

Tandberg 3000 X

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TANDBERG 3000X

Our reviewers examine a high-quality tape recorder, find points to stimulate discussion, and pronounce it a first-class product.



FOR THIS month's review we are examining equipment from the famous Norwegian manufacturer, Tandberg. The recorder is model 3000 X, basically a three-head stereophonic record/playback mechanism, using separate record and playback heads and amplifiers to give full monitoring facilities before and after record.

The equipment is mains-operated and is intended for use with an auxiliary amplifier and loudspeakers. The sample examined is a four-track model but an identical half-track version is available.

Although we have referred to the machine as "basically three-head", in fact it includes a fourth separate bias head which applies the bias current necessary for the record process to the rear (shiny side) of the tape, on the Crossfield principle. The more conventional tape recorder has its bias signal fed to the record head, together with the recording signal; the effect of separating the two is claimed to improve frequency response, particularly at slow speeds.

As usual, our first drill was to demagnetise the heads and we were delighted to find that both the head covers, front and back, had been designed for easy removal, being held in place by spring clips.

We were not quite so pleased to find a pressure pad operating against a small fixed metal plate situated within the sound channel immediately preceding the erase head. This somewhat unusual device is presumably intended to smooth out irregularities in tape motion, but we feel that it could encourage the appearance of "tape squeal", should there be any tendency for this phenomenon to arise.

Incorporated within the front head cover is a "tweeter control", a device which brings a recorded tape up to the playback head during the fast wind process so enabling the listener to hear the high-pitched tweeting noises produced as it runs rapidly past the head. This materially assists in the location of specific recorded sections during fast winding and is a facility found on most professional equipment, although the professional machine uses a somewhat more sophisticated means of achieving that end.

Azimuth alignment was found to be correct, but it was noted that excessive tape vibration occurs between the pinch wheel and the micro switch when in the Run mode, particularly at the fastest speed of 7½ ips. Although the machine is mechanically quiet the passage of the tape itself does produce rather more noise than we would have liked.

Before checking frequency responses it was noted that although a 5-pin DIN In/Out socket is provided and the input connections are duplicated with a pair of phono-type line-in sockets, there is no similar duplication for line-out. In addition, when measuring the outputs of the two channels at the DIN receptacle (these are at fixed level and cannot be user-adjusted) there was a difference of 2 dB between channels. This imbalance could only be corrected through the use of the balance control at the amplifier, or, in the case of the SS11, by means of the separate volume controls.

For playback-only measurements the standard calibration tapes were reproduced and reference to our test chart will at once reveal a truly excellent set of figures. In every case our measurements indicate a performance standard up to the very tight published specification, with only very minor, trifling departures that are of no consequence.

It should be particularly noted that the deviation from flat between 63 and 18,000 Hz is never more than 1.5 dB at 7½ ips, whilst at 3¾ ips we have one of the best curves it is possible to obtain at that speed, with maximum deviations of minus 2 dB at 63 Hz to plus 1 dB at 16,000 Hz throughout the full bandwidth of the calibration tape.

Frequency Hz	TANDBERG 3000X TEST CHART					
	Overall Response dB			Playback Only dB		
	7½ ips	3¾ ips	1 7/8 ips	7½ ips	3¾ ips	1 7/8 ips
31.5	-2.0	-3.0	-3.0	+1.25	-1.5	0
40	+0.5	-2.0	0	+2.25	-1.25	+2.0
63	+2.0	-0.75	+2.0	+2.25	-2.0	+1.0
125	0	+2.0	+3.0	+0.25	-0.5	+0.5
250	0	0	+3.0	+0.25	0	0
500	0	0	+2.0	+0.25	0	0
1000	0	-0.25	0	0	0	-0.25
2000	0	-0.25	-0.5	0	0	-0.75
4000	+0.25	-1.0	-1.0	-0.5	-0.5	-0.5
6000	-0.25	-1.5	-2.0	-1.0	-0.5	-1.0
8000	-1.0	-1.5	-3.0	-1.0	-1.25	0
10000	-1.0	-2.0	-4.0	-1.5	-0.75	+3.5
12000	-1.0	-2.5		-0.75	-0.25	
14000	-0.25	-2.5		-0.25	0	
16000	0	-2.5		-0.25	+1.0	
18000	-0.5	-3.0		-0.25		
20000	-1.0					
Wow & Flutter RMS	0.10%	0.125%	0.21%			
Wow & Flutter DIN 45 511	0.08%	0.12%	0.20%			
Signal/noise ratio: 52.7 dB unweighted; 60.7 dB "A"						
Distortion: 3% at 7½ ips.						

NOTES: The Overall Response figures relate to record and playback using the spool of Tandberg long-play low-noise tape provided. Playback Only relates to the reproduction of standard DIN calibration tapes to the following time constants: at 7½ ips 3180 50, at 3¾ ips 3180 90, at 1 7/8 ips 1590 120.

For Signal-to-Noise Ratio the Tandberg tape was recorded at 7½ ips to a level to give 3% distortion in the playback signal and this was related to the noise level produced from tape erased in the machine; figures are also quoted in the text for 3¾ and 1 7/8 ips but at these speeds the reference is to 5% distortion. The readings are given as both "unweighted" and "A" scale measurements.

Distortion as quoted in the Test Chart refers to a level deliberately imposed in order to standardise measurements as above, but coincidentally in this machine that level is identical to both reference level and a zero reading on the internal meters at a frequency of 1,000 Hz.

Wow and Flutter is given as both RMS and according to DIN 45 511. Test equipment used included: Bruel & Kjaer Signal Generator, B & K Frequency Analyser Type 2107, B & K Level Recorder Type 2305 and Gaumont-Kalee Wow and Flutter Meter.

At 1 ips we are still within specification with a remarkably flat curve, which, interestingly enough, is rising between 8,000 and 10,000 Hz to give plus 3.5 dB at the latter frequency.

Good as these figures are, they become even more meaningful when examined in relation to the overall response curves, in the production of which we used the 7-inch spool of Tandberg long-play low-noise tape provided with the machine.

These results indicate a very, very, high standard of performance, guaranteeing the reproduction of commercially pre-recorded material to professional limits of accuracy and ensuring that recordings made on the machine itself will be equally good at 7½ ips, while still retaining an excellent quality potential at half that speed. Even at 1 ips the frequency response curve indicates that on the 3000X this highly economical running speed could be considered for some kinds of musical repertoire.

But, as we have said so often, frequency response is by no means the beginning and end of the matter. Equally important are distortion and noise and so, as usual, we examined these two aspects together.

Firstly we confirmed that the distortion levels on both channels are virtually identical, and at 7½ ips the record-to-playback distortion at reference level (which coincides with a zero reading on the two built-in record level meters) was exactly 3%, conforming to our own standard for tape recorder high fidelity reproduction. When working at the slower speeds it was found that at both 3¾ and 1 ips 5% distortion was reached when the input signal was increased by 4.5 dB.

Measuring noise levels against these distortion parameters, we found that on the low noise tape provided, and working with tape erased on the machine itself, the unweighted value at 7½ ips was 52.7 dB, while the A scale measurement was 60.7 dB. Working to 5% distortion at the slower speeds, the figures at 3¾ ips were 55 dB unweighted and 63.5 to the A scale, at 1 ips 56.5 dB unweighted and 63.2 to the A scale.

Published specification figures refer noise to 5% distortion at 7½ ips and therefore cannot be related directly to our own measurements, which in conformity with other reviews have been referred to the 3% distortion level at the tape speed. We believe this to be far more realistic. A notorious attribute of figures is their ability to prove anything, depending on how they are expressed, so we can best summarize our noise and distortion findings by describing them quite unequivocally as representing some of the best performance standards we have ever encountered in equipment of this kind and price.

Speed stability is the next important requirement and here it was found that when running at 7½ ips a 1,000 Hz tone was counted out electronically at 998. This represents a degree of accuracy so close to the absolute that it could be regarded as 100%. At both slower speeds our readings were 1.2% slow, a figure well within the specified plus or minus 1.5%.

As usual, we checked wow and flutter at the beginning, middle, and end of a 7-inch spool of tape and were delighted to find that substantially the same readings were obtained at each of the three test points. The RMS readings were found to be: at 7½ ips 0.1%; at 3¾ ips 0.125%; and at 1 ips 0.21%. When measured according to the DIN standard 45 511, the equivalents are at 7½ ips 0.08%; at 3¾ ips 0.12%; and at 1 ips 0.20%. No better tribute could be paid to the efficiency of this well-tried Tandberg tape transport mechanism than the evidence of these consistently excellent figures.

We must here refer to the presentation of the manufacturer's specification, which clearly sets out his statements of the machine's performance capabilities. It was commented in the laboratory that one could summarize the efficiency of the sample submitted for review by merely glancing at the specification and then

considering the possibility of a machine that would operate well inside the very tight tolerances allowed by those figures. Such sincerity is highly commendable and we would be failing in our duty if we did not draw our readers' attention to it. This admirable conformity to claimed standards has been noted and remarked on in some of our previous reviews of this manufacturer's products.

But it is our job to make a critical assessment and we have already mentioned the fact that there is a 2 dB difference in output between the two stereophonic channels. Another criticism we discovered lies in the fact that when the output is switched to "Source" the response curve rolls off at its two extremities to give minus 3 dB at 50 and 15,000 Hz.

Such phenomena are inexplicable, because the change will tend to defeat the true object of the A/B monitoring facility, by failing accurately to compare the signals before and after record. This has no effect whatsoever on the record of playback potentialities of the equipment, but relates simply to comparison monitoring.

In addition, it was noted that the record level meters are positioned within the circuit after the record pre-emphasis has been applied, thus giving rise to the possibility of over-indication at high frequencies. Such an arrangement is by no means uncommon in domestic equipment, but we like to point out its potential weakness whenever we find it. The meters read record levels only, not playback levels.

We will treat the user section of our review very briefly indeed, since Tandberg equipment has been dealt with so frequently in this magazine in the past.

Tape transport is controlled by the familiar "joy-stick" and the pause control on this model is now operated by means of a two-position Start/Stop switch on the front of the deck. The Record mode is engaged by means of two separate push-buttons, one for the left-hand channel and the other for the right; when actuated the meters are internally illuminated. Record Level is by a pair of small rotary controls travelling against numeric scales.

We must repeat the warning we have given with regard to other Tandberg machines that, since the pinch-wheel assembly is not solenoid-operated, it is essential for the joy-stick lever to be returned to its neutral position whenever the tape has been stopped for any reason or when the equipment is not in use. Failure to observe this requirement would leave the pinch-wheel and capstan under pressure and so tend to produce "flats", giving rise to excessive wow.

The equipment is smartly styled and is provided with spool retaining caps, and legs for use in vertical operation.

No snags whatever were encountered during use and in all cases the audio quality of pre-recorded and self-recorded material was up to the very high standard indicated by our technical report. From our experience with other Tandberg equipment it is confidently anticipated that the purchaser of the 3000X will enjoy many, many years of trouble-free use of a very high quality tape recorder which, at its cost of under £100, represents really first-class value for money and enables us to congratulate the manufacturer on the excellence of his product.