TANDBERG

Tandberg 10X has been tested in France, and here is the report translated into English.

ON THE TEST BENCH:

T A N D B E R G

T A P E R E C O R D E R

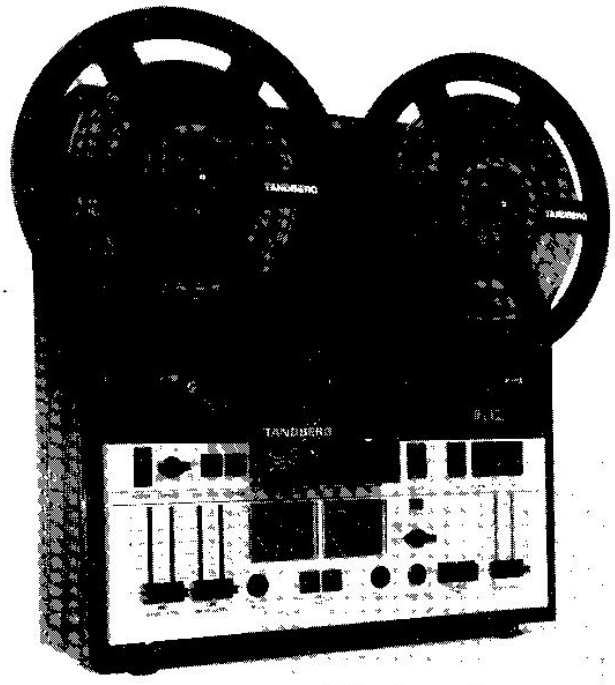
10 X

BANC D'ESSAI PARU DANS HIFI-STEREO FÉVRIER 1977

EN AVANT-PREMIERE

(Manufactured in Norway)

(Distributed by Tandberg France)



It comes from a Norwegian fiord. It has three motors, three speeds, and three heads. Its last name is Tandberg, its first name is 10X. We are, naturally, talking about a tape recorder. It belongs to the category of "high quality" or "professional" types, but has this little extra something which, furthermore, makes it a "technician's delight".

General remarks

With its wooden cabinet, black top plate, and brushed aluminium control panel, the 10X displays its obvious relationship to the 3500X, already known to our readers.

However, there are visible differences: first of all, a small button replaces the key for selection of speed on the 3500X: the scent of electronics. Furthermore, the speeds are not the same: 9,5, 19 and 38 cm/s, meeting the demands of the amateur who desires a background music, the professional who wants an impeccable quality, and, especially, the sophisticated twentieth century person who wants both, depending on the circumstances.

Another button (10½" reel) shows us that although the 10X has three heads but only two reels, the size of the latter makes up for their numerical deficiency, since it is possible to mount "big modules" of 27 cm. At the speed of 38 cm/s, the use of this size would, of course, be advisable.

Yet another difference: the trimming potentiometers applied to the micros. Together with the ones at the line input they form a simple but efficient mixer, which is sufficient in most cases.

Finally, a set of five push buttons - including a red button for recording - replaces the control levers of the 3500X: a slight touch of the finger, and they command the programmed minicomputer to execute the operations. There is no need to depress the stop button: the small electronic brain will do so for you, if need be, with the necessary time lag, if your impatience should have prevented you from anticipating the moment of inertia of the reels. However, there is one exception: the recording button will not operate until after the stop button has been pushed.

Construction

As can be seen from the control panel, the 10X has adopted a great many electronic solutions. But many good mechanical solutions have also been retained, and together they form a homogenious whole.

As is proper, let's begin with the capstan. It is driven by a belt and firmly attached to a gear wheel. The belt serves to place the motor at the ideal spot (far from the heads), whereas the gear wheel chops up a beam of light. The resulting bits, the length of which varies with the speed of the capstan, are carefully measured, and any deviation from the standard meter produces an immediate opposite variation in the motor supply, thus causing the motor to regain its speed. A simple change in the reference meter makes it possible to change the motor speed, and this is where the aforementioned small button enters the picture. This button can be used during operation facilitating certain simple tricks, as for instance, a dialogue between Donald Duck and Boris Goudounov, with a chorus at the intermediate speed. The type of servo motor used is for direct current and Hall effect switching, thus, doing away with the noise generating brushes. As you know - and in case you should not know this, now would be as good a time as ever for you to find out - the Hall effect cells are semiconductors which, when

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under the influence of a magnetic field, show a tension at their terminals, depending on the intensity and direction of the magnetic field. (It is, in a sense, the magnetic analogue to the piezoelectric cell which produces the same effect when under the influence of a mechanical force). If the magnetic field is that of the rotor's, formed by a permanent magnet, a chopped resistance will be obtained which, just like the conventional brushes, but by means of transistors, can be used for switching currents in the stator coils with the added advantage of silence, no sparks and no wear and tear.

Let us not end this little technical tour without mentioning the mechanical tape drive system, as well as the solid construction of the tape transport, which is firmly attached to an aluminium tape deck (5 mm thick), the sturdiness of which provides the unit with an excellent dimensional stability. It is mounted on a chassis of thick bichromated steel, which also supports the two rewinding motors, and upon which the cabinet is attached as well. Solid ribs protect it against unwarranted torsion.

As for the electronic part, the unit is equipped with plug-in printed circuits,which has the advantage of minimizing the immobilization of the machine in case of a failure. The circuits are easily accessible upon removal of the unit's rear panel, behind which they are carefully aligned. The interconnections, which are not provided by the basic circuit, are made by means of connectors.

Measurements

We have measured the response of the 10X as regards the three speeds, since they are all capable of meeting the high fidelity requirements.

At 9,5 cm/s, one will notice the excellent band width which is obtained from -10 dB on, 15 kHz being obtained at -6dB. At the much more realistic level of -20 dB, it is possible to reach close to 20 kHz with the same attenuation. The quality of this result is definitely due to the manufacturer's application of the Crossfield technique for the polarization of the tape.

At 19 cm/s, it will be noticed that from -3 dB on, the band reaches 20 kHz at -6 dB. Optimum performance is reached as early as -10 dB.

As for the performance at 38 cm/s, there is no need to comment, since right from 0 dB on the 20 kHz are reached with beautiful ease: actually, it is unnecessary to mention the attenuation, since there is none.

The tables 1 to 5 summarize the electrical performances, which are all at an excellent level.

The mechanical performances are not at all behind.

The table of our measurements gives the wow and flutter ratio with respect to speed. As will be seen, the 10X's performance equals that of a good turntable, which is not a small compliment. The credit for these results goes to the capstan's servo system: the gear wheel, which is directly engaged with the capstan, guides the transport speed of the tape, and not the rotation of the motor!

As for the speed precision, we admit our wonderment: it is

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better than our precision measurement. Therefore, we can only say that it is less than 0,1%, i. e. less than a second's deviation during more than a quarter of an hour's recording, at any selected speed, as long as the recorder has been allowed to warm up for 5 minutes.

The fast rewinding speed carries its name well: the 10X actually swallows one km of tape in less than 2 minutes!

Utilization

Like all modern tape decks, the 10X may be used lying flat or standing up. Due to its negligible bulkiness, it takes up very little space in this latter position and, still, presents an excellent stability with no need for artificial supports, such as retractable stands, etc.

In the rear of the machine, a recess, easily accessible, receives the connection plugs and further reduces the unit's overall depth. However, the headphone jack and the two micro inputs are located on the front surface. These are equipped with preamplifiers which present an interesting particularity: they actually adapt themselves, automatically, to the impedance that gives the weakest hum. The 10X is, also, like the 3500, equipped with monitoring (recording/playback) as well as a duplication system controlled by one simple button marked "S on S", which allows dubbing as well as echo effects, varying with the speed. Finally, the two level meters indicate the peak value of the signal (not the average value) which, in practice, guarantees recording without any excessive distortion.

The use of the 27 cm reels, together with the tremendous rewinding speed, calls for the observance of certain precautions: although going from fast forward to rewind causes no problem whatsoever (the servo system performs beautifully) one must be careful when going from rewind to play - or record - with reels of different sizes: the resulting great difference in moment of inertia may require a braking of the bigger one with the hand. In this special case, it is advisable to go through the "stop" position first.

Manual and guarantee

The machine, which is one of the first of its kind in France, has been delivered to us with a manual, in English, which is very clear, abundantly illustrated and, furthermore, comprising basic instructions on how to succeed with the first sound recordings. This should be duplicated by a manual in French of the same quality.

The guarantee and the service are provided by Tandberg France, a firm which is already well known by our readers since it has been the principal subject of a recent report of ours.

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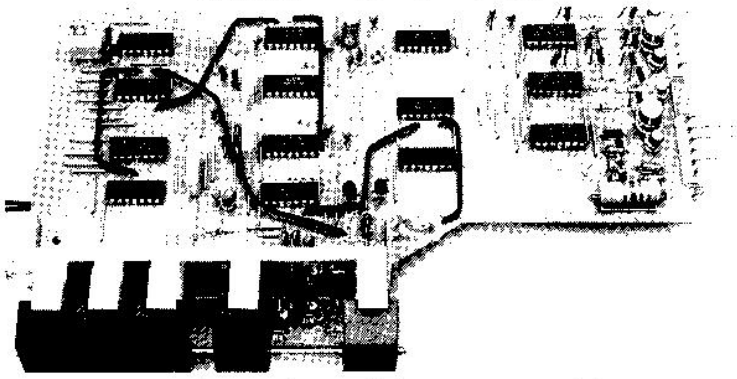
Conclusion

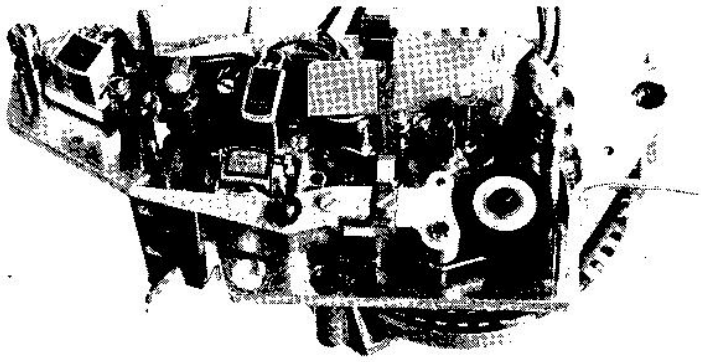
Both with regard to its performance as well as its possibilities, the Tandberg 10X belongs to the category of professional tape recorders. It presents, however, the added advantage of being semi professional, not in the sense that there has been a sacrificing of performance, but, on the contrary, in the sense that its possibilities have been extended to the greater public. This is proved by its speed of 9,5 cm/s, in addition to the 38 cm/s speed, its keyboard which makes the operation very subtle, its micro-line mixer ... and its beautiful appearance. It comes in two and four track versions and, for those who are not sold by its signal/noise ratio, in a 10XD version with Dolby. Furthermore, we can mention that an optional remote control case is also available.

Quality/price ratio:	Excellent
Technique:	Ultra-modern
Construction:	Sturdy
Manufacture:	Meticulous
Appearance:	Pleasant

This gear wheel, which is directly joined to the capstan, cuts up a light beam to control the speed



The 10X's brain forms a complete unit with the control buttons



The tape transport is firmly attached to the sturdy tape deck

TABLEAU I

TABLE I : INPUT AND OUTPUT SENSITIVITY

Input	Sensitivity	Saturation	Signal/noise ratio		Output
			Weighted	Unweighted	
Line	7 mV	5,5 V	63 dB	59 dB	1,5 V
Radio	22 mV	3 V	63 dB	59 dB	770 mV
Micro	0,1 mV	10 mV	50 dB	46 dB	line ou radio

TABLEAU II

TABLE II : SATURATION IN RECORDING AND PLAYBACK

Speed	9,5 cm/s		19 cm/s		38 cm/s	
Recording level	0 dB	— 10 dB	0 dB	— 10 dB	0 dB	— 10 dB
Frequences	dB	dB	dB	dB	dB	dB
1 000 Hz	0	— 10	0	— 10	0	— 10
2 000 Hz	— 1	— 10	0	— 10	0	— 10
4 000 Hz	— 3	— 10	— 1	— 10,5	— 1	— 9
6 000 Hz	— 4	— 10	— 2	— 11	+ 1	— 9
10 000 Hz	— 9	— 11	— 3	— 11	+ 0,5	— 9
12 000 Hz	— 14	— 12	— 3,5	— 11	+ 0,5	— 9
14 000 Hz	—	— 14	— 4	— 11	+ 0,5	— 10
16 000 Hz	—	— 16	— 5	— 11,5	+ 0,5	— 10
20 000 Hz	—	— 20	— 7	— 12,5	— 0,5	— 11

TABLEAU III

TABLE III : BAND WIDTH

Frequencies (Hz)	Standard band reading at -20dB	Recording Playback à — 20 dB		
		9,5 cm/s	19 cm/s	38 cm/s
31,5	— 21	— 26	— 24	— 21,5
40	— 18,5	— 23	— 22	— 21
63	— 18	— 21	— 21	— 20,5
125	— 18,5	— 20	— 20	— 20
250	— 19	— 20	— 20	— 20
500	— 19,5	— 20	— 20	— 20
1 000	— 20	— 20	— 20	— 20
2 000	— 20,5	— 20	— 20	— 19,5
4 000	— 21	— 20	— 20	— 19
6 300	— 21,5	— 20	— 20,5	— 19
8 000	— 21,5	— 20	— 20,5	— 19
10 000	— 21,5	— 20	— 20,5	— 19
12 500	— 21	— 21	— 20,5	— 19
14 000	— 20,5	— 22	— 20,5	— 19
16 000	— 19	— 23,5	— 21	— 19,5
18 000	— 20	— 24,5	— 21,5	— 20
20 000	—	— 26	— 22	— 20

TABLEAU IV

TABLE IV : DISTORTION AT 1 kHz (RECORDING AND PLAYBACK)

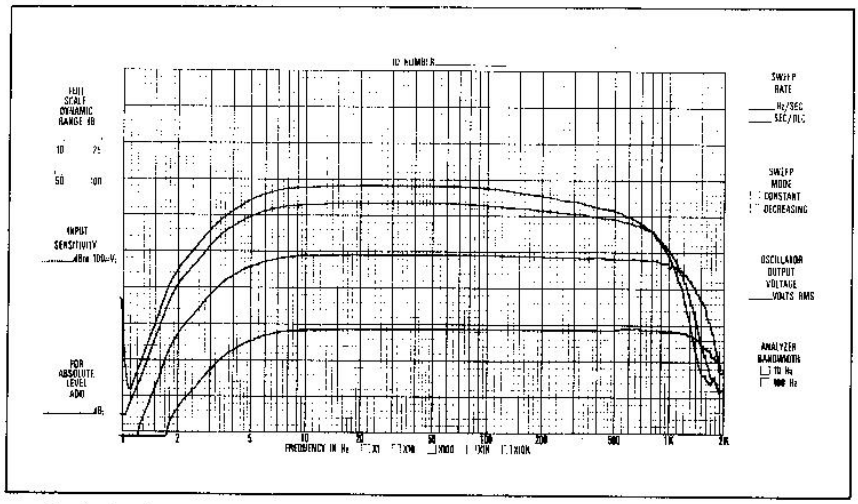
Speed	9,5 cm/s	19 cm/s	38 cm/s
Level	%	%	%
0 dB	1,3	1,5	2,1
— 3 dB	0,6	0,7	1
— 10 dB	0,4	0,4	0,4

TABLEAU V

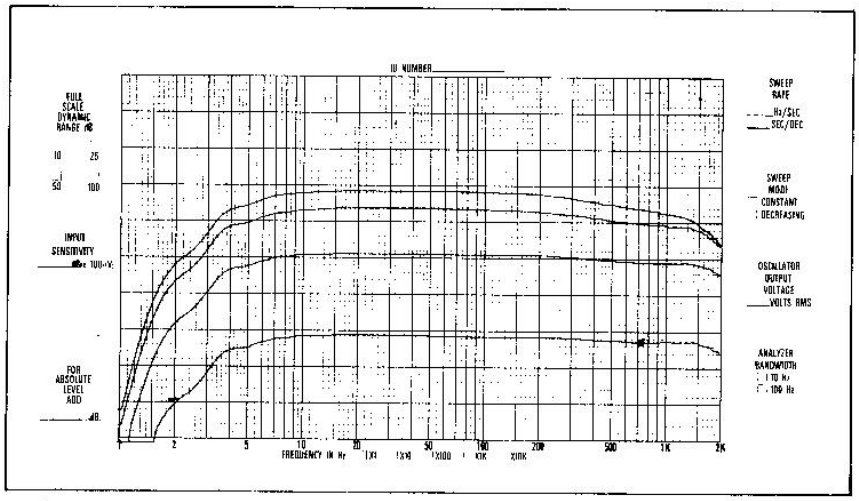
TABLE V : CROSSTALK

Frequencies (Hz)	40	200	1 000	4 000	16 000
Crosstalk (dB)	— 39	— 58	— 59	— 55	— 48

Response curves (recording and playback) at 0, -3, -10, and 20 dB for the speeds of 9,5 cm/s 19 cm/s and 38 cm/s



Courbe de réponse enregistrement + lecture à 0, - 3. — 10 et — 20 dB pour la vitesse de 9,5 cm/s.



Courbe de réponse enregistrement + lecture à 0, - 3. 10 et 20 dB pour 19 cm/s...

... et pour 38 cm/s.