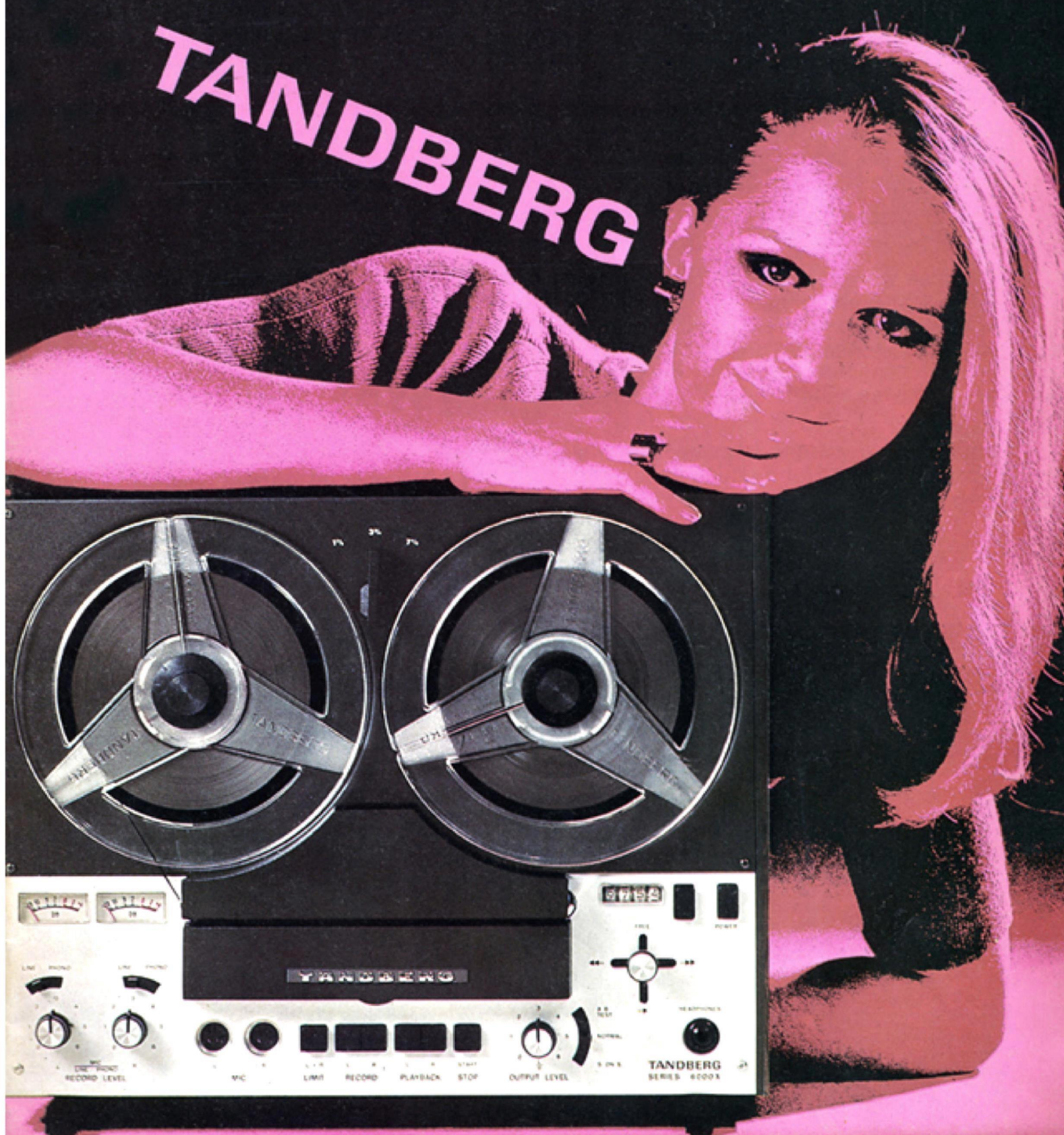


TANDBERG



- Living Sound!

The Tandberg Cross-Field Sound Head

The precious jewel, charming the ear with living sound, is an exquisite electronic creation of Norway's finest craftsmen — THE TANDBERG CROSS-FIELD SOUND HEAD.

This combination of rare metals and hair-fine conductors, machined and assembled to minute tolerances with the aid of microscopes, positioned and aligned with mathematical precision, will indeed delight the eye of a technician but not as an earclip or article of adornment. It is in fact a critical part of the very heart of the famous Tandberg tape recorder, instrumental in the creation of that indefinable character we know as 'TANDBERG LIVING SOUND'.

To those with an appreciation and understanding of such things the inside of any Tandberg Audio Instrument could well be compared to an assembly of precious building stones, links in a chain of gems, creations of our Twentieth Century electronic age; all enclosed in a handsome jewel case, the pride of Scandinavian cabinet makers.



A 'Sound' Investment

The purchase of a fine radio or tape recorder is an important occasion, worthy of very special consideration. The instrument selected will become an important part of your everyday life — to be lived with — therefore, it must not disturb the harmony of the home — either visually or audibly, for both are equally important. Money wisely spent is an investment producing entertainment dividends for many years to come, adorning the home, and delighting the ear.

Many considerations combine to influence the final choice — advertisements — sales literature — consumer test reports — and perhaps most important of all, the personal recommendation of friends. It is certainly not easy to reach a decision, particularly as few have an understanding of technicalities.

Fortunately if some simple basic essentials are not overlooked the problem is simplified: — "A cheap article is unworthy of consideration if you cannot be sure that it will do all you require of it, especially if you doubt its ability to perform consistently and reliably over a long period of time — in other words you must have **confidence** in the product — often what costs just a little more is a much better buy — a sound investment."

"CONFIDENCE" should be the watchword throughout, not only in respect of the product itself but most of all in the manufacturers' brand name and his reputation for consistent high quality and unfailing reliability. "CONFIDENCE" also in the Dealer, in his integrity, skill and knowledge. We at Tandberg choose our dealers carefully — we have confidence in them — they are firms selected for their high trade standing and their sense of fair dealing and service responsibility.

Tandbergs are not low-priced products. True quality is costly and Tandberg equipment is built up to a standard — not down to a price. You owe it to yourself to spend your money wisely, remember if you buy Tandberg it will be with you a long time.

So consult your Tandberg dealer — rely upon his expert advice and experience — he is there to guide you and he will almost certainly inform you that "Discriminating customers prefer Tandberg".



TANDBERG SERIES 6000X STEREO

- a Cross-Field top-model for the world market

- Specifications better than DIN standard 45,500
- 4 sound heads
- The Tandberg Cross-Field recording technique
- Fully transistorized
- Mixing in stereo and mono
- AB-test switch
- «Sound-on-Sound», «Add-a-Track» and echo
- Listening during fast winding
- Input-signal limiter control
- Pre-amplifier for magnetic pick-up
- Ceramic pick-up input
- Input selector
- Centre channel output
- Socket for stereo headphones
- Pause-button. Instant stop/start
- Automatic end-stop
- 3 speeds
- For use in vertical or horizontal position

Series 6000X — the «flagship» of all the Tandberg tape recorders — designed for the world's most discriminating markets, and in a class by itself when it comes to precision and sound reproduction. The tape recorder is intended for use together with separate Hi-Fi amplifiers, and has therefore no built-in power amplifiers. The design of Series 6000X is modern and pleasing. Operational controls are clearly arranged and in spite of the numerous technicalities the tape recorder is simple and easy to operate.

Series 6000X is a fully transistorized stereo recorder with 3 speeds: 7½,



3 $\frac{3}{4}$ and 1 $\frac{7}{8}$ ips. There are separate heads for recording and playback, and special heads for erase and bias.

The recording is based upon the Cross-Field technique, giving sensationally good specifications for frequency range and signal-to-noise ratio. Inputs for dynamic microphone, line, radio, magnetic and ceramic pick-up. Limiter prevents excessive input signal levels during recording. Listening during fast wind and rewind if desired, makes it easy to locate a programme on the tape. Professional tape recorder users will appraise the merits of Series 6000X. Mixing possibilities in stereo with separate input controls (2 for each channel), microphone with pick-up, line or radio. 4 input controls for mixing in mono. AB-test — that is you can listen to a programme during recording (monitoring). And you can also listen to the playback during recording. Possibilities for «Sound-on-Sound» copying of a programme from one track to the other, and mixing in a new programme synchronously with the first one. Possibilities for echo and other recording effects.

Tandberg 6000X has one-lever control of tape drive, push-buttons for electrical functions and track selection, illuminated 4-digit revolution counter, automatic end-stop and pause-button.

2 or 4 track, cabinet in teak or rosewood. Accessories, see pages 22–23.

TECHNICAL SPECIFICATIONS:

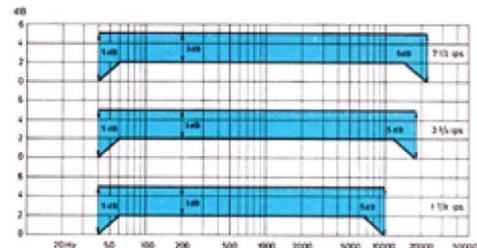
Functions: Stereo or mono recording and playback. Playback from one track while recording on the other, enables «Sound-on-Sound» and Add-a-Track recordings to be made. Amplifier mode.

Monitoring: Separate heads for recording and playback allow programme monitoring before or after recording (AB-test). **Listening during Fast Winding** («cueing») can be accomplished if desired. Facilitates identification of programme parts. **Counter:** Indicates number of revolutions of takeup turntable.

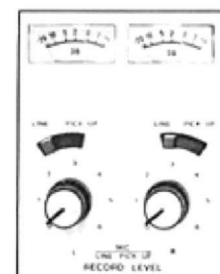
Mixing: Stereo: microphone and line,

or microphone and pick-up. Mono: 2 microphones and 2 lines, or 2 microphones and 2 mono pick-ups, or 2 microphones, 1 line and 1 mono pick-up. **Instantaneous Start/Stop:** Push-button for instantaneous starting or stopping or tape motion during recording and playback. **Automatic End-Stop:** Stops tape motion at the end of tape or in case of tape breakage. **Remote Control:** Start and stop can be remotely controlled by means of foot pedal (TFC 2) or other suitable contact arrangement. **Limiter:** Prevents distortion caused by excessive input signal levels. Operates on all inputs. Attack time about 5 ms, release time about 1 s. **Recording from Record Player:** Pick-up selector allows either magnetic or ceramic cartridge to be used.

Indicator: Two moving coil meters which are illuminated during recording, show peak recording level. Rise time about 40 ms. In playback the meters are not illuminated and indicate line output level (1.5V at 0dB). **Motor:** 4-pole hysteresis synchronous. **Fast Wind and Rewind:** 1 $\frac{3}{4}$ minutes in each direction for 1,200 ft. of tape, 2 $\frac{1}{2}$ minutes for 1,800 ft. of tape. **Number of Tracks:** 2 or 4. **Heads:** Erase head, record head, bias head and playback head. **Bias:** Tandberg Cross-Field. **Bias- and Erase Voltage:** 85.5 kHz, less than 0.5% distortion. **Tape:** Low Noise. **Maximum Reel Size:** 7". **Mounting Angle:** Horizontal or vertical or any intermediate angle. **Connections:** MIC: Balanced inputs for dynamic microphones, DIN sockets are standard, jacks on U.S. model. RADIO: DIN socket for connection of receiver or amplifier for recording or playback. PICKUP: Phono sockets in parallel with DIN socket. LINE: (Left and right input) phono sockets. LINE OUTPUT: DIN connector intended for copying of tape. OUTPUTS LEFT/RIGHT: Phono sockets for connection of equipment with input impedance greater than 200 ohm. CENTER CH: Common output for both channels, minimum load impedance 200 ohm, phono socket. HEADPHONES: DIN socket for headphones with impedance greater than 200 ohm. Phone jack on U.S. model. FOOT CONTROL: Jones-socket for connection of Tandberg Foot Control (TFC 2). + 26V: Terminal for operating voltage to external equipment. **Weight:** 21 lbs (9.5 kg). **Dimensions:** Length 15 $\frac{1}{2}$ ", height 6 $\frac{1}{2}$ ", depth 12 $\frac{3}{8}$ ". Further data in table on page 12.



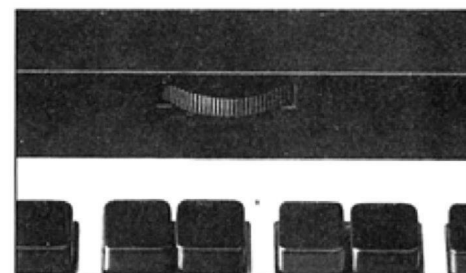
The coloured areas represent the tolerance ranges for frequency response measured according to DIN 45, 511.



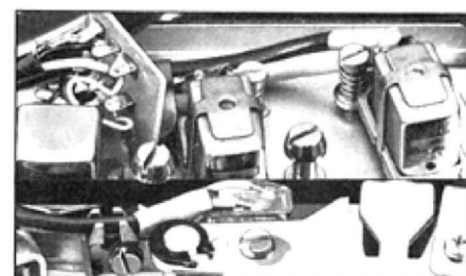
Series 6000X is ideal for mixing. There are separate recording controls for line/pick-up and microphone.



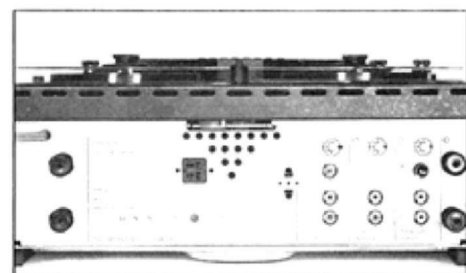
Separate playback controls for both channels. «Sound-on-Sound» switch with 3 positions.



Listening during fast wind and rewind («cueing») makes it easy to locate a programme on the tape.



In Series 6000X the recording is based upon the epoch-making Cross-Field technique of Tandberg. (Cross-Field biasing), giving sensationally good specifications for frequency range and signal-to-noise ratio. The Tandberg Cross-Field means better sound and better tape economy.



All connections are placed on the rear side of the tape recorder, except the microphone sockets and the output socket for headphones. All sockets are hidden under a cover when the tape recorder is used in vertical position.





TANDBERG SERIES 3000X STEREO

- the ideal partner for your radio/stereo-amplifier

- Specifications better than DIN standard 45,500
- 4 sound heads
- Tandberg Cross-Field recording technique
- Fully transistorized
- Mixing in mono
- AB-test switch
- «Sound-on-Sound» and echo
- 2 recording controls and indicators
- 3 speeds

- 4-digit revolution counter
- One-lever operation for tape drive
- Listening during fast wind and rewind
- Socket for stereo headphones
- Pause-button. Instant start/stop
- Automatic end-stop
- For use in vertical or horizontal position

The Tandberg Series 3000X is a new

tape recorder with special emphasis on the recording and playback quality. It has been designed for those who require a tape recorder for use with a good quality tuner/amplifier or amplifier. There are therefore no built-in power amplifiers.

The Series 3000X also incorporates the Tandberg Cross-Field recording technique, with a separate bias head in front of the record head. This system provides an impressive sound quality with signal-to-noise ratio results which can hardly be matched in the world to-day. This very high standard of recording quality

is maintained even at the lowest tape speeds, thereby obtaining substantially greater tape economy.

The 3000X has a good new design with the operational controls clearly and logically placed. It has an output selection with 5 positions, providing the following possibilities: Stereo A-test, A-test in mono on both outputs, stereo B-test, mono B-test on both outputs. In addition to this a switch on the rear side of the recorder provides possibilities for «Sound-on-Sound» and echo without external lead. Socket for stereo headphones is placed on the top plate. When headphones are used no external amplification is necessary. This makes the tape recorder most practical for instance for language instruction.

Series 3000X is fully transistorized and has 3 speeds — $7\frac{1}{2}$, $3\frac{3}{4}$ and $1\frac{7}{8}$ ips. There are 3 inputs for each channel: For crystal or ceramic pick-up, radio, and for dynamic microphone. The two channels also have separate recording controls. When recording in mono, however, the 2 inputs will be connected in parallel so as to allow mixing. 2 recording meters indicate peak value of input signal. Like in all the Tandberg tape recorders the meters indicate the power going through the record head and they will therefore also indicate the correct value at high frequency.

The tape can be listened to during wind and rewind («cueing»). One-lever operation of tape drive, indirectly illuminated, 4-digit revolution counter, pause-button and automatic end-stop. It is made for use both in vertical and horizontal position. All connections are placed on the rear side of the recorder, except the microphone sockets and headphone output socket.

Take a close look at Series 3000X and you will realize that this tape recorder may be a valuable supplement to your tuner-amplifier. This is the ideal unit in a Tandberg mu-

sical installation. (See also pages 20–21.)

2 or 4 track, cabinet in teak or rosewood. Accessories, see pages 22–23.

TECHNICAL SPECIFICATIONS:

Functions: Mono or stereo recording, «Sound-on-Sound», echo recording in mono, mono and stereo preamplifier.

Monitoring: The programme can be monitored before being recorded (A-test) or after recording (B-test).

Cueing: Listening during winding, facilitates spotting of programme parts. The cueing can be switched on and off as desired. **Mixing:** In mono, one microphone and 2 line programmes, 2 microphone programmes or 4 line programmes. In stereo, 2 line programmes.

Instantaneous Start/Stop: Lever provides instantaneous start/stop during recording and playback. **Automatic End-**

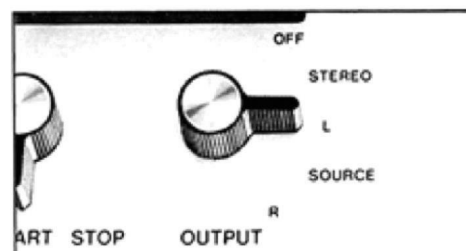
Stop: Stops the motor at the end of tape or if the tape breaks. **Indicator:** Separate meter for each channel indicating peak recording level. Rise time: Approx. 40 ms. The indicators are illuminated in record mode. **Motor:** 2-pole shadowpole motor. **Winding time:** Approx. $2\frac{1}{2}$ min. for 1,800 ft. reels. **Counter:** Indicates number of revolutions of takeup turntable. **Number of tracks:** 2 or 4. **Heads:**

Erase head, recording head, playback head and bias head. **Bias:** Tandberg Cross-Field. **Erase- and Bias Frequency:** 85.5 kHz, distortion less than 0.5 %.

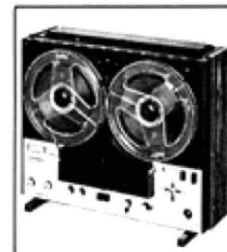
Tape: Low Noise. **Reel diameter:** Maximum 7". **Mounting Angle:** Horizontal or vertical, or any intermediate angle.

Inputs and outputs: MIC: DIN sockets for dynamic microphones. RADIO: DIN socket for recording and playback via tuner/amplifier. LINE INPUTS: Phono sockets for connection of record player with ceramic or crystal pick-up or other high impedance programme source. **HEADPHONES:** Standard jack for connection of stereo headphones. **Dimensions:** Length $15\frac{1}{2}$ " (39.4 cm), height $6\frac{1}{2}$ " (16.5 cm) and depth $12\frac{7}{16}$ " (31.6 cm). **Weight:** 20 lbs (9.1 kg).

Further data in table on page 12.



Series 3000X has output switch with 5 positions: OFF, STEREO, L, SOURCE and R.



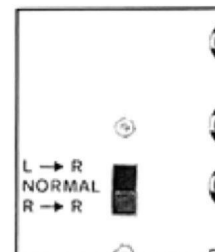
The tape recorder can be used both in vertical and horizontal position.



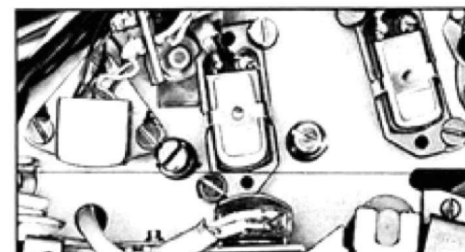
By means of the START/STOP switch the tape can be instantaneously stopped during recording or playback.



One-lever control of fast wind and rewind and normal drive for record and playback.



On the rear of the recorder there is a switch, giving possibilities for «Sound-on-Sound» and echo.



Series 3000X has the Tandberg Cross-Field technique, that is, there is a separate bias head in front of the recording head. This system means an essential improvement of the sound quality and provides possibilities for high quality recordings even at lower speeds.



TANDBERG SERIES 1200X

- Cross-Field stereo tape recorder and amplifier

- Specifications better than DIN standard 45,500
- Fully transistorized
- Mixing possibilities
- Adjustable monitoring during both mono and stereo recording
- «Add-a-Track»
- 2 built-in speakers
- Speaker selector with 3 positions
- Separate bass and treble controls
- Amplifier function with 2 x 10 watts R.M.S.
- Input selector
- Centre channel output
- Pause-button. Instant start/stop
- Automatic end-stop
- 3 speeds
- 4-digit revolution counter
- Language instruction facilities

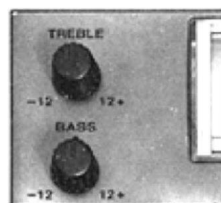
Tandberg Series 1200X Stereo tape recorder has numerous possibilities both as tape recorder and amplifier. It is excellent for forming the centre of a stereo Hi-Fi musical installation, where it can be used for instance as amplifier for record player with magnetic pick-up and tuner. Together with a microphone and Tandberg Hi-Fi loudspeakers, the Series 1200X will form an effective portable sound

system for hotels, conference rooms etc. There is hardly any limit to the possibilities offered by a Tandberg Series 1200X. 2 or 4 tracks. Cabinet in teak or rosewood. Accessories, see pages 22-23.

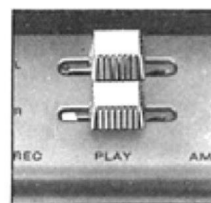
TECHNICAL SPECIFICATIONS:

Functions: Mono or stereo recording and playback, Add-a-Track, Amplifier mode. **Monitoring:** The programme being recorded can be monitored (A-test), in internal or external speakers or in headphones. **Mixing:** Input selector with three positions renders a great variety of mixing combinations for radio, pick-up and microphone programmes. **Instantaneous Start/Stop:** Lever for instantaneous starting or stopping of tape motion in record and playback. **Automatic End-Stop:** Stops tape motion at end of tape or in case of tape breakage. **Indicator:** Dual moving coil meter which shows peak recording level. Illuminated in record mode. **Motor:** 4-pole asynchronous, with capacitor splitphase. **Fast Wind and Rewind:** 2 1/2 minutes for 1,800 ft. of tape. **Counter:** Indicates number of revolutions of takeup turntable. **Number of Tracks:** 2 or 4. **Heads:** Erase head, combined record/playback head and bias head. **Bias:** Tandberg Cross-Field. **Bias- and Erase Voltage:**

85.5 kHz, distortion less than 0.5 %. **Tape:** Low Noise. **Maximum Reel Size:** 7". **Speaker:** Two 4" x 7" speakers, 8 ohm. **Maximum Output Power:** 10W continuous into 4 ohm load per channel. **Treble Control:** ± 10 dB at 8,000 Hz, continuous. **Bass Control:** ± 10 dB at 60 Hz, continuous. **Mounting Angle:** From horizontal to 85°. **Connections:** MIC: DIN socket (phone jack on U.S. version) for dynamic microphones. LINE: DIN socket in parallel with phono sockets for connection of radio or amplifier for recording or playback. PICKUP: DIN socket in parallel with phono sockets for connection of magnetic or ceramic pick-up. EXT SPEAKER: DIN socket and jack in parallel for each channel. PHONES STEREO: Jack for stereo headphones. R and L MONO: DIN socket for connection of mono headphones for monitoring of both channels simultaneously (centre channel). **Weight:** 23.3 lbs (10.6 kg). **Dimensions:** Length 15 1/2", height 6 7/8", depth 11 7/8". Further data in table on page 12.



Bass and treble continuous variable within ± 12 dB.



Function selectors for the 3 main functions of the tape recorder — recording, playback and amplifier.



TANDBERG SERIES 15

- the advanced monaural tape recorder

- Fully transistorized
- Microphone and record player amplifier — 10 watts R.M.S.
- Full mixing possibilities — adjustable monitoring during recording
- Separate bass and treble controls
- Built-in loudspeaker
- «Public Address» (commentary function)
- Pause-button. Instant stop/start
- Automatic end-stop
- 4-digit revolution counter
- «Free-Head» output

Tandberg Series 15 cover the many-sided tape recorder needs at home, at school, in industry etc. The model is based upon a construction which has proved to work excellently even after years of hard use in institutions and schools all over the world. It is easily portable and when used with Tandberg Hi-Fi speakers it becomes a first class sound system for hotel or conference work.

The Series 15 is the ideal recorder for the cine enthusiast. Very high quality sound tracks can be prepared and played back during projection or transferred onto the stripe film.

2 or 4 tracks. The 4 track model has

track selector with «DUO» position. Cabinet in teak or rosewood, or mounted in a carrying case. Series 15 is available in the following special versions:

With **F-equipment** for remote control for starting, stopping and rewinding. The **SL-models** are 2-track models intended first and foremost for language instruction.

Accessories on pages 22–23.

TECHNICAL SPECIFICATIONS:

Functions: Mono recording and playback. Amplifier mode. **Monitoring:** The programme being recorded can be monitored when recording (A-test), in internal or external speakers or in headphones. **Mixing:** Microphone- and line (radio) programmes, with provisions for separate adjustment of signal levels. **Instantaneous Start/Stop:** Lever for instantaneous starting or stopping of tape motion in record and playback. **Automatic End-Stop:** Stops tape motion at end of tape or in case of tape breakage. **Indicator:** Moving coil meter which shows peak recording level. Illuminated in record mode. **Motor:** 2-pole shaded pole asynchronous. **Fast Wind and Rewind:** 1 $\frac{2}{3}$ minutes in each direction for 1,200 ft. of tape, 2 $\frac{1}{4}$ minutes for 1,800 ft. of tape. **Counter:** Indicates number of revolutions of takeup turntable. **Number of Tracks:** 2 or 4. **Heads:** Erase head and

combined record/playback head. **Bias:** Conventional. **Bias- and Erase Voltage:** 85.5 kHz, distortion less than 0.5 %. **Tape:** Low Noise. **Maximum Reel Size:** 7". **Speaker:** 4" x 7", 8 ohm. **Maximum Output Power:** 10W continuous into 4 ohm load. **Treble Control:** ± 10 dB at 8,000 Hz, continuous. **Bass Control:** ± 10 dB at 60 Hz, continuous. **Mounting Angle:** From horizontal to 85°. **Connections:** MIC: DIN socket (phone jack on U.S. version) for dynamic microphone. **RADIO:** DIN socket in parallel with phono sockets. **RADIO and PREAMP** for connection of radio or amplifier for recording or playback. **PICKUP:** DIN socket in parallel with phono socket for connection of ceramic or crystal pick-up. **EXT SPEAKER:** DIN socket and phone jack for external speaker. **FREE HD:** Phono socket for connection of Tandberg Tape Slide Synchronizer. **Weight:** Cabinet model: 19 lbs (8.7 kg). Case model: 22.7 lbs. **Dimensions:** Cabinet model: Length 15 $\frac{3}{8}$ ", height 6 $\frac{3}{4}$ ", depth 11 $\frac{3}{4}$ ". Case model: Length 15 $\frac{3}{8}$ ", height 6 $\frac{3}{4}$ ", depth 13 $\frac{1}{8}$ ". Further data in table on page 12.



Series 15 can be used as microphone amplifier. Monitoring volume is adjustable.



Model 15SL is a special version intended for language instruction.



TANDBERG SERIES 1700

- a small tape recorder with great potentialities!

- Fully transistorized
- Microphone and record player amplifier, 9 watts R.M.S.
- Monitoring during recording
- Separate bass and treble controls
- Built-in front-speaker
- Combined mains switch and lever for tape drive
- «Flying Start» button
- Pause-button. Instant stop/start
- Automatic end-stop
- 4-digit revolution counter

By this new Series 1700 Tandberg has constructed a simple tape recorder at a reasonable price, without lowering the quality.

Series 1700 is a neat, monaural recorder, light in weight and easy to handle. It fills its everyday purpose to perfection: Recording from radio or record player. Play-back through built-in or external speaker or external amplification system. In addition the tape recorder can also be used as microphone and record player amplifier with fully 9 watts output power. Like several of the other tape recorders in the Tandberg range, Series 1700 may, in connection with a microphone and one or several Tandberg Hi-Fi speakers form an excellent amplifier installation which is easily portable. Series 1700 has one speed — $3\frac{3}{4}$ ips, thus giving the best combination of tape economy and sound quality. To obtain small dimensions

on the tape recorder, it is designed for maximum reel size $5\frac{3}{4}$ ". This will give a playing time of 64 minutes in each direction with a 1200 ft tape. On a 4 track model this means a playing time of $4\frac{1}{2}$ hours.

2 or 4 track, 4 track models have track selector with «DUO» position, that is 2 programmes can be played back simultaneously through one speaker. Cabinet in teak or rose-wood.

Accessories, see pages 22–23.

TECHNICAL SPECIFICATIONS:

Functions: Mono recording and playback, or use as preamplifier. **Monitoring:** Programme to be recorded can be monitored in internal or external speaker or in headphones. **Mixing:** Programmes from radio and pick-up inputs are mixed. Levels cannot be separately adjusted. **Instantaneous Start/Stop:** Lever provides instantaneous start and stop during recording and playback. **Automatic End-Stop:** Stops motor at the end of tape or if tape breaks. **Flying start:** Direct switching from playback to recording or vice versa. **Indicator:** Meter for peak indication of recording level. Illuminated during recording. **Motor:** 2-pole shadow-pole combined with mains transformer. **Reel Size:** Maximum $5\frac{3}{4}$ ". **Winding time:** Approx. 125 seconds in each direction. **Counter:** Indicates number of revolutions of takeup turntable. **Number of Tracks:** 2 or 4. **Heads:** Erase head and record/playback head. **Bias:** Conventional. **Tape:** Low Noise. **Speaker:** 4" x 7", 8 ohm, 4.5W maximum. **Output Power:** 9W maximum

in 4 ohm external speaker. **Treble control:** ± 10 dB at 8,000 Hz. **Bass control:** ± 10 dB at 60 Hz. **Mounting:** Horizontal. **Connections:** MIC: DIN socket for dynamic microphone. RADIO: DIN socket for recording/playback via tuner/amplifier. P. UP.: DIN socket for connection of ceramic or crystal pick-up. EXT. SPKR.: DIN socket for connection of extension speaker or headphones. Internal speaker is alive or disconnected depending on which way the plug is inserted. **Weight:** 14.5 lbs (6.6 kg). **Dimensions:** Length $13\frac{1}{4}$ " (33.5 cm), height $6\frac{3}{8}$ " (16 cm), depth 11" (27.8 cm).

Further data in table on page 12.



Series 1700 has pause-button for instantaneous start/stop and push-button for «Flying start».



Function selector for each of the 3 main functions of the tape recorder: recording, playback and amplifier.



TANDBERG SERIES 11

- professional battery portable tape recorder

- Fully transistorized
- 3 sound heads
- 3 speeds
- Mixing controls
- AB-test switch
- Limiter amplifier
- Weight (with batteries) only 5.25 kilos (11.3 lbs)
- Mini monitor speaker
- Headphone output
- Will accept 7" spools

Tandberg Series 11 has been specially developed for the advanced users needing a dependable tape recorder which is portable. The recorder is ideal for all those who make the strongest demands for numerous possibilities, dependability and quality reproduction.

Series 11 has 3 speeds — $7\frac{1}{2}$, $3\frac{3}{4}$ and $1\frac{7}{8}$ ips, 2-track or full-track for monaural recording and playback. By means of a highly effective electronic speed control the speed will be constant within $\pm 0.5\%$, no matter the position of the recorder.

All operation facilities are handily arranged on the front. Separate volume controls for microphone and line inputs allow mixing. Outputs — line, monitor and built-in speaker — have separate volume control. Pause-button for instantaneous start/stop. Possibility for AB-test during recording. Limiter-amplifier preventing overload of tape may be switched on. Mains operation is possible using additional battery eliminator.

Tandberg Series 11 is also available with pilot-tone equipment for synchronisation with movie camera, Model 11-1P.

Accessories, see pages 22–23.

TECHNICAL SPECIFICATIONS:

Functions: Mono recording and playback. **Monitoring:** Before and after recording (AB-test) in fast wind: Facilitates identification of programme parts.

Mixing: Microphone- and line (radio) programmes, with provisions for separate adjustment of signal levels. **Instantaneous Start/Stop:** Lever for instantaneous starting or stopping of tape motion in record and playback.

Indicator: Moving coil meter which shows peak recording level, battery voltage, or output level in playback.

Motor: DC pulse excited. **Fast Wind and Rewind:** $1\frac{3}{4}$ minutes in each direction for 1,200 ft. of tape, $2\frac{1}{2}$ minutes for 1,800 ft. of tape.

Speed Control: Electronic control of selected speed. **Number of Tracks:** 1 or 2. **Heads:** Erase head, record head, playback head, and tachometer head for speed control.

Bias: Conventional. **Bias- and Erase Voltage:** 85.5 kHz, distortion less than 0.5 %.

Tape: Standard quality. **Maximum Reel Size:** 7" with lid off, otherwise 5".

Speaker: 2" x 3", 20 ohm. **Maximum Output Power:** 0.25W continuous into 20 ohm load.

Connections: MIC: DIN or CANNON socket for dynamic microphone input, balanced. LOW: Miniature jack for low impedance signal sources.

HIGH: For high impedance signal sources. LINE: Output for balanced line, min. load impedance 200 ohm, miniature jack. MONIT: Output for headphones

with min. 100 ohm impedance, miniature jack. **Dimensions:** Length 13", height 4", depth 10". **Weight:** 11.3 lbs (5.25 kg). Further data in table on page 12.

PILOT-MODEL (11-1P)

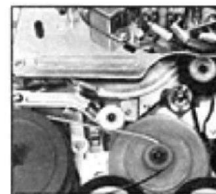
Same specifications as standard version except for the following:

All heads are full-track. A NEO-pilothed (DIN 15575) for synchronizing. Direct switching from playback to record (flying start).

Number of transistors: 53.



7" spools can be used when cover is removed, 5" spools with cover in position.

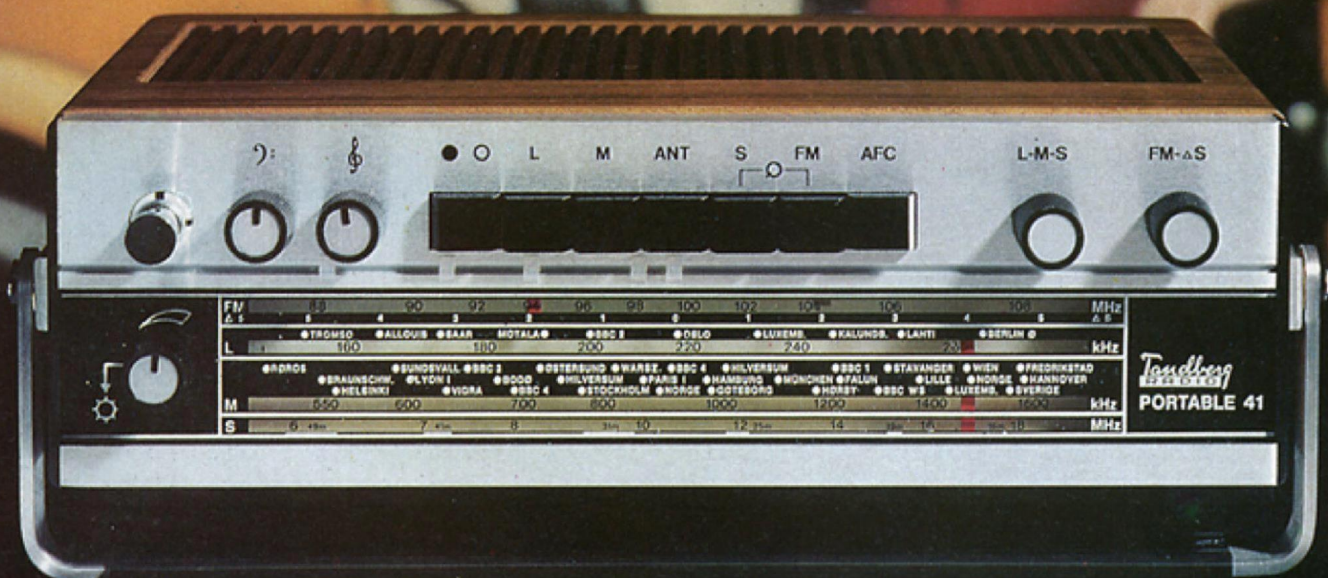


Tachometer wheel continuously controls the speed of tape.



Tandberg Models 11 and 11-1P can be carried and used in a strong practical shoulder bag with pocket for tape and accessories.





TANDBERG PORTABLE RADIO 41

The radio for your home - the radio to take with you wherever you go

- 4 wavebands
- Separate tuning for AM og FM
- Automatic fine-tuning on FM
- Manual fine tuner on shortwave
- 5 moveable station markers
- 5" x 9" special loudspeaker
- Separate bass and treble controls
- Highly effective built-in aerials
- Amplifier switch
- Headphone socket
- Complete car attachment
- Mains power unit

Tandberg Portable Radio 41 is an elegant radio - the weight is only 5.5 lbs batteries included - with an impressive output. The design gives features usually offered in larger models. This is a radio for every use. General purpose in your home, as a tuner for your Hi-Fi system, in your car, in the country, in the class room...

4 wavebands: long-, medium- and shortwave plus FM. There is an unusually large loudspeaker covering most of the front of the receiver, providing a sound quality which is quite unique.

Available in elegant cabinet in walnut. Accessories: see pages 22-23.

TECHNICAL SPECIFICATIONS:

Fully transistorized AM/FM portable receiver with 13 transistors, 5 diodes and 1 voltage stabilizing cell. 4 wavebands: Longwave: 150 - 268 kHz (2,000 - 1,120 m). Mediumwave: 518 - 1,600 kHz (579 - 187 m). Shortwave: 5.8 - 18.5 MHz (51.7 - 16.2 m). FM: 87.5 - 108 MHz. Separate tuning for AM and FM. 5 moveable Station Markers. **Automatic Frequency Control (AFC):** Ensures accurate tuning on FM, can be switched off. **Manual Fine Tuning** on shortwave. **Antenna:** Ferrite antenna for long- and mediumwave, telescopic antenna for FM and shortwave. Socket for connection of external antenna. **Dial Illumination** when volume control knob is depressed. **Output Power:** 1.5W at 3 % distortion (1.8W/10 %) when operating on internal batteries, 2.5 W (3.5W/10 %) when used in automobile with 12 volts supply and when operated on 12 volts mains power unit. **Frequency Range:** 40 - 20,000 Hz. **Tone Controls:** Separate controls for continuous adjustment of bass and treble. **Loudspeaker:** 5" x 9", 3.2 ohm with ceramic magnet. **Connections:** DIN sockets for connection of separate speaker, mains power unit, and tape recorder/record player. Minijack for headphones. **Power Requirements:** 9 V (6 x 1.5 V flashlight cells) or 12 V from mains power unit

(Battery Eliminator) or car battery. **Current Drain:** At no output 25 mA, at 50 mW output 75 mA, and at full output power 295 mA. **Car Adaptor:** For installation in cars with 12 volts supply. Provides automatic connection to car battery, antenna and speaker. **Dimensions:** Length 11", height 7 1/8" not including carrying handle and knobs, depth 3 1/4". **Weight** including batteries: 5.5 lbs (2.5 kg).



Tandberg Portable Radio 41 is suitable for use in the car. A mounting bracket under the dashboard automatically connects the radio to the car battery, the car aerial and the external loudspeaker, if any.



The radio has output socket for tape recorder or record player and is an excellent FM tuner. Here is Tandberg Portable Radio 41 together with tape recorder Series 1200X Stereo.



TANDBERG MODEL SS11 STEREO - a new radio/stereo-amplifier!

- Fully transistorized
- 4 wavebands
- Separate tuning for AM and FM
- Automatic fine tuning on FM
- 5 moveable station markers
- Built-in ferrite antenna
- Continuous variable bass and treble controls
- Bass and treble boost at low volume
- 2 x 15 watts R.M.S. power
- Pre-amplifier for record player with magnetic and ceramic pick-up
- Specifications better than DIN standard 45, 500

The new SS11 Tandberg tuner-amplifier offers a handsome new exterior with a highly advanced fully transistorized interior. Model SS11 has 4 wavebands: long-, medium- and shortwave plus FM. Available prepared or fully equipped for stereo FM reception.

In the Tandberg Model SS11, the AM radio part has an overvoltage protected dual-gate Mos-fet transistor in the input stage. This kind of transistor has a construction which is quite different from ordinary transistors, and has characteristics similar to a tube. This has made it

possible to make the SS11 fully transistorized without reducing the input saturation and cross-modulation characteristics.

Tandberg Model SS11 is available with or without built-in loudspeakers, models are respectively SS11-72 and SS11-71. Cabinet in choice teak or rosewood.

TECHNICAL SPECIFICATIONS:

Power Requirements: 115 - 220 - 240 V, 50/60 Hz. **Fully Transistorized:** 32 transistors, including 1 DUAL GATE MOSFET with integrated protection circuits. **Dimensions:** Model SS11 - 71: Length: 43.8 cm (17 1/4"), height: 11 cm (4 3/8"), depth: 23.7 cm (9 3/8") + knobs. Model SS 11-72: Length: 78 cm (30 3/4"), height: 13.4 cm (5 1/4"), depth: 23.7 cm (9 3/8") + knobs.

FM-Section

Frequency Range: 87.5 - 108 MHz. **Signal/Hum, unweighted (DIN 45500):** 69 dB. **Signal/noise weighted (DIN 45500):** 79 dB. **Distortion (DIN 45500):** 0.3%. **Image Frequency Rejection (IHF):** 55 dB. **400 kHz selectivity (IHF):** 57 dB. **Bandwidth (6 dB):** 210 kHz. **Capture Ratio (IHF):** 4.8 dB. **AM-suppression (75 kHz FM/50% AM):** 59 dB at 100 µV/75 ohm ant. signal. **Automatic frequency control (AFC):** Provides automatic fine-tuning. The AFC can be inactivated.

Crosstalk Rejection (DIN 45500): >35 dB at 1 kHz. 3 dB limiting: 2.4 µV.

AM-section

Frequency Ranges: LW: 150 - 268 kHz, MW (BC): 518 - 1600 kHz, SW: 5.8 - 18.5 MHz. **Adjacent Channel Selectivity (9 kHz):** 40 dB. **Ferrite Bar Antenna:** Built-in for LW and MW (BC). Can be disconnected when outside antenna is to be used.

Low Frequency Section

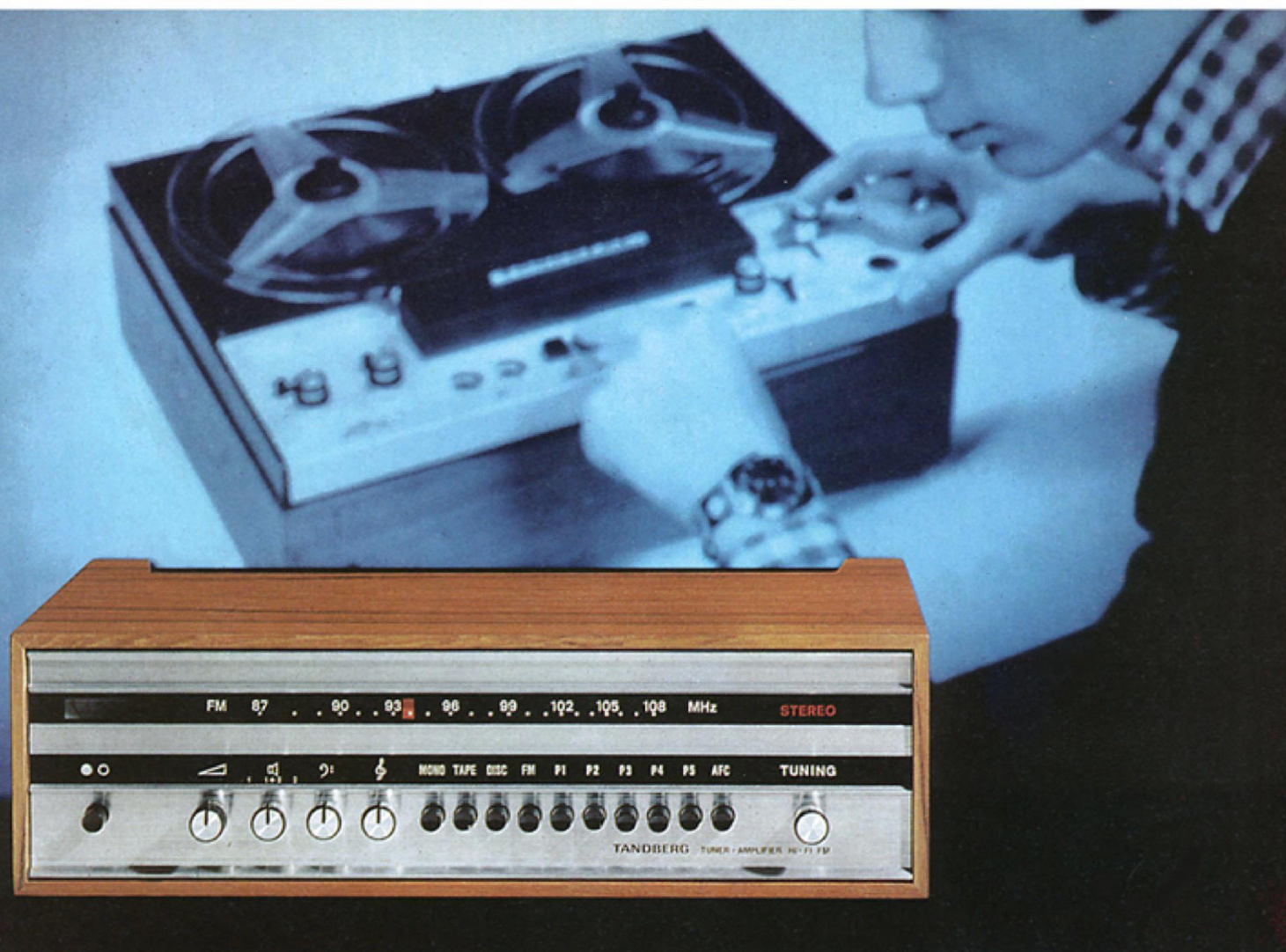
Power Output: 2 x 15 W continuous sinus at 0.5% distortion. **Music Power (DIN 45500 and IHF):** 2 x 26 W at 1% distortion. **Frequency Range (DIN 45500):** 25 - 25,000 Hz. **Power Bandwidth (DIN 45500):** 25 - 25,000 Hz. **Bass Control:** + 13, - 13 dB at 50 Hz. **Treble Control:** + 10, - 14 dB at 10 kHz.

Loudness Contour: Max. 6 dB at 50 Hz, max 3.5 dB at 10 kHz. **Intermodulation (DIN 45500):** 1.5%. **Signal/Hum at 50mW (DIN 45500):** 54 dB from TAPE input, 53 dB from pick-up input (MAGN), 55 dB from pick-up input (CER). **Crosstalk Rejection in Stereo (DIN 45500):** 47 dB at 1,000 Hz. **Crosstalk Rejection between Inputs (DIN 45500):** > 80 dB at 1,000 Hz.

Inputs:

Input	Sensitivity	Max. Input Signal	Impedance
TAPE	250 mV	5 V	30 kohm
PICKUP (MAGN)	2.5 mV	100 mV	47 kohm
PICKUP (CER)	50 mV	2.2 V	1 Mohm/200 pF

TAPE Output (FM): Output voltage unloaded at 75 kHz deviation: 200 mV. Output impedance: 47 kohm. **Tape Output (AM):** Output voltage unloaded at 80% modulation: 200 mV. Output impedance: 47 kohm.



TANDBERG TUNER-AMPLIFIER HI-FI FM - a highly advanced unit in a musical installation

- Better than DIN standard 45,500
- 2 x 15 watts R.M.S. power
- Pre-amplifier for record player with magnetic and ceramic cartridge
- Fully transistorized
- Pre-selection of 6 stations
- Automatic fine-tuning (AFC)
- 3 position speaker selector

Tandberg Tuner-Amplifier Hi-Fi FM is the ideal unit in a musical installation when you need an FM receiver in addition to the stereo amplifier. The receiver surpasses the DIN standard 45,500 for Hi-Fi equipment. The amplifiers provide 2 x 15 watts R.M.S. Pre-set controls allow press-button operation of 6 FM stations. RIAA equalized pre-amplifier for magnetic pick-up and high impedance input socket for ceramic pick-up. Bass and treble are boosted at low setting of the volume controls.

The receiver is intended for use together with Tandberg Hi-Fi loudspeakers. (See pages 18-19.) With a Hi-Fi FM as the centre of a musical installation you are ensured a crystal clear sound reproduction. To

the Hi-Fi FM receiver can be connected a Tandberg tape recorder — for instance Model 3000X Stereo — a record player and Tandberg Hi-Fi loudspeakers. (See also pages 20-21.)

Available in choice teak or rosewood, prepared for or fully equipped for stereo FM reception.

TECHNICAL SPECIFICATIONS:

Power Requirements: 115 — 220 — 240 V, 50/60 Hz. **Power Consumption:** At full output power: 80 W, at 1/8 of rated power: 34 W. **Fully transistorized:** 29 transistors. **Diodes:** 4 double tuning diodes, 1 zener diode, 19 diodes, 1 rectifier. **Dimensions:** Length: 42.5 cm (16 7/8"), height: 13.5 cm (5 1/4"), depth: 21.5 cm (8 1/2"). **Weight:** 5.1 kg (11 lbs).

FM Section

Frequency Range: 87.5 — 108 MHz. **Sensitivity at 30 dB signal/noise (IHF):** 2 μ V/300 ohm or 1 μ V/75 ohm. **Signal/Noise (weighted DIN 45 500):** 78 dB. **Signal/Noise and Hum (IHF):** 61 dB. **Distortion (IHF):** Less than 1%. **Distortion (DIN 45 500):** Less than 0.5%. **IF-Rejection (IHF):** 100 dB. **Image Frequency Rejection (IHF):** 85 dB. **400 kHz selectivity (IHF):** 59 dB. **Bandwidth (6dB):** 220 kHz. **AM-Suppression (75 kHz FM/50 % AM):** 61 dB. **Automatic Fre-**

quency Control (AFC): Provides automatic fine tuning within a pull-in range of 200 — 400 kHz at 1 mV. The AFC can be inactivated. **Crosstalk Attenuation in Stereo (DIN 45 500):** Better than 35 dB at 1 kHz. **Pilot Tone Suppression (DIN 45 500):** 35 dB at 19 kHz, 56 dB at 38 kHz. **3 dB Limiting:** 3 μ V/75 ohm. **Push-Button Selection:** 6 stations. **Stereo Decoder:** Can be plugged in.

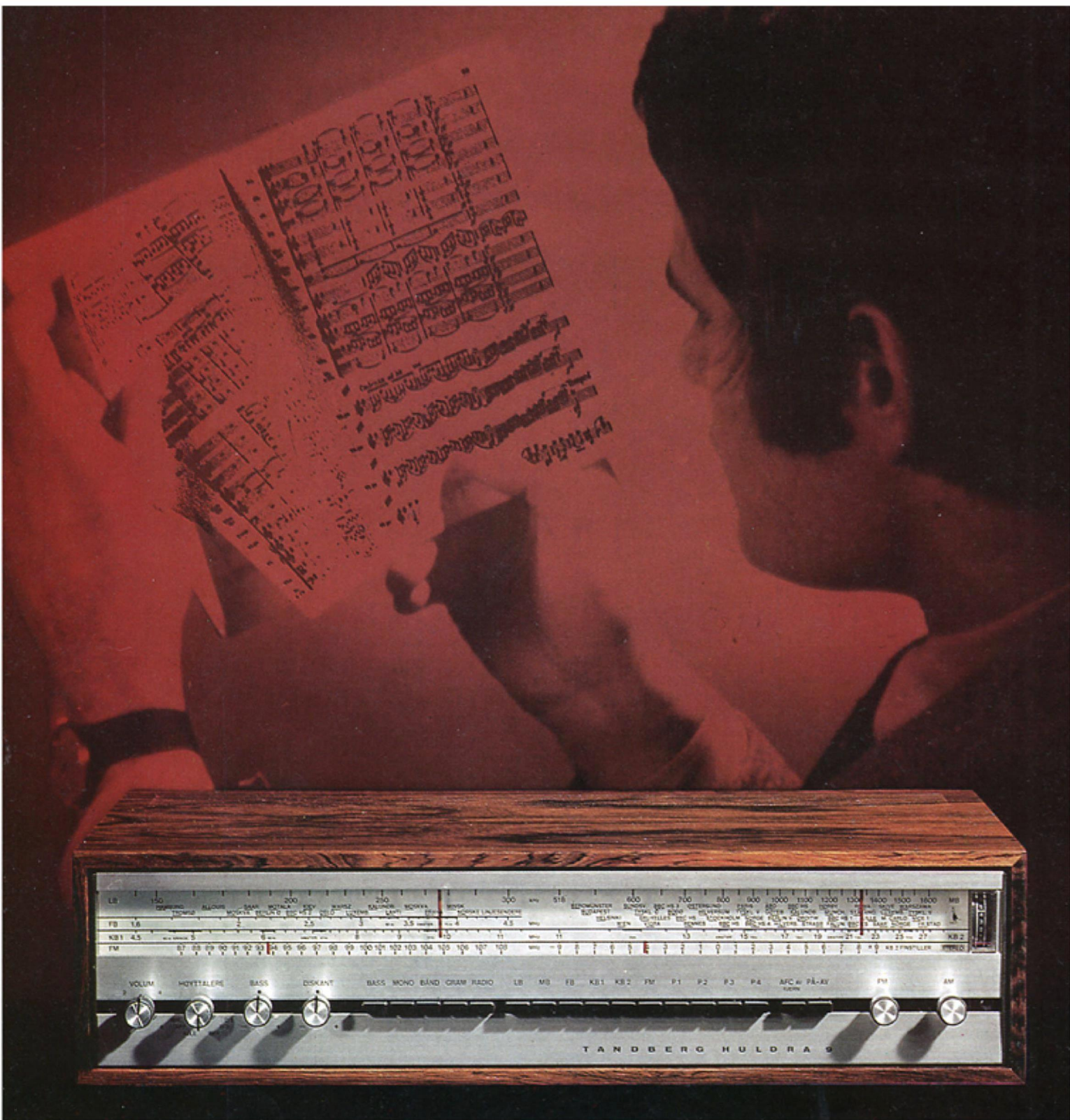
Low Frequency Section

Output Power, continuous: 2 x 15 W at 0.5% distortion. **Music Power (DIN 45 500 and IHF):** 2 x 26 W at 1% distortion. **Optimal Load Impedance:** 4 ohm. **Damping factor at 1,000 Hz (DIN 45 500 and IHF):** 13. **Frequency Range (DIN 45 500):** 15 — 40,000 Hz. **Power Bandwidth (DIN 45 500):** 15—40,000 Hz. **Intermodulation (DIN 45 500):** 1%. **Bass Control:** + 13, — 13 dB at 50 Hz. **Treble Control:** + 9, — 14 dB at 10 kHz. **Loudness Contour:** Maximum 6 dB at 50 Hz, maximum 6 dB at 10 kHz. **Signal/Hum at 50 mW output (DIN 45 500):** 53 dB from TAPE input, 50 dB from DISC input (MAGN), 51 dB from DISC input (CER). **Crosstalk Attenuation in Stereo (DIN 45 500):** 42 dB at 1,000 Hz. **Crosstalk Attenuation between Inputs (DIN 45 500):** 80 dB at 1,000 Hz.

Inputs:

Input	Sensitivity	Max. Input Signal	Impedance
TAPE	250 mV	5 V	30 kohm
DISC (MAGN)	2.5 mV	100 mV	47 kohm
DISC (CER)	50 mV	2.2 V	1 Mohm/300 pF

TAPE Output: Output voltage unloaded at 75 kHz deviation 220 mV. Output impedance: 47 kohm.



TANDBERG HULDRA 9 STEREO

- an exquisite centre of a Hi-Fi stereo musical installation

- Technical specifications better than DIN standard 45,500
- Pre-amplifier for record player with magnetic and ceramic cartridge
- 2 x 25 watts R.M.S. power
- Bass and treble boost switch at low setting of the volume
- FM reception with pre-selection of 5 stations
- Automatic fine tuning on FM
- AM reception with all wavebands
- Separate tuning for AM and FM

- Fine-tuner for shortwave
- Microphone amplifier
- Possibilities for double programmes
- Headphone output

Tandberg Huldra 9 Stereo has technicalities offered by no other radio/ stereo-amplifier. This is the radio for those who want something extraordinary. Electronically Huldra 9 Stereo is a masterpiece, and the cabinet is an elegant combination of

choice wood and satin finished metal. The receiver has a great number of technical features but is nevertheless easy to operate. Controls which are not in daily use, are hidden behind the cover on the lower part of the front.

Huldra 9 Stereo has 4 main functions: AM-receiver with all wavebands, FM-tuner with pre-selection of 5 stations, stereo-amplifier with 2 x 25 watts R.M.S. — and amplifier for dynamic microphone. RIAA-equalized pre-amplifier for record player with magnetic pick-up, high impedance input for ceramic pick-up.

With a Huldra 9 Stereo as the basic unit of a stereo Hi-Fi musical installation you can enjoy a crystal clear sound reproduction. To the receiver you may connect 4 Tandberg Hi-Fi loudspeakers, a Tandberg tape recorder — for instance Series 6000X or 3000X Stereo — and a record player. Huldra 9 is also the most advanced long-distance receiver, adapted to Norway's difficult reception conditions. The receiver has 35 transistors, 23 diodes, 1 single and 4 double capacity diodes. To ensure the best possible reception on AM, that is long-, medium- and short-wave, it has also 3 tubes. By means of Huldra 9 you can come into contact with the whole world. In order to cover a greater frequency range, the shortwave has been divided into 3 bands. Shortwave 3, going as far as the 11 metre band (27.5 MHz) has a fine-tuner to facilitate the setting in the high frequencies. Variable selectivity and a 9 kHz interference filter prevent annoying noise from neighbouring stations. A sensitive ferrite antenna for long- and mediumwave can be connected when it is difficult to use an outdoor antenna.

On the FM-band, 5 stations can be pre-selected. Automatic frequency control (AFC) takes care of the fine-tuning. The sensitivity on FM is very high. Huldra 9 Stereo is delivered prepared for or fully equipped for stereo FM reception.

Normally the volume for each channel will be controlled simultaneously, but there is also a possibility for separate volume control. Bass and treble boost at low setting of volume control can be switched in. By a switch a meter will indicate the power in the right or left channel.

Huldra 9 can be used for 2 programmes at the same time, for example radio in one set of speakers and tape recorder or record player in the other. Huldra 9 Stereo is intended for use together with Tandberg Hi-Fi loudspeakers (see pages 18–19). Available in teak or rosewood.

TECHNICAL SPECIFICATIONS:

Power Requirements: GB version: 220/240 V, 50/60 Hz. Standard export version: 115/230 V, 50/60 Hz. **Power Consumption:** At full output power: 155 W, at $\frac{1}{8}$ of rated power: 77 W. **Antenna:** Switchable ferrite antenna on LW and MW. **Dimensions:** Length: 21 $\frac{1}{4}$ " (54 cm), height: 5 $\frac{1}{2}$ " (14 cm), depth: 10 $\frac{3}{8}$ " + knobs $\frac{3}{4}$ " (27 cm + 2 cm). **Weight:** 20 lbs (9.1 kg).

FM Section

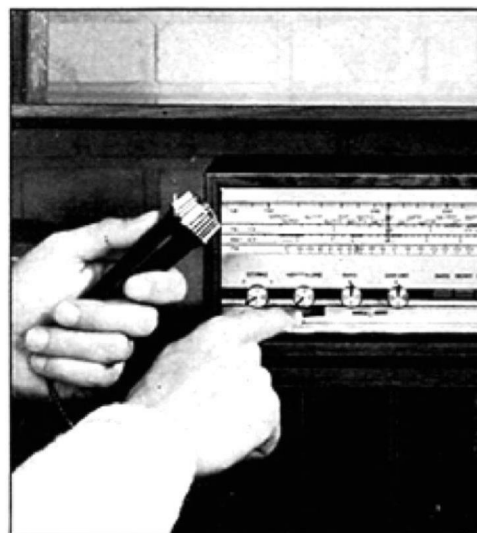
Frequency Range: 87.5 – 108 MHz. **Sensitivity at 30 dB signal/noise (IHF):** 2 μ V/300 ohm or 1 μ V/75 ohm. **Signal/Noise (weighted DIN 45 500):** 72 dB. **Signal/Noise and Hum (IHF):** 59 dB. **Distortion (IHF):** Less than 1%. **IF-Rejection (IHF):** 100 dB. **Image Frequency Rejection (IHF):** 80 dB. **400 kHz Selectivity (IHF):** 54 dB. **Bandwidth (6 dB):** 200 kHz. **Capture Ratio (IHF):** 4.5 dB. **AM-Suppression (75 kHz FM/50 % AM):** 60 dB. **Automatic Frequency Control (AFC):** Provides automatic fine tuning within a pull-in range of 150 – 400 kHz at 1mV. The AFC can be inactivated. **Push-Button Selection:** 5 stations. **Stereo Decoder:** Can be plugged in. **Stereo Indicator:** Illuminated when stereo broadcast is received, and in modes TAPE and PHONO. **Stereo Channel Separation (DIN 45 500):** Better than 35 dB at 1 kHz. **Pilot Tone Suppression (DIN 45 500):** 30 dB at 19 kHz, 50 dB at 38 kHz. **3 dB Limiting:** 6 μ V/75 ohm.

AM Section

Frequency Ranges: Longwave: 150 – 300 kHz (2,000 – 1,000 m). Mediumwave: 518 – 1,600 kHz (580 – 187 m). Shortwave 1: 1.6 – 4.5 MHz (187 – 66.5 m). Shortwave 2: 4.5 – 11 MHz (66.5 – 27.3 m). Shortwave 3: 11 – 27.5 MHz (27.3 – 10.9 m). **Bandsread:** 50 – 300 kHz on shortwave 3 by means of the FM tuning knob. **IF-Rejection:** Better than 53 dB. **Selectivity Switch:** 2 positions: Local and distant. **Bandwidth (6 dB):** 8 kHz in local, 5 kHz in distant mode. **Interference Filter, 9 kHz (10 kHz in U.S. version):** Min. 40 dB attenuation. **Adjacent Channel Selectivity (9 kHz):** 44 dB in distant mode.

Low Frequency Section

Music Power Output (DIN 45 500): 2 x 40 W in 4 ohms. **Continuous Power Output:** 2 x 25 W in 4 ohms, less than 0.5 % dist. **Continuous Power Output:**



Operational devices not in daily use are hidden behind a hinged cover in the lower part of the front. Separate volume control for microphone amplifier, switch for power indicator, button for ferrite antenna for long- and mediumwave and potentiometers for presetting of favourite FM stations. When Huldra 9 is used as a microphone amplifier, the meter automatically acts as a power indicator.

2 x 19 W in 8 ohms, less than 0.5 % dist. **IM-distortion (DIN 45 500):** Less than 1 %. **Electronic overload protection circuit.** **Power Bandwidth (DIN 45 500):** 25 – 25,000 Hz. **Frequency Range (DIN 45 500):** 25 – 25,000 Hz. **Damping Factor:** 14 at 4 ohms, 28 at 8 ohms. **Signal/Hum (DIN 45 500):** 52 dB below 50 mW. **Signal/Hum at max. volume:** 66 dB below full output power. **Signal/Hum at min. volume:** 79 dB below full output power. **Bass Control:** $\pm$ 13 dB at 50 Hz. **Treble Control:** $\pm$ 15 dB at 10,000 Hz. **Loudness Contour:** Max. 13 dB at 50 Hz, max. 3 dB at 10,000 Hz. **Outputs:** TAPE. **DIN-connector.** Output impedance: 33 kohms. Output voltage (FM), 40 kHz deviation: 0.1 volt, 75 kHz deviation: 0.16 volt. **LOUDSPEAKERS:** DIN sockets for left and right master- and remote speakers. Mating DIN plugs are supplied with receivers sold in U.S.A. Total load impedance for each channel must not be less than 2 ohm. Phone jack for stereo headphones.

Inputs:

Input	Impedance	Sensitivity	Max. Inp. Signal	Connector
TAPE	30 kohm	250 mV	2.5 V	Phone/DIN
PHONO magn.	47 kohm	3.5 mV	35 mV	Phone/DIN
PHONO cer.	2 Mohm/200 pF	70 mV	0.7 V	Phone/DIN
MIC	1.4 kohm	110 μ V	11 mV	DIN



The series of Tandberg Hi-Fi systems comprises 10 different loudspeaker systems. You will therefore always be able to find Tandberg loudspeakers which will fit into your set-up. From left to right Hi-Fi System No. 12, 20, 17, 19, 18, 15, 10, 7, 11, 13.



TANDBERG HI-FI LOUDSPEAKERS

The loudspeaker is the last and decisive link in any sound reproduction system, and should therefore be carefully selected. Some of the most important specifications for the estimation and selection of the Tandberg Loudspeakers will appear in the surveys on the next page.

For stereo amplifiers, tape recorders and record players there are rather accurate and measureable specifications, and usually it is therefore no problems attached to the selection of units which will fit together. When it comes to the selection of loudspeakers, however, it is not as simple. Some of the speakers' properties can be measured, and the results may be of some help, but there will always be room for subjective judgement, especially when the given specifications shall be judged for what they mean to the reproduction.

By and large all the Tandberg loudspeakers meet the same strong demands for quality of sound. The difference in efficiency between the various systems lies mainly in the maximum power radiated in the bass area without distortion, and in the input power at which the speaker can operate continuously.

Even radiation — Multispeaker system

Any loudspeaker has a limited frequency range which is dependent on the size. The largest speakers will have a low frequency response, while the small speakers will radiate the high frequency register and have no bass reproduction at all.

To obtain balance within the whole Hi-Fi frequency range, a combination of large and small loudspeakers is required. The frequency range in all Tandberg Hi-Fi systems has therefore been divided in two or three, — each part with a loudspeaker carefully adapted. At high sound level the frequency range is usually divided in three, with a special loudspeaker for each area, i. e. woofer-, midrange- and tweeter-loudspeaker.

Pressure chamber systems

All Tandberg Hi-Fi loudspeakers are pressure chamber systems. Tandberg have been using this system for more than 35 years. The construction allows small dimensioned loudspeaker cabinets which at the same time give a very rich bass reproduction.

Resonance frequency — bass reproduction

Any speaker system has a characteristic resonance frequency which coincides with the lowest bass tone that the system can reproduce undistorted and with the same volume as the rest of the frequency range. A low resonance frequency is therefore a necessary condition for high quality reproduction of bass tones.

Size of cabinet — bass tone

In a pressure chamber system, the resonance is decided by the volume of the cabinet, the size of the woofer and the weight of the speaker's membrane. If a small box is used, the weight of the membrane is increased and its diameter reduced, but the resonance may still be kept on a low tone, and the bass may be just as rich. This has been done in the new small Tandberg Hi-Fi systems 18, 19 and 20. They have an impressive bass reproduction in proportion to the modest dimensions of the cabinets.

Power limiter

There is a limit to what input power can be handled by the loudspeaker. In the table for technical specifications these limits are given in the columns marked «Max. supplied music power» and «Max. supplied continuous power». The small pres-

VOLUME	LIVING-ROOM LEVEL		CONCERT-LEVEL	
BASS REPRODUCTION	Medium Bass (Orchestra)	Deep Bass (Organ)	Medium Bass (Orchestra)	Deep Bass (Organ)
LIVING-ROOM (250 sq. ft.)	Hi-Fi 10 Hi-Fi 11 Hi-Fi 12 Hi-Fi 18 Hi-Fi 19	Hi-Fi 12 Hi-Fi 20 Hi-Fi 17	Hi-Fi 12 Hi-Fi 7 Hi-Fi 13 Hi-Fi 19	Hi-Fi 17 Hi-Fi 15
Min. amplifier power	0.5 x D	0.5 x D	2 x D	2 x D
LIVING-ROOM (500 sq. ft.)	Hi-Fi 7 Hi-Fi 13 Hi-Fi 17 Hi-Fi 19	Hi-Fi 17 Hi-Fi 15	Hi-Fi 7 Hi-Fi 13 Hi-Fi 17 Hi-Fi 15	Hi-Fi 15
Min. amplifier power	1 x D	1 x D	4 x D	4 x D
LARGE HALL (2,000 sq. ft.)	Hi-Fi 7 Hi-Fi 13 Hi-Fi 17	Hi-Fi 15	Hi-Fi 7 Hi-Fi 13 Hi-Fi 15	Hi-Fi 15 (4 pcs. coupled in series-parallel.)
Min. amplifier power	4 x D	4 x D	16 x D	

TANDBERG HI-FI LOUDSPEAKERS										
HI-FI SYSTEM	18	10	11	19	12	20	7	13	17	15
Outer dimensions	L: 9 1/4" H: 9 1/4" D: 4 1/4"	L: 7 1/8" H: 9 1/8" D: 9 1/8"	L: 12 1/8" H: 8 1/2" D: 6"	L: 9 1/4" H: 8 1/4" D: 7 1/2"	L: 17 1/16" H: 8 1/16" D: 7 1/2"	L: 18 1/8" H: 8 1/2" D: 7 1/2"	L: 20 1/2" H: 10 1/4" D: 10"	L: 25 7/16" H: 8 1/4" D: 9 11/16"	L: 20 1/2" H: 10 1/4" D: 10"	L: 27 1/2" H: 13 3/4" D: 11"
Internal volume l	3.5	6.5	6.5	7.5	12.5	12.5	25	25	25	50
Frequency response Hz	50 - 18,000	60 - 16,000	60 - 16,000	50 - 18,000	50 - 16,000	45 - 18,000	50 - 16,000	50 - 16,000	35 - 18,000	35 - 18,000
Resonance frequency Hz	85	90	90	85	70	70	85	85	50	50
Operating power ¹⁾ watts	8	4	4	4	4	4	1	1	4	2
Max. supplied continuous power ²⁾ watts	20	20	20	25	25	25	20	20	35	45
Max. supplied music power ³⁾ watts	40	40	40	50	50	50	40	40	50	70
Impedance ohm	4	4	4	4	4	4	3.2	3.2	4	4
Number of loudspeakers	Woofer	5"	6.5"	6.5"	6.5"	6.5"	6" x 10"	6" x 10"	8"	12"
	Midrange	—	—	—	—	—	—	—	4" x 7"	5"
	Tweeter	2 1/4"	2"	2"	2 1/4"	2"	2"	2"	2 1/2"	2 1/2"
Type of wood T: Siamese teak R: Rosewood O: Oak	T, R, O.	T, R.	T, R.	T, R.	T, R.	T, R, O.	T, R, O.	T, R.	T, R.	T, R.

¹⁾ DIN 45,500 Sheet 7,2.2
²⁾ DIN 45,500 " 7,2.6.1
³⁾ DIN 45,500 " 7,2.6.2

sure chamber systems can profitably be used for the moderate sound levels. For the high volumes the large speaker systems which can handle the high amplifier power should be used.

Selection of loudspeakers

Before choosing loudspeakers, it is important to know the conditions under which they will be used. The demands may be comprized in three points:

1. The speaker must be strong enough to fill the room with sufficient sound volume. Some rooms will be strongly muted by wall-to-wall carpets etc., and will therefore demand far more from the loudspeaker than other rooms. In this case larger speakers should be chosen.
2. The speaker should be adapted for the kind of music that is to be reproduced. It is for instance of great significance to know how much sound is wanted in the bass area. Organ, bass-viol, etc. demand larger loudspeakers than orchestral music with normal bass.
3. Loudspeaker and amplifier must be adapted to each other. The amplifier should be strong enough to make the speaker work at the desired sound level.

One may believe that the need for sound efficiency per loudspeaker is halved when going from mono to stereo. However, the difference is not significant. Even in stereo one must take into account that the whole sound efficiency can now and then lie in one channel, and consequently will be reproduced through only one speaker.

It is therefore recommended to put the same claims on all loudspeakers in both mono and stereo, for a given volume in the room.

The upper table gives a survey of which loudspeakers should be chosen according to the size of the room, desired sound level and the content of bass notes in the music. There are also specifications for calculation of the size of the amplifier needed to feed the various loudspeakers with the pre-supposed sound volume.

The table can be used in the following way:

If you have a 250 sq. ft. living-room, start in this column. If you want a normal living-room volume, with medium bass, look to the columns called «Living-room level» and «Medium bass», and you will find the Hi-Fi systems Nos. 10, 11, 12, 18 and 19. If much bass is wanted, you should pick Hi-Fi 12 or 20, — and for pipe organ reproduction Hi-Fi 17.

Necessary amplifier power

This can be calculated on the basis of the operating power. The operating power is the input power required for each single loudspeaker to obtain a certain strong sound level (96 dB) at a distance of 1 meter from the speaker.

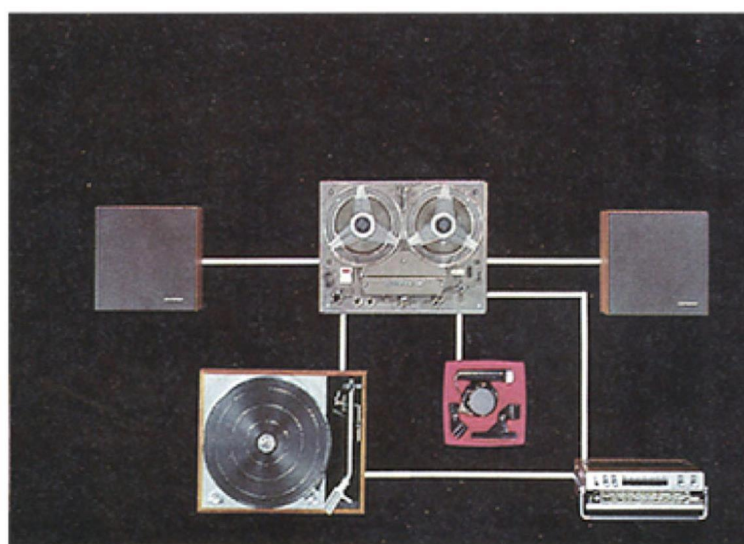
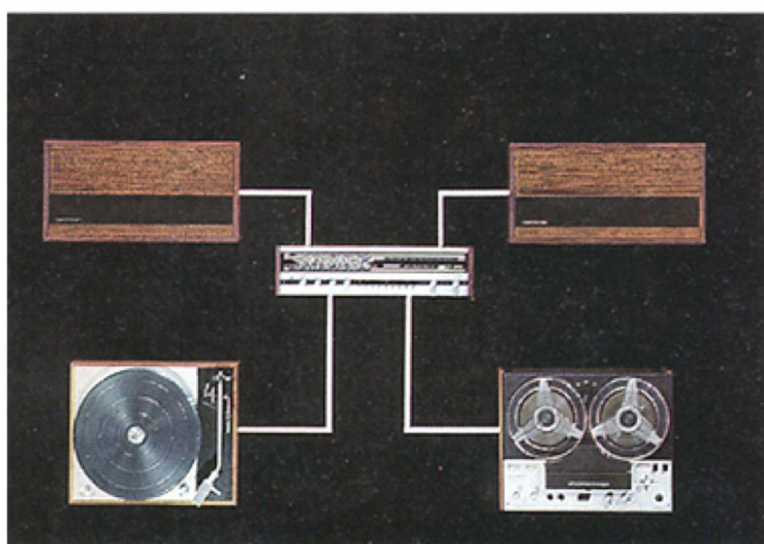
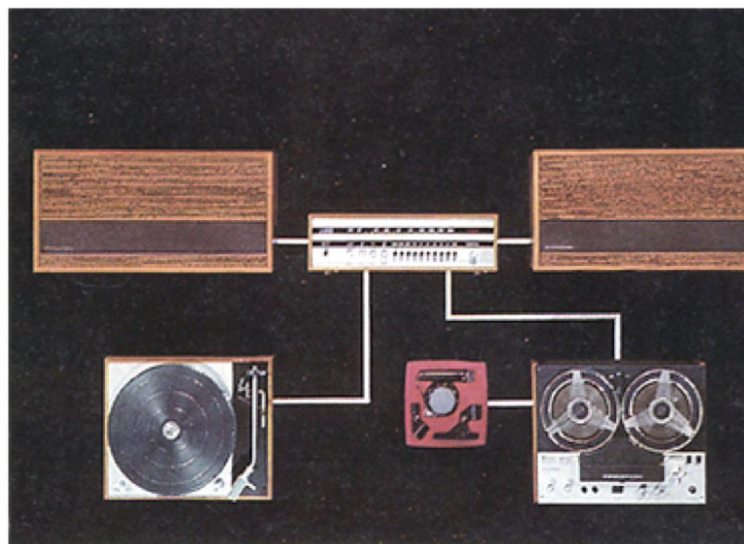
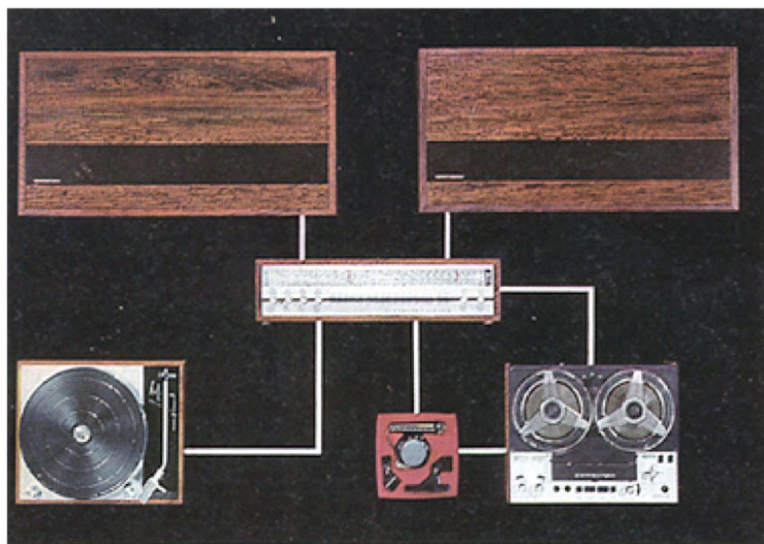
A speaker with low efficiency requires a high amplifier power to reach this sound volume, i. e. it has a high operating power.

In each one of the columns in this table, for living-room level and concert level, there is a factor which is different for the three room-sizes. When having chosen a loudspeaker, the necessary amplifier power can be calculated by multiplying the operating power of the loudspeaker with the factor given in the column for this particular loudspeaker.

Example:

Size of the living-room 250 sq. ft.
Desired volume Living-room level
Bass reproduction Medium-bass
Loudspeaker model Hi-Fi 18
Factor for operating power 0.5

Operating power for Hi-Fi 18, 8 watts, will appear from the lower table. Required amplifier power will therefore be as follows: 0.5 x 8 watts = 4 watts. The amplifier must therefore in this particular case be able to supply 4 watts.



TANDBERG MUSICAL INSTALLATION

- Hi-Fi and stereo for the connoisseurs ...

At one time, people would buy a radio and then later a record playing unit as a supplement. Modern technique and the discriminating public of today, are requiring far more from a musical installation. Today electronics have got a solid foothold in almost every home and are a manifestation of the importance of modern mass media. Now, a musical installation together with a TV set form natural elements of the general outfit in a steadily growing number of houses.

The musical installation gives a quite new musical experience in your home. This is why more and more homes are getting a stereo installation to the delight of the whole family. When it comes to the advanced musical installation, only the perfect sound mirror should be good enough. With Tandberg products you are sure to get such an image. "Tandberg Sound" has become a symbol for quality all over the world, and stands for the closest you can come by means of electronics to the pure musical experience in a concert hall.

Hi-Fi, Stereo, DIN 45,500

Hi-Fi equipment, stereo-equipment, musical installation ... designations used as often in wrong connections as in correct ones. We therefore find it appropriate to explain these significant terms.

Hi-Fi and stereo cover different areas in connection with sound reproduction. Hi-Fi is short for High Fidelity — technique providing a sound reproduction as close to the natural sound as possible. Hi-Fi is a quality conception for sound reproduction equipment. Then what is stereo? Stereo means recording and playback of sound — preferably music — across two separate channels. The two channels are creating a feeling of direction which makes you locate the position of every single instrument.

Stereo gives both width and depth to the sound reproduction. When the combination Hi-Fi stereo is used, Hi-Fi stands for the sound quality, while stereo tells how the reproduction takes place. Consequently, a Hi-Fi stereo musical installation is a

(contd. page 21)

Tandberg Hi-Fi musical installations on this page

Upper, left:
Huldra 9 Stereo.
2 Tandberg Hi-Fi Systems 15.
Tandberg tape recorder Series 6000X Stereo.
Record player.
Microphone, Tandberg TM4 Complete.

Upper, right:
Tandberg Tuner-Amplifier Hi-Fi FM.
2 Tandberg Hi-Fi Systems 17.
Tandberg tape recorder Series 3000X Stereo.
Record player.
Microphone, Tandberg TM4 Complete.

Below, left:
Tandberg Model SS11-71 Stereo.
2 Tandberg Hi-Fi Systems 20.
Tandberg tape recorder Series 3000X Stereo.
Record Player.

Below, right:
Tandberg tape recorder Series 1200X Stereo.
2 Tandberg Hi-Fi Systems 18.
Tandberg Portable Radio 41.
Record player.
Microphone, Tandberg TM4 Complete.

In this example Tandberg Series 1200X Stereo is used both as tape recorder and amplifier. This model is excellent for forming the centre of a stereo Hi-Fi musical installation where it can be used for instance as amplifier for record player with magnetic pick-up.

combination of technical equipment for music reproduction in which every element has two channels. Each element must comply with certain demands for Hi-Fi equipment set by the DIN standard 45,500. (DIN stands for Deutsche Industrie Normen). There are standard measurements for all elements in a musical installation, such as tuner - amplifier, loudspeakers, tape recorders, record players etc.

The Tandberg products reach far beyond these international standards, and with units from Tandberg you are ensured of exceptionally clear reproduction. A Tandberg Hi-Fi stereo installation makes it possible to listen to music in your own sitting-room with the same pleasure as if it was heard in a concert hall.

A Musical Installation is being built

A musical installation often consists of a tuner-amplifier, at least 2 loudspeakers, tape recorder and record player. Not all budgets allow the purchase of a complete installation at once however, but when you have made up your mind as to what to demand from your installation, do not yield! "No chain is stronger than its weakest link" is a saying that fits especially well in this connection. An excellent record player for instance will never do justice to itself if the quality of the amplifier and loudspeakers is not on the same level.

A musical installation can be built up successively. You can start with a combination of a tuner-amplifier — SS11 Stereo, Hi-Fi FM or Huldra 9 Stereo — and a pair of Tandberg loudspeakers. Later on the installation can be extended by tape recorder and record player.

The Tape Recorder

A musical installation with a tape recorder as one of the elements, is something more than a mere playback equipment. An advanced tape recorder offers a great number of facilities and opens the door to varied uses.

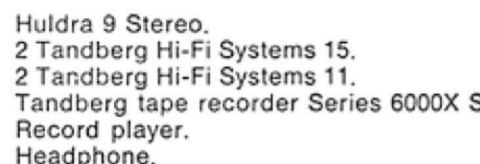
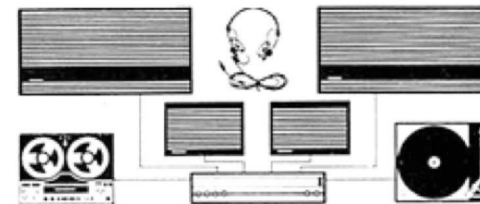
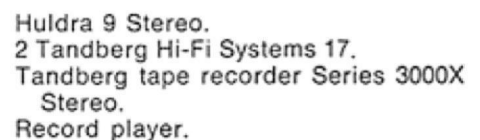
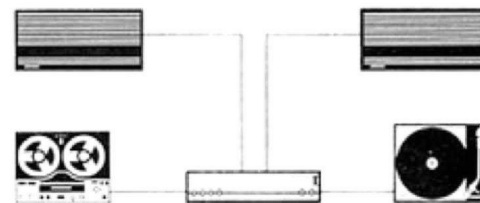
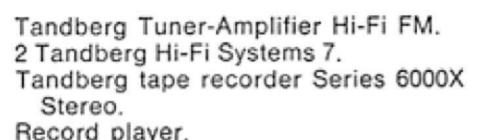
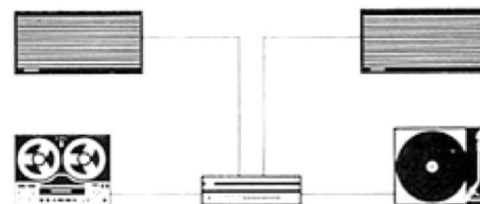
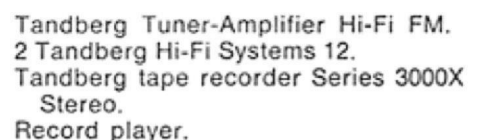
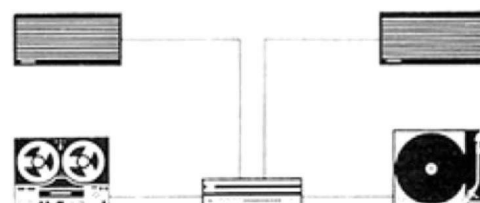
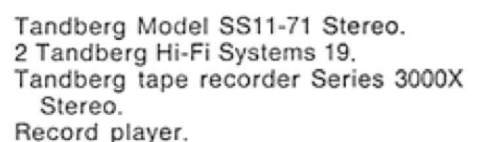
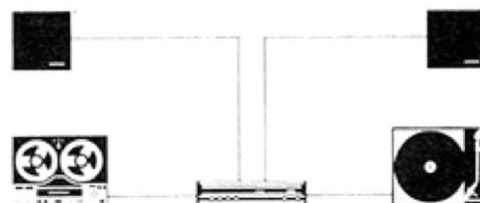
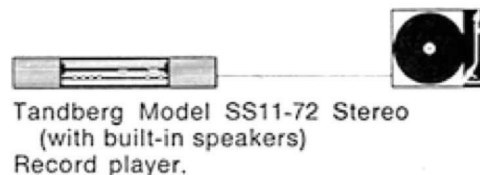
The music lover can preserve the original quality of his LP-records by copying them on tape which — in contrast to the records — can be played back again and again without losing quality. By means of the tape recorder you can make recordings of the sound from your TV-set — provided the set has an output socket for the connection of a tape recorder (Tandberg TV sets have). Further you can make recordings from radio — especially from the FM-band, where, if your tuner has a decoder, you may well receive stereo-transmissions, thus securing

economical access to programmes for your musical installation.

For the music performer the tape recorder provides control- and trick possibilities during rehearsal in groups or alone. And if you want to enjoy yourself — and others — you can make a radio play, make comments and background music for film and slides etc. The tape recorder can easily be called the activating element in a musical installation. For further information, please see pages 4-12.

"Tandberg Sound"

Tandberg musical installations offer numerous possibilities to get "Tandberg Sound" in your home. On these pages we have set up a few examples, from the simplest equipment at the most reasonable price, up to the highly advanced installation. Needless to say there are other combinations than the ten examples given here. However, we believe that in most cases these examples will meet the needs and requirements of discriminating people for crystal clear reproduction of all kinds of music.



TANDBERG accessories



TANDBERG TM4 COMPLETE

This is a high-quality dynamic microphone, ideal for Hi-Fi recording of both speech and music. Every single microphone is thoroughly tested and checked. Sensitivity and frequency range have been measured to be within the tolerance given in technical specifications. The microphone is omni-directional, i. e. it accepts signals almost equally well from all directions, although best when received from the front.

Technical Specifications:

Frequency range: ± 3 dB, 50–17,000 Hz. Sensitivity: 0.1 mV/ μ bar (at 1,000 Hz). Impedance: 200 ohm. Dimensions: Length 5 1/4", diameter 1 5/12", weight without stand: 5 oz.

Tandberg TM4 Complete is available in a presentation case with an adjustable table stand, chest stand, cord with clip, floor stand mounting bracket, wind-shield, 13 ft lead and DIN-plug.



TANDBERG TM4 HANDY

A high quality dynamic, omni-directional microphone, especially suited for recording of speech and music. Each microphone is thoroughly tested before leaving the factory.

Technical Specifications:

Frequency range: ± 3 dB, 50–17,000 Hz. Sensitivity: 0.1 mV/ μ bar (at 1,000 Hz). Impedance: 200 ohm. Dimensions: Length 5 1/4", diameter 1 5/12". Weight 1.2 lbs. 5 oz without stand.



TANDBERG TM3

Tandberg TM3 is a high quality crystal microphone suited for Hi-Fi recording of speech and music. TM3 is omni-directional, i.e. it accepts signals equally well from all directions

Technical Specifications:

Frequency range: ± 3 dB, 30–12,000 Hz. Sensitivity: 1.25 mV/ μ bar (at 1,000 Hz). Impedance: 2.2 Mohm. Dimensions: 1 3/4" x 7/8". Weight: 1 oz. Weight with stand: 9 oz. Tandberg TM3 is available with adjustable table- and chest stand, with a 13 ft lead, jack plug and cord for suspension around the neck.

TANDBERG MICROPHONE TRANSFORMER

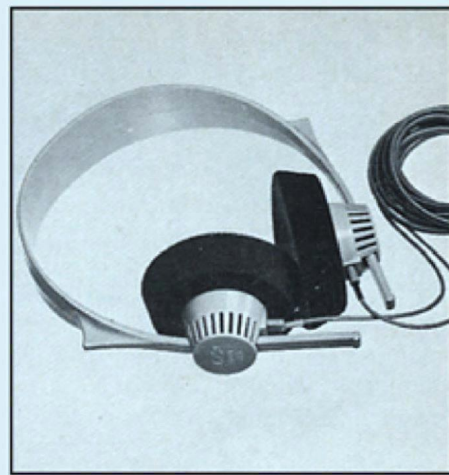
should be used when the Tandberg Microphone TM4 is connected to any tape recorder with high input impedance. Transformer voltage ratio: 1:15. Available with DIN or jack plug.

FOOT CONTROLLER

for remote control of tape recorders — for start and stop (for F-models also rewind). For Series 6000X type TFC2, for F-models: type TF/C1.

HEADPHONE WITH MICROPHONE K58

suitable for use with SL tape recorders at language exercise. Impedance: Microphone 300 ohm, phone 150 ohm.



STEREO HEADPHONE HD 414

Stereo headphone with extremely good sound reproduction — agreeable in use. When used in mono the headphones can be connected in series or parallel. The headphones are delivered with DIN plug for loudspeaker outputs. Frequency response: 20–20,000 Hz. Sensitivity: 100 dB S.P.L. (sound pressure level) at 1 volt input. Impedance: 2000 ohm per headphone.

HEADPHONE WITH MICROPHONE HF 204

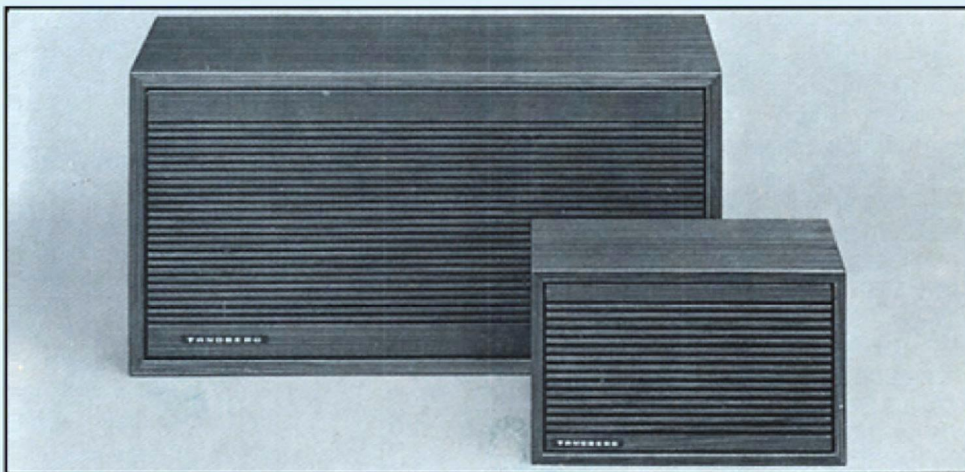
A combination of headphone and microphone suitable for use with tape recorders for language exercises. Impedance: Microphone 200 ohm, phone 200 ohm.

STEREO HEADPHONE K50

suitable for monitoring during recording, mixing etc., as well as private listening during stereo playback. Available with cable and DIN plug. Impedance: Microphone 300 ohm, phone 200 ohm.

STETOSET HEADPHONES

Light and comfortable for monitoring and private listening. Impedance: 250 ohm.



SEPARATE LOUDSPEAKER 9

A high quality remote loudspeaker for kitchen, sitting-room, children's room or bedroom.

Dimensions: Length 16 1/2", height 8 1/4", depth 6". Volume 8.5 litres.

KITCHEN LOUDSPEAKER MODEL 16

A small, handy loudspeaker for kitchen, bathroom etc. Dimensions: Length 8 1/16", height 5", depth 4 5/16".



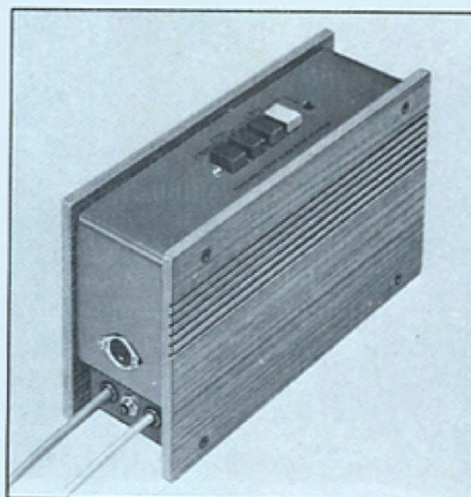
BATTERY ELIMINATOR No. 4 for Tandberg Tape Recorder Series 11 and 11-1P. Can be placed in the recorder instead of the batteries, or used externally.

TANDBERG SYNCHRONIZER MODEL 3

Tandberg Synchronizer 3 is intended for use together with Tandberg Tape Recorder 11-1P for synchronized copying and post sync. shooting. The synchronizer will hold the synchronism even if the camera has deviated 8 per cent from the nominal speed. Push-button for correction of fault in synchronism. Two indicators give signals when the Synchronizer receives either reference tone or pilot-tone. A stable, built-in oscillator allows possibility for camera speed check.

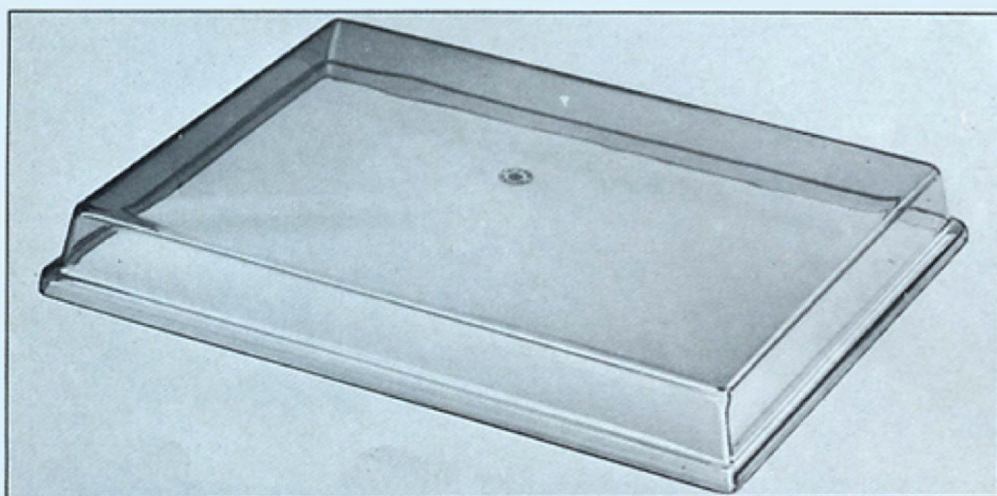
BAG for Tandberg Tape Recorder 11 and 11-1P. Solid and practicable with shoulder strap. Pocket for tape and window for spools.

TAPE of the very best quality available in all standard-lengths from 3600 to 200 ft. Empty spools in following sizes: 7", 5 3/4", 5", 3 1/4" and 3".



TANDBERG SLIDE SYNCHRONIZER MODEL 3

The synchronizer allows automatic slide projection with recorded music and commentary. The commentary is recorded on one track of the tape, while the impulses are recorded on the other by means of the synchronizer. During playback, the synchronizer will provide change of slide at the right moment. Tandberg Slide Synchronizer can be used with any automatic slide projector and a stereo tape recorder, and also with monaural tape recorders with "Free-Head" output, i.e. Tandberg Series 15 and 13.



DUST COVER protects the tape recorder when it is not in use. Available in three versions: One for Tandberg tape recorders Series 15 and 1200X Stereo, one for Series 1700 and one for tape recorders Series 3000X and 6000X Stereo.



CARRYING CASE No. 4 is made for Series 15 and 1200X Stereo — No. 5 for Series 3000X and 6000X Stereo and No. 6 for the Series 1700. Complete with lock.

BAG for Tandberg tape recorders Series 15 and 1200X Stereo, made of elegant and solid plastic material. Can be folded. Plastic cover is enclosed in the lid.

BAG with shoulder strap for Tandberg Portable Radio 41.

SPECIAL CAR BRACKET

for Tandberg Portable Radio 41, with voltage regulator for connection to a 12 volt car battery. The bracket allows automatic connection of supply voltage, and the batteries in the receiver are disconnected. Car aerial and possible remote speaker are connected. When Tandberg Portable Radio 41 is used in a car with 6 volt battery, a 6-12 volt converter or mounting bracket should be used.

MOUNTING BRACKET without connections for Tandberg Portable Radio 41, — to be used when a simpler fastening is wanted.

BATTERY ELIMINATOR No. 5 for Tandberg Portable Radio 41. The eliminator is connected to 220V AC mains socket. The lead from the eliminator has connector with centre pin to —. Battery eliminator No. 5 gives 12V direct current at a maximum 0.4 A load.

TECHNICAL SPECIFICATIONS:	SERIES 6000X STEREO 4-track 2-track	SERIES 3000X STEREO 4-track 2-track	SERIES 1200X STEREO 4-track 2-track	SERIES 15 MONO 4-track 2-track	SERIES 1700 MONO 4-track 2-track	SERIES 11 MONO 2-track 1-track
POWER REQUIREMENTS 50 or 60 Hz optional	240/230/115 V, 50 Hz 240/230/115 V, 60 Hz	230/240/115 V, 50 Hz 230/240/115 V, 60 Hz	230/115 V, 50 Hz 230/115 V, 60 Hz	240/230/115 V, 50 Hz 240/230/115 V, 60 Hz	230 V, 50 Hz	Battery operated, 15 V 10 x 1.5 V cells
POWER CONSUMPTION	45 W	40 W	50 - 100 W	50 W	50 W	2 - 3 W
TAPE SPEED, " per. sec.	7 1/2 - 3 3/4 - 1 7/8	7 1/2 - 3 3/4 - 1 7/8	7 1/2 - 3 3/4 - 1 7/8	7 1/2 - 3 3/4 - 1 7/8	3 3/4	7 1/2 - 3 3/4 - 1 7/8
SPEED TOLERANCE	± 1 %	± 1.5 %	± 1.5 %	± 1.5 %	± 2 %	± 0.5 %
WOW, max. Peak DIN 45511 7 1/2" per sec. 3 3/4" per sec. 1 7/8" per sec. R. M. S. 7 1/2" per sec. 3 3/4" per sec. 1 7/8" per sec.	0.1 % 0.2 % 0.4 % 0.07 % 0.14 % 0.28 %	0.1 % 0.2 % 0.4 % 0.07 % 0.14 % 0.28 %	0.1 % 0.2 % 0.4 % 0.07 % 0.14 % 0.28 %	0.1 % 0.2 % 0.4 % 0.07 % 0.14 % 0.28 %	0.2 % 0.14 %	0.15 % 0.25 % 0.4 % 0.1 % 0.18 % 0.3 %
FREQUENCY RANGE DIN 45511 7 1/2" per sec. 3 3/4" per sec. 1 7/8" per sec. ± 2 dB 7 1/2" per sec. 3 3/4" per sec. 1 7/8" per sec. AMPLIFIER MODE ± 3 dB	40 - 22,000 Hz 40 - 18,000 Hz 40 - 10,000 Hz 40 - 20,000 Hz 50 - 16,000 Hz 50 - 9,000 Hz 30 - 18,000 Hz	40 - 22,000 Hz 40 - 18,000 Hz 40 - 10,000 Hz 40 - 20,000 Hz 50 - 16,000 Hz 50 - 9,000 Hz 50 - 18,000 Hz	40 - 20,000 Hz 40 - 16,000 Hz 40 - 9,000 Hz 40 - 20,000 Hz 50 - 16,000 Hz 50 - 9,000 Hz 30 - 16,000 Hz	40 - 18,000 Hz 40 - 13,000 Hz 40 - 7,000 Hz 40 - 18,000 Hz 50 - 12,000 Hz 60 - 6,500 Hz 30 - 16,000 Hz	30 - 13,000 Hz 40 - 12,500 Hz 30 - 16,000 Hz	30 - 18,000 Hz 40 - 12,000 Hz 50 - 6,000 Hz 40 - 16,000 Hz 50 - 10,000 Hz 60 - 5,000 Hz 30 - 18,000 Hz
SIGNAL/TAPE NOISE at highest tape speed and 5 % distortion DIN 45511 (weighted) DIN 45511 (unweighted) IEC A-curve IEC, unweighted R.M.S.	4-track 56 dB 2-track 58 dB 54 dB 64 dB 58 dB	4-track 54 dB 2-track 56 dB 51 dB 62 dB 57 dB	4-track 53 dB 2-track 55 dB 50 dB 60 dB 55 dB	4-track 52 dB 2-track 54 dB 50 dB 59 dB 54 dB	4-track 51 dB 2-track 53 dB 50 dB 56 dB 55 dB	2-track 55 dB 1-track 59 dB 55 dB 63 dB 58 dB
CROSSTALK ATTENUATION at 1,000 Hz Mono Stereo	> 60 dB > 50 dB	> 60 dB > 50 dB	> 60 dB > 50 dB			
DISTORTION, max. From record amplifier at 0 dB From playback amplifier From tape at 0 dB record level	0.5 % 0.3 % at 1.5 V 3 %	0.5 % 0.3 % at 0.75 V 3 %	0.5 % 0.3 % at 0.9 V 3 - 5 %	0.5 % 0.3 % at 0.9 V 3 - 5 %	0.5 % 0.3 % at 0.75 V 5 %	0.5 % 0.5 % at 2.5 V 3 %
INPUTS Input impedance/sensitivity max. voltage at 400 Hz. (Pick-up input at 1,000 Hz)	MIC: 1/70 μV/70 mV RADIO: 100 kohm/5 mV/15 V LINE: 100 kohm/5 mV/15 V PHONO: M: 33 kohm/1 mV/3 V C: 1/10 mV/30 V	MIC: 1/0.1 mV/25 mV LINE: 1 Mohm/100 mV/20 V RADIO: 57 kohm/5 mV/1 V	MIC: 1/90 μV/100 mV LINE: 100 kohm/5 mV/10 V PICKUP: MAGN: 33 kohm/2 mV/2V CER: 1/20 mV/10 V	MIC: 1/0.1 mV/10 mV RADIO: 100 kohm/10 mV/1 V PICKUP: 1 Mohm/100 mV/10 V	MIC: 1/0.1 mV/10 mV P. UP: 1 Mohm/35 mV/3.5 V RADIO: 56 kohm/7 mV/0.7 V	MIC: 1/0.1 mV/50 mV LOW: 10 kohm/5 mV/1 V HIGH: 200 kohm/125 mV/10 V
OUTPUTS Min. load impedance/voltage	RADIO: 5 kohm/0.75 V ²⁾ LINE: 5 kohm/160 mV ²⁾ LEFT and RIGHT: 200 ohm/1.5 V CENTER CH: 200 ohm/1.5 V HEADPHONES: 200 ohm/1.5 V	RADIO: 100 ohm/0.75 V HEADPHONES: 100 ohm/0.75 V	EXT SPKR: 4 ohm/10 W PHONES STEREO: 80 ohm/6 V ²⁾ R and L MONO: 40 ohm/3 V ²⁾ PREAMP L and R: 5 kohm/0.75 V ²⁾	RADIO: 20 kohm/0.9 V EXT SPEAKER: 4 ohm/10 W FREE HD: 20 kohm	EXT. SPKR.: 4 ohm/9 W RADIO: 5 kohm/0.75 V ²⁾	LINE: 200 ohm/1.55 V
TRANSISTORS	57	34	37	20	17	41

¹⁾ Suitable for dynamic microphone with impedance less than 700 ohm.

²⁾ Output impedance/open circuit voltage.
³⁾ Impedance adapted for ceramic pick-up.