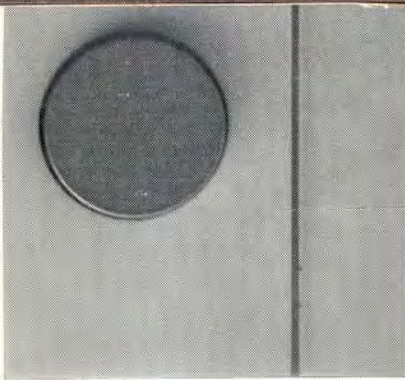
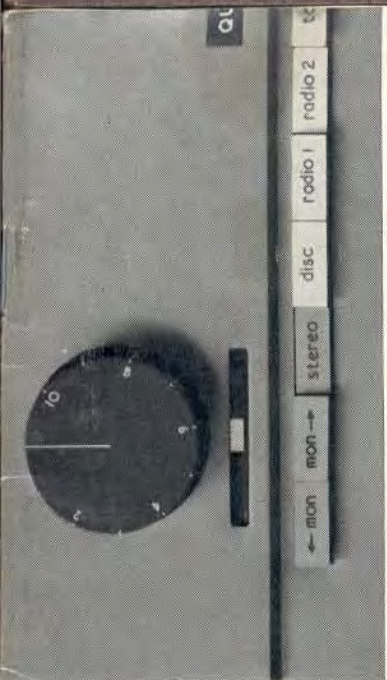
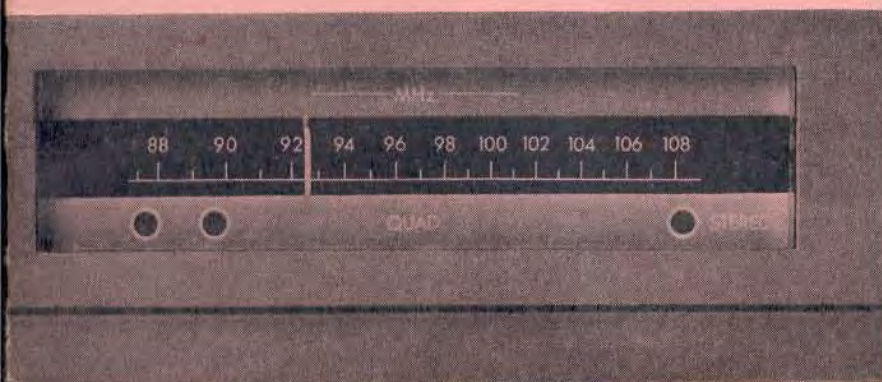


# QUAD FM 3 TUNER

instruction booklet



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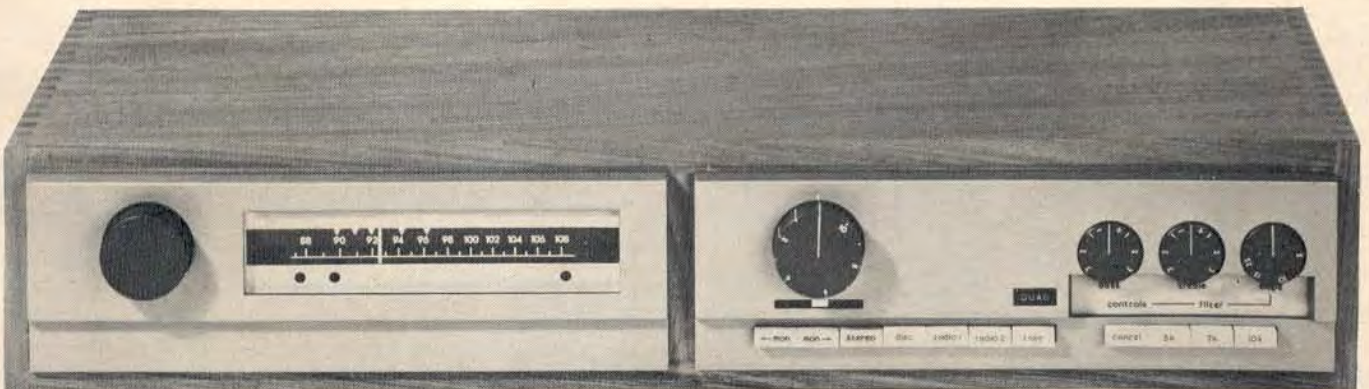
# QUAD FM 3 TUNER

instruction booklet

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St Peters Road, Huntingdon, Hunts, England  
*Telephone: 2561/2 Telegrams: Acoustical, Huntingdon*

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 **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 afrosmosia sleeve

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Issue 2 1M1271

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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.



### 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.

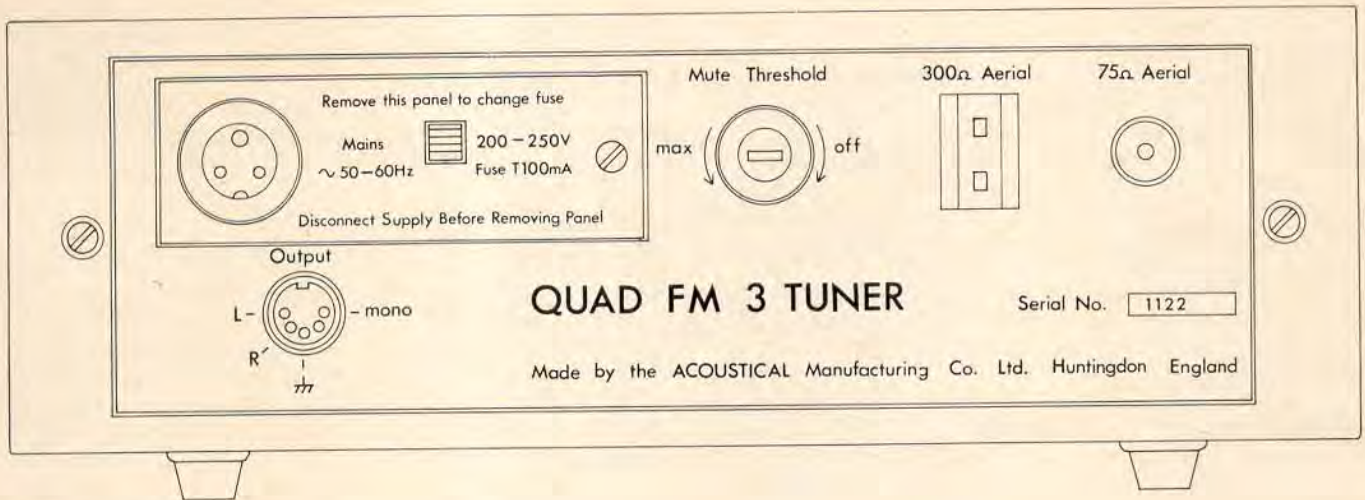
### ADJUSTABLE STATION MARKERS

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).

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Rear panel view



## 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 $\mu$ 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 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.

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## 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 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 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



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 $\mu$ V  
*Aerial input:* 75 $\Omega$  coaxial  
 300 $\Omega$  balanced  
*Full limiting:* from less than 2 $\mu$ 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:*  $\pm$  1dB 20 Hz—15 kHz  
*Channel separation:* 40dB at 1 kHz  
*Output:* 100mV per channel for 30% modulation

*Source impedance:* 5k $\Omega$

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

*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 $\frac{3}{8}$ " (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

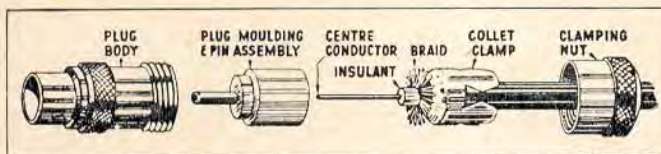
(allow 2 $\frac{1}{2}$ " (64 mm)

beyond rear panel for connectors)

*Weight:* 6 lb (2.7 Kg)

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## 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*

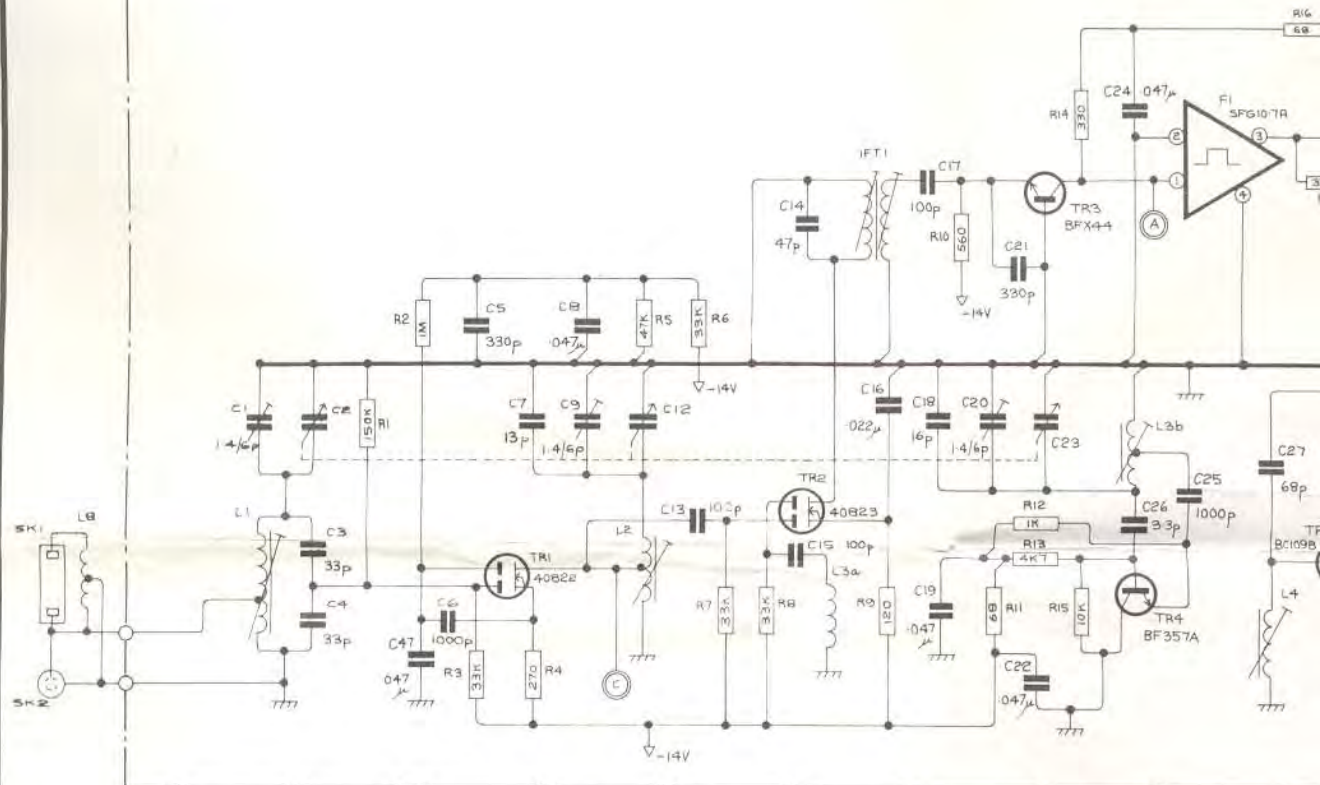












No	VALUE	TOL	VOL	REFERENCE	STOCK No
R1	150K	±10%		1SKRA UPM 050	193/A
R2	1M	±10%		1SKRA UPM 050	165/C
R3	33K	±10%		1SKRA UPM 050	209/D
R4	270	±10%		1SKRA UPM 050	208/F
R5	47K	±10%		1SKRA UPM 050	208/F
R6	33K	±10%		1SKRA UPM 050	209/D
R7	33K	±10%		1SKRA UPM 050	209/D
R8	33K	±10%		1SKRA UPM 050	209/D
R9	120	±10%		1SKRA UPM 050	300/B
R10	560	±10%		1SKRA UPM 050	265/A
R11	68	±10%		1SKRA UPM 050	307/B
R12	1K	±10%		1SKRA UPM 050	268/E
R13	4K7	±10%		1SKRA UPM 050	240/F
R14	330	±10%		1SKRA UPM 050	260/C
R15	10K	±10%		1SKRA UPM 050	230/E
R16	68	±10%		1SKRA UPM 050	307/B
R17	390	±10%		1SKRA UPM 050	275/A
R18	10K	±10%		1SKRA UPM 050	230/E
R19	2K7	±10%		1SKRA UPM 050	248/D
R20	10K	±10%		1SKRA UPM 050	230/E
R21	2K2	±10%		1SKRA UPM 050	250/C
R22	47K	±10%		1SKRA UPM 050	208/F
R23	22K	±10%		1SKRA UPM 050	217/A
R24	47K	±10%		1SKRA UPM 050	208/F
R25	68	±10%		1SKRA UPM 050	307/B
R26	1M	±10%		1SKRA UPM 050	165/C
R27	150K	±10%		1SKRA UPM 050	193/A
R28	10K	±10%		1SKRA UPM 050	230/E
R29	150K	±10%		1SKRA UPM 050	193/A
R30	10K	±10%		1SKRA UPM 050	230/E
R31	150K	±10%		1SKRA UPM 050	193/A
R33	1K	±10%		1SKRA UPM 050	258/E
R34	68	±10%		1SKRA UPM 050	307/B
R35	4K7	±10%		1SKRA UPM 050	240/F
R36	4K7	±10%		1SKRA UPM 050	240/F
R37	150	±10%		1SKRA UPM 050	295/A
R38	10K	±10%		1SKRA UPM 050	230/E
R100	22K	±10%		1SKRA UPM 050	217/A
R101	220	±10%		1SKRA UPM 050	285/A
R102	47K	±10%		1SKRA UPM 050	208/F
R103	3K3	±10%		1SKRA UPM 050	244/B

No	VALUE	TOL	VOL	REFERENCE	STOCK No
R104	390	±10%		1SKRA UPM 050	276/A
R105	4K7	±5%		1SKRA UPM 050	240/H
R106	3K3	±10%		1SKRA UPM 050	244/B
R107	6K8	±5%		1SKRA UPM 050	235/D
R108	18K	±5%		1SKRA UPM 050	220/C
R109	3K3	±10%		1SKRA UPM 050	244/B
R110				MULLARD E295DD/220	
R111	18K	±5%		1SKRA UPM 050	220/C
R112	4K7	±5%		1SKRA UPM 050	240/H
R113	4K7	±5%		1SKRA UPM 050	240/H
R114	1M	±10%		1SKRA UPM 050	165/C
R115	10K	±10%		1SKRA UPM 050	230/E
R116	10K	±10%		1SKRA UPM 050	230/E
R117	10K	±10%		1SKRA UPM 050	230/E
R118	10K	±10%		1SKRA UPM 050	230/E
R119	10K	±10%		1SKRA UPM 050	230/E
R120	10K	±10%		1SKRA UPM 050	230/E
R121	1K	±10%		1SKRA UPM 050	258/E
R122	1K	±10%		1SKRA UPM 050	258/E
R123	4K7	±5%		1SKRA UPM 050	240/H
R124	4K7	±5%		1SKRA UPM 050	240/H
R125	1M	±10%		1SKRA UPM 050	165/C
R126	1M	±10%		1SKRA UPM 050	165/C
R127	3K3	±10%		1SKRA UPM 050	244/B
R128	220	±10%		1SKRA UPM 050	285/A
C1	14/p			STEARITE R-TRIKO 112-06-50	554/B
C2				DAU 338/30	554/B
C3	33p	±5%		ERIE APD N330	537/B
C4	33p	±5%		ERIE APD N330	537/B
C5	330p	±20%		ERIE APD	523/C
C6	1000p	±20%		ERIE B61	516/B
C7	13p	±5%		ERIE APD N330	
C8	047μ	±78%		LEMCO LEMPLAC 12P	500/1
C9	14/p			STEARITE R-TRIKO 112-06-50	554/0
C12				DAU 338/30	554/B
C13	100p			ERIE AD	
C14	47p	±2%		IN IFT1	
C15	100p			ERIE AD	504/A
C16	022μ	±80%		LEMCO LEMPLAC 10P	504/A
C17	100p	±2%		IN IFT1	
C18	16p	±5%		ERIE APD N220	