REVOX
SERIES 36

Part Two

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COMMON to all the *36* range of models is the head plate and mounting assembly, shown in one or two of the illustrations published last month and again in our photo **B**. Five adjustments for each head can be seen.

The heads themselves are cylindrical, ring-core, with a central threaded suspension rod that is not itself used for adjustment, except that the limiting screws bear down on the top plate and the central rod enables the assembly to be tightened upwards by locking with the slotted nut. The central nut is slackened before other adjustments can be made and, for rotation of the head around the vertical axis, it is necessary to keep the top of the head shield plate up against the limiting screws all the time. Adjustment becomes a tricky business if the centre screw is too loose.

The height adjustment can be done with a section of transparent tape but it is possible to make a reasonably accurate initial setting with normal tape. Brass washers are used as spacers, clamped in the head assembly, and these bright strips running across the edges of the gap length form a useful datum. The height is correct when the spacer just above the gap facing is divided by the edge of the tape. This setting is best done with the rear screw as limiter, and the verticality can then be adjusted finely by the front screw. Remember, however, that incorrect adjustment of azimuth afterwards may nullify the height setting.

Azimuth setting is done with the left screw of the two in line with the tape, the right one again used as initial limiter and clamping screw only. The nut always sits low on this screw and the best way of adjusting is to cut a slot in the end of an unwanted screwdriver blade, or make a slotted-end tool especially for the job. Trying to hack the nut around with a pair of pliers, as I have seen done, makes fine adjustment impossible.

It is assumed that azimuth adjustments are being made by the 'normal' method, ie replaying a test tape, such as a steady tone or, better still, white noise, while the replay head is adjusted for a maximum reading at the cathode follower output, measured on a valve voltmeter. But a more accurate method, recommended by Revox and possible with the aid of an oscilloscope, is to adjust for minimum phase difference.

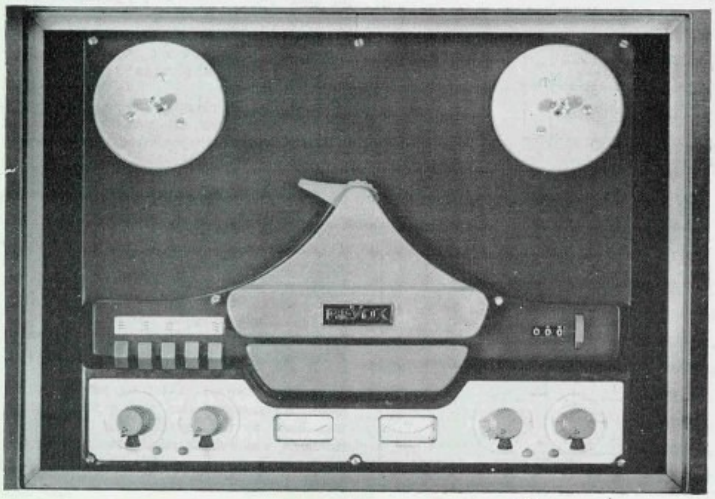
A double-beam oscilloscope is a help. The full-track test tape is played back and the outputs paralleled for VVM indication, with an HF test tone ; 10 kHz is recommended but 8 kHz is a more realistic value to suit test tapes on the general market. Maximum output reading under these conditions permits a much finer adjustment. With the 'scope, each track is applied to one beam and a direct visual comparison of phase is possible. A tape with stepped frequency changes of equal modulation level gives an immediate check of phase relationship, which should be maintained at all frequencies.

When making these head adjustments, do not forget that it is possible to move the outer screen relative to the head, and deceptive hum levels can be registered. Similarly, when testing with the chassis out of the cabinet, which has inner screening, the lack of a screen at the bottom will cause hum and spurious pick-up of radiated test signals. An auxiliary test screen is used in the workshop; even a tin tray on the kitchen table is better than no screen at all.

Screening for the reduction of hum is very often a compromise. No less on such an exalted performer as the Revox. With two channels in operation, it would be foolish to test for hum on one alone. The best method is again a combined output from the cathode follower terminals, measured with a valve voltmeter, and adjustment of screens for minimum hum reading. It should be superfluous to add that a much better method is the use of the oscilloscope, where the proportion of hum can be seen.

Remaining in the replay mode for the present, we find that Revox give a whole table of figures for playback response. This is most easily checked by feeding an audio generator signal across a 10 ohm resistor inserted in the

A Top plate of the 936



B View of the headplate showing alignment screws

head return lead, measuring the resultant output at the cathode follower. As a reference, a 1 kHz signal is adjusted to give a reading of 70 mV output. Other readings are related to this input, and will vary a lot, depending on the equalisation. A few spot frequencies will give some idea of the response. These figures are for the 70 μS equalisation curve: +19.5 dB at 40 Hz, +10 dB at 250 Hz, —4.5 dB at 4 kHz, —3.5 dB at 10 kHz, —2.5 dB at 10 kHz. This is with the speed selector at 19 cm/s.

Variations from these readings will lead one to investigate the circuitry and, as can be seen in our accompanying photographs, this is a simple matter. Each stage is built around the valve-base; the valves are in a row on a single metal strip, and the release of a couple of screws allows the whole circuit assembly to be moved out for immediate access to any part. Principal voltages are given on our circuit and it will be noted that cathode voltages are accorded some prominence. In this, as in many other machines which consider a stage to be more a frequency-conscious unity than a mere booster, it is often the cathode voltage that gives the first clue to any trouble. Valve ageing is possible on any equipment: substitution is the quickest and easiest test. But please be warned that the haphazard swapping of valves is not a very good idea. Tackle the job logically. Start with one good replacement valve of each kind—*ECC81* and *ECC83*—and go about the job systematically. In the playback amplifier, I have found that a weak *ECC83* will quite often show up as an early loss of bass boost. With the fairly low anode voltages, an HT rail well below 200 V, and the ample sectional smoothing, one does not get much bother with noisy stages. DC heating minimises hum in the preamp stages of both record and play amplifiers. But the price one pays for this splitting of supplies is the vulnerability of selenium contact-cooled rectifiers, one of which is indicated in one of our illustrations. Three are employed, the main one rated at 100 mA for HT supply, and the other two low voltage types (30 V, 600 and 250 mA) for solenoid operation and valve heater supply respectively.

Turning to the recording amplifier, we find some test requirements that are more refined. In practice, of course, nothing is simpler than to bring the replay amplifier up to scratch, then record a signal and do an A-B test. But for more specific evaluation, we need to read bias, check the recording section with bias filtered, and make more detailed measurements.

This filtering at the output of the playback amplifier to remove residual bias is not needed on the later *G36*, where filters are already incorporated, but for earlier models, and indeed for other machines which have the bother of residual bias affecting output readings when record and replay amplifiers are in operation together, some method of removing bias voltages while not affecting audio output readings is needed to avoid false indications. The filters used by Revox are made up of a tuned trap circuit in series with the output from the cathode of the playback amplifier to the cathode follower output terminal, limited by a series 1.2 K resistor, and decoupled with a 3.3 kpF capacitor directly across the output. I am currently experimenting to find what external filter values of resistor and capacity can be used for optimum results, without affecting the signal—but audio bandwidth is so wide with Revox machines that an L-C filter is almost imperative to get the right slope.

Which brings me to what must surely be the tape recording joke of all time. Among the modifications Revox have brought out is one to reduce the frequency response peak at the top end in the record amplifier.

'Very laudable,' I hear you say. 'So what are the new figures?'

With an absolutely straight face, Willi Studer will tell you that they have found it necessary, because of the odd chance of interference with certain types of radio distribution system, mainly in the studios, to iron out a peak at 30 kHz, lowering the pre-emphasis peak to 23 kHz. Response throughout the normal audio band is not affected. Machines with serial numbers above 48701 are already modified. For those deprived owners who have machines below this number, the modification consists of:

(a) Addition of a 10 pF feedback capacitor between anode and grid of the first stage of the main recording amplifier (C79 of V4 and C80 of V3).

(b) Reduction of the cathode bypass capacitor, from 0.015 to 0.012 μF, of these two stages.

Such minor alterations may seem unimportant to the chap who wants to 'bung in a point one capacitor' wherever capacity is needed, but that they should even be made at all is a measure of the high standards to which these recorders are produced.

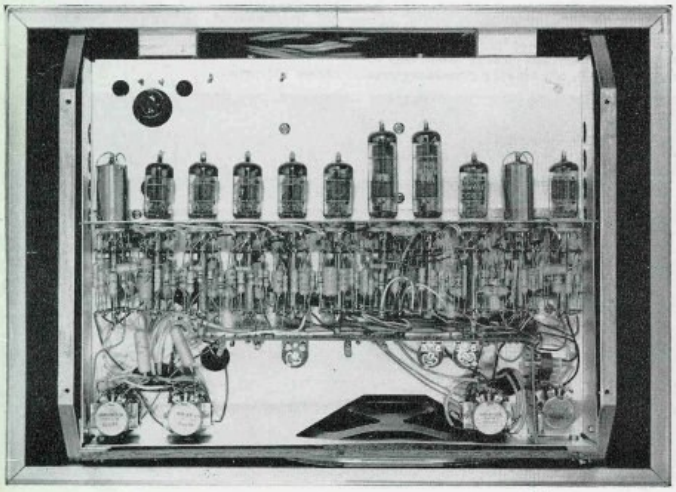
To maintain these high standards, as we all know, it is necessary to adjust your bias to the conditions under which you are working. A change of tape will demand a change of bias magnitude, to achieve correct modulation level for specified distortion and signal-to-noise ratio.

Having fitted the aforesaid bias filter, or made alternative arrangements to ensure we are measuring only the audio signal at the output, we connect our VVM to the cathode follower socket. Press the record button and, with audio input disconnected and record level turned down, adjust for minimum reading across the filter. Residual bias level should be at least 35 dB below the signal level.

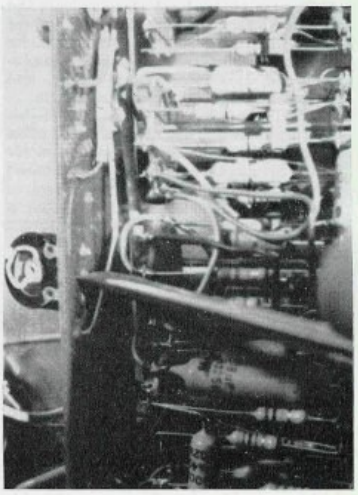
Revox make the point that bias leakage masking the signal makes it necessary to record, rewind, then replay and measure to be able to check adjustments. They also give instructions on bias adjustment that underline

(continued overleaf)

C The amplifier is constructed in a group-stage manner and can be removed *en bloc*



D VU meter preset



factors too often overlooked. I can do no better than quote from the service manual:

'Any alteration of the bias current changes the remanent tape flux and consequently affects output level, frequency response and distortion. As no two heads can be made to perform exactly alike, there is little value in measuring the bias current alone . . . the near-optimum value has to be found first before frequency response tests can be commenced.'

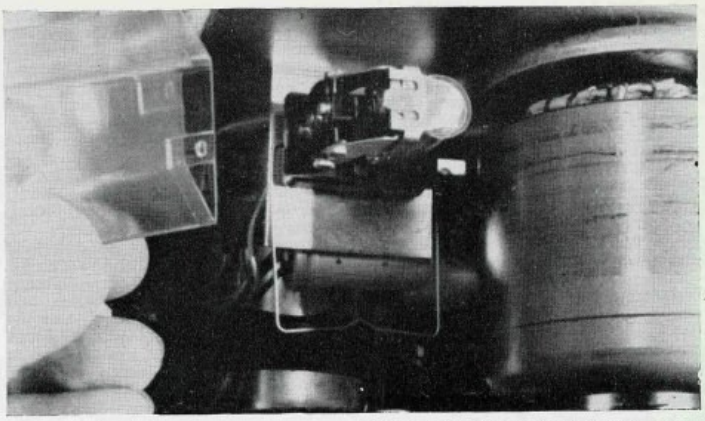
Some correspondents have taken me to task for allegedly harping on about bias adjustment. The foregoing should augment at least some of my arguments. The method recommended by Revox is to record a 1 kHz signal on a good tape, at 3 dB below full modulation and at the lower speed. Bias is adjusted for maximum audio output while this test is made (and providing the bias filters are used). Then the generator signal is reduced 20 dB and, still at 1 kHz, the output level is noted. Next, the generator is tuned to 10 kHz and the bias is readjusted to give the same output as was obtained with the 1 kHz input. This is the setting to use—and it will depend, I must again stress, on the tape with which you make the test. Differences in output level, frequency response and distortion that you would not notice with a plain adjustment of bias for maximum, or '2 dB down the curve,' or any other personal formula, will always show up with this kind of test.

The bias adjusters are easily accessible, in the bottom corner of the chassis, beneath the key section, near the *ECC82* oscillator. The two preset resistors near the bottom, on the printed circuit board, are not bias adjusters but meter setting controls (see photo **C**). Quite near them, to the right and at right angles, looking at the chassis upended, the new bias filter coils will be seen, but the main bias traps, common to all *G36* models, are the two coils L1 and L2 in the head feed circuit. Purpose of these is to prevent feedback of bias current into the recording amplifier circuit. They are adjusted after first switching to record, measuring the voltage at pin 1 of V5 for Channel 1 and pin 6 of V5 for Channel 2. In each case, the slug of the coil is adjusted for a minimum reading. In practice, I have found this measurement and adjustment rather touchy, and recommend the use of a good oscilloscope.

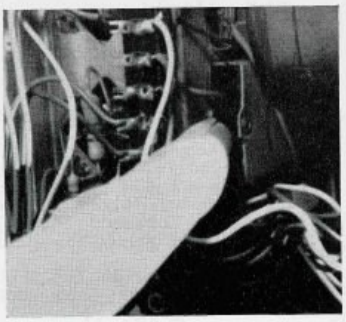
Some of the differences from earlier models that we promised to describe, and which affect servicing, are the tape-end switch and motor control circuits. On models with serial numbers above 36500 a gold-wire trip switch is used, as shown in our illustration, and the circuit is modified to provide an increased starting torque to the wind motors when the switch is made. The two-second operational delay still applies, but this time in the opposite way, ie after the circuit is made, and not between stop action and function clearance which actuates the solenoid. On still later models, an interesting change was made, whereby the relay, seen in photo **E**, is actuated by a pulse from the capacitor C68, stored while the play button is in the neutral position, then allowed to actuate the relay instantaneously when the button is pressed, opening the supply circuit from the low-voltage rectifier. The energising period is only about a third of a second and, during this time, the changeover switch feeds a higher supply voltage to the right-hand motor, keeping the take-up smooth. The reason is that trouble was experienced after all adjustments had been made to suit the normal 26.5 cm spools and then small spools, perhaps of odd diameters, were fitted. Now there should be no spillage and a smooth pull when starting, even for the sort of frequent editing use that this class of deck often experiences.

Tape tensioning is altered by the switch shown in the illustration below (photo **G**), which is operated by a lever, swung outwards for the correct back tension when small spools are in use. The main problem is refitting, against the strong blade of the spring that locates the flat side of the lever stem.

A final note, resulting from a telephoned 'Do you get much bother with worn capstans ?'. To be honest, I had not suffered much; but the lads who give these machines a prodigious beating in the studios, where they are in operation many hours each day, report that capstan wear is something of a problem. Let me stress that it only affects absolute speed, and thus compatibility. The wobble figure does not immediately deteriorate. Chromium capstans are the cure, virtually unwearable but difficult to manufacture and consequently rather expensive.



E Delayed-action relay



F Rectifiers are recessed in the deck assembly

G Spool tension lever ready for replacement. The F36 tape end switch can be seen and should be watched carefully when the top-plate is replaced