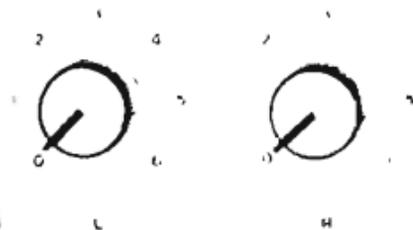




**TANDBERG**  
SERIES 3000X

**TANDBERG**



RECORD LEVEL



MIC



RECORD



START

# Instruction Manual Series 3000 X

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# Tandberg Series 3000 X

Tandberg Series 3000 X is fully transistorized tape recorder, designed for the world's most discriminating markets in respect of quality, precision and sound reproduction. This model is intended for use in conjunction with separate Hi-Fi amplifiers or tuners such as, for example Tandberg Tuner Amplifier Hi-Fi FM.

3000 X is a stereo model with the revolutionary Tandberg Cross-field. This technique provides improved reproduction in the higher registers and is of inestimable value at low tape speeds which are afforded wider application for high quality reproduction. Series 3000 X has three tape speeds and is fitted with separate precision gapped recording and playback heads, allowing A- and B-testing of programs, sound-on-sound and echo effects. The tape recorder is equipped with DIN sockets for connection of microphones, receiver or amplifier, while applying telephone jack for stereo headphone connection. High level inputs are furnished with phono sockets. Microphone inputs are highly sensitive and designed for microphones of 200–700 ohms impedance. The recording indicators are peak reading instruments.

A cueing control allows the tape to be positioned against the playback head during fast wind and rewind, thus making it possible to listen to the tape and locate programs.

In Series 3000 X Tandberg have produced a tape recorder for home use which more than satisfies the stringent demands of the advanced customer.

**Speed selector**

**Recording level meters for channel L (left) and R (right)**

**Recording controls for L and R inputs**

**Microphone inputs for channel L and R**

**Recording buttons for channel L and R**

**Cueing control for use during fast wind or rewind**

**Instantaneous start/stop knob**

**Sound-on-sound switch with 3 positions**

**Front and rear head covers**

**Counter, indicates tape position**

**Zero button for counter**

**Mains switch**

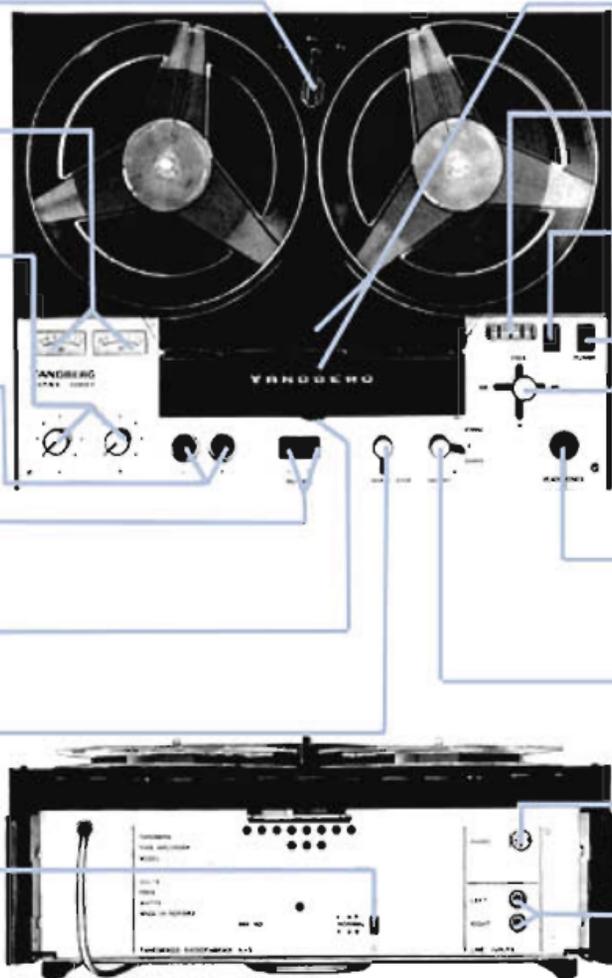
**Operating lever for tape motion**

**Output for stereo headphones**

**Output selector with 5 positions**

**RADIO.** DIN socket for connection of AM/FM receiver.

**LINE INPUTS.** For connection of high level sources.



## Tapes

Tandberg tape recorder 3000 X is designed for Low Noise Tape, which has an extremely good signal/noise ratio. If conventional tapes are used, music will not be

heard to the best advantage, since the highest frequencies will be attenuated. Low Noise Tapes are therefore recommended for recording.

## Power supply

This tape recorder is designed for 230 V/50 Hz mains operation. It can, however, be wired for 115 V or 240 V operation.

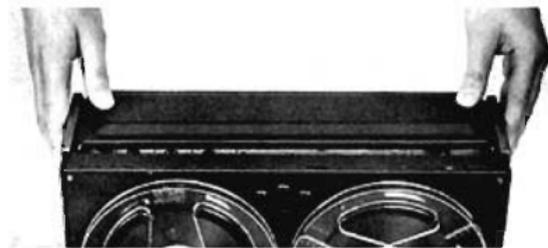
To change the tape recorder from 50 to 60 Hz (or 60 to 50 Hz) operation, the motor pulley must be changed, while motor and transformer must be rewired. We recommend that only a Tandberg service station, re-

presentative or competent technician perform this service. Power consumption maximum 40 W.

Note: Owing to the AUTOMATIC END STOP mechanism, the motor will not start before a tape is placed in the tape path.

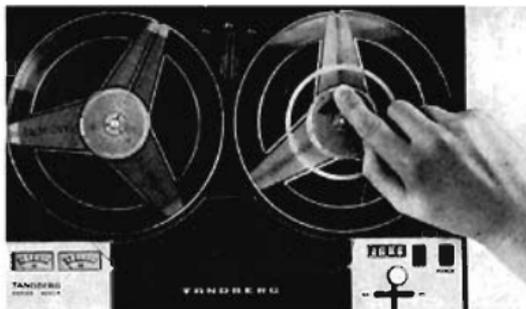
## Vertical installation

The tape recorder can be used in the vertical or horizontal position. When used vertically it is necessary to attach feet to the front of the case. In addition, the two rubber stops must be attached over the two turntable spindles after the tape reels have been put on. This prevents the reels from falling off or being displaced while tape recorder is in use. The rear panel supplied with the tape recorder is specially designed for vertical installation. This panel conceals all connections; it is very simple to fit. Press it in place in the grooves and push it towards the top plate.



## Preparation for use

Connect the mains cable to a socket providing the correct voltage and press the POWER button. The tape recorder is ready for immediate use. Place a reel of tape on the left hand turntable, ensuring that the reel runs anti-clockwise when the tape is drawn off. Put the tape in the tape path and place the free end in the hub slot of the empty reel on the right hand turntable. Set the operating lever in the FREE position. Both reels are now free to revolve independently of each other. Turn the right hand reel anti-clockwise until the tape is secure. Set the counter to zero. Set the speed selector to the required speed.  $7\frac{1}{2}$  ips gives the best sound quality while  $1\frac{1}{8}$  ips gives the longest playing time. See technical specifications page 22



## Inputs and outputs

### Stereo receiver or amplifier

For stereophonic recording and playback through receiver or amplifier, connect a 5-pin DIN cable from RADIO socket on the tape recorder to the TAPE socket on the receiver or amplifier.

If the receiver or amplifier has high output signal level, apply for recording phono sockets LINE INPUTS LEFT and RIGHT.



RADIO



LEFT

RIGHT

LINE INPUTS



## Headphones

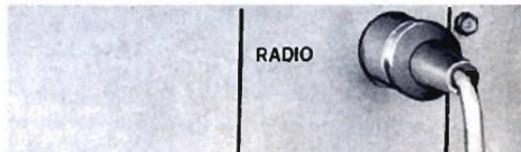
The stereo jack marked HEADPHONES is intended for connection of stereo headphones. The headphone jack can be used for playback of programs, for program monitoring (AB-test) and for mixing of different programs. Use headphones with an impedance of minimum 100 ohms.



## Copying tapes

When copying tape programs apply a special lead for this purpose.

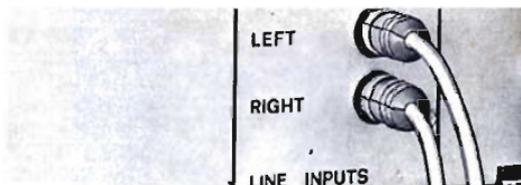
The lead can be purchased at your Tandberg dealer.



## Record player with ceramic or crystal pick-up

Stereo record player with ceramic or crystal pick-up can be connected to terminals LINE INPUTS LEFT and RIGHT.

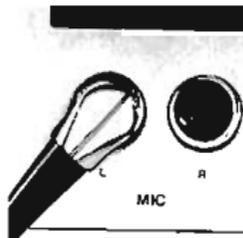
Mono record player with ceramic or crystal pick-up is connected to either LINE INPUTS LEFT or RIGHT terminal.



## Microphone

For mono or stereo recording of live programs, connect one or two microphones respectively to the inputs MIC L and R on the top plate.

For mono recording, the microphone amplifiers for channels L and R are connected in parallel. Thus recording can take place on either channel, irrespective of which input the microphone is connected to. For stereo recording, place the microphone connected to MIC R to the right of the sound source, and the microphone connected to MIC L to the left of the sound source.



## Mono recording

Connect external equipment as under "Inputs and outputs" pages 6-8. Set the START/STOP knob to position STOP. Press RECORD L if the recording is to be made on the left (L) channel (RECORD R for the right channel) and hold it in while moving the operating lever to the → position.

Indicator for left or right channel will be illuminated. Adjust the recording level of the channel in question by means of RECORD LEVEL L or R knob.

In mono recording, the input amplifiers for channels L and R are connected in parallel. Thus it is possible to record the program on either channel at will, even though the program source may be connected to the input for the other channel.

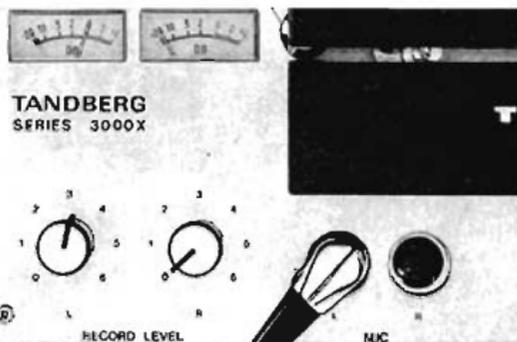
When connecting microphone, programs fed to line inputs on same channel are automatically disconnected.

RECORD LEVEL knob which is not in use during recording should be set to zero.

During recording, the indicator needle should deflect up to the red sector. For short periods with high level it is permissible for the indicator needle to deflect into the red sector. Start the recording by moving START/STOP knob to START position.

The RECORD button is released when operating lever is returned to neutral.

**Note:** Sound on sound switch in position NORMAL.



## Stereo recording

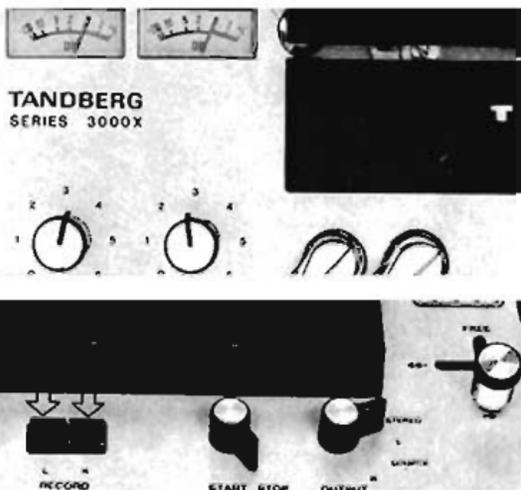
Connect the program source to the tape recorder as described under "Inputs and outputs" pages 6-8. Procedure for stereo recording is the same as for mono, with the following exceptions:

The recording levels are controlled with RECORD LEVEL L and R buttons.

Set the START/STOP knob in STOP position. Press the recording buttons RECORD L and R while moving the operating lever to → position. Both indicators will be illuminated. Adjust the recording levels so that the needles deflect up to the red sectors of the instruments. For short periods of high signal level it is permissible for the needles to deflect into the red sectors. To start recording set START/STOP knob to START position.

The RECORD buttons are released when operating lever is returned to neutral.

**Note:** Sound on sound switch in position NORMAL.



## Program monitoring during recording

The program can be monitored in two ways while recording is in progress:

1. Before it is recorded on the tape (A-test).
2. After recording, through playback head and amplifier (B-test).

For program monitoring connect headphones or amplifier and loudspeakers.

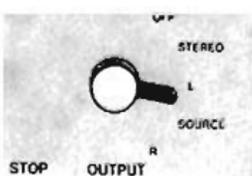
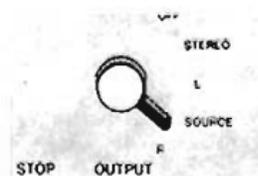
**Mono:** A-test when OUTPUT selector is set to position SOURCE. Program from recording channel is monitored at outputs of both channels.

B-test when OUTPUT selector is set to position L or R. Program from recording channel fed to outputs of both channels.

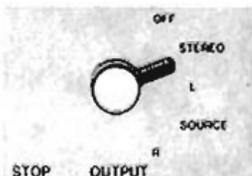
**Stereo:** A-test. Set OUTPUT selector to position SOURCE. Programs from L and R channels are fed to their respective outputs.

B-test. Set OUTPUT selector to position STEREO. L and R programs are fed to their respective outputs.

### Mono



### Stereo



## Mono playback

Connect AM/FM receiver, amplifier or headphones as described under "Inputs and outputs", pages 6-8. During fast wind or rewind, the counter or the cueing control can be used to locate the beginning of the desired program. Check that the START/STOP knob is set to position STOP. Set OUTPUT selector to position L when playing back from channel L, and to position R when playing back from R channel. In both cases, the program is fed to outputs of both channels. Set the operating lever to position → and commence playback by operating the START/STOP knob. Playback level is adjusted by volume controls on receiver or amplifier.



After playback, set the operating lever to the neutral position.

## Stereo playback

Connect external equipment as described under "Inputs and outputs", pages 6-8. Apply the counter or the cueing control to locate the beginning of the desired program. Set START/STOP knob to STOP position, and OUTPUT selector to position STEREO. Set operating lever to position →. Commence playback by moving the START/STOP knob to START position. Playback levels are controlled by volume controls on receiver or amplifier. The programs from the L and R channels are now fed to their respective output terminals. After playback, set the operating lever to neutral position.



## Using the taperecorder as an amplifier

The tape recorder can be used as a preamplifier for a AM/FM receiver or external amplifier. Set the OUTPUT selector to position SOURCE and control input levels by means of the RECORD LEVEL knobs. It is not necessary to have tape in the tape path.



### Mono

Press one of the record buttons, RECORD L or R, while moving the operating lever to the → position.

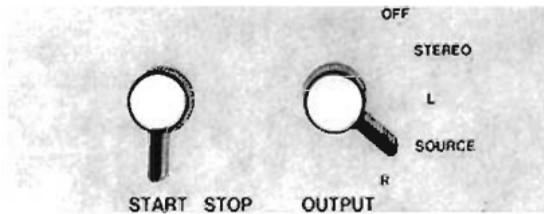
If there is tape in the tape path, set the START/STOP knob to STOP position. Feed the program to left (L)

or right (R) inputs as desired. The amplified program is fed to outputs of both channels. When microphone is connected to MIC L, any program fed to inputs for L channel (RADIO socket pin 1 and LINE INPUT LEFT) is prevented from entering the amplifier. When microphone is connected to MIC R a similar inhibiting of the corresponding channel R inputs will occur.

### Stereo

For use as a stereo preamplifier leave both RECORD buttons unoperated, in order to feed program from channel L inputs to L outputs and from channel R inputs to R outputs.

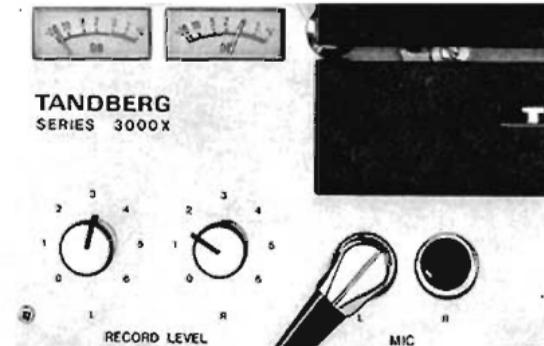
When microphones are plugged in, any program being fed to the line inputs will be prevented from entering the amplifier.



### Sound-on-sound

Sound-on-sound is a technique by which a program can be played back from one channel and transferred by internal connections in the tape recorder to recording amplifier for the other channel.

The program being played back can be monitored in headphones and mixed with a second program from a microphone or other program source. The composite program is then recorded on the other channel. Only left channel inputs (MIC L) can be used for connection of source. Assume that a melody is prerecorded on channel L. Set the sound-on-sound switch at the rear to position L→R, and START/STOP knob to STOP position. Depress RECORD R button and move the operating lever to → position. Connect stereo headphones to



stereo jack marked HEADPHONES. Adjust microphone level with button RECORD LEVEL L. Start the recording by operating the START/STOP knob, and adjust level of played back program being fed to input on channel R with RECORD LEVEL R.

Level of composite program is indicated on the channel R indicator.

The mixed program can be controlled and monitored in B-test, the OUTPUT selector is then set to position R. A-test, set to position SOURCE. Because of the time-lag between microphone and monitor output signal, B-test is not suitable for the artist in sound-on-sound.

Set the sound-on-sound switch to position NORMAL and play back the mixed program from channel R. Sound-on-sound recording from channel R to channel L can be accomplished in the same way as explained above with the following exceptions:

Set the sound-on-sound switch to R→R position. Depress RECORD L button. Composite recording level is indicated on left hand instrument.

L → R  
NORMAL  
R → R



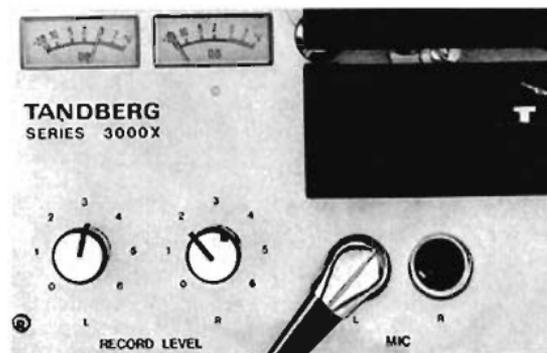
## Echo

The time delay between the separate record- and playback heads can be utilized to produce echo effects when recording in mono. The reverberation time is longest at the lowest tape speed.

Assume the echo to be recorded on channel L. Set sound-on-sound switch at the rear of the tape recorder to position L→R.

Program may be fed via microphone MIC L or line inputs for L channel (RADIO socket pin 1 or LINE INPUTS LEFT). Connect stereo headphones to jack marked HEADPHONES.

Recording level of supplied program is adjusted with



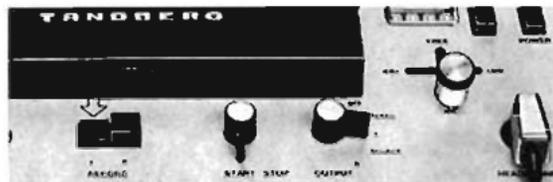
RECORD LEVEL L while the echo level is controlled with RECORD LEVEL R. Depress RECORD L button and set the operating lever to → position. Left hand indicator is now illuminated. OUTPUT selector must be in L position. Adjust the recording level to correct deflection on the meter. The echo program is reproduced via outputs of both channels.

After completion of echo program, set sound-on-sound switch to position NORMAL.

The procedure for recording echo on channel R is the same as described above with the following exceptions: Set the sound-on-sound switch to R → R position, and OUTPUT selector to R position. Depress RECORD R button. Echo program is then registered on channel R indicator.

**Note:** Do not turn up RECORD LEVEL R so high that the echo becomes distorted.

L → R  
NORMAL  
R → R



## Mixing

When producing mono recording, or when the tape recorder is used as mono preamplifier it is possible to mix as many as 4 different program sources: Two line programs connected to inputs for each of the channels (RADIO socket pin 1 and LINE INPUT LEFT for L channel, and RADIO socket pin 4 and LINE INPUT RIGHT for R channel). If microphone is applied on one channel, line programs fed to inputs on same channel are automatically disconnected. The signal levels from RADIO and LINE INPUT socket for same channel cannot be adjusted separately on the tape recorder. REC-

ORD LEVEL L adjusts the program fed to L inputs while RECORD LEVEL R controls program connected to R Inputs.

### Stereo

When recording in stereo or when using the tape recorder as a stereo preamplifier, it is possible to mix two programs on each channel: Programs fed to RADIO socket pin 1 or 4 and LINE INPUTS LEFT or RIGHT. The two program levels cannot be adjusted separately on the tape recorder.

## Language training

For language training use the sound-on-sound function. The master program which is prerecorded on one channel is played back and rerecorded, mixed with the student response. Monitoring of mixed program in A-test, OUTPUT selector to position SOURCE.

When recapitulating master and student programs, play back in mono with the OUTPUT selector set for the channel on which the program was rerecorded.

## Output selector

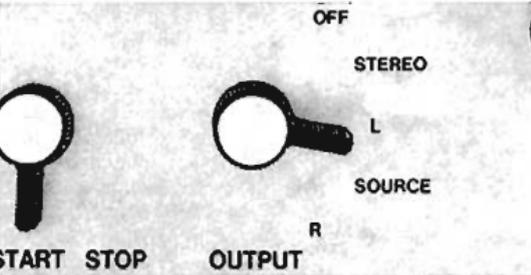
The OUTPUT selector has five positions: OFF, STEREO, L, SOURCE and R.

**OFF:** No program is supplied to output terminals of left (L) and right (R) channels in any mode of operation.

**STEREO:** Channels L and R are separated. During playback or B-test operation in record mode, program from L channel is fed to L output and program from R channel to R output.

**L:** Playback from channel L. L program is fed to outputs for both channels.

**SOURCE:** Channels L and R are separated. Programs connected to inputs L and R are fed directly from input amplifiers to their respective output terminals.



**R:** Playback from channel R. R program is fed to outputs for both channels.

## Sound-on-sound switch

The sound-on-sound switch has three positions: L → R, NORMAL and R → R.

**L → R:** Program from L channel playback amplifier is in sound on sound fed to RADIO input pin 4 by internal connection for recording on R channel. In echo mode, recording takes place on L channel.

**NORMAL:** In NORMAL position the connection between L or R playback amplifier and RADIO input pin 4 is removed. Position NORMAL should be used in all modes of operation except for sound-on-sound, echo and language training.



**R → R:** Program from R channel playback amplifier is in sound on sound fed to RADIO input pin 4 by internal connection for recording on L channel. In echo mode, the recording takes place on R channel.

## 4-track recording and playback

This section applies for the 4-track version of Series 3000 X.

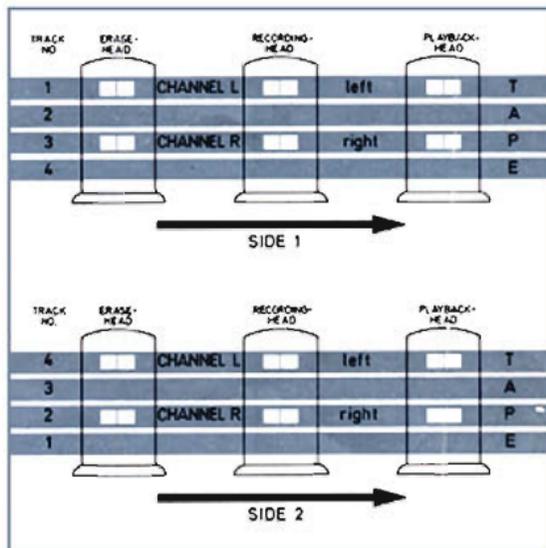
### Recording

Program can be recorded on four separate tracks. Each track covers almost a quarter of the tape width. All programs are recorded on the same side of the tape, i.e. the dull side. For practical reasons, however, the text refers to sides 1 and 2 of the tape, side 1 being defined as tracks 1 and 3 while side 2 is defined as tracks 2 and 4.

Recording on channel L, with the RECORD L button depressed, records the program on tape track 1. When the whole length of the tape has been recorded, turn over the tape reels and interchange so that side 2 comes up. Continuing to record on channel L, with RECORD L button depressed, records the program on track 4. When the track is full, turn over and interchange the tape reels again so that side 1 comes up. The next program must be recorded on track 3, and RECORD R must therefore be depressed. When track 3 has been filled, turn over the tape yet again so that side 2 comes up, and record on track 2 with RECORD R depressed.

### Playback

For mono playback it is possible to choose between programs from tracks 1 and 3 by switching between



positions L and R on OUTPUT selector. Turning over the tape so that side 2 comes up, similarly offers a choice between tracks 4 and 2.

## Erasing

When a new program is recorded on one or two tracks (mono or stereo), the existing programs on these tracks are automatically erased simultaneously with recording. If it is desired to erase a program

without making a new recording, this can be effected by running the tape through the tape recorder in record position, with the RECORD LEVEL buttons set to zero.

## Program editing

Tapes are not always recorded in the same sequence as they are required for playback. It may therefore be necessary to edit tapes, i.e. cut and splice them so as to present the programs in the desired sequence. When a cutting point has been located during playback, stop the tape instantaneously by means of the START/STOP knob. Take hold of the tape at the right hand guide post and pull it out to the right hand edge of the POWER switch.

The operating lever must be set in position →.

The point at which the tape is to be cut (see "Tape



splicing" below) is now at the right hand guide post the point from which the tape was pulled.

## Tape splicing

For editing purposes, or if the tape has snapped, the ends must be spliced.

Lay the ends of the tape over each other with the same side of the tape facing upwards.

Cut the tape with scissors or a knife (non-magnetic) at an angle of about  $45^\circ$ . Lay the tape ends against each other, shiny side up. Lay the splicing tape across the join, parallel to the cut, and press firmly, squeezing out any air bubbles.

Cut off the splicing tape at both edges, cutting in a slight curve into the edge of the recording tape. This will prevent adhesive on the splicing tape from being deposited on the magnetic heads.

**Note:** Adhesive tape which is not expressly intended for splicing recording tapes, must under no circumstances be used.



## Monitoring during fast wind or rewind - cueing

During fast wind or rewind, the monitoring and cueing control can be used to press the tape against the playback head. Programs recorded on L, R or both channels can be monitored depending on whether the OUTPUT selector is set to L, R or STEREO.

Monitoring is effected through an external amplifier and speaker or through headphones connected to the tape recorder. Owing to the high winding speed the sound will change character, but it is sufficiently recognisable to permit location of programs and starting points for further recording.



## Cleaning of heads and tape path

The heads, capstan and guide posts should be cleaned at regular intervals since certain types of tape leave deposits on these parts. For this reason it is also important to use good quality tapes. Deposits will cause a reduction of the signal/noise ratio and poor treble reproduction. Dirt on the magnetic heads also causes drop-outs. If any of these symptoms are notified, it is time to clean heads, capstan and guide posts.

The procedure is as follows: Remove the front and back covers by depressing the springloaded buttons as indicated on fig. Lift the covers free from the retaining brackets.

Wrap a piece of flannel cloth round a small stick and moisten with purified alcohol. Acetone or trichlorethylene must not be used since these may damage the heads. Clean the heads, guide posts and capstan. Replace the covers by inserting into retaining brackets and press into position.



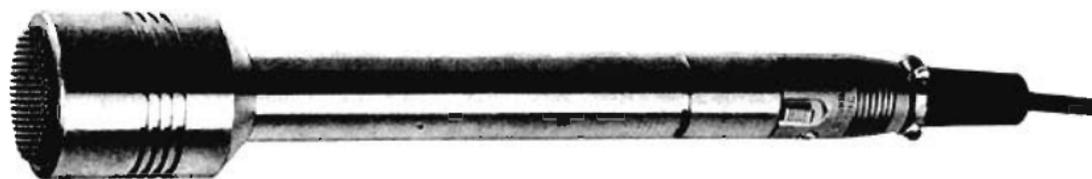
**Note:** The head adjustment screws must not be touched.

## Carrying case

Carrying case model 5 is an attractive, practical and rugged transport case for tape recorder 3000 X in cassette. Place the front of the tape recorder in the case, towards the side marked FRONT. The case is fitted with locks. Weight: 5 lbs (2,3 kg).



## Microphone TM5



Tandberg TM 5 is a dynamic microphone with high sensitivity in an omnidirectional pattern. The sensitivity to contact sounds and blowing noises is negligible. TM 5 is especially designed for reporting purposes and for recording of song and music.

The frequency response is very flat, with an intentional roll-off at lower frequencies to reduce low frequency reverberation and noise.

The connector at the end of the metal housing is fitted with a lock that will prevent the plug from being pulled out.

### Specifications:

Frequency range: 90–13 000 Hz,  $\pm 3$  dB

Sensitivity at 1000 Hz: 0.2 mV/ $\mu$ bar.

Impedance: 600 ohms

Length: 6 $\frac{1}{2}$ " (165 mm)

Diameter: 1 $\frac{11}{32}$ " (34 mm).

## Automatic stop

Series 3000 X is fitted with a switch which automatically stops the motor and the turntables when the tape is finished or if it breaks. The sensor which controls the switch is located in the tape path near the right hand guide post. The automatic stopping mechanism also prevents the motor from starting before a tape

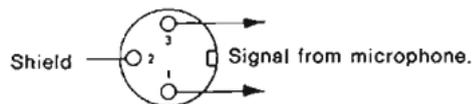
has been laid in the path. If the tape is incorrectly inserted, the motor will not start.

**Note:** When the tape is finished and the tape recorder has stopped, return the operating lever to neutral position.

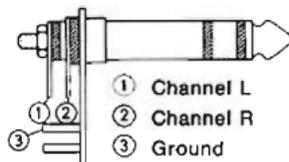
## Connecting plugs

Wiring diagrams for plugs to be connected to the terminals MIC L and R, HEADPHONES, RADIO and LINE INPUTS L and R.

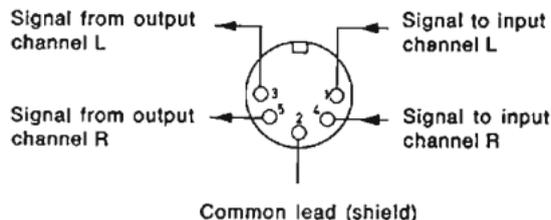
### MIC



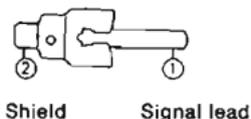
### HEADPHONES



### RADIO



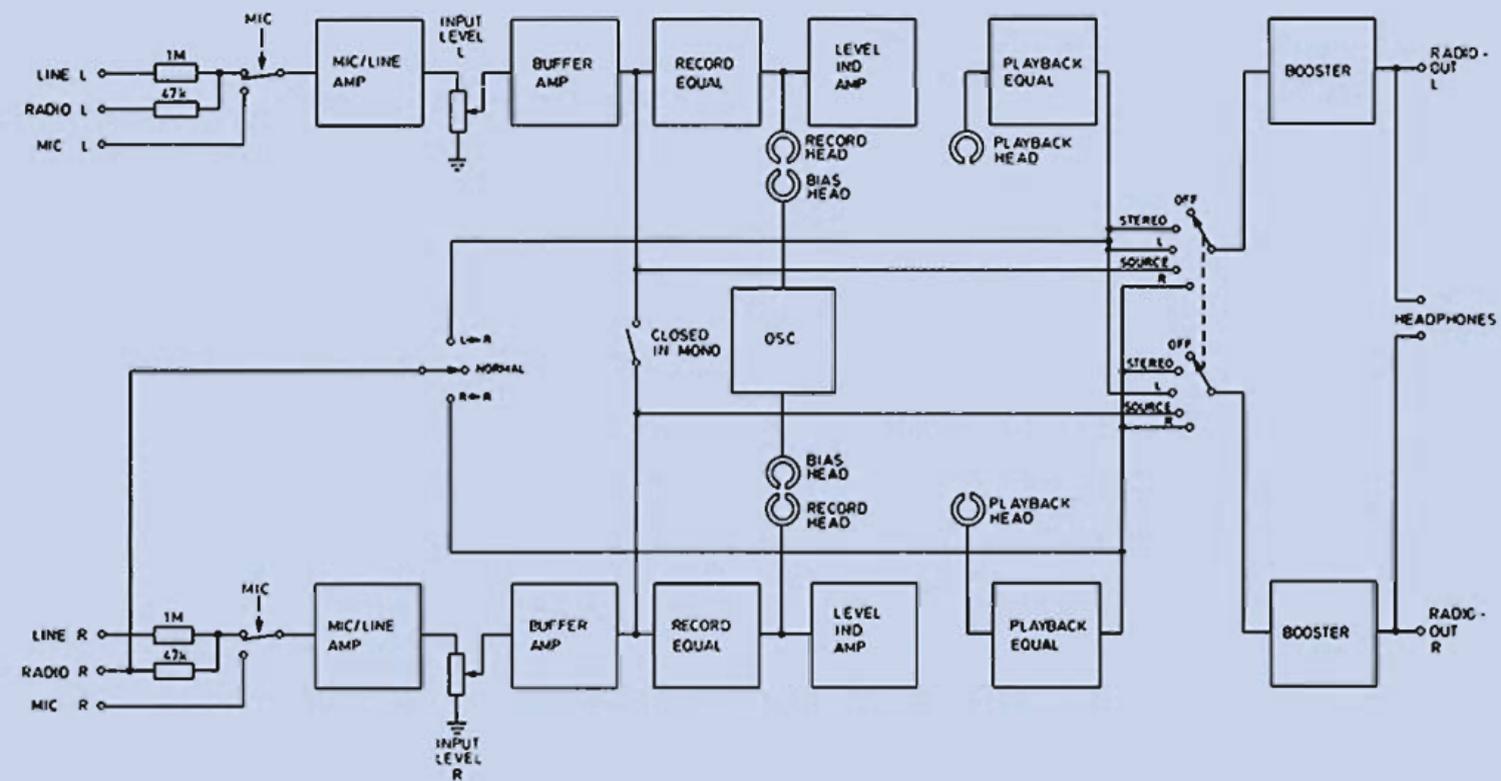
### LINE INPUT



# F function table

Use of series 3000 X	Position of buttons and selectors				
Function	Record buttons 	Output selector	Sound on Sound and echo selector	Program at outputs	Remarks
Mono record playback on L channel with AB-test		Position SOURCE A-test Position L: B-test	NORMAL	A-test: Program to outputs on both channels B-test: Program to outputs on both channels via tape	
Mono record playback on R channel with AB-test		Position SOURCE A-test Position R: B-test	NORMAL		
Stereo record playback with AB-test		Position SOURCE A-test Position STEREO B-test	NORMAL	Channels separated, and stereo program in A- or B-test	
Mono playback from L channel		Position L	NORMAL	L program at outputs on both channels	
Mono playback from R channel		Position R	NORMAL	R program at outputs on both channels	
Stereo playback		Position STEREO	NORMAL	Stereo program (channels separated)	
Mono pre-amplifier, L channel		Position SOURCE	NORMAL	Same program at outputs on both channels	Operating lever in → position with or without tape in tape path
Mono pre-amplifier, R channel		Position SOURCE	NORMAL	Same program at outputs on both channels	Operating lever in → position with or without tape in tape path
Stereo pre-amplifier		Position SOURCE	NORMAL	Stereo program (channels separated)	
Mono mixing during L channel recording with AB-test		Position SOURCE A-test Position L: B-test	NORMAL	Same program at outputs on both channels	4 different programs can be mixed
Mono mixing during R channel recording with AB-test		Position SOURCE A-test Position R: B-test	NORMAL	Same program at outputs on both channels	4 different programs can be mixed
Stereo mixing during recording with AB-test		Position SOURCE A-test Position STEREO B-test	NORMAL	Stereo program (channels separated)	2 different programs can be mixed on each channel
Sound on Sound		Position L or R	R → R	Position L: Sound on sound recording to outputs both channels. R position: Played back program to outputs	Use always L channel mic (or line inputs) for connection of program source. Record level L controls program source input level while played back program is controlled by record level R.
		Position R or L	L → R	Position R: Sound on sound recording to outputs both channels. L position: Played back program to outputs	
Mono echo		Position L	L → R	Echo program at outputs on both channels	Connect always program sources to inputs on L channel. Program controlled with record level L. Adjust echo level with Record level R.
		Position R	R → R		

# Block diagram Series 3000 X



# Technical specifications

## Power requirements:

230 V—50 Hz. Can be wired to 115 V and 240 V.  
For 50—60 Hz operation, see page 5

## Power consumption:

40 watts.

## Motor:

Asynchronous.

## Tape:

Maximum reel diameter 7". Low Noise Tape should be used for recording.

## Tape speeds:

7 $\frac{1}{2}$ , 3 $\frac{3}{4}$  and 1 $\frac{7}{8}$  ips.

## Speed tolerance:

Absolute speed tolerance:  $\pm 1.5\%$ .

## Winding times:

1200 ft. of tape: 1 $\frac{3}{4}$  min.  
1800 ft. of tape: 2 $\frac{1}{2}$  min.

## Heads:

Separate heads for erasure, recording, playback and bias (Tandberg Cross-field).

## Erase- and bias frequency:

85.5 kHz. Distortion less than 0.5 %.

## Indicators:

Moving coil meters. Optimum recording level:  
Deflection up to 0 dB at maximum 3 % distortion.

## Inputs:

Each channel has the following inputs:

1. Microphone input for dynamic low impedance microphone. Impedance: 200—700 ohms. Sensitivity at 400 Hz: 0.1 mV. Maximum input level: 25 mV.
2. Line input (LINE INPUT) for high impedance source. Impedance: 1 Mohm. Sensitivity at 400 Hz: 100 mV. Maximum input level: 20 V.
3. Line input (RADIO pins 1 and 4) for low impedance source. Impedance: 57 kohms. Sensitivity at 400 Hz: 5 mV. Maximum input level: 1 V.

## Outputs:

Emitter follower outputs, RADIO socket pins 3 and 5. Minimum load impedance: 100 ohms. Output level: A tape recorded with 400 Hz signal at 0 dB level will give 0.75 V in playback.

HEADPHONES, stereo jack for connection of stereo headphones. Stereo jack is connected in parallel with RADIO socket pins 3 and 5.

## Distortion:

Distortion in recording amplifier: Recording of a 400 Hz signal at 0 dB level, gives less than 0.5 % distortion from recording amplifier.  
Distortion in playback amplifier: 0.3 % at 0.75 V output voltage.

## Frequency response:

7 $\frac{1}{2}$  ips: 40—20 000 Hz  $\pm 2$  dB  
3 $\frac{3}{4}$  ips: 50—16 000 Hz  $\pm 2$  dB  
1 $\frac{7}{8}$  ips: 50—9 000 Hz  $\pm 2$  dB

Measured to DIN 45511

7 $\frac{1}{2}$  ips: 40—22 000 Hz  
3 $\frac{3}{4}$  ips: 40—18 000 Hz  
1 $\frac{7}{8}$  ips: 40—10 000 Hz

## Wow:

R.M.S.:  
7 $\frac{1}{2}$  ips — better than 0.07 %  
3 $\frac{3}{4}$  ips — better than 0.14 %  
1 $\frac{7}{8}$  ips — better than 0.28 %

Measured to DIN 45511

7 $\frac{1}{2}$  ips — better than 0.1 %  
3 $\frac{3}{4}$  ips — better than 0.2 %  
1 $\frac{7}{8}$  ips — better than 0.3 %

**Signal/tape noise, weighted (Geräuschspannung):**

Peak value measured to DIN 45511 at tape speed 7 1/2 ips and 5 % tape distortion:

<b>4-track</b>	<b>2-track</b>
54 dB	56 dB

**Signal/tape noise, unweighted (Fremdspannung):**

Peak value measured to DIN 45511 at tape speed 7 1/2 ips and 5 % tape distortion:

<b>4-track</b>	<b>2-track</b>
51 dB	51 dB

**Signal/tape noise:**

Measured linear R.M.S. at tape speed 7 1/2 ips and 5 % distortion:

<b>4-track</b>	<b>2-track</b>
57 dB	57 dB

**Signal/tape noise, weighted (IEC A-curve) R.M.S.:**

Measured at tape speed 7 1/2 ips and 5 % tape distortion:

<b>4-track</b>	<b>2-track</b>
62 dB	64 dB

**Crosstalk attenuation, according to DIN 45511:**

At 1000 Hz:

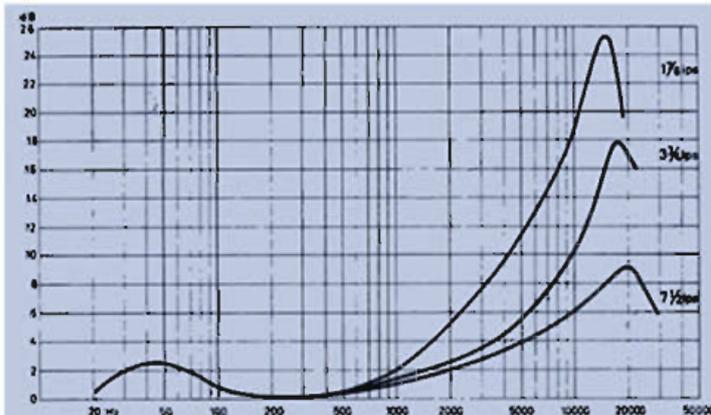
Mono > 60 dB      Stereo > 50 dB.

**Dimensions:**

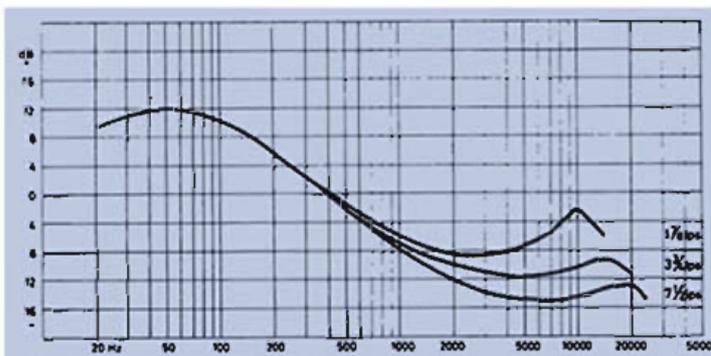
Length: 15 1/2" (39,4 cm), height: 6 1/2" (16,5 cm), depth: 12 3/8" (31,6 cm).

**Weight:**

20 lbs (9,1 kg).



Recording curves. Series 3000 X.



Playback curves. Series 3000 X.