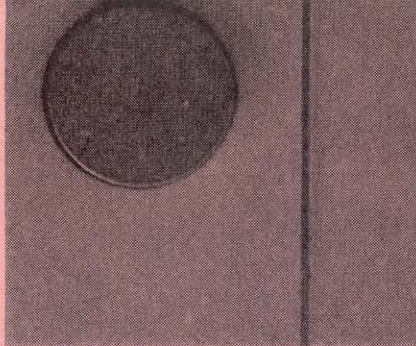
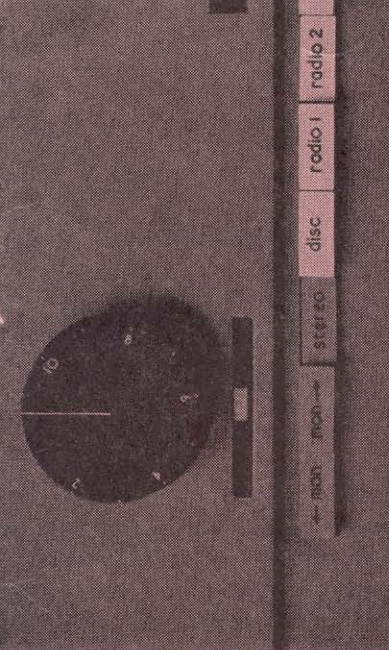
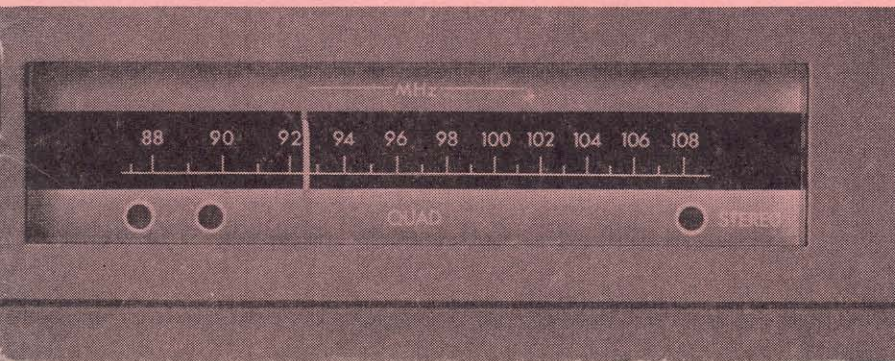




QUAD FM 3 TUNER

instruction booklet



QUAD FM 3 TUNER

instruction booklet

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INTRODUCTION

The Quad FM3 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 override the automatic switching under difficult reception conditions.

The unique twin lamp 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 lamp on the scale lights when a stereo transmission is received, and the scale positions of up to five stations can be marked by the easily re-set station markers.

Inter-station noise is suppressed to an extent determined by the pre-set control at the rear of the tuner.

All internal circuits have been aligned at the factory and the tuner is supplied ready for use. External connectors are in the rear compartments of the moulded polystyrene pack.

INSTALLATION

Mounting

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

In the latter case cut a rectangular aperture 10" x 3" approximately, in the panel using the 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 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, 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.

The tuner requires no ventilation.

Mains Voltage

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

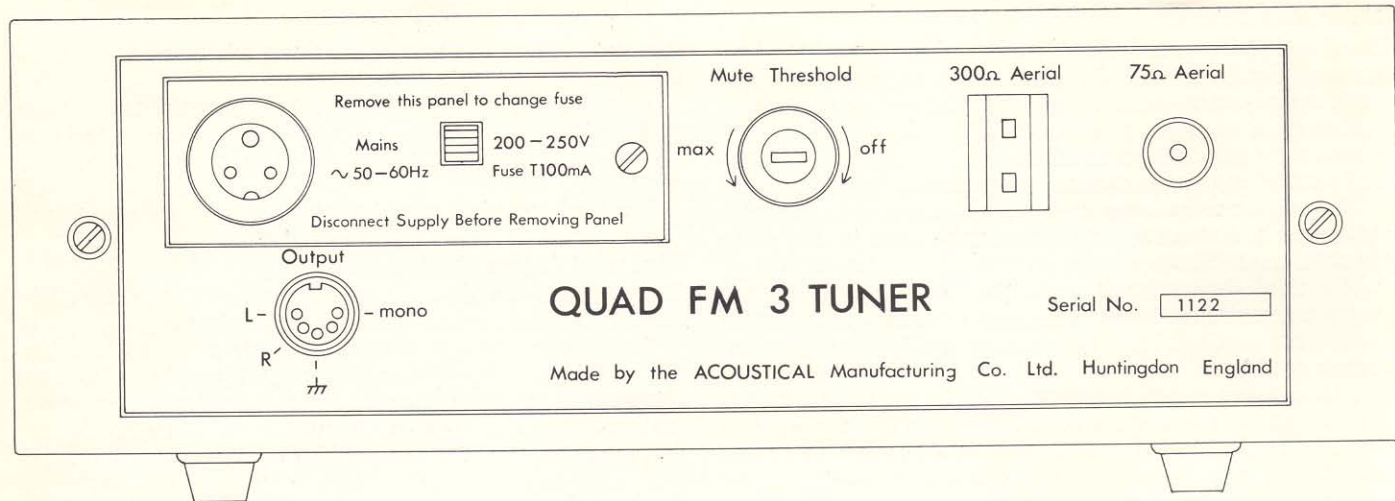
The reversible cover plate at the rear of the tuner determines the position of the slide switch used to effect the circuit change from one voltage range to another and automatically ensures that the switch is correctly set for the voltage marked on the exposed side of the cover plate.

Connections

The tuner is supplied with leads and plugs for direct connection to the Quad 33 control unit. For use with other amplifiers see the separate section under this heading. (Page 6).

Mains

The 3-pin connector fits the corresponding mains input at the rear of the tuner and the plug with the two flat pins at the opposite end of this lead 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 of the tuner.



Rear panel view

Signal

The signal lead is terminated at each end in a 5-pin DIN plug used as:

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

One plug should be inserted into the Radio 1 socket at the rear of the control unit and the other into the DIN socket at the rear of the tuner. The lead is reversible.

Aerial

The tuner provides for either a 75 ohms coaxial feeder or a 300 ohm balanced feeder. Both sockets are at the rear of the tuner and both types of plug are provided. VHF aerials usually consist of dipoles either alone or with reflectors and directors. In general the weaker the signal the more complex the aerial required but as the signal will be affected by such local factors as screening by high ground or nearby buildings and possibly by reflections from them too, as well as by the distance from the transmitter and the power it radiates, the advice of a local specialist dealer should be sought regarding the most suitable type for each location.

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 ideal 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 the interference suppressing capability of FM.

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.

ADJUSTABLE STATION MARKERS

The approximate position on the tuning scale of any five stations may be indicated for future reference by adjusting the station markers. This is done by turning the tuning knob until the scale pointer is aligned with one of the markers, pressing the knob inwards against its spring so as to engage the pointer with the marker, and, still keeping the knob pressed, tuning to the station to be marked. Releasing the knob disengages the pointer from the marker leaving the latter in that position.

Since one marker cannot pass another they should be adjusted in sequence according to the position of the stations on the scale.

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 lamp 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 100mV at 22.5 kHz deviation and the amplifier used should give full output from this signal level. The input resistance of each channel must be greater than 50,000 ohms and any associated capacity not greater than 1000pF.

Check that the pins used in the DIN plug (see page 5) 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 (see Operation). Such an input should comply with the above requirements but before making such connections it should also be ascertained that the amplifier input selector switching does not short circuit inputs not in use.

DE-EMPHASIS

FM broadcasts are pre-emphasised (accentuation of the higher frequencies) prior to transmission and must be de-emphasised at the receiver to restore the correct tonal balance. (This is similar to the record equalisation procedure with discs.) The correct de-emphasis for Britain and Europe is 50 μ sec and for North America 75 μ sec. Normally this will have been correctly set prior to purchase but the 50 μ sec equalisation can be easily converted to

75 μ sec by adding a capacitor of .0056 μ F in parallel with the existing correction capacitor (C109/C112) in each channel. These additional capacitors may most conveniently be located on the underside of the printed circuit board.

OPERATION

Switch on the Quad 33 control unit and press the appropriate bushbuttons. Tune in a station in the normal way guided either by the frequency scale or one of the previously set station markers. Then make the final tuning adjustment using the twin lamp tuning indicator. The correct point is where both lamps are alight and off-setting the tuning to either side causes one to brighten and the other to dim. If the left-hand lamp 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 when, under difficult reception conditions, a weak signal results in too much background noise on stereo.

When the station to which the FM3 is tuned broadcasts stereo the Stereo indicator lamp on the scale will light regardless of the push-buttons pressed.

MUTE THRESHOLD CONTROL

This control is on the rear panel and is intended to be set when the tuner is first installed.

The muting circuit suppresses all incoming signals below a level (threshold) determined by the setting of the Mute Threshold control. With this in the Max position only strong signals will be heard, all weak signals and inter-station noise being suppressed (muted). In the off position there will be virtually no muting and every signal present and all the inter-station noise will be reproduced. Between these two extremes there will be found a position which will permit reception of all usable stations without unnecessary inter-station noise and this setting will depend on both local reception conditions and the user's preference. It is therefore recommended that the control be set initially to the fully off position and advanced as required until the preferred position is found empirically.

Note that both tuning lamps are extinguished when the muting circuit is operated by the noise level rising above the threshold.

GENERAL DESCRIPTION

The FM3 is built on two printed circuit boards. One carries the power supplies and stereo decoder, while the other carries RF, IF and discriminator together with tuning indicator and noise sensing circuits.

RF Board (M12248)

The aerial signal is fed via the tuned circuit L1 C2 to one gate of the RF amplifier, (a dual gate MOS FET device with

integral protection for the gates) and thence via L2 C12 to the mixer TR2. The local oscillator signal, provided by TR4 operating in the earthed collector mode, is injected into the second gate of the mixer via L3a which is inductively coupled to L3b.

The IF output from the mixer TR2 is applied to TR3, an earthed base IF amplifier which provides good matching to the multi-element ceramic filter F1, the output of which is amplified by IC1. Further amplification is provided by IC2 which also incorporates the limiter and discriminator. At pin 14 of IC2 there appear both the recovered audio signal and a d.c. voltage from the discriminator. The audio passes through the low pass filter L7 C44 C46 and thence to the decoder IC101. The d.c. voltage is used to drive the tuning indicator circuit comprising TRs 7, 9, 10, 11, which also provide a d.c. output via R35 and R36, to operate the muting circuit embodied in the decoder. The preset control RV2 enables the tuning indicators to be set for equal brilliance when the discriminator is correctly balanced as part of the alignment procedure.

High frequency noise components of the audio signal are selected by L4, amplified by TR5 and TR6 and detected by MR3. The resultant d.c. activates the muting circuit via TR8 and so mutes the audio output in the presence of weak noisy signals. The gain of the noise amplifier may be varied by RV1 thus pre-setting the noise level (threshold) at which the muting operates.

Stereo Decoder (M12247)

The integrated circuit IC101, provides the functions of 19 kHz amplification, frequency doubling, 38 kHz amplifi-

cation, demodulation, muting and operating the stereo beacon. L101 with C104 and L102 with C105 are tuned to 19 kHz, L103 with C107 is tuned to 38 kHz, and RV101 provides residual crosstalk adjustment. After de-emphasis by C109 and C112, the left and right outputs from pins 11 and 12 are filtered by L104 C114 and L105 C115 to remove the 38 kHz switching components before passing to the output DIN socket.

An accurate mono signal is reconstructed by addition of left and right components in the buffer amplifier TR105.

Power Supply

The power requirements of +14v 150mA and -14v 75mA are provided by two regulators comprising TRs 101-4. Fine adjustment of the output voltages is effected by RV102 and RV103.

SPECIFICATION

Frequency range: 88-108 MHz

Sensitivity: 30dB sig: noise for $1\mu\text{V}$

Aerial input: 75 Ω coaxial

300 Ω balanced

Full limiting: from less than $2\mu\text{V}$

Image rejection: 56dB

IF rejection: 80dB

400 kHz selectivity: 46dB

Capture ratio: 3dB

IF bandwidth: Less than -3dB at ± 120 kHz

Greater than -60dB at ± 400 kHz

Output at 38 kHz and above: -50dB

Frequency response: ± 1 dB 20 Hz-15 kHz

Channel separation: 40dB at 1 kHz

Distortion: at 1 kHz and ± 40 kHz deviation : typically 0.3%

Output: 100mV per channel for 30% modulation

Source impedance: 5k Ω

Recommended load impedance: Greater than 50k Ω

Recommended load capacity: Less than 1000pF

De-emphasis: 50 μ Sec or 75 μ Sec as required

Power input: 100-125/200-250V ; 50-60 Hz ; 6VA

Dimensions: Width 10 $\frac{1}{4}$ " (260 mm)

Height 3 $\frac{5}{8}$ " (92 mm) free standing

3 $\frac{1}{4}$ " (83 mm) panel only

Depth 6 $\frac{1}{2}$ " (165 mm) free standing

5 $\frac{1}{2}$ " (140 mm) behind cabinet panel

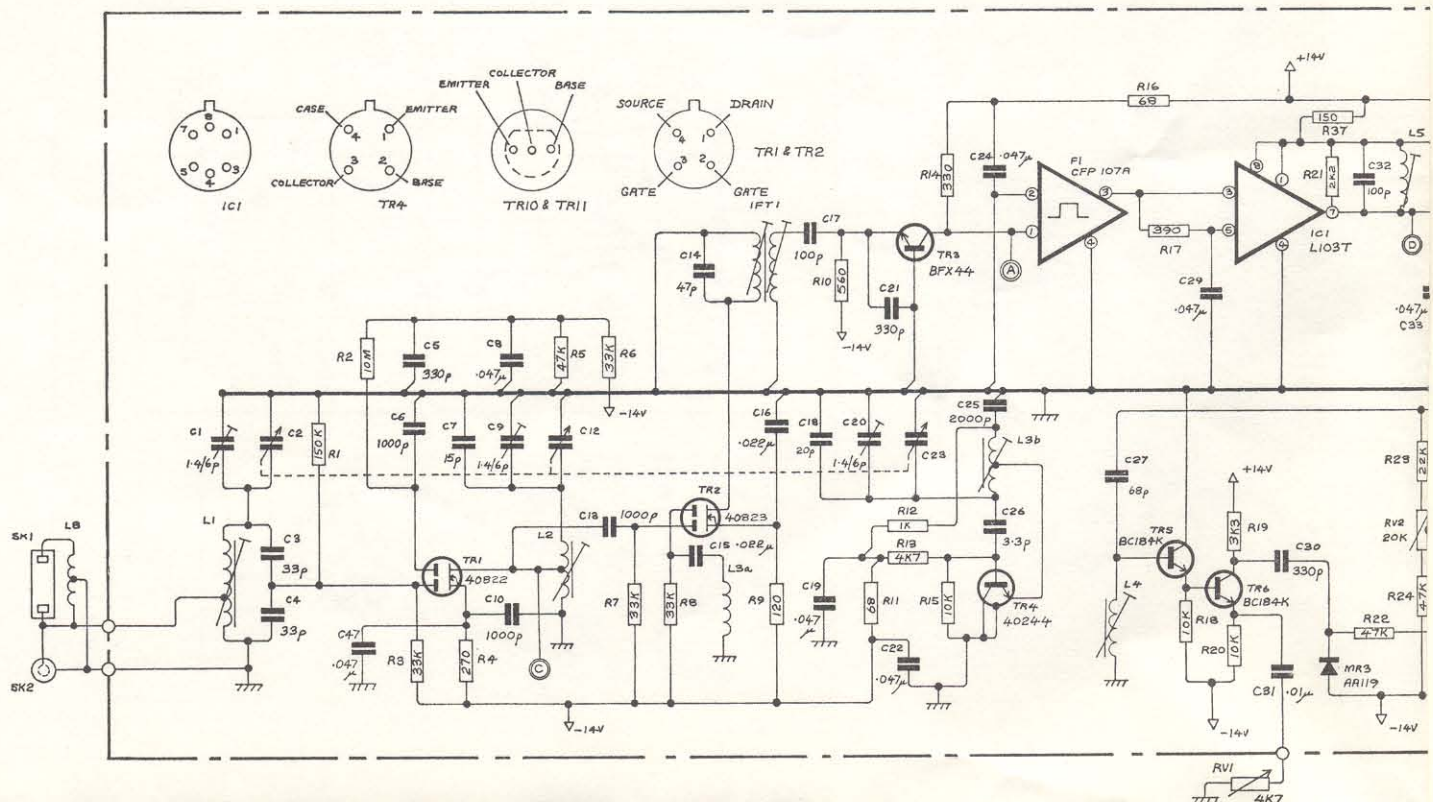
when mounted

(allow 2 $\frac{1}{2}$ " (64 mm)

beyond rear panel for

connectors)

Weight: 6 lb (2.7 Kg)



No	VALUE	TOL	VOL	MAKERS	REFERENCE	STOCK No.	No	VALUE	TOL	VOL	MAKERS	REFERENCE	STOCK No.	No	VALUE	TOL	VOL	MAKERS	REFERENCE	STOCK No.
R1	150K	±10%		ISKRA	UPM 1/4W	193/A	R107	10K	±10%		ISKRA	UPM 1/4W	230/E	C24	0.047μ	±20%		LEMCO	LEMPLAC 12	554/B
R2	10M	±10%		ISKRA	UPM 1/4W	148/A	R108	3K3	±10%		ISKRA	UPM 1/4W	230/E	C25	2000p	±20%		HUNTS	3D18	554/B
R3	33K	±10%		ISKRA	UPM 1/4W	203/D	R109	10K	±10%		ISKRA	UPM 1/4W	230/E	C26	33p	±20%		ERIE	APD	554/B
R4	270	±10%		ISKRA	UPM 1/4W	283/A	R110	4K7	±10%		ISKRA	UPM 1/4W	230/E	C27	68p	±20%		ERIE	APD	554/B
R5	47K	±10%		ISKRA	UPM 1/4W	208/F	R111	3K3	±10%		ISKRA	UPM 1/4W	230/E	C28	0.047μ	±20%		LEMCO	LEMPLAC 12	554/B
R6	33K	±10%		ISKRA	UPM 1/4W	209/D	R112	270	±10%		ISKRA	UPM 1/4W	230/E	C29	330p	±20%		ERIE	APD	554/B
R7	33K	±10%		ISKRA	UPM 1/4W	209/D	R113	3K3	±10%		MULLARD	E 299 D5/220	230/E	C30	330p	±20%		ERIE	APD	554/B
R8	33K	±10%		ISKRA	UPM 1/4W	209/D	R114	3K3	±10%		ISKRA	UPM 1/4W	230/E	C31	0.01μ	±20%	160V	TCC	PMX 1 OR ERO	554/B
R9	120	±10%		ISKRA	UPM 1/4W	300/B	R115	3K3	±10%		ISKRA	UPM 1/4W	230/E	C32	100p	±20%		IN	L5	554/B
R10	560	±10%		ISKRA	UPM 1/4W	265/A	R116	3K3	±10%		ISKRA	UPM 1/4W	230/E	C33	0.047μ	±20%		LEMCO	LEMPLAC 12	554/B
R11	68	±10%		ISKRA	UPM 1/4W	307/B	R117	3K3	±10%		ISKRA	UPM 1/4W	230/E	C34	47p	±20%		LEMCO	LEMPLAC 12	554/B
R12	1K	±10%		ISKRA	UPM 1/4W	258/E	R118	100K	±2%		ISKRA	UPM 1/4W	230/E	C35	0.047μ	±20%		LEMCO	LEMPLAC 12	554/B
R13	4K7	±10%		ISKRA	UPM 1/4W	240/F	R119	100K	±2%		ISKRA	UPM 1/4W	230/E	C36	64μ	±20%		MULLARD	C246/R	554/B
R14	330	±10%		ISKRA	UPM 1/4W	280/C	R120	1K	±10%		ISKRA	UPM 1/4W	230/E	C37	0.01μ	±20%		TCC	PMX 1 OR ERI	554/B
R15	10K	±10%		ISKRA	UPM 1/4W	230/E	R121	1K	±10%		ISKRA	UPM 1/4W	230/E	C38	0.047μ	±20%		LEMCO	LEMPLAC 12	554/B
R16	68	±10%		ISKRA	UPM 1/4W	307/B	R122	150K	±10%		ISKRA	UPM 1/4W	230/E	C39	100p	±20%		ERIE	APD	554/B
R17	390	±10%		ISKRA	UPM 1/4W	275/A	R123	4K7	±10%		ISKRA	UPM 1/4W	230/E	C40	0.047μ	±20%		LEMCO	LEMPLAC 12	554/B
R18	10K	±10%		ISKRA	UPM 1/4W	230/E	R124	150K	±10%		ISKRA	UPM 1/4W	230/E	C41	33p	±5%		ERIE	APD N330	554/B
R19	3K3	±10%		ISKRA	UPM 1/4W	244/B	R125	150K	±10%		ISKRA	UPM 1/4W	230/E	C42	0.047μ	±20%		LEMCO	LEMPLAC 12	554/B
R20	10K	±10%		ISKRA	UPM 1/4W	230/E	R126	150K	±10%		ISKRA	UPM 1/4W	230/E	C43	2000p	±5%	125V	SUFLEX		554/B
R21	2K2	±5%		ISKRA	UPM 1/4W	250/C	R127	180	±10%		ISKRA	UPM 1/4W	230/E	C44	0.047μ	±20%		LEMCO	LEMPLAC 12	554/B
R22	47K	±10%		ISKRA	UPM 1/4W	208/F	C1	1-4/6p			STATITE	R-TAIKO 112-06-5D	554/B	C45	2000p	±5%	125V	SUFLEX		554/B
R23	28K	±10%		ISKRA	UPM 1/4W	217/A	C2				WINGROVE & ROGERS	CQ80 DQ2/R12/17E C2 & C23	554/B	C46	0.047μ	±20%		LEMCO	LEMPLAC 12	554/B
R24	47K	±10%		ISKRA	UPM 1/4W	208/F	C3	33p	±5%		ERIE	APD N330	554/B	C47	0.047μ	±20%		LEMCO	LEMPLAC 12	554/B
R25	68	±10%		ISKRA	UPM 1/4W	307/B	C4	33p	±5%		ERIE	APD N330	554/B	C101	68μ	±5%	35V	UNION	CARBIDE K	554/B
R26	1M	±10%		ISKRA	UPM 1/4W	165/C	C5	330p	±20%		ERIE	APD	554/B	C102	28μ	±5%	250V	MULLARD	C280/RS/R	554/B
R27	150K	±10%		ISKRA	UPM 1/4W	193/A	C6	1000p	±20%		ERIE	TYPE B61	554/B	C103	28μ	±5%	250V	MULLARD	C280/RS/R	554/B
R28	10K	±10%		ISKRA	UPM 1/4W	230/E	C7	15p	±5%		ERIE	APD	554/B	C104	0.01μ	±5%	160V	WIMA	FKS	554/B
R29	150K	±10%		ISKRA	UPM 1/4W	230/E	C8	0.047μ	±20%		LEMCO	LEMPLAC 12P	554/B	C105	0.05μ	±5%		ITT	PMA	554/B
R30	10K	±10%		ISKRA	UPM 1/4W	230/E	C9	1/4p			STATITE	R-TAIKO 112-06-5D	554/B	C106	0.047μ	±5%	250V	TCC	PMX 3 OR ERI	554/B
R31	150K	±10%		ISKRA	UPM 1/4W	193/A	C10	1000p	±20%		ERIE	TYPE B61	554/B	C107	2700p	±5%	160V	WIMA	FKS	554/B
R32	SELECTED ON TEST TO MATCH IC2			ISKRA	UPM 1/4W	230/E	C11	1000p	±20%		WINGROVE & ROGERS	CQ80 DQ2/R12/17E C2 & C23	554/B	C108	64μ	±5%	160V	MULLARD	C426/RS/R	554/B
R33	1K	±10%		ISKRA	UPM 1/4W	300/D	C12				WINGROVE & ROGERS	CQ80 DQ2/R12/17E C2 & C23	554/B	C109	0.01μ	±5%	160V	WIMA	FKS	554/B
R34	10	±10%		ISKRA	UPM 1/4W	240/F	C13	1000p	±20%		ERIE	TYPE B61	554/B	C110	1000p	±5%	25V	ERIE	21105-104-OI	554/B
R35	4K7	±10%		ISKRA	UPM 1/4W	240/F	C14	47p	±2%		IN	I.F.T.1	554/B	C111	1000p	±5%	25V	ERIE	21105-104-OI	554/B
R36	4K7	±10%		ISKRA	UPM 1/4W	240/F	C15	0.02μ	±20%		LEMCO	LEMPLAC 10P	554/B	C112	0.01μ	±5%	160V	WIMA	FKS	554/B
R37	150	±10%		ISKRA	UPM 1/4W	205/A	C16	0.02μ	±20%		LEMCO	LEMPLAC 10P	554/B	C113	300μ	±5%	10V	CALLINS	GPC9-3/I	554/B
R101	150	±10%		ISKRA	UPM 1/4W	295/A	C17	100p	±2%		IN	I.F.T.1	554/B	C114	2700p	±5%	160V	WIMA	FKS	554/B
R102	470	±5%		ISKRA	UPM 1/4W	274/F	C18	20p	±5%		ERIE	APD N330	554/B	C115	2700p	±5%	160V	WIMA	FKS	554/B
R103	2K2	±5%		ISKRA	UPM 1/4W	250/C	C19	0.047μ	±20%		LEMCO	LEMPLAC 12P	554/B	C116	64μ	±5%		MULLARD	C426/RS/R	554/B
R104	33K	±10%		ISKRA	UPM 1/4W	209/D	C20	1/4p			STATITE	R-TAIKO 112-06-5D	554/B	C117	64μ	±5%		MULLARD	C426/RS/R	554/B
R105	33K	±10%		ISKRA	UPM 1/4W	209/D	C21	330p	±20%		ERIE	APD	554/B	C118	64μ	±5%		MULLARD	C426/RS/R	554/B
R106	10K	±10%		ISKRA	UPM 1/4W	230/E	C22	0.047μ	±20%		LEMCO	LEMPLAC 12P	554/B	C119	0.01μ	±5%		ERIE	APD	554/B

MODIFICATIONS

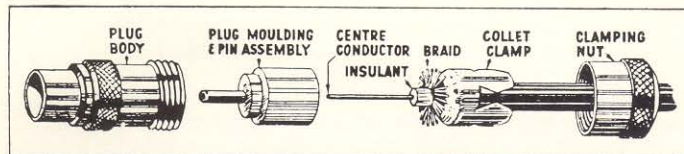
C26 is now 4.7 pF NPO

L101-105 are now Toko type CAN 1980/BX

C105 is now 0.01 mF PMC (Polycarbonate)

A diode type 1S920 has been added between pin 2 of IC 101 and the pink lead from the RF board (anode to pin 2)

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 $\frac{7}{8}$ " 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 reassembling 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.

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.

QUAD is a registered trademark

10" (254 mm)

3.025" (77 mm)

CUTOUT TEMPLATE FOR QUAD CONTROL UNIT & TUNER