

TANDBERG

PRICE \$ 1.50

HI-FI STEREO 76/77



TANDBERG RECEIVERS

The Tandberg Receiver Series 2000 is certainly the most advanced series of stereo tuner/amplifiers we have ever produced — and among the most advanced in the world!

The underlying design philosophy of Series 2000 is that each element in a receiver must be of equal quality.

The quality of the tuner must match the quality of the preamplifier and the amplifier. For in reality a receiver is simply three separate components placed on a single chassis. You will find some receivers with more powerful amplifiers on the market, but we do not believe it is possible to find a more technically excellent integration of tuner, preamplifier and amplifier on one chassis than the TR 2075, top model in this series. And we believe it will be difficult to find more technically excellent separate components.

This same philosophy of quality matching has been followed throughout the 2000 series. The research testing, and most important the listening, which have gone into Series 2000, combined with Tandberg's forty years of practical experience in the manufacture of radio products mark each of these limited series receivers as a product worthy of the most serious and discerning user. Each unit is distinguished by its own selected rosewood veneered cabinet, giving each a distinct tasteful personality of its own. Performance specifications for these models are not claims or averages. They are guaranteed minimum performance standards. This means that every single unit leaving the factory has a performance equal to or better than our specification.

We specifically call your attention to the FM tuner performance, as it is not customary to find this performance standard in a receiver. And we refer you to page 23 where the detailed performance specifications are listed. But technical performance is not the only criterium of judging a fine high fidelity product. We like to believe that performance is only the beginning. Convenience, human engineering, flexibility, and reliability, all the overworked words of the advertising copywriters, must also have a real meaning. And there should be real enjoyment associated with using the product.

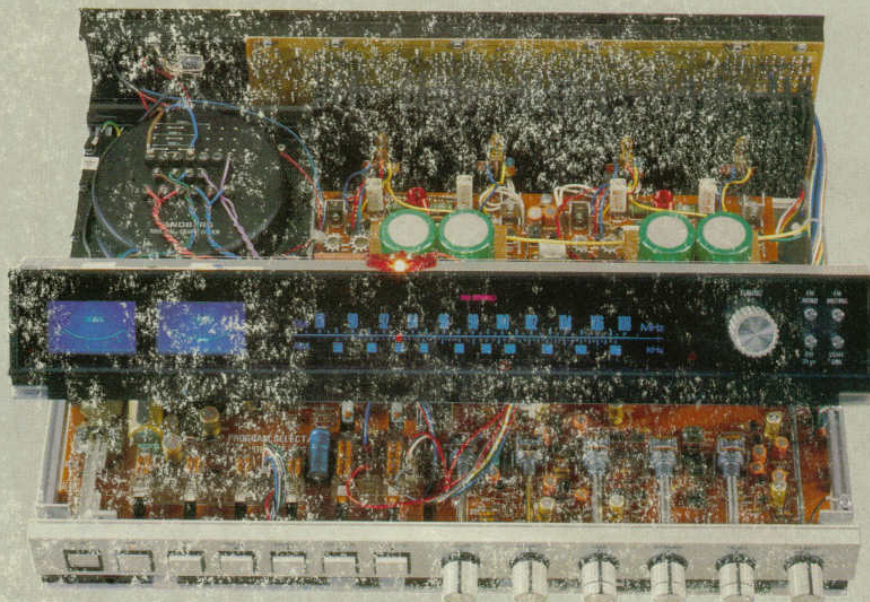
TANDBERG

TR 2075

TR 2075 is the most flexible and powerful model in the 2000 Series, with three separate components of top matching quality combined on a single extruded aluminum chassis. This unusual construction, while more costly, assures manufacturing precision and product durability. Each section has its own special power supply suited to its performance requirement.

***POWER OUTPUT:** Average continuous sinewave power is 75 watts minimum RMS per channel, both channels driven into 8 ohms load, from 20 Hz to 20 kHz with no more than 0.15% total harmonic distortion from 1/4 watt to 75 watts.

*Measured according to FTC rules.



THE FM SECTION

- Regulated MOSFET transistors, 4-pole ceramic filters. Integrated PLL
- Signal-to-noise ratio 74 dB in stereo and 78 dB in mono at 65 dBf
- Electronic varactor diode tuning
- Defeatable FM muting for quiet tuning
- Precision tuning and signal strength meter with wide dynamic range
- Precision center tuning meter
- FM 25 μ s deemphasis switch for use with external Dolby* decoder when receiving FM Dolby* broadcasts

THE AM SECTION

- 2 MOSFETS in the RF and mixer
- 2 tuned RF circuits provide a superb signal/noise ratio
- AVC for reproduction of all stations at equal listening level

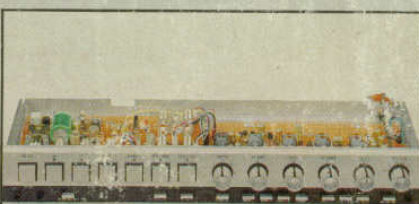
* The name Dolby is a registered trade mark of Dolby Laboratories Inc., USA.

THE PREAMPLIFIER SECTION

- Extremely low noise and distortion
- LED function indicators
- Electronic diode switching for smooth transitions from source to source
- 2 inputs for transcription units
- Completely separate RIAA corrected preamps
- 2 inputs/outputs for tape recorders
- Tape copy facilities permit dubbing from either tape recorder to the other while listening to a third source
- Input sensitivity controls for exact level matching of program sources
- Preamp record — an output which enables tone controls to be used to rebalance recordings on a third recorder
- 6 tone controls, 3 for each channel
- 3 filters, 2 additive high and 1 low
- 2 output jacks for stereo headphones
- Loudness contour

THE AMPLIFIER SECTION

- Differential input for minimum d.c. offset, permits your speakers to react accurately to the signal
- True complementary output with constant current feeding for inaudible secondary crossover distortion
- Excellent stability and recovery with transient sounds
- Outstandingly low phase distortion
- Very wide frequency bandwidth with 1 μ s rise time for excellent reproduction of short duration high harmonics
- Slew rate factor 15V/ μ s for clean, tight sound
- Facilities for 3 pairs of speakers
- 7 protection systems for the output stage and the speakers
- Protection systems never prematurely engage to affect the sound



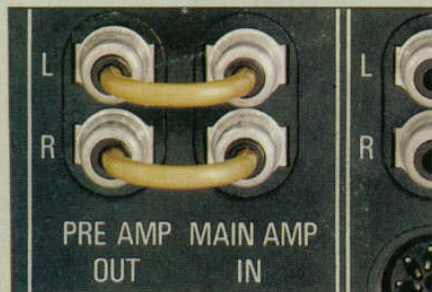
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TR 2075



TR 2075 is a total product. Each section has been designed to give the best possible performance.

Preamp output/main amp input. Enables TR 2075 to be used in bi-amplification systems.



Tandberg Toroidal Transformer eliminates powerful magnetic fields within the TR 2075.



TR 2075 has some very unusual features which make it a pleasure to use. The special combination of input sensitivity controls and electronic diode switching permits each source to be pre-set to exactly the same listening level and then provides a smooth momentary fade-out, fade-in when switching from one program source to another. This is not only pleasant to listen to but very useful for the tape recordist as it makes it possible to switch from one transcription unit directly to the other while recording continuously and without changing recording levels, stopping the recorder or making any other adjustments.



The tape dubbing facilities as well as the facility for using the tone controls to rebalance or recontour a recording being made on the third tape recorder (preamp record) adds unusual flexibility and enjoyment. The signal strength meter doubles as a power reading meter which instantaneously reads the higher peak voltage output of either channel of the amplifier. This enables you to safeguard highly efficient speakers against any possibility of damage from the very powerful amplifier.

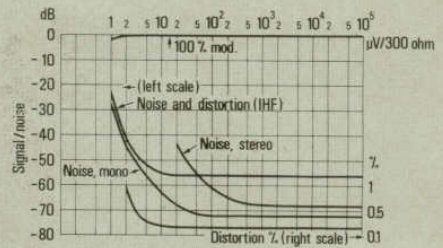
Most important, of course, is the sound quality — and the pleasure to be derived from the very clean, transparent purity of undistorted music.

Cabinet

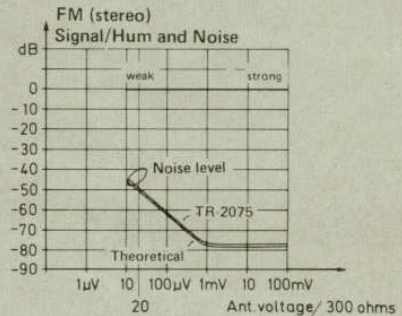
TR 2075 is delivered in a cabinet of high grade compressed wood, veneered with choice selected rosewood.

General

Mains voltage: 120 V, 60/50 Hz (internal tapings for 120 - 220 - 240 V).
Dimensions: width 20 1/2" (51.5 cm), height 6" (15.3 cm), and depth 14" (35.3 cm) plus 1" (2.4 cm) for knobs.
Weight: 27.5 lb (12.5 kg).
Specification, see page 23.
 Read more about the TR 2075 in the large separate informative brochure!

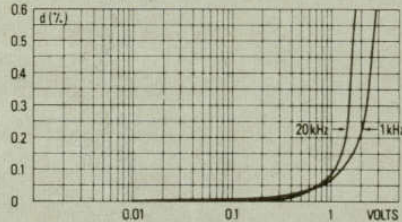


Signal/noise ratio for stereo and mono, and distortion for the FM receiver.

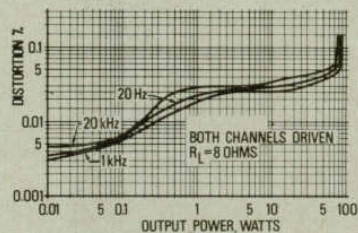


A comparison between the theoretical tuner quieting slope and the actual TR 2075 quieting slope in stereo.

Distortion (%)



Distortion in the pre-amplifier versus output voltage measured on preamp output sockets. 0.45 volts from the preamplifier provides full output from the amplifier.



Distortion as a function of output power (both channels driven simultaneously).

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TR 2055



TR 2055 is of precisely the same quality as our more powerful receiver/amplifier TR 2075. It will also bear comparison with separate component systems. TR 2055 has the same reference standard FM stereo tuner as in our top model, and the same preamplifier, with only slightly less flexibility. These sections are combined with a powerful main amplifier delivering 55 watts minimum continuous RMS power per channel, both channels driven into 8 ohms from 20 Hz to 20 000 Hz with the same, low noise and low distortion as our top model.

THE FM SECTION

- Regulated MOSFET transistors, 4-pole ceramic filters. Integrated PLL decoder: excellent sensitivity, selectivity and low distortion
- Signal-to-noise ratio 75 dB in stereo and 78 dB in mono at 65 dBf
- Automatic FM stereo switching
- Electronic varactor diode tuning for long life. Smooth flywheel tuning
- Defeatable FM muting for quiet tuning
- Precision tuning and signal strength meter with wide dynamic range
- Precision center tuning meter for

minimum distortion

- FM 25 μ s deemphasis switch for use with external Dolby* decoder when receiving FM Dolby* broadcasts

* The name Dolby is a registered trade mark of Dolby Laboratories Inc., USA.

THE PREAMPLIFIER SECTION

- Extremely low noise and distortion
- LED function indicators
- Electronic, time-delayed diode switching for smooth transitions from source to source



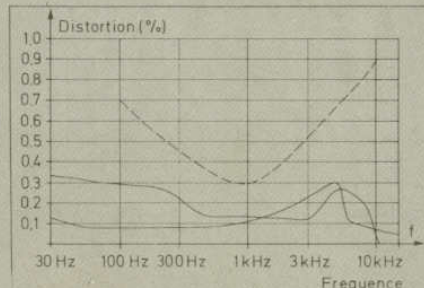
- Inputs for 2 transcription units with separate RIAA corrected preamplifiers
- Inputs/Outputs for 2 tape recorders
- Adjustable input sensitivity for one transcription unit and for both tape recorders for matching program levels
- Both tape recorder inputs have tape monitor facility

Input sensitivity controls permit level matching of program sources.



- Tape copy facilities permit dubbing from either recorder to the other while listening to a third program
- Front output jack for tape recorder (Tape Contour Out) enabling the tone controls to be used to rebalance a recording being made on a third tape recorder

FM distortion versus modulation frequency, usually specified only at 1 kHz by most manufacturers.



- Bass, treble and balance controls
- 2 filters (Low and High): with precision controlled slopes
- 2 output jacks for stereo headphones
- Loudness contour

THE AMPLIFIER SECTION

- Differential input
- True complementary output with constant current feeding for inaudible secondary crossover distortion
- Excellent stability and recovery with transients
- Outstandingly low phase shift distortion
- Very wide bandwidth with 1 μ s rise time
- Excellent slew rate factor
- Facilities for 2 sets of speakers
- 7 protection systems, none of which will prematurely activate to affect sound quality

In brief all the most useful and important functions have been incorporated into this FM-only receiver. The Tandberg developed delayed diode switching gives the smooth fade out/fade in effect when switching from one program source to another. The input sensitivity controls permit level matching. Tape copy, tape contour facilities and two transcription inputs are ideal for any of the most flexible demands. And the 25 μ s tuner deemphasis switch used with an external Dolby* decoder or with any of the Tandberg Dolby equipped tape recorders to decode Dolby encoded FM broadcasts makes this a very complete and exciting receiver/amplifier to own, to use, to enjoy.

Cabinet

TR 2055 is delivered in a cabinet of high grade compressed wood, veneered with choice selected rosewood.

General

Mains voltage: 120 V, 60/50 Hz (internal tappings for 120 - 220 - 240 V).
 Dimensions: width 20" (51 cm), height 6" (15.3 cm), and depth 14" (35.3 cm) plus 1" (2.4 cm) for knobs.
 Weight: 28 3/4 lb (13 kg).
 Specification: see page 23.

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TR 2025

The TR 2025 completes the TR 2000 Series — all top models designed to meet a variety of needs and means.

This is an FM-only receiver which incorporates pre-tuning facilities for five favorite FM stations.

The unit includes an exceptionally fine FM tuner section not usually associated with receivers in this price range. The preamplifier is quiet, clean and versatile. The power amplifiers delivers 25 watts RMS continuously per channel both channels driven into an 8 ohm load with no more than 0.15% distortion over the complete frequency range from 20 to 20 000 Hz from 1/4 watt to 25 watts. Similar design criteria were used for this amplifier as in the other 2000 Series models, assuring the same high quality sound and safety.

- Excellent stereo tuner. MOSFETS, IC's, and 3x4-pole ceramic filters providing extremely good sensitivity and selectivity
- Automatic switchover to stereo
- Automatic frequency control (AFC) disconnects itself during tuning and connects itself again when tuning is completed. Can also be operated manually
- Heavy flywheel gives smooth, precise tuning
- 2 large sensitive meters
- Muting for quiet tuning
- DIN sockets for 2 tape recorders. Both inputs have TAPE MONITOR facility
- Copying facilities for 2 tape recorders simultaneously
- Input for transcription unit
- LOW and HIGH filters
- Switchable frequency/loudness compensated volume control
- Front output jack for stereo headphones

TR 2025 is equipped with a special FM muting circuit which assures almost silent entry and exit from each station as you tune. An automatic AVC circuit completes fine tuning. And the signal strength meter is dual purpose: when tuning manually it indicates the signal strength; but it is also the tuning scale for the five pre-tuned stations.

If sound can be described, we would say that the TR 2025 will give you clear, clean, spacious sound that is a sheer delight to listen to.

Cabinet

TR 2025 is delivered in a cabinet of high grade compressed wood, veneered with choice selected rosewood. Each cabinet has its own unique wood grain.

General

Mains voltage: 120 V, 60/50 Hz (Internal tappings for 120 - 220 - 240 V).

Dimensions: width 20 1/2" (51.5 cm), height 5 3/4" (14.3 cm), and depth 12 3/4" (32 cm) plus 7/8" (2 cm) for knobs.

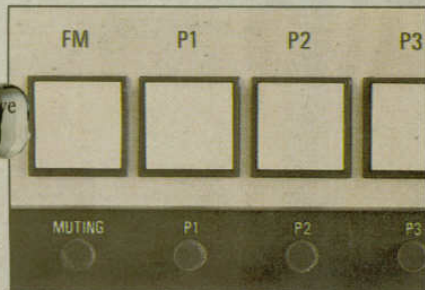
Weight: 19 lb (8.3 kg).

Specification, see page 23.

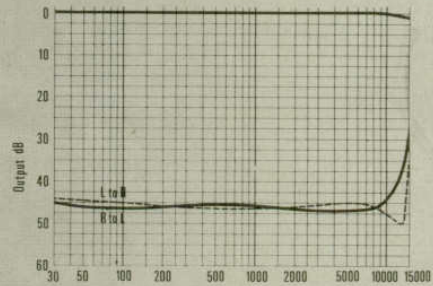




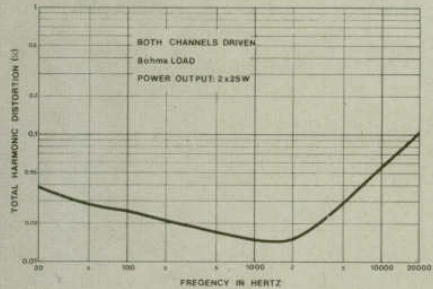
Pre-tuning for 5 FM stations.
 This allows you to pre-tune up to 5 stations so that afterwards any station can be instantly selected by its P button.



2 large meters. Signal strength meter (left) is dual purpose. For manual FM tuning it indicates signal strength with a large dynamic range. It is also a frequency scale for the 5 pre-tuned stations. The meter on the right is a fine-tuning meter.



Frequency response and separation on FM.



Distortion as a function of frequency, both channels driven to full power.

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REEL-TO-REEL RECORDERS

Tandberg became internationally known through the introduction of their reel-to-reel tape decks. Today the company's reputation is closely linked to these machines. The name itself has become a synonym for recording excellence.

We are flattered and pleased by this reputation, but it imposes very heavy responsibilities.

The need for continual research and development is assumed. The need to constantly excel is also assumed. But most importantly the need to continue our basic philosophy is paramount.

It is the function of recording which distinguishes a tape recorder; the playback quality of a tape is only as good as the quality of the recorder which produced it. This means that the major part of a serious machine's cost must go inside the unit — to produce genuinely reliable mechanisms and the best possible combination of heads and electronics. So-called features must be included only if they contribute to better quality and are genuinely useful — not just good «sales points».

This stress on concrete functional values has led us to the development of machines we are particularly proud to be associated with. Two of these machines are described on the following pages.

TANDBERG

10XD



Model 10XD is the top model in our reel-to-reel series recorders — designed for the most discriminating user.

- 3 speeds: 15, 7½, 3¾ ips, electronically selected
- 3 motors; Hall-effect capstan motor
- 3 heads; plus separate bias head
- Electronic servo speed control
- Electronic logic mode controls, including photo optics
- Electronic balanced microphone inputs
- Peak indicating meters
- Direct transfer from playback to record (flying start)
- Ferrite playback head with symmetrical balanced output for cancelling hum and differential playback amplifier
- Echo, sound-on-sound, editing, A and B tests

TANDBERG

10XD

The Dolby* switch

The four Dolby processors in the 10XD can be used to record and monitor the signal simultaneously. The 19 kHz filter can be used for proper record encoding of normal FM signals, and there are provisions for recording already encoded FM stereo broadcasts. The Dolby B* system reduces tape hiss by up to 10 dB.

* The name Dolby is a registered trade mark of Dolby Laboratories Inc., USA.

Balanced microphone inputs

To prevent the unintentional introduction of unwanted electrical noise during live recording, 10XD is equipped with balanced microphone inputs. The inputs are transformer-less to give correct low frequency reproduction and to reduce the risk of microphony. Tandberg has developed a special microphone input amplifier which automatically adjusts itself to the impedance of the microphone to further assure minimum noise contribution during live recording.

Electronic or mechanical editing

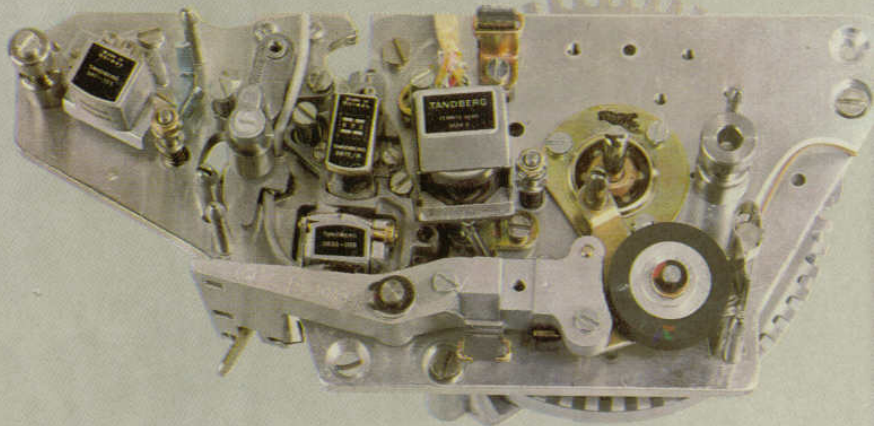
A so-called «Flying Start» facility enables direct transfer from playback to record for exact «running edit». The Edit/Cue control defeats the automatic tape lifters and muting circuit so that the program may be heard during fast forward winding to simplify the location of a particular passage. Tape reels may be rocked back and forth either manually or electronically for locating points.

Optional accessories

Tandberg microphones. Remote control unit, case, kit for rack mounting (19" rack). Pitch control unit (by special order with pitch control machines). See page 22.

Cabinet

Model 10XD is furnished in a cabinet of compressed wood composition finished with high grade rosewood veneers.



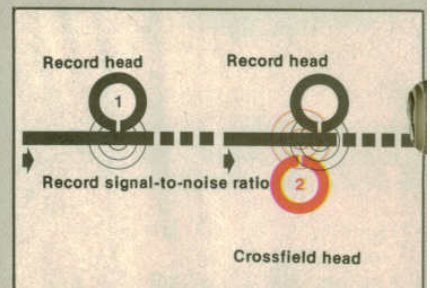
The tape path

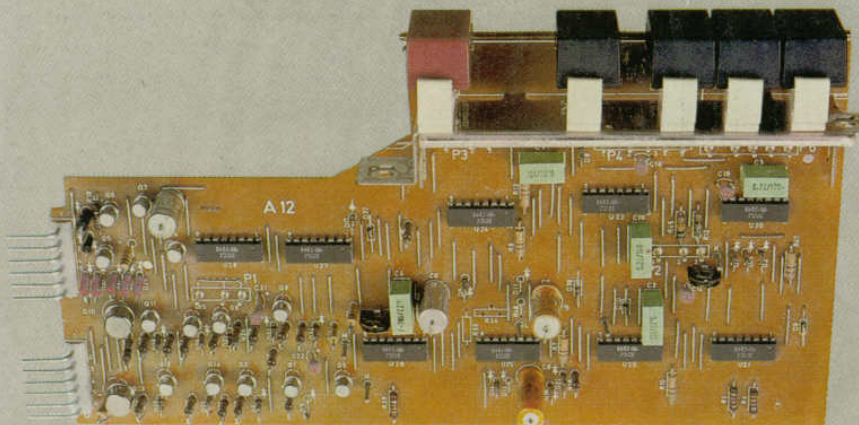
The tape path and the magnetic heads are the heart of any tape recorder. 10XD is equipped with a studio-type tape path. This mechanism is mounted on a rigid 5 mm plate providing great stability. The capstan is made from special stainless steel and manufactured by a process that guarantees complete control over the dimensions and surface treatment. The capstan is attached to a flywheel which is precision balanced and runs in special self-lubricating, hermetically sealed ball-races. In addition the *studio-type flutter filter* guarantees minimum speed variations and prevents modulation noise that can arise as the tape travels over the various polished surfaces.

The heads and the motor pulley can be microadjusted in three dimensions. This guarantees the best possible contact between the heads and the tape. In addition to the special Tandberg Crossfield head, the Tandberg ferrite playback head is of special interest as it employs a balanced output to minimize any possible induced hum. All the magnetic heads, which have been developed and manufactured at Tandbergs Radiofabrikk in Oslo, are subjected to special tests and hand-picked for each machine to have as far as possible the same performance.

Tandberg Crossfield recording technique

The main point with the Crossfield technique is that the tape passes between the record head and a special Crossfield head. During recording the Crossfield head provides transverse bias magnetization which means that the tape is thoroughly magnetized. The result is that the tape can accept much stronger signals than with conventional techniques and reproduce the same signals without audible distortion. This yields, amongst other benefits, minimum distortion, a generous overload margin, a very wide frequency range at all tape speeds, and an extended dynamic range.



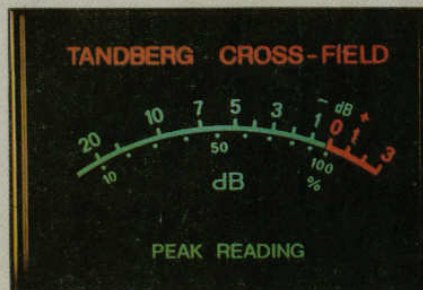


High-level logic control

The 10XD control system is an «electronic brain» composed of high-level logic circuits employing a number of integrated circuits on one easily serviced printed board. This compact design corresponds to several hundred transistors. Touch buttons mounted on the same board control all operational modes and trigger the proper activity sequence without the user having to press intermediate mode buttons. For example, to go from fast forward into play mode, only the play button need be touched. The logic will automatically control all braking modes to stop the tape, an infra-red light emitting diode and photo transistor sensor will inform the logic when the stop mode is completed, and the logic will then «remember» that «Play» has been touched and engage that mode. Lamps in each key indicate the function being performed. The greatest advantage of this system is that commands are transmitted in milliseconds and that changeover from one mode to another is very fast, with fully automatic control to prevent tape spill and assure proper tape tension and security. The system provides maximum possible simplicity and safety of operation and can be remotely controlled with an optional unit.

Peak-indicating level meters

Large meters indicate the level during record and playback. The meters indicate the peaks of the signal. This means that even when the loud parts of the program have a duration as short as 40 to 50 ms the meters still respond. If the tape is overloaded with signals of a shorter duration than 40 ms the human ear does not perceive the distortion. VU meters are often used on tape recorders. A VU meter has a long time constant and is slow to respond. It therefore gives an average indication and has very little regard for the loud sounds of short duration. These sounds can overload the tape and the person watching the meter will be totally unaware that it is happening. A peak indicating meter therefore gives a far better guarantee of a successful recording than a VU meter.



General

Adjusted for lowest noise, highest output tape. Largest spool diameter 10 1/2". Delivered as a 4-track machine (2-track and pitch control units by special order). Standard equipment: 2 adapters (NAB) and empty spool 10 1/2" (NAB). Dimensions (without spools): width 17 1/2" (43.5 cm) height 7 1/2" (18.5 cm), depth 18 3/8" (45 cm). Weight: 36 lb (16.4 kg). Specification: see page 24.

Electronic servo-controlled speed regulation.

The servo-control system for regulating the tape speed during record and playback is one of the many professional features on the 10XD. It is responsible for a remarkably low speed tolerance: better than $\pm 0.3\%$! The servo-control system operates as follows: an infra-red light-emitting diode is located on one side of the toothed wheel attached to the flywheel. The teeth break the light beam and the resulting light pulses are transferred to electronic circuits via a photo-transistor. Each speed (15", 7 1/2" and 3 3/4" per second) corresponds to a particular pulse frequency. If the comparison reveals a deviation, the capstan motor either increases or decreases its speed accordingly. The system operates instantaneously and naturally the corrections are far too small to be noticeable.

The sophisticated servo-controlled brushless d.c. motor is operated by built-in Hall Effect devices. Power to the flywheel is transferred so that there is no danger of «hunting» effects or electrical noise as with direct drive systems. Tape stability is further maintained by a servo-controlled back-tensioning system which keeps the tape tension constant in the tape path regardless of the amount of tape on the supply reel.



TANDBERG

3500X



- Tandberg Crossfield recording technique
- 3 speeds: 7 1/2, 3 3/4, and 1 7/8 ips
- 4 heads, including the Crossfield bias head
- Precise control of record and playback levels with slide potentiometers
- Large peak indicating meters — the best way to measure program levels
- Easy editing with direct switchover

- from playback to record
- Tape and source monitoring during recording
- Trick recording facilities: sound-on-sound, echo, mixing in mono
- Photo-electric end stop
- Front jack for stereo headphones

We have designed this model for those who desire a machine which offers exceptional recording quality at a moderate price point. A straight forward recorder, it provides the highest possible recording quality at the lowest possible price. Emphasis has been placed upon coupling the finished electronics with a very stable, reliable and proven mechanically driven transport system.

The tape transport

The 3500X tape transport and tape path have been engineered to allow the tape to pass smoothly and precisely across the heads without stress. Tape path components are micro-machined. A flutter filter is incorporated to reduce intermodulation noise to a minimum. The heads have been developed and manufactured by Tandberg to exploit the best features of the latest types of tape.

The electronics

Significant care has been given to selecting only the finest grade electrical components to ensure that the residual electronic noise is far quieter than the residual tape hiss from the finest tapes available. This means in essence that the 3500X is limited only by the state-of-the-art of recording tape and that future tape improvements in conventional tape format should yield even better results with this machine.

Crossfield recording

3500X features the famous Tandberg Crossfield recording technique which increases the high frequency output from the tape by reducing losses associated with conventional tape recording. This results in a wider dynamic range, permits stronger signals to be recorded on the tape and produces a dramatically better signal-to-noise ratio with no increase in distortion. The final result for your ears: professional studio class sound reproduction — even at 3 ¼ ips!

Versatile features

You can record and reproduce in stereo or mono from various sound sources: microphones, receiver with a transcription unit or another tape recorder connected. Direct replay and program control through the stereo headphone socket in front or to a separate Hi-Fi stereo amplifier. Input and output levels are controlled with slide potentiometers providing precise and gentle control. Program being recorded can be mixed in mono. Other recording facilities are echo and sound-on-sound. The recording quality can be guaranteed with A and B tests.

Peak indicating meters

Model 3500X has large, illuminated peak indicating level meters. They respond within 40 to 50 milliseconds, are equalized and show exactly what is going onto the tape at any instant. This allows you to use the tape recorder's full dynamic range. It also enables the characteristics of the tape to be fully exploited.

Optional accessories

Tandberg microphones, case, dust cover, kit for 19" rack mounting. See page 22.

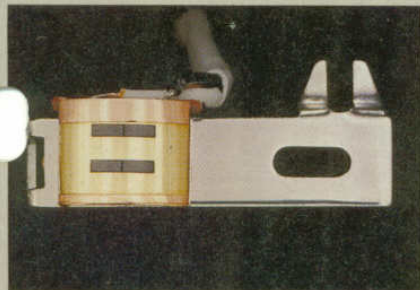
Cabinet

3500X is furnished in a cabinet of compressed wood composition finished with high grade selected walnut veneer.

General

Adjusted for lowest noise, highest output tape. Largest spool diameter 7". Equipped with reel locks for use when vertically mounted. Delivered as 4-track version. **Dimensions:** width 15 3/4" (40 cm), height 7 1/8" (18 cm) and depth 16" (41 cm). **Weight:** 20 lb (9.1 kg). **Specification: see page 24**

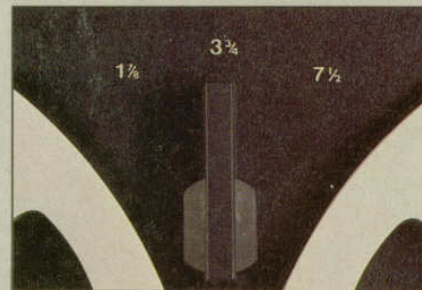
The 3500X Crossfield head. This special head supplies transverse bias during the recording process for improved frequency response and dynamic range.



Model 3500X is equipped with a photo-electric stop. The tape passes between a lamp and a photo-transistor. At the end of the tape or when the tape is transparent, the forward drive stops automatically.



3500X has three recording speeds making it economically suitable for all applications from background music reproduction to live recording.



TANDBERG

CASSETTE RECORDERS

Tandberg was the first company in the world to design a cassette tape recorder with a combination of 3 motors and an advanced tape transport called the dual-capstan closed-loop system. On the following pages we present two models, our three head cassette machine TCD 330 and our two head deck TCD 310.

Both these models are based upon our famous three motor, dual capstan transport. Both employ advanced circuitry. Our philosophy of recorder design means that just as with the reel-to-reel recorders, our emphasis must be placed upon the real problems of recording, not just the superficial elements which show in specification claims. Therefore, we have been doubly careful not to find relatively simple solutions to complex problems. For example, it is not very difficult technically to extend the frequency response of a tape recorder to a very impressive figure. But carried to extreme the techniques which can yield these very impressive claims can also destroy the ability of the recorder to handle the high dynamics of music; so a balance must be struck. We believe these two machines offer the most correct balance of technical solutions. We guarantee that they will perform as specified and we know that they will produce the best results possible in their format.

TCD 330

TCD 330 represents a new level of cassette deck performance. This is a three head, dual capstan, logic operated deck which offers a rare combination of flexibility and convenience.

The precision-made tape path and the 3-motor drive system unfailingly handle the cassettes and the tape in the firmest but gentlest manner.

The sympathetic interplay between the «electronic brain» in the logic control and the tape tensioning system enables the TCD 330 to switch directly from mode to mode without going through stop; this includes direct switchover from playback to record which provides an electronic editing facility. All modes can be remote controlled. Tight tolerances on all mechanical parts means a tape transport system with an outstanding performance. TCD 330 is an exciting new development incorporating the famous Tandberg three head reel-to-reel technology with our cassette tradition.

We believe that no cassette recorder can match our professional reel-to-reel recorder for total flexibility and absolute professionalism in recording. But we believe that within the cassette format TCD 330 offers the closest approach to professional reel-to-reel performance in a compact, convenient format suited to the majority of tape recording demands.

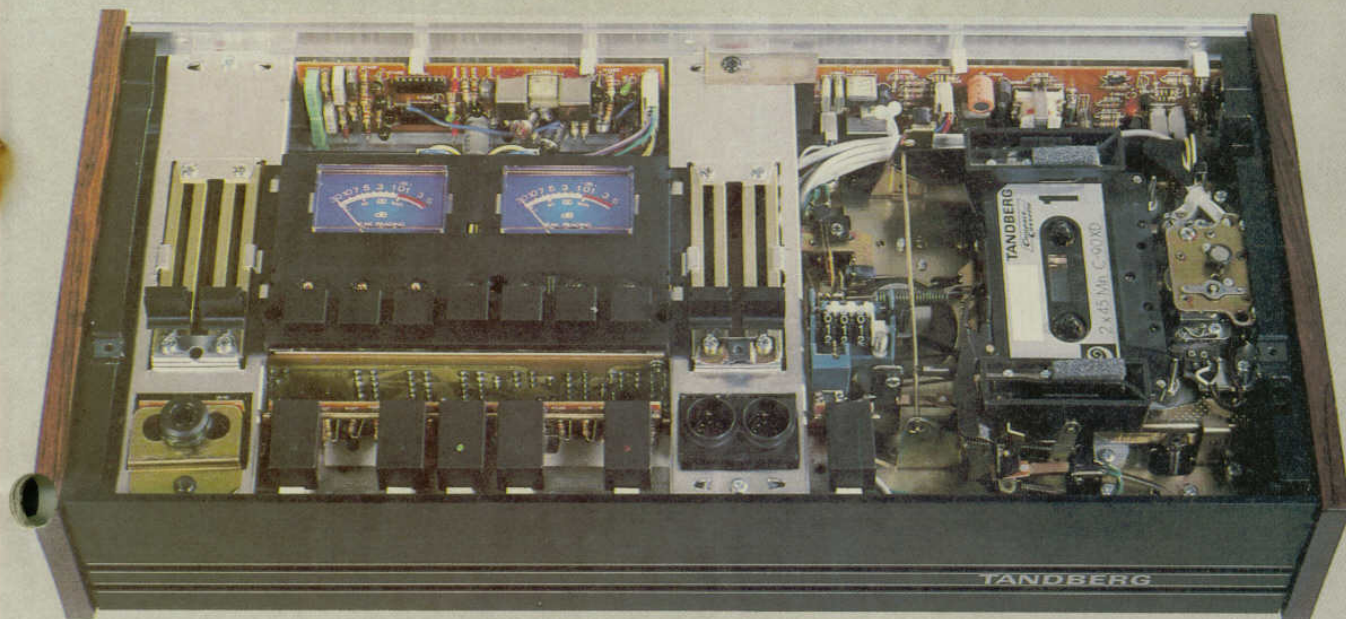
TCD 310

TCD 310 has become a legend among two head cassette recorders. It has been consistently top rated by some of the most serious technical journals in the world.

In professional reel-to-reel tape recorders and in the most advanced semi-professional machines 3 motors are taken for granted. Tandberg has made a two-head Hi-Fi cassette tape recorder which is the first in the world with 3 motors, with a very special tape transport system, with peak level meters and with the Dolby B* noise reduction system.

TANDBERG

TCD 330



- 3 Heads: for tape/source monitoring during recording
- Azimuth Adjustment: for precise tape/head alignment
- Electronic Editing: for program tailoring
- 3 Motors: for reliability
- Servo Tape Winding: for gentle tape handling
- Dual-Capstan Closed-Loop Drive System: for longterm stability
- Fingertip Logic Control: for foolproof transition from mode to mode
- Dual Dolby* System: for simultaneous record/playback Dolby* processing
- FM Dolby* Decoder (25 μ s deemphasis): for the quietest FM listening or recording
- MPX Filter Switch: for accurate FM record Dolby* tracking
- Peak Equalized Meters: for security against overload and distortion
- Linear Input and Output Level Controls: for precise adjustments
- Headphones Jack: for monitoring live recordings
- Rewind Memory: for added convenience

3 heads — source and tape tests as you record!

This facility has been normal on reel-to-reel machines for many years, but it has been very difficult to achieve properly on cassette machines. The TCD 330 has separate record and playback heads placed in the tape path where they enable you to listen to the recording as it takes place, but a fraction of a second after it has been recorded (tape test). With this facility we have fully exploited the advantage of 3 separate heads located in the correct places.

Electronic editing facility

A great limitation of cassette recorders until now has been the difficulty in editing. We have incorporated the «Flying Start» capability of our professional reel-to-reel recorder into the TCD 330. It is possible to go directly from playback to record without going via stop; you can edit tapes and clean-up recording overlaps in a simple, precise way without clicks.

Rapid servo-controlled winding

The TCD 330 winds and rewinds rapidly and has an automatic electronic servo-system controlling the wind/rewind

speed. The design problem is that the tape can easily be stretched at the ends if the speed and winding power are too great. We solved this problem by automatically reducing the speed as the tape gets near the end. So the tape speed is always correct and the tape is never exposed to powerful tugs when it stops.

Peak level meters

The peak level meters have a very fast rise time (40 to 50 ms) and a slower decay time so they show you the exact current applied to the record heads. Unlike peak indicator lamps, these meters give you complete control over the recording process so that you have the best chance of avoiding distortion from high energy, short duration, music passages.

The Dolby B* circuits. Dolby processors are provided.

This «Dual Dolby*» system enables proper encoding/decoding while recording and monitoring take place. The TCD 330 Dolby B* circuits are used for normal record and playback operations and to record so-called «Dolbyized FM programs» in stereo! With the DOLBY* N.R. button in the position «FM» the TCD 330 can be used either to

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TCD 330



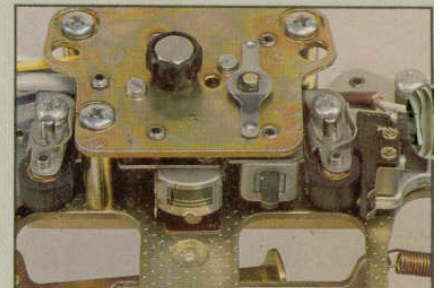
record Dolby* encoded FM broadcasts with the correct 25 μ s deemphasis supplied, or as a decoder, without activating the record mode.

How the tape path for the 3 heads and dual capstans was designed

The designer of a tape path for advanced cassette machines is faced with certain constraints, e.g. the cassette has 5 different windows and the heads and capstans must be inserted into these

windows in a particular order to obtain tape/source tests and a good performance. With the TCD 330 we have used the correct opportunities open to the designer. The playback head is located in the middle window which is the only window where it benefits from the cassette hum-shield. The record head was specially designed to fit in the window beside the playback head and the erase head is located in the same window as the first capstan. The dual-capstan,

closed-loop transport assures stable tape movement. All the heads are mounted on a single solid headplate and you can adjust the azimuth easily to match each cassette!





The TCD 330 has 3 motors controlled by electronics. The two reel motors are connected directly to the reel spindles while the third motor controls the capstans. The number of moving parts

has been reduced to a minimum — a big advantage because all mechanisms sooner or later wear out and need adjusting or replacing. The advantages with electronic control of the TCD 330 are first and foremost, no mechanical time delays between operational modes and second, all operation times are minimal. The TCD 330 can go direct from wind to rewind, or from rewind to wind and, even more important, direct from playback to record. In short, with the TCD 330 we have achieved the same mechanical excellence normally found only on advanced reel-to-reel machines.

Completely logic controlled

All the operational modes are logic controlled — including even the cassette eject mechanism. The control system is an «electronic brain» with integrated circuits.

This provides a very compact and reliable design. Regardless of how you use the mode buttons, the «electronic brain» always ensures that the tape flows smoothly and is not damaged.

Cabinet

The TCD 330 is delivered in a cabinet of compressed wood composition finished with high grade selected rosewood veneer.

Optional accessories

Tandberg microphones, Tandberg remote control unit. See page 22.

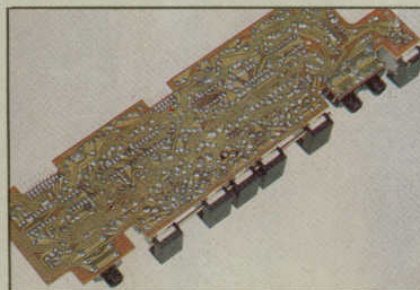
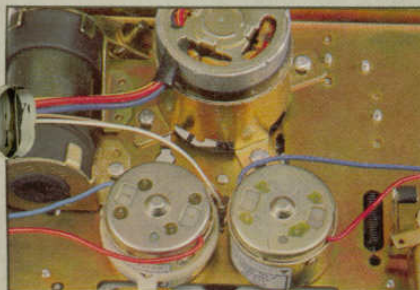
General

Dimensions: width 18 1/2" (47 cm), height 4 1/8" (10.5 cm) and depth 9 1/8" (23 cm).
Weight: 13 lb (6.6 kg).
Specification: see page 24.

Adjustable azimuth on record head

The critical stage in the recording process is where the tape crosses the record head. Correct reproduction of the highest tones is very dependent on the angle between the tape and the head face. The angle must be 90° to achieve the best performance. A 10 minutes angle error will give 6 dB loss at 15 kHz, and a 15 minutes error will give 6 dB loss at 10 kHz.

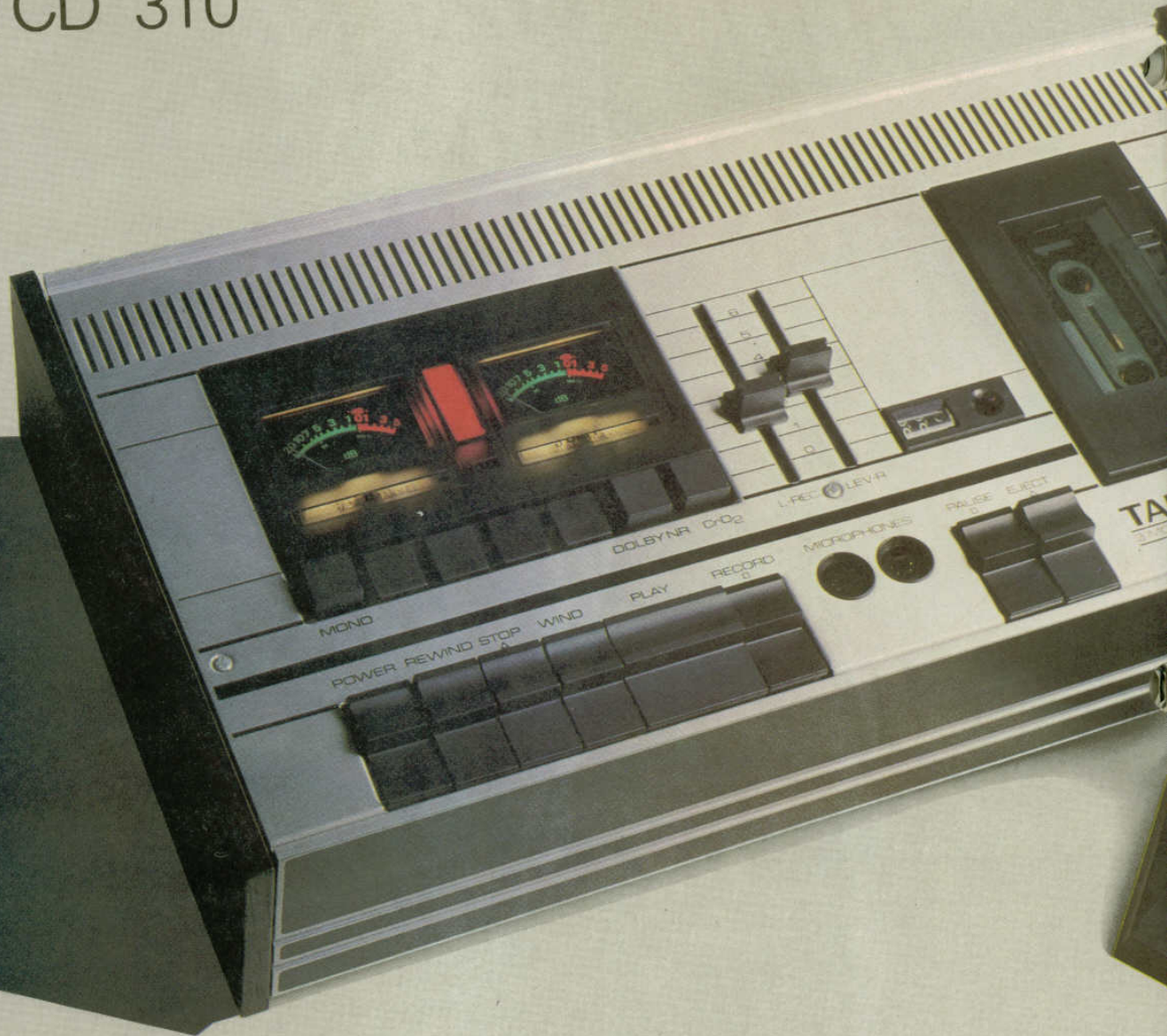
The tape path is always slightly different from one cassette to another because of small deviations in cassette construction. So the tape/head angle will not always be 90°. The TCD 330 has a simple, built-in head-angle adjustment facility (azimuth adjustment) that allows you to set the head exactly to 90° for any cassette. So you get the best results from every cassette!



- RECORD HEAD AZIMUTH ALIGNMENT
- RECORD HEAD SCREW
1. INSERT CASSETTE
 2. TEST TONE TO 'ON'
 3. OUTPUT LEVEL TO MAX
 4. START RECORDING
 5. MONITOR TO TAPE
 6. TURN RECORD HEAD SCREW FOR MAX DEFLECTION ON RIGHT METER
 7. TEST TONE TO 'OFF'

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TCD 310



- Tape transport system has 2 capstans and 2 pressure rollers (closed loop). Amongst other things this means that speed variations are reduced to a very low level
- Electronic controls
- High quality magnetic heads
- Large peak level meters
- Mixing in mono
- Automatic stop
- Can be used in vertical or horizontal position

The Dolby B* system

The TCD 310 has the Dolby* noise reduction system. This reduces tape noise by about 10 dB compared with conventional systems. The Dolby* system is especially important in a cassette tape recorder because the tape noise is higher than in a reel-to-reel tape recorder. The Dolby* system can be connected and disconnected with a switch.

* The name Dolby is a registered trade mark of Dolby Laboratories Inc., USA.

Tape selector

The magnetic heads and the electronic circuits in the TCD 310 were designed for maximum exploitation of the best characteristics of the newest tapes. A selector allows you to adjust the tape recorder to optimum for different types of tape.

Peak level meters

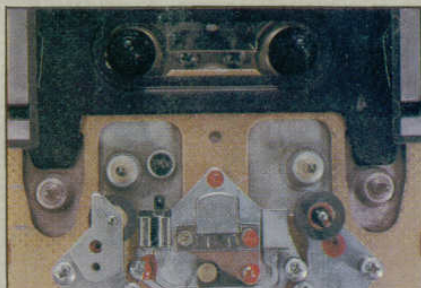
Peak level indicating meters assure the best possible recording conditions.



The tape transport

In a tape recorder it is a big advantage if the number of moving parts is reduced to a minimum. All mechanisms sooner or later wear out, and complicated clutch systems and mechanical linkages contribute to a worsening performance. This is particularly true for cassette machines because the cassette's construction gives narrow tolerances for high quality sound reproduction. The tape transport system in the TCD 310 has been designed to ensure that the machine's high performance will be retained for a very long time. Even heavily worn cassettes will not be damaged in the TCD 310 because it has a built-in safety device that automatically stops the tape-drive if the tape is jammed. The dual-capstan closed-loop system consists of 2 capstans with precision flywheels and two pinch rollers. This provides a stable tape path with minimum speed variations. The mechanism is simple and solid giving a reliable performance. The tape transport system provides the correct tape tension across the magnetic heads and cancels irregularities in the sound level caused by the pressure pad in the cassette. During record/replay and fast winding the driving mechanism is automatically disconnected at the end of the tape.

One of the special features on TCD 310: the tape transport system with 2 capstans/flywheels and 2 pinch rollers in a closed loop system.



Cabinet

TCD 310 is delivered in a cabinet of compressed wood composition finished with selected walnut veneer.

Optional accessories

Tandberg microphones. See page 22.

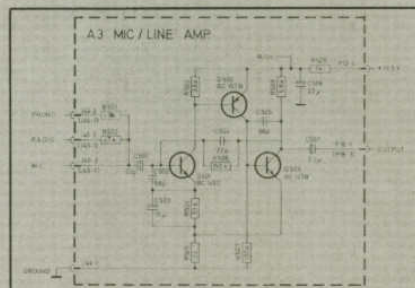
General

Dimensions: width 17" (43 cm), height 4 1/4" (10.5 cm) and depth 9 1/4" (23 cm).
Weight: 15 1/2 lb (6.5 kg).
Specification: see page 24.

Self-adjusting input amplifier

This novel self-adjusting input amplifier was specially designed at Tandbergs Radiofabrikk. While conventional input amplifiers are optimized to a particular program source and are often badly matched to other program sources, this amplifier adjusts itself automatically to different program sources (radio, record player with ceramic pick-up, amplifier, microphone). The result is something that cannot be achieved with conventional amplifiers: a full dynamic range and the absolute minimum noise from the input circuits — regardless of which program source and which recording level are used.

Responsive to peaks of 40 to 50 milliseconds or longer, these meters show the exact current delivered to the record head and therefore give you complete control over the recording process. This is especially important in the cassette format where the chances of overload and distortion are much greater than with reel-to-reel recorders.

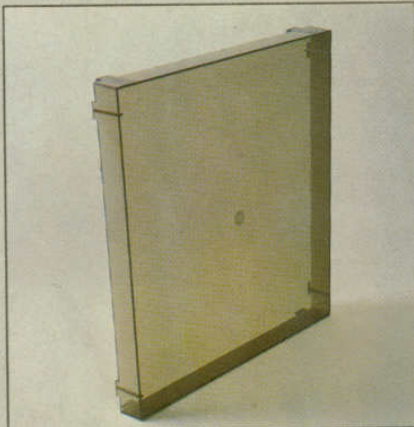


TANDBERG ACCESSORIES



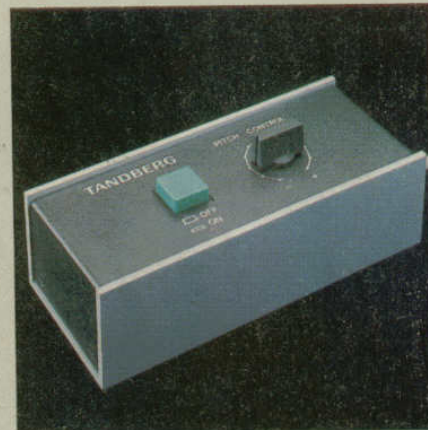
Rack Mount Kits

Rack mount kits are available for models 3500X and 10XD and adapt the model for mounting in standard 19" American Racks. For 3500X please specify model **RM9**, for 10 XD please specify model **RM 10**.



Dust cover

Smartly styled, smoked plastic, durable dust covers are available for Tandberg reel-to-reel recorders. For Model 3500 X please specify **PDC 4**. For Model 10XD please specify **PDC 5**.



Tandberg Pitch Control Unit

Available only with special order version of Model 10XD, prepared for this unit. The Tandberg Pitch Control Unit enables the tape speed to be varied electronically within certain tolerances for specialized applications. Please specify **PCK**.

Tandberg Remote Control Unit

For Models 10XD and TCD 330 with 16 feet of cable. Remote control of fast spooling, recording, replay and stop. The same keyboard as on the tape recorder (even if the remote control unit is connected the keyboard on the tape recorder continues to work). The remote control unit can be connected to a timer which gives automatic recording, replay and stop at chosen times. Please specify **RC-9**.



Tandberg TM 6 Microphone

An elegant case in extruded aluminium. Suitable for reproduction of speech, vocal and instrumental music. TM 6 is not sensitive to touch noise and is well damped for wind noise and breath noise. This means that it can also be used very near to the sound source for singing or speaking. The TM 6 has a spherical characteristic and can accept sound from practically any direction. The TM 6 is delivered in an elegant plastic case with a table stand and fixture for mounting on a floor stand. As an accessory a bigger and more stable table stand can be delivered.

TM 6 specification

Frequency response: 50 to 15 000 Hz (+3, -6 dB).
Directional characteristic: spherical (omnidirectional).
Principle: electro-dynamic.
Sensitivity: 0.1 mV/μbar (at 1000 Hz).
Impedance: 250 ohms.
Connections: permanently connected to a 4 m lead with a DIN plug.
Dimensions: width 7 5/16" (185 mm), max. diameter 15/16" (23.5 mm).
Weight: 5 1/2 oz (160 g) with cable and plug.

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TECHNICAL SPECIFICATIONS, RECEIVERS

FM SECTION Specifications according to IHF-T-200, 1975 (IEEE std. 185, 1975)	TR 2075	TR 2055	TR 2025	Special additional technical data for TR 2075
Usable sensitivity, mono into 300 ohms.	1.7 μ V (9.8 dBf)	1.7 μ V (9.8 dBf)	2.0 μ V (11.2 dBf)	AM SECTION Tuning range: 518 to 1600 kHz. IF frequency: 455 kHz. Sensitivity, IHF: 20 dB quieting at 1000 kHz, 30% mod.; ferrite antenna 250 μ V/m, external antenna 20 μ V. Selectivity: 45 dB at ± 10 kHz. IF rejection: 80 dB. Image frequency rejection: 90 dB. Harmonic distortion: 1.5% at 80% modulation, 0.8% at 30% modulation.
50 dB quieting sensitivity (300 ohms) Mono Stereo	3 μ V (14.8 dBf) 40 μ V (37.3 dBf)	3 μ V (14.8 dBf) 40 μ V (37.3 dBf)	3.5 μ V (16.2 dBf) 40 μ V (37.3 dBf)	
Signal-to-noise ratio at 65 dBf (1 mV, 300 ohms) Mono Stereo	78 dB 75 dB	78 dB 75 dB	72 dB 70 dB	
Frequency response, 30 Hz to 15 kHz Mono and stereo	+1, -2 dB	+1, -2 dB	+1, -2 dB	
Distortion at 65 dBf (1 mV/300 ohms at 1 kHz) Mono, less than Stereo, less than	0.2% 0.3%	0.2% 0.3%	0.4% 0.5%	
Capture ratio	0.9 dB	0.9 dB	1.5 dB	
Alternate channel selectivity (± 400 kHz)	80 dB	80 dB	75 dB	
Spurious response ratio, greater than	95 dB	95 dB	95 dB	
Image response ratio, greater than	70 dB	70 dB	70 dB	
I. F. response ratio, greater than	95 dB	95 dB	95 dB	
AM suppression ratio, greater than	70 dB	70 dB	65 dB	
Stereo separation, 60-10,000 Hz, greater than	40 dB	40 dB	40 dB	
Subcarrier product ratio	60 dB	60 dB	52 dB	
AMPLIFIER SECTION				
Power output in 8 ohms (4 ohms), 20-20,000 Hz at 0.15% distortion*)	2 x 75 W (2 x 100 W)	2 x 55 W (2 x 75 W)	2 x 25 W (2 x 25 W)	
Total harmonic distortion at any power from 1/4 watt up to rated power into 8 ohms load*)	0.15%	0.15%	0.15%	
Total harmonic distortion at 1 dB below rated output into 8 ohms load	0.08%	0.08%	0.08%	
Intermodulation distortion, IHF	0.15%	0.15%	0.15%	
Damping factor at rated output power 20-20,000 Hz, 8 ohms load	60	50	50	
Frequency response (-1.5 dB)	6-80,000 Hz	7-80,000 Hz	8-50,000 Hz	
Channel separation, any input at 1 kHz, minimum	60 dB	60 dB	60 dB	
Tone controls: Bass at 50 Hz Midrange at 1 kHz Treble at 10 kHz Loudness at 50 Hz, max. Loudness at 10 kHz, max.	± 15 dB - ± 7 dB ± 15 dB + 8 dB + 3 dB	± 15 dB - ± 15 dB + 8 dB + 3 dB	± 15 dB - ± 15 dB + 8 dB + 3 dB	
Filters LOW: -12 dB/octave, 3 dB at HIGH 1: -12 dB/octave, -3 dB at HIGH 2: -6 dB/octave, -3 dB at	70 Hz 8 kHz 8 kHz	70 Hz 8 kHz -	70 Hz 8 kHz -	
Input sensitivity at rated output, 8 ohms load; and impedance				
TAPE 1	150-600 mV 25-33 k ohms	150-600 mV 25-33 k ohms	170 mV 15-27 k ohms	
TAPE 2	150-600 mV 25-33 k ohms	150-600 mV 25-33 k ohms	170 mV 15-27 k ohms	
PHONO 1	2.2-10 mV 47 k ohms	2.2-10 mV 47 k ohms	2.3 mV 47 k ohms	
PHONO 2	3 mV 47 k ohms	3 mV 47 k ohms	- -	
Signal/hum and noise ratio, IHF, shorted input, A network, maximum sensitivity				
TAPE 1	94 dB	94 dB	94 dB	
TAPE 2	92 dB	92 dB	92 dB	
PHONO 1	78 dB	78 dB	75 dB	
PHONO 2	78 dB	78 dB	-	

*) Measured according to F.T.C. rules.
Specifications are subject to change without notice for improvement. More comprehensive specification available on request.

TECHNICAL SPECIFICATIONS, RECORDERS

Note that the figures given in the data are closely related to the measurement method used. (See signal/noise figures below.)
 Meanings of figures are clarified in left-hand column.

Technical specifications All specifications better than requirements of DIN 45 511	SERIES 10XD STEREO DECK 4-track	SERIES 10XD STEREO DECK 2-track	SERIES 3500X STEREO DECK 4-track	CASSETTE DECK TCD 330 STEREO	CASSETTE DECK TCD 310 STEREO
POWER REQUIREMENTS 50 or 60 Hz	240/230/115 V	240/230/115 V	240/230/115 V	230/115 V	230/115 V
POWER CONSUMPTION	100 W	100 W	45 W	40 W	34 W
TAPE SPEED i.p.s.	15 - 7 1/2 - 3 1/4	15 - 7 1/2 - 3 1/4	7 1/2 - 3 1/4 - 1 1/2	1 1/2	1 1/2
SPEED TOLERANCE max ¹⁾	± 0.3%	± 0.3%	± 1%	± 0.3%	± 1%
WOW and FLUTTER, max					
Peak DIN 45 511	0.07% 0.09% 0.15%	0.07% 0.09% 0.15%	0.1% 0.18% 0.35%	0.18%	0.2%
Weighted R.M.S.	0.04% 0.06% 0.11%	0.04% 0.06% 0.11%	0.07% 0.12% 0.25%	0.12%	0.15%
FREQUENCY RESPONSE					
DIN 45 500	30-30 000 Hz 30-26 000 Hz 30-20 000 Hz	30-30 000 Hz 30-26 000 Hz 30-20 000 Hz	30-26 000 Hz 30-20 000 Hz 30-11 000 Hz	20-20 000 Hz	30-16 000 Hz
± 3 dB	30-25 000 Hz 30-22 000 Hz 40-18 000 Hz	30-25 000 Hz 30-22 000 Hz 40-18 000 Hz	30-22 000 Hz 40-9 000 Hz	30-18 000 Hz	40-14 000 Hz
SIGNAL/TAPE NOISE RATIO at highest tape speed with lowest noise, highest output level, IEC A-curve (DIN 45 500, weighted) IEC, unweighted R.M.S. (DIN 45 560, unweighted)	Dolby 73 dB 62 dB	Dolby 75 dB 62 dB	64 dB 57 dB	65 dB 55 dB	Dolby 65 dB 55 dB
CROSSTALK ATTENUATION at 1000 Hz, minimum	Mono 60 dB Stereo 50 dB	Mono 60 dB Stereo 50 dB	Mono 60 dB Stereo 50 dB	Side 1 to side 2 60 dB Track 1 to track 2 35 dB	Side 1 to side 2 60 dB Track 1 to track 2 35 dB
HARMONIC DISTORTION, max. From amplifier at 0 dB From tape at 0 dB record level	0.2% 2%	0.2% 2%	0.3% 3%	0.3% 3%	0.3% 3%
INPUTS input impedance/sensitivity, max. voltage at 400 Hz (MIC inputs are suitable for dynamic microphones. The sensitivity is automatically adjusted for the mic impedance)	MIC: balanced: 0.5 mV - 70 mV RADIO: 50 k ohm/30 mV - 1.2 V LINE: 200 k ohm/100 mV - 5 V	MIC: balanced: 0.5 mV - 70 mV RADIO: 50 k ohm/30 mV - 1.2 V LINE: 200 k ohm/100 mV - 5 V	MIC: 130 µV-25 mV RADIO: 50 k ohms/8 mV-1.2 V LINE: 500 k ohms/100 mV-10 V	MIC: 0.15 mV-20 mV LINE: 470 k ohms/80 mV-10 V RADIO: 47 k ohms/8 mV-1 V (stereo)	MIC: 0.15 mV-20 mV LINE: 220 k ohms/40 mV-5 V RADIO: 47 k ohms/8 mV-1 V (stereo)
OUTPUTS Min. load impedance/voltage with unloaded output or power output for each channel	RADIO: 5 k ohms/0.775 V LINE: 150 ohms/1.5 V HEADPHONES: 8 ohms/5 mW	RADIO: 5 k ohms/0.775 V LINE: 150 ohms/1.5 V HEADPHONES: 8 ohms/5 mW	RADIO: 5 k ohms/1 V HEADPHONES: 100 ohms/1 V	RADIO: 5 k ohms/0.775 mV LINE: 0.1 k ohms/1.5 V HEADPHONES: 8 ohms/5 mW	RADIO/LINE: 10 k ohms/0.775 V

¹⁾ With nominal mains voltage and normal operating temperature.

Note that the signal-to-noise ratios for Dolby and non-Dolby models cannot be compared directly because the Dolby system does not cover the entire frequency range used for the signal-to-noise measurements.
 Specifications are subject to change without notice for improvement.

TANDBERG THE NORWEGIAN PRODUCTION WITH A WORLDWIDE REPUTATION

Every musical performance is an experience. The composer's message is re-created by the players and the conductor for the listener. Tandberg products are designed to carry musical experiences and messages from people to people: to bring images, ideas, impressions, and contact: to stimulate, inspire and enrich people's lives.

For more than 40 years Tandberg has developed and produced advanced electronic equipment with the highest regard for quality and reliability.

Personal involvement in good working conditions and a pleasant environment gives the people behind Tandberg products the incentive to design and produce something out of the ordinary.

We receive pleasure and enthusiasm from making products that are amongst the best in the world and we would like our customers to share this same pleasure and enthusiasm through owning a Tandberg product.

TANDBERG

HI-FI STEREO 76/77



Tandberg believes that good working conditions are necessary for the manufacture of good products. Therefore small factories are preferred located in pleasant

surroundings. About 3000 employees are today divided between Tandberg's seven factories.

The HULDRA — a Nordic legendary symbol — also a symbol of Tandbergs Radiofabrikk A/S.

DEALER:

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