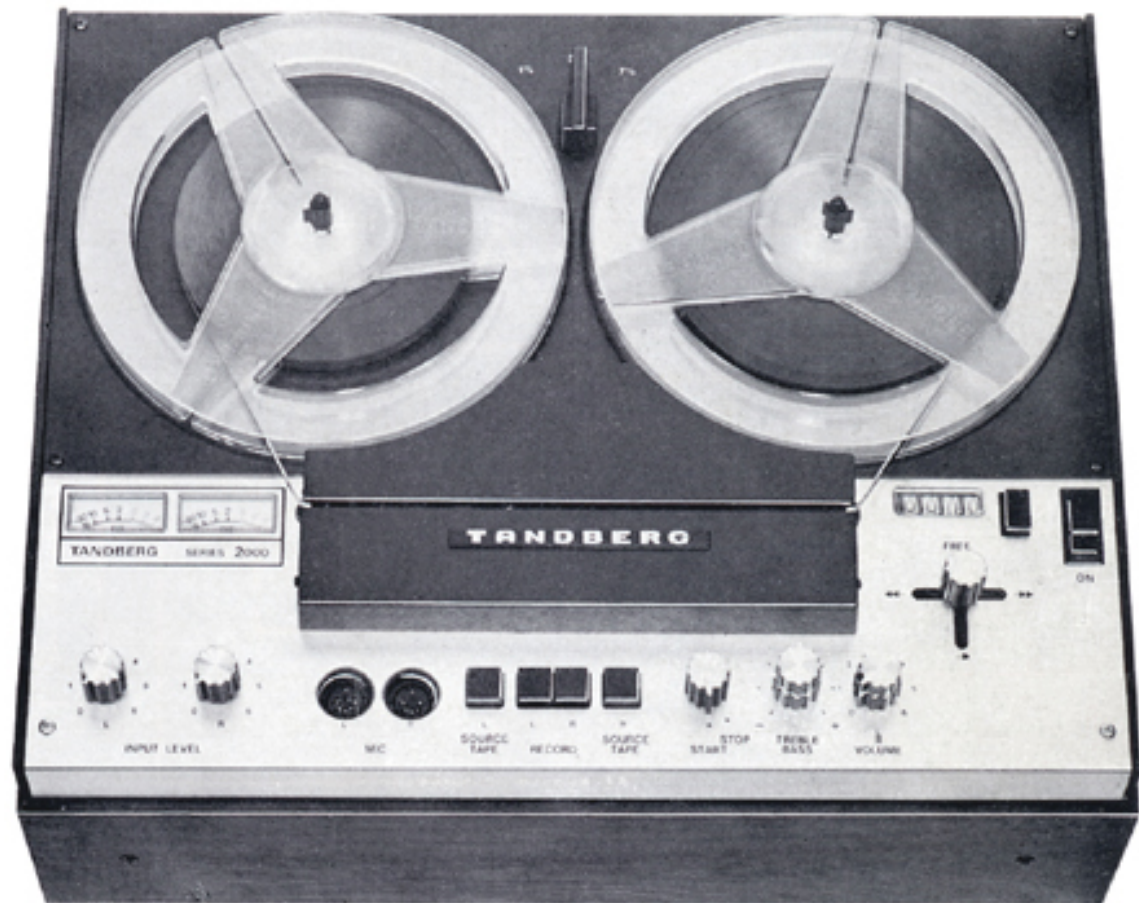


Instruction Manual Series 2000

Contents

Tapes	5
Power supply	5
Vertical mounting	5
Preparation for use	6
Connections	6
Microphone	6
Stereo receiver or amplifier	6
Record player	7
Loudspeakers.....	7
Headphones.....	7
Copying of tape.....	7
Recording.....	8
Mono.....	8
Stereo.....	9
Programme monitoring during recording ..	9
Mono.....	9
Stereo.....	10
Playback	10
Mono.....	10
Stereo.....	10
The tape recorder used as an amplifier ...	11
Mono.....	11
Stereo.....	11
Sound on sound	12
A-test	12
B-test	13
Echo	13
Language learning	14
Four-track recording and playback	15
Combined playback-amplifier function ...	16
Mixing	16
Programme editing	17
Tape splicing	17
Automatic stop	18
Maintenance	18
Inspection	18
Cleaning	19
Erasing	19
Block diagram	20
Function table	21
Connecting plugs	22
Technical specifications	23

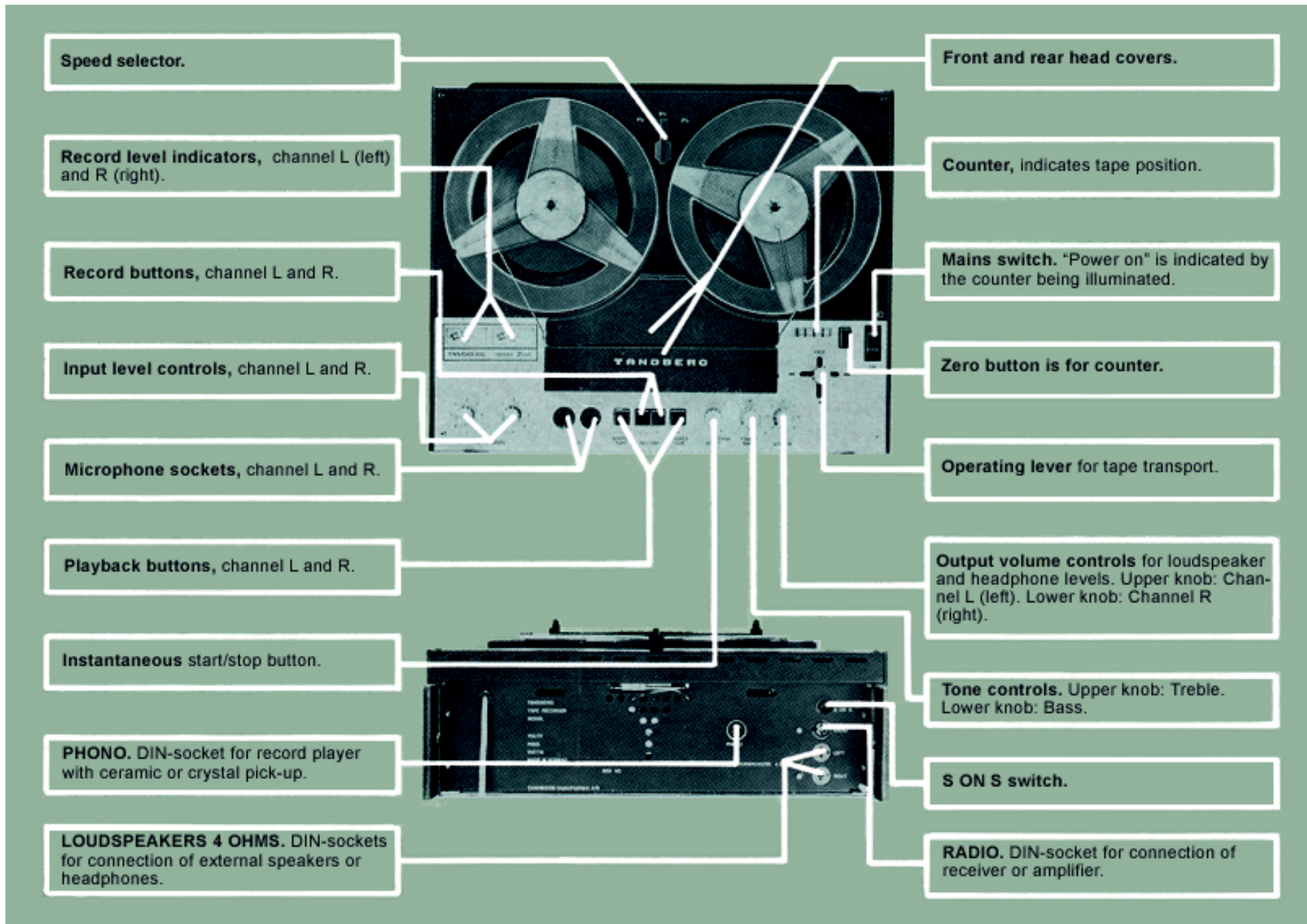


Tandberg Series 2000

Series 2000 is a fully transistorized tape recorder, designed for the world's most discriminating markets in respect of quality and sound reproduction.

The recorder has a lot of functions with operating buttons and controls logically and well arranged, thus giving a very simple operation of the recorder. Series 2000 has three tape speeds and is fitted with separate precision gapped recording and playback heads allowing A- and B-testing of programmes, sound-on-sound and echo effects. The tape recorder is equipped with DIN sockets for connection of microphone, receiver or amplifier, record player with ceramic or crystal pick-up, and loudspeakers or headphones. The recording level meters are peak reading instruments with damped return to facilitate the readings.

The output amplifiers are furnished with continuously variable bass- and treble controls. Each channel has separate output volume control. These features make series 2000 well suited as a vital part in a Hi-Fi music system. The model more than adequately meets all the requirements of the Hi-Fi specifications of DIN 45 500.



Tapes

Tandberg tape recorder 2000 is adjusted for recording on Low Noise Tape, which gives a favourable signal-to-noise ratio. If ordinary tape is used for recording,

the highest frequencies will be attenuated, resulting in degradation of music reproduction. It is therefore recommended to use Low Noise Tape for recording.

Power supply

The tape recorder is set for operation on 230 V, 50 Hz, but can easily be rewired for 115 or 240 V. To change the tape recorder from 50 to 60 Hz (or 60 to 50 Hz) operation, the motor pulley must be changed while the transformer has to be rewired. We recommend that only a Tandberg service station or a competent technician per-

form this service. Power consumption is maximum 90 watts.

Note: Because of the automatic end-stop mechanism, the motor will not start until a tape has been properly inserted in the tape path. Wrong threading of tape may prohibit starting.

Vertical mounting

The tape recorder can be used in horizontal or vertical position. For vertical operation mount the legs furnished with the recorder to the front of the cabinet after first having removed the two screws. To prevent the tape reels from falling off or being displaced during operation, rotate the upper part of turntable spindles 1/4 turn to lock reels when having put tape reels on the turntables. A rear cover for concealing the cables in vertical operation, is delivered as an accessory.

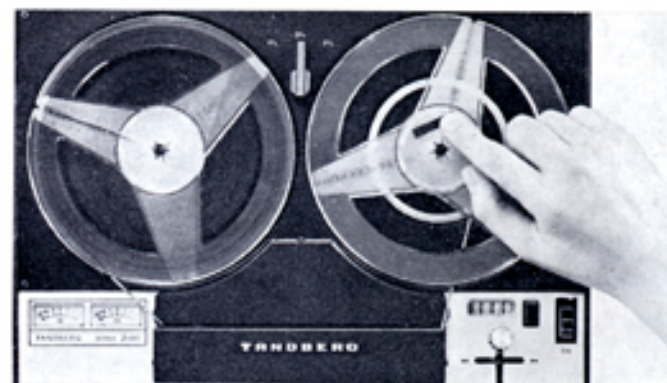


Preparation for use

Connect the mains cable to a socket providing the correct voltage, and set power switch to ON. The tape recorder is now immediately ready for use.

Put a tape reel on left hand turntable, ensuring that the reel runs anticlockwise when the tape is drawn off.

Thread tape through 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 FREE position to let the reels rotate independently. Rotate the right hand reel anticlockwise until the tape is firm. Reset the counter. Set the tape speed selector for the desired tape speed. $7\frac{1}{2}$ ips gives the best sound quality.



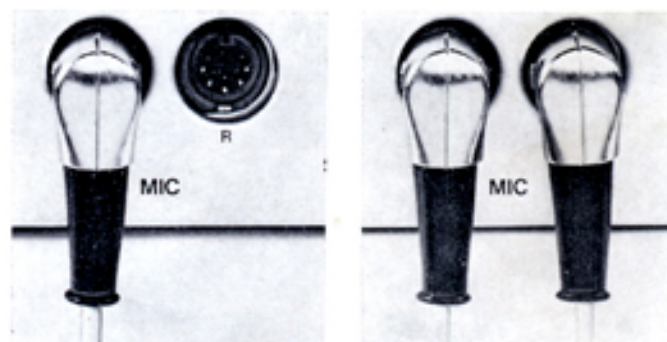
Connections

Microphone

For mono or stereo recording of live programmes, connect one or two microphones respectively to 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, for instance an orchestra, and the microphone connected to MIC L to the left of the sound source.

Note: Undesired mixing may occur if programme is connected to RADIO or PHONO socket.



Stereo receiver or amplifier

For stereophonic recording and playback through receiver or amplifier, connect a 5-pin DIN cable from RADIO socket on the recorder to the TAPE socket on the receiver or amplifier. Pins 1 and 4 on the socket are used for recording, while pins 3 and 5 are used for playback.



Record player

Connect record player with ceramic-crystal pick-up or magnetic pick-up with preamplifier to DIN-socket PHONO.

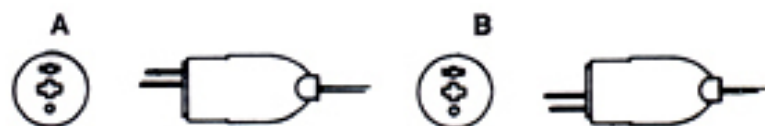


Loudspeakers

Connect external loudspeakers, with impedance 4–8 ohms, to DIN-sockets LOUDSPEAKERS 4 OHMS L and R.

To use both internal and external speakers, connect as shown in fig. A.

If only external speakers are to be used, connect according to fig. B.



Note: Set VOLUME L and R to zero before connecting headphones. Adjust VOLUME L and R when headphones are put on your head and you are listening to the programme in A- or B-test. BASS and TREBLE controls are also active.

Headphones

Connect headphones, with minimum impedance 4 ohms, to sockets LOUDSPEAKERS 4 OHMS L and R as shown in loudspeaker connections fig. B above. Internal speakers are now disabled.



Copying of tape

When copying mono or stereo tapes, use a special cable for this purpose.

This cable can be purchased from your Tandberg dealer.



Recording

Mono

Connect external equipment as explained in connections page 6–7. Set START/STOP knob to STOP position. SOUND-ON-SOUND switch at the rear of the recorder must be in position NORMAL, not depressed.

Depress RECORD L button if recording is to be made on left (L) channel (RECORD R for right channel) and hold while moving operating lever to position →. Left or right indicator will be illuminated.

Adjust the recording level of the channel in question by means of INPUT LEVEL L or R.

The graduation for the input level controls are intended as a guide only. For accurate setting, use the record level meter deflection.

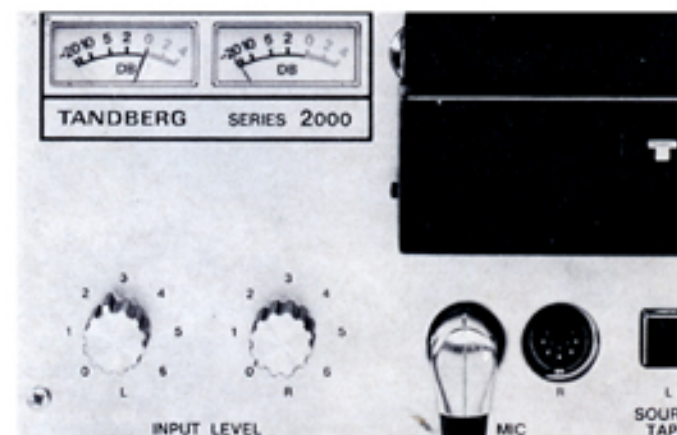
During recording, the indicator needle should deflect up to the red sector. For short periods with high level, it is permissible for the needle to deflect into the red sector.

Excessive signal level will give distortion, whereas too low level will result in an unfavourable signal-to-noise ratio.

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

The INPUT LEVEL knob that is not being used during recording should be set to zero. Reset the counter.

Start the recording by operating the START/STOP knob. For monitoring in A- or B-test, see chapter on moni-



ring. The recording can be interrupted or terminated by setting the START/STOP knob to STOP position. **For longer stops, move the operating lever to centre position.** The RECORD button will then be released.

Stereo

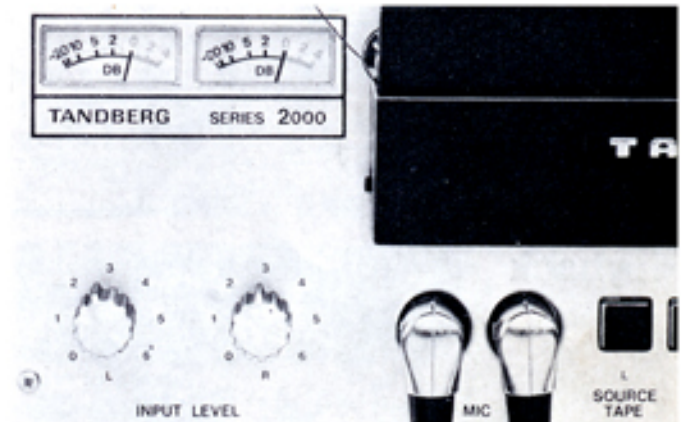
Connect the programme source to the tape recorder as explained in connections page 6-7.

The procedure for stereo recording is the same as for mono, except for the following:

Depress both RECORD L and R buttons. Both indicators



will then be illuminated, and the programme level for each channel is set with the corresponding INPUT LEVEL knob.



Programme monitoring during recording

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

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

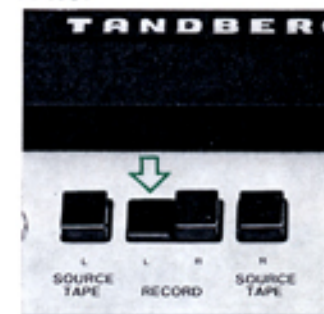
By switching between A- and B-test it can be checked that there is no difference in programme quality before and after recording on the tape.

Mono

A-test (SOURCE) of recorded programme is possible when both playback buttons are in released position, SOURCE. B-test (TAPE) of programme when playback button for recording channel is depressed, position TAPE.

In both cases the programme is reproduced through outputs for both channels.

A-test



B-test



The level in loudspeakers or headphones is set with VOLUME L for left channel and VOLUME R for right channel. BASS and TREBLE controls are common for the two channels.

Note: Sound-on-sound switch must be in released position, NORMAL.

Programme monitoring during recording, continued

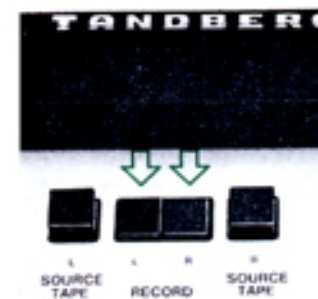
Stereo

A-test (SOURCE) when both playback buttons are in released position, SOURCE.

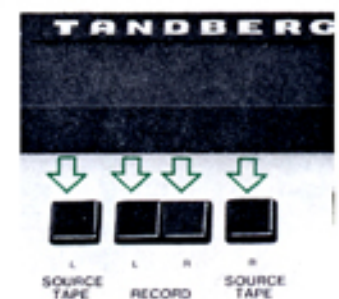
B-test (TAPE) when both playback buttons are depressed during recording. B-test programme from playback channel is fed to outputs for both channels. Volume and tone controls are adjusted as during mono programme monitoring.

Note: SOUND-ON-SOUND switch must be in released position, NORMAL.

A-test



B-test



Playback

Mono

Connect AM/FM receiver, amplifier, loudspeaker or headphones as explained in chapter on connection page 6–7. Locate programme to be played back by means of counter. **Do not press any of RECORD buttons during fast wind or rewind as this will erase already existing programme on the tape.** Set START/STOP knob to STOP.

Depress selected playback button, position TAPE, and set operating lever to position →.

Playback is started by operating the START/STOP knob which can also be used for shorter pauses during playback.

The reproduced programme is fed to the outputs for both channels, and the level in speakers or headphones is set with VOLUME L for left channel and VOLUME R for right channel. The BASS and TREBLE controls are common for the two channels.



Tonal balance and volume for programme played back via auxiliary amplifier or receiver connected to RADIO socket, must be controlled on the connected receiver/amplifier.

Return the operating lever to centre position when playback has been finished.

Stereo

The procedure for stereo playback is the same as for mono playback, except that both playback buttons must be depressed, position TAPE. The played back stereo programme is fed to the outputs for the respective channels.

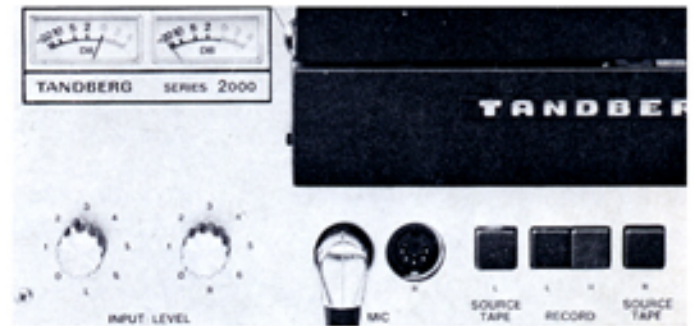


The tape recorder used as an amplifier

The tape recorder is excellent for use as an amplifier for microphone, receiver, record player or other programme source.

Mono

Depress one of RECORD L or R buttons while moving operating lever to position →. If there is tape in the tape path, set START/STOP knob to STOP position. Programme can be fed to input for both channels. Set output level controls VOLUME L and R to maximum, while the output level is controlled with INPUT LEVEL L and R, and the BASS and TREBLE controls. Both playback buttons must be in unoperated position, SOURCE.

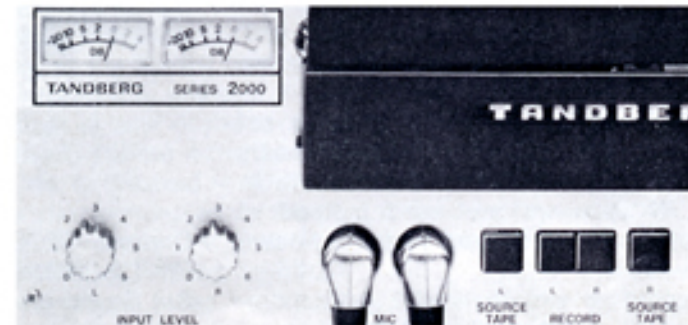


Stereo

For use as a stereo amplifier leave both playback buttons unoperated, position SOURCE, in order to feed

programme from channel L inputs to L outputs and from channel R inputs to R outputs.

Set the operating lever to centre position, neutral.



B-test

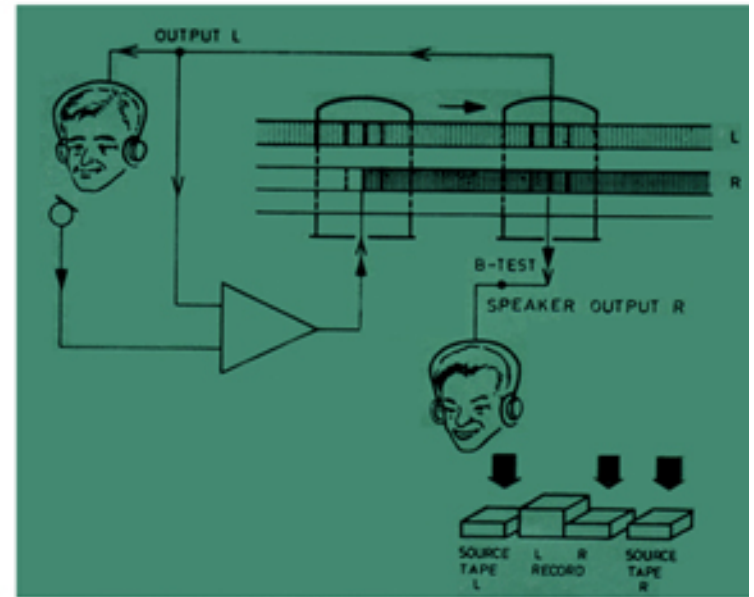
Sound-on-sound recording in B-test is accomplished as for A-test except that the playback buttons for both channels have to be depressed, TAPE. To ensure high quality recording with monitoring in B-test, two persons are needed.

The one singing or playing the secondary programme listens to the pre-recorded programme with headphones connected to LOUDSPEAKERS 4 OHMS L (A-test).

The output level is adjusted with VOLUME L. The other person listens to the programme in headphones connected to LOUDSPEAKERS 4 OHMS R (B-test), after it has been mixed and recorded. Both playback buttons must be depressed, position TAPE. The B-test monitor level is controlled with VOLUME R.

The relative levels of the two programmes, and the input level of the composite programme are set by the monitoring operator. Sound-on-sound recording in B-test on channel L is performed in a similar way.

Set sound on sound switch to position NORMAL when sound on sound recording is completed.



Echo

The distance between the separate recording and playback heads can be utilized to produce echo effects during mono recording. The reverberation time is longest at the lowest tape speed. Assume the echo to be recorded on channel L. Set the SOUND-ON-SOUND switch at rear of the recorder to NORMAL position, released. During echo recording, a 5-pin DIN plug has to be connected to RADIO socket. Pins 3 and 4 must be inter-connected on the plug to feed programme from output of channel L or R to input on channel R. Set START/STOP knob to STOP.

Programme must be supplied via microphone connected to MIC L. Connect stereo headphones to LOUDSPEAKERS 4 OHMS L and R.



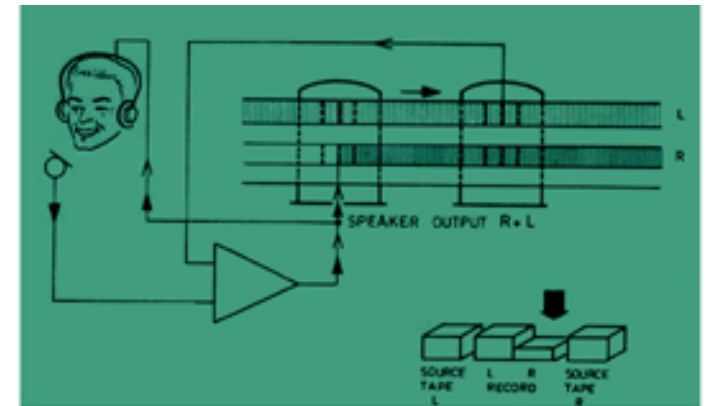
Sound-on-sound

A-test

Sound-on-sound is a technique by which a programme can be played back from one channel to be mixed with another programme and recorded on the other channel.

Depress SOUND-ON-SOUND switch at the rear of the recorder. As shown in figure, it is assumed that the original programme is recorded on channel L. This programme is played back and fed via internal connection to the input amplifier of channel R.

Another programme from a microphone is fed to input amplifier of channel L.



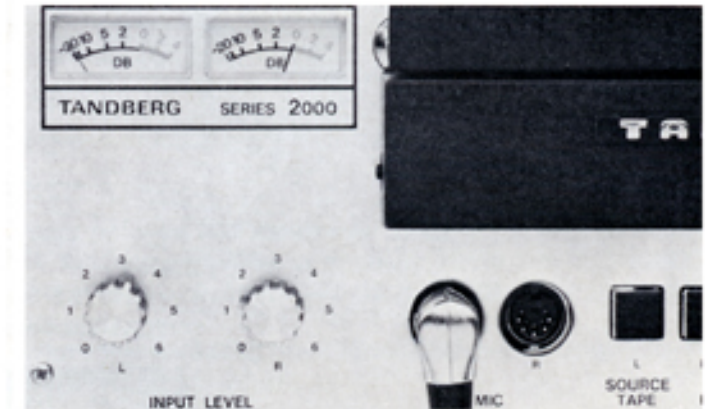
When recording in mono, RECORD R depressed, both programmes will be mixed and recorded on channel R. In order to synchronize the programmes and to adjust the relative signal levels, the mixed programme is monitored in headphones connected to LOUDSPEAKERS 4 OHMS L and R (A-test).

The states of the function selectors are shown in the figure. The level of the primary programme transferred from channel L to channel R is adjusted with INPUT LEVEL R.

Programme from microphone (MIC L) is controlled with INPUT LEVEL L. The level of the composite programme is indicated on the right hand level meter.

Output volume from speakers or headphones is set with VOLUME L AND R. Output level is also affected by INPUT LEVEL controls when playback buttons are in SOURCE position. If speakers are used instead of headphones, the volume controls must be turned down to avoid acoustic feedback.

Sound-on-sound recording on channel L is accomplished as for R channel with the following changes:



Depress RECORD L button. The composite programme level is indicated on left record level meter.

Set Sound-on-sound switch to position NORMAL when sound-on-sound recording is completed.

Echo, continued

Recording level of supplied programme is controlled with INPUT LEVEL L, while the echo level is adjusted with INPUT LEVEL R. Set playback button for channel L to position TAPE. Depress RECORD L while moving the operating lever to position →. Start the recording by operating START/STOP knob. Adjust to correct deflection on left hand level meter.

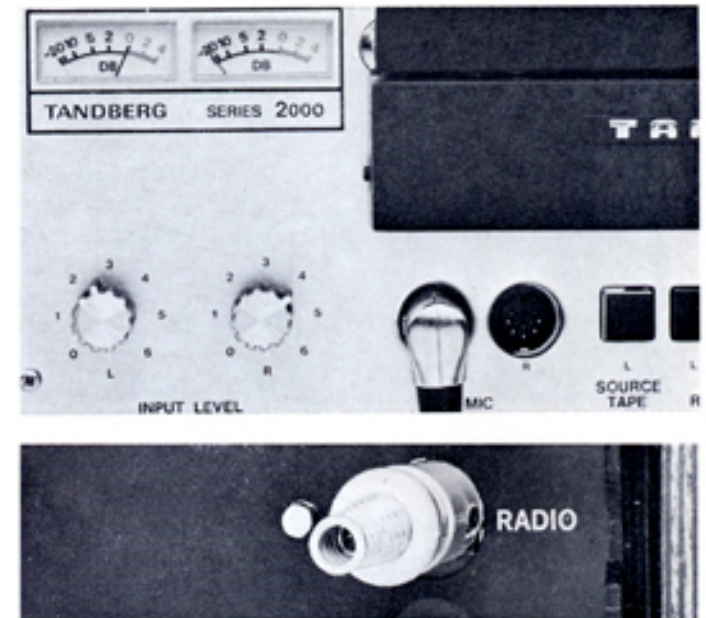
The echo programme is reproduced through outputs of both channels. After completion of echo programme remove the plug from the RADIO socket.

The procedure for recording echo on channel R is the same as explained above with the following exceptions: Depress RECORD R button and set playback button for the same channel to position TAPE.

Playback button for L channel must be in unoperated position, SOURCE.

Echo programme is indicated on right hand level meter.

Note: Do not turn INPUT LEVEL R so high that echo becomes distorted.



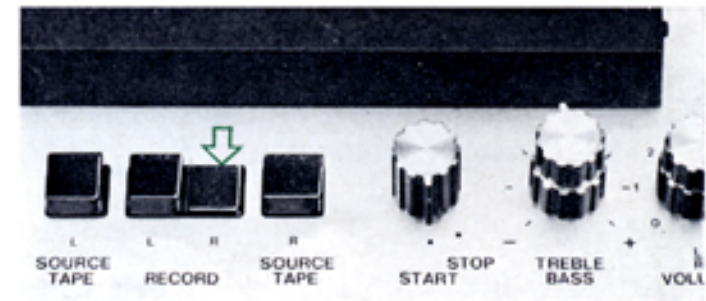
Language learning

For language learning use the sound-on-sound A-test technique. In the following summary of the procedure, the master programme is assumed to be prerecorded on left channel (track 1). This programme is played back, mixed with student response and rerecorded on right channel (track 3).

Connections and level settings

Connect mono headphones to LOUDSPEAKERS 4 OHMS L and R and microphone to MIC L. Set START/STOP knob to STOP position.

Set SOUND-ON-SOUND switch to position S-ON-S. Depress RECORD R button while setting operating lever to position →. Set playback buttons for both channels to SOURCE. INPUT LEVEL R, controlling the level of transferred master programme should be set to position 4, approx.



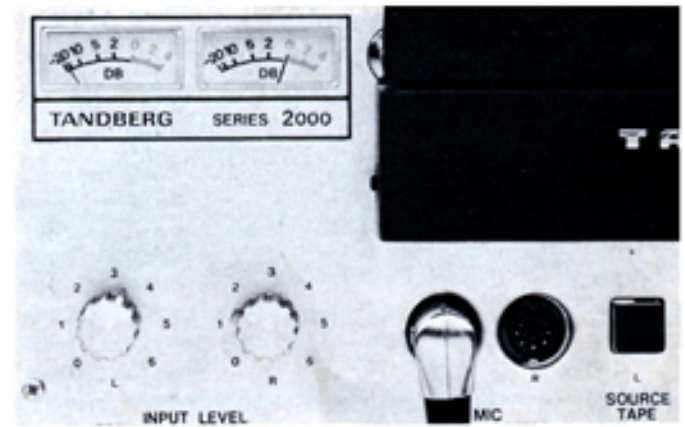
INPUT LEVEL L should be set for deflection up to 0 dB on right hand level meter, when speaking into the microphone. VOLUME L and R adjusts headphone level together with BASS and TREBLE controls. Set counter to

zero. Start recording by operating START/STOP knob. Listen to the master programme and repeat in the pauses.

Master programme as well as student response is recorded on student track (right channel). When the recording is completed, rewind to beginning of programme, observe counter.

Depress channel R playback button, position TAPE, and monitor the mixed programme (master and student) from channel R.

Note: Be careful not to operate left record button, RECORD L, to prevent erasure of master programme.



Four-track recording and playback

This chapter applies for the four-track version of series 2000 only.

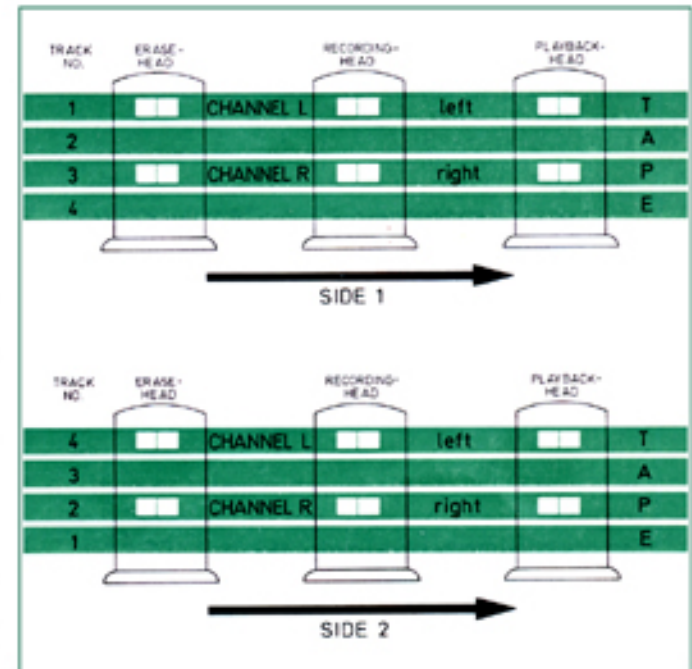
Recording

Recording can take place on four separate tracks equally spaced across the width of the tape, with track 1 uppermost when playing back from one end of the tape, defined as side 1, and track 4 uppermost when playing from the opposite end, side 2. With RECORD L depressed and side 1 up, track 1 is recorded. When the tape has run through, put the full reel on the left turntable and continue with RECORD L depressed. Recording then takes place on track 4.

If RECORD R button is depressed, track 3 will be recorded on side 1, and track 2 on side 2.

Playback

In mono playback, side 1 of the tape gives choice between tracks 1 and 3 depressing left and right channel playback buttons respectively. Side 2 gives the choice of tracks 4 and 2 respectively.



Combined playback-amplifier function

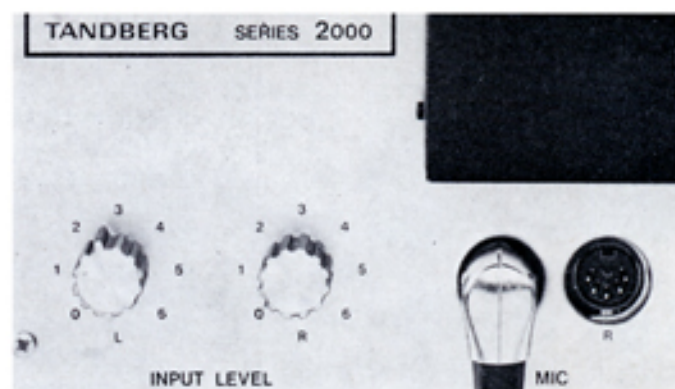
When a programme exists on track 3 and/or 2 (channel R), this programme can be played back while using channel L as a microphone amplifier.

A consequence of this feature is that Series 2000 is well suited as a central unit in a music and speech distributing system.

Connect microphone to socket MIC L and set both VOLUME buttons to maximum.

Depress the sound-on-sound switch at the rear of the recorder, position S-ON-S. Set START/STOP knob to STOP. Both playback buttons must be in unoperated position, SOURCE. Move the operating lever to position →. Start the playback by operating the START/STOP knob.

Adjust playback level by means of INPUT LEVEL R. When it is desirable to interrupt the music programme, to use microphone for announcement, turn up INPUT LEVEL L, while simultaneously turning down the music with INPUT LEVEL R until the desired balance between speech and music is obtained. After completion of the announcement, turn INPUT LEVEL L to zero while resetting the music level.



Mixing

Mono

Mixing of two programmes with full control of the individual programme levels is possible in mono recording or mono amplifier mode.

To obtain this, connect one programme source to one of the left inputs (L) and the other source to one of the right inputs (R).

Programme from more than one input (MIC, RADIO, PHONO) of the same channel will mix in the ratio determined by the controls of the respective programme

sources. INPUT LEVEL L controls programmes fed to L inputs, while INPUT LEVEL R controls programmes fed to R inputs.

Stereo

In stereo recording or stereo amplifier mode, programme from more than one source (MIC, RADIO, PHONO) connected to each channel, will mix in the ratio determined by the controls of the respective programme sources.

Programme editing

Programmes 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 so as to present the programmes in the desired sequence. When a cutting point has been located during playback, stop the tape instantaneously by means of START/STOP knob.

Take hold of the tape at the right hand guide post, and pull it out to the right edge of the power switch.

The operating lever must remain 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 tape ends must be spliced.

Lay the ends of the tape over each other with the same side of tape facing upwards. Cut the tape with scissors or a knife (non-magnetic) at an angle of approx. 45 degrees.

Lay the tape ends against each other, shiny side facing upwards. Lay the splicing tape across the join, parallel to the cut, and press firmly, squeezing out any air bubbles.

Cut the splicing tape along both edges. The cut should curve slightly into the edge of the recording tape to 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.



Automatic stop

A switch located in the right tape guide post will operate at the end of tape or if the tape snaps. Motor and turntables will then stop.

Owing to this end stop mechanism, the motor will not start until a tape has been correctly inserted into the tape path.

Maintenance

When using the tape recorder, dust and particles from the tape will deposit on heads and guide posts. The coating will cause reduced signal-to-noise ratio, impaired treble reproduction and may also cause drop-outs.

Inspection and cleaning of the tape path should be performed at regular intervals, before the symptoms become noticeable.

It is highly recommended to use tape of the best quality because these tapes, in addition to giving a better

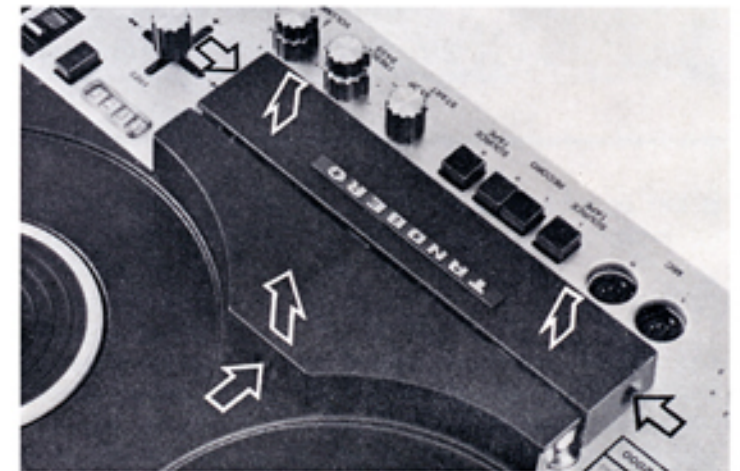
sound reproduction, also leaves less deposits and cause less wear of the heads. Cleaning should be performed at intervals of 50 to 100 hours of operation, depending of tape quality, temperature, amount of dust in the environments etc.

Cleaning and lubrication of motor and tape drive mechanism should only be performed at an authorized service station at intervals of approx. 3000 hours of operation. This corresponds to more than 4 months continuous operation.

Inspection

Remove the front head cover by depressing the spring loaded buttons at both ends, and lifting the cover straight upwards. The operating lever should be in centre position. The rear head cover can be lifted off when the button on its rear side is depressed.

Inspect for contamination of the parts shown in the figure. Pay particular attention to the sharp corners of the tape guide posts where deposits tend to settle (tape edge). Replace the head covers.



Cleaning

The cleaning can be performed with cotton, wool or a piece of flannel, wrapped around a small stick, and moistened with pure alcohol or benzine.

A kit intended for this purpose, «Tandberg Professional Tape Head Cleaner», containing a number of plastic pins with cotton (Q-tips) and a bottle with nonflammable cleaning liquid, is available. Solvents, such as acetone or trichlorethylene must NOT be used, as these may damage the heads.

Clean at the spots indicated on figure.

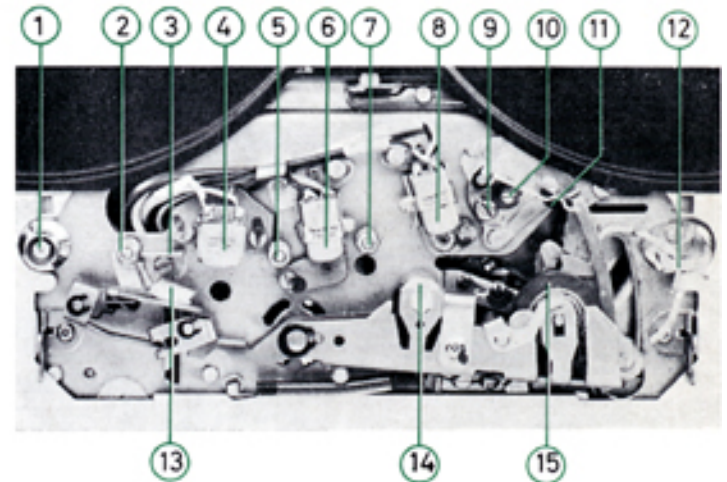
The plush pad pressing the tape against the tape rest, must not be moistened as this will upset the friction conditions.

Cleaning of the pad should be done with a dry brush.

Note: Care should be taken, not to disturb the position of heads or guide posts.

1. Fixed guide post.
2. Adjustable guide post.
3. Pressure pad support.
4. Erase head.
5. Adjustable guide post.
6. Record head.
7. Adjustable guide post.

8. Playback head.
9. Adjustable guide post.
10. Capstan.
11. Tape brake.
12. Fixed guide post with feeler for automatic end stop.
13. Pressure pad.
14. Flutter roller.
15. Pressure wheel.

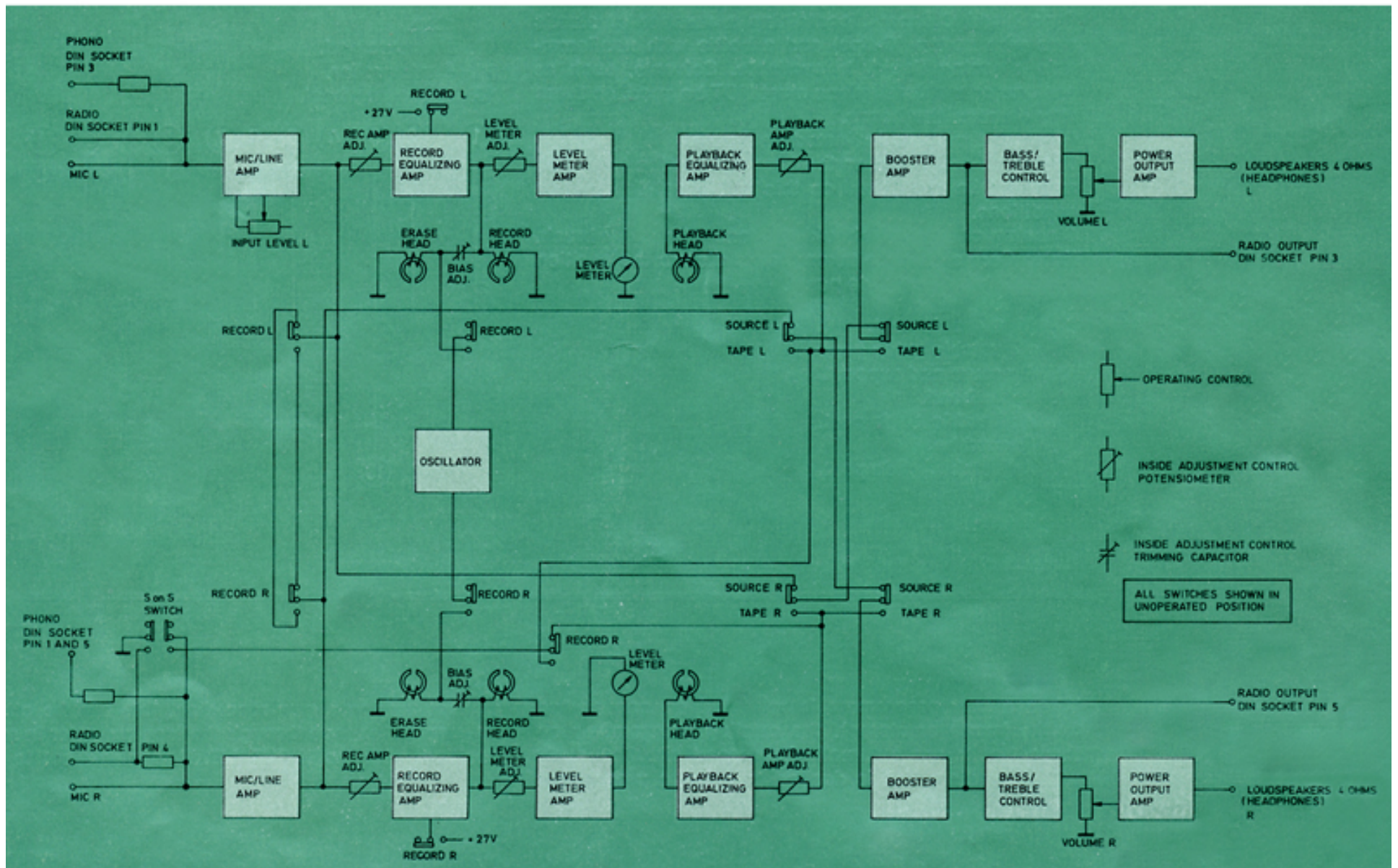



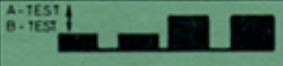
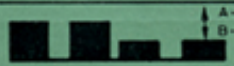




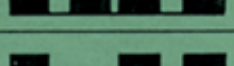
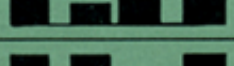

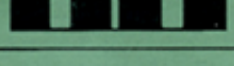

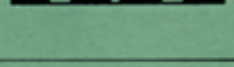

Erasing

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

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

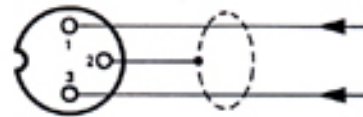
Block diagram series 2000



Mode of operation	Position of buttons and selectors		Programme at outputs	Remarks
		Sound-on-sound switch		
Mono recording on L channel with programme monitoring, AB-test		Normal	A-test: Programme to outputs on both channels. B-test: Programme to outputs on both channels via tape	L and R inputs will be mixed
Mono recording on R channel with programme monitoring, AB-test		Normal	A-test: Programme to outputs on both channels. B-test: Programme to outputs on both channels via tape	L and R inputs will be mixed
Stereo recording with programme monitoring, AB-test		Normal	Stereo programme—channels separated in A- or B-test	
Mono playback from channel L		Normal	L programme to outputs on both channels	
Mono playback from channel R		Normal	R programme to outputs on both channels	
Stereo playback		Normal	Stereo programme—channels separated	
Mono amplifier—channel L		Normal	Same programme at output on both channels	Operating lever in \Rightarrow position with or without tape in the tape path. L and R inputs will be mixed.
Mono amplifier—channel R		Normal	Same programme at output on both channels	Operating lever in \Rightarrow position with or without tape in the tape path. L and R inputs will be mixed.
Stereo amplifier		Normal	Stereo programme—channels separated	
Sound on sound recording on channel L		S-on-s	Channel L } A-test of mixed programme Channel R }	Programme source must be connected to channel L input, and the level is controlled with RECORD LEVEL L. Played back programme is controlled with RECORD LEVEL R. For B-test operation, see separate chapter in the manual.
Sound on sound recording on channel R		S-on-s	Channel L } A-test of mixed programme Channel R }	Programme source must be connected to channel L input, and the level is controlled with RECORD LEVEL L. Played back programme is controlled with RECORD LEVEL R. For B-test operation, see separate chapter in the manual.
Echo recording on channel L		Normal	Echo programme at outputs on both channels	Programme source must be connected to MIC L input. The source level is controlled with RECORD LEVEL L. The echo level is controlled with RECORD LEVEL R. Note: Apply special plug to interconnect pins 3 and 4 on RADIO socket
Echo recording on channel R		Normal	Echo programme at outputs on both channels	Programme source must be connected to MIC L input. The source level is controlled with RECORD LEVEL L. The echo level is controlled with RECORD LEVEL R. Note: Apply special plug to interconnect pins 3 and 4 on RADIO socket

Connecting plugs

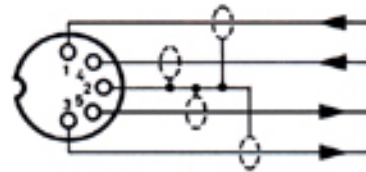
MIC



1. Signal from microphone.
2. Shield.
3. Signal from microphone.

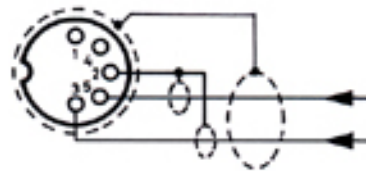
Pins 1 and 2 are interconnected on the socket.

RADIO



1. Signal from tuner/amplifier, left channel.
2. Common lead (shielding).
3. Signal to tuner/amplifier, left channel.
4. Signal from tuner/amplifier, right channel.
5. Signal to tuner/amplifier, right channel.

PHONO



2. Common lead.
5. Signal from pick-up, right channel.
3. Signal from pick-up, left channel.

The outer shielding, which is usually connected to the record player's chassis, should be connected to the plug's metal housing, not to the common lead.

Pins 1 and 5 are interconnected on the socket.

LOUD-SPEAKERS 4 OHMS



Signal to external speaker (4–8 ohms) or headphones.
When connecting to recorder, see paragraph on connections on page 7.

Note: The plugs are seen from the wiring side.

Technical specifications

Mains voltage:

Standard model: 230 V/50 Hz. Can be rewired for 115 or 240 V.

US model: 115 V/60 Hz. Can be rewired for 220 or 240 V.

Power consumption: Maximum 90 watts.

Motor: 2-pole asynchronous.

Tape:

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

Tape speed: 7¹/₂, 3³/₄ and 1⁷/₈ ips.

Speed tolerance: 1 %.

Fast forward—and reverse winding:

1200 ft. of tape, 7" reel: 1 min. 45 s.

1800 ft. of tape, 7" reel: 2 min. 10 s.

Heads: Erase head, record head and playback head.

Record level meter:

Moving coil instrument. Deflection up to 0 dB corresponds 3 % tape distortion.

Inputs: Each channel has the following inputs:

1. Microphone input, unbalanced (MIC, DIN-socket), for dynamic microphone with impedance below 700 ohms. Sensivity: 0.05 mV. Maximum input level: 5 V.
2. Line input (RADIO, DIN-socket). Impedance: 50 kohms. Sensitivity: 5 mV. Maximum input level: 10 V.
3. Pick-up input (PHONO, DIN-socket) for ceramic/crystal pick-up. Impedance: 1 Mohm. Sensitivity: 100 mV.

Outputs: Each channel has the following outputs:

1. Speaker output (LOUDSPEAKERS 4 OHMS, DIN-socket).
Speaker impedance: 4–8 ohms. Maximum power: 6 watts of continuous sinusoidal power from each channel (8 watts of music power). Output level: Dependent on volume and tone controls setting. Headphones can be connected to LOUDSPEAKERS 4 OHMS.
2. Line output (RADIO, DIN-socket). Minimum load impedance: 200 ohms. Output level: A tape recorded with a 400 Hz signal at 0 dB deflection of the instrument will give 0,75 V when played back.

Speakers:

Internal speakers 4" x 7" with impedance 8 ohms.

Tone Controls:

Bass and treble controls are continuously variable and affect programmes fed to speakers or headphones only. The bass and treble controls are common for the two channels.

Bass: \pm 10 dB at 50 Hz

Treble: \pm 10 dB at 10.000 Hz

Transistors: 41

Distortion:

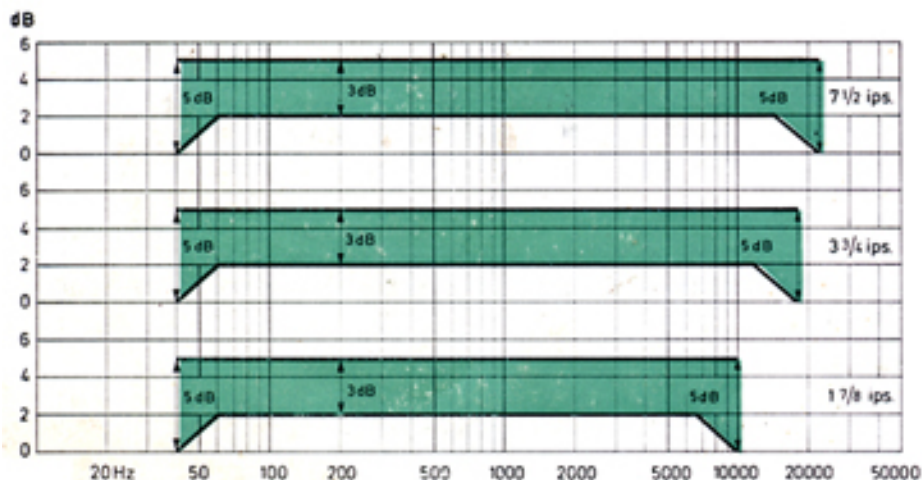
Distortion in recording amplifier: Recording of a 400 Hz signal at 0 dB level, gives less than 0.5 % distortion. Distortion in playback amplifier: 0.3 % at 0.75 V output level.

Tape distortion:

A tape recorded with a 400 Hz signal at 0 dB level, gives less than 3 % tape distortion when played back.

Wow:

Wow, maximum W.R.M.S.	According to DIN 45511
7 ¹ / ₂ ips: 0.07 %	7 ¹ / ₂ ips: 0.1 %
3 ³ / ₄ ips: 0.14 %	3 ³ / ₄ ips: 0.2 %
1 ⁷ / ₈ ips: 0.28 %	1 ⁷ / ₈ ips: 0.4 %



The coloured sectors indicate tolerance areas for total frequency response measured according to DIN 45511.

Frequency response:

Referred to 400 Hz	According to DIN 45511
7 1/2 ips: 40–18.000 Hz \pm 2 dB	7 1/2 ips: 40–20.000 Hz
3 3/4 ips: 50–12.500 Hz \pm 2 dB	3 3/4 ips: 40–15.000 Hz
1 7/8 ips: 60– 6.500 Hz \pm 2 dB	1 7/8 ips: 40– 7.500 Hz
Amplifier position: 30–18.000 Hz \pm 3 dB	

Crosstalk suppression:

Measured at 1000 Hz according to DIN 45511:
 Mono > 60 dB Stereo > 50 dB

Signal/tape noise measured at 7 1/2 ips and 5 % tape distortion, minimum:

	4-track	2-track
Weighted (Geräuschspannung—DIN 45511)	52 dB	54 dB
Linear (Fremdspannung—DIN 45511)	50 dB	50 dB
Weighted, IEC A-curve (R.M.S.)	60 dB	62 dB
Linear (R.M.S.)	55 dB	55 dB

Note:

At 3 % tape distortion, the signal/noise figures are reduced by 2 dB for all measurements.

Dimensions:

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

Weight: 20 lbs (9,5 kg).

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DEALER: