

Equipment Review

Tandberg Model 3 Stereo Tape Recorder—Lektrostat
Record Cleaner—Heathkit EA-2 12-watt Amplifier

TANDBERG STEREO TAPE MACHINE

The Tandberg Model 3 stereo tape recorder (Figs. 1, 2, 3), a product of Norway, is designed to play in-line stereo tapes and to record monaurally. It is a small, versatile, high-quality 32-pound (with case) package crammed with features reflecting the designers' efforts to anticipate the stereofan's public needs, whether for a limited cost or money-no-object installation.

With this machine, a reel of stereo tape, and just one speaker, stereo can immediately be brought into the home, at least on a modest basis, for the Tandberg already contains two power amplifiers and a speaker, a $5\frac{1}{2} \times 8$ " unit. Thus the would-be stereofan can get off the ground without having to wait until he acquires a second chain of high fidelity components—control amplifier, power amplifier, and speaker. Eventually, depending upon his sights, he may wish to use a better amplifier and better speaker in place of those in the Tandberg. In the interim, however, the latter enable him to enjoy stereo.

The Tandberg's internal speaker can be connected either to its channel 1 amplifier (upper track; left speaker) or to its channel 2 amplifier (lower track; right speaker) by flicking the monitor speaker switch respectively to left or right. In mid-position of the switch, the speaker is disconnected altogether.

Figure 3 shows the output jack arrangement, intended for banana plugs, which may be used to feed a signal either directly to external speakers or to the inputs of control or power amplifiers. Should the listener wish to combine both stereo channels into a single speaker, he can do so by taking the output from jacks 2 and 4, thus putting the two output transformer secondaries in series

and thereby feeding the outputs from both tracks to the single speaker.

The Tandberg's power amplifiers have single-ended outputs, each using one EL-84, but are able to put out enough power at reasonably low distortion to drive an efficient speaker to a very substantial level. On a Tandberg that he used for several weeks, the writer found that 1M distortion of each amplifier measured below 2 per cent at 1 watt output (equivalent sine wave power), which was enough to drive his speakers well above the desired level. If the machine is used to supply signal voltages to external amplifiers, with the gain control set between positions 2 and 3 it can supply 0.5 volt on each channel—ample for any control amplifier—at about 0.5 per cent 1M, which is consistent with high fidelity performance; this data is also based on the writer's measurements.

If it is desired to play a monaural tape, one can feed the monaural signal into both amplifiers by turning the monaural-stereo switch to the monaural position. This connects both amplifiers to the upper track signal and prevents playing both tracks at once, which would result in garbled sound, particularly since one of the tracks would be played backwards.

All or most stereo tapes are now recorded with NARTB equalization, wherefore it is important that the playback machine incorporate NARTB playback equalization. This the Tandberg does, and quite accurately. On the machine used by the writer, equalization remained within 1.5 db of the NARTB standard over virtually the entire audio range. There is a strong temptation not to maintain full bass boost at the very low end inasmuch as this accentuates the problem of hum. However, the Tandberg does not succumb to this temptation and maintains NARTB bass boost, within 1.5 db, down to at least 30 cps. The



Fig. 3. Rear panel of recorder indicates line voltage to which set, and provides for the outputs and the high-level input. Small compartment at right holds power card.

record-playback response (monaural) of the Tandberg is also excellent, being flat within 1 db between 50 and 10,000 cps, and only 2 db down at 15 kc and 3 db at 20 cps.

There are many features of interest from the viewpoint of designing a quality tape machine and from the operating viewpoint. The motor has a one-pound, large diameter, dynamically balanced flywheel, which helps account for the exceptionally good wow and flutter characteristics of the Tandberg, less than 0.1 per cent at 7.5 ips. For minimum hum, the heaters of the first tube of each amplifier are d.c. operated, and the tube is shielded by mu-metal; the entire amplifier is screened by metal foil. The magic-eye record level indicator is damped so that the eye may follow its peak indications. The in-line head achieves a cross-talk ratio of better than 60 db by means of a mu-metal shield between its two sections; this is important when a dual-track monaural tape is played, so that the signal picked up by the lower section of the head is not coupled to the upper section and thereby heard in playback. The gaps of each section are sufficiently co-linear that the head may be used to play full-track recordings without an apparent time difference between the signals from each section.

When the tape is rewound or wound in the forward direction, the tape is lifted away from the heads to prevent head wear due to abrasive action of the tape coating. No pressure pad is required to maintain firm contact between the tape and in-line head—good contact is very important in

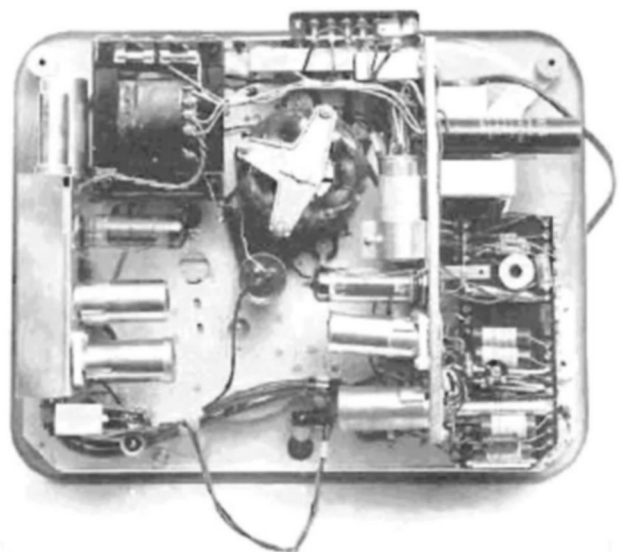
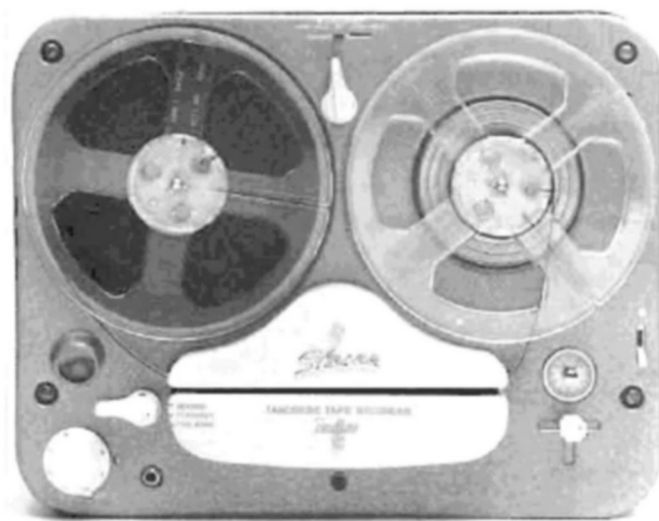


Fig. 1 (left). Panel view of Tandberg Model 3 Stereo Tape Recorder. Fig. 2 (right). Underside view of Tandberg recorder. Section at right is "B" channel in which the output tube serves as the erase-bias oscillator when used as a monaural recorder.

preserving high-frequency response—and the absence of a pad reduces flutter and prolongs head life. Tape tension when the machine is running is kept to a low 10 grams, which serves to minimize wear of heads, tape guides, and capstan. Starting and stopping tensions are respectively about 40 and 120 grams, which means that the very thin "half-mil" tape, which affords twice the playing time of standard tape on a given size reel, can be handled without danger of breakage or stretching.

For the purpose of easily spotting a desired passage, the Tandberg incorporates a program counter with clock-type dial and two hands. The machine can be used for public address purposes by putting the mode selector switch in the lowest position; the monitor speaker or an external speaker or both can then be utilized. A microphone rated as having response to 13,000 cps within 3 db is supplied.