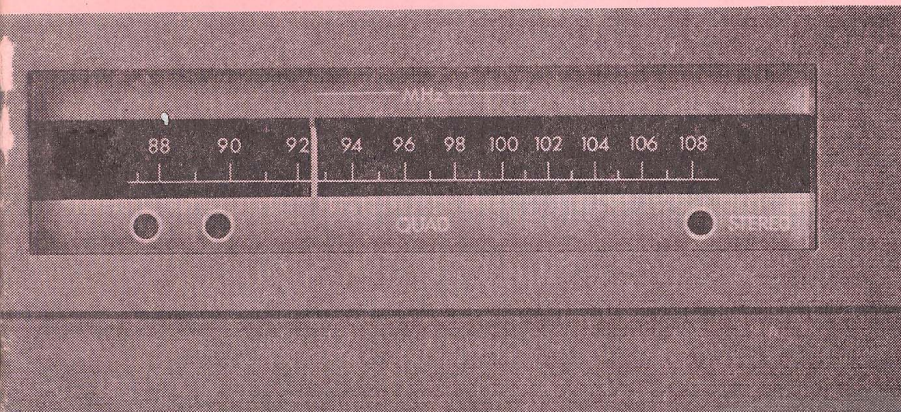


service supplement

QUAD FM 3 TUNER



QUAD FM 3 TUNER

service supplement

Contents	<i>page</i>
Alignment – IF	2
RF	3
Circuit Diagram	inside rear cover
Decoder	4
Detector Probe	2
Drive Cord replacement	5
Equipment required	2
Filter Coding	2
Front Panel Assembly	8
Modifications	7
Noise Sensing Coil	4
Response Curves	3
Voltage Adjustment	2
Voltage Readings	7

The Acoustical Manufacturing Co. Ltd
St Peters Road, Huntingdon, Hunts, England
*Telephone: 0480-52561/2 Telegrams: Acoustical,
Huntingdon*

500-2.72

ALIGNMENT PROCEDURE

General

To achieve the specified performance this alignment procedure should be followed closely. Alignment should not be attempted without the equipment listed below.

Equipment required

- 1 10.7 MHz wobblator with a maximum output of 100mV rms.
- 2 Oscilloscope with a maximum Y sensitivity of 10mV/cm and D.C. coupled Y amplifier.
- 3 VHF signal generator covering the range 88-108MHz, with AM and FM modulation facilities and an attenuator accurate at signal levels of $2\mu\text{V}$. (e.g. the Radiometer MS27).
- 4 Stereo signal generator with both multiplexed audio and multiplex RF outputs (e.g. the Radiometer SMG1).
- 5 Harmonic distortion meter or 19KHz notch filter.
- 6 Detector probe (a suitable circuit is shown in fig. 1).

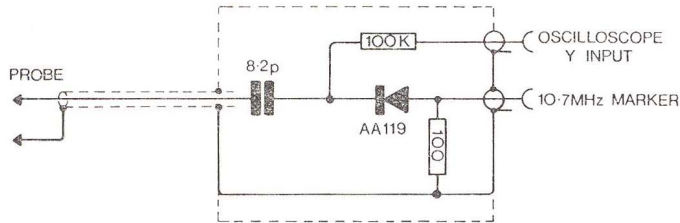


Fig. 1 Suggested Circuit of Detector Probe

2

Filter coding

The ceramic filters (F1) used are colour coded to denote their centre frequency as follows:

Green	$10.62 \pm .03\text{MHz}$	White	$10.74 \pm .03\text{MHz}$
Blue	$10.66 \pm .03\text{MHz}$	Yellow	$10.78 \pm .03\text{MHz}$
Red	$10.70 \pm .03\text{MHz}$		

If crystals are available for these frequencies they can be used with a marker oscillator to aid alignment, but this is not essential since the actual intermediate frequency will be adjusted to suit the filter during alignment.

HT Voltage adjustment

Set the positive and negative supplies to 14v by means of RV102 and RV104 respectively.

IF Alignment

Connect the detector probe to test point D, inject a wobbled 10.7MHz signal at test point C, and observe the probe output on the oscilloscope. Throughout the following procedure progressively reduce the wobblator output as necessary to maintain an oscilloscope display amplitude of approximately 50mV peak to peak.

If a 10.7MHz crystal oscillator is available it may be injected at the appropriate probe terminals to provide a marker. Adjust both cores of IFT1 simultaneously for a maximum response.

Adjust the core of L5 for maximum response.

Make small adjustments to IFT1 and L5 cores as necessary to obtain the response shown in fig. 2.

IFT 1

L5

IF responses: The amplitudes shown should be obtained when the generator output is set to give the response of Fig. 4.

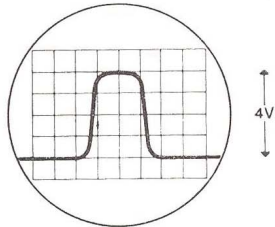


Fig. 2 Response at output of IC1 (Test point D)

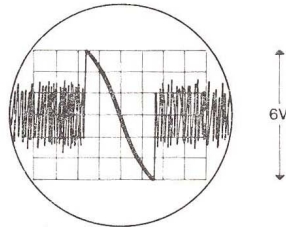


Fig. 3 Discriminator response (Test point B)

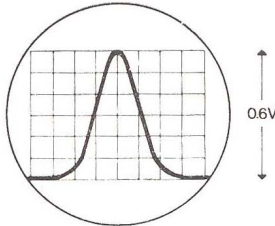


Fig. 4 Response at test point A, with filter removed

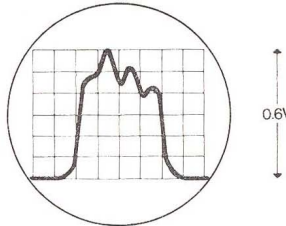


Fig. 5 Response at test point A, with filter present

Remove detector probe from test point D and transfer oscilloscope input lead to point B (Pink interconnecting lead). Adjust core of discriminator coil L6 for maximum slope of the centre portion of the discriminator characteristic.

Transfer probe to test point A and unsolder the

filter input pin (pin 1). This is necessary since the response at this point (fig. 5) is dominated by the filter input impedance. It should be noted that the peak response at this point does not correspond with the filter centre frequency.

The response at test point A with filter removed is shown in fig. 4 and should show no signs of double humping. If it does it will be necessary to replace IFT1.

Remove wobbulator input but retain detector probe at test point A.

R.F. Circuit Alignment

Connect the RF generator to the aerial socket and inject a $300\mu V$, 75% amplitude modulated signal at 90MHz. Preset the cores of L1, L2, L3 level with the tops of the formers, and the trimming capacitors C1, C9, C20 approximately three threads out. Check that pointer travel is symmetrical about end scale markings, and that pointer is fixed to string. (If necessary secure with spot of Durofix or similar adhesive).

Set the tuner to 90MHz and adjust the cores of L3, L2, L1 in that order for maximum amplitude of oscilloscope display. If the front end of the tuner is badly misaligned it may be necessary temporarily to increase the generator output slightly. Caution should be exercised since it is possible to align to a spurious response if too high an input level is used. It should be possible to obtain about 10mV peak to

IFT 1

L1
L2
L3
C1
C9
C20

L6

peak at the probe output for an RF input of $300\mu\text{V}$ or less. Necessity to apply an input signal greater than 1mV should be treated as a fault condition.

Retune generator and tuner to 104MHz and adjust C20, C9 and C1 in that order for maximum response.

Repeat adjustment of cores and trimmers until no further improvement is possible.

Remove probe, resolder filter pin 1 and connect oscilloscope to test point B, together with valve voltmeter. Inject $2\mu\text{V}$ 90MHz 30% FM at aerial socket.

Retune tuner to 90MHz observing the oscilloscope. The correct tuning point occurs with noise just showing in equal amounts on positive and negative peaks of the audio output.

Make small adjustments to the core of L6 to obtain maximum audio output level as observed on the voltmeter.

Adjustment of Noise sensing coil L4

Adjustment of this core should be unnecessary unless it is not possible to mute signals below $100\mu\text{V}$.

If alignment is necessary, connect a suitable amplifier to the audio output socket and the FM generator to the aerial socket. Unscrew the core of L4 until level with top of can.

C1
C9
C20

Inject an FM signal of $10\mu\text{V}$ and advance the mute control to the point just prior to muting. Screw the core of L4 in until muting occurs. Increase the signal level until the tuner comes out of muting and re-adjust L4. Repeat adjustments of L4 progressively increasing signal level until no further improvements are possible.

This completes the RF board alignment with the exception of L7 which must be aligned in conjunction with the decoder.

L7

Decoder

Remove the pink inter-board lead from the decoder and inject a 19KHz pilot tone at a level of 30mV from the multiplex generator.

L6

Connect the valve voltmeter by means of un-screened cable, to the tap on L101. Adjust the core of L101 for maximum output. L102 and L103 are aligned in a similar manner with the valve voltmeter connected to their respective taps.

L101
L102
L103

L4

Connect the distortion meter input to the output socket Pin 5 and tune the distortion meter to 19KHz . Observe the distortion meter output on the oscilloscope which will show the residual 38KHz switching components together with smaller quantities of harmonics. Adjust the core of L104 for minimum display amplitude. Similarly connect the distortion meter to Pin 3 and adjust L105.

L104
L105

With the distortion meter still connected to Pin 3, apply a stereo signal modulated with 1KHz on right channel only and adjust RV101 for minimum crosstalk. Slight adjustments of L101 in conjunction with RV101 should now enable the crosstalk to be reduced to a small second harmonic component. Remove the multiplex input and reconnect the pink interconnecting lead. Inject at the aerial an FM stereo signal carrying right channel modulation at 1KHz.

Again observing the distortion meter output adjust the core of L7 for minimum crosstalk. As a check on these last three separation adjustments apply 10KHz right channel modulation and measure crosstalk which should be better than -30dB.

INSTRUCTIONS FOR REPLACING DRIVE CORD

(see Fig. 6)

Use nylon braided glass cored cord such as Finlayson size 20. Ensure that it does not come into contact with lubricant on pulley spindles.

Remove front panel (4 screws) and tuning drum (2 grub screws).

Take 16 inches (40 cm) of cord, knot one end and trim, then thread through hole (2).

Take another length of cord 30 inches (76 cm) long, knot one end and trim, then thread through hole (6) to outer edge of tuning drum (1) and through hole (7).

Turn tuning capacitor to fully closed position, replace tuning drum in position shown in Fig. 6. Lay the shorter length of cord around drum (1 turn) in clockwise direction to pulley (3). Attach free end of cord to spring (4), so that spring is approximately $\frac{1}{4}$ " from pulley (5). Remove surplus cord and loop free end of spring temporarily to pulley (5) spindle.

Take other length of cord, and lay around tuning drum ($2\frac{1}{2}$ turns) in anticlockwise direction to capstan (8), around capstan (2 turns) in clockwise direction to pulley (9), then around pulleys (10) and (5). Attach cord to free end of spring, allowing spring to extend 25%, and remove surplus cord.

Replace front panel, then with tuning capacitor fully closed, replace pointer (11) so that it lies at tuning knob end of scale line.

L7

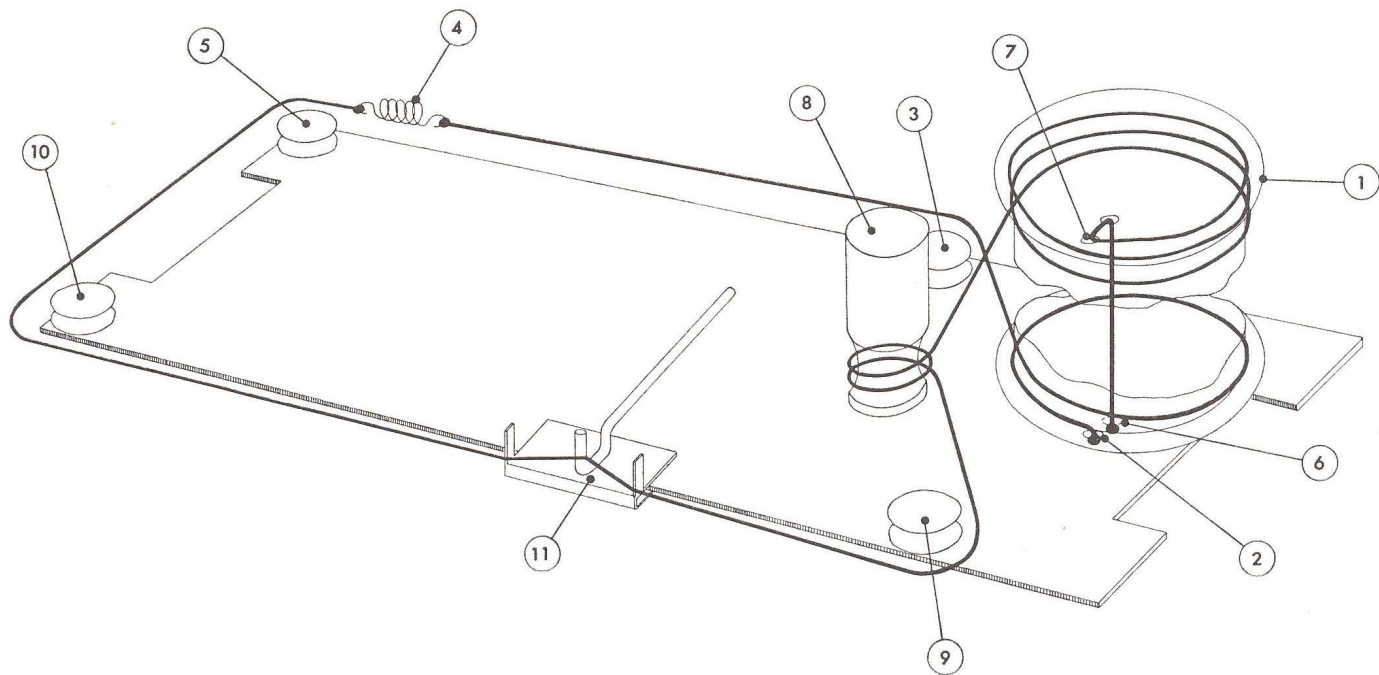


Fig. 6. Replacing Drive Cord

Voltage Readings

All readings are subject to 10% variation and are measured with 20,000 Ω /volt meter, with HT rails set to $\pm 14V$ and a signal tuned in.

<i>Location</i>	<i>Voltage measured between</i>	<i>Reading</i>
Source TR1	Source TR1 and $-14V$	0.2V
Source TR2	Source TR2 and $-14V$	2.7V
Collector TR3	Collector and chassis	4.5V
Emitter TR4	Across R12	3.9V
Pin 1 IC1	Pins 1 and 8	2.0V
Pin 6 IC2	Pin 6 and chassis	1.3V
Pin 14 IC2	Pin 14 and chassis	7.0V
Collector TR6	Collector and chassis	9.8V
Emitter TR10 or 11	Emitter and chassis	7.0V
ICI01 Pin 8	Pin 8 and chassis	9.0V
ICI01 Pin 11	Pin 11 and chassis	6.5V
ICI01 Pin 12	Pin 12 and chassis	6.5V
ICI01 Pin 1	Pin 1 and chassis	9.0V
ICI01 Pin 10	Pin 10 and chassis	3.7V
Emitter TR105	Emitter and chassis	5.8V

MODIFICATIONS

RF Board

From Serial No. 540 onwards

- 1 New L6 coil coded yellow.
- 2 L5—modified* and mounted with colour spot to R16.
- 3 MR4, MR5 removed and replaced by 4K7 resistors.

- 4 C11 removed.
- 5 R32 removed.
- 6 C32 changed from 33pF to 18pF.
- 7 R12 changed from 680 Ω to 1K.
- 8 R21 changed to 2K2.
- 9 C34 changed to 47pF.
- 10 C47 .47 μ F added.

From Serial No. 1500 onwards

Issue 4 printed circuit board M12248

- 1 R37 added.
- 2 L5 unmodified* as pre 540.
- 3 R32 restored (see parts list re value).

* Modification to coil L5 comprised cutting off the unused centre legs to permit re-orientation.

Decoder

From Serial No. 540 onwards

R103 removed.
C105 changed to .015 μ F
L102 modified
R126 changed to 180 Ω

From Serial No. 900 onwards

R101 changed to 150 Ω

Alternative transistors

Early tuners used type 40673 for both TR1 and TR2. For replacements use type 40822 for TR1 and 40823 for TR2.

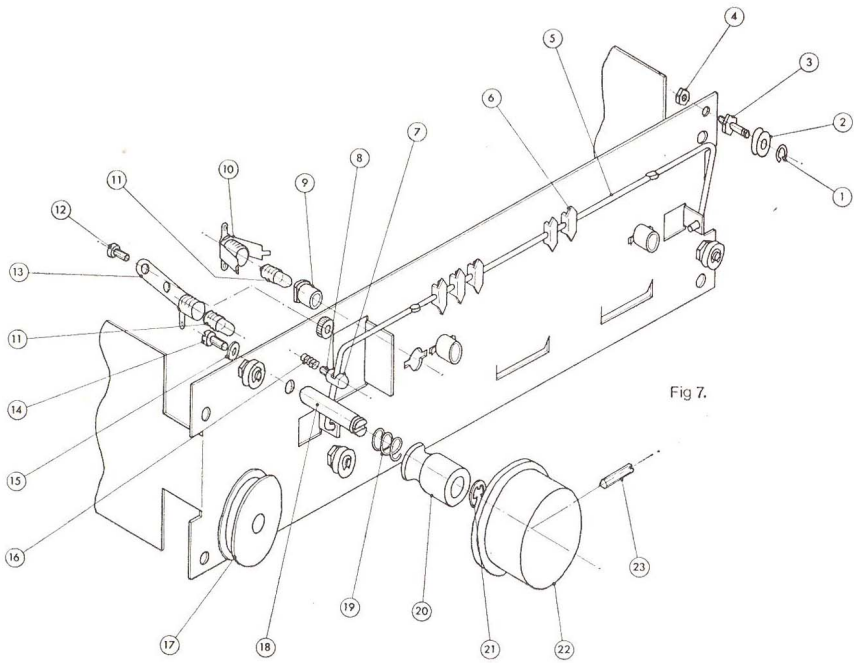
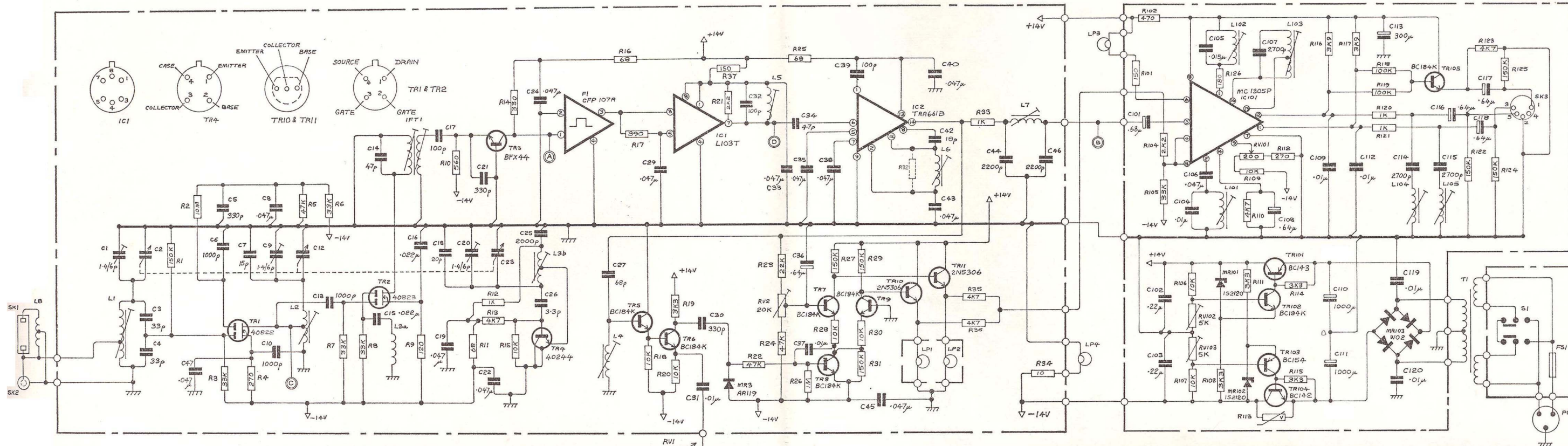


Fig 7.

<i>No.</i>	<i>Description</i>	<i>Stock No.</i>
1	Circlip	752/K
2	Pulley	748/Q
3	Pulley Spindle	A12208
4	6BA Nut	16/B
5	Station Marker Support	A12193
6	Station Marker	A12199
7	Tappet	A12234
8	6BA Grub Screw	7/G
9	Bush	752/L
10	Lampholder	691/H
11	Bulb	690/M
12	6BA Screw	80/D
13	Lampholder	691/K
14	4BA Screw	63/D
15	Friction Washer	103/D
16	Tappet Spring	12833
17	Tuning Drum	A12198
18	Support	A12168/3
19	Capstan Spring	31275
20	Capstan	A12168/2
21	Circlip	748/N-A
22	Knob	A12168/1
23	4BA Grub Screw	7/D



QUAD FM3 TUNER

No	VALUE	TOL	VOL	MAKERS	REFERENCE	STOCK No.	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 12P	500/I	C120	0.01μ			ERIE	BPD	506/H	
R2	10M	±10%		ISKRA	UPM 1/4W	148/A	R108	3K3	±10%		ISKRA	UPM 1/4W	244/B	C25	2000p			HUNTS	BD18	515/C	R11	4K7			PLESSEY	TYPE MP 404/8/02852		
R3	33K	±10%		ISKRA	UPM 1/4W	209/D	R109	10K	±10%		ISKRA	UPM 1/4W	230/E	C26	3.3p			ERIE	APD	548/H	R12	20K			MORGANITE	TYPE 62H OR PIHER PTIOU		
R4	270	±10%		ISKRA	UPM 1/4W	283/A	R110	4K7	±10%		ISKRA	UPM 1/4W	240/F	C27	68p			ERIE		529/D	R13	33K						
R5	47K	±10%		ISKRA	UPM 1/4W	208/F	R111	3K3	±10%		ISKRA	UPM 1/4W	244/B	C28	0.047μ	±20%		LEMCO	LEMPLAC 12P	500/I	R14	330						
R6	33K	±10%		ISKRA	UPM 1/4W	209/D	R112	270	±10%		ISKRA	UPM 1/4W	283/A	C29	0.047μ	±20%		LEMCO	LEMPLAC 12P	500/I	R15	10K						
R7	33K	±10%		ISKRA	UPM 1/4W	209/D	R113	3K3	±10%		ISKRA	UPM 1/4W	244/B	C30	330p			ERIE	APD	548/H	R16	68						
R8	33K	±10%		ISKRA	UPM 1/4W	209/D	R114	3K3	±10%		ISKRA	UPM 1/4W	244/B	C31	0.01μ	±2%	160V	TCC	PMX 1 OR EROFOL 30 KT 1807-310/1	506/K	R17	4K7						
R9	120	±10%		ISKRA	UPM 1/4W	209/D	R115	100K	±2%		ISKRA	UPM 1/4W	200/C	C32	100p			IN L5		534/A	R18	10K						
R10	560	±10%		ISKRA	UPM 1/4W	265/A	R116	3K9	±2%		ISKRA	UPM 1/4W	241/D	C33	0.047μ	±20%		LEMCO	LEMPLAC 12P	500/I	R19	120						
R11	68	±10%		ISKRA	UPM 1/4W	307/B	R117	3K9	±2%		ISKRA	UPM 1/4W	241/D	C34	4.7p			LEMCO	7X4mm	500/I	R20	1K						
R12	1K	±10%		ISKRA	UPM 1/4W	258/E	R118	100K	±2%		ISKRA	UPM 1/4W	200/C	C35	0.047μ	±20%		LEMCO	LEMPLAC 12P	500/I	R21	1K						
R13	4K7	±10%		ISKRA	UPM 1/4W	240/F	R119	100K	±2%		ISKRA	UPM 1/4W	200/C	C36	6.4μ			MULLARD	C246/RS/H064	489/A	R22	4.7K						
R14	330	±10%		ISKRA	UPM 1/4W	209/D	R120	1K	±10%		ISKRA	UPM 1/4W	258/E	C37	0.01μ	±2%	160V	TCC	PMX 1 OR EROFOL 30 KT 1807-310/1	506/K	R23	20K						
R15	10K	±10%		ISKRA	UPM 1/4W	230/E	R121	1K	±10%		ISKRA	UPM 1/4W	258/E	C38	0.047μ	±20%		LEMCO	LEMPLAC 12P	500/I	R24	4.7K						
R16	68	±10%		ISKRA	UPM 1/4W	307/B	R122	150K	±10%		ISKRA	UPM 1/4W	193/A	C39	100p			ERIE	APD	528/B	R25	68						
R17	390	±10%		ISKRA	UPM 1/4W	275/A	R123	4K7	±10%		ISKRA	UPM 1/4W	240/F	C40	0.047μ	±20%		LEMCO	LEMPLAC 12P	500/I	R26	4.7K						
R18	10K	±10%		ISKRA	UPM 1/4W	230/E	R124	150K	±10%		ISKRA	UPM 1/4W	193/A	C41	0.047μ	±20%		LEMCO	LEMPLAC 12P	500/I	R27	150K						
R19	3K3	±10%		ISKRA	UPM 1/4W	244/B	R125	150K	±10%		ISKRA	UPM 1/4W	193/A	C42	33p	±5%		ERIE	APD N330	537/B	R28	150K						
R20	10K	±10%		ISKRA	UPM 1/4W	230/E	R126	180	±10%		ISKRA	UPM 1/4W	290/B	C43	0.047μ	±20%		LEMCO	LEMPLAC 12P	500/I	R29	150K						
R21	2K2	±5%		ISKRA	UPM 1/4W	250/C							C44	2200p	±5%	125V	SUFLEX		514/M	R30	10K							
R22	47K	±10%		ISKRA	UPM 1/4W	208/F							C45	0.047μ	±20%		LEMCO	LEMPLAC 12P	500/I	R31	150K							
R23	22K	±10%		ISKRA	UPM 1/4W	217/A							C46	2200p	±5%	125V	SUFLEX		514/M	R32	150							
R24	47K	±10%		ISKRA	UPM 1/4W	208/F							C47	0.047μ	±20%		LEMCO	LEMPLAC 12P	500/I	R33	1K							
R25	68	±10%		ISKRA	UPM 1/4W	307/B															R34	10						
R26	1M	±10%		ISKRA	UPM 1/4W	165/C															R35	4K7						
R27	150K	±10%		ISKRA	UPM 1/4W	193/A															R36	4K7						
R28	10K	±10%		ISKRA	UPM 1/4W	230/E															R37	150						
R29	150K	±10%		ISKRA	UPM 1/4W	193/A																						
R30	10K	±10%		ISKRA	UPM 1/4W	230/E																						
R31	150K	±10%		ISKRA	UPM 1/4W	193/A																						
R32	SELECTED ON TEST TO MATCH IC2. ISK TO 100K																											
R33	1K	±10%		ISKRA	UPM 1/4W	258/E																						
R34	10	±10%		ISKRA	UPM 1/4W	320/D																						
R35	4K7	±10%		ISKRA	UPM 1/4W	240/F																						
R36	4K7	±10%		ISKRA	UPM 1/4W	240/F																						
R37	150	±10%		ISKRA	UPM 1/4W	205/A																						
R101	150	±10%		ISKRA	UPM 1/4W	295/A																						
R102	470	±5%		ISKRA	UPM 1/4W	270/F																						
R104	2K2	±5%		ISKRA	UPM 1/4W	250/C																						
R105	33K	±10%		ISKRA	UPM 1/4W	209/D																						
R106	10K	±10%		ISKRA	UPM 1/4W	230/E																						
C1	1.4/6p			STARTITE	R-TRIKO 112-06-5D	554/D	C1	1.4/6p			STARTITE	R-TRIKO 112-06-5D	554/D	C101	68μ		35V	UNION	CARBIDE	KR68E35	488/B	C109	2700p	±5%	160V	WIMA	FKS	514/B
C2	33p	±5%		ERIE	APD N330	537/B	C2	33p	±5%		ERIE	APD N330	537/B	C102	0.22μ		250V	MULLARD	C280/RE/RE20K	494/C	C110	1000μ						
C3	33p	±5%		ERIE	APD N330	537/B	C3	33p	±5%		ERIE	APD N330	537/B	C103	0.22μ		250V	MULLARD	C280/RE/RE20K	494/C	C111	1000μ						
C4	330p	±20%		ERIE	APD	548/H	C4	330p	±20%		ERIE	APD	548/H	C104	0.01μ	±5%	160V	WIMA	FKS	506/J	C112	0.01μ	±5%	160V	WIMA	FKS	506/J	
C5	1000p	±20%		ERIE	TYPE 861	549/C	C5	1000p	±20%		ERIE	TYPE 861	549/C	C105	0.015μ			ITT	PMA		C113	300μ		10V	CALLINS	8PC9-3/1	484/A	
C6	15p	±5%		ERIE	APD	548/H	C6	15p	±5%		ERIE	APD	548/H	C106	0.047μ		250V	TCC	PMX 3 OR EROFOL 30 KT 1807-347/1	500/H	C114	2700p	±5%	160V	WIMA	FKS	514/B	
C7	15p	±5%		ERIE	APD	548/H	C7	15p	±5%		ERIE	APD	548/H	C107	2700p	±5%	160V	WIMA	FKS	514/B	C115	2700p	±5%	160V	WIMA	FKS	514/B	
C8	0.047μ	±20%		LEMCO	LEMPLAC 12P	500/I	C8	0.047μ	±20%		LEMCO	LEMPLAC 12P	500/I	C108	0.047μ		160V	MULLARD	C426/RS/H064	489/A	C116	0.047μ		160V	MULLARD	C426/RS/H064	489/A	
C9	1.4/6p			STARTITE	R-TRIKO 112-06-5D	554/D	C9	1.4/6p			STARTITE	R-TRIKO 112-06-5D	554/D	C109	0.047μ		250V	TCC	PMX 3 OR EROFOL 30 KT 1807-347/1	500/H	C117	6.4μ						
C10	1000p	±20%		ERIE	TYPE 861	549/C	C10	1000p	±20%		ERIE	TYPE 861	549/C	C110	1000μ			ERIE	21105-104-0102-0A-0250	450/B	C118	6.4μ						
C11	1.4/6p			STARTITE	R-TRIKO 112-06-5D	554/D	C11	1.4/6p			STARTITE	R-TRIKO 112-06-5D	554/D	C111	1000μ			ERIE	21105-104-0102-0A-0250	450/B	C119	0.01μ						
C12	47p	±2%		IN I.F.T. 1		504/A	C12	47p	±2%		IN I.F.T. 1		504/A	C112	0.01μ	±5%	160V	WIMA	FKS	506/J	C120	0.01μ						
C13	1000p	±20%		ERIE	TYPE 861	549/C	C13	1000p	±20%		ERIE	TYPE 861	549/C	C113	300μ		10V	CALLINS	8PC9-3/1	484/A								
C14	47p	±2%																										

