

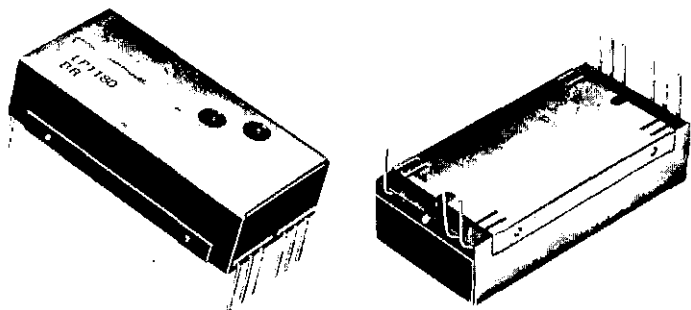
# R.F. - I.F. AMPLIFIER MODULE

# LP1180

## QUICK REFERENCE DATA

This module is a fully screened, transistorised I.F. amplifier and mixer (without oscillator coils) for use in radios covering long, medium and short wave bands.

Supply voltage	+7.6	V
I. F. frequency	470	kHz
Sensitivity, for 50mV output	1.8	$\mu$ V
Bandwidth, at 3dB points	5	kHz



### CASING

The assembly is encased in a metal can for screening and protection.

### TERMINATIONS

9 solder pins on 3.81mm (0.15 in) pitch.

### SPECIAL FEATURES

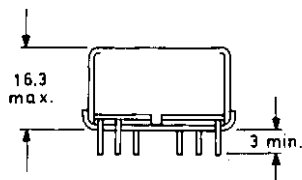
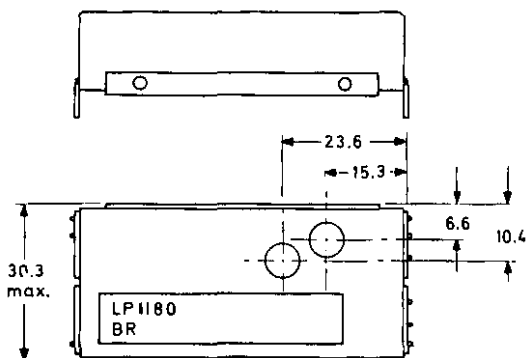
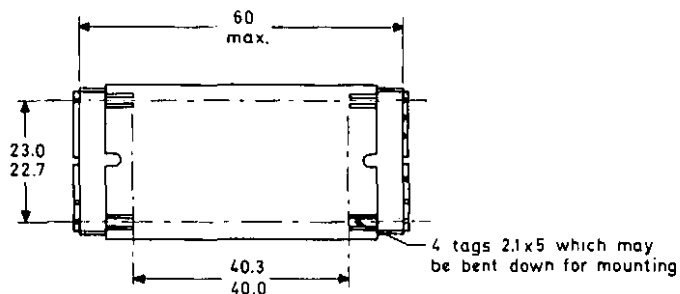
Good selectivity and low thermal drift due to the use of a ceramic resonator.

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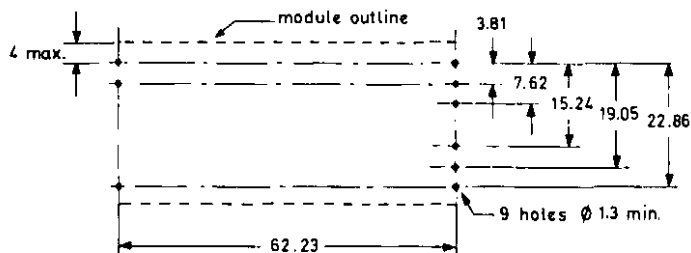
**Mullard**

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DIMENSIONS (millimetres)



Piercing diagram



D2269

millimetres	3.81	7.62	15.24	19.05	22.86
inches	0.15	0.3	0.6	0.75	0.9

# R.F. - I.F. AMPLIFIER MODULE

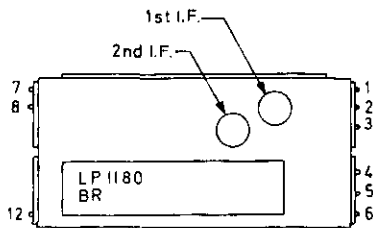
# LP1180

## ELECTRICAL DATA

Unless otherwise specified, all characteristics apply at an ambient temperature of 20 ±5°C, atmospheric pressure of 1000mbars and a relative humidity of 75% max.

	Conditions	Value
Supply voltage	design	+7.6V
	absolute maximum	+9V
Supply current	-	5mA
Centre frequency	-	470kHz
Tolerance on frequency	-	± 2kHz
Bandwidth	at -3dB points	5 ± 1kHz
Selectivity	at -30dB points	± 9kHz
Sensitivity (for 50mV output)	at 470kHz with 400Hz for 30% modulation and a 0.01µF capacitor in parallel with a 10kΩ resistor for load output	1.8µV ± 7dB
Signal to noise level	as sensitivity	> 10dB
A.G.C.	-	35dB
Maximum ambient temperature	-	60°C

## CONNECTIONS

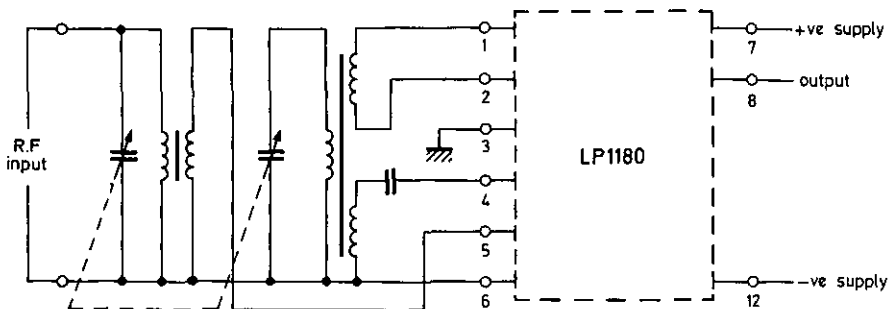


View of module top

Pin	Function
1	See circuit diagrams
2	1st I. F. transformer
3	Screening can
4	Emitter of 1st stage transistor
5	Input
6*	Input earthy Negative supply
7	Positive supply
8	Output
12*	Output earthy

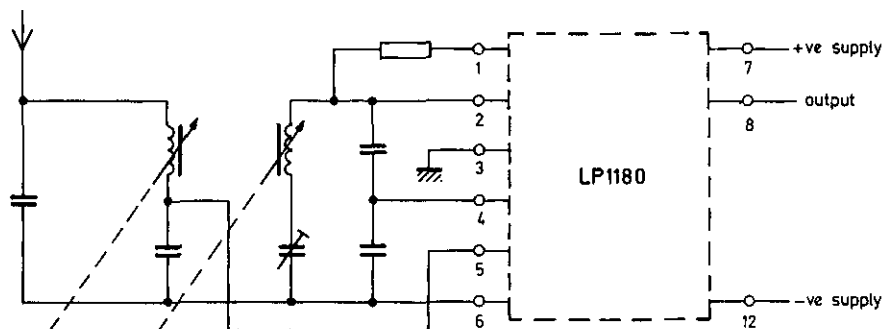
\* Pins 6 and 12 are internally connected

## ASSOCIATED CIRCUITS



D1590

Inductively coupled oscillator circuit (continuous tuning)



Colpitts type oscillator circuit (push button tuning)

D1591

## MOUNTING

The module can be mounted by means of its termination pins or by the 4 tags provided.

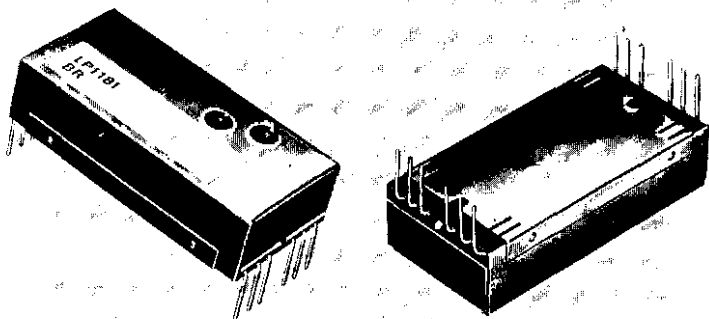
## HANDLING NOTES

- The module may be soldered directly into a circuit using either a soldering iron or a solder bath. The soldering temperature must not exceed  $245^{\circ}\text{C}$  and the soldering time must be less than 5 seconds.
- If it is desired to bend the terminations, extreme care must be taken to prevent damage to the printed circuit of the module.
- All soldering irons and input signal supplies should be earthed to prevent breakdown of the transistors.

## QUICK REFERENCE DATA

This module is a fully screened, transistorised i.f. amplifier and mixer (without oscillator coils) for use in radios covering long, medium and short wavebands.

Supply voltage	+7.6	V
I. F. frequency	470	kHz
Sensitivity, for 50mV output	1.8	$\mu$ V
Bandwidth, at 3dB points	5	kHz



### CASING

The assembly is encased in a metal can for screening and protection.

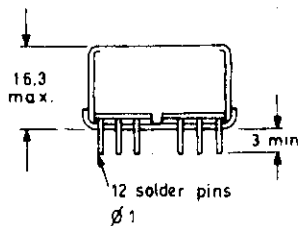
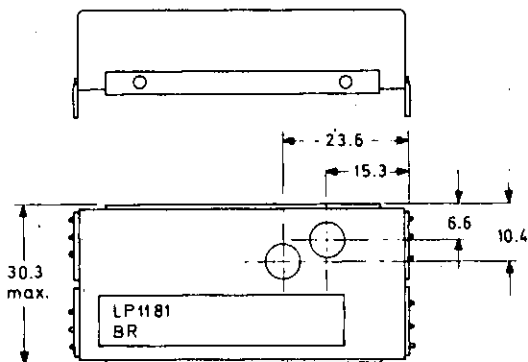
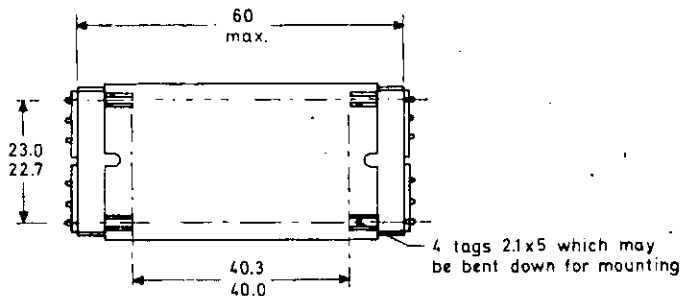
### TERMINATIONS

12 solder pins on 3.81mm (0.15 in) pitch.

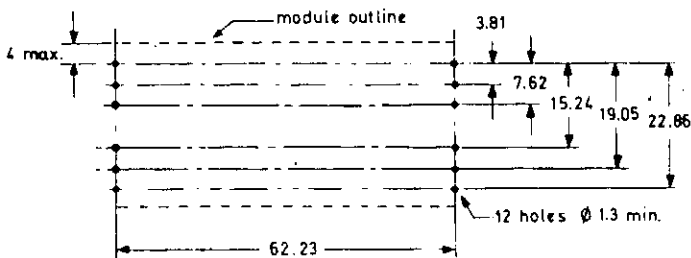
### SPECIAL FEATURES

Good selectivity and low thermal drift due to the use of a ceramic resonator.

DIMENSIONS (millimetres)



Piercing diagram



D3323

millimetres	3.81	7.62	15.24	19.05	22.86
inches	0.15	0.3	0.6	0.75	0.9

# R.F.—I.F. AMPLIFIER MODULE

# LP1181

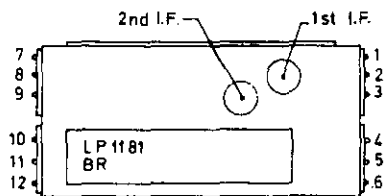
## ELECTRICAL DATA

Unless otherwise specified, all characteristics apply at an ambient temperature of  $20 \pm 5^\circ\text{C}$ , atmospheric pressure of  $10^5\text{N/m}^2$ , and a relative humidity of 75% max.

Characteristic	Conditions	Value
Supply voltage	design	+7.6V
	absolute maximum	+9V
Supply current	-	5mA
Centre frequency	-	470kHz
Tolerance on frequency	-	$\pm 2\text{kHz}$
Bandwidth	at -3dB points	$5 \pm 1\text{kHz}$
Selectivity	at -30dB points	$\pm 9\text{kHz}$
Sensitivity (for 50mV output)	$f_{\text{in}} = 470\text{kHz}$ , modulation = 30% (400Hz), output load = $0.01\mu\text{F}$ in parallel with $10\text{k}\Omega$ .	$1.8\mu\text{V} \pm 7\text{dB}$
Signal to noise level	as sensitivity	$>10\text{dB}$
A. G. C. (see note)	$39\text{k}\Omega$ between pins 9 and 11	35dB
Maximum ambient temperature	-	$60^\circ\text{C}$

Note: The 35dB figure is obtained in a closed loop a.g.c. system, with a  $39\text{k}\Omega$  resistor connected between pins 9 and 11. If required, the a.g.c. output from pin 9 may be used instead to control a separate r.f. stage; in this case the gain of the LP1181 may also be controlled by this output, or set by two suitable biasing resistors, one between pins 10 and 11, the other between pins 11 and 12.

## CONNECTIONS



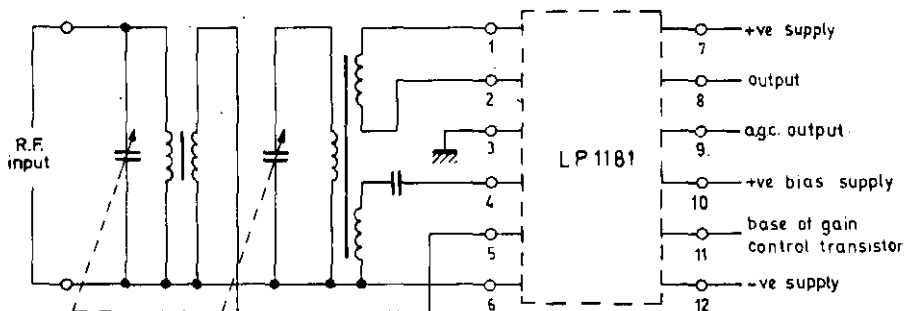
03324

Pin	Function	Pin	Function
1	See ASSOCIATED CIRCUITS	7	+ve supply
2	1st i. f. transformer	8	Output
3	Screening can	9	A. G. C. output
4	Emitter of 1st stage transistor	10	Decoupled +ve bias supply
5	Input	11	Base of gain control transistor
*6	Input earthy and -ve supply	*12	Output earthy

\*Pins 6 and 12 are internally connected

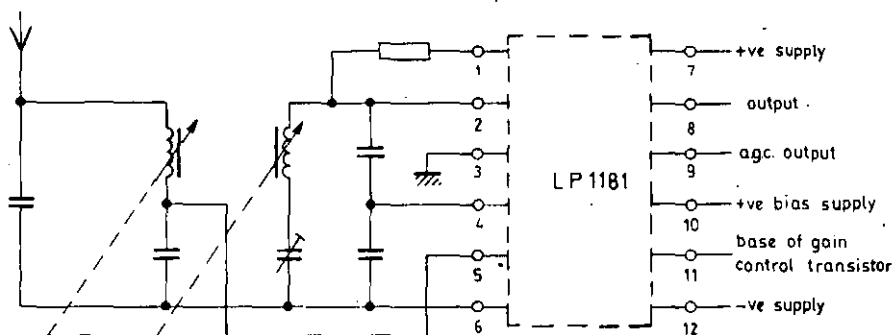
# Mullard

## ASSOCIATED CIRCUITS



D3325

Inductively coupled oscillator circuit (continuous tuning)



D3326

Colpitts type oscillator circuit (push button tuning)

## MOUNTING

The module can be mounted by means of its termination pins or by the 4 tags provided.

## HANDLING NOTES

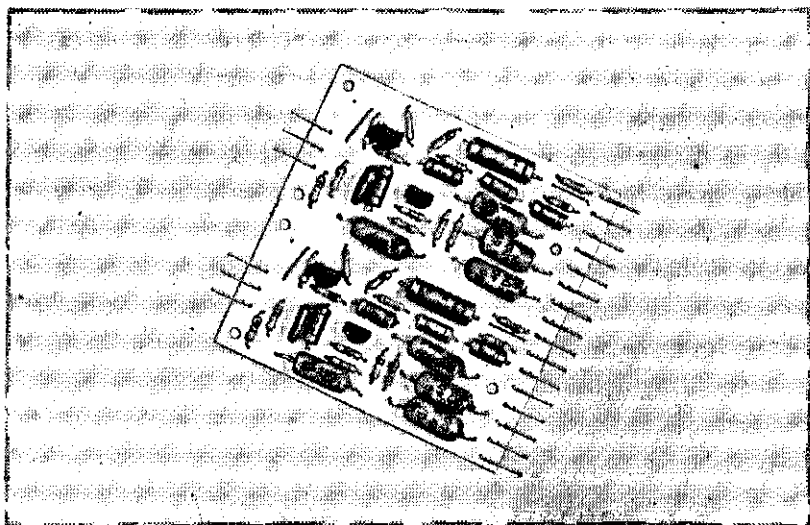
- The module may be soldered directly into a circuit using either a soldering iron or a solder bath. The soldering temperature must not exceed  $245^{\circ}\text{C}$  and the soldering time must be less than 5 seconds.
- If it is desired to bend the terminations, extreme care must be taken to prevent damage to the printed circuit of the module.
- All soldering irons and input signal supplies should be earthed to prevent break-down of the transistors.



## QUICK REFERENCE DATA

Dual-input module designed for use from a positive supply line with stereo systems using ceramic or low input crystal pick-up heads.

Supply voltage	+24	V
Frequency response (at -3dB points)	20Hz to 25kHz	
Sensitivity for 150mV output at 1kHz		
input 1	110	mV
input 2	240	mV
Bass and treble control ranges	$\pm 14$	dB



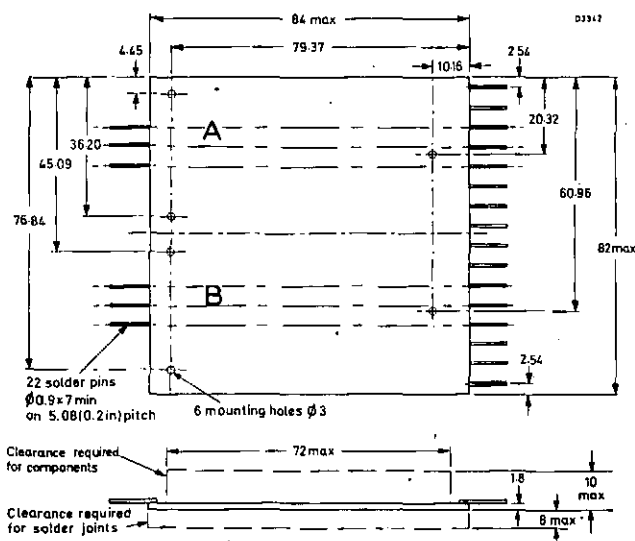
## CONSTRUCTION

Discrete components assembled on to a printed-wiring board.

## TERMINATIONS

22 solder pins arranged 16 on one side and 6 on the other, using a 5.08mm (0.2 in) pitch.

DIMENSIONS (millimetres)



ELECTRICAL DATA

Unless otherwise specified, all characteristics apply at an ambient temperature of  $20 \pm 5^\circ\text{C}$ , atmospheric pressure of  $10^5\text{N/m}^2$  and a relative humidity of 75% max.

	Conditions	Value
Supply voltage (d. c.)	design	+24V
	absolute maximum	+27V
Supply current	-	0.6mA
Input impedance	-	see fig. 1
Recommended volume control	*external potentiometer	20k $\Omega$ log
Frequency response	at -3dB points	20Hz to 25kHz
Bass control range	60Hz with * external 500k $\Omega$ linear potentiometer	-14 to +14dB
Treble control range	16kHz with *external 250k $\Omega$ linear potentiometer	-14 to +14dB
Recommended balance control	*external potentiometer	50k $\Omega$ linear
Sensitivity	1kHz and 150mV output	input 1   110mV
		input 2   240mV
Distortion	1kHz and 150mV output	<0.1%
Max. ambient temperature	-	50 $^\circ\text{C}$

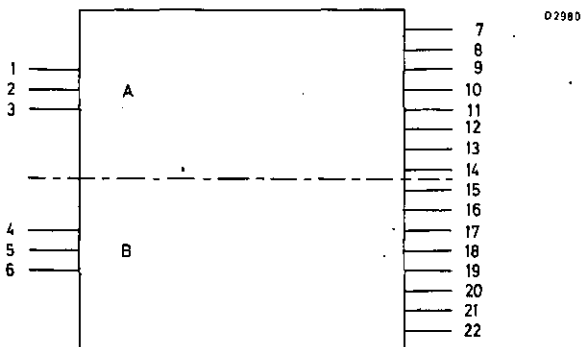
\*See ASSOCIATED CIRCUITS figure 2.

**Mullard**

# STEREO PRE-AMPLIFIER MODULE

# LP1183/2

## CONNECTIONS



Print side of module

Pin	Connection	Pin	Connection
1	Input 1 (A)	12	Output (A)
2	Input 2 (A)	13	*Supply negative (A)
3	*Input common (A)	14	Supply positive (A)
4	Input 1 (B)	15	Bass control max. (B)
5	Input 2 (B)	16	Treble control max. (B)
6	**Input common (B)	17	Bass + treble wiper common (B)
7	Bass control max. (A)	18	Bass control min. (B)
8	Treble control max. (A)	19	Treble control min. (B)
9	Bass + treble wiper common (A)	20	Output (B)
10	Bass control min. (A)	21	**Supply negative (B)
11	Treble control min. (A)	22	Supply positive (B)

\*Pins 3 and 13 are internally connected

\*\*Pins 6 and 21 are internally connected

## MOUNTING

By the six  $\varnothing 3\text{mm}$  holes provided; insulated fixings are recommended. Alternatively, the module may be directly mounted by its pins.

## HANDLING NOTES

- The module may be soldered directly into a circuit using either a soldering iron or a solder bath. The soldering temperature must not exceed  $245^{\circ}\text{C}$ ; the soldering time must be less than 5 seconds.
- If it is necessary to bend the terminations, extreme care must be taken to prevent damage to the printed circuit of the module.
- All soldering irons and input signal supplies should be earthed to prevent breakdown of the transistors.

**Mullard**

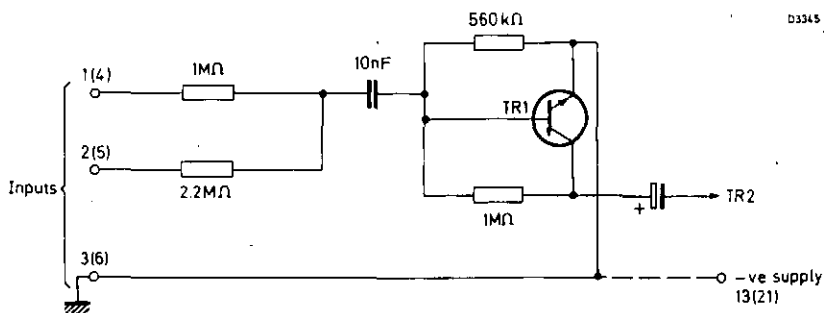
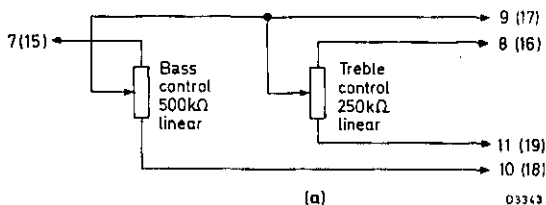
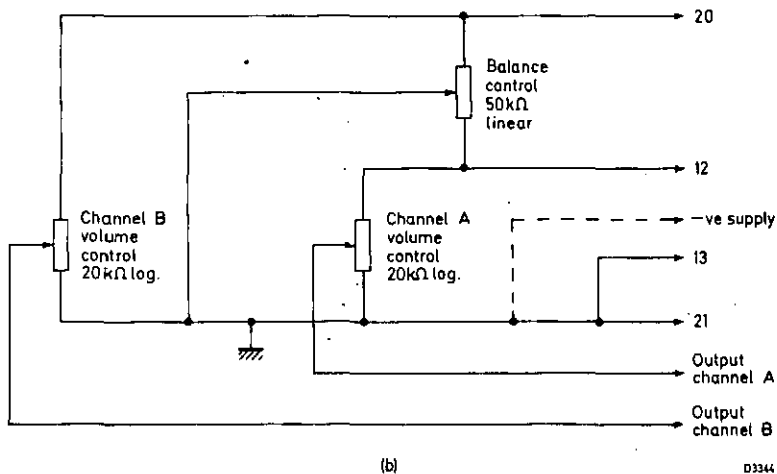


Fig. 1. Module input circuit



D3343



D3344

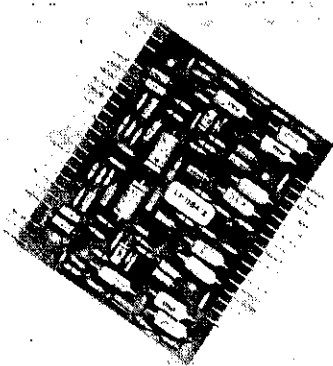
Figure 2. (a) treble and bass control circuit connections channel A (channel B)

(b) stereo balance and volume control circuit connections, both channels

## QUICK REFERENCE DATA

Featuring very low distortion, the LP1184/2 has been designed with four inputs for use in stereo systems requiring compatibility with ceramic pick-ups, magnetic pick-ups, mono and stereo radio tuners.

Supply voltage	+24	V
Frequency response (at -3dB points)	16Hz to 60kHz	
Sensitivity for 150mV output		
ceramic pick-up	85	mV
magnetic pick-up	2	mV
mono radio	60	mV
stereo radio	85	mV
Bass and treble control ranges	$\pm 14$	dB



## CONSTRUCTION

Discrete components assembled on a printed-wiring board.

## TERMINATIONS

38 solder pins arranged 16 on one side and 22 pins on the other, using a 5.08mm (0.2 in) pitch.

## ELECTRICAL DATA

Unless otherwise specified, all characteristics apply at an ambient temperature of  $20 \pm 5^\circ\text{C}$ , atmospheric pressure of  $10^5\text{N/m}^2$  and a relative humidity of 75% max.

	Conditions	Value	
Supply voltage (d. c.)	design	+24V	
	absolute maximum	+27V	
Supply current	-	2.2mA	
Frequency response	at -3dB points	16Hz to 60kHz	
Sensitivity (see note 1)	$f_{in} = 1\text{kHz}$ $V_{out} = 150\text{mV}$	ceramic pick-up	85mV
		magnetic pick-up	2mV
		mono radio	60mV
		stereo radio	85mV
Pick-up input handling prior to 'clipping'	magnetic pick-up input	40mV	
	ceramic pick-up input	2V	
Output level prior to 'clipping' (see note 2)	-	3.3V	
Total harmonic distortion	$f_{in} = 1\text{kHz}$ , $V_{out} = 150\text{mV}$	0.02%	
Intermodulation distortion	magnetic pick-up	0.06%	
Input impedance	$f_{in} = 1\text{kHz}$ $V_{out} = 150\text{mV}$	ceramic pick-up	1.2M $\Omega$
		magnetic pick-up	40k $\Omega$
		mono radio	4k $\Omega$
		stereo radio	1.2M $\Omega$
Signal-to-noise ratio	-	70dB	
Recommended potentiometer values	bass each channel	500k $\Omega$ linear	
	treble each channel	250k $\Omega$ linear	
	volume control each channel	20k $\Omega$ log	
	channel balance	50k $\Omega$ linear	
Bass control range	measured at 60Hz	-14 to +14dB	
Treble control range	measured at 16kHz	-14 to +14dB	
Temperature rating	maximum ambient	50 $^\circ\text{C}$	

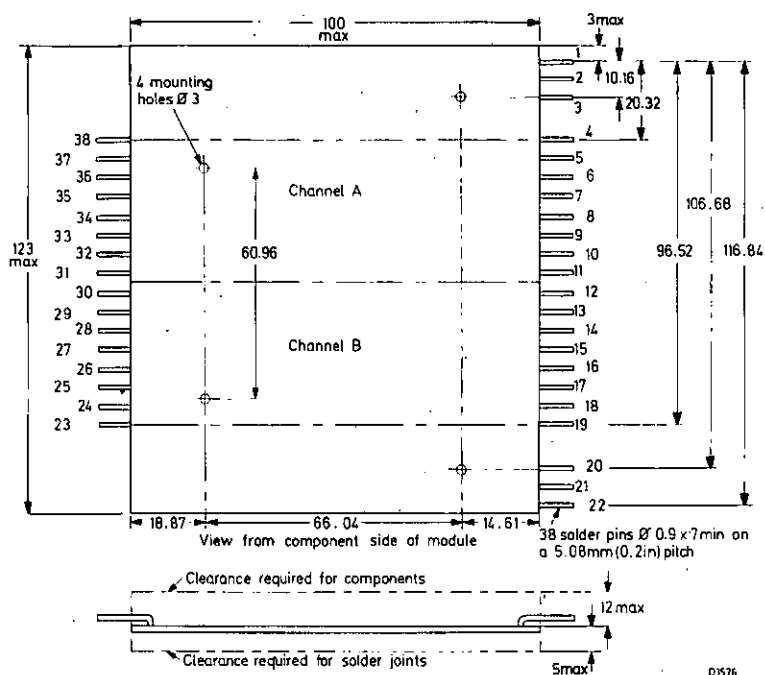
## NOTES

1. Due to the high sensitivity of this module on magnetic input, some form of screening may be required to prevent hum pick-up from external sources.
2. The output capability is sufficient to drive two Mullard LP1173 audio modules in a 10W stereo system.

# STEREO PRE-AMPLIFIER MODULE

# LP1184/2

CONNECTIONS AND DIMENSIONS (millimetres)



Pin numbers		Connection	Pin numbers		Connection
channel A	channel B		channel A	channel B	
1	22	Magnetic equalisation	38	23	Bass (-14dB)
2	21	Flat equalisation	37	24	Bass (+14dB)
3	20	Equalisation link point	36	25	Tone control wipers
4	19	Volume wiper	35	26	Treble (+14dB)
5	18	Volume	34	27	Treble (-14dB)
6	17	Mono radio input	33	28	Output
7	16	Stereo radio input	32	29	+24V supply
8	15	Ceramic pick-up input	31	30	+20V stabilised supply (see note 3)
9	14	Magnetic pick-up input			
10	13	Magnetic link			
11*	12*	Earth			

\*Pins 11 and 12, are internally connected.

NOTE 3: The module incorporates supply voltage dropper resistors in order to be compatible with other Mullard audio modules working on +24V supplies. Where a poorly regulated supply is used, however, it is recommended that the module be fed from a 20V stabilised supply to pins 30 and 31 so avoiding the possibility of distortion due to signal clipping at high input levels.

## Mullard

## MOUNTING

By the four  $\varnothing 3\text{mm}$  holes provided; insulated fixings are recommended. Alternatively, the module may be directly mounted by its terminations.

## HANDLING NOTES

- The module may be soldered directly into a circuit using either a soldering iron or a solder bath. The soldering temperature must not exceed  $245^{\circ}\text{C}$  and the soldering time must be less than 5 seconds.
- If it is necessary to bend the terminations, extreme care must be taken to prevent damage to the printed circuit of the module.
- All soldering irons and input signal supplies should be earthed to prevent breakdown of the transistors.

## ASSOCIATED CIRCUITS

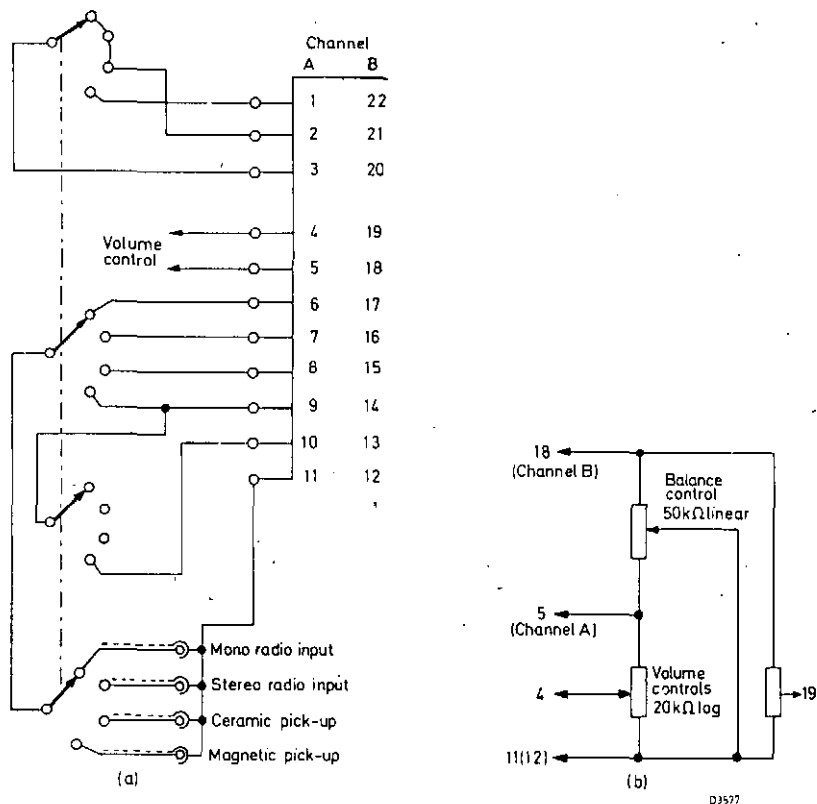


Figure 1. (a) switching connections for both channels

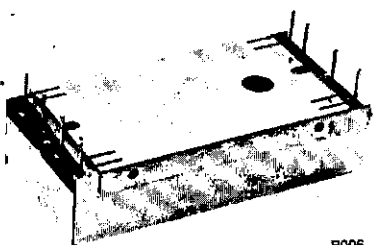
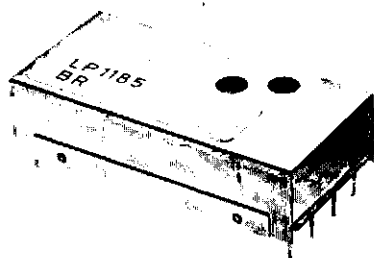
(b) stereo balance and volume control circuit connections, both channels



**QUICK REFERENCE DATA**

Fully screened i.f. amplifier, designed for use with other Mullard circuit modules, for amplification and detection of f.m. signals at 10.7MHz.

Supply voltage	+9	V
Sensitivity, for 40mV output	180	$\mu$ V
Bandwidth (at -3dB points)	250	kHz



P006

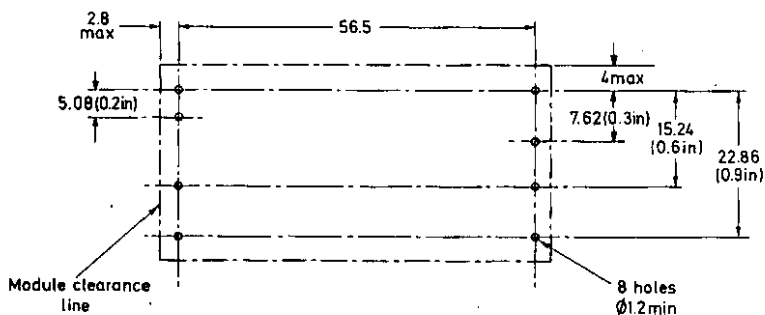
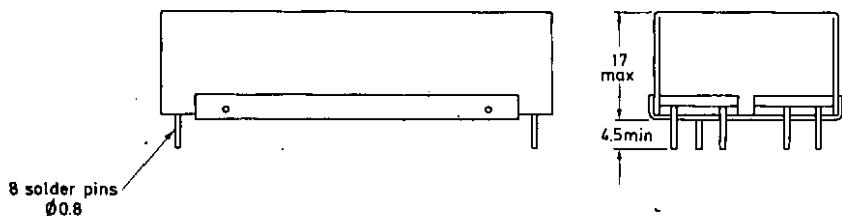
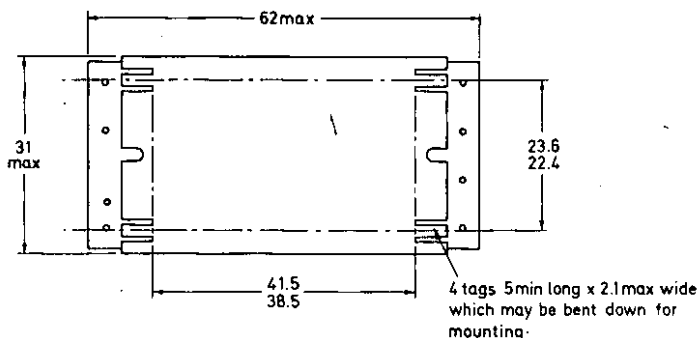
**CASING**

The amplifier is encased in a metal can for screening and protection.

**TERMINATIONS**

8 solder pins on a 2.54mm (0.1 in) pitch. The rigid pins allow the module to plug directly into standard connector terminals.

**DIMENSIONS (millimetres)**



Piercing diagram  
(view from component side of board)

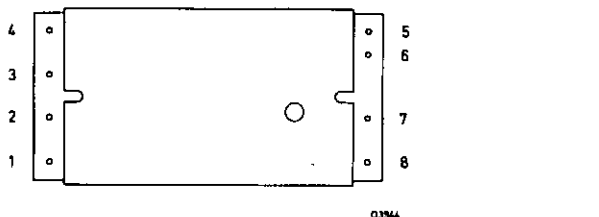
D3943

**ELECTRICAL DATA**

Unless otherwise specified, all characteristics apply at an ambient temperature of  $20 \pm 5^{\circ}\text{C}$ , an atmospheric pressure of  $10^5 \text{N/m}^2$ , and a relative humidity of 75% maximum. All values are measured at a supply voltage of 9V, with a  $4.7\text{k}\Omega$  output load and a 22.5kHz deviation.

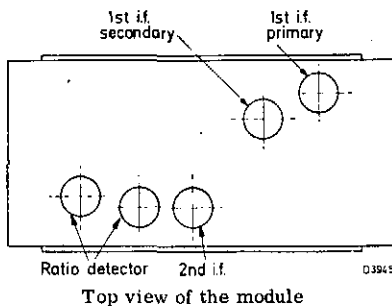
	Conditions	Values
Supply voltage (d.c.)	design	+9V
	absolute maximum	+10V
Supply current	design	6.5mA
Centre frequency	-	10.7MHz $\pm 50\text{kHz}$
I. F. bandwidth	at -3dB points (10.7MHz)	250kHz
	at -20dB points	300kHz
Sensitivity	for 40mV output	min. $300\mu\text{V}$
		max. $60\mu\text{V}$
F. M. output at limiting	1mV input and output measured across a $100\text{k}\Omega$ load	180mV
Signal-to-noise level	$150\mu\text{V}$ input	60dB
A. F. C. output	$\pm 100\text{kHz}$ off tune (open cct.volts)	$\pm 1\text{V}$
A. M. rejection	input 5mV modulated 30% at 1kHz (a. m. ) and 22.5kHz 400Hz (f. m. )	40dB
Maximum ambient temperature	-	$60^{\circ}\text{C}$

\*A negative going a. f. c. voltage is produced by an increase in frequency.

**CONNECTIONS**


View of module base

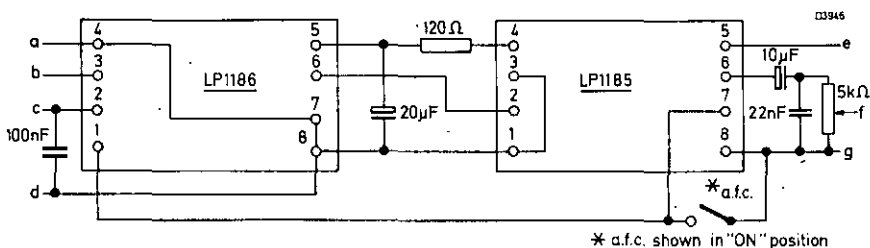
Pin number	Connections	Pin number	Connections
1	Input earthy	5	Supply positive
2	Input	6	Audio output
3	Can	7	A. F. C.
4	Supply positive for tuner	8	Output earthy



## MOUNTING

The module may be mounted into a printed wiring board by its terminations or by suitable positioning of the four tags provided in the base tray.

## TYPICAL CONNECTION DIAGRAM



## External connections

Ref	Connection	Ref	Connection
a	Aerial input (earthy)	e	Supply positive
b	Aerial input (75Ω)	f	Audio output
c	Tuning voltage (positive)	g	Output (earthy)
d	Tuning voltage (earthy)		

## Notes on external connections

1. The 100nF capacitor may be required, depending on layout.
2. The 10μF capacitor may not be required, if the output is fed into a high impedance (100kΩ).
3. The 22nF capacitor is a de-emphasis component, and is not used with stereo decoder.

## HANDLING NOTES

- (a) The module may be soldered directly into a circuit using either a soldering iron or a solder bath. The soldering temperature must not exceed 245°C and the soldering time must be less than 5 seconds.
- (b) All soldering irons and input signal supplies should be earthed to prevent breakdown of the transistors.

# F.M. TUNER MODULE

with diode tuning

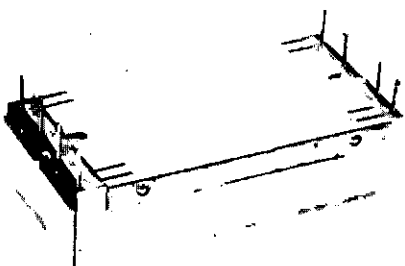
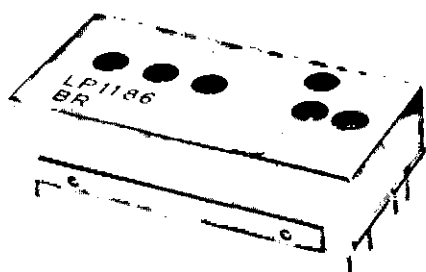
# LP1186

## QUICK REFERENCE DATA

D.C. voltage controlled tuner module designed for use primarily with the Mullard LP1185 i.f. amplifier module, in band II radio receivers.

Supply voltages (d.c.)

transistors	+8	V
vari-cap diodes	+2 to +12	V
Frequency tuning range	87.4 to 104.5	MHz
Power gain (at 95MHz)	30	dB



### CASING

The module is encased in a metal can for protection and screening.

### TERMINATIONS

8 solder pins on a 2.54mm (0.1 in) printed-wiring grid.

### SPECIAL FEATURES AND CIRCUIT DESCRIPTION

The module has three stages, a tuned aerial and r.f. stage, giving good image and i.f. rejection, a separate oscillator stage for good signal handling, and a mixer stage with a double-tuned i.f. output circuit.

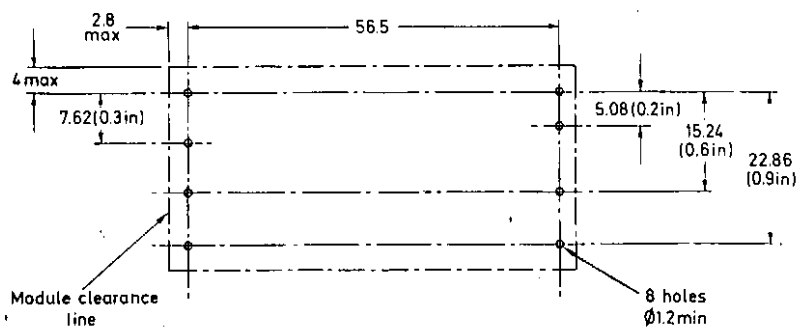
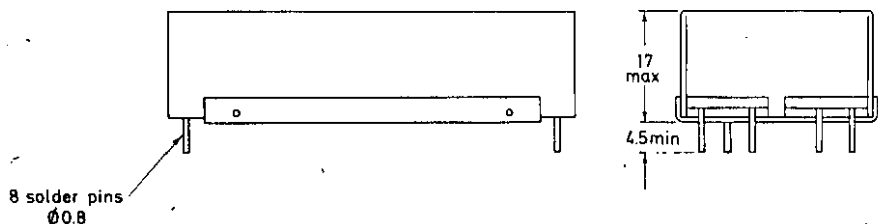
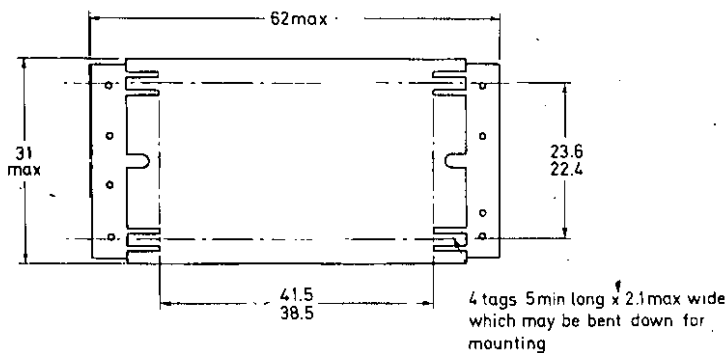
The use of variable capacitance diodes results in a compact unit size, ideally suited for use with simple remote or local push-button pre-set tuning systems.

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# Mullard

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DIMENSIONS (millimetres)



Piercing diagram  
(view from component side of board)

03475

**ELECTRICAL DATA**

Unless otherwise specified, all characteristics apply at an ambient temperature of  $20 \pm 5^{\circ}\text{C}$ , an atmospheric pressure of  $10^5\text{N/m}^2$ , a relative humidity of 75% maximum with a supply voltage of 8V and a load impedance of  $470\Omega$ .

	Conditions	Value
Supply voltage for transistors	design	+8V
	absolute maximum	+9V
	minimum	+6V
Supply voltage for diodes	design	2 to 12V
Supply current, transistors	-	0.1mA
frequency tuning range	-	87.4 to 104.5MHz
Range accuracy (see note 1)	2V tuning voltage	87.4MHz $\pm$ 200kHz
	12V tuning voltage	104.5MHz $\pm$ 500kHz
Bandwidth	at -3db points	300kHz
Aerial impedance	-	75 $\Omega$
Output impedance	-	75 $\Omega$
Centre frequency	-	10.7MHz $\pm$ 50kHz
Oscillator stability with respect to supply voltage	a.f.c. disconnected $f_{in} = 95\text{MHz}$	60kHz/V
Oscillator stability with respect to temperature	a.f.c. disconnected $f_{in} = 95\text{MHz}$	-10kHz per degC rise
A.F.C. (see note 2)	$V_{in} = \pm 1\text{V}$ , $f_{in} = 95\text{MHz}$ source resistance = 100k $\Omega$	$\pm 200\text{kHz}$
Power gain	$f_{in} = 95\text{MHz}$	30dB
Variation of power gain over tuning range	typical	1dB
	maximum	6dB
Noise factor	$f_{in} = 95\text{MHz}$	6.5dB
Image suppression	$f_{in} = 95\text{MHz}$	40dB
I.F. rejection	$f_{in} = 95\text{MHz}$	65dB
Maximum ambient temperature	-	60 $^{\circ}\text{C}$

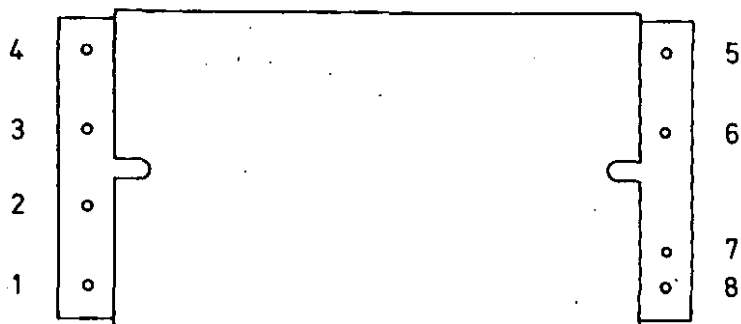
**NOTES**

1. Tuning range can be extended to 108MHz if a tuning voltage of approximately 17V is available.
2. A negative going a.f.c. voltage produces an increase in the oscillator frequency.

## MOUNTING

The module may be mounted into a printed-wiring board by its terminations or by suitable positioning of the four tags provided in the base tray.

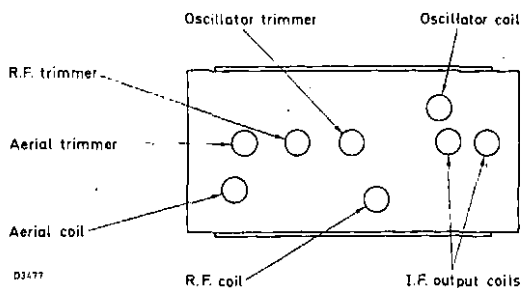
## CONNECTIONS



View of module base

D34

Pin	Connection	Pin	Connection
1	A. F. C.	5	+ve supply
2	Tuning voltage (+ve)	6	Output
3	Aerial input	7	Output (earthy)
4	Aerial input (earthy)	8	-ve supply and can



Top view of the module

## HANDLING NOTES

- The module may be soldered directly into a circuit using either a soldering iron or a solder bath. The soldering temperature must not exceed  $245^{\circ}\text{C}$  and the soldering time must be less than 5 seconds.
- All soldering irons and input signal supplies should be earthed to prevent breakdown of the transistors.



### QUICK REFERENCE DATA

The modules generate e.h.t. and focus voltages from line time base pulses, to supply colour picture tubes.

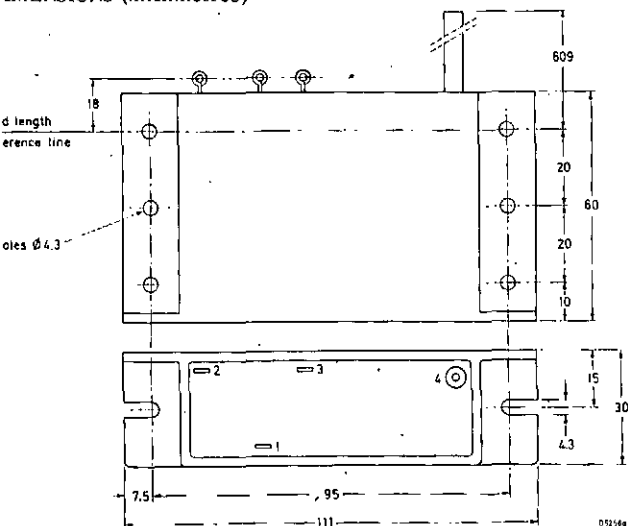
	Circuit A	Circuit B	
$V_{in}$ (peak-to-peak)	8.3	8.6	kV
$V_{out}$ (e.h.t. supply) (d.c.)	25	25	kV
$V_{out}$ (focus supply) (d.c.)	8.3	7.7	kV

### 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

### COUNTING 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	k
$V_{out}$ (e.h.t. supply) (d.c.)	25	25	k
$I_{out}$ (e.h.t.) (d.c.)	1	1	m
$I_{out}$ (focus) (d.c.)	0.4	0.1	m
E. H. T. regulation (0 to 1.5mA)	2	2.4	M

## Limiting values

These are absolute operating conditions which must not be exceeded under any condition.

$V_{in}$ (peak-to-peak)	10.4	10.8	k
$V_{out}$ (e.h.t.)	31.2	31.5	k
$I_{out}$ (clipping diode)	2.5	2.5	m
$T_{amb}$	60	60	c

For other limiting values see figures 2 and 3.

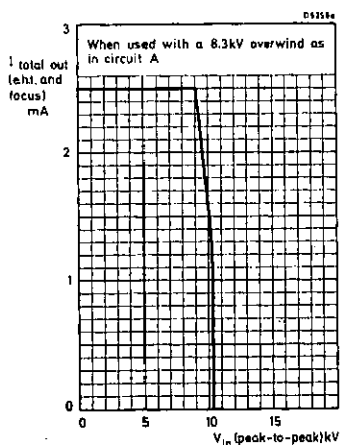


Fig. 2

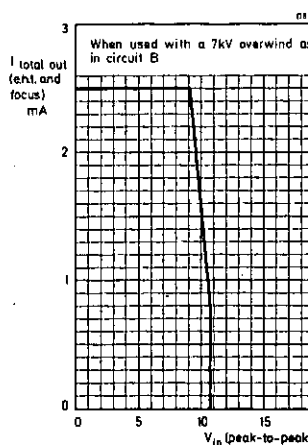


Fig. 3

## TYPICAL APPLICATION CIRCUITS

### Circuit A

With this arrangement the  $A_1$  diode may be omitted. This configuration is shown for  $110^\circ$  operation.

The beam circuit limiting components may be removed, if not required, and point B connected to earth.

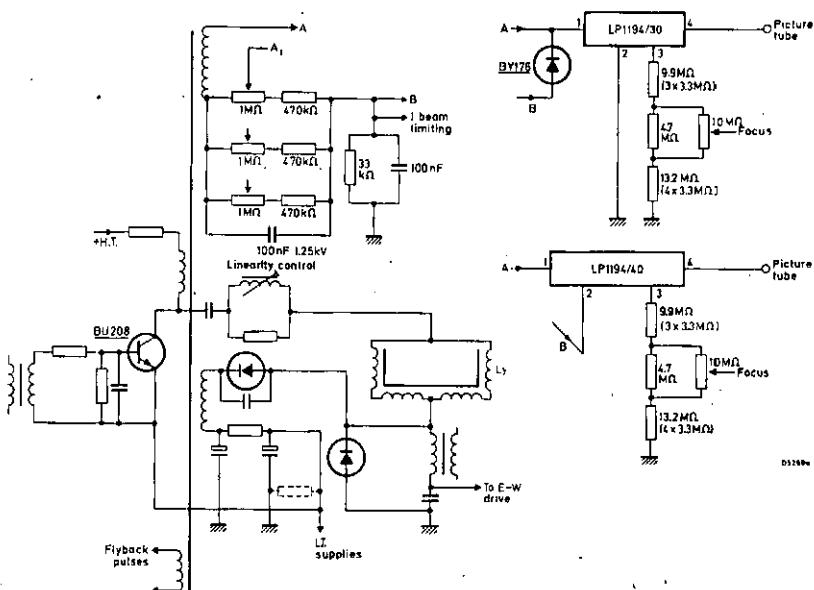


Fig. 4

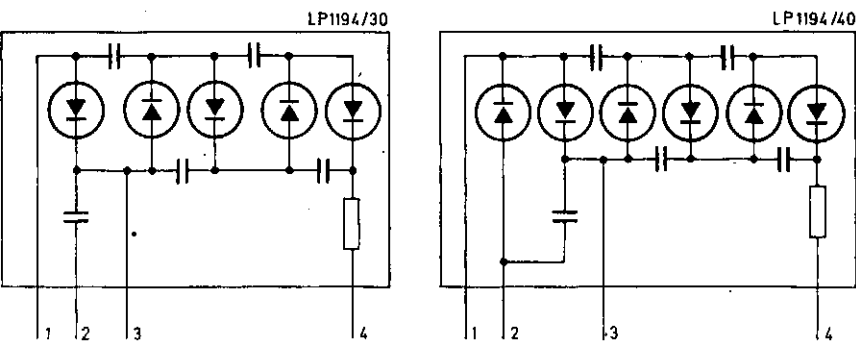


Fig. 5

### 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.

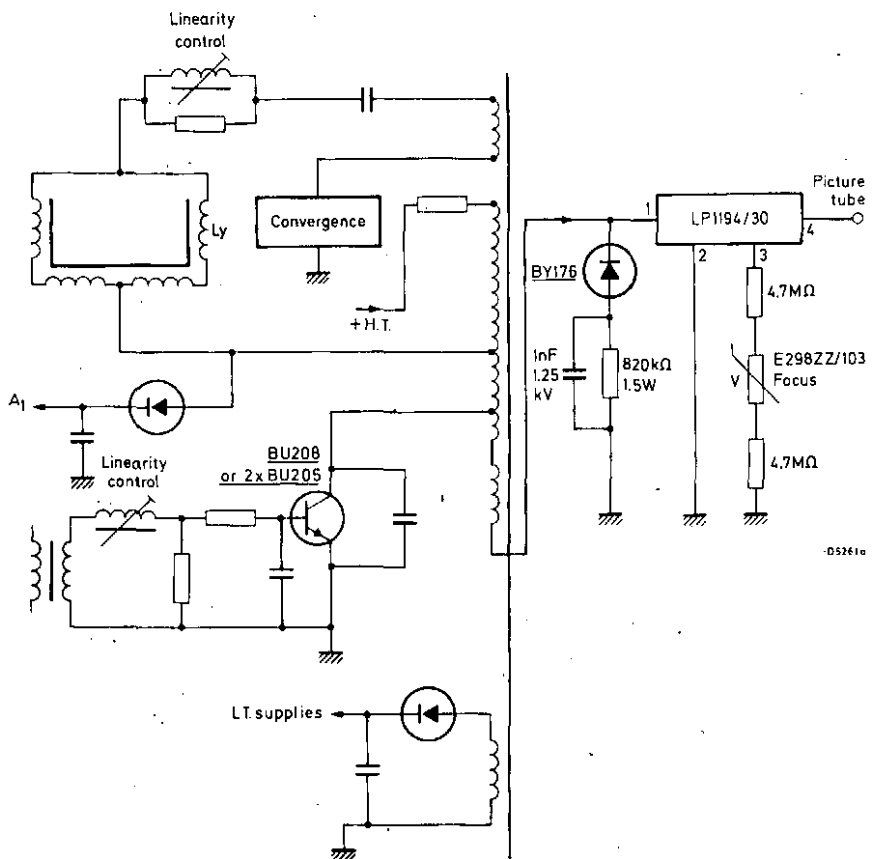


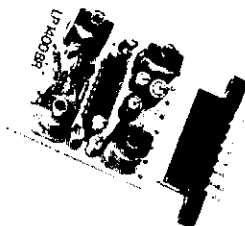
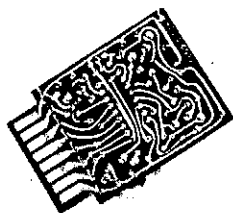
Fig. 6

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.

## QUICK REFERENCE DATA

Stereo decoder module using frequency multiplex system for use in f.m. stereo radio and tuner amplifier equipment.

Supply voltage (d. c.)	8 to 18	V
Channel separation, min.	38	dB
Voltage gain per channel	9.5	dB



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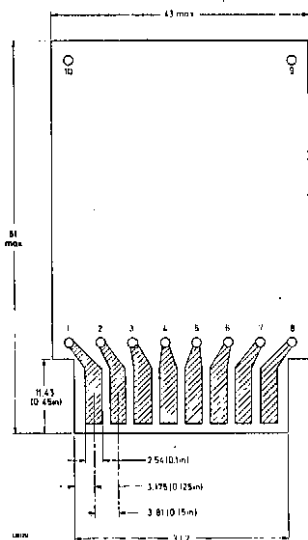
## CONSTRUCTION

IC with discrete components assembled on a printed wiring board.

## TERMINATIONS

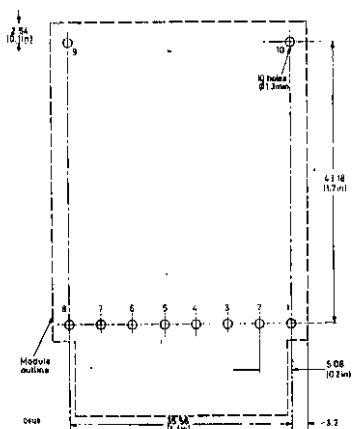
8 tinned pads suitable for use with a 3.18mm (0.15in) pitch edge connector. The pads have 8 solder pins at their heads with a further pin at each corner of the opposite edge.

DIMENSIONS (millimetres) AND CONNECTIONS

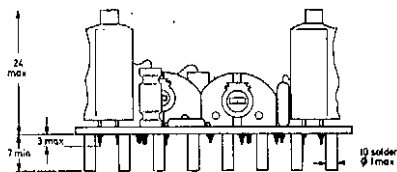


Pin	Function
1	0V (internally connected to pins 7, 10)
2	Input
3	Stereo inhibit
4	Lamp drive
5	Left output
6	Right output
7	0V (internally connected to pins 1, 10)
8	15V
9	15V
} Supply voltage (internally connected)	
10	0V (internally connected to pins 1, 7)

Connecting pads for use with 0.15in pitch edge connector



Piercing diagram  
(view from component side of board)



SOLDERING CONDITIONS

245°C max. for 5s max.

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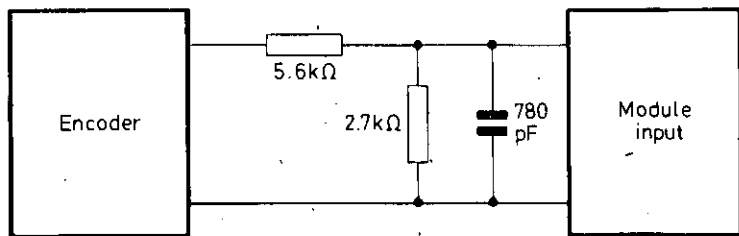
**ELECTRICAL DATA**

Unless otherwise specified, all characteristics apply at an ambient temperature of  $20 \pm 5^{\circ}\text{C}$ , an atmospheric pressure of  $10^5\text{Pa}$  (1000mbars), a relative humidity of 75% maximum. Measured with a supply voltage of 15V, a load impedance of 100k $\Omega$ , composite signal of 1V peak-to-peak at 1kHz modulation including 35mVrms of 19kHz pilot tone with either left or right channel modulation.

	Conditions	Values			
		Min.	Nom.	Max.	
Supply voltage (see note 1)	-	8	15	-	V
Supply current	-	-	21	30	mA
Indicator lamp drive	design	-	-	100	mA
Input voltage	-	-	-	1.0	V peak-to-peak
Output voltage (see note 2)	-	-	-	1.0	V rms
Channel separation (see note 3)	-	38	-	-	dB
Voltage gain per channel (see note 3)	-	-	9.5	-	dB
Channel balance	-	-	-	1.0	dB
Harmonic distortion	1Vrms output	-	0.2	-	%
Frequency response	at -3dB points	20	-	15 000	Hz
Pilot tone level for stereo operation	-	-	15	-	mV rms
Pilot tone switching hysteresis mono/stereo	-	-	1.0	-	dB
Voltage levels to switch stereo inhibit	mono (inhibited)	1.35	-	3.0	V
	stereo (enabled)	0	-	0.8	V
Input current for mono override	-	13	-	-	$\mu\text{A}$
Input impedance	-	50	150	-	k $\Omega$
Output impedance (see notes 1, 2)	-	-	5.6	-	k $\Omega$
Ultrasonic frequency rejection	19kHz	36	-	-	dB
	38kHz	36	-	-	dB
	75kHz	-	19	-	dB
	77kHz	-	19	-	dB

## NOTES

1. For low voltage operation between 10 and 13V, 10k $\Omega$  resistors are required between each output and earth to prevent clipping; this will reduce the gain to approximately 6dB. Similarly between 8 and 10V, 3.3k $\Omega$  resistors are required with a reduction in gain to approximately 3dB.
2. Each output is at a d. c. potential of approximately 6V which should be decoupled before being fed into the succeeding audio stage.
3. The module is aligned for optimum performance when used with an i. f. amplifier with the attenuation of 0.5dB at 38kHz (relative to 1kHz). For test purposes, the circuit of Fig. 1 is used. Other alignments are possible.



D6132

## ABSOLUTE RATINGS

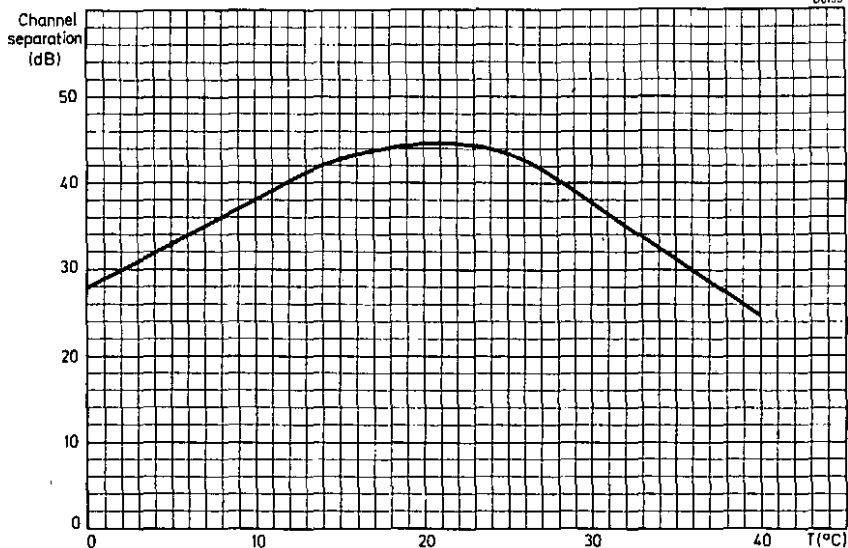
These are absolute operating limits, which must not be exceeded under any conditions.

	Conditions	Values	
Supply voltage	-	18V	max
Supply voltage for lamp drive	-	28V	max
Indicator lamp inrush current surge at switch	20V max.	200mA	max
	28V max.	100mA	max
Indicator lamp quiescent current	-	100mA	max
*Mono/stereo switch control voltage	-	3V	max
*Mono/stereo switch control current	-	300 $\mu$ A	max
Operating ambient temperature	-	10 $^{\circ}$ C	min
	-	45 $^{\circ}$ C	max
Storage temperature	-	-10 $^{\circ}$ C	min
	-	+60 $^{\circ}$ C	max

\*These limits do not always occur simultaneously.



D6133



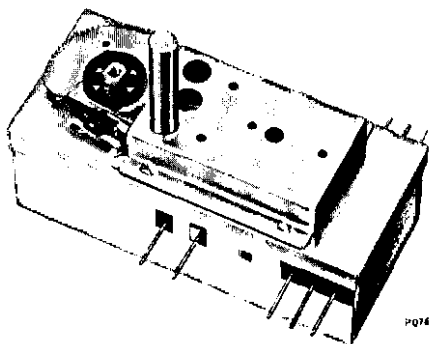
CHANNEL SEPARATION/TEMPERATURE CHARACTERISTIC



## QUICK REFERENCE DATA

F.M. tuner module (i.f. = 10.7MHz), with capacitance tuning for a.m.; designed for use with other Mullard circuit modules in radio receivers.

Supply voltage	+6.8	V
Frequency tuning range (f.m.)	87.4 to 104.5	MHz
Power gain (at 95MHz)	28	dB



### CASING

The module is encased in a metal can for protection and screening.

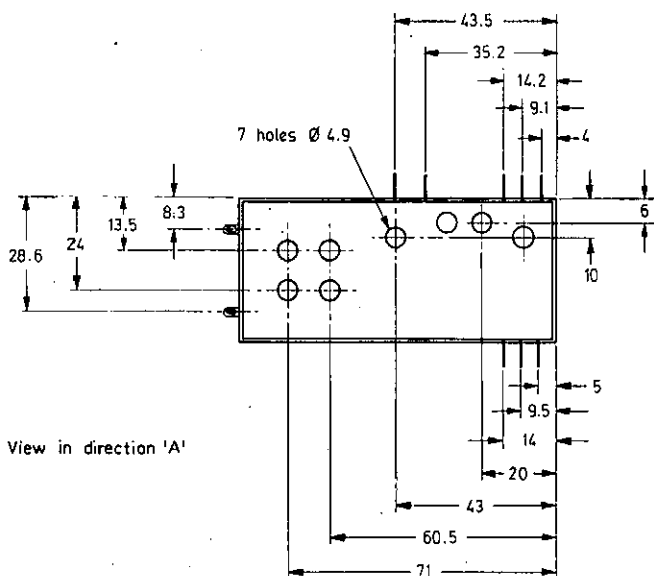
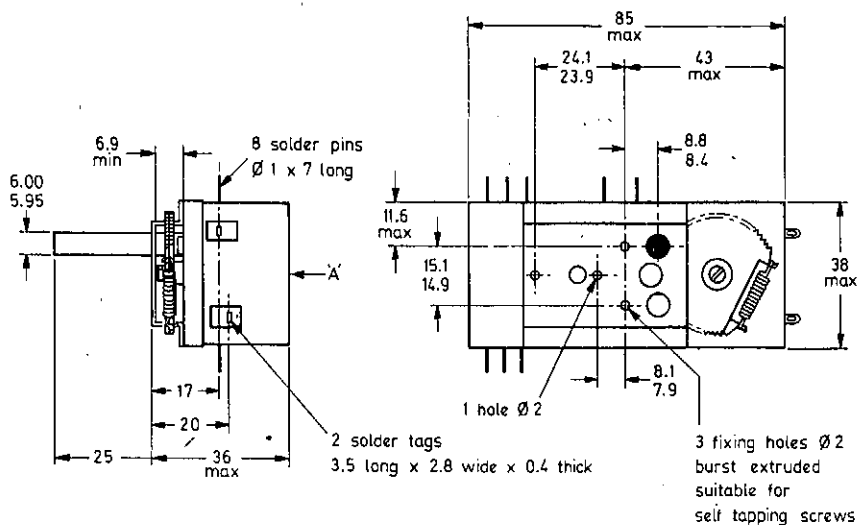
### TERMINATIONS

8 solder pins and 2 solder tags.

### SPECIAL FEATURES

Tuning for both f.m. and a.m. is provided by a four section foil dielectric gang capacitor.

DIMENSIONS (millimetres)



01541a

MECHANICAL DATA

Reduction gear ratio (anti-backlash type gear)

6.3:1

Maximum permissible torque applied to spindle (capacitor on end stop)

$79 \times 10^{-3}$

Nm

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**ELECTRICAL DATA**

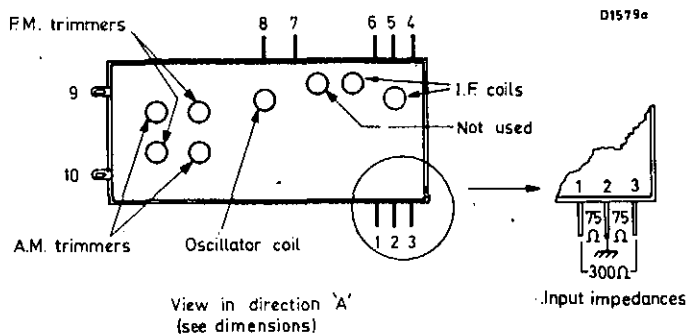
Unless otherwise specified, all characteristics apply at an ambient temperature of  $20 \pm 5^\circ\text{C}$ , an atmospheric pressure of  $10^5$  Pa (1000 mbars), a relative humidity of 75% maximum with a supply voltage of 6.8V and a load impedance of 2.2k $\Omega$ .

	Conditions	Value
Supply voltage	design	+6.8V
	limits at any temperature	+4.5 to +7.8V max.
Supply current	-	4.5mA
Frequency tuning range	-	87.4 to 104.5MHz
Range accuracy	$f_{in} = 87.4\text{MHz}$	$\pm 200\text{kHz}$
	$f_{in} = 104.5\text{MHz}$	$\pm 500\text{kHz}$
Bandwidth	at -3dB points	300kHz
Aerial impedances	-	75 or 300 $\Omega$
Output impedance	-	90 $\Omega$
I. F.	-	10.7MHz $\pm$ 50kHz
Oscillator stability with respect to supply voltage	a. f. c. disconnected	30kHz/V
A. F. C. voltage with respect to can (see note 1)	design range	-2 to +2V
	$f_{in} = 95\text{MHz} - 350\text{kHz}$	+1V
	$f_{in} = 95\text{MHz} + 500\text{kHz}$	-1V
Power gain	$f_{in} = 95\text{MHz}$	28dB
Variation of power gain over tuning range	-	< 6dB
Noise factor	$z_{source} = 75\Omega, f_{in} = 87.4\text{MHz}$	4dB
	$z_{source} = 75\Omega, f_{in} = 95\text{MHz}$	4.8dB
Image suppression	$f_{in} = 95\text{MHz}$	27dB
I. F. rejection	$f_{in} = 95\text{MHz}$	50dB
Distortion	in circuit	see note 2
A. M. capacitance swing	-	8.5 to 288.5pF
A. M. trimmer capacitance swing	-	> 9pF
Maximum ambient temperature	-	60 $^\circ\text{C}$

## NOTES

1. A positive going a.f.c. voltage decreases the oscillator frequency.
2. When the LP1402 module is used in conjunction with Mullard a.m./f.m. i.f. modules the tuner will handle signal levels in excess of 0.5V without excessive distortion.

## CONNECTIONS



Pin number	Connection	Pin number	Connection
1	75Ω input	6	I.F. output earth
2	Input earth	7	Positive supply
3	75Ω input	8	A.F.C. input
4	Negative supply and can	9	A.M. oscillator capacitor
5	I.F. output	10	A.M. aerial capacitor

N.B. The tuner has been pre-aligned by our factory and only the a.m. trimmer capacitors (if a.m. section is used) require adjustment.

## MOUNTING

Three fixing holes are provided, suitable for  $\varnothing 2\text{mm}$  self-tapping screws.

## HANDLING NOTES

- (a) The module may be soldered directly into a circuit using either a soldering iron or a solder bath. The soldering temperature must not exceed  $245^{\circ}\text{C}$  and the soldering time must be less than 5 seconds.
- (b) If it is desired to bend the terminations, extreme care must be taken to prevent damage to the printed circuit of the module.
- (c) All soldering irons and input signal supplies should be earthed to prevent breakdown of the transistors.