Mullard
Book 3 Part 5
Loudspeakers, television assemblies and modules
August 1978

Mullard technical handbook

Book three
Components, materials and assemblies

Part five
Loudspeakers, television assemblies and modules

August 1978

LOUDSPEAKERS, TELEVISION ASSEMBLIES AND MODULES

CONTENTS

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Book 3 comprises the following parts—

Part 1	Capacitors, resistors
Part 2	Magnetic materials and components, piezoelectric ceramics
Part 3	Vinkor inductor cores
Part 4	RM inductor cores
Part 5	Loudspeakers, television assemblies and modules
Part 6	Circuit blocks, input and output devices, peripheral devices,

Made and printed in England by Burrup, Mathieson & Co. Ltd.

BOOK 3 (Part 5)

COMPONENTS
MATERIALS
AND
ASSEMBLIES

Loudspeakers, television assemblies and modules

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The Mullard data handbook system is made up of three sets of books, each comprising several parts; plus the Signetics technical handbook.

The three sets of books, easily identifiable by the colours on their covers, are as follows:

Book 1	(blue)	Semiconductor devices and integrated circuits
Book 2	(orange)	Valves and tubes
Book 3	(green)	Passive components, materials, and assemblies.

Each part is completely reviewed annually; revised and reprinted where necessary. Revisions to previous data are indicated by an arrow in the margin.

The data contained in these books are as accurate and up to date as it is reasonably possible to make them at the time of going to press. It must however be understood that no guarantee can be given here regarding the availability of the various devices or that their specifications may not be changed before the next edition is published.

The devices on which full data are given in these books are those around which we would recommend equipment to be designed. Where appropriate, other types no longer recommended for new equipment designs, but generally available for equipment production are listed separately with abridged data. Data sheets for these types may be obtained on request. Older devices on which data may still be obtained on request are also included in the index of the appropriate part of each book.

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Technical Publications Department
Mullard Limited
New Road
Mitcham
Surrey CR4 4XY

Telex: 22194

Information regarding price and availability of devices must be obtained from our authorised agents or from our representatives.

SELECTION GUIDE

SELECTION GUIDE

Section A

LOUDSPEAKERS

High power (⩾ 10 watts) to DIN45500 requirements for high fidelity speakers.

Cone diameter (inches)	Type No.	Shape of flange	Impedance versions (Ω)	Maximum power (W)	Type of use
1	AD0140/T	round	4, 8	20, 40	Tweeter
1	AD0162/T	round	8, 15	20, 4	Tweeter
1	AD0163/T	round	8, 15	20, 4	Tweeter
2	AD0210/Sq	round	4, 8	60	Squawker
2	AD0211/Sq	round	4, 8	60	Squawker
4	AD4050/W	round	4, 8	15	Woofer
5	AD5060/Sq	octagonal	4, 8	40	Squawker
5	AD5061/Sq	octagonal	4, 8	10	Squawker
7	AD7060/W	octagonal	4, 8	30	Woofer
7	AD7066/W	octagonal	4, 8	40	Woofer
8	AD8000	octagonal	–	–	Passive resonator
8	AD8061/W	octagonal	4, 8	30	Woofer
8	AD8066/W	octagonal	4, 8	40	Woofer
8	AD8067/W	octagonal	4, 8	40	Woofer
10	AD1065/W	round	4, 8	30	Woofer
10	AD10100/W	round	4, 8	40	Woofer

High power (⩾ 10 watts) full range loudspeakers

5	AD5061/M	octagonal	4, 8	10	7 litre enclosures
7	AD7062/M	octagonal	4, 8	30	7 litre enclosures
7	AD7063/M	octagonal	4, 8	10	25 litre enclosures
8½	9710/M8	round	8	20	Studio monitors,etc.
10	AD1065/M	round	4, 8, 15	10	20 litre enclosures
12	AD1265/M	round	4, 8, 15	20	P.A. systems
12	AD12100/HP	round	4, 8	50	Guitar amplifier, electronic organs.
12	AD12100/M	round	4, 8, 15	25	50 litre enclosures

Medium power (2 – 10 watts) dual cone loudspeakers

Cone diameter (inches)	Type No.	Shape of flange	Impedance versions (Ω)	Maximum power (W)
4 x 6	AD4681/M	oval	4, 8, 25	6
4 x 6	AD4691/M	oval	4, 8, 15, 25	4
5 x 7	AD5780/M	oval	4, 8, 15, 25	6
5 x 7	AD5790/M	oval	4, 8, 15	4
7	AD7080/M	octagonal	4, 8, 15	6
7	AD7091/M	octagonal	4, 8	3

Medium power (2 – 10 watts) loudspeakers

3 x 5	AD3591/X	oval	4, 8, 15, 25	3
3 x 5	AD3595/X	oval	4, 8, 15, 25	3
3 x 8	AD3880/X	oval	4, 8, 15	4
3 x 8	AD3890/X	oval	4, 8, 15, 25	4
4	AD4080/X	round	4, 8, 15, 25	3
4	AD4480/X	square	4, 8, 15, 25	3
4	AD4085/X	round	4, 8, 15	3
4	AD4485/X	square	4, 8, 15	3
4	AD4090/X	round	8, 15	2
4	AD4481/X4	square	4	8
4 x 6	AD4681/X	oval	4, 8, 15, 25	6
4 x 6	AD4691/X	oval	4, 8, 15, 25	4
4 x 8	AD4890/X	oval	4, 8, 15, 25	10
5 x 7	AD5780/X	oval	4, 8, 15, 25	6
5 x 7	AD5790/X	oval	4, 8	4
7	AD7080/X	octagonal	4, 8	6
7	AD7091/X	octagonal	4, 8	3

Low power (1 – 3 watts) plastic frame loudspeakers

2½	AD2071/Z	round	4, 8, 15, 25	1
3	AD3071/Y	round	4, 8, 15, 25	2
3	AD3371/Y	square	4, 8, 15, 25	2
4	AD4072/X	round	4, 8, 15, 25	3
4	AD4472/X	square	4, 8, 15, 25	3

Crossover networks

Crossover frequency (Hz)	Type No.	Impedance versions (Ω)	Maximum power (W)	Tweeter impedance for high sensitivity tweeters (Ω)
1500	ADF1500/4	4	80	8
1800	ADF1500/8	8	80	15
2400	ADF2400/4	4	20	8
2400	ADF2400/8	8	20	15
650 and 2800	ADF700/2600/4	4	80	8
700 and 2600	ADF700/2600/8	8	80	15

Section B

TELEVISION TUNERS

Channel coverage	Supply voltage (V)		Power gain (dB)	Noise factor (dB)	Type No.
	transistors	tuning diodes			
V.H.F.	+12	+0.3 to +28	20	7	ELC1042
V.H.F.	+12	+0.3 to +25	20	7	ELC1042/05
U.H.F. 21 – 69	+12	+0.3 to +25	22	7	ELC1043/05
U.H.F. 21 – 69	+12	+0.3 to +25	12	7	ELC1043/06
U.H.F./V.H.F. E2 to C E5 to E12 E21 to E69	+12	+0.5 to +28	29	6.5	ELC2000
U.H.F. E21 to E69	+12	+1 to +28	18	7.5	U321/321LO
U.H.F. E21 to E69	+12	+1 to +28	19	7.5	U322/322LO
V.H.F. NZ1 to E4 1A to 1C E5 to E12 1D to 1J	+12	+1 to +28	20	6.5	V311
V.H.F. E2 to C Morocco 4 to E12	+12	+1 to +28	20	6.5	V314
V.H.F. E2 to S1 S2 to (min) S17	+12	+1 to +28	20	6.5	V315/315LO

Section C

MONOCHROME TELEVISION ASSEMBLIES

(for use with 110° picture tubes with a neck diameter of 28 mm)

Description	Type No.
Deflection coil assembly	AT1040/15
Deflection unit	AT1074
Line output transformer	AT2048/11
Line linearity control unit (adjustable)	AT4042/02
Line linearity control unit (fixed)	AT4042/14

Industrial monochrome assemblies for monitors, V.D.U. etc.

Deflection unit	AT1071/01
Deflection unit	AT1074
Line output transformer	AT2102/01
Line output transformer	AT2140/10
Line linearity control unit (adjustable)	AT4034/01
Line linearity control unit (adjustable)	AT4036
Line linearity control unit (adjustable)	AT4042/08
Line driver transformer	AT4043/59

Section D

COLOUR TELEVISION ASSEMBLIES

110° self converging system (20AX)

Description	Type No.
Deflection coil assemblies	AT1080, 1083/01, 1085
Line output transformers	AT2080/10, 2080/15
Line output transformers (diode split)	AT2076/35, 2076/55
Multipole unit	AT1081
Line linearity control unit	AT4042/38
Line driver transformer	AT4043/29
Twist compensation unit	AT4043/34
Bridge coil	AT4043/38
Balancing coil (E — W)	AT4044/20
Balancing coil	AT4044/26
Four pole adjusting coil	AT4044/27
Switched mode power supply transformer	AT2095

Delay lines and crystals

Chrominance delay line	DL50
Chrominance delay line	DL51
Chrominance delay line	DL60
Chrominance delay line	DL700
Luminance delay lines	VS340/1, 400/1, 470/1, 550/1, 600/1
4.4 MHz crystal	4322 152 01100
8.8 MHz crystal	4322 143 03120

Section E

MODULES

Description	Type No.
Voltage multiplying module	BG100
Voltage multiplying module	LP1174 Series
Voltage multiplying module	LP1194 Series
Voltage multiplying module	LP1196 Series

LOUDSPEAKERS

A

A

LOUDSPEAKERS

INTRODUCTORY NOTES

INTRODUCTION

A correctly chosen loudspeaker is essential to obtain acoustic results from electro-acoustic equipment.

The following factors should be considered when choosing a loudspeaker:

- Shape, size and attachment with reference to the available space:
- Quality and sensitivity, a compromise between fidelity of reproduction and price:
- The frequency response characteristic in relation to the kind of application:
- Impedance and power handling capacity, which should be adapted to the output stage of the equipment:
- Appearance and finish.

To assist customers in making their choice our loudspeakers have been divided into three main groups:

- High power	(≥ 10 watt): (hi-fi /full range)
- Medium power	(2 - 10 watt)
- Low power	(≤ 2 watt)

High power types

High power types: tweeters, woofers, squawkers

These speakers have been specially designed for use in hi-fi equipment, where a high power-handling capacity, a very wide frequency range and a negligible distortion level are required. They all conform to the high fidelity standards of IEC268 and DIN45500. Examples of application: sealed hi-fi enclosures with cross-over networks.

High power full range types

These types offer more than the medium and low power types and some of them meet the hi-fi standards of IEC268 and DIN45500. Examples of application: discotheques, public address systems, monitoring and hi-fi equipment in open or sealed enclosures.

Medium and low power types

The medium and low power speakers form an extensive group offering a diversity in characteristics, size and price for all kinds of radio and television sets, music centres, tape recorders, sound columns, etc.
Most of the medium and low power speakers contain a ferrite magnet (Magnadur). For television sets and other applications where the external magnetic field should be as small as possible, there are loudspeakers having a metal (Ticonal) magnet in a pot system.

LOUDSPEAKER CODING

AD ●● ●● ●●

nominal cone size (inches) and shape of flange

01 = 1 to 1¼ dome
02 = 2 dome
10 = 10 round
12 = 12 round
20 = 2 to 2½ round
22 = 2 to 2½ square
30 = 3 round
33 = 3 square
35 = 3 x 5 oval
38 = 3 x 8 oval
40 = 4 round
44 = 4 square
46 = 4 x 6 oval
48 = 4 x 8 oval
50 = 5 octagonal
57 = 5 x 7 oval
69 = 6 x 9 oval
70 = 7 octagonal
80 = 8 octagonal

magnet system

		diameter mm	mass g
10	=Magnadur	102	420
40	=Magnadur	62	100
60,61,62,63	=Magnadur	72	260
65,66,67	=Magnadur	90	450
70,71	=Magnadur	31*	20
80,81,82	=Magnadur	53	100
85	=Magnadur	46	53
90,91,92	=Ticonal	18	27
95	=Ticonal	14	13
99	=Ticonal	10	6
100	=Magnadur	130	1050

*square

audio response

HP	high power
M	double cone, smooth response over wide frequency range
Sq	squawkers; for mid-range frequencies
T	tweeter, for high frequencies
W	woofer; for very low frequencies
Z	notably higher sensitivity at about 3 kHz
Y	notably higher response level in the region 2 to 6 kHz
X	as Z, but wider frequency range

rated impedance (Ω)

4
8
15
25

RESPONSE CURVES

For the medium and low power range one curve (a), showing the sound pressure as a function of the frequency is given in the Data sheets.

For the high power range the curves a, b and c are given, and for the squawkers and tweeters a directional response curve (d).

Measuring conditions concerning mounting of the loudspeaker:

			sound pressure		distortion
		curve a	curve b	curve d	curve c
range \ measured in		anechoic room	half free field/ anechoic room	anechoic room	anechoic room
Medium /low power		unmounted			
High power full range		unmounted	baffle or enclosure		baffle or enclosure
High power range	tweeters	unmounted	baffle	unmounted	baffle
	squawkers	unmounted	baffle or enclosure	unmounted	baffle or enclosure
	woofers	unmounted	enclosure		enclosure

TERMS AND DEFINITIONS

"Unmounted": The loudspeaker is placed in a clamping set-up which does not influence its radiation characteristics.

"Mounted in enclosure": The loudspeaker with the gasket outside the enclosure of dimensions specified on the data sheet (flush mounted or front mounted as specified).

"Baffle": The loudspeaker is fitted to a baffle, dimensions of which are specified on the data sheet (flush mounted or front mounted).

"Half free field": The acoustical conditions on the forward side approach those of free space.

"Anechoic room": The acoustical conditions approach those of free space.
(IEC publication 268, part 5, section 1).

"Operating power": is the sine-wave power input to the loudspeaker which corresponds with a sound level of 96 dB with respect to 2×10^{-4} μbar at a microphone distance of 1 m, or 86 dB on a distance of 3 m respectively. This sound level is the average level over the rated frequency range of the loudspeaker.

TEST METHODS AND MEASUREMENTS

The atmospheric conditions for measurement are:

Temperature	15 to 35 °C
Relative humidity:	45 to 75 %
Pressure:	860 to 1060 mbar

1 Impedance

The impedance is the modulus of the lowest value of the electrical impedance in the frequency range above the bass resonance frequency of the loudspeaker as determined by the method specified in para. 3 below.

1.1 Measuring apparatus

- Audio frequency sinewave signal generator with a constant output voltage over the range from 0 to 20 000 Hz.
- Linear amplifier with an output impedance not greater than 1/3 of the rated loudspeaker impedance and a power output of approx. 0.1 × the power handling capacity of the loudspeaker.
- A 1Ω resistor connected in series with the loudspeaker.
- An electronic voltmeter shunted across the 1 Ω resistor.

1.2 Conditions

- The loudspeaker is unmounted.
- The power input to the loudspeaker will not exceed 0.1 × the power handling capacity as determined in para. 4 below.

1.3 Measuring result

Rated impedance is stated on the data sheets. The measured impedance will not be lower than 20% of the rated impedance.

2 Voice coil resistance

The voice coil resistance is the (d.c.) resistance of the voice coil.

2.1 Measuring apparatus

Low current d.c. Ohm-meter.

2.2 Conditions

The d.c. power input to the loudspeaker does not exceed 0.1 × the power handling capacity.

2.3 Measuring circuit

The rated resistance is given on the data sheets, tolerance ± 10%

3 Resonance frequency

The resonance frequency is that frequency where the modulus of the electrical impedance has its first principal maximum in an ascending scale, the electrical input being such as to have no significant effect on the resonant frequency.

3.1 Measuring apparatus

Same as for "Impedance". See para. 1.

3.2 Conditions

- The loudspeaker is measured unmounted.
- The resonance frequency is determined after applying to the loudspeaker for a duration of 5 s a test signal equal to that required to test the power handling capacity.

3.3 Measuring result

The resonance frequency is that frequency at which the voltmeter indicates the first minimum deflection as the frequency is swept slowly from 0 Hz, the output voltage of the amplifier being such that the voltmeter reads for the resonance frequency:

40 to 60 mV for loudspeakers with a rated impedance less than 20 Ω:

15 to 25 mV for loudspeakers with a rated impedance between 20 Ω and 100 Ω:

4 to 6 mV for loudspeakers with a rated impedance greater than 100 Ω.

The rated resonance frequency is stated on the data sheets.

4 Power handling capacity

The power handling capacity is the nominal power which the loudspeaker will satisfactorily handle as checked by an accelerated life test.

4.1 Test apparatus

- Generator supplying test signal in accordance with IEC268, para. 9.3.
- Power amplifier with an output impedance not greater than 1/3 of the rated impedance of the loudspeaker.
- Voltmeter indicating the r.m.s. value of the voltage.

4.2 Conditions

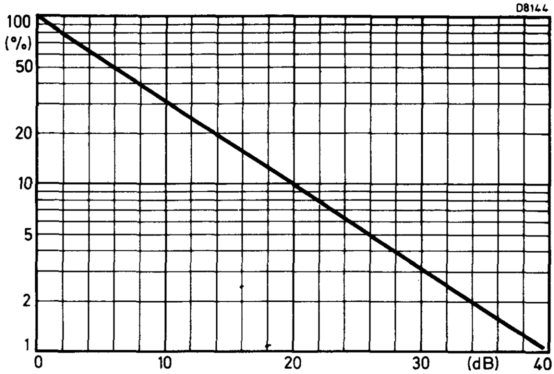
- A test voltage is applied to the loudspeaker for an uninterrupted period of 100 hrs. The r.m.s. value of this voltage corresponds with the specified power handling capacity of the loudspeaker.
- The test voltage has a frequency distribution corresponding with that of the output of a filter as specified in IEC Publication 268, part 5 para. 9.3 when fed from a white noise source.
- If the loudspeaker is designed to operate in a restricted frequency range, the corresponding network (filter) which is connected to the loudspeaker during the test, is specified on the data sheet. The test voltage is measured at the input terminals of the network.
- The method of mounting is as specified on the data sheet.

4.3 Test result

To pass this test the loudspeaker has to function properly at the end of the test period. Deviation from the specified resonance frequency is allowed.

5 Total non-linear distortion

This is the ratio between the r.m.s. value of the harmonic content of the sound pressure to the value of the total sound pressure over the frequency range of the loudspeaker.
The difference in dB between fundamentals and harmonic contents, can be converted into a distortion percentage with the aid of the following nomogram.



Difference in dB converted into % distortion

5.1 Conditions

- The loudspeaker is mounted as specified on the data sheet.
- The power input to the loudspeaker is the operating power.
- The microphone distance is as specified on the data sheet. (See also definition of "Operating power").

5.2 Measuring result

The distortion curve with its limit of high power loudspeakers is given on the data sheet.

6 Sweep voltage

The sweep voltage test imposes on the loudspeaker a sinusoidal test signal of specified constant amplitude. The frequency of this signal is swept through the specified frequency range.

6.1 Test apparatus

- Audio frequency sinewave signal generator with a constant output voltage over the range from 0 to 20 000 Hz.
- Linear amplifier with an output power appropriate to the loudspeaker under test and an output impedance not greater than 1/3 × the rated loudspeaker impedance. For power see 6.2.
- An electronic voltmeter with high input impedance.

6.2 Conditions

- The loudspeaker is tested unmounted.
- The input voltage is
  - a) for the medium and low power range such that the power input to the loudspeaker is 0.5 × the specified power handling capacity.
  - b) for the high power range as specified on the data sheets.
- If the loudspeaker is designed to operate in a restricted frequency range, the corresponding network (filter) which is connected to the loudspeaker during the test, is specified on the data sheet. The test voltage is measured at the input terminals of the network.

6.3 Test result

To pass this test the loudspeaker has to function properly during the test.

7 Flux density

This is the magnetic flux density measured in the air gap.

7.1 Measuring apparatus

- Differential search coil
- Galvanometer

7.2 Conditions

- The distance between the centres of the two coils is equal to the air gap height minus 1 mm.
- The two coils are put into the air gap symmetrical with respect to the poleplate.

7.3 Measuring result

The minimum flux density as measured on production samples is stated on the data sheet.

8 Frequency response

The frequency response is the graph representing the sound pressure as a function of frequency applying to the loudspeaker a constant sine-wave signal V.

8.1 Measuring apparatus

- Microphone	Bruel and Kjaer, type 413, 4145
- Microphone amplifier	Bruel and Kjaer, type 2606, 2607, 2608
- Cathode follower	Bruel and Kjaer, type 2619
- Sine/random generator	Bruel and Kjaer, type 1024
- Level recorder	Bruel and Kjaer, type 2305, 2307

The apparatus is set as follows:

- Writing speed	125 mm/s
- Paper speed	3 mm/s
- Range potentiometer	50 dB
- Lower limiting frequency	10 Hz
- Rectifier response	r.m.s.
- Writing width	100 mm
- Compressor speed	300 dB/s

8.2 Conditions

- Sine-wave signal $V = \sqrt{W.Z_r}$
  where
- for anechoic room measurements W = 50 mW, unless otherwise stated on the data sheets.

  V = test voltage
  Z_r = rated impedance as specified on the data sheet
- Microphone position: in axis of loudspeaker on a distance of 50 cm for anechoic room measurements
- Curve a is measured in a anechoic room; loudspeaker unmounted
- Curve b is measured in a half free field; loudspeaker mounted as specified on the data sheet
- Curve d is measured in a anechoic room; loudspeaker unmounted.

8. 3 Measuring result

A description of the sensitivity and the frequency response curve(s), together with the limits for curve a are given on the data sheet.

9 Direction of magnetisation

The magnet is so magnetised that the centrepole is south for systems with a ring magnet, and north for systems with a slug magnet.

10 Polarity

The cone of the loudspeaker will move outward when a d.c. voltage is applied to the terminals so that the red marked terminal is positive.
The voltage applied does not exceed the "sweep voltage".

1 inch HIGH POWER DOME TWEETER LOUDSPEAKER

APPLICATION

For the reproduction of audio frequencies from 1600 Hz to 22 000 Hz in multi-way high-fidelity loudspeaker systems. Minimum recommended cross-over frequency 1600 Hz with 12 dB/octave slope.

TECHNICAL DATA

	version		
	T4	T8	
Rated impedance	4	8	Ω
Voice coil resistance	3, 4	6, 3	Ω
Rated frequency range	1600 to 20 000		Hz
Resonance frequency	1200		Hz
Power handling capacity,			
measured with filter: 12 µF - 0, 35 mH	20		W
5 µF - 0, 2 mH	40		W
8 µF - 0, 5 mH		20	W
3, 2 µF - 0, 35 mH		40	W
loudspeaker unmounted			
Operating power	4		W
Sweep voltage (500 to 20 000 Hz)	3	4, 5	V
Energy in air gap	59		mJ
Flux density	0, 9		T
Air-gap height	2, 5		mm
Voice coil height	2, 4	3, 2	mm
Core diameter	25		mm
Magnet material	Magnadur		
diameter	61		mm
mass	0, 1		kg
Mass of loudspeaker	0, 25		kg

The loudspeaker has a polycarbonate dome and a voice coil of aluminium wire.

Connection to the loudspeaker is by means of 3.2 mm (0.12 inch) tag connectors or by soldering.

Dimensions (mm)

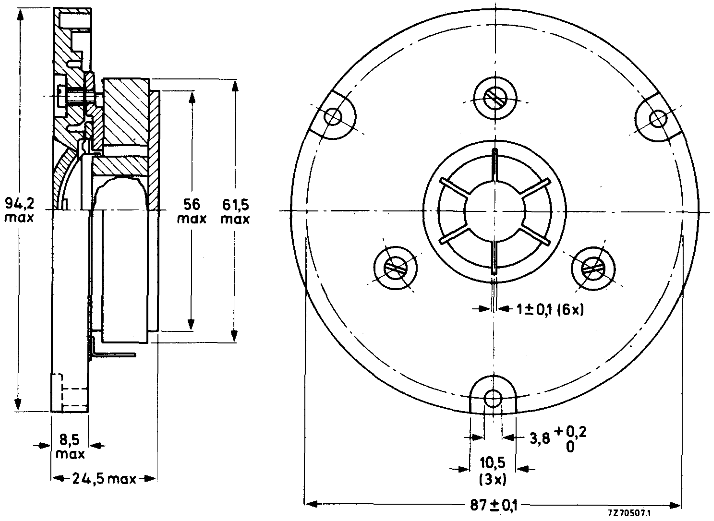


Fig. 1

One tag is indicated by a red mark for in-phase connection

Baffle hole diameter 75 mm.
Face of loudspeaker should lie in line with plane of baffle.

FREQUENCY RESPONSE CURVES

Curve b:	Sound pressure measured in half free field, input at operating power. Loudspeaker mounted on baffle, dimensions 50 x 50 mm.
Curve c:	2nd and 3rd harmonic distortion, measured at the operating power of 4 W in anechoic room. Loudspeaker unmounted.

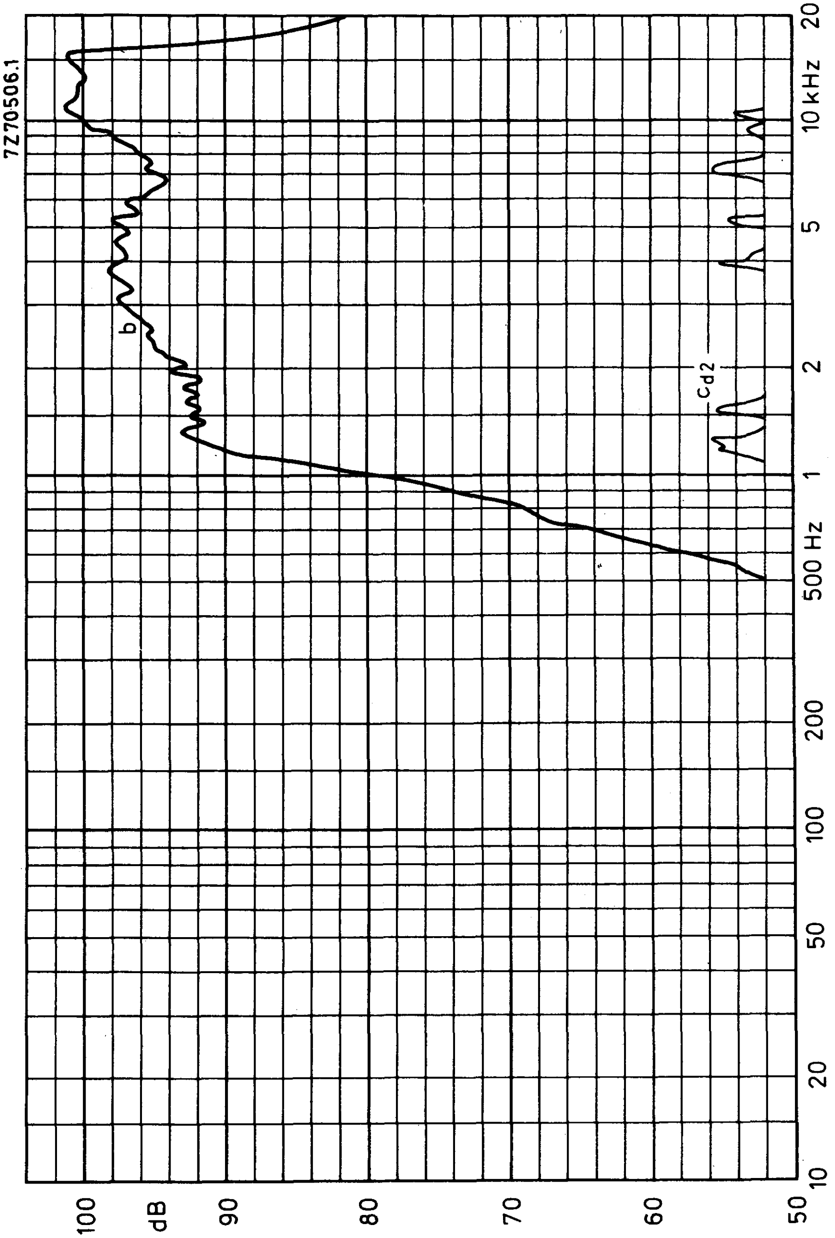

7Z70506.1
b
Cd2
100
dB
90
80
70
60
50
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20

Fig. 2

1 INCH HIGH POWER DOME TWEETER LOUDSPEAKER

AD0162/T.

APPLICATION

For use in direct and indirect radiating systems for reproduction of audio frequencies from 2000 Hz to 22 000 Hz with very low distortion in multi-way high fidelity loudspeaker systems in accordance with DIN45500. Minimum recommended cross-over frequency 1600 Hz. The loudspeaker has a very high sensitivity.

TECHNICAL DATA

	version		
	T8	T15	
Rated impedance	8	15	Ω
Voice coil resistance	6,3	12,5	Ω
Rated frequency range	2000 to 22 000		Hz
Resonance frequency	1000		Hz
Power handling capacities a/b (see Fig. 1)			
at 2000 Hz C = 8 μF L = 0,5 mH	20/4		W
C = 3,3 μF L = 1 mH		20/4	W
at 4000 Hz C = 3,2 μF L = 0,35 mH	50/6		W
C = 1,5 μF L = 0,8 mH		50/6	W
Operating power	2		W
Sweep voltage frequency range : 500 - 20 000 Hz high pass filter : 8 μF - 0,5 mH	4,5	5,5	V
Energy in air gap	75		mJ
Flux density	1,2		T
Air gap height	2,5		mm
Voice coil height	2,4	3,4	mm
Core diameter	25		mm
Magnet material	Magnadur		
diameter	72		mm
mass	0,24		kg
Mass of loudspeaker	0,5		kg

The loudspeaker has a polycarbonate dome and a diffusor integrated in the cover.

Connection to the loudspeaker by means of 2,8 mm (0,11 inch) Fastons or soldering.

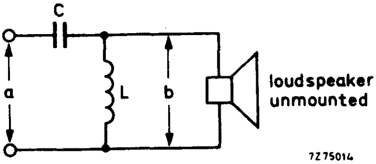


Fig. 1. Measuring circuit.
a = system power handling capacity
b = loudspeaker power handling capacity.

Dimensions (mm)

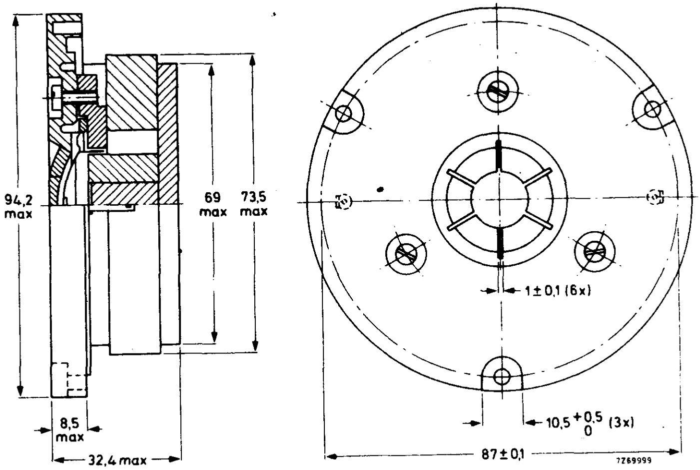


Fig. 2.

One tag is indicated by a red mark for in-phase connection.
Face of loudspeaker should not lie behind plane of baffle.

FREQUENCY RESPONSE CURVES (see Fig. 3)

Curve b: Sound pressure measured in anechoic room, loudspeaker unmounted. Above 1000 Hz, over the width of one octave, the sound pressure may be a maximum of 2 dB lower than indicated.

Curve c: 2nd and 3rd harmonic distortion, measured at the operating power of 2 W in anechoic room, loudspeaker unmounted.

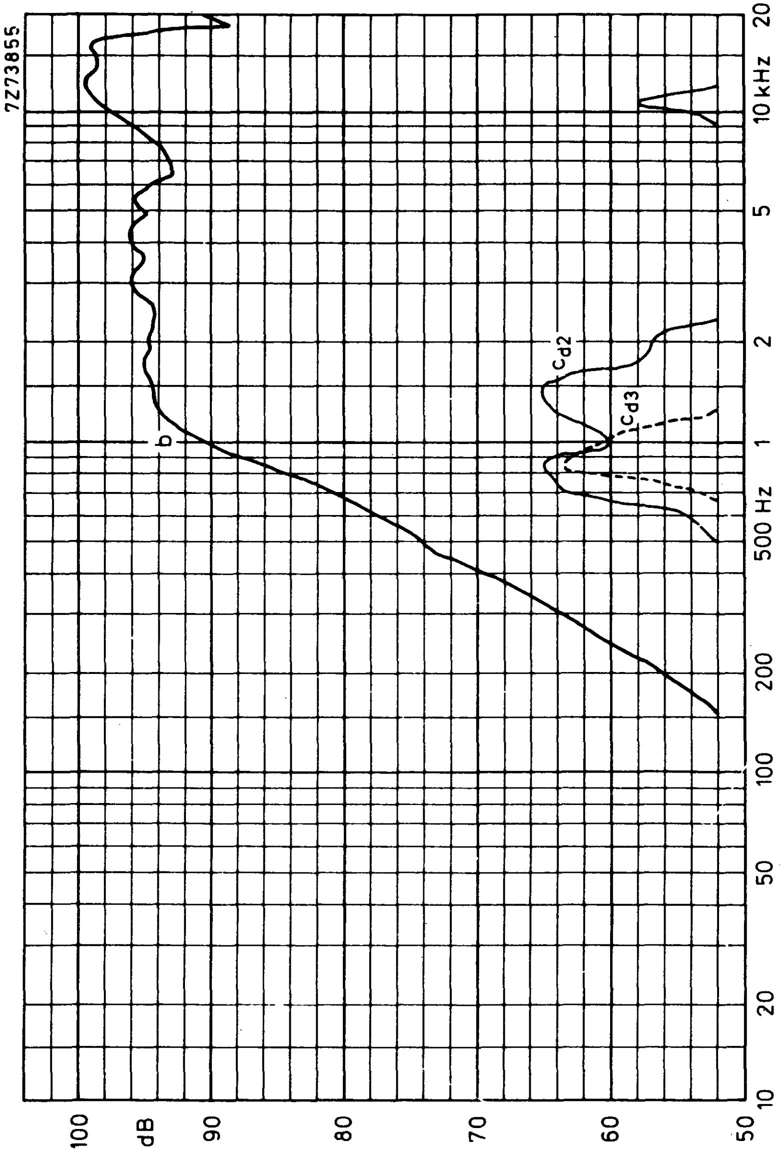

7Z73855
dB
100
90
80
70
60
50
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20
b
C_{d2}
C_{d3}

Fig. 3.

1 INCH HIGH POWER DOME TWEETER LOUDSPEAKERS

APPLICATION

For use in direct and indirect radiating systems for reproduction of frequencies from 2000 Hz to 22 000 Hz with very low distortion in multi-way high-fidelity loudspeaker systems in accordance with DIN 45500. Minimum recommended crossover frequency 2000 Hz. The loudspeaker has a very high sensitivity.

TECHNICAL DATA

	version		
	T8	T15	
Rated impedance	8	15	Ω
Voice coil resistance	6,3	12,5	Ω
Rated frequency range	2000 to 22 000		Hz
Resonance frequency	1300		Hz
Power handling capacities, a/b (see Fig.1), loudspeaker unmounted,			
at 2000 Hz; C = 8 µF; L = 0,5 mH	20/4		W
at 2000 Hz; C = 3,3 µF; L = 1 mH		20/4	W
at 4000 Hz; C = 3,2 µF; L = 0,35 mH	50/6		W
at 4000 Hz; C = 1,5 µF; L = 0,8 mH		50/6	W
Operating power	2		W
Sweep voltage, frequency range: 500 to 20 000 Hz high pass filter:			
8 µF – 0,5 mH	4,5		V
3,3 µF – 1 mH		5,5	V
Energy in air gap	75		mJ
Flux density	1,2		T
Air-gap height	2,5		mm
Voice coil height	2,4	3,4	mm
Core diameter	25		mm
Magnet material	Magnadur		
diameter	72		mm
mass	0,24		kg
Mass of loudspeaker	0,5		kg

The loudspeaker has an impregnated textile dome and a diffuser integrated in the cover. Connection to the loudspeaker by means of 2,8 mm (0,11 inch) Fastons or soldering.

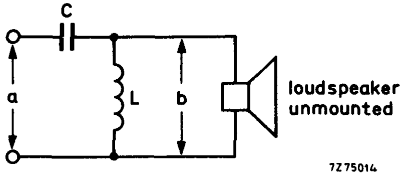


Fig.1 Measuring circuit.
a = system power handling capacity.
b = loudspeaker power handling capacity.

Dimensions (mm)

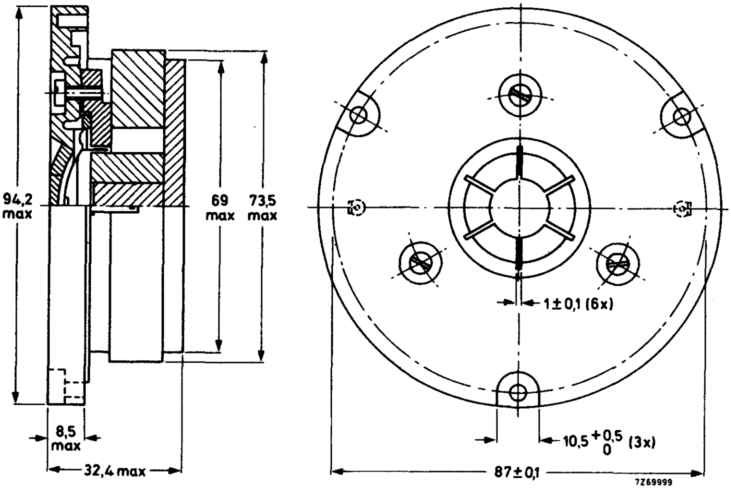


Fig.2

One tag is indicated by a red mark for in-phase connection. Face of loudspeaker should not lie behind plane of baffle.

FREQUENCY RESPONSE CURVES (see Fig.3)

Curve b: Sound pressure measured in anechoic room, loudspeaker unmounted.

Curve c: 2nd and 3rd harmonic distortion, measured at the operating power of 2 W in anechoic room, loudspeaker unmounted.

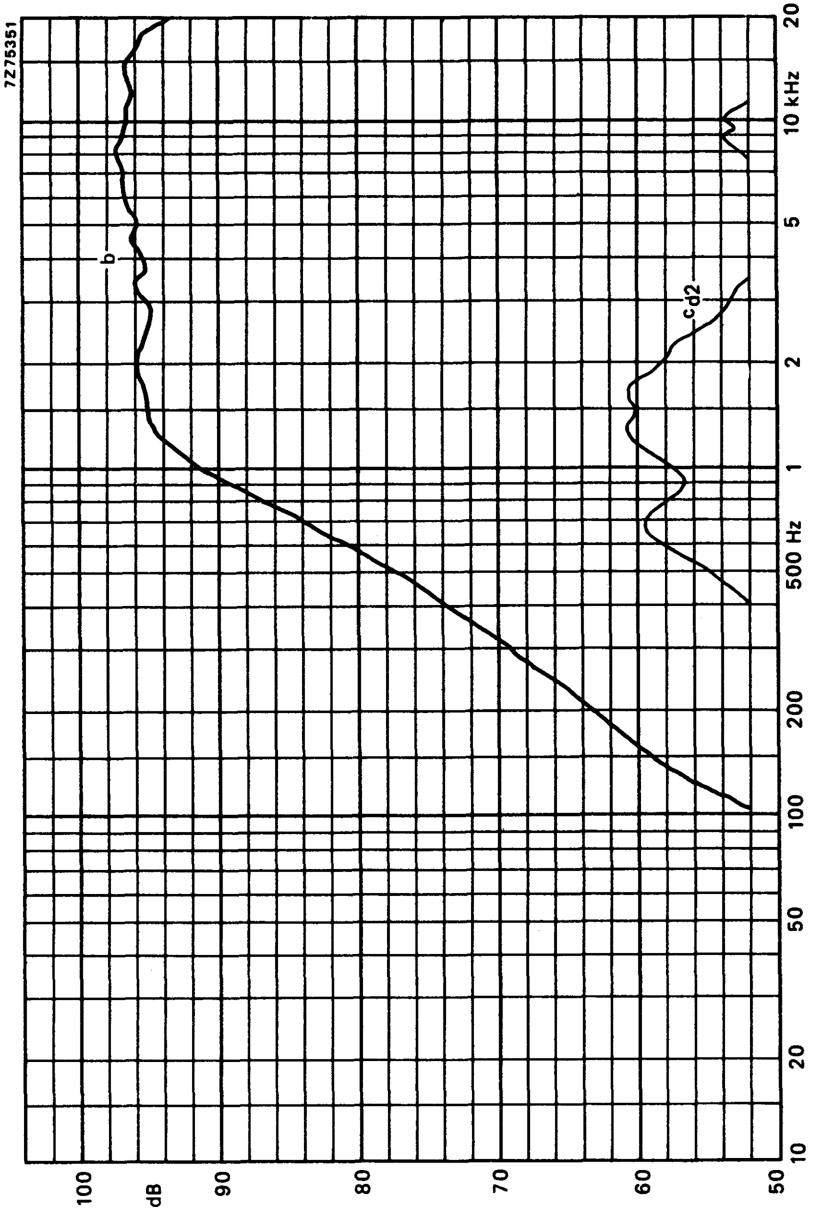

7Z75351
b
c
d2
100
dB
90
80
70
60
50
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20

Fig.3

2 inch HIGH POWER DOME SQUAWKER LOUDSPEAKER

AD0210/Sq.

APPLICATION

For the reproduction of audio frequencies from 500 to 5000 Hz with very low distortion in multi-way high-fidelity loudspeaker systems according to DIN45500.
The loudspeaker has an excellent spherical radiation pattern.

TECHNICAL DATA

	version		
	Sq4	Sq8	
Rated impedance	4	8	Ω
Voice coil resistance	3, 4	6, 6	Ω
Resonance frequency	370		Hz
Rated frequency range	550 to 5000		Hz
Power handling capacity,			W
measured with filter 36 μF - 1, 2 mH	60		
18 μF - 2, 4 mH		60	
loudspeaker unmounted			
Power handling capacity of speaker only	20		W
Operating power	5		W
Sweep voltage (100 to 10 000 Hz, filter 36 μF - 1, 2 mH	4, 5		V
18 μF - 2, 4 mH)		6, 3	V
Energy in air gap	0		mJ
Flux density	0, 8		T
Air-gap height	5		mm
Voice coil height	3, 3	3, 6	mm
Core diameter	50		mm
Magnet material	Magnadur		
diameter	102		mm
mass	0, 42		kg
Mass of loudspeaker	1		kg

The loudspeaker has a paper dome, textile rim and a sealed pot; no acoustic isolation required.

Connection to the loudspeaker is by means of 5,1 mm (0, 2 inch) Fastons or soldering.

Dimensions (mm)

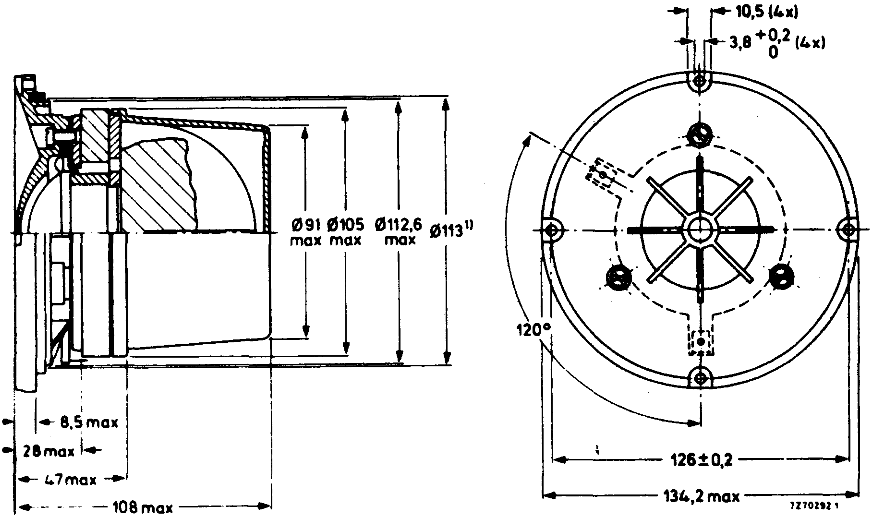


Fig. 1

¹) Baffle hole diameter 110 mm

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES

See Fig. 2 Input power 50 mW

Curve b: Sound pressure measured in anechoic room, loudspeaker mounted on DIN baffle at operating power.

Curve c: 2nd and 3rd harmonic distortion, measured at the operating power of 5 W in anechoic room. Loudspeaker front mounted on DIN baffle.

2 inch HIGH POWER DOME SQUAWKER LOUDSPEAKER

AD0210/Sq.

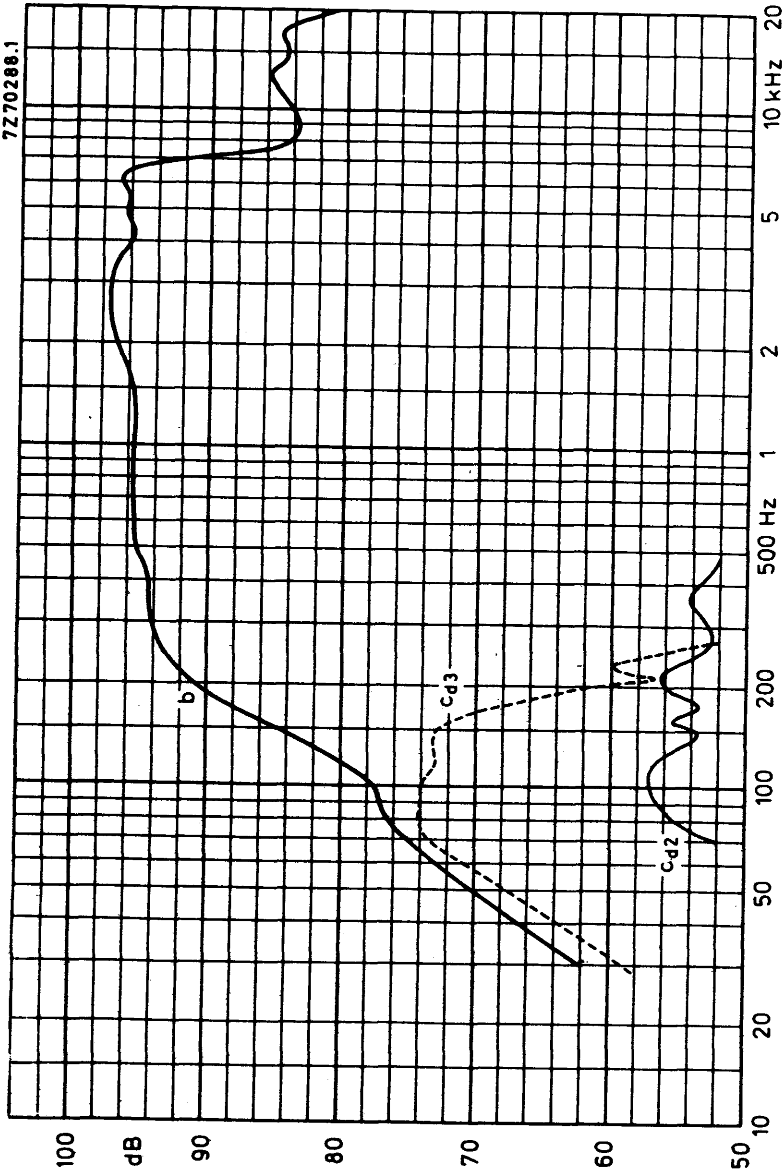


Fig. 2

2 INCH HIGH POWER DOME SQUAWKER LOUDSPEAKER

APPLICATION

For the reproduction of audio frequencies from 500 to 5000 Hz with very low distortion in multi-way high-fidelity loudspeaker systems according to DIN 45500. The loudspeaker has an excellent spherical radiation pattern.

TECHNICAL DATA

	version		
	Sq4	Sq8	
Rated impedance	4	8	Ω
Voice coil resistance	3,4	6,6	Ω
Resonance frequency	340	370	Hz
Rated frequency range	550 to 5000		Hz
Power handling capacity, loudspeaker unmounted, measured with filter			
50 μF – 1,6 mH	60		W
24 μF – 3,2 mH		60	W
Power handling capacity of speaker only	20		W
Operating power	5		W
Sweep voltage (100 to 10 000 Hz, filter 50 μF – 1,6 mH	4,5		V
24 μF – 3,2 mH)		6,3	V
Energy in air gap	250		mJ
Flux density	0,8		T
Air-gap height	5		mm
Voice coil height	3,3	3,6	mm
Core diameter	50		mm
Magnet material	**Magnadur**		
diameter	102		mm
mass	0,42		kg
Mass of loudspeaker	1		kg

The loudspeaker has a textile dome and surround, and a sealed pot; no acoustic isolation required. Connection to the loudspeaker is by means of 5,1 mm (0,2 inch) Fastons or soldering.

Dimensions (mm)

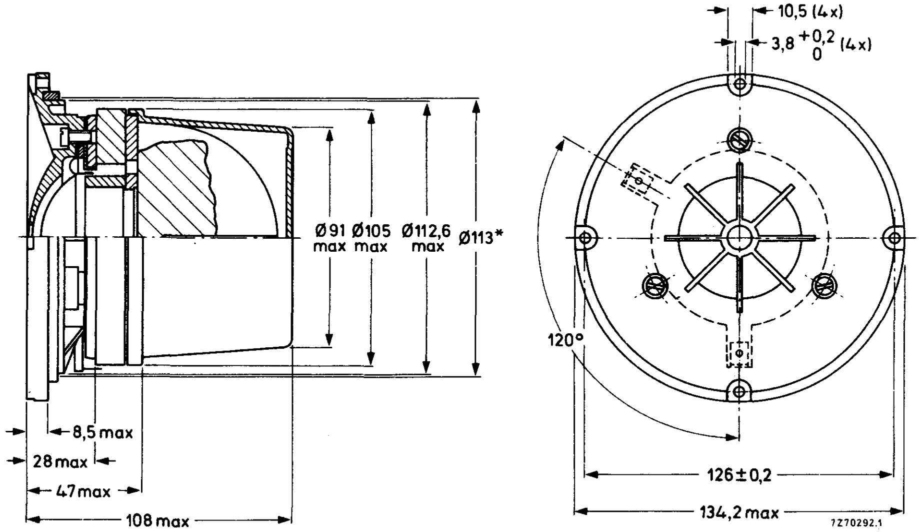


Fig. 1

* Baffle hole diameter 110 mm.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve a: Sound pressure measured in anechoic room, loudspeaker mounted on IEC baffle at operating power.

Curves d2 and d3: 2nd and 3rd harmonic distortion, measured at the operating power in anechoic room. Loudspeaker front mounted on IEC baffle.

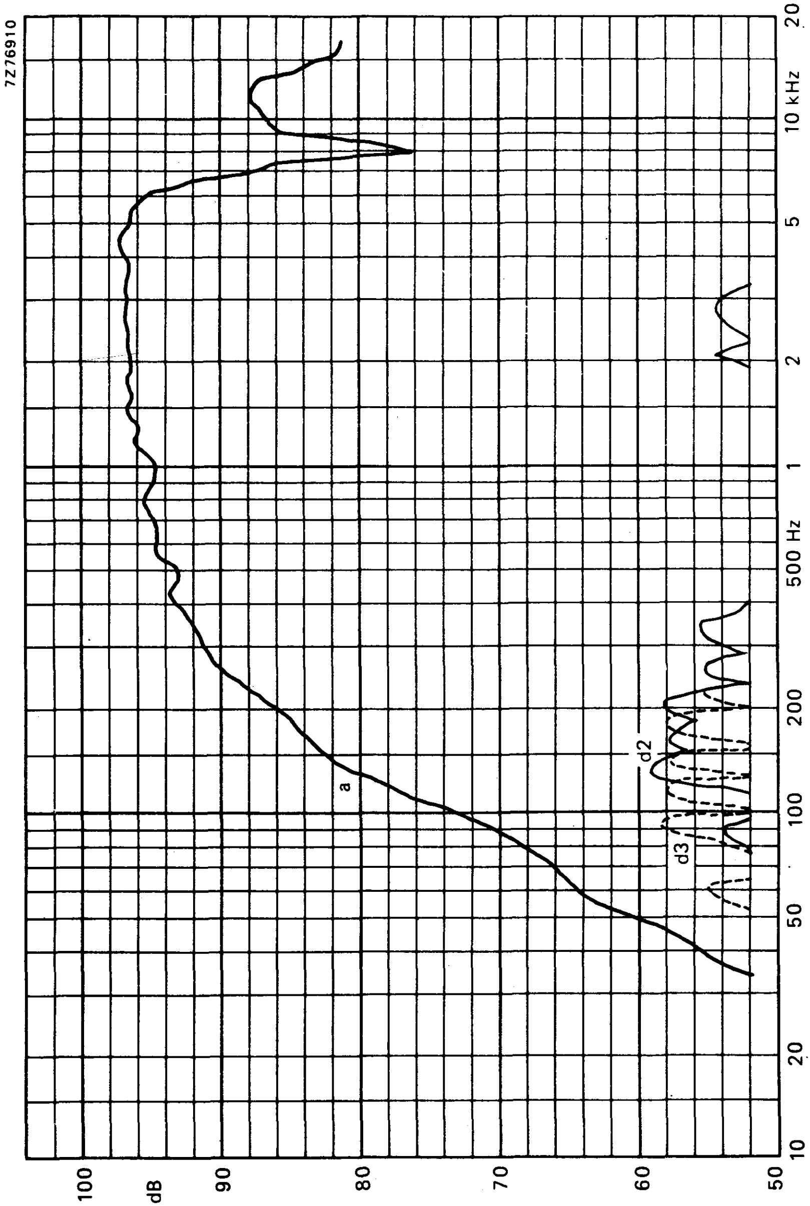

7Z76910
100
dB
90
80
70
60
50
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20
a
d2
d3

Fig. 2

2½ INCH LOW POWER LOUDSPEAKER

APPLICATION

For portable receivers and intercoms.

TECHNICAL DATA

	version				
	Z4	Z8	Z15	Z25	
Rated impedance	4	8	15	25	Ω
Voice coil resistance	3,5	7,1	13,7	22,8	Ω
Rated frequency range	180 to 4000				Hz
Resonance frequency	360				Hz
Power handling capacity, loudspeaker unmounted, measured without filter	1				W
Operating power (sound level 90 dB, 0,5 in)	0,25				
Sweep voltage (frequency range: 240 to 15000 Hz)	1	1,4	1,9	2,5	V
Energy in air gap	12,7				mJ
Flux density	0,74				T
Air-gap height	2,5				mm
Voice coil height	2,7	2,2	3,0	3,6	mm
Core diameter	10				
Magnet material	Magnadur				
diameter	31				mm
mass	0,02				kg
Mass of loudspeaker	0,064				kg

The loudspeaker has a plastic frame, and a paper cone and surround. Connection to the loudspeaker by means of 2,8 mm (0,11 inch) Fastons or soldering.

Dimensions (mm)

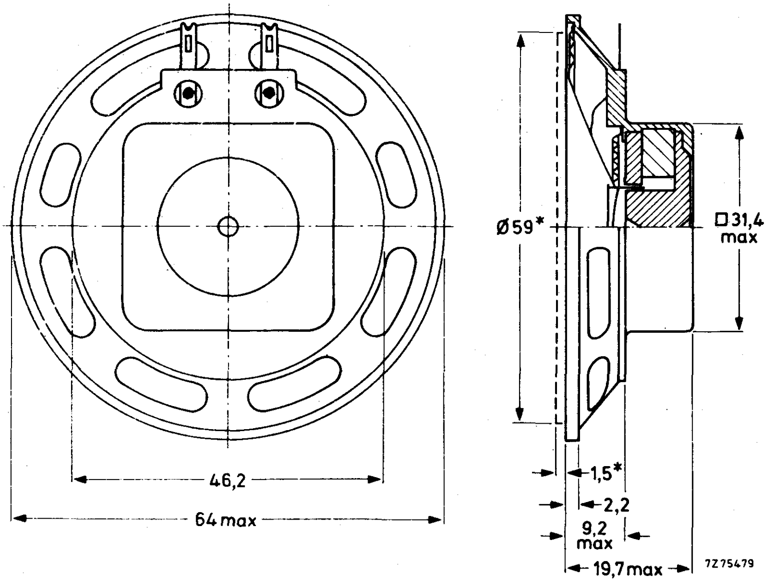


Fig. 1.

*Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by + sign for in-phase connection.

FREQUENCY RESPONSE CURVE (see Fig. 2)

Sound pressure measured in anechoic room, loudspeaker mounted on IEC baffle.

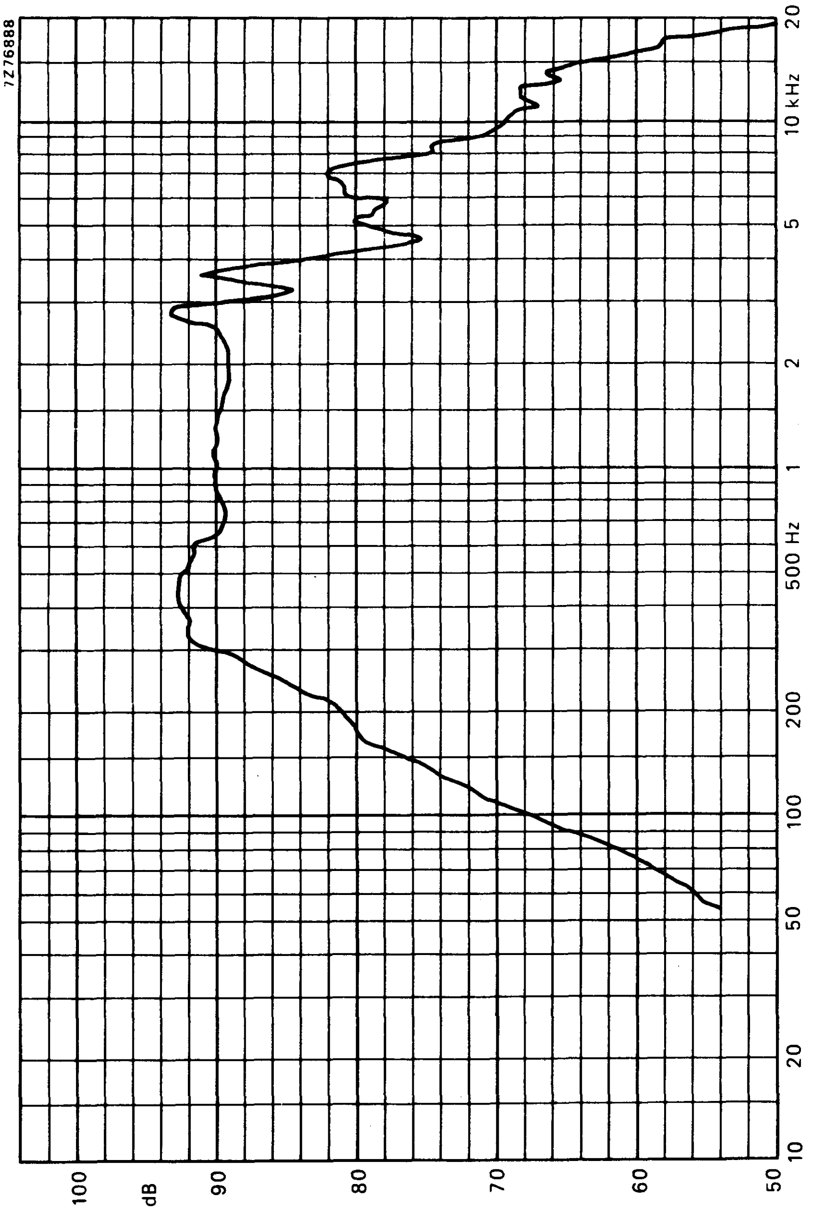


Fig.2.

3 INCH LOW POWER LOUDSPEAKER

APPLICATION

For portable receivers and intercoms.

TECHNICAL DATA

	version				
	Y4	Y8	Y15	Y25	
Rated impedance	4	8	15	25	Ω
Voice coil resistance	3.5	7.1	13.7	22.8	Ω
Rated frequency range	100 to 6000				Hz
Resonance frequency	250				Hz
Power handling capacity, loudspeaker unmounted, measured without filter	2				W
Operating power (sound level 90 dB, 0.5 in)	0.225				W
Sweep voltage (frequency range 170 to 15 000 Hz)	1.4	2.0	2.7	3.5	V
Energy in air gap	12.7				mJ
Flux density	0.74				T
Air-gap height	2.5				mm
Voice coil height	2.7	2.2	3.0	3.6	mm
Core diameter	10				mm
Magnet material	Magnadur				
diameter	31				mm
mass	0.02				kg
Mass of loudspeaker	0.069				kg

The loudspeaker has a plastic frame, and a paper cone and surround. Connection to the loudspeaker by means of 2.8 mm (0.11 inch) Fastons or soldering.

Dimensions (mm)

AD3071/Y

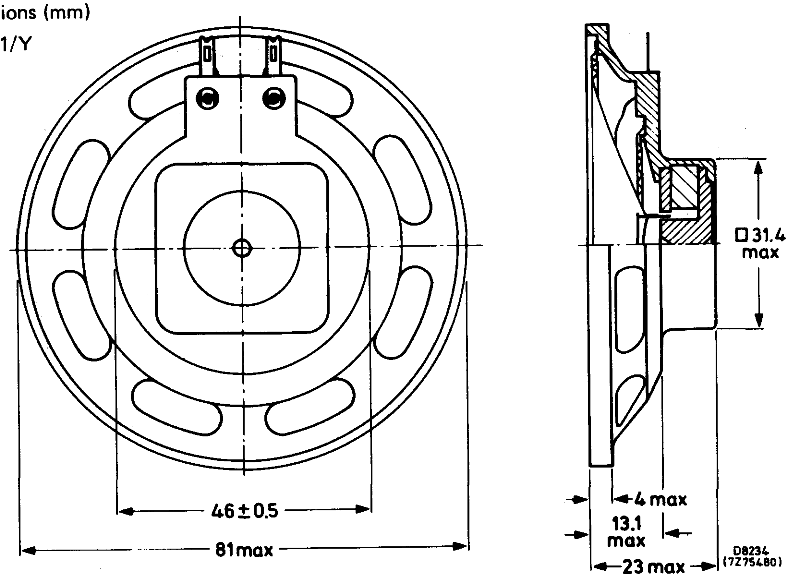
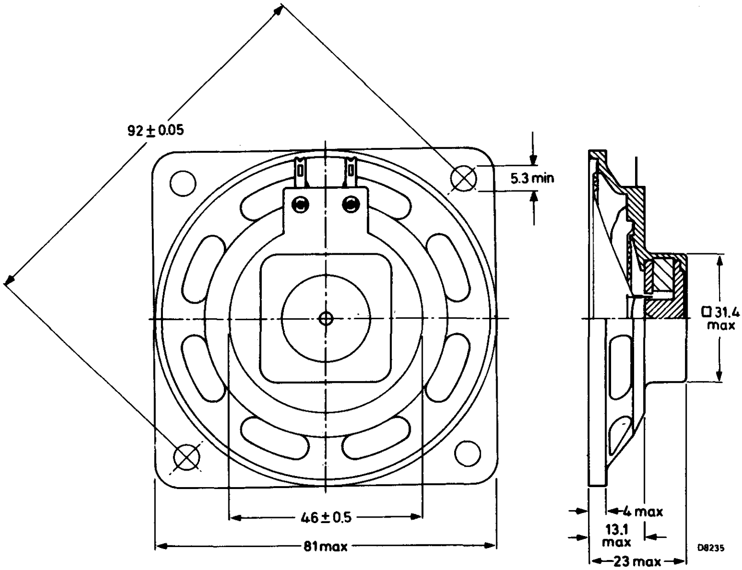


Fig.1

AD3371/Y



Baffle hole 72 mm diameter

Fig.2

FREQUENCY RESPONSE CURVE

Sound pressure measured in anechoic room, loudspeaker mounted on IEC baffle.

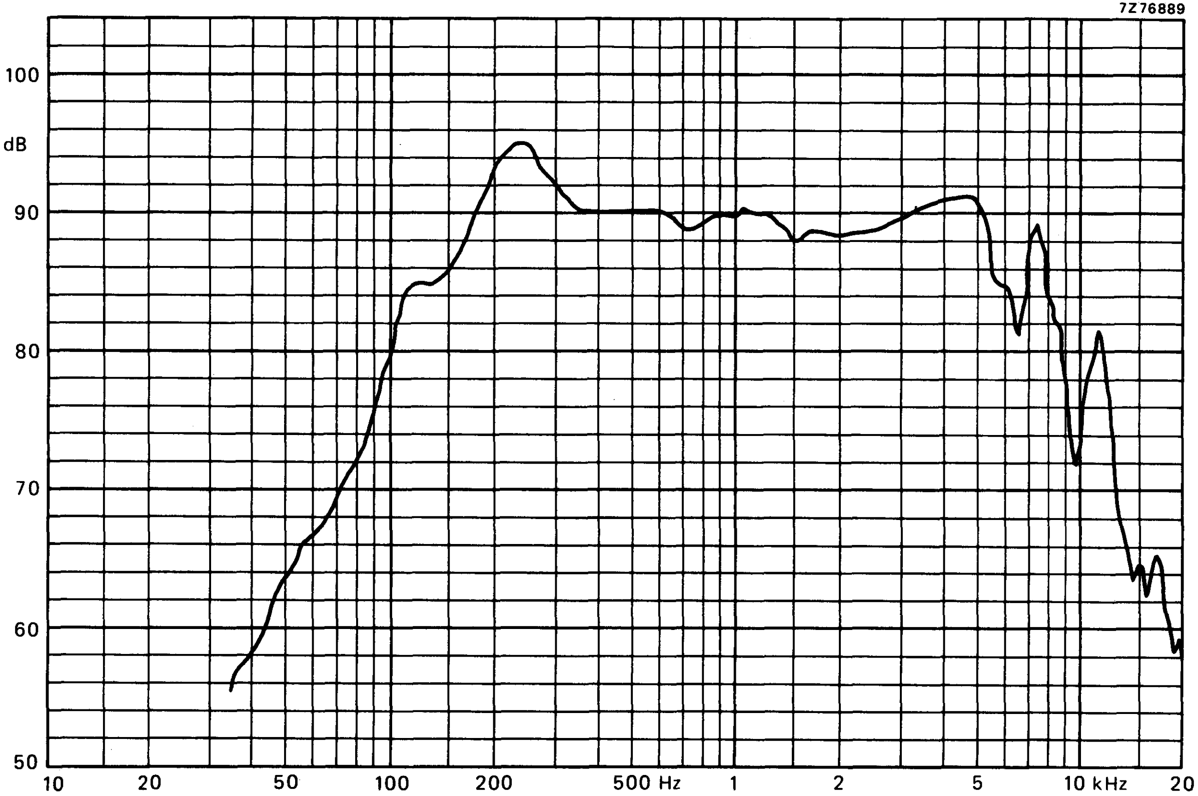


Fig.3

3 x 5 INCH OVAL
MEDIUM POWER LOUDSPEAKER

AD3591/X

APPLICATION

For use in portable radios, tape recorders and, due to absence of stray magnetic field, this loudspeaker can also be used in television sets. High sensitivity.

TECHNICAL DATA

	version				
	X4	X8	X15	X25	
Rated impedance	4	8	15	25	Ω
Voice coil resistance	3,4	7,2	13,8	22,6	Ω
Rated frequency range			85 to 12000		Hz
Resonance frequency			180		Hz
Power handling capacity, measured without filter, loudspeaker unmounted			3		W
Sweep voltage	2,4	3,5	4,7	6,1	V
Energy in air gap			39		mJ
Flux density			0,8		T
Air-gap height			3		mm
Voice coil height	2	1,8	2,55	2,8	mm
Core diameter			18		mm
Magnet material	Ticonal	Ticonal	Ticonal	Ticonal	
diameter			18		mm
mass			0,027		kg
Mass of loudspeaker			0,13		kg

The loudspeaker has a paper cone and surround.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

Baffle hole

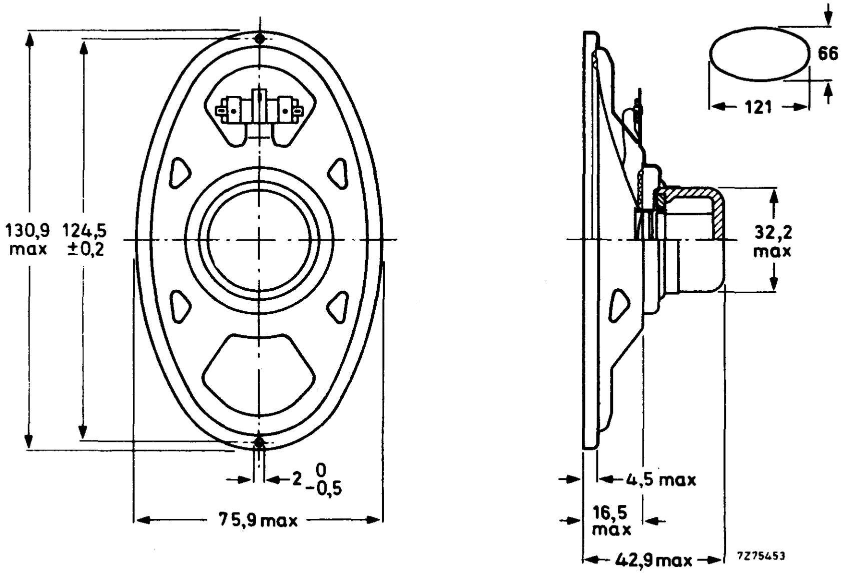


Fig. 1.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE (see Fig. 2)

Curve a: Sound pressure.

Curves d2 and d3: 2nd and 3rd harmonic distortion.

The curves are measured in anechoic room, loudspeaker mounted on IEC baffle.

3 x 5 INCH OVAL MEDIUM POWER LOUDSPEAKER

AD3591/X

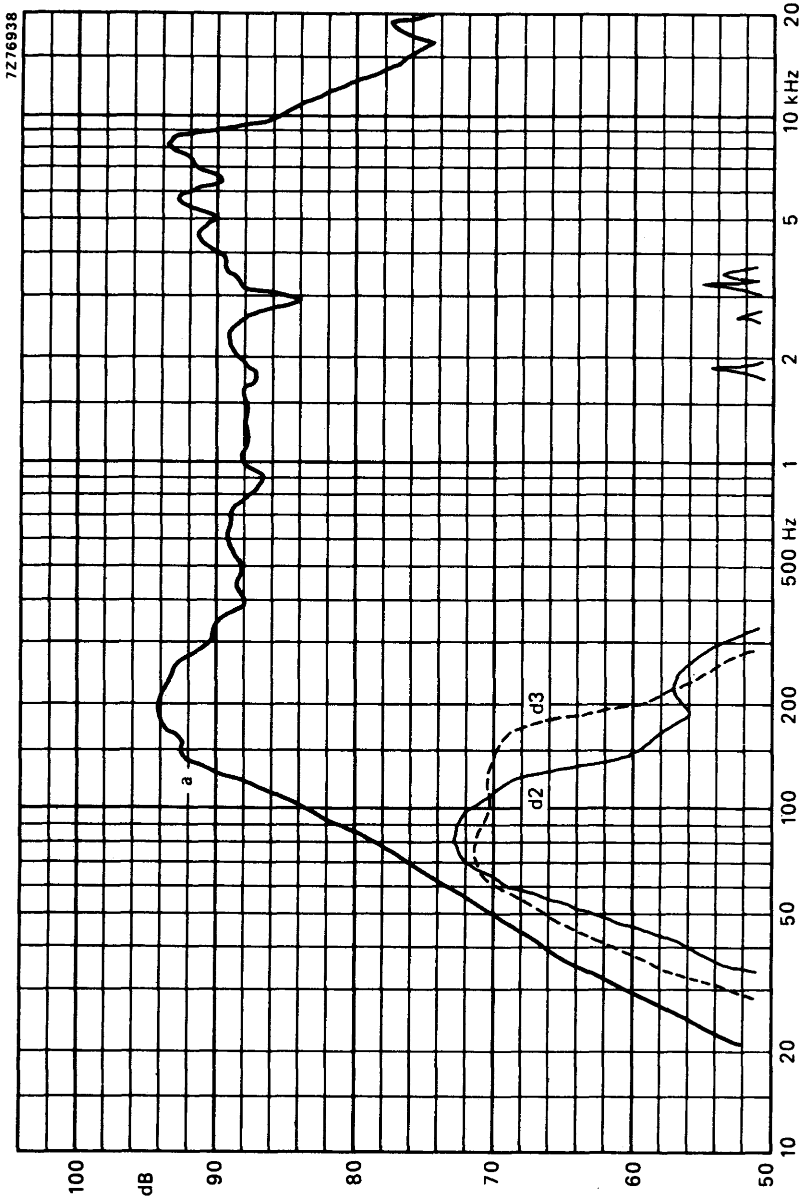


Fig. 2.

3 x 5 INCH
MEDIUM POWER LOUDSPEAKER

AD3595/X

APPLICATION

For use in portable radios, tape recorders and, due to absence of stray magnetic field, this loudspeaker can also be used in television sets. High sensitivity.

TECHNICAL DATA

	version				
	X4	X8	X15	X25	
Rated impedance	4	8	15	25	Ω
Voice coil resistance	3,4	7,1	13,5	22,5	Ω
Rated frequency range	90 to 15000				Hz
Resonance frequency	180	170	170	170	Hz
Power handling capacity, measured without filter, loudspeaker unmounted	3				W
Operating power (sound level 90 dB, 1 m)	1,5				W
Sweep voltage, frequency range: 80 to 20 000 Hz	2,5	3,5	4,7	6,2	V
Energy in air gap	20,5				mJ
Flux density	0,77				T
Air-gap height	2,5				mm
Voice coil height	3,5	4,2	2,7	3,3	mm
Core diameter	14,5				mm
Magnet material	Ticonal				
diameter	14,5				mm
mass	0,013				kg
Mass of loudspeaker	0,13				kg

The loudspeaker has a paper surround and a foam plastic gasket on the flange. Connection to the loudspeaker by means of 2,8 mm (0,11 inch) Fastons, or soldering.

Dimensions (mm)

Baffle hole

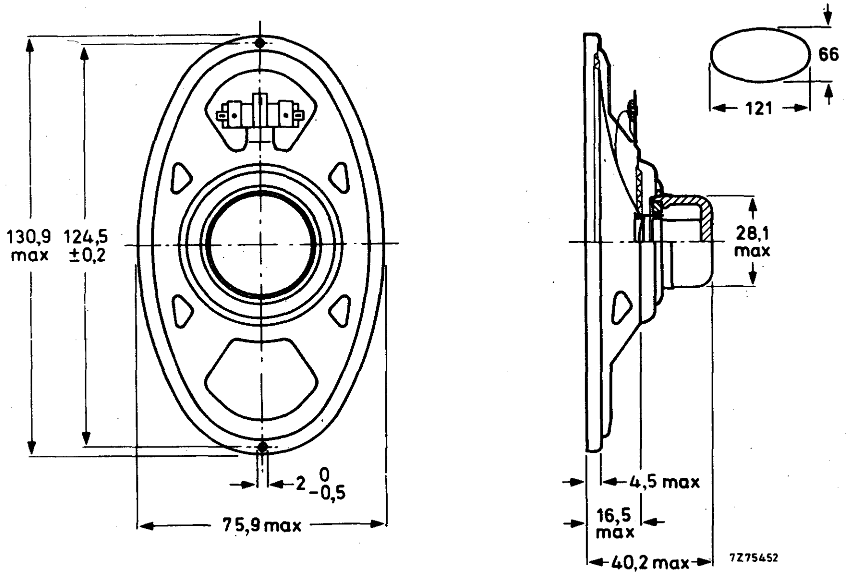


Fig. 1.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve a: Sound pressure.

Curves d2 and d3: 2nd and 3rd harmonic distortion, measured at the operating power of 1,5 W.

The curves are measured in anechoic room, loudspeaker mounted on IEC baffle.

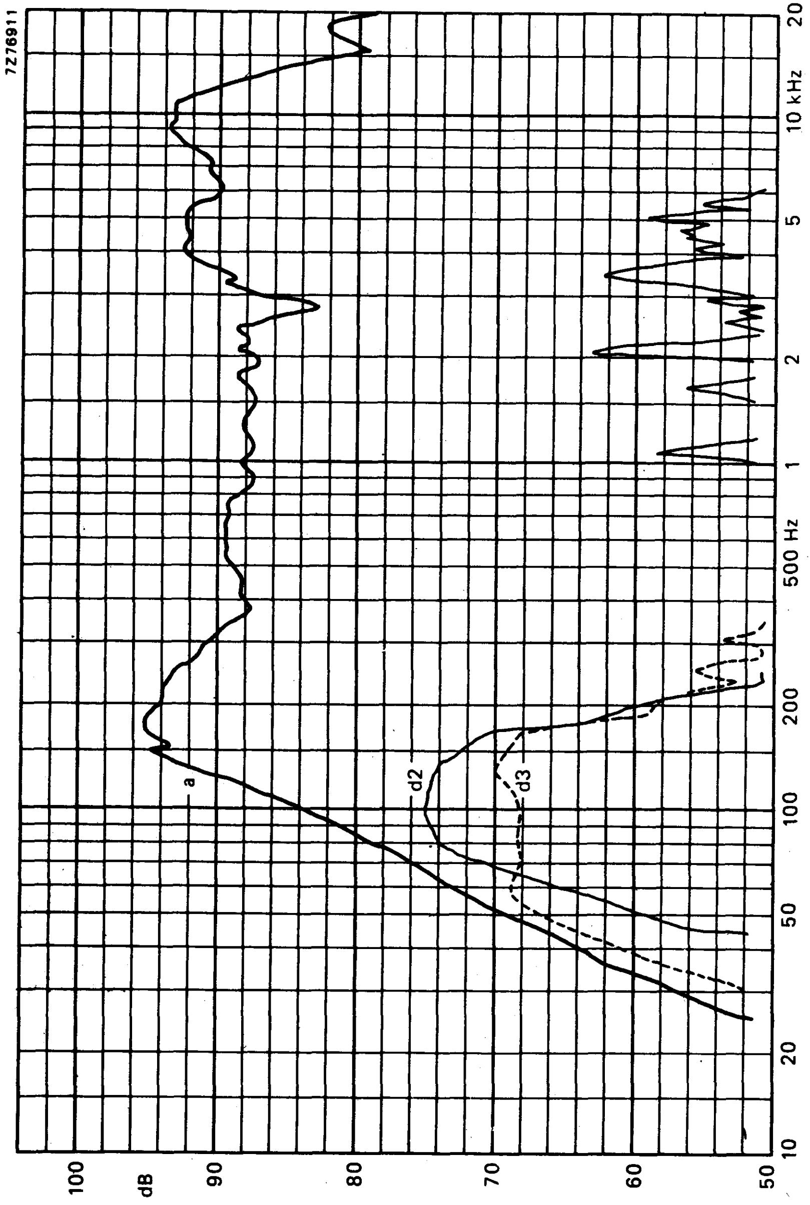

7Z76911
100
dB
90
80
70
60
50
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20
a
d2
d3

Fig. 2.

3 x 8 INCH OVAL MEDIUM POWER LOUDSPEAKERS

AD3880/X Series

APPLICATION

For use in portable radios and tape recorders

TECHNICAL DATA

	version			
	X4	X8	X15	
Rated impedance	4	8	15	Ω
Voice coil resistance	3,4	7,1	13,8	Ω
Resonance frequency	120	120	120	Hz
Power handling capacity, measured without filter, loudspeaker unmounted	4	4	4	W
Sweep voltage	2,8	5,5	5,5	V
Energy in airgap	55	55	55	mJ
Flux density	1	1	1	T
Airgap height	3	3	3	mm
Voice coil height	2,4	3,1	2,5	mm
Core diameter	18	18	18	mm
Magnet material		Magnadur		
diameter	53	53	53	mm
weight	0,1	0,1	0,1	kg
Weight of loudspeaker	0,3	0,3	0,3	kg

The loudspeaker has a paper cone and a treated paper surround.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

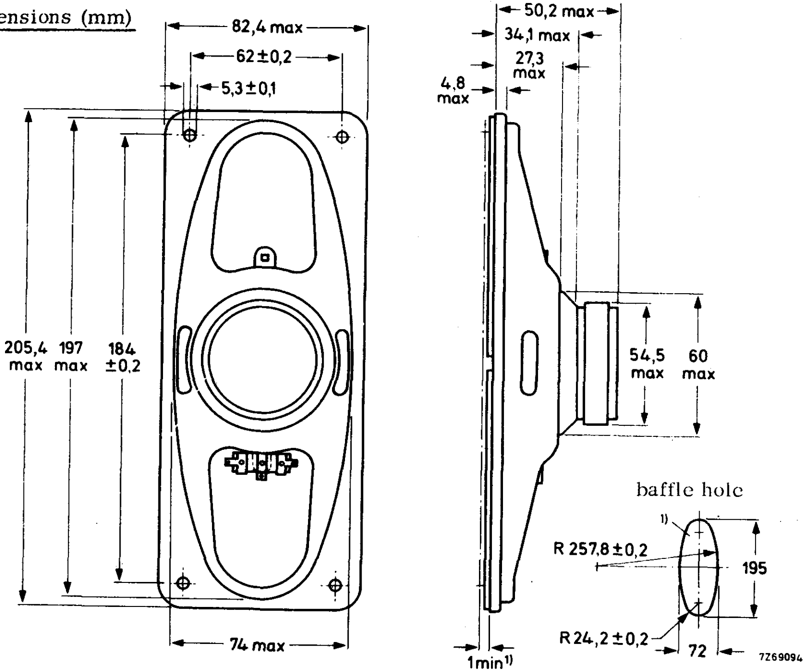


Fig. 1

1) Baffle hole and clearance depth required for cone movement at specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

See Fig. 2. Input power 50 mW

Sound pressure measured in anechoic room, loudspeaker unmounted. Above 1000 Hz the sound pressure may be, over the width of one octave, maximum 2 dB lower than indicated.

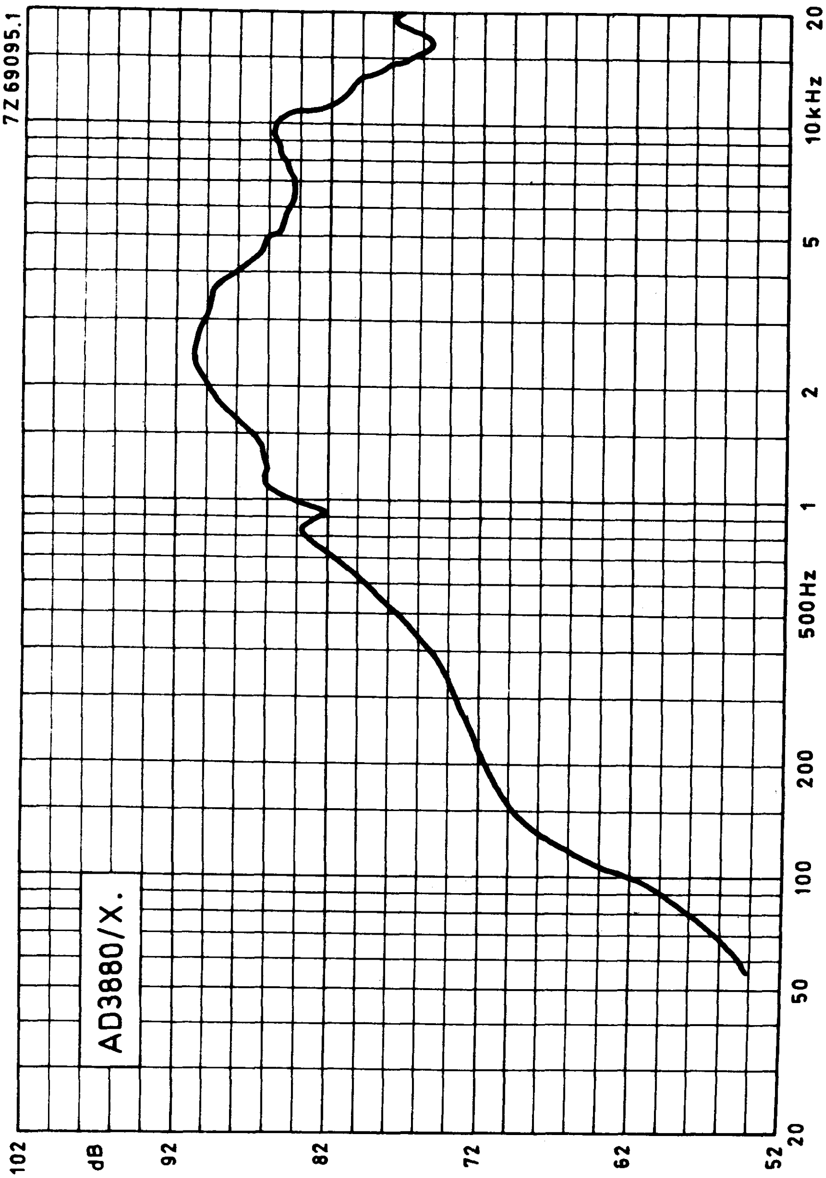

7Z69095.1
AD3880/X.
20
10kHz
5
2
1
500Hz
200
100
50
20
102
dB
92
82
72
62
52

Fig. 2

3 x 8 INCH OVAL MEDIUM POWER LOUDSPEAKERS

AD3890/X Series

APPLICATION

For use in portable radios and tape recorders.
The absence of stray field due to ticonal sinterpot magnet system, makes this loudspeaker also suitable for use in television sets.

TECHNICAL DATA

	version				
	X4	X8	X15	X25	
Rated impedance	4	8	15	25	Ω
Voice coil resistance	3,4	7,1	13,5	22,7	Ω
Resonance frequency	120	120	120	120	Hz
Power handling capacity, measured without filter, loudspeaker unmounted	4	4	4	4	W
Sweep voltage	2,8	4	5,5	7,1	V
Energy in airgrap	39	39	39	39	mJ
Flux density	0,8	0,8	0,8	0,8	T
Airgap height	3	3	3	3	mm
Voice coil height	2,4	2,8	2,5	2,8	mm
Core diameter	18	18	18	18	mm
Magnet material	Ticonal	Ticonal	Ticonal	Ticonal	
diameter	18	18	18	18	mm
weight	0,027	0,027	0,027	0,027	kg
Weight of loudspeaker	0,21	0,21	0,21	0,21	kg

The loudspeaker has a paper cone and a treated paper surround.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

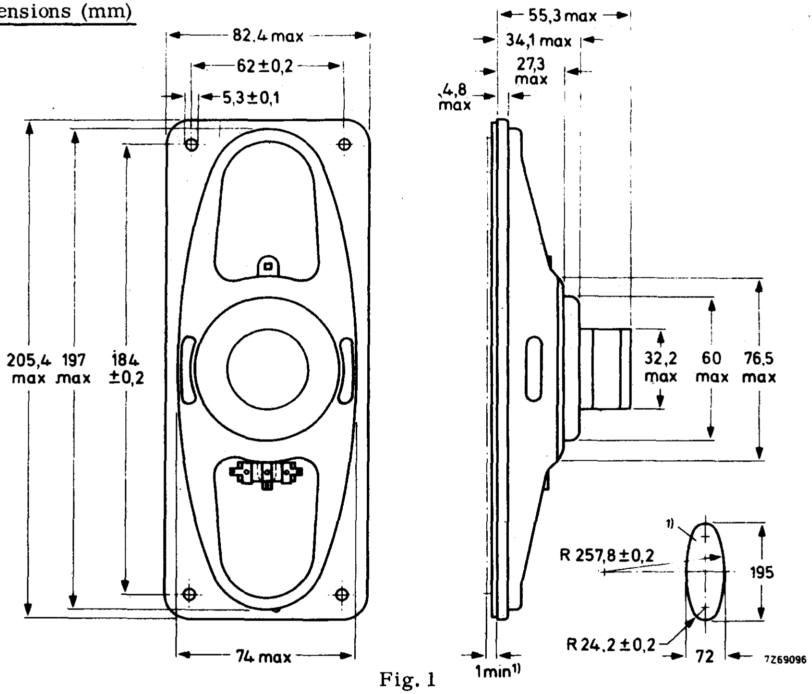


Fig. 1

1) Baffle hole and clearance depth required for cone movement at specified power handling Capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

See Fig. 2. Input power 50 mW

Sound pressure measured in anechoic room, loudspeaker unmounted. Above 1000 Hz the sound pressure may be, over the width of one octave, maximum 2 dB lower than indicated.

3 x 8 INCH OVAL MEDIUM POWER LOUDSPEAKERS

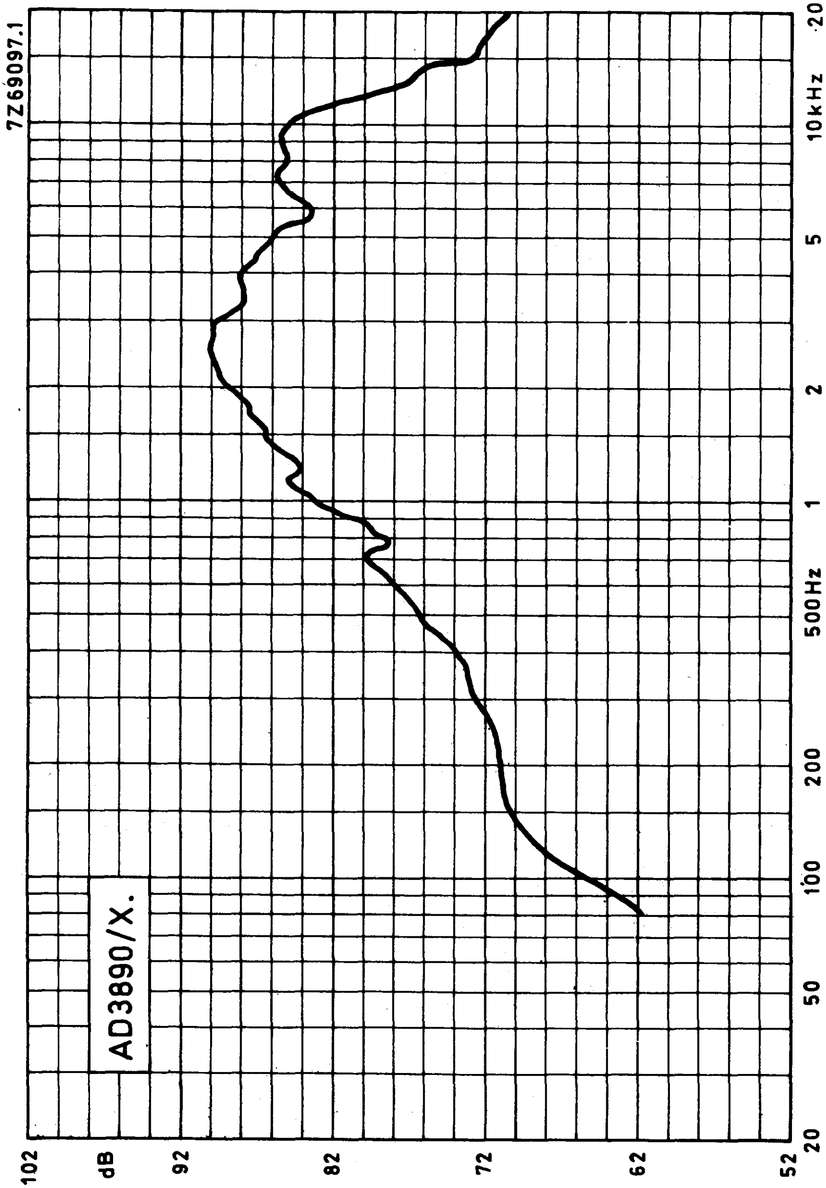


Fig. 2

4 INCH HIGH POWER WOOFER LOUDSPEAKER

APPLICATION

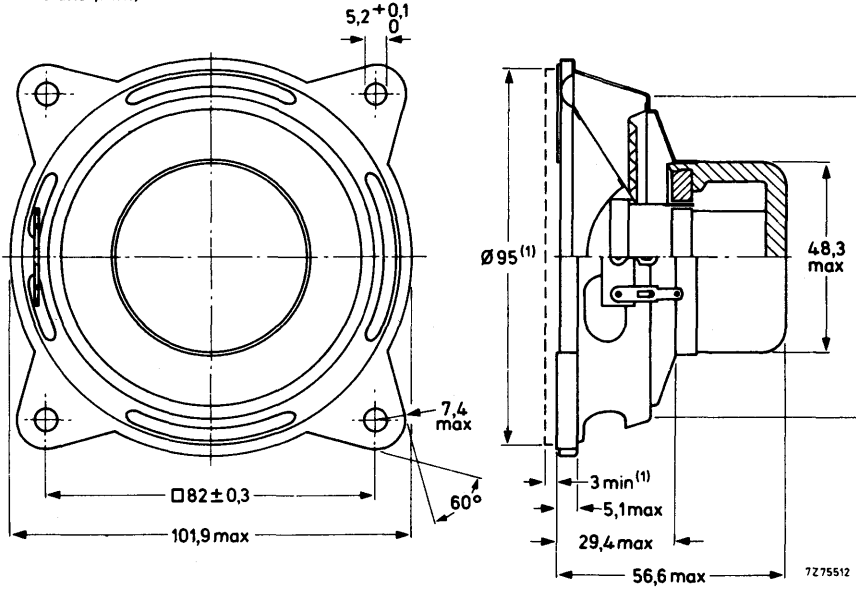
The absence of stray field due to Ticonal sinterpot magnet system makes this loudspeaker very suitable for use in television sets. It can be used in sealed acoustic enclosures and in bass reflex enclosures of maximum 7 litres.

TECHNICAL DATA

	version			
	W4		W8	
Rated impedance	4		8	Ω
Voice coil resistance	3.2		7	Ω
Rated frequency range		35 to 2000		Hz
Resonance frequency		60		Hz
Power handling capacity measured without filter, mounted in 7 1 bass reflex enclosure		15		W
Operating power		8		W
Sweep voltage, frequency range; 30 to 6000 Hz	5.5		7.75	V
Energy in air gap		100		mJ
Flux density		0.85		T
Air-gap height		5		mm
Voice coil height		6		mm
Core diameter		25		mm
Magnet material		Ticonal		
diameter		25		mm
mass		0.06		kg
Mass of loudspeaker		0.42		kg

The loudspeaker has a rubber surround and a sealing strip at the rear of the basket. Connection to the loudspeaker by means of 2.8 mm (0.11 inch) Fastons, or soldering.

Dimensions (mm)



(1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve a: Sound pressure measured in anechoic room, loudspeaker mounted in 7 l bass reflex enclosure.
Curves d2 and d3: 2nd and 3rd harmonic distortion, measured at the operating power.

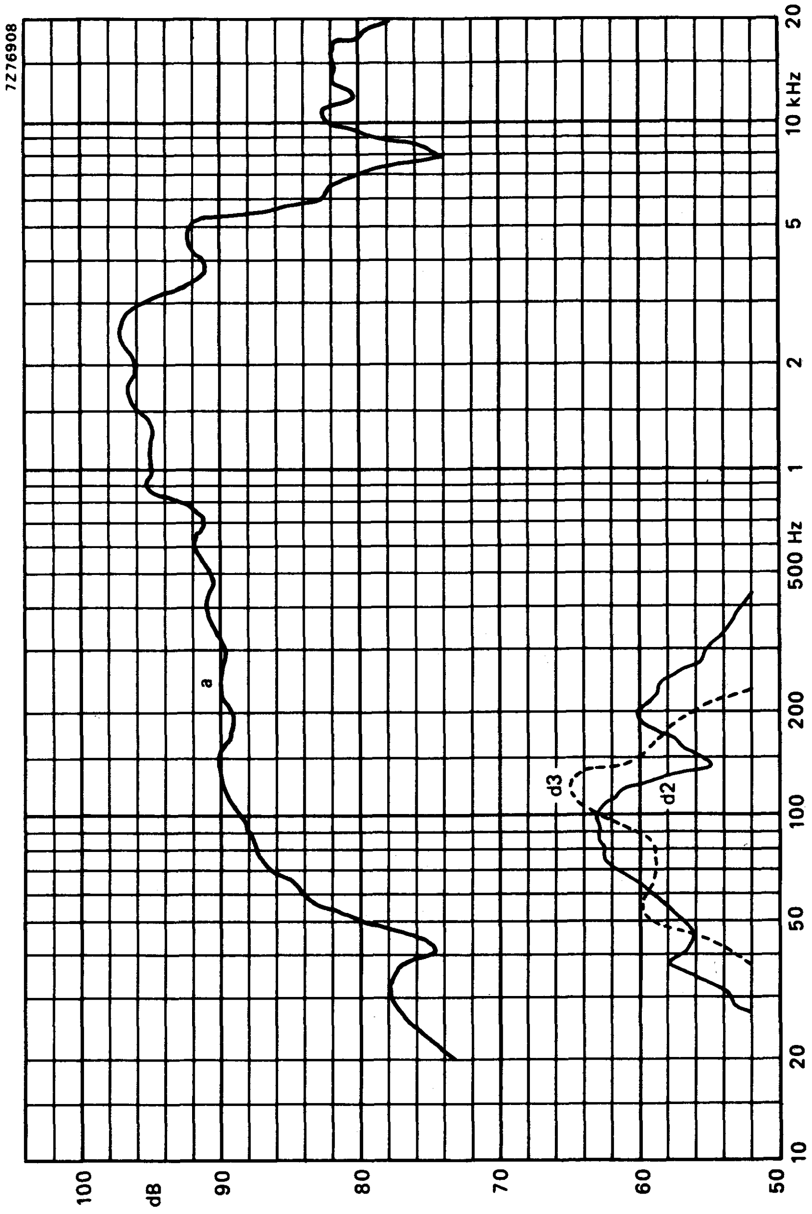

7Z76908
100
dB
90
80
70
60
50
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20
a
d3
d2

Fig. 2.

4 INCH MEDIUM POWER LOUDSPEAKERS

APPLICATION

For portable receivers and intercoms.

TECHNICAL DATA

	version				
	X4	X8	X15	X25	
Rated impedance	4	8	15	25	Ω
Voice coil resistance	3,5	7,1	13,7	22,8	Ω
Rated frequency range	80 to 15 000				Hz
Resonance frequency	170				Hz
Power handling capacity, loudspeaker unmounted, measured without filter	3				W
Operating power (sound level 90 dB, 0,5 in)	0,18				W
Sweep voltage (frequency range 100 to 20 000 Hz)	1,4	2	2,7	3,5	V
Energy in air gap	12,7				mJ
Flux density	0,74				T
Air-gap height	2,5				mm
Voice coil height	2,7	2,2	3,0	3,6	mm
Core diameter	10				mm
Magnet material	Magnadur				
diameter	31				mm
mass	0,02				kg
Mass of loudspeaker,					
round flange version	0,079				kg
square flange version	0,087				kg

The loudspeakers have a plastic frame, and a paper cone and surround. Connection to the loudspeakers is by means of 2,8 mm (0,11 inch) Fastons or soldering.

Dimensions (mm)

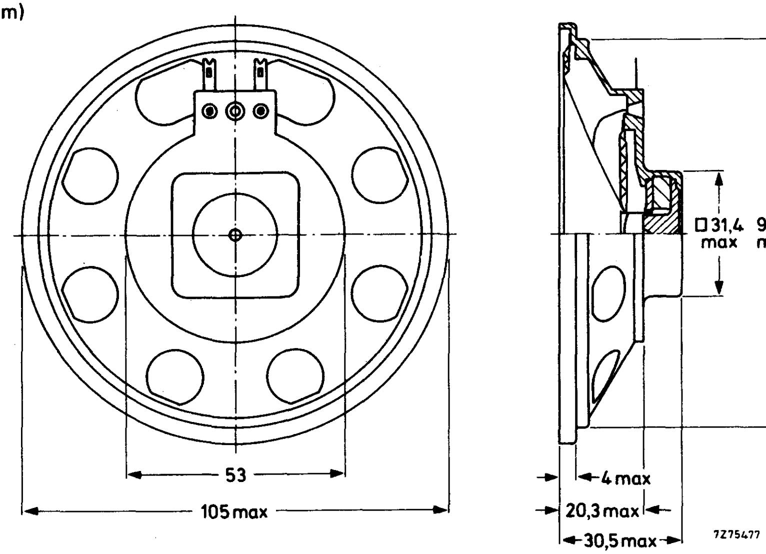


Fig. 1a.

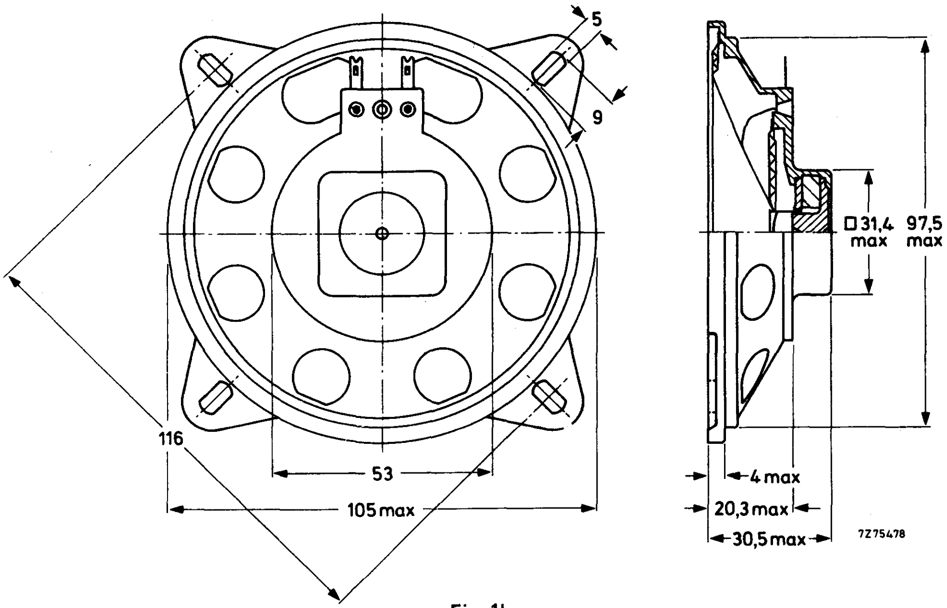


Fig. 1b.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

Sound pressure measured in anechoic room, loudspeaker mounted on IEC baffle.

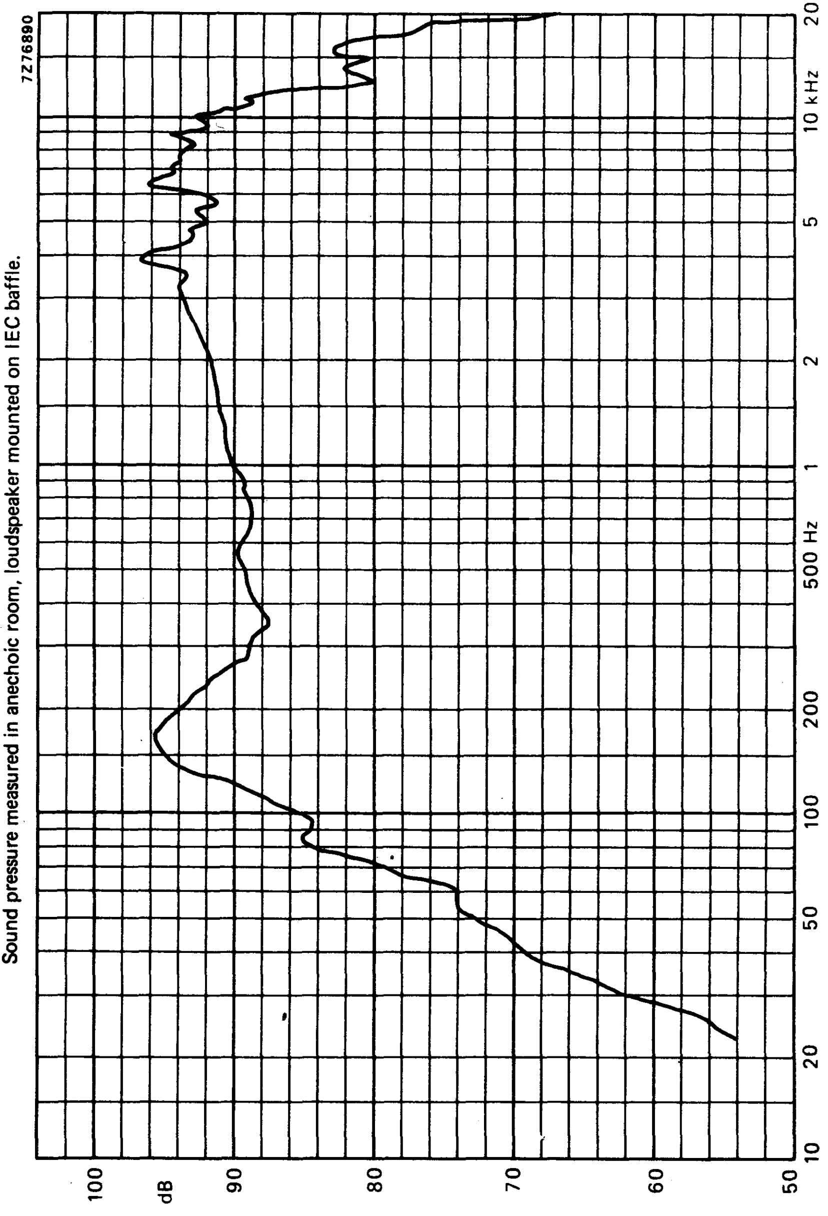


Fig.2.

4 INCH MEDIUM POWER LOUDSPEAKERS

AD4080/X
AD4480/X
Series

APPLICATION

For portable receivers, small tape recorders and intercoms.

TECHNICAL DATA

	version				
	X4	X8	X15	X25	
Rated impedance	4	8	15	25	Ω
Voice coil resistance	3, 4	7, 1	13, 8	22, 6	Ω
Resonance frequency	165	165	165	165	Hz
Power handling capacity, measured without filter loudspeaker unmounted	3	3	3	3	W
Sweep voltage	2, 45	3, 5	4, 75	6, 1	V
Energy in airgap	55	55	55	55	mJ
Flux density	1	1	1	1	T
Airgap height	3	3	3	3	mm
Voice coil height	2, 4	3, 1	2, 55	2, 8	mm
Core diameter	18	18	18	18	mm
Magnet material	Magnadur				
diameter	53	53	53	53	mm
weight	0, 1	0, 1	0, 1	0, 1	kg
Weight of loudspeaker	0, 25	0, 25	0, 25	0, 25	kg

The loudspeaker has a paper cone and surround.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

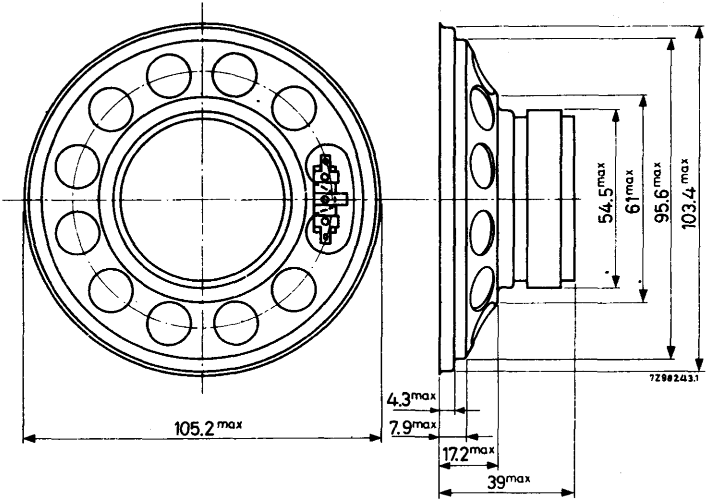


Fig. 1a Round flange version

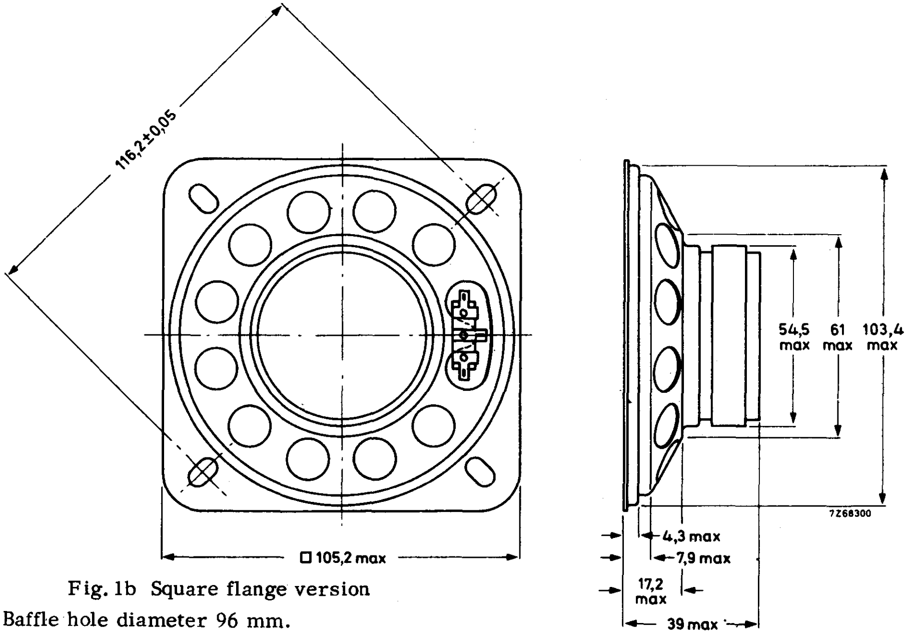


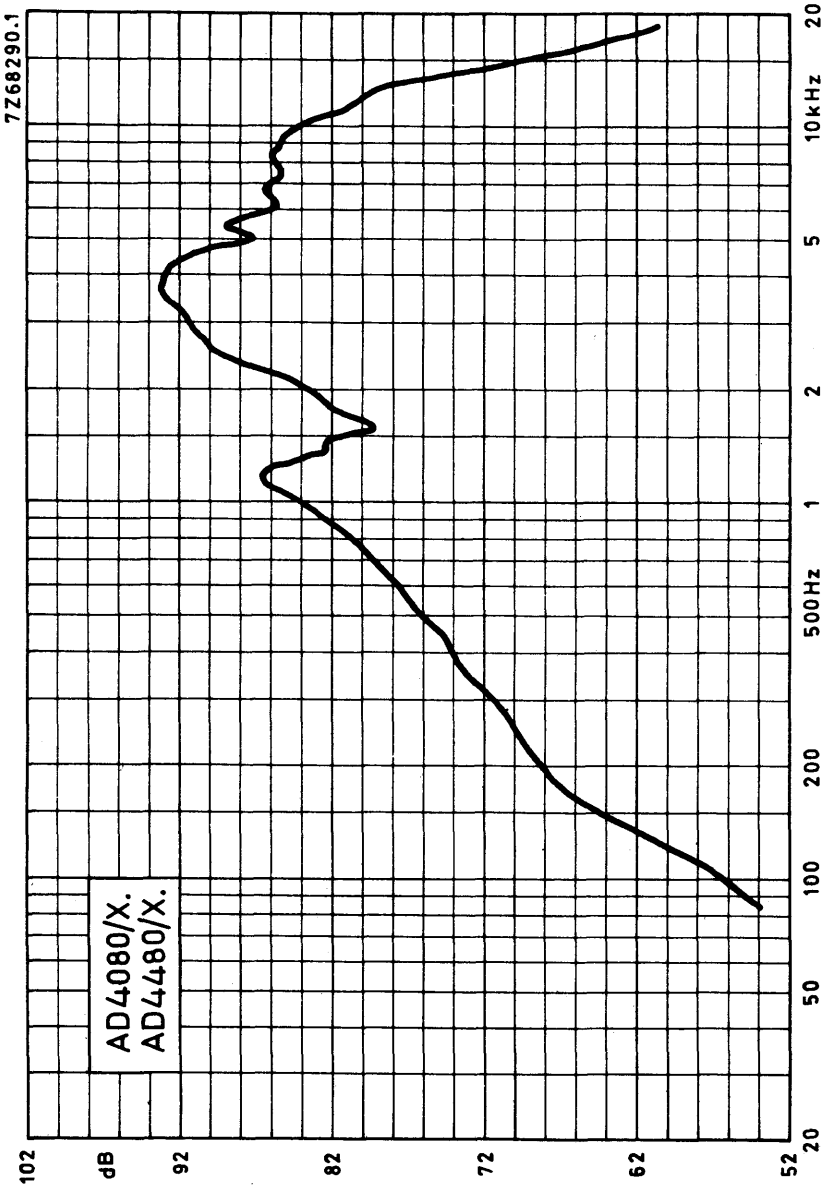
Fig. 1b Square flange version

Baffle hole diameter 96 mm.

One tag is indicated by a red mark for in-phase connection.

4 INCH MEDIUM POWER LOUDSPEAKERS

AD4080/X
AD4480/X
Series



FREQUENCY RESPONSE CURVE

Sound pressure measured in anechoic room, loudspeaker unmounted. Above 1000 Hz, the sound pressure may be, over the width of one octave, maximum 2 dB lower than indicated. Input power 50 mW

4 INCH MEDIUM POWER LOUDSPEAKER

AD4085/X
AD4485/X

APPLICATION

For audio equipment in general. Frequency response up to 12 kHz, high sensitivity in bass region.

TECHNICAL DATA

		version		
	X4	X8	X15	
Rated impedance	4	8	15	Ω
Voice coil resistance	3,4	7,1	13,5	Ω
Rated frequency range		80 to 14 000		Hz
Resonance frequency		150		Hz
Power handling capacity, measured without filter, loudspeaker unmounted		3		W
Operating power (sound level 90 dB, 1 m)		0,7		W
Sweep voltage (75 to 20 000 Hz)	2,5	3,5	4,7	V
Energy in air gap		38		mJ
Flux density		1,1		T
Air-gap height		2,5		mm
Voice coil height	3,5	4,1	2,7	mm
Core diameter		14		mm
Magnet material		Magnadur		
diameter		46		mm
mass		0,053		kg
Mass of loudspeaker		0,16		kg

The loudspeaker has a paper rim. Connections to the loudspeaker can be made by means of Fastons or by soldering.

Dimensions (mm)

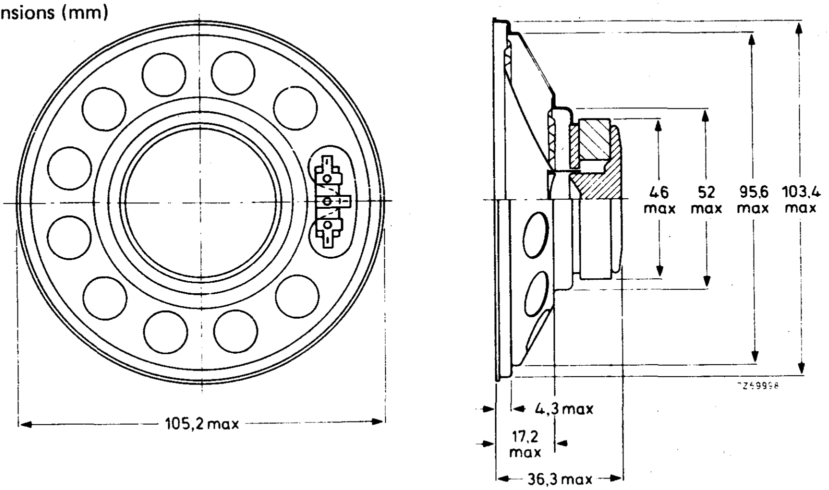


Fig. 1a Round flange type AD4085/X.

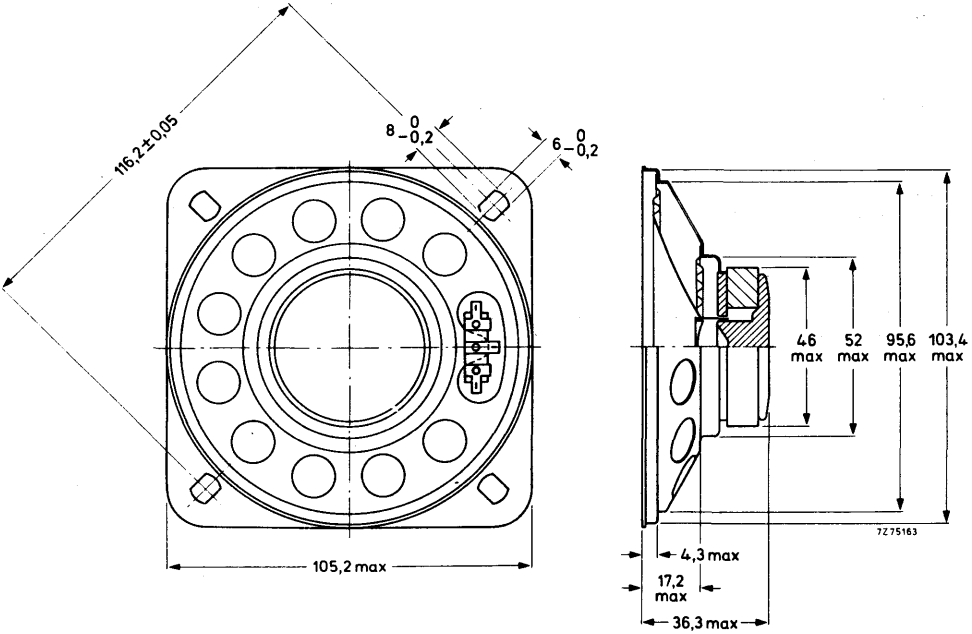


Fig. 1b Square flange type AD4485/X.

Baffle hole diameter 96 mm.

One tag is indicated by a red mark for in-phase connection.

4 INCH MEDIUM POWER LOUDSPEAKER

AD4085/X
AD4485/X

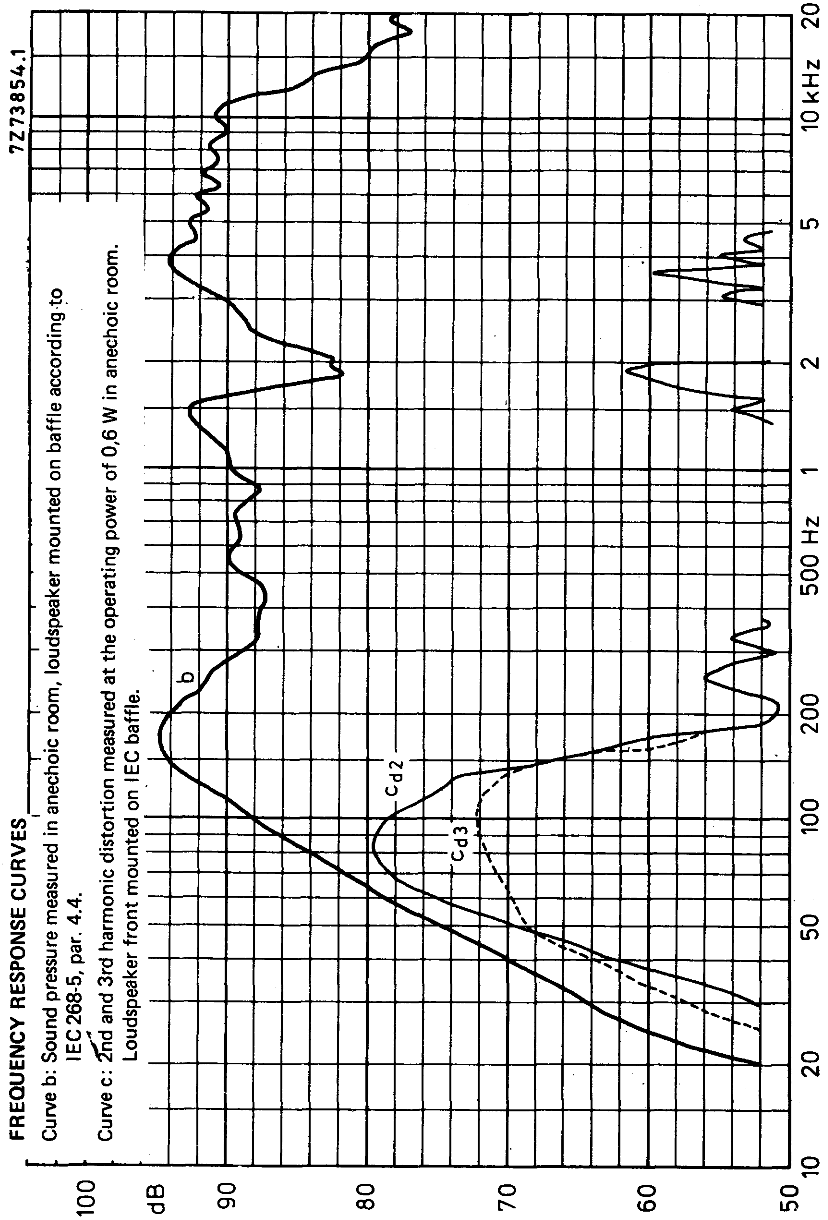


Fig. 2.

Mullard

4 INCH LOW POWER LOUDSPEAKERS

AD4090/X. Series

APPLICATION

For portable receivers.

TECHNICAL DATA

	version		
	X8	X15	
Rated impedance	8	15	Ω
Voice coil resistance	7,2	13,8	Ω
Resonance frequency	190	190	Hz
Power handling capacity, measured without filter loudspeaker unmounted	2	2	W
Sweep voltage	2,8	3,9	V
Energy in airgap	39	39	mJ
Flux density	0,8	0,8	T
Airgap height	3	3	mm
Voice coil height	1,8	2,55	mm
Core diameter	18	18	mm
Magnet material	Ticonal	Ticonal	
diameter	18	18	mm
weight	0,027	0,027	kg
Weight of loudspeaker	0,125	0,125	kg

The loudspeaker has a paper cone and surround.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

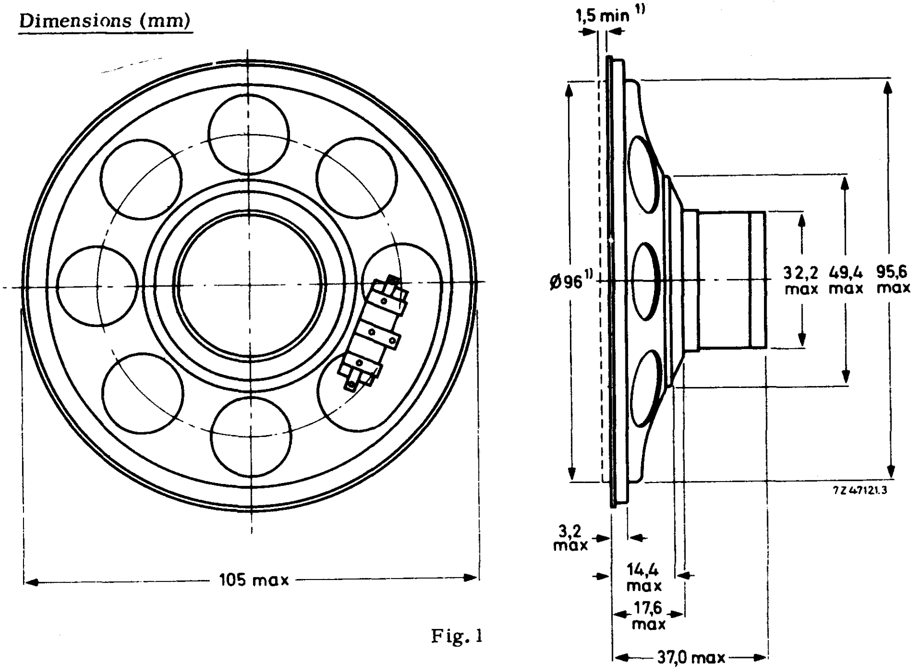


Fig. 1

1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

Fig. 2 Input power 50 mW
Sound pressure measured in anechoic room, loudspeaker unmounted.
Above 1000 Hz the sound pressure may be, over the width of one octave, maximum 2 dB lower than indicated.

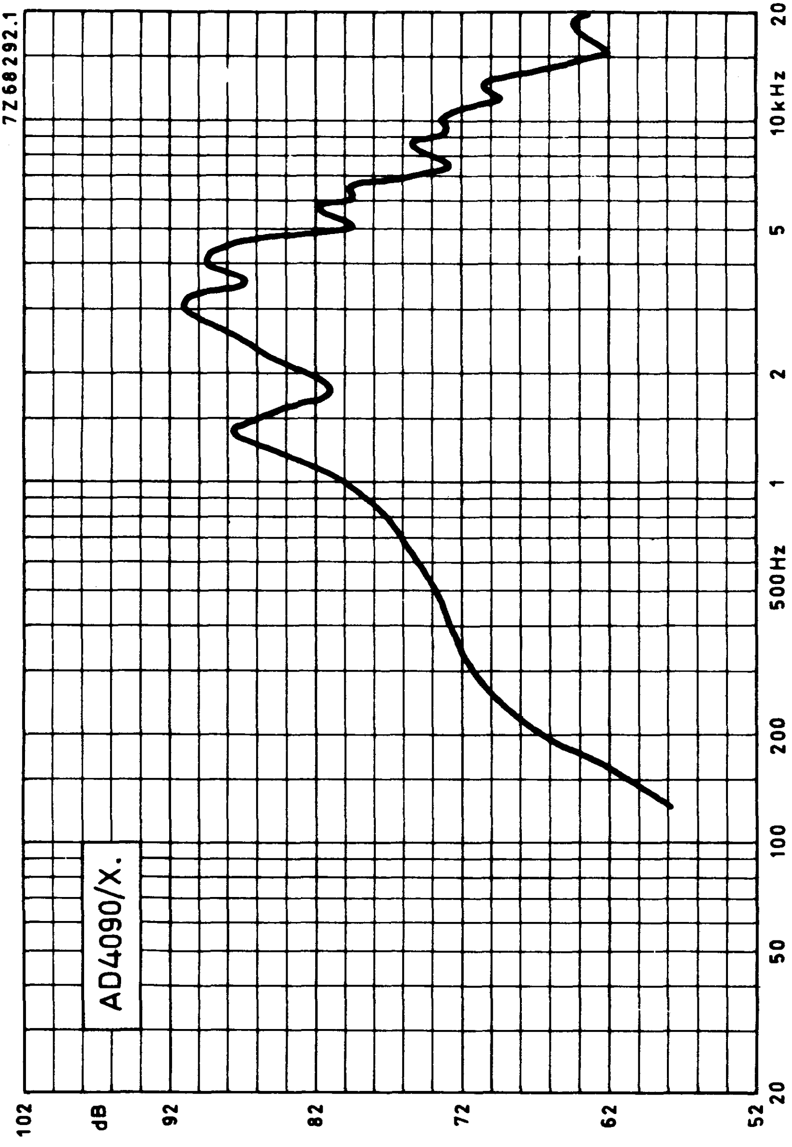

7Z68292.1
AD4090/X.
102
dB
92
82
72
62
52
20
50
100
200
500Hz
1
2
5
10kHz
20

Fig. 2

4 INCH MEDIUM POWER LOUDSPEAKER

AD4481/X4

APPLICATION

With its excellent power handling capacity very suitable for car radios.

TECHNICAL DATA

Rated impedance	4	Ω
Voice coil resistance	3,4	Ω
Rated frequency range	90 to 14000	Hz
Resonance frequency	140	Hz
Power handling capacity, measured without filter loudspeaker unmounted	8	W
Operating power (sound level 90 dB, 1 m)	0,8	W
Sweep voltage (80 to 20000 Hz)	3,5	V
Energy in air gap	50	mJ
Flux density	0,95	T
Air gap height	3	mm
Voice coil height	4,4	mm
Core diameter	18	mm
Magnet material	Magnadur	
diameter	54	mm
mass	0,1	kg
Mass of loudspeaker	0,25	kg

The loudspeaker has a paper cone and a textile surround.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

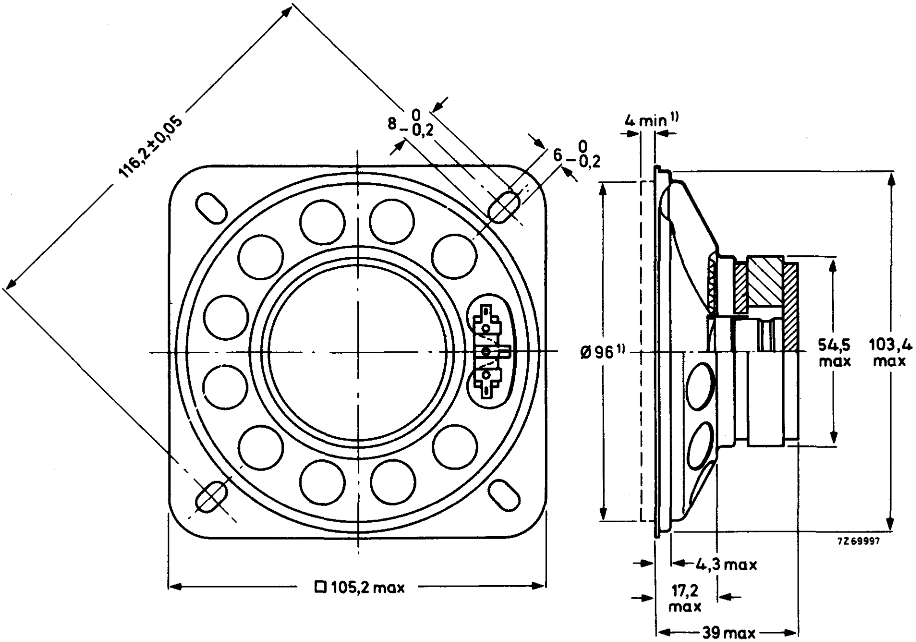


Fig. 1

[1] Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve b: Sound pressure measured in anechoic room, loudspeaker mounted on baffle according to IEC268-5, par. 4.4.

Curve c: 2nd and 3rd harmonic distortion, measured at the operating power of 0,8 W. Loudspeaker front mounted on IEC baffle.

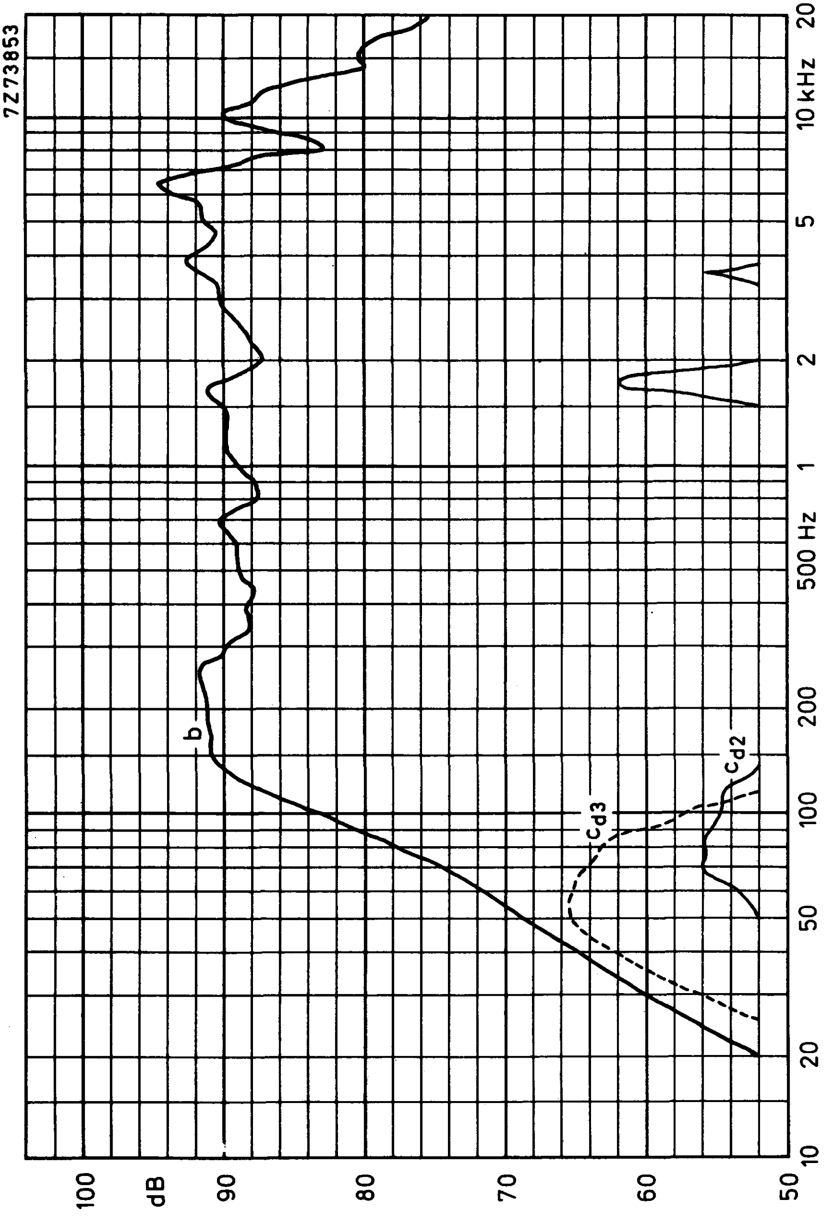

7Z73853
dB
100
90
80
70
60
50
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20
b
C_{d3}
C_{d2}

Fig.2

4 x 6 INCH OVAL MEDIUM POWER LOUDSPEAKERS

AD4681/M Series

APPLICATION

A full range loudspeaker for car and domestic radios, tape recorders and portable record players.
This speaker has an extended frequency response up to 20 kHz.

TECHNICAL DATA

	version			
	M4	M8	M25	
Rated impedance	4	8	25	Ω
Voice coil resistance	3,4	7,1	22,7	Ω
Resonance frequency	135	135	135	Hz
Power handling capacity, measured without filter loudspeaker unmounted	6	6	6	W
Sweep voltage	2,8	4	7,1	V
Energy in airgap	55	55	55	mJ
Flux density	1	1	1	T
Airgap height	3	3	3	mm
Voice coil height	3	3,9	4	mm
Core diameter	18	18	18	mm
Magnet material		Magnadur		
diameter	53	53	53	mm
weight	0,1	0,1	0,1	kg
Weight of loudspeaker	0,26	0,26	0,26	kg

The loudspeaker has a paper cone and surround and a foam plastic gasket on the flange.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

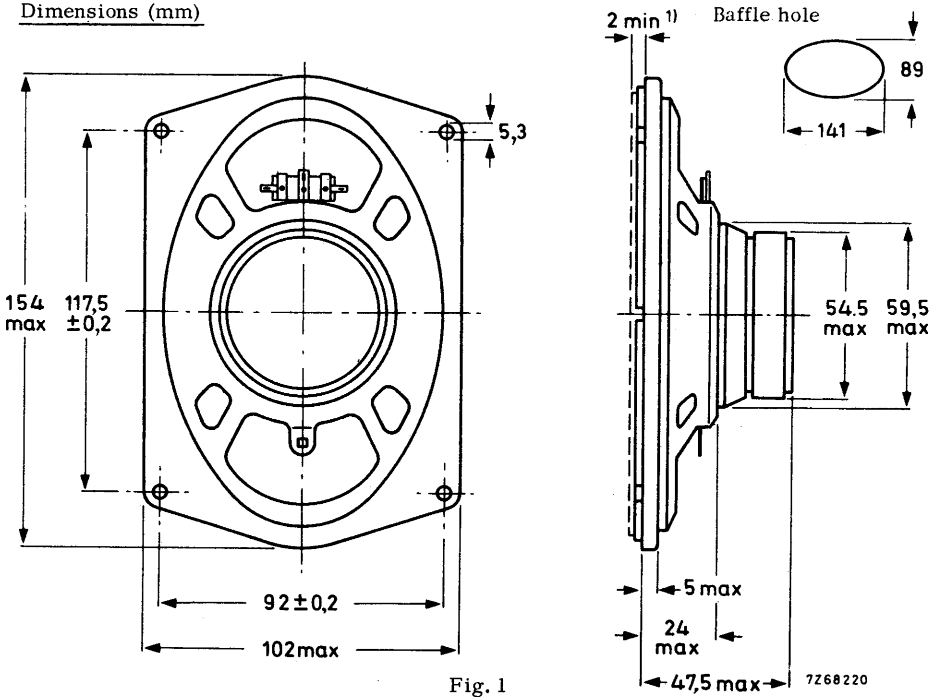


Fig. 1

[1]) Baffle hole and clearance depth required for cone movement at specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

Fig. 2 Sound pressure measured in anechoic room, loudspeaker unmounted.
Above 1000 Hz the sensitivity may be, over the width of one octave, maximum 2 dB lower than indicated.
Input power 50 mW.

4 x 6 INCH OVAL MEDIUM POWER LOUDSPEAKERS

AD4681/M Series

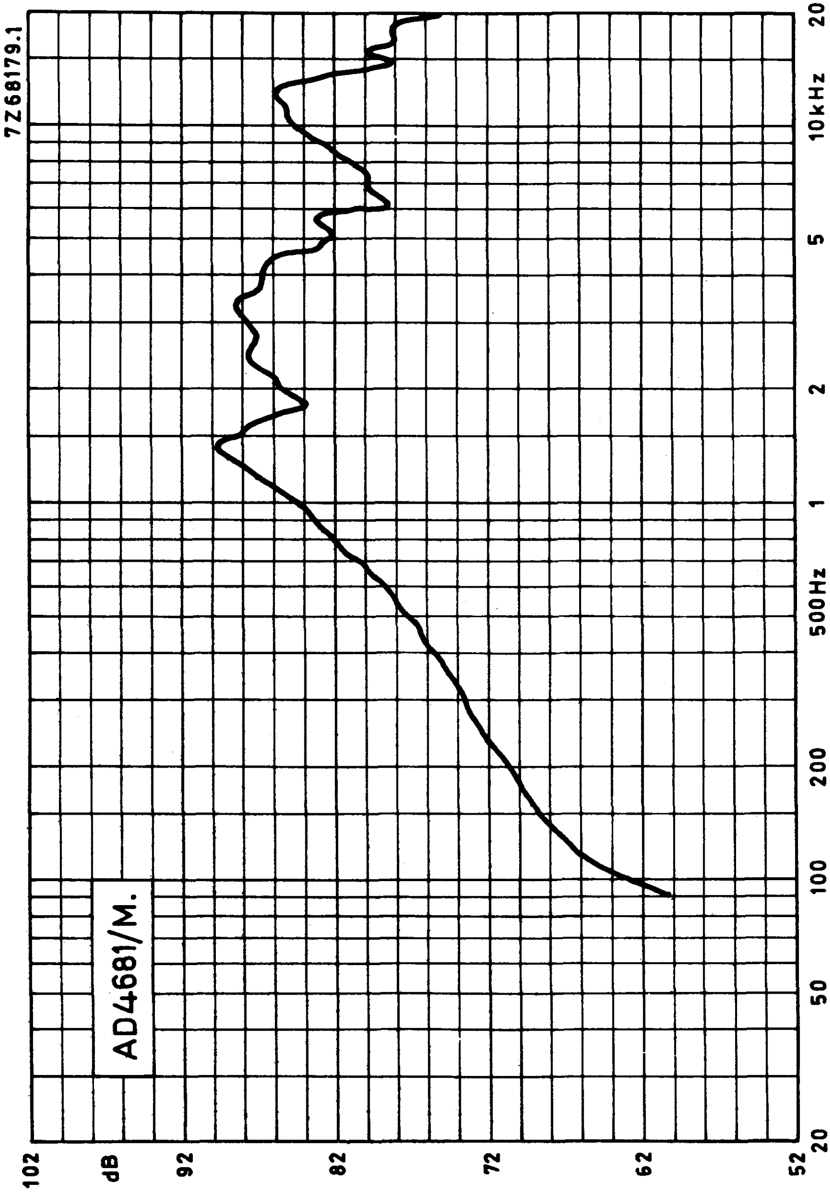


Fig. 2

4 × 6 inch OVAL MEDIUM POWER LOUDSPEAKER

APPLICATION

For car and domestic radios, tape recorders and portables. Frequency range up to 12 kHz. High sensitivity at 3000 Hz.

TECHNICAL DATA

	version X4	X8	X15	X25	
Rated impedance	4	8	15	25	Ω
Voice coil resistance	3, 1	7, 1	13, 5	22, 7	Ω
Resonance frequency	140	140	140	140	Hz
Power handling capacity, measured without filter loudspeaker unmounted	6	6	6	6	W
Sweep voltage	3, 5	4, 9	6, 7	8, 7	V
Energy in airgap	55	55	55	55	mJ
Flux density	1	1	1	1	T
Airgap height	3	3	3	3	mm
Voice coil height	3	3, 9	3, 2	4	mm
Core diameter	18	18	18	18	mm
Magnet material	Magnadur				
diameter	53	53	53	53	mm
weight	0, 1	0, 1	0, 1	0, 1	kg
Weight of loudspeaker	0, 26	0, 26	0, 26	0, 26	kg

The loudspeaker has a paper cone and surround and a foam plastic gasket on the flange.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

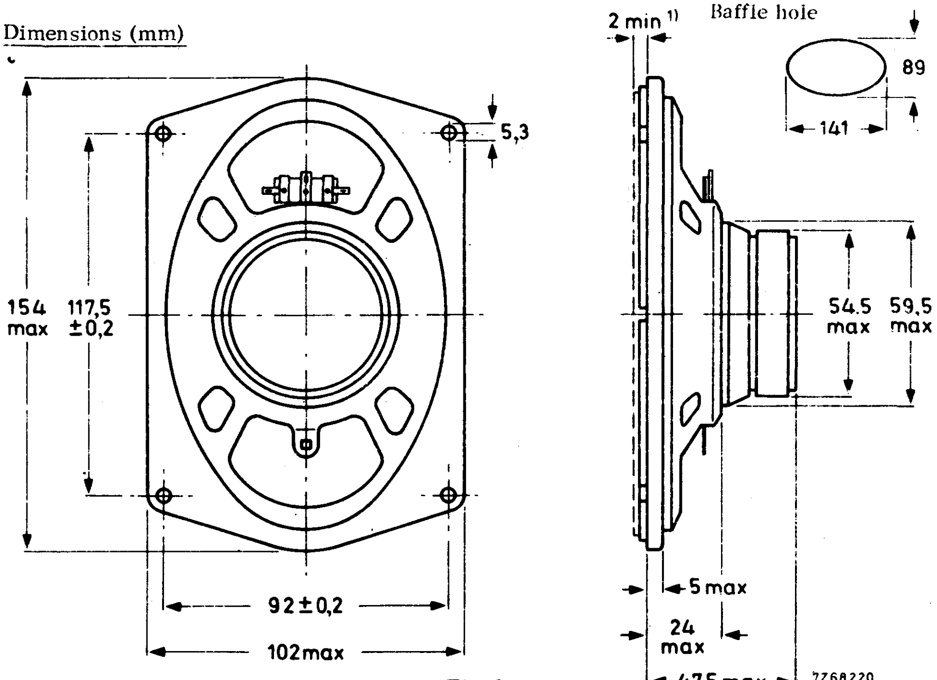


Fig. 1

1) Baffle hole and clearance depth required for cone movement at specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

Fig. 2. Input power 50 mW
Sound pressure measured in anechoic room, loudspeaker unmounted. Above 1000 Hz the sensitivity may be, over the width of one octave, maximum 2 dB lower than indicated.

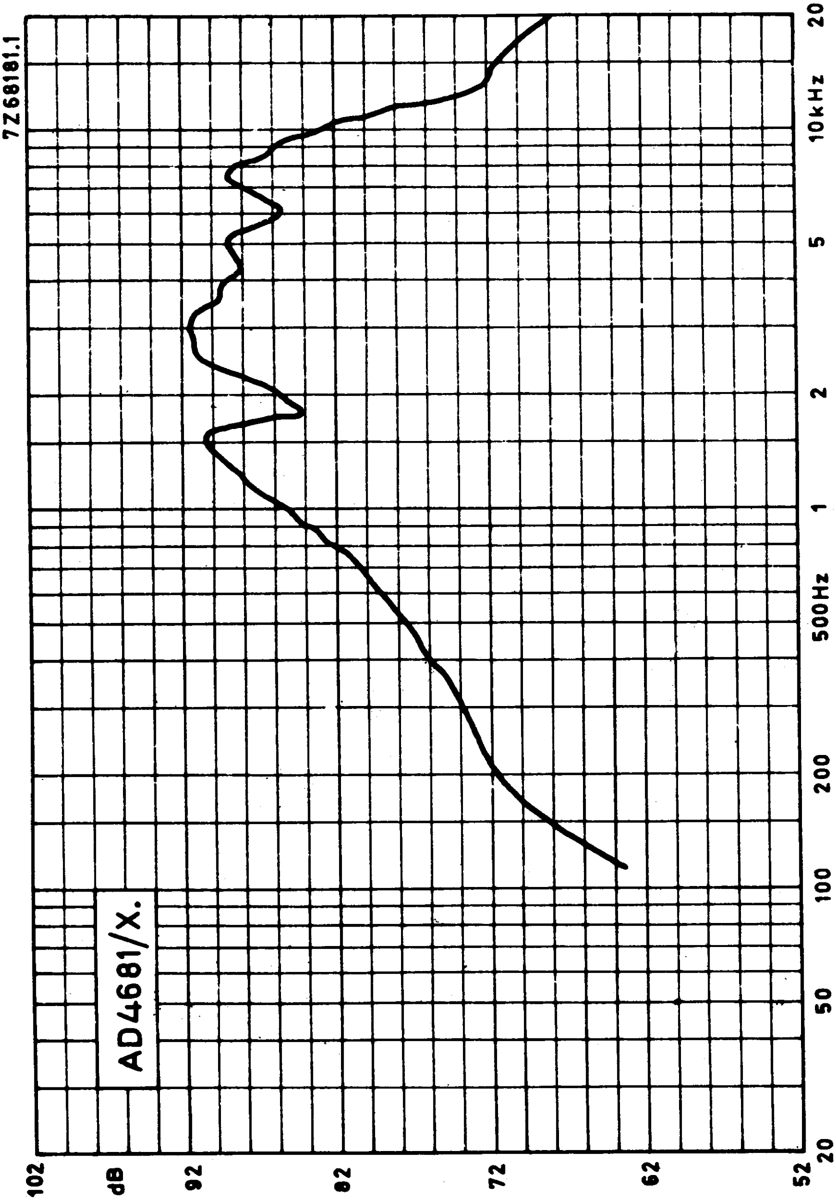

7Z68181.1
AD4681/X.
102
dB
92
82
72
62
52
20
50
100
200
500Hz
1
2
5
10kHz
20

Fig. 2

4 x 6 INCH OVAL MEDIUM POWER LOUDSPEAKERS

AD4691/M Series

APPLICATION

A full range loudspeaker with an extended frequency response up to 20 kHz. Due to absence of stray ticonal sinterpot magnetic field, this loudspeaker can be used for black and white as well as colour television sets.

TECHNICAL DATA

	version				
	M4	M8	M15	M25	
Rated impedance	4	8	15	25	Ω
Voice coil resistance	3,4	7,1	13,5	22,7	Ω
Resonance frequency	135	135	135	135	Hz
Power handling capacity, measured without filter loudspeaker unmounted	4	4	4	4	W
Sweep voltage	2,8	4	5,5	7,1	V
Energy in airgap	39	39	39	39	mJ
Flux density	0,8	0,8	0,8	0,8	T
Airgap height	3	3	3	3	mm
Voice coil height	3	3,9	3,2	4	mm
Core diameter	18	18	18	18	mm
Magnet material	Ticonal	Ticonal	Ticonal	Ticonal	
diameter	18	18	18	18	mm
weight	0,027	0,027	0,027	0,027	kg
Weight of loudspeaker	0,16	0,16	0,16	0,16	kg

The loudspeaker has a paper cone and surround and a foam plastic gasket on the flange.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

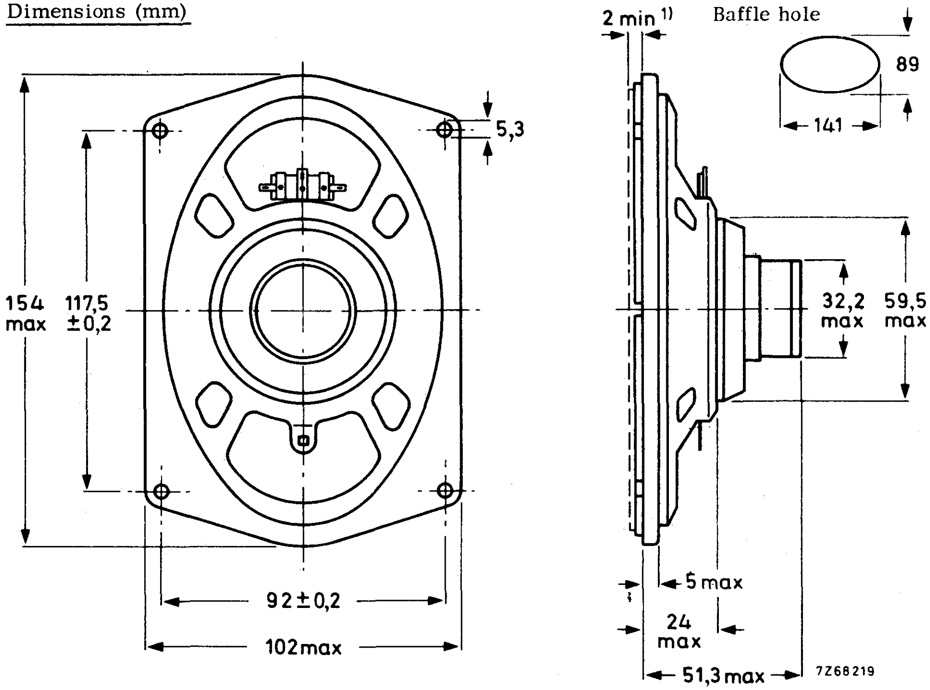


Fig. 1

[1] Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

Fig. 2 Sound pressure measured in anechoic room, loudspeaker unmounted.
Above 1000 Hz the sensitivity may be, over the width of one octave, maximum 2 dB lower than indicated.
Input power 50 mW

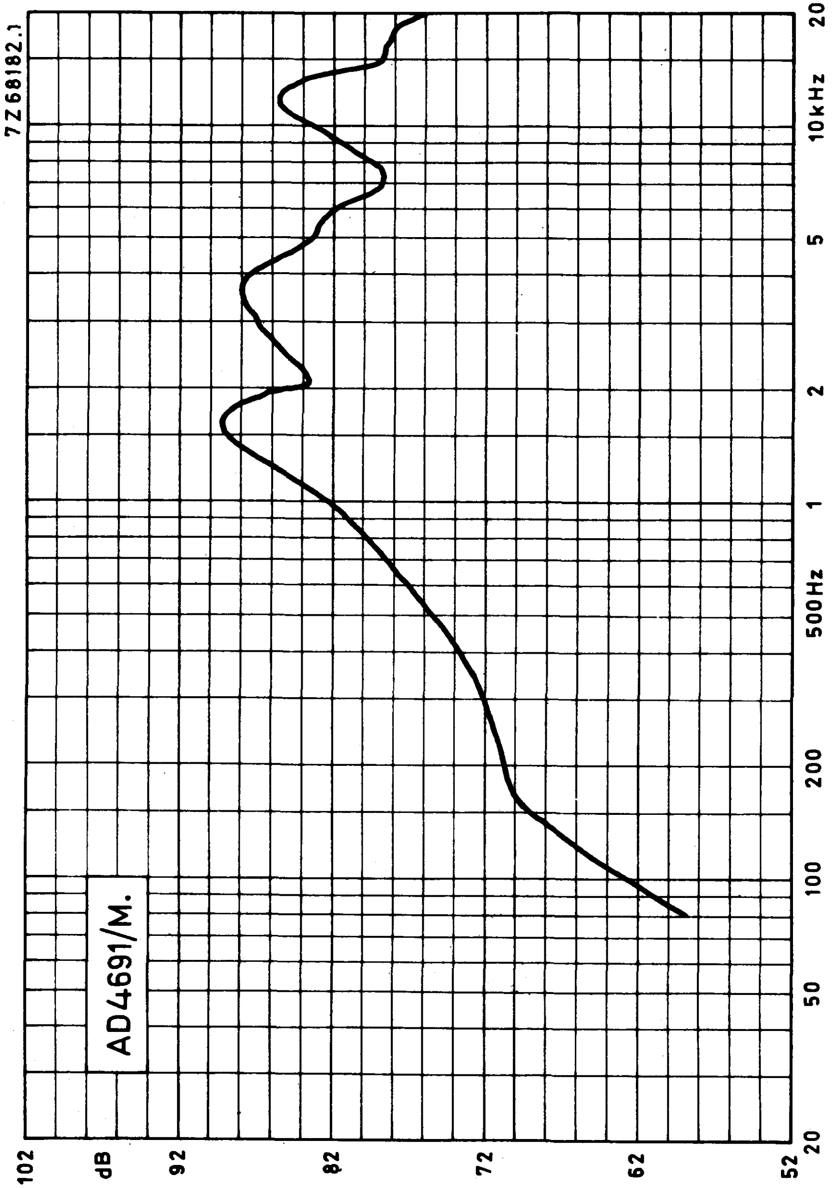

7Z68182.1
AD4691/M.
102
dB
92
82
72
62
52
20
50
100
200
500Hz
1
2
5
10kHz
20

Fig.2

4 x 6 INCH OVAL MEDIUM POWER LOUDSPEAKER

AD4691/X

APPLICATION

Due to absence of stray magnetic ticonal sinterpot field, the loudspeaker can be used in black and white as well as colour television sets.
High sensitivity at 3000 Hz. Frequency response up to 12 kHz.

TECHNICAL DATA

	version				
	X4	X8	X15	X25	
Rated impedance	4	8	15	25	Ω
Voice coil resistance	3,4	7,1	13,5	22,7	Ω
Resonance frequency	140	140	140	140	Hz
Power handling capacity, measured without filter, loudspeaker unmounted	4	4	4	4	W
Sweep voltage	2,8	4	5,5	7,1	V
Energy in airgap	39	39	39	39	mJ
Flux density	0,8	0,8	0,8	0,8	T
Airgap height	3	3	3	3	mm
Voice coil height	3	3,9	3,2	4	mm
Core diameter	18	18	18	18	mm
Magnet material	Ticonal	Ticonal	Ticonal	Ticonal	
diameter	18	18	18	18	mm
weight	0,027	0,027	0,027	0,027	kg
Weight of loudspeaker	0,16	0,16	0,16	0,16	kg

The loudspeaker has a paper cone and surround and a foam plastic gasket on the flange.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

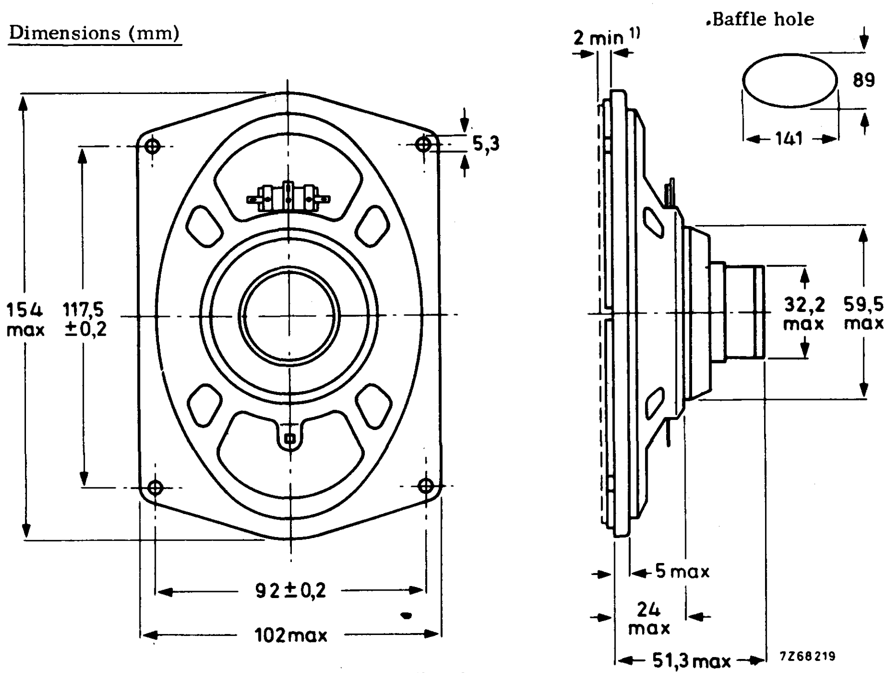


Fig. 1

1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

Fig. 2. Input power 50 mW
Sound pressure measured in anechoic room, loudspeaker unmounted.
Above 1000 Hz sensitivity may be, over the width of one octave, maximum 2 dB lower than indicated.

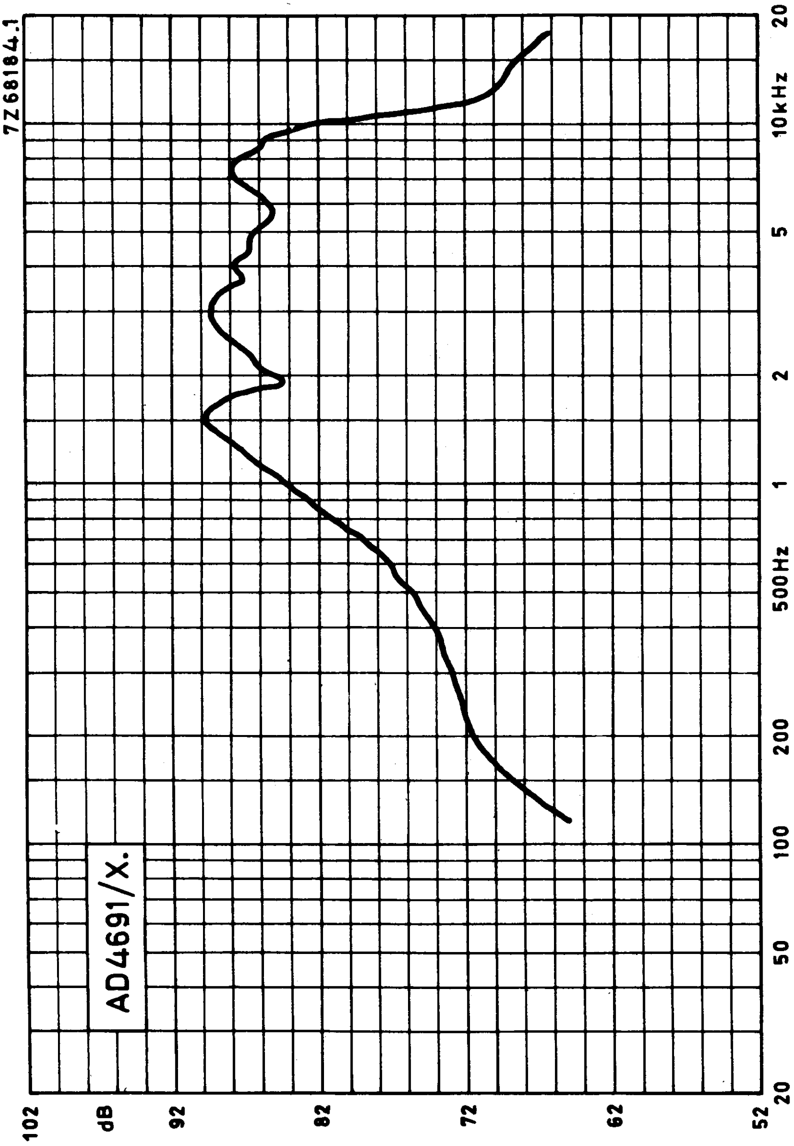

7Z68184.1
AD4691/X.
102
dB
92
82
72
62
52
20
50
100
200
500Hz
1
2
5
10kHz
20

Fig.2

4 x 8 INCH OVAL MEDIUM POWER LOUDSPEAKER

AD4890/X

APPLICATION

For colour television sets. Low stray field, low resonance frequency, high sensitivity in bass region.

TECHNICAL DATA

	version				
	X4	X8	X15	X25	
Rated impedance	4	8	15	25	Ω
Voice coil resistance	3.4	7.1	13,5	22,7	Ω
Rated frequency range	55 to 13 000				Hz
Resonance frequency	110				Hz
Power handling capacity, measured without filter, loudspeaker unmounted	10				W
Operating power (sound level 90 dB, 1 m)	0,7				W
Sweep voltage (55 to 20 000 Hz)	4	5,7	7,8	10	V
Energy in air gap	39				mJ
Flux density	0,8				T
Air gap height	3				mm
Voice coil height	4,5	3,9	3,2	4	mm
Core diameter	18				mm
Magnet material	Ticonal				
diameter	18				mm
mass	0,027				kg
Mass of loudspeaker	0,23				kg

The loudspeaker has a paper cone and surround and a foam plastic gasket on the flange.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

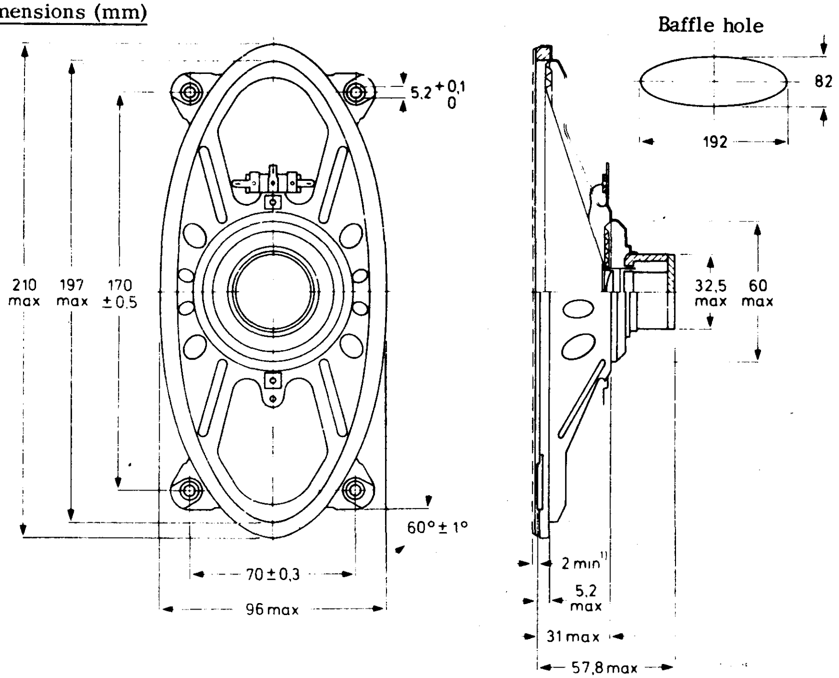


Fig. 1

[1]) Clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve b: Sound pressure measured in anechoic room, loudspeaker mounted on baffle according to IEC268-5, par. 4.4.

Curve c: 2nd and 3rd harmonic distortion, measured at the operating power of 0, 7 W in anechoic room. Loudspeaker front mounted on IEC baffle.

4 x 8 INCH OVAL
MEDIUM POWER LOUDSPEAKER

AD4890/X

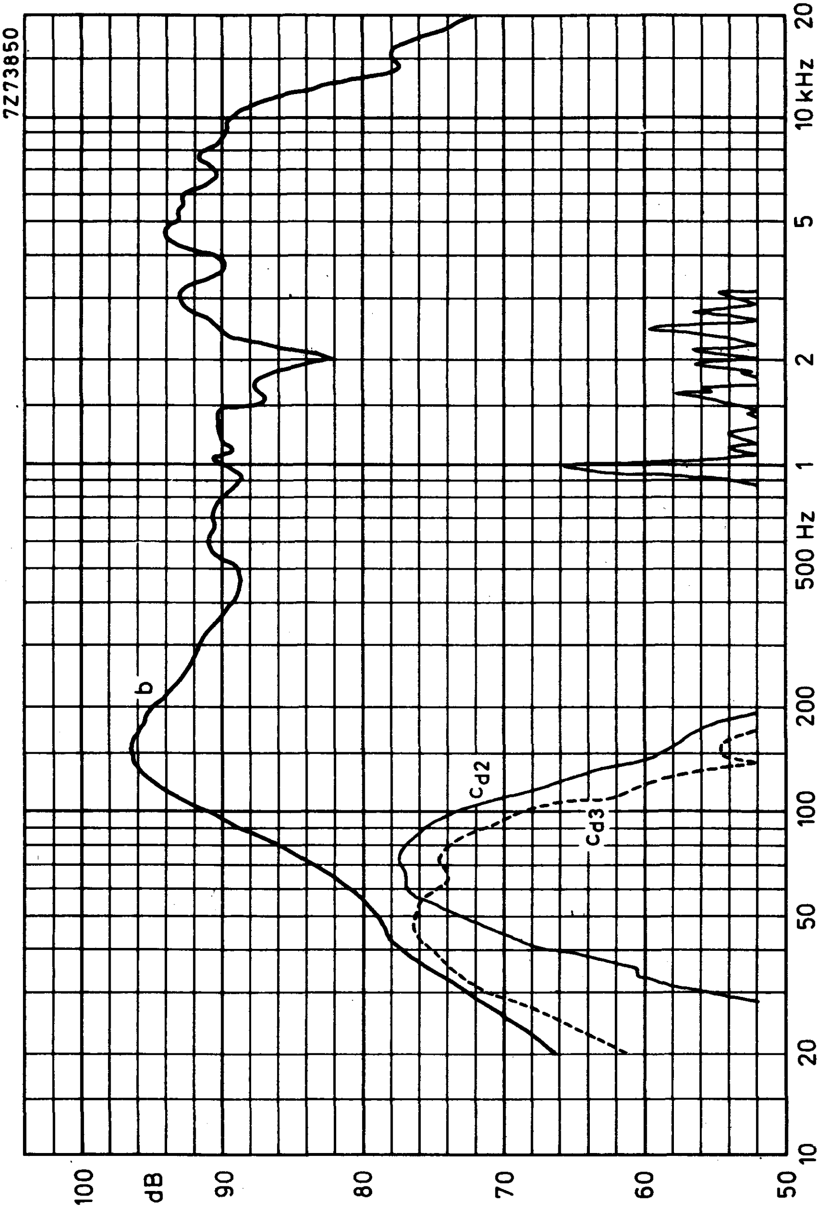


Fig. 2

5 inch HIGH POWER SQUAWKER LOUDSPEAKER

APPLICATION

For the reproduction of audio frequencies from 500 to 4500 Hz with very low distortion ← in multi-way high-fidelity loudspeaker systems in accordance with DIN45500. The loudspeaker has an excellent spherical radiation pattern. Rated frequency range 500 to 5000 Hz.

TECHNICAL DATA

	version Sq4	version Sq8	
Rated impedance	4	8	Ω
Voice coil resistance	3, 4	6, 4	Ω
Resonance frequency	210	210	Hz
Power handling capacity measured with filter: 72 μF - 2, 1 mH (4Ω)	40	–	W
36 μF - 4, 5 mH (8Ω) loudspeaker unmounted	–	40	W
Operating power	4	4	W
Sweep voltage frequency range: 400 - 5000 Hz filter high pass : 72 μF - 2, 1 mH (4Ω)	3, 5	–	V
36 μF - 4, 5 mH (8Ω)	–	5	V
Energy in air gap	140	140	mJ
Flux density	0, 93	0, 93	T
Air-gap height	5	5	mm
Voice coil height	6, 8	6, 8	mm
Core diameter	25	25	mm
Magnet material	Magnadur		
diameter	72	72	mm
mass	0, 23	0, 23	kg
Mass of loudspeaker	0, 8	0, 8	kg

The loudspeaker has a paper cone, a rubber surround and a sealed pot; no acoustic isolation required.
Connection to the loudspeaker by means of 6.3 mm (0.25 inch) tag connectors or by soldering.

Dimensions (mm)

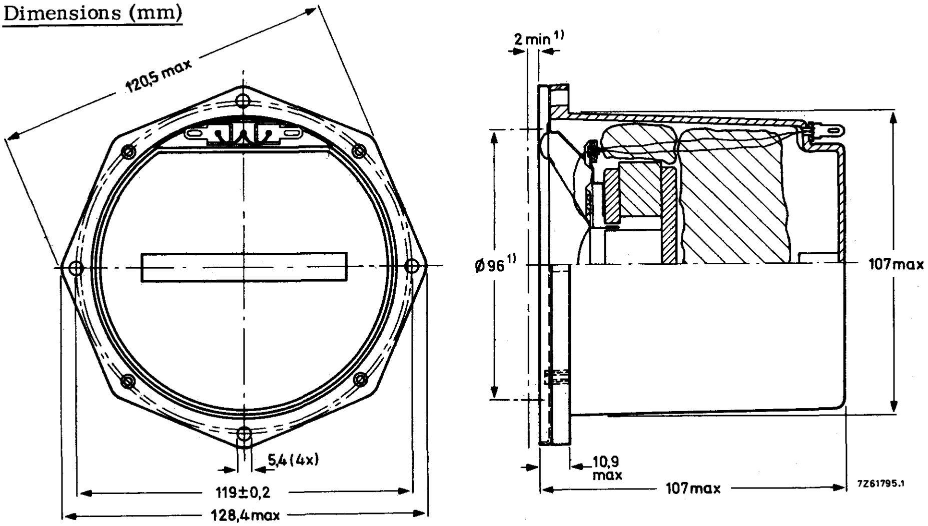


Fig. 1

1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve b: Sound pressure measured in half free field at operating power of 4 W in anechoic room, loudspeaker mounted on IEC baffle.

Curve c: 2nd and 3rd harmonic distortion, measured at the operating power of 4 W in anechoic room.

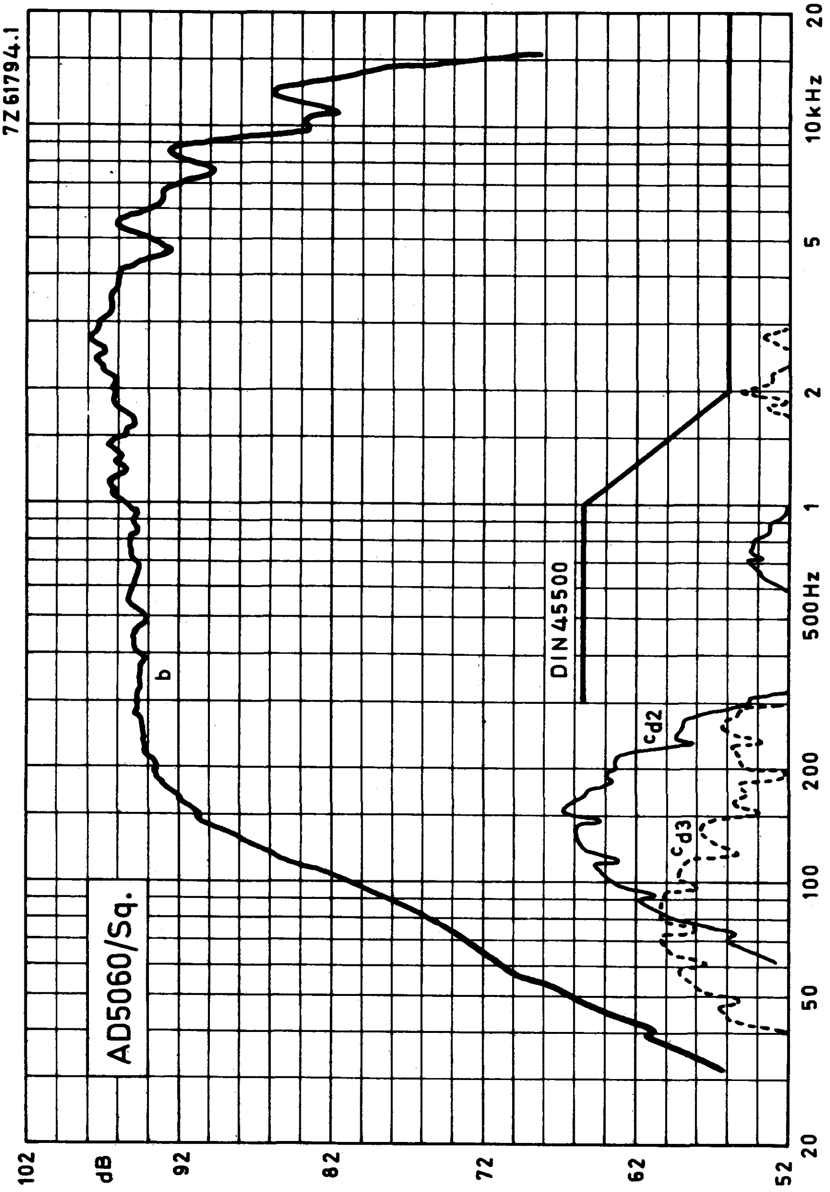

7Z61794.1
102
dB
92
82
72
62
52
20
50
100
200
500Hz
1
2
5
10kHz
20
AD5060/Sq.
b
c_{d2}
c_{d3}
DIN45500

Fig. 2

5 inch HIGH POWER FULL RANGE LOUDSPEAKER

APPLICATION

A full range loudspeaker for small sealed enclosures of maximum 7 litres and also suitable for use in bookshelves enclosures.
Extended frequency response 75 - 20 kHz in 7 litres enclosures.

TECHNICAL DATA

	version M4	version M8	
Rated impedance	4	8	Ω
Voice coil resistance	3,4	7	Ω
Resonance frequency	85	85	Hz
Power handling capacity measured without filter, loudspeaker unmounted	10	10	W
Operating power	2	2	W
Sweep voltage	3,2	4,5	V
Energy in airgap	127	127	mJ
Flux density	0,87	0,87	T
Airgap height	5	5	mm
Voice coil height	6,5	6,5	mm
Core diameter	25	25	mm
Magnet material	Magnadur		
diameter	72	72	mm
weight	0,26	0,26	kg
Weight of loudspeaker	0,665	0,665	kg

The loudspeaker has a paper cone, a textile surround and a foam plastic gasket on the flange.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

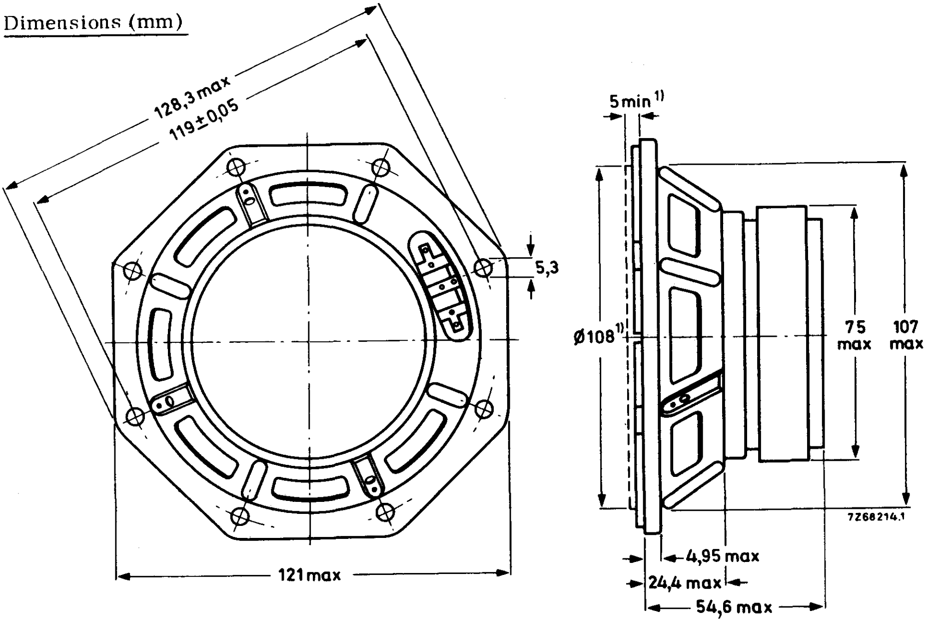


Fig. 1

1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

Curve b : Sound pressure measured in anechoic room at input power of 2 W.
Loudspeaker mounted on IEC baffle.

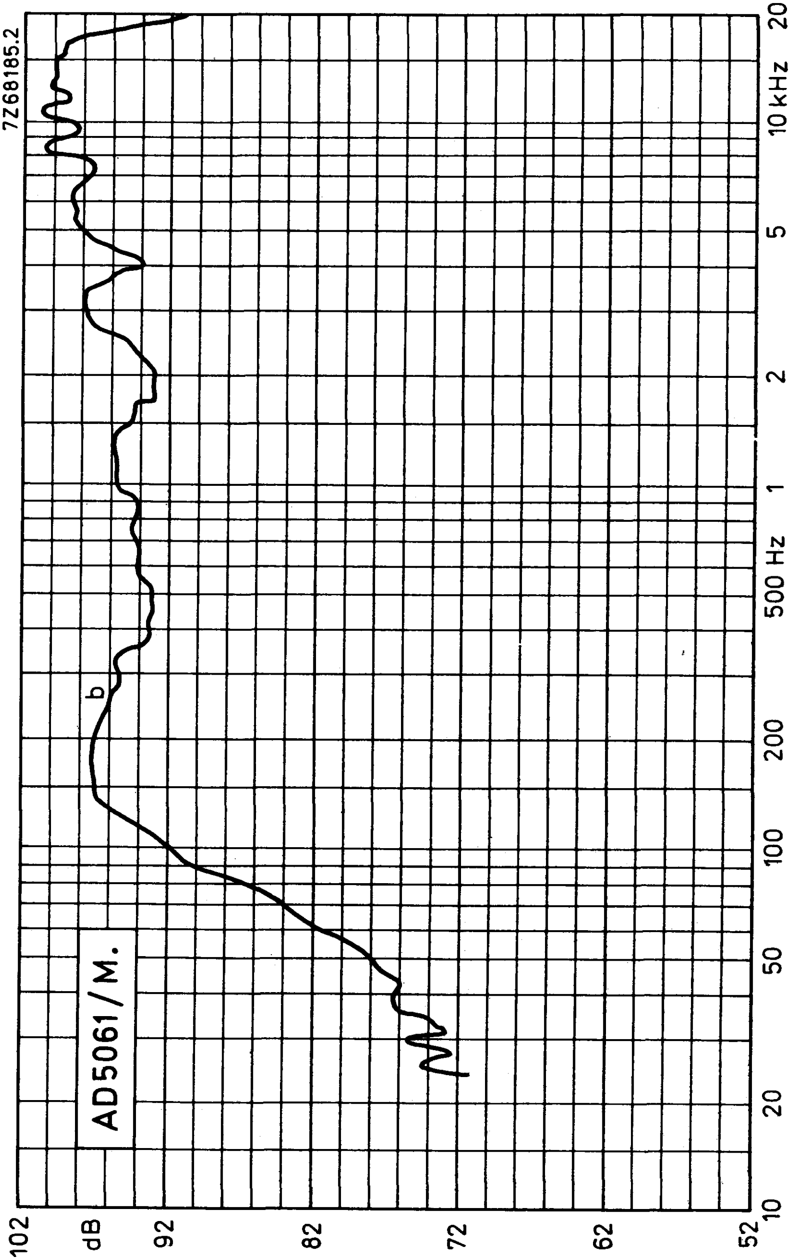

7Z68185.2
AD5061/M.
b
dB
102
92
82
72
62
52
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20

Fig. 2

5 INCH HIGH POWER SQUAWKER LOUDSPEAKER

AD5061/Sq

APPLICATION

For the reproduction of audio frequencies from 1300 to 5000 Hz with very low distortion in multi-way high-fidelity loudspeaker systems in accordance with DIN45500. The loudspeaker has an excellent spherical radiation pattern.

TECHNICAL DATA

	version		
	Sq4	Sq8	
Rated impedance	4	8	Ω
Voice coil resistance	3,4	7	Ω
Resonance frequency	680		Hz
Rated frequency range	1300 to 5000		Hz
Power handling capacity, measured with filter: 24 μF - 0,4 mH	10		W
12 μF - 0,8 mH		10	W
loudspeaker unmounted			
Operating power	2		W
Sweep voltage frequency range: 300-5000 Hz high pass filter: 24 μF - 0,4 mH	3,5		V
12 μF - 0,8 mH		5	V
Energy in air gap	140		mJ
Flux density	0,93		T
Air-gap height	5		mm
Voice coil height	6,8		mm
Core diameter	25		mm
Magnet material	Magnadur		
diameter	72		mm
mass	0,23		kg
Mass of loudspeaker	0,8		kg

The loudspeaker has a sealed frame and a textile rim.

Connection to the loudspeaker is by means of 2,8 mm (0,11 inch) Fastons or soldering.

Dimensions (mm)

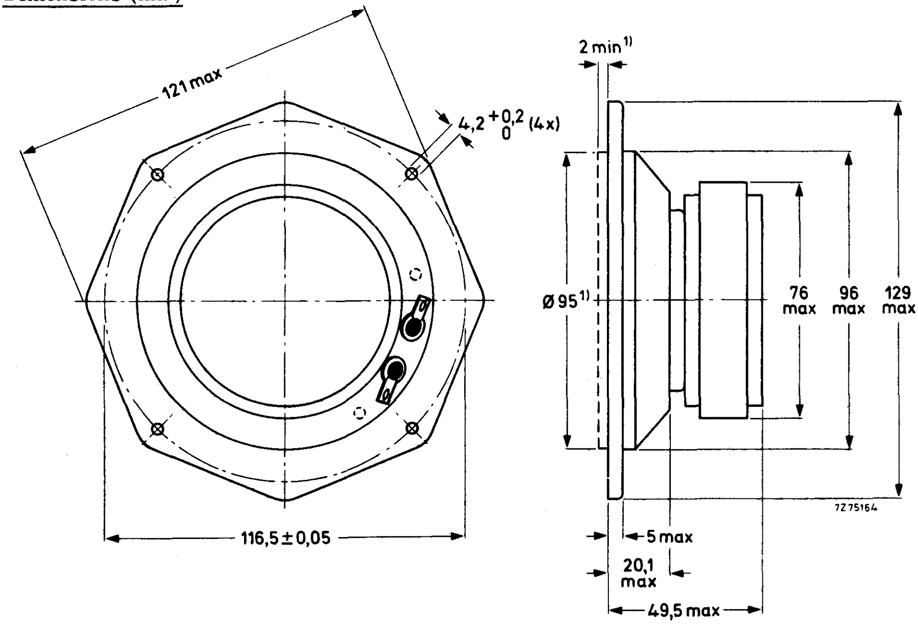


Fig. 1

[1] Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve b: Sound pressure measured in half free field at operating power of 2 W in anechoic room, loudspeaker mounted on IEC baffle.

Curve c: 2nd and 3rd harmonic distortion, measured at the operating power of 2 W in anechoic room.

5 INCH HIGH POWER SQUAWKER LOUDSPEAKER

AD5061/Sq

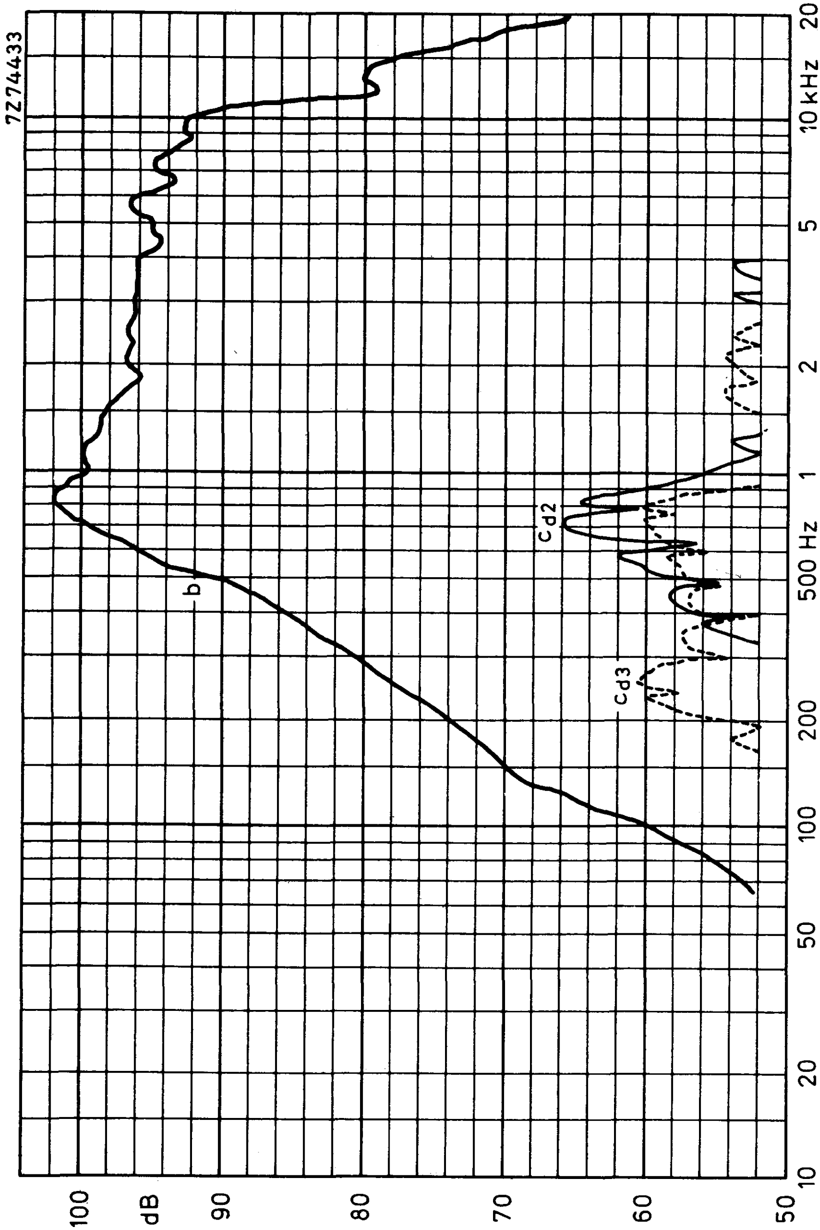


Fig. 2

5 × 7 inch OVAL MEDIUM POWER LOUDSPEAKER

APPLICATION

A full range loudspeaker for car and domestic radios, tape recorders and portable record players.
Due to its dual-cone construction, this loudspeaker has an extended frequency response up to 20 kHz.

TECHNICAL DATA

	version				
	M4	M8	M15	M25	
Rated impedance	4	8	15	25	Ω
Voice coil resistance	3, 4	7, 1	13, 5	22, 7	Ω
Resonance frequency	100	100	100	100	Hz
Power handling capacity, measured without filter loudspeaker unmounted	6	6	6	6	W
Sweep voltage	2, 8	4	5, 5	8, 7	V
Energy in air gap	53	53	53	53	mJ
Flux density	0, 98	0, 98	0, 98	0, 98	T
Air-gap height	3	3	3	3	mm
Voice coil height	3	3, 9	3, 2	4	mm
Core diameter	18	18	18	18	mm
Magnet material	Magnadur				
diameter	53	53	53	53	mm
mass	0, 1	0, 1	0, 1	0, 1	kg
Mass of loudspeaker	0, 32	0, 32	0, 32	0, 32	kg

The loudspeaker has a paper cone and a foam plastic gasket on the flange.

Connection to the loudspeaker by means of 0.28 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

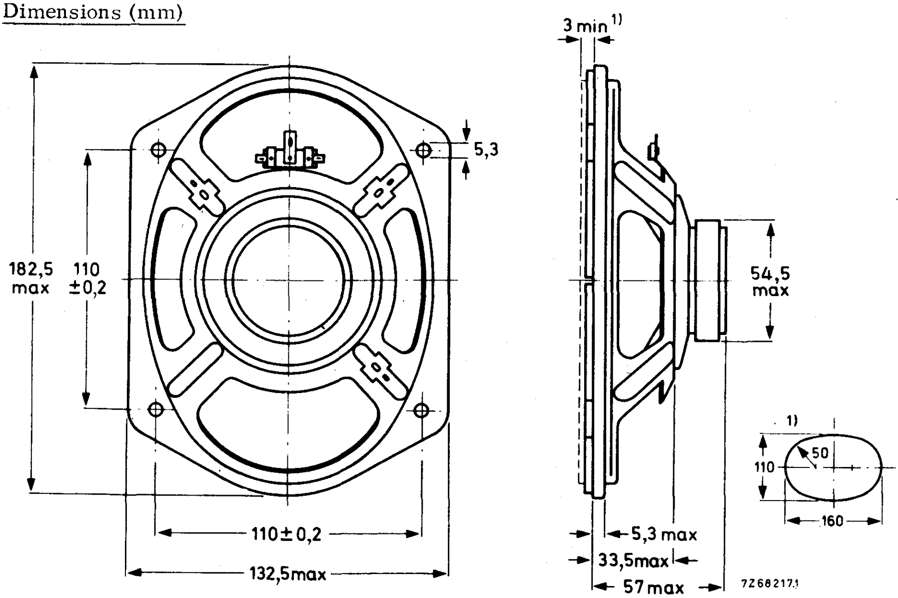


Fig. 1

1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

Fig. 2. Input power 50 mW
Sound pressure measured in anechoic room, loudspeaker unmounted.
Above 1000 Hz the sensitivity may be, over the width of one octave, maximum 2 dB lower than indicated.

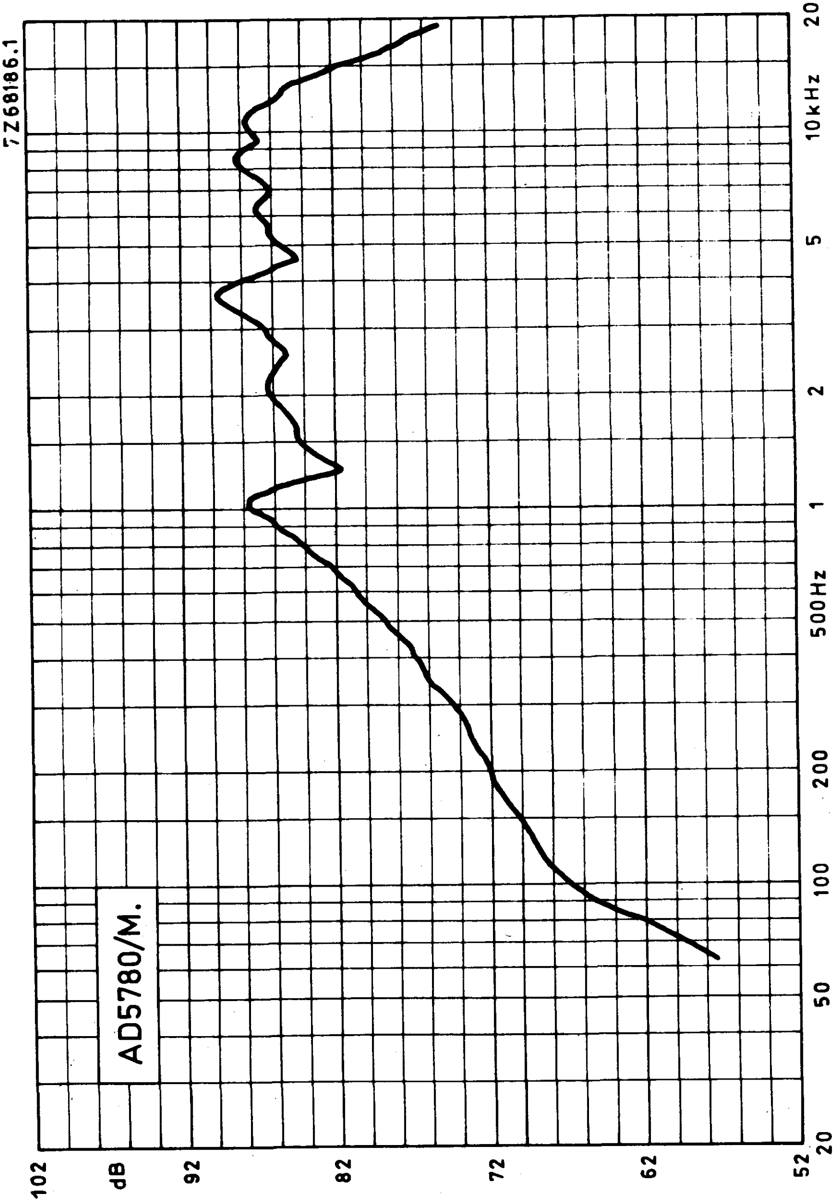

7Z68186.1
AD5780/M.
dB
102
92
82
72
62
52
20
50
100
200
500Hz
1
2
5
10kHz
20

Fig.2

5 × 7 inch OVAL MEDIUM POWER LOUDSPEAKER

APPLICATION

For car and domestic radios, tape recorders and portable record players.
High sensitivity at 4000 Hz. Frequency range up to 10 kHz.

TECHNICAL DATA

	version				
	X4	X8	X15	X25	
Rated impedance	4	8	15	25	Ω
Voice coil resistance	3, 4	7, 1	13, 5	22, 7	Ω
Resonance frequency	115	115	115	115	Hz
Power handling capacity, measured without filter, loudspeaker unmounted	6	6	6	6	W
Sweep voltage	3, 4	3, 5	4, 8	6, 1	V
Energy in airgap	55	55	55	55	mJ
Flux density	0, 98	0, 98	0, 98	0, 98	T
Airgap height	3	3	3	3	mm
Voice coil height	3	3, 9	3, 2	4	mm
Core diameter	18	18	18	18	mm
Magnet material	Magnadur				
diameter	53	53	53	53	mm
weight	0, 1	0, 1	0, 1	0, 1	kg
Weight of loudspeaker	0, 32	0, 32	0, 32	0, 32	kg

The loudspeaker has a paper cone and surround and a foam plastic gasket on the flange.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

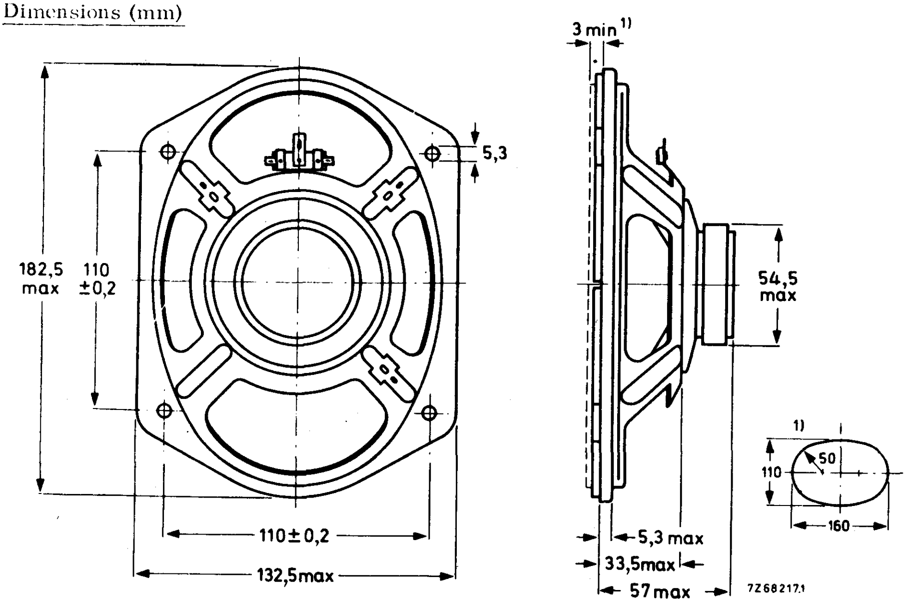


Fig. 1

1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

Fig. 2. Input power 50 mW
Sound pressure measured in anechoic room, loudspeaker unmounted.
Above 1000 Hz the sensitivity may be, over the width of one octave, maximum 2 dB lower than indicated.

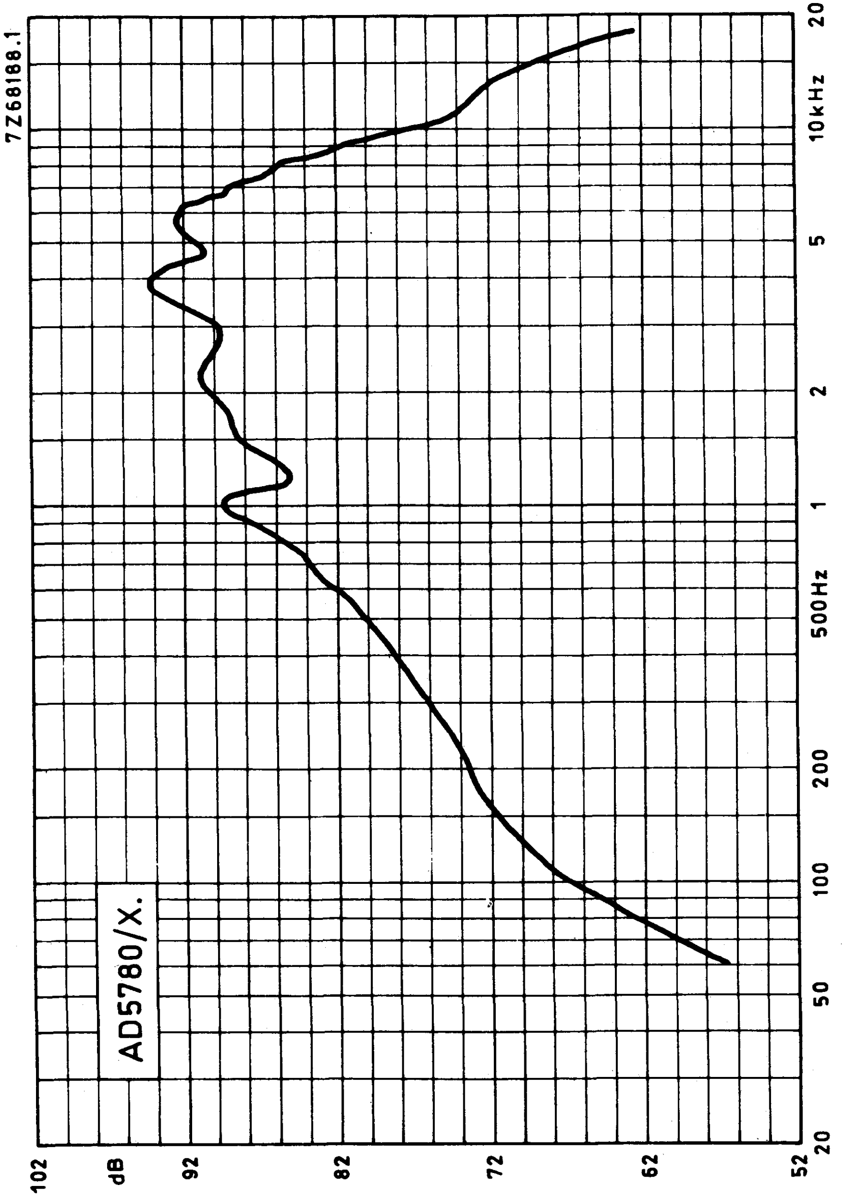

7Z68188.1
AD5780/X.
102
dB
92
82
72
62
52
20
50
100
200
500Hz
1
2
5
10kHz
20

Fig. 2

5 x 7 INCH OVAL MEDIUM POWER LOUDSPEAKERS

AD5790/M Series

APPLICATION

Due to absence of stray magnetic ticonal sinterpot field, the loudspeaker can be used in black and white as well as colour television sets. High sensitivity at 3000 Hz.

TECHNICAL DATA

	version			
	M4	M8	M15	
Rated impedance	4	8	15	Ω
Voice coil resistance	3,4	7,1	13,5	Ω
Resonance frequency	100	100	100	Hz
Power handling capacity, measured without filter, loudspeaker unmounted	4	4	4	W
Sweep voltage	2,8	4	5,5	V
Energy in airgap	39	39	39	mJ
Flux density	0,8	0,8	0,8	T
Airgap height	3	3	3	mm
Voice coil height	3	3,9	3,2	mm
Core diameter	18	18	18	mm
Magnet material	Ticonal	Ticonal	Ticonal	
diameter	18	18	18	mm
weight	0,027	0,027	0,027	kg
Weight of loudspeaker	0,22	0,22	0,22	kg

The loudspeaker has a paper cone and surround and a foam plastic gasket on the flange.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

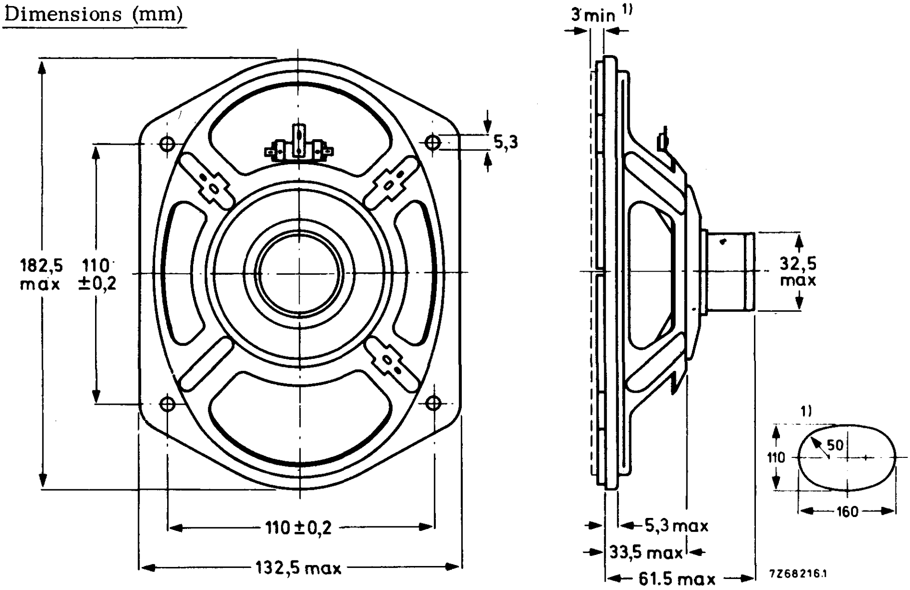


Fig. 1

[1] Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

Fig. 2 Sound pressure measured in anechoic room, loudspeaker unmounted.
Above 1000 Hz the sensitivity may be, over the width of one octave, maximum 2 dB lower than indicated.
Input power 50 mW

5 x 7 INCH OVAL MEDIUM POWER LOUDSPEAKERS

AD5790/M Series

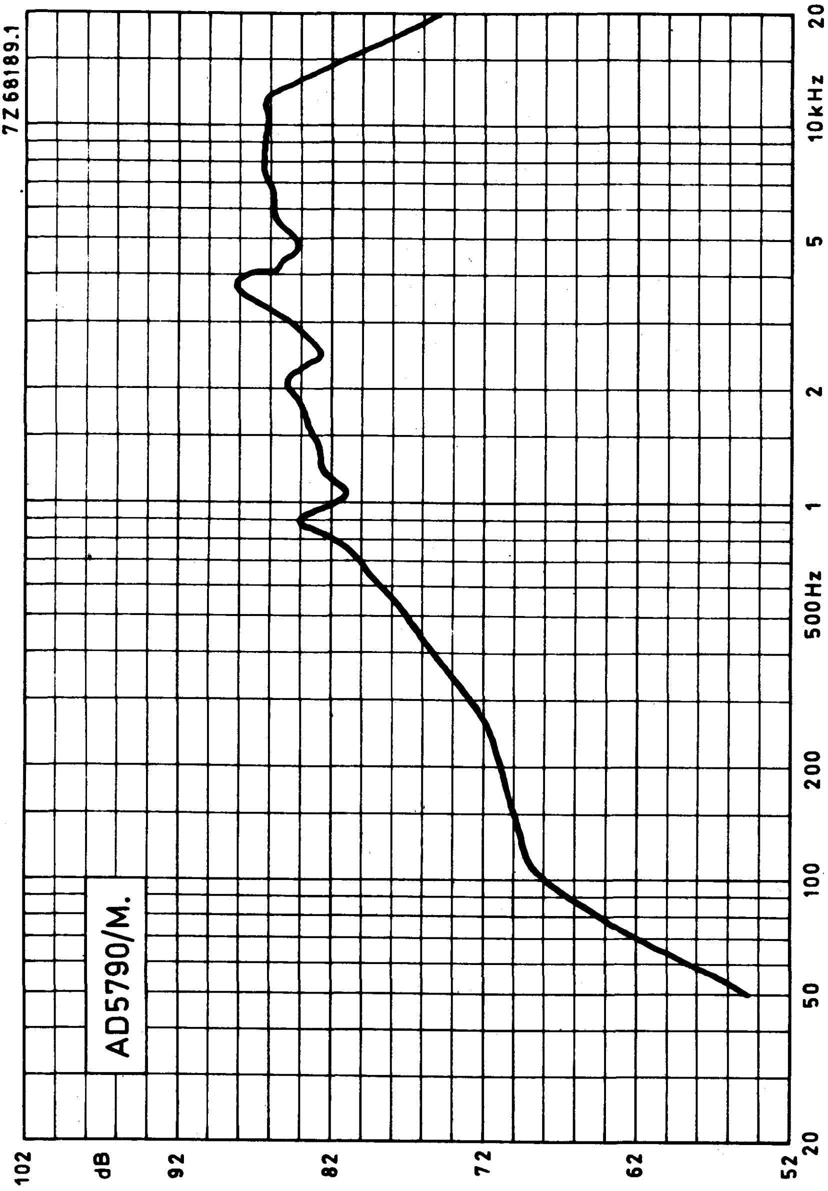


Fig. 2

5 × 7 inch OVAL MEDIUM POWER LOUDSPEAKER

APPLICATION

Due to absence of stray magnetic Ticonal sinterpot field, the loudspeaker can be used in black and white as well as colour television sets. High sensitivity at 3000 Hz.

TECHNICAL DATA

<table>
<tr><th></th><th colspan="2">version</th><th></th></tr>
<tr><th></th><th>X4</th><th>X8</th><th></th></tr>
<tr><td>Rated impedance</td><td>4</td><td>8</td><td>Ω</td></tr>
<tr><td>Voice coil resistance</td><td>3, 4</td><td>7, 1</td><td>Ω</td></tr>
<tr><td>Resonance frequency</td><td colspan="2">115</td><td>Hz</td></tr>
<tr><td>Power handling capacity,
measured without filter,
loudspeaker unmounted</td><td colspan="2">4</td><td>W</td></tr>
<tr><td>Operating power</td><td colspan="2">0, 7</td><td>W</td></tr>
<tr><td>Sweep voltage</td><td>2, 45</td><td>4</td><td>V</td></tr>
<tr><td>Energy in air gap</td><td colspan="2">39</td><td>mJ</td></tr>
<tr><td>Flux density</td><td colspan="2">0, 8</td><td>T</td></tr>
<tr><td>Air-gap height</td><td colspan="2">3</td><td>mm</td></tr>
<tr><td>Voice coil height</td><td>3</td><td>3, 9</td><td>mm</td></tr>
<tr><td>Core diameter</td><td colspan="2">18</td><td>mm</td></tr>
<tr><td>Magnet material</td><td colspan="2">Ticonal</td><td></td></tr>
<tr><td>diameter</td><td colspan="2">18</td><td>mm</td></tr>
<tr><td>mass</td><td colspan="2">0, 027</td><td>kg</td></tr>
<tr><td>Mass of loudspeaker</td><td colspan="2">0, 22</td><td>kg</td></tr>
</table>

The loudspeaker has a paper cone, a treated paper surround and a foam plastic gasket on the flange.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

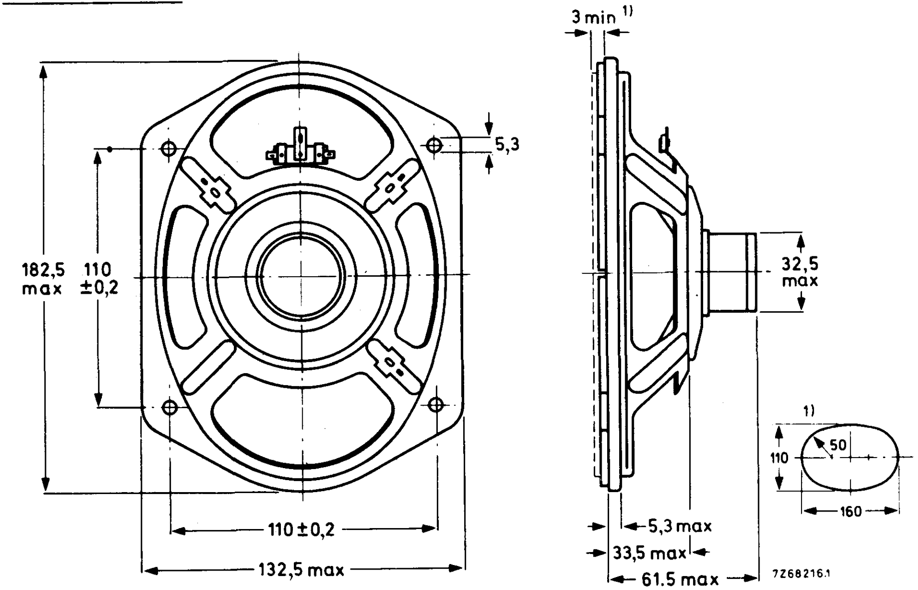


Fig. 1

[1] Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve b: Sound pressure measured in anechoic room at input power of 2, 2 W. Loudspeaker mounted on IEC baffle.

Curve c: 2nd and 3rd harmonic distortion, measured at input power of 2, 2 W in anechoic room. Loudspeaker mounted on IEC baffle.

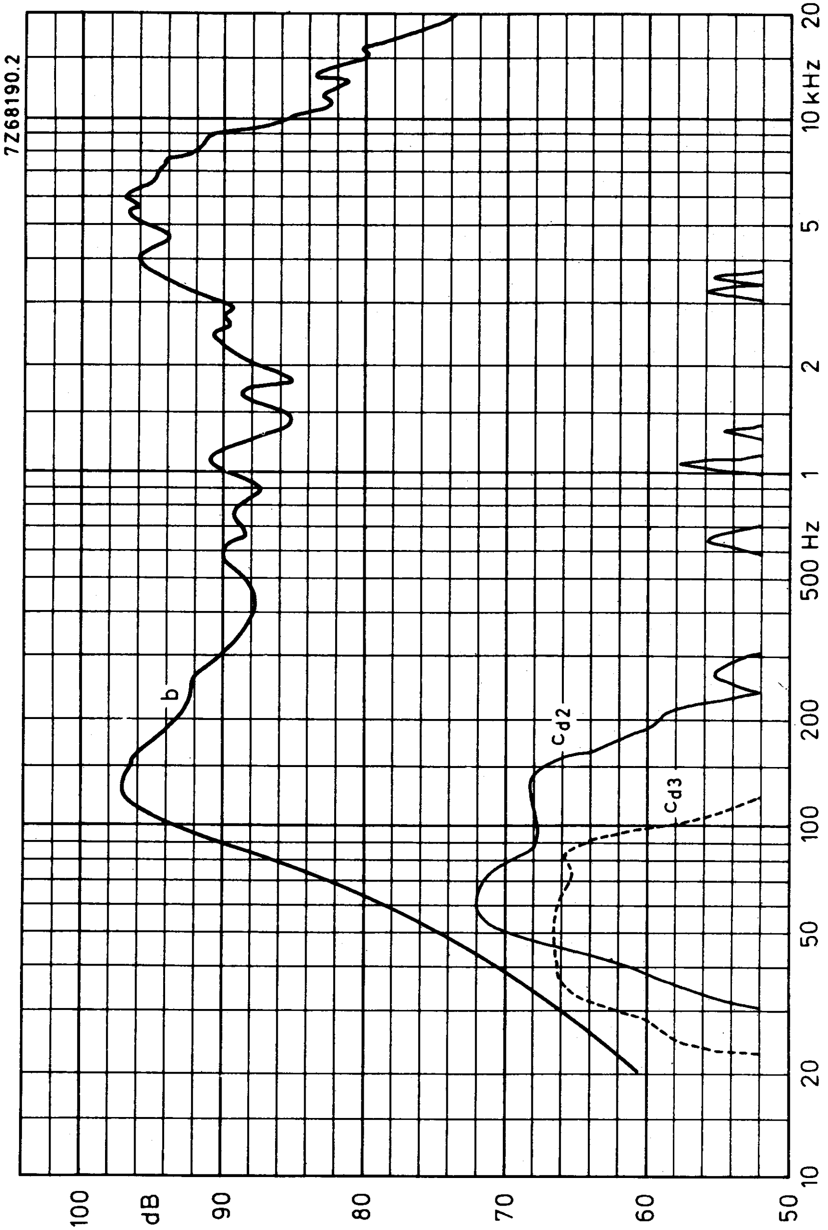

7Z68190.2
b
C_{d2}
C_{d3}
100
dB
90
80
70
60
50
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20

Fig. 2

7 inch HIGH POWER WOOFER LOUDSPEAKER

AD7060/W

APPLICATION

For high fidelity reproduction in sealed acoustic enclosures.
Maximum enclosure volume 7 litres; maximum recommended cross-over frequency 3 000 Hz.
Rated frequency range 40 to 3 000 Hz.

TECHNICAL DATA

	version		
	W4	W8	
Rated impedance	4	8	Ω
Voice coil resistance	3, 4	6, 8	Ω
Resonance frequency	45	45	Hz
Power handling capacity, measured without filter, mounted in 7 ℓ sealed enclosure	30	30	W
Operating power	6, 3	6, 3	W
Sweep voltage frequency range 35 - 5000 Hz	3, 8	5, 3	V
Energy in airgap	135	140	mJ
Flux density	0, 87	0, 93	T
Airgap height	5	5	mm
Voice coil height	9, 7	9, 7	mm
Core diameter	25	25	mm
Magnet material	Magnadur		
diameter	72	72	mm
weight	0, 26	0, 26	kg
Weight of loudspeaker	0, 68	0, 68	kg

The loudspeaker has a rubber surround.

Connection to the loudspeaker by means of 6, 3 mm (0, 25 inch) Fastons or soldering.

Dimensions (mm)

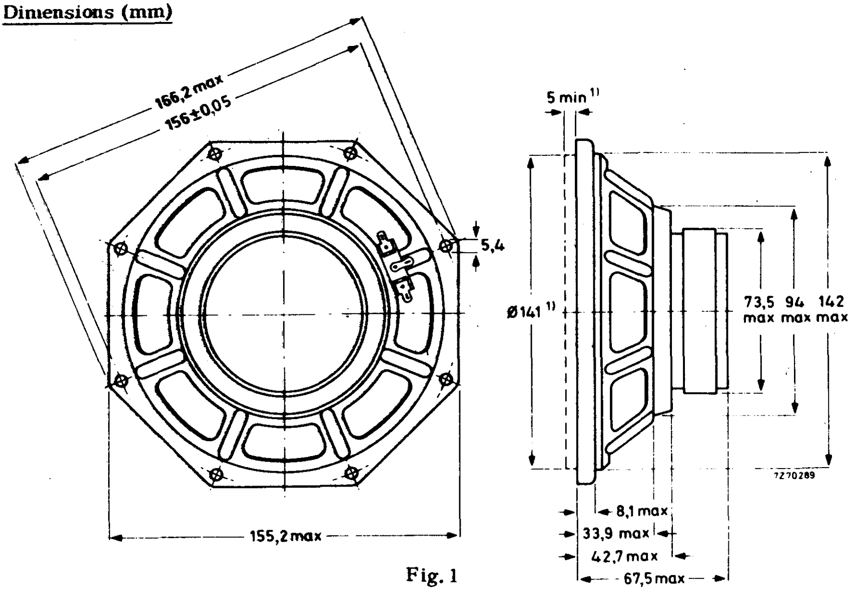


Fig. 1

1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve b: Sound pressure measured in anechoic room, input at an operating power of 6, 3 W. Loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

Curve c: 2nd and 3rd harmonic distortion, measured at the operating power of 6, 3 W in anechoic room, loudspeaker mounted in sealed 80 l enclosure with 1 kg of glass wool.

7 inch HIGH POWER WOOFER LOUDSPEAKER

AD7060/W

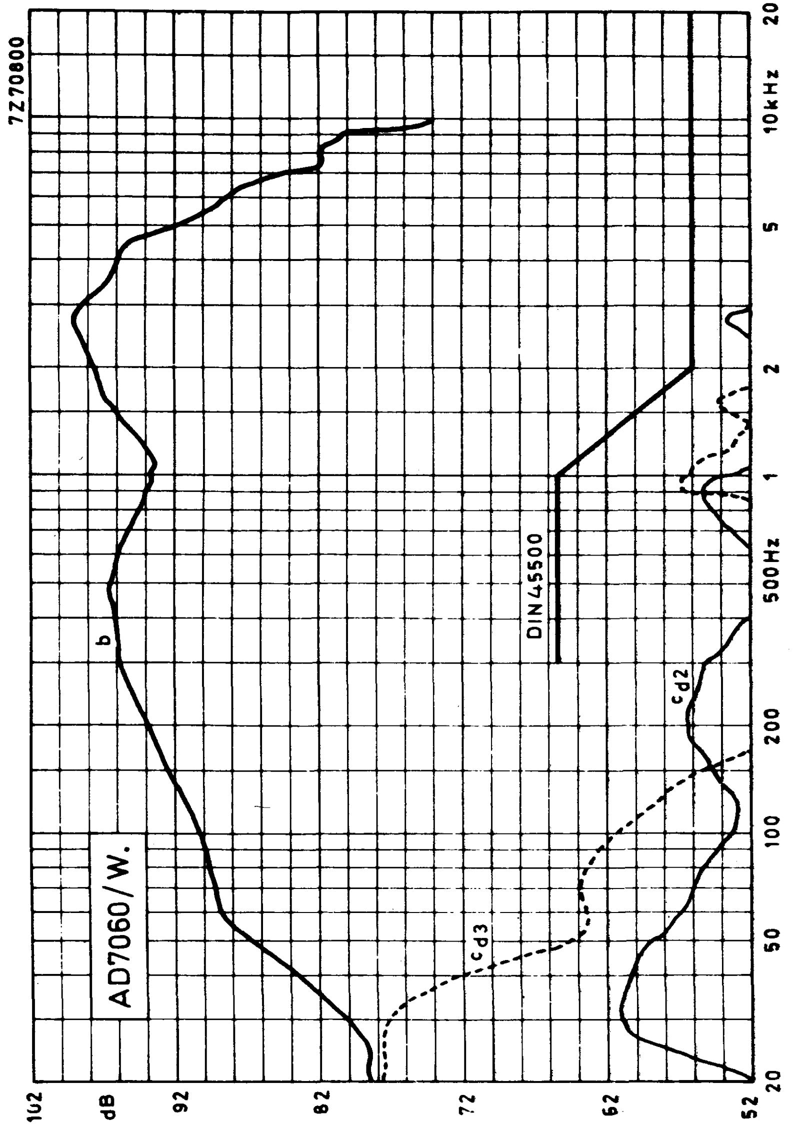


Fig. 2

7 INCH HIGH POWER FULL RANGE LOUDSPEAKER

AD7062/M

APPLICATION

For high fidelity reproduction in sealed acoustic enclosures. Maximum enclosure volume 7 litres. High power handling capacity with very low distortion.

TECHNICAL DATA

	version		
	M4	M8	
Rated impedance	4	8	Ω
Voice coil resistance	4,3	8	Ω
Resonance frequency	45	45	Hz
Power handling capacity, measured without filter, mounted in 7 l sealed enclosure	30	30	W
Operating power	5	5	W
Sweep voltage	3,8	5,3	V
Energy in air gap	135	140	mJ
Flux density	0,87	0,93	T
Air-gap height	5	5	mm
Voice coil height	11	11	mm
Core diameter	25	25	mm
Magnet material	Magnadur		
diameter	72	72	mm
mass	0,26	0,26	kg
Mass of loudspeaker	0,68	0,68	kg

The loudspeaker has a rubber surround and a double cone.

Connection to the loudspeaker by means of 6,3 mm (0,25 inch) Fastons or soldering.

Dimensions (mm)

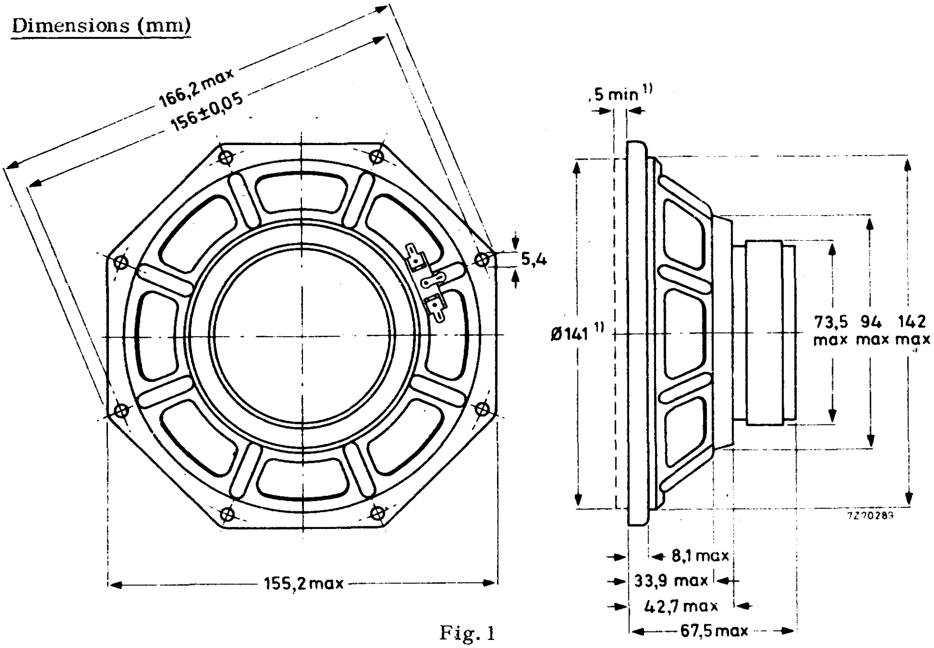


Fig. 1

1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

See Fig. 2

Curve b: Sound pressure measured in anechoic room at operating power. Loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

Curve c: 2nd and 3rd harmonic distortion, measured at the operating power of 5 W in anechoic room, loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

7 INCH HIGH POWER FULL RANGE LOUDSPEAKER

AD7062/M

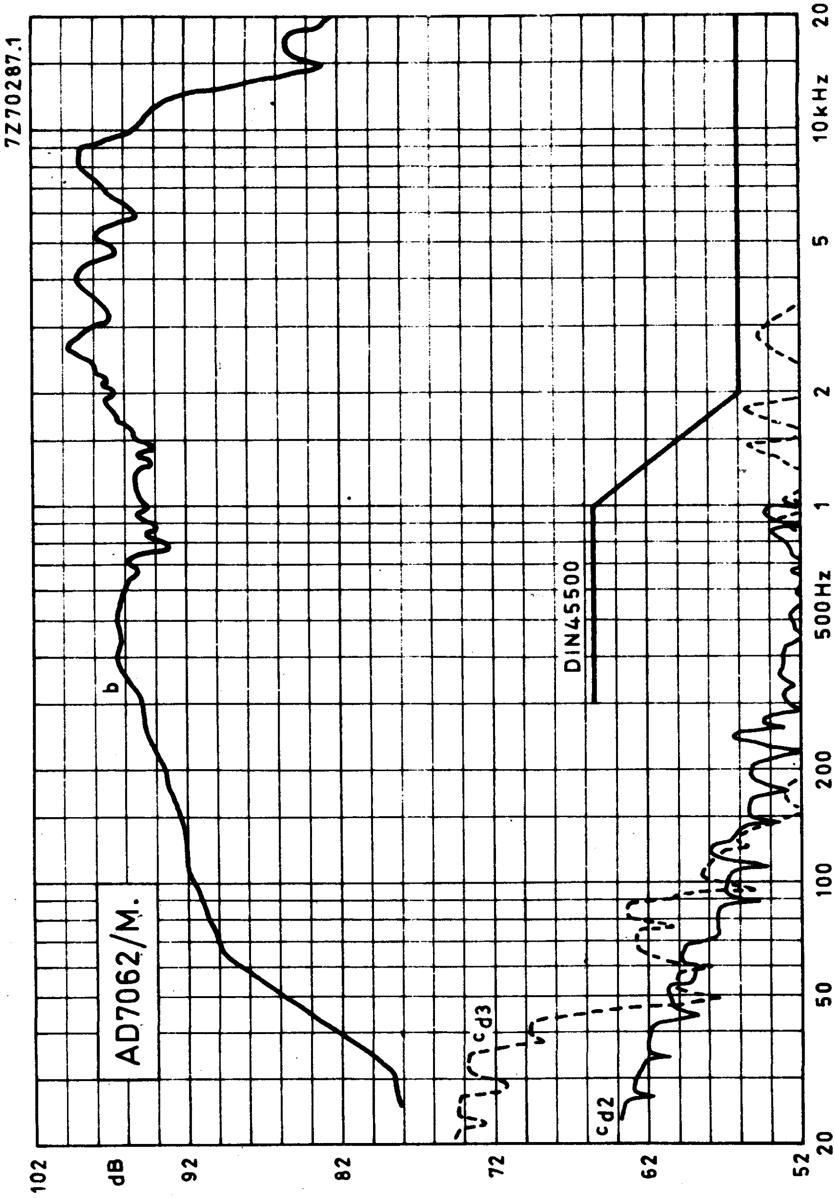


Fig. 2

7inch HIGH POWER FULL RANGE LOUDSPEAKER

AD7063/M

APPLICATION

For high fidelity reproduction in sealed acoustic enclosures. Maximum enclosure volume 25 litres.

TECHNICAL DATA

	version M4	version M8	
Rated impedance	4	8	Ω
Voice coil resistance	3, 4	7	Ω
Resonance frequency	55	55	Hz
Power handling capacity, measured without filter, loudspeaker unmounted	10	10	W
Operating power	2, 2	2, 2	W
Sweep voltage	4, 5	6, 3	V
Energy in airgap	127	127	mJ
Flux density	0, 87	0, 87	T
Airgap height	5	5	mm
Voice coil height	6, 8	6, 8	mm
Core diameter	25	25	mm
Magnet material	Magnadur		
diameter	72	72	mm
weight	0, 26	0, 26	kg
Weight of loudspeaker	0, 745	0, 745	kg

The loudspeaker has a textile surround and a double cone.

Connection to the loudspeaker by means of 6, 3 mm (0, 25 inch) Fastons or soldering.

Dimensions (mm)

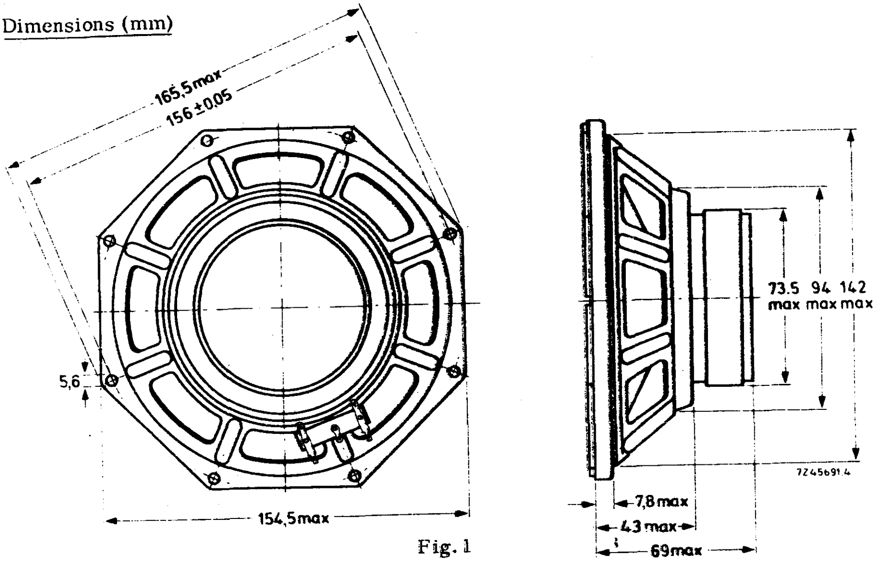


Fig. 1

Baffle hole diameter 141 mm
One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES

Curve b : Sound pressure measured in anechoic room at input power of 2, 2 W. Loudspeaker mounted on IEC baffle.

Curve c : 2nd and 3rd harmonic distortion, measured at input power of 2. 2 W in anechoic room. Loudspeaker mounted on IEC baffle.

7inch HIGH POWER FULL RANGE LOUDSPEAKER

AD7063/M

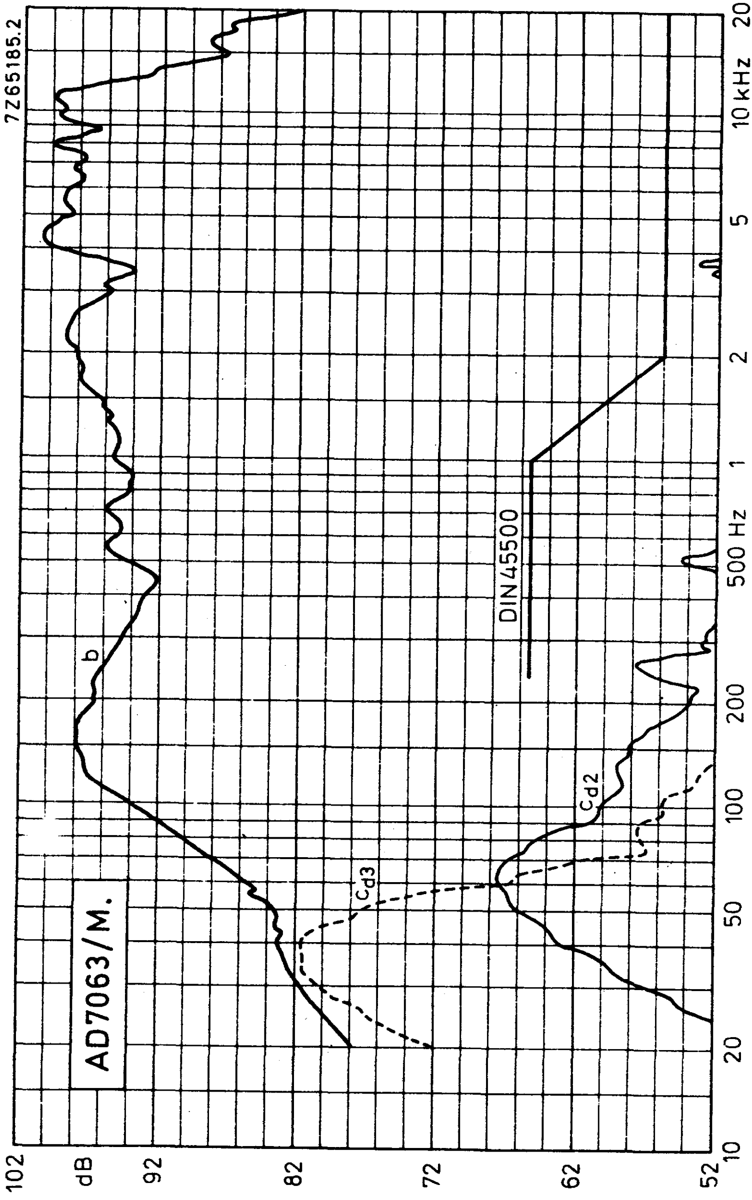


Fig. 2

7 inch HIGH POWER WOOFER LOUDSPEAKER

APPLICATION

For high fidelity reproduction in sealed acoustic enclosures in accordance with DIN45500. Maximum enclosure volume 7 1.
Maximum recommended cross-over frequency 2000 Hz. High power handling capacity with very low distortion.

TECHNICAL DATA

	version		
	W4	W8	
Rated impedance	4	8	Ω
Voice coil resistance	4, 3	8	Ω
Resonance frequency	45	45	Hz
Power handling capacity, measured without filter mounted in 7 1 sealed enclosure	40	40	W
Operating power	4	4	W
Sweep voltage	3, 8	5, 3	V
Energy in air gap	225	207	mJ
Flux density	1, 1	1, 2	T
Air-gap height	5	5	mm
Voice coil height	11	11	mm
Core diameter	25	25	mm
Magnet material	Magnadur		
diameter	90	90	mm
mass	0, 45	0, 45	kg
Mass of loudspeaker	1, 15	1, 15	kg

The loudspeaker has a paper cone and rubber surround.

Connection to the loudspeaker by means of 6.3 mm (0.25 inch) tag connectors or by soldering.

Dimensions (mm)

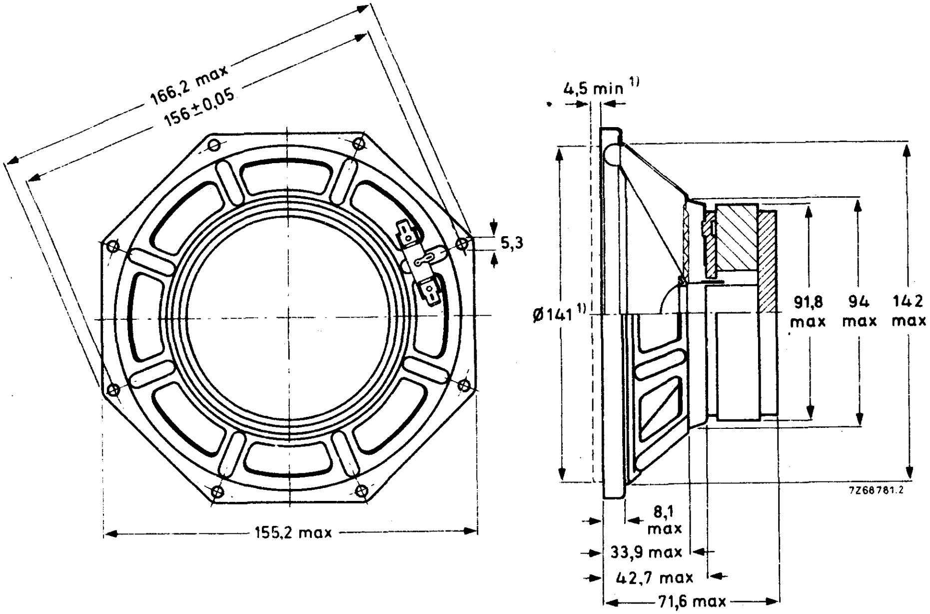


Fig.1

[1] Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES

Fig.2

Curve b: Sound pressure measured in anechoic room, loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

Curve c: Total non-linear distortion, measured at the operating power of 4 W in anechoic room, loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool. Loudspeaker front mounted on baffle, dimensions 640 x 540 mm.

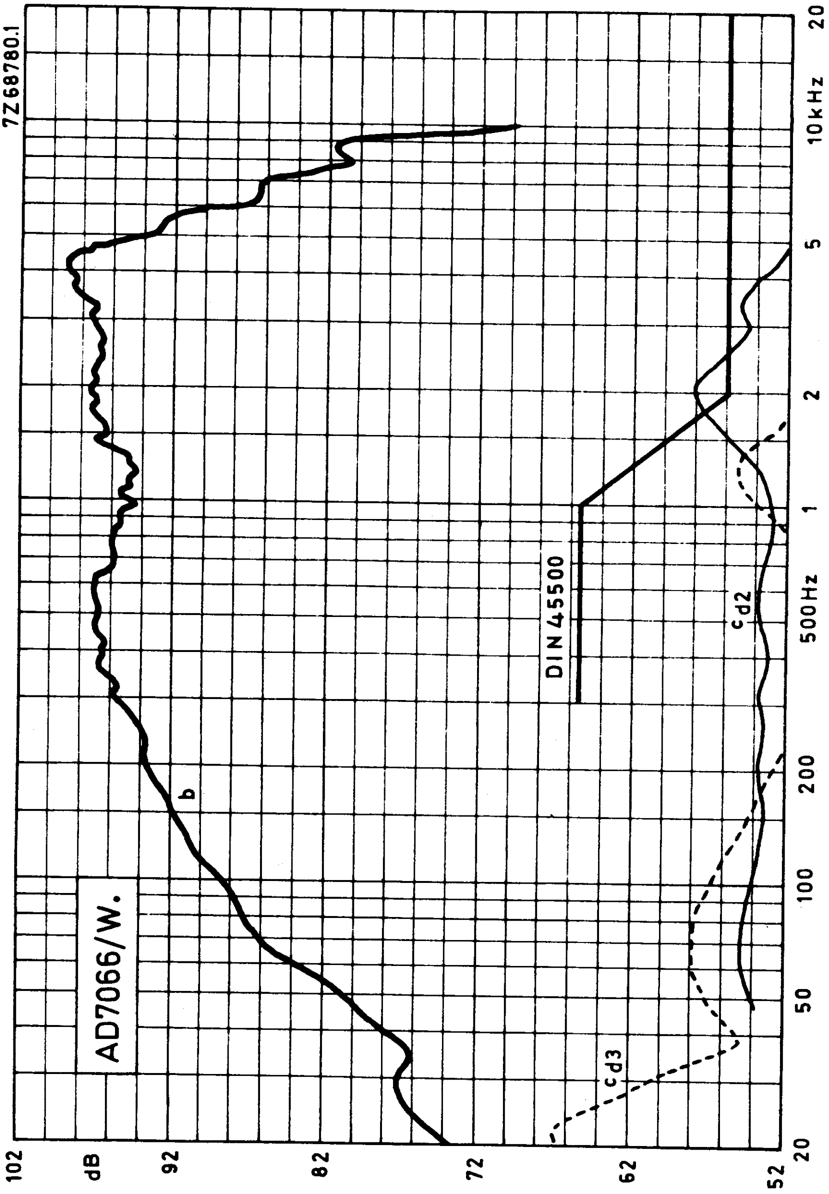

7Z68780.1
AD7066/W.
b
DIN 45500
c d2
c d3
102
dB
92
82
72
62
52
20
50
100
200
500 Hz
1
2
5
10 kHz
20

Fig. 2

7 inch OCTAGONAL MEDIUM POWER LOUDSPEAKER

APPLICATION

For car and domestic radios, acoustic enclosures and public address systems.
Frequency range up to 15 kHz.

TECHNICAL DATA

	version			
	M4	M8	M15	
Rated impedance	4	8	15	Ω
Voice coil resistance	3, 4	7, 1	13, 5	Ω
Resonance frequency	105	105	105	Hz
Power handling capacity, measured without filter loudspeaker unmounted	6	6	6	W
Sweep voltage	2, 8	4	6, 7	V
Energy in airgap	55	55	53	mJ
Flux density	0, 98	0, 98	0, 98	T
Airgap height	3	3	3	mm
Voice coil height	3	3, 9	3, 2	mm
Core diameter	18	18	18	mm
Magnet material		Magnadur		
diameter	53	53	53	mm
weight	0, 1	0, 1	0, 1	kg
Weight of loudspeaker	0, 29	0, 29	0, 29	kg

The loudspeaker has a dual paper cone and a paper surround and has a foam plastic gasket on the flange.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

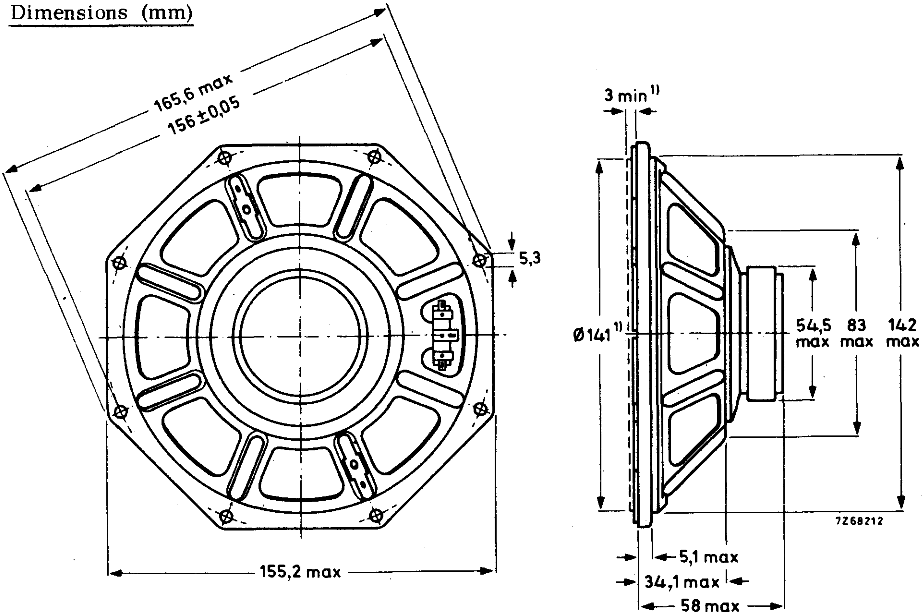


Fig. 1.

1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

Fig. 2. Input power 50 mW
Sound pressure measured in anechoic room, loudspeaker unmounted.
Above 1000 Hz the sensitivity may be over the width of one octave, maximum 2 dB lower than indicated.

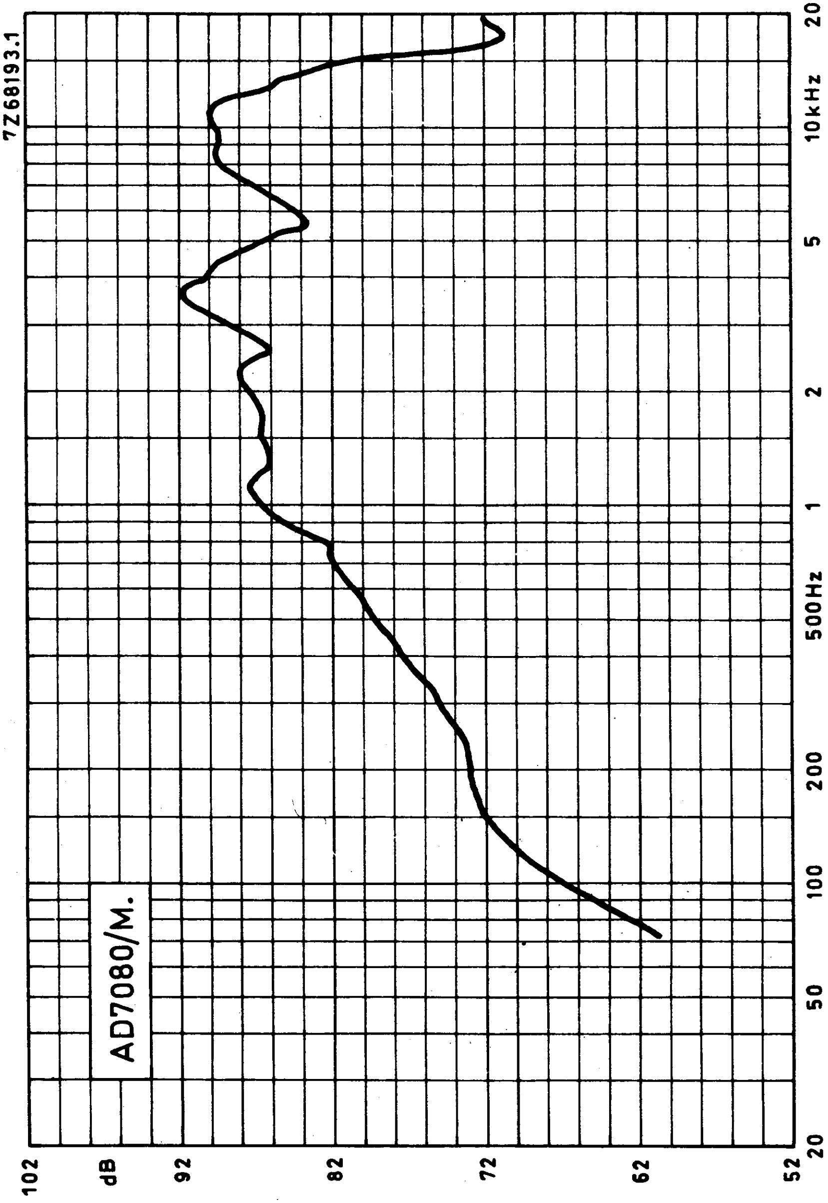

7Z68193.1
AD7080/M.
102
dB
92
82
72
62
52
20
50
100
200
500Hz
1
2
5
10kHz
20

Fig.2

7inch OCTAGONAL MEDIUM POWER LOUDSPEAKER

AD7080/X

APPLICATION

For car and domestic radios and accoustic enclosures.
High sensitivity at 4000 Hz.

TECHNICAL DATA

	version		
	X4	X8	
Rated impedance	4	8	Ω
Voice coil resistance	3,4	7,1	Ω
Resonance frequency	115	115	Hz
Power handling capacity, measured without filter loudspeaker unmounted	6	6	W
Sweep voltage	3,5	4,9	V
Energy airgap	55	55	mJ
Flux density	0,98	0,98	T
Airgap height	3	3	mm
Voice coil height	3	3,9	mm
Core diameter	18	18	mm
Magnet material	Magnadur		
diameter	53	53	mm
weight	0,1	0,1	kg
Weight of loudspeaker	0,29	0,29	kg

The loudspeaker has a paper cone and surround and a foam plastic gasket on the flange.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

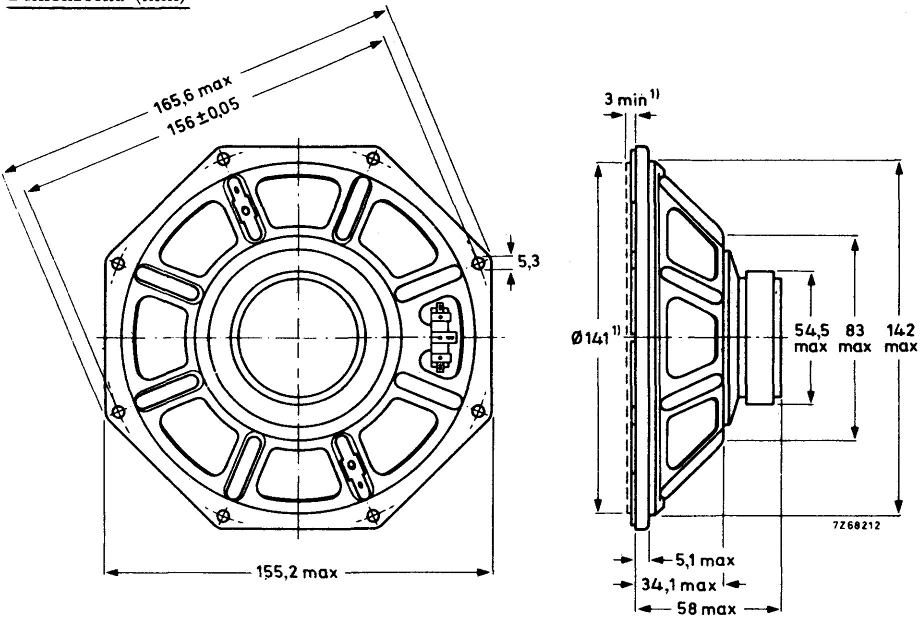


Fig. 1.

1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for on-phase connection.

FREQUENCY RESPONSE CURVE

Fig. 2. Input power 50 mW
Sound pressure measured in anechoic room, loudspeaker is unmounted.
Above 1000 Hz the sensitivity may be, over the width of one octave, maximum 2 dB lower than indicated.

7inch OCTAGONAL
MEDIUM POWER LOUDSPEAKER

AD7080/X

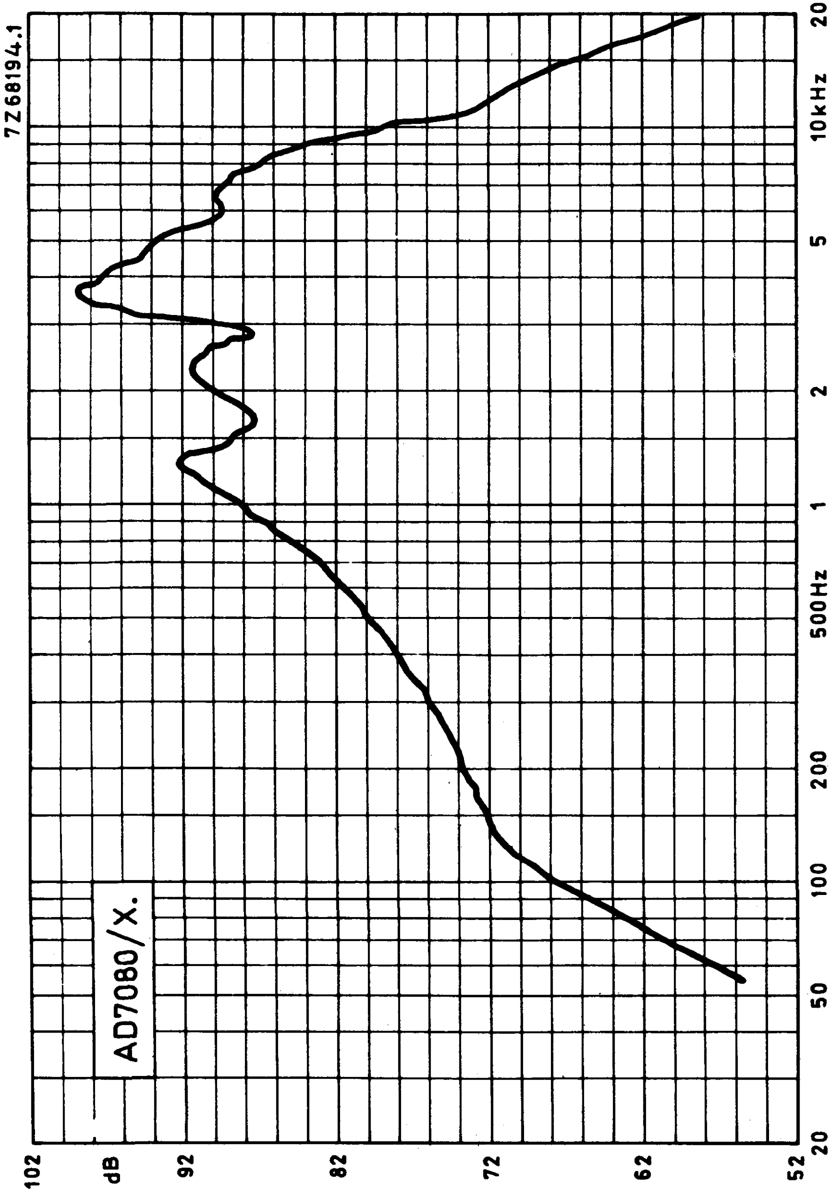


Fig.2

7 INCH ROUND MEDIUM POWER LOUDSPEAKERS

AD7091/M Series

APPLICATION

For television sets and record players.

TECHNICAL DATA

	version		
	M4	M8	
Rated impedance	4	8	Ω
Voice coil resistance	3,4	7,1	Ω
Resonance frequency	105	105	Hz
Power handling capacity, measured without filter loudspeaker unmounted	3	3	W
Sweep voltage	2,45	3,5	V
Energy in airgap	39	39	mJ
Flux density	0,8	0,8	T
Airgap height	3	3	mm
Voice coil height	2,4	3,1	mm
Core diameter	18	18	mm
Magnet material	Ticonal	Ticonal	
diameter	18	18	mm
weight	0,027	0,027	kg
Weight of loudspeaker	0,22	0,22	kg

The loudspeaker has a dual paper cone, a paper surround and a foam plastic gasket on the flange.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

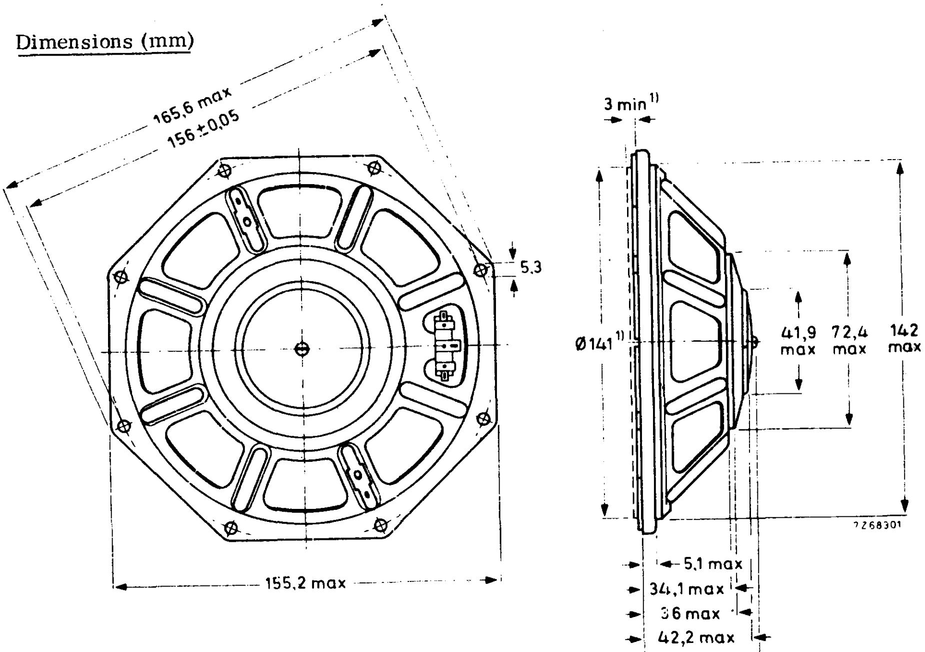


Fig. 1

[1] Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

Fig. 2 Input power 50 mW
Sound pressure measured in anechoic room, loudspeaker unmounted.
Above 1000 Hz the sound pressure may be, over the width of one octave, maximum 2 dB lower than indicated.

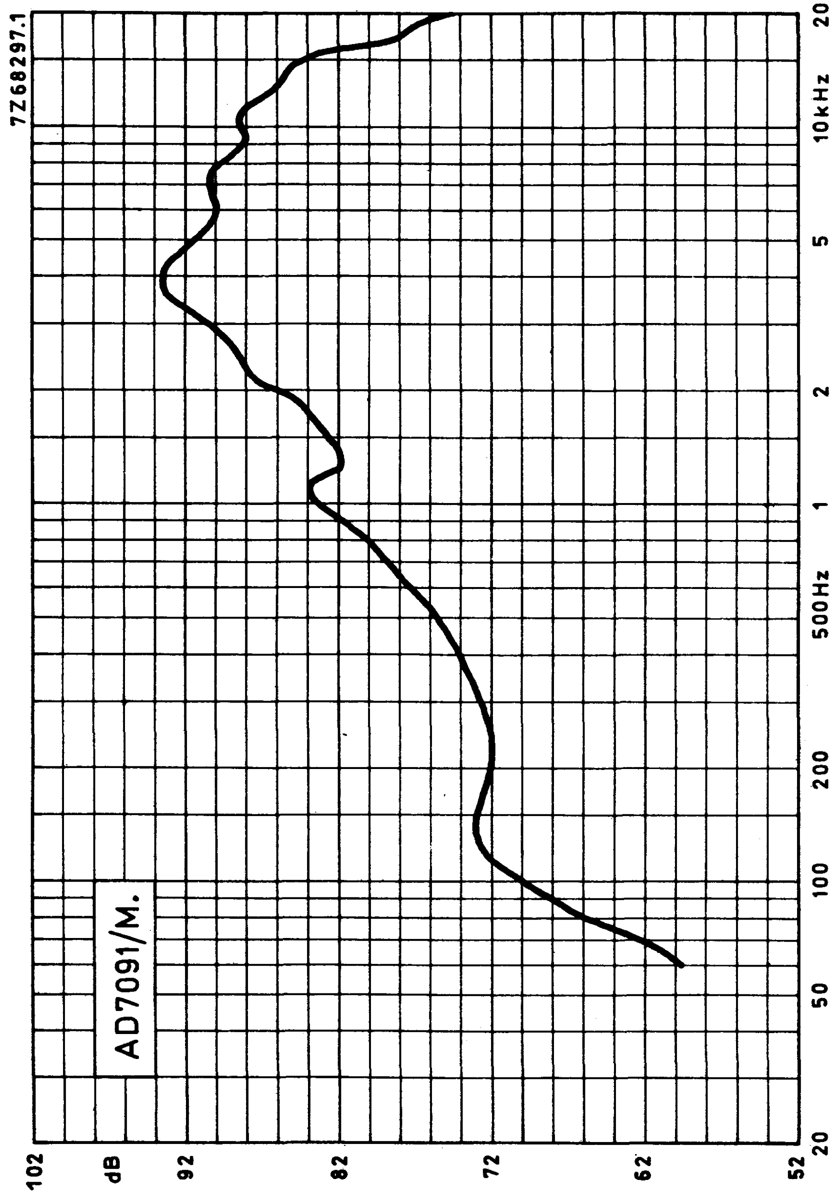

7Z68297.1
AD7091/M.
102
dB
92
82
72
62
52
20
50
100
200
500Hz
1
2
5
10kHz
20

Fig. 2

7 INCH ROUND
MEDIUM POWER LOUDSPEAKER

AD7091/X

APPLICATION

For television sets and record players.

TECHNICAL DATA

	version X4	X8	
Rated impedance	4	8	Ω
Voice coil resistance	3,4	7,1	Ω
Resonance frequency	115	115	Hz
Power handling capacity, measured without filter loudspeaker unmounted	3	3	W
Sweep voltage	2,45	3,5	V
Energy in airgap	39	39	mJ
Flux density	0,8	0,8	T
Airgap height	3	3	mm
Voice coil height	2,4	3,1	mm
Core diameter	18	18	mm
Magnet material	Ticonal	Ticonal	
diameter	18	18	mm
weight	0,027	0,027	kg
Weight of loudspeaker	0,22	0,22	kg

The loudspeaker has a paper cone and surround and a foam plastic gasket on the flange.

Connection to the loudspeaker by means of 2.8 mm (0.11 inch) tag connectors or by soldering.

Dimensions (mm)

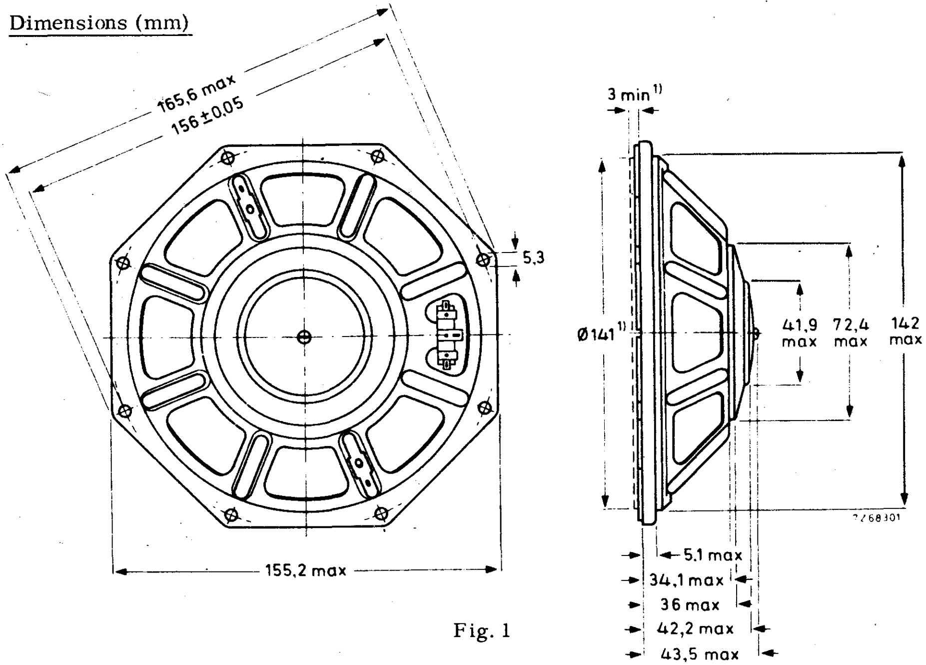


Fig. 1

1). Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVE

Fig. 2 Input power 50 mW
Sound pressure measured in anechoic room, loudspeaker unmounted.
Above 1000 Hz the sound pressure may be, over the width of one octave, maximum 2 dB lower than indicated.

7 INCH ROUND
MEDIUM POWER LOUDSPEAKER

AD7091/X

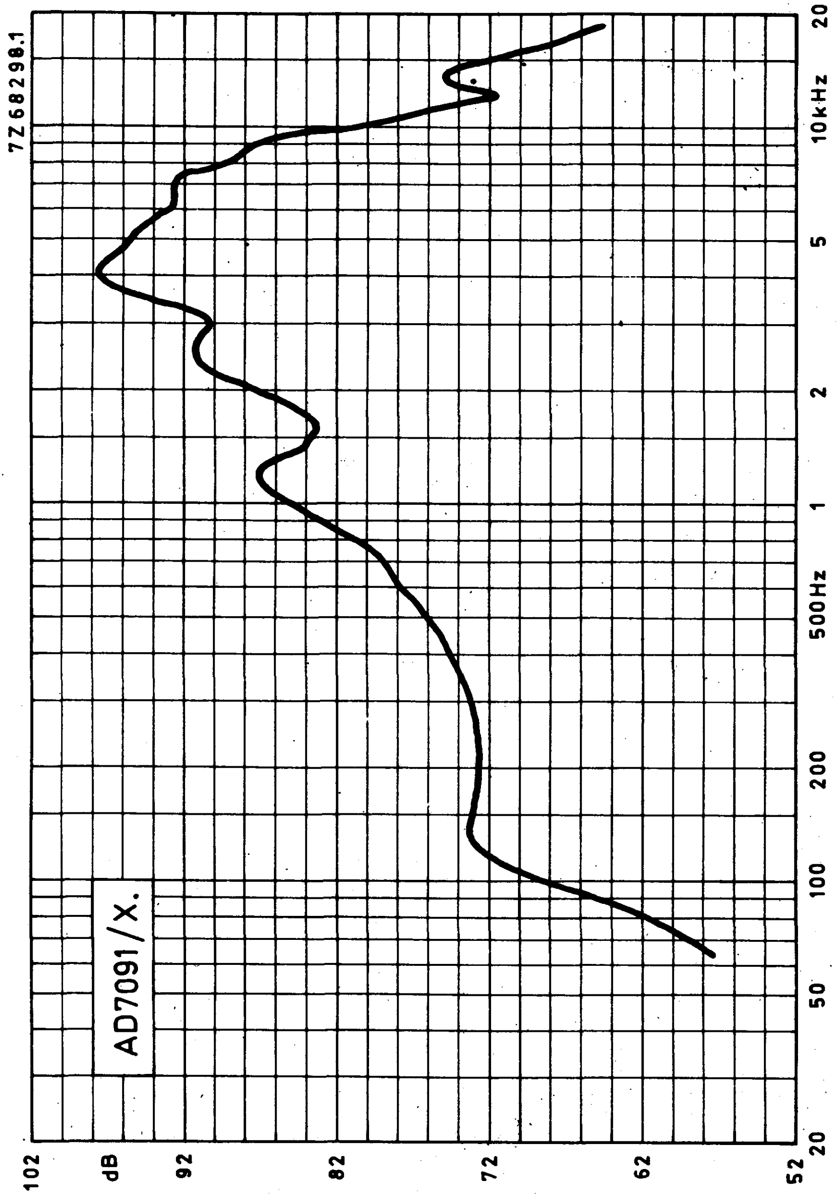


Fig. 2

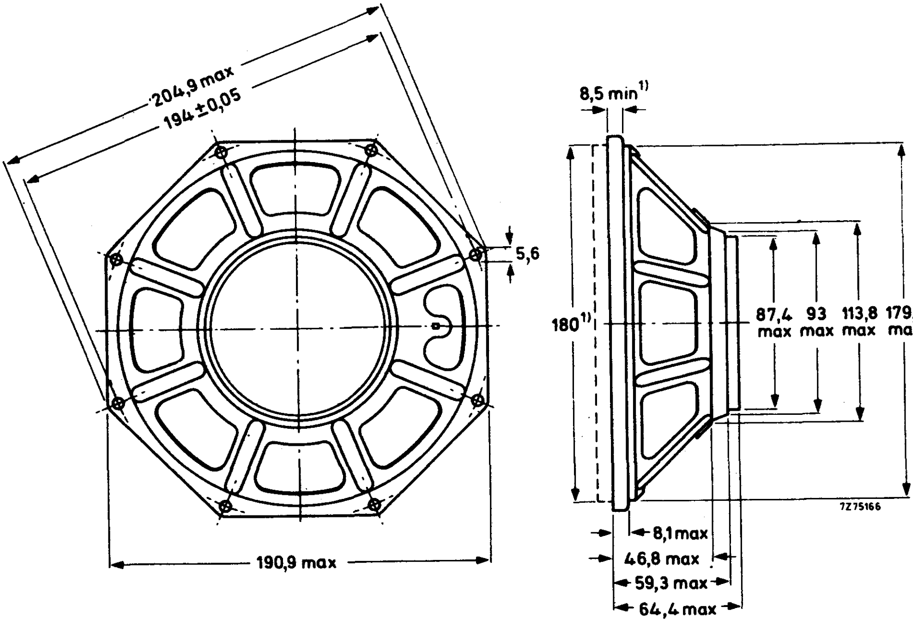
8inch PASSIVE RADIATOR AD8000

APPLICATION

To be used in combination with 8 inch woofer loudspeakers in a sealed enclosure for an improved bass response.

TECHNICAL DATA

Effective area	$2,5 \times 10^{-2}$	m^2
Moving mass:		
tuned mass	21,5	g
cone mass	9,8	g
total moving mass	31,3	g
Mass of radiator	0,235	kg



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[1] Baffle hole and clearance depth required for cone movement.

8 inch HIGH POWER WOOFER LOUDSPEAKER

APPLICATION

For high fidelity reproduction in sealed acoustic enclosures. Maximum enclosure volume 25 litres. Maximum recommended cross-over frequency 2000 Hz.
Rated frequency range 30 to 5 000 Hz.

TECHNICAL DATA

	version		
	W4	W8	
Rated impedance	4	8	Ω
Voice coil resistance	4, 3	8	Ω
Resonance frequency	42	42	Hz
Power handling capacity, measured without filter, mounted in 25 l sealed enclosure	30	30	W
Operating power	3, 4	3, 4	W
Sweep voltage	5	7	V
Energy in air gap	135	140	mJ
Flux density	0, 87	0, 93	T
Air-gap height	5	5	mm
Voice coil height	11	11	mm
Core diameter	25	25	mm
Magnet material	Magnadur		
diameter	72	72	mm
mass	0, 26	0, 26	kg
Mass of loudspeaker	0, 8	0, 8	kg

The loudspeaker has a paper cone and a rubber surround.

Connection to the loudspeaker by means of 6.3 mm (0.25 inch) tag connectors or by soldering.

Dimensions (mm)

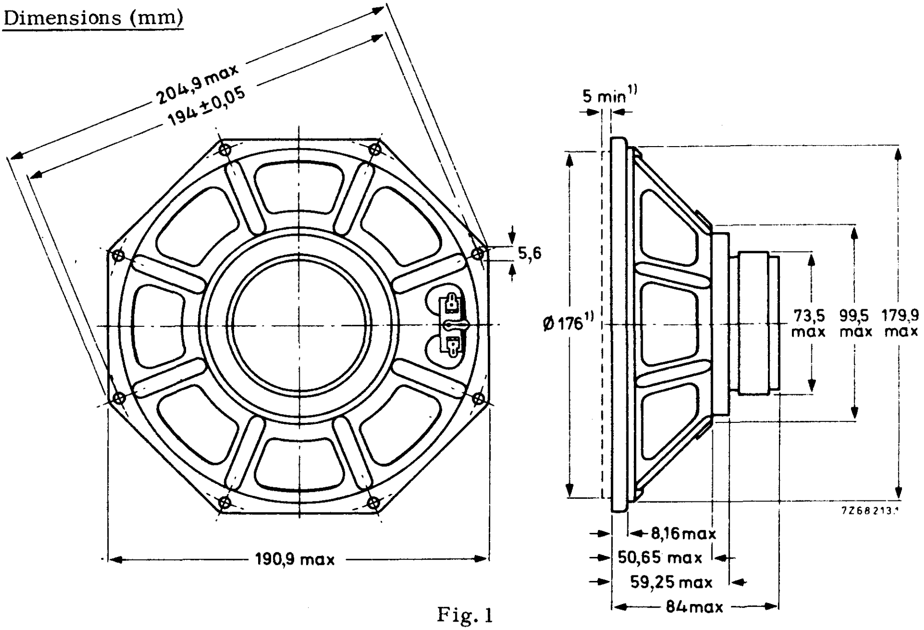


Fig. 1

1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES

See Fig. 2

Curve b: Sound pressure measured in anechoic room at operating power. Loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

Curve c: 2nd and 3rd harmonic distortion, measured at the operating power of 3, 4 W in anechoic room, loudspeaker mounted in 80 l enclosure, filled with 1 kg of glass wool.

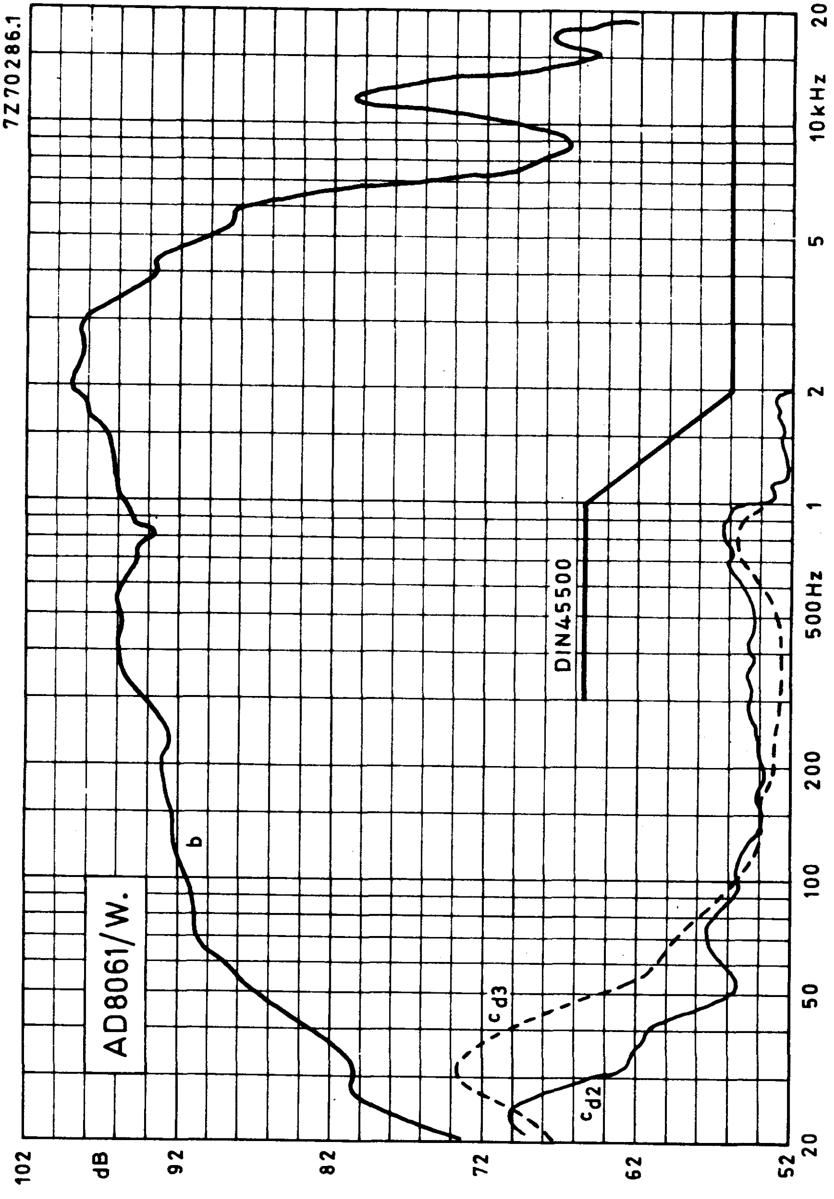

7Z70286.1
AD8061/W.
b
c_{d3}
c_{d2}
DIN45500
102
dB
92
82
72
62
52
20
50
100
200
500Hz
1
2
5
10kHz
20

Fig. 2

8 inch HIGH POWER WOOFER LOUDSPEAKER

APPLICATION

For high fidelity reproduction in sealed acoustic enclosures. Maximum enclosure volume 25 litres. Maximum recommended cross-over frequency 2500 Hz.
Rated frequency range 30 to 5 000 Hz.

TECHNICAL DATA

	version		
	W4	W8	
Rated impedance	4	8	Ω
Voice coil resistance	4, 3	8	Ω
Resonance frequency	39	39	Hz
Power handling capacity, measured without filter, mounted in 25 l sealed enclosure	40	40	W
Operating power	2, 5	2, 5	W
Sweep voltage	5	7	V
Energy in air gap	229	203	mJ
Flux density	1, 1	1, 2	T
Air-gap height	5	5	mm
Voice coil height	11	11	mm
Core diameter	25	25	mm
Magnet material	Magnadur		
diameter	90	90	mm
mass	0, 45	0, 45	kg
Mass of loudspeaker	1, 15	1, 15	kg

The loudspeaker has a paper cone and rubber surround.

Connection to the loudspeaker by means of 6.3 mm (0.25 inch) tag connectors or by soldering.

Dimensions (mm)

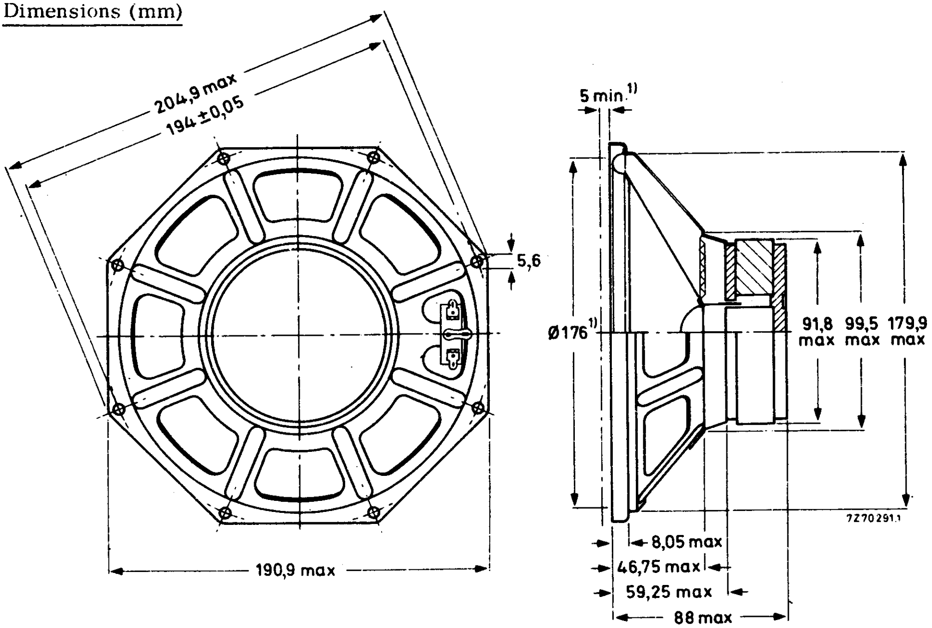


Fig. 1

1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES

See Fig. 2

Curve b: Sound pressure measured in anechoic room at operating power. Loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

Curve c: 2nd and 3rd harmonic distortion, measured at the operating power of 2,5 W in anechoic room, loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

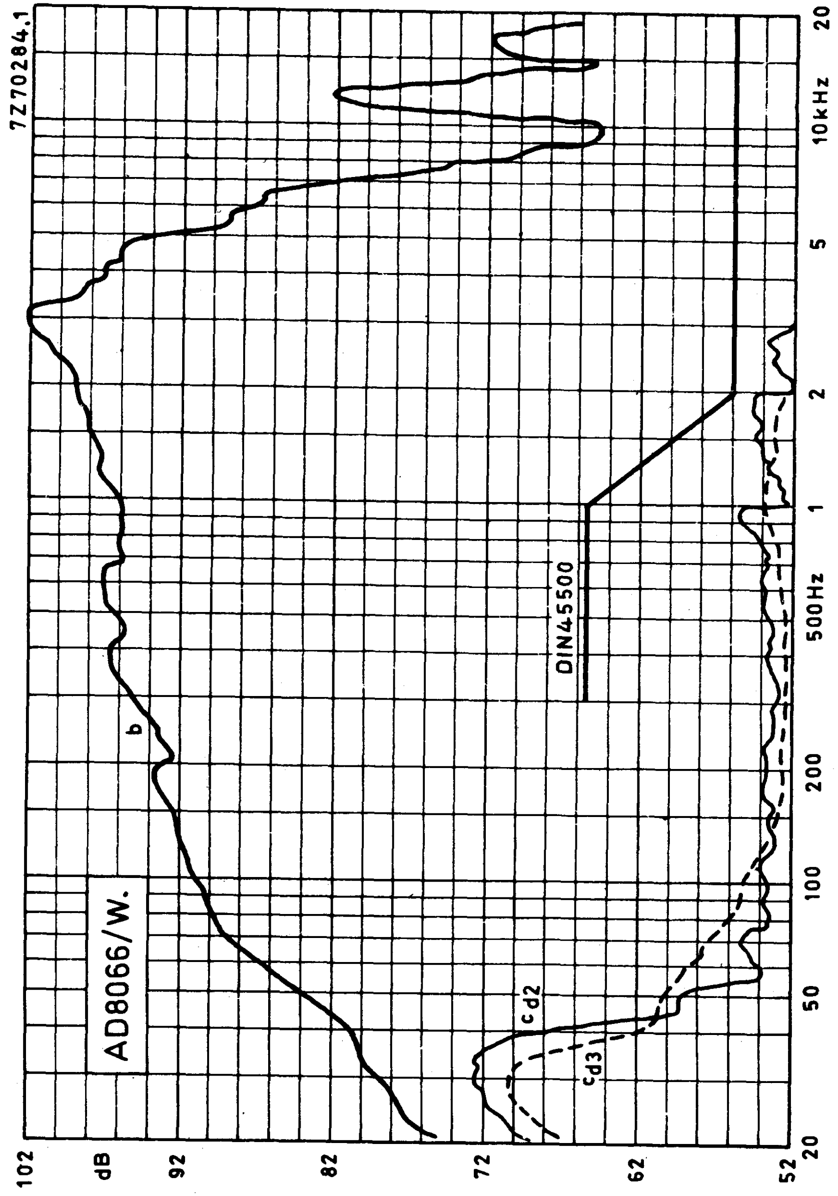

7Z70284.1
AD8066/W.
b
c d2
c d3
DIN45500
102
dB
92
82
72
62
52
20
50
100
200
500Hz
1
2
5
10kHz
20

Fig. 2

8 inch HIGH POWER WOOFER LOUDSPEAKER

APPLICATION

For high fidelity reproduction according to DIN45500 in sealed acoustic enclosures. Maximum enclosure volume 25 litres. Maximum recommended cross-over frequency 3000 Hz.

TECHNICAL DATA

	version W4	version W8	
Rated impedance	4	8	Ω
Voice coil resistance	3,2	6,4	Ω
Resonance frequency	32	32	Hz
Power handling capacity, measured without filter, mounted in 25 l enclosure	40	40	W
Operating power	6	6	W
Sweep voltage	5	7	V
Energy in air gap	225	225	mJ
Flux density	0,7	0,7	T
Air-gap height	5	5	mm
Voice coil height	12,7	12,8	mm
Core diameter	34	34	mm
Magnet material	Magnadur		
diameter	90	90	mm
mass	0,42	0,42	kg
Mass of loudspeaker	1,3	1,3	kg

The loudspeaker has a paper cone and a rubber surround.

Connection to the loudspeaker by means of 6.3 mm (0.25 inch) tag connectors or by soldering.

Dimensions (mm)

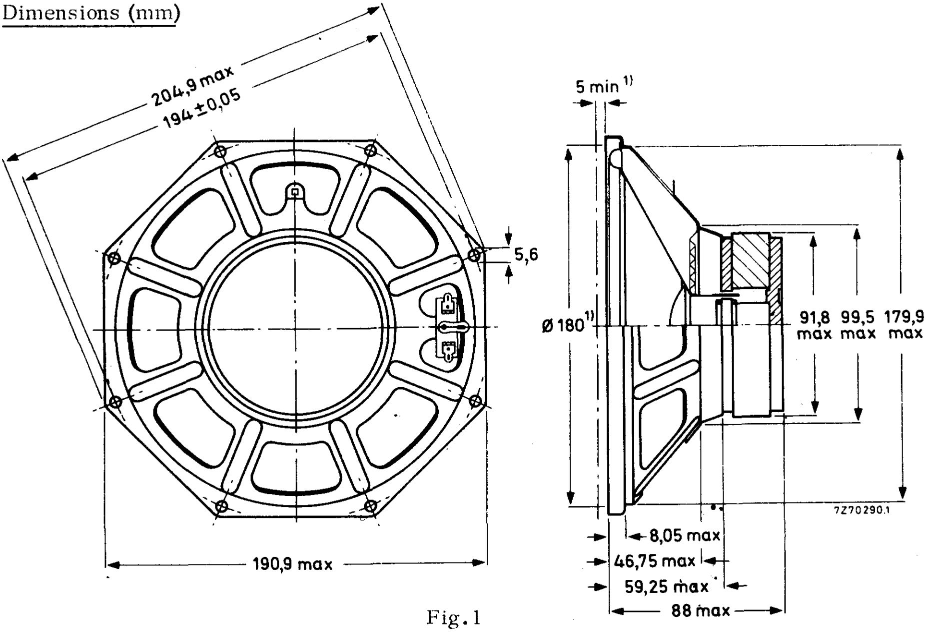


Fig. 1

1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES

See Fig. 2

Curve a : Sound pressure measured in anechoic room, loudspeaker unmounted. Above 1000 Hz the sound pressure may be, over the width of one octave, maximum 2 dB lower than indicated. Input power 50 mW (0, 44 V).

Curve b : Sound pressure measured in half free field at operating power. Loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

Curve c : 2nd and 3rd harmonic distortion, measured at the operating power of 6 W in anechoic room, loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

Curve e : Maximum distortion according DIN45500, Blatt 7.

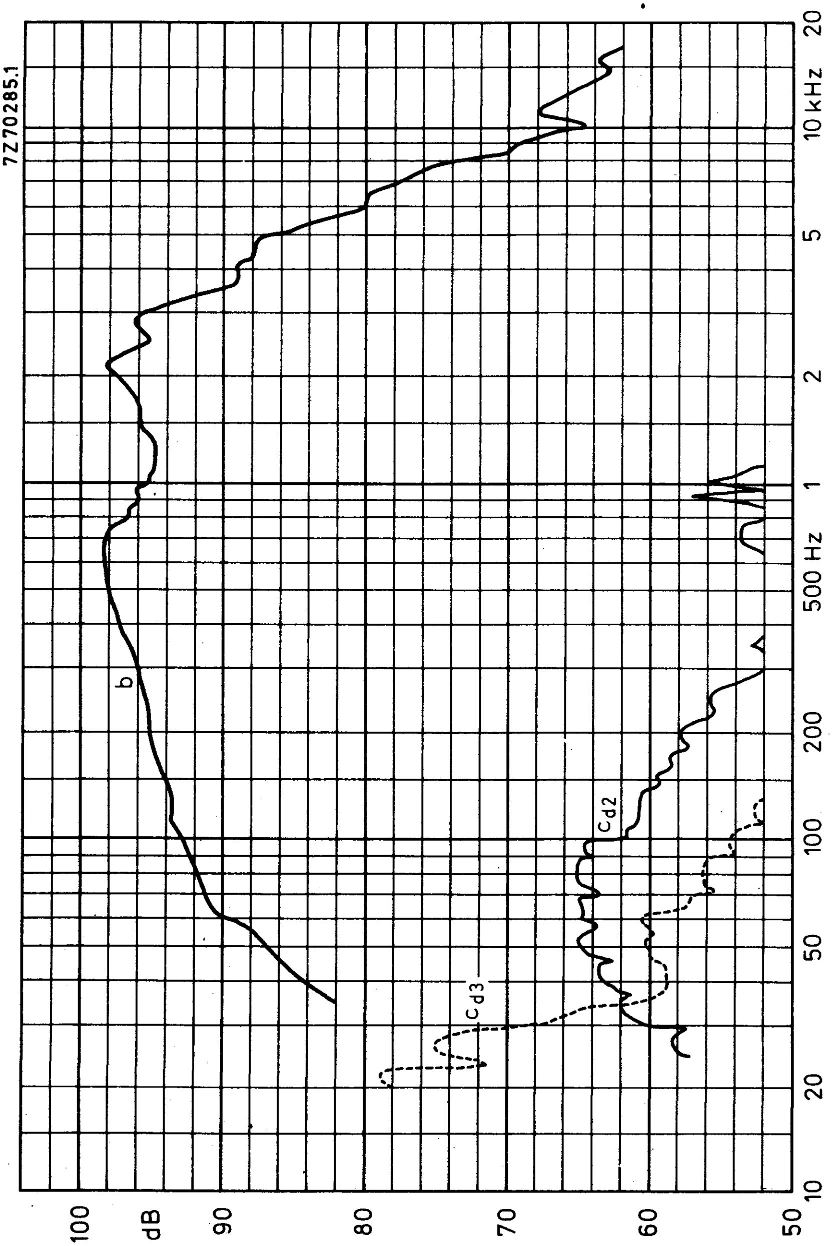

7Z70285.1
100
dB
90
80
70
60
50
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20
b
c_{d2}
c_{d3}

Fig. 2

8½INCH HIGH POWER FULL RANGE LOUDSPEAKER

9710/M8

APPLICATION

A full range loudspeaker for studio monitoring equipment and domestic bass reflex enclosures for high fidelity reproduction from 45 Hz to 19 kHz.

TECHNICAL DATA

Rated impedance	8	Ω
Voice coil resistance	5	Ω
Resonance frequency	50	Hz
Power handling capacity, measured without filter,		
loudspeaker mounted in sealed enclosure < 30 l	20	W
loudspeaker mounted in sealed enclosure > 30 l	10	W
Operating power	1, 3	W
Sweep voltage	5, 9	V
Energy in airgap	361	mJ
Flux density	0, 75	T
Airgap height	11	mm
Voice coil height	7	mm
Core diameter	34	mm
Magnet material	Magnadur	
diameter	105	mm
weight	0, 4	kg
Weight of loudspeaker	1, 75	kg

The loudspeaker has a paper surround and a cork gasket on the flange.

Connection to the loudspeaker by means of 6.3 mm (0.25 inch) tag connectors or by soldering.

Dimensions (mm)

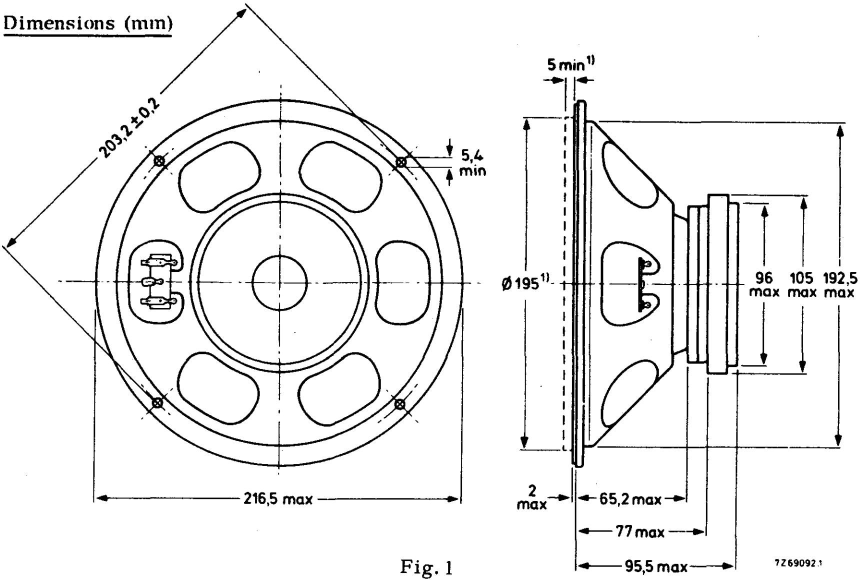


Fig. 1

1) Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES

See Fig. 2.

Curve b: Sound pressure measured in anechoic room, loudspeaker mounted in sealed 80 l enclosure. Input power at operating power of 1,3 W.

Curve c: 2nd and 3rd harmonic distortion, measured at the operating power of 0,7 W in anechoic room, loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

8½INCH HIGH POWER FULL RANGE LOUDSPEAKER

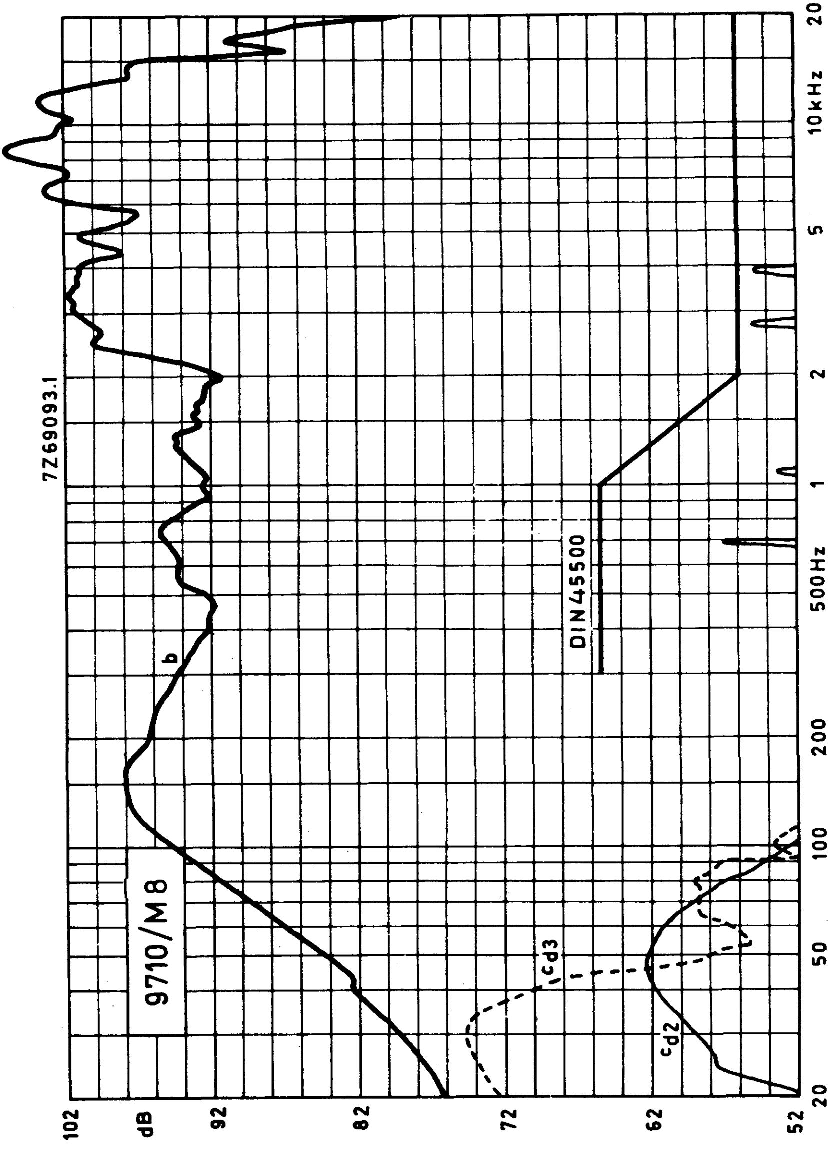


Fig. 2

10 INCH HIGH POWER FULL RANGE LOUDSPEAKERS

AD1065/M Series

APPLICATION

A full range loudspeaker with high sensitivity for public address systems in enclosures greater than 20 litres.
Smooth response from 60 Hz to 18 000 Hz.

TECHNICAL DATA

	version			
	M4	M8	M15	
Rated impedance	4	8	15	Ω
Voice coil resistance	3,4	7	13	Ω
Resonance frequency	55	55	55	Hz
Power handling capacity, measured without filter, loudspeaker unmounted	10	10	10	W
Operating power	1,5	1,5	1,5	W
Sweep voltage	4,5	6,3	8,7	V
Energy in airgap	225	225	225	mJ
Flux density	1,12	1,12	1,12	T
Airgap height	5	5	5	mm
Voice coil height	6,5	6,5	4,5	mm
Core diameter	25	25	25	mm
Magnet material		Magnadur		
diameter	90	90	90	mm
weight	0,45	0,45	0,45	kg
Weight of loudspeaker	1,52	1,52	1,52	kg

The loudspeaker has a paper surround and a double cone.

Connection to the loudspeaker by means of 6,3 mm (0,25 inch) Fastons or soldering.

Dimensions (mm)

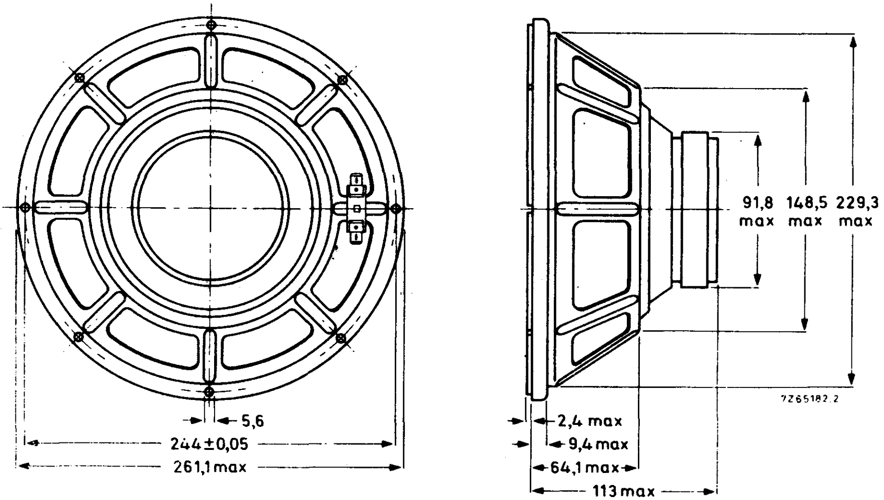


Fig. 1

Baffle hole diameter 227 mm

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve b : Sound pressure measured in anechoic room at operating power of 1,5 W. Loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

Curve c : 2nd and 3rd harmonic distortion, measured at operating power of 1,5 W in anechoic room. Loudspeaker mounted in 80 l enclosure, filled with 1 kg of glass wool.

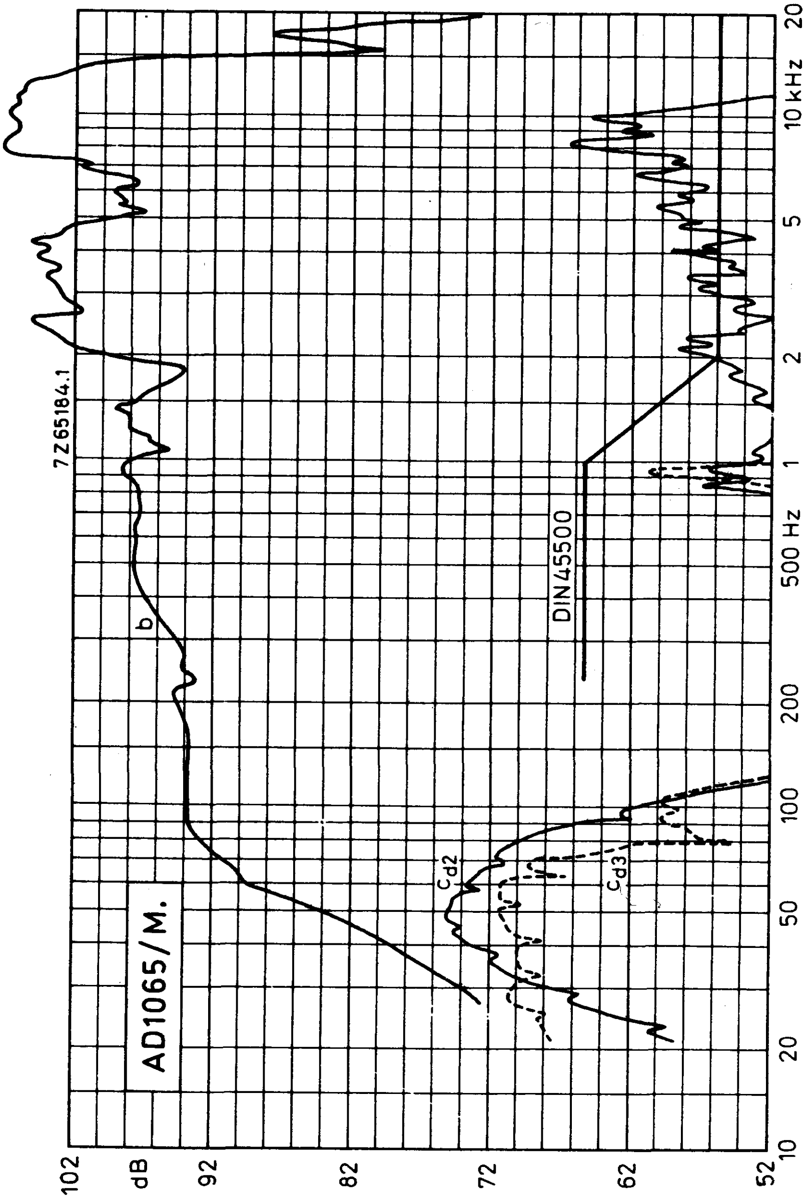

AD1065/M.
7Z65184.1
b
C_{d2}
C_{d3}
DIN45500
102
dB
92
82
72
62
52
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20

Fig. 2

10 inch HIGH POWER WOOFER LOUDSPEAKER

APPLICATION

For high fidelity reproduction in sealed acoustic enclosures in accordance with DIN 45500. Recommended enclosure volume 35 litres. Maximum recommended cross-over frequency 1000 Hz. Rated frequency range 40 to 3000 Hz.

TECHNICAL DATA

	version		
	W4	W8	
Rated impedance	4	8	Ω
Voice coil resistance	3,2	6,8	Ω
Resonance frequency	20	20	Hz
Power handling capacity, measured without filter, mounted in 35 l sealed enclosure	30	30	W
Operating power	5	5	W
Sweep voltage	5	7	V
Energy in airgap	280	280	mJ
Flux density	0,94	0,94	T
Airgap height	5	5	mm
Voice coil height	12,1	13,5	mm
Core diameter	25	25	mm
Magnet material	Magnadur		
diameter	90	90	mm
weight	0,45	0,45	kg
Weight of loudspeaker	1,8	1,8	kg

The loudspeaker has a paper cone and a rubber surround.

Connection to the loudspeaker by means of 6.3 mm (0.25 inch) tag connectors or by soldering.

Dimensions (mm)

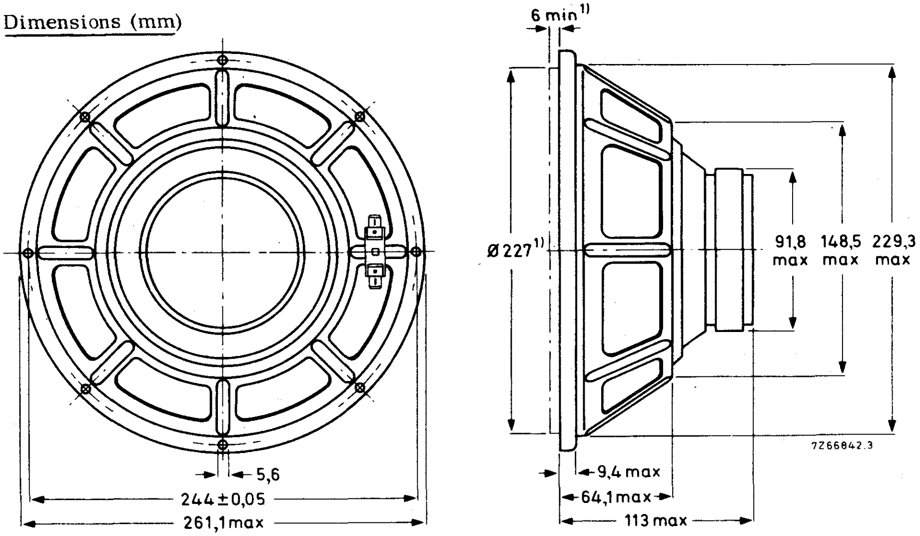


Fig. 1

[1] Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve b : Sound pressure measured in anechoic room at operating power of 5 W. Loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

Curve c : 2nd and 3rd harmonic distortion, measured at operating power of 5 W in anechoic room. Loudspeaker mounted in 80 l enclosure, filled with 1 kg of glass wool.

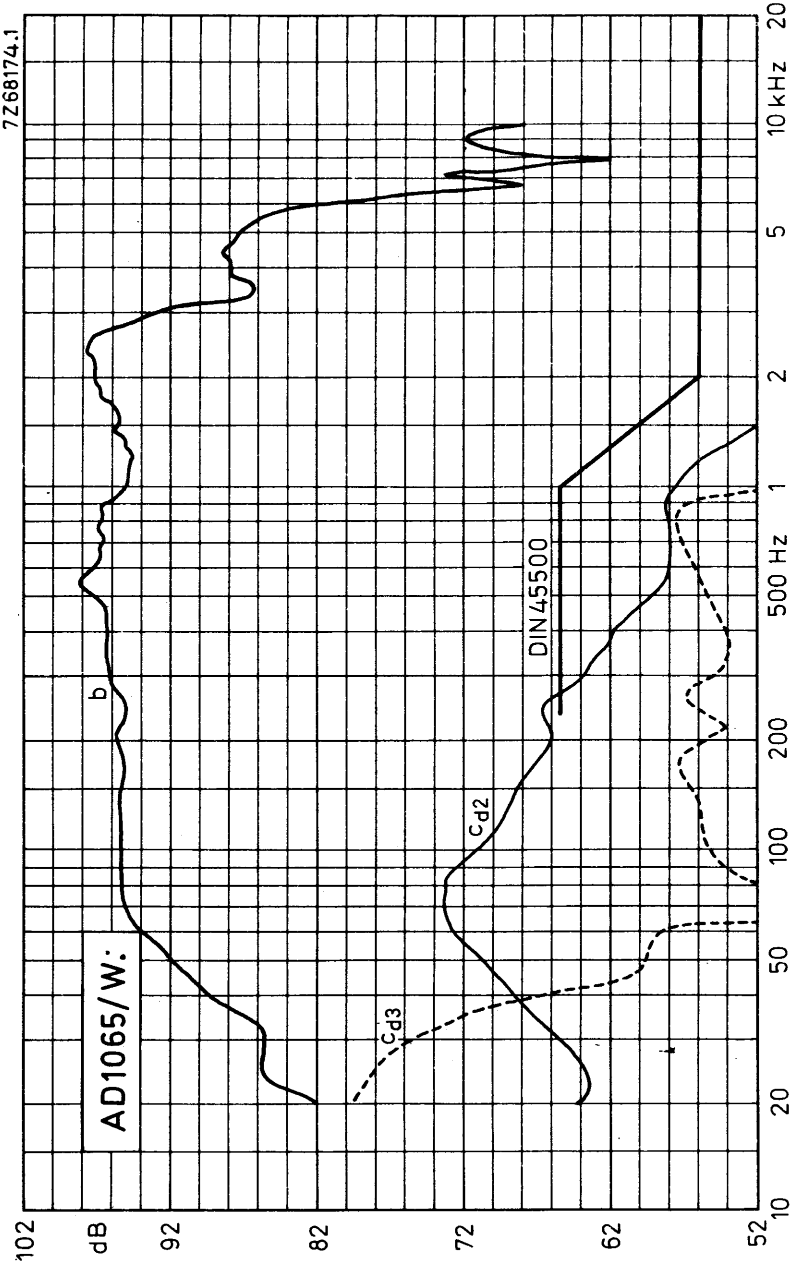

7Z68174.1
AD1065/W:
b
c_{d2}
c_{d3}
DIN45500
102
dB
92
82
72
62
52
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20

Fig 2

10 inch HIGH POWER WOOFER LOUDSPEAKER

APPLICATION

For high fidelity reproduction in sealed acoustic enclosures in accordance with DIN45500. Recommended enclosure volume 35 litres. Maximum recommended cross-over frequency 800 Hz. Rated frequency range 35 to 800 Hz.

TECHNICAL DATA

	version		
	W4	W8	
Rated impedance	4	8	Ω
Voice coil resistance	3,4	6,5	Ω
Resonance frequency	25	25	Hz
Power handling capacity, measured without filter mounted in 35 l sealed enclosure	40	40	W
Operating power	2,5	2,5	W
Sweep voltage	5	7	V
Energy in airgap	820	820	mJ
Flux density	1,03	1,03	T
Airgap height	8	8	mm
Voice coil height	15	17,2	mm
Core diameter	50	50	mm
Magnet material	Magnadur		
diameter	130	130	mm
weight	1,05	1,05	kg
Weight of loudspeaker	3,0	3,0	kg

The loudspeaker has a paper cone and a rubber surround.

Connection to the loudspeaker by means of 6.3 mm (0.25 inch) tag connectors or by soldering.

Dimensions (mm)

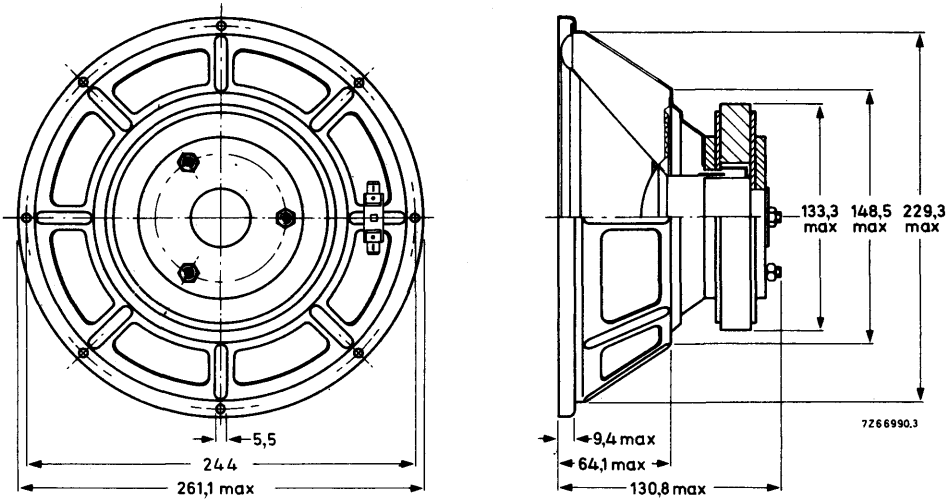


Fig. 1

Baffle hole diameter 227 mm

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve b : Sound pressure measured in anechoic room at operating power of 2, 5 W. Loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

Curve c : 2nd and 3rd harmonic distortion, measured at operating power of 2, 5 W in anechoic room. Loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

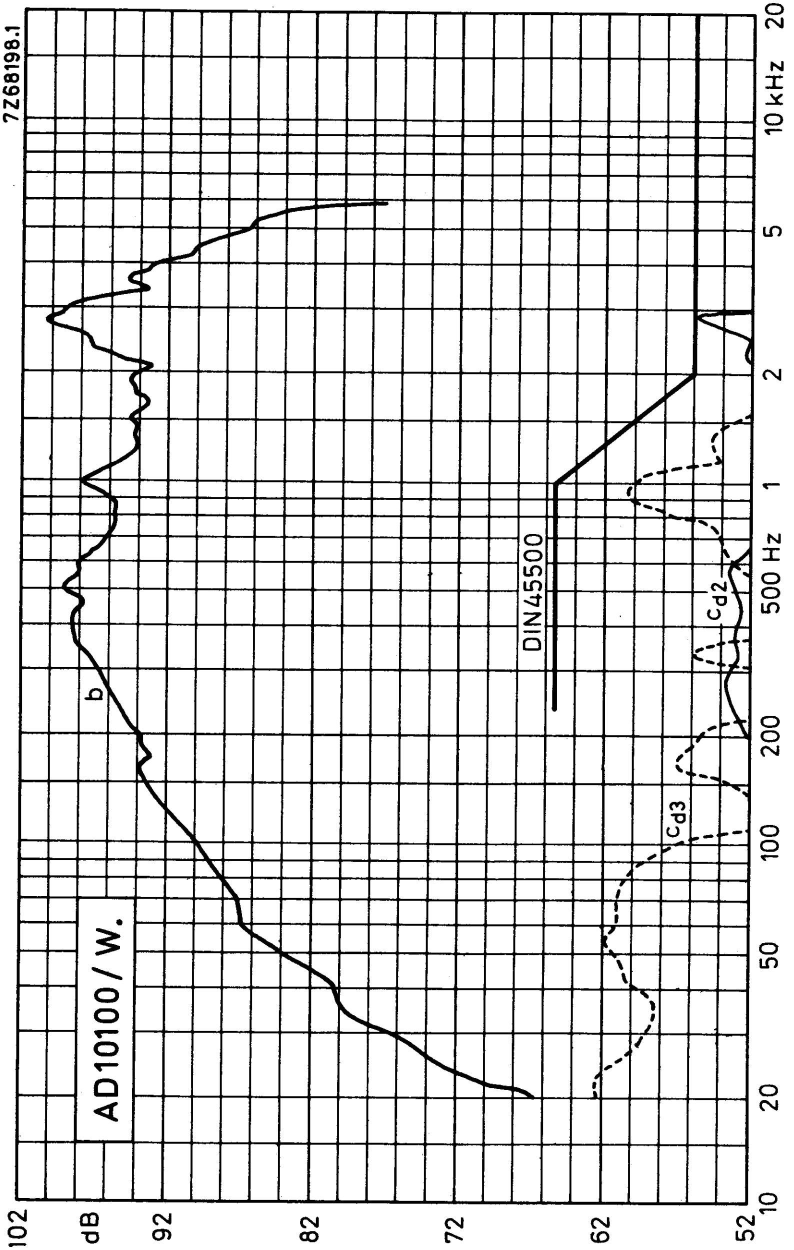

7Z68198.1
AD10100/W.
b
DIN45500
c_{d2}
c_{d3}
102
dB
92
82
72
62
52
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20

Fig. 2

12 INCH HIGH POWER FULL RANGE LOUDSPEAKERS

AD1265/M Series

APPLICATION

Public address systems.

TECHNICAL DATA

	version			
	M4	M8	M15	
Rated impedance	4	8	15	Ω
Voice coil resistance	3,4	7	13	Ω
Resonance frequency	45	45	45	Hz
Power handling capacity, measured without filter, loudspeaker unmounted	20	20	20	W
Operating power	1,44	1,44	1,44	W
Sweep voltage	6,3	9	12,2	V
Energy in airgap	225	225	225	mJ
Flux density	1,12	1,12	1,12	T
Airgap height	5	5	5	mm
Voice coil height	6,5	6,5	4,5	mm
Core diameter	25	25	25	mm
Magnet material		Magnadur		
diameter	90	90	90	mm
weight	0,45	0,45	0,45	kg
Weight of loudspeaker	1,8	1,8	1,8	kg

The loudspeaker has a paper surround and a double cone.

Connection to the loudspeaker by means of 6,3 mm (0,25 inch) Fastons or soldering.

Dimensions (mm)

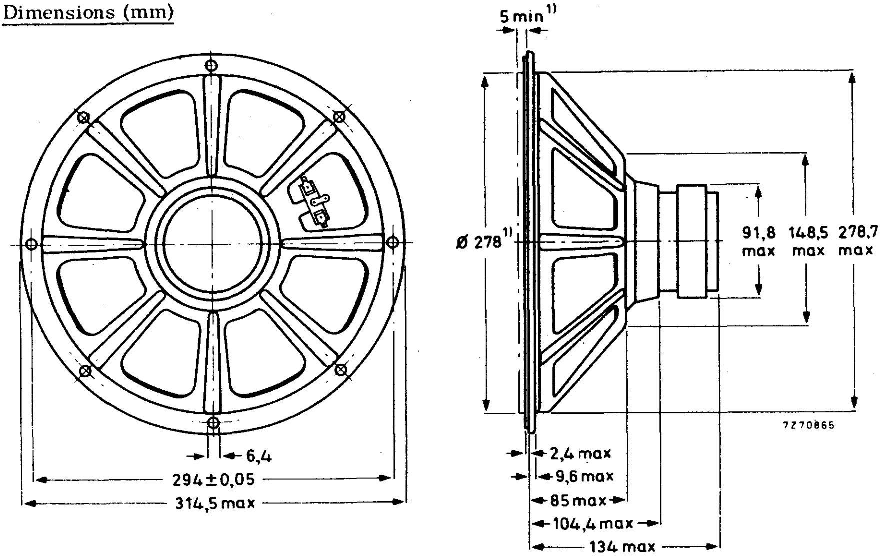


Fig. 1

[1] Baffle hole and clearance depth required for cone movement at the specified power handling capacity.

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve b : Sound pressure measured in anechoic room at operating power of 1, 44 W. Loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

Curve c : 2nd and 3rd harmonic distortion, measured at operating power of 1, 44 W in anechoic room. Loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

12 INCH HIGH POWER FULL RANGE LOUDSPEAKERS

AD1265/M Series

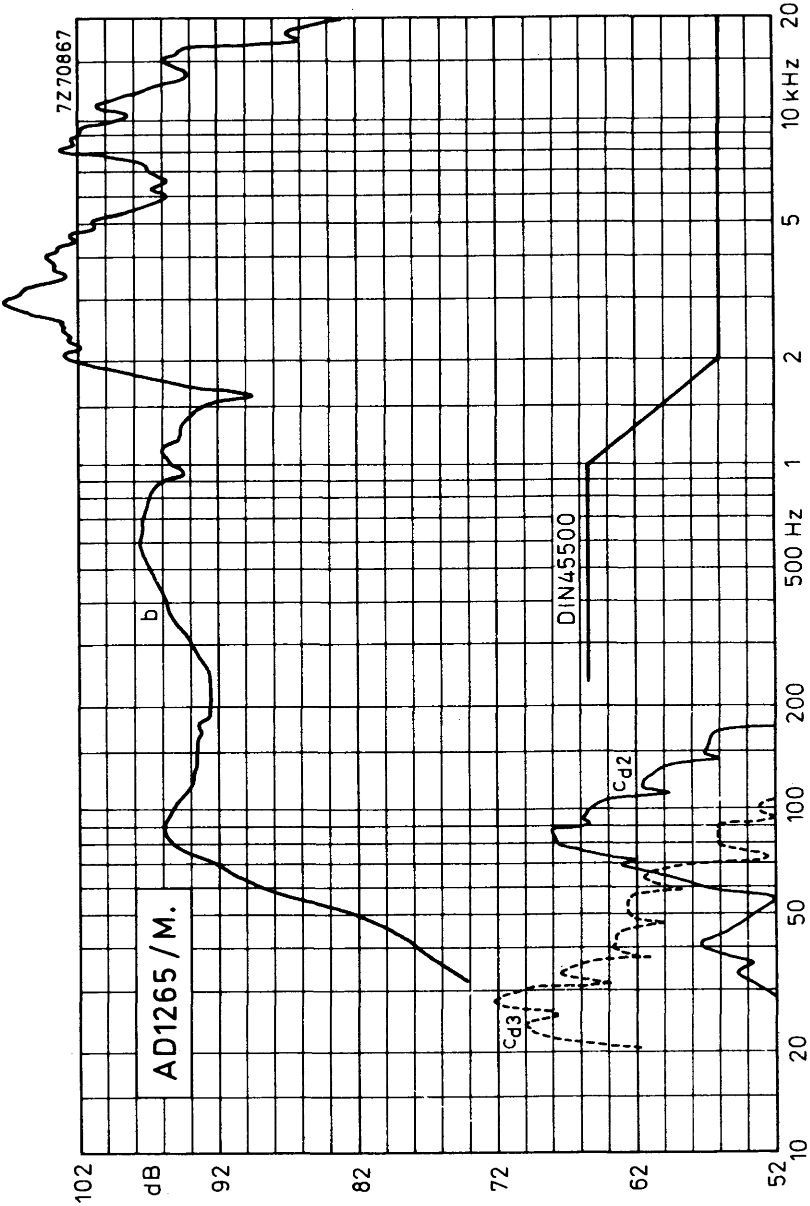


Fig. 2

12 inch HIGH POWER FULL RANGE LOUDSPEAKER

APPLICATION

A dual cone loudspeaker for high power applications such as guitar amplifiers and electronic organs.

TECHNICAL DATA

	version		
	HP4	HP8	
Rated impedance	4	8	Ω
Voice coil resistance	3,5	7,2	Ω
Resonance frequency	60	60	Hz
Power handling capacity, measured without filter loudspeaker unmounted	50	50	W
Operating power	1	1	W
Sweep voltage	10	14	V
Energy in airgap	820	820	mJ
Flux density	1,03	1,03	T
Airgap height	8	8	mm
Voice coil height	12,2	12,5	mm
Core diameter	50	50	mm
Magnet material	Magnadur		
diameter	130	130	mm
weight	1	1	kg
Weight of loudspeaker	3,27	3,27	kg

The loudspeaker has a paper cone, a textile surround and a cork gasket on the flange.

Connection to the loudspeaker by means of 6.3 mm (0.25 inch) tag connectors or by soldering.

Dimensions (mm)

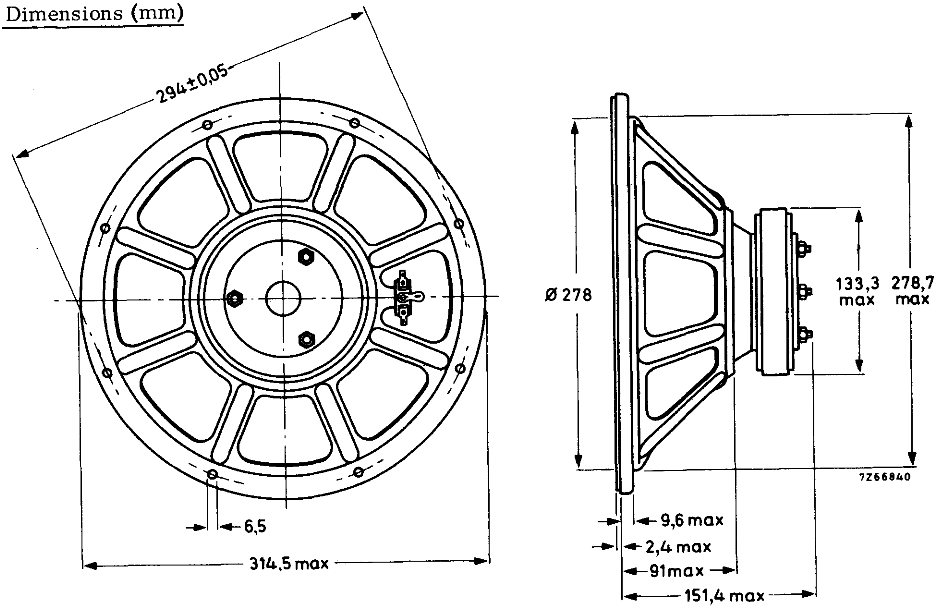


Fig. 1

Baffle hole diameter 278 mm

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve b : Sound pressure measured in anechoic room at operating power of 1 W. Loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

Curve c : 2nd and 3rd harmonic distortion, measured at operating power of 1 W in anechoic room. Loudspeaker mounted in 80 l enclosure, filled with 1 kg of glass wool.

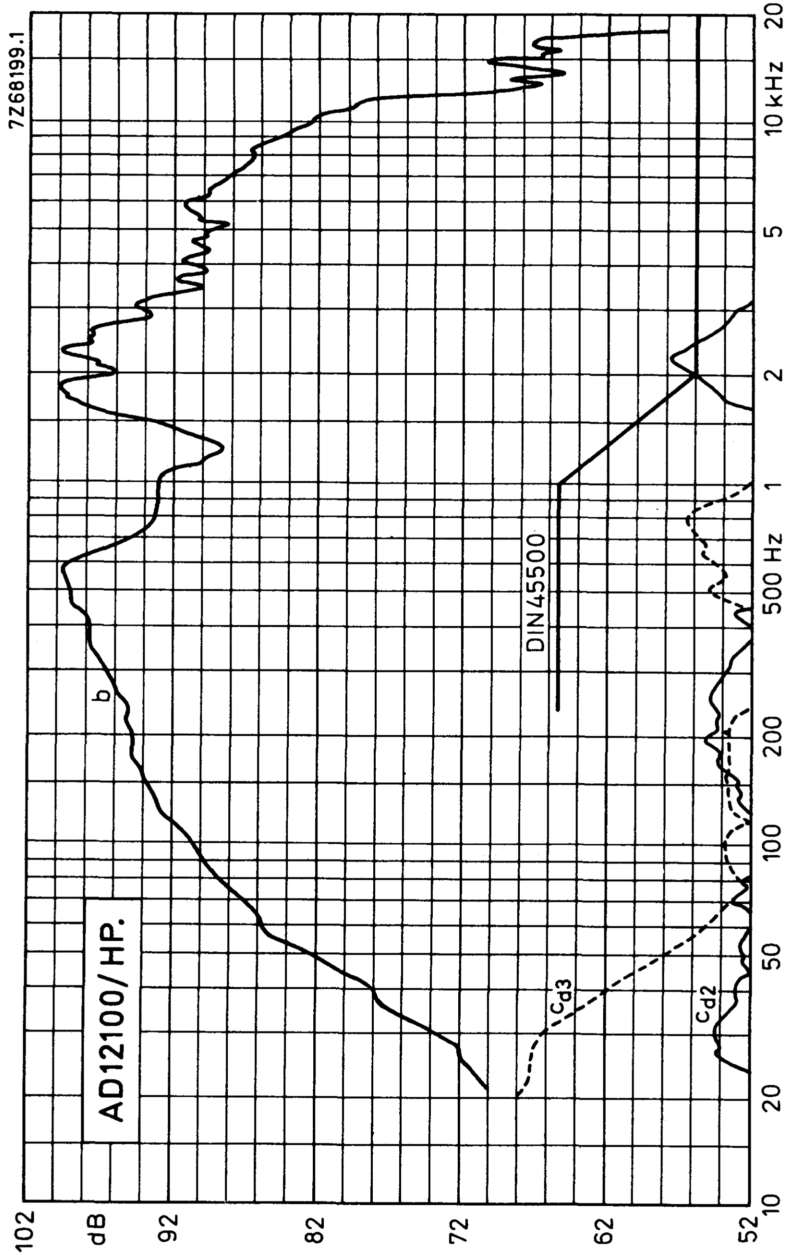

7Z68199.1
AD12100/HP.
b
DIN45500
c_{d3}
c_{d2}
102
dB
92
82
72
62
52
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20

Fig. 2

12 inch HIGH POWER FULL RANGE LOUDSPEAKER

APPLICATION

A dual-cone loudspeaker with extremely high sensitivity for power applications such as public address systems, discotheques and domestic enclosures greater than 50 litres, and open baffles.

TECHNICAL DATA

	version			
	M4	M8	M15	
Rated impedance	4	8	15	Ω
Voice coil resistance	3, 2	7	13, 2	Ω
Resonance frequency	45	45	45	Hz
Power handling capacity, measured without filter, loudspeaker unmounted	25	25	25	W
Operating power	0, 55	0, 55	0, 6	W
Sweep voltage	6, 3	9	12, 2	V
Energy in airgap	970	970	970	mJ
Flux density	1, 15	1, 15	1, 15	T
Airgap height	8	8	8	mm
Voice coil height	9, 1	10, 3	13, 3	mm
Core diameter	33, 4	33, 4	33, 4	mm
Magnet material	Magnadur			
diameter	130	130	130	mm
weight	1	1	1	kg
Weight of loudspeaker	3, 3	3, 3	3, 3	kg

The loudspeaker has a paper cone and surround and a cork gasket on the flange.

Connection to the loudspeaker by means of 6.3 mm (0.25 inch) tag connectors or by soldering.

Dimensions (mm)

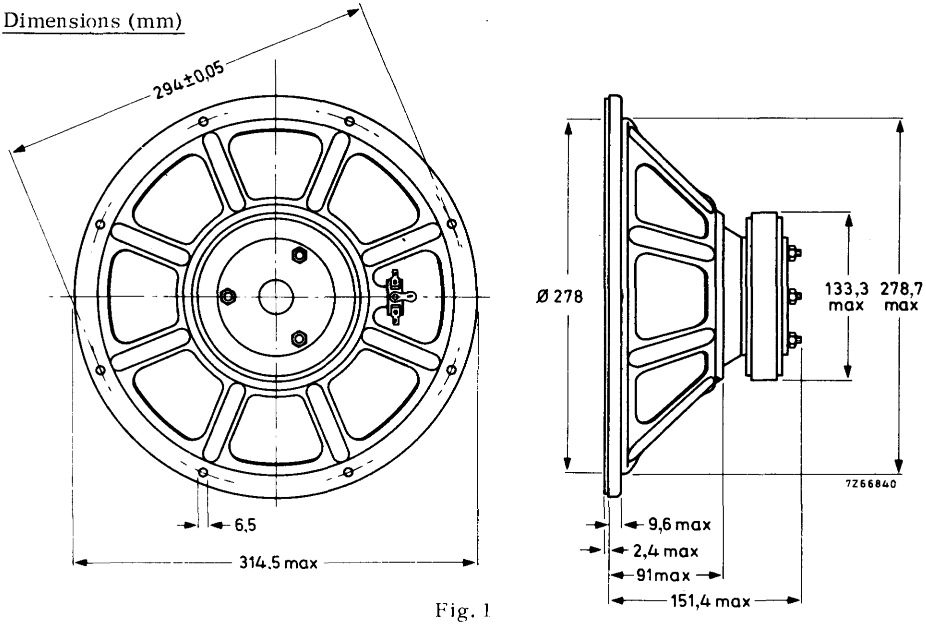


Fig. 1

Baffle hole diameter 278 mm

One tag is indicated by a red mark for in-phase connection.

FREQUENCY RESPONSE CURVES (see Fig. 2)

Curve b : Sound pressure measured in anechoic room at operating power of 0, 55 W. Loudspeaker mounted in sealed 80 l enclosure, filled with 1 kg of glass wool.

Curve c : 2nd and 3rd harmonic distortion, measured at operating power of 0, 55 W in anechoic room. Loudspeaker mounted in 80 l enclosure, filled with 1 kg of glass wool.

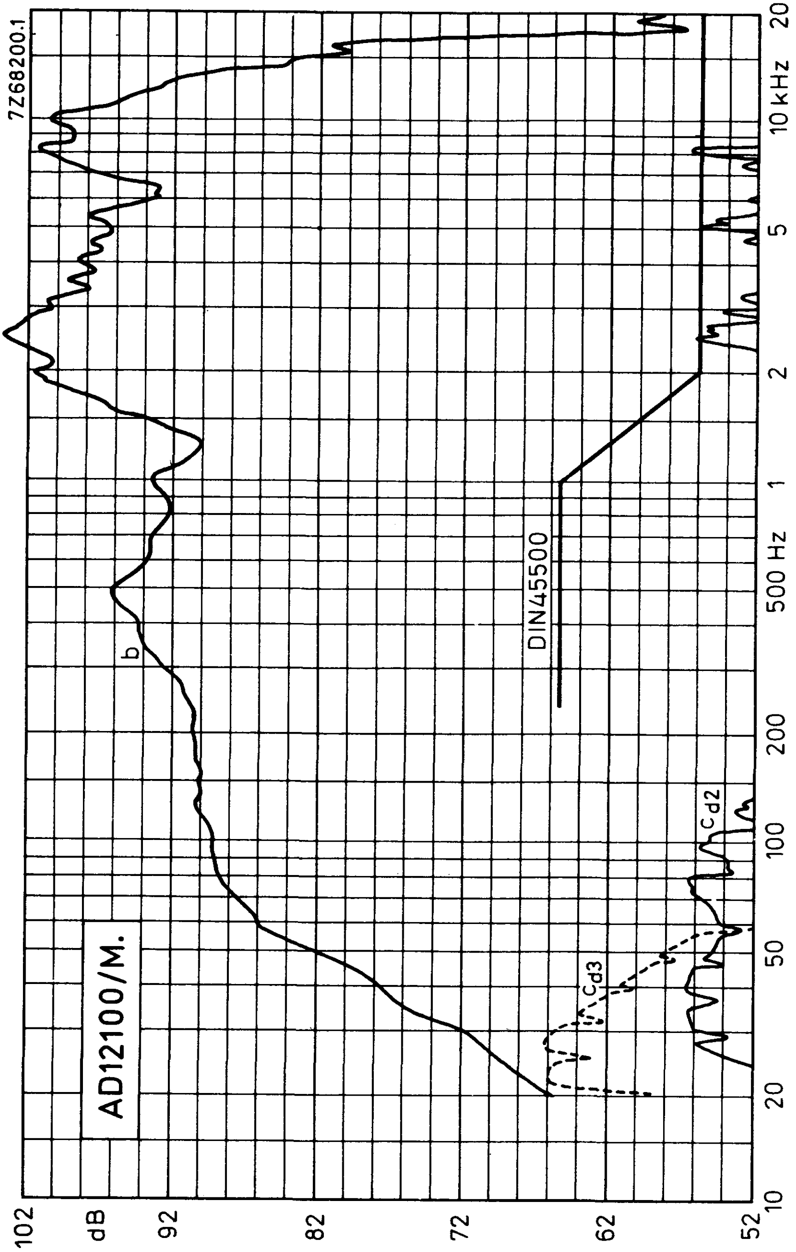

7Z68200.1
AD12100/M.
b
DIN45500
Cd2
Cd3
102
dB
92
82
72
62
52
10
20
50
100
200
500 Hz
1
2
5
10 kHz
20

Fig. 2

2-WAY CROSS-OVER NETWORK

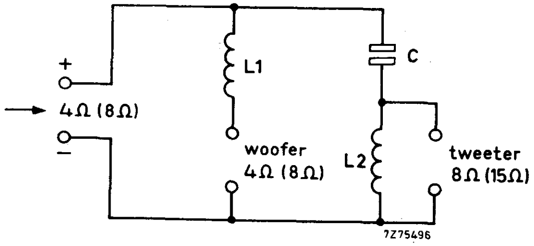
APPLICATION

For use in 2-way loudspeaker systems with high fidelity woofers and dome tweeters. The latter with increased impedance to obtain a higher power handling capacity for the system.

TECHNICAL DATA

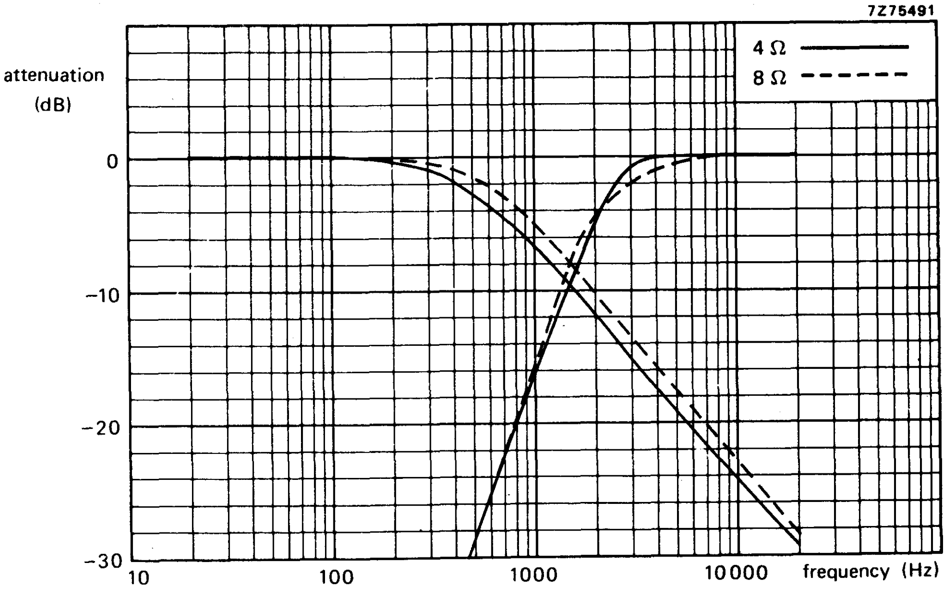
Rated impedance	
type ADF1500/4	4 Ω
type ADF1500/8	8 Ω
Cross-over frequency	
type ADF1500/4	1500 Hz
type ADF1500/8	1800 Hz
Power handling capacity	80 W
Slope	
low pass	6 dB/octave
high pass	12 dB/octave

Circuit diagram



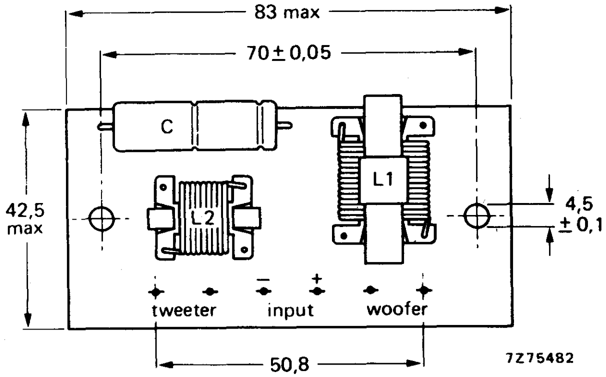
	version 4 Ω	version 8 Ω	
L1	1,2	2,1	mH
L2	0,5	1,2	mH
C	8	3,3	μF

Frequency characteristics



Dimensions (mm) and connections

Total height 35 mm
6 soldering tags for connection



2-WAY CROSS-OVER NETWORK

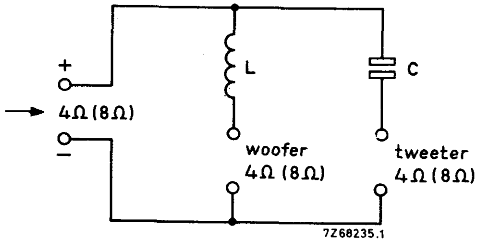
APPLICATION

For use in 2-way loudspeaker systems with high fidelity or high quality woofers and cone tweeters AD2071/T., AD2090/T. or AD2095/T.

TECHNICAL DATA

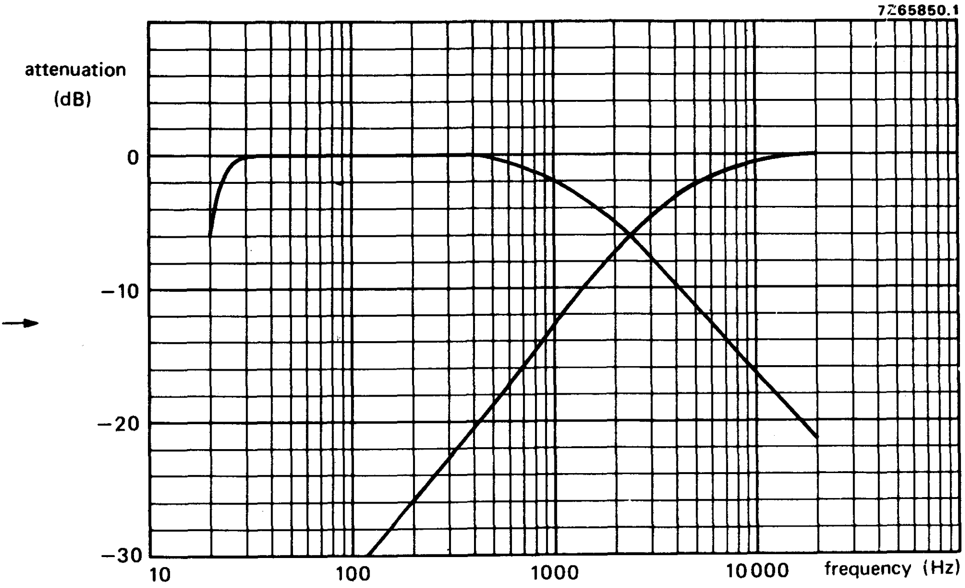
Rated impedance	
type ADF2400/4	4 Ω
type ADF2400/8	8 Ω
Cross-over frequency	2400 Hz
Power handling capacity	20 W
Slope	
low pass	6 dB/octave
high pass	6 dB/octave

Circuit diagram



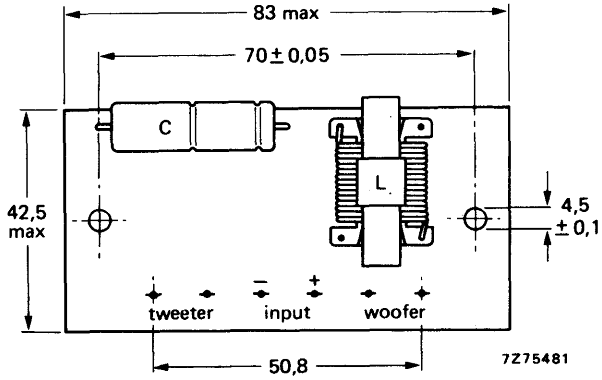
	version		
	4 Ω	8 Ω	
L	0,5	1,2	mH
C	12	5	μF

Frequency characteristics



Dimensions (mm) and connections

Total height 35 mm
6 soldering tags for connection



3-WAY CROSS-OVER NETWORK

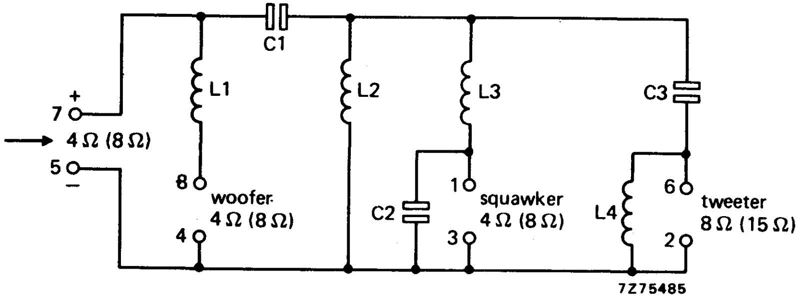
APPLICATION

For use in 3-way loudspeaker systems with high fidelity woofers, squawkers and dome tweeters; the high sensitivity type tweeters AD0162/0163 should have twice the impedance of the woofer and squawker to obtain a higher power handling capacity.

TECHNICAL DATA

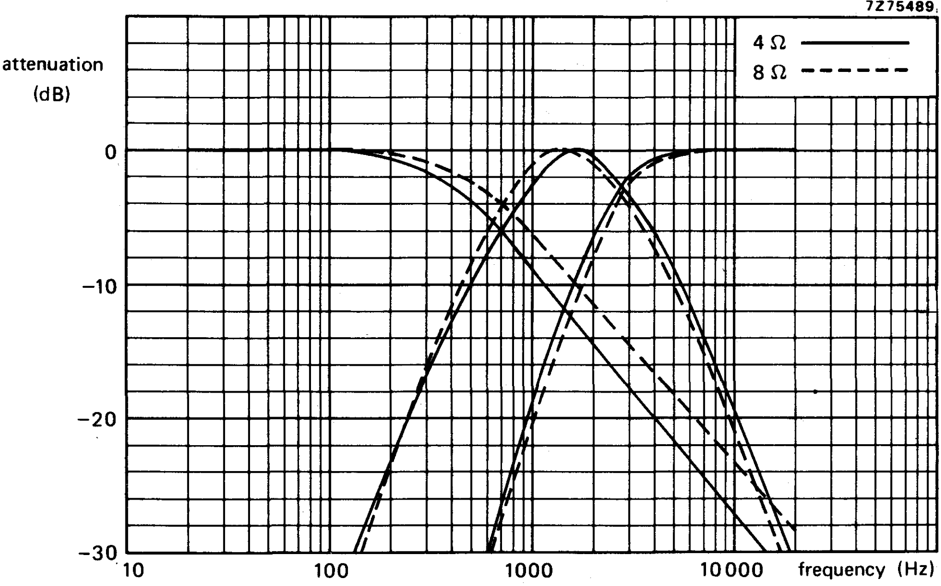
Rated impedance	
type ADF700/2600/4	4 Ω
type ADF700/2600/8	8 Ω
Cross-over frequencies	
type ADF700/2600/4	650 and 2800 Hz
type ADF700/2600/8	700 and 2600 Hz
Power handling capacity	80 W
Slope	
low pass	6 dB/octave
band pass (mid-range)	12 dB/octave
high pass	12 dB/octave

Circuit diagram



	version 4 Ω	8 Ω	
L1	2,1	3	mH
L2	1,2	2,1	mH
L3	0,35	0,8	mH
L4	0,5	0,8	mH
C1	36	24	μF
C2	8	5	μF
C3	5	3,3	μF

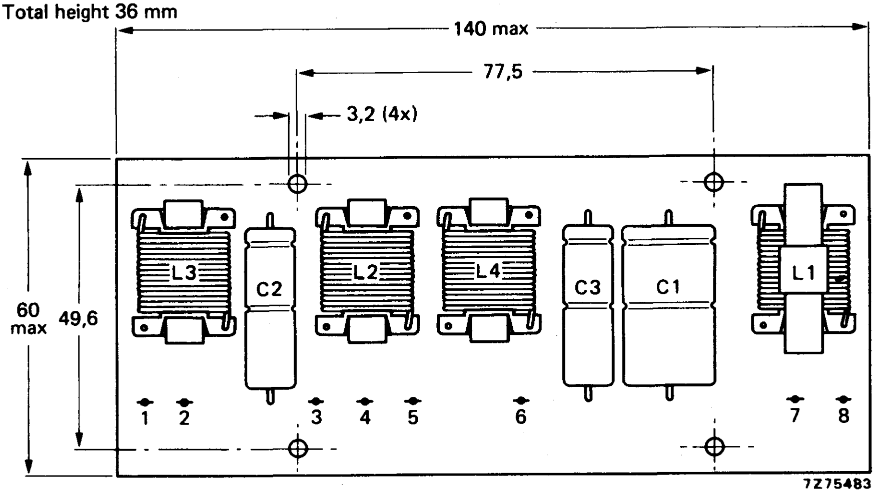
Frequency characteristics



Dimensions (mm) and connections

See also circuit diagram for connection to the 8 soldering tags.

Total height 36 mm



TELEVISION TUNERS

B

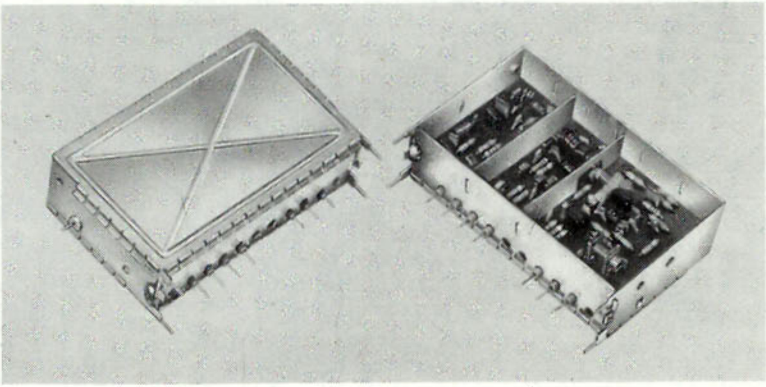
V.H.F. TELEVISION TUNER with diode tuning

ELC1042

QUICK REFERENCE DATA

Designed to cover the present 405 line v.h.f. and 625 line (wired distribution) channels. It also covers the CCIR v.h.f. channels required for export receivers.

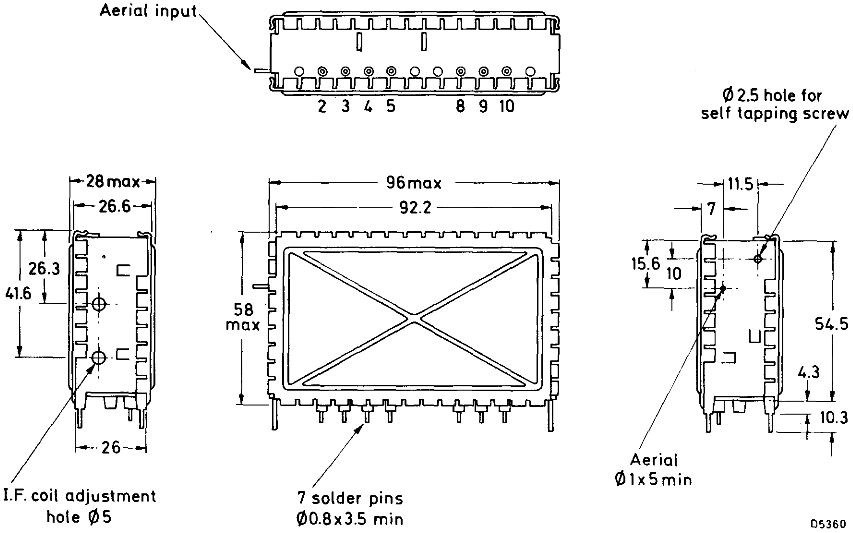
Systems	U.K. and CCIR	
Channel coverage		
band I	1 to 5 and A to C	
band III	6 to 14, D to I and CCIR E12	
Supply voltages		
transistors and switching diodes	+12	V
tuning diodes	+0.3 to + 28	V
Noise factor, typical		
band I	7	dB
band III	7	dB
Power gain, typical		
band I	20	dB
band III	22	dB

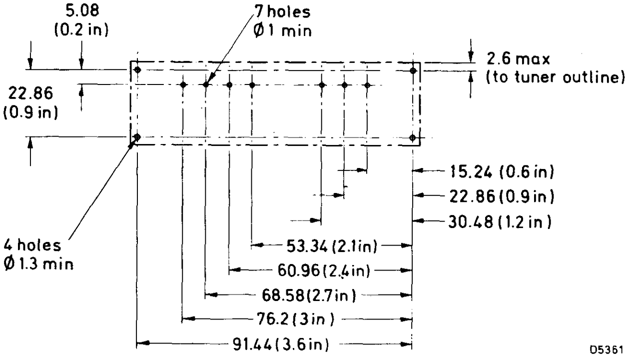


CONSTRUCTION

The components are mounted on a printed wiring board, suitable screening is added and the whole assembly is placed in a metal box. The external connection terminations are brought out of the box, by feed-through capacitors. The i.f. coil is situated at one end of the tuner and can be adjusted through a hole provided in the end of the box.

DIMENSIONS (millimetres) AND CONNECTIONS





Piercing diagram viewed from component side of board

Pin	Connection	Pin	Connection
2	A.G.C., positive	8	+12V, oscillator + mixer supply
3	+12V switching voltage, band III	9	Test point
4	+12V, r.f. transistor supply	10	I.F. output
5	+0.3 to +28V tuning diode supply		

V.H.F. TELEVISION TUNER
with diode tuning

CIRCUIT DESCRIPTION

The tuner is of the three transistor type, comprising an r.f. stage, a mixer and an oscillator. The tuning of the r.f./mixer bandpass filter and the oscillator stage is accomplished by variable capacity diodes.

Switching from band I to band III is achieved by applying a 12V supply to five diodes, via pin 3 of the tuner.

ELECTRICAL DATA

Unless otherwise specified, all characteristics apply at an ambient temperature of 20 ± 5°C and a relative humidity of 75% max. All values are typical unless otherwise specified.

	Conditions	Value
Channel coverage band I (see note 1)	41.5MHz sound carrier	channel 1
	63.25MHz sound carrier	channel 5
Channel coverage band III (see note 1)	175.25MHz vision carrier	channel D
	224.25MHz vision carrier	CCIR E12
Input impedances	asymmetrical	75Ω
Intermediate frequencies, vision	405 line system	34.65MHz
	625 line system	39.5 MHz
Intermediate frequencies, sound	405 line system	38.15MHz
	625 line system	33.5 MHz
Supply voltages	transistors	+12V ± 10%
	tuning diodes (see note 2)	+0.3V to +28V
	switching diodes (band III only)	+12V
Supply currents	r.f. amplifier at nominal gain	3.4mA
	oscillator plus mixer at nominal gain	6.8mA
	tuning diodes	35μA
	switching diodes	12mA
A.G.C. voltage (see figs. 3 and 4)	band I at nominal gain	2.5V
	band I at 40dB gain reduction	4.9V
	band III at nominal gain	2.5V
	band III at 40dB gain reduction	4.3V

ELECTRICAL DATA (contd.)

	Conditions	Value
A.G.C. current	band I at 40dB gain reduction	max. 0.8mA
	band III at 40dB gain reduction	max. 0.6mA
A.G.C. range	both bands	min. 40dB
V.S.W.R.	both bands at nominal gain, or with a.g.c. except channel 1	max. 3.5
R.F. bandwidth	band I channels 2 to 5 and A to C band III all channels	10 to 12MHz 10 to 25MHz
Relative levels of sound and vision carriers (tilt)	any channel except channels 1 and CCIR E12	max. 3dB
	channel 3	1dB
	channel 8	1dB
Power gain	any channel except channel 1	min. 18dB
	channel 1	min. 16dB
	channel 2	20dB
	CCIR E4	22dB
	CCIR E5	23dB
	CCIR E12	22dB
Noise figure	any channel	max. 10dB
	channel 3	7dB
	channel 10	7dB
I.F. rejection	channel 2	min. 30dB
	channel 5	min. 40dB
	CCIR E12	min. 60dB
Image rejection	band I any channel band III any channel	min. 60dB min. 40dB
Signal handling, signal input level producing 1% cross modulation (see note 3)	in channel at nominal gain, on wanted vision carrier from interfering accompanying sound carrier	band I 10mV band III 8mV
	in band at nominal gain, on wanted vision carrier channel (X) from interfering vision carrier channel (X-2)	band I 80mV band III 25mV
Signal handling, signal input level producing overloading (see note 4)	band I any channel at nominal gain	20mV
	band III any channel at nominal gain	13mV
	both bands at 40dB gain reduction	min. 200mV
I.F. output detuning	after band switching and tuning	max. 200kHz

ELECTRICAL DATA (contd.)

	Conditions	Value
Oscillator frequency drift	10% change in supply voltage	max. 300kHz
	3 to 60 second warm up after switch on	max. 50kHz
	input signal of 20 to 50mV at nominal gain	20kHz
	temperature change from 25 to 40°C	max. 400kHz
Temperature ranges	operating ambient	+5 to +50°C
	storage	-25 to +60°C

NOTES

1. There is a tuning margin of 2MHz at the extremes of Band III (including CCIR channel E12) and Band I (including channel C) below channel 1 and 1MHz above channel 5.

2. A stabilised supply of +28V is required for the tuning diodes to minimise tuning variations caused by mains fluctuations. See figures 1 and 2 for tuning voltages plotted against channel settings and frequencies.

3. This is the aerial e.m.f. (referred to 75Ω), which will cause the transference of 1% of the modulation of an unwanted signal to the carrier of the wanted signal.

4. A signal causing overloading is that aerial e.m.f. (referred to 75Ω) which produces a 30% compression of the synchronisation pulses (of a standard television signal) or a noticeable deterioration of the picture quality.

Oscillator radiation

The tuner is designed to meet the oscillator radiation quoted in BS905 (1969), providing the conditions for relaxation are adhered to, and no permanent connection is made to the tuner test point (pin 9). Connections between the tuner and i.f. amplifier should be kept as short as possible.

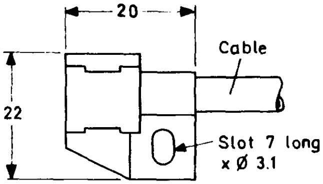
ACCESSORIES (dimensions in millimetres)

Immunity shield

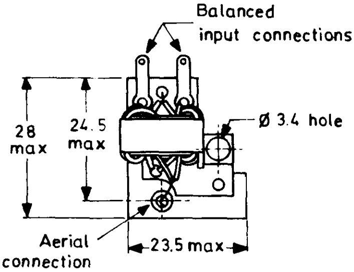
In order to meet the immunity requirements of BS905 (1969) it is recommended that the aerial connection should be screened. A suitable screening shield, fixed by a screw to the tuner is available under type No. 4313 135 01170.

Baluns

A balun transformer, type number ELC1094, is available to convert the aerial input from 75Ω asymmetric to 300Ω balanced, for tuners incorporated into export (CCIR) receivers.



Immunity shield and cable clamp
for aerial connector



300Ω balun transformer D5362

MOUNTING

The most suitable method of mounting the tuner is soldering directly on to a printed wiring board using the piercing diagram shown under DIMENSIONS AND CONNECTIONS.

SOLDERING CONDITIONS 260°C maximum for 5 seconds maximum

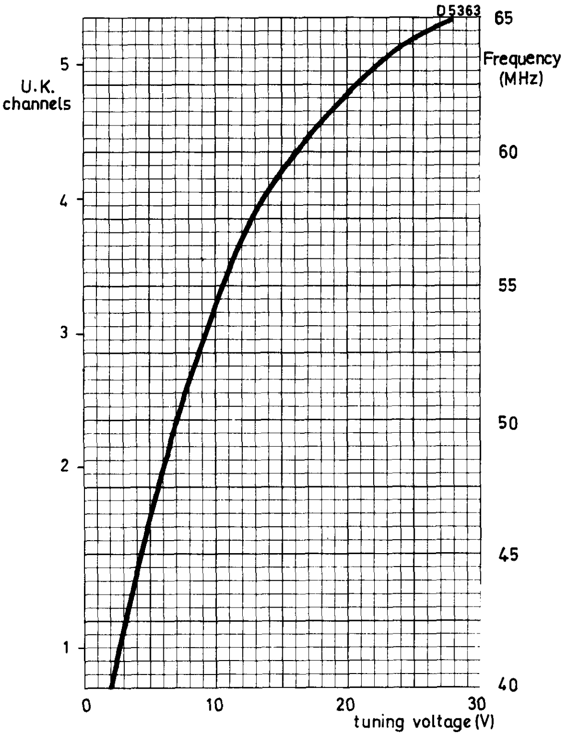


Figure 1. TYPICAL BAND I TUNING VOLTAGE PLOTTED AGAINST CHANNEL SETTING WITH A SOUND I. F. OF 38. 15MHz

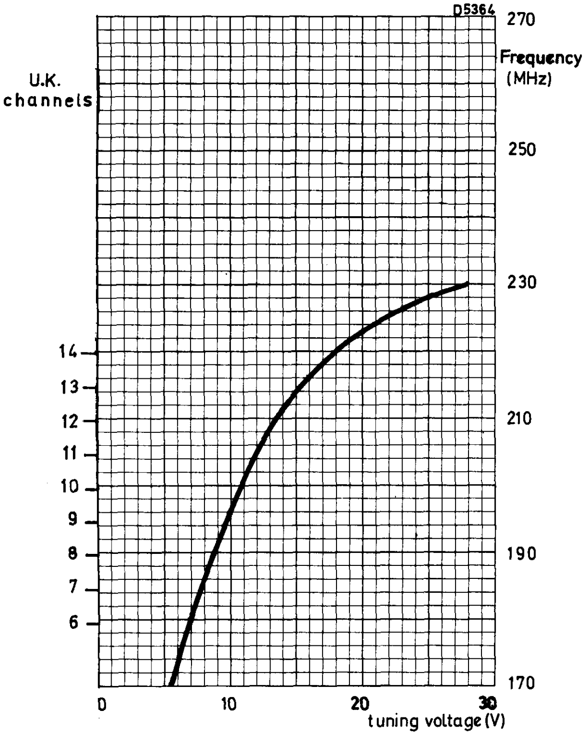


Figure 2. TYPICAL BAND III TUNING VOLTAGE PLOTTED AGAINST CHANNEL SETTING WITH A VISION I. F. OF 34. 65MHz

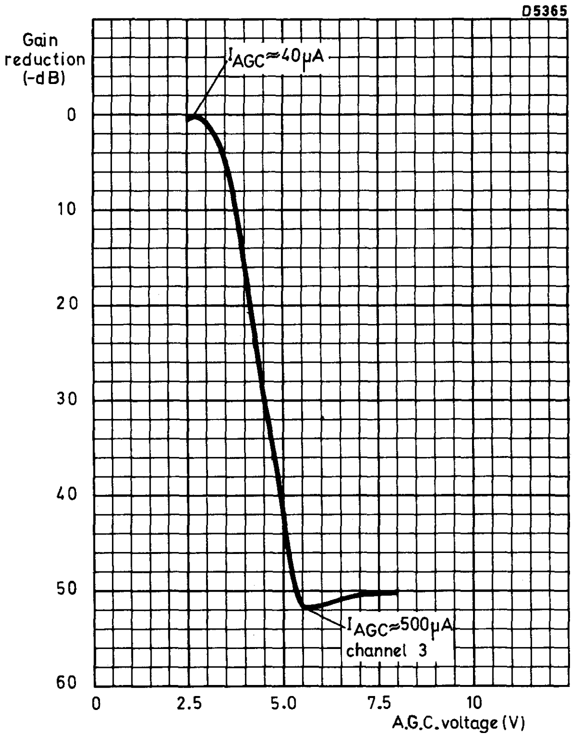


Figure 3. TYPICAL I A.G.C. VOLTAGE PLOTTED AGAINST GAIN REDUCTION

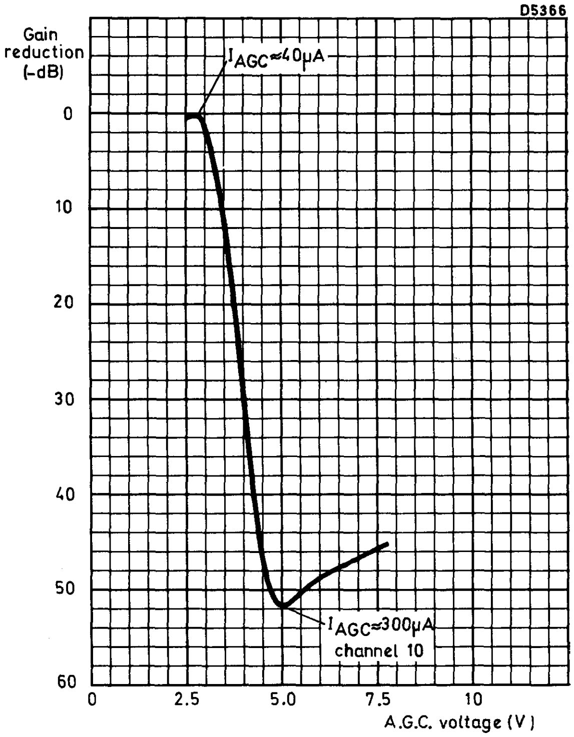


Figure 4. TYPICAL BAND III A.G.C. VOLTAGE PLOTTED AGAINST GAIN REDUCTION

V.H.F. TELEVISION TUNER
with diode tuning

ELC1042/05

QUICK REFERENCE DATA

Designed to cover 405 lines v.h.f., and 625 lines (wired distribution) channels, and the u.h.f. channels of the C.C.I.R. system B.

Systems	C.C.I.R. systems A, B and I		
Channels	System A	System B	System I
band I	B1 to B5	E2 to E4	IA to IC
band III	B6 to B14	E5 to E12	ID to IJ
Intermediate frequencies			
picture	34.65 MHz	38.9 MHz	39.5 MHz
sound	38.15 MHz	33.4 MHz	33.5 MHz

DESCRIPTION

A v.h.f. tuner with electronic tuning and band switching, covering the v.h.f. band I (frequency range 41.5 to 68 MHz, and the v.h.f. band III (frequency range 174 to 230 MHz).

Mechanically, the tuner is built on a low-loss printed-wiring board, carrying all components and housed in a metal case consisting of a rectangular frame and front and rear covers (see Fig. 2). The aerial connection is on the frame side, all other connections (supply voltages, a.g.c. voltage, tuning and switching voltages) are made via feedthrough capacitors in the underside. The mounting method is described below.

The v.h.f. aerial signal is fed via an i.f. trap to a tuned input circuit, which is connected to the emitter of the input transistor BF264. The collector load of this transistor is formed by a double tuned circuit, transferring the signal to the base of the mixer transistor BF195. The oscillator is equipped with a BF194 transistor. The three r.f. circuits are tuned by three capacitance diodes BB105G. Switching between v.h.f. I and III is achieved by five switching diodes BA182.

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.

The tuner requires transistor supply voltages of +12 V, a switching voltage of +12 V, a.g.c. voltages variable from +2.5 V (normal operating point) to about +6 V (maximum a.g.c.), and a tuning voltage variable from +0.3 V to +25 V.

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

→ DIMENSIONS (millimetres)

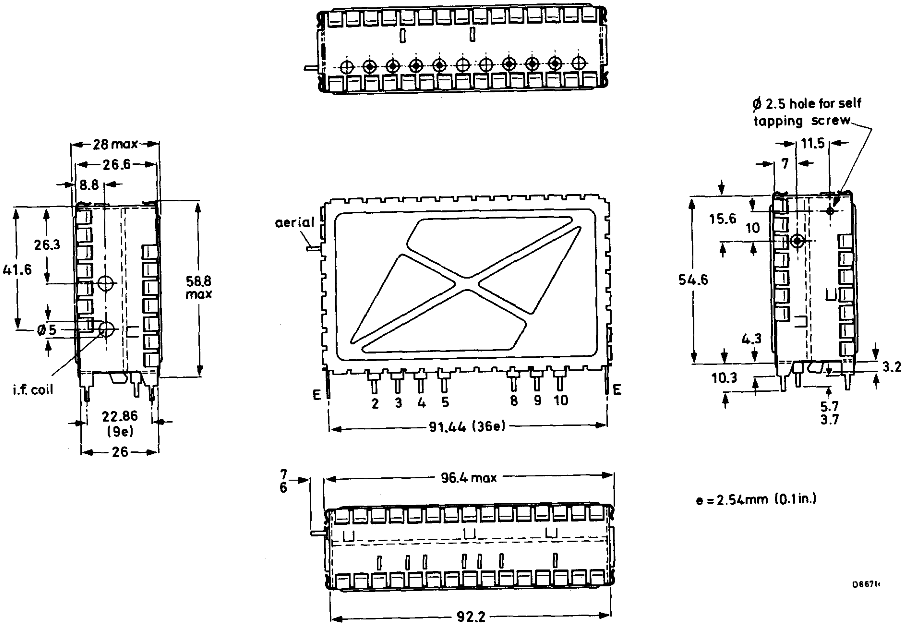


Fig. 1

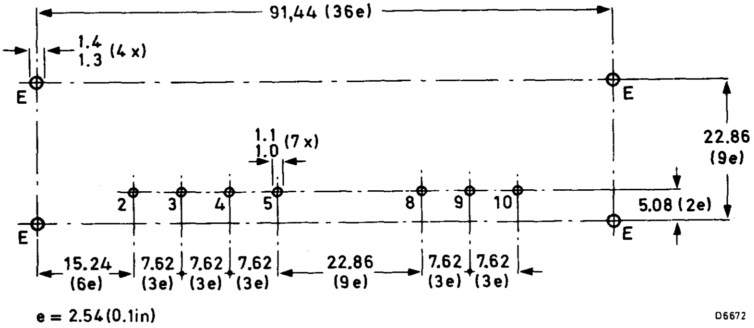


Fig. 2. Piercing diagram viewed from solder side of board.

V.H.F. TELEVISION TUNER with diode tuning

ELC1042/05

CIRCUIT DIAGRAM

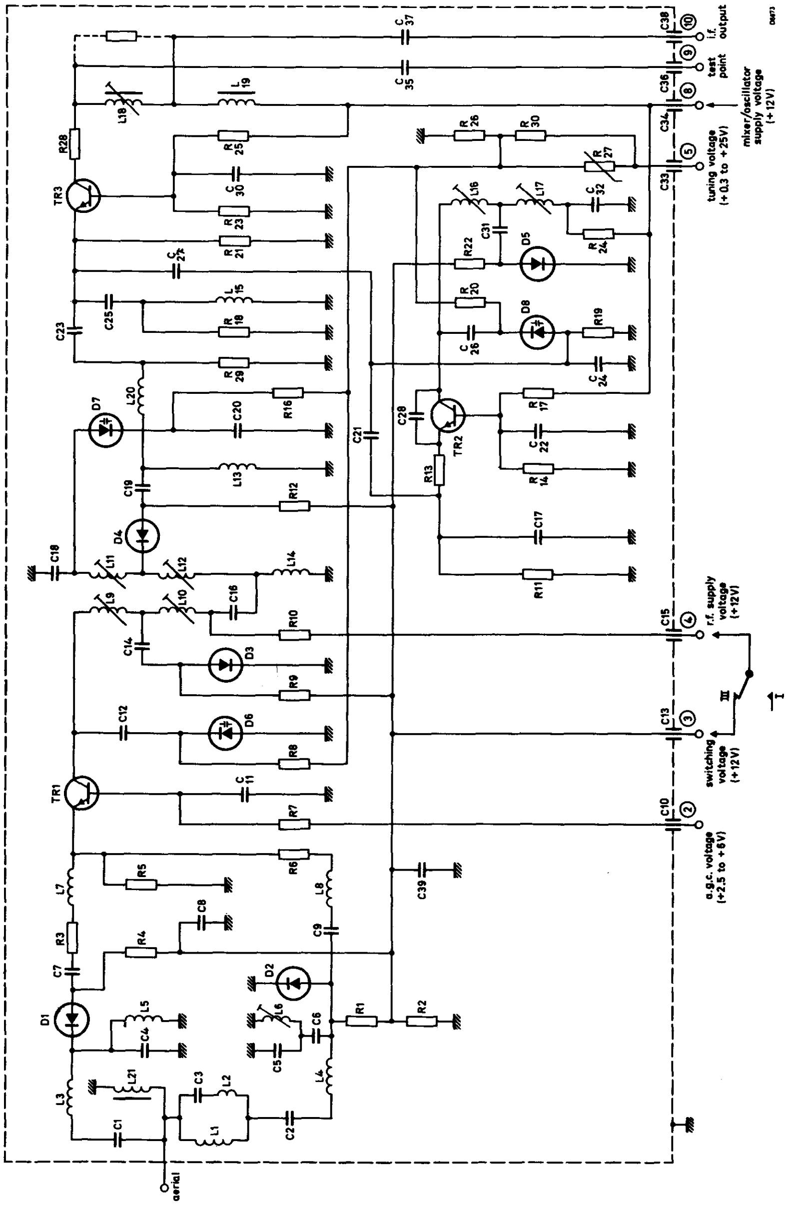


Fig. 3.

TERMINATIONS

2 = a.g.c. voltage, +2.5 to +6.0 V

3 = switching voltage, v.h.f. III, +12 V (approx. 12.5 mA)

4 = r.f. supply voltage, +12 V (approx 3.2 to 10 mA)

5 = tuning voltage, +0.3 to +25 V

8 = mixer/oscillator supply voltage, +12 V (approx. 6.7 mA)

9 = test point

10 = 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. 2. 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.

Dimensions in millimetres

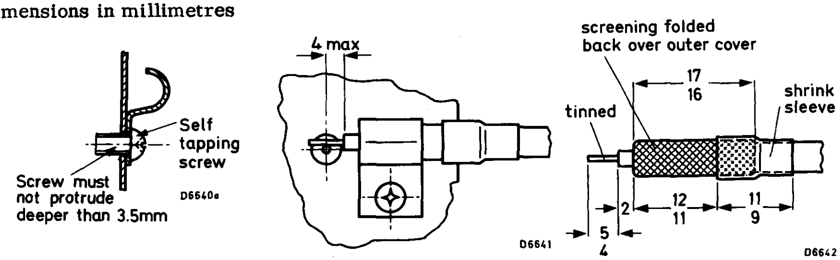


Fig. 4 Recommended fixing method of the aerial cable.

ACCESSORIES

Aerial input transformer (balun) for converting the aerial input from 75 Ω asymmetric to 300 Ω symmetric - type no. ELC1094.

Immunity shield for screening the aerial connection - type no. 4313 132 01910

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,	
r.f. amplifier	BF264
mixer	BF195
oscillator	BF194
tuning diodes	3 × BB105G
switching diodes	5 × BA182
Ambient temperature range	
operating	+5 to +55 °C
storage	-25 to +85 °C

ELECTRICAL DATA (Contd.)

Supply voltage	+12 V, ±10%	
Current drawn from +12 V supply		
band I	10 to 16.5 mA	depending on a.g.c. voltage
band III	22.5 to 29 mA	
A.G.C. voltage (Figs. 5 and 6)		
band I		
at nominal gain	+2.5 V	
at 40 dB gain reduction	typ. +4.9 V	
band III		
at nominal gain	+2.5 V	
at 40 dB gain reduction	typ. +4.3 V	
A.G.C. current at 40 dB gain reduction		
band I	max. 0.8 mA	
band III	max. 0.6 mA	
Tuning voltage range (Figs. 7 and 8)	+0.3 to +25 V	
Current drawn from 25 V tuning voltage supply	max. 30 μA	
Switching voltage		
band I	open circuit	
band III	+12 V, ± 10%	

Frequency ranges	System A	System B	System J
band I	channel B1 (picture carrier 45 MHz) to channel B5 (picture carrier 66.75 MHz)	channel E2 (picture carrier 48.25 MHz) to channel E4 (picture carrier 62.25 MHz)	channel IA (picture carrier 45.75 MHz) to channel IC (picture carrier 61.75 MHz)
band III	channel B6 (picture carrier 179.75 MHz) to channel B14 (picture carrier 219.75 MHz)	channel E5 (picture carrier 175.25 MHz) to channel E12 (picture carrier 224.25 MHz)	channel ID (picture carrier 175.25 MHz) to channel IJ (picture carrier 215.25 MHz)
Intermediate frequencies			
picture	34.65 MHz	38.9 MHz	39.5 MHz
sound	38.15 MHz	33.4 MHz	33.5 MHz

ELECTRICAL DATA (Contd.)

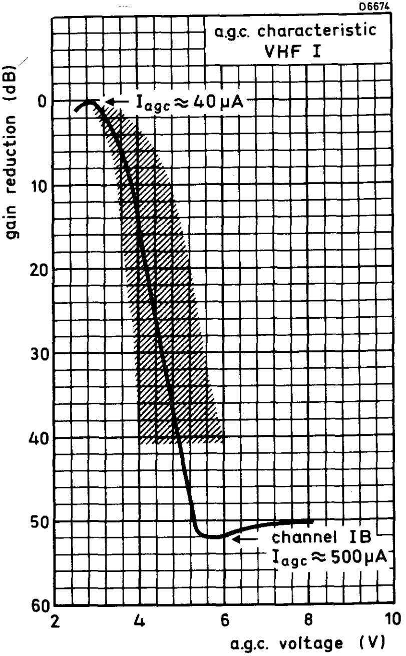


Fig. 5.

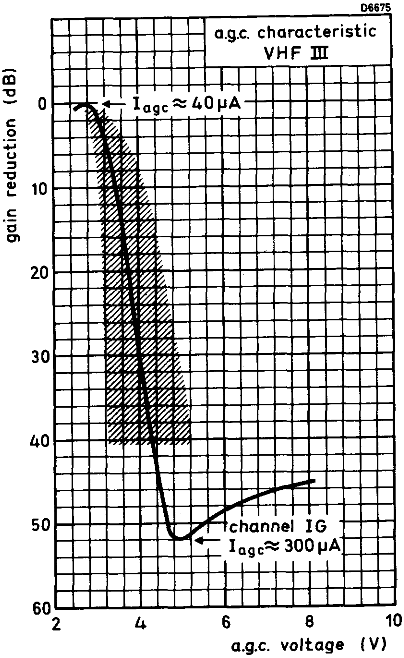


Fig. 6.

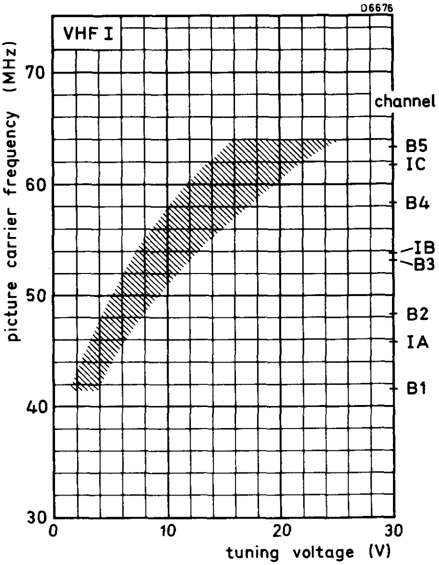


Fig. 7.

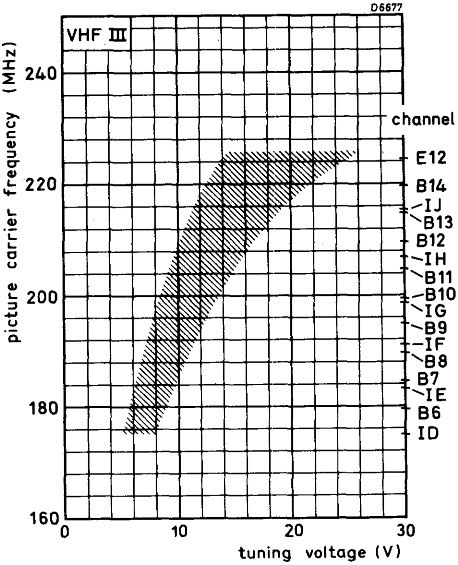


Fig. 8.

ELECTRICAL DATA (Contd.)

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 (ecept channel B1)	max. 3.5	max. 3.5
band III	max. 3.5	max. 3.5

A.G.C. range	
band I	min. 40 dB
band III	min. 40 dB
R.F. curves	
bandwidth	
band I, except channel B1	typ. 10 to 12 MHz
band III	typ. 9 to 20 MHz
tilt	
band I, except channel B1	max. 3 dB
band III, except channel E12	max. 3 dB
Power gain (see also MEASURING METHOD OF POWER GAIN)	
band I, except channel B1	min. 18 dB
channel B1	min. 16 dB
channel IA	typ. 20 dB
channel IC	typ. 22 dB
band III	min. 18 dB
channel ID	typ. 25 dB
channel IJ	typ. 24 dB
Noise figure	
band I, except channel B1	max. 10 dB
channel IB	typ. 7.5 dB
band III	max. 10 dB
channel IG	typ. 7.0 dB
I.F. rejection	
band I, channel B2	min. 30 dB
channel B5	min. 40 dB
band III	min. 60 dB
Image rejection	
band I	min. 60 dB
band III	min. 40 dB

ELECTRICAL DATA (Contd.)

Signal handling (see also Figs. 9 and 10)		
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. 8 to 14 mV	(note 1 overleaf)
v.h.f. III	typ. 6 to 10 mV	
in band		
wanted signal: picture carrier frequency of channel X, interfering signal: picture carrier of channel X -2		
v.h.f. I	typ. 60 to 100 mV	(note 1 overleaf)
v.h.f. III	typ. 20 to 30 mV	
Minimum input signal (e.m.f.) producing overloading, at nominal gain		
v.h.f. I	typ. 20 mV	(note 2 overleaf)
v.h.f. III	typ. 13 mV	
Minimum input signal (e.m.f.) at nominal gain producing a shift of the oscillator frequency of 20 kHz	typ. 20 to 50 mV	(note 3 overleaf)
Detuning of the i.f. output circuit as a result of bandswitching and tuning	max. 200 kHz	
Shift of oscillator frequency at a change of the supply voltage of 10%		
band I	max. 300 kHz	
band III	max. 300 kHz	
during warm -up time (measured between 3 s and 60 s after switching on)		
band I	max. 50 kHz	
band III	max. 50 kHz	
Drift of oscillator frequency at a change of the ambient temperature from 25 to 40 °C		
band I	max. 400 kHz	
band III	max. 400 kHz	

Oscillator radiation (oscillator voltages at the aerial terminal)

The oscillator radiation will be within the limits of BS905: 1969 provided no connection has been made to the test point and the circuit connected to the i.f. output is carefully shielded.

For the oscillator fundamentals, use is made of the relaxed limits, assuming that the design of the i.f. amplifier of the receiver is such that a detuning of the oscillator of > -2.0 MHz or >+0.6 MHz from the nominal frequency will result in unacceptable picture and/or sound degradation.

ELECTRICAL DATA (Contd.)

Immunity from radiated interference

If the tuner, including the aerial connection (see Fig. 4), is installed in a professional manner, the immunity from radiated interference will be within the limits specified in BS905: 1969.

If a higher safety margin, or another cable connection is required, use can be made of an immunity shield (see ACCESSORIES).

Microphonics

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

NOTES:

1. This e.m.f. 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. 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. is referred to an impedance of 75 Ω.

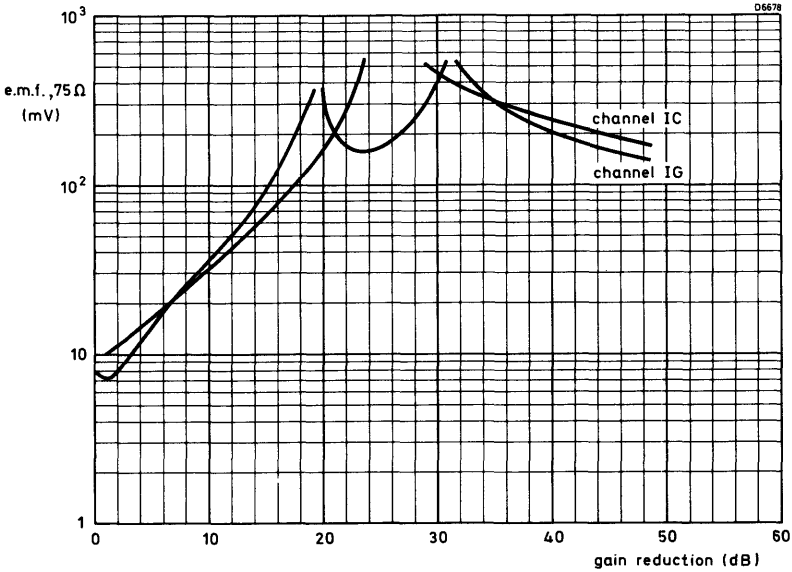


Fig. 9. Cross modulation, in channel.

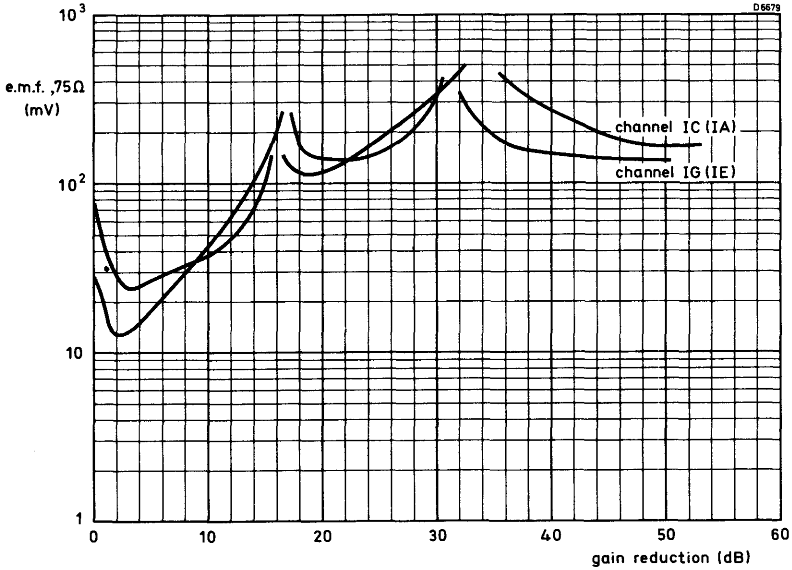


Fig. 10. Cross modulation, in band; the interfering channels are given between brackets.

MEASURING METHOD OF POWER GAIN

1. The i.f. output of the tuner should be terminated with the circuit given below, the test-point (terminal 9) not being connected.

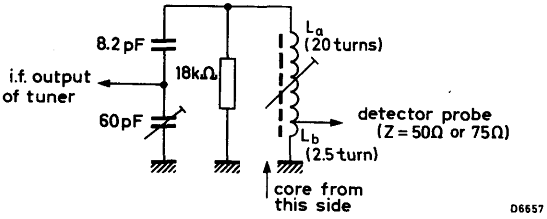


Fig. 11.

2. Feed an i.f. sweep signal to the v.h.f. I - mixer coupling coil.

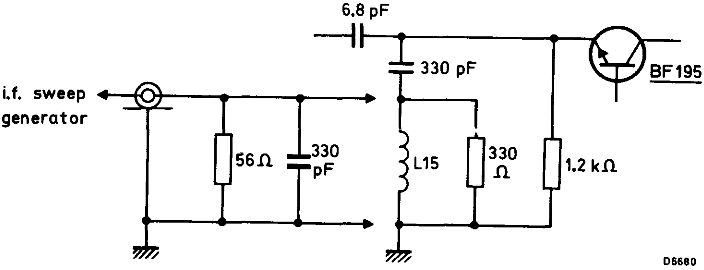


Fig. 12.

3. Adjust the trimmer (Fig. 11), tunable coil La/Lb, i.f. output coil of the tuner L18 (Fig. 1), and the coupling between La and Lb to get the resonant curve as given below.

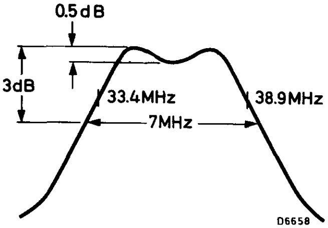


Fig. 13.

MEASURING METHOD OF POWER GAIN (Contd.)

Display the r.f. and i.f. curve of the tuner at 190 MHz (picture carrier frequency) and make, if necessary, small corrections in the alignment of the i.f. coils L_a/L_b and L18 to get the markers 39.5 MHz and 33.5 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 the tuner and dummy circuits between a 75 Ω source and a 75 Ω detector, or between a 50 Ω source, a matching pad 50/75 Ω, and a 50 Ω detector.

OTHER AVAILABLE VERSIONS

ELC1042: This is identical with the ELC1042/05 except that the i.f. coil L18 of the ELC1042 has four additional turns.

U.H.F. TELEVISION TUNER
with diode tuning

ELC1043/05

QUICK REFERENCE DATA

Designed for use in colour and monochrome television receivers.

Systems	C.C.I.R. systems G and I	
Channels	21 to 69	
Intermediate frequencies	System G	System I
picture	38.9 MHz	39.5 MHz
sound	33.4 MHz	33.5 MHz

DESCRIPTION

A u.h.f. tuner with electronic tuning covering the u.h.f. bands IV and V (frequency range 470 to 860 MHz).

Mechanically, the tuner is built on a low-loss printed-wiring board, carrying all components, and housed in a metal case consisting of a rectangular frame and front and rear covers (see Fig. 1). The aerial connection is on the frame side, and all other connections (supply voltages, a.g.c. voltage and tuning voltage) are made via feedthrough capacitors in the underside. The mounting method is described below.

The tuner is of the three transistor type, comprising two r.f. stages and an oscillator/mixer. The input circuit is untuned, so that optimum noise figures may be realised, whilst the additional r.f. stage compensates for the increased insertion loss associated with diode tuned circuits.

The coupling between the first and second r.f. stages is by a half-wave tuned line; the coupling between the second r.f. stage and the mixer is by bandpass half-wave tuned lines. The secondary of the passband is coupled to the emitter of the oscillator/mixer stage via a coupling loop, which also provides the inductive feedback for the oscillator.

Half-wave lines, terminated at one end by a fixed capacitor and tuned at the other end by a variable capacitance diode, are used throughout.

The tuner requires transistor supply voltages of +12 V, a.g.c. voltages variable from +2.5 V (normal operating point) to about +7.5 V (maximum a.g.c.), and a tuning voltage variable from +0.3 V to +25 V.

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

→ DIMENSIONS (millimetres)

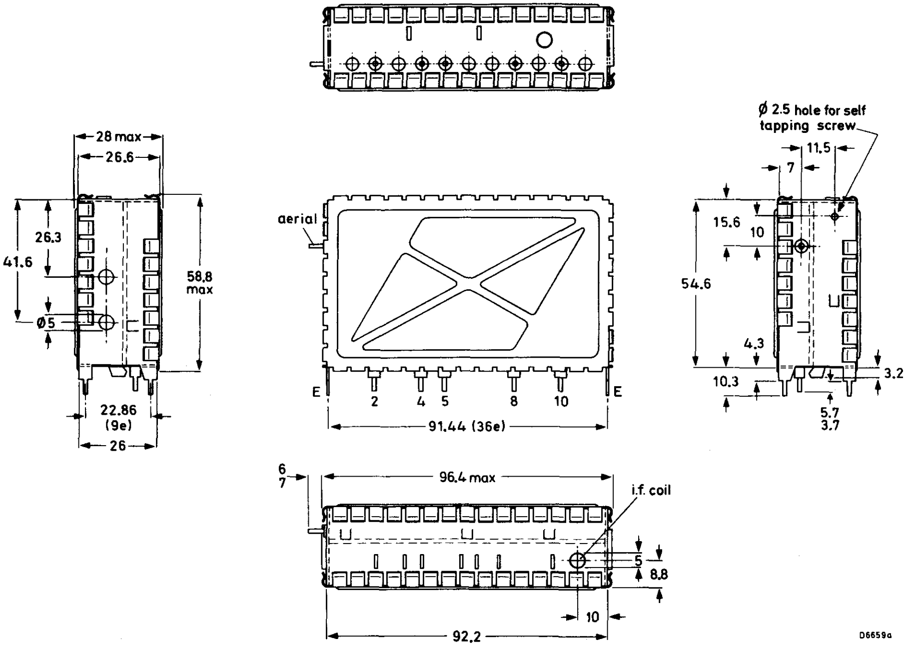


Fig. 1.

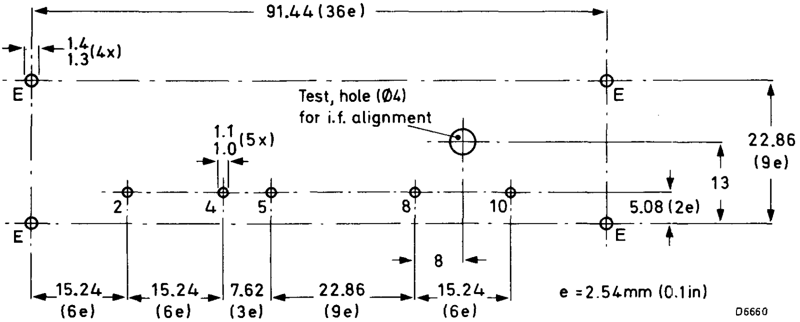


Fig. 2. Piercing diagram viewed from solder side of board.

U.H.F. TELEVISION TUNER
with diode tuning

ELC1043/05

CIRCUIT DIAGRAM

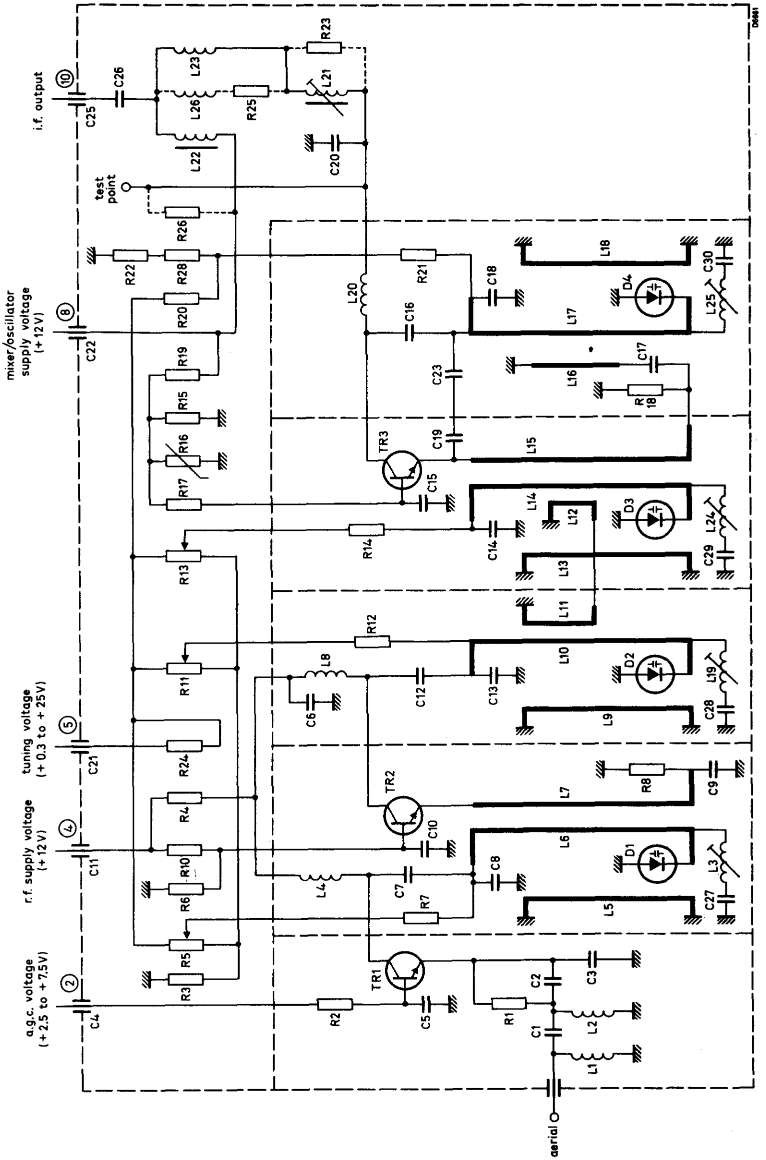


Fig. 3.

TERMINATIONS

2 = a.g.c. voltage, +2.5 to +7.5 V

4 = r.f. supply voltage, +12 V (approx. 8.8 to 13 mA)

5 = tuning voltage, +0.3 to +25 V

8 = mixer/oscillator supply voltage, +12 V (approx. 3.6 mA)

10 = 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. 2. The tuner may also be mounted by means of a snap-in mount or a bracket; information will be supplied on request.

The tuner may be mounted anywhere in the receiver and there are no restrictions on orientation.

Dimensions in millimetres

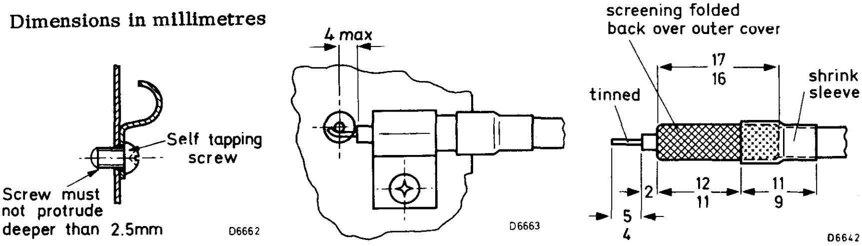


Fig. 4. Recommended fixing method of the aerial cable.

ACCESSORIES

Aerial input transformer (balun) for converting the aerial input from 75 Ω asymmetric to 300 Ω symmetric - type no. ELC1095.

Immunity shield for screening the aerial connection - type no. 4313 132 01910.

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,	
r.f. amplifiers	2 × BF362
mixer/oscillator	BF363
tuning	4 × BB105B
Ambient temperature range	
operating	+5 to +55 °C
storage	-25 to +85 °C
Supply voltage	+12 V ± 10%
Current drawn from +12 V supply	
r.f. amplifiers	8.8 mA (at nominal gain) to 12 to 17 mA (at 30 dB gain reduction)
mixer/oscillator	3.6 mA

ELECTRICAL DATA (Contd.)

A.G.C. voltage (Fig. 5)		
at nominal gain	+2.5 V	
at 30 dB gain reduction	6 V (max. 7.5 V)	
A.G.C. current at 30 dB gain reduction	max. 1.2 mA	
Tuning voltage range	+0.3 to +25 V	
Slope of tuning characteristic	min. 5 MHz/V	
Current drawn from 25 V tuning voltage supply	max. 20 μA	
Frequency range	channel 21 (picture carrier 471.25 MHz) to channel 69 (picture carrier 855.25 MHz).	
Margin at the extreme channels	min. 3 MHz	
Intermediate frequencies	system G	System I
picture	38.9 MHz	39.5 MHz
sound	33.4 MHz	33.5 MHz
Input impedance		
asymmetrical	75 Ω	
symmetrical	300 Ω (see ACCESSORIES)	
	at nom. gain without a.g.c.	during gain control up to 30 dB
V.S.W.R. (between picture carrier and sound carrier)	max. 4	max. 6

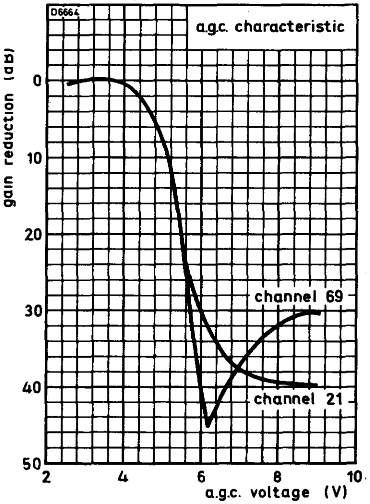


Fig. 5.

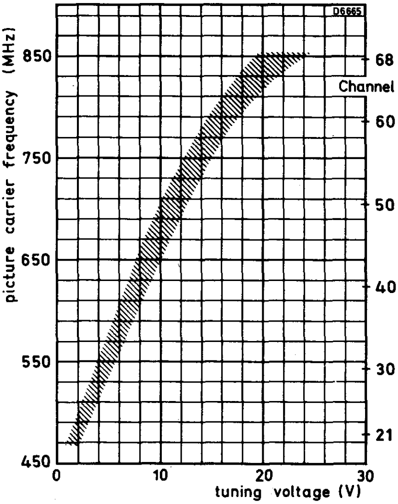


Fig. 6.

ELECTRICAL DATA (Contd.)

A.G.C. range	min. 30 dB
R.F. curves	
bandwidth	typ. 10 to 20 MHz
tilt	4 dB (0 to 2 dB typical)
Power gain (see also MEASURING METHOD OF POWER GAIN)	min. 17 dB
channel 21	typ. 22 dB
channel 50	typ. 22 dB
channel 69	typ. 22 dB
Noise figure	max. 10 dB
channel 21	typ. 6 dB
channel 50	typ. 6.5 dB
channel 69	typ. 7 dB
I.F. rejection	min. 60 dB
Image rejection, channels 21 to 61	min. 53 dB
n + 4 rejection (obtained between the picture carrier of the wanted channel n and the sound carrier of an unwanted signal spaced 4 channels above the wanted channel).	min. 53 dB
Signal handling	
Minimum input signal (e.m.f.) producing cross modulation of 1% at nominal gain,	
in channel wanted signal: picture carrier frequency, interfering signal: sound carrier frequency.	typ. 8 mV (note 1 overleaf)
in band wanted signal: picture carrier frequency of channel X, interfering signal: picture carrier of channel X -5	typ. 25 mV (note 1 overleaf)
Minimum input signal (e.m.f.) producing overloading,	
at nominal gain	typ. 15 to 20 mV (note 2 overleaf)
at maximum a.g.c.	min. 250 mV (note 2)
Minimum input signal (e.m.f.) at nominal gain producing a shift of the oscillator frequency of 20 kHz	typ. 5 to 15 mV (note 3 overleaf)
Detuning of the i.f. output circuit as a result of tuning	max. 150 kHz
Shift of oscillator frequency at a change of the supply voltage of 10%	max. 500 kHz
during warm-up time (measured between 3 s and 60 s after switching on)	max. 200 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 50 °C	max. 1000 kHz

ELECTRICAL DATA (Contd.)

Oscillator radiation (oscillator voltages at the aerial terminal)

The oscillator radiation will be within the limits of BS905: 1969 provided the circuit, connected to the i.f. output, is carefully shielded.

For the oscillator fundamentals, use is made of the relaxed limits, assuming that the design of the i.f. amplifier of the receiver is such that a detuning of the oscillator of > -2.0 MHz or > +0.6 MHz from the nominal frequency will result in unacceptable picture and/or sound degradation.

Immunity from radiated interference

If the tuner, including the aerial connection (see Fig. 4) is installed in a professional manner, the immunity from radiated interference will be within the limits specified in BS905: 1969.

If a higher safety margin or another cable connection is required, use can be made of an immunity shield (see ACCESSORIES).

Microphonics

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

NOTES:

1. This e.m.f. 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. 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. is referred to an impedance of 75 Ω.

MEASURING METHOD OF POWER GAIN

(1) The i.f. output of the tuner should be terminated with the circuit given below.

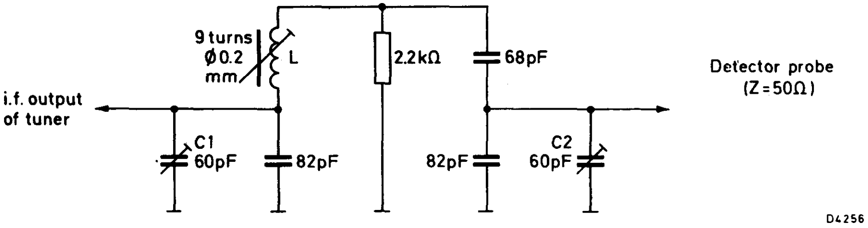


Fig. 7

(2) Feed an i.f. sweep signal to the emitter of the BF363 (mixer/oscillator) and make the oscillator inoperative (e.g. ferrite core in resonant chamber)

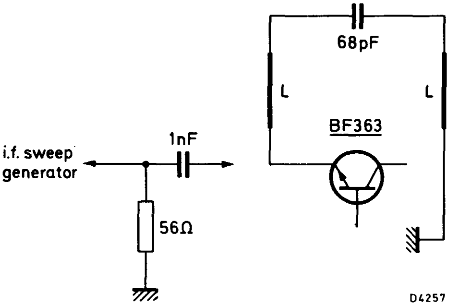


Fig. 8.

(3) Adjust the trimmers C1 and C2, coil L (fig. 7) and the i.f. output coil of the tuner (L21), to get the resonant curve with maximum gain as shown.

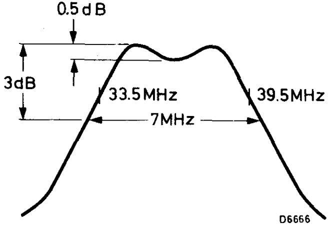


Fig. 9.

(4) Display the r.f. and i.f. curve of the tuner at 470 MHz and make, if necessary, small corrections in the alignment of C1, C2, and L and L21 to get the markers 38.9 MHz and 33.4 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 the tuner and the dummy circuit between a 75 Ω source and a 75 Ω detector, or between a 50 Ω source, a matching pad 50/75 Ω and a 50 Ω detector.

OTHER AVAILABLE VERSION

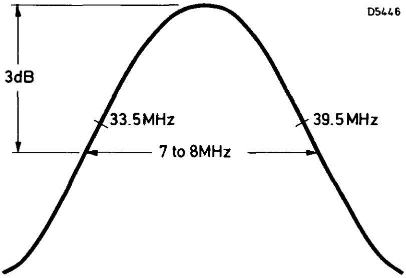
ELC1043/06

U.H.F. TELEVISION TUNER
with diode tuning

ELC1043/06

This type is identical to ELC1043/05 except for the following:-

1. The i.f. output circuit consists of an i.f. coil with increased turns damped by a 680Ω resistor. This changes the tuning range and 'Q' of the i.f. output coil, making it suitable for coupling to a block filter input i.f. amplifier.
2. The power gain is reduced to a nominal of 12dB and a minimum of 9dB by the damping resistor mentioned above.
3. The same dummy circuit is used for measuring power gain but, as a result of damping the i.f. coil, a single tuned response will appear at the output, instead of the double tuned response, as in the case of ELC1043/05. (see below).



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

ELC2000

QUICK REFERENCE DATA

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

Systems	C.C.I.R. systems B and G
Channels	E2 to C (band I) E5 to E12 (band III) E21 to E69 (bands IV and V)
Intermediate frequencies	
picture	38.9 MHz
sound	33.4 MHz

DESCRIPTION

A combined v.h.f./u.h.f. tuner with electronic tuning and band switching, covering the v.h.f. band I including the Italian channel C (frequency range 47 to 88 MHz), the v.h.f. band III (frequency range 174 to 230 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, and housed in a metal case consisting of a rectangular frame and front and rear covers (see Fig. 1). 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 feedthrough capacitors in the underside. The mounting method is described below.

Electrically, the tuner consists of a v.h.f. and u.h.f. part. 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 BF194. The four r.f. circuits are tuned by four capacitance diodes BB106. Switching between v.h.f. I and III is achieved by four switching diodes BA243/244.

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 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 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 another 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 assymmetrical. For use in symmetrical aerial systems, aerial transformers (baluns) are available (see ACCESSORIES).

→ DIMENSIONS (millimetres)

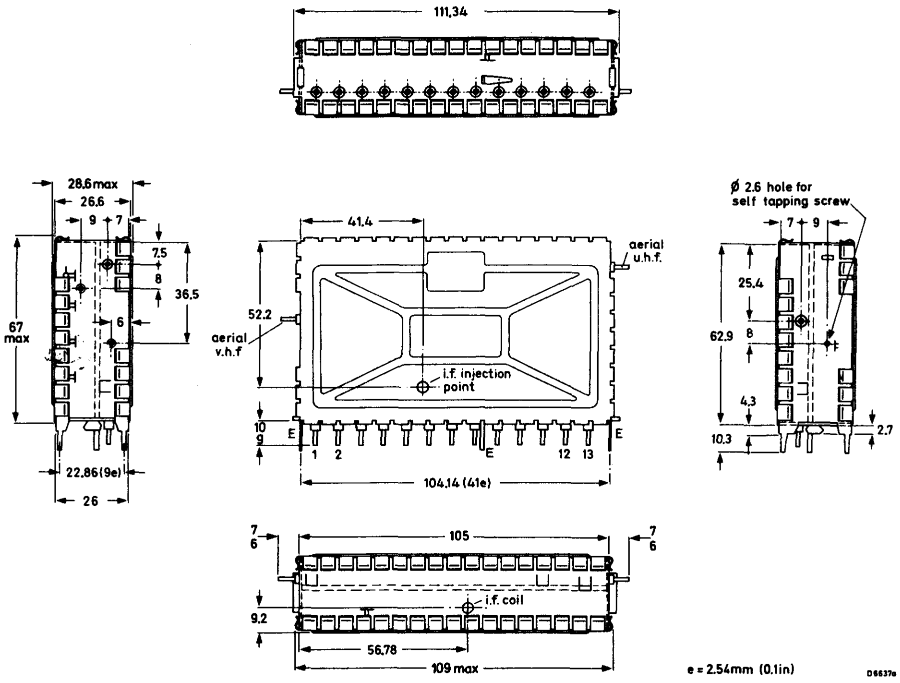


Fig. 1.

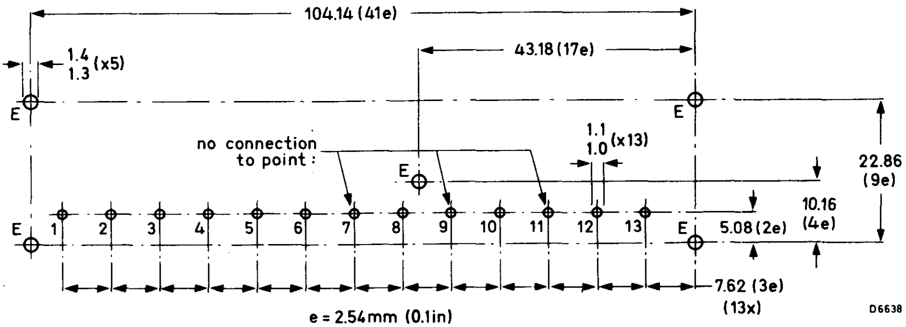


Fig. 2. Piercing diagram viewed from solder side of board. No connection must be made to terminals 7, 9 and 11, as otherwise the oscillator radiation would increase.

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

ELC2000

CIRCUIT DIAGRAM

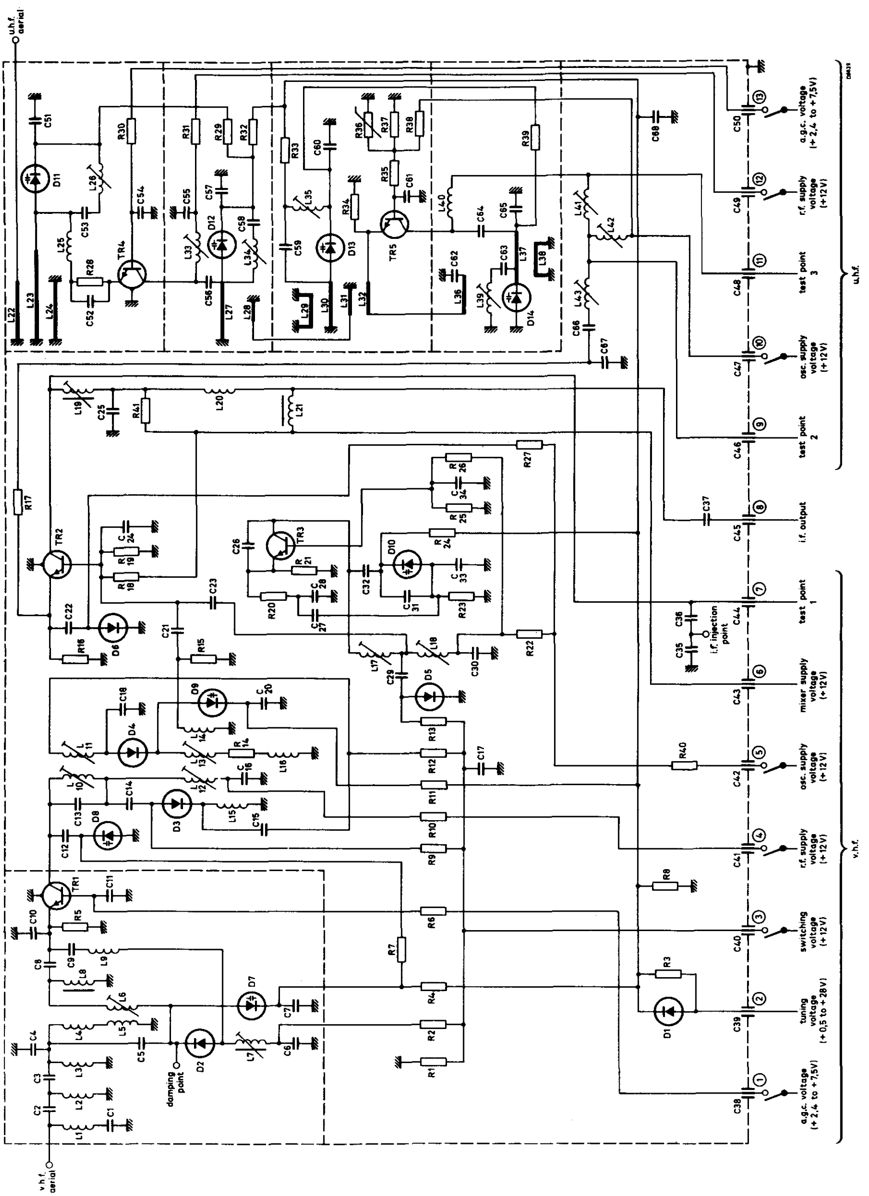


Fig. 3.

TERMINATIONS

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. 20 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 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. 2. 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.

Dimensions in millimetres

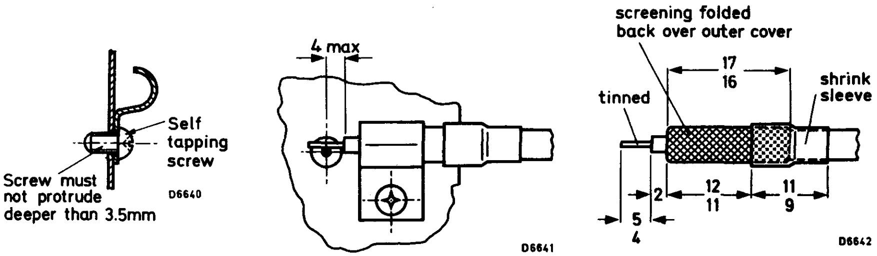


Fig. 4. Recommended fixing method of the aerial cables.

ACCESSORIES

Aerial input transformer (balun) v.h.f. - type no. ELC1094
Aerial input transformer (balun) u.h.f. - type no. ELC2092

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		
bands I and III,		
r.f. amplifier	BF200	
mixer	BF182	
oscillator	BF194	
tuning diodes	4 × BB106	
switching diodes	5 × BA243/244	
bands IV and V,		
r.f. amplifier	BF180	
mixer/oscillator	BF181	
tuning diodes	4 × BB105B	
drift compensating diode	BAW62	
Ambient temperature range		
operating	+5 to +55 °C	
storage	-25 to +85 °C	
Supply voltage	+12 V ± 10%	
Current drawn from +12 V supply		
band I	14 to 21 mA	depending on a.g.c. voltage
band III	34 to 41 mA	
bands IV and V	31.5 to 38 mA	
A.G.C. voltage (Figs. 5, 6 and 7)		
band I,		
at nominal gain	2.4 V	
at 40 dB gain reduction	typ. 5.5 V	
band III,		
at nominal gain	2.4 V	
at 40 dB gain reduction	typ. 4.5 V	
bands IV and V,		
at nominal gain	2.4 V	
at 30 dB gain reduction	typ. 5.0 V	
A.G.C. current		
band I at 40 dB gain reduction	max. 0.8 mA	
band III at 40 dB gain reduction	max. 0.6 mA	
bands IV and V 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	
Switching voltage		
band I	open circuit	
band III	+12 V	
band IV and V	+12 V	

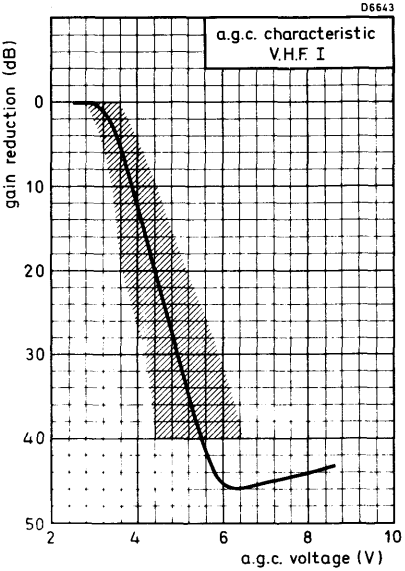


Fig. 5

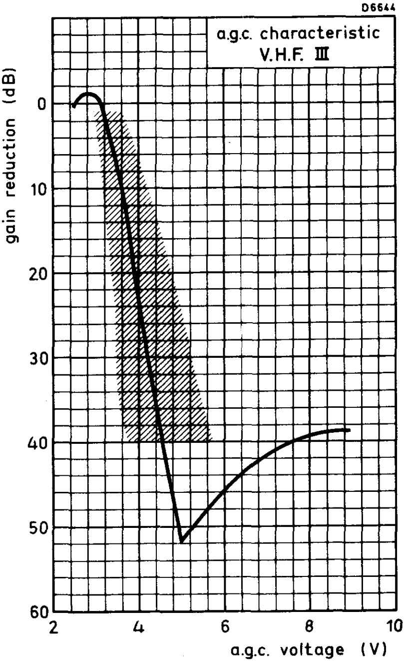


Fig. 6

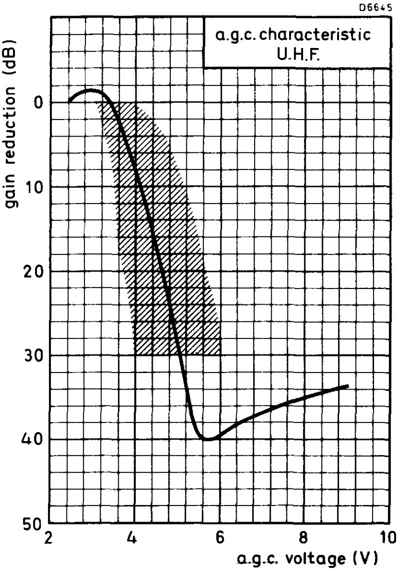


Fig. 7

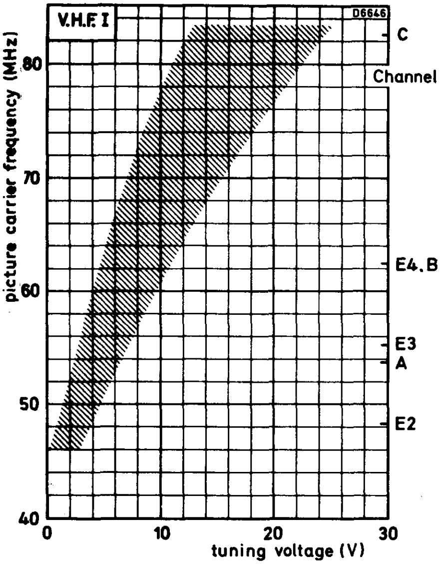


Fig. 8

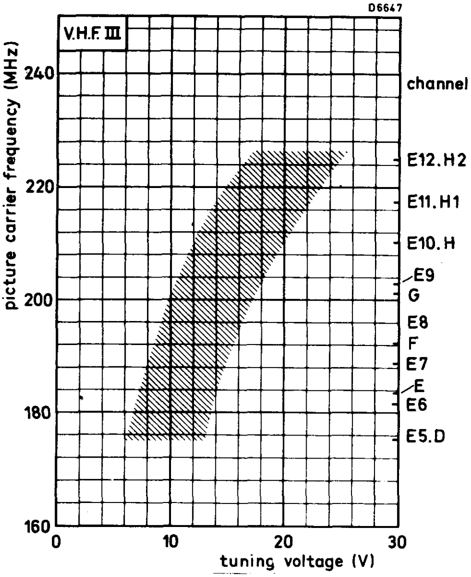


Fig. 9

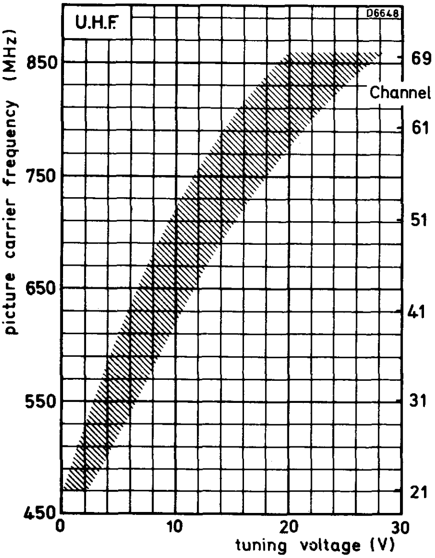


Fig. 10

ELECTRICAL DATA (continued)

Frequency ranges	
band I	channel E2 (picture carrier 48.25 MHz) to channel C (picture carrier 82.25 MHz).
margin at the extreme channels	min. 1.2 MHz
band III	channel E5 (picture carrier 175.25 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)	at nom. gain		during gain control	
	best value (max.)	worst value (max.)	best value (max.)	worst value (max.)
band I (except channel C)	3	4	4	5
band III (except channel E12)	3	4	4	5
bands IV and V	-	4	-	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 15 MHz
bands IV and V	typ. 15 to 25 MHz
tilt	
band I	max. 3 dB
band III	max. 3 dB
bands IV and V, channels E21 to E60	max. 3 dB
channels E61 to E69	max. 4 dB

ELECTRICAL DATA (continued)

Power gain (see also MEASURING METHOD OF POWER GAIN)

band I	min.	26 dB
channel E2	typ.	29 dB
channel C	typ.	32 dB
band III	min.	25 dB
channel E5	typ.	28 dB
channel E11	typ.	28 dB
bands IV and V	min.	25 dB
channel E21	typ.	32 dB
channel E31	typ.	29 dB
channel E69	typ.	33 dB

Noise figure

band I	max.	8.5 dB
channel E4	typ.	6.5 dB
band III	max.	8 dB
channel E9	typ.	6.5 dB
bands IV and V	max.	12 dB
channel E21	typ.	8.0 dB
channel E51	typ.	9.5 dB
channel E68	typ.	10.5 dB

I.F. rejection

band I, channel E2	min.	40 dB
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 of 1% at nominal gain, in channel

wanted signal: picture carrier frequency, interfering channel: sound carrier

frequency, v.h.f. I	typ.	4 mV	note 1
v.h.f. III	typ.	4 mV	
u.h.f.	typ.	5 to 10 mV	

continued on next page)

ELECTRICAL DATA (continued)

Signal handling, (continued)

in band		
wanted signal: picture carrier frequency of channel X, interfering signal: picture carrier of channel X-2 (v.h.f.), X-5 (u.h.f.)		
v.h.f. I	typ. 15 to 60 mV	note 1
v.h.f. III	typ. 10 to 50 mV	
u.h.f.	typ. 15 to 50 mV	
Minimum input signal (e.m.f.) producing overloading,		
at nominal gain	typ. 10 mV	note 2
at maximum a.g.c.	min. 200 mV	
Minimum input signal (e.m.f.) at nominal gain producing a shift of the oscillator frequency of 10 kHz.		
band I	min. 25 mV	note 3
band III	min. 25 mV	
bands IV and V	typ. 10 to 20 mV	
Detuning of the i.f. output circuit as a result of bandswitching and tuning with respect of channel E8	max. 400 kHz	
Shift of oscillator frequency at a change of the supply voltage of 10%		
band I	max. 300 kHz	
band III	max. 300 kHz	
bands IV and V	max. 600 kHz	
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	
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 ^{o}C		
band I	max. 300 kHz	
band III	max. 300 kHz	
bands IV and V	max. 500 kHz	

Oscillator radiation

The tuner conforms 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. 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.

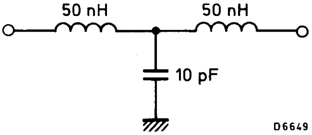


Fig. 11

No connections must be made to the terminals 7, 9 and 11.

Earthing of the tuner and connection to the i.f. amplifier must 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 appreciable microphonics.

NOTES

1. This e,m.f. 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. 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. is referred to an impedance of 75 Ω.

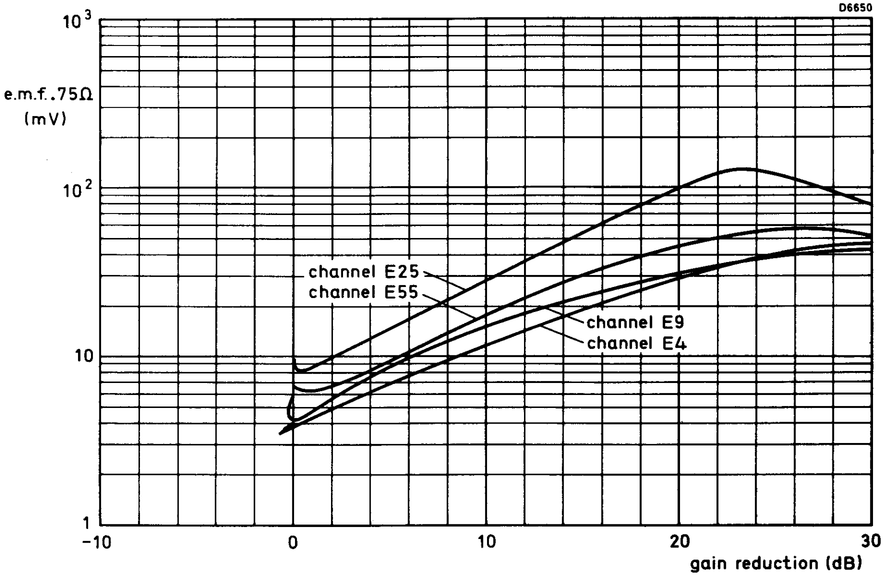


Fig. 12. Cross modulation, in channel.

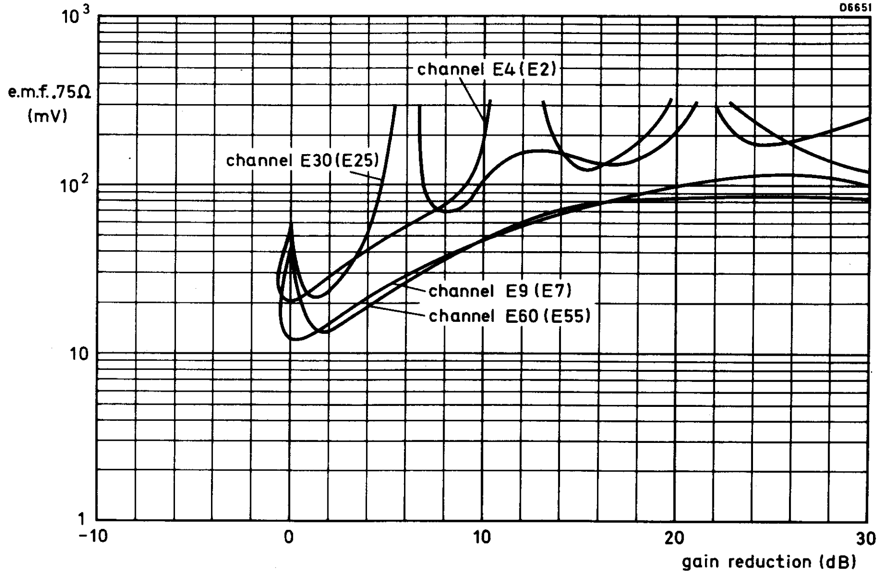


Fig. 13. Cross modulation in band; the interfering channels are given between brackets.

APPLICATION

Connection of the tuner

For connection of the tuner, see terminal location in Fig. 1. 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.

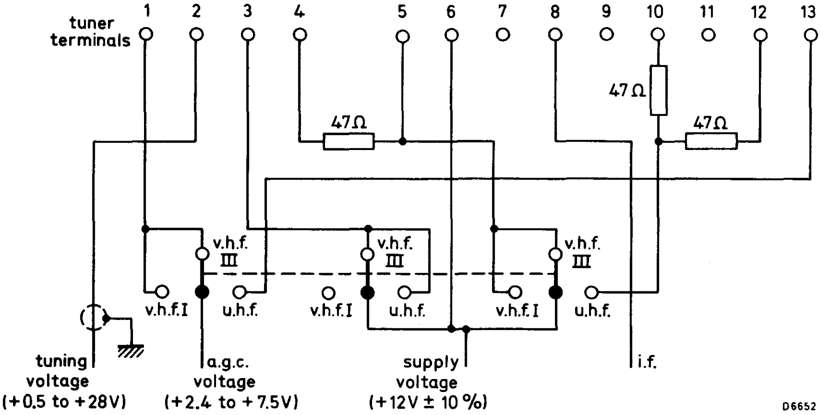


Fig. 14. Connection diagram with three switches.

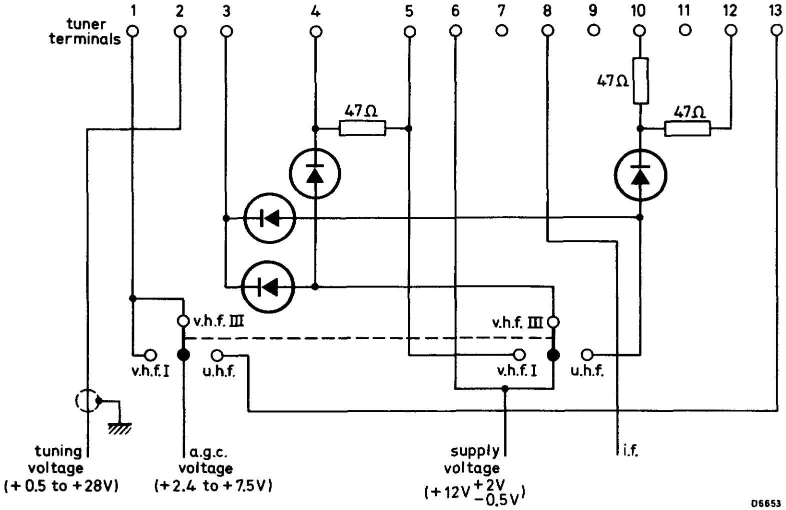


Fig. 15. Connection diagram with two switches.
All diodes: BAX13, BA217 or comparable silicon diodes.

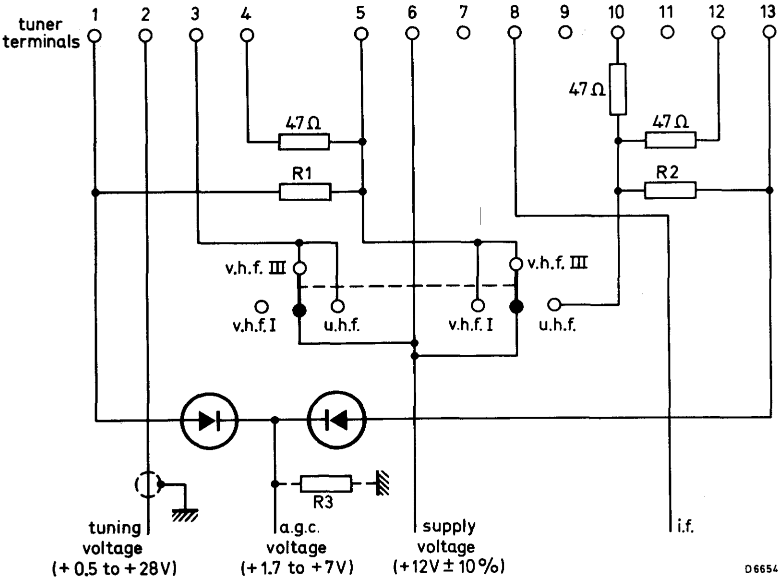


Fig. 16. Connection diagram with two switches.
All diodes: BAX13, BA217 or comparable silicon diodes.
The values of R_1, R_2 and R_3 are depending on a.g.c. circuit.

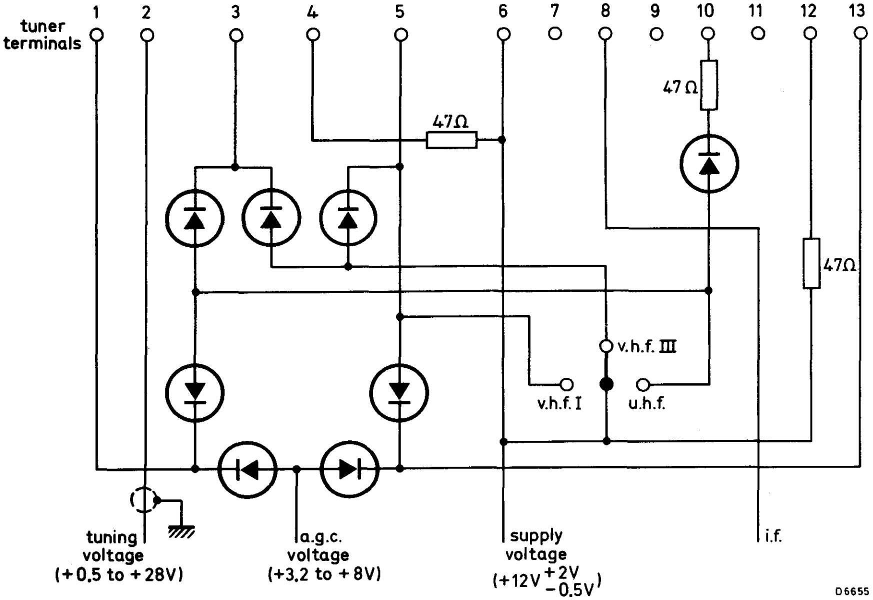


Fig. 17. Connection diagram with one switch.
All diodes: BAX13, BA217 or comparable silicon diodes.

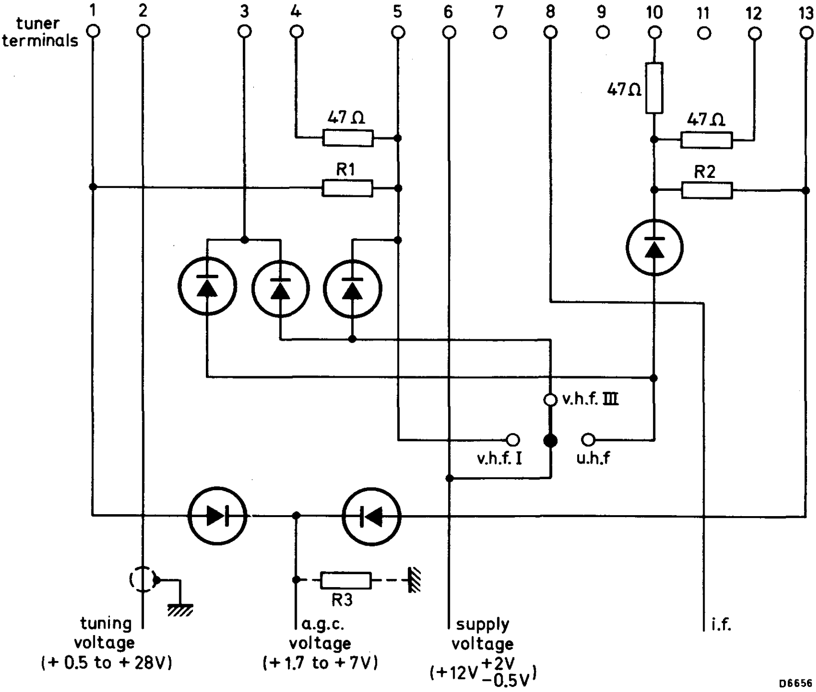


Fig. 18. Connection diagram with one switch.
All diodes: BAX13, BA217 or comparable silicon diodes.
The values of R_1, R_2 and R_3 are depending on a.g.c. circuit.

Alignment of 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. 1).
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. 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 not be connected.

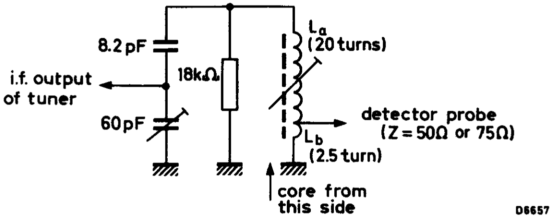


Fig. 19

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 the i.f. injection point. Adjust the trimmer (Fig. 19), tunable coil (L_a/L_b), i.f. output coil of the tuner L19 (Fig. 3) and the coupling between L_a and L_b to get the resonant curve as given below.

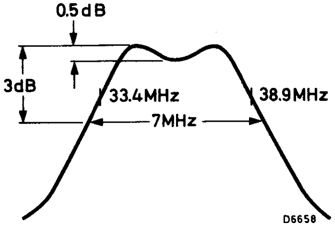


Fig. 20

Then display the r.f. and 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 L19, if necessary, to get the markers 38.9 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 the tuner and the dummy circuit between a 75 Ω source and a 75 Ω detector (or between a 50 Ω source, a matching pad 50/75 Ω, and a 50 Ω detector).

U.H.F. TELEVISION TUNER with diode tuning

U321

DEVELOPMENT SAMPLE DATA

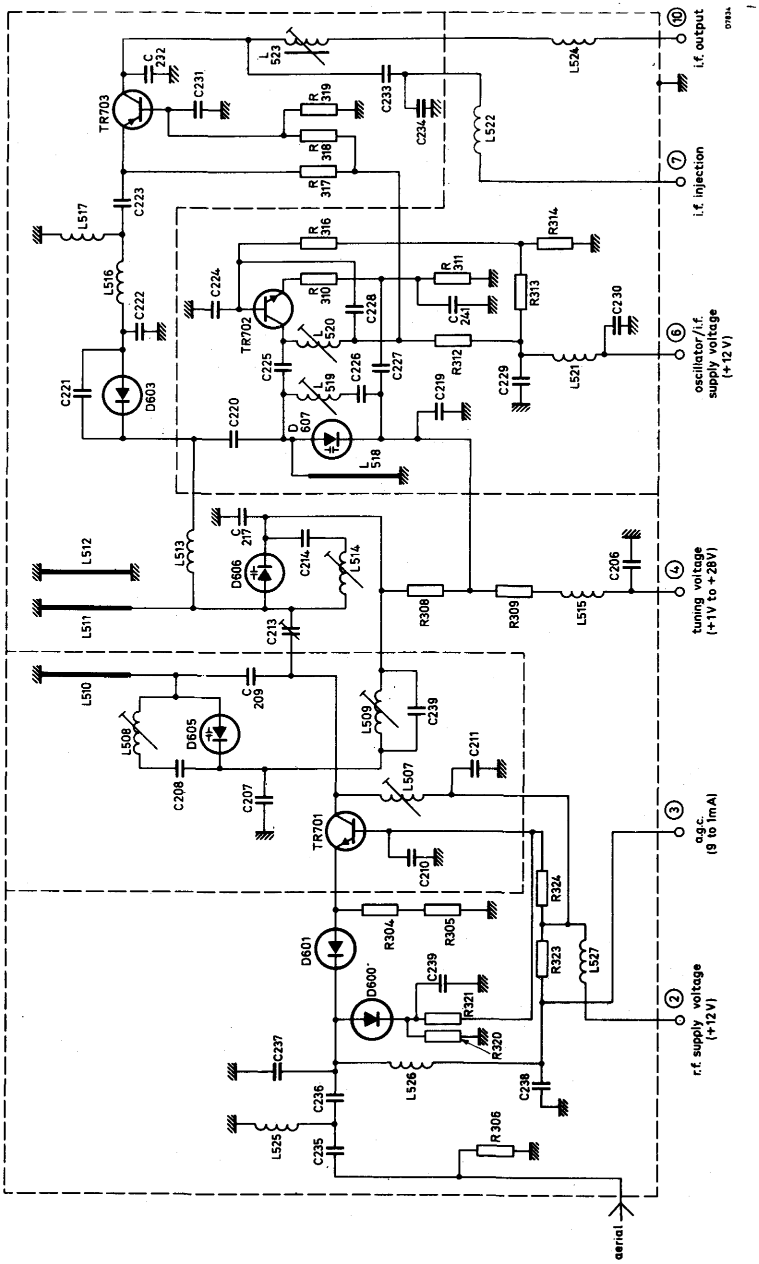
QUICK REFERENCE DATA	
Systems	United Kingdom system
Channels	E21 to E69
	systems I and K
Intermediate frequencies	
picture	39.5 MHz
sound	33.5 MHz

APPLICATION

This tuner is designed to cover the u.h.f. channels E21 to E69 to meet the special requirements of the United Kingdom.

This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

CIRCUIT DIAGRAM



Mullard

U.H.F. TELEVISION TUNER with diode tuning

U321

DESCRIPTION

The U321 is a u.h.f. tuner with electronic tuning, covering the u.h.f. band from 470 to 860 MHz (channels E21 to E69).
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).
A shielded aerial terminal is on one of the shorter sides of the frame, all the other terminals (supply input stage, a.g.c., tuning voltage, supply oscillator/i.f. stage, i.f. injection and i.f. output) are made via connecting pins (1.32 mm diameter) on the bottom side. Mounting is shown in Fig. 2 and 3.
Electrically the tuner consists of an input circuit with high pass characteristic, followed by a P.I.N. diode attenuator (2 diodes BA379), and a transistor BF480 in grounded base configuration (see Fig. 5). This transistor is operating at an emitter current of about 5 to 8 mA, featuring good noise figures and good handling properties as well. 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 by special means, so that the stringent requirements of the U.K. can be met. 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 and transistor BF324 features good noise figures and good signal handling properties as well. 3 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 ground for the collector current of the i.f. transistor 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. For details see page 11.
An i.f. injection point is available at the collector of the i.f. transistor, connected to a terminal on the bottom side.

DEVELOPMENT SAMPLE DATA

MECHANICAL DATA (Provisional dimensions in mm)

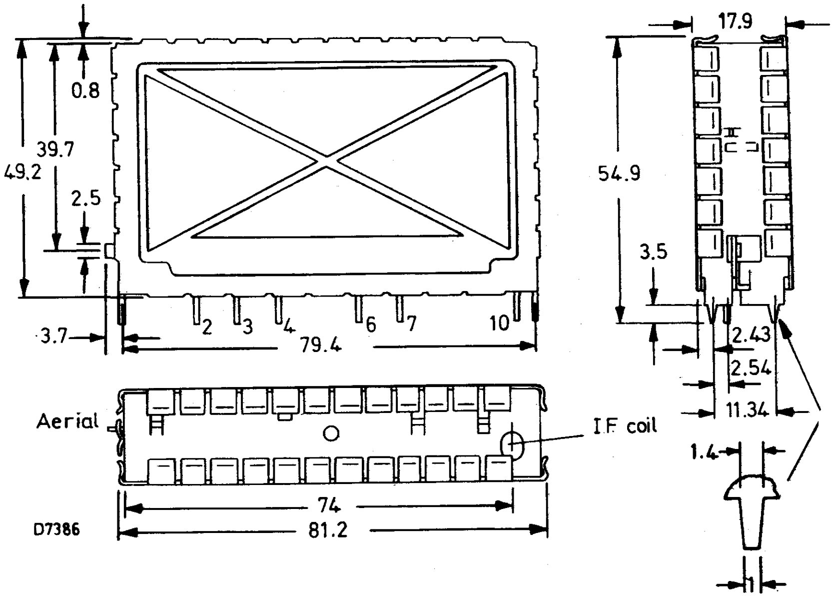


Fig. 2a

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

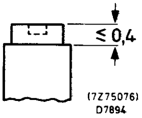


Fig. 2b. I.F. output coil.
Torque for alignment: 2 to 15 mNm
Press-through force : ≥10 N

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).

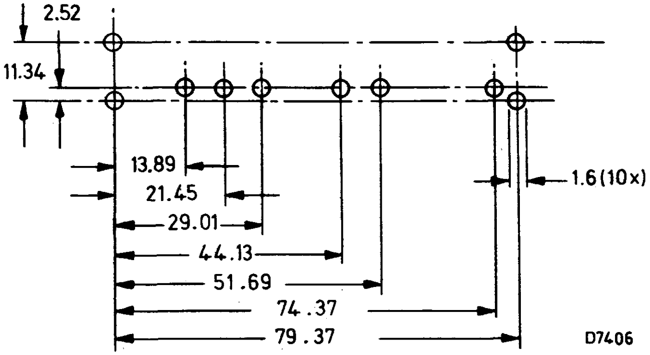


Fig. 3

Hole pattern of the printed wiring board
(viewed on solder side)

DEVELOPMENT SAMPLE DATA

Aerial connection

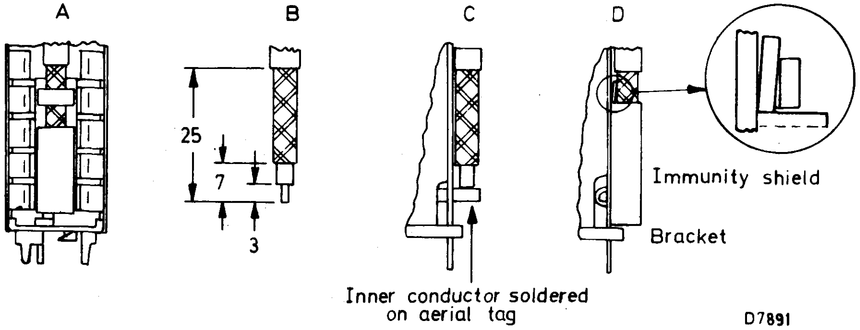


Fig. 4

Fixing of the aerial cable

Recommended cable: DAVU wire CX4004 (outer sheath diameter 5.32 mm)

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.

U.H.F. TELEVISION TUNER with diode tuning

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.

General

Semiconductors

P.I.N. diode	2 × BA379
r.f. amplifier	BF480
tuning diode	3 × BB205B
mixer diode	BA280
oscillator	BF480
i.f. amplifier	BF324

Environmental conditions

Temperature, operating	+5 to +55 °C
Temperature, storage	-25 to +85 °C
Humidity, operating	max. 90% R.H.

Voltages and currents

Supply voltage

Voltage	+12 V ± 10% (+10% -15%)*

Note: The supply voltage of the 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. Under most unfavourable conditions a ripple of ≥ 7.5 mV peak-to-peak may produce a just visible disturbance.

Current drawn from +12 V supply

Current for r.f. stage terminal 2 at nominal gain	typ.	16 mA
at 26 dB gain reduction	typ.	13 mA
Current for oscillator and i.f. stage terminal	6 ≤	16 mA

A.G.C. current

at nominal gain		-9 ± 0.5 mA
at 26 dB gain reduction	typ.	-5.6 mA

For a.g.c. characteristics see Fig. 7

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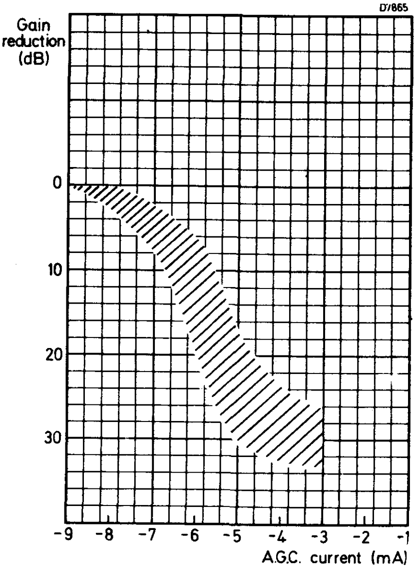
*A supply voltage of +12 V -15% is admissible, if a possible deterioration of gain, noise figure, signal handling, oscillator shift and drift is accepted.



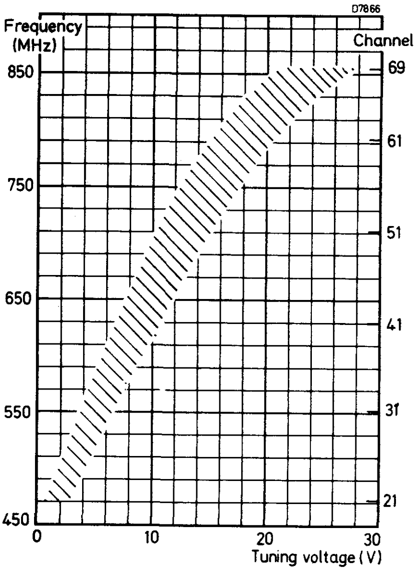


Fig. 4

A.G.C. characteristic

Fig. 5

Tuning characteristic

Tuning voltage range (Fig. 5)	+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 max. 47 kΩ at tuning voltages below 3 V.

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
Immediate frequency	
picture	39.5 (38.9) MHz
sound	33.5 (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. of both systems can be applied. The tilt limit is valid for 39.5/33.5 MHz.

Wanted signal characteristics

Input impedance	
asymmetrical	75 Ω
V.S.W.R. at picture carrier frequency, at nominal gain	max. 5
Reflection coefficient at picture carrier frequency, at nominal gain	max. 66%
A.G.C. range	min. 26 dB; typ. 31 dB
R.F. curves	
bandwidth	typ. 18 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. 18 dB
channel E21	typ. 23 dB
channel E40	typ. 22 dB
channel E69	typ. 24 dB
Gain difference between any two channels	typ. 3dB
Noise figure	max. 10 dB
channel E21	typ. 6.5 dB
channel E40	typ. 7.5 dB
channel E69	typ. 8.0 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
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 of 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))	min. 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

Oscillator characteristics (Contd.)

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)	max. 1000 kHz

I.F. circuit characteristics

Bandwidth of i.f. output circuit 1)	5 MHz ± 500 kHz
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. 6, i.e. a 100 pF capacitor is connected in parallel with C1, R1 is short circuited, tuning voltage is 15 V.

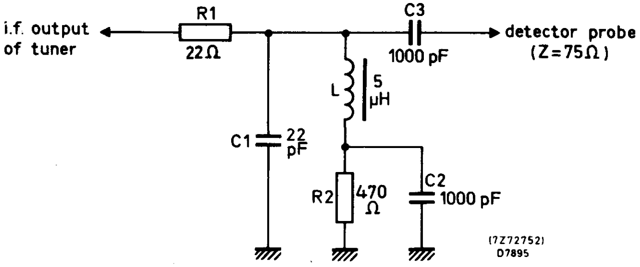


Fig. 6

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

I.F. circuit characteristics (Contd.)

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. 6, i.e. a 100 pF capacitor is connected in parallel with C1, R1 is short circuited; tuning voltage is 15 V.

Tuning range of i.f. output coil [1]	max. 33 to min. 40 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 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.

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.

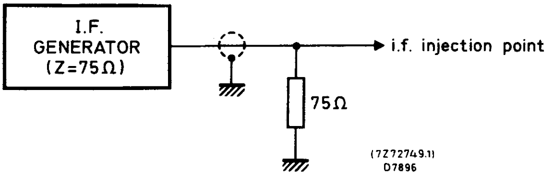

Fig. 7

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[1] I.F. output of the tuner terminated with the circuit shown in Fig. 6; tuning voltage 15 V.

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).
In the case 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.

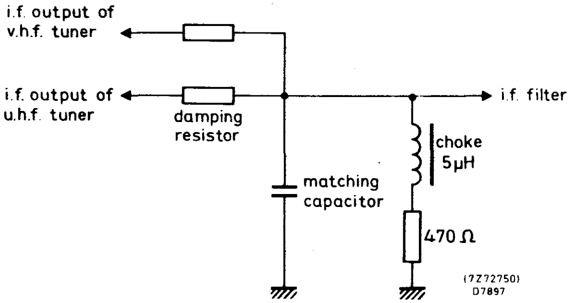


Fig. 8

Measuring method of power gain

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

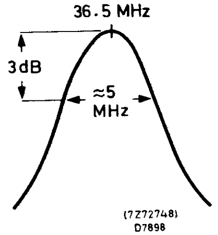


Fig. 9

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 009 47680.

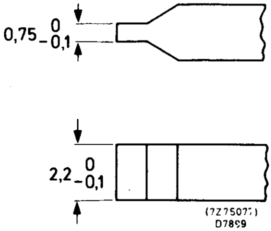


Fig. 10

ACCESSORIES

Immunity shield	3122 121 24910

U.H.F. TELEVISION TUNER
For use with digital tuning systems

U321-LO

DEVELOPMENT SAMPLE DATA

This all electronic tuner is identical to the U321, but has been designed for use in colour or monochrome television receivers fitted with closed loop digital tuning systems requiring an oscillator sample output. The tuner features good noise figure and improved signal handling properties, particularly for cross-modulation, by the use of a large signal r.f. transistor and schottky diode mixer. The tuner is equipped with a P.I.N. diode attenuator in the input circuit which is controlled by the A.G.C. system of the receiver.

QUICK REFERENCE DATA

Supply voltage		+12	V
Tuning voltage range		+1 to +28	V
Current drawn from +28 V tuning voltage supply		<0.5	μA
Frequency range		Channels 21 - 69	
V.S.W.R.		≤5	
Power gain	typ.	23	dB
Noise factor	typ.	7	dB
Image rejection		≥53	dB
A.G.C. control range		≥26	dB
A.G.C. control current			
maximum gain	typ.	9	mA
-26 dB	typ.	5	mA

OUTLINE AND DIMENSIONS

See Page 4

ACCESSORIES

Immunity shield Code No. 3122 121 24911

This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

ELECTRICAL DATA

Supply voltage		+12	V
Tuning voltage range		+1 to +28	V
Current drawn from +28 V tuning voltage supply		<0.5	µA
Frequency range		Channels 21 - 69	
V.S.W.R.		≤5	
Power gain	typ.	23	dB
Noise factor	typ.	7	dB
Image rejection		≥53	dB
A.G.C. control range		≥26	dB
A.G.C. control current			
maximum gain	typ.	9	mA
-26 dB		5	mA

Cross modulation:

Input signal e.m.f., 75 Ω, which will cause the transference of 1% of the modulation of an unwanted signal to the carrier of the wanted signal.

In channel cross-modulation:

(wanted signal: vision carrier frequency;
interfering signal: sound carrier frequency)

At maximum gain	typ.	25	mV
with a.g.c.	typ.	≥100	mV

In band cross-modulation:

(wanted signal: vision carrier of channel N;
interfering signal: vision carrier of channel N ± 3)

At maximum gain	typ.	50	mV
with a.g.c.	typ.	≥200	mV

Out of band cross-modulation:

VHF I	typ.	>500	mV
VHF III	typ.	>100	mV
n ± 4: Interfering vision carrier, e.m.f., 75 Ω, for -53 dB: (at maximum gain)	typ.	20	mV

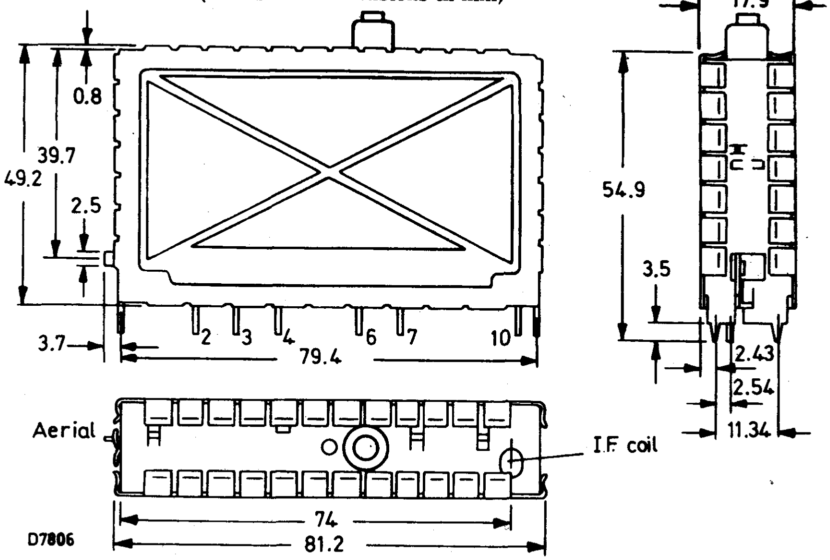
Oscillator stability:

Shift for a change in supply voltage of ±5%		≤500	kHz
Drift for a change of ambient temperature from 25 °C to 50 °C		≤1000	kHz

ELECTRICAL DATA (Oscillator sample)

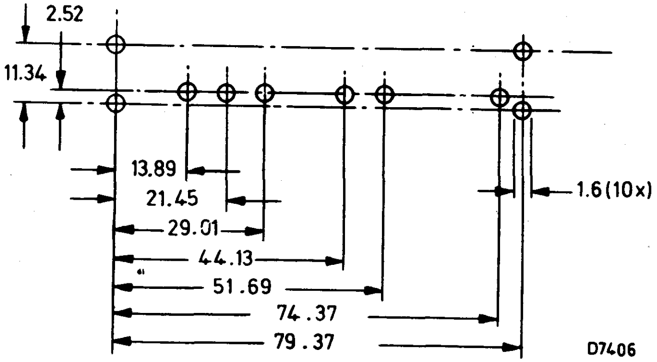
Oscillator sample voltage, p.d., 75 Ω	Min.	Typ.	Max.	
V_{supply} = +10.8 to +13.2 V, V_{tuning} +0.5 to +28 V, T_{amb} = +5 to +55 °C	13	-	100	mV
V_{supply} = 12 V, T_{amb} = 25 °C	-	33	-	mV
Impedance of oscillator sample port	-	75	-	Ω
V.S.W.R. at oscillator sample port				
Oscillator frequency <600 MHz	-	3	4	
Oscillator frequency >600 MHz	-	2	3	
Reflection coefficient at oscillator sample port				
Oscillator frequency <600 MHz	-	50	60	%
>600 MHz	-	33	50	%
Harmonic content of oscillator sample				
Harmonics below 1000 MHz (2nd harmonic of fundamentals ≤ 500 MHz) with reference to fundamental	-15	-20	-	dB
R.F. rejection at oscillator sample port				
Tuner input of wanted frequency, 5 mV e.m.f., 75 Ω, tuner operated at nominal gain. V_{signal} at sample port reference oscillator fundamental	-17	-24	-34	dB
I.F. rejection at oscillator sample port				
I.F. signal converted from tuner input of wanted frequency, 5 mV e.m.f., 75 Ω; tuner operated at nominal gain. I.F. signal at sample port, reference oscillator fundamental	-20	-35	-	dB
Radio interference				
Oscillator port open or terminated 75 Ω oscillator radiation	-	-	3	mV/m

MECHANICAL DATA (Provisional dimensions in mm)



CONNECTIONS

2. V supply	+12 V	6. V supply oscillator/i.f.	+12 V
3. A.G.C.	9 mA to 1 mA	7. I.F. injection.	
4. tuning	+1 V to +28 V	10. I.F. output	



Hole pattern of the printed wiring board.
(viewed on solder side)

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.

DEVELOPMENT SAMPLE DATA

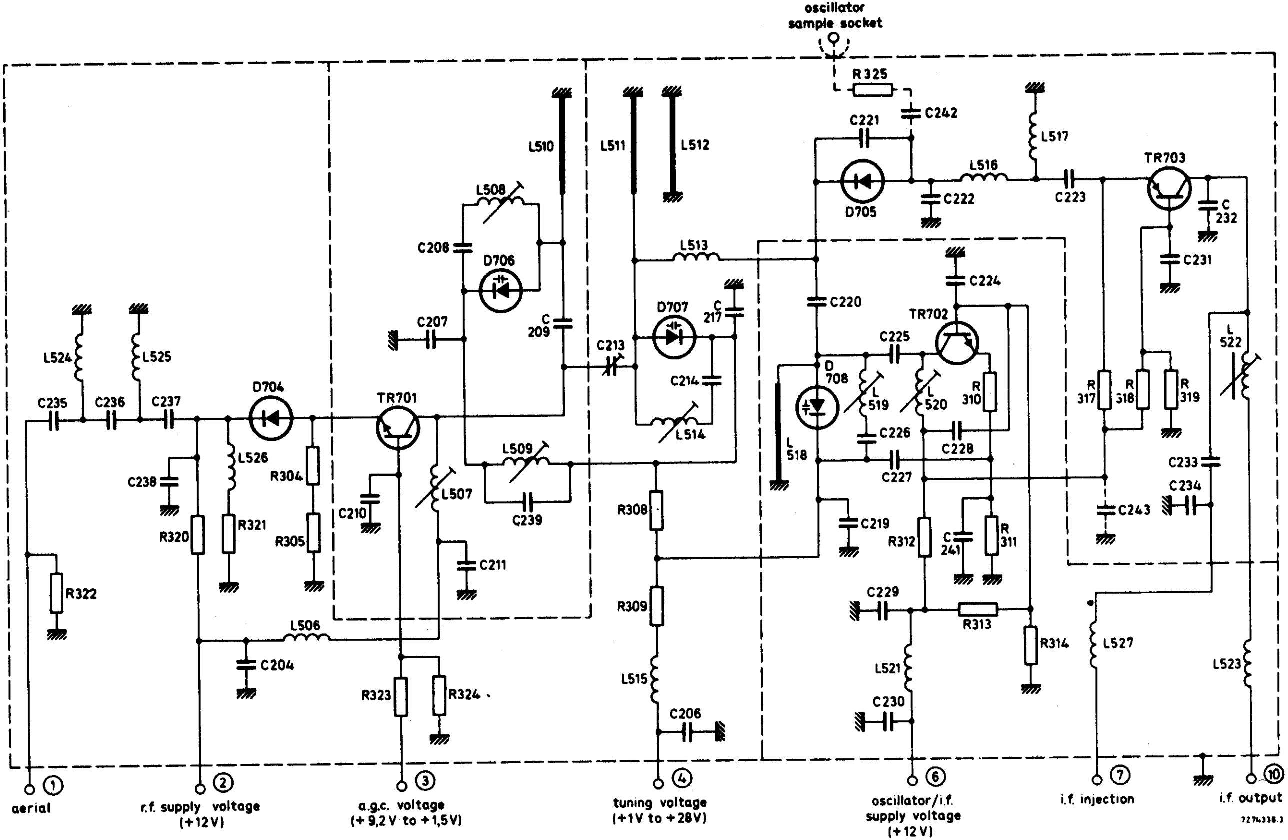


Fig. 1.

MECHANICAL DATA

Dimensions in mm

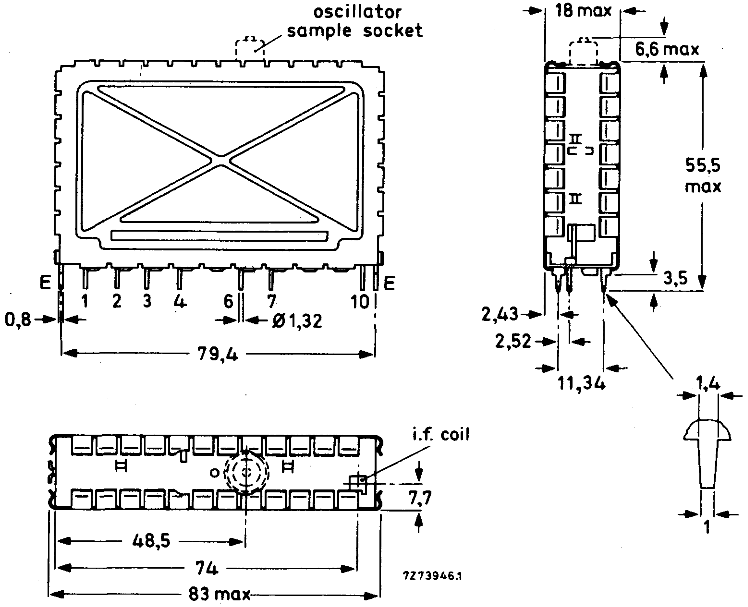


Fig. 2a The oscillator sample socket, drawn with dotted lines, applies only to tuner U322LO.

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.

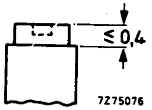


Fig. 2b I.F. output coil.
Torque for alignment : 2 to 15 mNm
Press-through force : ≥ 10 N

Mass approx. 75 g

DEVELOPMENT SAMPLE DATA

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).

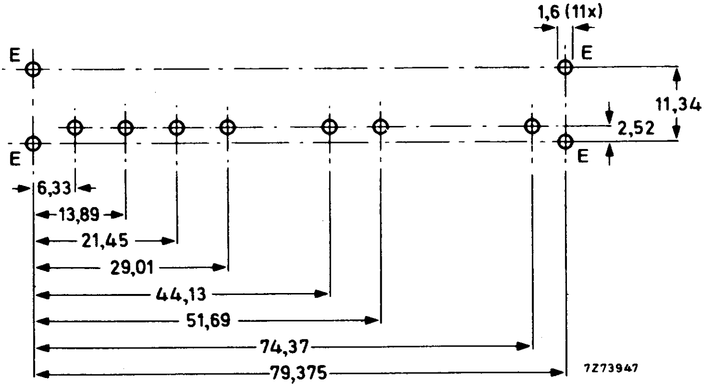


Fig. 3 Piercing diagram viewed from solder side of board.

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

DEVELOPMENT SAMPLE DATA

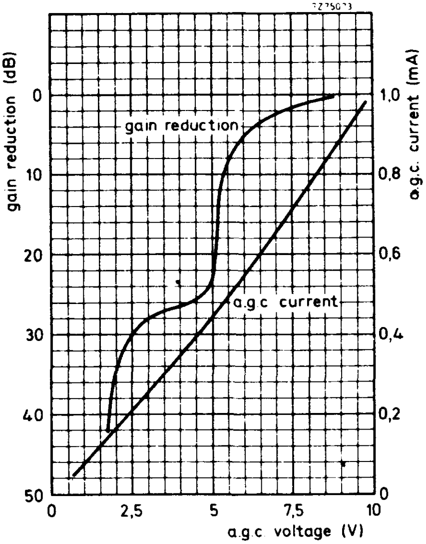


Fig. 4.

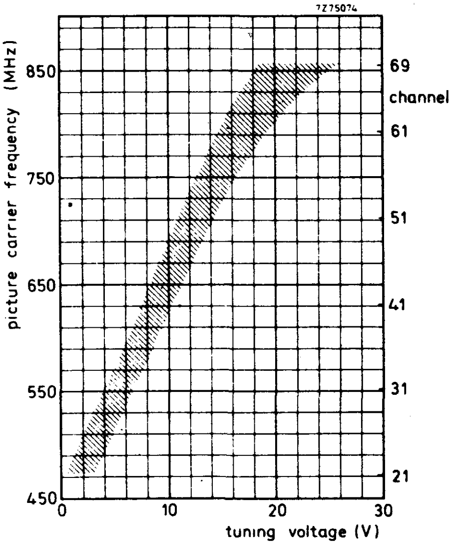


Fig. 5.

Tuning voltage range (Fig. 5)	+ 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.

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. 82 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	
Input impedance of 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	

DEVELOPMENT SAMPLE DATA

Power gain (see also Measuring method of power gain)	min. 19 dB
channel E21	typ. 23 dB
channel E40	typ. 22 dB
channel E69	typ. 26 dB
Gain difference between any two channels	max. 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. 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. 46 dB; typ. 53 dB
Harmonic content of oscillator sample; only valid for U322LO	
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 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. 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 of channel N; interfering signal: picture carrier of channel N ± 5)
at nominal gain (wanted input level 60 dB (μV)) typ. 88 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 + 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 MHz ± 500 kHz

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

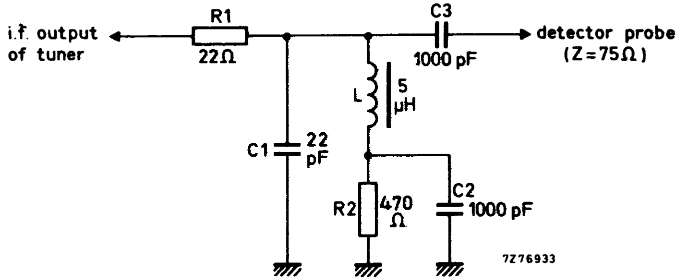


Fig. 6.

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

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* 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.

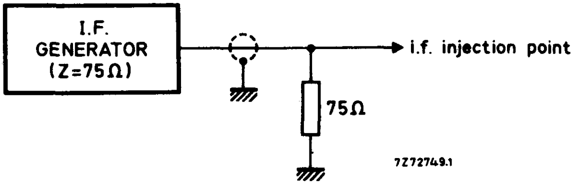

Fig. 7.

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.

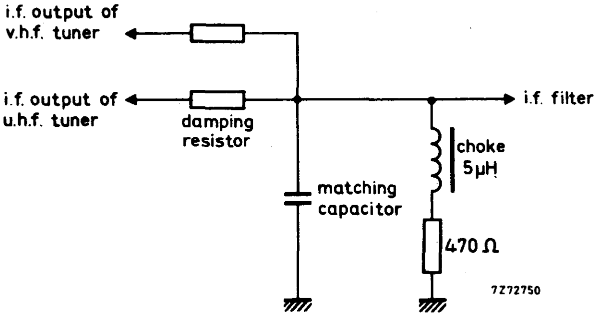

Fig. 8.

Measuring method of power gain

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

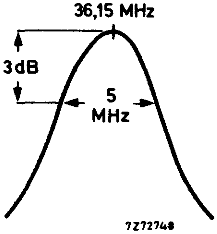

Fig. 9.

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.

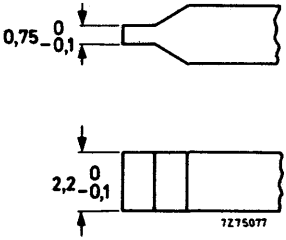

Fig. 10.

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.

V.H.F. TELEVISION TUNER
with diode tuning

V311

DEVELOPMENT SAMPLE DATA

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.

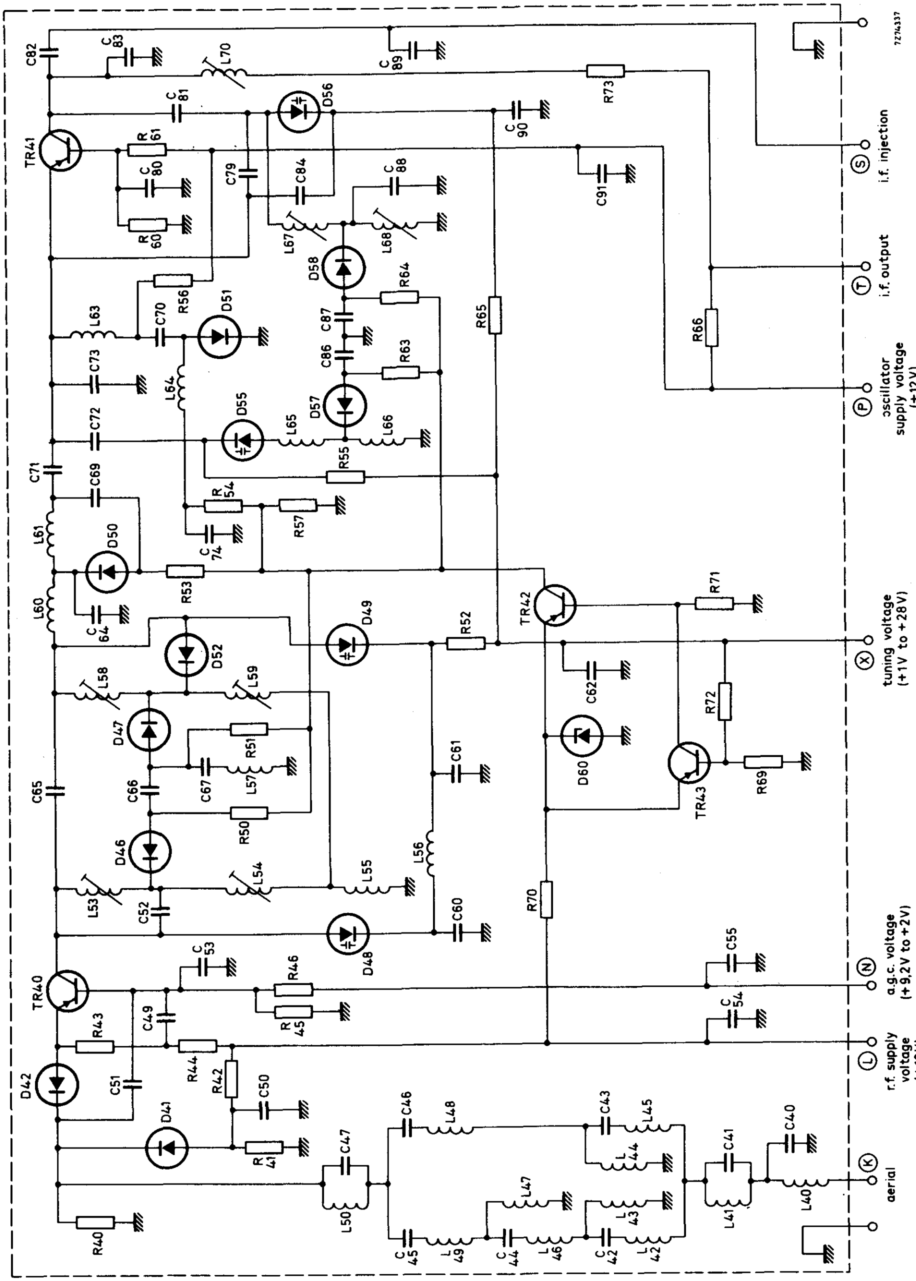
7Z74337
S i.f. injection
T i.f. output
P oscillator supply voltage (+12V)
X tuning voltage (+1V to +28V)
N a.g.c. voltage (+9,2V to +2V)
L r.f. supply voltage (+12V)
K aerial
TR40
TR41
TR42
TR43
D41
D42
D46
D47
D48
D49
D50
D51
D52
D55
D56
D57
D58
D60
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Fig. 1

V.H.F. TELEVISION TUNER with diode tuning

V311

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.

MECHANICAL DATA

Dimensions in mm

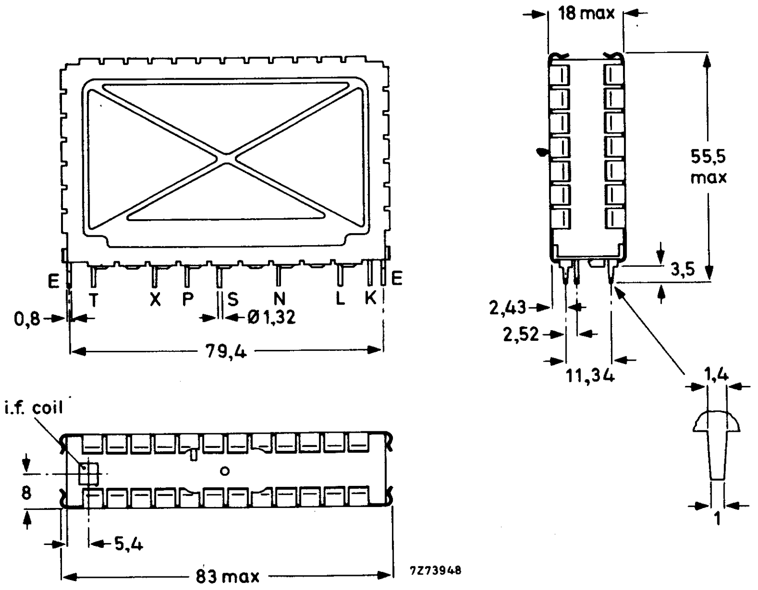

Fig. 2a.

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.

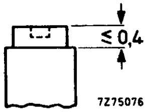

Fig. 2b. I. F. output coil.
Torque for alignment : 2 to 15 mNm
Press-through force : ≥ 10 N

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).

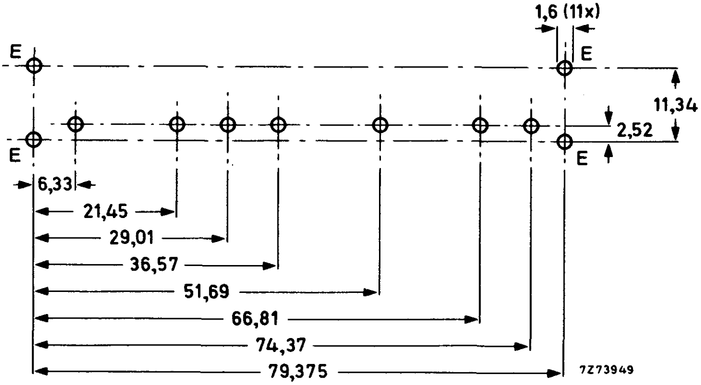

Fig. 3. Piercing diagram viewed from solder side of board.

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.

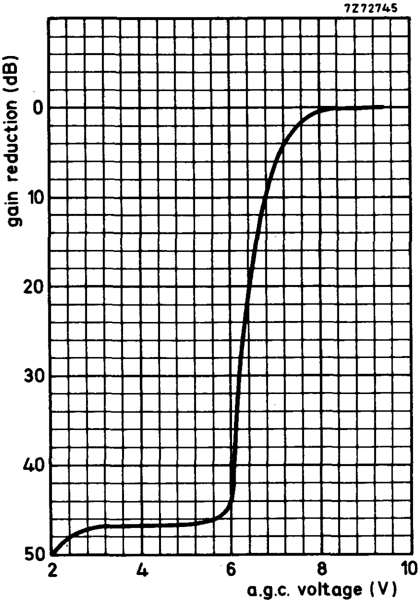

Fig. 4
A.G.C. voltage characteristic, channel E2; typical curve.

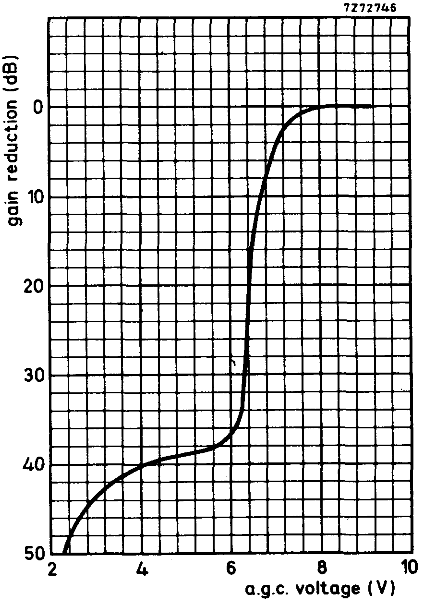

Fig. 5
A.G.C. voltage characteristic, channel E5; typical curve.

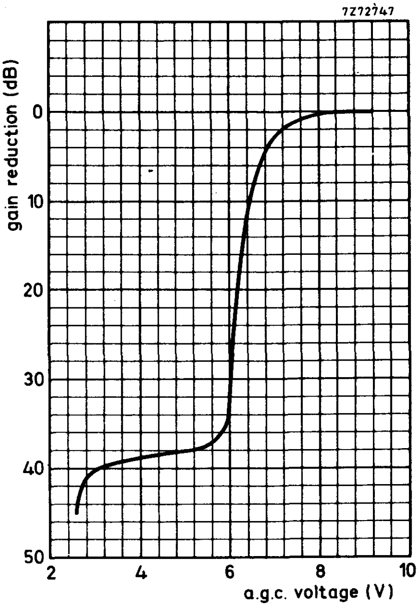

Fig. 6
A.G.C. voltage characteristic, channel E 12; typical curve.

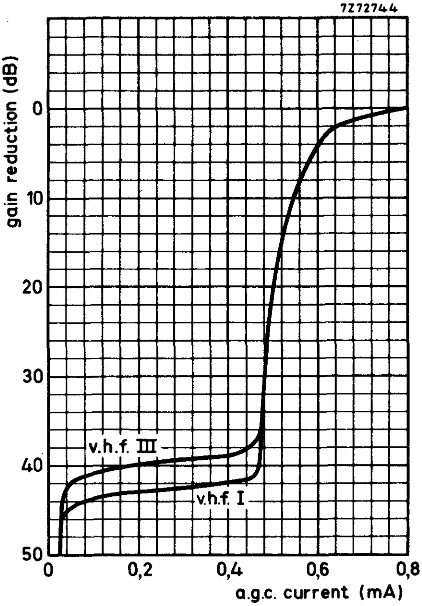

Fig. 7
A.G.C. current characteristic; typical curves.

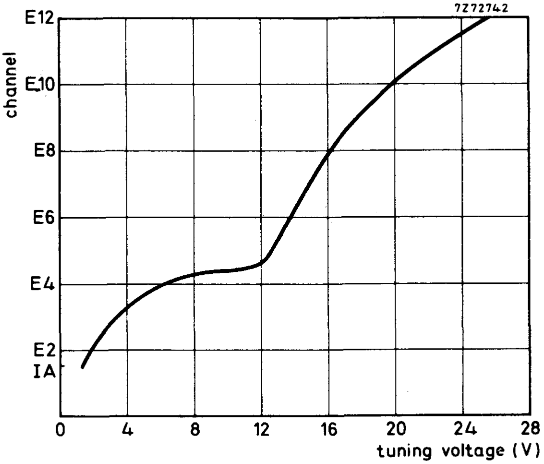

Fig. 8
Tuning voltage characteristic; typical curve.

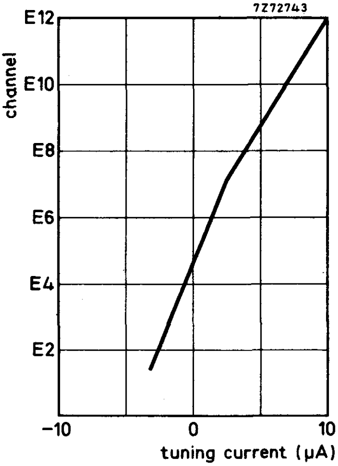

Fig. 9
Tuning current characteristic; typical curve.

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 224,25MHz). Margin at the extreme channels: min. 1,5 MHz.

	system B	system I
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 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 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.	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.	100 dB (μV) into 75 Ω
at 40 dB gain reduction (wanted input level 100 dB (μV)	typ.	106 dB (μV) into 75 Ω

Out of band cross modulation at nominal gain	
v.h.f. I, interfering from v.h.f. III	to be established
interfering from u.h.f.	to be established
v.h.f. III, interfering from v.h.f. I	to be established
interfering from u.h.f.	to be established

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 +40 °C)	max. 300 kHz

I.F. circuit characteristics

Bandwidth of i.f. output circuit 1)	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.

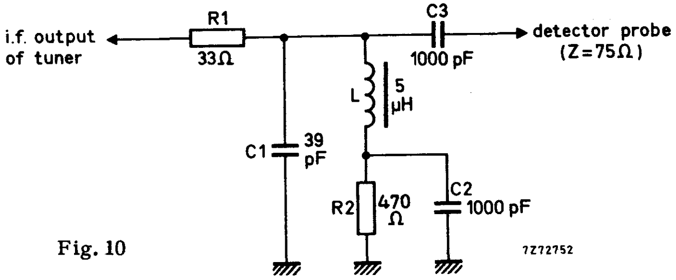

Fig. 10

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 100pF capacitor is connected in parallel with C1 and R1 is short circuited; tuning voltage is 15 V.

Tuning range of i.f. output coil 1)	max. 33 to min. 40 MHz
Attenuation between i.f. injection point and i.f. output of the tuner	typ. 23 dB

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

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 flash-over 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 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.

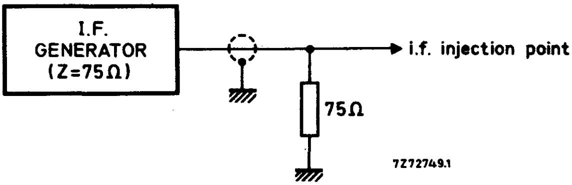


Fig. 11

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.

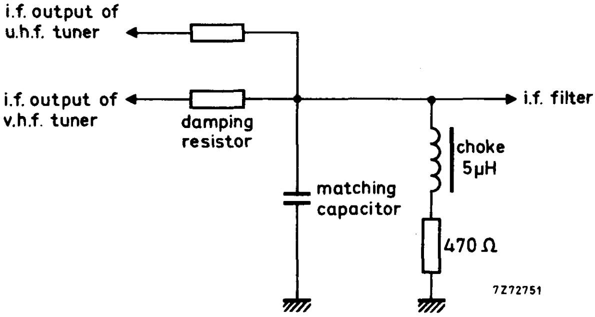


Fig. 12

Measuring method of power gain

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

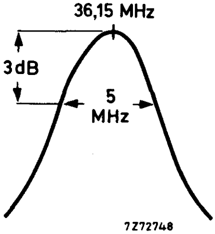


Fig. 13

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.

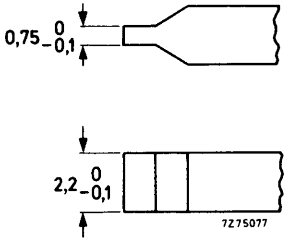


Fig. 14

ACCESSORIES

Connector assembly for use of tuner V311 in combination with u.h.f. tuner U322 (or UD1):
connector, catalogue number 3112 200 20720;
washer, catalogue number 3112 221 01220;
clamp, catalogue number 3112 274 13220.

V.H.F TELEVISION TUNER

QUICK REFERENCE DATA

Systems	C.C.I.R. systems B and G
Channels	
v.h.f. I	E2 to C
v.h.f. III	Morocco 4 to E12
Intermediate frequencies	
picture	38,9 MHz
sound	33,4 MHz

APPLICATION

This tuner is 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 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.

The tuner is compatible with tuner V315. It is also compatible with tuner V311 except for the band switching.

DESCRIPTION

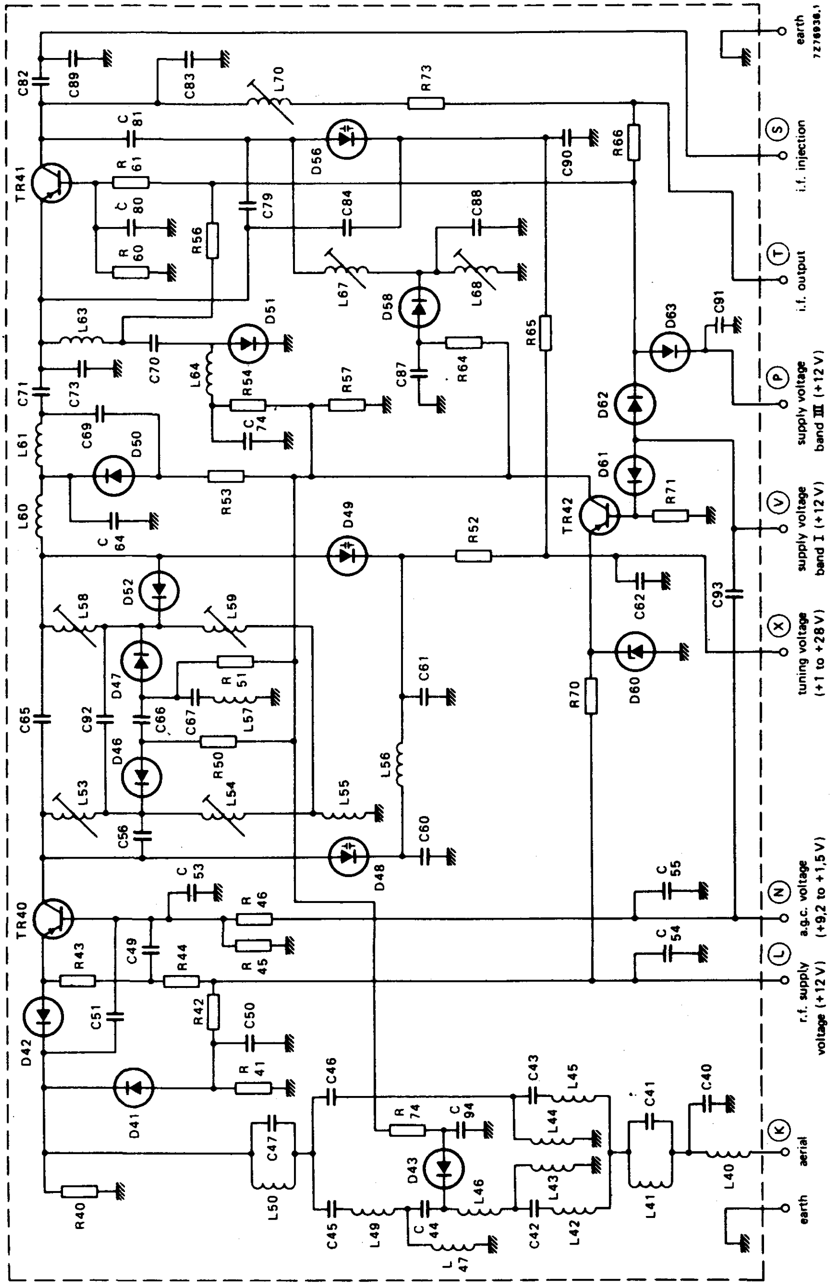
The V314 is a v.h.f. tuner with electronic tuning, covering the v.h.f. band I (47 to 88 MHz) and the v.h.f. band III (162 to 230 MHz). Switching between the bands is done by connecting the supply voltage to terminal V for band I and to terminal P for band III.

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.

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. Three 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.


earth
7Z78936.1
S
i.f. injection
T
i.f. output
P
supply voltage band III (+12 V)
V
supply voltage band I (+12 V)
X
tuning voltage (+1 to +28 V)
N
a.g.c. voltage (+9,2 to +1,5 V)
L
r.f. supply voltage (+12 V)
K
aerial
earth
TR41
TR40
TR42
C82
C89
C83
L70
R73
C81
D56
C90
R66
R61
C80
C79
C84
C88
R60
R56
L67
D58
L68
L63
D51
R65
D63
C91
C70
L64
C73
C71
C87
R64
R54
R57
D62
C74
C69
L61
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R53
R71
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C93
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D42
C51
R42
C50
D41
R41
C46
C43
L45
C41
C40
R74
C94
L44
C47
D43
L43
L50
L46
R40
C45
L49
C44
C42
L42
L41
L40
L47

Fig. 1.

MECHANICAL DATA

Dimensions in mm

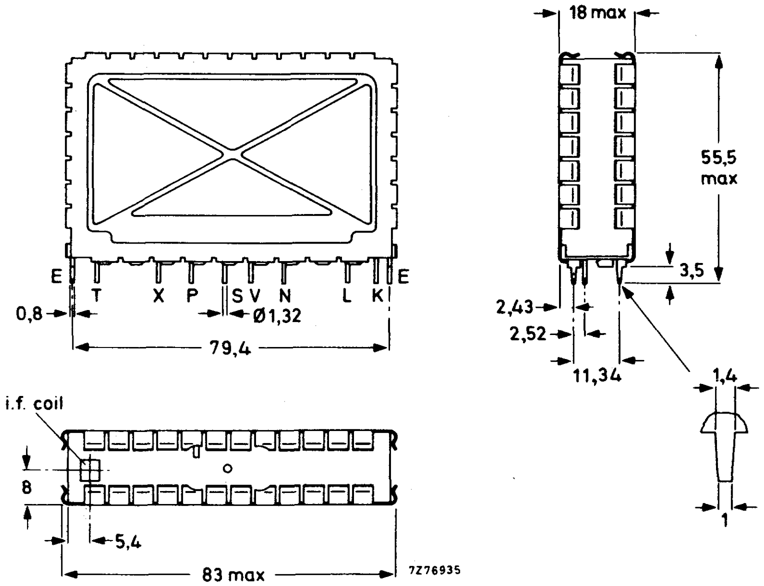

Fig. 2a.

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.

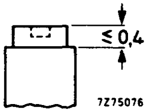

Fig. 2b I.F. output coil.
Torque for alignment: 2 to 15 mNm
Press-through force : ≥ 10 N

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).

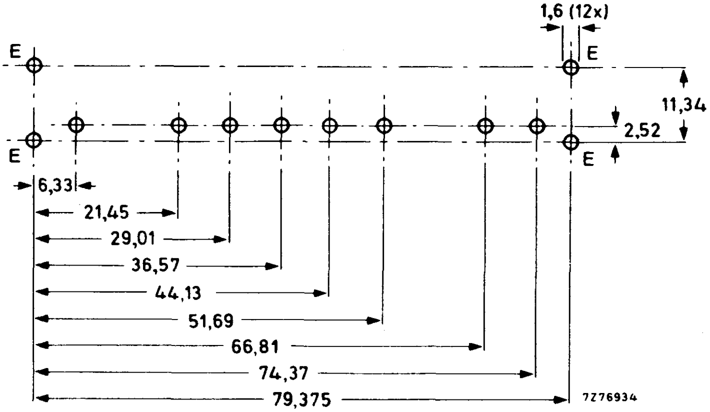

Fig. 3 Piercing diagram viewed from solder side of board.

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	3 x BB106
switching diodes	4 x BA220; 6 x BA243
switching transistor	BC558
voltage regulator diode	BZX79 – C5V6
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. 40 mA
v.h.f. I, at 40 dB gain reduction	typ. 42 mA
r.f. amplifier, v.h.f. III, at nominal gain	typ. 40 mA
v.h.f. III, at 40 dB gain reduction	typ. 42 mA
self-oscillating mixer	typ. 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.

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 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	max. 150 nA

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

Switching current	max. 16 mA

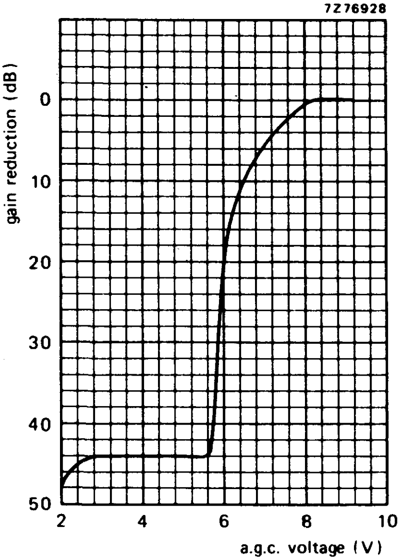

Fig. 4 A.G.C. voltage characteristic, channel E2; typical curve.

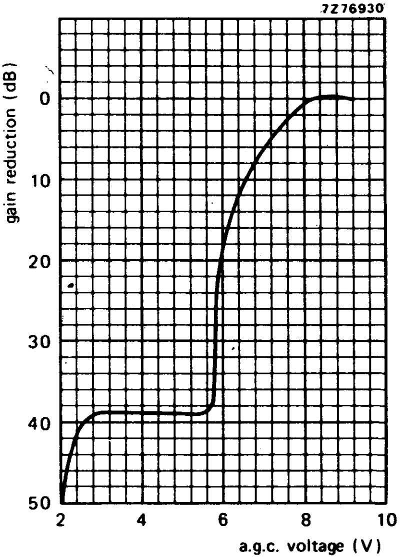

Fig. 5 A.G.C. voltage characteristic, channel C; typical curve.

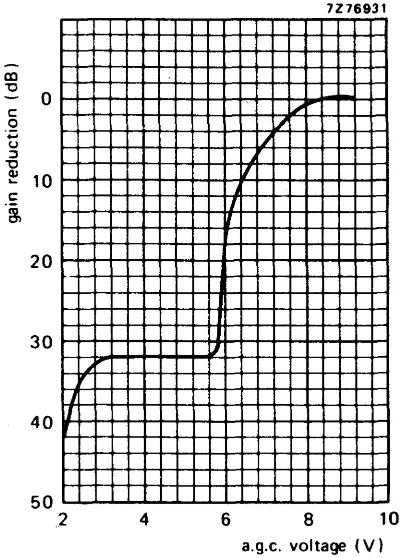

Fig. 6 A.G.C. voltage characteristic, channel M4; typical curve.

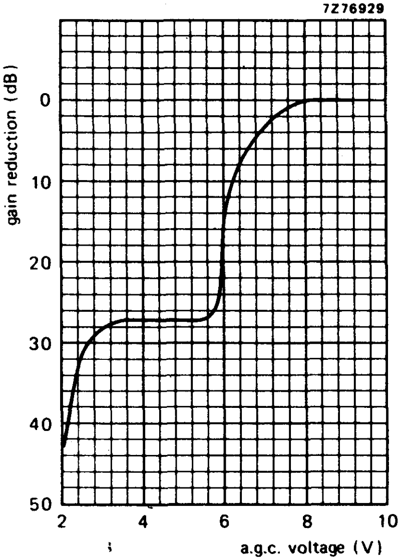

Fig. 7 A.G.C. voltage characteristic, channel E12; typical curve.

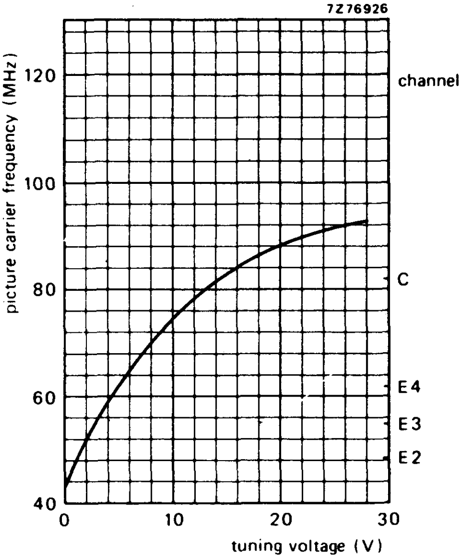

Fig. 8 Tuning voltage characteristic, v.h.f. I; typical curve.

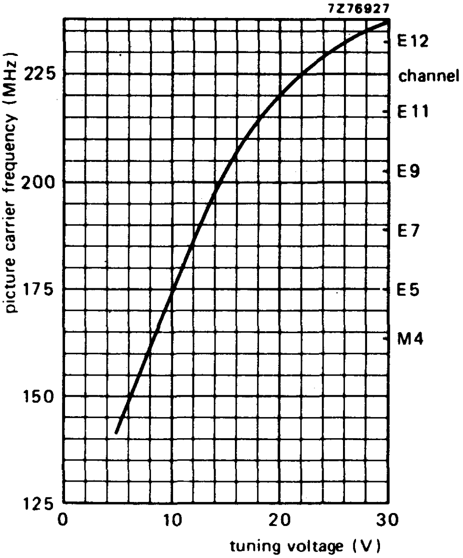

Fig. 9 Tuning voltage characteristic, v.h.f. III; typical curve.

Frequencies

Frequency ranges	
v.h.f. I	channel E2 (picture carrier 48,25 MHz) to channel C (picture carrier 82,25 MHz) Margin at the extreme channels: 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	
	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%

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. 20 dB
channel E5	typ. 25 dB
channel E12	typ. 25 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 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.	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.

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.	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 v.h.f. I, interfering from u.h.f. v.h.f. III, interfering from v.h.f. I v.h.f. III, interfering from u.h.f.	to be established

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 + 60 °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.

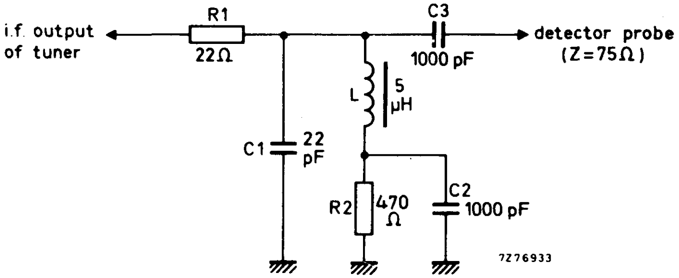

Fig. 10.

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

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.

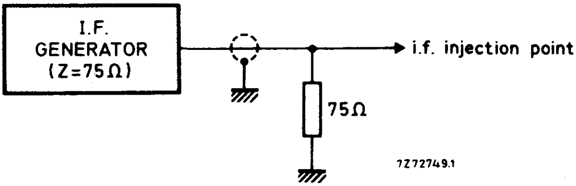

Fig. 11.

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.)

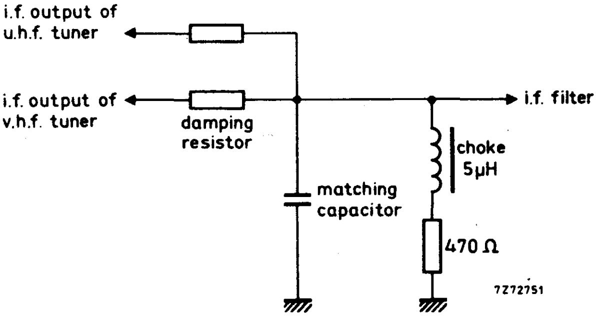

Fig. 12.

Measuring method of power gain

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

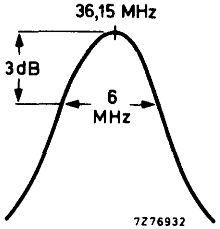

Fig. 13.

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.

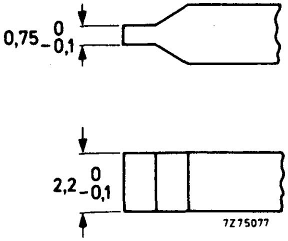

Fig. 14.

ACCESSORIES

Connector assembly for use of tuner V314 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.

This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

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 min. S17 (typ. 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 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 279 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 BF198. 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.

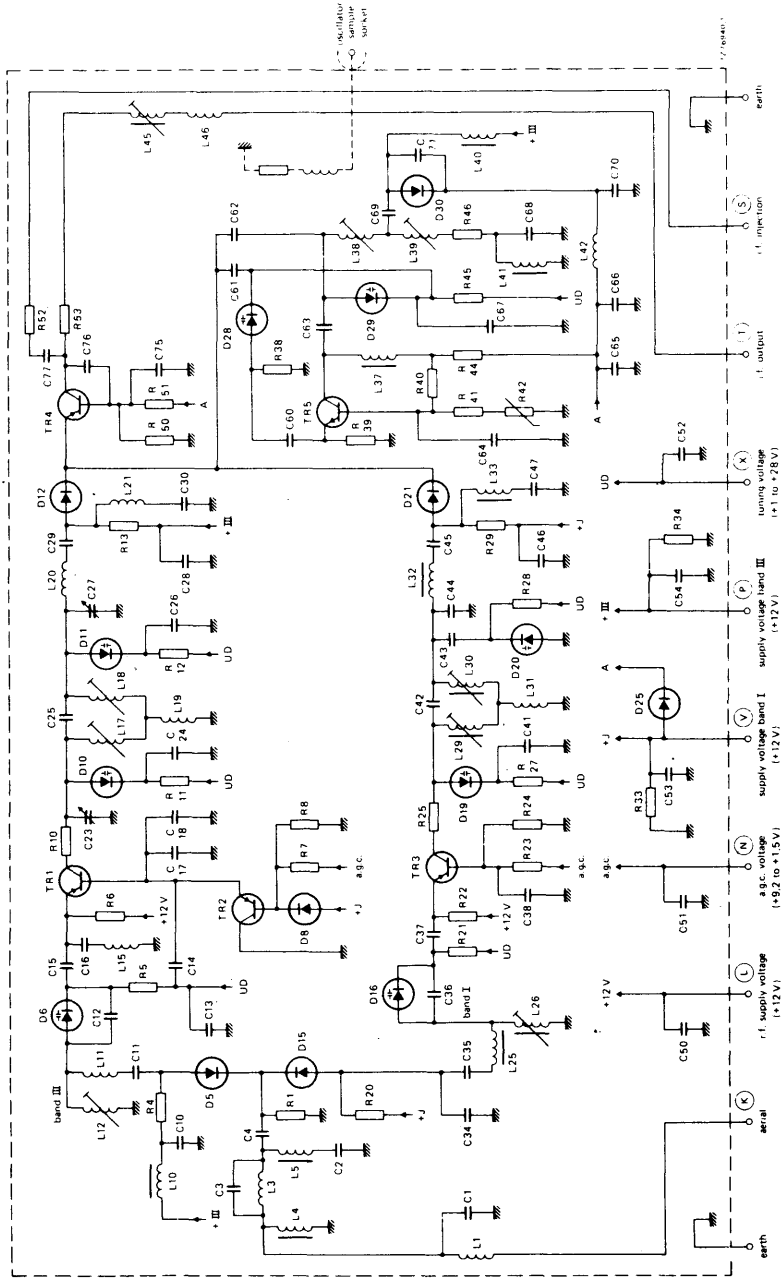
oscillator sample socket
earth
r.f. injection
r.f. output
tuning voltage (+1 to +28 V)
supply voltage band III (+12 V)
supply voltage band I (+12 V)
a.g.c. voltage (+9.2 to +1.5 V)
r.f. supply voltage (+12 V)
aerial
earth
S
T
X
P
V
N
L
K
band III
band I
UD
a.g.c.
+12 V
+J
+III
A
TR1
TR2
TR3
TR4
TR5
D5
D6
D8
D10
D11
D12
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Fig. 1.

MECHANICAL DATA

Dimensions in mm

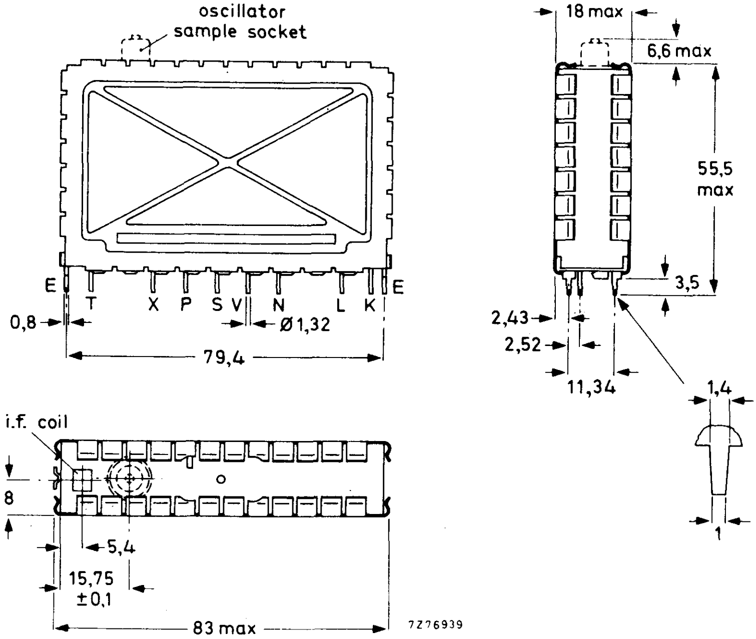

Fig. 2a The oscillator sampling socket, drawn with dotted lines, applies only to tuner V315LO.

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.

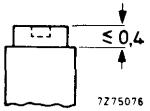

Fig. 2b I.F. output coil.
Torque for alignment: 2 to 15 mNm
Press-through force: ⩾ 10 N

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).

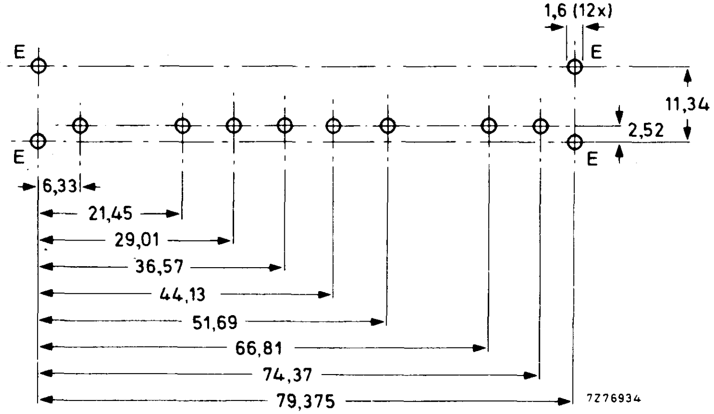

Fig. 3 Piercing diagram viewed from solder side of board.

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. 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	BF198
tuning diodes	8 x BB209
switching diodes	BA182; 2 x BA244; 2 x BA220; 2 x BA283
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 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	max. 400 nA

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

Switching current	max. 16 mA

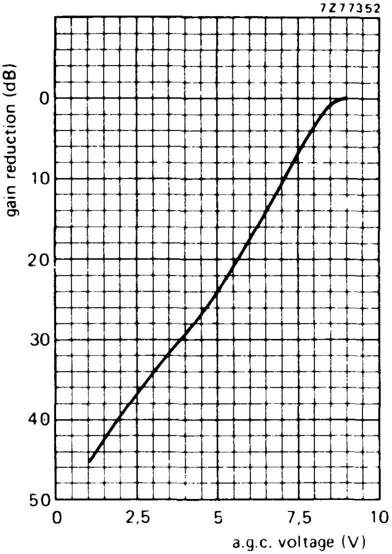

Fig. 4 A.G.C. voltage characteristic, channel E2; typical curve.

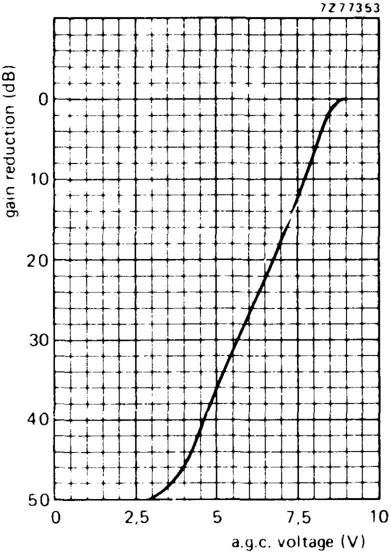

Fig. 5 A.G.C. voltage characteristic, channel S1; typical curve.

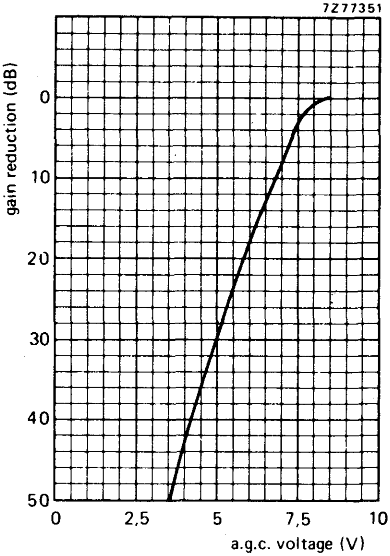

Fig. 6 A.G.C. voltage characteristic, channel S2; typical curve.

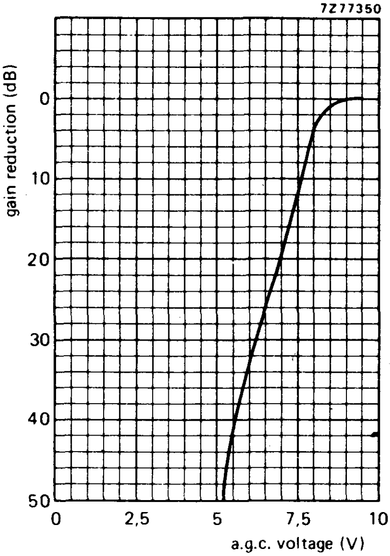

Fig. 7 A.G.C. voltage characteristic, channel S20; typical curve.

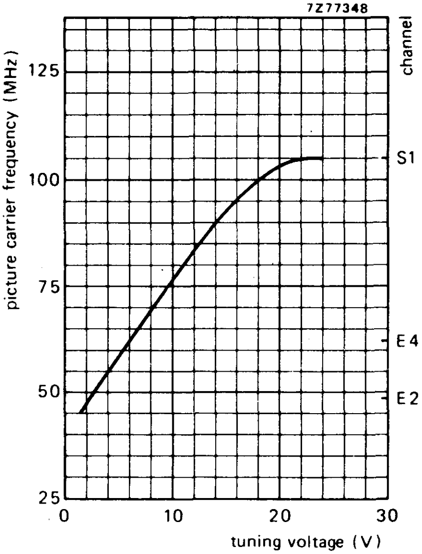

Fig. 8 Tuning voltage characteristic, v.h.f. I; typical curve.

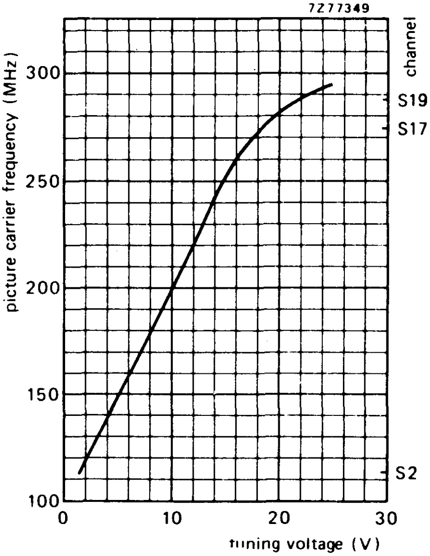

Fig. 9 Tuning voltage characteristic, v.h.f. III; typical curve.

Oscillator sample signal; **only valid for V315LO**	
at + 12 V supply voltage and T_{amb} = + 25 °C	typ. 84 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.

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 312,15 MHz (typ. 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 S17 (picture carrier 273,25 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
Input impedance of 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 channel E2	min. 40 dB
A.G.C. range, channel E2	min. 30 dB
Power gain (see also Measuring method of power gain)	min. 20 dB
channel E3	typ. 23 dB
channel E5	typ. 23 dB
channel E12	typ. 23 dB
Gain difference between any two channels	typ. 6 dB

Unwanted signal characteristics

Image rejection (measured at picture carrier frequency), channels E2 to E12	min. 60 dB

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 (measured at picture carrier frequency), channels E3 to E55	min. 60 dB
channel E2	min. 55 dB

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

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)	to be established
at 40 dB gain reduction (wanted input level 100 dB (μV)	

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)	to be established
at 40 dB gain reduction (wanted input level 100 dB (μV)	

Out of band cross modulation at nominal gain

v.h.f. I, interfering from v.h.f. III	to be established
v.h.f. I, interfering from u.h.f.	
v.h.f. III, interfering from v.h.f. I	
v.h.f. III, interfering from u.h.f.	

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. **400** 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)	max. **650** 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 of connected in parallel with C1 and R1 is short-circuited; tuning voltage is 15 V.

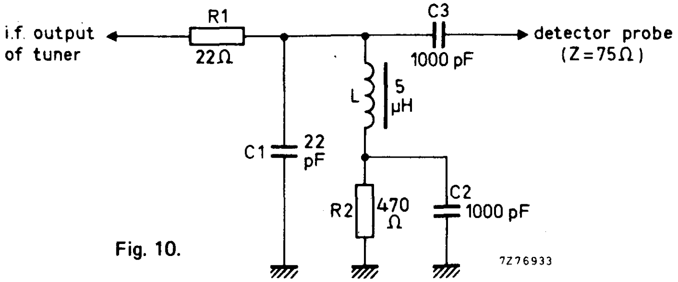

Fig. 10.

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).
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.

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* For V315LO: 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 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.

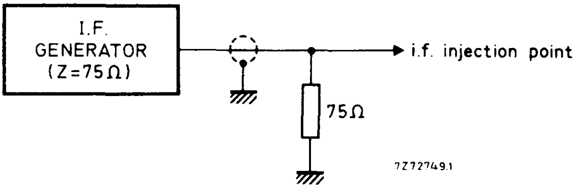

Fig. 11.

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.)

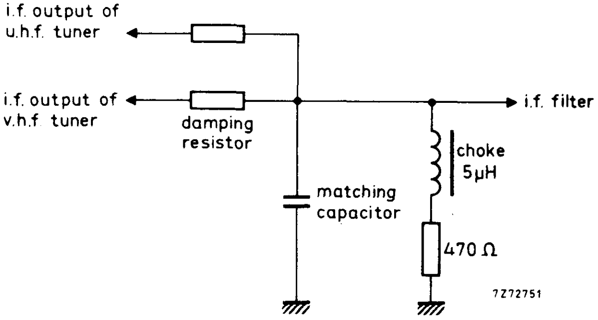

Fig. 12.

Measuring method of power gain

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

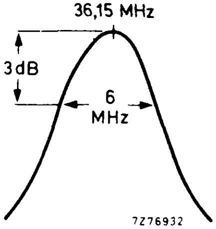

Fig. 13.

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.

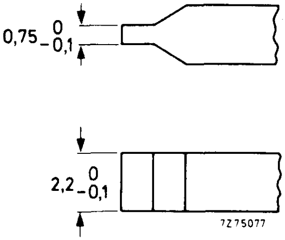

Fig. 14.

ACCESSORIES

Connector assembly for use of tuner V315 or V315LO in combination with u.h.f. tuner U322 (or UDI):
- connector, catalogue number 3112 200 20720;
- washer, catalogue number 3112 221 01220;
- clamp, catalogue number 3112 274 13220.

MONOCHROME TELEVISION ASSEMBLIES

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C

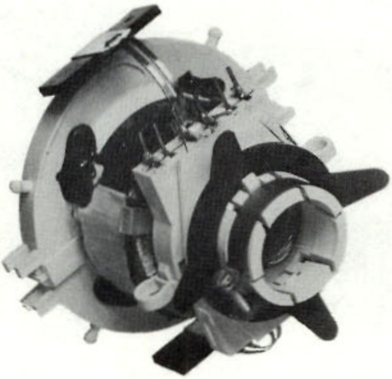
DEFLECTION COIL ASSEMBLY
for monochrome television receivers

AT1040/15

QUICK REFERENCE DATA

Designed for use with 110^{0} picture tubes with a neck diameter of 28mm. The unit is suitable for use with line output transformer AT2048/11 for transistor drive, and line linearity control units AT4042/02 or AT4042/14.

Line deflection coils (parallel connected) inductance	3.3mH
Field deflection coils (parallel connected) resistance	7.5Ω



GENERAL

The design of the coil is such as to bring the centre of deflection into the conical part of the picture tube; the coil should therefore be pushed right up the neck of the tube until it touches the cone. Picture shift magnets are mounted on the rear moulding of the coil, and adjustable raster correction magnets are fitted, mounted on 'stalks' for vertical pincushion correction. Facilities are provided on the periphery of the moulding, for mounting small plastic bonded magnets for correcting the corners of the raster.

To orientate the raster correctly, the unit should be rotated by hand on the neck of the picture tube. A screw-tightened clamping ring permits it to be locked in the desired position, both axially and radially.

The assembly is manufactured in flame retardant material to conform to BS415 and IEC 65.

DIMENSIONS (millimetres)

First angle projection

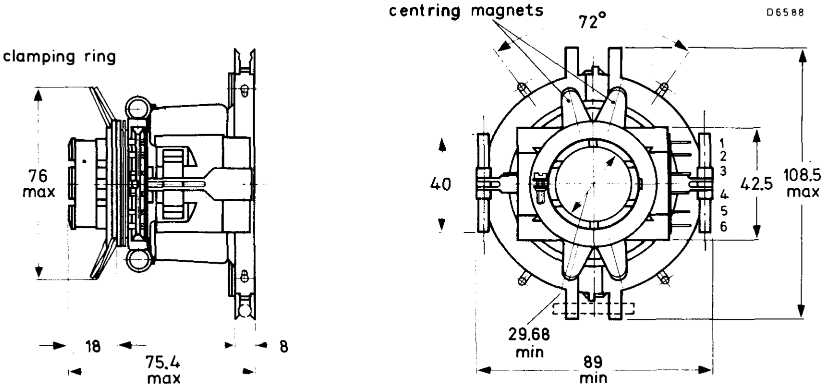


Fig. 1

MOUNTING

For optimum raster shape the soldering tag plate must be positioned as shown in Fig. 1.

CONNECTIONS

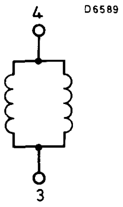


Fig. 2

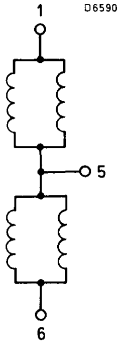


Fig. 3

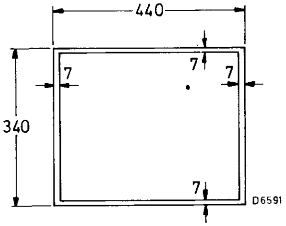
DEFLECTION COIL ASSEMBLY
for monochrome television receivers

AT1040/15

ELECTRICAL DATA (at 25°C)		
Line deflection coils, parallel connected (see Fig. 2)		
Connections to pins	3 and 4	
Inductance	3.3 ± 5%	mH
Resistance	6.1 ± 10%	Ω
Deflection current, peak-to-peak (at 18kV and beam deviation of 495mm on a 61 cm (24in) reference picture tube)	2.3 ± 6.5%	A
Field deflection coils, parallel connected (see Fig. 3)		
Connection to pins	1 and 6	
Inductance	17 ± 10%	mH
Resistance	7.5 ± 8%	Ω
Deflection current, peak-to-peak (at 18kV and beam deviation of 390mm on a 61cm (24in) reference picture tube	1.1 ± 5.5%	A
Maximum voltage between line and field coils (50Hz)	2	kV
MAXIMUM OPERATING TEMPERATURE	105	°C
ADJUSTMENT RANGE OF CENTRING MAGNETS	Ø5 to Ø45	mm

RASTER DISTORTION

The raster edges fall between the two rectangles, as shown in Fig. 4.



Dimensions in millimetres

Fig. 4

ADJUSTMENTS

Correction of eccentricity

After adjustment of the linearity of the deflection current, the eccentricity of the picture tube and the deflection unit can be corrected by means of two independently movable, diametrically magnetised centring magnets. By turning the magnets with respect to each other, the magnetic force of the resultant field of both magnets is adjusted. The direction of the resultant magnetic field is adjusted by turning the magnets simultaneously.
It should be noted that the centring magnets cannot be used for compensating the effects of non-linearity or of phase differences between synchronisation and time base, as otherwise the correction needed becomes excessive and, even if the correction is within the range of the magnets, curved lines may appear in the centre of the raster.

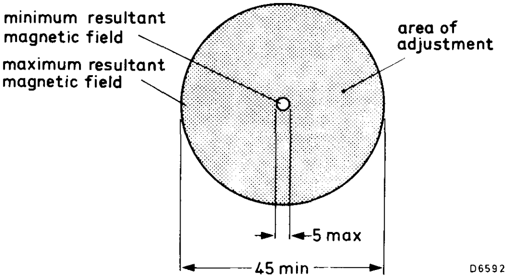


Fig. 5

APPLICATION

Deflection coil	Line output transformer	Line linearity control unit	Output device
AT1040/15	AT2048/11	AT4042/02 or AT4042/14	BU205

DEFLECTION UNIT
for black and white monitors

AT1071/01

QUICK REFERENCE DATA	
Monitor tube, diagonal	24 cm (9 in)
neck diameter	28 mm
Deflection angle	90 °
Line deflection current, edge to edge at 14 kV	8, 6 A (p-p)
Inductance of line coils, parallel connected	93 µH
Field deflection current, edge to edge at 14 kV	0, 425 A (p-p)
Resistance of field coils, series connected	27 Ω

APPLICATION

This deflection unit has been designed for use with a 90° black and white monitor tube type M24-100 W in conjunction with:

line output transformer	AT2102/01;
linearity control unit	AT4036 and;
line output transistor	BD160.

DESCRIPTION

The saddle-shaped line deflection coils are moulded so that the deflection centre is well within the conical part of the picture tube.
The field deflection coils are wound on a Ferroxcube yoke ring which is flared so that the frame and line deflection centres coincide.

For centring and pin-cushion distortion see under "Correction facilities".

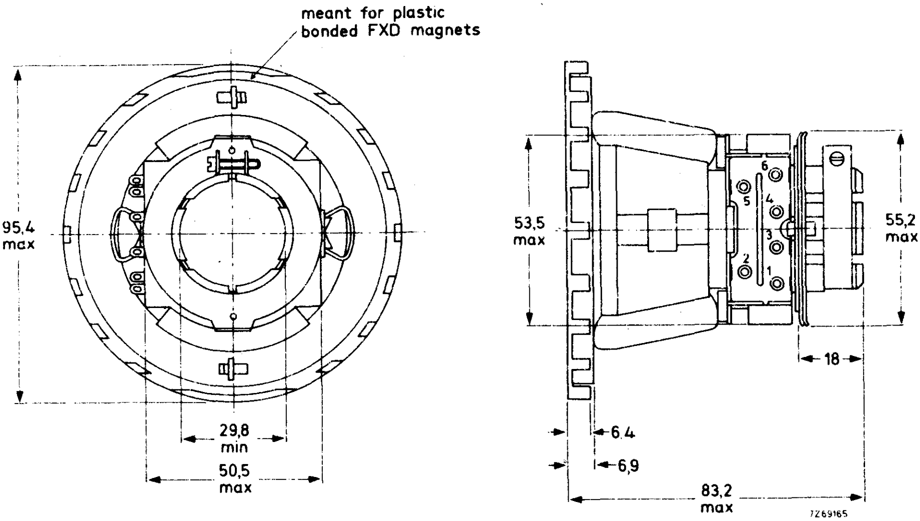


Fig. 1

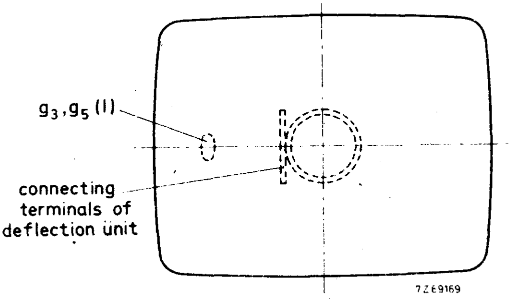
The unit is provided with soldering pins for connection. The pin numbering in Fig. 1 corresponds to that in the connection diagram (Figs. 3 and 4).

MOUNTING

The unit should be mounted as far forward as possible on the neck of the picture tube, so that it touches the cone. For optimum raster shape, the coil should be mounted as shown in Fig. 2.

To orientate the raster correctly, the unit may be rotated on the neck of the picture tube. A clamping ring locks the unit both axially and radially.

Fig. 2 Front view of picture tube.



DEFLECTION UNIT
for black and white monitors

AT1071/01

ELECTRICAL DATA

Line deflection coils, parallel connected (Fig. 3) terminals 3 and 4	
Inductance	typ. 93 µH
Resistance	typ. 0,15 Ω
Field deflection coils, series connected (Fig. 4) terminals 1 and 5	
Inductance	typ. 56 mH
Resistance	typ. 27 Ω
Maximum peak voltage between terminals of line and field coils (50 Hz)	2000 V
Maximum operating temperature	95 °C

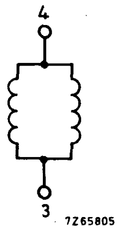


Fig. 3 Line coils

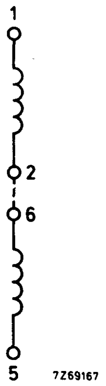


Fig. 4 Field coils

The following characteristics are measured at an e.h.t. of 14 kV on a 24 cm (9 in) reference tube, type M24-100 W.

Sensitivity

Deflection current edge to edge	
in line direction	8,6 A (p-p)
in field direction	0,425 A (p-p)

Geometric distortion (measured without correction magnets and centring ring)

Pin-cushion, barrel and trapezium distortion	The edges of the raster fall within the two rectangles shown in Fig. 5.

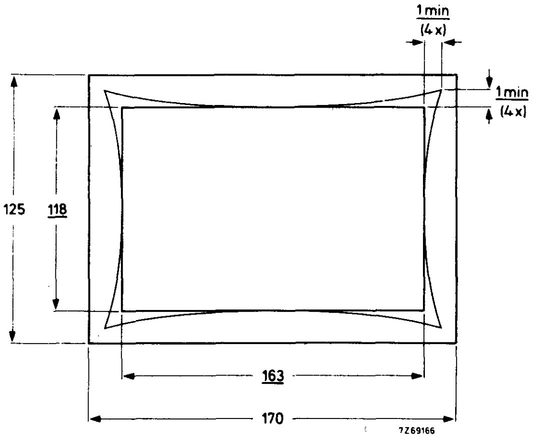


Fig. 5

CORRECTION FACILITIES

For centring

After adjustment of the linearity of the deflection current, the eccentricity of the picture tube and the deflection unit can be corrected by means of two independently movable centring magnets of plastic-bonded Ferroxdure. These magnets are magnetized diametrically. By turning the magnets with respect to each other the resulting field strength is varied. The direction of the resulting magnetic field is adjusted by turning the magnets simultaneously.

These centring magnets can not be used for compensating the effects of non-linearity or of phase differences between the synchronization and time base, as otherwise the correction needed becomes excessive. Even if the correction is within the range of the magnets, curved lines may appear in the centre of the raster.

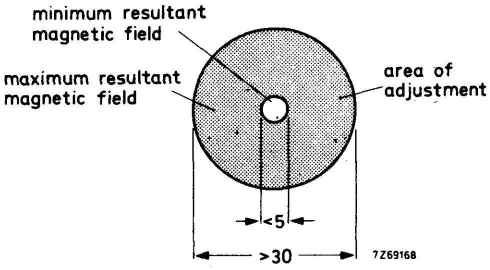


Fig. 6

For pin-cushion distortion

This can be corrected by moving magnets of plastic-bonded Ferroxdure (catalogue number 3122 104 95000) which may be mounted in the rim at the front of the deflection unit.

DEFLECTION UNIT

QUICK REFERENCE DATA

Picture tube		
diagonal	31 cm (12 in) 34 cm (14 in)	24 cm (9 in) 31 cm (12 in)
neck diameter	max. 20,9 mm	max. 20,9 mm
Deflection angle	110°	90°
Line deflection current for full scan, at 11 kV	5,02 A (p-p)	4,05 A (p-p)
Inductance of line coils, parallel connected	255 μH	
Field deflection current for full scan, at 11 kV	1,1 A (p-p)	0,91 A (p-p)
Resistance of field coils, parallel connected	2,7 Ω	

APPLICATION

The deflection unit has been designed for use with 31 cm (12 in) or 34 cm (14 in) 110° black and white picture tubes, or 24 cm (9 in) or 31 cm (12 in) 90° black and white monitor tubes. The unit is used in conjunction with:

– line output transformer AT2140/10 or AT2140;
– linearity control unit AT4042/39;
– line driver transformer AT4043/56.

DESCRIPTION

The saddle shaped line deflection coils are moulded so that the deflection centre is well within the conical part of the picture tube. The field deflection coils are wound on a Ferroxdure yoke ring which is flared so that the frame and line deflection centres coincide. Provisions are made for centring, and correction of pin-cushion distortion. The unit meets the self-extinguishing and non-dripping requirements of IEC 65.

MOUNTING

The unit should be mounted as far forward as possible on the neck of the picture tube, so that it touches the cone.

To orient the raster correctly, the unit may be rotated by hand on the neck of the picture tube, with which it makes a slip fit. A screw-tightened clamping ring permits it to be locked, both axially and radially, in the desired position.

MECHANICAL DATA

Dimensions in mm

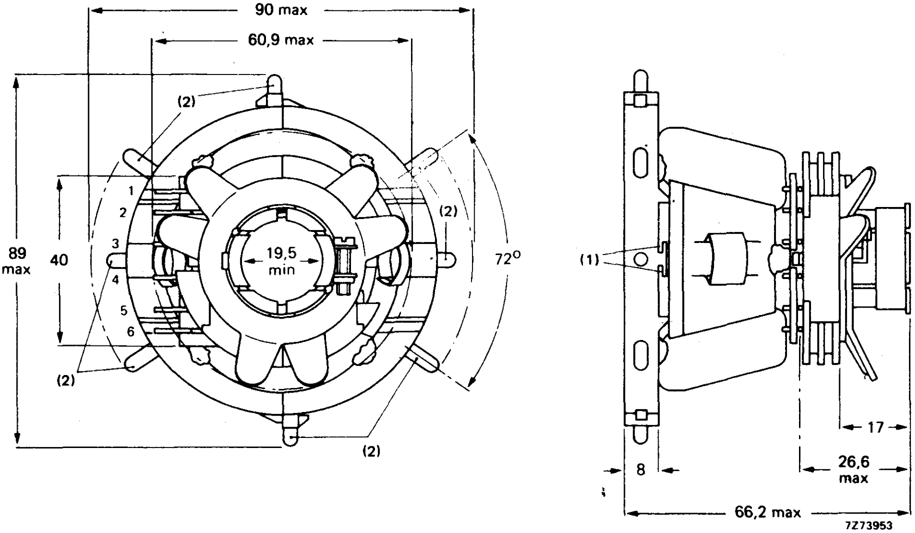


Fig. 1 Deflection unit AT1074. Facilities for fitting correction magnets:
(1) for bracket with plastic-bonded FXD magnet strip, catalogue number 3122 137 10160;
(2) for plastic-bonded FXD magnets, catalogue number 3122 104 94120.

The unit is provided with solder pins for connection. The pin numbering in Fig. 1 corresponds to that in the connection diagrams (Fig. 2).

ELECTRICAL DATA

The electrical values apply at an ambient temperature of 25 °C.

Line deflection coils, parallel connected (Fig. 2a) terminals 3 and 4	
Inductance	255 μH ± 5%
Resistance	0,56 Ω
L/R	455 μH/Ω ± 8%
Field deflection coils, parallel connected (Fig. 2b) terminals 1 and 6	
Inductance	7,7 mH ± 8%
Resistance	2,7 Ω
L/R	2,87 mH/Ω ± 10%
Maximum d.c. voltage between terminals of line and field coils	500 V
Maximum operating temperature	95 °C

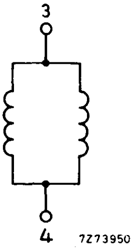


Fig. 2a Line coils.

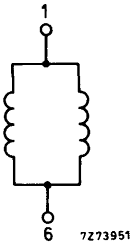


Fig. 2b Field coils.

The following characteristics are measured at an e.h.t. of 11 kV on a 31 cm (12 in) reference picture tube.

Sensitivity

Deflection current edge to edge	110°	90°
in line direction	5,02 A (p-p)	4,05 A (p-p)
in field direction	1,1 A (p-p)	0,91 A (p-p)

Geometric distortion measured without correction magnets, on a 31 cm (12 in) reference picture tube.

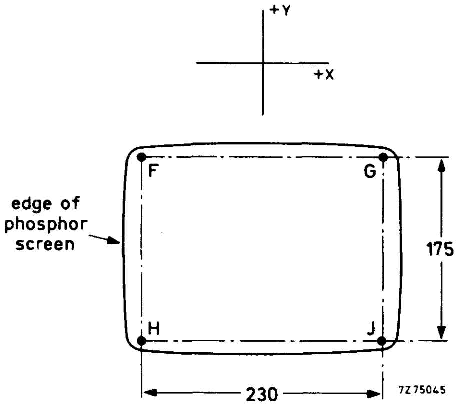


Fig. 3.

Fy : 0^{+4}_{-2}	Fx : 0^{-4}_{+2}
Gy : 0^{+4}_{-2}	Gx : 0^{+4}_{-2}
Jy : 0^{-4}_{+2}	Jx : 0^{+4}_{-2}
Hy : 0^{-4}_{+2}	Hx : 0^{-4}_{+2}

CORRECTION FACILITIES

For centring

After adjustment of the linearity of the deflection current, the eccentricity of the picture tube and the deflection unit can be corrected by means of two independently movable centring magnets of plastic-bonded Ferroxdure. These magnets are magnetized diametrically. By turning the magnets with respect to each other the resulting field strength is varied. The direction of the resulting magnetic field is adjusted by turning the magnets simultaneously.

These centring magnets cannot be used for compensating the effects of non-linearity or of phase differences between the synchronization and time base, as otherwise the correction needed becomes excessive. Even if the correction is within the range of the magnets, curved lines may appear in the centre of the raster.

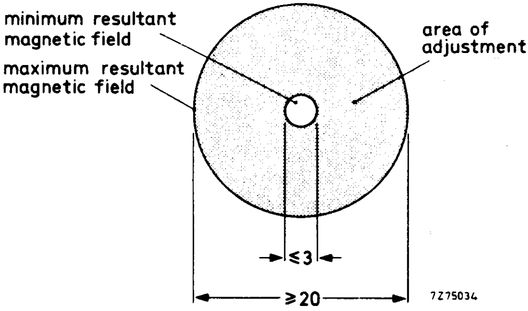


Fig. 4.

For geometric distortion

The unit has provisions for mounting brackets for magnet strips* to correct pin-cushion distortion and for magnets** to correct the raster corners, see Fig. 1.

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* Plastic-bonded Ferroxdure magnet strips (with bracket) are available on request (catalogue number 3122 137 10160).

** Plastic-bonded Ferroxdure magnets are available on request (catalogue number 3122 104 94120).

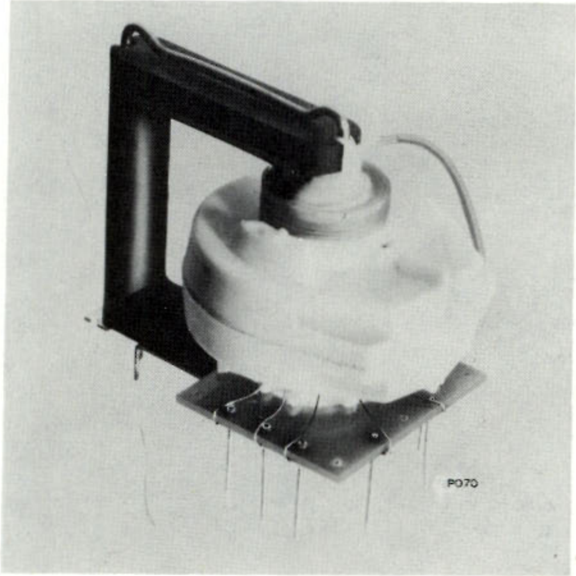
LINE OUTPUT TRANSFORMER
for monochrome television receivers

AT2048/11

QUICK REFERENCE DATA

Designed for use in a fully transistorised monochrome television receiver to provide the line scan for the 110^{o} picture tubes with 28mm neck diameter. Intended for use in conjunction with the deflection coil AT1040/15, line linearity control units AT4042/02 or AT4042/14, the line output transistor BU205 and a semiconductor e.h.t. rectifier.

Supply voltage	150	V
E.H.T.	18	kV



GENERAL

The primary, secondary and the e.h.t. windings are placed on one limb of the Ferroxcube U and I cores. The e.h.t. coil is encapsulated in a flame retardant polyester.

DIMENSIONS (millimetres)
First angle projection

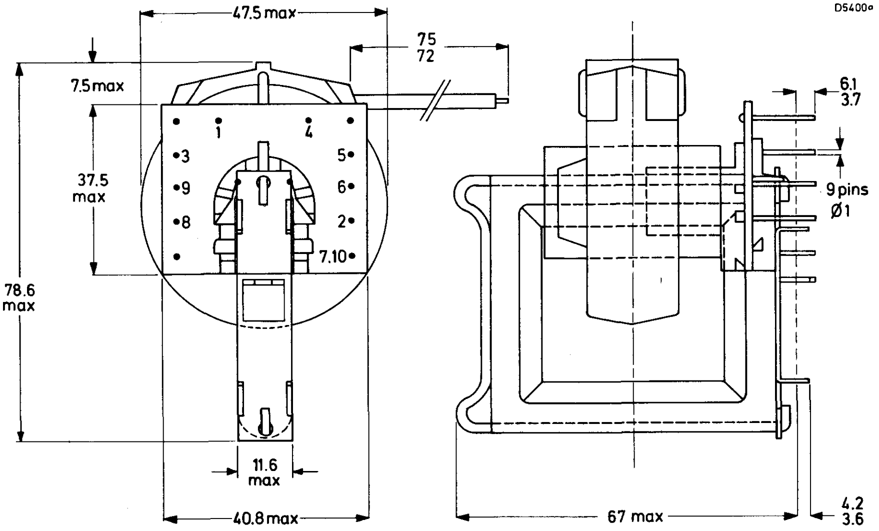


Fig. 1

ELECTRICAL DATA

Beam current	35	435	µA
Supply voltage	150	150	V
*Supply current	240	290	mA
E.H.T.	17.8	16.2	kV
Internal resistance of e.h.t.	-	4	MΩ
Collector to emitter voltage of BU205, peak-to-peak	960	-	V
Deflection current, peak-to-peak	2.2	-	A
Overscan	6.5	10	%
Low voltage supply			
pin 5 to earth	31	-	V
pin 6 to earth	12	-	V
pin 8 to 9	6.3	-	V

*With 20W of low voltage power

Note: - The maximum operating temperature of the transformer and core is 105°C. This allows for a maximum operating temperature of 70°C.

MOUNTING

The transformer can be mounted either on a printed-wiring board or a metal chassis. When mounting on a printed-wiring board (Fig. 2), the transformer is secured by its four mounting pins and two screws.

A separation of at least 25mm must be maintained between the transformer and any adjacent metal parts, to avoid reducing the efficiency of the transformer. A free passage of air round the transformer is required to allow sufficient cooling to maintain an operating ambient temperature below 70°C.

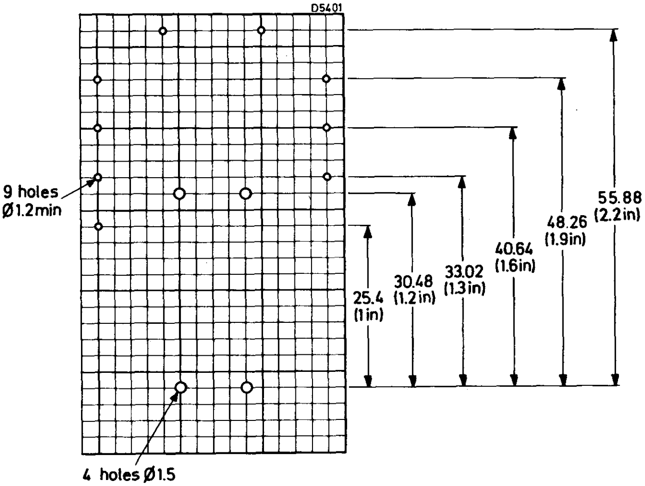
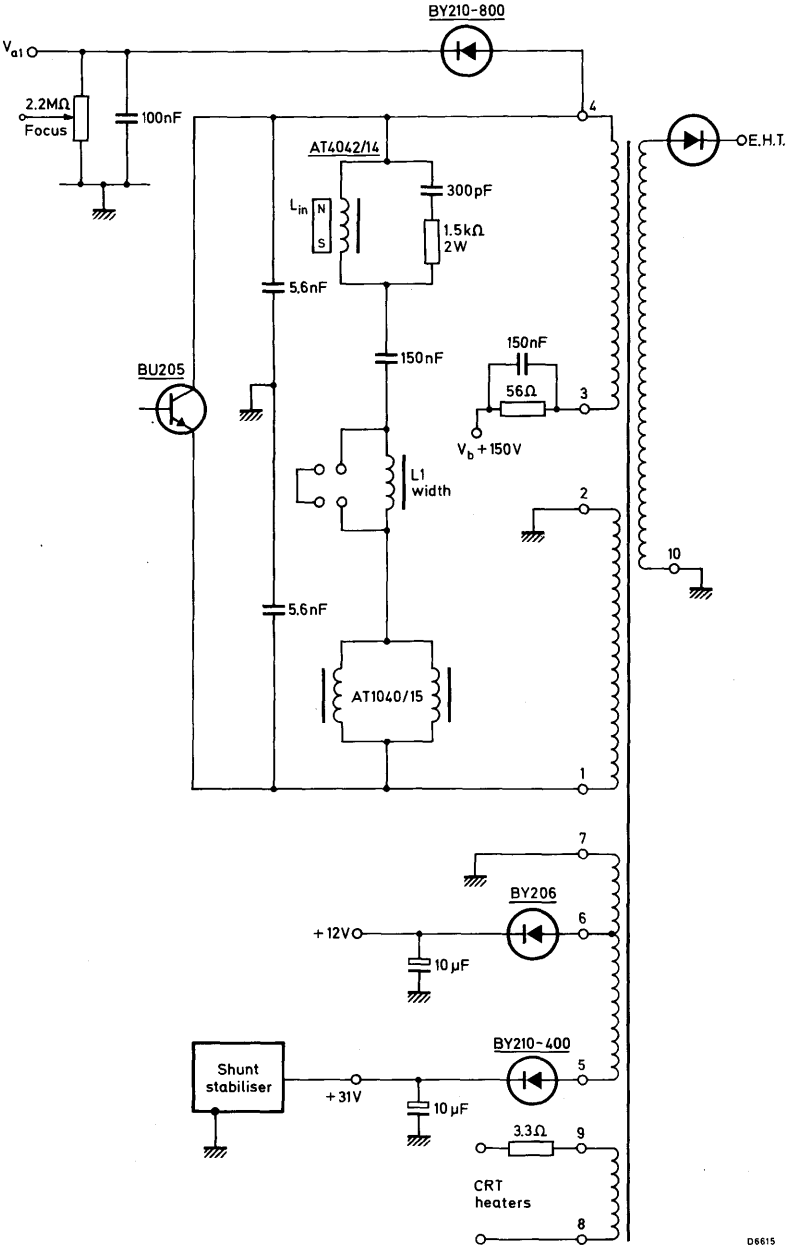


Fig. 2

CIRCUIT DIAGRAM

See overleaf

CIRCUIT DIAGRAM



LINE OUTPUT TRANSFORMER for black and white monitors

AT2102/01

QUICK REFERENCE DATA				
I_{eht}	0,03		0,23	mA
E.H.T.	14,5		13,2	kV
$R_{i(eht)}$		6		MΩ
I_{p-p} deflection	8			A
Supply voltage (V_B)	12		12	V
current (I_B)	830		1100	mA
Voltages of auxiliary windings	-102 $V_{(p)}$, $+820$ $V_{(p)}$			

APPLICATION

This transformer has been designed to provide the required scanning amplitude for 24 cm (9 inch) 90° monitor tubes with a neck diameter of 28 mm in transistor equipped monitors presenting 625 lines at 50 frames per second (CCIR) or 525 lines at 60 frames per second (USA).

It is intended for use in conjunction with :
- deflection unit AT 1071/01;
- linearity control unit AT4036;
- line output transistor BD160;
- booster (efficiency) diode BYX55, BYX 71;
- e.h.t. rectifier device TV 18KT.

See also circuit diagram of Fig. 3.

DESCRIPTION

The magnetic circuit of the transformer comprises Ferroxcube U and I-cores clamped together with brackets.
The primary windings and the auxiliary windings are situated on one leg of the core, the e.h.t. winding and the coupling winding are situated on the other leg. The e.h.t. winding is encapsulated in flame retardent polyester. The whole transformer meets the self-extinguishing requirements of IEC publication 65, para. 14.4 and UL492, para. 280-SE 1.
The transformer is provided with four mounting pins.
External circuit connection is made to connecting pins, positioned as indicated in Fig. 1 enabling the unit to be soldered directly into a printed-wiring board.

MECHANICAL DATA

Dimensions in mm

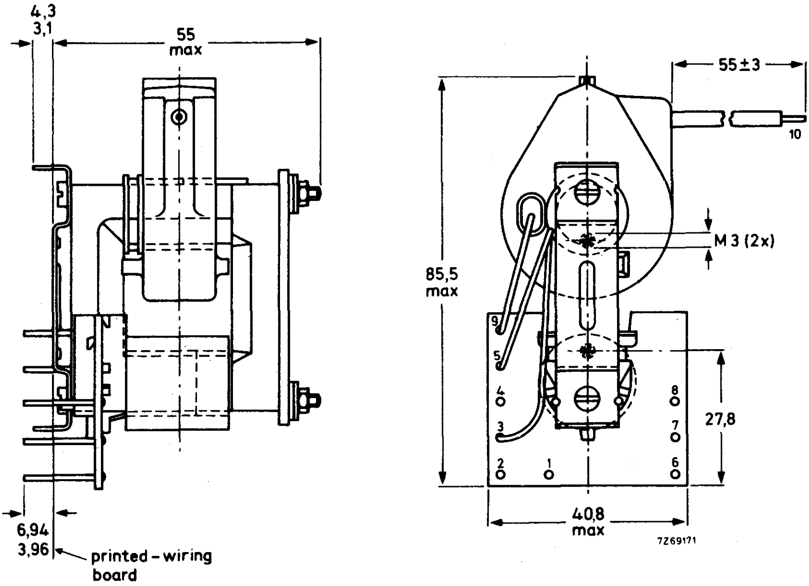


Fig. 1

MOUNTING

For mounting on a printed-wiring board the fit of the connecting and mounting pins in a printed-wiring grid with a pitch of 2, 54 mm (0, 1 in) is illustrated in Fig. 2. The transformer core must be earthed

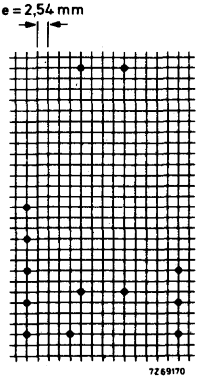


Fig. 2 Hole pattern for mounting on a printed-wiring board (solder side).
Grid holes 1, 3 ± 0, 1 mm.

Temperature

The operating temperature of the core and the coils should not exceeded 95 °C under worst conditions, i.e. taking into account:
- over-voltage on the windings;
- low atmospheric pressure (at high altitudes) implying bad cooling by convection;
- high room temperature (up to 45 °C).

To satisfy these requirements it may be desirable to provide ample cool air circulation around the transformer.

Distances

The following minimum distances between the transformer and neighbouring conductive flat surfaces must be maintained (it should be noticed that edges of conductive parts must have a greater distance):

- from the e.h.t. winding, radially 20 mm,
  axially 12 mm;
- from the e.h.t. cap and lead 20 mm;
- from the primary coil 10 mm;
- between the upper edge of the rectifier socket and the primary coil 10 mm.

The transformer, and the leads and components carrying high voltage pulses should be kept free from metal particles, solder drops, etc.

ELECTRICAL DATA

Measured in the circuit shown in Fig. 3 (auxiliary windings unloaded).

	I_{eht}	mA	0,03	0,23
E.H.T. supply	e.h.t.	kV	14,5	13,2
	$R_{i(eht)}$	MΩ	6	
	V_B	V	12	12
Power supply	V_B	V	24	23,7
	$I_{average}$	mA	830	1100
Output transistor	V_{CEM}	V	180	
	I_{p-p}	A	8	
Deflection	Overscan variation	%		3
Auxiliary windings,	connecting pin 6	V_p	+820	
	connecting pin 8	V_p	-102	

Application circuit

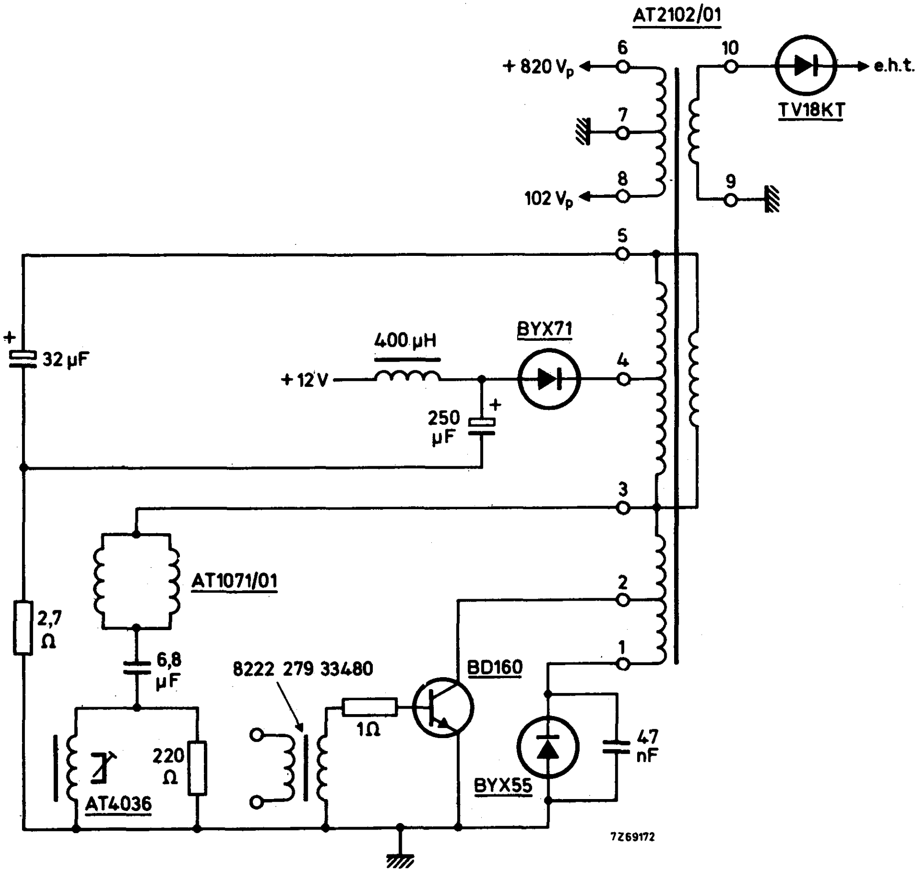


Fig. 3

DEVELOPMENT SAMPLE DATA

This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

LINE OUTPUT TRANSFORMER

QUICK REFERENCE DATA

I_{eht}	0 μA	100 μA
E.H.T.	11 kV	10,2 kV
$R_{i(eht)}$	8 MΩ	
Supply voltage (V_B)	8,8 V	8,8 V
Supply current (I_B)	920 mA	1100 mA
Deflection current	4,2 A (p-p)	4,1 A (p-p)
Auxiliary voltages	15 V (d.c.), 75 V (d.c.), 200 V (d.c.)	

APPLICATION

This transformer has been designed to provide the required scanning amplitude for 31 cm (12 in) and 34 cm (14 in) 90° black and white monitor tubes with a neck diameter of 20 mm in video display monitors presenting 625 lines at 50 frames per second (CCIR) or 525 lines at 60 frames per second (USA).

It is intended for use in conjunction with:
- deflection unit AT1074;
- adjustable linearity control unit AT4042/39;
- line driver transformer AT4043/56.

DESCRIPTION

The magnetic circuit of the transformer comprises two Ferroxcube U-cores, clamped together with a bracket. The primary winding, the auxiliary windings and the e.h.t. winding are situated on one leg of the core. An e.h.t. rectifier diode is incorporated in the transformer. All windings are encapsulated in flame retardent polyester. The whole transformer meets the self-extinguishing and non-dripping properties of the American Underwriters' Laboratories rating mentioned in UL94SE-1.

The transformer is provided with four mounting pins. External circuit connection is made to connecting pins, enabling the unit to be soldered directly into a printed-wiring board.

MECHANICAL DATA

Dimensions in mm

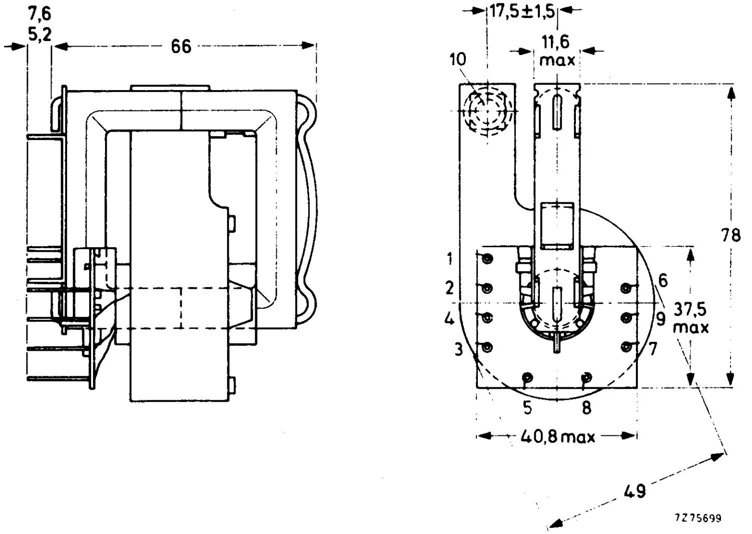


Fig. 1 Line output transformer AT2140/10.

MOUNTING

The transformer may be mounted on a printed-wiring board. The fit of the connecting and mounting pins in a printed-wiring grid with a pitch of 2,54 mm (0,1 in) is illustrated in Fig. 2. The core of the transformer must be earthed.

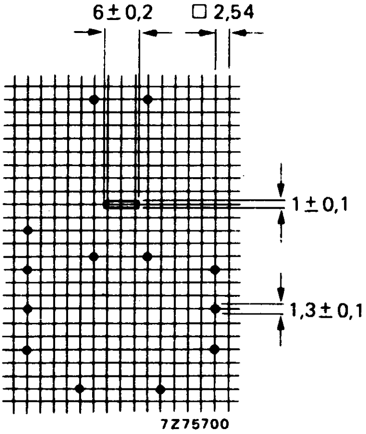


Fig. 2 Hole pattern for mounting on a printed-wiring board (solder side).

Temperature

The operating temperature of the core and the coils should not exceed 90 °C, under worst conditions, i.e. taking into account:

over-voltage on the windings;
low atmospheric pressure (at high altitudes) implying bad cooling by convection;
high room temperature (up to 45 °C)

To satisfy these requirements it may be desirable to provide ample cool air circulation around the transformer.

Distances

The following minimum distances between the transformer and neighbouring conductive flat surfaces must be maintained (in proportion to their sharpness protruding parts must have a greater distance):

a. From the e.h.t. winding, radially 18 mm, axially 10 mm.
b. From the e.h.t. lead 15 mm.

The transformer, and the leads and components carrying high-voltage pulses should be kept free from metal particles, solder drops etc.

ELECTRICAL DATA (see also Fig. 3)

E.H.T. supply	I_{eht}	0 μA	100 μA
	E.H.T.	11 kV	10,2 kV
	$R_{i(eht)}$	8 MΩ	
Power supply	V_B	8,8 V	8,8 V
	I_B	920 mA	1100 mA
Output transistor	V_{CEM}	220 V	220 V
	I_{CM}	3,6 A	3,7 A
Deflection	Current	4,2 A (p-p)	4,1 A (p-p)
	Flyback ratio (average)	9,4 %	9,4 %
	Overscan variation	0 %	0 %

Auxiliary windings

connecting pin 1	200 V (d.c.)
connecting pin 2	75 V (d.c.)
connecting pin 4	15 V (d.c.)

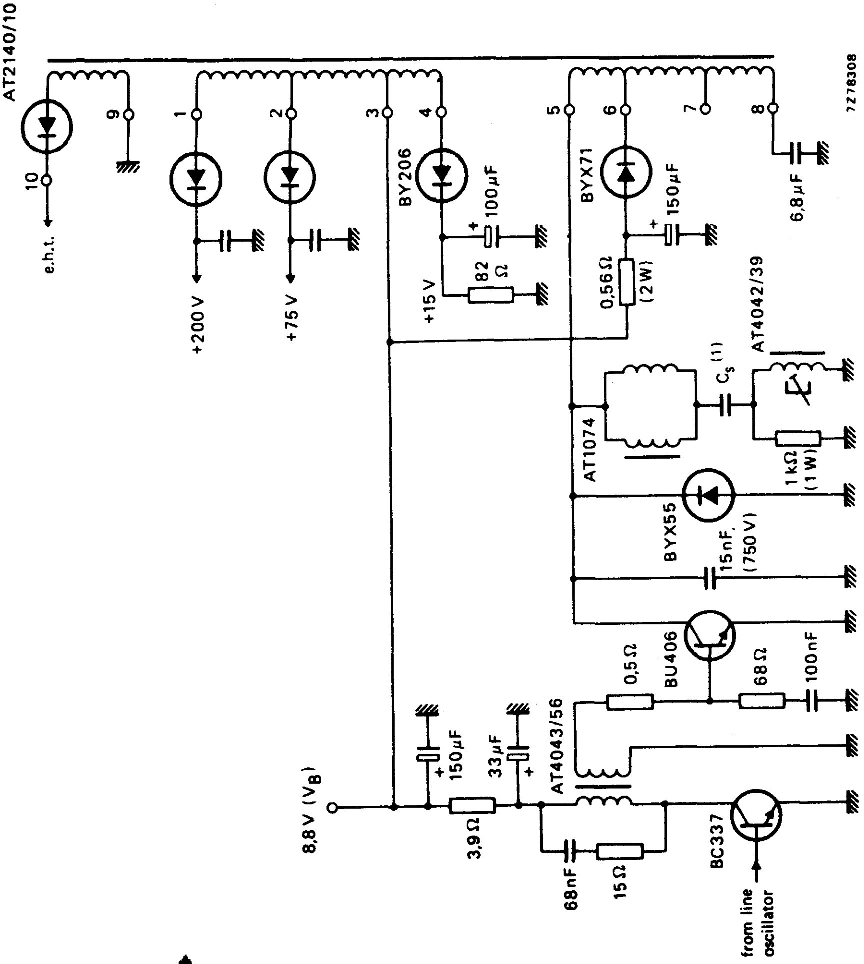


Fig. 3 Application circuit.

ADJUSTABLE LINEARITY CONTROL UNIT

APPLICATION

This linearity control unit has been designed for use in black and white monitors with 24 cm (9 in) or 31 cm (12 in) 90° monitor tubes. It can be used in conjunction with deflection unit AT1071/03, line output transformer AT2102/02 and line driver transformer AT4043/56.

DESCRIPTION

The unit consists of a coil wound on a Ferroxcube rod and two Ferroxdure magnets. One of these magnets has the shape of a half ring and is placed around the Ferroxcube rod under the coil. The other magnet is cylindrical; it is placed parallel to and clamped against the Ferroxcube rod opposite the first one. This magnet is provided with a square hole to facilitate turning of it to adjust the biasing field and so the linearity of the line deflection.

MECHANICAL DATA

Dimensions in mm

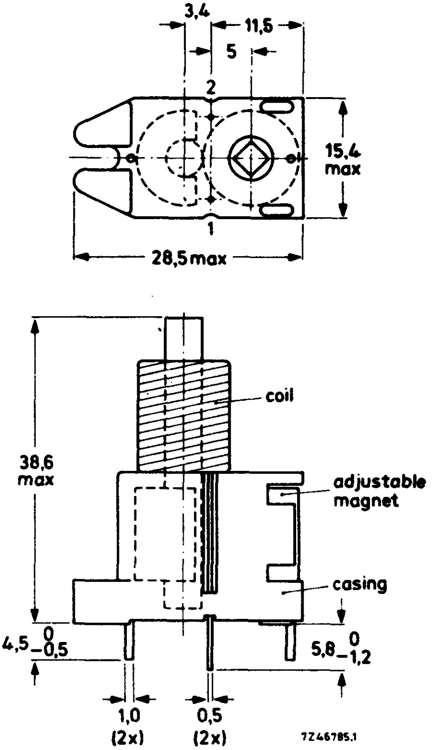


Fig. 1 Adjustable linearity control unit AT4036.

ELECTRICAL DATA

When a sawtooth current (without S-correction) of 6 A (p-p), frequency 15 625 Hz, flyback ratio 18%, flows through the linearity control unit (one connection point to earth), the correction voltage is adjustable between 1,05 and 1,95 V.

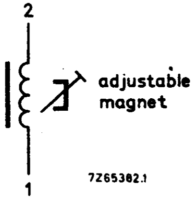


Fig. 2 Circuit diagram.

MOUNTING

The unit can be mounted either on printed-wiring boards by means of its two connection pins and two mounting pins (see Fig. 3), or on metal chassis by bending the two mounting pins and/or by means of a screw through an aperture in the casing (see Fig. 4). To prevent distortion of the magnetic field no iron part should approach the magnetic parts nearer than 3 mm. The coil should be shunted with a 1 W carbon resistor to damp ringing phenomena.

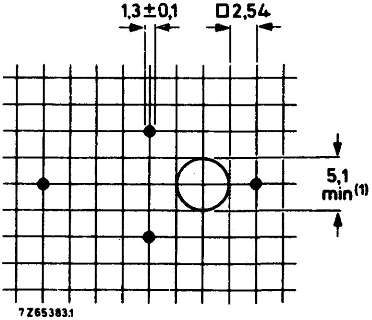


Fig. 3 Hole pattern for mounting on a printed-wiring board.
(1) Hole for bottom adjustment, if required.

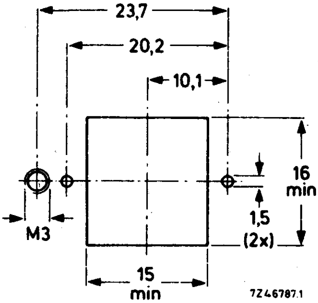


Fig. 4 Hole pattern for mounting on a chassis.

ADJUSTABLE LINE LINEARITY CONTROL UNIT

AT4042/02

QUICK REFERENCE DATA

For use in conjunction with:

1. Monochrome deflection unit AT1040/15 and line output transformer AT2048/11 ←
2. Colour deflection units AT1027/AT1029 Series and line output transformer AT2055 Series.


P016

GENERAL

The unit can be mounted either on the printed-wiring board by the two connection and two mounting pins (see figs. 1 and 2), or on a metal chassis by bending the two mounting pins, and/or by a screw through an aperture in the casing.

To prevent distortion of the magnetic field, a separation of 3mm must be maintained between the unit and any metal part.

A series resistor and capacitor are connected across the coil to damp out ringing. If under fault conditions the coil goes open circuit, the capacitor will limit the scanning coil current and enables a low wattage resistor to be used.

DIMENSIONS (millimetres) (First angle projection) ←

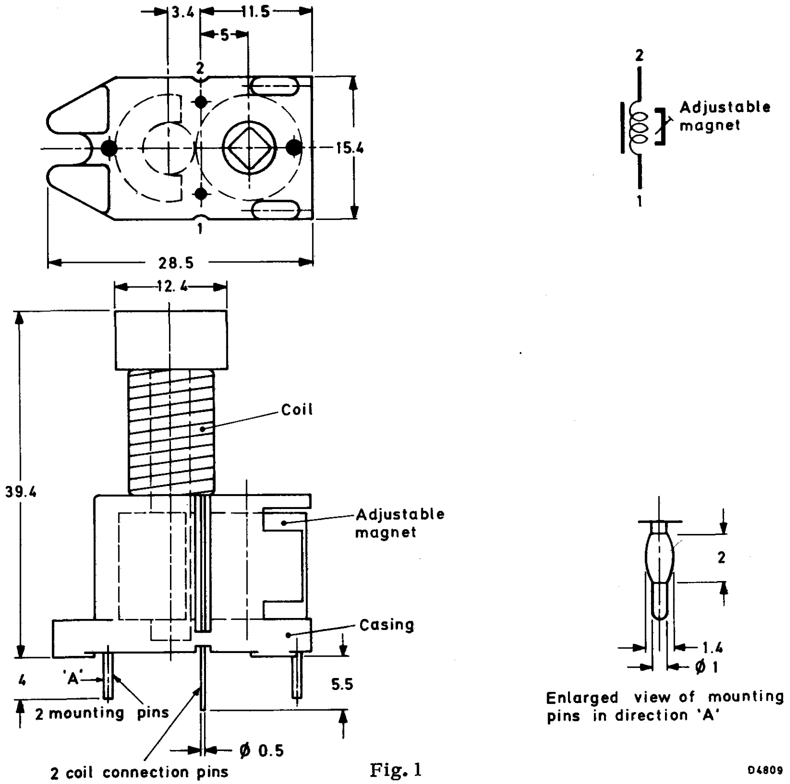
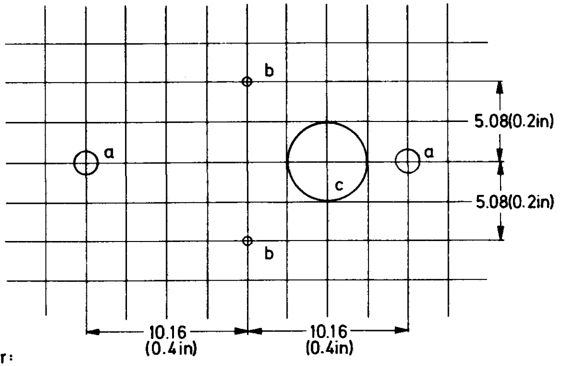


Fig. 1



Holes for:
a = ø 1.5min mounting pins
b = ø 0.6min coil connection pins
c = ø 5min bottom adjustment

Fig. 2
Piercing diagram

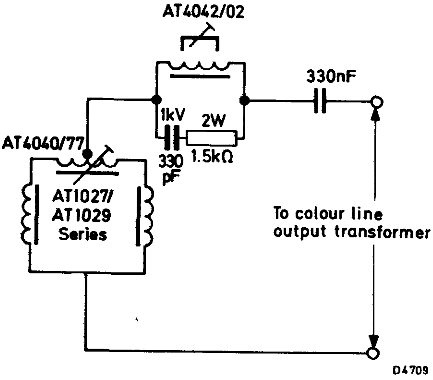
ADJUSTABLE LINE LINEARITY CONTROL UNIT

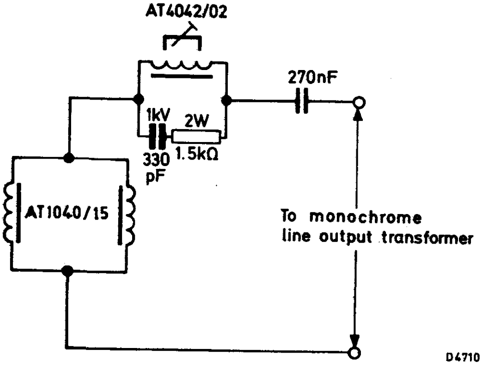
AT4042/02

ELECTRICAL DATA

When a sawtooth current (without S-correction) of 2.8A peak-to-peak and frequency 15.625kHz, having a flyback of 18% flows through the linearity control unit, the correction voltage will be adjustable between 15V and 26V.

APPLICATION CIRCUITS





FIXED LINE LINEARITY CONTROL UNIT

AT4042/14

APPLICATION

This non-adjustable linearity control unit is designed for use in black and white television sets equipped with 110° deflection angle picture tube.

It is intended for use in conjunction with:
- deflection unit AT 1040/15;
- line output transformer AT 2048/12.

DESCRIPTION

The unit consists of a coil wound on a Ferroxcube rod, and a Ferroxdure magnet, which is placed around the rod next to the coil.

Dimensions in mm

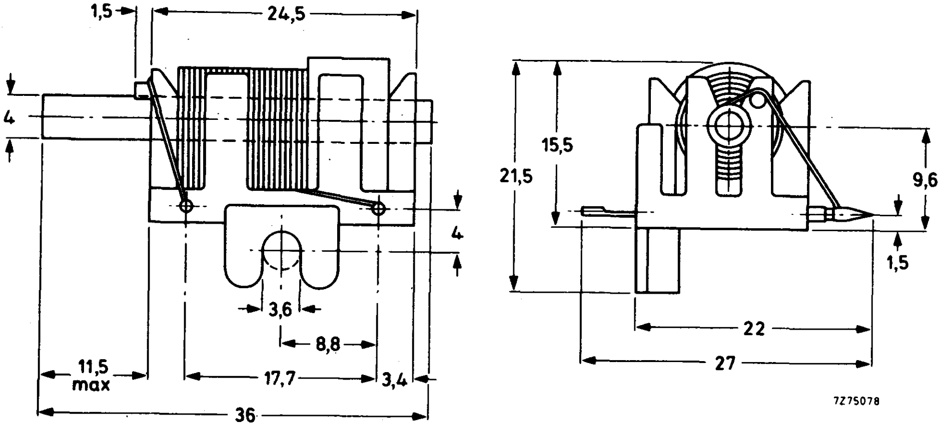


Fig. 1

ELECTRICAL DATA

When a saw-tooth current (without S-correction) of 2, 2 A(p-p), frequency 15 625 Hz, flyback ratio 18%, flows through the linearity control unit, the correction voltage is 17 V.

MOUNTING

The unit can be mounted on printed-wiring boards by means of its two connection pins and two mounting pins (see Fig. 1). To prevent distortion of the magnetic field no iron part should approach the magnetic parts anywhere nearer than 3 mm.

ADJUSTABLE LINEARITY CONTROL UNIT

APPLICATION

This linearity control unit has been designed for use in black and white monitors with 31 cm (12 in) or 38 cm (15 in) 110° monitor tubes. It can be used in conjunction with deflection unit AT1038/20, and line output transformer AT2102/05.

DESCRIPTION

The unit consists of a coil wound on a Ferroxcube rod, two Ferroxdure magnets and one magnet of plastic-bonded Ferroxdure. The last mentioned magnet is placed around the Ferroxcube rod, above the coil. One of the Ferroxdure magnets has the shape of a half ring; it is placed around the Ferroxcube rod under the coil. The other Ferroxdure magnet is cylindrical; it is positioned parallel to and clamped against the Ferroxcube rod opposite the first one. It is provided with a square hole to facilitate turning to adjust the biasing field and so the linearity of the line deflection.

MECHANICAL DATA

Dimensions in mm

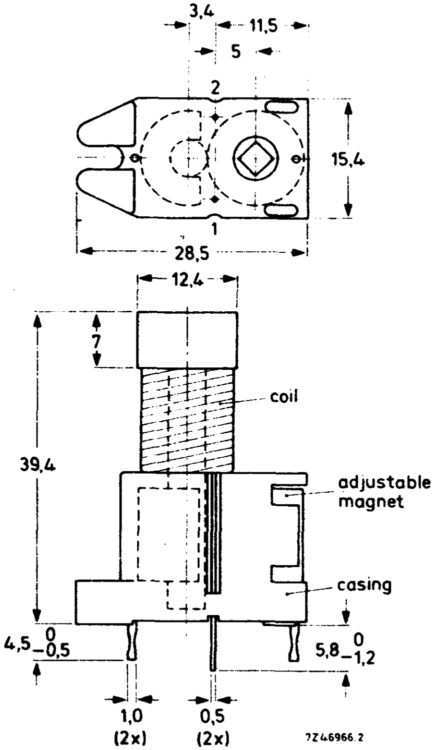


Fig. 1 Adjustable linearity control unit AT4034/01.

ELECTRICAL DATA

When a sawtooth current (without S-correction) of 2,4 A (p-p), frequency 15 625 Hz, flyback ratio 18%, flows through the linearity control unit (one connection point to earth), the correction voltage is adjustable between 12 and 24 V.

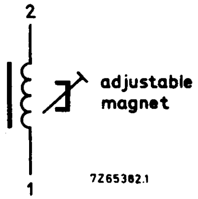


Fig. 2 Circuit diagram.

MOUNTING

The unit can be mounted either on printed-wiring boards by means of its two connection pins and two mounting pins (see Fig. 3), or on metal chassis by bending the two mounting pins and/or by means of a screw through an aperture in the casing (see Fig. 4). To prevent distortion of the magnetic field no iron part should approach the magnetic parts nearer than 3 mm. The coil should be shunted with a 1 W carbon resistor of 1500 Ω to damp ringing phenomena.

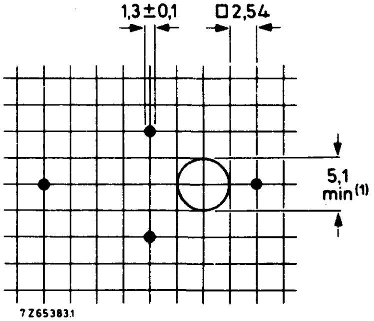


Fig. 3 Hole pattern for mounting on a printed-wiring board.
(1) Hole for bottom adjustment, if required.

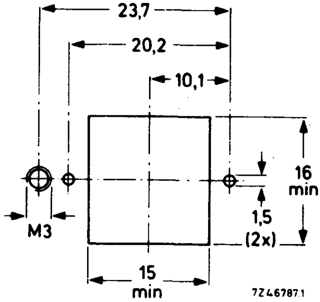


Fig. 4 Hole pattern for mounting on a chassis.

ADJUSTABLE LINEARITY CONTROL UNIT

APPLICATION

This linearity control unit has been designed for use in black and white monitors with 31 cm (12 in) or 38 cm (15 in) 110° monitor tubes. It can be used in conjunction with deflection unit AT1038/40, line output transformer AT2102/04 and line driver transformer AT4043/59. The unit is also to be used in colour television sets with a 110° colour picture tube.

DESCRIPTION

The unit consists of a coil, mounted on a Ferroxcube rod, two Ferroxdure magnets and one plasto-ferrite magnet. One magnet has the shape of a ring and is placed around the Ferroxcube rod above the coils. One has the shape of a half ring and is placed around the Ferroxcube rod under the coils. The third magnet is cylindrical; it is positioned to and clamped against the Ferroxcube rod opposite the hal ring magnet. It is provided with a square hole to facilitate turning to adjust the biasing field and, therefore, the linearity of the line deflection.

MECHANICAL DATA

Dimensions in mm

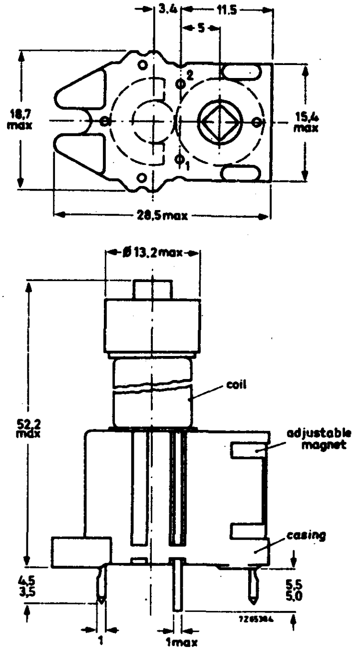


Fig. 1 Adjustable linearity control unit AT4042/08.

ELECTRICAL DATA

When a sawtooth current of 6 A (p-p), frequency 15 625 Hz, fly-back ratio 18% (without S-correction) flows through the linearity control unit (coils connected in parallel, one connection point to earth), the correction voltage is adjustable between 15 and 25 V.
With a sawtooth current of 4,65 A (p-p) the correction voltage is adjustable between 8 and 15 V.

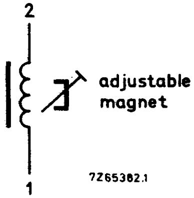


Fig. 2 Circuit diagram.

MOUNTING

The unit can be mounted either on printed-wiring boards by means of its two connection pins and two mounting pins, or on metal chassis by bending the two mounting pins and/or by means of a screw through an aperture in the casing (see Fig. 4). To prevent distortion of the magnetic field, no iron part should approach the magnetic parts nearer than 3 mm. The coils should be shunted with carbon resistors to damp ringing phenomena; the value of resistor depends on applied line output transformer.

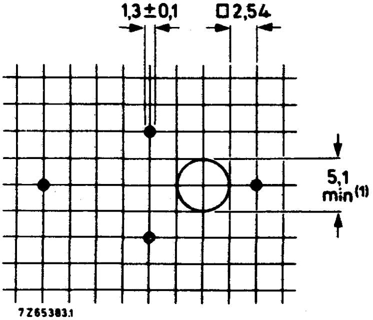


Fig. 3 Hole pattern for mounting on a printed-wiring board.
(1) Hole for bottom adjustment, if required.

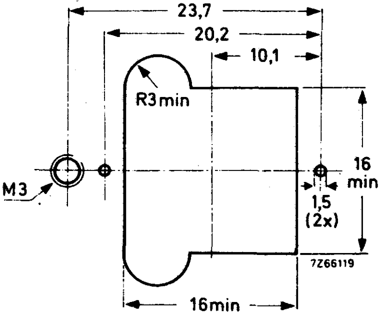


Fig. 4 Hole pattern for mounting on a chassis.

LINE DRIVER TRANSFORMER

APPLICATION

This transformer has been designed for use in black and white monitors. The required supply voltage is 24 V. The transformer is used in conjunction with deflection unit AT1038/40, line-output transformer AT2102/04, and linearity control unit AT4042/08.

MECHANICAL DATA

Dimensions in mm

The magnetic circuit of the transformer comprises two Ferroxcube U-cores. The unit is provided with pins for mounting on a printed-wiring board.

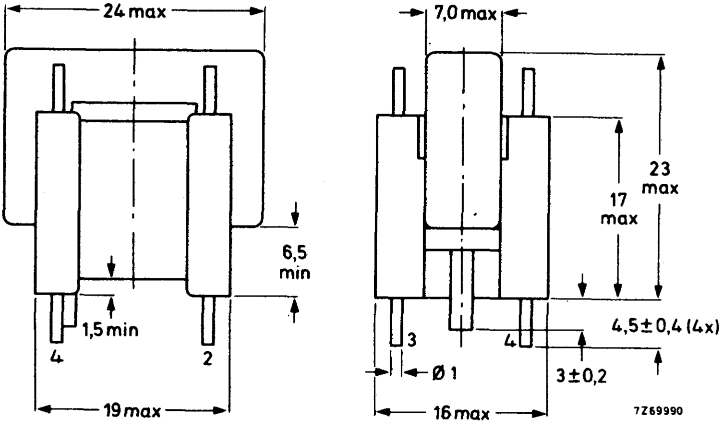


Fig. 1 Line driver transformer AT4043/59.

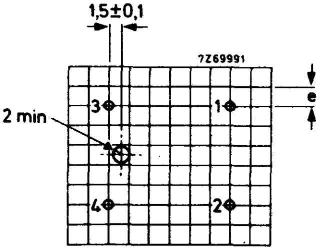


Fig. 2 Hole pattern for mounting on a printed-wiring board (component side). Hole diameter 1,3 + 0,1 mm. e = 2,54 mm (0,1 in).

ELECTRICAL DATA

Inductance (primary, 1-2)	6,1 mH
Leakage inductance (secondary)	12 μH ± 15%
Transformation ratio	4,18 : 1
Maximum operating temperature	95 °C

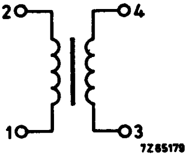


Fig. 3 Circuit diagram.

Application circuit

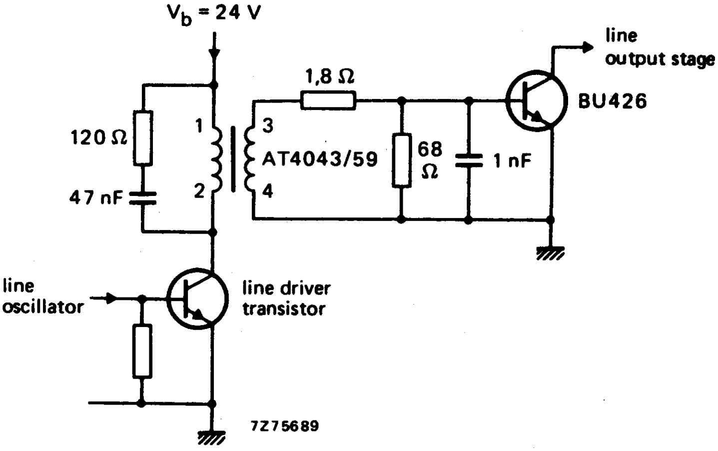


Fig. 4.

COLOUR TELEVISION ASSEMBLIES

D

D

DEFLECTION UNIT

- with built-in 4-pole coils for symmetrizing of the line and field astigmatism

QUICK REFERENCE DATA

Picture tube, gun arrangement	in line
diagonal	66 cm (26 in)
neck diameter	36,5 mm
Deflection angle	110°
Line deflection current, edge to edge at 25 kV	6,35 A p-p
Inductance of line coils, parallel connected	1,11 mH
Field deflection current, edge to edge at 25 kV	3,4 A p-p
Resistance of field coils, series connected	3,0 Ω
4-pole coils,	
sensitivity for line direction	± max. 34 mm/A
sensitivity for field direction	± max. 23 mm/A
resistance (series connected)	1,6 Ω

APPLICATION

This deflection unit has been designed for use with the 110° colour picture tube types A66-500X and A66-510X in CTV receivers in conjunction with:

diode-split line output transformer	AT2076/30 and
line output transistor	BU208A
linearity control unit	AT4042/38
multipole unit	AT1081

DESCRIPTION

The saddle-shaped line and field deflection coils, and the Ferroxcube yoke ring with 4-pole unit, are supported by a plastic cap. This set is built into a plastic coaxial housing, which is provided with a plastic axial alignment ring. This ring enables the set to be axially adjusted over a distance of 6 mm, after the complete unit has been fastened on the neck of the picture tube with a clamping ring.
The screw of the clamping ring is accessible with a screwdriver via a recess in the axial alignment ring. To correct the raster orientation with the complete unit in position on the picture tube neck, the coil assembly can be rotated by means of the protruding parts on the supporting ring, which can be reached by the top and bottom recesses in the coaxial housing. The whole coil assembly is locked in the required position by pushing the levers down until they block.

The unit meets the self-extinguishing requirements of IEC 65 para. 14.4 and UL94, SE1.

MECHANICAL DATA

Dimensions in mm

Outlines

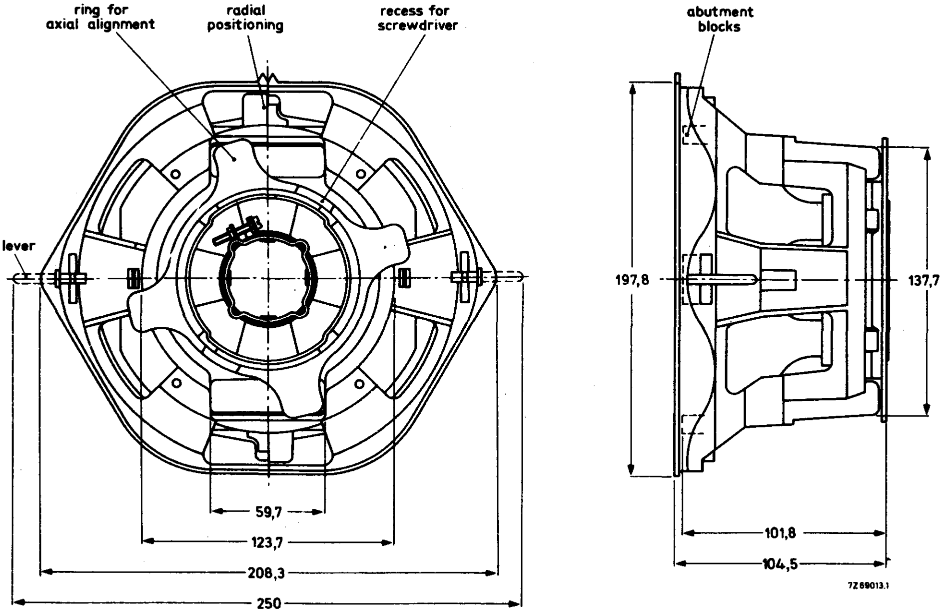


Fig. 1.

The unit is provided with soldering pins for connection.

Mounting

To obtain easily reproducible and accurate alignment of the picture tube and the deflection unit, the cone of the picture tube has a moulded indexing ridge to centre the deflection unit housing. The deflection unit is brought into correct position by alignment of the protrusion on the housing with the location mark on the cone of the tube. The unit must be pressed against the cone, so that the housing is indexed by the moulded ridge on the cone. The unit is then fixed by tightening the screw in the clamping ring at the rear. The screw should be tightened with a torque of 1,2 to 1,4 Nm.

ELECTRICAL DATA

Line coils, parallel connected	
inductance	1,11 mH ± 4%
resistance at 25 °C	1,2 Ω ± 10%
Line deflection current, edge to edge at 25 kV	6,35 A p-p
Field coils, series connected	
inductance	3,5 mH ± 10%
resistance at 25 °C	3,0 Ω ± 7%
Field deflection current, edge to edge at 25 kV	3,35 A p-p
4-pole coils,	
sensitivity for line direction	± max. 34 mm/A
sensitivity for field direction	± max. 23 mm/A
resistance (series connected)	1,6 Ω
Maximum operating temperature	95 °C

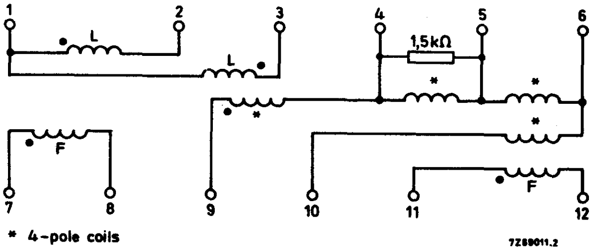


Fig. 2 Connection diagram. L = Line, F = Field.

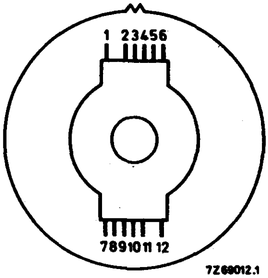


Fig. 3 Terminal location. The pin numbering corresponds to that in Fig. 2.

BEAM CORRECTIONS

With the deflection unit AT1080 and the multipole unit AT1081 mounted on the tube A66-500X or A66-510X, the following corrections may be required:

Maximum required horizontal displacement of the electron beams with respect to the phosphor stripes by the purifying magnet of the AT1081 (note 1)	45 µm
Static convergence deviations must be corrected by the adjustable four-pole and six-pole fields of the AT1081 centred around the tube axis.	
Maximum required compensation for static convergence	
4-pole device: red opposite to blue (in any direction)	6 mm
6-pole device: red and blue to green (in any direction)	3 mm

Notes, see page 4.

North-South raster shape correction circuitry is not required.

To obtain a symmetrical shape for the horizontal lines at the upper and lower parts of the screen, the unit AT1081 comprises an additional two-pole correction magnet giving a displacement of the beam in the centre of the screen in vertical direction of maximum 5 mm

Maximum centring error in any direction after colour-purity, static convergence, and horizontal centre line correction 5 mm

With respect to dynamic convergence, the display system, consisting of picture tube A66-500X or A66-510X and deflection unit AT1080, is inherently self converging. However, a small systematic correction is required on the vertical axis, and also small corrections should be made to compensate for tolerances and asymmetries in the tube and deflection unit combination. For this purpose two types of dynamic magnetic four-pole fields can be used. One is generated by additional windings on the yoke ring of the deflection unit energized by adjustable sawtooth currents synchronized with scanning. The other type is generated by sawtooth and parabolic currents which are synchronized with scanning and flow through the deflection coils.

Compensation to be provided by these corrections:

– horizontal red-to-blue distance at the end of the horizontal axis (line symmetry)	(note 2)	0 ± 2 mm
– horizontal red-to-blue distance at the top of the vertical axis (field symmetry top)	(note 3)	3,5 ± 1,5 mm
– horizontal red-to-blue distance at the bottom of the vertical axis (field symmetry bottom)	(note 3)	3,5 ± 1,5 mm
– vertical red-to-blue distance at the ends of the horizontal axis in opposite directions (line balance)	(note 4)	0 ± 1,5 mm
– vertical red-to-blue distance at the ends of the vertical axis (field balance)	(note 5)	0 ± 1,2 mm

Application information available on request.

Notes

1. Purity adjustment in vertical direction is not required.
2. This correction is made by feeding a sawtooth current of line frequency through the additional four-pole windings on the deflection unit.
3. This correction is made by feeding a rectified sawtooth current of field frequency through the additional four-pole windings on the deflection unit.
4. This correction is made by unbalancing the line deflection coils.
5. This correction is made by unbalancing the field deflection coils.

MULTIPOLE UNIT

QUICK REFERENCE DATA

Horizontal beam displacement for colour purity (2-pole)	for undeflected beams min.	45	μm
Static convergence			
red opposite to blue in any direction (4-pole)	min.	8	mm
red-blue with respect to green in any direction (6-pole)	min.	4	mm
Vertical displacement for optimum straightness of the horizontal lines (2-pole)	min.	5	mm

APPLICATION

This unit has been designed for the colour picture tubes A66-500X, A66-510X, A56-500X, A56-510X, ← A51-500X and A51-510X, with in-line gun arrangement and the deflection units AT1080, AT1083/01 and AT1085. Its purpose is threefold:

- horizontal colour-purity adjustment
- static convergence adjustment
- adjustment of raster symmetry in N and S or adjustment of the horizontal axis for optimum straightness.

DESCRIPTION

The unit incorporates four ring-shaped permanent magnets, supported by non-magnetic plastic support rings, and a cam-actuated collet, which enables the unit to be clamped to the neck of the picture tube. The magnetic rings are made up of an inner and an outer ring coupled by non-magnetic pinion gears to form an epicyclic train. The support rings carry the pinion gears. The magnetic rings comprise:

- two pairs of 2-pole magnets
- one pair of 4-pole magnets
- one pair of 6-pole magnets

(each pair consisting of an inner and outer ring of identical magnetic configuration). The support rings of both the 2-pole rings are fixed to the collet, those of the 4- and 6-pole rings are rotatable. Rotating the lug on an outer magnetic ring varies the *resultant field strength.*
Rotating the lug on a support ring varies the *direction of the resultant field.*

MECHANICAL DATA

Dimensions (mm)

See Fig. 1 on next page.

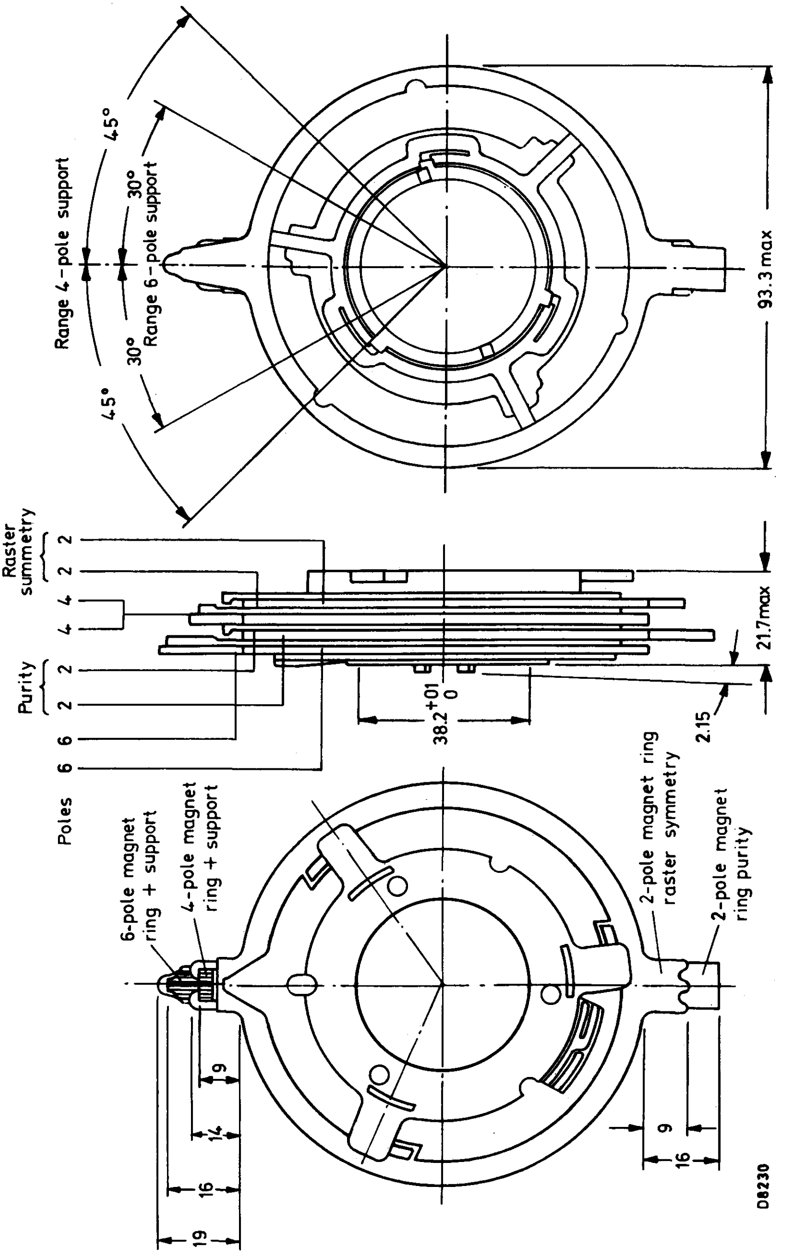

Range 4-pole support
45°
45°
Range 6-pole support
30°
30°
93.3 max
Raster summetry
2
2
4
4
Purity
2
2
6
6
Poles
21.7max
38.2^{+01}_{0}
2.15
2-pole magnet ring raster symmetry
2-pole magnet ring purity
6-pole magnet ring + support
4-pole magnet ring + support
9
14
16
19
9
16
D8230

Fig. 1.

Mounting

Before mounting the multipole unit, the lug on the rear end of the collet must be rotated anti-clockwise. The unit is slid over the neck of the picture tube and pressed to the deflection unit. Two protrusions on the front of the unit and the corresponding recesses on the back of the deflection unit, will bring the unit into correct position. By rotating the lug on the collet clockwise the unit will be clamped.

ADJUSTMENTS

Horizontal colour purity is obtained by varying the field strength of the 2-pole magnet situated between the 4-pole and 6-pole magnets (see Figs 1 and 2).

Vertical colour purity adjustment is not required (see data on colour picture tubes).

The *static convergence* is adjusted by varying the field strength and direction of the 4-pole and 6-pole. The 4-pole field moves the outer electron beams (red and blue) equally in opposite directions (see Fig. 3). The 6-pole field moves the outer electron beams equally in the same direction (see Fig. 4). The centre beam (green) is unaffected. Horizontal axis or raster symmetry is adjusted by varying the field strength of the 2-pole magnet situated at the rear of the unit (see Fig. 1). All three beams are equally moved in a vertical direction (see Fig. 5).

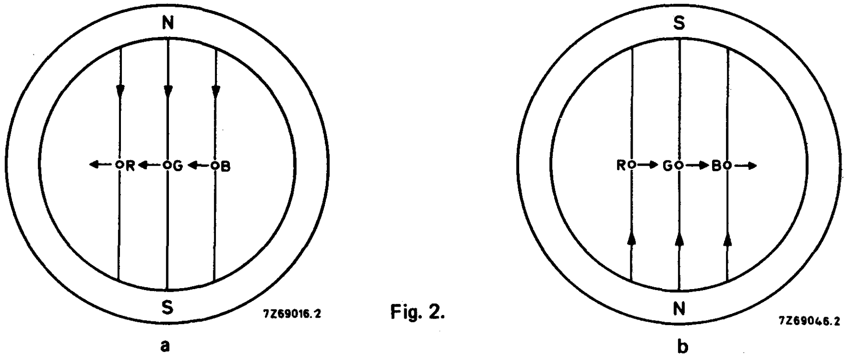
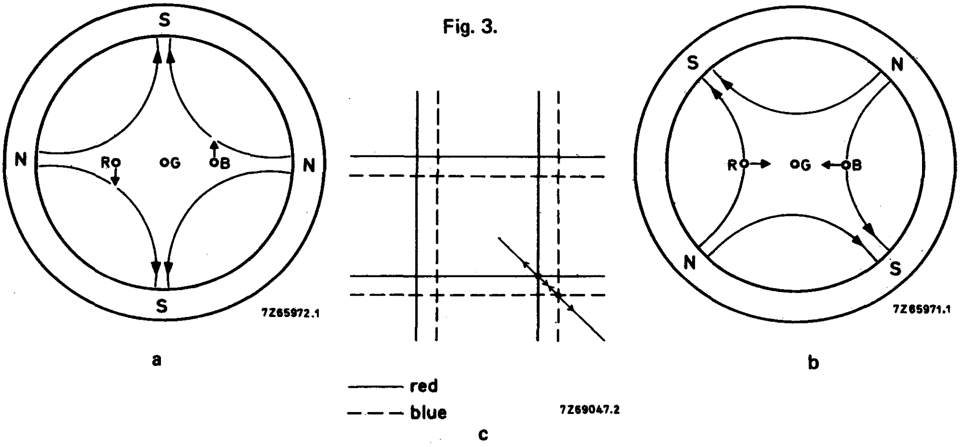
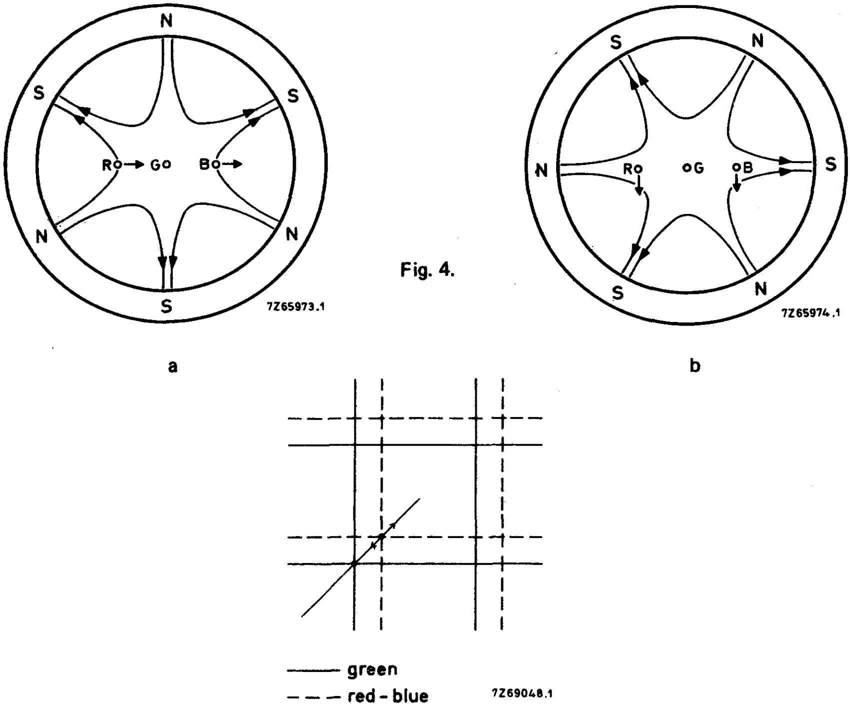


Fig. 2.

Fig. 3.



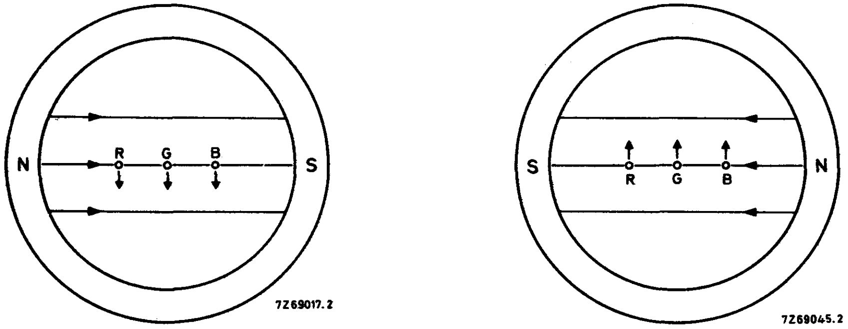


a

b

c

Fig. 4.



a

b

Fig. 5.

DEFLECTION UNIT

- with built-in 4-pole coils for symmetrizing of the line and field astigmatism

QUICK REFERENCE DATA

Picture tube, gun arrangement	in line
diagonal	55 cm (22 in)
neck diameter	36,5 mm
Deflection angle	110°
Line deflection current, edge to edge at 25 kV	6,2 A p-p
Inductance of line coils, parallel connected	1,14 mH
Field deflection current, edge to edge at 25 kV	3,4 A p-p
Resistance of field coils, series connected	3,36 Ω
4-pole coils,	
sensitivity for line direction	± max. 25 mm/A
sensitivity for field direction	± max. 18 mm/A
resistance (series connected)	1,4 Ω

APPLICATION

This deflection unit has been designed for use with the 110° colour picture tube types A56-500X and A56-510X in CTV receivers in conjunction with:

diode-split line output transformer	AT2076/30 and
line output transistor	BU208A
linearity control unit	AT4042/38
multipole unit	AT1081

DESCRIPTION

The saddle-shaped line and field deflection coils, and the Ferroxcube yoke ring with 4-pole unit, are supported by a plastic cap. This set is built into a plastic coaxial housing, which is provided with a plastic axial alignment ring. This ring enables the set to be axially adjusted over a distance of 5 mm, after the complete unit has been fastened on the neck of the picture tube with a clamping ring. The screw of the clamping ring is accessible with a screwdriver via a recess in the axial alignment ring.
To correct the raster orientation with the complete unit in position on the picture tube neck, the coil assembly can be rotated by means of the protruding parts on the supporting ring, which can be reached by the top and bottom recesses in the coaxial housing. The whole coil assembly is locked in the required position by pushing the levers down until they block.

The unit meets the self-extinguishing requirements of IEC 65 para. 14.4 and UL94, SE1.

MECHANICAL DATA

Dimensions in mm

Outlines

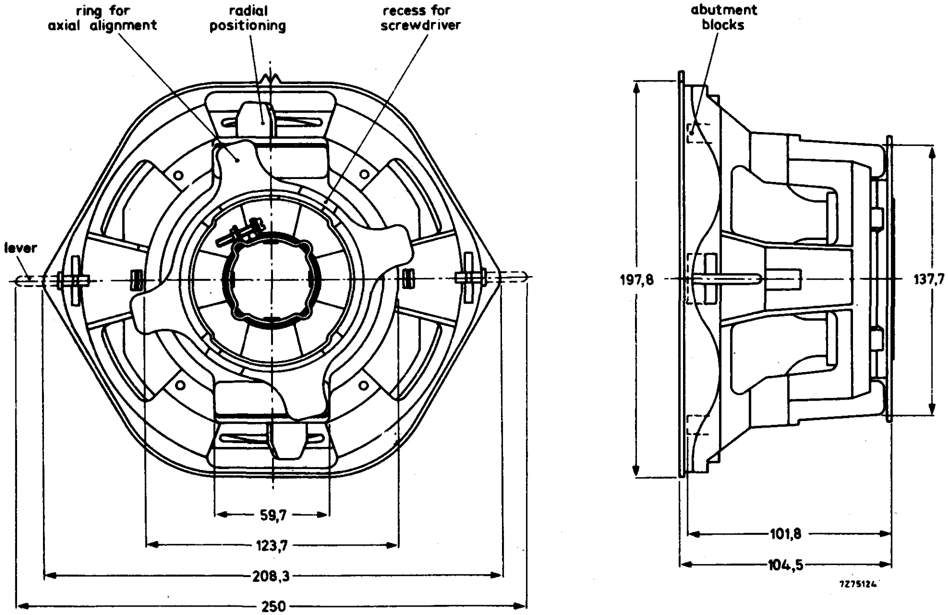


Fig. 1.

The unit is provided with soldering pins for connection.

Mounting

To obtain easily reproducible and accurate alignment of the picture tube and the deflection unit, the cone of the picture tube has a moulded indexing ridge to centre the deflection unit housing. The deflection unit is brought into correct position by alignment of the protrusion on the housing with the location mark on the cone of the tube. The unit must be pressed against the cone, so that the housing is indexed by the moulded ridge on the cone. The unit is then fixed by tightening the screw in the clamping ring at the rear. The screw should be tightened with a torque of 1,2 to 1,4 Nm.

ELECTRICAL DATA

Line coils, parallel connected	
inductance	1,14 mH ± 4%
resistance at 25 °C	0,9 Ω ± 10%
Line deflection current, edge to edge at 25 kV	6,2 A p-p
Field coils, series connected	
inductance	3,9 mH ± 10%
resistance at 25 °C	3,36 Ω ± 7%
Field deflection current, edge to edge at 25 kV	3,4 A p-p
4-pole coils,	
sensitivity for line direction	± max. 25 mm/A
sensitivity for field direction	± max. 18 mm/A
resistance (series connected)	1,4 Ω
Maximum operating temperature	95 °C

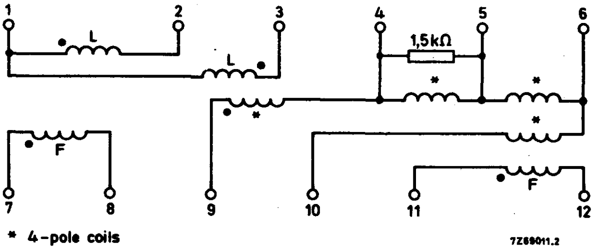


Fig. 2 Connection diagram. L = Line, F = Field.

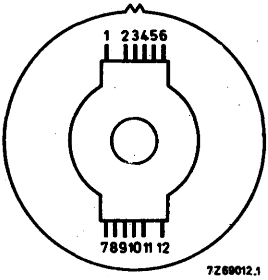


Fig. 3 Terminal location. The pin numbering corresponds to that in Fig. 2.

BEAM CORRECTIONS

With the deflection unit AT1083/01 and the multipole unit AT1081 mounted on the tube A56-500X or A56-510X, the following corrections may be required:

Maximum required horizontal displacement of the electron beams with respect to the phosphor stripes by the purifying magnet of the AT1081 (note 1)	45 µm

Static convergence deviations must be corrected by the adjustable four-pole and six-pole fields of the AT1081 centred around the tube axis.

Maximum required compensation for static convergence	
4-pole device: red opposite to blue (in any direction)	5,5 mm
6-pole device: red and blue to green (in any direction)	2,8 mm

Notes, see page 4.

North-South raster shape correction circuitry is not required

To obtain a symmetrical shape for the horizontal lines at the upper and lower parts of the screen, the unit AT1081 comprises an additional two-pole correction magnet giving a displacement of the beam in the centre of the screen in vertical direction of maximum		4,5 mm
Maximum centring error in any direction after colour-purity, static convergence, and horizontal centre line correction		4,5 mm

With respect to dynamic convergence, the display system, consisting of picture tube A56-500X or A56-510X and deflection unit AT1083/01 is inherently self converging. However, small corrections should be made to compensate for tolerances and symmetries in the tube and deflection unit combination. For this purpose two types of dynamic magnetic four-pole fields can be used. One generated by additional windings on the yoke ring of the deflection unit energized by adjustable sawtooth currents synchronized with scanning. The other type is generated by sawtooth and parabolic currents which are synchronized with scanning and flow through the deflection coils.

Compensation to be provided by these corrections:

– horizontal red-to-blue distance at the end of the horizontal axis (line symmetry)	(note 2)	0 ± 1,5 mm
– horizontal red-to-blue distance at the ends of the vertical axis (field symmetry)	(note 3)	0 ± 1,5 mm
– vertical red-to-blue distance at the ends of the horizontal axis in opposite directions (line balance)	(note 4)	0 ± 1,0 mm
– vertical red-to-blue distance at the ends of the vertical axis (field balance)	(note 5)	0 ± 1,0 mm

Application information available on request.

Notes
1. Purity adjustment in vertical direction is not required.
2. This correction is made by feeding a sawtooth current of line frequency through the additional four-pole windings on the deflection unit.
3. This correction is made by feeding a rectified sawtooth current of field frequency through the additional four-pole windings on the deflection unit.
4. This correction is made by unbalancing the line deflection coils.
5. This correction is made by unbalancing the field deflection coils.

DEFLECTION UNIT

- with built-in 4-pole coils for symmetrizing of the line and field astigmatism

QUICK REFERENCE DATA

Picture tube, gun arrangement	in line
diagonal	51 cm (20 in)
neck diameter	36,5 mm
Deflection angle	110°
Line deflection current, edge to edge at 25 kV	6,2 A p-p
Inductance of line coils, parallel connected	1,14 mH
Field deflection current, edge to edge at 25 kV	3,4 A p-p
Resistance of field coils, series connected	3,36 Ω
4-pole coils,	
sensitivity for line direction	± max. 23 mm/A
sensitivity for field direction	± max. 16 mm/A
resistance (series connected)	1,4 Ω

APPLICATION

This deflection unit has been designed for use with the 110° colour picture tube types A51-500X and A51-510X in CTV receivers in conjunction with:

diode-split line output transformer	AT2076/30 and
line output transistor	BU208A
linearity control unit	AT4042/38
multipole unit	AT1081

DESCRIPTION

The saddle-shaped line and field deflection coils, and the Ferroxcube yoke ring with 4-pole unit, are supported by a plastic cap. This set is built into a plastic coaxial housing, which is provided with a plastic axial alignment ring. This ring enables the set to be axially adjusted over a distance of 5 mm, after the complete unit has been fastened on the neck of the picture tube with a clamping ring.
The screw of the clamping ring is accessible with a screwdriver via a recess in the axial alignment ring.
To correct the raster orientation with the complete unit in position on the picture tube neck, the coil assembly can be rotated by means of the protruding parts on the supporting ring, which can be reached by the top and bottom recesses in the coaxial housing. The whole coil assembly is locked in the required position by pushing the levers down until they block.

The unit meets the self-extinguishing requirements of IEC 65 para. 14.4 and UL94, SE1.

MECHANICAL DATA

Dimensions in mm

Outlines

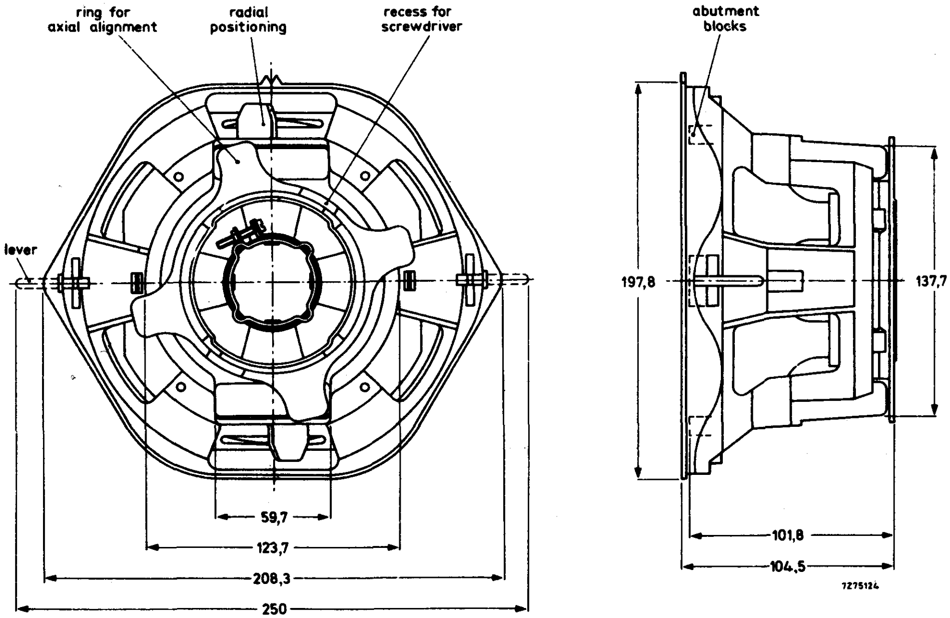


Fig. 1.

The unit is provided with soldering pins for connection.

Mounting

To obtain easily reproducible and accurate alignment of the picture tube and the deflection unit, the cone of the picture tube has a moulded indexing ridge to centre the deflection unit housing. The deflection unit is brought into correct position by alignment of the protrusion on the housing with the location mark on the cone of the tube. The unit must be pressed against the cone, so that the housing is indexed by the moulded ridge on the cone. The unit is then fixed by tightening the screw in the clamping ring at the rear. The screw should be tightened with a torque of 1,2 to 1,4 Nm.

ELECTRICAL DATA

Line coils, parallel connected	
inductance	1,14 mH ± 4%
resistance at 25 °C	0,9 Ω ± 10%
Line deflection current, edge to edge at 25 kV	6,2 A p-p
Field coils, series connected	
inductance	3,9 mH ± 10%
resistance at 25 °C	3,36 Ω ± 7%
Field deflection current, edge to edge at 25 kV	3,4 A p-p
4-pole coils,	
sensitivity for line direction	± max. 23 mm/A
sensitivity for field direction	± max. 16 mm/A
resistance (series connected)	1,4 Ω
Maximum operating temperature	95 °C

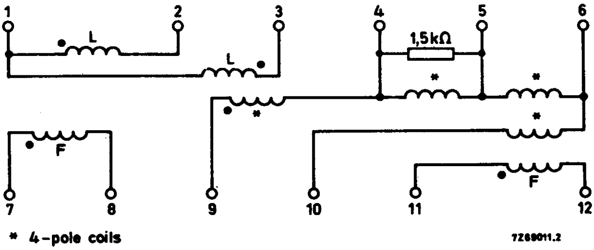


Fig. 2 Connection diagram. L = Line, F = Field.

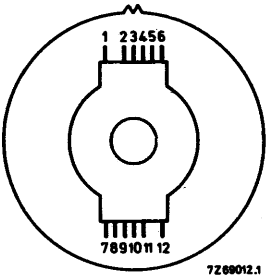


Fig. 3 Terminal location. The pin numbering corresponds to that in Fig. 2.

BEAM CORRECTIONS

With the deflection unit AT1085 and the multipole unit AT1081 mounted on the tube A51-500X or A51-510X the following corrections may be required:

Maximum required horizontal displacement of the electron beams with respect to the phosphor stripes by the purifying magnet of the AT1081 (note 1)	45 μm
Static convergence deviations must be corrected by the adjustable four-pole and six-pole fields of the AT1081 centred around the tube axis.	
Maximum required compensation for static convergence	
4-pole device: red opposite to blue (in any direction)	5 mm
6-pole device: red and blue to green (in any direction)	2,5 mm

Notes, see page 4.

North-South raster shape correction circuitry is not required.

To obtain a symmetrical shape for the horizontal lines at the upper and lower parts of the screen, the unit AT1081 comprises an additional two-pole correction magnet giving a displacement of the beam in the centre of the screen in vertical direction of maximum	4 mm
Maximum centring error in any direction after colour-purity, static convergence, and horizontal centre line correction	4 mm

With respect to dynamic convergence, the display system, consisting of picture tube A51-500X or A51-510X and deflection unit AT1085 is inherently self converging. However, a small fixed line parabola correction of 1,3 mm, is required on the horizontal axis and also small corrections should be made to compensate for tolerances and asymmetries in the tube and deflection unit combination. For this purpose two types of dynamic magnetic four-pole fields can be used. One is generated by additional windings on the yoke ring of the deflection unit energized by adjustable sawtooth currents synchronized with scanning. The other type is generated by sawtooth and parabolic currents which are synchronized with scanning and flow through the deflection coils.

Compensation to be provided by these corrections:

– horizontal red-to-blue distance at the end of the horizontal axis (line symmetry)	(note 2)	0 ± 1,5 mm
– horizontal red-to-blue distance at the ends of the vertical axis (field symmetry)	(note 3)	0 ± 1,5 mm
– vertical red-to-blue distance at the ends of the horizontal axis in opposite directions (line balance)	(note 4)	0 ± 1,0 mm
– vertical red-to-blue distance at the ends of the vertical axis (field balance)	(note 5)	0 ± 1,0 mm

Application information available on request.

Notes
1. Purity adjustment in vertical direction is not required.
2. This correction is made by feeding a sawtooth current of line frequency through the additional four-pole windings on the deflection unit.
3. This correction is made by feeding a rectified sawtooth current of field frequency through the additional four-pole windings on the deflection unit.
4. This correction is made by unbalancing the line deflection coils.
5. This correction is made by unbalancing the field deflection coils.

DIODE SPLIT LINE OUTPUT TRANSFORMER

QUICK REFERENCE DATA

For transistor line output stages

I_{eht}	max. 1.5 mA
E.H.T.	25 kV
$R_{i(eht)}$	2 MΩ
$I_{p\text{-}p}$ deflection (incl. 6% overscan)	6.5 A
Load inductance (of line deflection coils)	1.12 mH
Supply voltage (V_B')	148 V
Supply current ($I_{average}$) at I_{eht} = 1.5 mA	660 mA
Voltages of primary windings*	+64 V_p, +105 V_p, +335 V_p, +520 V_p
Voltages of auxiliary windings	−335 V_p, −160 V_p, +160 V_p, +335 V_p picture tube heater voltage

APPLICATION

This transformer has been designed to provide the required scanning amplitude for 20AX 110° colour picture tubes with a neck diameter of 36.5 mm in transistor equipped television receivers presenting 625 lines at 50 fields per second (CCIR) or 525 lines at 60 fields per second (USA).

It is intended for use in conjunction with:
- deflection unit AT1080, AT1083/01 or AT1085;
- linearity control unit AT4042/38;
- line output transistor BU208A;
- a screened e.h.t. cable with a length of 1 m (available under catalogue number 3122 137 58254), as shown in the circuit diagram of Fig.3.

DESCRIPTION

The magnetic circuit of the transformer comprises 2 Ferroxcube U-cores, screwed together. The primary winding of aluminium foil and the secondary windings are situated on one leg of the core. The e.h.t. winding is moulded in flame retarding polyester, meeting the self-extinguishing requirements of IEC65, para. 14.4 and UL492, para. 280-SE1. The transformer is provided with 2 M3 screw-studs for mounting. **External circuit connection is made to connecting pins, positioned as indicated in Fig.1 enabling the unit to be soldered directly into a printed-wiring board (Fig.2)

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* D.C. component on the pulses is V_B' (see Fig.3).

**For mounting on the printed-wiring board a washer of 20 mm in diameter has to be used. Tightening torque on printed-wiring board: 500 + 100 mNm.

MECHANICAL DATA

Dimensions in mm

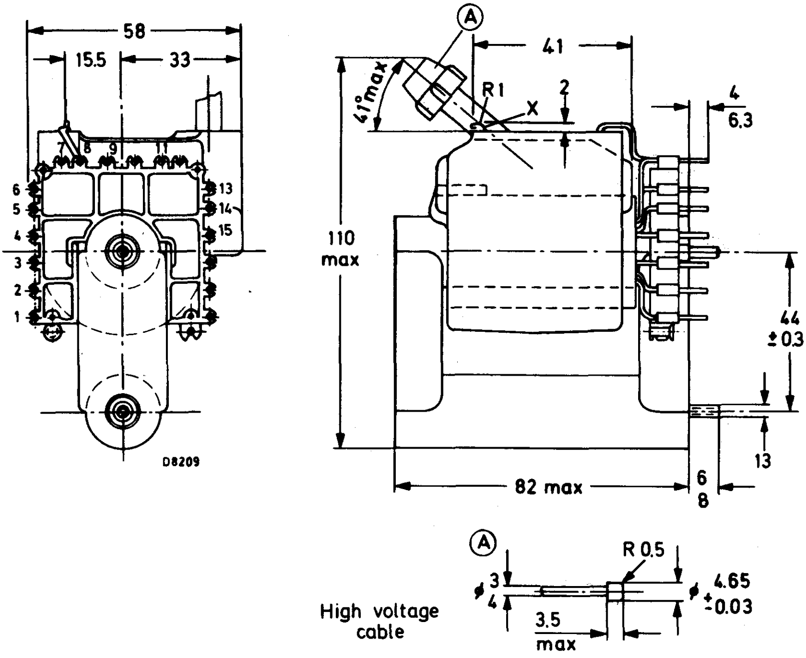

Fig.1

Mass	500 g approximately
Solderability	in accordance with IEC 68, Test T

MOUNTING

The transformer may be mounted on either a printed-wiring board or, under certain conditions, on a metal chassis. Two securing studs (M3) are provided. The fit of the connecting and the mounting pins in a printed-wiring grid with a pitch of 2.54 mm is illustrated in Fig.2.

RECOMMENDED PIERCING DIAGRAM (solder side)

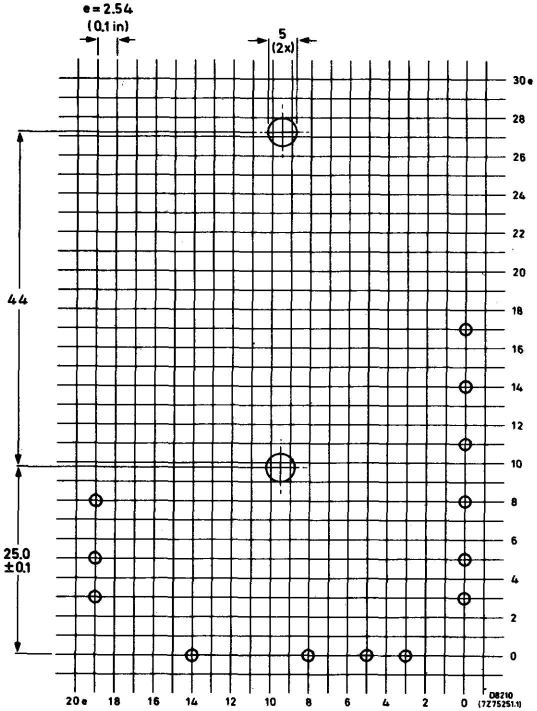

Fig.2

Hole pattern for mounting on a printed-wiring board.
Hole diameter 1.3 ± 0.1 mm.

Whether the transformer is board or chassis mounted, the core must be earthed.

Temperature

The operating temperature of the e.h.t. coil should not exceed +85 °C under worst conditions, i.e. taking into account:

- over-voltage on the coils;
- low atmospheric pressure (at high altitudes) implying bad cooling by convection;
- high ambient temperature (up to 45 °C).

To satisfy this requirement it may be necessary to provide an ample cool air flow around the transformer.

Distances

The following minimum distances between the transformer and neighbouring conductive flat surfaces must be maintained (it should be noticed that edges of conductive parts must have a greater distance):

From the e.h.t. coil radially, 10 mm
axially 10 mm

The transformer, and the leads and components carrying high voltage pulses, should be kept free from metal particles, solder drops etc.

ELECTRICAL DATA (measured in circuit of Fig.3, mains voltage 220 V)

E.H.T. supply	I_{eht}	50	1500	μA
	e.h.t.	25.0	21.8	kV
	$R_{i(eht)}$	2		MΩ
Power supply	V_B	163	163	V
	V_B'	148	141.5	V
	$I_{(AV)}$	540	760	mA
Output transistor	V_{CEM}	1200	1180	V
	I_{CM}	4.1	4.25	A
Deflection	$I_{p\text{-}p}$	6.5	6.2	A
	overscan	6	7	%
	flyback time	11		
Focus voltage	V_{focus}	630	5.65	kV
Auxiliary windings: picture tube heater voltage (4.67 W)	$V_1 - 2$	7.6	7.4	V_{rms}
Peak voltages at pin 3	V_3	−335		V (+38 V d.c.)
pin 4	V_4	−160		V
pin 6	V_6	+160		V
pin 7	V_7**	+335		V
pin 9	V_9**	+105		V
pin 11	V_{11}**	+64		V
pin 14	V_{14}**	+520		V
Video supply after rectification*		223	224	V

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* Class-B video stage.

**D.C. component on these pulses is V_B'.

APPLICATION CIRCUIT

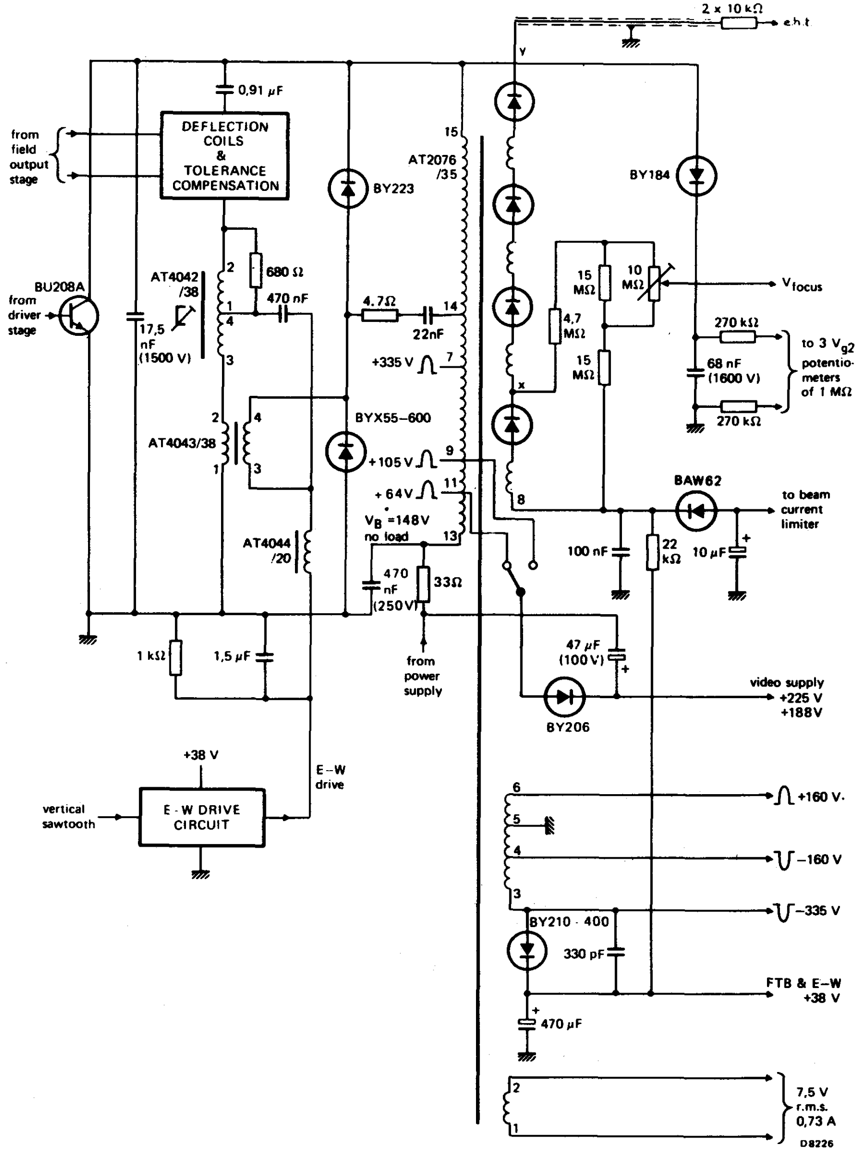


Fig.3

DIODE SPLIT LINE OUTPUT TRANSFORMER

QUICK REFERENCE DATA

I_{eht}	1.5 mA
E.H.T.	25 kV
$R_{i(eht)}$	2.0 MΩ
$I_{p\text{-}p}$ deflection (incl. 6% overscan)	6.5 A
Load inductance (of line deflection)	1.12 mH
Input voltage (V_B')	148 V
current (I_B) at I_{eht} = 1.5 mA	605 mA
Voltages of auxiliary windings	– 170, + 170 + 330 V_p
Picture tube heater voltage	6.8 V
Primary taps	+ 510, + 330, + 105, + 64 V*

APPLICATION

This transformer has been designed to provide the required scanning amplitude ~~for 20AX 110°~~ colour picture tubes with a neck diameter of 36.5 mm in transistor equipped television receivers 625 lines at 50 fields per second (CCIR) or 525 lines at 60 fields per second (USA).

It is intended for use in conjunction with:

deflection unit AT1080 or AT1083/01 or AT1085
linearity control unit AT4042/38
line driver transformer AT4043/50
line output transistor BU208A
a screened e.h.t. cable with a length of 1 metre (available under catalogue number 3122 137 58250)
as shown in the circuit diagram of Fig.3.

DESCRIPTION

The magnetic circuit of the transformer comprises two Ferroxcube U-cores, screwed together. The primary winding of aluminium foil and the secondary windings are situated on one leg of the core. The windings are impregnated in flame retardant polyester, meeting the self-extinguishing requirements of IEC65, para. 14.4 and UL492, para. 280-SEI. The transformer is provided with two M3 screws for mounting**. External circuit connection is made to connecting pins, positioned as indicated in Fig.1, enabling the unit to be soldered directly into a printed wiring board (Fig.2).

* The voltages have a d.c. component, the average value of which is V_B'.

**For mounting on a printed wiring board a washer of 20 mm in diameter has to be used.
Tightening torque on printed wiring board: 500 + 100 mNm.

MECHANICAL DATA

Dimensions in mm

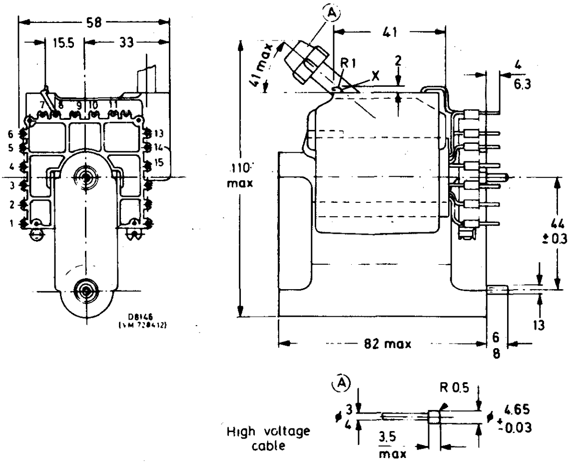


Fig.1

Weight: 500 g approximately

Solderability: in accordance with IEC, Test T.

MOUNTING

The transformer may be mounted on either a printed-wiring board or, under certain conditions, on a metal chassis. Two securing studs (M3) are provided.
The fit of the connecting and the mounting pins in a printed-wiring grid with a pitch of 2.54 mm is illustrated in Fig.2.

RECOMMENDED PIERCING DIAGRAM (solder side)

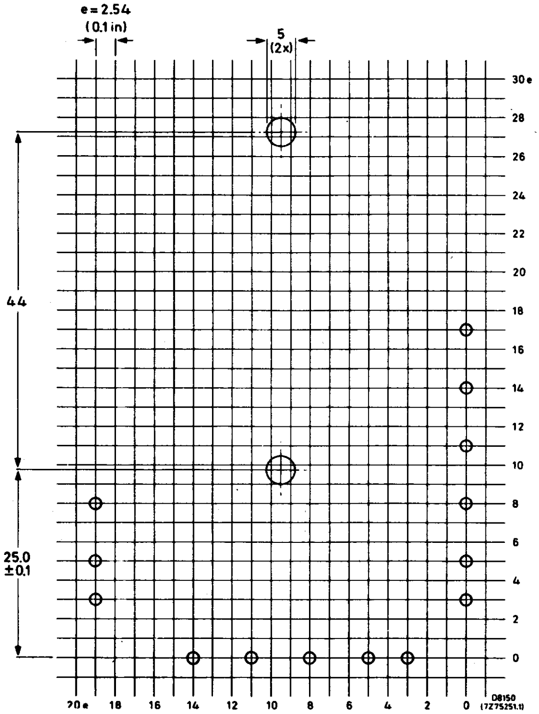


Fig.2

Grid spacing: 2.54 mm (0.1 in.)
Hole diameter 1.3 ± 0.1 mm

Whether the transformer is board or chassis mounted, the core must be earthed.

Temperature

The operating temperature on the e.h.t. coil should not exceed + 85 °C under worst conditions.
To satisfy this requirement it may be necessary to provide an ample cool air flow around the transformer.

Distances

The following minimum distances between the transformer and neighbouring conductive flat surfaces must be maintained (edges of conductive parts must have a greater distance):

From the e.h.t. coil, radially 10 mm
axially 10 mm

The transformer, and the leads and components carrying high voltage pulses, should be kept free from metal particles, solder drops etc.

ELECTRICAL DATA (measured in circuit of Fig.3)

E.H.T. supply	I_{eht}	50	1500	µA
	e.h.t.	25.0	21.8	kV
	$R_{i(eht)}$	2		MΩ
Power supply	V_B	159	159	V
	V_B'	148	144	V
	$I_{(AV)}$	400	605	mA
Output transistor	V_{CEM}	1200	1130	V
	I_{CM}	4.0	4.1	A
Deflection	I_{p-p}	6.5	6.2	A
	overscan	6	8	%
	flyback time	11.5	11.55	µs
Focus voltage	V_{focus}	6.15	5.45	kV

Peak voltage between pins 3 – 10	V_3	–170		V
5 – 4	V_5	+170		V
6 – 4	V_6	+330		V
7 – 13*	V_7	+330		V
9 – 13*	V_9	+100		V
11 – 13*	V_{11}	+50		V
14 – 13*	V_{14}	+510		V
Picture tube heater voltage	V_{1-2} (rms)	6.8	6.4	V (typical load 4.67 W)
Scan voltage after rectification				
from pins 3 – 10	V_3'	+14	+13.2	V_{dc} (load 3.4 W)
pins 4 – 10	V_4'	+38	+36	V_{dc} (load 24 W)
Video supply from pins 9 – 10		+228	+218	V_{dc} (load 3.0 W)
pins 11 – 10		+188	+178	V_{dc} (load 3.0 W)

* These voltages have a d.c. component the average value of which is V_B'.

APPLICATION CIRCUIT

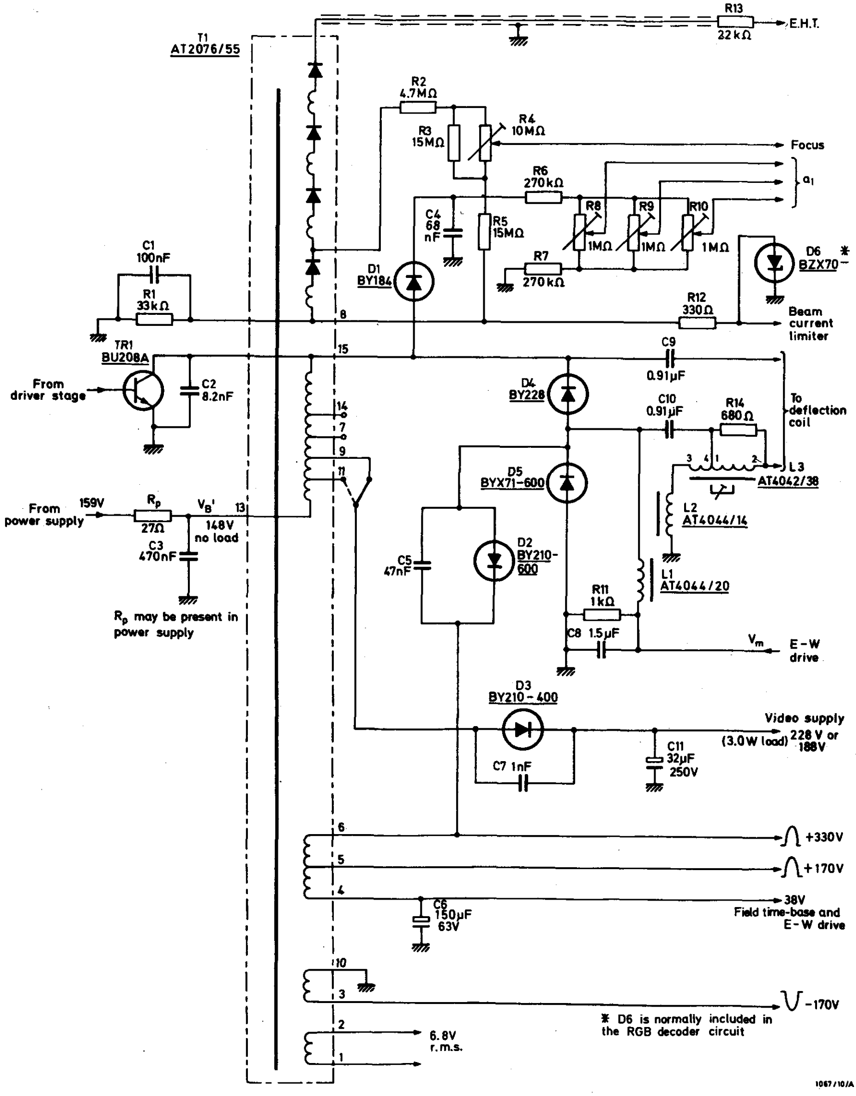


Fig.3

LINE OUTPUT TRANSFORMER

AT2080/10

QUICK REFERENCE DATA

I_{eht}	max. 1.5 mA
E.H.T.	8.4 kV
$R_{i(eht)}$	2.0 MΩ
I_{p-p} deflection	6.5 A
Load inductance (of line deflection)	1.12 mH
Supply voltage (V_B')	148 V
current (I_B) at I_{eht} = 1.5 mA	605 mA
Voltages of auxiliary windings	-320 V_p, -155 V, +155 V_p, +320 V_p picture tube heater voltage

APPLICATION

This transformer has been designed to provide the required scanning amplitude for 20AX 110° colour picture tubes with a neck diameter of 36.5 mm in transistor equipped television receivers presenting 625 lines at 50 fields per second (CCIR) or 525 lines at 60 fields per second (USA).

It is intended for use in conjunction with:
- deflection units AT1080, AT1083/01 or AT1085
- linearity control unit AT4042/38
- line output transistor BU208A
- e.h.t. multiplier LP1194/40 or LP1196/40

according to circuit diagram of Fig. 3.

DESCRIPTION

The magnetic circuit of the transformer comprises a Ferroxcube U- and a Ferroxcube I-core, clamped together with brackets. The primary windings, the secondary windings and the e.h.t. winding are situated on one leg of the core. The windings are impregnated in flame retardant polyester, meeting the self-extinguishing requirements of IEC65, para. 14.4 and UL492, para. 280-SE1. The transformer is provided with four mounting pins and two threaded holes for mounting. External circuit connection is made to connecting pins, positioned as indicated in Fig. 1 enabling the unit to be soldered directly into a printed-wiring board (Fig. 2).

MECHANICAL DATA

Dimensions (in mm) and terminals

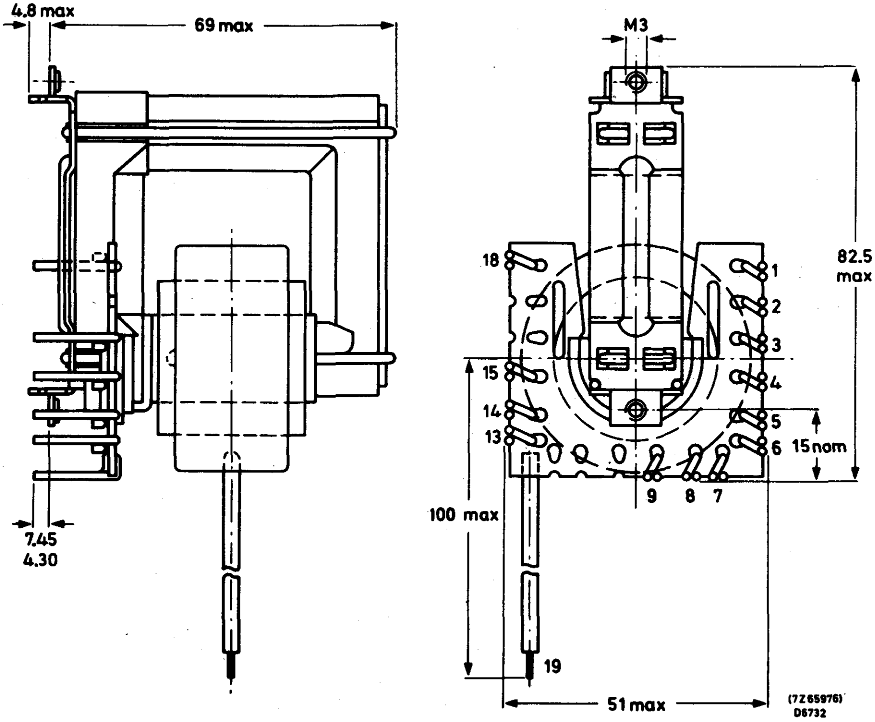


Fig. 1

Weight 240 g approximately

MOUNTING

The transformer may be mounted on either a printed-wiring board or, under certain conditions, on a metal chassis. It may be secured with M3 screws.
For mounting on a printed-wiring board the fit of the connecting and the mounting pins in a printed-wiring grid with a pitch of 2.54 mm is illustrated in Fig. 2.

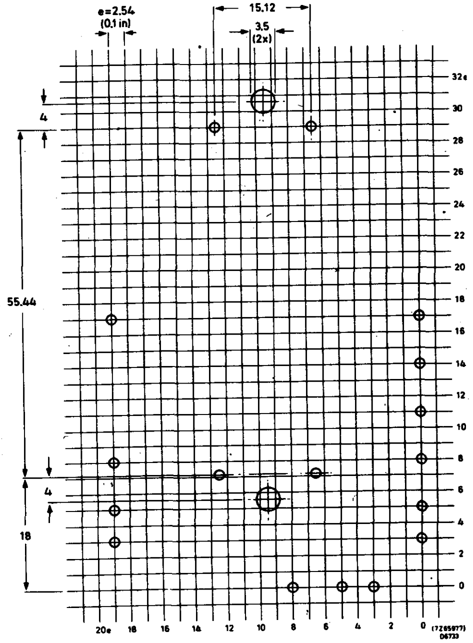


Fig. 2 Hole pattern for mounting on a printed-wiring board (solder side)
Grid hole diameter 1.3 ± 0.1 mm

Whether the transformer is board- or chassis mounted, the core must be earthed.

Temperature

The operating temperature of the core and the coils should not exceed 105 ^{o}C, under worst conditions.

To satisfy this requirement it may be desired to provide ample cool air circulation around the transformer.

Distances

The following minimum distances between the transformer and neighbouring conductive flat surfaces (it should be noticed that edges of conductive parts must have a greater distance) must be maintained:

a. From the e.h.t. winding, radially 15 mm
axially 10 mm

b. From the e.h.t. lead 15 mm

The transformer, and the leads and components carrying high voltage pulses should be kept free from metal particles, solder drops etc.

ELECTRICAL DATA

E.H.T. supply	I_{eht}	mA	0.05	1.5
	e.h.t.	kV	24.9	22.0
	$R_{i(eht)}$	MΩ	1.8	
Power supply	V_B	V	159	159
	V_B'	V	148	143
	$I_{average}$	mA	400	605
Output transistor	V_{CEM}	V	1200	1150
	$+I_{CM}$	A	4.0	4.0
Deflection	I_{p-p}	A	6.5	6.2
	flyback ratio (average)	%	11.6	
	Overscan	%	6	
	Variation	%	≤1.5	
Focus voltage		kV	8.4	7.7
Auxiliary windings:				
picture tube heater voltage	V_{1-2}	V_{rms}	8.2	7.6
Voltages between	pin 3 - 5	V_p	-320 (+38 $V_{d.c.}$)	
	pin 4 - 5	V_p	155 (+14 $V_{d.c.}$)	
	pin 6 - 5	V_p	+155	
	pin 7 - 5	V_p	+320	
	pin 8*	$V_{d.c.}$	+224 (159 + 65)	

*Video supply

APPLICATION CIRCUIT

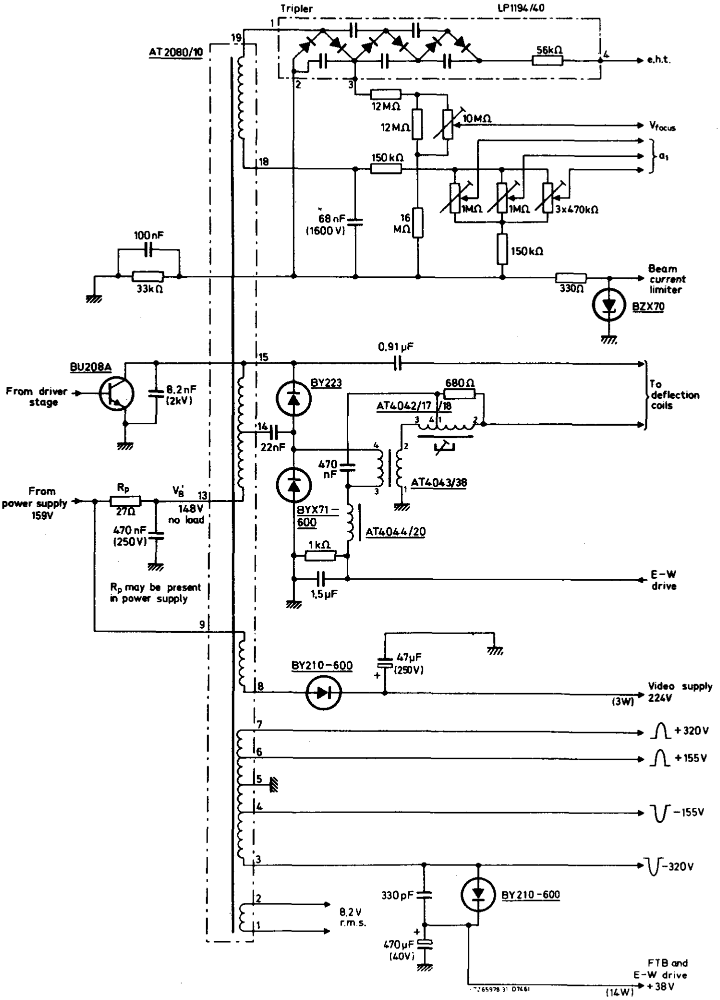


Fig. 3

LINE OUTPUT TRANSFORMER

AT2080/15

QUICK REFERENCE DATA

I_{eht}	max. 1.5 mA
E.H.T.	8.4 kV
R_{i}(eht)	2.0 MΩ
I_{p-p} deflection	6.4 A
Load inductance (of line deflection)	1.11 mH
Supply voltage (V_B')	148 V
current (I_B) at I_{eht} = 1.5 mA	690 mA
Voltages of auxiliary windings	-380 V_p, +155 V, -155 V_p, +320 V_p picture tube heater voltage

APPLICATION

This transformer has been designed to provide the required scanning amplitude for 20AX 110° colour picture tubes with a neck diameter of 36.5 mm in transistor equipped television receivers presenting 625 lines at 50 fields per second (CCIR) or 525 lines at 60 fields per second (USA).

It is intended for use in conjunction with:
- deflection units AT1080, AT1083/01 or AT1085
- linearity control unit AT4042/38
- line output transistor BU208A
- e.h.t. rectifier/multipliers LP1194/40 or LP1196/40

according to circuit diagram of Fig. 3.

DESCRIPTION

The magnetic circuit of the transformer comprises a Ferroxcube U- and a Ferroxcube I-core, clamped together with brackets. The primary windings, the secondary windings and the e.h.t. winding are situated on one leg of the core. The windings are impregnated in flame retardant polyester, meeting the self-extinquishing requirements of IEC65, para. 14.4 and UL492, para. 280-SE1. The transformer is provided with four mounting pins and two threaded holes for mounting. External circuit connection is made to connecting pins, positioned as indicated in Fig. 1 enabling the unit to be soldered directly into a printed-wiring board (Fig. 2).

MECHANICAL DATA

Dimensions (in mm) and terminals

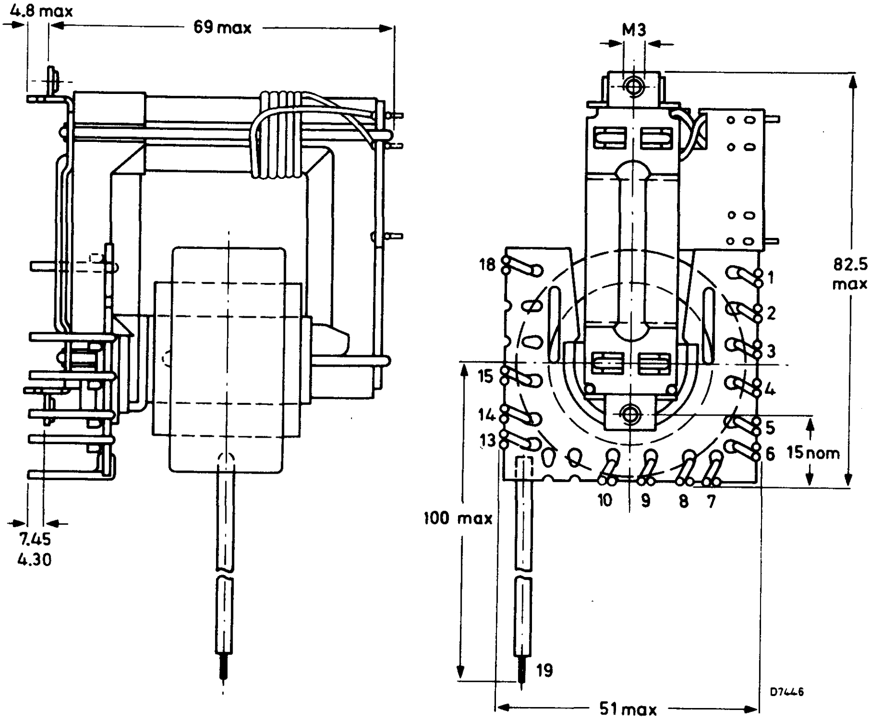


Fig. 1

Weight 240 g approximately

MOUNTING

The transformer may be mounted on either a printed-wiring board or, under certain conditions, on a metal chassis. It may be secured with M3 screws.
For mounting on a printed-wiring board the fit of the connecting and the mounting pins in a printed-wiring grid with a pitch of 2.54 mm is illustrated in Fig. 2.

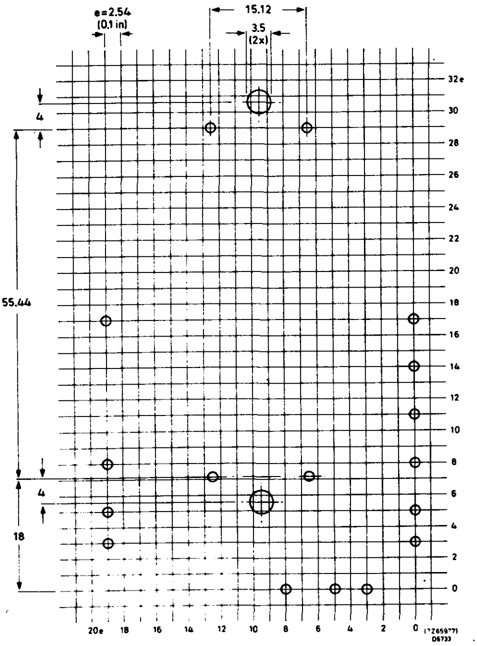


Fig. 2 Hole pattern for mounting on a printed-wiring board (solder side)
Grid hole diameter
1.3 ± 0.1 mm

Whether the transformer is board- or chassis mounted, the core must be earthed.

Temperature

The operating temperature of the core and the coils should not exceed 105 °C, under worst conditions.

To satisfy this requirement it may be desired to provide ample cool air circulation around the transformer.

Distances

The following minimum distances between the transformer and neighbouring conductive flat surfaces (it should be noticed that edges of conductive parts must have a greater distance) must be maintained:

a. From the e.h.t. winding, radially 15 mm
axially 10 mm

b. From the e.h.t. lead 15 mm

The transformer, and the leads and components carrying high voltage pulses should be kept free from metal particles, solder drops etc.

ELECTRICAL DATA

E.H.T. supply	I_{eht}	mA	0.05	1.5
	e.h.t.	kV	24.9	22.0
	$R_{i(eht)}$	MΩ	2.0	
Power supply	V_B	V	159	159
	V_B'	V	148	143
	$I_{average}$	mA	400	605
Output transistor	V_{CEM}	V	1200	1150
	$+I_{CM}$	A	4.0	4.0
	$-I_{CM}$	A	2.0	2.0
Deflection	I_{p-p}	A	6.4	6.2
	flyback ratio (average)	µs	11.6	
	Overscan	%	6	
	Variation	%	≤1.5	
Focus voltage		kV	8.4	7.7
Auxiliary windings:				
picture tube heater voltage	V_{1-2}	V_{rms}	6.62	6.18
Voltages between pin 3 - 5		V_p	-350	
pin 4 - 5		V_p	+16	
pin 6 - 5		V_p	+160	
pin 7 - 5		V_p	+350	
pin 10*		$V_{d.c.}$	184 (159 + 25 V)	
pin 8*		$V_{d.c.}$	224 (159 + 65 V)	

* Video supply

APPLICATION CIRCUIT

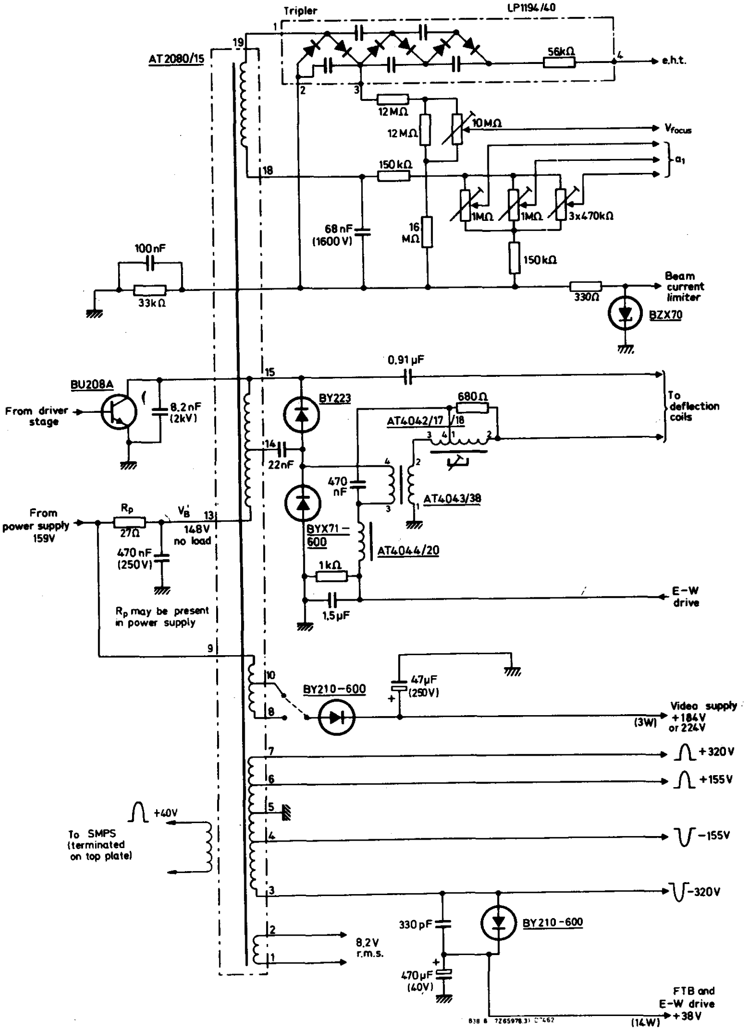


Fig. 3

SWITCHED MODE POWER SUPPLY OUTPUT TRANSFORMER

AT2095

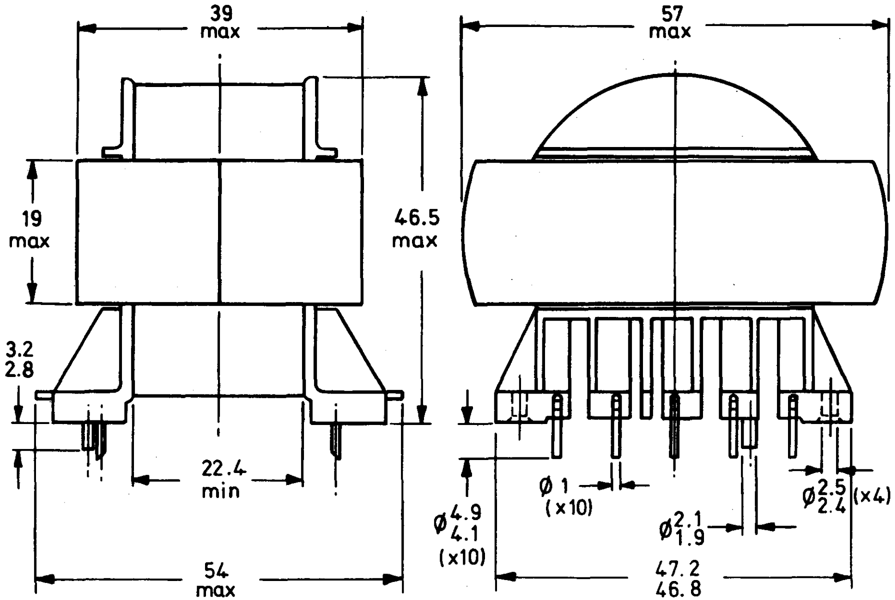
APPLICATION

The AT2095 output transformer has been designed for use in non-isolated parallel switched-mode power supplies operating over a range of 16 to 20 kHz.
It is used in conjunction with AT4043/03 driver transformer and switched-mode transistor BU126 and control i.c. TDA2640.
The magnetic circuit of the transformer comprises two Ferroxcube E-cores with an air gap in the centre pole. The unit is provided with pins for mounting on a printed circuit board. (See page 2 for dimensions)

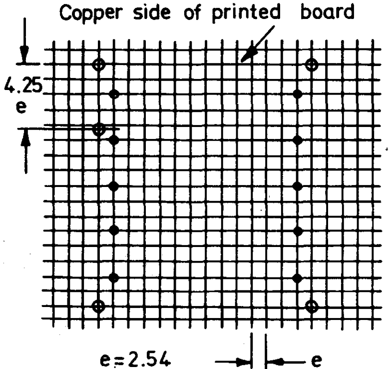
ELECTRICAL DATA

Inductance	Primary 8-9	5 ± 10%	mH
D.C. Resistance	Primary 8-9	0.63 ± 10%	Ω
Leakage inductance	1-2 (8-9 Shorted)	≤ 7	μH
Turns ratio	Primary 8-9 to Secondary 1-2	5:1 ± 4%	
	Primary 8-9 to Secondary 6-7	6.4:1 ± 4%	
Absolute maximum operating temperature		115	°C

DIMENSIONS (millimetres)

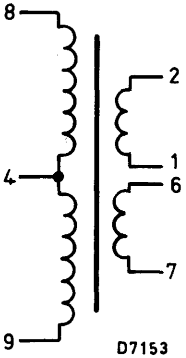


D7151

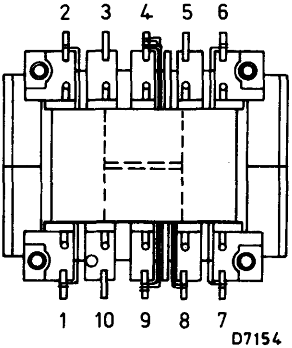


D7152

Connections



D7153

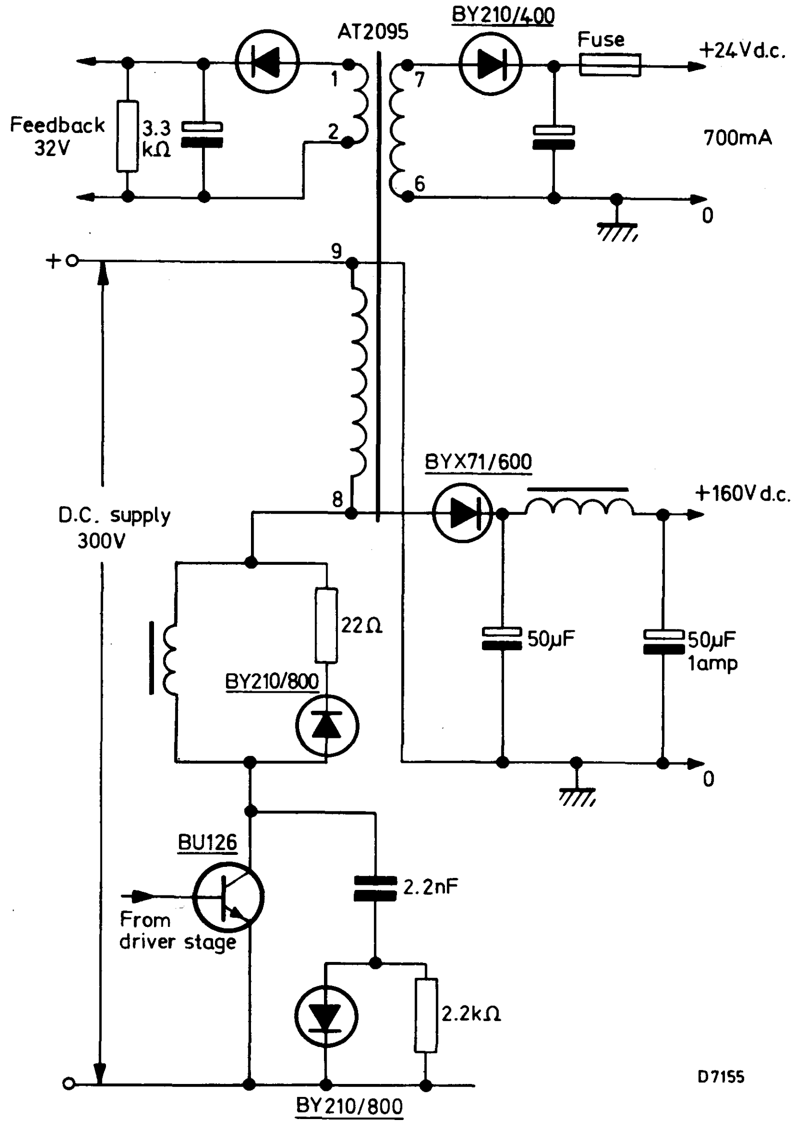


D7154

SWITCHED MODE POWER SUPPLY OUTPUT TRANSFORMER

AT2095

APPLICATION CIRCUIT



Mullard

ADJUSTABLE LINE LINEARITY CONTROL UNIT

AT4042/38

APPLICATION

This unit has been designed for use in colour TV sets equipped with a 110° deflection angle colour picture tube, to adjust the linearity of line deflection. It can be used in combination with the unit AT1080 if parallel connected line coils are used.

DESCRIPTION

The unit consists of a coil, mounted on a Ferroxcube rod, two Magnadur magnets and one plastoferrite magnet. One magnet has the shape of a ring and is placed around the Ferroxcube rod above the coils. One has the shape of a half ring and is placed around the Ferroxcube rod under the coils. The third magnet is cylindrical; it is positioned to, and clamped against the Ferroxcube rod opposite the half ring magnet. It is provided with a square hole to facilitate turning to adjust the biasing field and, therefore, the linearity of the line deflection.

MECHANICAL DATA

Dimensions in mm

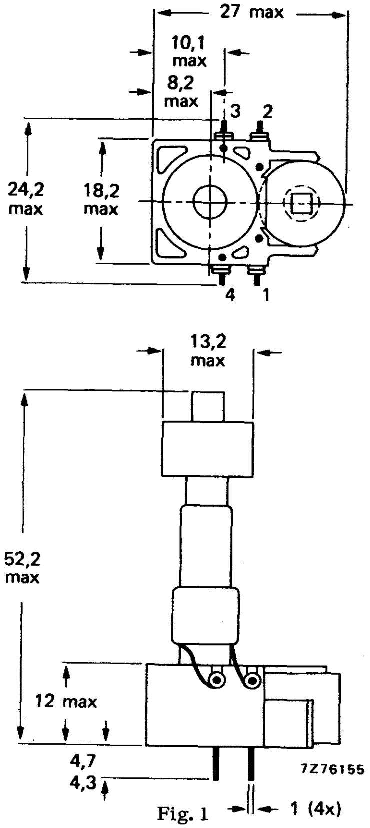


Fig. 1

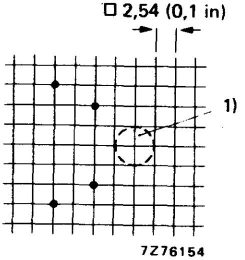
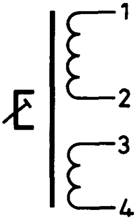


Fig. 2 Hole pattern for mounting on a printed-wiring board. Hole diameter 1. 3 + 0. 1

1) Hole (dia. 5. 1 mm min.) only necessary for bottom adjustment.

ELECTRICAL DATA

The correction voltage is pre-adjusted to 23.5 V ± 2.5% at a saw tooth current of 6.4 A peak-to-peak, frequency 15625 Hz, fly-back ratio 18% (without S-correction), flowing through winding 1-2. The voltage between pins 2 and 3 (pins 1 and 4 interconnected) is then 28.5 V ± 10%.



7Z69289

Fig. 3 Circuit diagram

MOUNTING

The unit can be mounted on printed-wiring boards by means of its four connection pins (see Fig. 2). To prevent distortion of the magnetic field, no iron part should approach the magnetic parts nearer than 3 mm. The coils should be shunted with a carbon resistor to damp ringing phenomena; the value of resistor depends on applied deflection transformer (typical value 560 Ω with transformer AT2076/10).

---

*) Pins 2 and 3 should be interconnected on the printed-wiring board.

DRIVER TRANSFORMER
for use in switched mode power supplies in television receivers

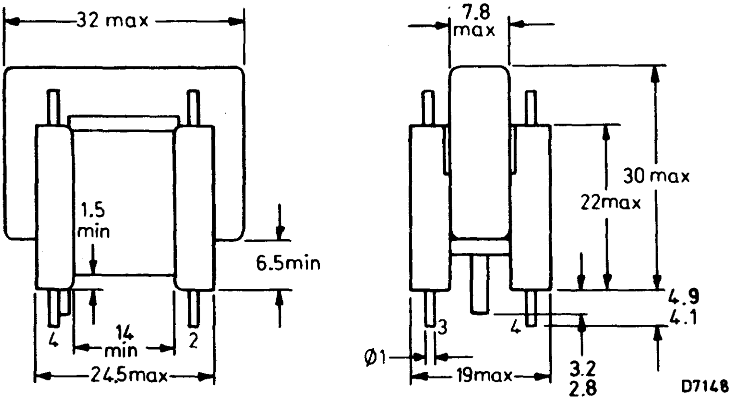
AT4043/03

APPLICATION

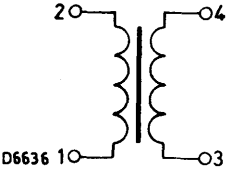
The transformer is used in conjunction with non-isolated transformer AT2095

It uses two Ferroxcube U-cores and it is provided with pins for mounting on a printed wiring board.

DIMENSIONS (millimetres)



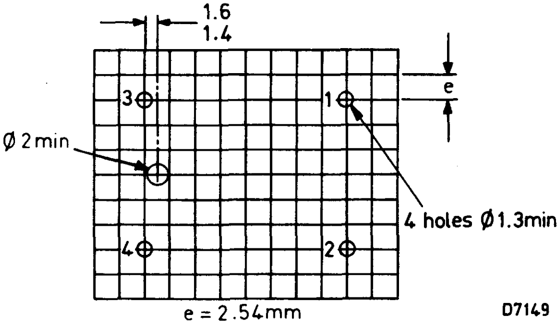
CIRCUIT DIAGRAM



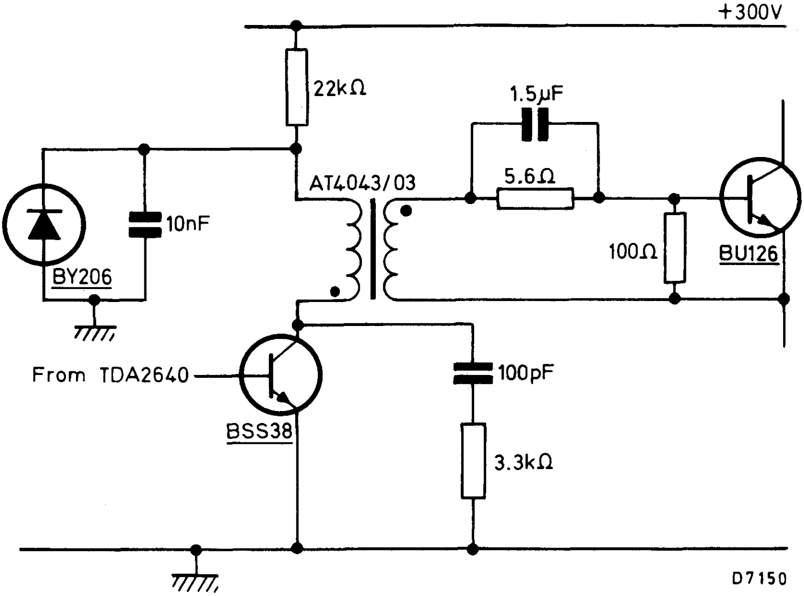
ELECTRICAL DATA

Inductance	Primary (3-4)	≥350	mH
	Secondary (1-2) (with (3-4) Shorted)	< 5	μH
Absolute maximum operating temperature		115	°C
Turns ratio		21. 74 ± 4%	

RECOMMENDED PIERCING DIAGRAM



APPLICATION CIRCUIT



LINE
DRIVER TRANSFORMER

AT4043/29

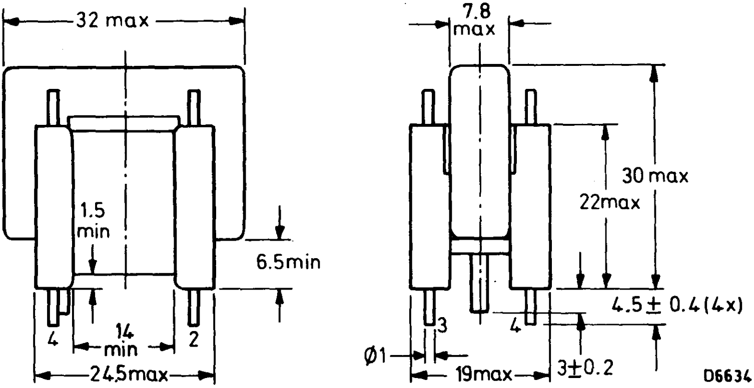
APPLICATION

The transformer AT4043/29 has been designed for all-transistor colour television sets. It can be used in the single-transistor (BU208) line-output circuit in conjunction with the line-output transformer AT2063/03 and AT2080/...

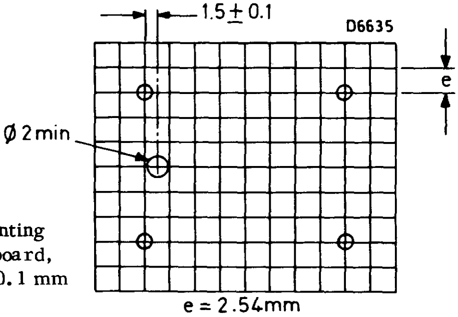
MECHANICAL DATA

The magnetic circuit of the transformer comprises two ferroxcube U-cores.
The unit is provided with pins for mounting on a printed-wiring board.

Dimensions (mm)



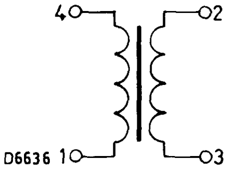
MOUNTING



Hole pattern for mounting
on a printed-wiring board,
hole diameter 1.3 + 0.1 mm

ELECTRICAL DATA

Inductance (primary)	370 mH ± 12%
Maximum working temperature	100 °C



Mullard

NOVEMBER 1974

TWIST COMPENSATION TRANSFORMER

AT4043/34

APPLICATION

This transformer has been designed for all-transistor or transistor/thyristor colour television sets. It is intended to be used in conjunction with the deflection unit AT1080, which is provided with a 4-pole unit for equalisation of the line and field astigmatism (see also data sheet of AT1080).

MECHANICAL DATA

The magnetic circuit of the transformer comprises two Ferroxcube cores, an E-and an I-core. The unit is provided with pins for mounting on a printed-wiring board.

Dimensions (mm)

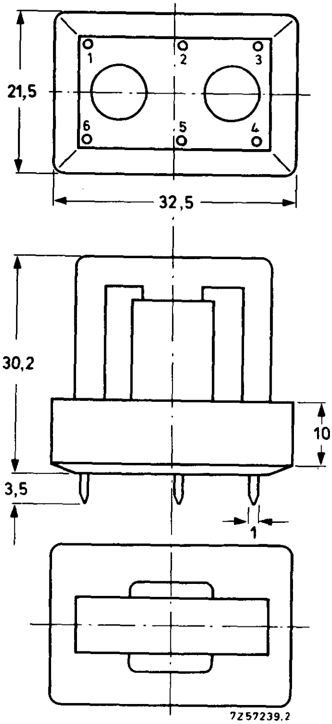


Fig. 1

Mounting

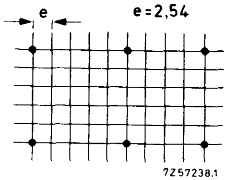


Fig. 2 Hole pattern for mounting on a printed-wiring board, hole diameter 1, 3 + 0, 1 mm.

ELECTRICAL DATA

Inductance between 1 and 6, 3 and 4 interconnected	7, 3 mH ± 10%
Maximum working temperature	105 °C

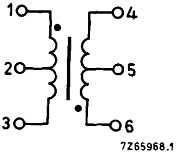


Fig. 3 Connection diagram

Application circuit

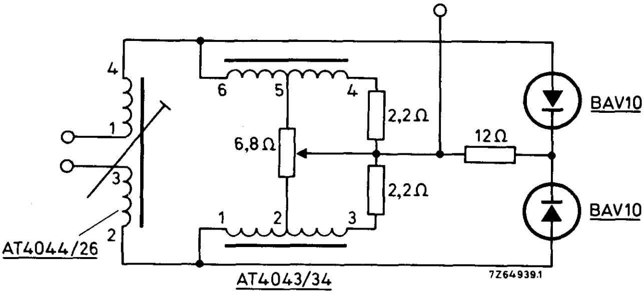


Fig. 4

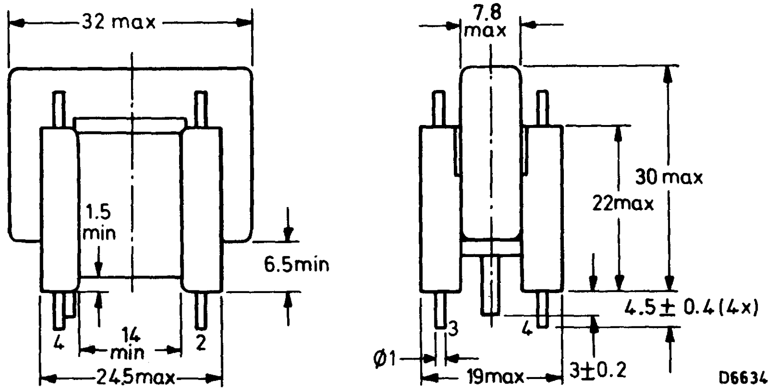
BRIDGE COIL
for colour television receivers

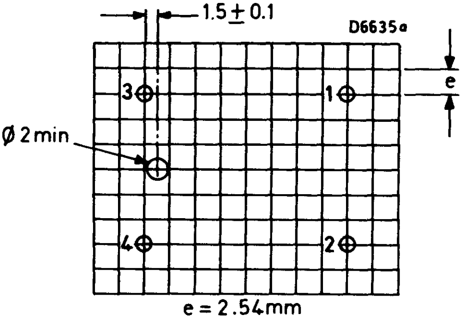
AT4043/38

APPLICATION

For use as a bridge transformer in the line output transformer circuit of the AT2080/10, in conjunction with the deflection unit AT1080 (see also data sheet AT2080/10).
The magnetic circuit of the coil comprises two Ferroxcube U-cores. The unit is provided with pins for mounting on a printed-wiring board.

Dimensions (millimetres)

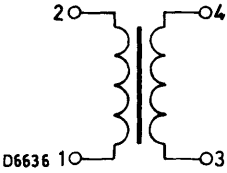




Hole pattern for mounting on a printed-wiring board. Hole diameter 1.3 min. e = 2.54 mm (0.1 in).

ELECTRICAL DATA

Inductance (primary 1-2)	425 µH ± 10 %
Resistance (primary 1-2)	< 0.4 Ω
Maximum voltage, peak-to-peak	400 V
Maximum current, peak-to-peak	6.7 A
Maximum current, r.m.s.	1.8 A
Maximum working temperature	100 °C



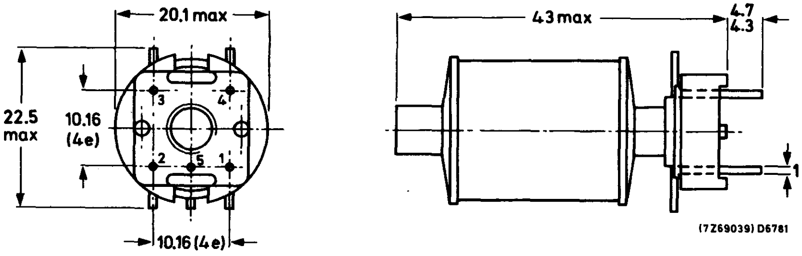
EAST-WEST LOADING COIL

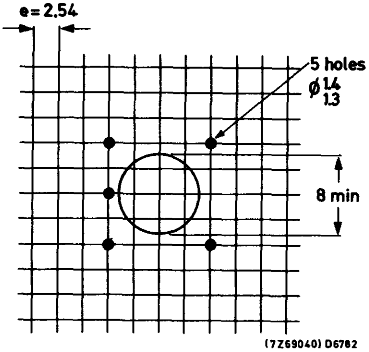
AT4044/20

GENERAL

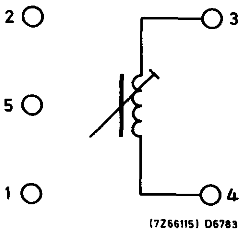
Designed for use with line output transformer AT2080 and deflection unit AT1080. The coil is provided with pins for mounting on a printed wiring board, and it can be adjusted by means of a trimming key.

DIMENSIONS (millimetres)





Recommended piercing diagram



Circuit diagram

ELECTRICAL DATA

Inductance between 3 and 4 (measured with 5000 pF in parallel	1 to 5.3	mH
Resistance between 3 and 4	2	Ω
MAXIMUM WORKING TEMPERATURE	95	°C

LINE BALANCE COIL AT4044/26

APPLICATION

This coil has been designed for the circuitry of the four-pole unit incorporated in the deflection unit AT1080, for equalization of line and field astigmatism (see also data on AT1080).

MECHANICAL DATA

Dimensions (mm)

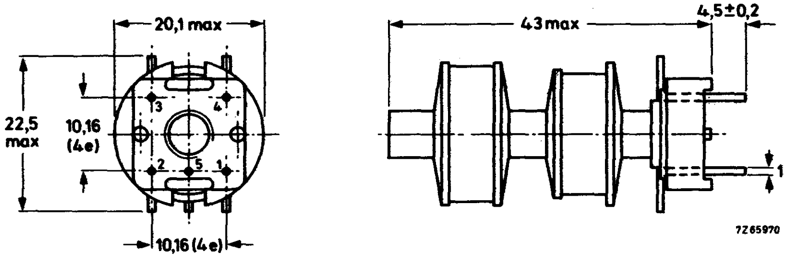


Fig. 1

The coil is provided with pins for mounting on a printed-wiring board. It can be adjusted at the top by means of a trimming key.

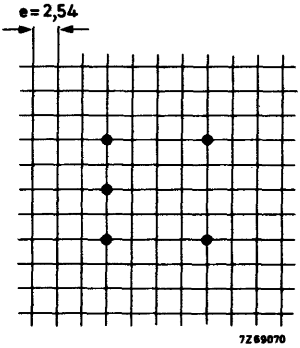


Fig. 2 Hole pattern for mounting on a printed-wiring board, hole dia 1,3 + 0,1 mm

ELECTRICAL DATA

Inductance	between 4 and 1 *)	110 to 30 μH
	between 2 and 3 *)	30 to 110 μH
Resistance	between 4 and 1 and 2 and 3	0, 23 Ω
Maximum working temperature		95 °C

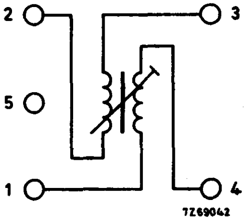


Fig. 3 Connection diagram

Pins 2 and 4 should be interconnected.

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*) measured with 5000 pF in parallel.

FOUR-POLE ADJUSTING COIL

AT4044/27

APPLICATION

This correction coil has been designed for the circuitry of the four-pole unit incorporated in the deflection unit AT1080, for equalization of line astigmatism (see also data on AT1080).

MECHANICAL DATA

Dimensions (mm)

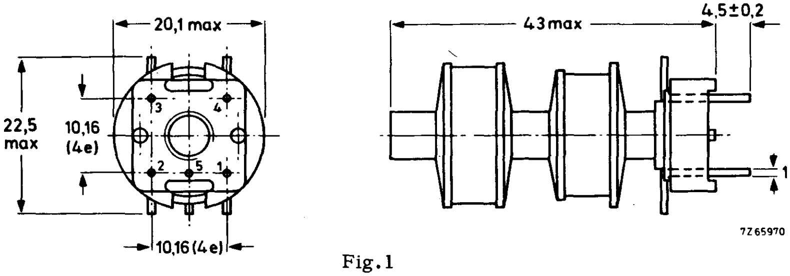

Fig. 1

The coil is provided with pins for mounting on a printed-wiring board. It can be adjusted at the top by means of a trimming key.

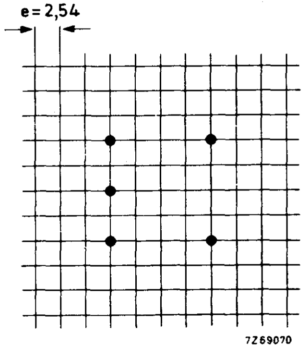

Fig. 2 Hole pattern for mounting on a printed-wiring board, hole dia 1,3 + 0,1 mm

ELECTRICAL DATA

Inductance, measured with 5000 pF in parallel		
between 3 and 5	*)	33 to 150 μH
between 4 and 5	*)	150 to 33 μH
Resistance at 25 °C		
between 1 and 2		0,23 Ω
between 3 and 4		0,18 Ω
Maximum working temperature		95 °C.

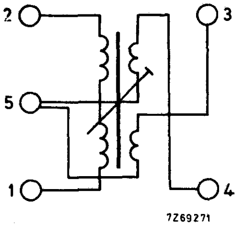

Fig. 3. Connection diagram

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*) Supplied with core position for $L_{3-5} = L_{5-4} = 11,3\ \mu H \pm 5\%$.

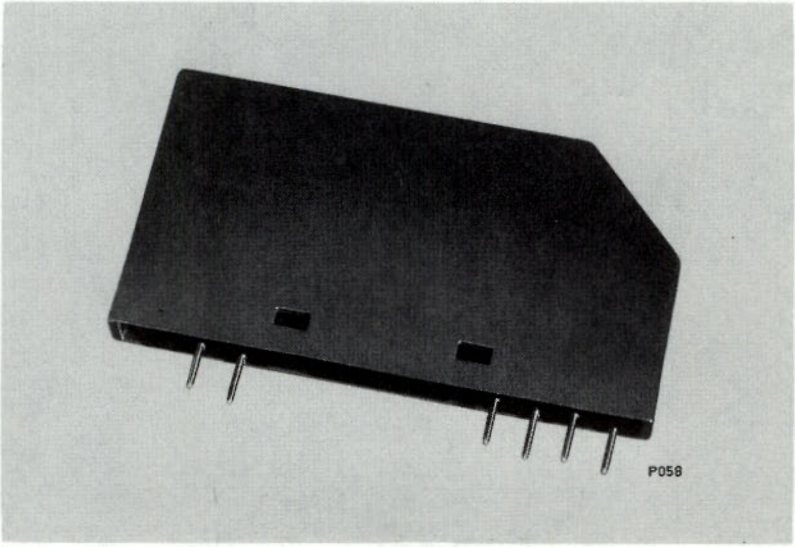
PAL DELAY LINE

DL50

QUICK REFERENCE DATA

For receivers up to European PAL standard.

Nominal frequency	4.433619	MHz
Phase delay time	63.943	μs
Dimensions	71 x 7.5 x 38	mm
Self-extinguishing properties		



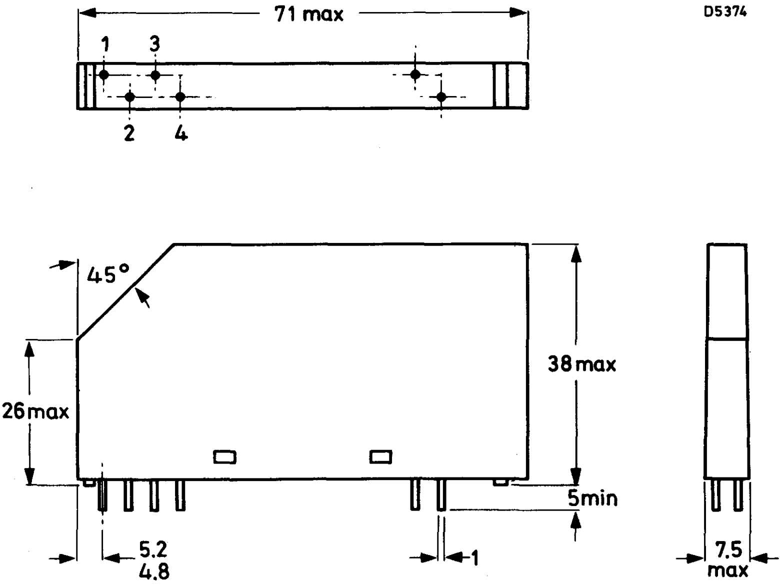
APPLICATION

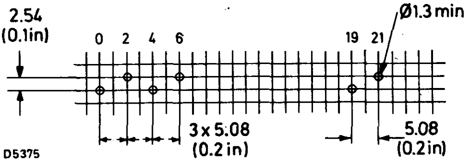
The DL50 is intended for use in decoder circuits of colour television receivers.

DESCRIPTION

A very thin slab of zero TC glass, provided with two transducers, is shock proof mounted in a suitable housing that complies with the self extinguishing and non-dripping properties of the American Underwriters Laboratories rating mentioned in UL94 SE-1. Six pins enable the unit to be soldered directly into a printed wiring board. Input and output coil are not to be included.

DIMENSIONS (millimetres)
First angle projection





Piercing diagram

PAL DELAY LINE

DL50

ELECTRICAL DATA

Measured at 25°C according to the measuring circuit of Fig. 3.

Nominal frequency (f_{nom})	4.433619	MHz
Phase delay time (τ) between V_1 and V_2 at f_{nom} (unmodulated) sinewave voltage	63.943 ± 0.005	μs
Bandwidth at -3 dB	from < 3.43 to > 5.23	MHz
Insertion loss at f_{nom}	8 ± 3	dB
Drift of phase delay with temperature (relative to 25°C)	max. 5, typ. 3	ns
Maximum input voltage at f_{nom}	15	V_{p-p}
Unwanted reflections at 3τ	≤ -22 with respect to 1τ signal	dB
Other reflections	≤ -30 with respect to 1τ signal	dB
Operating temperature range	-20 to +70	°C

Nominal terminations at f_{nom}

R1, R2	termination resistance	390	Ω
C1	total capacitance	120	pF
L1	inductive reactance	128	Ω
L2	inductive reactance	231	Ω

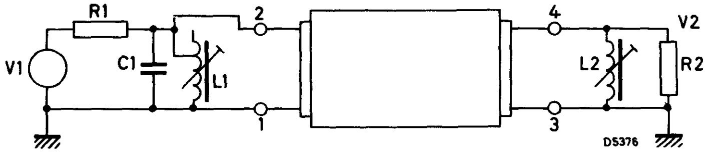


Fig. 3

Recommended adjustment range of the coils	-19 to +36	%
Maximum capacitance of the coils	20	pF

DELAY LINE

DL51

QUICK REFERENCE DATA	
For receivers to European PAL/SECAM standard	
Nominal frequency	4.433619 MHz
Phase delay time	63.943 μs
Dimensions	71 x 7, 5 x 37, 5 mm
Self-extinguishing properties	

APPLICATION

The DL51 is intended for use in decoder circuits of colour television receivers.

DESCRIPTION

A very thin slab of zero TC glass provided with two transducers is mounted shock proof in a housing, that complies with the self-extinguishing and non-dripping properties of the American Underwriters' Laboratories rating mentioned in UL94 SE-1 Six pins enable the unit to be soldered directly into a printed-wiring board. Input and output coil are not included.

MECHANICAL DATA

Dimensions (mm)

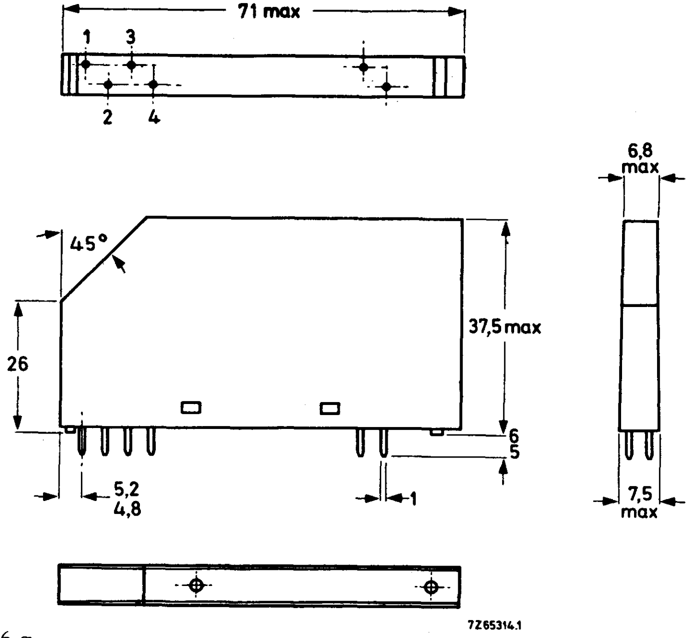


Fig. 1

Weight 16 g

Mounting

The unit can be soldered directly into a printed-wiring board.

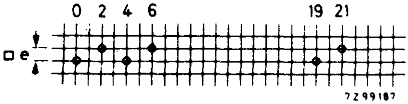


Fig. 2.

Recommended hole pattern for mounting on a printed-wiring board. e = 2,54 mm. The tolerance on the distances of the different holes to the 0-line is ±0,1 mm. Hole diameter is 1,3 ± 0,1 mm.

ELECTRICAL DATA

Measured according to the circuit of Fig.3 at 25 °C and f_{nom} (unless otherwise specified)

Nominal frequency (f_{nom})	4.433619 MHz
Phase delay time (τ) between V_1 and V_2 (unmodulated sinewave voltage)	63.943 ± 0.005 μs
Bandwidth at −3 dB	from ≤ 3.43 to ≥ 5.23 MHz
Insertion loss	8 ± 3 dB
Drift of phase delay from +10 to +60 °C (relative to 25 °C)	max. 5 ns, typ. 3 ns [1])
Maximum input voltage (p-p)	15 V
Unwanted reflections,	
3τ	≤ −22 dB with respect to 1 τ signal
other reflections	≤ −35 dB with respect to 1 τ signal
Operating temperature range	−20 to +70 °C

Measuring circuit

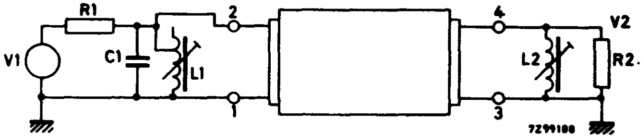


Fig.3

Nominal terminations

R1, R2	termination resistance	390 Ω
C1	total capacitance	120 pF
L1	inductive reactance	128 Ω
L2	inductive reactance	231 Ω

Recommended adjustment range of the coils	− 19 to + 36 %
Maximum capacitance of the coils	20 pF

DL60

QUICK REFERENCE DATA	
For receivers up to European PAL standard	
Nominal frequency	4,433619 MHz
Phase delay time	63,943 µs
Dimensions	37 x 7,5 x 28,5 mm
Self-extinguishing properties	

APPLICATION

The DL60 is intended for use in decoder circuits of colour television receivers.

DESCRIPTION

A very thin slab of zero TC glass provided with two transducers is shock-proof mounted in a housing that satisfies the flame test described in IEC 50 C (secretariat) 11. Four pins enable the unit to be soldered directly onto a printed-wiring board.

MECHANICAL DATA

Dimensions in mm

Outlines

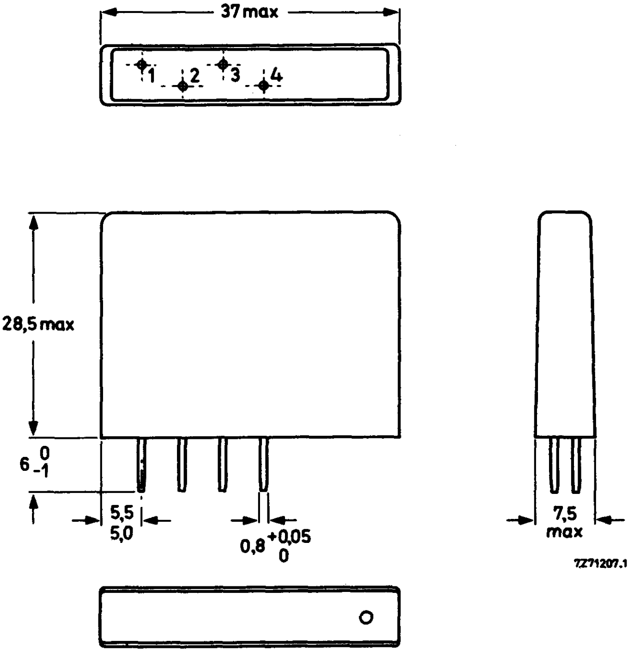


Fig. 1

Mass 7 g

Mounting

The unit can be soldered directly onto a printed-wiring board.

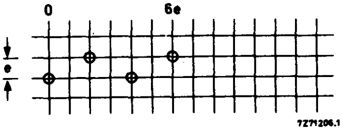


Fig. 2.

Recommended hole pattern for mounting on a printed-wiring board: e = 2,54 mm
The tolerance on the distances of the different holes to the 0-line is ± 0, 1 mm.
Hole diameter is 1, 0 + 0, 1 mm.

ELECTRICAL DATA

Measured with the circuit of Fig. 3 at 25 °C and f_0 (unless otherwise specified)

Nominal frequency (f_0)	4,433619 MHz
Phase delay time (τ)	63,943 ± 0,005 µs
Bandwidth at −3 dB	from ≤ 3,43 to ≥ 5,23 MHz
Insertion loss	9 ± 3 dB
Drift of phase delay from + 10 to + 60 °C (relative to + 25 °C)	max. 5 ns, typ. 3 ns
Maximum input voltage (p-p)	10 V
Spurious signals	
3 τ signals	≤ −22 dB with respect to 1 τ signal
other signals	≤ −30 dB with respect to 1 τ signal
Phase relation $\varphi_{4-3} - \varphi_{2-1}$	180°
Storage temperature range	−40 to +70 °C

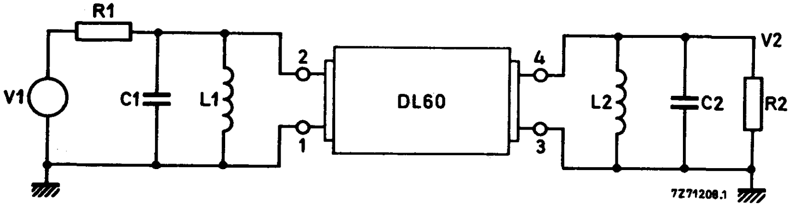


Fig. 3.

Terminations

R1 = R2 = 560 Ω

C1 = 20 pF, C2 = 30 pF: total capacitance of test jig without delay-line i.e. wiring capacitance, capacitance of coil and extra trimming capacitor.

L1 = 10,5 µH

L2 = 9,7 µH

Application circuit

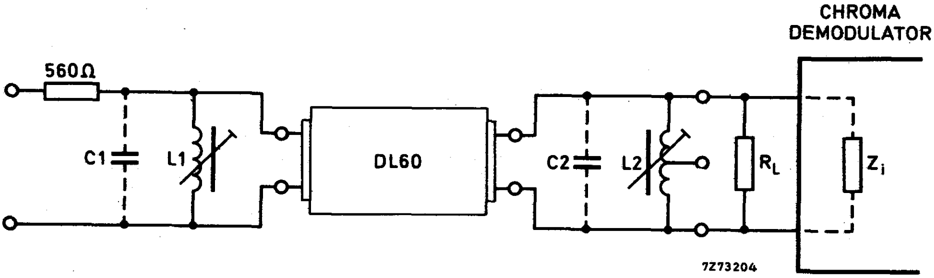


Fig. 4

$(R_L // Z_i) = 560\,\Omega$

C1, C2 < 30 pF (wiring capacitance and capacitance of the coil)

L1, L2 nominal values depend on values of C1 and C2 to produce the reactances :

$$X1 = \frac{\omega_0 L1}{1 - \omega_0^2 L1C1} = 350\,\Omega$$

$$X2 = \frac{\omega_0 L2}{1 - \omega_0^2 L2C2} = 350\,\Omega$$

$f_0 = 4{,}433619$ MHz

Maximum bandwidth is obtained at minimum C1 and C2.

Recommended adjustment range of the coils -19 to $+36\%$.

DELAY LINE DL700

DEVELOPMENT SAMPLE DATA

QUICK REFERENCE DATA

For receivers up to European PAL standard

Nominal frequency	4.433619 MHz
Phase delay time	63.943 µs
Dimensions	37 × 7.5 × 28.5 mm
Self-extinguishing properties	

APPLICATION

The DL700 is intended for use in decoder circuits of colour television receivers.
It is physically interchangeable with the DL50 and DL60

DESCRIPTION

A very thin slab of zero TC glass provided with two transducers is shock-proof mounted in a housing that satisfies the flame test described in IEC 50 C.
Four pins enable the unit to be soldered directly onto a printed-wiring board.

This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

MECHANICAL DATA

Dimensions in mm

Outlines

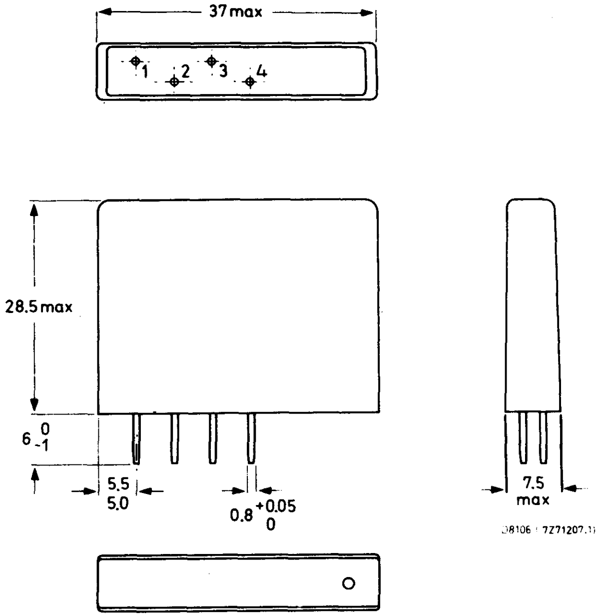


Fig. 1

Mass 7 g

Mounting

The unit can be soldered directly onto a printed-wiring board.

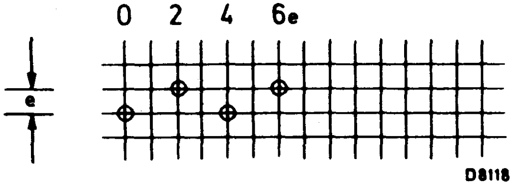


Fig. 2

Recommended hole pattern for mounting on a printed-wiring board: e = 2.54 mm
The tolerance on the distances of the different holes to the 0-line is ± 0.1 mm.
Hole diameter is 1.0 ± 0.1 mm

ELECTRICAL DATA

Measured with the circuit of Fig. 3 at 25 °C and f_0 (unless otherwise specified)

Nominal frequency (f_0)	4.433619 MHz
Phase delay time (τ)	63.943 ± 0.005 µs
Bandwidth at -3 dB	from ≤ 3.43 to ≥ 5.23 MHz
Insertion loss	9 ± 3 dB
Drift of phase delay from +10 to +60 °C (relative to +25 °C)	max. 5 ns, typ. 3 ns
Maximum input voltage (p-p)	10 V
Spurious signals	
3 τ signals	≤ -22 dB with respect to 1 τ signal
other signals	≤ -30 dB with respect to 1 τ signal
Phase relation $\phi_{4-3} - \phi_{2-1}$	180°
Storage temperature range	-40 to +70 °C

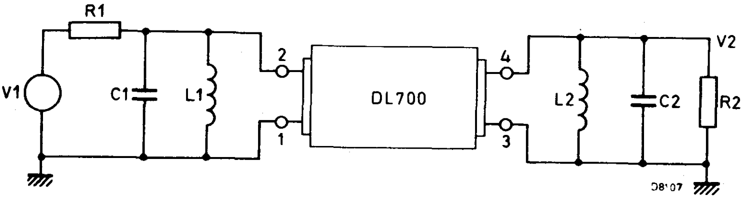


Fig. 3

Terminations
R1 = R2 = 390 Ω
C1 = 20 pF
C2 = 30 pF
L1 = 8.64 µH
L2 = 8.10 µH

} total capacitance of test jig without delay-line i.e. wiring capacitance, capacitance of coil and extra trimming capacitor.

Application circuit

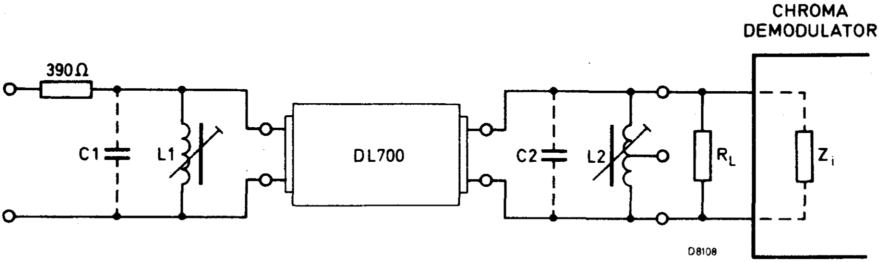


Fig. 4

$(R_L//Z_i)$ = 390 Ω

C1, C2 < 30 pF (wiring capacitance and capacitance of the coil)

L1, L2 nominal values depend on values of C1 and C2 to produce the reactances:

$$X1 = \frac{\omega_o\ L1}{1 - \omega_o^2\ L1C1} = 278\ \Omega$$

$$X2 = \frac{\omega_o\ L2}{1 - \omega_o^2\ L2C2} = 278\ \Omega$$

f_o = 4.433619 MHz

Maximum bandwidth is obtained at minimum C1 and C2.

Recommended adjustment range of the coils -19 to +36%.

LUMINANCE DELAY LINES

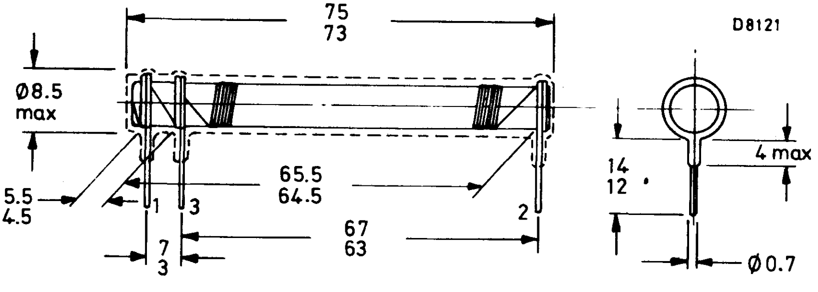
VS340/1 VS470/1 VS400/1 VS550/1 VS600/1

The VS series of luminance delay lines are designed for delaying the luminance signals at video frequencies in colour television receivers. Delay times in the range of t_d = 340 to 600 ns can be supplied to relate to the various set circuit and transmitter encodings. To cover this range the number of turns on the winding is varied and two different ceramic materials are employed. Therefore the characteristics of the delay lines do not vary uniformly with the delay time. The compact outline complies with modern requirements for miniaturisation and modular construction. The cylindrical ceramic body has fired-on silver lacquer tracks and the encapsulation ensures adequate protection against humidity and temperature as well as mechanical damage.

QUICK REFERENCE DATA

VS340/1	delay times	typ.	340	ns
VS400/1			400	ns
VS470/1			470	ns
VS550/1			550	ns
VS600/1			600	ns
Insertion loss		typ.	1	dB
Reflection coefficient		<	2	%

OUTLINE AND DIMENSIONS (millimetres)



weight 7 g

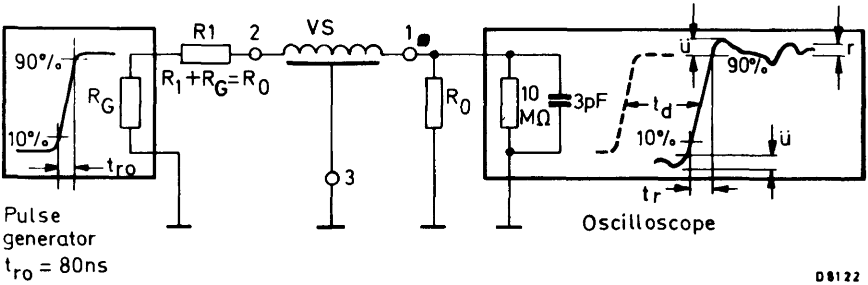
RATINGS Limiting values of operation according to the Absolute Maximum System.

Input voltage	V_{1-3}	100	V
Input current	I_{1-2}	30	mA
Operating temperature	T_{amb}	-20 to +80	°C
Storage temperature	T_{stg}	-20 to +100	°C

CHARACTERISTICS

The characteristics for the delay time (t_d), rise time (t_r), overshoot (ü) and reflection (r) are measured in the test circuit shown below.

Test circuit



Delay time

The delay time t_d will be within ± 10% of the nominal value (max. ± 50 ns)

Reflection

With terminations of the required standard resistance ($Z=f(t_d)$ the reflection is typically less than 2%. This value applies to all types in the range.

Insertion loss

The insertion loss at low frequencies ($f <<< B$) measured assuming that $R_1 = R_0 = Z$, increases approximately with the delay time and has a maximum value of 2 dB.

LUMINANCE DELAY LINES

VS340/I VS470/I
VS400/I VS550/I
VS600/I

ELECTRICAL DATA

Type No.	Delay time ns	Impedance Z Ω	Bandwidth B		Reflection r	
			typ. MHz	min. MHz	typ. %	max. %
VS340/1	340	1000	8.0	7.0	1.8	4.0
VS400/1	400	1200	7.0	6.0	1.8	4.0
VS470/1	470	1300	7.0	6.0	1.8	4.0
VS550/1	550	820	4.2	3.8	1.8	4.0
VS600/1	600	910	4.2	3.8	1.8	4.0

QUARTZ CRYSTAL UNIT

QUICK REFERENCE DATA

Nominal frequency	8867, 238 Hz
Mode of vibration	fundamental
Type of holder	RW-10

APPLICATION

Intended to be used in the sub-carrier oscillator of colour television sets according to the PAL system.

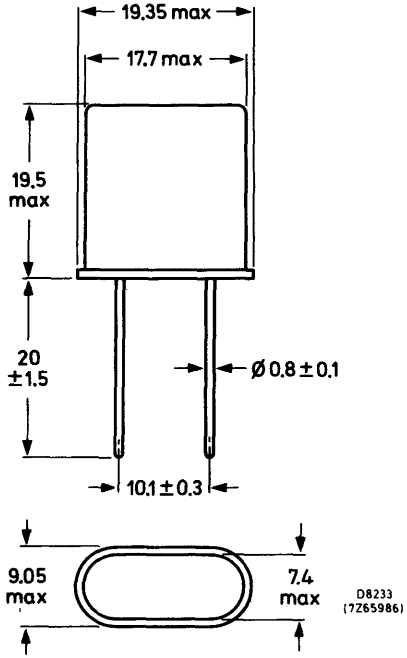
DESCRIPTION

The unit consists of a metal-plated AT-cut quartz plate, mounted in a resistance welded metal holder, provided with two connecting leads.

MECHANICAL DATA

Dimensions in mm

Outline



MARKING

The holder is marked as follows

Frequency in kHz
5 digit code number (0312)
Date code (year/week)

Note: The last digit of the code number signifies the factory production specification and should not be used for ordering purposes.

MASS approx. 2 g

ELECTRICAL DATA*

Unless otherwise specified the values apply at a temperature of 25 ± 2 °C

Load resonance frequency, load capacitance 20 pF drive level 0.5 mW		8867, 238	kHz
Adjustment tolerance	±max.	40 x 10^{-6}	
Tolerance over the temperature range of +10 to +60 °C, with respect to +25 °C	±max.	30 x 10^{-6}	
Trimability at a load capacitance of 20 pF with a load capacitance variation of 10 pF	min.	950	Hz
Motional capacitance (C_1)	typ.	21	fF
Parallel capacitance (C_0)	max.	6	pF
	typ.	5	pF
Resonance resistance	typ.	15	Ω
in temperature range of +10 to +60 °C	max.	60	Ω
Maximum permissible d.c. voltage between terminations		100	V
Operating temperature range		+10 to +60	°C

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*The terminology of IEC document 49 (secretariat) 76 is used.

TESTS AND REQUIREMENTS

Essentially the following tests mentioned in the schedule of IEC publication 122 are carried out along the lines of IEC publication 68.

IEC 122 clause	IEC 68-2 test method	test	procedure	requirements
2.5.17	–	Aging	30 days, +85 °C	Δf/f ± max. 15 ppm
2.5.12	Db	Damp heat accelerated	1 day, +55 °C 100% R.H.	Δf/f ± max. 10 ppm R_{ins} at 50 V d.c. min. 20 MΩ
	Na	Rapid change of temperature	–20/+50 °C 15 cycles 1 h per cycle	Δf/f ± max. 5 ppm
2.5.2	Ea	Shock	40 g, sawtooth 6 directions, 1 blow per direction	Δf/f ± max. 5 ppm ΔR/R ± max. 15%
2.5.3	Fc	Vibration	10-55-10 Hz, 0.75 mm displacement 2 h, 3 directions*	Δf/f ± max. 5 ppm ΔR/R ± max. 15%
2.5.6	Ub	Flexibility of terminations	1 x 90°, 5 N	no visible damage
2.5.10	T	Soldering	300 °C, 2 s	Δf/f ± max. 2 ppm good tinning no visible damage

*The batch is divided into three equal parts, each part is tested in one of the three perpendicular directions.

ORDERING

Crystals should be ordered using the full catalogue number e.g. 4322 143 03120.

QUARTZ CRYSTAL UNIT

QUICK REFERENCE DATA

Nominal frequency	4433,619 kHz
Mode of vibration	fundamental
Type of holder	RW-10

APPLICATION

Intended to be used in the sub-carrier oscillator of colour television sets according to the PAL system.

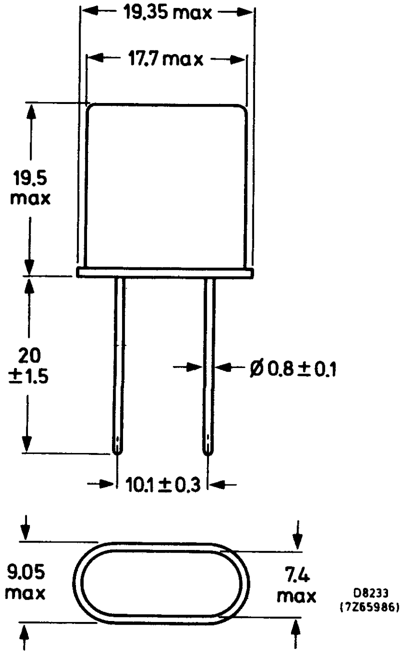
DESCRIPTION

The unit consists of a metal-plated AT-cut quartz plate, mounted in a resistance welded metal holder, provided with two connecting leads.

MECHANICAL DATA

Outline

Dimensions in mm



MARKING

The holder is marked as follows

Frequency in kHz
5 digit code number (0110).
Date code (year/week)

Note: The last digit of the code number signifies the factory production specification and should not be used for ordering purposes.

MASS approx. 2 g

ELECTRICAL DATA*

Unless otherwise specified the values apply at a temperature of 25 ± 2 °C

Load resonance frequency, load capacitance 20 pF drive level 0.5 mW		4433,619	kHz
Adjustment tolerance	±max.	40×10^{-6}	
Tolerance over the temperature range of +10 to +60 °C, with respect to +25 °C	±max.	30×10^{-6}	
Trimability at a load capacitance of 20 pF with a load capacitance variation of 10 pF	min.	600	Hz
Motional capacitance (C_1)	typ.	29	fF
Parallel capacitance (C_0)	max.	7	pF
	typ.	6.5	pF
Resonance resistance	typ.	15	Ω
in temperature range of +10 to +60 °C	max.	50	Ω
Maximum permissible d.c. voltage between terminations		100	V
Operating temperature range		+10 to +60	°C

---

*The terminology of IEC document 49 (secretariat) 76 is used.

TESTS AND REQUIREMENTS

Essentially the following tests mentioned in the schedule of IEC publication 122 are carried out along the lines of IEC publication 68.

IEC 122 clause	IEC 68-2 test method	test	procedure	requirements
2.5.17	–	Aging	30 days, +85 °C	Δf/f max. 15 ppm
2.5.12	Db	Damp heat accelerated	1 day, +55 °C 100% R.H.	Δf/f ± max. 10 ppm R_{ins} at 50 V d.c. min. 20 MΩ
	Na	Rapid change of temperature	−20/+50 °C 15 cycles 1 h per cycle	Δf/f ± max. 5 ppm
2.5.2	Ea	Shock	40 g, sawtooth 6 directions, 1 blow per direction	Δf/f ± max. 5 ppm ΔR/R ± max. 15%
2.5.3	Fc	Vibration	10-55-10 Hz, 0.75 mm displacement 2 h, 3 directions*	Δf/f max. 5 ppm ΔR/R ± max. 15%
2.5.6	Ub	Flexibility of terminations	1 x 90°, 5 N	no visible damage
2.5.10	T	Soldering	300 °C, 2 s	Δf/f ± max. 2 ppm good tinning no visible damage

*The batch is divided into three equal parts, each part is tested in one of the three perpendicular directions.

ORDERING

Crystals should be ordered using the full catalogue number e.g. 4322 152 01100.

MODULES

E

VOLTAGE MULTIPLYING MODULE

BG100

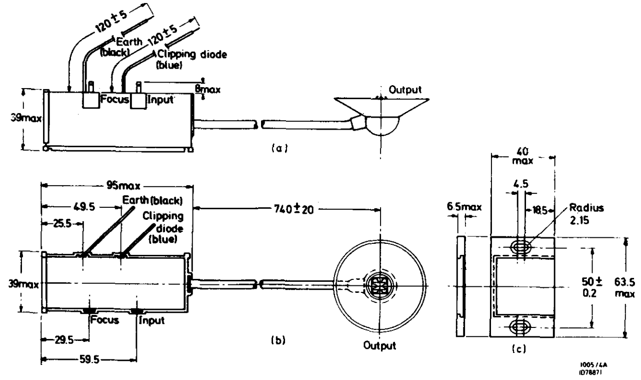
DEVELOPMENT SAMPLE DATA

Voltage tripler designed for domestic high performance colour television receivers. The electrical operation is entirely conventional and it can be used in a standard system. However, every aspect of component design and assembly has been re-assessed and only the optimum solutions have been adopted in order that the tripler can be characterised by its intrinsic reliability.

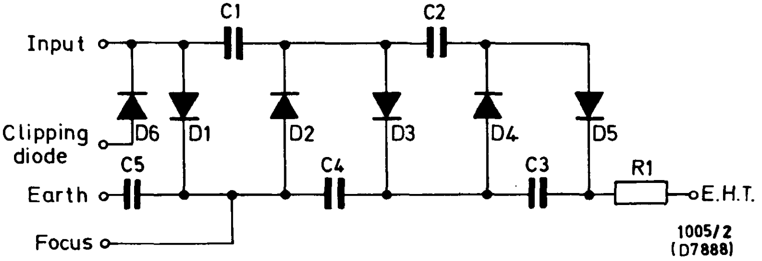
QUICK REFERENCE DATA

V_{in} (peak-to-peak)	8.3	kV
V_{out} (e.h.t. supply) (d.c.)	25	kV
V_{out} (focus supply) (d.c.)	8.3	kV

DIMENSIONS (millimetres)



CIRCUIT DIAGRAM



This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

Mullard

RATINGS (Limiting values according to the Absolute Maximum System)

V_{in} (peak-to-peak)	10.6	kV
V_{out} (I_{out} = 0)	30	kV
Focus to e.h.t. voltage	20	kV
I_{out} (e.h.t.)	1.7	mA
I_{out} (clipping diode)*	4.0	mA
Focus current	0.4	mA
T_{amb} (tripler)	70	°C
T_{stg}	-25 to +70	°C

*Clipping diode current is the sum of the clipping diode load plus focus and e.h.t. currents.

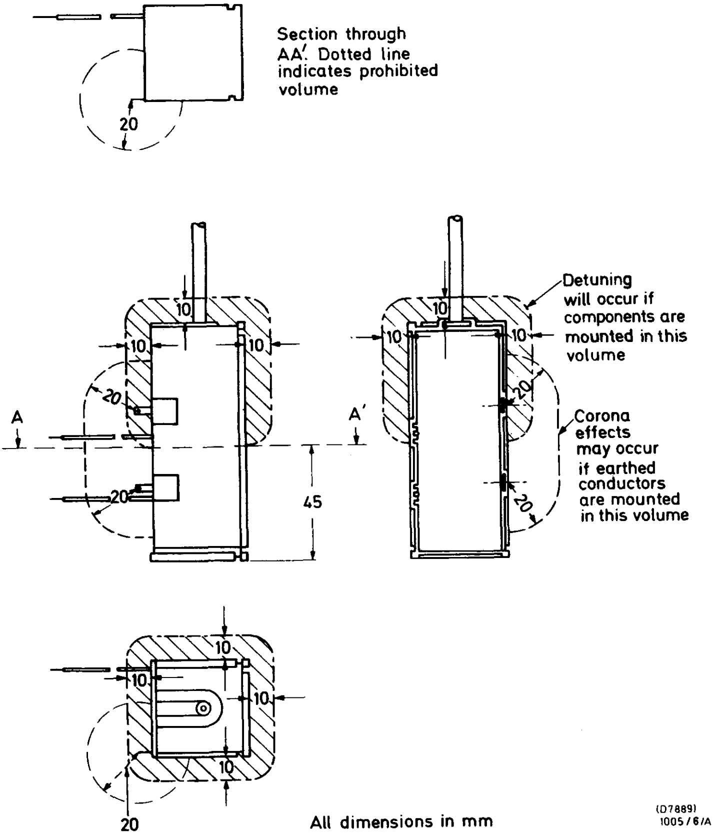
TYPICAL OPERATING CONDITIONS

V_{in} (peak-to-peak)	8.3	kV
V_{out} (e.h.t. supply) (d.c.)	25	kV
V_{out} (focus supply (d.c.)	8.3	kV
I_{out} (e.h.t. supply) (d.c.)	1.0	mA
I_{out} (focus supply) (d.c.)	0.25	mA
Internal impedance (I_{out} = 0.1 to 1.5 mA)	<0.5	MΩ
Surge limiting resistor	47	kΩ
Input capacitance	9 ± 1.0	pF

VOLTAGE MULTIPLYING MODULE

MOUNTING PRECAUTIONS

Sufficient clearance must be maintained around the tripler body to prevent corona and detuning as shown below.
Components or other conducting parts shall not be introduced within the volume specified.



Section through AA'. Dotted line indicates prohibited volume

Detuning will occur if components are mounted in this volume

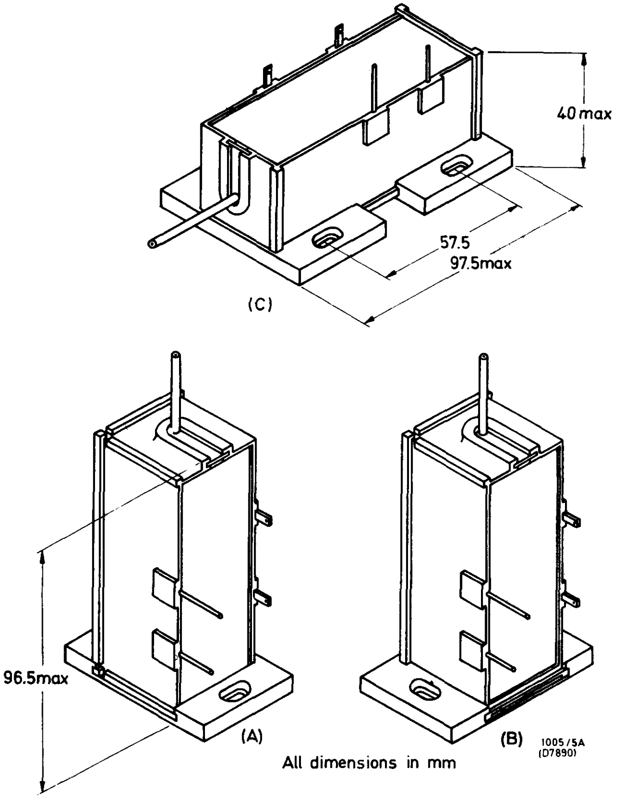
Corona effects may occur if earthed conductors are mounted in this volume

All dimensions in mm

(D7889)
1005/6/A

MOUNTING

Is intended to be versatile in either of the two mounting faces.



All dimensions in mm

PRODUCT SAFETY

For the safety of operators it is recommended that precautions should be taken to prevent personnel from coming within 2 inches of the tripler body or its leads and connections unless the device is not energised and is fully discharged. The module is sold in compliance with a valid BS415 certificate.

VOLTAGE MULTIPLYING MODULES

LP1174
Series

AVAILABLE FOR CURRENT PRODUCTION; NOT INTENDED FOR NEW DESIGNS

The modules generate e.h.t. and focus voltage from line output pulses to supply colour picture tubes. To be used in conjunction with AT2055 or AT2056 line output transformers.

QUICK REFERENCE DATA

v_{in}	(peak-to-peak)	8.7	kV
V_{out}	(e.h.t. supply) (d.c.)	25	kV
V_{out}	(focus supply) (d.c.)	7.7	kV
I_{out}	(e.h.t. supply) (average)	1	mA
I_{out}	(focus supply) (average)	100	µA

MOUNTING PRECAUTIONS

A separation of at least 15 mm between any part of the main module body or its leads and any metal parts of the receiver is essential to avoid any capacitive discharge current and detuning effects of the line output transformer. Mounting brackets must be confined to the module mounting flanges.

TYPE NUMBER DESIGNATION

Type No.	Number of		
	capacitors	diodes	surge limiting resistors
LP1174/1x	4	5	None
LP1174/3x	5	5	1
LP1174/4x	5	6	1

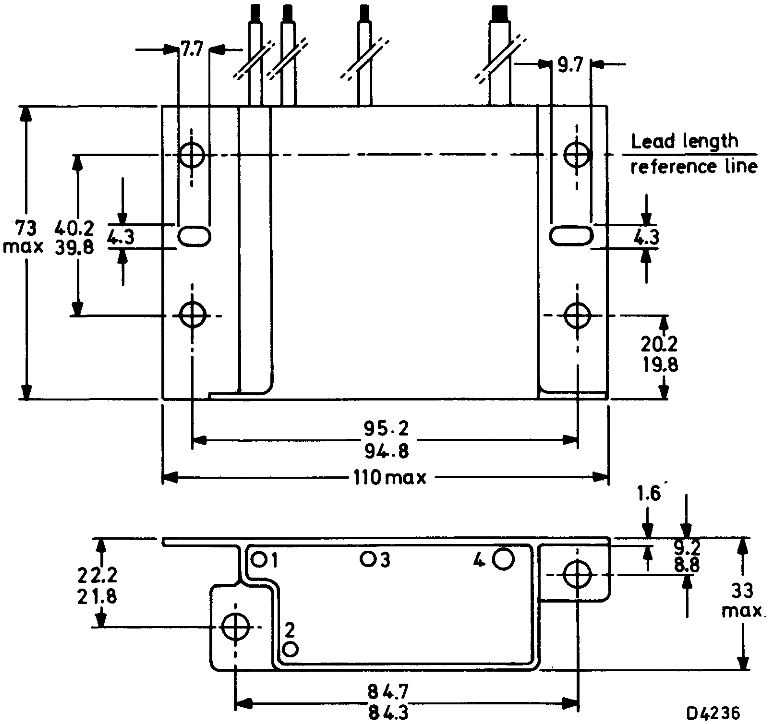
x = variations in lead lengths and terminations.

CASE AND TERMINATIONS

The modules are encapsulated in a flame retardant plastic case. Connections are by means of flying leads (termination No. 1 can also be supplied with a pin) which are flame retardant to IEC197.

Termination No.	Function	Type of termination
1	Input	Flying lead or pin
2	Earth	Flying lead
3	Focus voltage	Flying lead
4	E.H.T. output	Flying lead

DIMENSIONS (millimetres)



ELECTRICAL DATA

Typical operation conditions

v_{in} (peak-to-peak) [1]	8.7	kV
V_{out} (e.h.t. supply) (d.c.)	25	kV
V_{out} (focus supply) (d.c.)	7.7	kV
I_{out} (e.h.t. supply)	1	mA
I_{out} (focus supply)	100	μA
E.H.T. regulation (0 to 1.5 mA)	1.3	MΩ

Limiting values - these are the absolute operating limits which must not be exceeded under any conditions.

v_{in} (peak-to-peak)	10.5	kV
V_{out} (e.h.t. supply) (d.c.) [2]	31	kV
I_{out} (e.h.t. + focus)	2	mA
T_{amb}	60	°C

CIRCUIT DIAGRAMS

See next page

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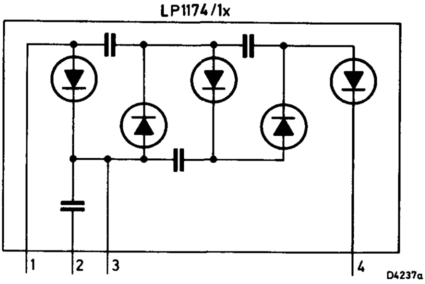
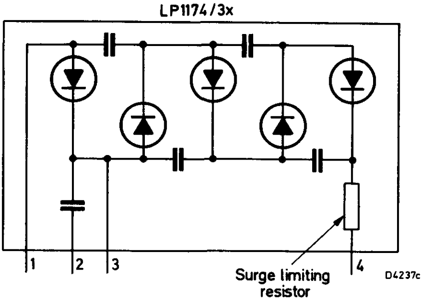
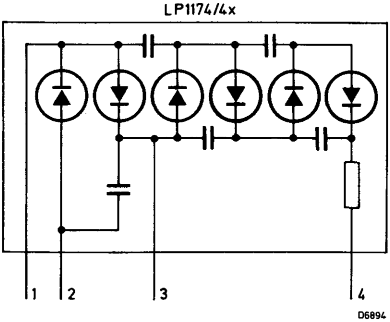
[1] Maximum pulse duration 18% of one cycle.

[2] This does not imply that the voltage rating for the final anode of the picture tube may be exceeded.

CIRCUIT DIAGRAMS







VOLTAGE MULTIPLYING MODULES

LP1194
Series

QUICK REFERENCE DATA

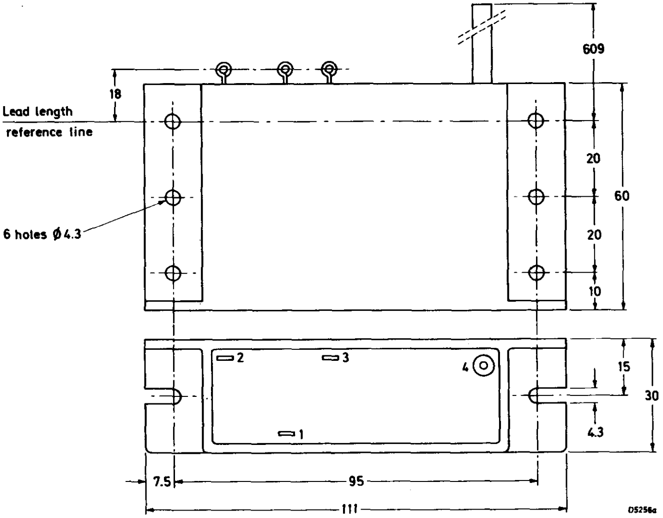
The modules generate e.h.t. and focus voltages from line time base pulses, to supply colour picture tubes.

	Circuit A	Circuit B	
V_{in} (peak-to-peak)	8.3	8.6	kV
V_{out} (e.h.t. supply) (d.c.)	25	25	kV
V_{out} (focus supply) (d.c.)	8.3	7.7	kV

TYPE NUMBERS

LP1194/30 - A five capacitor, five diode module with surge limiting resistor.
LP1194/40 - As LP1194/30 with a clipping diode across the input.

DIMENSIONS (millimetres)



Terminations:

1 = Input
2 = Earth
3 = Focus
4 = Output

Fig. 1

MOUNTING PRECAUTIONS

A separation of at least 15mm between any part of the main module body or its lead and any metal parts of the receiver is essential to avoid any capacitive discharge current and detuning effects of the line output transformer. Mounting brackets must be confined to the module mounting flanges.

ELECTRICAL DATA

Typical operating conditions (where used in typical application circuits A or B)

		Circuit A	Circuit B	
V_{in}	(peak-to-peak)	8.3	8.6	kV
V_{out}	(e.h.t. supply) (d.c.)	25	25	kV
I_{out}	(e.h.t.) (d.c.)	1	1	mA
I_{out}	(focus) (d.c.)	0.4	0.1	mA
E.H.T. regulation (0 to 1.5mA)		2	2.4	MΩ

Limiting values

These are absolute operating conditions which must not be exceeded under any condition.

V_{in}	(peak-to-peak)	10.4	10.8	kV
V_{out}	(e.h.t.)	31.2	31.5	kV
I_{out}	(clipping diode)	2.5	2.5	mA
T_{amb}		60	60	^{o}C

For other limiting values see figures 2 and 3.

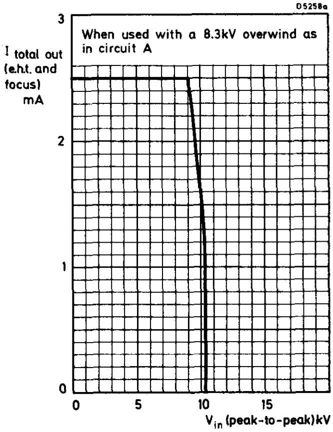


Fig. 2

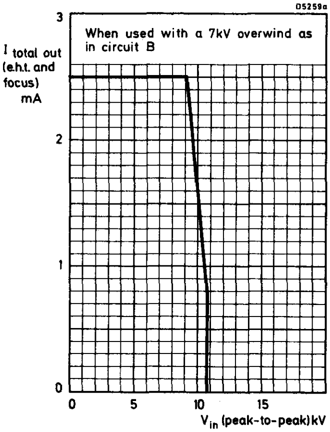


Fig. 3

TYPICAL APPLICATION CIRCUITS

Circuit A

With this arrangement the A_1 diode may be omitted. This configuration is shown for 110° operation.

The beam circuit limiting components may be removed, if not required, and point B connected to earth.

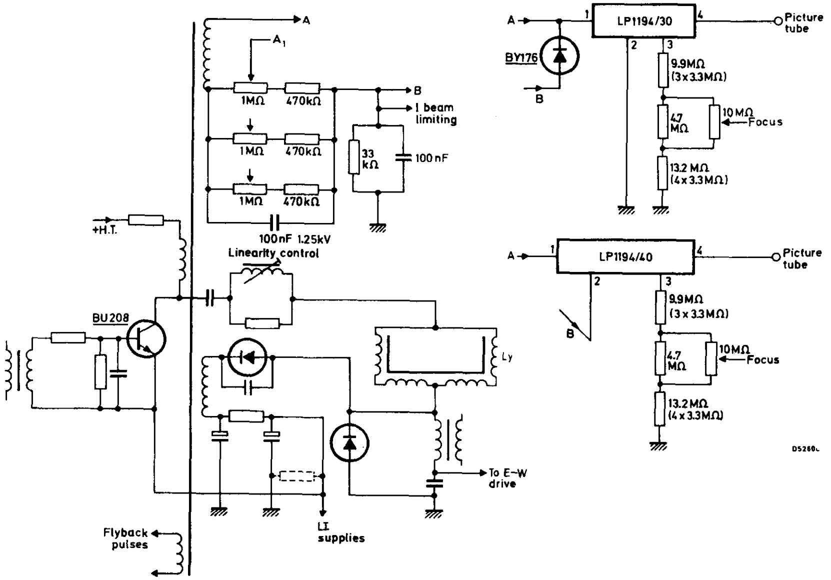


Fig. 4

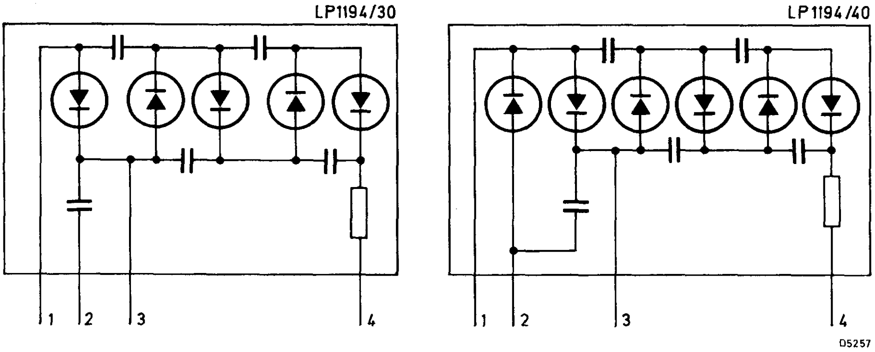


Fig. 5

Circuit B

For a 7kV overwind, connected to the primary. This configuration is used mainly in 90° time bases and the circuit shown is for 90° operation.

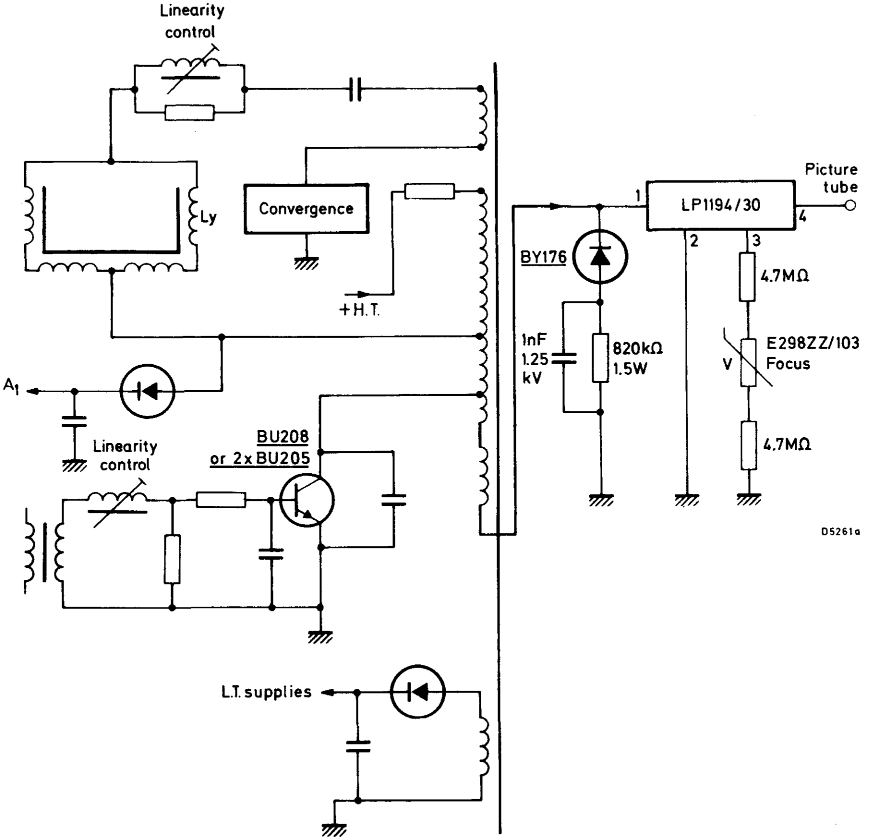


Fig. 6

Both configurations shown in Figs. 4 and 6 may of course be used in either 90° or 110° operation. The connections between the overwind and tripler will remain the same for both deflection angles.

VOLTAGE MULTIPLYING MODULES

LP1196
Series

New range of Mullard voltage multiplying modules conforming to the 'European Standard' outline. This range is intended for new colour television chassis designs where space saving is an important consideration.

QUICK REFERENCE DATA

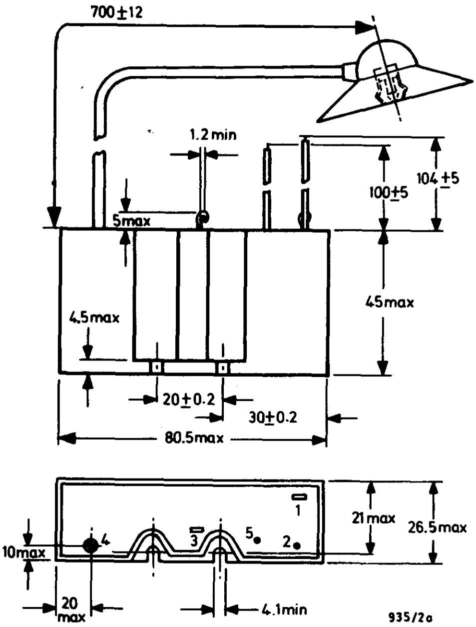
	LP1196/60	
V_{in} (peak to peak)	8.3	kV
V_{out} (e.h.t. supply) (d.c.)	25	kV
V_{out} (focus supply) (d.c.)	8.3	kV

TYPE NUMBERS

LP1196/40 - A five capacitor, six diode module with surge limiting resistor and with the clipping diode across the input.

LP1196/60 - As LP1196/40 with separate lead out for the clipping diode.

DIMENSIONS (millimetres)



Terminations

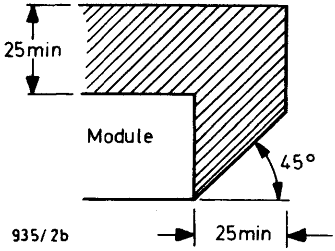
1 = input
2 = earth
3 = focus
4 = output
5 = clipping diode

TYPICAL OPERATING CONDITIONS

V_{in} (peak-to-peak) (d.c.)	8.3	kV
V_{out} (e.h.t. supply) (d.c.)	25	kV
V_{out} (focus supply) (d.c.)	8.3	kV
I_{out} (e.h.t. supply) (d.c.)	1.0	mA
I_{out} (focus supply) (d.c.)	0.25	mA
Internal impedance	<1	MΩ
Surge limiting resistor	60	kΩ
Input capacitance	10	pF

MOUNTING PRECAUTIONS

A minimum clearance of 25 mm is essential around all surfaces except the base, to prevent breakdown and detuning effects. This is only necessary above an angle of 45° from the base of the module.



HEALTH AND SAFETY

The module is sold in compliance with a valid BS 415 certificate. It is designed to meet the normal conditions of use in a television set with regard to corona, insulation etc. However, the volume of minimum clearance as defined above, under mounting precautions, and within 2" of exposed terminations, must be considered as always being hazardous to personnel unless fully discharged.

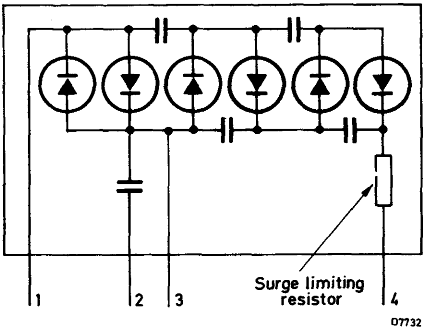
RATINGS (Limiting values of operation according to the Absolute Maximum System).

Input voltage (peak-to-peak)	10.6	kV
Ambient temperature (tripler)	60	°C
Output voltage (I_{out} = 0)	30	kV
Output current (e.h.t.)	1.7	mA
Focus current	0.4	mA
Clipping diode current	4.0	mA*
Storage temperature	-25 to +70	°C
Focus to e.h.t. voltage	20	kV

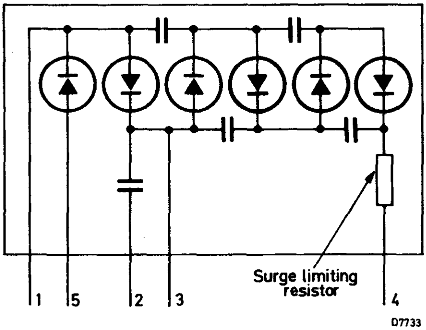
*The clipping diode current is the sum of the clipping diode load current plus the focus and e.h.t. currents.

CIRCUIT DIAGRAMS

LP1196/40



LP1196/60



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LOUDSPEAKERS, TELEVISION ASSEMBLIES AND MODULES

*Available for current production; not intended for new designs.

The following data sheets have been withdrawn:

AT1025 Series
AT1027
AT1029
AT1062/01
AT1063/01
AT1068/03
AT1068/04
AT2055
AT2055/02
AT2063/00
AT2063/03
AT4040 Series
AT4041/08
AT4041/37
AT4041/40
AT4042/17
AT4043/86
AT4046 Series
LP1173
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LP1183/2
LP1184/2
LP1185
LP1186
LP1400
LP1402

LOUDSPEAKERS, TELEVISION ASSEMBLIES AND MODULES

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Mullard Limited
Mullard House, Torrington Place, London, WC1E 7HD

Printed in England
TP 1735

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Book 3 Part 5

Loudspeakers, television
assemblies and modules

August 1978