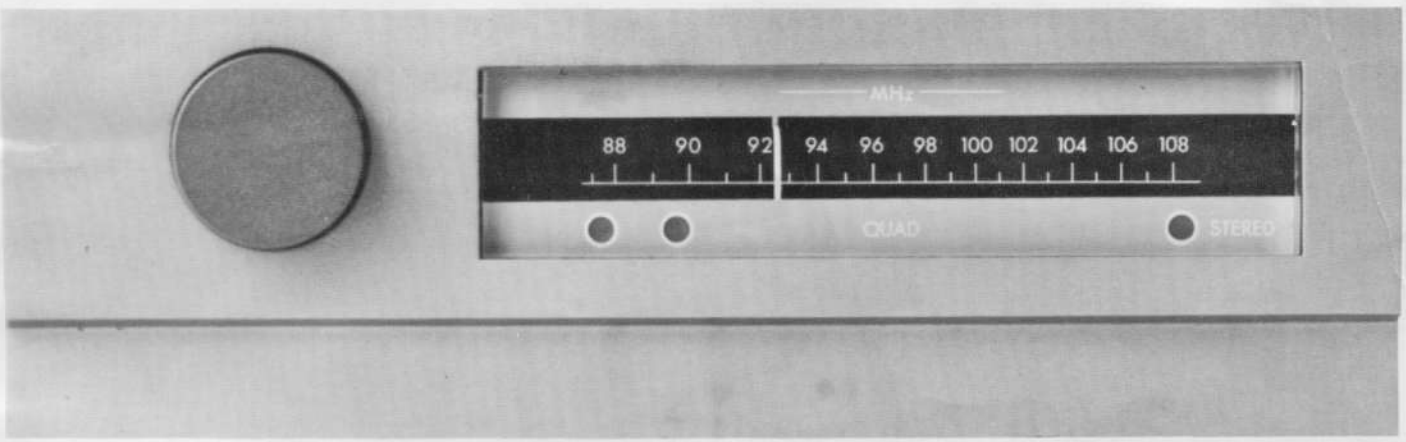
QUAD FM3 STEREO TUNER



This tuner is typical of Quad designs in terms of both styling and engineering. Although intended for integration with other equipment in the Quad range, it is self-contained and can be used with any amplifier system. The front is refreshingly 'clean' and uncluttered. All that one sees is the linear tuning scale, the familiar 'two-lamp' Quad indicator for accurate tuning, and a lamp to show when a stereo transmission is being received. The rear of the tuner carries the mains input socket, DIN output socket, a 'muting' control, and two aerial input sockets for alternative 300 ohms balanced or 75 ohms co-axial inputs.

The tuning scale is softly illuminated and has a broad pointer. Accurate logging would prove difficult. The tuning range extends from 87.5 MHz to over 108 MHz. The calibration was fairly accurate over most of the range, but it runs out at the bottom (e.g. 88.5 instead of 88 MHz), and was 0.3 MHz high at the top of the range. An ingenious system is used to position any of the five 'markers' on the tuning scale by pressing the tuning knob when tuning the station to be marked.

The advanced circuit design can best be described as 'generous'. It is noted that, if a circuit function can be carried out with two semiconductors but would do it better with three – then three are used. The power supply is a good example of this design philosophy. A full-wave diode rectifier is used, with four transistors in a voltage stabiliser, and a pair of zener diodes. Many designers would settle for zener diodes alone for stabilisation.

The output from a tuned radio frequency amplifier using a MOS FET is fed to a MOS FET mixer, to which is coupled the output from the tuned oscillator. The mixer output at intermediate frequency (IF) is amplified and passed to a ceramic filter, from which it is passed to two integrated circuits for further processing. The second IC includes limiting, demodulation and the provision of a DC voltage which (a) drives the tuning indicator lamps, and (b) operates the muting system. The demodulated output is fed to a third IC which carries out the multiplicity of functions involved in stereo decoding, such as 19 kHz and amplification, de-coding, muting and operations of the stereo indicator lamp. L and R outputs are filtered and de-emphasised, and a mono output (available on a separate pin of the DIN socket) is re-constituted by adding L and R in an emitterfollower stage. This mono output is obviously useful when receiving weak signals.

How it performed

The frequency response differs very slightly between mono and stereo, and is shown in Fig. 1. In each case the departure from linearity is within ±1 dB.

The sensitivity is high, full limiting being reached with an input signal level of 0.5 μV, as shown in Fig. 2. These curves show noise and signal output for varying RF input, using 30% modulation. It will be noted that noise reduction is under way with an input signal level of only 0.1 μV, and is virtually complete at about 0.7-0.8 μV. These measurements proved to be a challenging exercise. Accurate measurement of RF voltage below 1 μV requires special care if the results are to be meaningful, and extraction of output voltages deeply immersed in noise, posed some interesting problems.

The selectivity was very good, ably assisted by the tuned input circuit and ceramic IF filter. A test at ±500 kHz gave more than 60 dB attenuation. It is not often realised that high sensitivity requires a high order of selectivity. A strong local signal adjacent to a weak signal would be 'captured' if the selectivity were not adequate to separate the two stations completely.

The muting control can be adjusted to silence the output, so far as inter-station noise is concerned, until the signal input overrides any desired value of input voltage, from zero input to 100 μV. With the control at zero (as it might be when searching for weak signals) there is a disconcerting flashing of the stereo indicator lamp, produced by noise. It was found that a signal input of 0.4 μV was required to suppress this 'flashing'. This is an unfortunate value, because a further test showed that this value of signal

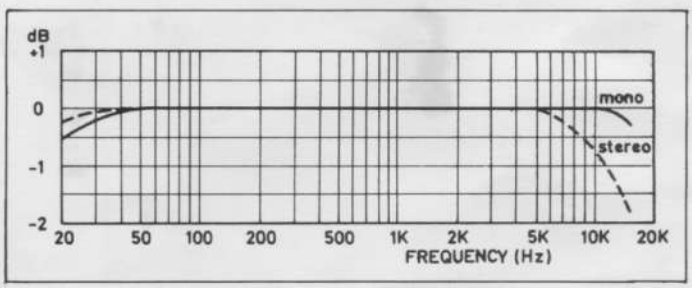


Fig. 1. Quad FM3 mono and stereo frequency response

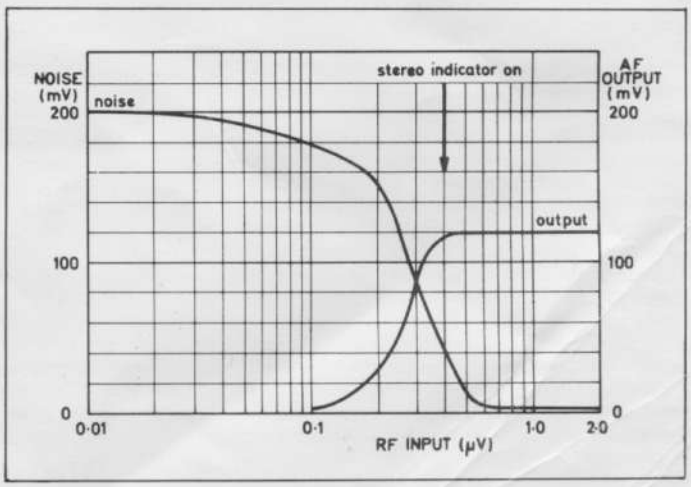


Fig. 2. Output voltage and noise level for 30% modulation

input coincides with the minimum value of stereo signal that will light the stereo indicator lamp It will be seen from Fig. 2 that a stereo signal input of 0.4 μV does not provide the best signal/noise ratio, and it is suggested that the indicator system could, with advantage, be de-sensitised so that it comes into operation for a signal input of about 0.7-0.8 μV. To be realistic, it would be a poor aerial system that would not operate this tuner well beyond the limiting value but, if a weat stereo signal of special interest arrived at a level of about 0.4 μV, the stereo lamp would light, but the signal/noise ratio would not be at its best.

Figure 3 shows the channel isolation, measured with 30% modulation. It will be seen that the isolation is more than adequate over the frequency range where it matters most.

What do these tests add up to? An excellent tuner, fully representative of up-to-date, 'state of the art' design. Its sensitivity is high and, with a suitable aerial system, can be used to take full advantage of those good signals that often arrive from Europe.

Finally, a word about the instruction manual that comes with the tuner. All too often the user is supplied with the minimum of very brief information. In this case he is supplied with a large amount of well thought-out detail, and full circuit information. It is refreshing to see some well chosen words on the often-neglected aerial.

R. S. ROBERTS

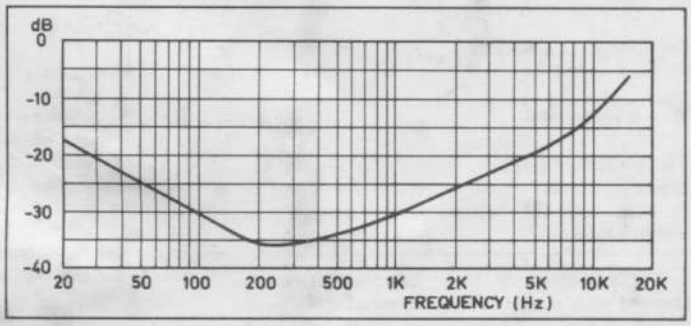


Fig. 3. Stereo channel isolation

SPECIFICATION AND TEST RESULTS QUAD FM3 TUNER		
	Maker's Specification	Test Result
1. Tuning range (MHz)	88-108	See text
2. Sensitivity (μV for 80 dB signal/noise)	1	0.5 (See Fig. 2)
3. Stereo decoder	Yes	Yes
4. Audio output (mV)	100	—
5. Frequency response (Hz)	20-15,000 ± 1 dB	See Fig. 1
6. Tuning indicator	two-lamp type	—
7. Aerial input (ohms)	75 coaxial 300 balanced	— —
8. Image rejection (dB)	56	60
9. IF bandwidth	greater than —60 dB at ± 400 kHz	agreed
10. Channel separation (dB)	40 at 1 kHz	See Fig. 3
11. Recommended load impedance (ohms)	greater than 50,000	—
12. Dimensions (in.)	10¼ x 3⅝ x 6½	—

This leaflet is compiled from extracts from the following reviews:

QUAD 33/303	AUDIO RECORD REVIEW FEBRUARY 1968 HI FI NEWS APRIL 1968 GRAMOPHONE FEBRUARY 1968
QUAD ELECTROSTATIC LOUDSPEAKER	HIGH FIDELITY NOVEMBER 1960 STUDIO SOUND JULY 1972
QUAD FM3	GRAMOPHONE MARCH 1973