as to be barely detectable. The square-wave oscillogram (Fig. 3) is smooth and level, indicating safe handling of transients and indeed there can have been few cartridges tracking at 1 gram which give the user such a feeling of safe record handling combined with crisp and clear reproduction. The bass end too is impressive and an output rated at about 3·3mV for 5cm/s will give absolutely no trouble with amplifier matching. The Shure design team are to be congratulated on refining their original "V15" concept still further. With a performance rivalled by only a few of the more expensive and less trackable moving-coil exotics, the V15 Type V makes a very safe recommendation indeed. JOHN BORWICK.

Quad FM4 VHF tuner

Manufacturer: Acoustical Manufacturing Company Ltd., Huntingdon, Cambs PE18 7DB. Price: £229.

It is always an event when this founding rock of British high-fidelity manufacturers introduces a new product and, although we have known for some time that a new FM tuner was on the drawing-board, it still comes as a pleasant surprise when the first working samples are shown to us, followed soon after by the delivery of a production model for test. Actually mine had been rather thoroughly tested by the Post Office before I got my hands on it. The carton was badly gashed, the lid torn off and resealed, the polystyrene packing shattered and the substantial steel casework of the tuner itself distorted and bent. One might imagine it had been kicked all the way from Huntingdon to Oxford, but it rose to the challenge and performed perfectly when switched on.

Quad were amongst the first to produce an experimental VHF tuner when the BBC first started comparative AM versus FM tests from Wrotham back in the 1950s. As soon as FM won the day, their first valve design became a standard in the industry with its ingenious and very accurate indicator using two miniature neon lamps. In due course a stereo version, the FM2, followed and then a solid-state version the FM3. All used mechanical tuning, the FM1 and FM2 by a micrometer screw moving ferrite cores in strip inductors, the FM3 with a multiple-gang variable capacitor. Over the years the FM3, still in production for it matches the Quad 33 control unit in appearance, has been improved out of all recognition in Quad's quiet way and is therefore probably one of the most underestimated tuners around today—when we are all (perhaps too easily) blinded by claims from the land of the rising sun. However, there was an obvious need for a new horse in the Quad stable for their most recent Quad 44 control unit (which we reviewed in August 1980) is in a rather different style. Furthermore, modern electronic tuning techniques lend themselves to push-button selection of a number of frequently required transmissions and so the FM4 started to design itself in the image of the Quad 44. In the event, it has been possible to slim the new tuner to half the 44's height and this might lead one to speculate on future products. Coloured buttons and LEDs for chosen programmes match the 44's input selection arrangements, the manual tuning knob equates with the volume control and the digital display of frequency and the tuning bargraph occupy a cutout in the diecast front panel similar to the tone and filter sub-panel of the 44. Certainly together they make a handsome pair but, although the FM4 is supplied with leads and connectors for use with the 44, it is also quite suitable for use with most amplifiers, possibly needing the simplest of adaptations for alternative connections.

MAKER'S SPECIFICATION: QUAD FM4

Frequency range (MHz)	88-108
Sensitivity (μV for 50dB quieting)	Mono 2.7 Stereo 25
Full limiting (μV)	less than 1
Signal/noise ratio (dB for 1mV)	Mono 76 Stereo 70
Selectivity (dB)	53
Capture ratio (dB)	2.5
AM suppression (dB)	60
Image rejection (dB)	80
Pilot tone suppression (dB)	60
Crosstalk (dB at 1kHz)	40
Frequency response (Hz)	20–15,000 +0, −1
Output level (mV for 30% mod.)	100
Recommended load impedance (ohms)	more than 20,000
Aerial input	75 ohms unbalanced
De-emphasis (μs)	50 or 75
Dimensions (mm)	321 × 64 × 207

Station tuning

Setting up the FM4 for one's own particular choice of stations is simplicity itself. There are eight small push-switches at the left of the panel, seven yellow with green LEDs alongside for the preset stations and a red manual Tune button with accompanying red LED. British versions are legended BBC 1, 2, 3, 4, ILR (independent local radio) 1, 2 and BBC LR while overseas models are simply marked 1 to 7. At bottom right of the panel is a mains on/off switch and manual tuning knob. This directly operates a ten-turn helical potentiometer used to set the voltage applied to the tuning diodes, and therefore feels rather less smooth in operation than might be expected. Behind the central cutout an illuminated phosphorescent display gives a direct reading of tuned frequency in Megahertz in steps of 50kHz (obtained by comparing the set's oscillator frequency with an internal quartz reference crystal) and, by means of twin vertical bargraphs, indicates both the strength of an incoming signal and accuracy of tuning. The former is shown by the number of segments lit progressively from the bottom, and the latter by equalizing the height of the two columns. A guide to the signal strength required to light three, six or all ten segments is contained in the lucid instruction book but, the maximum indication is actually nine segments, as is explained in a correction sheet I received later; my local transmitter pumps in many millivolts of signal and easily raised nine segments. Helpfully the book lists the frequencies of all the United Kingdom VHF/FM transmissions by regions and, by making one's selection from these, it is a simple matter to tune them accurately with the manual control and transfer each one to the internal microprocessor's memory by pressing the chosen yellow button and the red manual button simultaneously. Then, after about a second, the red manual LED extinguishes and the green preset one takes over. Thereafter the setting will be maintained until deliberately altered by repeating the foregoing sequence. This will be so even if the set is not used, or is disconnected completely, for there is a small battery inside charged from the power supply and with ample capacity to hold the microprocessor for perhaps five years. In practice, the chosen seven stations are probably more than enough for most people's day-to-day listening habits, but those who like to prowl around the 88 to 108MHz FM band seeking some of the more distant transmissions from the UK and Europe will find that the FM4 is no slouch. The specification shows, and my own tests and measurements confirm, that only the more exotic and expensive designs can show any sort of advantage and in most cases it could only be regarded as marginal.

The internal construction of the new tuner is exceptional even by Quad standards so that it could be shown off anywhere in the world with pride. Metalwork used for the main framework is heavy-gauge steel and smoothly finished—none of those razor-sharp guillotined edges here. Paintwork is impeccable as is the plating of the internal screening sections. The single large circuit board, well labelled and skilfully laid out, is printed on both sides; most of the components are mounted on it, the remainder being on the rear face of the front panel. Some 20 integrated circuits include the microprocessor chip and the timebase and counter chips associated with the frequency readout. All these integrated circuits are used to provide the performance and facilities that only a few years ago would have been a designer's dream and it is satisfying to see a British manufacturer employing them so confidently. It is thus a sign of the times that the actual receiver section, including the stereo decoder, occupies less than a third of the area, the remainder being taken up by the control and display components and a screened-off corner for the power supply.

The rear panel carries a standard 75-ohm coaxial socket (not the plug now more often found on tuners, the socket being retained for TV), a five-pin DIN socket for audio output, a voltage selector, a fuse, a mains input connector and an unswitched mains output socket. These are of the three-pin IEC type which was intended as a new world standard. Unfortunately the original good intention has now taken on the aspects of a Whitehall farce. Soon after the introduction, it was realized that the flexible socket and flexible plug could be coupled incorrectly with one pin, possibly live, hanging out. To prevent this, two alternative and incompatible adaptations appeared; the first had an additional spigot moulded on the plug and a complementary recess in the socket; the second had a shrouding wall around the pins of the plug, permitting coupling to the existing flexible socket but requiring the chassis-mounted socket to have a corresponding moat around it. However, if an early plug is used with this socket (and there are hundreds of thousands in existence), it is easily possible to drop one pin accidentally into the moat and plug the earth into the live, a potentially lethal arrangement. To prevent this, a further socket with shutters operated by the shroud has now appeared and is used on the FM4. Three types of plug and four different sockets seems to be the record to date, but be warned and take care when using any of them to make sure that all pins are engaged correctly; GRAMOPHONE does not want to lose any readers through this sad saga of standardization gone mad.

Showing the new Quad FM4 tuner with the matching Quad 44 control unit

After this diversion, perhaps a word about the performance of this tuner. It only needs a word—excellent. I fail to understand those people, distinguished audio critics and top dealers among them, who profess to find no value in radio broadcasts. From the BBC, and now increasingly from independent radio, we are constantly presented with a staggering variety of highly entertaining, informative and often startlingly realistic sounds; and it's free. I know of no other country with our good fortune; if we don't use it, the service will deteriorate—perhaps it already has. Try an FM4 and hear exactly how good it can be.

GEOFFREY HORN.

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