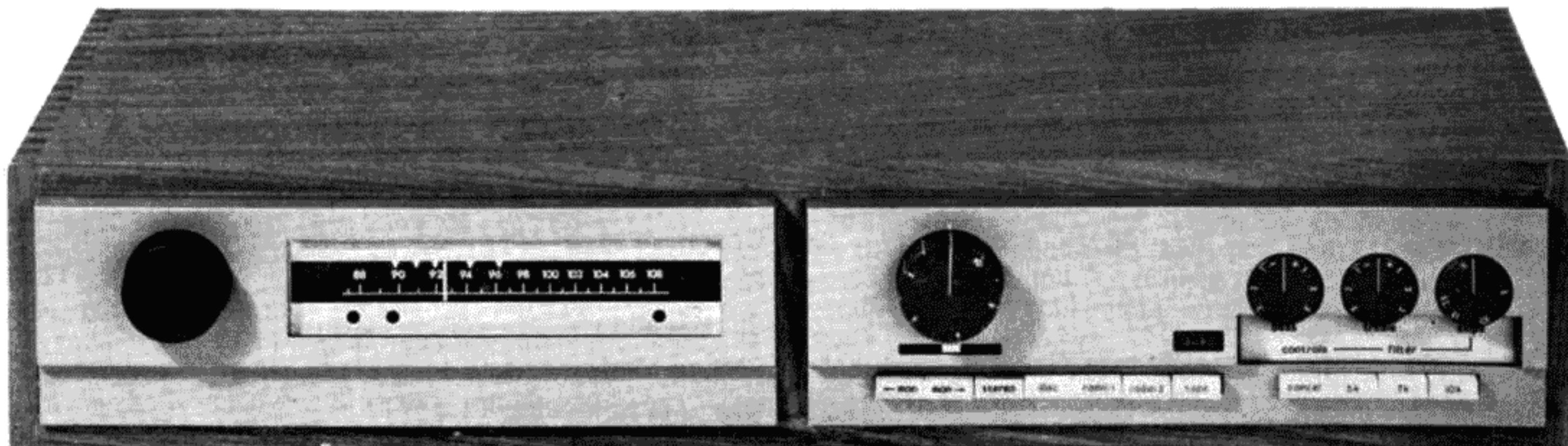


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# FM 3 Stereo Tuner Instruction Book

● QUAD for the closest  
approach to the original sound



Free standing unit comprising QUAD FM3 tuner and QUAD 33 control unit housed in the QUAD afrormosia sleeve

# QUAD FM 3 TUNER

instruction booklet

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Stock No. OIF38EH

## 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

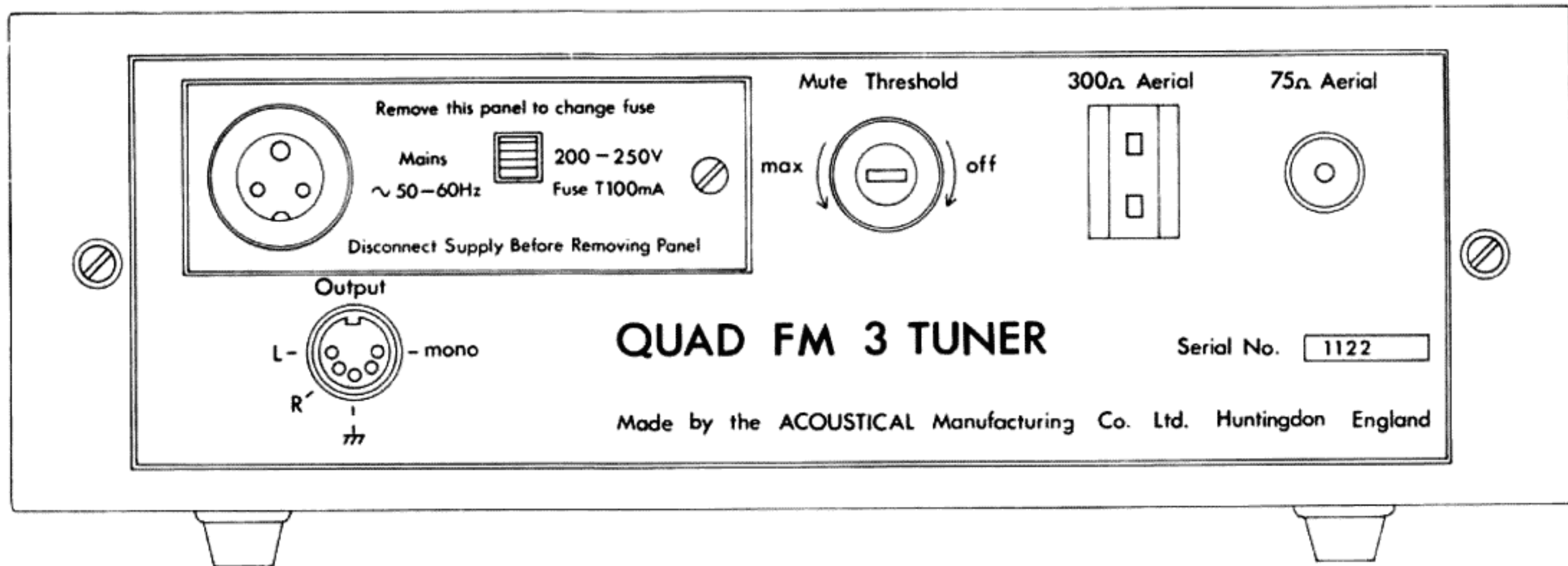
Ensure that the mains voltage adjustment at the rear of the tuner is correctly set for your supply voltage.

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).

When used with the Quad 44 control unit it will be necessary to remove the two-pin American type mains connector and replace it with one of the main output connectors supplied with the Quad 44, and since the PM3 is earthed via the signal lead the centre pin of the mains plug can be left unconnected.



Rear panel view

## **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.

## **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.

### **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 pro-

cedure with discs.) The correct de-emphasis for Britain and Europe is 50 $\mu$ sec and for North America 75 $\mu$ sec. Normally this will have been correctly set prior to purchase but the 50 $\mu$ sec equalisation can be easily converted to 75 $\mu$ sec by adding a capacitor of .0056 $\mu$ F in parallel with each of the existing correction capacitors C108, C110 & C111. These additional capacitors may most conveniently be located on the underside of the printed circuit board.

### **OPERATION**

Switch on the control unit and press the appropriate push-buttons. 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.



The stereo override facility is not available on the Quad 44 unless the output from pin 1 of the tuner is fed to the Auxiliary input.

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.

### **CIRCUIT 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 (M12327)**

The aerial signal is fed via the tuned circuit L1 C2 to one gate of the RF amplifier TR1 (a dual gate MOS FET device with integral protection) and thence via L2 C11 to the mixer TR2. The local oscillator signal provided by TR3 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 via a tuned matching transformer IFT1 to the multi element ceramic filter F1 the output of which feeds IC1.

IC1 contains the IF amplifier and limiter, and provides with L6 a quadrature discriminator. At pin 6 of IC1 there appears both the recovered audio and a d.c. voltage from the discriminator. After passing through an emitter-follower TR6 the audio passes through the low pass filter L7 C31 C32 to the decoder, and the d.c. voltage is used to drive the tuning indicator circuit TRs 7, 9, 10, 11, 12, 13, which also provides an output via R34 and R35 to operate the muting circuit in the stereo decoder. The pre-set control RV2 is used, as part of the alignment procedure, to set the tuning indicators to equal brilliance when correctly tuned to an incoming signal.

High frequency noise components of the audio signal are selected by L4, amplified by TR4 and TR5, and detected by D1. 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 (M12307)**

The audio signal is passed via the muting circuit TR100 to IC100 and TR101. IC100 is a phase locked loop stereo decoder which produces left and right outputs on pins 4 and 5 and a beacon output at pin 6, in the presence of a 19 kHz pilot tone.

The left and right signals pass through active filters (TR106 and 107) to the output DIN socket. An undecoded, i.e. mono, signal is supplied by TR101.

De-emphasis is performed by C108, C110 and C111.

### **Power Supply**

The RF board draws 80 mA from the +14 volt supply and 50 mA from the -14 volt supply.

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## **SPECIFICATION**

*Frequency range:* 88-108 MHz

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

*Aerial input:*  $75\Omega$  coaxial

$300\Omega$  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  $\pm 120$  kHz

Greater than -60dB at  $\pm 400$  kHz

*Output at 38 kHz and above:* -50dB

*Frequency response:*  $\pm 1$ dB 20 Hz—15 kHz

*Channel separation:* 40dB at 1 kHz

*Distortion:* at 1 kHz and  $\pm 40$  kHz deviation : typically 0.3%

*Output:* 100mV per channel for 30% modulation

*Source impedance:*  $5\text{k}\Omega$

*Recommended load impedance:* Greater than  $50\text{k}\Omega$

*Recommended load capacity:* Less than 1000pF

*De-emphasis:*  $50\mu$  Sec or  $75\mu$  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)

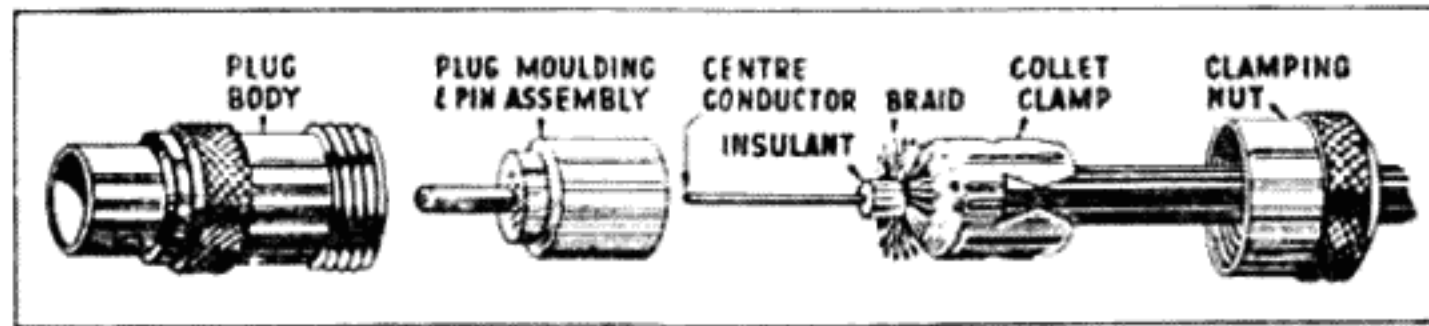
beyond rear panel for

connectors)

*Weight:* 6 lb (2.7 Kg)



# 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 tuner is guaranteed against any defect in material and workmanship for a period of twelve months from the date of purchase.

Within this period we undertake to supply replacement parts free of charge provided that failure was not occasioned by misuse, accident or negligence. Labour and carriage costs are not covered unless by local agreement.

Within the U.K. the guarantee offered with this equipment does not limit the consumer's existing statutory rights.

