EQUIPMENT REVIEWS

Shure V15/III Pickup Cartridge
Acoustic Research LST Loudspeaker
Dual 1229 Automatic Turntable

Shure V15/III

MANUFACTURER'S SPECIFICATION.

Operating system: Moving magnet. **Output:** 3·5 mV at 5 cms/sec. **Tracking force:** ¾–1¼ gram. **Frequency response:** 10–25 kHz ±2 dB. **Channel separation:** Nominally 28 dB at 1 kHz. **Load impedance:** 47 k+400/500 pf. **Lateral radius:** 0·0007 in. **Contact radius:** 0·0002 in.–0·0001 between record contact points. **Tip mass:** 0·33 mg. **Weight:** 6 grams. **Mounting:** Standard ½ in centres. **Price:** £39·60. **Manufacturers: Shure Electronics Ltd., Blackfriars Road, London, SE7.**

THERE is no doubt that, among the top-flight pickup cartridges of recent years the Shure V.15/II enjoyed the widest acceptance. Not everyone thought it produced a better sound than any other cartridge; no one, least of all the makers, expected that, but it had few vices. It didn't make harsh or ugly sounds, even when the discs were not very good, and it always seemed to be performing within its capabilities, save on very rare occasions. The acceptability of the cartridge was based on acceptability *by* the cartridge. It was seldom strained, and neither were its users. This situation stemmed from the concept, due to Shure, of 'trackability' a word which they coined in an attempt to combine and summarise under one heading some of the more practically important factors in pickup performance. It has been defined as the ability of the stylus to maintain contact with the groove at a specified tracking force and across the frequency spectrum found on records. Readers interested in detailed discussion of the subject are referred to the article *Trackability* by J. H. Kogen which appeared in our issue of November 1966.

The V.15/II had a smooth but not a flat response curve. The deviation is common in kind to cartridges of the same type—a saucer-like depression in the middle and upper registers, beginning at about 1·5 kHz, typically 3 dB down at 8–10 kHz and rising again thereafter, and due to the interaction of the stylus HF resonance with the electrical characteristic of the cartridge. Some people found that this had a 'dimming' effect on reproduction. It could be corrected, approximately, as John Crabbe pointed out in his review of the V.15/II in our issue of April 1967, by means of the treble and filter controls of some amplifiers, by adjusting the RIAA replay HF time-constant of 75 micro sec. to around 40 μs. or by the use of an external circuit as suggested by J. E. Sugden in his article *Flatten Your Head* in our columns in April 1968, or provided by the Bowers and Wilkins pickup equalizer Type SE/A designed to plug directly into the SME arm base. Incidentally, although perfectly well aware of the situation, Shure themselves never produced any form of correction device or circuit, nor advocated modification of the characteristic, which was regarded as a satisfactory 'trade-off' for outstanding trackability, and produced excellent results with many speakers which had a rise in response over the same part of the range. Nevertheless, some records still presented detectable tracking difficulties, particularly at high frequencies, and Shure embarked upon an extensive programme of research and development with a view to the improvement of the overall tracking performance of the V.15/II, together with its frequency response, no parameter of performance being considered in isolation. An account of this work was presented to the technical press in a seminar on March 21st together with its end product, the V.15/III.

The performance of a cartridge is a combination of its mechanical and electrical characteristics. It was found impossible to improve the V.15/II performance in the manner and to the extent desired without serious loss of output using the existing electrical structure, and it was necessary to devise a more efficient one. Consideration of transformer design led to the use of a laminated core and pole–piece structure, so designed that there is no interruption of the magnetic path. The stylus assembly was also re-designed, and the effective mass reduced from just under half to just over one third of a milligram (Shure's figures), which in turn pushed up the HF resonance to 23 kHz, while the output remains the same: 3·5 mV at 5 cm/sec. velocity.

The V.15/III looks very much like its predecessor, but the stylus assemblies are *not* interchangeable, and even if they were, such a change would not convert the one to the other, because of the structural changes noted above.

The new cartridge was installed in the improved SME arm, with fixed headshell, and tracking pressure set at 1 gram for preliminary listening. Results, from a wide range of discs, were excellent—quite different from, and better than, those given by the V.15/II—so good in fact that these listening tests continued for a much longer period than usual at this stage, because we were loath to exchange the pleasure of listening for the 'chore' of measurement.

The Shure disc TTR.101 *An Audio Obstacle Course* has become famous as a listening test for tracking performance. It has proved to be very consistent in production, and remains available, but to coincide with the introduction of the V.15/III two new test discs have been issued: TTR.110 *An Audio Obstacle Course Era* III and TTR. 103 *Phono Cartridge Tracking Test Disc* (12 in. 45 rpm). This latter is an engineer's tool, designed to enable distortion due to mistracking to be measured, and requires extensive laboratory equipment for its full exploitation. Originally a design aid in the Shure laboratories, it carries trackability tests for high, middle, and low frequencies. At HF the test is by means of filtered tone bursts containing no LF components; when mistracking occurs, LF components appear in the spectrum, and the waveform on the 'scope is distorted; MF trackability is checked using 1 kHz and 1·5 kHz tones of equal amplitude. Mistracking produces sum and difference tones; similarly, LF tracking uses a large 400 Hz signal and a much smaller 4000 Hz signal. When the lower frequency is mistracked, the higher one is affected. Audible interpretation of the results is perfectly possible, but TTR.103 is not intended for domestic use.

The limitations of, and variations in, available test discs have been recognised for a long time. Shure engineers have investigated this matter very thoroughly, and devised calibration procedures. Readers technically equipped and interested are referred to papers by C. R. Anderson and P. W. Jenrick *A Practical H.F. Trackability Test for Phono Pickups*, and by B. W. Jakobs *Frequency Response Analysis of Phono Pickups on Calibrated Test Discs* and *Analysis of Crosstalk on Stereo Test Records* printed in the Journal of the A.E.S. Vol. 20 No. 3, Vol. 18 No. 3, and Vol. 19 No. 4 respectively.

We must say at this point that we have not calibrated our test records, but for a long time we have bought two or three copies of the same disc at the same time, and checked the results against those obtained from the previous sample with the same cartridge under the same conditions, to ensure that there are no very significant variations, which at least provides reasonable consistency.

TTR.110 is designed, like the original *Audio Obstacle Course*, for use without test equipment. The principal differences between the two discs are that the material on Era III is not presented in the form of solo instruments but in its normal musical context, as excerpts from specified commercial records, and that the increasing velocity levels are divided into 5 steps instead of 4: an initial 6 dB increase, followed by three more of 2 dB each, instead of three equal increases of 4 dB each on TTR.101, the total range of increase being the same in each case. Additionally, TTR.110 carries sibilance and violin tests, and it is considered by the producers that the inclusion of the whole ensemble with, and around, the

particularly difficult material provides a more demanding test under more natural conditions.

The tracking weight range recommended for the V.15/III is ¾ to 1¼ grams, and trackability is quoted at 1 gram. Under our test conditions, optimum performance was obtained at a fraction over this weight—1·15 grams on the Shure SFG.2. Stylus Gauge—and at this pressure the Shure test material was tracked without audible signs of loss of groove contact, which is a remarkable achievement. HFS.69 was also handled perfectly, together with EMI. TTF 590 and the worst specimens from my 'Bad Boy's Book of Beasts'. The SME bias corrector was set at ¾ gram. The 1 kHz square-wave from STR.111 showed a trace of ringing, and suggested efficient but not excessive damping.

The results of our measurements of frequency response and crosstalk are shown on the graph. Shure state in their instruction booklet that the optimum load for this cartridge is 47 k in parallel with 400/500 pF but that the load may be increased to 70 k (which accommodates the 68 k load presented by some amplifiers) without audible change in response. The SME leads present not much above 100 pF. capacitance, and decent amplifiers add little to this. We therefore took two frequency runs, one with the SME working into 68 k and the other into the recommended load of 47 k+ 400 pF, and it will be seen that the difference is indeed small. The response in the recommended condition is so flat—the least deviation we have ever found—that it was decided to see whether it was repeated with other samples. Two more were obtained (not directly from Shure) and measured, using the same test disc, in one case with a different set of test equipment. In both cases the maximum deviation was ·5 dB, as in the original, but in one cartridge it appeared at two points, and in the other an octave higher and in the opposite direction. This represents quality control of the highest order. The observed waveform was impeccable throughout the range, and measured output was ·7 mV/cm/sec at 1 kHz.

Crosstalk measurements from our disc were within the specification. We do not claim that they are absolutely accurate. The important matter here is the smooth nature of the curve, the evidence of more than adequate separation at and above 10 kHz, and the subjective effect of clear separation and placement of particular sources between the speakers. Vertical tracking angle is 18°, well within the margin cut on discs.

Given any respectable arm, the ability of the stylus to maintain continuous contact with the groove at mid and high frequencies is a function of the cartridge. At LF (below about 50 Hz) this ability is determined by the complete system, arm+cartridge, and depends on the *dynamic* compliance and the effective mass of the cartridge and arm working in conjunction. The dynamic compliance of a cartridge is not a constant, but varies with frequency; it is always less than the static compliance, and is exceedingly difficult to measure. It is highly desirable that the system shall be able to track properly all the frequencies found on discs (and these include ripple and warp frequencies which extend down to ½ Hz) because such surface irregularities carry musical material, and if the ripples or warps cannot be tracked, neither can the recorded signals which they carry. This does not mean that the cartridge compliance has to be made as high as possible, because the resonant frequency of the system is reduced if the compliance or the arm mass is raised, and it is necessary to place the fundamental resonance of the arm/cartridge combination below the audio band LF extremity (about 20 Hz) and above the highest rumble, ripple or warp frequencies (about 7 Hz). If it falls within the audio band it may well be excited by the recorded signals, producing a rising bass characteristic, with distortion and mistracking; and if it is below 10 Hz, warps, ripples, etc. will throw it into resonance producing severe variations in tracking pressure and dramatically reducing trackability. If the resonance is well placed, between about 10 and 15 Hz, it will cause little trouble, because below resonance the response will fall and there will be no independent movement of the stylus, which will move over the warps and ripples together with the cartridge and arm, maintaining tracking pressure. It is these considerations which constitute cartridge/arm compatibility, a subject frequently raised in our correspondence.

As a matter of interest, we measured the static compliance of the V.15/III and obtained a figure of 38 c.u. and a resonance in the SME improved arm (fixed headshell) at 13 Hz. Obviously, the V.15/III must be used only in arms of comparably low mass and low friction, particularly in the vertical plane.

We come now to the most difficult part of this report. We have to try to convey to readers what this cartridge sounds like. We have, we hope, indicated that the V.15/III has at least as few technical shortcomings as any other cartridge. Indeed, we are happy to say that we have been unable to fault it at any point, but such a statement can never be more than half the story.

The final aim of any designer of audio equipment can arguably be expressed in one word: neutrality. The extent to which a piece of apparatus imposes any detectable character of its own on the reproduced sound is a measure of its imperfection. The V.15/III closely approaches this highly desirable state of neutrality. In direct comparison with the V.15/II, the sound of the Mk. III, heard through amplifiers and speakers of the highest quality, has more immediacy. The bass has a cleaner, firmer quality, without ever being obtrusive. Higher up the scale, the sound is livelier and clearer than that produced by the Mk II (Improved) in the middle register, and in the extreme top there is an immediately appreciable increase in finesse and delicate detail; over the whole spectrum, there is greatly improved analysis of complex sounds: a 'Festival Hall' quality.

This V.15/III has been in continuous use at home for almost three months, and during this time it has been subjected to most of the insults and cruelties which can be offered to a cartridge, and also required to reproduce the finest recordings I know. It has accepted all with equanimity. To pervert Shakespeare, truthfully, 'The quality of tolerance is not strained'—and neither is the listener. Properly installed, in a suitable arm, the V.15/III 'jibs' at nothing.

Just two technical interpolations here: We had available a Dual 1229 player, and installed and tested the V.15/III in that for a period with perfectly satisfactory results, used in the single play mode only, of course. We were also able to try the cartridge on a CD-4 disc, and to observe on the 'scope the 35 kHz carrier frequency perfectly reproduced. This is not to suggest that the V.15/III as it stands is suitable for playing such discs, but it does indicate the 'spare capacity' at HF of a cartridge with a specified range up to 25 kHz. The cartridge is fully screened. We encountered no trace of hum.

We have commented before on the small differences among cartridges in the top flight, and on the impossibility of saying that one is better than the others. The final assessment must be subjective, and in this category the best cartridge for any listener is the one he likes best, playing his own records, through the same equipment. We will, however, say that anyone who buys a high quality cartridge without listening to the V.15/III is certainly emulating the late Admiral Nelson.

In conclusion, we offer congratulations to the Shure engineers; they have indeed justified their approach: The whole is greater than the sum of the parts.

Some of our readers may remember seeing somewhere a cartoon of the period of the First World War by Bruce Bainsfather, which appeared above the caption '. . . and if yer knows a better 'ole, go to it!' If you know a better cartridge than the V.15/III, buy it. I don't.

B. J. Webb