CRYSTAL-CONTROLLED RECEIVER RC1/8

See also RC1/3

Introduction

The RC1/8 is a crystal-controlled Band-II receiver for f.m. stereo broadcasts. It has three audio outputs: left and right stereo signals and one multiplex signal, and the audio output is sufficient to send signals to line for remote listening.

Other facilities are:

automatic stereo decoding on reception of pilot tone,
front-panel lamp indication of stereo reception,
internal a.g.c. voltage available at pin 12 of rear connector,
carrier fail indication at pin 9 of rear connector; pin 9 is connected to earth and all audio outputs are muted.

Mechanical Details

All connections to the unit are made via the rear 15-way connector, but the r.f. input can be modified on site to a front-panel BNC connector.

The receiver is mounted on a CH1/12A chassis with code pins 62 and 65.

Electrical Specification

Power supply	240 volts 50 Hz 10 W, or 24 to 40 volts d.c. 150 mA
Ambient temperature	0 to 50°C
Frequency coverage	87 to 109 MHz
Local oscillator crystal	Signal frequency 10.7 MHz
Intermediate frequency	10.7 MHz
Input impedance	50 ohms or 200 ohms
Audio output level (150-ohm load)	+12 dB at 75 kHz deviation
Output impedance	51 ohms
Distortion at 75 kHz deviation	0.5 per cent
Stereo separation	40 dB minimum at 1 kHz
Frequency response (−1 dB) (left and right)	20 Hz to 15 kHz (with de-emphasis)
Frequency response (−1 dB) multiplex	20 Hz to 50 kHz (without de-emphasis)
Pin 11 current, maximum	200 mA(pilot on)
Pin 11 voltage, maximum	50 volts (pilot off)
Pin 9 current, maximum	200 mA (carrier off)
Pin 9 voltage, maximum	50 volts (carrier on)
A.G.C. voltage at pin 12	4.9 volts at about 10 μV input 4.3 volts at 100 μV input 2.5 volts at 1 mV input 0 volts at 10 mV input
Carrier mute level	2 μV to 100 μV (see note on Fig. 1, first i.f. stage)
Signal-to-noise ratio (mono)	60 dB at 2 mV input (typical)
Signal-to-noise ratio (stereo)	56 dB at 2 mV input (typical)

Circuits

The various circuits of this receiver are as follows:

Fig. 1.	R.F. Tuner: R.F., Mixer, Local Oscillator and A.G.C. Circuits
Fig. 1 of RC1/3.	I.F. and Demodulator Circuits
Fig. 2 of RC1/3.	Decoder Circuit
Fig. 2.	Carrier Fail Muting Circuit
Fig. 3 of RC1/3.	Output Stages: Circuit
Fig. 6 of RC1/3	Power Supply Circuit

The operation of these circuits is described in annotations on the diagrams.

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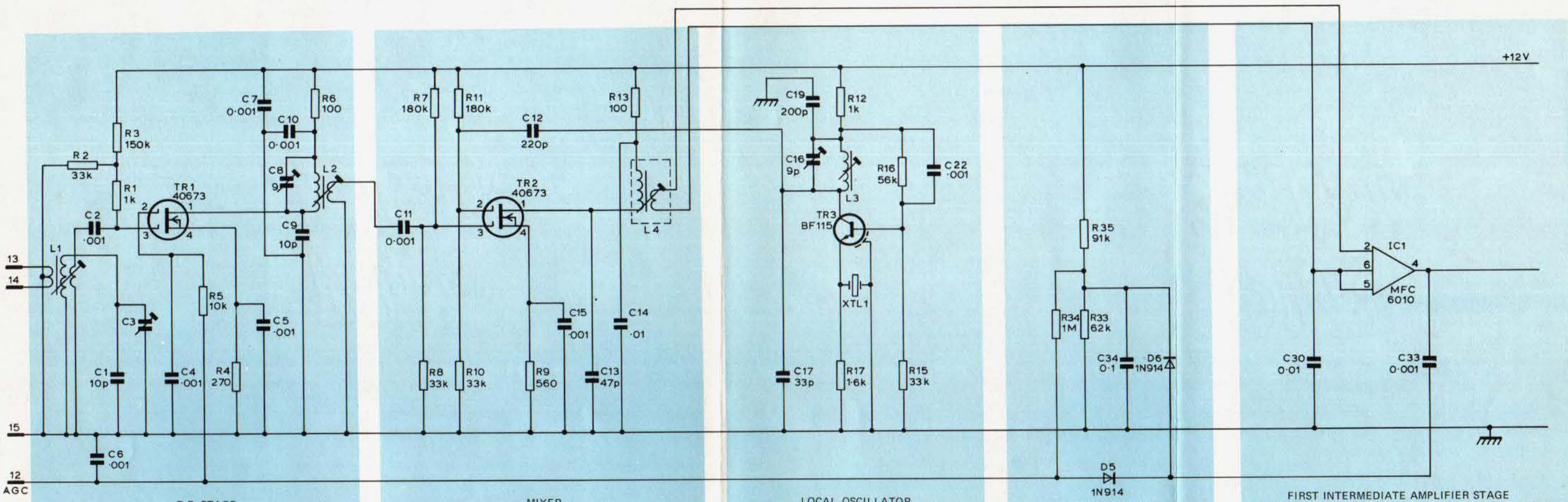

R.F. STAGE

Aerial input signal is fed to tuned circuit L1/(C1 + C3). Input impedance is 200 ohms balanced at pins 13, 14 or 50 ohms at pins 14, 15 (earth). Third winding of L1 couples input signal to gate 1 of dual-gate F.E.T. (TR1), which is forward-biased by potential divider R2, R3. A.G.C. is effected by rectification of the signal at the output of the I.F. stage (pin 4 of IC1). TR1 drain circuit is tuned by L2/(C8 + C9) and the signal is fed to the mixer circuit from the secondary winding of L2.

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MIXER

Dual-gate F.E.T. TR2 operates as mixer. Signal from R.F. stage is fed via C11 to gate 1 and local oscillator output via C12 to gate 2. The resulting 10.7-MHz I.F. is developed across the tuned drain circuit L4/C13 and fed from the secondary winding of L4 to the 1st I.F. amplifier.

LOCAL OSCILLATOR

Collector circuit of TR3 contains tuned circuit of TR3 contains tuned circuit L3/(C16 + C17) and feedback is from C19 via C22 to TR3 base. Crystal XTL1 selects frequency of emitter decoupling and therefore allows the oscillator to function at the series resonant frequency of crystal when collector circuit is tuned to same frequency. Oscillator frequency 10.7 MHz below signal frequency.

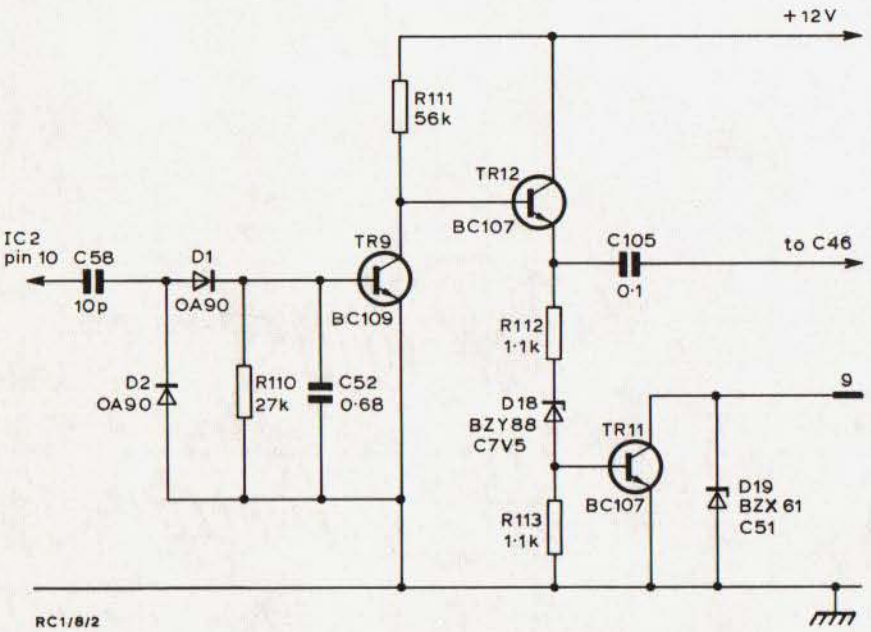
A.G.C. CIRCUIT

Signal from pin 4 of IC1 is rectified by voltage doubler rectifiers D5, D6, so decreasing the voltage on C6 derived from potential divider R35, R33 and therefore reducing gain of TR1. A.G.C. voltage at pin 12 gives an indication of applied signal level; the source impedance of this, however, is 1 megohm and the external load should not be lower than 2 megohms, otherwise the performance of the receiver will be altered.

FIRST INTERMEDIATE AMPLIFIER STAGE

Circuit as Fig. 1 of RC1/3, but note that if a diode is connected between pins 12 and 15 (cathode) of the rear connector the maximum gain of the receiver is reduced, and the carrier mute then operates at about 10 μV aerial input instead of the normal 2 μV. A short circuit raises this level to 100 μV.

Fig.1. RC1/8: R.F. Tuner: R.F., Mixer, Local Oscillator & A.G.C. Circuits



MUTING CIRCUIT

With loss of signal at pin 10 of IC2, TR9 is switched off. TR12, TR11 conduct; pin 9 is thereby earthed and can operate an external circuit. An a.c. short circuit appears via C105, across C46 (demodulator circuit), and mutes the audio signal.

Fig. 2 RC1/8 Carrier Fail Muting Circuit

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RC1/8 V.H.F. RECEIVER

INTRODUCTION

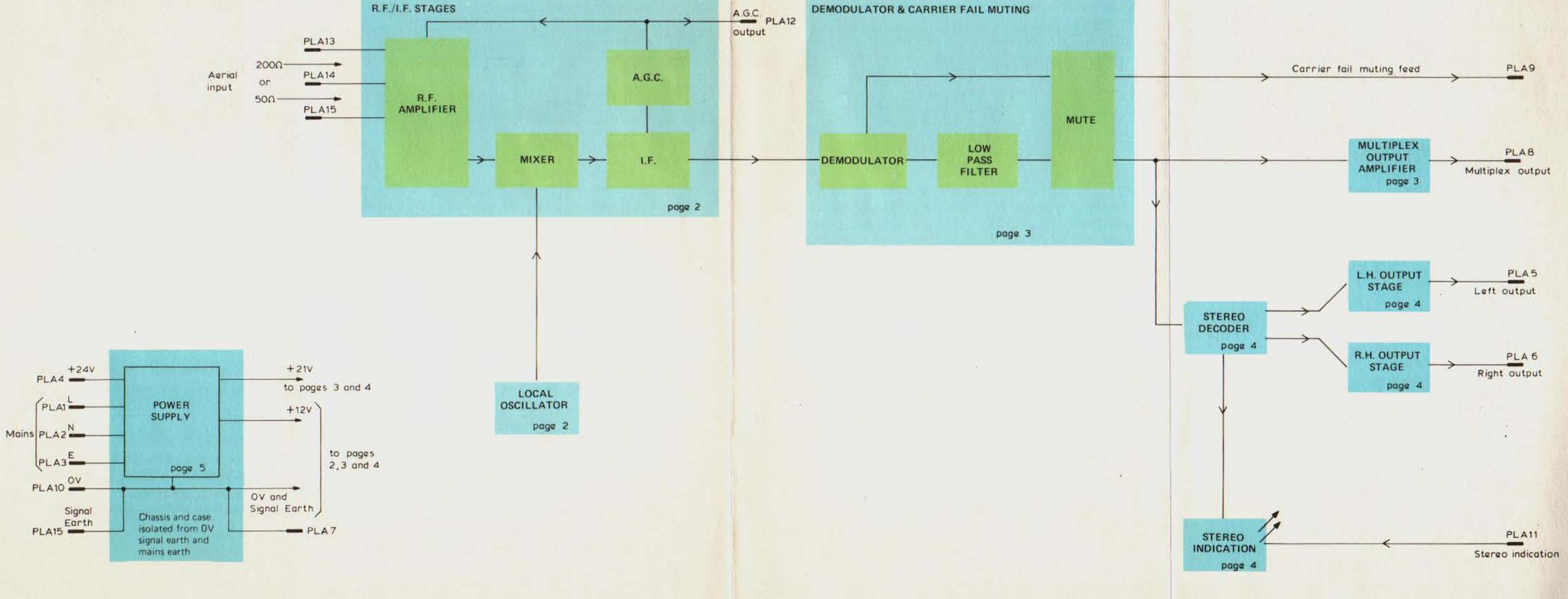
This is a crystal controlled Band II receiver for F.M. stereo broadcasts. Inputs and outputs are available at a rear connector and if required the front panel may be modified to provide a B.N.C. aerial input.

The RC1/8 can be used with a PN20/10 Panel Termination Unit. This provides aerial BNC input socket, mains XLR socket, multiplex output (P.O. No. 1C) and remaining supplies, switching and audio feeds via a miniature (series 159) 19 pole plug. Two audio transformers each provide two 600 Ω outputs of the left or right audio signal.

If a frequency change is required consult Equipment Department.

SPECIFICATION

Frequency Coverage
Single frequency 87MHz to 109MHz.
Input Level
Maximum: 100mV r.m.s.
Mute: threshold 5μV ±6dB.
Input Impedance
50Ω unbalanced or 200Ω balanced.
A.F. Output Level
+12dB into 150Ω at ±75kHz deviation, 1kHz mono modulation.
Output Impedance
51Ω.
Distortion at 75kHz Deviation
Less than 0.5%.
Signal-to-Noise Ratio
Mono: 60dB at 2mV input. (Unweighted)
Stereo: 56dB at 2mV input. (Unweighted)
Stereo Separation
40dB at 1kHz.
Frequency Response
Left and right outputs: 10Hz to 15kHz (−1dB) with de-emphasis
Multiplex: 10Hz to 100kHz (−1dB) without de-emphasis.
Muting Feed Rating, PLA9
Open collector transistor.
+50V 200mA maximum.
Low impedance to PLA7 when muting.
Stereo Indication Feed Rating, PLA11
Open collector transistor.
+50V 200mA maximum.
Low impedance to PLA7 when stereo.
A.G.C. Output, PLA12
±1V for max, input signal.
+4V to +6V for no input signal.
Loading not to be less than 2MΩ.
Power Supplies
Note: Chassis and case are isolated from 0V, signal earth and mains earth.
Mains: 240V 50Hz Fused 150mA Anti surge.
External d.c. supply: 24V to 40V Fused 250mA. Positive to PLA4 negative to PLA10.
Operating Temperature Range
0^{o} to 50^{o}C.
Chassis
CH1/12A. Code pins 62 and 65.



CIRCUIT DIAGRAM (Part 1)

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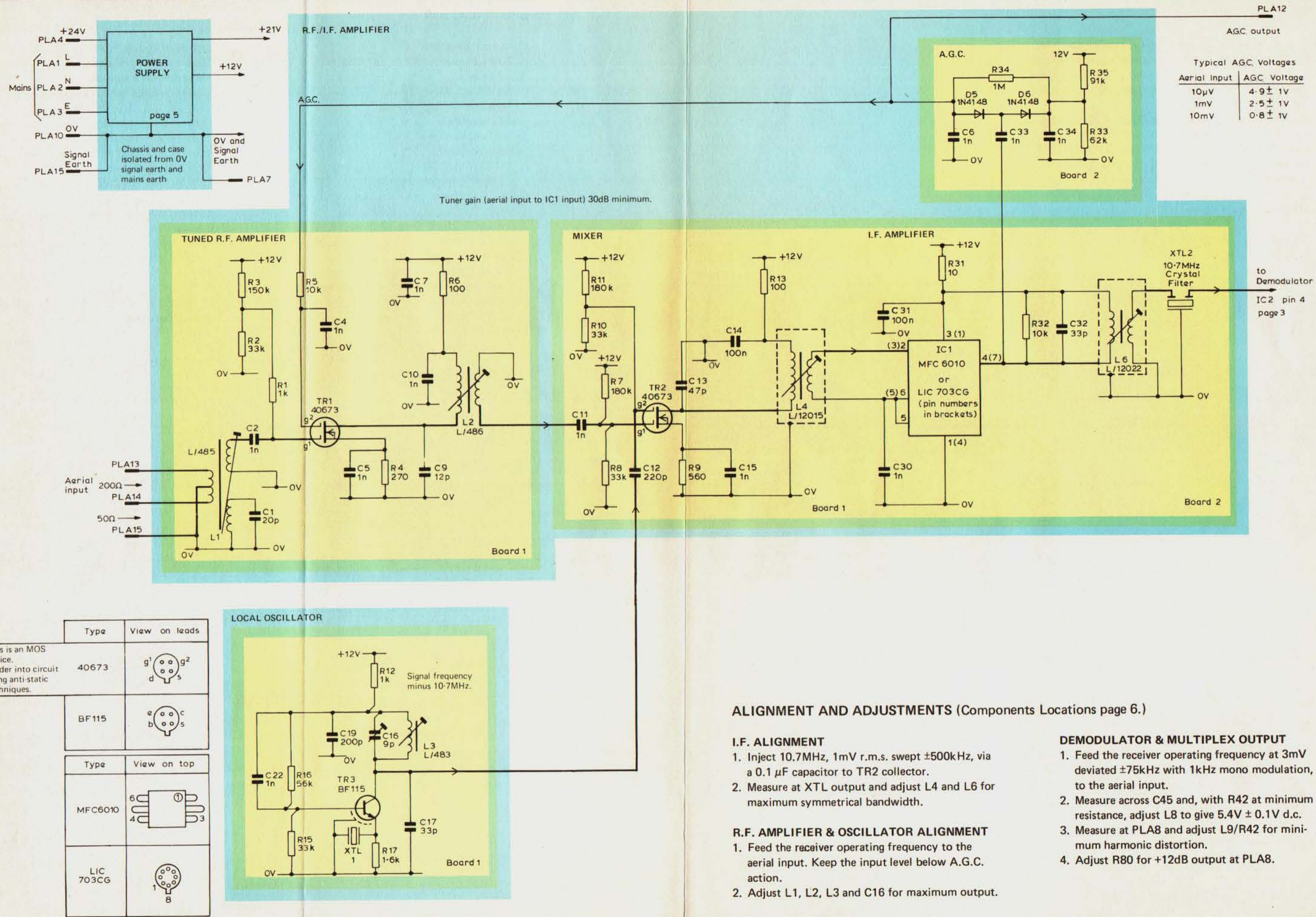

Type	View on leads
This is an MOS device. Solder into circuit using anti-static techniques. 40673	
BF115	

Type	View on top
MFC6010	
LIC 703CG	

ALIGNMENT AND ADJUSTMENTS (Components Locations page 6.)

I.F. ALIGNMENT

1. Inject 10.7MHz, 1mV r.m.s. swept ±500kHz, via a 0.1 µF capacitor to TR2 collector.
2. Measure at XTL output and adjust L4 and L6 for maximum symmetrical bandwidth.

R.F. AMPLIFIER & OSCILLATOR ALIGNMENT

1. Feed the receiver operating frequency to the aerial input. Keep the input level below A.G.C. action.
2. Adjust L1, L2, L3 and C16 for maximum output.

DEMODULATOR & MULTIPLEX OUTPUT

1. Feed the receiver operating frequency at 3mV deviated ±75kHz with 1kHz mono modulation, to the aerial input.
2. Measure across C45 and, with R42 at minimum resistance, adjust L8 to give 5.4V ± 0.1V d.c.
3. Measure at PLA8 and adjust L9/R42 for minimum harmonic distortion.
4. Adjust R80 for +12dB output at PLA8.

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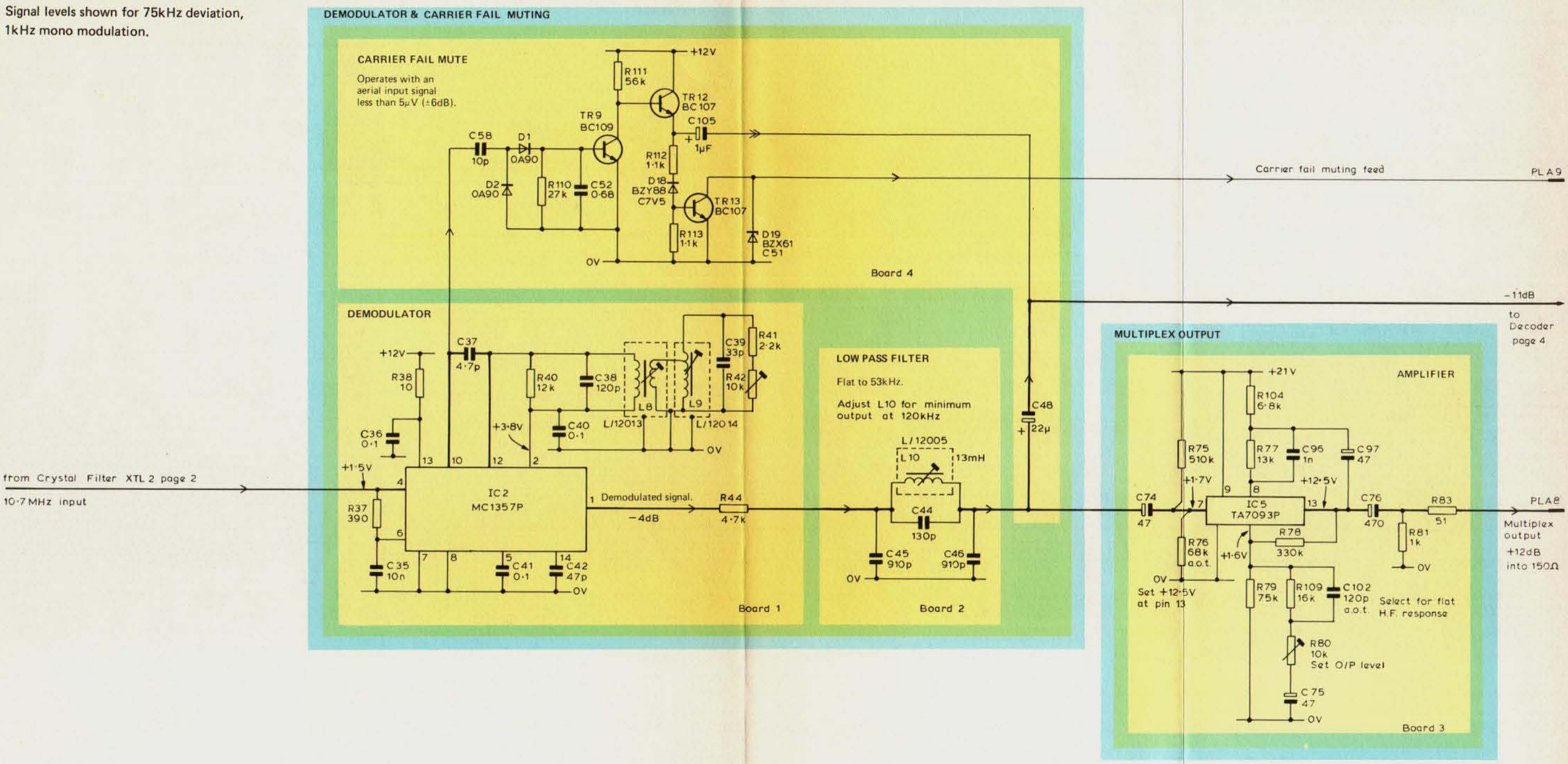
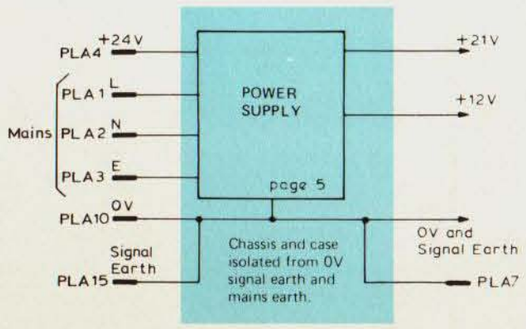
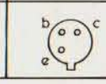
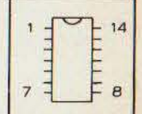
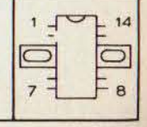
CIRCUIT DIAGRAM (Part 2)

Signal levels shown for 75kHz deviation, 1kHz mono modulation.





Type	View on leads
BC 107 BC 109	

Type	View on top
MC 1357	
TA7093P	

CIRCUIT DIAGRAM (Part 3)

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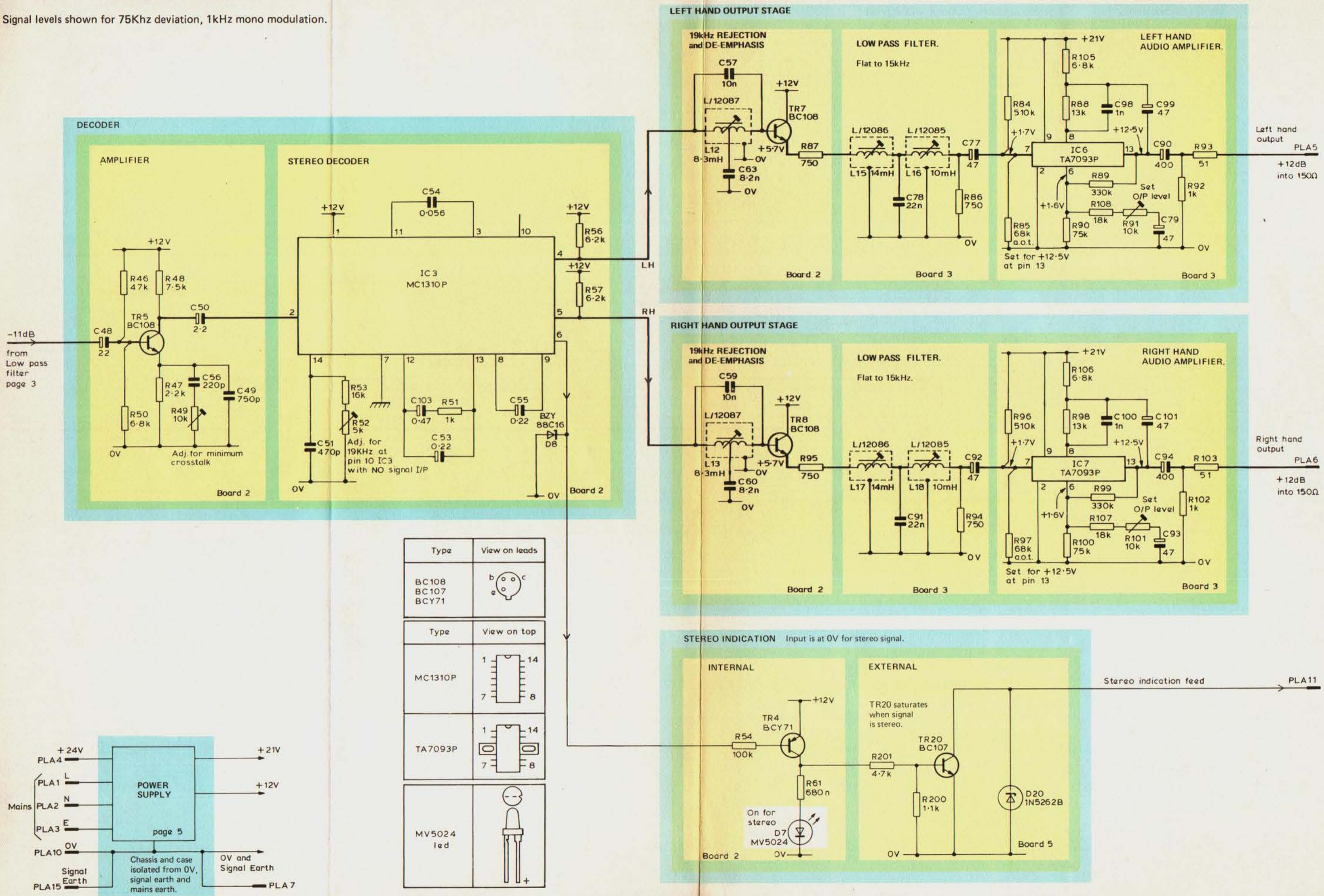
Signal levels shown for 75Khz deviation, 1kHz mono modulation.



Type	View on leads
BC108 BC107 BCY71	

Type	View on top
MC1310P	
TA7093P	
MV5024 led	

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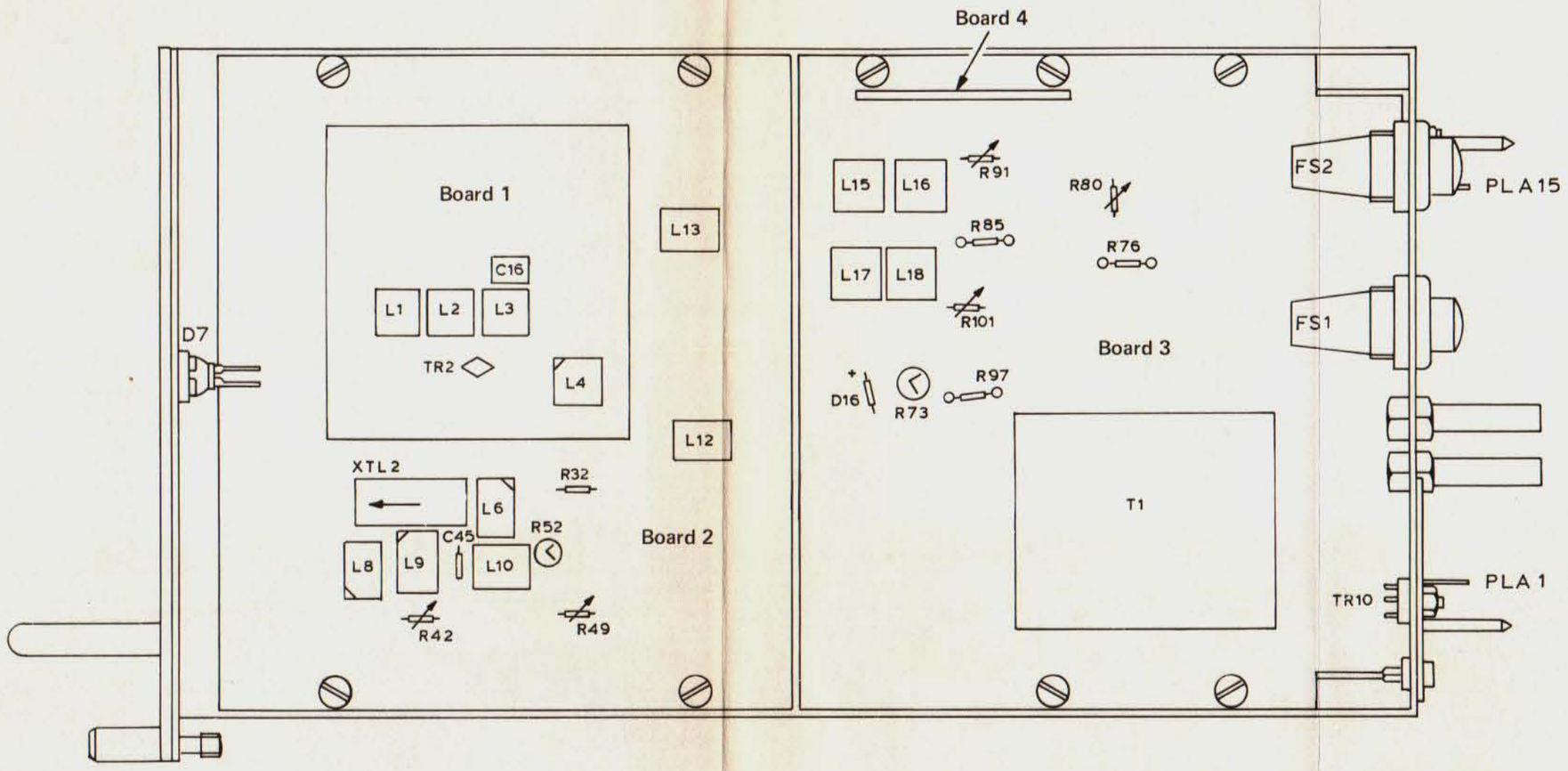
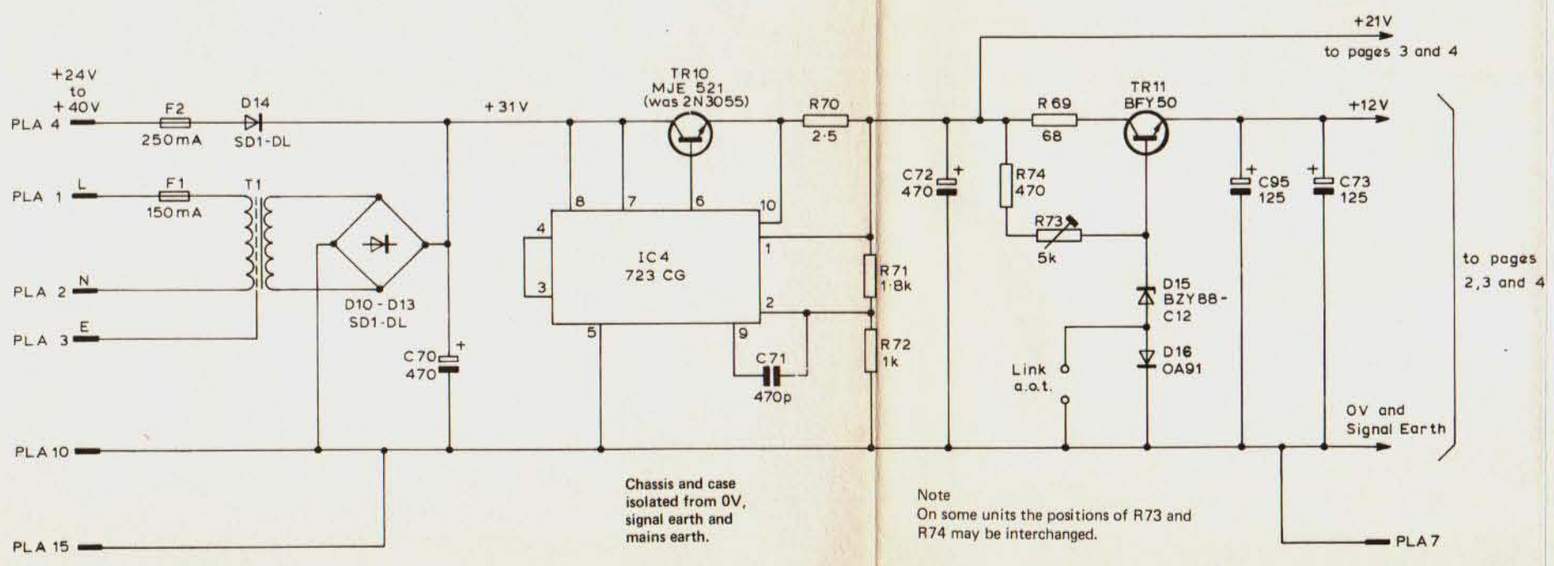
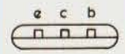
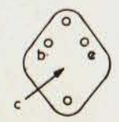




Chassis and case isolated from 0V, signal earth and mains earth.

Note
On some units the positions of R73 and R74 may be interchanged.

Type	View on top
LIC 723 CG	

Type	View on leads
BFY 50	
MJE 521	
2N3055	

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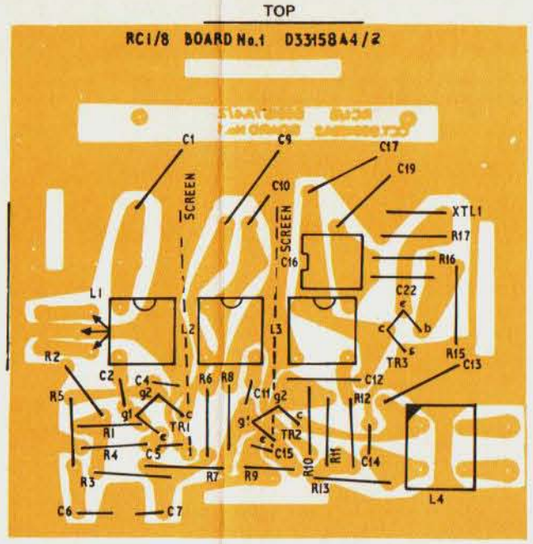
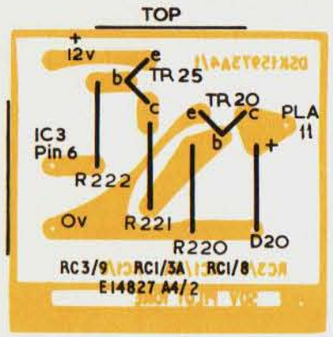
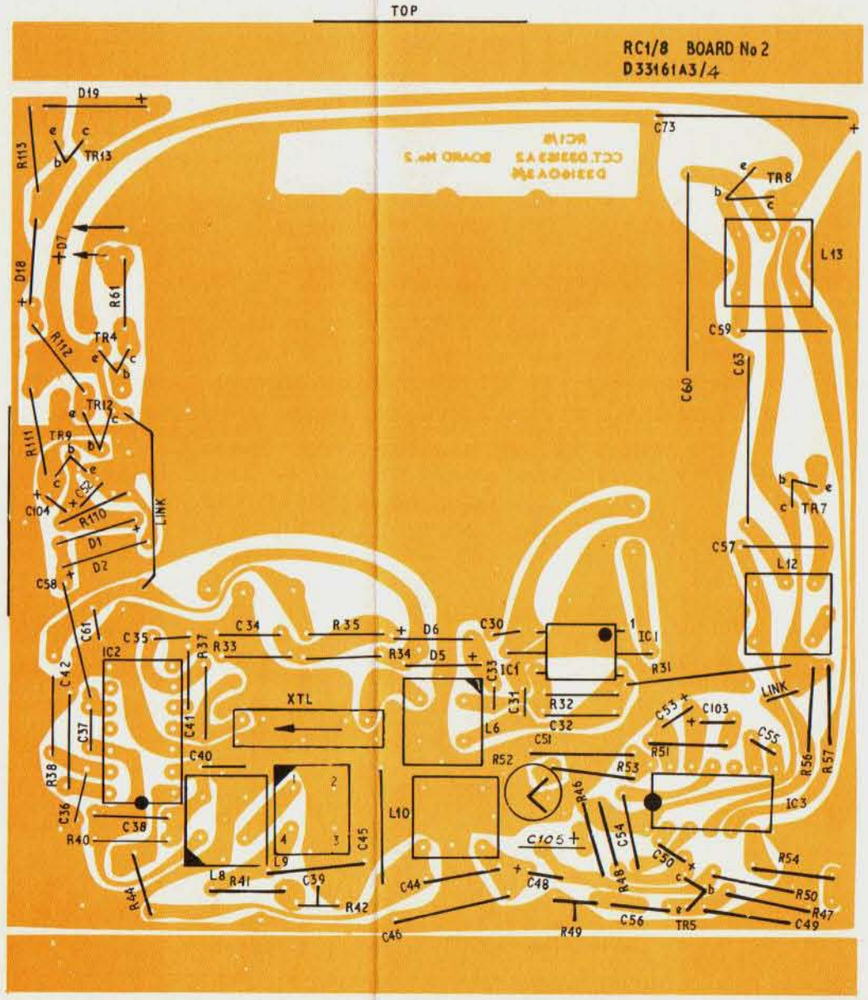


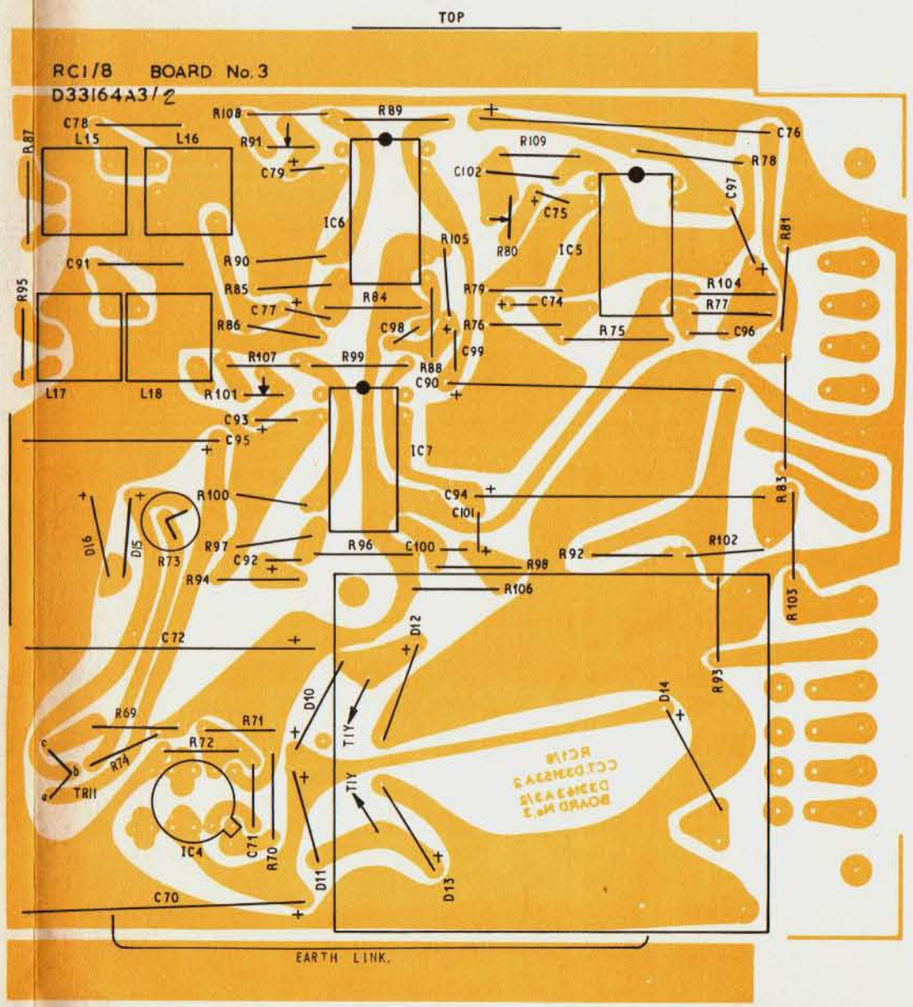
BOARD 1



BOARD 4



BOARD 2



BOARD 3