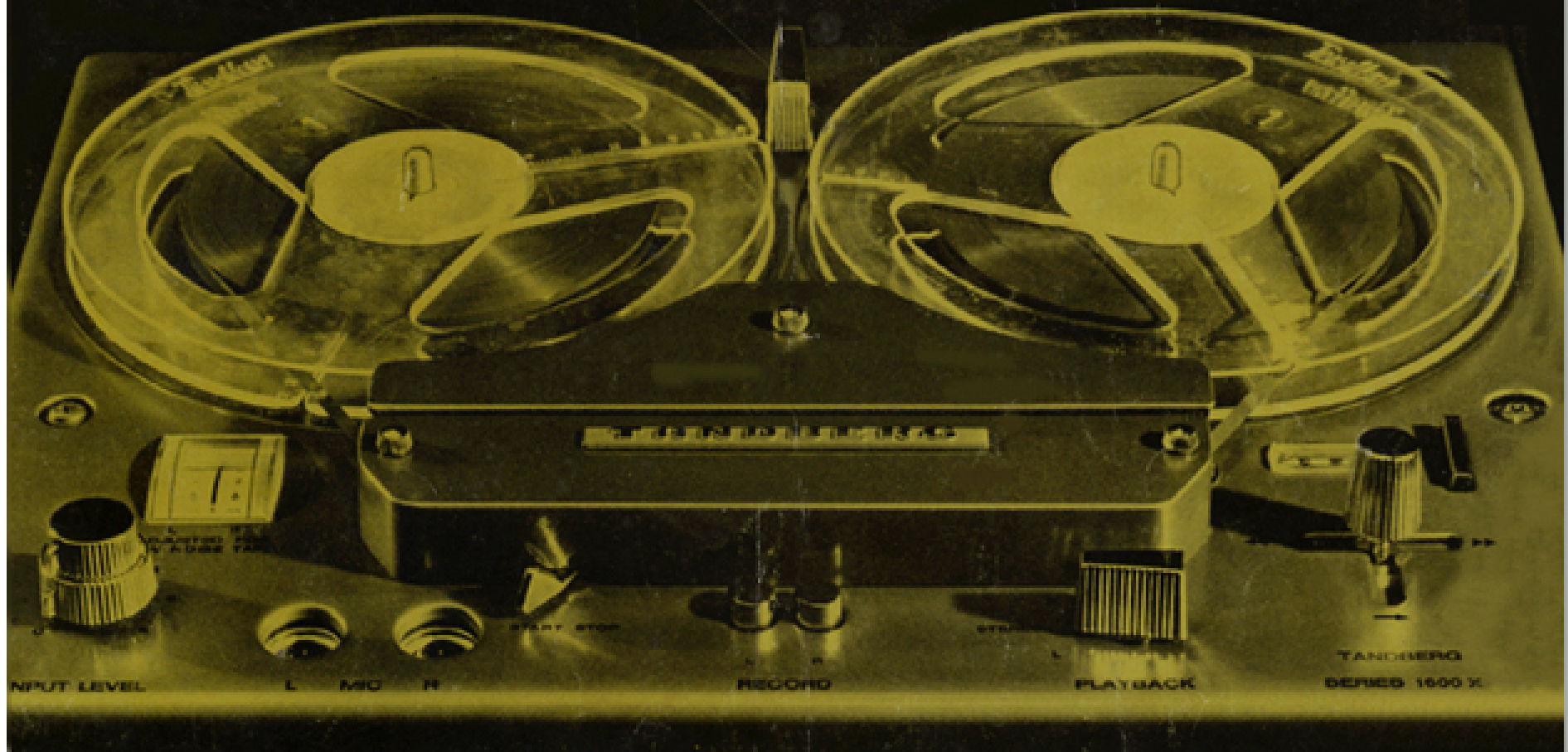


TANDBERG



Instruction manual Series 1600 X

THE STATE OF ART

in tape recording is presented to you with the Tandberg model 1600X. Successful application of the crossfield bias technique gives a significant improvement of high frequency response, resulting in better tape economy as lower tape speeds can be used for high quality sound reproduction.

The conventional method of using tape with a thinner magnetic coating for extending frequency range upwards, led to an increase of the relative noise level. Using tape with normal coating thickness, Tandberg 1600X will give you improved frequency response at no sacrifice of dynamic range.



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Tape

The Tandberg Tape Recorder 1600X is adjusted for LOW NOISE recording tape which gives the most ideal signal-to-noise ratio. Music which encompasses the highest frequencies cannot be fully enjoyed when using other than LOW NOISE TAPE for recording.

Unpacking

Plastic strips are placed between the top plate and the cabinet in order to reduce the possibility of damage during shipment. These plastic strips can easily be removed by loosening the four large screws located in the top plate. Thereafter adjust the screws so as to leave a small opening between the top plate and the cabinet.

Power requirements

The tape recorder is designed for 230 V, 50 Hz operation but can be changed over to either 115 V or 240 V operation. U. S. version is connected for 115 V, 60 Hz operation. The power consumption is 40 watts.

Note. Due to the automatic end-stop feature, the motor cannot be started before a tape is placed in the tape path.

Front and rear head covers. Remove for cleaning of heads and tape path.

Recording meter. Correct recording level corresponds to an indicator reading just below the red area. Left indicator: L channel. Right indicator: R channel.

Input level. To regulate record volume level. Upper knob: L channel. Lower knob: R channel.

Microphone sockets: L and R channels.

Instantaneous START/STOP. Starts or stops tape movement during recording or playback.

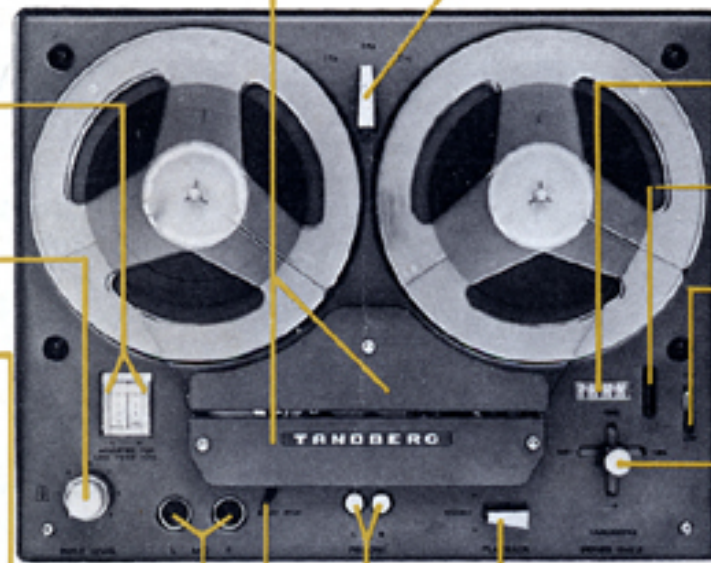
Record buttons. RECORD L depressed: recording L channel. RECORD R depressed: recording R channel. RECORD L and R depressed: recording stereo. Buttons in raised position: playback. The record buttons are locked when the tape motion lever is in position →.

HIGH IN phono connectors. Connection of record player with crystal or ceramic pick-up.

Storage room for power cord.

+ 26 V. Power output for Tandberg FM Multiplex filter.

Radio DIN connector. Connection of radio for recording and playback.



Speed selector. Choice of tape speeds: $7\frac{1}{2}$, $3\frac{3}{4}$ and $1\frac{7}{8}$ ips.

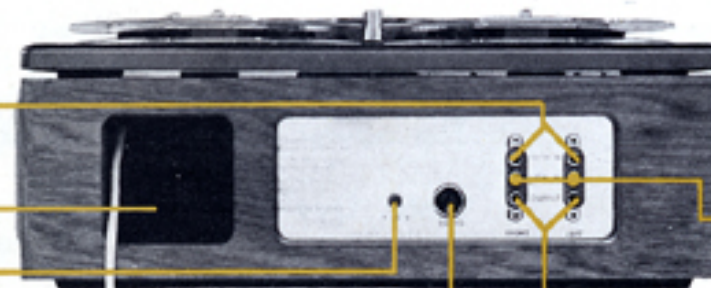
Counter. 4 digit counter which indicates tape position.

Reset button for counter.

ON/OFF switch.

Tape motion lever. Center position: Stop. →: normal forward drive for recording and playback. ←: fast rewind. →: fast wind. FREE: clutches disengaged for loading of tape. Tape motion lever should be in center position when tape recorder is not in use.

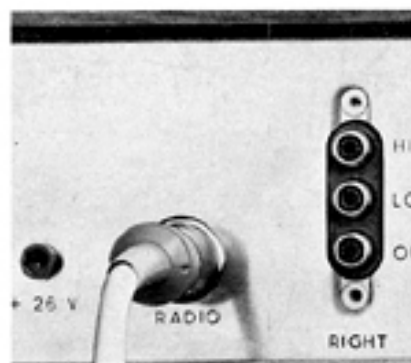
Output selector. L position: programme from L channel reproduced through OUTPUT RIGHT and LEFT. R position: programme from R channel reproduced through OUTPUT RIGHT and LEFT. STEREO position: stereo playback. Programme from left channel over OUTPUT LEFT and programme from right channel over OUTPUT RIGHT.



LOW IN phono connector. Connection of radio/amplifier for recording.

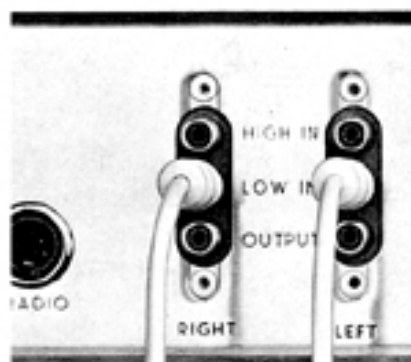
OUTPUT phono connector. Connection of headphones, radio or amplifier for playback.

Connection of external equipment



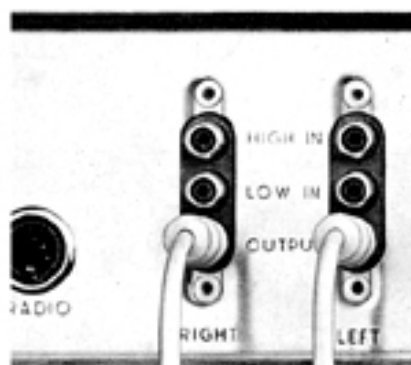
FM stereo Record/Playback from Radio (DIN Connector)

Connect a 5-pin DIN cable between the DIODE or TAPE connector on radio and RADIO connector on the tape recorder for record/playback of stereo broadcasts. With certain radios an annoying tone can be heard during recording. This can be eliminated by connecting a Tandberg FM/MX filter to the tape recorder as described on page 12.



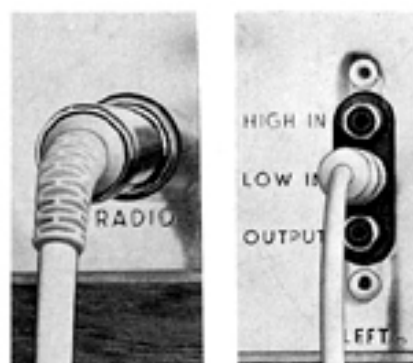
FM stereo Recording from Radio (Phono Connectors)

For stereo recording from radio equipped with phono connectors, connect phono cables between the DIODE or TAPE outputs on the radio and the LOW IN LEFT and RIGHT on the recorder. With certain radios an annoying tone can be heard during recording. This can be eliminated by connecting a Tandberg FM/MX filter to the tape recorder as described on page 12.



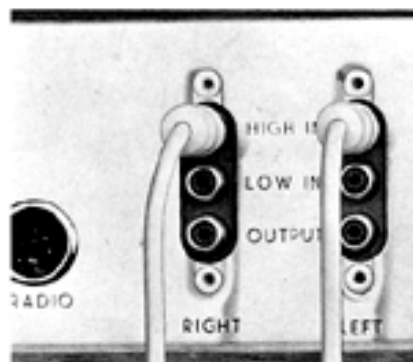
Stereo Playback from phono Connectors

For playback in stereo, both phono connectors, designated OUTPUT LEFT and RIGHT must be connected to either headphones, radio or external amplifier. The 5-pin DIN connector can also be used, as pins 3 and 5 are wired in parallel to phono OUTPUT LEFT and RIGHT respectively.



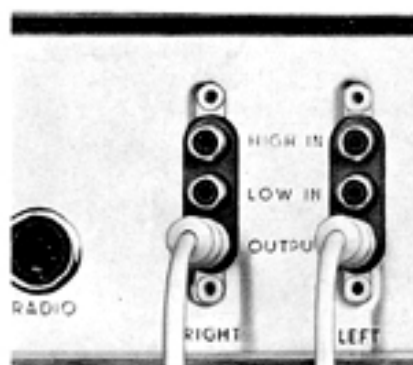
Recording from mono Radio

For recording from mono radio which is equipped with a DIN socket a DIN cable must be connected from the radio's socket to the RADIO connector on the tape recorder. If the radio is equipped with phono connectors, a cable with phono plugs must be connected between the DIODE or TAPE output on the radio and the LOW in LEFT or RIGHT on the tape recorder.



Record Player with crystal or ceramic Pick-up

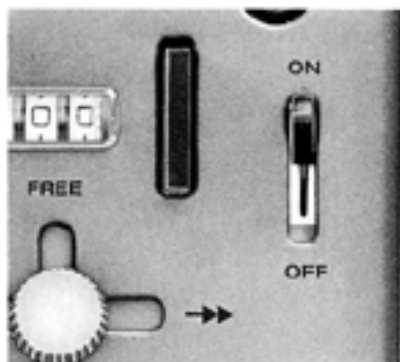
Connect record player with crystal or ceramic pick-up to the HIGH IN LEFT and RIGHT phono connectors. If a magnetic pick-up is to be used, it must be connected via an equalized preamplifier or a radio receiver or power amplifier with such a preamplifier.



Recording Tape to Tape

To record from one tape recorder to another, connect two phono cables between OUTPUT LEFT and RIGHT and the corresponding HIGH IN connectors on the tape recorder which is to be used for recording.

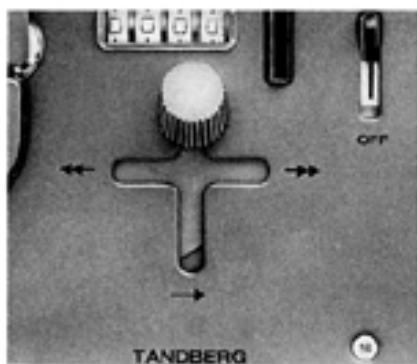
Preparations for recording



Connect the power cord located in the storage room at the rear of the tape recorder to power outlet. Set the power switch to ON.



Cut off the adhesive strip at the beginning of new tapes to avoid getting glue on the tape heads. Place a full reel of tape on the left turntable. Hold the tape taut between the left and right hand and lower the tape down into the opening insuring that the shiny side on the tape is towards the front of the machine.



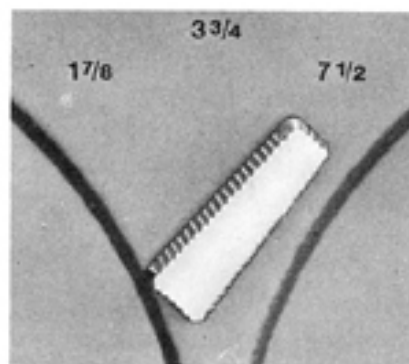
Set the tape motion lever in the FREE position, thereby disengaging both of the turntables from their clutches for easier loading.



Place the end of the tape in the opening in the empty reel and hold it in place while turning the reel counter-clockwise until the tape is taut.

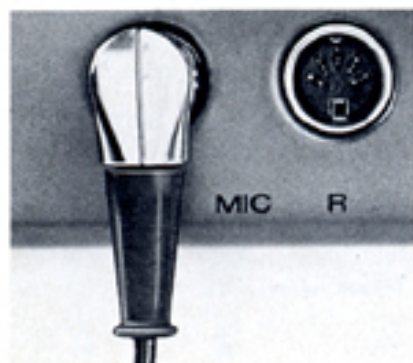


Set the revolution counter to 0 by pressing the reset button. The counter indicates the number of revolutions of the right hand turntable during recording, playback, fast rewind and fast wind, and can be depended upon as long as the inner diameter of the tape reel used on the right turntable is the same.

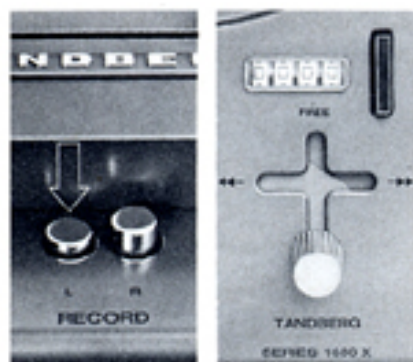


Set the speed selector to the desired speed. The best sound quality is obtained at the highest speed, $7\frac{1}{2}$ ips. See technical specifications on page 14.

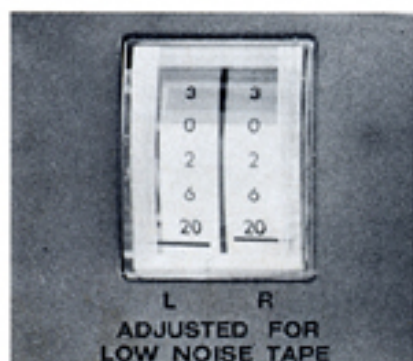
Mono recording



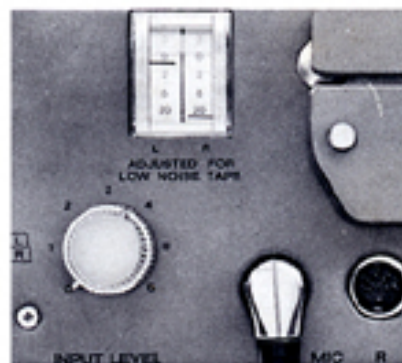
The input amplifiers for left and right channels are connected in parallel during mono recording (from line or microphone). In other words, recordings can be made on either the right or the left channel, even though the programme source is connected to the opposite input. When a microphone is connected, the corresponding line input is automatically disconnected.



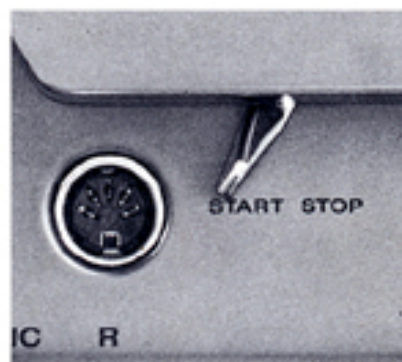
Slide the instantaneous START/STOP lever to the STOP position. Assuming that the recording is to be made on the left channel, depress the RECORD button designated L and hold while setting the tape motion lever in the → position. Should the recording be made on the right channel, depress the RECORD button designated R.



The L recording meter will light up when the left RECORD button is depressed. For recording on the right channel the R recording meter will light up.



Turn up the INPUT LEVEL knob L until the indicator deflects up to the red field. If the signal is being conveyed through one of the R channel inputs, adjust the recording level with the INPUT LEVEL R knob. It is permissible for the indicator to go into the red field for shorter periods of time but continuous registration in the red field will result in distortion. If the recording level is too low, the result will be an unfavourable signal-to-noise ratio.



Start the recording by sliding the START/STOP lever to the START position. During recording the tape can be stopped and started instantly by using the START/STOP lever.



Return the tape motion lever to the center position when the recording is completed. The recording button will then automatically return to the raised position and the machine will be ready for playback.

Mono playback



Set the tape motion lever in the ← position and rewind the tape to the beginning of the recorded passage. Stop rewinding when the tape revolution counter indicates starting number.



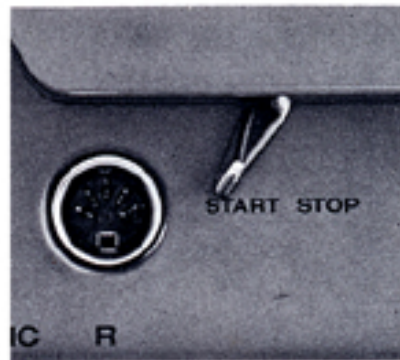
The tape recorder must be connected to a separate radio/amplifier for playback. The RECORD buttons must be in the raised position.



Slide the START/STOP lever to the STOP position and set the tape motion lever in → position.



Set the PLAYBACK selector in position L for playback from the left channel. The playback selector has three positions. Position L: left channel connected to both OUTPUT L and R, position R: right channel connected to both OUTPUT L and R, and position STEREO: left and right channels are separated and connected to OUTPUT L and R respectively.

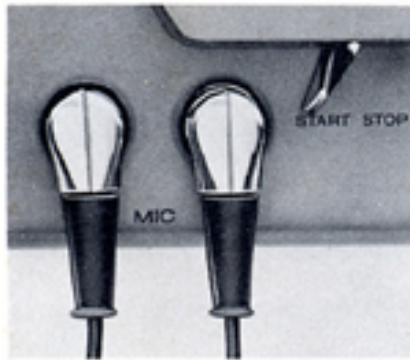


Slide the START/STOP lever to the START position and playback commences. During playback the tape can be instantly stopped and started by using the START/STOP lever.



Upon completion of playback return the tape motion lever to the center position. The tape motion lever should be in the center position when the tape recorder is not in use.

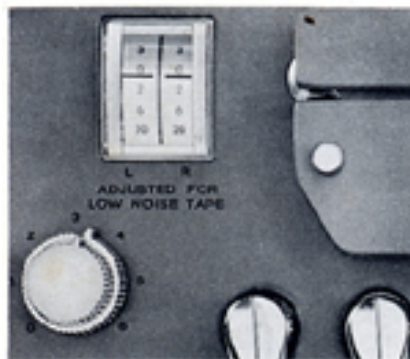
Stereo recording



Stereo recording is accomplished in the same manner as described for recording (described on page 7) with the following exceptions should microphones be used: Connect one microphone to the MIC L receptacle and place it to the left of the sound source. Connect the other microphone to the MIC R receptacle and place it to the right of the sound source.



Slide the START/STOP lever to the STOP position. Depress the RECORD L and R buttons and hold while setting the tape motion lever in the → position. Both recording meters will now light up.



Adjust INPUT LEVEL L and R in the same way as described on page 7. Upper knob: Left meter. Lower knob: Right meter. Slide the START/STOP lever to the start position and commence recording. For recording from another stereo tape recorder or record player the microphones must be disconnected from the machine.

Stereo playback



Stereo playback is accomplished in the same manner as described for mono playback on page 8. Rewind the tape and insure that the RECORD L and R buttons are in the raised position. Slide the START/STOP lever to the STOP position.

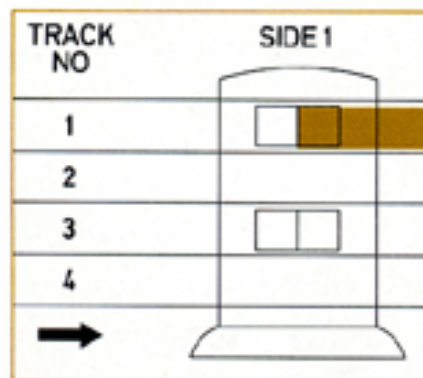


Set the tape motion lever in the → position.

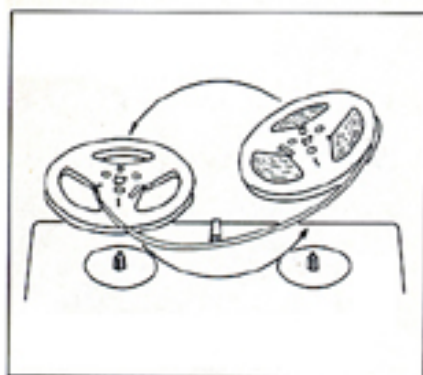


Set the PLAYBACK selector in the STEREO position and slide the START/STOP lever to the START position. The INPUT LEVEL knobs have no influence on the playback signal. Playback level is adjusted by the volume controls on the radio/amplifier.

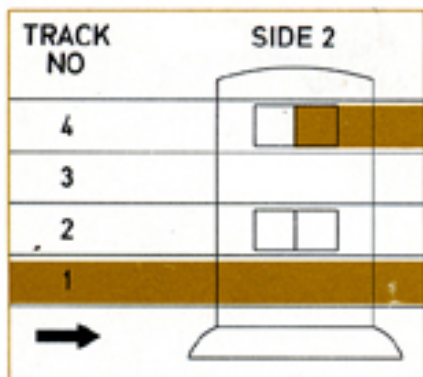
4-track recording (Model 1600X 4-track)



Programmes can be recorded on four separate tracks on 4-track models, with each track covering almost one-fourth of the width of the tape. If a programme is recorded on the left channel, the RECORD L button is depressed and the upper part of the tape head is activated. This programme is recorded on track 1.



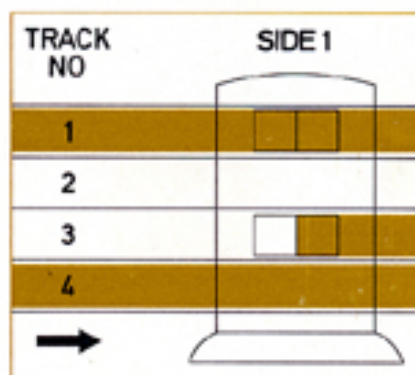
When the complete length of the tape has been recorded and the left reel is empty, turn the tape over, changing turntables. The full reel will now be on the left turntable and side 2 of the tape is ready for recording. For practical purposes the tape is referred to as having a side 1 and a side 2. These are defined as: Side 1: Tracks 1 and 3, side 2: Tracks 4 and 2. In reality only the dull side of the tape is recorded upon.



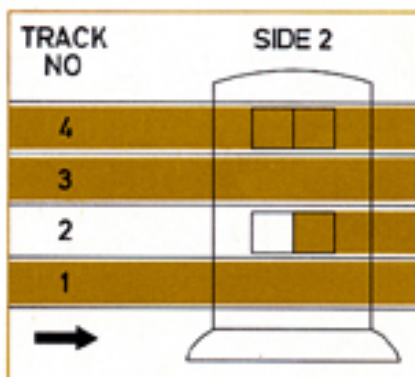
If recording is continued on the left channel, the upper part of the tape head is activated and the programme is recorded on track 4.



When the complete length of the tape has been recorded on track 4, turn over the tape so that side 1 is ready for recording again. Depress the RECORD R button and hold until the motion lever is set in the → position.

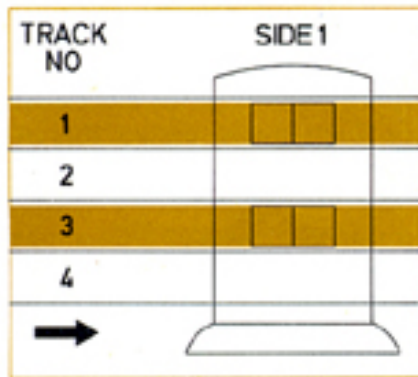


The upper part of the tape head is now disconnected and the lower part is active. The programme is recorded on track 3.

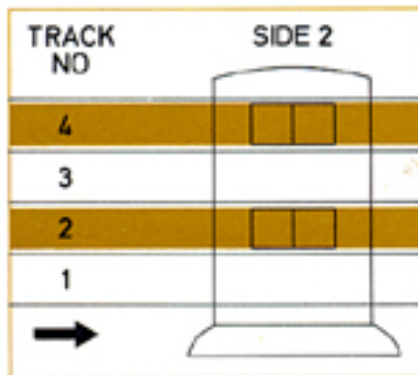


When the complete length of the tape has again been recorded, turn over the tape and continue recording on the right channel. The programme is now recorded on track 2.

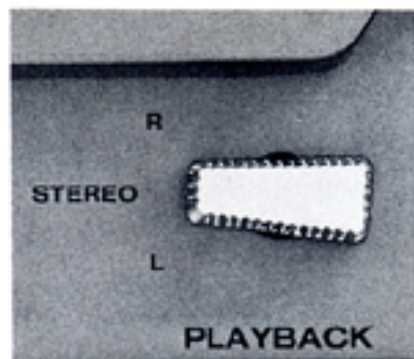
4-track playback



The choice of channel to be replayed is accomplished through the PLAYBACK selector. When side 1 of the tape is up, track 1 is replayed if the PLAYBACK selector is in position L, track 3 when the selector is in the R position.



When side 2 is up, track 4 is replayed if the PLAYBACK selector is in the L position, track 2 when the selector is in position R.



With PLAYBACK selector in the STEREO position two tracks are replayed at the same time. On side 1: Tracks 1 and 3, on side 2: Tracks 4 and 2. The programmes will then be fed separately to their corresponding outputs.

Mixing

It is possible to mix two microphone programmes or one microphone programme and one line programme while recording monophonically.

The signal level is adjusted by the INPUT LEVEL L and R knobs and the combined programme is recorded on the desired channel, depending on which RECORD button is depressed. The desired relation between the two programmes can be attained experimentally by first adjusting the level from one input only for correct indication on the record level indicator. Then make a note of the INPUT LEVEL setting and turn the knob to zero. Proceed likewise for adjustment of the other programme, and thereafter turn up the first INPUT LEVEL knob to its predetermined position. If one signal is being conveyed to the LOW IN connector and another signal to the HIGH IN connector, their relative levels cannot be regulated on the tape recorder.

The signals will be mixed and recorded on the tape.

Note. Remember that the recording indicator must not deflect into the red field for more than short periods.

FM/MX filter

The Tandberg FM/MX filter is specially designed for use with the Tandberg stereo tape recorders. The FM/MX filter is an active filter requiring a power source of + 26 V. This voltage is conveyed to the filter when the red plug from the filter is connected to the tape recorder receptacle marked + 26 V.



The filter should be used if there is annoying interference from the stereo multiplex pilot tone.

Connection of the FM/MX filter

Connect the DIN plug from the filter to the RADIO receptacle on the tape recorder and the red plug from the filter to the receptacle designated + 26 V on the recorder. Connect a DIN cable from the DIODE or TAPE output on the radio receiver to the RADIO input on the filter. If the radio receiver is equipped with phono receptacles, connect phono cables from the DIODE/TAPE outputs on the radio receiver to the FILTER INPUTS on the filter.

Instead of using the DIN plug supplied with the filter, connect a phono cable from each of the FILTER OUTPUTS on the filter to the LOW IN L and R inputs on the recorder. The red plug from the filter connects to the + 26 V receptacle on the tape recorder.

Automatic stop

The Model 1600X is equipped with a microswitch which automatically stops the motor and turntables at the end of a tape or if the tape should break. The sensor which operates the microswitch is located in the tape groove of the right hand tape guide. Because of this automatic tape stop mechanism the tape recorder will not function unless a tape is correctly threaded in the tape path.

Erasing

When a new programme is recorded on one or two tracks (mono or stereo), the existing programmes are automatically erased from these tracks during the recording operation. Should it, however, be desirable to erase a programme without recording a new one, simply run the tape through the tape recorder with the machine in the record mode and the INPUT LEVEL set at zero.

Cleaning of the heads

The heads and tape guide posts should be cleaned at regular intervals. Any film which may have collected on the guide posts should be removed.

Unscrew and remove the front and rear covers. Wrap a clean piece of flannel around a small stick and dampen with purified petrol (gasoline). Do NOT use acetone or trichlorethylene as these fluids can cause damage. Clean the heads and guide posts and replace the covers.

Note. The adjusting screw on the heads must on no account be disturbed.

Carrying case



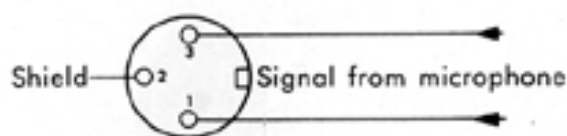
An elegant, practical and robust carrying case for transporting the Model 1600X. Weight 5 lbs.

DIN plugs

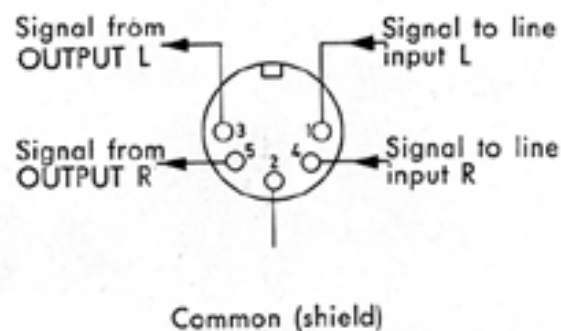
Schematic for DIN plugs to be connected to the MIC and RADIO receptacles:

Note. The plugs are shown from the wiring side.

MIC



RADIO



Microphone TM4



This dynamic microphone is designed especially for Tandberg tape recorders. The Tandberg TM4 is a top quality microphone suitable for both speech and music.

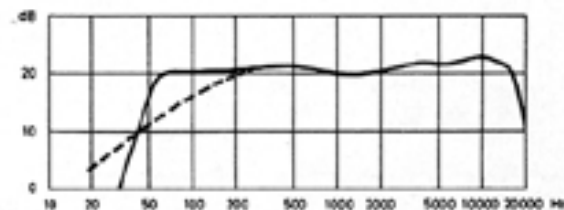
The Tandberg TM4 Handy is equipped with a handy, small table mount as well as a cord for hanging the microphone around the neck.

The Tandberg TM4 Complete is equipped with an adjustable table stand of unbreakable plastic material as well as a cord for hanging the microphone around the neck. Additionally, the TM4 Complete is equipped with a wind screen for recording outdoors and a connection for floor stands or camera stands. The TM4 Complete is delivered in a robust, unbreakable plastic case.

Technical specifications

Frequency Range: ± 3 dB from 50–17,000 Hz
Sensitivity: 0,096 mV/ μ bar (at 1,000 Hz)
Impedance: 200 ohm
Length: 5¹/₄"
Diameter: 1⁵/₁₆"

The dotted curve in diagram below represents the low frequency response when the hole in the microphone housing is closed.



Technical specifications

Model 1600X

Power requirements: Standard model: 230 V, 50 Hz. Convertible to 115 V or 240 V.

US Model: 115 V, 60 Hz. Convertible to 230 V and 240 V.

Power consumption: 40 W.

Motor: 2-pole, 230 V-115 V, 50 Hz.

US Model: 115 V-230 V, 60 Hz.

Tape: Maximum reel diameter: 7 inch. LOW NOISE tape should be used.

Tape speeds: 7¹/₂, 3³/₄, 1⁷/₈ ips.

Speed tolerance: Absolute tolerance $\pm 1,5\%$.

Playing time:

For 1200 ft tape:

| | Stereo | Mono |
|------------------------------------|-------------|-------------|
| 7 ¹ / ₂ ips: | 2 × 32 min | 4 × 32 min |
| 3 ³ / ₄ ips: | 2 × 64 min | 4 × 64 min |
| 1 ⁷ / ₈ ips: | 2 × 128 min | 4 × 128 min |

For 1800 ft tape:

| | Stereo | Mono |
|------------------------------------|-------------|-------------|
| 7 ¹ / ₂ ips: | 2 × 48 min | 4 × 48 min |
| 3 ³ / ₄ ips: | 2 × 96 min | 4 × 96 min |
| 1 ⁷ / ₈ ips: | 2 × 192 min | 4 × 192 min |

Fast wind and rewind: Approx. 1³/₄ min for 1200 ft tape and 2¹/₄ min for 1800 ft tape, without wear to heads.

Heads - 4-track model:

- 1 ea 4-track erase head
- 1 ea 4-track record/playback head
- 1 ea 4-track crossfield/bias head

Heads - 2-track model:

- 1 ea 2-track erase head
- 1 ea 2-track record/playback head
- 1 ea 2-track crossfield/bias head

Erase and bias frequency:

85,5 kHz - distortion less than 0,5%.

Inputs: Each channel has the following inputs:

1. Microphone input for low impedance dynamic microphone. Impedance 200 ohm, unbalanced. Sensitivity 0,1 mV at 400 Hz. Max. input level 30 mV. 5-pin DIN receptacle.
2. Line input (HIGH IN) for high impedance connection. Impedance 1 Mohm. Sensitivity: 100 mV at 400 Hz. Max. input level: 20 V. Phono receptacle.
3. Line input (LOW IN) for low impedance connection. Impedance 57 kohm. Sensitivity 5 mV at 400 Hz. Max. input level 1 V. Phono receptacle.
Pin 1 and 4 on the DIN receptacle (RADIO) are connected in parallel with phono receptacles LOW IN LEFT and RIGHT respectively.

Outputs: Emitter follower outputs. Min. load impedance 200 ohm.

Output level: A tape recorded at 400 Hz and to 0 dB deflection on the recording meter, will at playback give 0,9 volt output. Phono receptacles.

Pin 3 and 5 on the DIN receptacle (RADIO) are connected in parallel with the phono sockets OUTPUT LEFT and RIGHT respectively.

Amplifier distortion: Record amplifier: 0,5% at 0 dB recording level. Playback amplifier: 0,2% at 0,9 volt output.

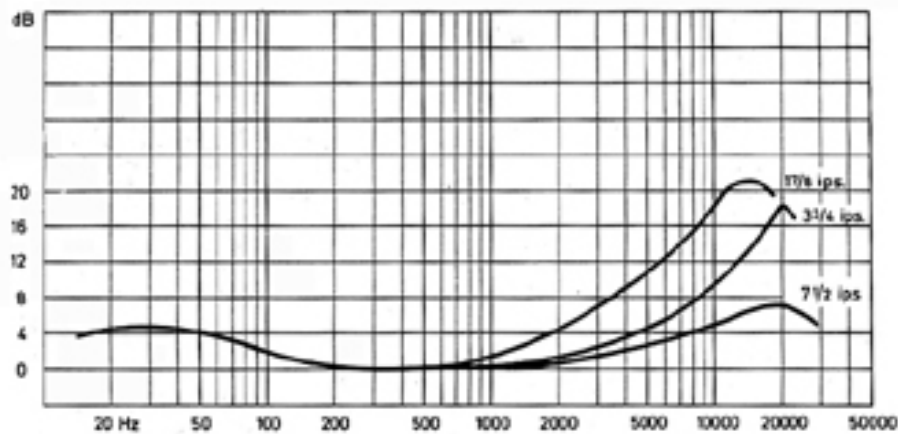
Tape distortion: A 400 Hz signal recorded at 0 dB deflection on the recording meter, gives less than 5% tape distortion in playback. A 400 Hz signal recorded 8 dB below 0 dB on the recording meter gives less than 1% distortion in playback.

Frequency response:

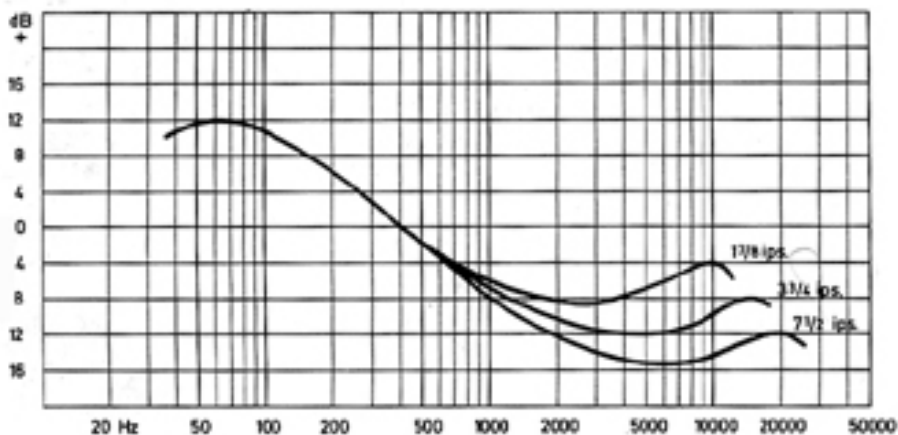
| | |
|------------------------------------|-------------------------|
| 7 ¹ / ₂ ips: | 40-20.000 Hz ± 2 dB |
| 3 ³ / ₄ ips: | 50-16.000 Hz ± 2 dB |
| 1 ⁷ / ₈ ips: | 50- 9.000 Hz ± 2 dB |

Measured according to DIN 45511:

| | |
|------------------------------------|--------------|
| 7 ¹ / ₂ ips: | 40-20.000 Hz |
| 3 ³ / ₄ ips: | 40-16.000 Hz |
| 1 ⁷ / ₈ ips: | 40- 9.000 Hz |



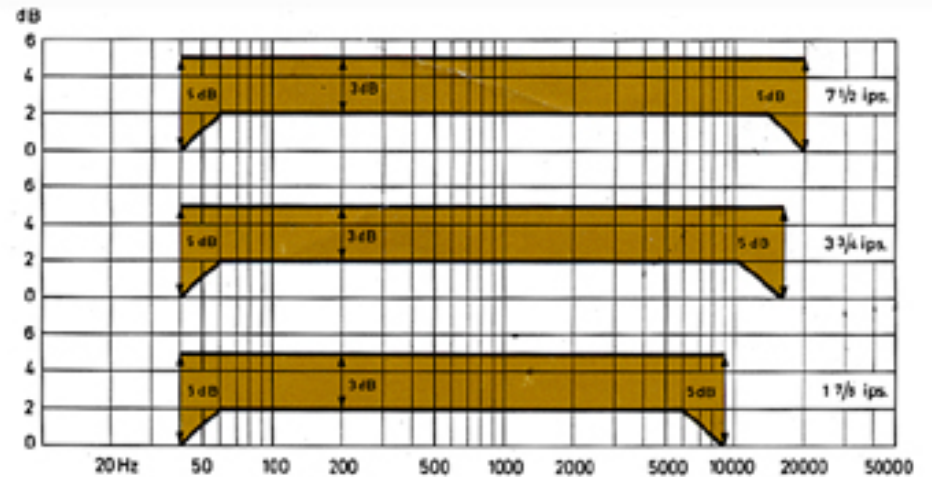
Frequency response, recording.



Frequency response, playback.

Wow: Peak value measured in % according to DIN 45507:

| | |
|---------------|--------------------|
| 7 1/2 ips: | better than 0,1 % |
| 3 3/4 ips: | better than 0,2 % |
| 1 7/8 ips: | better than 0,4 % |
| R.M.S. | |
| 7 1/2 ips: | better than 0,07 % |
| 3 3/4 ips: | better than 0,14 % |
| 1 7/8 ips: | better than 0,28 % |



The coloured areas indicate the tolerances for total frequency response according to DIN 45511.

Signal/tape noise:

R.M.S. unweighted:

| | |
|---------|---------|
| 4-track | 2-track |
| 55 dB | 55 dB |

Measured according to IEC standard (A-curve) R.M.S.:

| | |
|---------|---------|
| 4-track | 2-track |
| 60 dB | 62 dB |

Signal/noise: Peak value measured according to DIN 45405 (Geräuschspannung) at tape speed 7 1/2 ips and 5 % tape distortion:

| | |
|---------|---------|
| 4-track | 2-track |
| 53 dB | 55 dB |

Signal/hum: Peak value measured according to DIN 45405 (Fremdspannung) at tape speed 7 1/2 ips and 5 % tape distortion:

| | |
|---------|---------|
| 4-track | 2-track |
| 50 dB | 50 dB |

Crosstalk: At 1.000 Hz according to DIN 45521:

Mono: better than 60 dB Stereo: better than 50 dB

Dimensions: Length: 15 5/8", height: 6 11/16", depth: 11 13/16".

Weight: 19 lbs 2 oz.



Tandbergs Radofabrikk A/S, Kjelsås

TANDBERGS RADIOFABRIKK A/S

KJELSÅSVEIEN 161 — OSLO — NORWAY



Tandbergs Radiofabrikk A/S, division Kjeller.

Tandberg
RADIO

TANDBERG has a world wide reputation for quality. This quality finds its source in every phase of production. Continuous research, perfect construction plus incessant testing of components and finished products are prerequisites for high level quality. But it is of primary importance that the demand for quality begins with the people who work at Tandberg. TANDBERGS RADIOFABRIKK A/S has 1300 employees in the Oslo area alone. The positive effort and skill which these people have given has been decisive in maintaining and extending Tandberg's reputation. Therefore great emphasis is placed on creating and maintaining an ideal working atmosphere. Even the architectural design of the plant and its location in this typical Norwegian setting has been carried out with maximum consideration given to creating a pleasant and friendly atmosphere. Tandberg working conditions and social benefits are unique in the world.

DEALER:

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Reklametrykk