dB (μV) into 75 Ω
In band cross-modulation (wanted signal: picture carrier of channel N; interfering signal: picture carrier of channel N ± 2 for v.h.f. I or channel N ± 3 for v.h.f. III	
at nominal gain (wanted input level 60 dB (μV)	typ. 94 dB (μV) into 75 Ω
at 40 dB gain reduction (wanted input level 100 dB (μV)	typ. 100 dB (μV) into 75 Ω
Out of band cross-modulation at nominal gain	
v.h.f. I, interfering from v.h.f. III	typ. 92 dB (μV) into 75 Ω
interfering from u.h.f.	typ. 100 dB (μV) into 75 Ω
v.h.f. III, interfering from v.h.f. I	typ. 100 dB (μV) into 75 Ω
interfering from u.h.f.	typ. 100 dB (μV) into 75 Ω

Oscillator characteristics

Pulling	
Input signal of tuned frequency producing a shift of the oscillator frequency of 10 kHz, at nominal gain	
v.h.f. I	typ. 73 dB (μV) into 75 Ω
v.h.f. III	typ. 73 dB (μV) into 75 Ω
Shift of oscillator frequency at a change of the supply voltage of 5%	max. 250 kHz
Drift of oscillator frequency	
during warm-up time (after the tuner has been completely out of operation for 15 min, measured between 5 s and 15 min after switching on)	max. 250 kHz
during warm-up time (after the input stage is in operation for 15 min, measured between 2 s and 15 min after switching on the self-oscillating mixer stage)	max. 250 kHz
at a change of the ambient temperature from + 25 to + 40 °C (measured after 3 cycles from + 25 to + 55 °C)	max. 300 kHz

I.F. circuit characteristics

Bandwidth of i.f. output circuit *	5 MHz
Bandwidth variation of i.f. output circuit as a result of r.f. tuning and bandswitching (reference: v.h.f. III)	max. 350 kHz

Note

I.F. output of the tuner terminated with a modified circuit of Fig. 10, i.e. a 100 pF capacitor is connected in parallel with C1 and R1 is short-circuited; tuning voltage is 15 V.

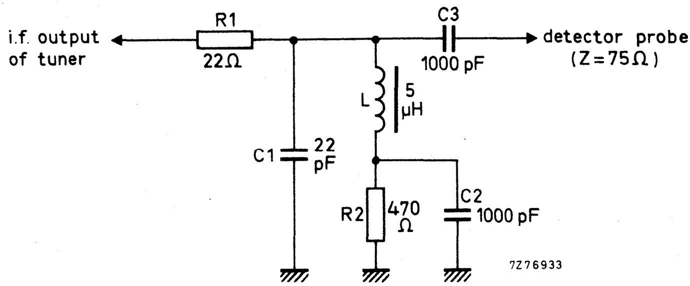


Fig. 10.

* I.F. output of the tuner terminated with the circuit shown in Fig. 10; tuning voltage is 15 V.

Detuning of the i.f. output circuit as a result of r.f. tuning and bandswitching (reference; v.h.f. III),	
excluded channel E2	max. 350 kHz
channel E2	max. 450 kHz

Note
I.F. output of the tuner terminated with a modified circuit of Fig. 10, i.e. a 100 pF capacitor is connected in parallel with C1 and R1 is short-circuited; tuning voltage is 15 V.

Tuning range of i.f. output coil *	max. 34 to min. 41 MHz
Attenuation between i.f. injection point and i.f. output of the tuner	typ. 23 dB

Miscellaneous

Radio interference	
Oscillator radiation and oscillator voltage at the aerial terminal	Within the limits of C.I.S.P.R. 24/3 (1970) and VDE 0872/7.72. For the oscillator radiation above 200 MHz use is made of the relaxed limit of 2 mV/m (66 dBμV/m).
Microphonics	There will be no microphonics, provided the tuner is installed in a professional manner.
Surge protection	
Protection against voltages	max. 8 kV

Note
Three discharges of a 470 pF capacitor into the aerial terminal.

Protection against flashes	max. 30 kV, 400 mWs

Note
A flashover circuit producing flashes with frequencies of 1 to 20 Hz for 30 s is connected to the aerial terminal.

* I.F. output of the tuner terminated with the circuit shown in Fig. 10; tuning voltage is 15 V.

ADDITIONAL INFORMATION

If the tuner is used in receivers designed for v.h.f. only, a capacitor of 5,6 pF should be applied between the aerial input and earth.

I.F. injection

The tuner is provided with an i.f. injection point at the collector of the mixer transistor (coupled via a capacitor to terminal S). The i.f. generator can be connected directly to this point (Fig. 11).

The tuner needs normal supply voltages and a tuning voltage of 15 V; the i.f. output should be loaded with the circuit shown in Fig. 10.

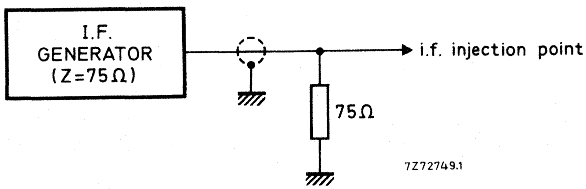


Fig. 11.

Connection of the i.f. amplifier

The tuner needs a d.c. path from the i.f. output terminal (T) to earth, preferably via a choke of approx. 5 μH outside the tuner (Fig. 12).

In the case where the tuner is used in combination with a u.h.f. tuner, this choke can be common for both tuners; a resistor in series with the choke can make ineffective the i.f. output circuit of the switched off tuner. For damping the i.f. output circuit and matching the i.f. output impedance of the tuner to the i.f. amplifier, a series resistor and a parallel capacitor as shown in Fig. 12 should be used.

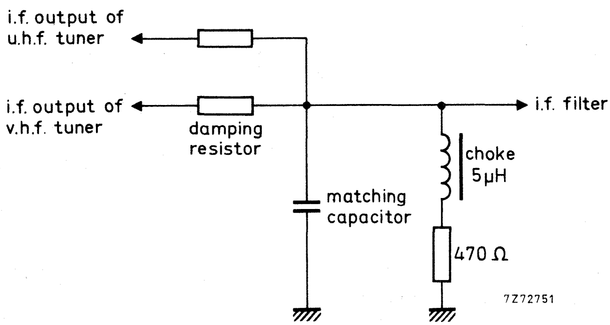


Fig. 12.

Measuring method of power gain

The i.f. output of the tuner should be terminated with the RC-circuit given in Fig. 10.

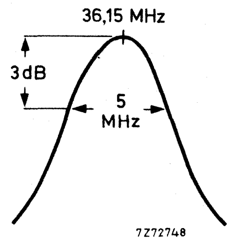


Fig. 13.

The RC-circuit roughly matches the i.f. output impedance to 75 Ω at the resonant frequency of the i.f. output circuit, which should be tuned to 36,15 MHz; the bandwidth should be approx. 5 MHz (Fig. 13).

Because the input and output impedances of the tuner are now 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and RC-circuit between a 75 Ω source and a 75 Ω detector.

Alignment of the i.f. output coil

The i.f. output coil should be adjusted with a brass tool with a blade as shown in Fig. 14. A suitable tool is available under catalogue number 7122 009 47680.

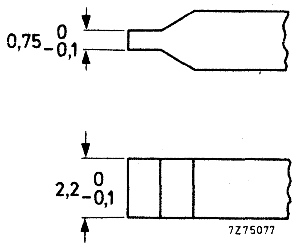


Fig. 14.

ACCESSORIES

Connector assembly for use of tuner V311 in combination with u.h.f. tuner U322:
connector, catalogue number 3112 200 20720;
washer, catalogue number 3112 221 01220;
clamp, catalogue number 3112 274 13220.

V.H.F. TELEVISION TUNERS

QUICK REFERENCE DATA

Systems	C.C.I.R. systems B and G
Channels	
v.h.f. I	NZ1 to R4
v.h.f. III	Morocco 4 to E12
Intermediate frequencies	
picture	38,9 MHz
sound	33,4 MHz

APPLICATION

These tuners are designed to cover the v.h.f. channels of C.C.I.R. systems B and G, including the Italian and Moroccan channels.

In combination with the u.h.f. tuner U322 or U322LO respectively, they can be used in v.h.f./u.h.f. receivers. The aerial inputs and i.f. outputs of both tuners can then be connected in parallel without additional circuitry.

The tuners are compatible with tuner V315. They are also compatible with tuner V311 except for the band switching.

The V314LO is a special version of the V314; an output voltage from the local oscillator is made available for driving digital tuning systems. Apart from this the tuners are identical.

DESCRIPTION

The V314 is a v.h.f. tuner with electronic tuning, covering the v.h.f. band I (44 to 92 MHz) and the v.h.f. band III (162 to 230 MHz). Switching between the bands is done by connecting the supply voltage to terminal V for band I and to terminal P for band III.

Mechanically, the tuner is built on a printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear cover (see Fig. 2a). All connections (aerial, supply voltage, a.g.c. voltage, tuning voltage, i.f. injection, i.f. output) are made via terminals on the underside. The mounting method is shown in Fig. 3. Tuner V314LO has a coaxial socket on the top of the frame for coupling out the oscillator sample.

Electrically the tuner consists of two input circuits in parallel (bands I and III) with band-pass characteristics, followed by a P-I-N diode attenuator (2 diodes BA379) and the input transistor BF979 in grounded-base configuration. This transistor operates at an emitter current of about 4 to 12 mA, featuring good noise figures and good signal handling properties. It also supplies the current drive for the P-I-N diode attenuator, controlled by an a.g.c. voltage fed to the transistor's base. This combination has good signal handling properties throughout the a.g.c. range. The collector load of the input transistor is formed by a double tuned circuit, transferring the signal to the self-oscillating mixer BF967. The selectivity of this circuit at the intermediate frequency has been improved. Three capacitance diodes BB109 tune the double tuned circuit and the oscillator.

The i.f. output circuit of the tuner is a single tuned one, at the low end of which the i.f. signal is coupled out of the tuner. A d.c. path to earth for the collector current of the mixer has to be provided outside the tuner, preferably by a choke of about 5 μH. Damping of the i.f. output circuit and matching of the i.f. output to the i.f. circuit of the receiver can be chieved by connecting a series resistance and a parallel capacitance outside the tuner.

An i.f. injection point has been provided at the collector of the mixer transistor, connected to terminal S.

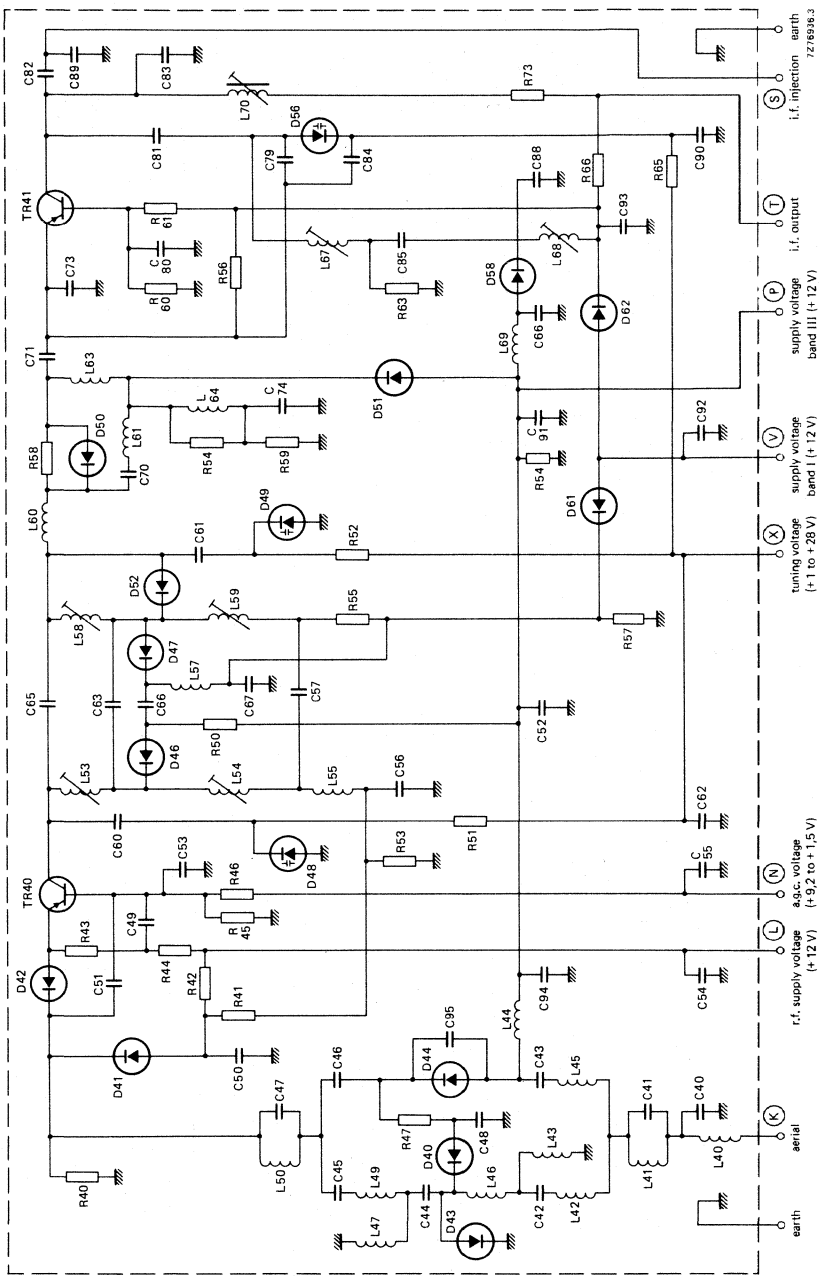


Fig. 1a Diagram of tuner V314.

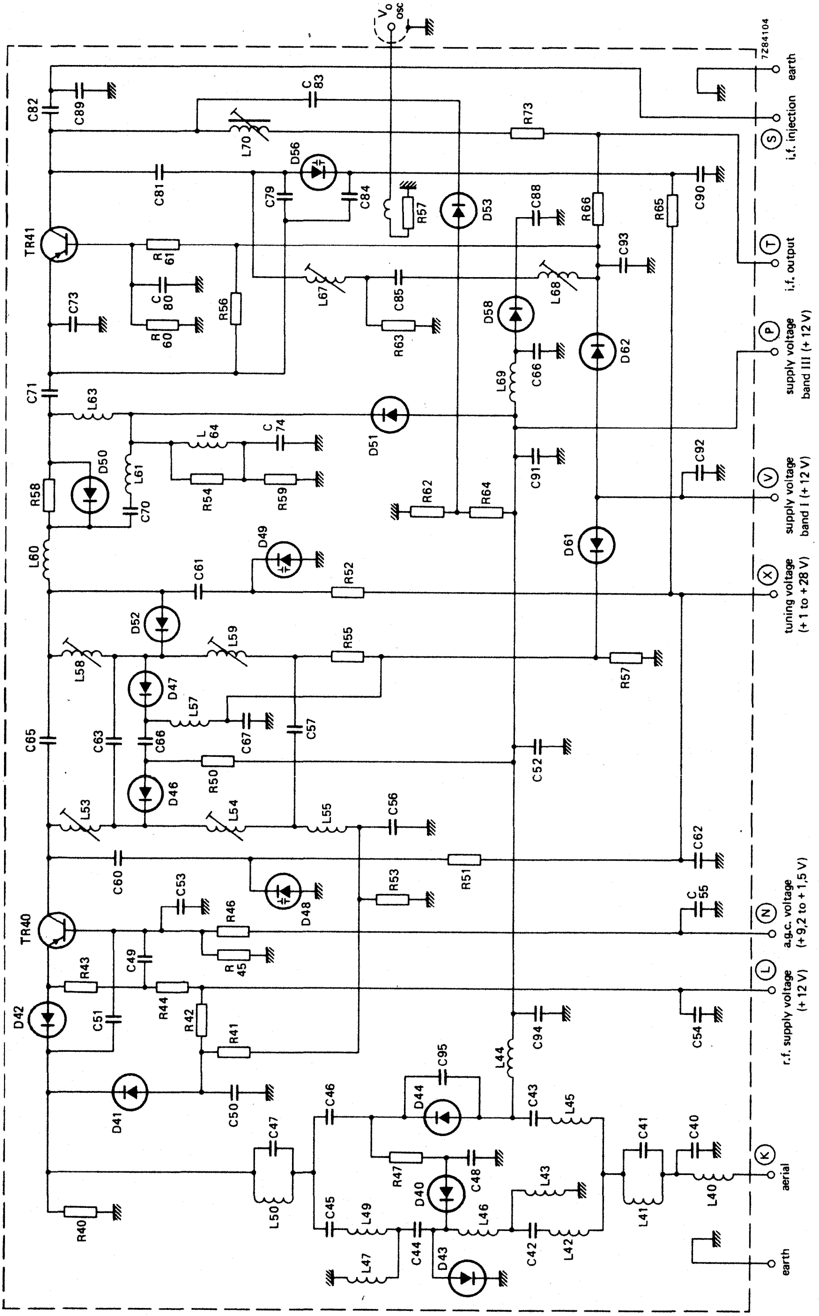


Fig. 1b Diagram of tuner V314LO.

MECHANICAL DATA

Dimensions in mm

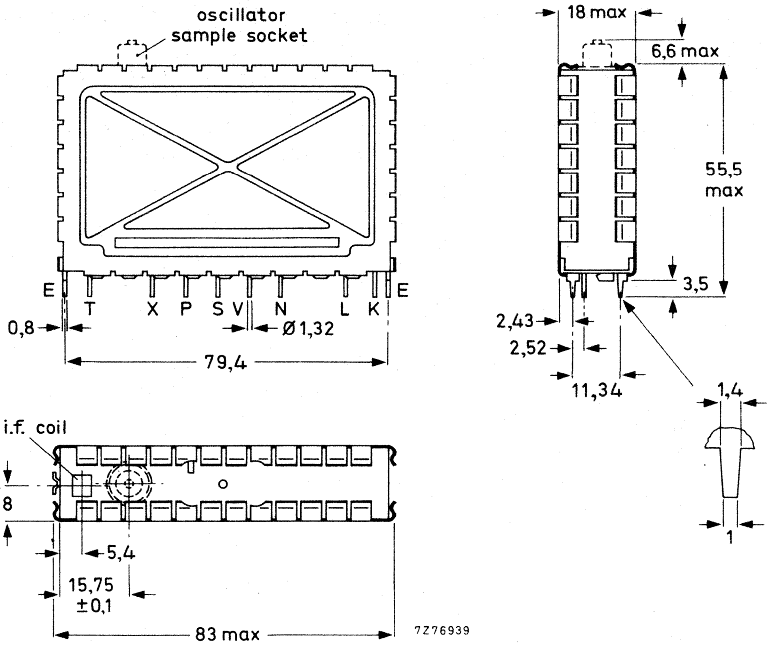


Fig. 2a The oscillator sample socket, drawn with dotted lines, applies only to tuner V314LO.

Terminal T = i.f. output
X = tuning voltage, + 1 to + 28 V
P = supply voltage, band III, + 12 V
S = i.f. injection point
V = supply voltage, band I, + 12 V
N = a.g.c. voltage, + 9,2 to + 1,5 V
L = r.f. stage supply voltage, + 12 V
K = aerial

Note: When the tuner is operated together with a u.h.f. tuner, only the supply voltage at terminals P and V should be switched off during u.h.f. operation.

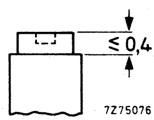


Fig. 2b I.F. output coil.
Torque for alignment: 2 to 15 mNm
Press-through force : ≥ 10 N

Mass approx. 80 g

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, with connections as shown by the piercing diagram in Fig. 3. (The tuner may also be mounted in a socket. Information will be supplied upon request.)

It is recommended that the tuner be installed in a cool part of the receiver cabinet and not exposed to the vibrations of the loudspeaker. There are no restrictions on orientation.

The solderability of the terminals and mounting tabs is according to IEC 68-2, test Ta (230 ± 10 °C, 2 ± 0,5 s). The resistance to soldering heat is according to IEC 68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

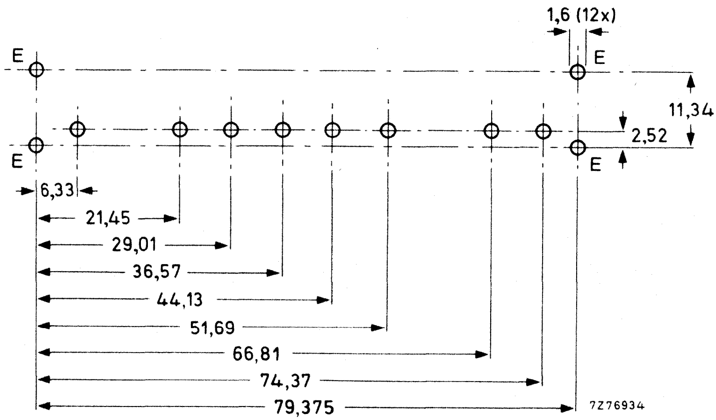


Fig. 3 Piercing diagram viewed from solder side of board.

→ A coaxial plug has to be used for connection to the socket on the top of the tuner V314LO; type 3/2-50 (manufacturer: Daut und Rietz) is recommended.

ELECTRICAL DATA

The electrical values are measured on the v.h.f. tuner alone, but they are also valid for the v.h.f. tuner in combination with a u.h.f. tuner U322 or U322LO respectively. Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C, a relative humidity of 60 ± 15%, a supply voltage of 12 ± 0,3 V and an a.g.c. voltage of 9,2 ± 0,2 V.

Within the given tolerance range of supply voltage and a.g.c. voltage only insignificant deviations from the specified values can be expected. Under the extreme conditions of temperature and humidity as given below, the tuner will function normally, but some specified limits may be exceeded.

General

Semiconductors	
P-I-N diodes	2 x BA379
r.f. amplifier	BF979
self-oscillating mixer	BF967
tuning diodes	3 x BB109
switching diodes	7 x BA482, 3 x BA220
protection diode	BA220
Ambient temperature range	
operating	+ 5 to + 55 °C
storage	−25 to + 85 °C
Relative humidity	max. 90%

Voltages and currents

Supply voltage	+ 12 V ± 10%

Note: The supply voltage at terminals P and V should be filtered.

Current drawn from + 12 V supply	
r.f. amplifier, v.h.f. I, at nominal gain	typ. 11 mA
v.h.f. I, at 40 dB gain reduction	typ. 16 mA
r.f. amplifier, v.h.f. III, at nominal gain	typ. 11 mA
v.h.f. III, at 40 dB gain reduction	typ. 16 mA
self-oscillating mixer, terminal P	typ. 12,5 mA
terminal V	typ. 7 mA

Band switching

For operation in band I the supply voltage must be connected to terminal V, for band III operation to terminal P. If the tuner operates together with a u.h.f. tuner only the supply voltage at terminals P and V should be switched off during u.h.f. operation.

A.G.C. voltage (Figs 4 to 7)	
at nominal gain	+ 9,2 ± 0,5 V
at 40 dB gain reduction	min. + 1,5 V

Note: A.G.C. voltages between 0 and + 10 V may be applied without risk of damage.

A.G.C. current	
during gain control (0 to 40 dB)	max. + 1,5 mA
at nominal gain	typ. + 0,8 mA
at 40 dB gain reduction	typ. −0,2 mA
Tuning voltage range (Figs 8 and 9)	+ 1 to + 28 V
Current drawn from + 28 V tuning voltage supply	
at 25 °C	max. 150 nA
at 55 °C	max. 600 nA

Note: The source impedance of the tuning voltage offered to terminal X must be maximum 47 kΩ.

Switching current	max. 16 mA

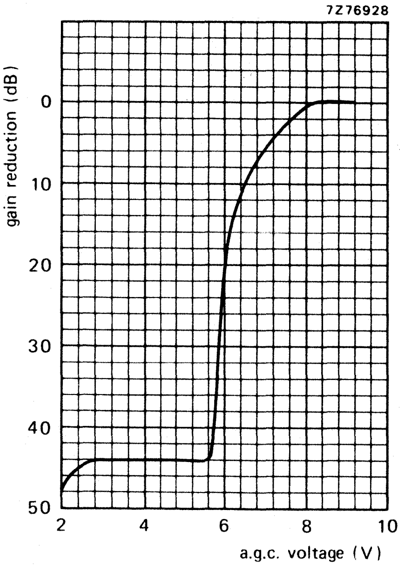


Fig. 4 A.G.C. voltage characteristic, channel E2; typical curve.

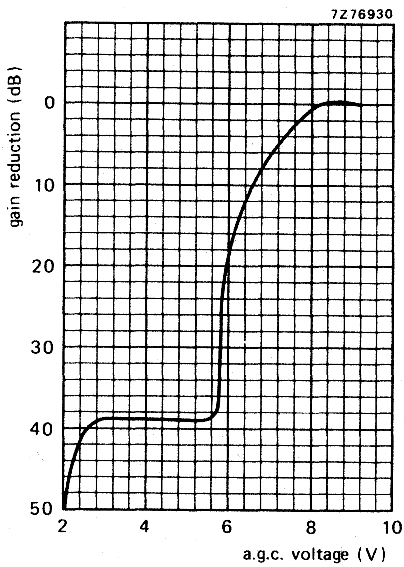


Fig. 5 A.G.C. voltage characteristic, channel C; typical curve.

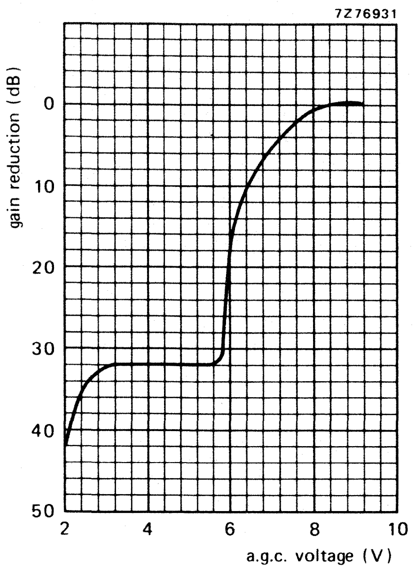


Fig. 6 A.G.C. voltage characteristic, channel M4; typical curve.

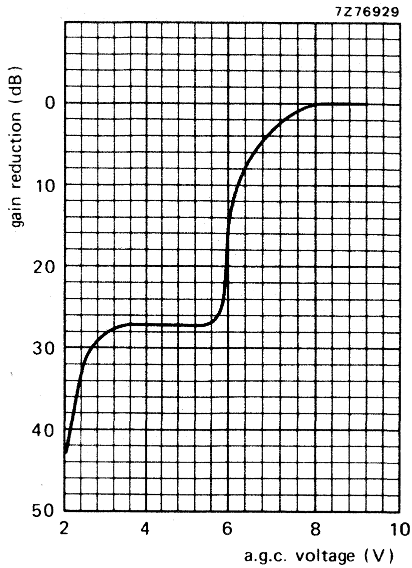


Fig. 7 A.G.C. voltage characteristic, channel E12; typical curve.

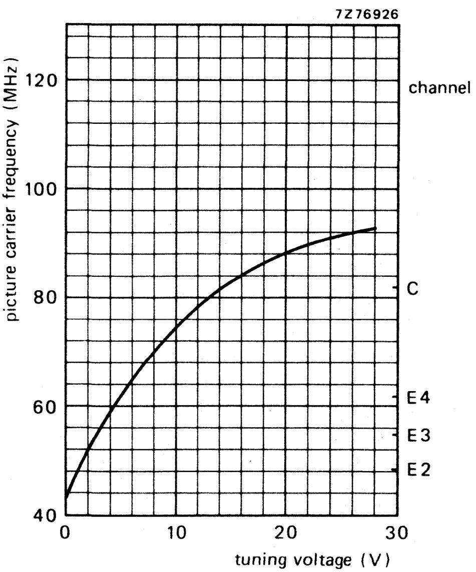


Fig. 8 Tuning voltage characteristic, v.h.f. I; typical curve.

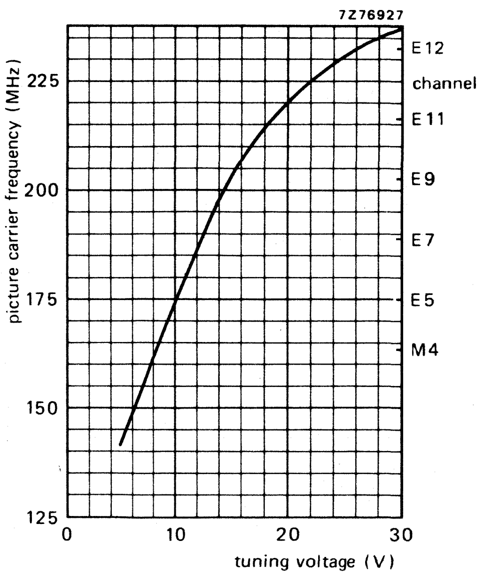


Fig. 9 Tuning voltage characteristic, v.h.f. III; typical curve.

Oscillator sample signal; **only valid for V314LO**

At a supply voltage of + 10,8 to + 13,2 V, an operating temperature of + 5 to + 55 °C, and within the tuning voltage range + 0,5 to + 30 V	typ. 84 dB (μV) into 75 Ω min. 80 dB (μV) into 75 Ω max. 104 dB (μV) into 75 Ω

Note: A tuning voltage higher than + 28 V will not damage the tuner and may be applied at the user's own risk. Under this condition the published reverse voltage limit of the oscillator tuning diode will be exceeded; the oscillator frequency will never decrease with increasing tuning voltage.

Frequency of oscillator sample signal; **only valid for V314LO**

v.h.f. I	87,15 to 124,15 MHz
v.h.f. III	202,15 to 263,15 MHz

Frequencies

Frequency ranges

v.h.f. I	channel NZ1 (picture carrier 45,25 MHz) to channel R4 (picture carrier 85,25 MHz) Margin at the extreme channnels: min. 1 MHz.
v.h.f. III	channel M4 (picture carrier 163,25 MHz) to channel E12 (picture carrier 224,25 MHz) Margin at the extreme channels: min. 1 MHz.

Intermediate frequencies

picture	38,9 MHz
sound	33,4 MHz The oscillator frequency is higher than the aerial signal frequency

Wanted signal characteristics

Input impedance

asymmetrical	75 Ω

Output impedance at the oscillator sample socket; **only valid for V314LO**

asymmetrical	75 Ω

V.S.W.R. and reflection coefficient	minimum value between picture carrier and sound carrier frequency	maximum value at picture carrier frequency
v.s.w.r.	max. 4	max. 4
reflection coefficient	max. 60%	max. 60%

V.S.W.R. and reflection coefficient at oscillator sample socket; **only valid for V314LO**

v.s.w.r., v.h.f. I	max. 2
v.s.w.r., v.h.f. III	max. 2
reflection coefficient, v.h.f. I	max. 33%
reflection coefficient, v.h.f. III	max. 33%

R.F. curves, bandwidth	typ. 12 MHz
R.F. curves, tilt	on any channel the amplitude difference between the top of the r.f. resonant curve and the picture carrier marker, the sound carrier marker, or any frequency between them will not exceed 3 dB at nominal gain, and 4 dB in the a.g.c. range between nominal gain and 20 dB gain reduction.
A.G.C. range	min. 40 dB
Power gain (see also Measuring method of power gain)	min. 20 dB
channel E3	typ. 23 dB
channel E5	typ. 24 dB
channel E12	typ. 24 dB
Gain difference between any two channels	typ. 4 dB
Noise figure	max. 9 dB
channel E3	typ. 6 dB
channel E5	typ. 7,5 dB
channel E12	typ. 8 dB
Overloading	
Input signal producing 1 dB gain compression at nominal gain	typ. 80 dB (μV) into 75 Ω
Input signal producing either a detuning of the oscillator of + 300 kHz or −1000 kHz or stopping of the oscillations at nominal gain	typ. 90 dB (μV) into 75 Ω

Unwanted signal characteristics

Image rejection (measured at picture carrier frequency)	min. 53 dB
I.F. rejection (measured at picture carrier frequency) channel E2 to E12	min. 60 dB

Note: At colour sub-carrier frequency maximum 6 dB less rejection.

Harmonic content of oscillator sample; **only valid for V314LO**

Suppression of harmonics which fall into the frequency range below 1000 MHz	min. 15 dB below oscillator fundamental

R.F. rejection at oscillator sample socket; **only valid for V314LO**

Signal voltage at oscillator sample socket (input signals of wanted frequency 70 dB (μV) into 75 Ω, tuner operating at nominal gain)	min. 20 dB below oscillator fundamental

I.F. rejection at oscillator sample socket; **only valid for V314LO**

I.F. signals at oscillator sample socket (input signals of wanted frequency 70 dB (μV) into 75 Ω, tuner operating at nominal gain)	min. 20 dB below oscillator fundamental

Cross modulation
Input signal producing 1% cross modulation, i.e. 1% of the modulation depth of the interfering signal is transferred to the wanted signal.

In channels cross modulation (wanted signal: picture carrier frequency; interfering signal: sound carrier frequency).

at nominal gain (wanted input level 60 dB (μV)	typ. 70 dB (μV) into 75 Ω
at 40 dB gain reduction (wanted input level 100 dB (μV)	typ. 106 dB (μV) into 75 Ω

In band cross modulation (wanted signal: picture carrier of channel N; interfering signal: picture carrier of channel N ± 2 for v.h.f. I or channel N ± 3 for v.h.f. III

at nominal gain (wanted input level 60 dB (μV)	typ. 88 dB (μV) into 75 Ω
at 40 dB gain reduction (wanted input level 100 dB (μV)	typ. 100 dB (μV) into 75 Ω

Out of band cross modulation at nominal gain

v.h.f. I, interfering from v.h.f. III	typ. 110 dB (μV) into 75 Ω
v.h.f. I, interfering from u.h.f.	typ. 110 dB (μV) into 75 Ω
v.h.f. III, interfering from v.h.f. I	typ. 110 dB (μV) into 75 Ω
v.h.f. III, interfering from u.h.f.	typ. 110 dB (μV) into 75 Ω

Oscillator characteristics

Pulling
Input signal of tuned frequency producing a shift of the oscillator frequency of 10 kHz, at nominal gain

v.h.f. I	typ. 73 dB (μV) into 75 Ω
v.h.f. III	typ. 73 dB (μV) into 75 Ω

Shift of oscillator frequency at a change of the supply voltage of 5%	max. 250 kHz

Drift of oscillator frequency

during warm-up time (after the tuner has been completely out of operation for 15 min, measured between 5 s and 15 min after switching on)	max. 250 kHz
during warm-up time (after the input stage is in operation for 15 min, measured between 2 s and 15 min after switching on the self-oscillating mixer stage)	max. 250 kHz
at a change of the ambient temperature from + 25 to + 40 ^{o}C (measured after 3 cycles from + 25 to + 55 ^{o}C)	max. 300 kHz

I.F. circuit characteristics

Bandwidth of i.f. output circuit 6 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 10; tuning voltage is 15 V; band III at minimum gain.

Bandwidth variation of i.f. output circuit
as a result of r.f. tuning and band switching
(reference: v.h.f. III) max. 350 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 10, i.e. a 100 pF capacitor is connected in parallel with C1 and R1 is short-circuited; tuning voltage is 15 V.

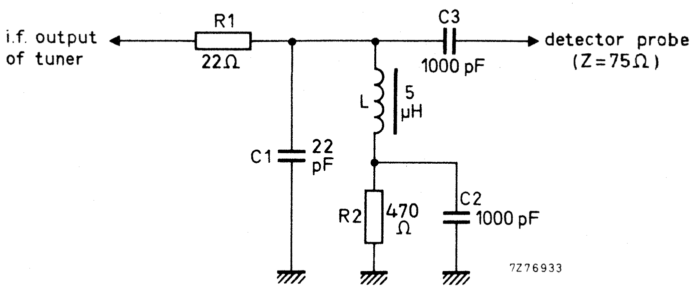


Fig. 10.

Detuning of the i.f. output circuit as
a result of r.f. tuning and band switching
(reference: v.h.f. III) max. 350 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 10, i.e. a 100 pF capacitor is connected in parallel with C1 and R1 is short-circuited; tuning voltage is 15 V.

Tuning range of i.f. output coil max. 34 to min. 41 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 10; tuning voltage is 15 V.

Attenuation between i.f. injection point
and i.f. output of the tuner typ. 23 dB

Miscellaneous

Radio interference Oscillator radiation and oscillator voltage at the aerial terminal	Within the limits of C.I.S.P.R. 13 (1975) and VDE 0872/7.72.* For the oscillator radiation above 200 MHz use is made of the relaxed limit of 2 mV/m (66 dBμV/m).
Microphonics	There will be no microphonics, provided the tuner is installed in a professional manner.
Surge protection	
Protection against voltages	max. 8 kV

Note: Three discharges of a 470 pF capacitor into the aerial terminal.

Protection against flashes	max. 30 kV, 400 mWs

Note: A flashover circuit producing flashes with frequencies of 1 to 20 Hz for 30 s is connected to the aerial terminal.

ADDITIONAL INFORMATION

If the tuner is used in receivers designed for v.h.f. only, a capacitor of 8,2 pF should be applied between the aerial input and earth.

I.F. injection

The tuner is provided with an i.f. injection point at the collector of the mixer transistor (coupled via a capacitor and a resistor to terminal S). The i.f. generator can be connected directly to this point. (Fig. 11).

The tuner needs normal supply voltages and a tuning voltage of 15 V; the i.f. output should be loaded with the circuit shown in Fig. 10.

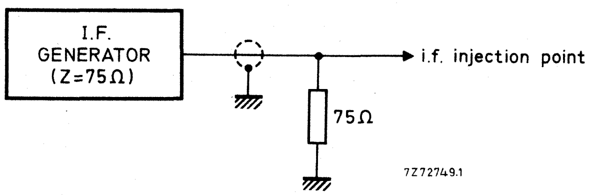


Fig. 11.

* For V314LO: when the oscillator sample socket is either open or terminated with a shielded resistor of 75 Ω.

Connection of the i.f. amplifier

The tuner needs a d.c. path from the i.f. output terminal (T) to earth, preferably via a choke of approx. 5 μH outside the tuner (Fig. 12). Where the tuner is used in combination with a u.h.f. tuner, this choke can be common for both tuners; a resistor in series with the choke can make ineffective the i.f. output circuit of the switched off tuner. For damping the i.f. output circuit and matching the i.f. output impedance of the tuner to the i.f. amplifier, a series resistor and a parallel capacitor as shown in Fig. 12 should be used. (During v.h.f. operation the voltage across the 470 Ω resistor is 1 to 1,2 V).

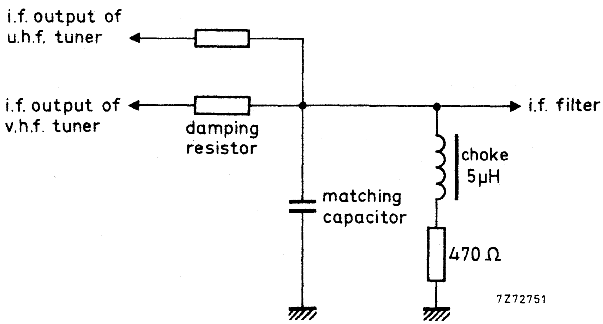


Fig. 12.

Measuring method of power gain

The i.f. output of the tuner should be terminated with the RC-circuit given in Fig. 10.

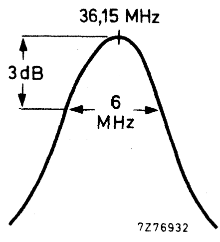


Fig. 13.

The RC-circuit roughly matches the i.f. output impedance to 75 Ω at the resonant frequency of the i.f. output circuit, which should be tuned to 36,15 MHz; the bandwidth should be approx. 6 MHz (Fig. 13).

Because the input and output impedances of the tuner are now 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and RC-circuit between a 75 Ω source and a 75 Ω detector.

Alignment of the i.f. output coil

The i.f. output coil should be adjusted with a brass tool with a blade as shown in Fig. 14. A suitable tool is available under catalogue number 7122 005 47680.

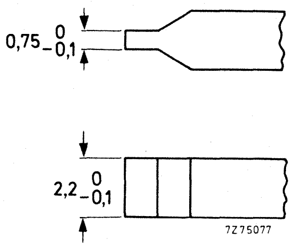


Fig. 14.

ACCESSORIES

Connector assembly for use of tuner V314 or V314LO in combination with u.h.f. tuner U322 or U322LO:

connector, catalogue number 3112 200 20720;
washer, catalogue number 3112 221 01220;
clamp, catalogue number 3112 274 13220.

V.H.F. TELEVISION TUNERS

QUICK REFERENCE DATA

Systems	C.C.I.R. systems B and G
Channels	
v.h.f. I	E2 to S1
v.h.f. III	S2 to S19
Intermediate frequencies	
picture	38,9 MHz
sound	33,4 MHz

APPLICATION

These tuners are designed to cover the v.h.f. channels of C.C.I.R. systems B and G, including the S channels for cable television.

In combination with the u.h.f. tuner U322 or U322LO respectively, they can be used in v.h.f./u.h.f. receivers. The aerial inputs and i.f. outputs of both tuners can then be connected in parallel without additional circuitry.

The tuners are compatible with tuner V314. They are also compatible with tuner V311, except for the band switching.

The V315LO is a special version of the V315: an output voltage from the local oscillator is made available for driving digital tuning systems. Apart from this the tuners are identical.

DESCRIPTION

The tuners are v.h.f. tuners with electronic tuning, covering the v.h.f. band I (47 to 111 MHz) and the v.h.f. band III (111 to 293 MHz). Switching between the bands is done by external band switching.

Mechanically, the tuners are built on a printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear cover (see Fig. 2a). All connections (aerial, supply voltage, a.g.c. voltage, tuning voltage, i.f. injection, i.f. output) are made via terminals on the underside. The mounting method is shown in Fig. 3. Tuner V315LO has a coaxial socket on the top of the frame, for coupling out the oscillator sample.

Electrically the tuner consists of two tunable input circuits in parallel (bands I and III), each followed by an r.f. transistor in grounded-base configuration (BF939 for band I, BF967 for band III). The collector load of each input transistor is formed by a double tuned circuit, transferring the signal to the mixer BF324 fed by the oscillator BF606A. Eight capacitance diodes BB209 tune the double-tuned circuit and the oscillator.

The i.f. output circuit of the tuner is a single tuned one, at the low end of which the i.f. signal is coupled out of the tuner. A d.c. path to earth for the collector current of the mixer has to be provided outside the tuner, preferably by a choke of about 5 μH. Damping of the i.f. output circuit and matching of the i.f. output to the i.f. circuit of the receiver can be achieved by connecting a series resistance and a parallel capacitance outside the tuner.

An i.f. injection point has been provided at the collector of the mixer transistor, connected to terminal S.

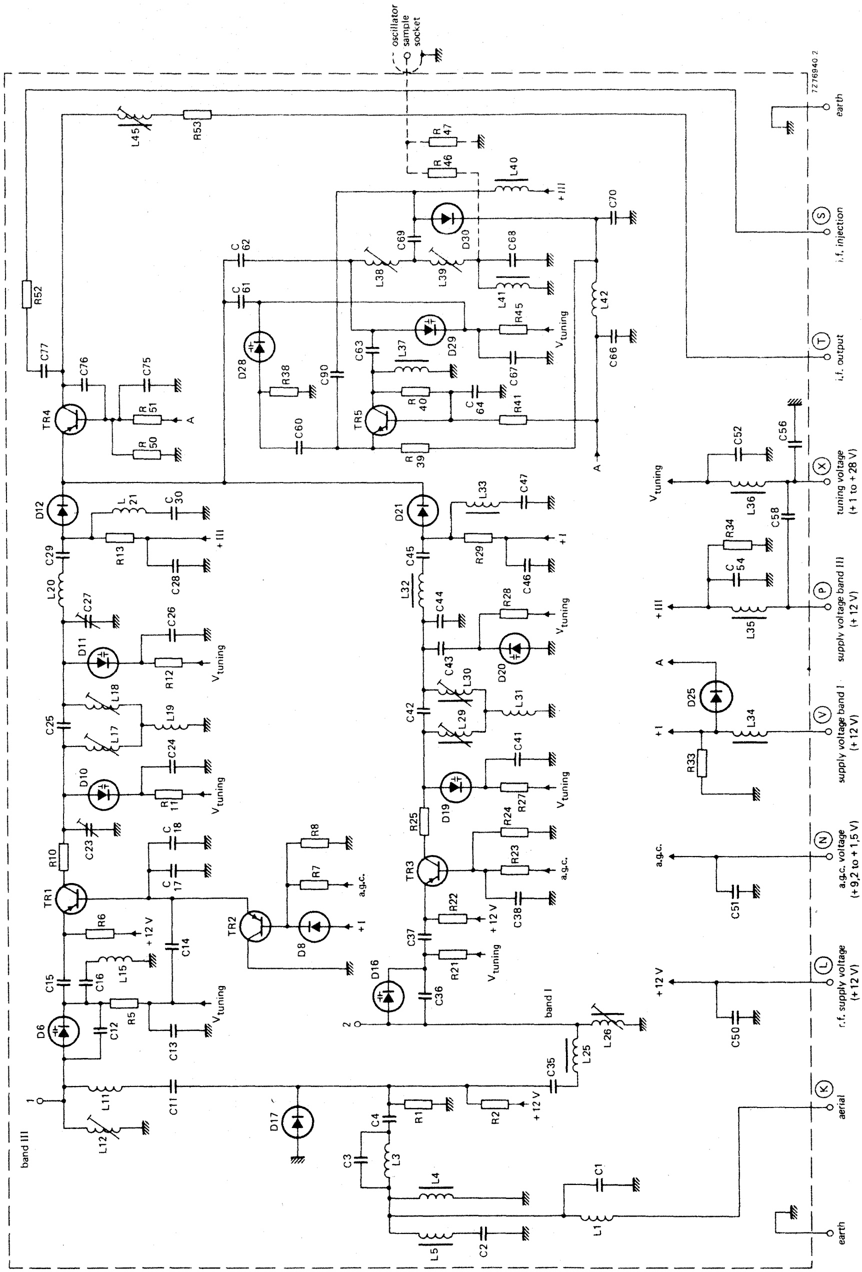

oscillator sample socket
7Z76940.2
earth
i.f. injection
i.f. output
tuning voltage (+1 to +28 V)
supply voltage band III (+12 V)
supply voltage band I (+12 V)
a.g.c. voltage (+9,2 to +1,5 V)
r.f. supply voltage (+12 V)
aerial
earth
band III
band I

Fig. 1.

MECHANICAL DATA

Dimensions in mm

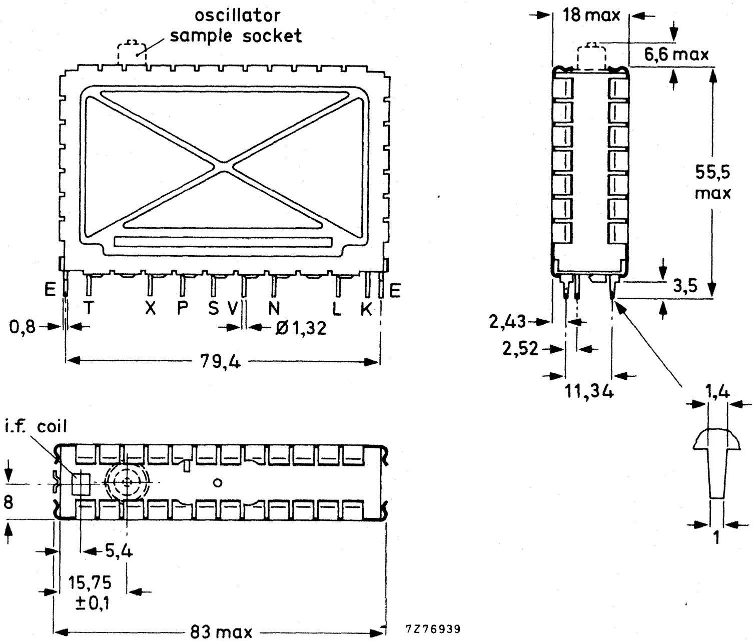


Fig. 2a The oscillator sample socket, drawn with dotted lines, applies only to tuner V315LO.

Terminal
- T = i.f. output
- X = tuning voltage, + 1 to + 28 V
- P = supply voltage, band III, + 12 V
- S = i.f. injection point
- V = supply voltage, band I, + 12 V
- N = a.g.c. voltage, + 9,2 to 1,5 V
- L = r.f. stage supply voltage, + 12 V
- K = aerial

Note: When the tuner is operated together with a u.h.f. tuner, only the supply voltage at terminals P and V should be switched off during u.h.f. operation.

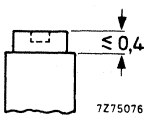


Fig. 2b I.F. output coil.
Torque for alignment: 2 to 15 mNm
Press-through force: ⩾ 10 N

Mass approx. 80 g

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, using the piercing diagram shown in Fig. 3. (The tuner may also be mounted by means of a socket. Information will be supplied upon request.)

It is recommended that the tuner be installed in the cool part of the receiver cabinet and not exposed to the vibrations of the loudspeaker. There are no restrictions on orientation.

The solderability of the terminals and mounting tabs is according to IEC 68-2, test Ta (230 ± 10 °C, 2 ± 0,5 s). The resistance to soldering heat is according to IEC 68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

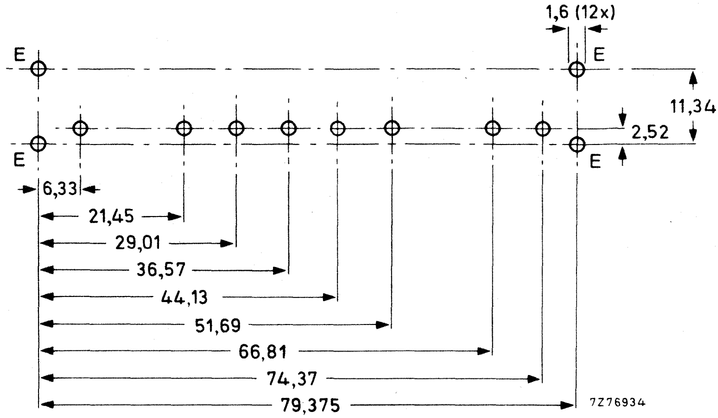


Fig. 3 Piercing diagram viewed from solder side of board.

For connection to the socket on the top of tuner V315LO a coaxial plug has to be used; type 3/2-50 (manufacturer: Daut und Rietz) is recommended.

ELECTRICAL DATA

The electrical values are measured on the v.h.f. tuner alone, but they are also valid for the v.h.f. tuner in combination with a u.h.f. tuner U322 or U322LO respectively. Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C, a relative humidity of 60 ± 15%, a supply voltage of 12 ± 0,3 V and an a.g.c. voltage of 9,2 ± 0,2 V.

Within the given tolerance range of supply voltage and a.g.c. voltage only insiginificant deviations from the specified values can be expected. Under the extreme conditions of temperature and humidity as given below, the tuner will function normally, but some specified limits may be exceeded.

General

Semiconductors	
r.f. amplifier, band I	BF939
r.f. amplifier, band III	BF967
mixer	BF324
oscillator	BF606A
tuning diodes	8 x BB209
switching diodes	BA182; 2 x BA244; BA483; 3 x BA220
switching transistor	BC558
Ambient temperature range	
operating	+ 5 to + 55 °C
storage	–25 to + 85 °C
Relative humidity	max. 90%

Voltages and currents

Supply voltage	+ 12 V ± 10%

Note: The supply voltage at terminals P and V should be filtered.

Current drawn from + 12 V supply	
r.f. amplifier, v.h.f. I, at nominal gain	typ. 5,8 mA
v.h.f. I, at 40 dB gain reduction	typ. 12,5 mA
r.f. amplifier, v.h.f. III, at nominal gain	typ. 10 mA
v.h.f. III, at 40 dB gain reduction	typ. 20 mA
mixer and oscillator	typ. 12 mA

Band switching

For operation in band I the supply voltage must be connected to terminal V, for band III operation to terminal P. If the tuner operates together with a u.h.f. tuner only the supply voltage at terminals P and V should be switched off during u.h.f. operation.

A.G.C. voltage (Figs 4 to 7)	
at nominal gain	+9,2 ± 0,5 V
at 40 dB gain reduction	min. + 1,5 V

Note: A.G.C. voltages between 0 and + 10 V may be applied without risk of damage.

A.G.C. current	
during gain control (0 to 40 dB)	max. + 0,5 mA
	min. −2,0 mA
at nominal gain	typ. + 0,3 mA
at 40 dB gain reduction	typ. −1,2 mA
Tuning voltage range (Figs 8 and 9)	+ 1 to + 28 V
Current drawn from + 28 V tuning voltage supply	
at 25 °C	max. 400 nA
at 55 °C	max. 4 μA

Note: The source impedance of the tuning voltage offered to terminal X must be max 47 kΩ.

Switching current	max. 16 mA

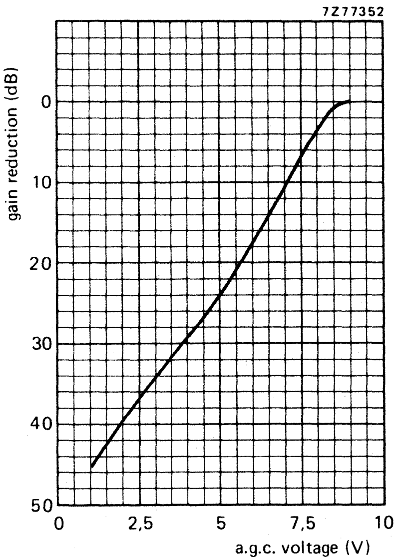


Fig. 4 A.G.C. voltage characteristic, channel E2; typical curve.

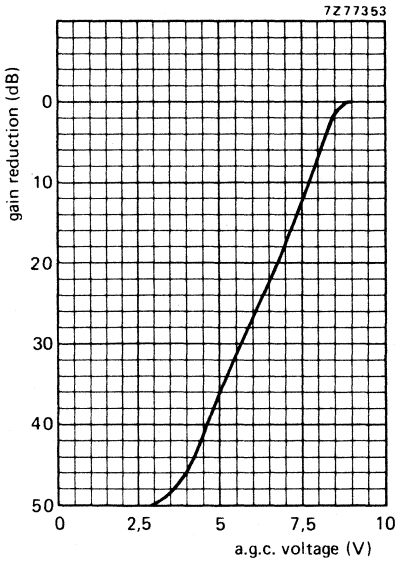


Fig. 5 A.G.C. voltage characteristic, channel S1; typical curve.

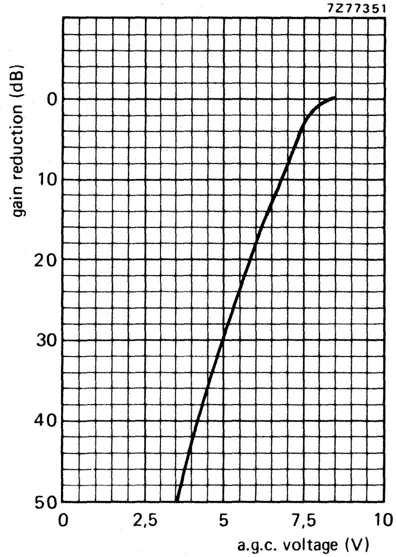


Fig. 6 A.G.C. voltage characteristic, channel S2; typical curve.

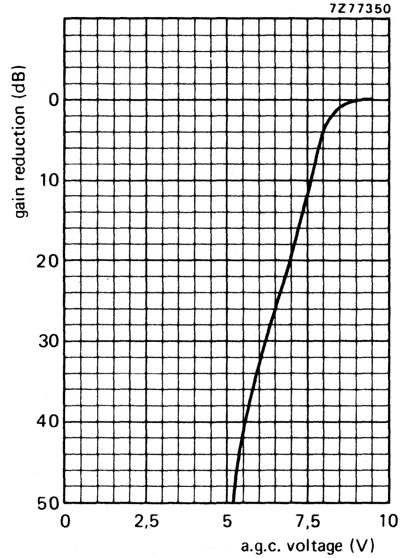


Fig. 7 A.G.C. voltage characteristic, channel S20; typical curve.

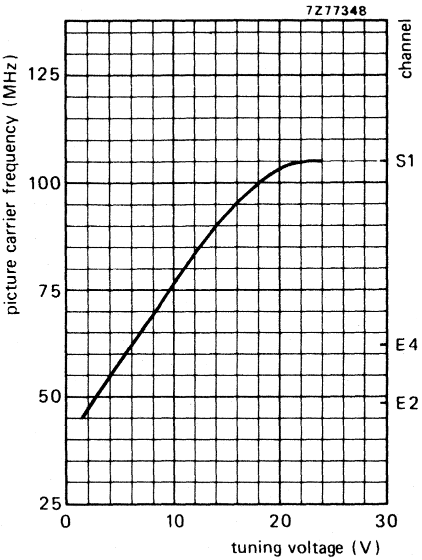


Fig. 8 Tuning voltage characteristic, v.h.f. I; typical curve.

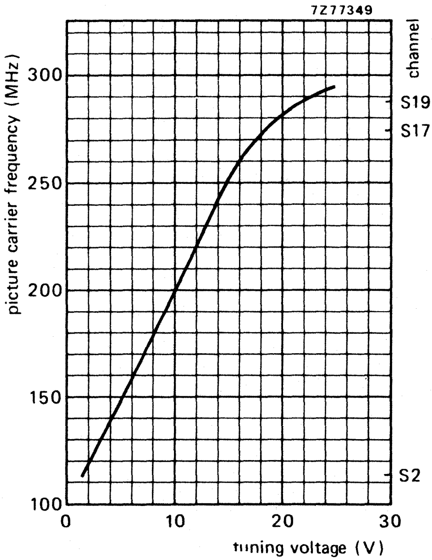


Fig. 9 Tuning voltage characteristic, v.h.f. III; typical curve.

Oscillator sample signal; **only valid for V315LO**

At a supply voltage of + 10,8 to + 13,2 V, an operating temperature of + 5 to + 55 °C, and within the tuning voltage range + 0,5 to + 30 V	typ. 84 dB (μV) into 75 Ω min. 80 dB (μV) into 75 Ω max. 104 dB (μV) into 75 Ω

Note: A tuning voltage higher than + 28 V will not damage the tuner and may be applied at the user's own risk. Under this condition the published reverse voltage limit of the oscillator tuning diode will be exceeded; the oscillator frequency will never decrease with increasing tuning voltage.

Frequency of oscillator sample signal; **only valid for V315LO**

v.h.f. I	87,15 to 144,15 MHz
v.h.f. III	151,15 to 326,15 MHz

Frequencies

Frequency ranges

v.h.f. I	channel E2 (picture carrier 48,25 MHz) to channel S1 (picture carrier 105,25 MHz) Margin at the extreme channels: min. 1 MHz.
v.h.f. III	channel S2 (picture carrier 112,25 MHz) to channel S19 (picture carrier 287,25 MHz) Margin at the extreme channels: min. 1 MHz.

Intermediate frequencies

picture	38,9 MHz
sound	33,4 MHz

The oscillator frequency is higher than the aerial signal frequency.

Wanted signal characteristics

Input impedance

asymmetrical	75 Ω

Output impedance at the oscillator sample socket; **only valid for V315LO**

asymmetrical	75 Ω

V.S.W.R. and reflection coefficient	minimum value between picture carrier and sound carrier frequency	maximum value at picture carrier frequency
v.s.w.r.	max. 4	max. 4
reflection coefficient	max. 60%	max. 60%

V.S.W.R. and reflection coefficient at oscillator sample socket; **only valid for V315LO**

v.s.w.r., v.h.f. I	max. 2
v.s.w.r., v.h.f. III	max. 2
reflection coefficient, v.h.f. I	max. 33%
reflection coefficient, v.h.f. III	max. 33%

R.F. curves, bandwidth	typ. 12 MHz
R.F. curves, tilt	on any channel the amplitude difference between the top of the r.f. resonant curve and the picture carrier marker, the sound carrier marker, or any frequency between them will not exceed 3 dB at nominal gain, and 4 dB in the a.g.c. range between nominal gain and 20 dB gain reduction.
A.G.C. range, except channels E2 and E3	min. 40 dB
A.G.C. range, channels E2 and E3	min. 30 dB
Power gain (see also Measuring method of power gain)	min. 20 dB
channel E3	typ. 27 dB
channel E5	typ. 26 dB
channel E12	typ. 28 dB
Gain difference between any two channels	typ. 6 dB
Noise figure	max. 10 dB
channel E3	typ. 5,5 dB
channel E5	typ. 8 dB
channel E12	typ. 8 dB

Unwanted signal characteristics

Image rejection (measured at picture carrier frequency), channels E2 to E12	min. 60 dB
I.F. rejection (measured at picture carrier frequency), channel E2	min. 55 dB

Note: At colour sub-carrier frequency max. 6 dB less rejection.

Harmonic content of oscillator sample; **only valid for V315LO**	
Suppression of harmonics which fall into the frequency range below 1000 MHz	min. 15 dB below oscillator fundamental
R.F. rejection at oscillator sample socket; **only valid for V315LO**	
Signal voltage at oscillator sample socket (input signals of wanted frequency 70 dB (μV) into 75 Ω, tuner operating at nominal gain)	min. 20 dB below oscillator fundamental
I.F. rejection at oscillator sample socket; **only valid for V315LO**	
I.F. signals at oscillator sample socket (input signals of wanted frequency 70 dB (μV) into 75 Ω, tuner operating at nominal gain)	min. 20 dB below oscillator fundamental

Cross modulation
Input signal producing 1% cross modulation, i.e. 1% of the modulation depth of the interfering signal is transferred to the wanted signal.

In channel cross modulation (wanted signal: picture carrier frequency; interfering signal: sound carrier frequency)

at nominal gain (wanted input level 60 dB (μV)	typ. 70 dB (μV) into 75 Ω
at 40 dB gain reduction (wanted input level 100 dB (μV)	typ. 100 dB (μV) into 75 Ω

In band cross modulation (wanted signal: picture carrier of channel N; interfering signal: picture carrier of channel N ± 2 for v.h.f. I or channel N ± 3 for v.h.f. III

at nominal gain (wanted input level 60 dB (μV)	typ. 86 dB (μV) into 75 Ω
at 40 dB gain reduction (wanted input level 100 dB (μV)	typ. 100 dB (μV) into 75 Ω

Out of band cross modulation at nominal gain

v.h.f. I, interfering from v.h.f. III	typ. 100 dB (μV) into 75 Ω
v.h.f. I, interfering from u.h.f.	typ. 100 dB (μV) into 75 Ω
v.h.f. III, interfering from v.h.f. I	typ. 100 dB (μV) into 75 Ω
v.h.f. III, interfering from u.h.f.	typ. 110 dB (μV) into 75 Ω

Oscillator characteristics

Pulling
Input signal of tuned frequency producing a shift of the oscillator frequency of 10 kHz, at nominal gain

v.h.f. I	typ. 75 dB (μV) into 75 Ω
v.h.f. III	typ. 75 dB (μV) into 75 Ω

Shift of oscillator frequency at a change of the supply voltage of 5%	max. 250 kHz
Drift of oscillator frequency during warm-up time (after the tuner has been completely out of operation for 15 min, measured between 5 s and 15 min after switching on)	max. 250 kHz
during warm-up time (after the input stage is in operation for 15 min, measured between 2 s and 15 min after switching on the self-oscillating mixer stage)	max. 250 kHz
at a change of the ambient temperature from + 25 to + 40 °C (measuerd after 3 cycles from + 25 to + 60 °C)	
channels S1 to S16	typ. 250 kHz max. 400 kHz
channels S17 to S19	max. 550 kHz

I.F. circuit characteristics

Bandwidth of i.f. output circuit	6 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 10; tuning voltage is 15 V; band III at minimum gain.

Bandwidth variation of i.f. output circuit as a result of r.f. tuning and band switching (reference: v.h.f. III)	max. 350 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 10, i.e. a 100 pF capacitor is connected in parallel with C1 and R1 is short-circuited; tuning voltage is 15 V.

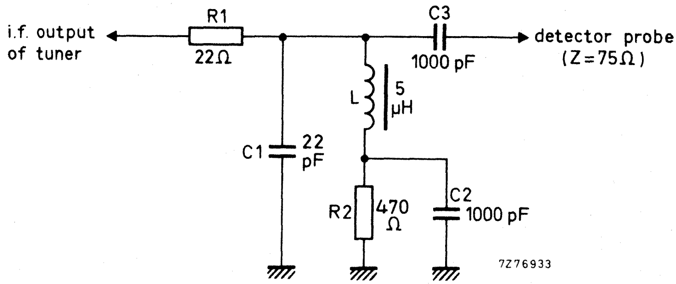


Fig. 10.

Detuning of the i.f. output circuit as a result of r.f. tuning in band III	max. 350 kHz

Note: I.F. output of the tuner terminated with a modified of Fig. 10, i.e. a 100 pF capacitor is connected in parallel with C1 and R1 is short-circuited; tuning voltage is 15 V.

Tuning range of i.f. output coil	max. 34 to min. 41 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 10; tuning voltage is 15 V.

Attenuation between i.f. injection point and i.f. output of the tuner	typ. 23 dB

Miscellaneous

Radio interference Oscillator radiation and oscillator voltage at the aerial terminal	Within the limits of C.I.S.P.R. 13 (1975) and VDE 0872/7.72.* For the oscillator radiation above 200 MHz use is made of the relaxed limit of 2 mV/m (66 dBμV/m).

* For V315LO: when the oscillator sample socket is either open or terminated with a shielded resistor of 75 Ω.

Microphonics | There will be no microphonics, provided the tuner is installed in a professional manner.

Surge protection

Protection against voltages — max. 8 kV

Note: Three discharges of a 470 pF capacitor into the aerial terminal.

Protection against flashes — max. 30 kV, 400 mWs

Note: A flashover circuit producing flashes with frequencies of 1 to 20 Hz for 30 s is connected to the aerial terminal.

ADDITIONAL INFORMATION

I.F. injection

The tuner has an i.f. injection point at the collector of the mixer transistor (coupled via a capacitor and a resistor to terminal S). The i.f. generator can be connected directly to this point (Fig. 11).

The tuner needs normal supply voltages and a tuning voltage of 15 V; the i.f. output should be loaded with the circuit shown in Fig. 10.

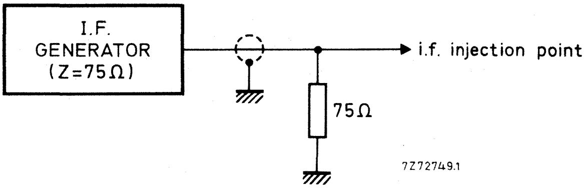


Fig. 11.

Connection of the i.f. amplifier

The tuner needs a d.c. path from the i.f. output terminal (T) to earth, preferably via a choke of approx. 5 μH outside the tuner (Fig. 12). Where the tuner is used in combination with a u.h.f. tuner, this choke can be common for both tuners; a resistor in series with the choke can inhibit the i.f. output circuit of the switched-off tuner. For damping the i.f. output circuit and matching the i.f. output impedance of the tuner to the receiver i.f. amplifier, a series resistor and a parallel capacitor as shown in Fig. 12 should be used (During v.h.f. operation the voltage across the 470 Ω resistor is 1 to 1,2 V).

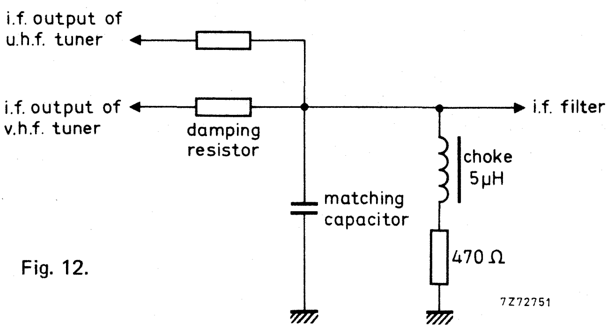


Fig. 12.

Measuring method of power gain

The i.f. output of the tuner should be terminated with the RC-circuit given in Fig. 10.

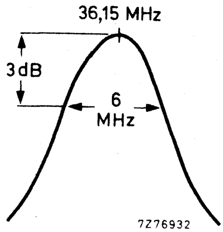


Fig. 13.

The RC-circuit roughly matches the i.f. output impedance to 75 Ω at the resonant frequency of the i.f. output circuit, which should be tuned to 36,15 MHz; the bandwidth should be approx. 6 MHz (Fig. 13).

Because the input and output impedances of the tuner are now 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and RC-circuit between a 75 Ω source and a 75 Ω detector.

Alignment of the i.f. output coil

The i.f. output coil should be adjusted with a brass tool with a blade as shown in Fig. 14. A suitable tool is available under catalogue number 7122 005 47680.

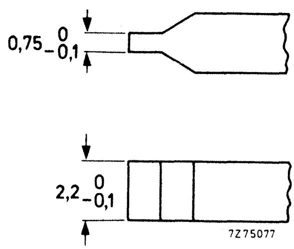


Fig. 14.

ACCESSORIES

Connector assembly for use of tuner V315 or V315LO in combination with u.h.f. tuner U322 or U322LO:
- connector, catalogue number 3112 200 20720;
- washer, catalogue number 3112 221 01220;
- clamp, catalogue number 3112 274 13220.

V.H.F. TELEVISION TUNERS

QUICK REFERENCE DATA

Systems	C.C.I.R. systems B and G
Channels	
v.h.f. I	E2 to R5
v.h.f. III	S2 to S19
Intermediate frequencies	
picture	38,9 MHz
sound	33,4 MHz

APPLICATION

These tuners are designed to cover the v.h.f. channels of C.C.I.R. systems B and G, including the S channels for cable television.

In combination with the u.h.f. tuner U322, U324, U342 or U342LO respectively, they can be used in v.h.f./u.h.f. receivers. The aerial inputs and i.f. outputs of both tuners can then be connected in parallel without additional circuitry.

The tuners are pin-compatible with tuners V314, V315 and V334.

The tuners comply with the requirements of radiation and signal handling capability of Amtsblatt DBP68/1979.

The V317LO is a special version of the V317: an output voltage from the local oscillator is made available for driving digital tuning systems. Apart from this the tuners are identical.

DESCRIPTION

The tuners are v.h.f. tuners with electronic tuning, covering the v.h.f. band I (47 to 101 MHz) and the v.h.f. band III (111 to 293 MHz). Switching between the bands is done by external band switching.

Mechanically, the tuners are built on a printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear cover (see Fig. 2a). All connections (aerial, supply voltage, a.g.c. voltage, tuning voltage, i.f. injection, i.f. output) are made via terminals on the underside. The mounting method is shown in Figs 3. Tuner V317LO has a coaxial socket on the top of the frame, for coupling out the oscillator sample.

Electrically the tuner consists of two tunable input circuits in parallel (bands I and III), each followed by an r.f. transistor in grounded-base configuration (BF939 for band I, BF967 for band III). The collector load of each input transistor is formed by a double tuned circuit, transferring the signal to the mixer BF324 fed by the oscillator BF606A. Seven capacitance diodes BB909A tune the double-tuned circuits and the oscillator.

The i.f. output circuit of the tuner is a single tuned one, at the low end of which the i.f. signal is coupled out of the tuner. A d.c. path to earth for the collector current of the mixer has to be provided outside the tuner, preferably by a choke of about 5 μH. Damping of the i.f. output circuit and matching of the i.f. output to the i.f. circuit of the receiver can be achieved by connecting a series resistance and a parallel capacitance outside the tuner.

An i.f. injection point has been provided at the collector of the mixer transistor, connected to terminal S.

DEVELOPMENT SAMPLE DATA

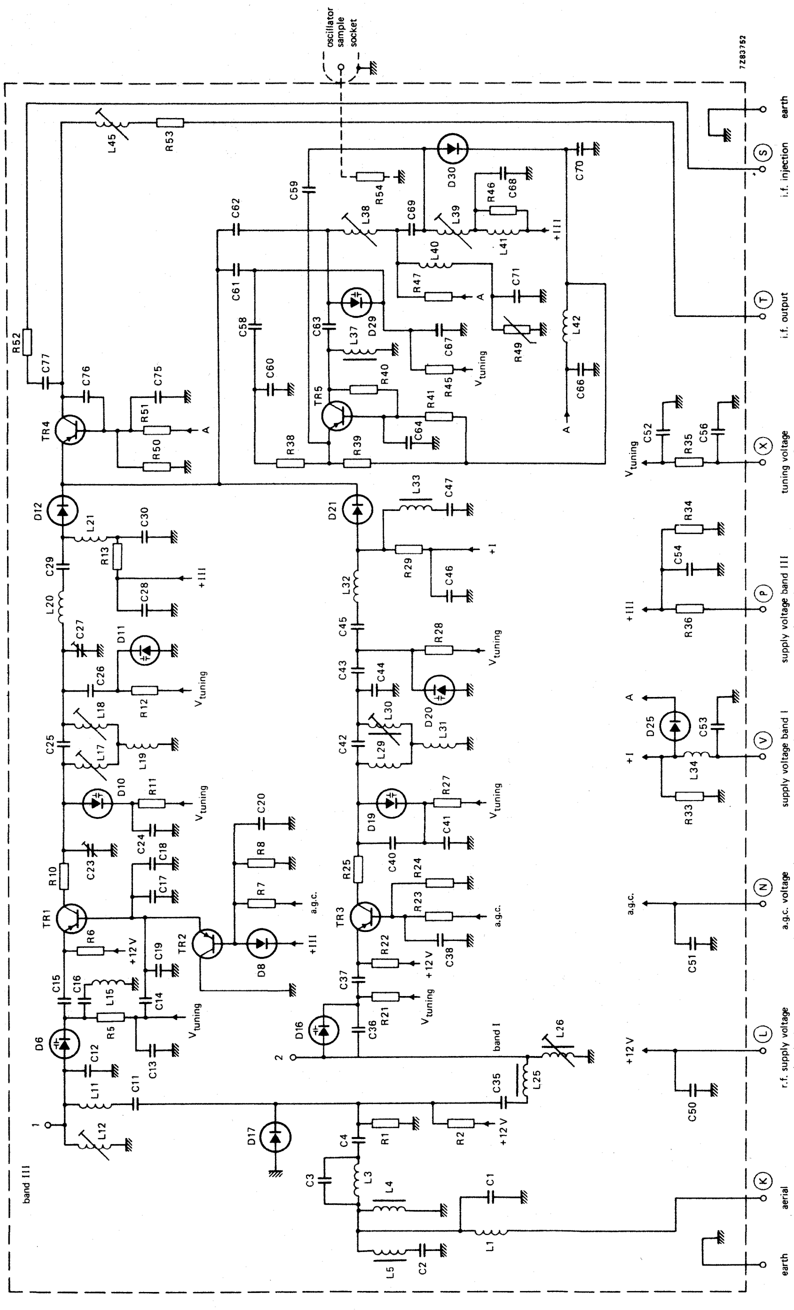


Fig. 1.

MECHANICAL DATA

Dimensions in mm

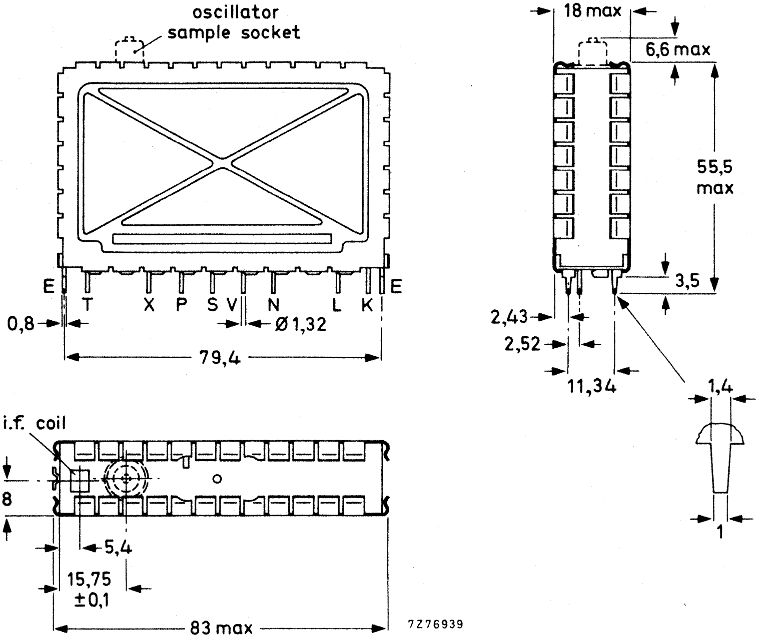


Fig. 2a The oscillator sampling socket, drawn with dotted lines, applies only to tuner V317LO.

Terminal T = i.f. output
X = tuning voltage, + 1 to + 28 V
P = supply voltage, band III, + 12 V
S = i.f. injection point
V = supply voltage, band I, + 12 V
N = a.g.c. voltage, + 9,2 to 1,5 V
L = r.f. stage supply voltage, + 12 V
K = aerial

Note: When the tuner is operated together with a u.h.f. tuner, only the supply voltage at terminals P and V should be switched off during u.h.f. operation.

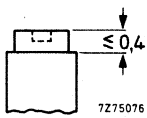


Fig. 2b I.F. output coil,
Torque for alignment: 2 to 15 mNm
Press-through force: ≥ 10 N

Mass approx. 80 g

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, using the piercing diagram shown in Fig. 3. (The tuner may also be mounted by means of a socket. Information will be supplied upon request.)

It is recommended that the tuner be installed in the cool part of the receiver cabinet and not exposed to the vibrations of the loudspeaker. There are no restrictions on orientation.

The solderability of the terminals and mounting tabs is according to IEC 68-2, test Ta (230 ± 10 °C, 2 ± 0,5 s). The resistance to soldering heat is according to IEC 68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

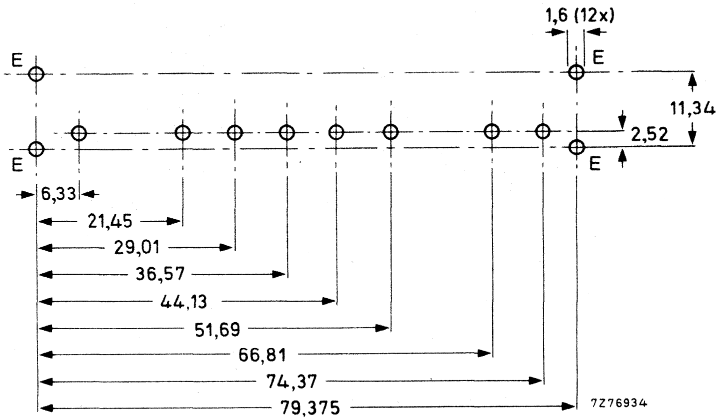


Fig. 3 Piercing diagram viewed from solder side of board.

For connection to the socket on the top of tuner V317LO a coaxial plug has to be used; type 3/2-50 (manufacturer: Daut und Rietz) is recommended.

DEVELOPMENT SAMPLE DATA

ELECTRICAL DATA

The electrical values are measured on the v.h.f. tuner alone, but they are also valid for the v.h.f. tuner in combination with a u.h.f. tuner U322, U324, U342 or UL342LO respectively. Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C, a relative humidity of 60 ± 15%, a supply voltage of 12 ± 0,3 V and an a.g.c. voltage of 9,2 ± 0,2 V.

Within the given tolerance range of supply voltage and a.g.c. voltage only insignificant deviations from the specified values can be expected. Under the extreme conditions of temperature and humidity as given below, the tuner will function normally, but some specified limits may be exceeded.

General

Semiconductors	
r.f. amplifier, band I	BF939
r.f. amplifier, band III	BF967
mixer	BF324
oscillator	BF606A
tuning diodes	7 x BB909A or BB709
switching diodes	BA244; BA482; BA483; BA220; 2 x BA317
switching transistor	BC558
Ambient temperature range	
operating	+5 to +55 °C
storage	−25 to +70 °C
Relative humidity	max. 90%

Voltages and currents

Supply voltage	+12 V ± 10%

Note: The supply voltage at terminals P and V should be filtered.

Current drawn from + 12 V supply	
r.f. amplifier, v.h.f. I, at nominal gain	typ. 12 mA
v.h.f. I, at 40 dB gain reduction	typ. 20 mA
r.f. amplifier, v.h.f. III, at nominal gain	typ. 10 mA
v.h.f. III, at 40 dB gain reduction	typ. 20 mA
mixer and oscillator	typ. 12 mA

Band switching

For operation in band I the supply voltage must be connected to terminal V, for band III operation to terminal P. If the tuner operates together with a u.h.f. tuner only the supply voltage at terminals P and V should be switched off during u.h.f. operation.

A.G.C. voltage (Figs 4 and 5)		
at nominal gain		+9,2 ± 0,5 V
at 40 dB gain reduction	min.	+1,5 V

Note: A.G.C. voltages between 0 and +10 V may be applied without risk of damage.

A.G.C. current (Figs 6 and 7)		
during gain control (0 to 40 dB)	max.	+1,0 mA
	min.	−2,0 mA
at nominal gain	typ.	+0,8 mA
at 40 dB gain reduction	typ.	−1,2 mA
Tuning voltage range (Figs 8 and 9)		+1 to +28 V
Current drawn from +28 V tuning voltage supply		
at 25 °C	max.	350 nA
at 55 °C	max.	1,5 μA

Note: The source impedance of the tuning voltage offered to terminal X must be max. 47 kΩ.

Switching current	max.	16 mA

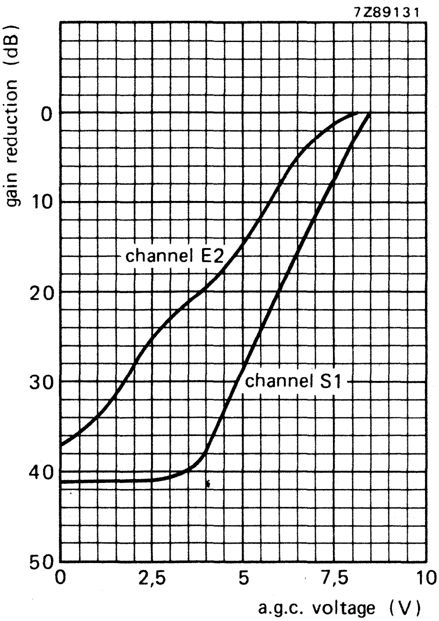


Fig. 4 Typical a.g.c. voltage characteristic, channels E2 and S1.

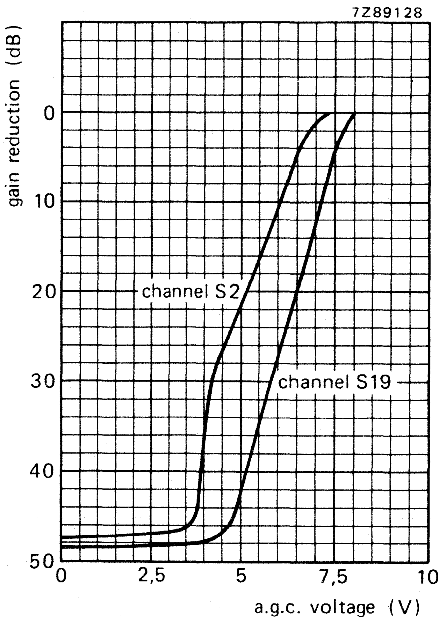


Fig. 5 Typical a.g.c. voltage characteristic, channels S2 and S19.

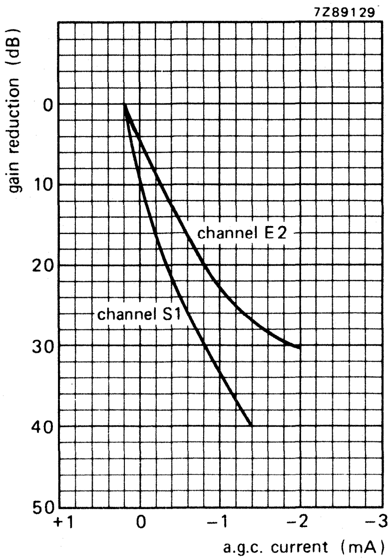


Fig. 6 Typical a.g.c. current characteristic, channels E2 and S1.

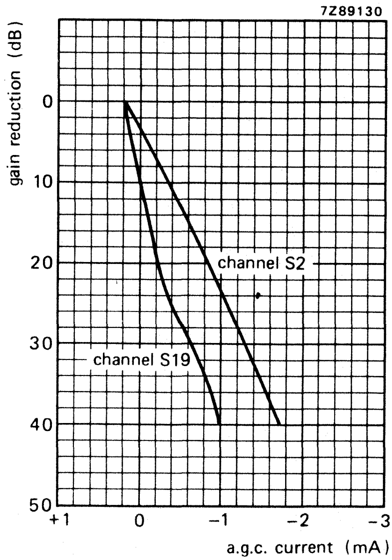


Fig. 7 Typical a.g.c. current characteristic, channels S2 and S19.

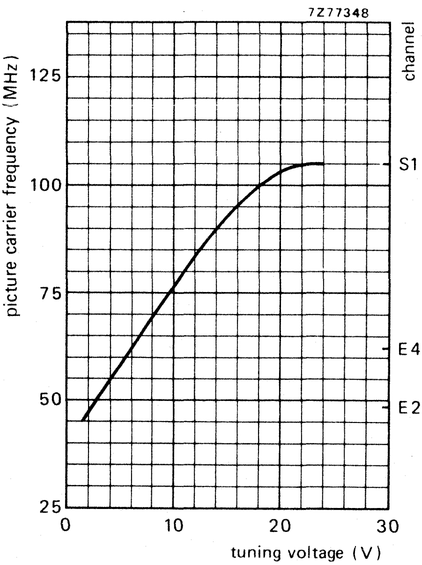


Fig. 8 Typical tuning voltage characteristic, v.h.f. I.

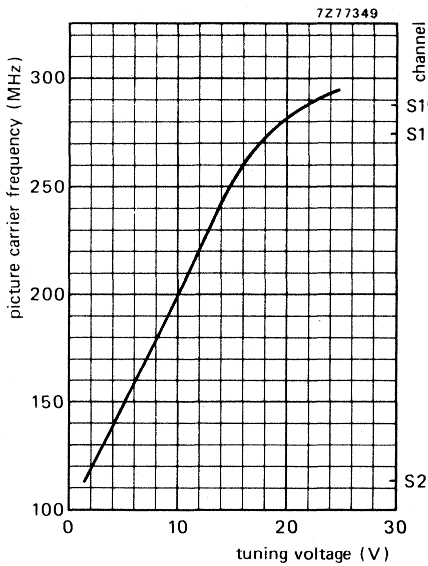


Fig. 9 Typical tuning voltage characteristic, v.h.f. III.

Oscillator sample signal; **only valid for V317LO**

At a supply voltage of + 10,8 to + 13,2 V, an operating temperature of + 5 to + 55 °C, and within the tuning voltage range + 0,5 to + 30 V	typ.	84 dB (μV) into 75 Ω
	min.	80 dB (μV) into 75 Ω
	max.	104 dB (μV) into 75 Ω

Note: A tuning voltage higher than + 28 V will not be harmful for the tuner and may be applied at the user's own risk. Under this condition the published reverse voltage limit of the oscillator tuning diode will be exceeded; the oscillator frequency will never decrease with increasing tuning voltage.

Frequency of oscillator sample signal; **only valid for V317LO**

v.h.f. I	87,15 to 132,15 MHz
v.h.f. III	151,15 to 326,15 MHz

Frequencies

Frequency ranges

v.h.f. I	channel E2 (picture carrier 48,25 MHz) to channel R5 (picture carrier 93,25 MHz). Margin at the extreme channels: min. 2 MHz.
v.h.f. III	channel S2 (picture carrier 112,25 MHz) to channel S19 (picture carrier 287,25 MHz) Margin at the extreme channels: min. 2 MHz.

Intermediate frequencies

picture	38,9 MHz
sound	33,4 MHz

The oscillator frequency is higher than the aerial signal frequency.

Wanted signal characteristics

Input impedance

asymmetrical	75 Ω

Output impedance at the oscillator sample socket; **only valid for V317LO**

asymmetrical	75 Ω

V.S.W.R. and reflection coefficient	minimum value between picture carrier and sound carrier frequency	maximum value at picture carrier frequency
v.s.w.r.	max. 4	max. 4
reflection coefficient	max. 60%	max. 60%

V.S.W.R. and reflection coefficient at oscillator sample socket; **only valid for V317LO**

v.s.w.r., v.h.f. I	max. 2
v.s.w.r., v.h.f. III	max. 2
reflection coefficient, v.h.f. I	max. 33%
reflection coefficient, v.h.f. III	max. 33%

R.F. curves, bandwidth	typ. 12 MHz	
R.F. curves, tilt	on any channel the amplitude difference between the top of the r.f. resonant curve and the picture carrier marker, the sound carrier marker, or any frequency between them will not exceed 3 dB at nominal gain, and 4 dB in the a.g.c. range between nominal gain and 20 dB gain reduction.	
A.G.C. range, except channels E2, E3 and E4	min.	40 dB
A.G.C. range, channels E2 and E3	min.	30 dB
channel E4	min.	35 dB
Power gain (see also Measuring method of power gain)	min.	20 dB
channel E3	typ.	27 dB
channel E5	typ.	26 dB
channel E12	typ.	28 dB
Gain difference between any two channels	typ.	6 dB
Noise figure	max.	10 dB
channel E3	typ.	5,5 dB
channel E5	typ.	8 dB
channel E12	typ.	8 dB
Overloading		
Input signal producing 1 dB gain compression at nominal gain	to be established	
Input signal producing either a detuning of the oscillator of +300 kHz or −1000 kHz or stopping of the oscillations at nominal gain	typ.	90 dB (μV) into 75 Ω

Unwanted signal characteristics

Image rejection (measured at picture carrier frequency)		
channels E2 to E12	min.	60 dB
channels S11 to S19	min.	53 dB
I.F. rejection (measured at picture carrier frequency),		
except channel E2	min.	60 dB
channel E2	min.	50 dB

Note: At colour sub-carrier frequency max. 6 dB less rejection.

Harmonic content of oscillator sample; **only valid for V317LO**

Suppression of harmonics which fall into the frequency range below 1000 MHz	min.	15 dB below oscillator fundamental

R.F. rejection at oscillator sample socket; **only valid for V317LO**

Signal voltage at oscillator sample socket (input signals of wanted frequency 70 dB (μV) into 75 Ω, tuner operating at nominal gain)	min.	20 dB below oscillator fundamental

I.F. rejection at oscillator sample socket; **only valid for V317LO**

I.F. signals at oscillator sample socket (input signals of wanted frequency 70 dB (μV) into 75 Ω, tuner operating at nominal gain)	min.	20 dB below oscillator fundamental

DEVELOPMENT SAMPLE DATA

Cross modulation
Input signal producing 1% cross modulation, i.e. 1% of the modulation depth of the interfering signal is transferred to the wanted signal.

In channel cross modulation (wanted signal: picture carrier frequency; interfering signal: sound carrier frequency)

at nominal gain (wanted input level 60 dB (μV)	typ. 70 dB (μV) into 75 Ω
at 40 dB gain reduction (wanted input level 100 dB (μV)	typ. 100 dB (μV) into 75 Ω

In band cross modulation (wanted signal: picture carrier of channel N; interfering signal: picture carrier of channel N ± 2 for v.h.f. I or channel N ± 3 for v.h.f. III

at nominal gain (wanted input level 60 dB (μV)	typ. 86 dB (μV) into 75 Ω
at 40 dB gain reduction (wanted input level 100 dB (μV)	typ. 100 dB (μV) into 75 Ω

Out of band cross modulation at nominal gain

v.h.f. I, interfering from v.h.f. III	typ. 100 dB (μV) into 75 Ω
v.h.f. I, interfering from u.h.f.	typ. 100 dB (μV) into 75 Ω
v.h.f. III, interfering from v.h.f. I	typ. 100 dB (μV) into 75 Ω
v.h.f. III, interfering from u.h.f.	typ. 110 dB (μV) into 75 Ω

Unwanted signal handling capability (visibility test) for channel combinations N ± 1, N ± 5, N + 11 — according to the requirements of Amtsblatt DBP68/1979, item 5.1.2.

Oscillator characteristics

Pulling
Input signal of tuned frequency producing a shift of the oscillator frequency of 10 kHz, at nominal gain

v.h.f. I	typ. 75 dB (μV) into 75 Ω
v.h.f. III	typ. 75 dB (μV) into 75 Ω

Shift of oscillator frequency at a change of the supply voltage of 5%	max. 250 kHz
Drift of oscillator frequency during warm-up time (after the tuner has been completely out of operation for 15 min, measured between 5 s and 15 min after switching on)	max. 250 kHz
during warm-up time (after the input stage is in operation for 15 min, measured between 2 s and 15 min after switching on the self-oscillating mixer stage)	max. 250 kHz
at a change of the ambient temperature from +25 to +40 °C (measured after 3 cycles from +25 to +60 °C)	
channels S1 to S16	typ. 250 kHz max. 400 kHz
channels S17 to S19	max. 550 kHz

I.F. circuit characteristics

Bandwidth of i.f. output circuit	5,9 ± 0,5 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 10; tuning voltage is 15 V; band III at minimum gain.

Bandwidth variation of i.f. output circuit as a result of r.f. tuning and band switching (reference: v.h.f. III)	max. 350 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 10, i.e. a 100 pF capacitor is connected in parallel with the i.f. output of the tuner; tuning voltage is 15 V.

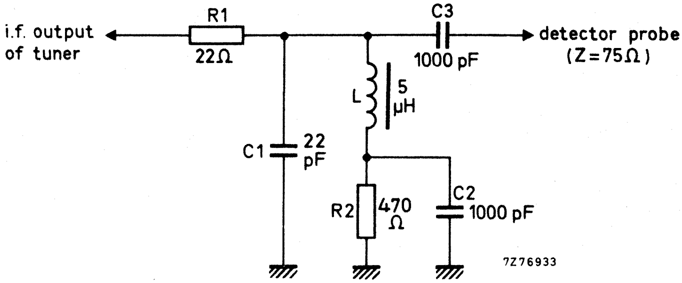


Fig. 10.

Detuning of the i.f. output circuit as a result of r.f. tuning in band III	max. 350 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 10, i.e. a 100 pF capacitor is connected in parallel with the i.f. output of the tuner; tuning voltage is 15 V.

Minimum tuning range of i.f. output coil	34 to 41 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 10; tuning voltage is 15 V.

Attenuation between i.f. injection point and i.f. output of the tuner	23 ± 3 dB

Miscellaneous

Radio interference

Oscillator radiation and oscillator voltage at the aerial terminal	Within the limits of C.I.S.P.R. 13 (1975), VDE 0872/7.72 and Amtsblatt DBP68/1979.*

* For V317LO: when the oscillator sample socket is either open or terminated with a coaxial plug (75 Ω impedance, e.g. type 3/2-50, Daut und Rietz).

Microphonics	There will be no microphonics, provided the tuner is installed in a professional manner.
Surge protection	
Protection against voltages	max. 5 kV

Note: Three discharges of a 470 pF capacitor into the aerial terminal.

Protection against flashes	max. 30 kV, 400 mWs

Note: A flashover circuit producing flashes with frequencies of 1 to 20 Hz for 30 s is connected to the aerial terminal.

ADDITIONAL INFORMATION

I.F. injection

The tuner is provided with an i.f. injection point at the collector of the mixer transistor (coupled via a capacitor and a resistor to terminal S). The i.f. generator can be connected directly to this point (Fig. 11).

The tuner needs normal supply voltages and a tuning voltage of 15 V; the i.f. output should be loaded with the circuit shown in Fig. 10.

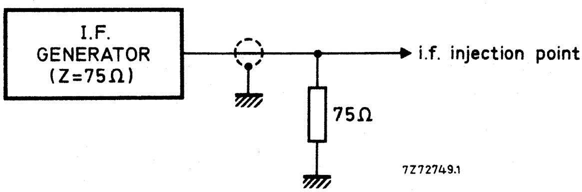


Fig. 11.

Connection of the i.f. amplifier

The tuner needs a d.c. path from the i.f. output terminal (T) to earth, preferably via a choke of approx. 5 μH outside the tuner (Fig. 12). Where the tuner is used in combination with a u.h.f. tuner, this choke can be common for both tuners; a resistor in series with the choke can make ineffective the i.f. output circuit of the switched-off tuner. For damping the i.f. output circuit and matching the i.f. output impedance of the tuner to the i.f. amplifier, a series resistor and a parallel capacitor as shown in Fig. 12 should be used (During v.h.f. operation the voltage across the 470 Ω resistor is 1 to 1,2 V).

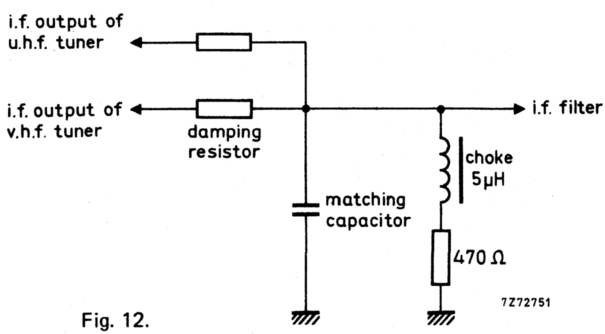


Fig. 12.

Measuring method of power gain

The i.f. output of the tuner should be terminated with the RC-circuit given in Fig. 10.

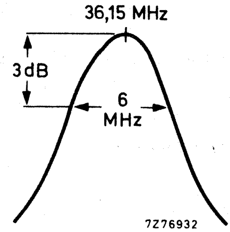


Fig. 13.

The RC-circuit roughly matches the i.f. output impedance to 75 Ω at the resonant frequency of the i.f. output circuit, which should be tuned to 36,15 MHz; the bandwidth should be approx. 6 MHz (Fig. 13).

Because the input and output impedances of the tuner are now 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and RC-circuit between a 75 Ω source and a 75 Ω detector.

Alignment of the i.f. output coil

The i.f. output coil should be adjusted with a brass tool with a blade as shown in Fig. 14. A suitable tool is available under catalogue number 7122 005 47680.

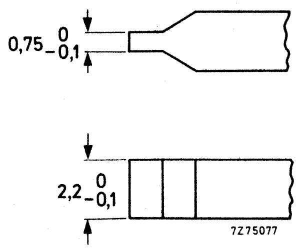


Fig. 14.

ACCESSORIES

Connector assembly for use of tuner V317 or V317LO in combination with u.h.f. tuner U342 or U342LO:

connector, catalogue number 3112 200 20720;
washer, catalogue number 3112 221 01220;
clamp, catalogue number 3112 274 13220.

V.H.F. TELEVISION TUNERS

QUICK REFERENCE DATA

Systems	C.C.I.R. systems B and G
Channels	
v.h.f. I	NZ1 to C
v.h.f. III	M4 to E12
Intermediate frequencies	
picture	38,9 MHz
sound	33,4 MHz

APPLICATION

These tuners are designed to cover the v.h.f. channels of C.C.I.R. systems B and G, including the Italian and Moroccan channels.

In combination with the u.h.f. tuner U322, U324, U342 or U342LO respectively, they can be used in v.h.f./u.h.f. receivers. The aerial inputs and i.f. outputs of both tuners can then be connected in parallel without additional circuitry.

The tuners are pin-compatible with tuners V314, V315 and V317.

The tuners comply with the requirements of radiation and signal handling capability of Amtsblatt DBP68/1979.

The V334LO is a special version of the V334; an output voltage from the local oscillator is made available for driving digital tuning systems. Apart from this the tuners are identical.

DESCRIPTION

The tuners are v.h.f. tuners with electronic tuning, covering the v.h.f. band I (44 to 88 MHz) and the v.h.f. band III (162 to 230 MHz). Switching between the bands is done by connecting the supply voltage to terminal V for band I and to terminal P for band III.

Mechanically, the tuner is built on a printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear cover (see Fig. 2a). All connections (aerial, supply voltage, a.g.c. voltage, tuning voltage, i.f. injection, i.f. output) are made via terminals on the underside. The mounting method is shown in Fig. 3. Tuner V334LO has a coaxial socket on the top of the frame for coupling out the oscillator sample.

Electrically the tuner consists of two input circuits in parallel (bands I and III) with band-pass characteristics, switchable for band I and band III, followed by a MOS-FET amplifier stage. The drain load of the MOS-FET is formed by a double tuned circuit, transferring the signal to the self-oscillating mixer BF967. The selectivity of this circuit at the intermediate frequency has been improved. Three capacitance diodes BB109G (or BB809) tune the double tuned circuit and the oscillator.

The i.f. output circuit of the tuner is a single tuned one, at the low end of which the i.f. signal is coupled out of the tuner. A d.c. path to earth for the collector current of the mixer has to be provided outside the tuner, preferably by a choke of about 5 μH. Damping of the i.f. output circuit and matching of the i.f. output to the i.f. circuit of the receiver can be chieved by connecting a series resistance and a parallel capacitance outside the tuner.

An i.f. injection point has been provided at the collector of the mixer transistor, connected to terminal S.

DEVELOPMENT SAMPLE DATA

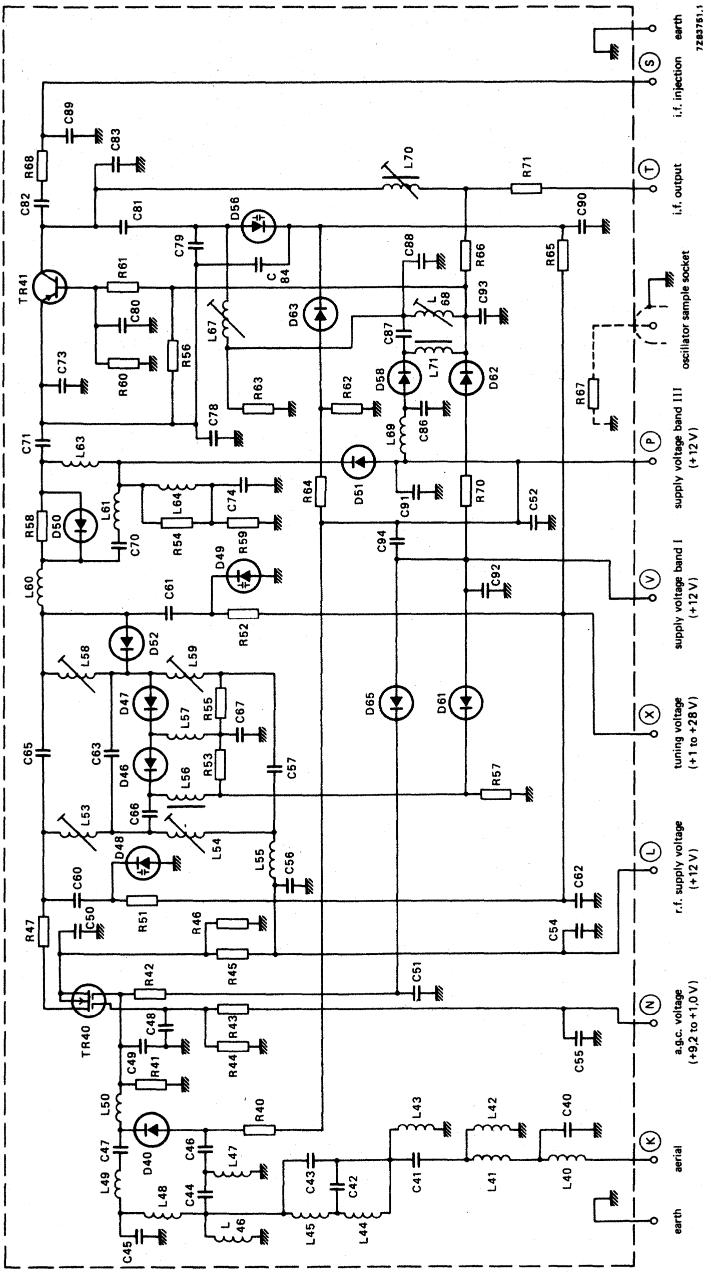


Fig. 1.

MECHANICAL DATA — Dimensions in mm

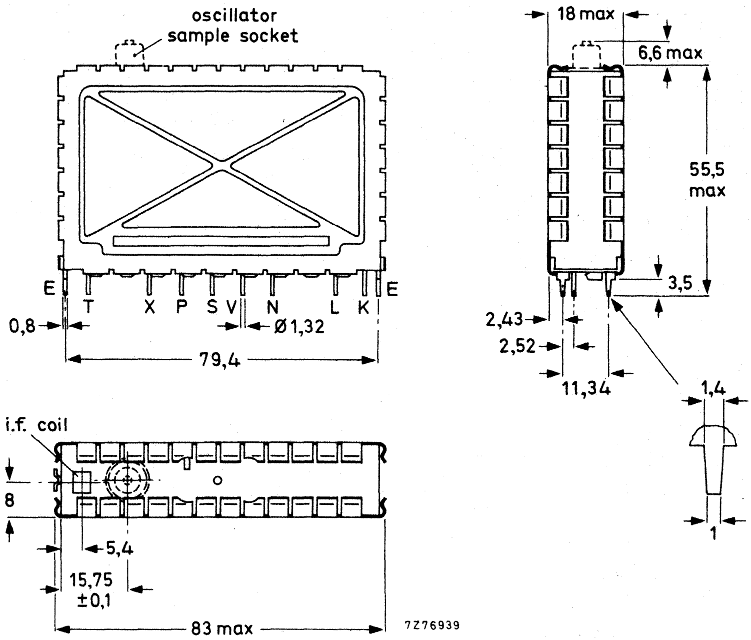


Fig. 2a The oscillator sampling socket, drawn with dotted lines, applies only to tuner V334LO.

Terminal T = i.f. output
X = tuning voltage, + 1 to + 28 V
P = supply voltage, band III, + 12 V
S = i.f. injection point
V = supply voltage, band I, + 12 V
N = a.g.c. voltage, + 9,2 to + 1,0 V
L = r.f. stage supply voltage, + 12 V
K = aerial

Note: When the tuner is operated together with a u.h.f. tuner, only the supply voltage at terminals P and V should be switched off during u.h.f. operation.

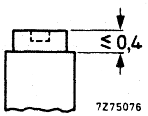


Fig. 2b I.F. output coil.
Torque for alignment: 2 to 15 mNm
Press-through force: ≥ 10 N

Mass approx. 80 g

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, using the piercing diagram shown in Fig. 3. (The tuner may also be mounted by means of a socket. Information will be supplied upon request).

It is recommended that the tuner be installed in the cool part of the receiver cabinet and not exposed to the vibrations of the loudspeaker. There are no restrictions on orientation.

The solderability of the terminals and mounting tabs is according to IEC 68-2, test Ta (230 ± 10 °C, 2 ± 0,5 s). The resistance to soldering heat is according to IEC 68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

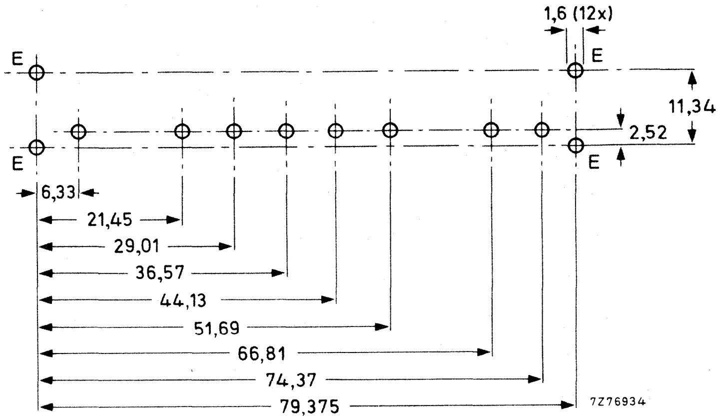


Fig. 3 Piercing diagram viewed from solder side of board.

For connection to the socket on the top of tuner V334LO a coaxial plug has to be used; type 3/2-50 (manufacturer: Daut und Rietz) is recommended.

DEVELOPMENT SAMPLE DATA

ELECTRICAL DATA

The electrical values are measured on the v.h.f. tuner alone*, but they are also valid for the v.h.f. tuner in combination with a u.h.f. tuner U322, U324, U342 or U342LO respectively. Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C, a relative humidity of 60 ± 15%, a supply voltage of 12 ± 0,3 V and an a.g.c. voltage of 9,2 ± 0,2 V.

Within the given tolerance range of supply voltage and a.g.c. voltage only insignificant deviations from the specified values can be expected. Under the extreme conditions of temperature and humidity as given below, the tuner will function normally, but some specified limits may be exceeded.

General

Semiconductors	
r.f. amplifier	BF961
self-oscillating mixer	BF967
tuning diodes	3 x BB109G (or BB809)
switching diodes	6 x BA482/BA483, 3 x BA220, 2 x BA318
Ambient temperature range	
operating	+ 5 to + 55 °C
storage	−25 to + 70 °C
Relative humidity	max. 90%

Voltages and currents

Supply voltage	+ 12 V ± 10%

Note: The supply voltage at terminals P and V should be filtered.

Current drawn from + 12 V supply		
r.f. amplifier, v.h.f. I, at nominal gain	typ.	25 mA
v.h.f. I, at 40 dB gain reduction	typ.	13,5 mA
r.f. amplifier, v.h.f. III, at nominal gain	typ.	25 mA
v.h.f. III, at 40 dB gain reduction	typ.	15 mA
self-oscillating mixer, terminal P	typ.	12,0 mA
terminal V	typ.	12,5 mA

Band switching

For operation in band I the supply voltage must be connected to terminal V, for band III operation to terminal P. If the tuner operates together with a u.h.f. tuner only the supply voltage at terminals P and V should be switched off during u.h.f. operation.

* All measurements on the tuner alone are done with a capacitor of 6,8 pF between aerial and earth.

A.G.C. voltage (Figs 4 to 7)	
at nominal gain	+9,2 ± 0,5 V
at 40 dB gain reduction	min. +1,0 V

Note: A.G.C. voltages between 0 and + 10 V may be applied without risk of damage.

A.G.C. current	
during gain control (0 to 40 dB)	max. +1,0 mA
at nominal gain	typ. +0,8 mA
at 40 dB gain reduction	typ. −0,2 mA
Tuning voltage range (Figs 8 and 9)	+1 to +28 V
Current drawn from +28 V tuning voltage supply	
at 25 °C	max. 150 nA
at 55 °C	max. 600 nA

Note: The source impedance of the tuning voltage offered to terminal X must be maximum 47 kΩ.

Switching current	max. 18 mA

DEVELOPMENT SAMPLE DATA

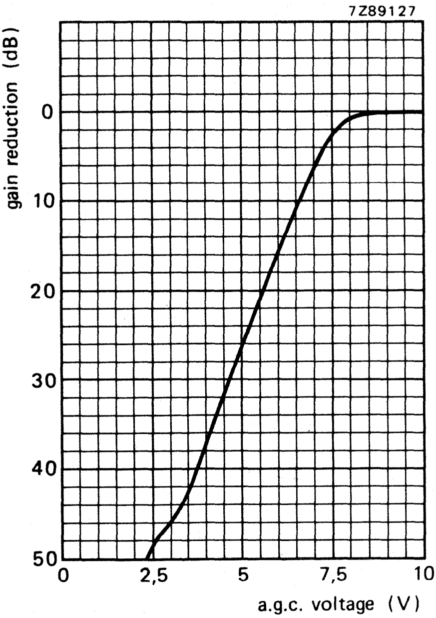


Fig. 4 Typical a.g.c. voltage characteristic, channel NZ1.

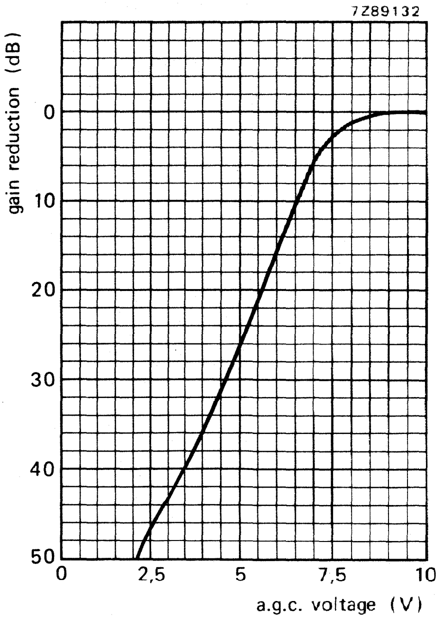


Fig. 5 Typical a.g.c. voltage characteristic, channel E4.

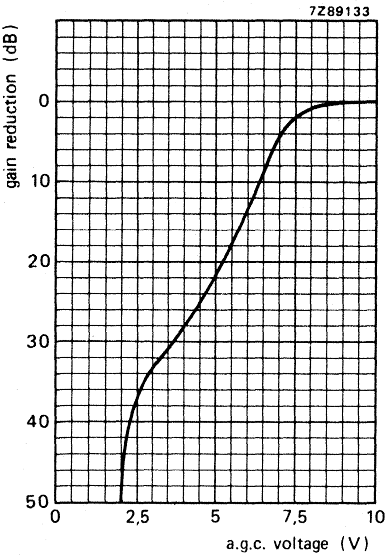


Fig. 6 Typical a.g.c. voltage characteristic, channel E5.

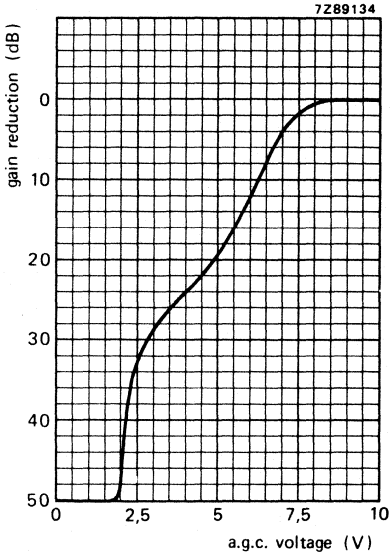


Fig. 7 Typical a.g.c. voltage characteristic, channel E12.

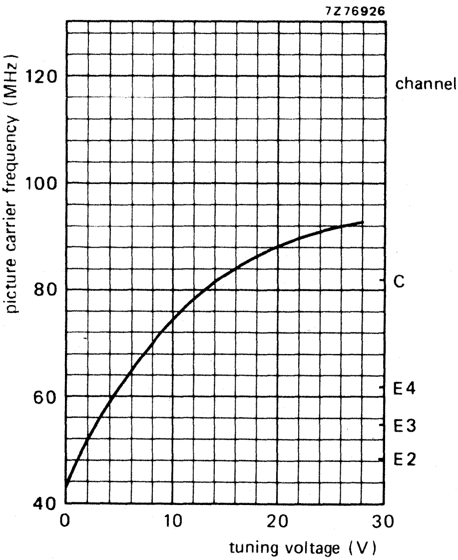


Fig. 8 Typical tuning voltage characteristic, v.h.f. I.

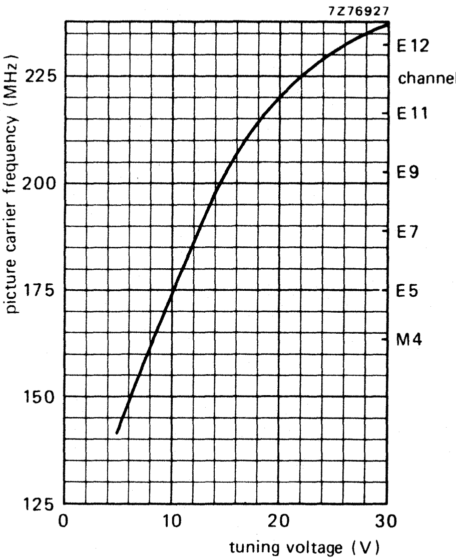


Fig. 9 Typical tuning voltage characteristic, v.h.f. III.

Oscillator sample signal; **only valid for V334LO**

At a supply voltage of + 10,8 to + 13,2 V, an operating temperature of + 5 to + 55 ^{o}C, and within the tuning voltage range + 0,5 to + 30 V	typ. 84 dB (μV) into 75 Ω
	min. 80 dB (μV) into 75 Ω
	max. 104 dB (μV) into 75 Ω

Note: A tuning voltage higher than + 28 V will not be harmful for the tuner and may be applied at the user's own risk. Under this condition the published reverse voltage limit of the oscillator tuning diode will be exceeded; the oscillator frequency will never decrease with increasing tuning voltage.

Frequency of oscillator sample signal; **only valid for V334LO**

v.h.f. I	84,15 to 121,15 MHz
v.h.f. III	202,15 to 263,15 MHz

Frequencies

Frequency ranges

v.h.f. I	channel NZ1 (picture carrier 45,25 MHz) to channel C (picture carrier 82,25 MHz) Margin at the extreme channels: min. 2 MHz.
v.h.f. III	channel M4 (picture carrier 163,25 MHz) to channel E12 (picture carrier 224,25 MHz) Margin at the extreme channels: min. 2 MHz.

Intermediate frequencies

picture	38,9 MHz
sound	33,4 MHz
	The oscillator frequency is higher than the aerial signal frequency

Wanted signal characteristics

Input impedance

asymmetrical	75 Ω

Output impedance at the oscillator sample socket; **only valid for V334LO**

asymmetrical	75 Ω

V.S.W.R. and reflection coefficient	minimum value between picture carrier and sound carrier frequency	maximum value at picture carrier frequency
v.s.w.r.	max. 4	max. 4
reflection coefficient	max. 60%	max. 60%

V.S.W.R. and reflection coefficient at oscillator sample socket; **only valid for V334LO**

v.s.w.r., v.h.f. I	max. 2
v.s.w.r., v.h.f. III	max. 2
reflection coefficient, v.h.f. I	max. 33%
reflection coefficient, v.h.f. III	max. 33%

DEVELOPMENT SAMPLE DATA

R.F. curves, bandwidth	typ. 12 MHz	
R.F. curves, tilt	on any channel the amplitude difference between the top of the r.f. resonant curve and the picture carrier marker, the sound carrier marker, or any frequency between them will not exceed 3 dB at nominal gain, and 4 dB in the a.g.c. range between nominal gain and 20 dB gain reduction.	
A.G.C. range	min.	40 dB
Power gain (see also Measuring method of power gain)	min.	20 dB
channel E3	typ.	23 dB
channel E5	typ.	24 dB
channel E12	typ.	24 dB
Gain difference between any two channels	typ.	6 dB
Noise figure	max.	9 dB
channel E3	typ.	6 dB
channel E5	typ.	7,5 dB
channel E12	typ.	8 dB

Overloading

Input signal producing 1 dB gain compression at nominal gain	typ.	80 dB (μV) into 75 Ω
Input signal producing either a detuning of the oscillator of +300 kHz or −1000 kHz or stopping of the oscillations at nominal gain	typ.	90 dB (μV) into 75 Ω

Unwanted signal characteristics

Image rejection (measured at picture carrier frequency), except channel M4	min.	60 dB
channel M4	min.	48 dB
I.F. rejection (measured at picture carrier frequency), except channels NZ1 and E2	min.	60 dB
channel NZ1	min.	40 dB
channel E2	min.	50 dB

Note: At colour sub-carrier frequency maximum 6 dB less rejection.

Harmonic content of oscillator sample; **only valid for V334LO**

Suppression of harmonics which fall into the frequency range below 1000 MHz	min.	15 dB below oscillator fundamental

R.F. rejection at oscillator sample socket; **only valid for V334LO**

Signal voltage at oscillator sample socket (input signals of wanted frequency 70 dB (μV) into 75 Ω, tuner operating at nominal gain)	min.	15 dB below oscillator fundamental

I.F. rejection at oscillator sample socket; **only valid for V334LO**

I.F. signals at oscillator sample socket (input signals of wanted frequency 70 dB (μV) into 75 Ω, tuner operating at nominal gain)	min.	15 dB below oscillator fundamental

Cross modulation
Input signal producing 1% cross modulation, i.e. 1% of the modulation depth of the interfering signal is transferred to the wanted signal.

In channel cross modulation (wanted signal: picture carrier frequency; interfering signal: sound carrier frequency);

at nominal gain (wanted input level 60 dB (μV)		
v.h.f. I	typ.	70 dB (μV) into 75 Ω
v.h.f. III	typ.	67 dB (μV) into 75 Ω
at 40 dB gain reduction (wanted input level 100 dB (μV)	typ.	100 dB (μV) into 75 Ω

In band cross modulation (wanted signal: picture carrier of channel N; interfering signal: picture carrier of channel N ± 2 for v.h.f. I or channel N ± 3 for v.h.f. III

at nominal gain (wanted input level 60 dB (μV)	typ.	88 dB (μV) into 75 Ω
at 40 dB gain reduction (wanted input level 100 dB (μV)	typ.	100 dB (μV) into 75 Ω

Out of band cross modulation at nominal gain

v.h.f. I, interfering from v.h.f. III	typ.	110 dB (μV) into 75 Ω
v.h.f. I, interfering from u.h.f.	typ.	110 dB (μV) into 75 Ω
v.h.f. III, interfering from v.h.f. I	typ.	110 dB (μV) into 75 Ω
v.h.f. III, interfering from u.h.f.	typ.	110 dB (μV) into 75 Ω

Unwanted signal handling capability (visibility test) for channel combinations N ± 1, N ± 5, N + 11 — according to the requirements of Amtsblatt DBP68/1979, item 5.1.2.

Oscillator characteristics

Pulling
Input signal of tuned frequency producing a shift of the oscillator frequency of 10 kHz, at nominal gain

v.h.f. I	typ.	73 dB (μV) into 75 Ω
v.h.f. III	typ.	69 dB (μV) into 75 Ω

Shift of oscillator frequency at a change of the supply voltage of 5%	max.	250 kHz
Drift of oscillator frequency		
during warm-up time (after the tuner has been completely out of operation for 15 min, measured between 5 s and 15 min after switching on)	max.	250 kHz
during warm-up time (after the input stage is in operation for 15 min, measured between 2 s and 15 min after switching on the self-oscillating mixer stage.	max.	250 kHz
at a change of the ambient temperature from + 25 to + 40 °C (measured after 3 cycles from + 25 to + 55 °C)	max.	300 kHz

DEVELOPMENT SAMPLE DATA

I.F. circuit characteristics

Bandwidth of i.f. output circuit — 5,8 ± 0,5 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 10; tuning voltage is 15 V; band III at minimum gain.

Bandwidth variation of i.f. output circuit as a result of r.f. tuning and band switching (reference: v.h.f. III) — max. 500 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 10, i.e. a 100 pF capacitor is connected in parallel with the i.f. output of the tuner; tuning voltage is 15 V.

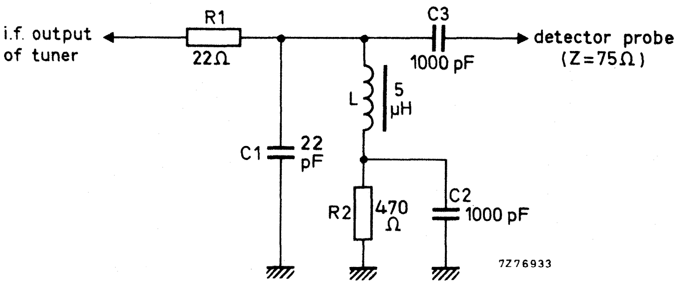


Fig. 10.

Detuning of the i.f. output circuit as a result of r.f. tuning and band switching (reference: v.h.f. III) — max. 350 kHz

Note: I.F. output of the tuner terminated with a modified circuit of Fig. 10, i.e. a 100 pF capacitor is connected in parallel with the i.f. output of the tuner; tuning voltage is 15 V.

Minimum tuning range of i.f. output coil — 34 to 41 MHz

Note: I.F. output of the tuner terminated with the circuit shown in Fig. 10; tuning voltage is 15 V.

Attenuation between i.f. injection point and i.f. output of the tuner — typ. 23 dB

Miscellaneous

Radio interference
Oscillator radiation and oscillator voltage at the aerial terminal — Within the limits of C.I.S.P.R. 13 (1975), VDE 0872/7.72 and Amtsblatt DBP68/1979*

Microphonics — There will be no microphonics, provided the tuner is installed in a professional manner.

Surge protection
Protection against voltages — max. 5 kV

Note: Three discharges of a 470 pF capacitor into the aerial terminal.

Protection against flashes — max. 30 kV, 400 mWs

Note: A flashover circuit producing flashes with frequencies of 1 to 20 Hz for 30 s is connected to the aerial terminal.

ADDITIONAL INFORMATION

If the tuner is used in receivers designed for v.h.f. only, a capacitor of 6,8 pF should be applied between the aerial input and earth.

I.F. injection

The tuner is provided with an i.f. injection point at the collector of the mixer transistor (coupled via a capacitor and a resistor to terminal S). The i.f. generator can be connected directly to this point. (Fig. 11).

The tuner needs normal supply voltages and a tuning voltage of 15 V; the i.f. output should be loaded with the circuit shown in Fig. 10.

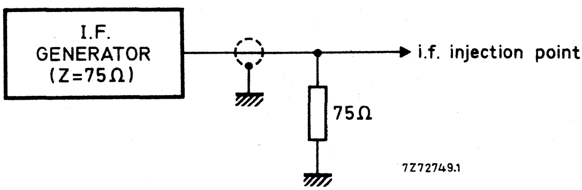


Fig. 11.

* For V334LO: when the oscillator sample socket is either open or terminated with a coaxial plug (75 Ω impedance, e.g. type 3/2-50, Daut und Rietz).

DEVELOPMENT SAMPLE DATA

Connection of the i.f. amplifier

The tuner needs a d.c. path from the i.f. output terminal (T) to earth, preferably via a choke of approx. 5 μH outside the tuner (Fig. 12). Where the tuner is used in combination with a u.h.f. tuner, this choke can be common for both tuners; a resistor in series with the choke can make ineffective the i.f. output circuit of the switched off tuner. For damping the i.f. output circuit and matching the i.f. output impedance of the tuner to the i.f. amplifier, a series resistor and a parallel capacitor as shown in Fig. 12 should be used. (During v.h.f. operation the voltage across the 470 Ω resistor is 1 to 1,2 V).

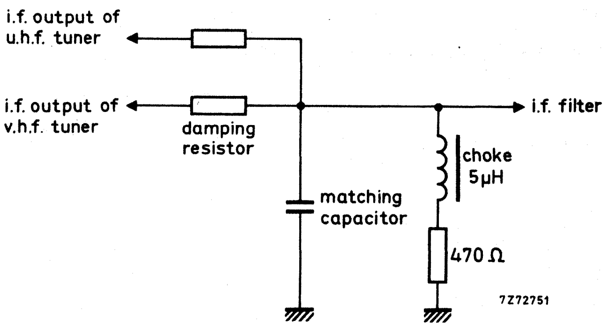


Fig. 12.

Measuring method of power gain

The i.f. output of the tuner should be terminated with the RC-circuit given in Fig. 10.

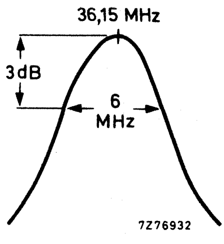


Fig. 13.

The RC-circuit roughly matches the i.f. output impedance to 75 Ω at the resonant frequency of the i.f. output circuit, which should be tuned to 36,15 MHz; the bandwidth should be approx. 6 MHz (Fig. 13).

Because the input and output impedances of the tuner are now 75 Ω, the power gain can be measured in the conventional manner by inserting tuner and RC-circuit between a 75 Ω source and a 75 Ω detector.

Alignment of the i.f. output coil

The i.f. output coil should be adjusted with a brass tool with a blade as shown in Fig. 14. A suitable tool is available under catalogue number 7122 005 47680.

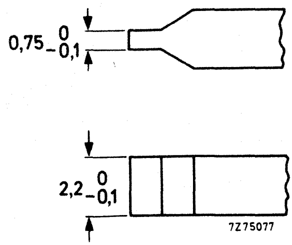


Fig. 14.

ACCESSORIES

Connector assembly for use of tuner V334 to V334LO in combination with u.h.f. tuner U342 or U342LO;

connector, catalogue number 3112 200 20720;
washer, catalogue number 3112 221 01220;
clamp, catalogue number 3112 274 13220.

DEVELOPMENT SAMPLE DATA

V.H.F. TELEVISION TUNER
with diode tuning

QUICK REFERENCE DATA

Systems	Systems E, L and L′		
Channels	System E	Systems L and L′	
v.h.f. I	F2, F4	A to C	
v.h.f. III	F5 to F12	1 to 6	
Intermediate frequencies			
picture	32.70	32.70	MHz
sound	43.85	39.20	MHz

APPLICATION

This tuner covers the v.h.f. channels of systems E, L and L′. In combination with the u.h.f. tuner UF5, it can be used in v.h.f./u.h.f. television receivers. The aerial inputs and i.f. outputs of both tuners can be connected in parallel without additional circuitry.

DESCRIPTION

The VF5 is a v.h.f. television tuner with electronic tuning, covering the v.h.f. band I and the v.h.f. band III. Switching between the bands is done by external switching.
The tuner circuit is built on a printed wiring board, and enclosed in a metal housing, comprising a rectangular frame with front and rear covers (see Fig. 2).
A shielded aerial lead is fitted to one of the shorter sides of the frame, all other connections (supply-input stage, a.g.c., tuning voltage, switching voltages, i.f. input from u.h.f. tuner, supply for oscillator and i.f. stage, and i.f. output) are made via terminals in the underside. Mounting as in Fig. 3.
Electrically the tuner consists of two input circuits in parallel (band I and band III) with band-pass characteristics and has the input transistor connected in grounded-base configuration. This transmitter operates at an emitter current of about 4 to 12 mA, featuring good noise figures and good signal handling properties. This combination has good handling properties throughout the a.g.c. range. The collector load of the input transistor is formed by a double tuned circuit, transferring the signal to the self-oscillating mixer. 3-variable capacitance diodes tune the double tuned circuits and the oscillator.
The i.f. output signal is extracted from the low end of the single-tuned output circuit.
A d.c. path to earth for the collector current of the mixer is provided inside the tuner.
An i.f. injection point is provided. Access is through a hole in the cover.

CIRCUIT DIAGRAM

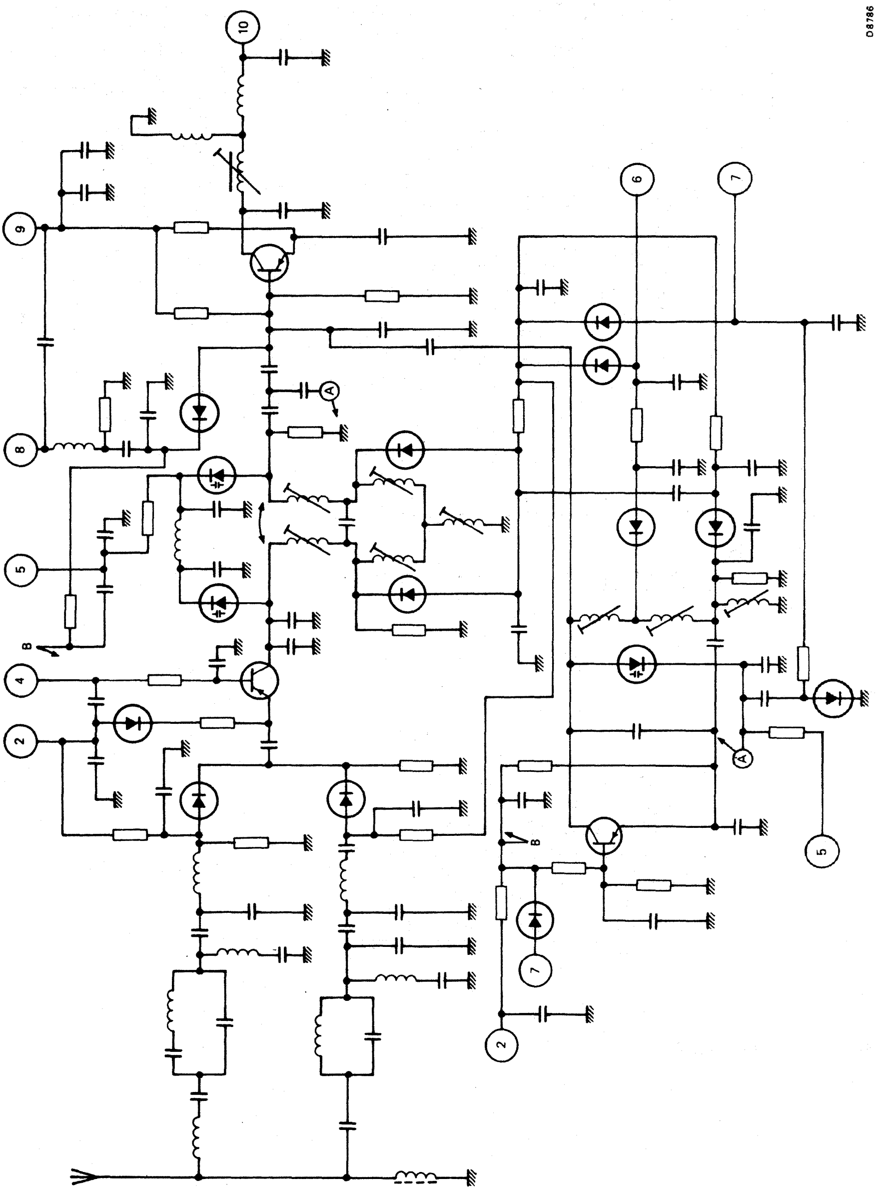


Fig. 1.

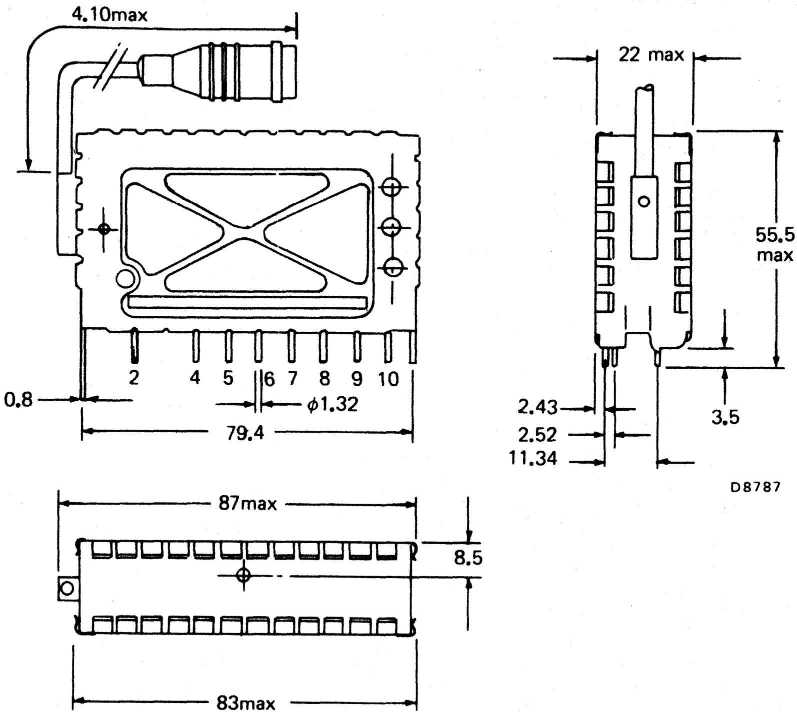


Fig.2

2 = r.f. stage supply voltage +12 V
4 = a.g.c. voltage
5 = tuning voltage +0.4 to +28 V
6 = Band III inverted (even channels) } Switching voltage +12 V
7 = Band III normal (odd channels) }
8 = i.f. input from u.h.f. tuner
9 = oscillator/i.f. supply voltage +12 V
10 = i.f. output

Mass approx. 75 g

Mounting

The tuner may be mounted by soldering it on to a printed-wiring board, with connections as shown by the piercing diagram in Fig. 3. (The tuner may also be mounted in a socket. Information will be supplied upon request).
It is recommended that the tuner be installed in a cool part of the receiver cabinet and not exposed to the vibrations of the loudspeaker. There are no restrictions on orientation.
The solderability of the terminals and mounting tabs is according to IEC 68-2, test Ta (230 ± 10 °C, 2 ± 0.5 s). The resistance to soldering heat is according to IEC 68-2, test Tb (260 ± 5 °C, 10 ± 1s).

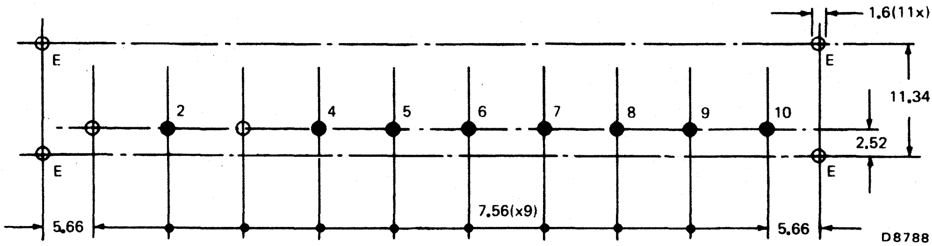


Fig. 3 Piercing diagram viewed from solder side of board

ELECTRICAL DATA

The electrical values are measured on the v.h.f. tuner alone, but they are also valid for the v.h.f. tuner when used with the u.h.f. tuner UF5. Unless otherwise specified all electrical values apply at an ambient temperature of 25 ± 5 °C, a relative humidity of 60 ± 15% and a supply voltage of 12 ± 0.1 V. Under the extreme conditions of temperature and humidity given below, the tuner will function normally, but some specified limits may be exceeded.

General

Ambient temperature range	
operating	+5 to +55 °C
storage	−25 to +85 °C
Relative humidity	max. 90%

Voltages and currents

Supply voltage	
positive	12 V ± 1 V
negative (negligible current)	−12 V ± 1 V
Current drawn from 12 V supply	
v.h.f. III at max. gain	typ. 38 mA
A.G.C. voltage	
at nominal gain	+9 V
at 40 dB gain reduction	band I 2.5 V
	band III 5.5 V
Tuning voltage range	+0.4 to +28 V
Current drawn from 28 V tuning voltage supply	0.5 μA

Frequencies

Range of frequencies

	System E			Systems L and L'		
	channel	vision	sound	channel	vision	sound
Band I	F2	52.4 MHz	41.25 MHz	A	47.75 MHz	41.25 MHz
				to		
	F4	65.55 MHz	54.40 MHz	C	63.75 MHz	57.25 MHz
Band III normal (odd channels)	F5 to F11	164.00 MHz 203.45 MHz	175.15 MHz 214.60 MHz	1 to 6	176.00 MHz 216.00 MHz	182.50 MHz 222.50 MHz
Band III inverted (even channels)	F6 to F12	173.40 MHz 212.85 MHz	162.25 MHz 201.70 MHz	– –	– –	– –

Intermediate frequencies	System E	System L and L'
picture	32.7 MHz	32.7 MHz
sound	43.85 MHz	39.2 MHz

The oscillator frequency may be higher or lower than the aerial signal frequency depending on the channel frequency and system.

Wanted signal characteristics

Input impedance asymmetrical	75 Ω
V.S.W.R.	max. 4
Reflection coefficient	max. 60%
R.F. curves, bandwidth	≤ 20 MHz
R.F. curves, tilt (only for i.f. 32.7/43.85)	On any channel the amplitude difference between the top of the r.f. resonant curve and the picture carrier marker, the sound carrier or any frequency between them will not exceed 2.5 dB
Power gain	
band I	≥ 19 dB
band III	≥ 21 dB
Noise figure	
band I	≤ 8 dB
band III	≤ 8 dB

Unwanted signal characteristics

Image rejection	
band I	⩾ 60 dB
band III normal	
channel 6 (L′)	⩾ 36 dB
other channels	⩾ 50 dB
band III inverted	
channels 6 to 10	⩾ 40 dB
other channels	⩾ 50 dB
I.F. rejection	
band III	⩾ 60 dB
band I	see table below

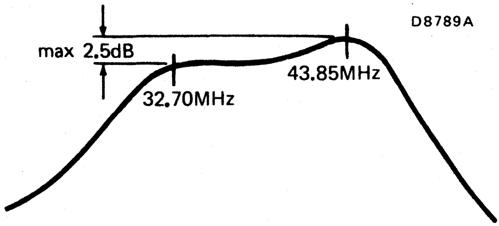
system	channel	frequency 32.7 MHz	39.2 MHz	43.85 MHz
E	F2	−28 dB		+5 dB
	F4	−33 dB		−4 dB
L′	A	−28 dB	+5 dB	
	B	−30 dB	−3 dB	
	C	−36 dB	−9 dB	

Maximum signal handling	
bands I and III	⩾ 5 dBmV
U.H.F. i.f. input signal handling	⩾ 23 dBmV

Oscillator characteristics

Shift of oscillator frequency at a change of ambient temperature of 15 °C (+25 to +40 °C)	⩽ 400 kHz

R.F./I.F. characteristics



Tuning peak vision	32.70 MHz
Tuning peak sound (system E)	43.85 MHz
Tuning peak sound (system L′)	39.20 MHz

Miscellaneous

Radio interference

Oscillator radiation at
the aerial terminal

(a) fundamental frequency	band I	$\leqslant -54$ dBm
	band III	$\leqslant -49$ dBm
(b) harmonic frequencies	$F_h < 300$ MHz	$\leqslant -59$ dBm
	$F_h > 300$ MHz and < 1000 MHz	$\leqslant -57$ dBm

Microphony

There will be no microphonics, providing that the tuner is installed in a professional manner.

COAXIAL AERIAL INPUT ASSEMBLIES

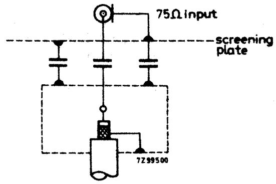
APPLICATION

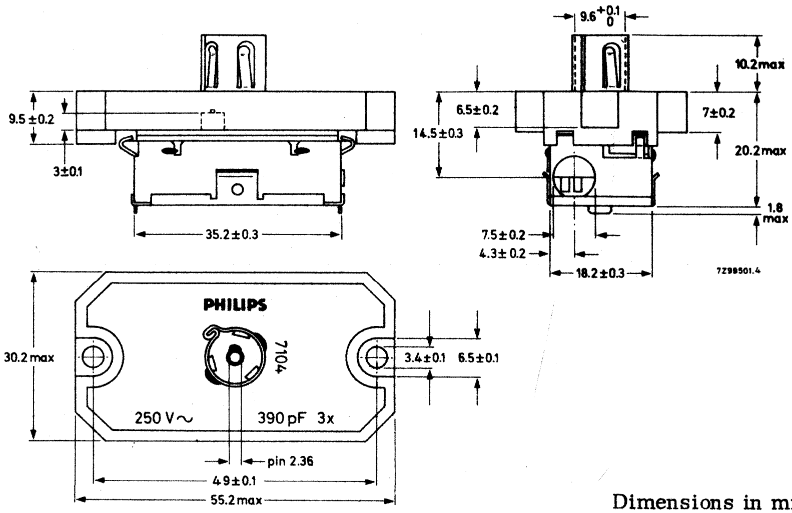
These coaxial aerial input assemblies have been developed for application in television sets with 75 ohm input impedance, for use in v.h.f. as well as in u.h.f. (40-890 MHz). The connectors meet the demands of both the IEC standards (diameter 9,5 mm) and the French standards (diameter 9,0 mm). They have to be used with plugs complying with the properties mentioned in DIN 45325, IEC 169-2 (diameter 9,5 mm) and SNIR (diameter 9,0 mm). The units meet the safety requirements of IEC 65.

AVAILABLE TYPES

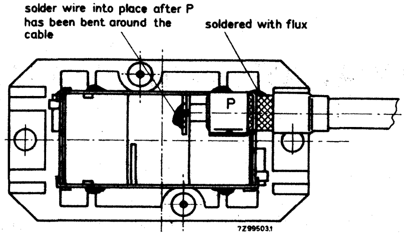
Coaxial aerial input assembly 75 Ω

Attenuation	: ≤ 1 dB
Reflection, v.h.f.	: ≤ 15%
u.h.f.	: ≤ 25%
Catalogue number	: 3122 127 10260

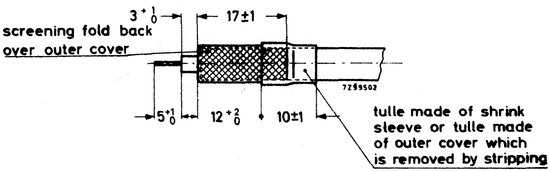




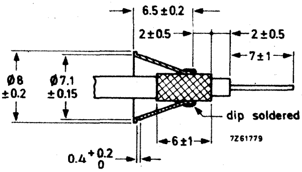
Dimensions in mm



Recommended fixing of the aerial cable
Soldering conditions: 370 ± 5 °C; 3,5 ± 0,5 s



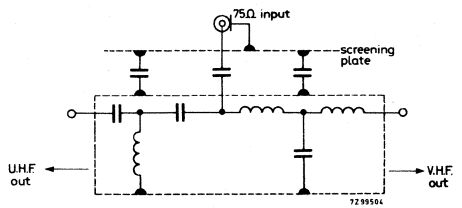
Cable diameter ≥ 5 mm

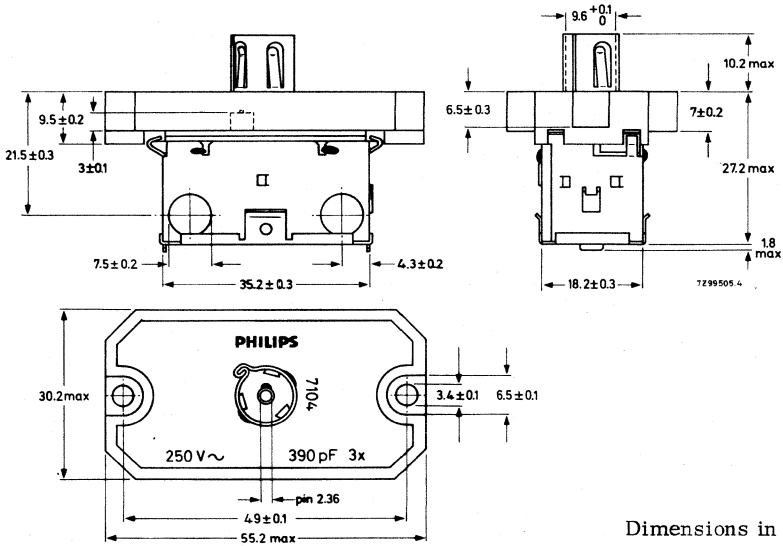


Cable diameter < 5 mm

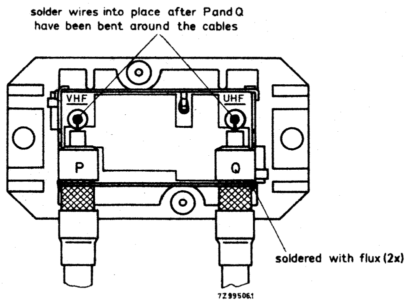
Coaxial aerial input assembly 75 Ω, with filter

Reflection, v.h.f.		≤ 25%
u.h.f.		≤ 30%
Frequency characteristic		
v.h.f.,	50 to 230 MHz	≤ 1 dB
	470 MHZ	≥ 13 dB
	700 MHz	23 dB (typical value)
u.h.f.,	470 to 850 MHz	≤ 1 dB
	230 MHz	≥ 15 dB
	100 MHz	40 dB (typical value)
Catalogue number		3122 127 10450

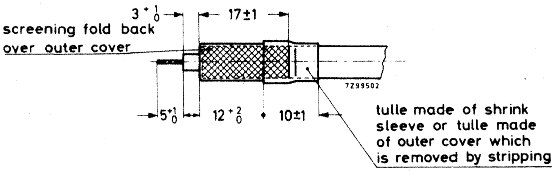




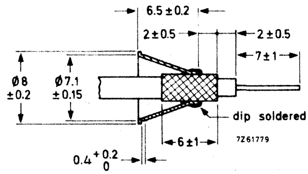
Dimensions in mm



Recommended fixing of the aerial cable
Soldering conditions: 370 ± 5 °C; 3,5 ± 0,5 s



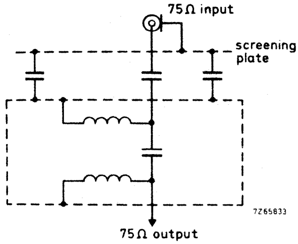
Cable diameter ≥ 5 mm



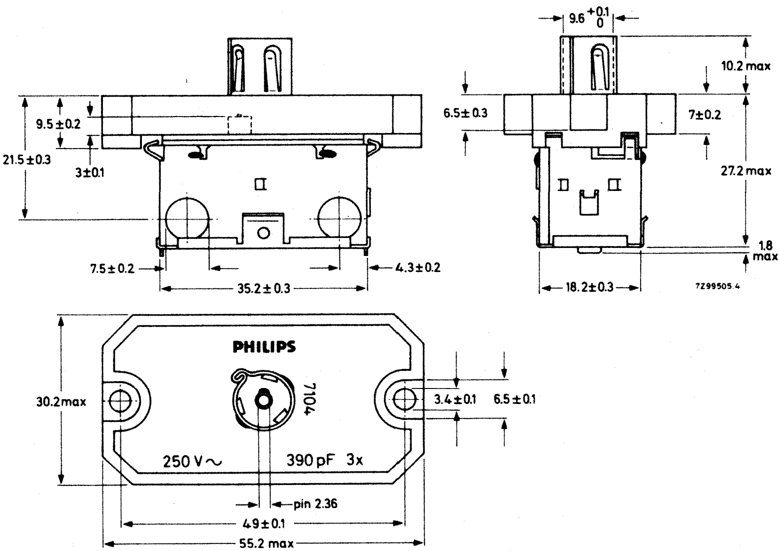
Cable diameter < 5 mm

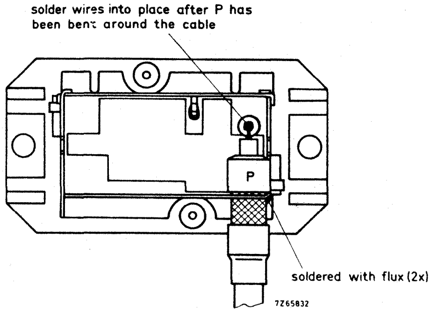
Coaxial aerial input assembly 75 Ω, with high-pass filter

Attenuation at	1 MHz	: 60 dB (typical value)
	5 MHz	: 40 dB (typical value)
	10 MHz	: ≥ 25 dB
	50 MHz	: ≤ 1 dB
	230 MHz	: ≤ 1 dB
	470 MHz	: ≤ 1 dB
	850 MHz	: ≤ 1,5 dB
Reflection,	v.h.f. I	: ≤ 35%
	v.h.f. III	: ≤ 15%
	u.h.f.	: ≤ 35%
Catalogue number		: 3122 127 14730

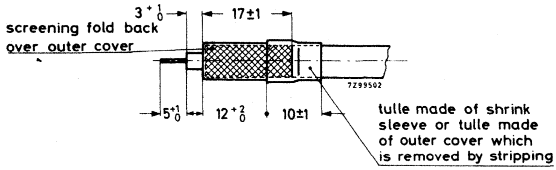


Dimensions in mm

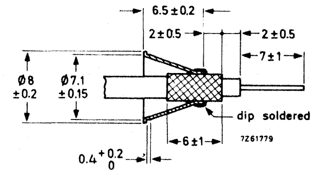




Recommended fixing of the aerial cable
Soldering conditions: 370 ± 5 °C; 3,5 ± 0,5 s



Cable diameter ≥ 5 mm



Cable diameter < 5 mm

COAXIAL AERIAL INPUT ASSEMBLY

APPLICATION

This coaxial aerial input assembly has been developed for application in TV sets with 75 Ω input impedance, for use in v.h.f. as well as in u.h.f. bands. Thanks to the use of safety capacitors in the assembly, the chassis of the TV set is separated from the aerial input. The connector for the aerial input meets the demands of the IEC standards (diameter 9,5 mm) and the French standards (diameter 9,0 mm).

The coaxial aerial input assembly complies with the requirements of immunity from radiated interference of Amtsblatt DBP68/1979 and BS 905. It meets the safety requirements of IEC 65; approbation approvals have been sought from KEMA, VDE, SEV, BSI, DEMKO, NEMKO, SEMKO, EI and LCEE.

DESCRIPTION

The assembly is provided with safety capacitors, which are moulded in thermo-setting insulation material, thus forming a capacitor block. This capacitor block is built in a metal housing, with lid, which is carried by a plastic fixing plate. All points to the safety capacitors are press contacts, achieved by the metal housing. The housing has an outlet for the coaxial cable to the television tuner.

ELECTRICAL DATA

The electrical values are measured at an ambient temperature of 25 ± 5 °C and a relative humidity of 60 ± 15%.

Input impedance of connector	75 Ω, asymmetrical
Frequency ranges	
v.h.f.	40 to 300 MHz
u.h.f.	470 to 890 MHz
Reflection	
v.h.f.	⩽ 15%
u.h.f.	⩽ 25%
Insertion loss	
v.h.f.	⩽ 1 dB; typ. 0,2 dB
u.h.f.	⩽ 1 dB; typ. 0,4 dB
Contact resistance of connector after 1 plug insertion	
inner bush	⩽ 10 mΩ
outer bush	⩽ 5 mΩ
Insulation resistance	> 500 MΩ
Immunity from radiated interference	in conformity with requirements of Amtsblatt DBP68/1979 and BS 905, provided the assembly is installed in a professional manner, and a proper coaxial cable is used.

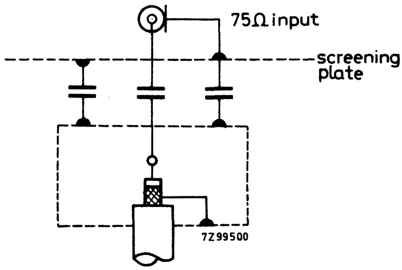


Fig. 1.

ENVIRONMENTAL DATA

Operating temperature range	0 to + 55 °C
Storage temperature range	−40 to + 85 °C
Relative humidity	⩽ 95%

MECHANICAL DATA

Dimensions in mm

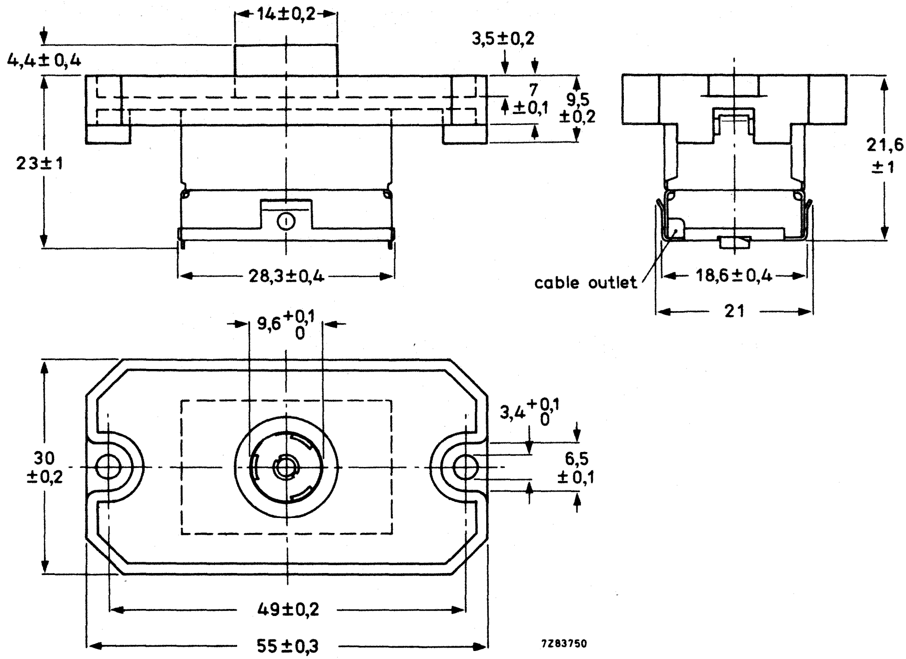


Fig. 2.

MOUNTING

The assembly can be mounted to the chassis of the TV set with two self-tapping screws, 4N x 9,5.

It must be connected to the tuner via a coaxial cable with a diameter of 3 mm. The inner cable conductor should be soldered to the metal plating of the capacitor block, and the cable earth sheath to the metal housing, see Fig. 3.

The soldering conditions are: 340 °C, 2 s.

Plugs to be used with the assembly have to comply with the properties mentioned in DIN 45325, IEC 69-2 (9,5 mm diameter) and SNIR (9 mm diameter).

It is advised not to use aluminium plugs.

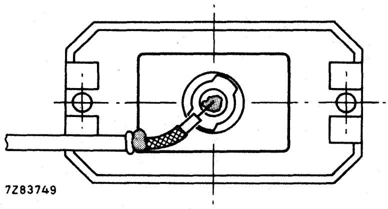


Fig. 3 Recommended fixing of the aerial cable.

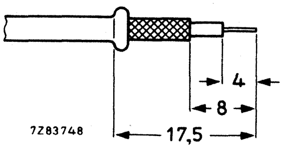


Fig. 4 Recommended cable stripping.

VIDEO MODULATORS

VIDEO MODULATORS

QUICK REFERENCE DATA

	REMO 100	REMO 200
C.C.I.R. system	G	I
Channels	30 to 40	30 to 40
Intercarrier sound frequency	5,5 MHz	6 MHz

APPLICATION

These video modulators are for use in:

– video tape recorders (VCR);
– TV cameras;
– video games;
– video information systems;
– closed circuit TV video systems.

DESCRIPTION

In the video modulator, video and sound signals are modulated onto a u.h.f. carrier. The modulated carrier at the output is suited for connection to the antenna socket of normal television receivers.
The carrier frequency can be adjusted from 563 to 624 MHz (channel 30 to channel 40), so 10 different channels can be linked via a single coaxial cable.
The modulators meet the radiation requirements of C.I.S.P.R. Recommendation No. 13.

Mechanically, the modulators are built on a low-loss printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear covers (see Fig. 1). The output connection is on a frame side, all other connections are made via feed-through capacitors on the underside. The mounting method is shown in Fig. 2.

MECHANICAL DATA

Dimensions in mm

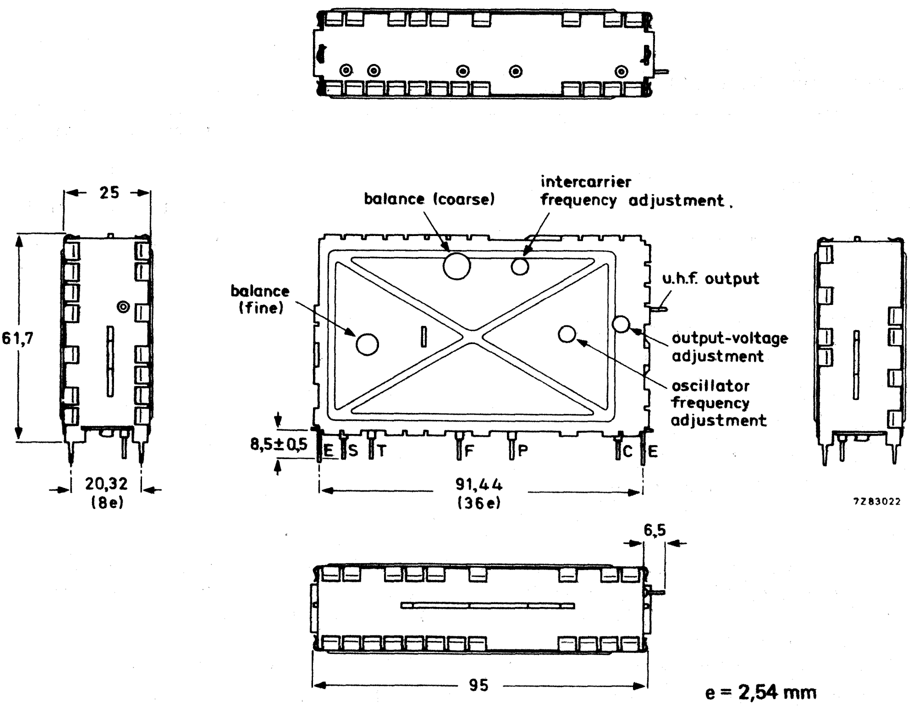


Fig. 1.

Terminal C = modulator supply voltage, +12 V
P = video input
F = oscillator supply voltage, +12 V
T = sound supply voltage, +12 V
S = sound input
E = earth.

Mounting

The modulators may be mounted by soldering on to a printed-wiring board, with connections shown by the piercing diagram in Fig. 2.
The solderability of the terminals and mounting tabs is according to IEC68-2, test Ta (230 ± 10 °C, 2 ± 0,5 s). The resistance to soldering heat is according to IEC 68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

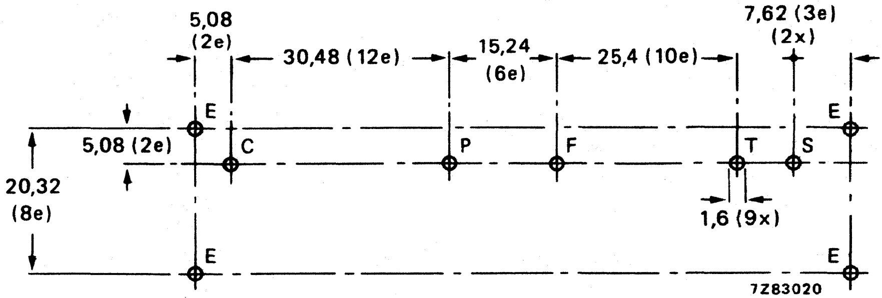


Fig. 2 Piercing diagram viewed from solder side of board; e = 2,54 mm (0,1 in).

ELECTRICAL DATA

Semiconductors	
amplifier	AF139
oscillator	BF194
Ambient temperature	
operating	0 to +50 °C
storage	−20 to +60 °C
Supply voltage	+12 ± 1 V (d.c.)
Current drawn from +12 V supply	typ. 20 mA
Output frequency range	563 to 624 MHz
Sound input	1 V (r.m.s.)
Sound input impedance (d.c. blocked)	120 kΩ
Intercarrier sound frequency	
REMO 100	5,5 MHz
REMO 200	6 MHz
Output (picture carrier at sync.)	typ. 3,5 mV (r.m.s.)
Output impedance	typ. 75 Ω
Video input (white level at 3,75 V)	1 V(p-p); see also Fig. 3

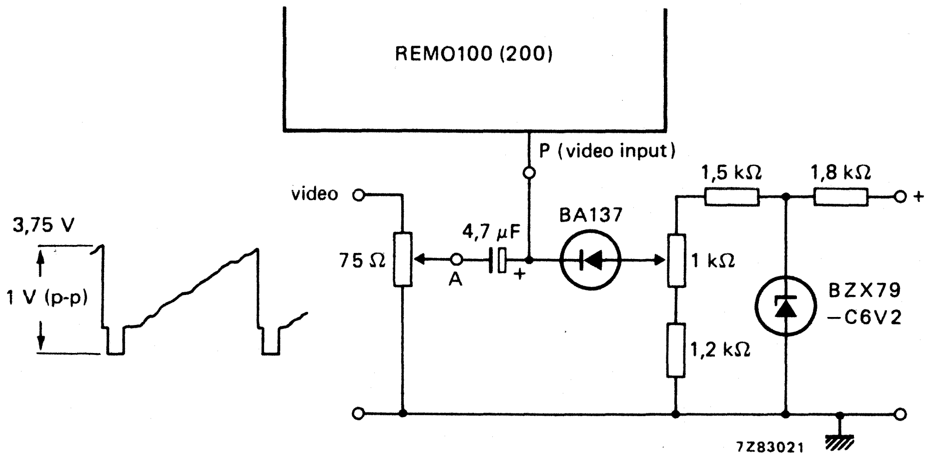


Fig. 3 Application diagram for adjusting the white level to 3,75 V; white level to be measured at point A.

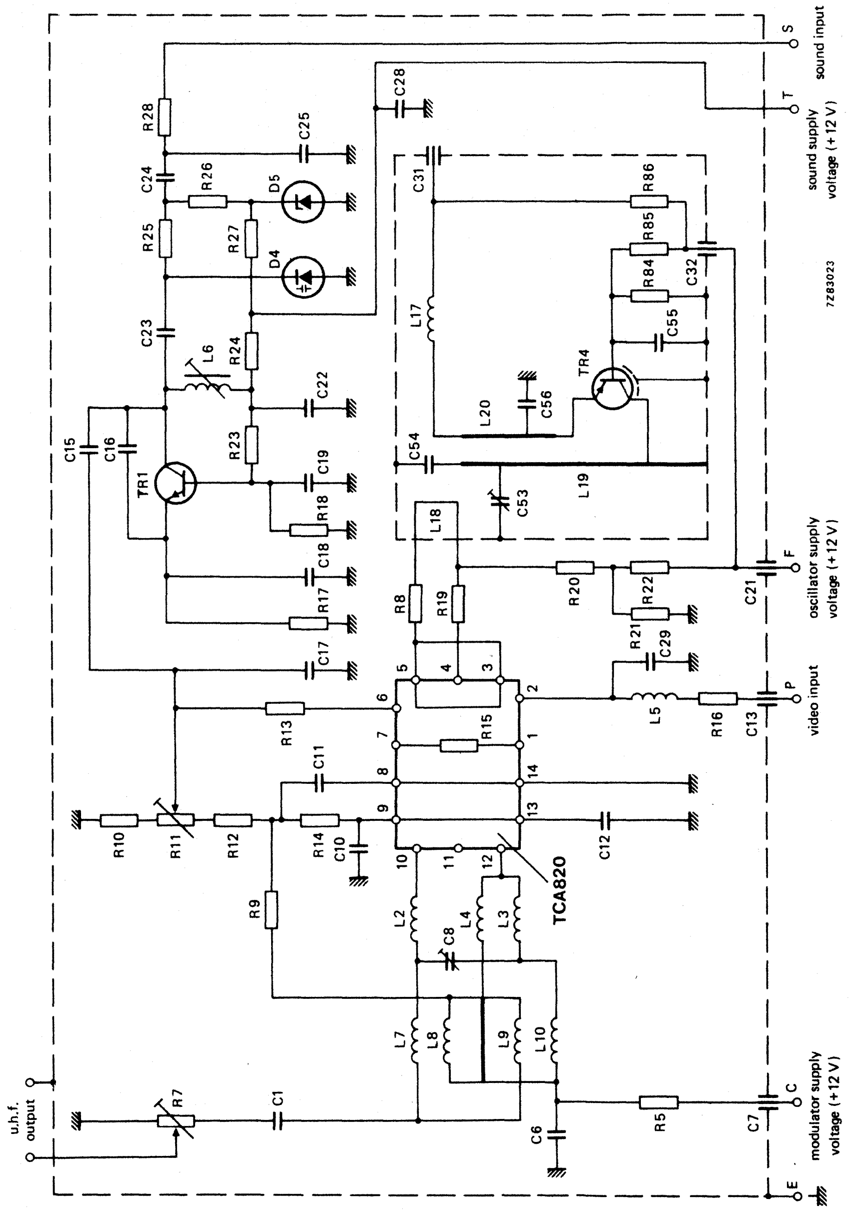

S
sound input
T
sound supply voltage (+12 V)
F
oscillator supply voltage (+12 V)
P
video input
C
modulator supply voltage (+12 V)
E
u.h.f. output
TCA820
7Z83023

Fig. 4.

VIDEO MODULATORS

QUICK REFERENCE DATA

	REMO 101	REMO 201
C.C.I.R. system	G	I
Channels	E30 to E40	E30 to E40
Intercarrier sound frequency	5,5 MHz	6 MHz

APPLICATION

These video modulators are for use in:

- video tape recorders (VCR);
- TV cameras;
- video games;
- video information systems;
- closed circuit TV video systems.

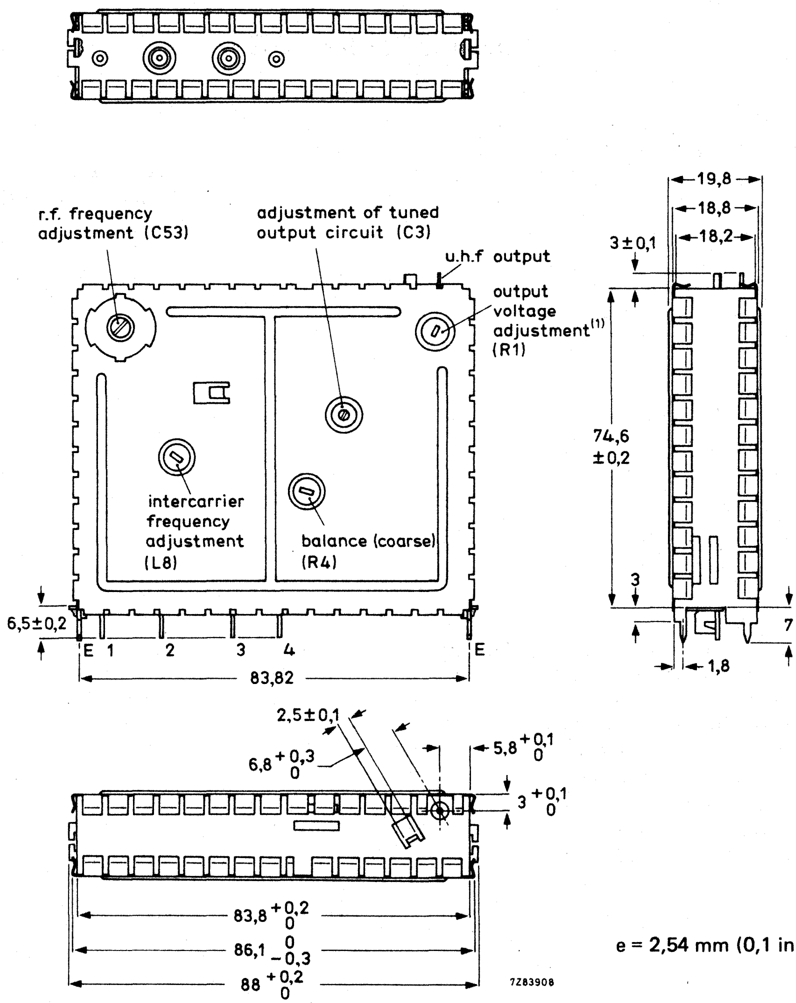
DESCRIPTION

In the video modulator, video and sound signals are modulated onto a u.h.f. carrier. The modulated carrier at the output is suited for connection to the antenna socket of normal television receivers. The carrier frequency can be adjusted from 540 to 624 MHz (channel E30 to channel E40) so 10 different channels can be linked via a single coaxial cable.
The modulators meet the radiation requirements of C.I.S.P.R. Recommendation No. 13.

Mechanically, the modulators are built on a low-loss printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear covers (see Fig. 1). The u.h.f. output connection is on the top of the housing, all other connections are made via feed-through capacitors on the underside. The mounting method is shown in Fig. 2.

MECHANICAL DATA

Dimensions in mm



e = 2,54 mm (0,1 in)

Fig. 1.

Terminal 1 = sound input
2 = video reference input
3 = supply voltage, +12 V
4 = video input
E = earth
(1) only for REMO 101

Mounting

The modulators may be mounted by soldering on to a printed-wiring board, with connections shown by the piercing diagram in Fig. 2.
The solderability of the terminals and mounting tabs is according to IEC68-2, test Ta (230 ± 10 °C, 2 ± 0,5 s). The resistance to soldering heat is according to IEC68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

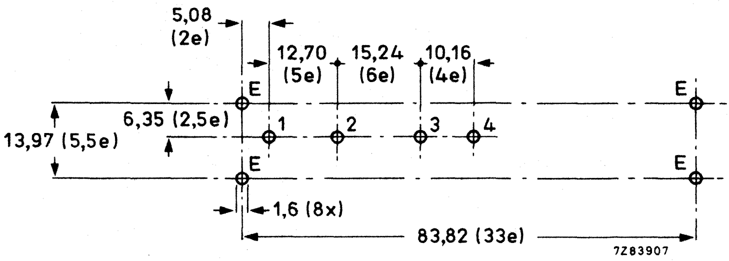


Fig. 2 Piercing diagram viewed from solder side of board; e = 2,54 mm (0,1 in).

DEVELOPMENT SAMPLE DATA

ELECTRICAL DATA

General

Semiconductors	
r.f. oscillator	AF139
intercarrier oscillator	BF494
modulator	TDA0820
Ambient temperature range	
operating	+5 to +55 °C
storage	−20 to +60 °C
Relative humidity	30 to 75%

Supply

Supply voltage	+12 ± 0,5 V
Current drawn from + 12 V supply	typ. 17 mA

Video modulation

Video input voltage (Fig. 3)	1 V(p-p)
Permissible voltage at video input terminal (4), and at video reference input terminal (2), for linear operation	max. 6 V min. 2 V
Input impedance at video input terminal (4) and at video reference input terminal (2)	> 50 kΩ
Residual carrier voltage*, except channels E30 and E40	⩽ 2,5% of output voltage during sync. pulse
channels E30 and E40	⩽ 3,5% of output voltage during sync. pulse
Differential gain	⩽ 10%
Differential phase	⩽ 15°

Sound modulation

Intercarrier sound frequency	
REMO 101	5,5 MHz ± 3 kHz
REMO 201	6,0 MHz ± 3 kHz
Sound input voltage, for Δf = 25 kHz (f = 1 kHz)	1,0 V(r.m.s.)
Pre-emphasis	50 µs
Sound input impedance	> 30 kΩ
Shift of oscillator frequency at a change of the supply voltage from 11,5 to 12,5 V	⩽ 8 kHz
Drift of oscillator frequency at a change of the ambient temperature from 25 to 40 °C	⩽ 4 kHz

* When input voltages at terminals 2 and 4 are equal.

Output

Output voltage (picture carrier during sync. pulse)	4,0 to 7,3 mV(r.m.s.)*
Output voltage of each sound carrier (double-sideband modulation)	10 to 15 dB below picture carrier
Output impedance	75 Ω
Output frequency (picture carrier)	543,25 to 623,25 MHz (channels E30 to E40)
Output frequency shift at a change of the supply voltage from 11,5 to 12,5 V	≤ 100 kHz
Output frequency drift at a change of the ambient temperature	
from 25 to 40 °C	≤ 150 kHz
from 15 to 55 °C	≤ 420 kHz

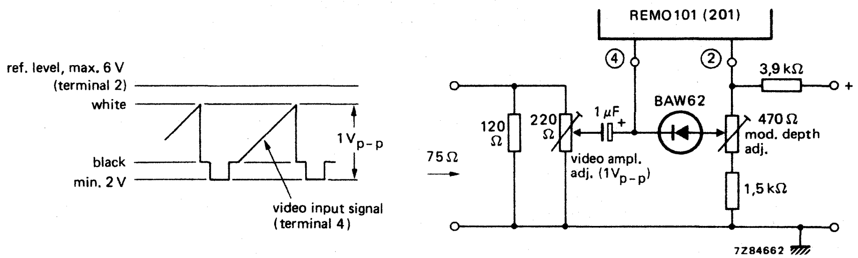


Fig. 3a Application diagram using a positive video signal.

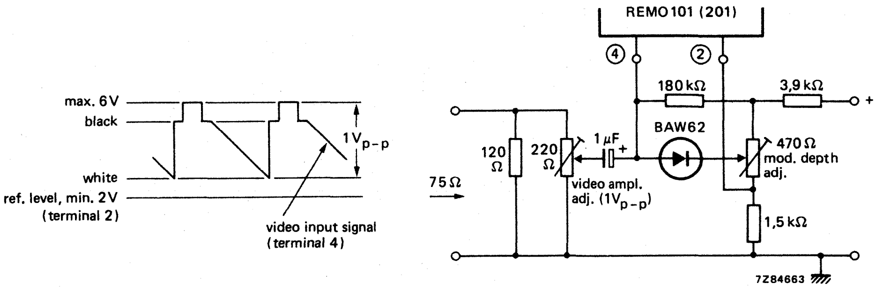


Fig. 3b Application diagram using a negative video signal.

Note: The r.f. output amplitude is proportional to the voltage difference between terminals 2 and 4.

* Adjustable for REMO 101.

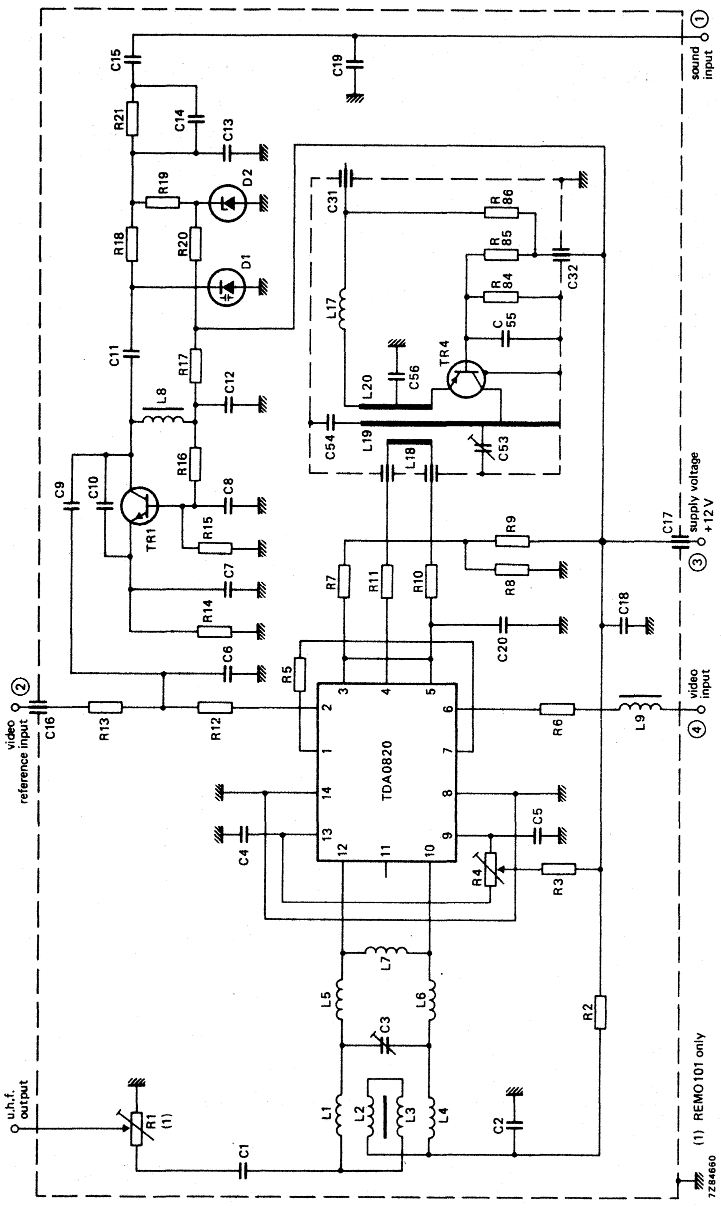


Fig. 4.

(1) REMO 101 only.

VIDEO MODULATOR

QUICK REFERENCE DATA

C.C.I.R. system	L
Channels	E30 to E40
Sound frequency	6,5 MHz

APPLICATION

These video modulators are for use in:

- video tape recorders (VCR);
- TV cameras;
- video games;
- video information systems;
- closed circuit TV video systems.

DESCRIPTION

In the video modulator, video and sound signals are modulated onto a u.h.f. carrier. The modulated carrier at the output is suited for connection to the aerial socket of normal television receivers. The carrier frequency can be adjusted from 540 to 624 MHz (channel E30 to channel E40) so 10 different channels can be linked via a single coaxial cable.
The modulator meets the radiation requirements of C.I.S.P.R. Recommendation No 13.

Mechanically, the modulators are built on a low-loss printed-wiring board, carrying all components, in a metal housing made of a rectangular frame and front and rear covers (see Fig. 1). The u.h.f. output connection is on the top of the housing, all other connections are made via feed-through capacitors in the underside. The mounting method is shown in Fig. 2.

MECHANICAL DATA

Dimensions in mm

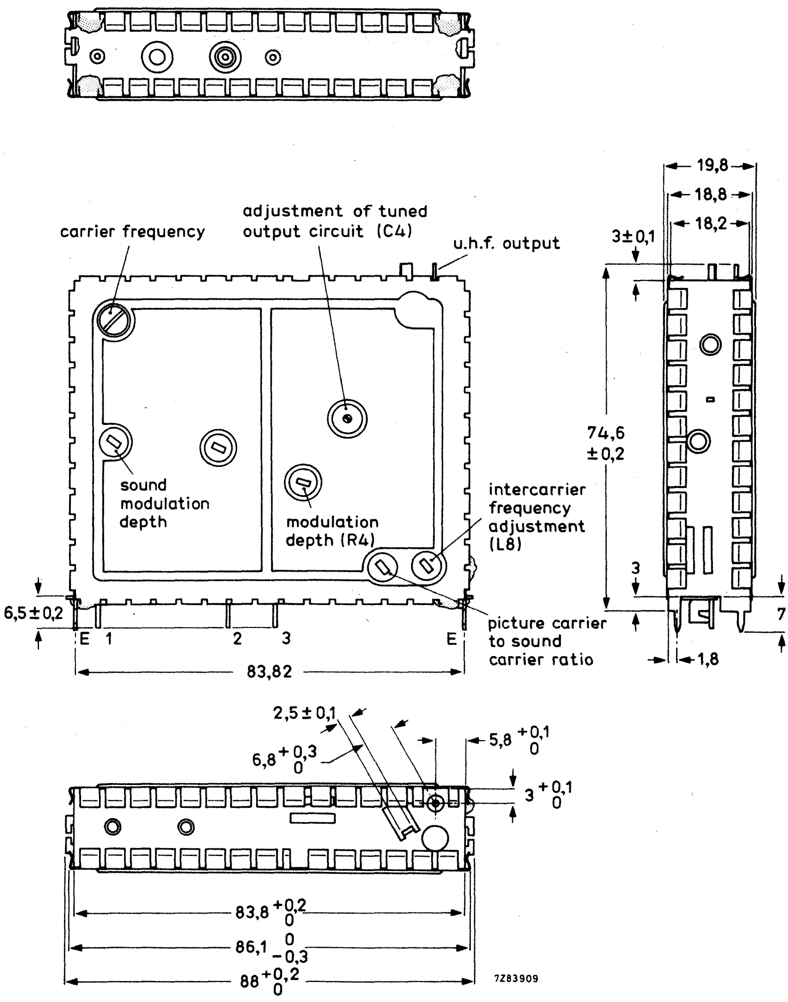


Fig. 1.

Terminal 1 = sound input
2 = supply voltage, + 12 V
3 = video input
E = earth

Mounting

The modulator may be mounted by soldering on to a printed-wiring board, with connections shown by the piercing diagram in Fig. 2.

The solderability of the terminals and mounting tabs is in accordance with IEC68-2, test Ta (230 ± 10 °C; 2 ± 0,5 s). The resistance to soldering heat is in accordance with IEC68-2, test Tb (260 ± 5 °C, 10 ± 1 s).

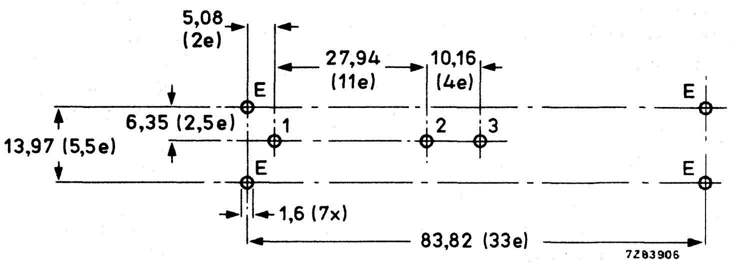


Fig. 2 Piercing diagram viewed from solder side of board; e = 2,54 mm (0,1 in).

DEVELOPMENT SAMPLE DATA

ELECTRICAL DATA

All electrical values are specified at an ambient temperature of 25 °C and a supply voltage of 12 V.

General

Semiconductors and integrated circuits	
sound amplifier	BC547A
sound modulator	TCA240
r.f. oscillator	BF569
picture modulator	TDA0820T
video emitter follower	BC548
Ambient temperature range	
operating	+ 5 to + 55 °C
storage	–20 to + 70 °C
Relative humidity	30 to 75%

Supply

Supply voltage	+ 12 ± 0,5 V
Current drawn from + 12 V supply	typ. 50 mA

Video modulation

Video input voltage	1 V (p-p)
D.C. level of sync.	2 to 4 V
Input impedance at video input	min. 50 kΩ
Modulation depth	87 to min. 95%
Residual carrier voltage	max. 5% of output voltage during white
Difference gain	max. 10%
Differential phase	max. 15°

Sound modulation

Sound frequency	6,5 MHz ± 10 kHz
Sound input voltage at 40% amplitude modulation	1,0 V r.m.s.
Sound input impedance	min. 5 kΩ
Bandwidth (–1 dB)	50 Hz to 15 kHz
Shift of oscillator frequency for a change of supply voltage from 11,5 to 12,5 V	max. 10 kHz
Drift of oscillator frequency over ambient temperature range 25 to 40 °C	max. 8 kHz

Output

Output voltage (picture carrier during white level)	min. 4,0 mV (r.m.s.)
Output voltage of each sound carrier (double-sideband modulation)	11 to 16 dB below picture carrier during white level
Output impedance	75 Ω
Output frequency	543,25 to 623,25 MHz (channels E30 to E40)
Output frequency shift for a change of supply voltage from 11,5 to 12,5 V	max. 100 kHz
Output frequency drift over ambient temperature	
range 25 to 40 °C	max. 150 kHz
range 15 to 55 °C	max. 420 kHz

DEVELOPMENT SAMPLE DATA

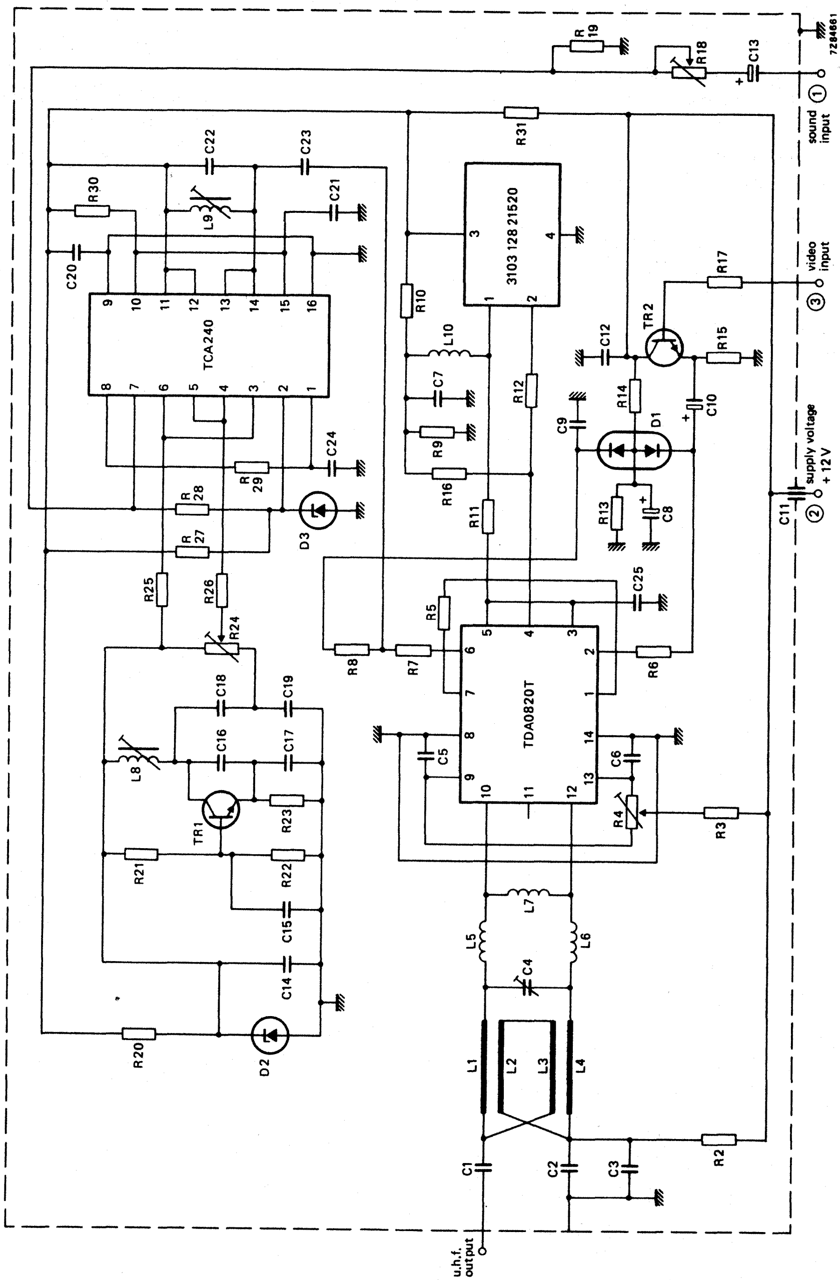

TCA240
TDA0820T
3103 128 21520
sound input
video input
supply voltage + 12 V
u.h.f. output
7Z84661

Fig. 3.

SURFACE ACOUSTIC WAVE FILTERS

SURFACE ACOUSTIC WAVE FILTER

The RW153A is a lithium niobate surface wave device for use as an i.f. bandpass filter in colour and monochrome TV receivers. Its low input capacitance improves the signal handling capabilities of the driving pre-amplifier. It is specifically designed for CCIR system I as used in the United Kingdom. Its use in place of conventional LC circuitry improves the amplitude and group delay characteristics, as well as avoiding the necessity for critical adjustments during receiver production. The response characteristics are stable with life.

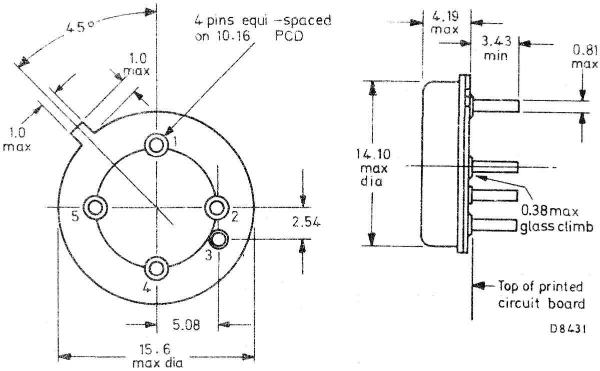
QUICK REFERENCE DATA

	Frequency MHz		Amplitude dB
Vision carrier	39,5		−6
Sound carrier	33,5	typ.	−19
Adjacent vision trap	31,5	<	−40
Adjacent sound trap	41,5	typ.	−46
Insertion loss (300 Ω source and load)	37,0	typ.	16
Operating temperature range	−10 to +70 °C		

MECHANICAL DATA

Dimensions in mm

5 lead TO-8



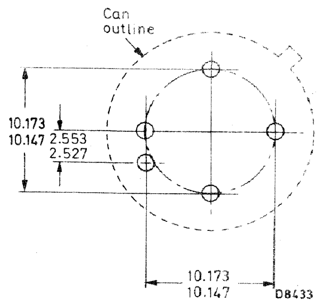


Fig. 1a Connections:
1. balanced output
2. input high
3. can (earth)
4. input (earth)
5. balanced output

Fig. 1b Printed circuit board hole layout
Standard 0,1″ grid
Hole dia. 1,2 mm min.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Operating ambient temperature	−10 to +70	°C
Storage temperature	−25 to +85	°C
Pin to pin voltage (short term) max.*	30	V

CHARACTERISTICS

Test conditions**

Ambient temperature	25	°C
Input drive impedance	50	Ω
Load impedance (balanced)	300	Ω

Amplitude response

	Frequency MHz	Amplitude dB		
Vision carrier (reference level)	39,5		−6	
		min.	typ.	max.
Chroma carrier	35,07	−3	−1	
Sound carrier	33,5	−21	−19	−18
Adjacent vision trap	31,5			−40
Adjacent sound trap	41,5		−46	
In-band ripple (p-p)	36 to 38		0,5	1,0
Out of band response	0 to 60			−38
Out of band response	60 to 100			−15

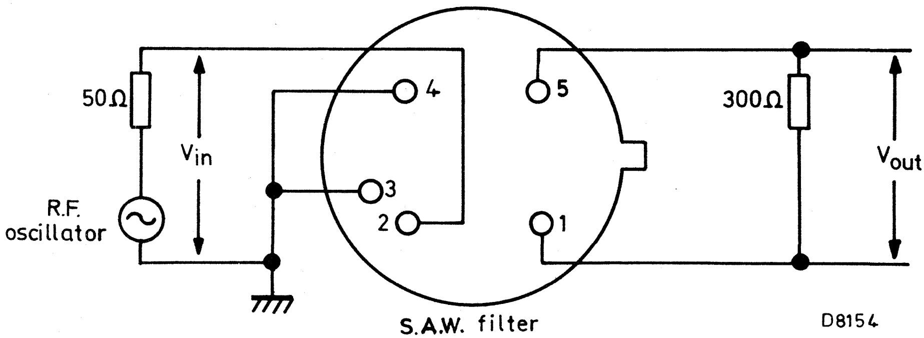
* For maximum operating life, the filter should be used with d.c. isolating capacitors.

** The amplitude level at the vision carrier frequency is −6 dB and is used as the reference for all relevant measurements.

DEVELOPMENT SAMPLE DATA

General

	Frequency MHz			
Insertion loss (300 Ω source and load)	36 to 38	typ.	16	dB
Voltage attenuation ratio (in preferred application circuit with a 50 Ω source and 300 Ω load)	37	typ.	18	dB
Group delay (relative to 0 ns at 39,5 MHz)	34,5 to 40,5	min. max.	−40 +40	ns ns
Spurious reflections and direct breakthrough (measured using 2Tsin^2 pulse and bar)	39,5	max.	−40	dB
2Tsin^2 pulse and bar k rating		max.	3,0	%
Temperature coefficient of frequency		typ.	−60	ppm/^{o}C
Small-signal impedance				
input	37,0	typ.	1,4 kΩ//8,5	pF
output	37,0	typ.	1,5 kΩ//14	pF



$$\text{Voltage attenuation ratio} = \frac{V_{in}}{V_{out}}$$

Fig. 2 Test and basic application circuit.

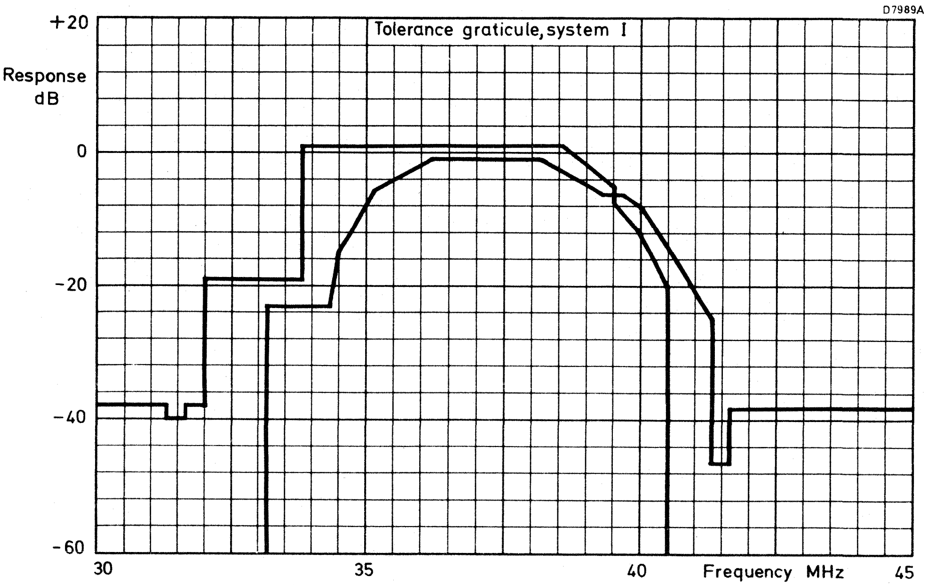

D7989A
+20
Tolerance graticule, system I
Response
dB
0
-20
-40
-60
30
35
40
Frequency MHz
45

Fig. 3.

DEVELOPMENT SAMPLE DATA

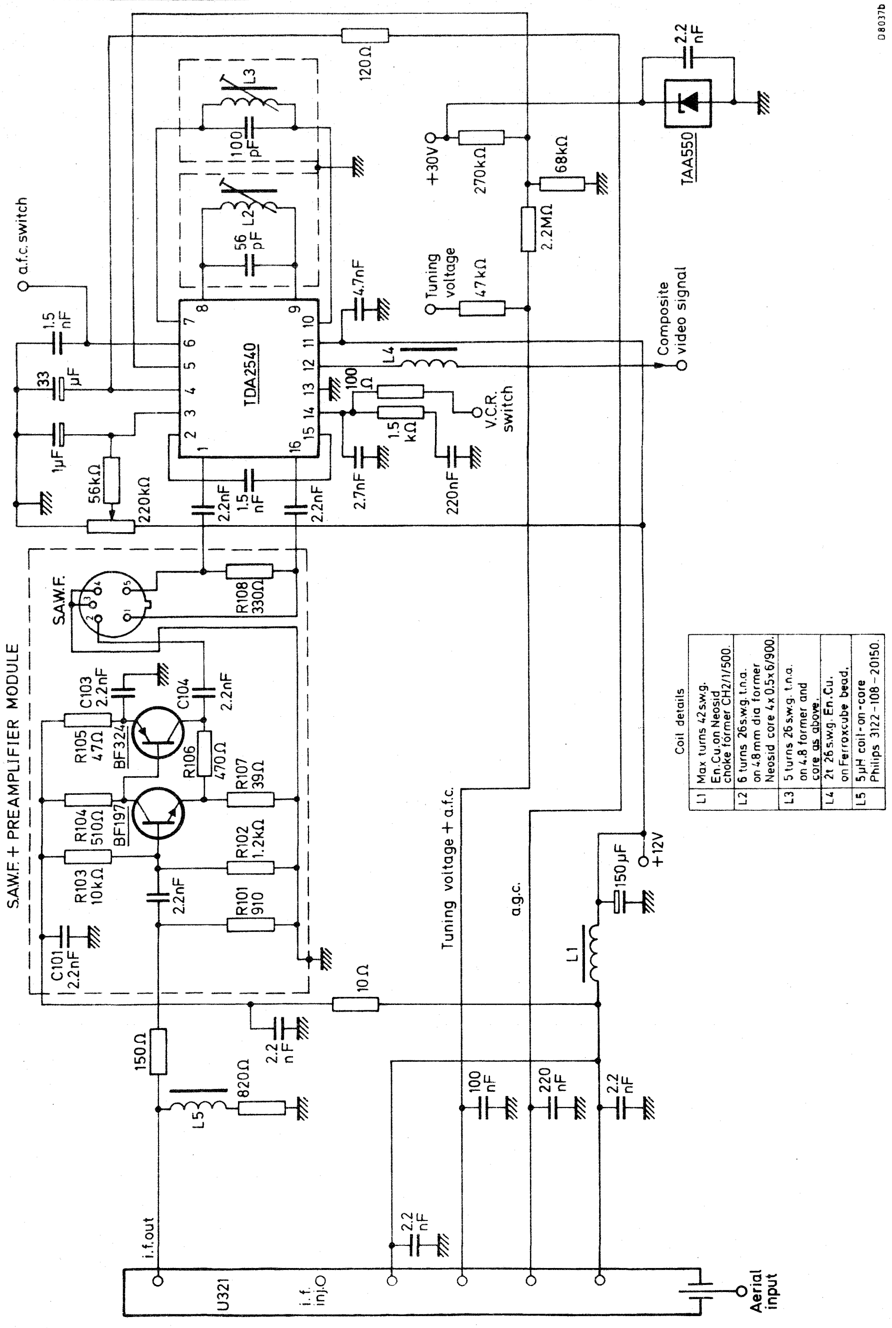


Fig. 4.

SURFACE ACOUSTIC WAVE FILTER

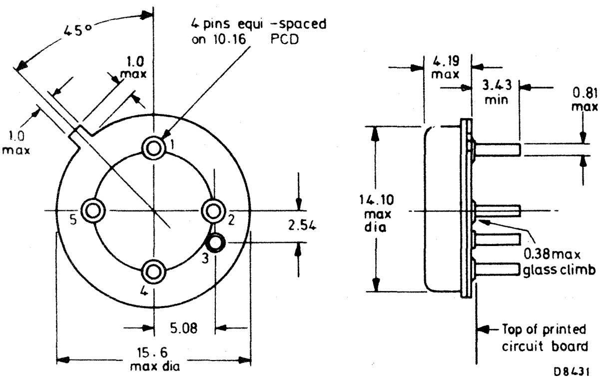
The RW171 is a lithium niobate surface wave device for use as an i.f. bandpass filter in colour and monochrome TV receivers. It is specifically designed for CCIR systems B and G as used in European and other countries. This device has an improved sound shelf specification over the SW211/M. Its use in place of conventional LC circuitry improves the amplitude and group delay characteristics as well as avoiding the need for critical adjustments in receiver production. The response characteristics are stable with life.

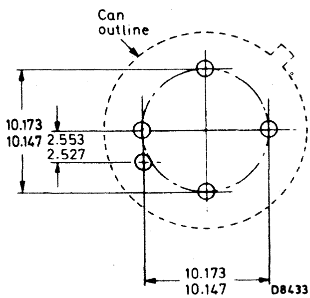
QUICK REFERENCE DATA

		Frequency MHz		Amplitude dB
Vision carrier		38.9		−6
Sound carrier		33.4	typ.	−18.5
Adjacent vision trap		31.9	<	−40
Adjacent sound trap	system B	40.4	<	−46
	system G	41.4	<	−40
Insertion loss (300 Ω source and load)		37.0	typ.	20
Operating temperature range		−10 to +70 °C		

MECHANICAL DATA

Dimensions in mm





Connections
1. balanced output
2. input high
3. can earth
4. input earth
5. balanced output

Printed circuit board hole layout
Standard 0.1″ grid
Hole dia. 1.2 mm min.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Operating ambient temperature		−10 to +70	°C
Storage temperature		−25 to +85	°C
Pin to pin voltage (short term) max.	note 1	30	V

CHARACTERISTICS

Test conditions note 2

Ambient temperature	25	°C
Input drive impedance	50	Ω
Load impedance (balanced)	300	Ω

Amplitude response

			Frequency MHz	Amplitude dB		
Vision carrier (reference level)			38.9		−6	
				min.	typ.	max.
Chroma carrier			34.47	−6	−4	−2
Sound carrier			33.4	−21	−18.5	−16
Adjacent vision trap			31.9			−40
Adjacent sound trap	system B	note 3	40.4		−50	−46
	system G	note 4	41.4		−45	−40
In-band ripple (p-p)			36 to 38		0.5	1.0
Out of band response			10 to 60			−38
Out of band response			60 to 100			−20

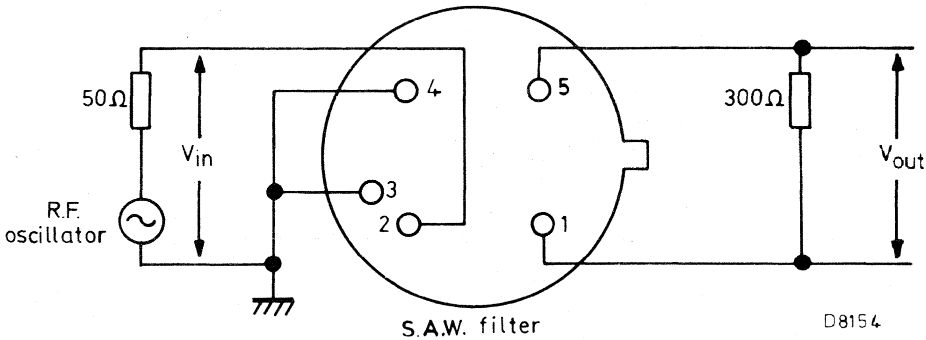
Notes

1. For maximum operating life, the filter should be used with d.c. isolating capacitors.
2. The amplitude level at the vision carrier frequency is −6 dB and is used as the reference for all relevant measurements.
3. 7 MHz channel spacing.
4. 8 MHz channel spacing.

General

	Frequency MHz			
Insertion loss (300 Ω source and load)	36 to 38	typ.	20	dB
Voltage attenuation ratio (in preferred application circuit with 50 Ω source and 300 Ω load)	37	typ.	23	dB
Group delay (relative to 0 ns at 38.9 MHz)	34.1 to 39.65	see fig. 2		
Spurious reflections and direct breakthrough (measured using 2T $\sin^2$ pulse and bar)	38.9	max.	−40	dB
2T$\sin^2$ pulse and bar k rating			3.0	%
Temperature coefficient of frequency		typ.	−90	ppm/°C
Small signal impedance				
input	37.0		1.2 kΩ//22	pF
output	37.0		1.2 kΩ//8.5	pF

Test and basic application circuit



$$\text{Voltage attenuation ratio} = \frac{V_{in}}{V_{out}}$$

Fig.1

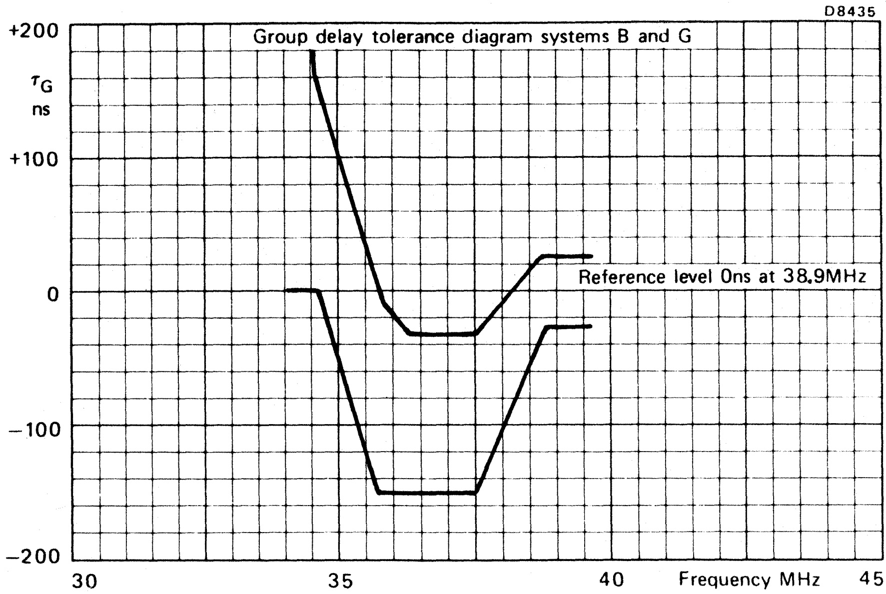

D8435
Group delay tolerance diagram systems B and G
+200
τ_G
ns
+100
0
−100
−200
Reference level 0ns at 38.9MHz
30
35
40
Frequency MHz
45

Fig. 2

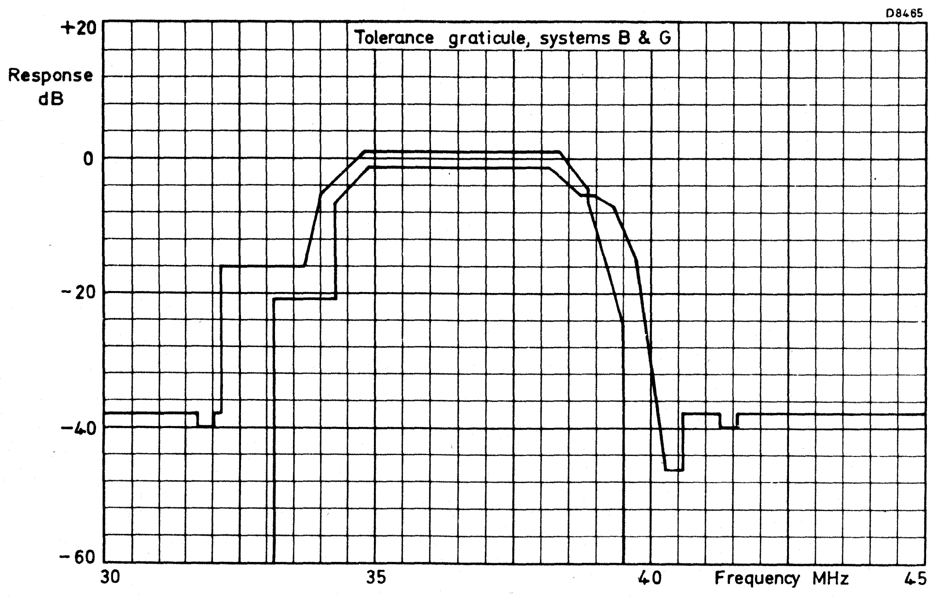
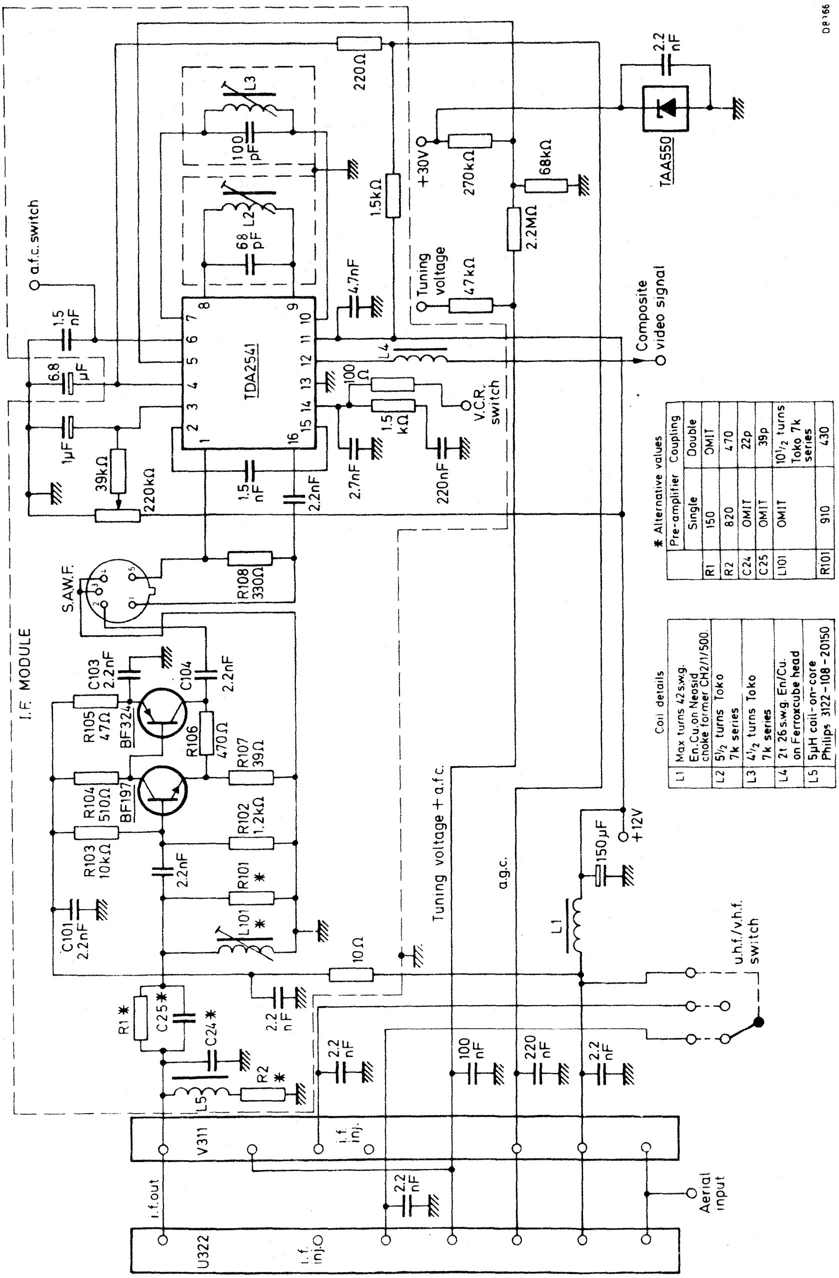

D8465
Tolerance graticule, systems B & G
+20
Response
dB
0
−20
−40
−60
30
35
40
Frequency MHz
45

Fig. 3



Coil details

L1	Max turns 42 s.w.g. En.Cu. on Neosid choke former CH2/1/500.
L2	5½ turns Toko 7k series
L3	4½ turns Toko 7k series
L4	2t 26 s.w.g. En/Cu. on Ferroxcube head
L5	5µH coil-on-core Philips 3122-108-20150

✱ Alternative values

	Pre-amplifier	Coupling
	Single	Double
R1	150	OMIT
R2	820	470
C24	OMIT	22p
C25	OMIT	39p
L101	OMIT	10½ turns Toko 7k series
R101	910	430

Fig. 4

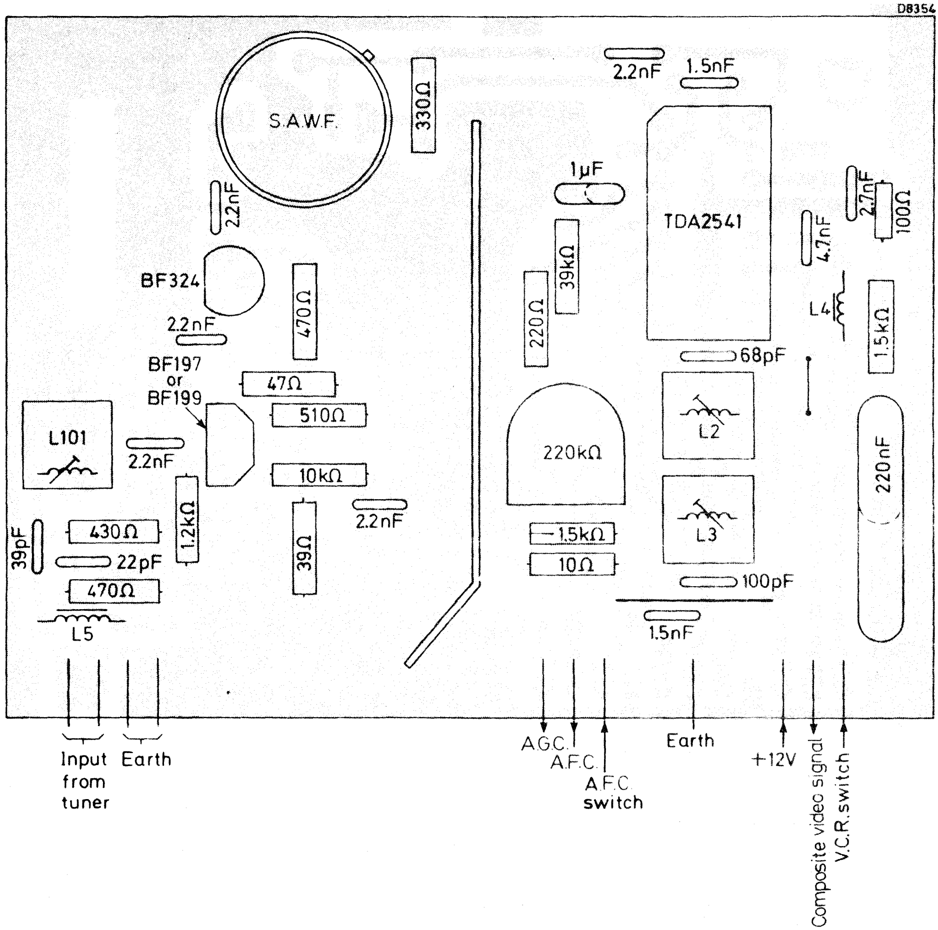


Fig. 5 Recommended printed circuit board layout for surface acoustic wave filter and pre-amplifier

SURFACE ACOUSTIC WAVE FILTER

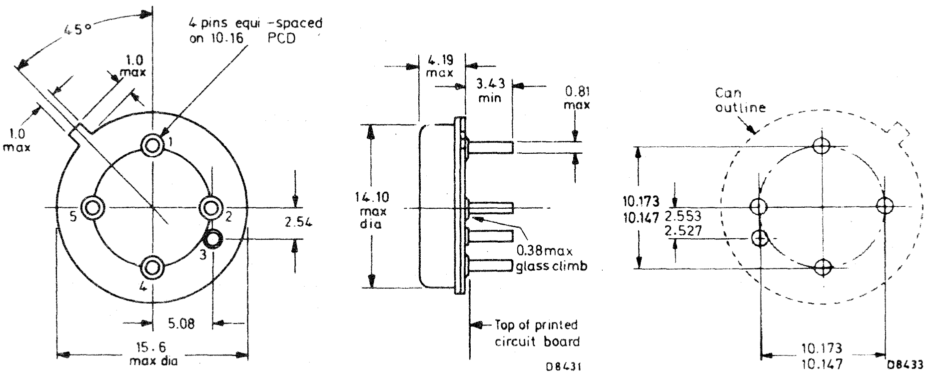
The RW173 is a lithium niobate surface wave device for use as an i.f. bandpass filter in colour and monochrome TV receivers. It is specifically designed for CCIR systems B and G as used in European and other countries. This device has an improved sound shelf specification over the SW211/M. Its use in place of conventional LC circuitry improves the amplitude and group delay characteristics as well as avoiding the need for critical adjustments in receiver production. The response characteristics are stable with life.

QUICK REFERENCE DATA

		Frequency MHz		Amplitude dB
Vision carrier		38.9		−6
Sound carrier		33.4	typ.	−18.5
Adjacent vision trap		31.9	<	−40
Adjacent sound trap	system B	40.4	<	−46
	system G	41.4	<	−40
Insertion loss (300 Ω source and load)		37.0	typ.	16
Operating temperature range		−10 to +70 °C		

MECHANICAL DATA

Dimensions in mm



Connections
1. balanced output
2. input high
3. can earth
4. input earth
5. balanced output

Printed circuit board hole layout
Standard 0.1″ grid
Hole dia. 1.2 mm min.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Operating ambient temperature	−10 to +70	°C
Storage temperature	−25 to +85	°C
Pin to pin voltage (short term) max. note 1	30	V

CHARACTERISTICS

Test conditions note 2

Ambient temperature	25	°C
Input drive impedance	50	Ω
Load impedance (balanced)	300	Ω

Amplitude response

			Frequency MHz	Amplitude dB min.	typ.	max.
Vision carrier (reference level)			38.9		−6	
Chroma carrier			34.47	−6	−4	−2
Sound carrier			33.4	−21	−18.5	−16
Adjacent vision trap			31.9			−40
Adjacent sound trap	system B	note 3	40.4		−50	−46
	system G	note 4	41.4		−45	−40
In-band ripple (p-p)			36 to 38		0.5	1.0
Out of band response			10 to 60			−38
Out of band response			60 to 100			−20

Notes

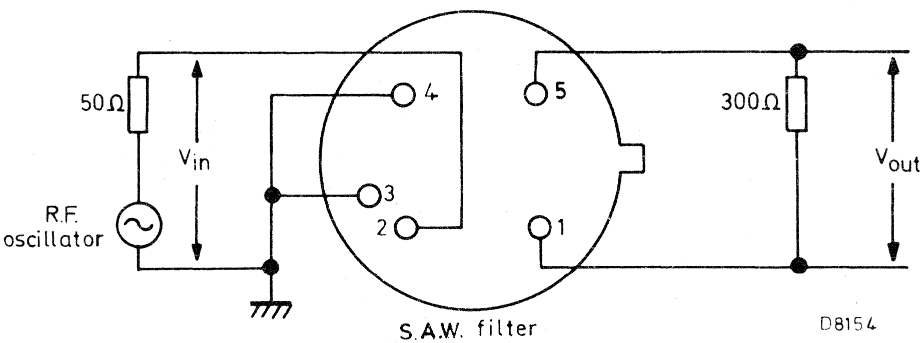
1. For maximum operating life, the filter should be used with d.c. isolating capacitors.
2. The amplitude level at the vision carrier frequency is −6 dB and is used as the reference for all relevant measurements.
3. 7 MHz channel spacing.
4. 8 MHz channel spacing.

General

	Frequency MHz			
Insertion loss (300 Ω source and load)	36 to 38	typ.	16	dB
Voltage attenuation ratio (in preferred application circuit with 50 Ω source and 300 Ω load)	37	typ.	23	dB
Group delay (relative to 0 ns at 38.9 MHz)	34.1 to 39.65	see fig. 2		
Spurious reflections and direct breakthrough (measured using 2T $\sin^2$ pulse and bar)	38.9	max.	−40	dB
2T$\sin^2$ pulse and bar k rating			3.0	%
Temperature coefficient of frequency		typ.	−90	ppm/°C
Small signal impedance				
input	37.0	to be established		
output	37.0	to be established		

DEVELOPMENT SAMPLE DATA

Test and basic application circuit



$$\text{Voltage attenuation ratio} = \frac{V_{in}}{V_{out}}$$

Fig.1

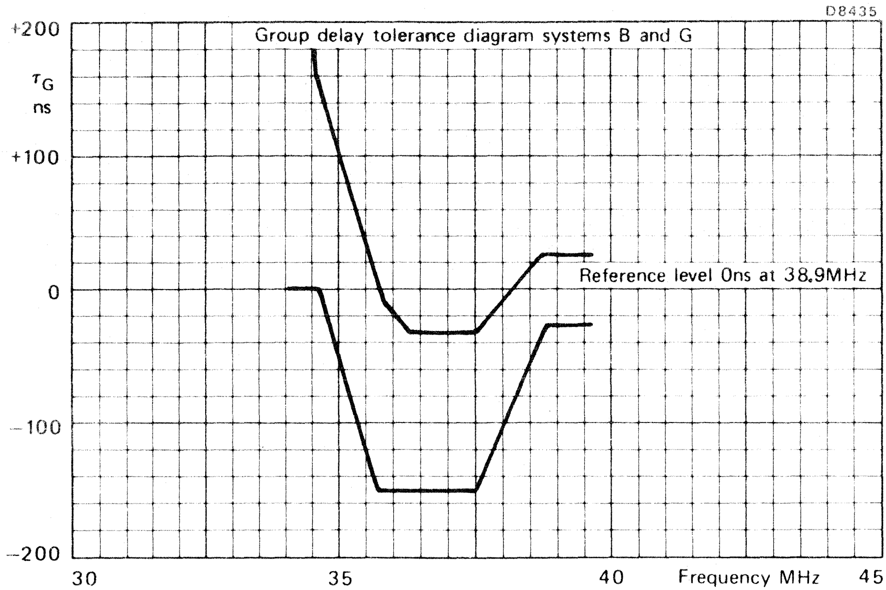

D8435
Group delay tolerance diagram systems B and G
+200
τ_G
ns
+100
0
−100
−200
Reference level 0ns at 38.9MHz
30
35
40
Frequency MHz
45

Fig. 2

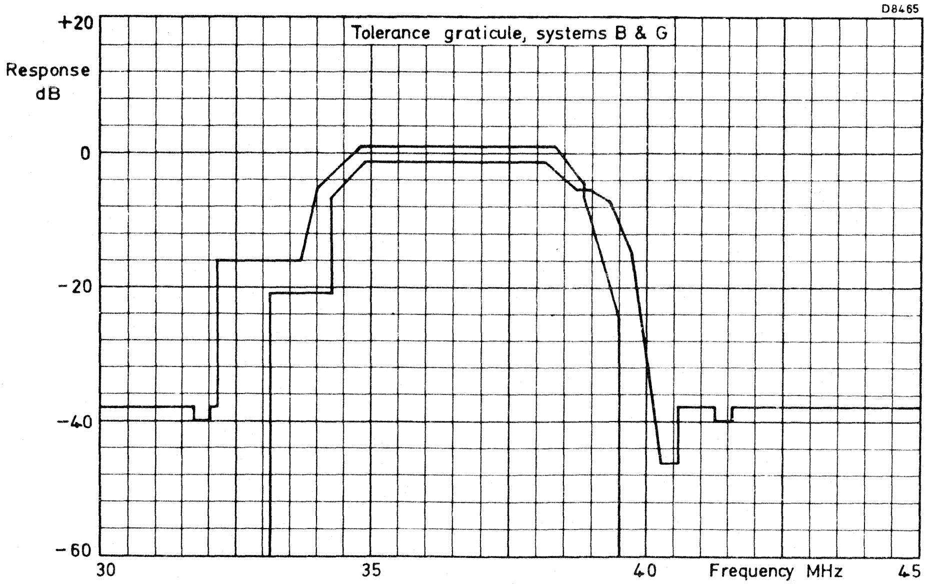

D8465
Tolerance graticule, systems B & G
+20
Response
dB
0
−20
−40
−60
30
35
40
Frequency MHz
45

Fig. 3

DEVELOPMENT SAMPLE DATA

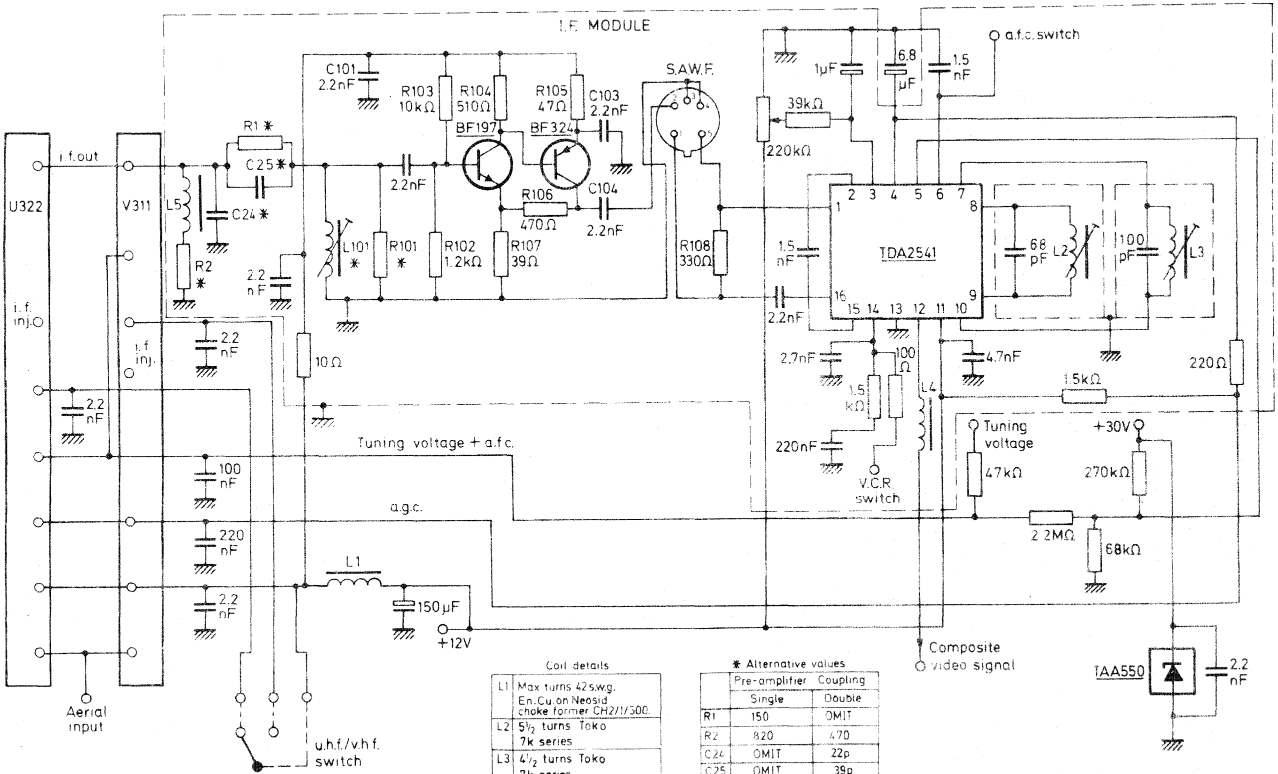


Fig. 4

L1	Max turns 42 s.w.g. En.Cu.on Neosid choke former CH2/1/500.
L2	5½ turns Toko 7k series
L3	4½ turns Toko 7k series
L4	2t 26 s.w.g. En/Cu. on Ferroxcube head
L5	5μH coil-on-core Philips 3122-108-20150

Coil details

	✱ Alternative values	
	Pre-amplifier Coupling	
	Single	Double
R1	150	OMIT
R2	820	470
C24	OMIT	22p
C25	OMIT	39p
L101	OMIT	10½ turns Toko 7k series
R101	910	430

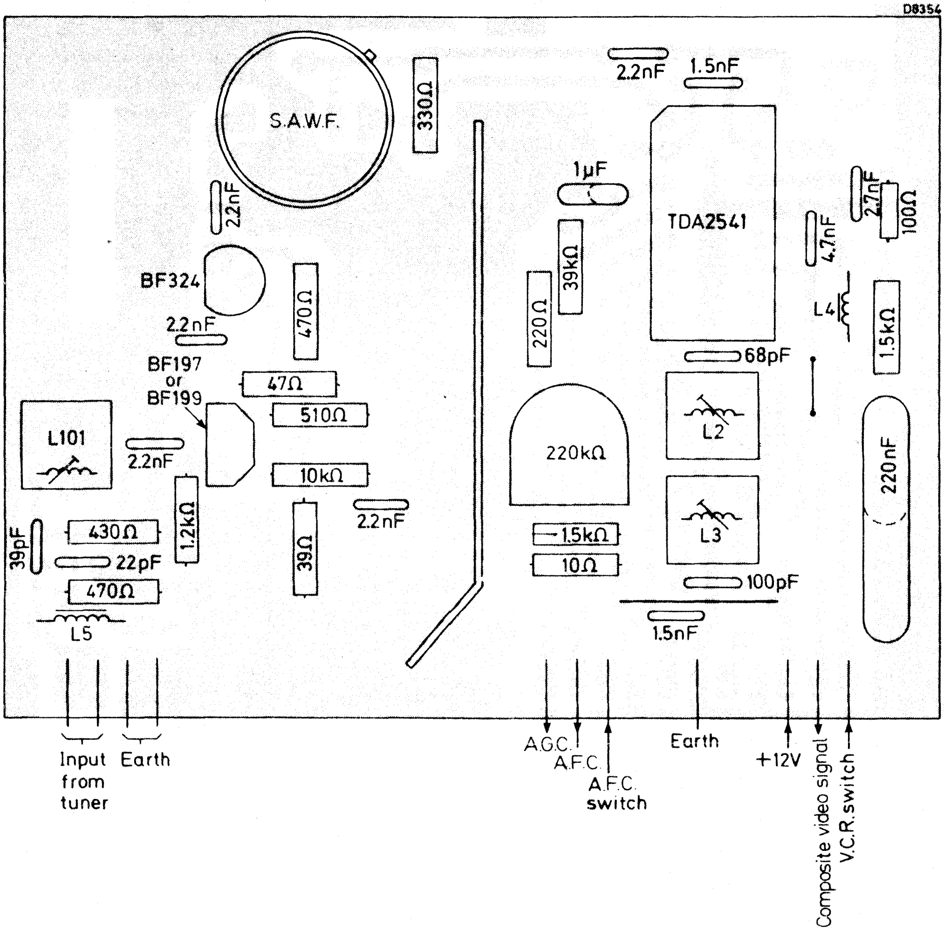


Fig. 5 Recommended printed circuit board layout
for surface acoustic wave filter and pre-amplifier

SURFACE ACOUSTIC WAVE FILTER

The RW300 is a lithium niobate surface wave device for use as an i.f. bandpass filter in colour and monochrome TV receivers. It has been designed to give optimum performance for the French transmission systems L and L′. Its use in place of conventional LC circuitry improves the amplitude and group delay characteristics as well as avoiding the need for critical adjustments in receiver production. The response characteristics are stable with life.

QUICK REFERENCE DATA

	Frequency MHz		Amplitude dB
Vision carrier	32,7		–6
Adjacent vision trap	40,7	<	–35
Sound trap			
v.h.f.	43,85	<	–40
u.h.f.	39,2	<	–40
Adjacent sound trap	31,2	<	–40
Insertion loss (300 Ω source and load)	36,0	typ.	23
Operating temperature range	–10 to + 70 °C		

MECHANICAL DATA

Dimensions in mm

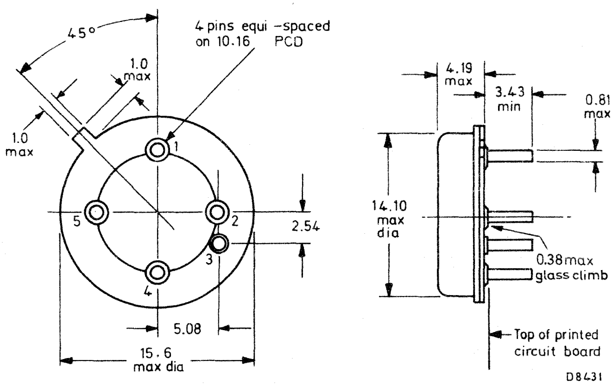


Fig. 1a Connections:

1. balanced output
2. input high
3. can earth
4. input earth
5. balanced output

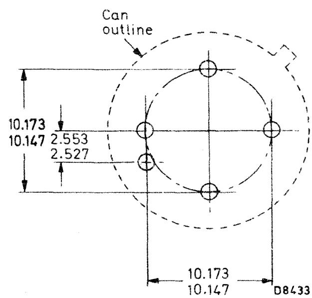


Fig. 1b

Printed circuit board hole layout
Standard 0,1″ grid
Hole dia. 1,2 mm min.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	−10 to + 70 °C
Storage temperature	−25 to + 85 °C
Pin to pin voltage (short term) max.*	30 V

CHARACTERISTICS

Test conditions**

Ambient temperature	25 °C
Input drive impedance	50 Ω
Load impedance (balanced)	300 Ω

Amplitude response

	Frequency MHz	Amplitude dB min.	Amplitude dB typ.	Amplitude dB max.
Vision carrier (reference level)	32,7		−6	
Chroma carrier fR	36,95	−1,5		+ 1,5
Chroma carrier fB1	37,10	−1,5		+ 1,5
Upper chroma limit	38,0	−6		
Adjacent vision trap	40,7			−35
Sound trap				
v.h.f.	43,85			−40
u.h.f.	39,2			−40
Adjacent sound trap	31,2			−40
In-band ripple (p-p)	35 to 37		0,5	1,0
Out of band response		see Fig. 3		

* For maximum operating life, the filter should be used with d.c. isolating capacitors.
** The amplitude level at the vision carrier frequency is −6 dB and is used as the reference for all relevant measurements.

General

	Frequency MHz			
Insertion loss (300 Ω source and load)	36	typ.	23	dB
Voltage attenuation ratio (in preferred application circuit with 50 Ω source and 300 Ω load)	36	typ.	27	dB
Group delay (relative to 0 ns at 32,7 MHz)	32,0 to 38,5	max.	+40	ns
		min.	−40	ns
Spurious reflections and direct breakthrough	32,7	max.	−40	dB
Temperature coefficient of frequency		typ.	−90	ppm/°C
Small-signal impedance				
input	36,0		1,9 kΩ/ /6,8	pF
output	36,0		3,1 kΩ/ / 10,3	pF

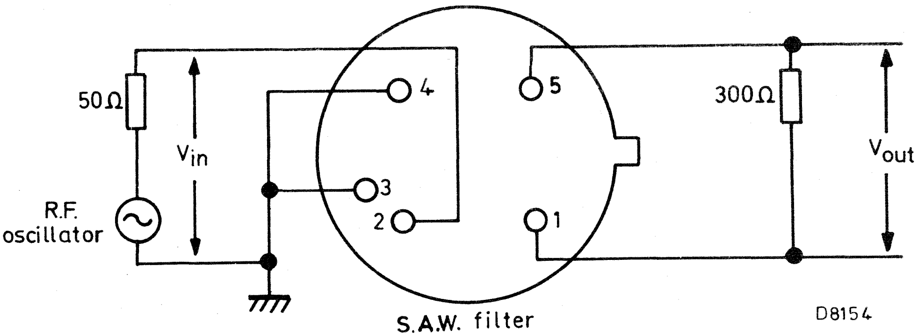


Fig. 2 Test and basic application circuit.

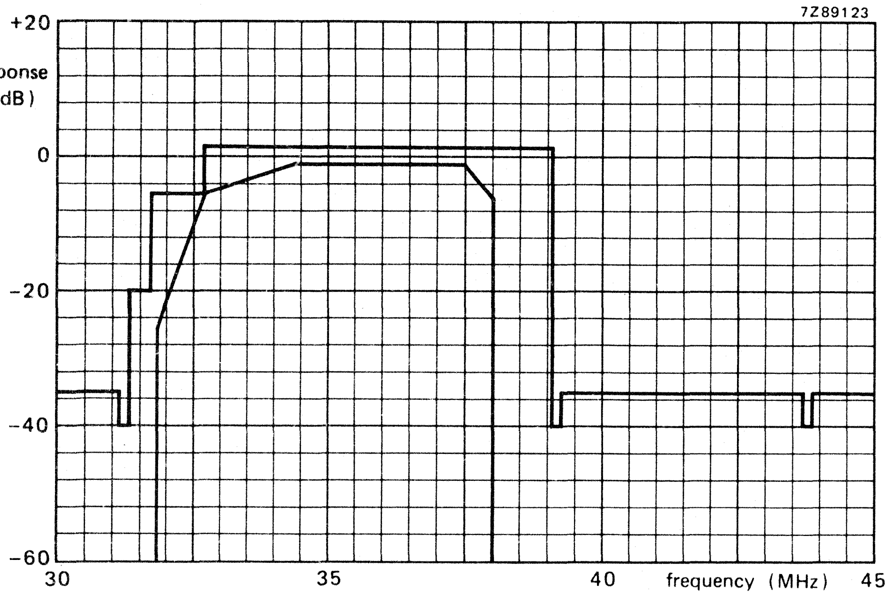


Fig. 3 Tolerance graticule.

Contents

TUNERS

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