



# QUAD FM STEREO TUNER

instruction booklet

## **QUAD**

**for the closest**

**approach to the**

**original sound**

## **INTRODUCTION**

The Quad FM Stereo tuner is a self-powered tuner designed for use with the Quad 33/303 amplifier. It incorporates automatic mono-stereo switching but it also provides a mono output on a separate pin of the DIN plug which can be selected by the control unit, so as to over-ride the automatic switching under difficult reception conditions.

The unique twin neon tuning indicator gives a positive indication of correct tuning without the need to detune to check it. The indicator shows an error of 1 part in 10,000.

The third indicator on the scale shows when a stereo transmission is received.

## INSTALLATION

### MOUNTING

The tuner may either be used free standing or mounted in a cabinet panel of up to  $\frac{3}{4}$ ".

In the latter case cut a rectangular aperture 10" x 3" approximately, in the panel using a template contained in the rear of this booklet.

Remove the two screws from the rear of the cover and slide the cover off.

Insert the tuner, leads first, into the aperture from the front, ensuring that the lugs on the rear of the tuner front panel locate inside the aperture.

Replace the cover from the rear making sure that the leads are not trapped. Insert the two screws and tighten until the tuner is just held in position and then give one additional half turn to each screw to lock securely.

### MAINS VOLTAGE

Ensure that the mains voltage adjustment at the rear of the tuner is correctly set for your supply voltage.

### CONNECTIONS

The tuner is supplied with leads and plugs for direct connection to the Quad 33 control unit. For use with other amplifiers see separate section under this heading.

**Mains.** The plug with the two flat pins should be inserted into one of the two corresponding sockets at the rear of the control unit, whose on/off switch will then also control the supply to the tuner

**Signal.** The signal lead terminates in a 5-pin DIN plug wired:

pin 1	Mono
2	Common screen
3	Left-hand stereo
4	Blank
5	Right-hand stereo

This plug should be inserted into the Radio 1 socket at the rear of the control unit.

**Aerial.** The tuner is designed for a  $75\ \Omega$  aerial system using co-axial feeder to the tuner. The aerial input socket is visible through the side of the tuner cover and a plug is provided. (See page 22 ).

VHF dipoles are available singly or with reflectors and directors. In general the weaker the signal the more complex the aerial required and because the choice obviously depends on local reception conditions the advice of a local specialist dealer should be sought.

Since stereo reception involves an inherently lower signal to noise ratio it is often necessary to use a more

efficient aerial for stereo than would be necessary for mono broadcasts.

With a suitable aerial the tuner is suitable for fringe area reception but even in areas of higher signal strength the aerial should be better than the minimum necessary to produce a signal if full advantage is to be taken of its interference suppressing capability.

**Earth.** The tuner does not require a separate external earth since it is bonded to the Quad 33 control unit via the existing interconnecting cables.

#### **MAGNETIC STATION MARKERS**

The approximate tuning position of any three stations may be indicated for future reference by fitting the magnetic station markers as follows.

Withdraw the tuner from the cover sufficiently to provide access from the top to the rear of the Perspex scale. Place the markers on the backing plate behind the scale so that their white faces are visible through the scale. Then tune to the station to be marked and using a non-metallic tool such as a plastic knitting needle, slide a marker into position behind the pointer. Repeat with the other markers on other stations as required. Replace the cover.

These markers are then used as a quick guide to the scale position of the station required and the final

tuning is carried out with the aid of the twin neon tuning indicator. (See Operation).

#### **USE WITH OTHER AMPLIFIERS**

Check the mains voltage adjustment and connect to a suitably switched supply.

The audio output of the tuner is 100 mV at 22.5 kHz deviation and the amplifier used should give full output from this signal level. The input resistance must be 100,000  $\Omega$  in order to maintain the correct frequency response (50  $\mu$ Sec de-emphasis in Europe and 75  $\mu$ Sec in North America).

Check that the pins used in the DIN plug agree with the input socket of the amplifier or make the appropriate alterations. If the amplifier switching does not provide for selecting pin 1 on mono this output could be taken to another Radio or Auxiliary input so as to preserve the facility of over-riding stereo under weak signal conditions.

## OPERATION

Switch on the Quad 33 control unit and press the appropriate pushbuttons. Allow a few moments for the tuner to warm up and tune in a station in the normal way guided either by the frequency scale or one of the previously set magnetic station markers. Then make the final tuning adjustment using the twin neon tuning indicator. The correct point is where both neons are alight and off-setting the tuning to either side causes one to brighten and the other to dim. If the left-hand neon is dim adjust the tuning so that the pointer moves slightly to the left and vice versa.

With the Stereo and Radio 1 pushbuttons pressed on the Quad 33 control unit the tuner will respond automatically to the incoming signal reproducing either as stereo or two channel mono as appropriate.

With either or both of the Mono buttons pressed, with the Radio 1 button, all signals will be reproduced in mono and this facility is useful for over-riding the automatic switching under difficult reception conditions.

When the station to which the tuner is tuned broadcasts stereo the Stereo indicator lamp on the scale will light regardless of the pushbuttons pressed.

## MAINTENANCE

The layout of the tuner is shown in fig. 1. To obtain access to the underside of the chassis of the RF and IF sections:

- (1) Remove the aerial plug from socket C.
- (2) Withdraw the 4 screws (D) holding the main frame to the front plate assembly, and remove the front panel and scale complete.
- (3) Slip the scale lampholder (E) off its mounting.
- (4) Slacken the chassis pivot screws (F) and hinge the RF and IF chassis together upwards to clear the main frame.

(Note: Re-inserting the aerial plug will then hold the chassis in the raised position).

- (5) Remove the baseplate by withdrawing the 4 screws (G). The underchassis layout is shown in Fig. 2.

Access to the decoder board is via suitably positioned holes in the rear section of the main frame.

## CIRCUIT DESCRIPTION

A broad band fixed tuned transformer couples the low impedance aerial to a RF amplifier pentode (6BH6), the output of which is transformer coupled to a low noise triode (one half of 12AT7) mixer stage.



The local oscillator (other half of 12AT7) is fully temperature compensated and provides an output 10.7 MHz above the signal frequency. It is capacitively coupled to the mixer grid.

Both the mixer grid and local oscillator circuits are ganged and permeability tuned by special low loss cores driven from the tuning spindle via a precision worm drive mechanism.

The resultant 10.7 MHz IF signal at the mixer anode is transformer coupled to the automatic gain controlled first IF stage (6BJ6). A combination of critical and over-coupled circuits and a single tuned circuit in the second IF stage (6BH6) together with a close control of the Q of these circuits ensures a wide IF passband with a steep cut-off outside the band.

The second IF anode tuned circuit is coupled via a short time constant CR circuit to the limiter valve (6BH6), the anode of which contains a transformer with a capacitively centre tapped secondary winding feeding two diodes (6AL5) in a phase discriminator circuit. Again the coupling and Q are chosen to give low distortion in the audio output.

The audio (or multiplex) signal is fed via a screened lead to the decoder board.

The DC component at the discriminator output whose magnitude is proportional to the amount of mistune and of polarity dependent upon the direction of mistune, is fed to a cathode coupled phase inverter stage (12AX7) which contains a miniature neon in each anode. Slight mistuning extinguishes one neon showing the direction of mistune while even illumination of both indicates correct tuning. In addition, this stage provides Automatic Frequency Control, one section of the double triode acting as a reactance valve across the local oscillator tuning coil.

The detector output of the FM tuner is fed to the high impedance input stage (Tr 100) of the decoder. The low impedance emitter output of this stage drives a diode ring demodulator (MR 102-5) via a 55 kHz low-pass filter to remove any 67 kHz sub-carrier signals present. The values of the low-pass filter are also chosen to effect overall phase compensation of the composite signal.

The diode ring demodulator is switched by the balanced output of a 38 kHz oscillator (Tr 2). The left and right hand channels are recovered directly, but as harmonics of the difference signal sub-carrier are removed during transmission the difference signal is reduced to  $2/\pi$  times the sum signal. The equality of the sum and difference signals is restored by subtracting

$1-2/\pi$  times the sum signal from each channel, the necessary reversed phase signal being taken from the input stage collector circuit.

A tuned circuit in the input stage collector feeds the 19 kHz pilot tone to the pilot tone amplifier (Tr 101). The push-pull output of this stage is rectified (MR100-1) in order to bias the diode signal switches (MR106-9) to the "Stereo On" position, and to turn Tr 103 off and

Tr 1 on, thus lighting the stereo indicator LP1. The 38 kHz rectifier current pulses are used to synchronise the locally generated 38 kHz switching signal with the pilot tone.

The power supply for the decoder board is produced by the tuner HT current flowing through two zener diodes (MR10-11).

## ALIGNMENT INSTRUCTIONS

**Each set is fully aligned before despatch and this procedure is intended only for subsequent re-alignment should it become necessary. No departure from this procedure is permissible and the work should be undertaken only by a competent radio service engineer.**

### **IF. ALIGNMENT** (see Fig. 2)

**Preliminary** Remove cover and hinge RF and IF chassis as described on page 5. Remove chassis base plate. Remove white lead (AGC feed to IFT1) from test point B and connect lead to chassis. Unscrew

primary cores (those accessible through top of can using a short trimming tool) of IFT1, IFT2, and IFT4, secondary cores (accessible from inside chassis) of IFT1, IFT2, and IFT4 and also IFT3, until core is projecting slightly from can. Note that the correct tuning point is

the first one reached when the core is screwed in. Switch on mains supply and allow tuner to warm up.

- (1) Connect a valve voltmeter (input resistance to exceed 1 Megohm) with full scale deflection of — 1 Volt to test point B. (Ignore the standing voltage of about 0.2 Volts). Apply 10.7 mc/s to V4 grid from a low source resistance (50 — 100 ohm) and tune IFT3 for maximum DC.
- (2) Connect the valve voltmeter ( $\pm 10$  Volt range) to test point A. With 10.7 mc/s to V4 grid, tune IFT4 secondary for zero DC in the middle of the discriminator curve.
- (3) Tune IFT4 primary until the positive and negative discriminator peaks occur at equal frequencies when signal generator is swung either side of 10.7 mc/s.
- (4) Repeat (2) and (3) until symmetry is obtained with zero DC at exactly 10.7 mc/s.
- (5) With valve voltmeter to test point B on — 1 Volt range inject 10.7 mc/s to V3 grid. Tune primary and secondary of IFT2 for maximum DC.
- (6) With voltmeter and input as (5), connect a damping resistor of 470 ohm across IFT2 primary and tune secondary for maximum. The receiver HT should be switched off whilst handling the damping resistor in this and subsequent operations.
- (7) Transfer damping resistor to IFT2 secondary and tune primary for maximum.
- (8) Repeat (6) and (7), keeping the input signal level adjusted to give above — 1 Volt DC at B, until correctly tuned. Remove damping resistor.
- (9) Inject 10.7 mc/s to the top of T2 secondary winding (i.e., tag on coil wired to pin 2 of V2). Tune IFT1 primary and secondary for maximum DC at B.
- (10) Connect 470 ohm damping resistor to IFT1 primary and tune secondary for maximum DC at B.
- (11) Transfer damping resistor to IFT1 secondary and tune primary for maximum DC at B.
- (12) Repeat (10) and (11), again keeping signal input level adjusted to give about — 1V at B, until correctly tuned. (Note that the input level differs little from that in (8) as the mixer grid coil tuned to 88 — 108 mc/s appears in parallel with the signal). Remove damping resistor.
- (13) With signal generator swung from 10.62 to 10.78 mc/s check that the voltage at B does not vary by more than  $\pm 2$ dB about a level of — 1 Volt at 10.7 mc/s. The curve should be symmetrical about 10.7 mc/s and should fall away sharply outside the band 10.6 to 10.8 mc/s.



## RF ALIGNMENT

**Preliminary.** Because the scale is removed when the chassis is swung out for access (see page 5 ) it must be temporarily replaced to set the pointer as required during this operation and removed again to provide access to T2 and T3 cores. While the scale is in position check that with tuning control fully clockwise the pointer lies at the right-hand end of the scale line. Re-connect white lead to test point B. Connect a signal generator with a source resistance of  $75\ \Omega$  to the aerial input.

- (1) Inject 90 mc/s, tune receiver to 90 mc/s and adjust T3 slug until signal is heard.
- (2) Inject 111.4 mc/s and check that image is heard (i.e., oscillator signal lies 10.7 mc/s above signal frequency. If the image is at 68.6 mc/s then T3 slug is too far in).
- (3) Inject 106 mc/s and tune receiver until signal is heard. If received signal lies below 106 mc/s on the scale move C10 away from T3 (and vice versa).
- (4) Repeat (1), (2) and (3) until both ends of the scale are correct.
- (5) Inject 98 mc/s. Tune in signal and adjust T1 for maximum DC at B keeping input level sufficient to give about — 1 Volt at B.

- (6) Inject 90 mc/s. Tune signal in (and keep tuned in with aid of tuning indicator) and adjust T2 core for maximum DC at B.
- (7) Inject 106 mc/s. Tune signal as in (6) and adjust T2 core for increase of DC at B. If T2 requires to be screwed out then move C6 towards T2 (and vice versa).
- (8) Repeat (6) and (7) until adjusting T2 core in either direction in (7) causes DC at B to fall. Finish at (6).
- (9) Re-assemble chassis base plate and cover, and adjust T3 core slightly to correct calibration. Replace large tuning knob.

## DECODER ALIGNMENT (see Fig. 3)

The decoder board must be aligned in position. Access to the unit is through holes in the rear plate.

The 67 kHz adjustment given under 1 below must be correct even if no 67 kHz sub-carrier is present in the local transmissions. The meter used must respond to 67 kHz.

The 19 kHz pilot tone must be accurate in frequency ( $\pm 2$  Hz) and modulation level (8–10%) from the signal generator. The modulation level of the left or right tones (400–1000 Hz) should be 20–30%. The FM tuner itself should be exactly in tune during alignment and

should be allowed to warm up before commencing decoder alignment.

1. Modulate the signal generator with 67 kHz and connect an AC voltmeter or CRO (10 mV FSD) to mono output (pin 1 of 5 pin output plug). Tune L101 for minimum reading.
2. Modulate the signal generator with Pilot tone and connect a DC voltmeter from the junction of MR100 and MR101 (point H) also accessible through a hole in the rear plate (I) to chassis. Tune L100 and L102 for maximum reading (about -23 volts).
3. Modulate the signal generator with tone on the left-hand channel only and connect AC meter or CRO across right-hand output. Tune L103 and RV100 for minimum output, which should now be about 35dB below left-hand output.

## SPECIFICATION

<b>Tuning Range</b>	87.5 – 108 MHz
<b>Sensitivity</b>	2 $\mu$ V for 30 dB quieting
<b>De-emphasis</b>	50 $\mu$ S (European Standard) 75 $\mu$ S (North American Standard)
<b>Output</b>	100mV (Nominal for 30% modulation) into 100k $\Omega$ each channel (50k $\Omega$ mono)
<b>Crosstalk</b>	Better than 30dB at 1 kHz
<b>Suppression</b>	19 kHz Pilot tone better than 36dB 38 kHz Switching tone better than 40dB
<b>Power Input</b>	100–125/200–250V 50–60 Hz 25 watts

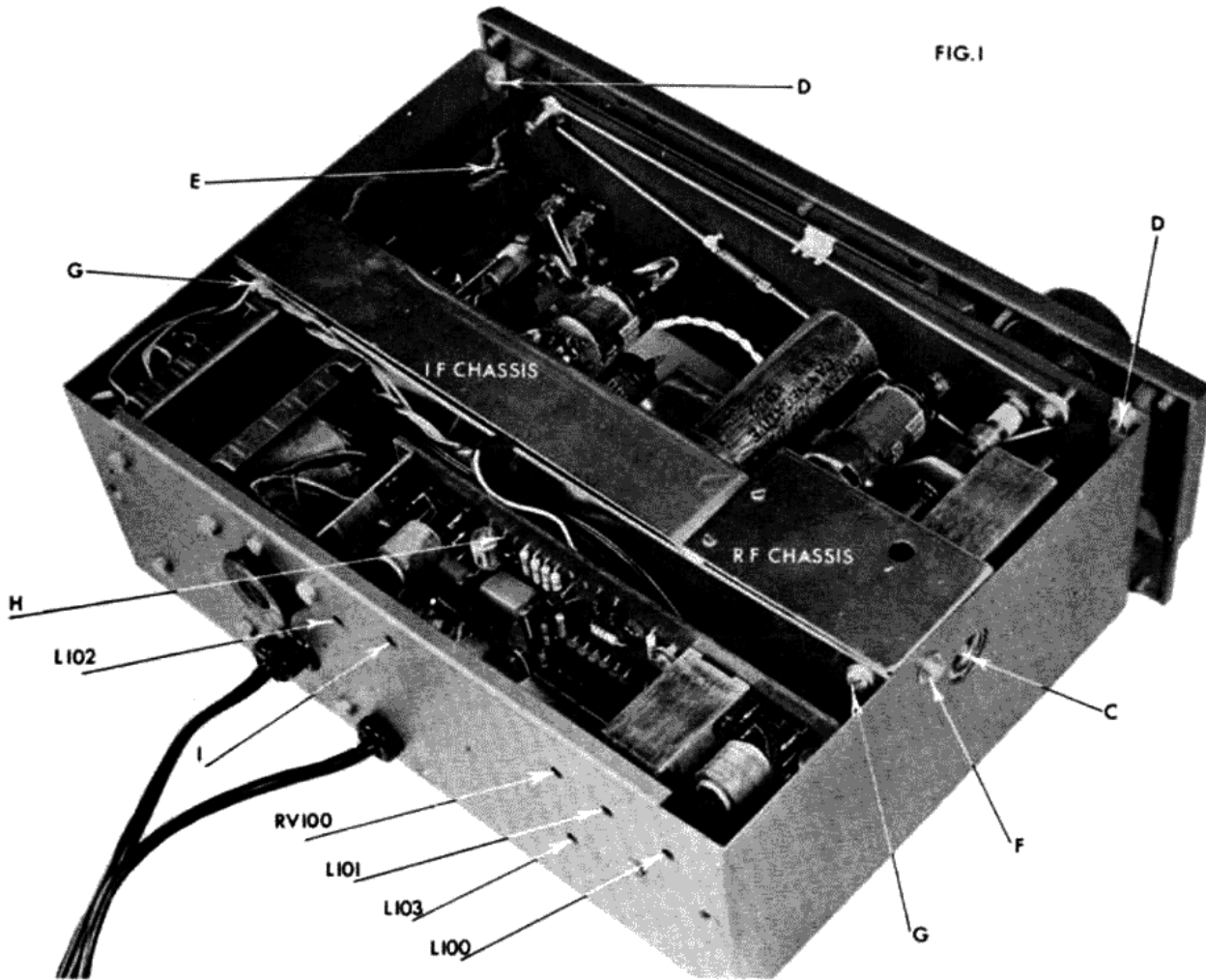


FIG. 1

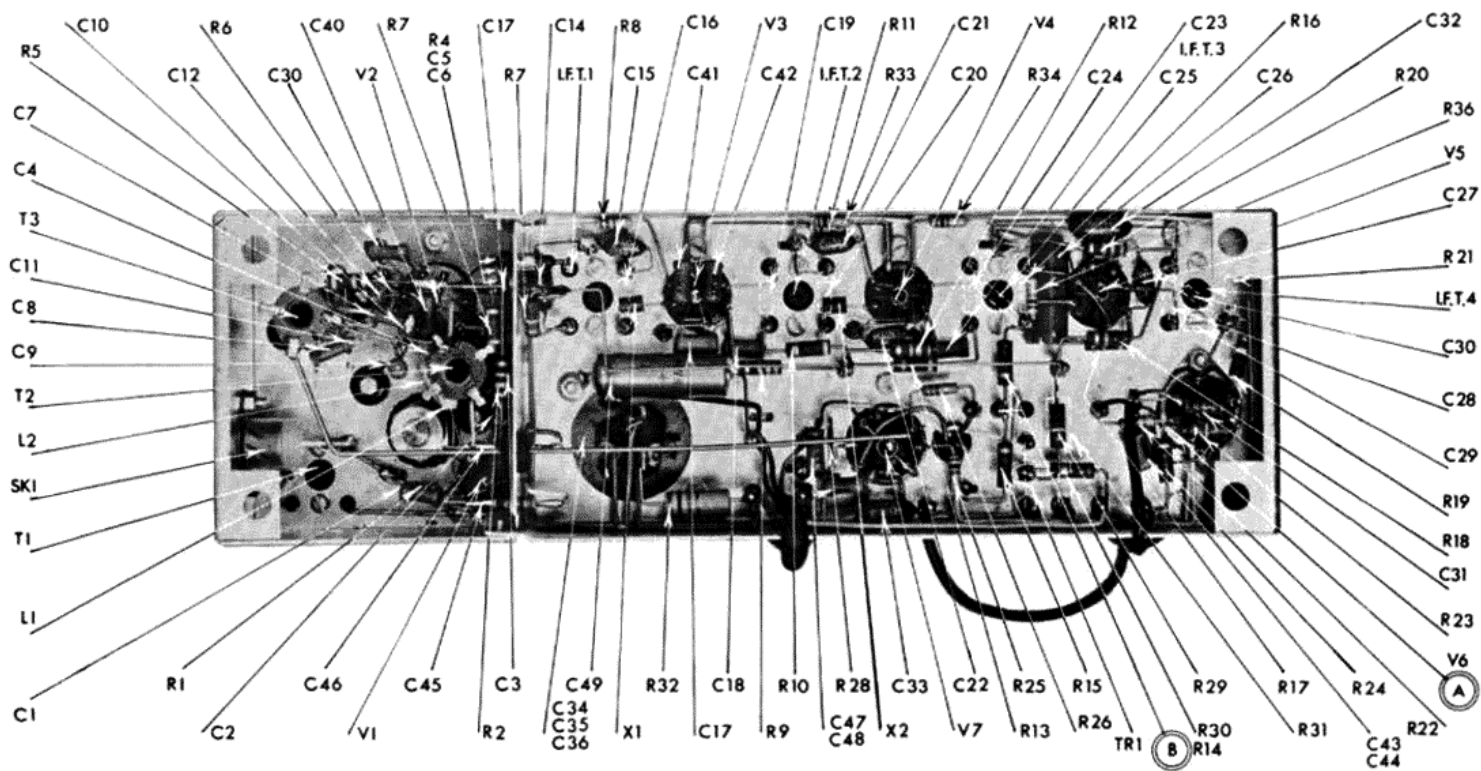


FIG. 2



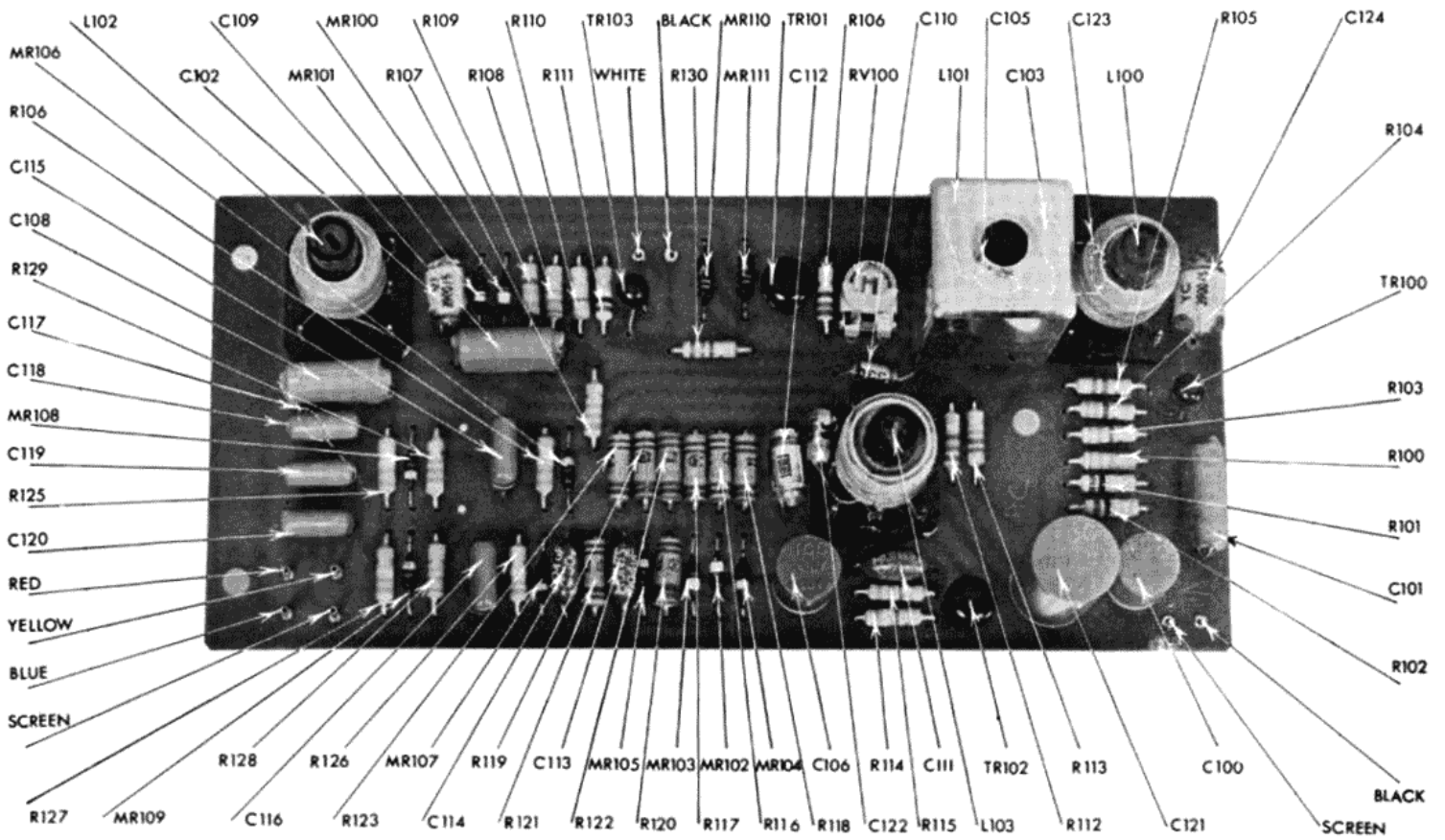


FIG.3

## COMPONENTS LIST

It is important that similar components be used for replacement purposes, especially as to tolerance, rating, and in the case of condensers, construction. Minor circuit changes may be introduced from time to time. Any query arising from such changes should be referred to the manufacturers.

### RESISTORS (Tuner Chassis)

	Value	Tolerance	Maker's Reference	Stock No.
R1	100	± 10%	Dubilier BTT	305/F
R2	33K	± 10%	Dubilier BTT	209/D
R3	4.7K	± 10%	Dubilier BTT	240/F
R4	2.2K	± 10%	Dubilier BTT	250/A
R5	47K	± 10%	Dubilier BTT	208/F
R6	10K	± 10%	Dubilier BTT	230/E
R7	82K	± 10%	Dubilier BTT	203/B
R8	120	± 10%	Dubilier BTT	300/C
R9	33K	± 10%	Dubilier BTT	209/D
R10	4.7K	± 10%	Dubilier BTT	240/F
R11	100	± 10%	Dubilier BTT	305/F
R12	33K	± 10%	Dubilier BTT	209/D
R13	4.7K	± 10%	Dubilier BTT	240/F
R14	1M	± 10%	Dubilier BTT	165/C
R15	1M	± 10%	Dubilier BTT	165/C
R16	47K	± 10%	Dubilier BTT (Part of IFT3)	208/F
R17	47K	± 10%	Dubilier BTT	208/F
R18	82K	± 10%	Dubilier BTT	203/B
R19	120K	± 10%	Dubilier BTT	195/B
R20	33K	± 10%	Dubilier BTT	209/D
R21	47K	± 10%	Dubilier BTT (Part of IFT4)	208/F

**RESISTORS (Tuner Chassis)**

	<b>Value</b>	<b>Tolerance</b>	<b>Maker's Reference</b>	<b>Stock No.</b>
R22	2·2K	± 10%	Dubilier BTT	250/A
R23	120K	± 10%	Dubilier BTT	195/B
R24	1·5M	± 10%	Dubilier BTT	160/A
R25	1K	± 10%	Dubilier BTT	258/E
R26	1K	± 10%	Dubilier BTT	258/E
R27	1M	± 10%	Erie Type 15	165/F
R28	1·5K	± 10%	Dubilier BTT	255/A
R29	100K	± 10%	Dubilier BTT	200/A
R30	6·8K	± 10%	Dubilier BTT	235/B
R31	1K	± 10%	1W Iskra UPM	258/F
R32	1K	± 10%	1W Iskra UPM	258/F
R33	1K	± 10%	Dubilier BTT	258/E
R34	1K	± 10%	Dubilier BTT	258/E
R35	1M	± 10%	Erie Type 15	165/F
R36	10K	± 10%	Dubilier BTT	230/E

**CAPACITORS (Tuner Chassis)**

	Value	Tolerance		Maker's Reference	Stock No.
C1	1000p	± 20%	500V	Erie AD Hi-K	516/1
C2	1000p	± 20%	500V	Erie AD Hi-K	516/1
C3	1000p	± 20%	500V	Erie AD Hi-K	516/1
C4	22P	± 5%	350V	Lemco 7 x 3 mm	543/A
C5	1000p	± 20%	500V	Hunts BD32	516/C
C6	27p	± 5%	350V	Lemco 7 x 3 mm	540/A
C7	2.7p	± .5P		Erie P100A	549/A
C8	4.7p	± .5P		Erie P100A	548/A
C9	8.2p	± .5P		Erie N330A	546/A
C10	6.8p	± .5P		Erie N470A	547/B
C11	33p	± 5%	350V	Lemco 7 x 3 mm	537/A
C12	1000p	± 20%	500V	Hunts BD32	516/C
C13	1000p	+ 50% - 20%		Erie K3500/2000	516/E
C14	.01μ	± 20%		Hunts BD13	506/B
C15	.01μ	± 20%		Hunts BD21	506/C
C16	27P	± 5%	350V	Lemco 7 x 3 mm (Part of IFT1)	540/A
C17	1800p	± 20%	500V	Erie AD Hi-K	515/1
C18	1800p	± 20%	500V	Erie AD Hi-K	515/1
C19	27p	± 5%	350V	Lemco 7 x 3 mm (Part of IFT2)	540/A
C20	27p	± 5%	350V	Lemco 7 x 3 mm (Part of IFT2)	540/A
C21	.01μ	± 20%		Hunts BD13	506/B
C22	.004μ	± 20%		Hunts BD35	513/B
C23	1800p	± 20%	500V	Erie AD Hi-K	515/1
C24	27p	± 5%	350V	Lemco 7 x 3 mm (Part of IFT3)	540/A
C25	47p	± 5%	350V	Lemco 7 x 4 mm (Part of IFT3)	534/A
C26	2μ		150V	TCC Elkomold C1	484/B
C27	.01μ	± 20%		Hunts BD13	506/B
C28	47p	± 5%	350V	Lemco 7 x 4 mm (Part of IFT4)	534/A



**CAPACITORS (Tuner Chassis)**

	Value	Tolerance		Maker's Reference	Stock No.
C29	68p	± 2½%	350V	Lemco 7 x 5 mm (Part of IFT4)	529/A
C30	68p	± 2½%	350V	Lemco 7 x 5 mm (Part of IFT4)	529/A
C31	15p	± 5%		Erie N330A	545/A
C32	.04μ	± 20%		Hunts BD16	501/A
C33	.04μ	± 20%		Hunts BD16	501/A
C34	32μ		275V	Hunts KD279	} 462/A
C35	32μ		275V	Hunts KD279	
C36	32μ		275V	Hunts KD279	
C37	1000p	± 20%	500V	Erie AD Hi-K	516/1
C38	1000p	± 20%	500V	Erie AD Hi-K	516/1
C39	1000p	± 20%	500V	Erie AD Hi-K	516/1
C40	1000p	± 20%	500V	Erie AD Hi-K	516/1
C41	1000p	± 20%	500V	Erie AD Hi-K	516/1
C42	1000p	± 20%	500V	Erie AD Hi-K	516/1
C43	1000p	± 20%	500V	Erie AD Hi-K	516/1
C44	1000p	± 20%	500V	Erie AD Hi-K	516/1
C45	1000p			Erie K3500/2000	516/E
C46	1000p			Erie K3500/2000	516/E
C47	1000p	± 20%	500V	Erie AD Hi-K	516/1
C48	1000p	± 20%	500V	Erie AD Hi-K	516/1
C49	160μ	+ 50%	25V	Mullard C437AR/F160	454/K
		- 10%			

**SUNDRIES**

	<b>Value</b>	<b>Tolerance</b>	<b>Maker's Reference</b>	<b>Stock No.</b>
L1			Heater Choke Dubilier 666	440/A
L2			Heater Choke Dubilier 666	440/A
Tr 1			Mullard AC176	
V1			6BH6	
V2			ECC81/12AT7	
V3			6BJ6	
V4			6BH6	
V5			6BH6	
V6			EB91/6AL5	
V7			ECC81/12AT7	
V8			29L	
V9			29L	
T1			Aerial Coil (Blue) Drg. A11058	748/E
T2			Mixer Grid Coil Drg. A11075	748/G
T3			Oscillator Coil Drg. A11074	748/F
T4			Mains Transformer	910/M
IFT1			Mixer Anode (Green) Drg. A11755	748/A
IFT2			I.F.I. Anode (Red) Drg. A11750	748/B
IFT3			Limiter Grid (Yellow) Drg. A11048	748/C
IFT4			Discriminator (White) Drg. A11749	748/D
MR1			Mullard BY100	
MR2			Mullard BY100	
FS1			250mA Antisurge (20 x 5mm) Beswick TDC 123	675/Q
LP1			Lilliput Tubular 12v. 1.5w	690/L
LP2			Lilliput Tubular 12v. 1.5w	690/L
X1			Ferrite Bead Mullard FX1242	442/A
X2			Ferrite Bead Mullard FX1242	442/A

**RESISTORS (Decoder)**

	<b>Value</b>	<b>Tolerance</b>	<b>Maker's Reference</b>	<b>Stock No.</b>
R100	68K	± 10%	Dubilier BTT	205/B
R101	100K	± 10%	Dubilier BTT	200/A
R102	100K	± 10%	Dubilier BTT	200/A
R103	3-3K	± 10%	Dubilier BTT	244/B
R104	330	± 10%	Dubilier BTT	280/C
R105	4-7K	± 10%	Dubilier BTT	240/F
R106	120	± 10%	Dubilier BTT	300/B
R107	33K	± 10%	Dubilier BTT	209/D
R108	68K	± 10%	Dubilier BTT	205/B
R109	3-3K	± 10%	Dubilier BTT	244/B
R110	470K	± 10%	Dubilier BTT	176/C
R111	100K	± 10%	Dubilier BTT	200/A
R112	2-7K	± 10%	Dubilier BTT	248/D
R113	22K	± 10%	Dubilier BTT	217/A
R114	390	± 10%	Dubilier BTT	275/A
R115	3-3K	± 10%	Dubilier BTT	244/B
R116	22K	± 5%	Welwyn F20	217/D
R117	22K	± 5%	Welwyn F20	217/D
R118	22K	± 5%	Welwyn F20	217/D
R119	22K	± 5%	Welwyn F20	217/D
R120	12K	± 5%	Welwyn F20	228/E
R121	12K	± 5%	Welwyn F20	228/E
R122	27K	± 5%	Welwyn F20	210/E
R123	27K	± 5%	Welwyn F20	210/E
R124	330K	± 10%	Dubilier BTT	179/B
R125	330K	± 10%	Dubilier BTT	179/B
R126	330K	± 10%	Dubilier BTT	179/B
R127	330K	± 10%	Dubilier BTT	179/B
R128	68K	± 10%	Dubilier BTT	205/B
R129	33K	± 10%	Dubilier BTT	209/D
R130	270	± 10%	Dubilier BTT	283/A
RV100	1K	± 20%	Morganite 62H	370/E

### CAPACITORS (Decoder)

	Value	Tolerance		Maker's Reference	Stock No.
C100	12 $\mu$		50V	TCC E 1072/9	472/B
C101	.33 $\mu$	$\pm 10\%$	250V	Hunts AM3428	493/A
C102	3900p	$\pm 5\%$	125V	Salford PF	513/N
C103	330p	$\pm 5\%$	125V	Salford PF (Part of L101)	523/B
C105	100p	$\pm 5\%$	350V	Salford PF (Part of L101)	528/A
C106	4 $\mu$		50V	TCC E1072/8	482/A
C107	3900p	$\pm 5\%$	125V	Salford PF	513/N
C108	.33 $\mu$	$\pm 10\%$	250V	Hunts AM3428	493/A
C109	.33 $\mu$	$\pm 10\%$	250V	Hunts AM3428	493/A
C110	330p	$\pm 5\%$	125V	Salford PF	523/B
C111	1000p	$\pm 20\%$		Hunts BD32	516/C
C112	1800p	$\pm 5\%$	125V	Salford PF	515/H
C113*	4000p	$\pm 10\%$	250V	Hunts BD11A	513/A
C113†	5600p	$\pm 10\%$	250V	Hunts BD72A	509/B
C114*	4000p	$\pm 10\%$	250V	Hunts BD11A	513/A
C114†	5600p	$\pm 10\%$	250V	Hunts BD72A	509/B
C115	.1 $\mu$	$\pm 20\%$	250V	TCC PMX4	495/F
C116	.1 $\mu$	$\pm 20\%$	250V	TCC PMX4	495/F
C117*	4000p	$\pm 10\%$	250V	Hunts BD11A	513/A
C117†	5600p	$\pm 10\%$	250V	Hunts BD72A	509/B
C118	.1 $\mu$	$\pm 20\%$	250V	TCC PMX4	495/F
C119	.1 $\mu$	$\pm 20\%$	250V	TCC PMX4	495/F
C120	.1 $\mu$	$\pm 20\%$	250V	TCC PMX4	495/F
C121	100 $\mu$		25V	TCC E1070/5	455/D
C122	39p	$\pm 10\%$	125V	Salford PF (Part of L103)	535/A
C123	3900p	$\pm 5\%$	125V	Salford PF	513/N
C124	3900p	$\pm 5\%$	125V	Salford PF	523/B

\* European standard

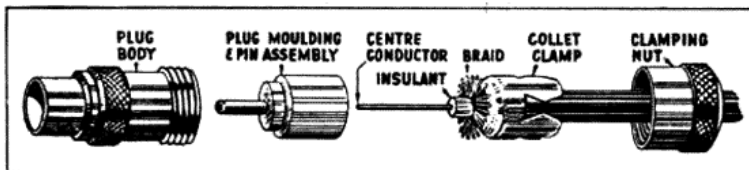
† North American standard



**SUNDRIES**

<b>Value</b>	<b>Tolerance</b>	<b>Maker's Reference</b>	<b>Stock No.</b>
Tr 100		SGS Fairchild BC154	
Tr 101		SGS Fairchild BC116	
Tr 102		SGS Fairchild BC116	
Tr 103		SGS Fairchild BC113	
MR100		Texas Instruments IS920	
MR101		Texas Instruments IS920	
MR102		Texas Instruments IS920	
MR103		Texas Instruments IS920	
MR104		Texas Instruments IS920	
MR105		Texas Instruments IS920	
MR106		Texas Instruments IS920	
MR107		Texas Instruments IS920	
MR108		Texas Instruments IS920	
MR109		Texas Instruments IS920	
MR100		Texas Instruments IS2075	
MR111		Texas Instruments IS2075	
L100		Acoustical Drg. A11697	750/A
L101		Acoustical Drg. A11699	750/C
L102		Acoustical Drg. A11700	750/D
L103		Acoustical Drg. A11698	750/B

## How to load the "Belling-Lee" Coaxial Aerial Plug L.734/P



1. Trim feeder by removing 1" outer cover,  $\frac{3}{4}$ " of braid and  $\frac{1}{8}$ " of insulant.
2. Slide clamping nut and collet on to feeder and splay the braid.
3. Push centre conductor through plug pin as far as possible and bend sharply for soldering. Solder and trim.
4. Slide collet up to splayed ends of braid and trim braid flush with plug moulding, using knife against collet.
5. Push assembly home into plug so that collet enters it. Screw nut on firmly to grip feeder. The plug pin must be firm.
6. In the case of feeder larger than 0.261" dia. over cover, the hole in the collet clamp encircles braid only.

### — ALWAYS —

- (a) Avoid scoring centre conductor and braid when removing insulant.
- (b) Solder the conductor with a quick iron, to avoid melting the cable and plug insulant.
- (c) Trim loose ends to avoid short circuiting.
- (d) Ensure that the claws of the collet are the correct way round so as to grip the outer sheath.
- (e) Avoid twisting cable when re-assembling plug, as this tends to break the conductor.

By courtesy of Belling & Lee, Ltd., Gt. Cambridge Road, Enfield, Middlesex

## Guarantee

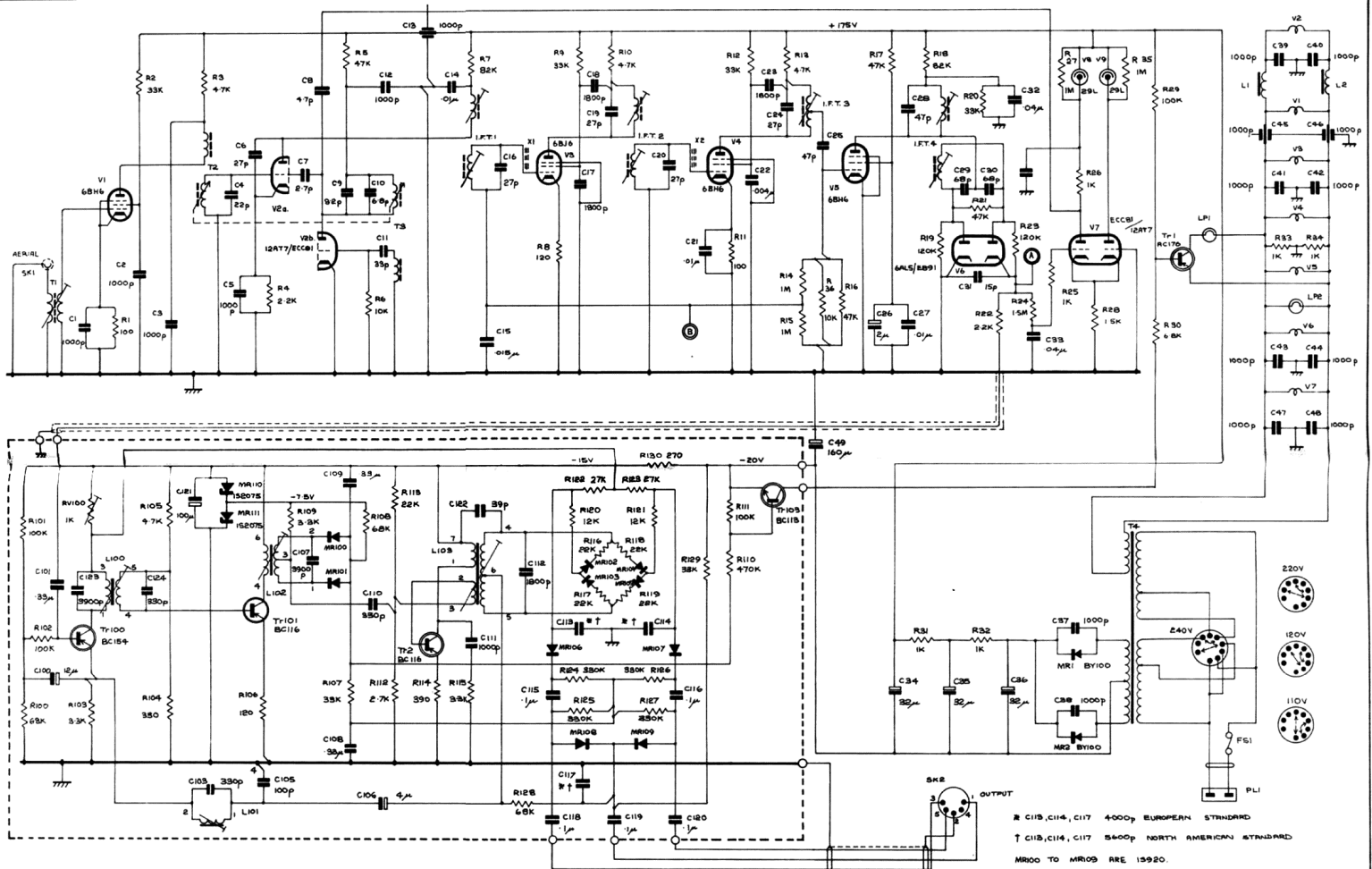
*This instrument is guaranteed against any defect in material or workmanship for a period of twelve calendar months from the date of purchase.*

*Within this period we undertake to supply replacements free of charge for any parts which may prove on examination to be defective provided that such defectiveness is not the result of misuse (including use with unsuitable ancillary equipment), accident or negligence, and further that the instrument was purchased at the proper retail price prevailing in the country of purchase.*

*Any set requiring service under this guarantee should be taken to the supplier through whom it was purchased, or, in case of difficulty, it should be carefully packed and consigned, carriage paid to the main distributor for the country of purchase quoting the date and place of purchase. It must not be sent to any other agent or distributor except by special arrangement.*

*This guarantee is valid only when these conditions are complied with and does not cover labour or carriage costs involved in any repair under the guarantee.*

C12042



\* C18, C14, C17 4000p EUROPEAN STANDARD  
 † C18, C14, C17 5000p NORTH AMERICAN STANDARD  
 MR00 TO MR09 ARE 19920.

ISSUE	DATE	MODIFICATION	ISSUE	DATE	MODIFICATION
No 1	4.12.47	REDRAWN			
No 2	19.1.48	R 9% ADDED.			
No 3	22.5.48	R 24 ADDED. V7 W/6 ECC81/12AT7. C13 & C84 ADDED.			

DRAWN	SM	4.12.47
TRACED	SM	4.12.47
CHECKED	MPA	31.5.47
APPROVED		

<b>QUAD</b> THE ACOUSTICAL MFG. CO. LTD. HUNTINGDON ENGLAND. <b>F. M. II TUNER</b> <b>CIRCUIT DIAGRAM</b>	<b>C12042</b>
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