PACKING

Please keep the original packing of your REVOX tape recorder. If you ever have to transport this valuable piece of equipment the special packing will give it the best possible protection.

GUARANTEE

Please ask your dealer for a guarantee card and send the reply card to the appropriate main agent.

We must remind you that unauthorised tampering with the machine will render the guarantee void.

Agencies in English speaking countries :

England : C.E. Hammond & Co. Ltd.,
90, High Street, Eton,
Windsor, Berks.

Manufactured by : WILLI STUDER
Fabrik für elektronische Apparate
8105 Regensdorf - Zurich, Switzerland

WILLI STUDER GmbH

WILLI STUDER GmbH
7829 Löffingen, Germany

printed in switzerland

18.103.268

REVOX

Now you are the proud owner of a REVOX 77A

You have an excellent small studio tape recorder at your disposal.

The REVOX 77A is easy to operate because all confusing double functions have been avoided.

The following brief operating instructions are intended for the initial operation and should enable you to make a recording although you may not get the best out of your machine immediately.

The REVOX 77A is, of course, capable of far more than that. It is the purpose of the subsequent full operating instructions to make you properly familiar with the techniques of tape recording and the operation of the REVOX 77A. A thorough knowledge of your machine will enable you to record sounds with above average quality.

May we wish you much pleasure and success.

CONTENTS

1. BRIEF OPERATING INSTRUCTIONS

These brief operating instructions explain all important operating processes in a concise form. Please unfold the diagrams in the front and rear cover of this manual. The red index numbers are printed in bold face in the text.

The following pages describe the procedure of recording and playback in sequence.

An example is used in order to make things clear. **All switch settings and connections for a simple recording with one microphone on track 1 (mono) and the reproduction thereof, are printed in the text in bold face.** (7 1/2 i.p.s., large reel).

Please read right through these brief operating instructions (up to page 11). Wherever there are several possibilities use the settings printed in bold face.

CHECKS before switching on

Check whether the voltage selector on the underneath side of the machine is set to the mains voltage. (See section 5.1.)

Check that the dummy plug **24** is inserted in the REMOTE CONTROL socket **25** .

SWITCHING ON

Plug the mains cable into the socket **31** and connect to the mains. Switch on by means of the switch **7** on the front panel.

TAPE SPEED	set the switch **7** to :
l e f t 3 3/4 i.p.s.	**r i g h t 7 1/2 i.p.s.**
for tape economy	for best quality

TAPE REEL DIAMETER

Large : up to 10.5" :	**first switch position Symbol : O**
Small : 7" and less :	second switch position Symbol : o

LOADING THE TAPE

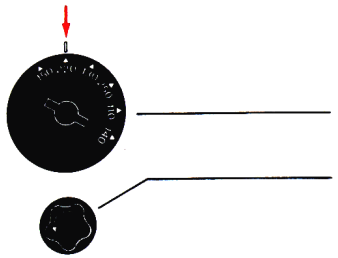
For loading the tape the cover plate **5** should be lowered. Please do not operate any of the push buttons below the cover plate as yet.

Place a full reel of tape on the left hand spooling plate **1** and an empty spool on the right hand spooling plate **4** .

Lift the three-pronged guide which protrudes over the tape spool and lock by turning through 60°.

Load the tape in accordance with the illustration opposite. Ensure that the tape is led through behind the guide post **43**.

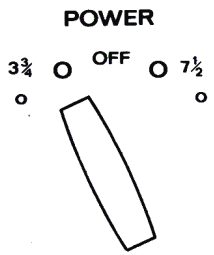
Attach the free end of the tape to the empty spool and secure it with a few revolutions.



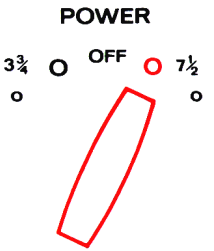
Voltage selector

Fuse 220 – 250 V 0.5 A
110 – 150 V 1.0 A

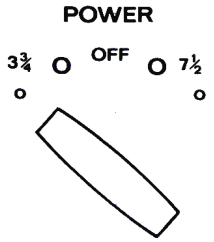
3 3/4 ips, large reels



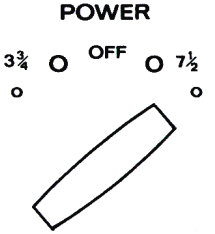
7 1/2 ips, large reels

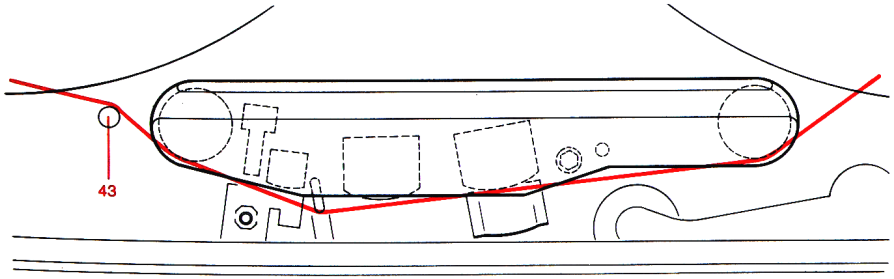


3 3/4 ips, small reels



7 1/2 ips, small reels





CONNECTIONS for recording (Inputs)

All input connections are duplicated for the two channels. All inputs CH I (left) go to the left hand input selector **16** , all inputs CH II (right) go to the right hand input selector **18** .

MIC **28** Connections for high and low impedance microphones **Rear panel : Cinch-sockets connect REVOX microphone to CH I** Front panel : Jack-sockets (parallel connections).

RADIO **29** Input connection for radio receiver. The 5-pole DIN standard socket provides the connections to the radio receiver for record and playback with one cable.

AUX **27** Universal input for amplifier outputs, tuners, record players (with equaliser pre-amplifier), tape recorders, mixers etc.

INPUT SELECTOR (Switching discs)

All inputs to channel I are selected by means of the left hand input selector **16** . **Set the left hand input selector 16 to MIC LO, (for REVOX microphone without transformer).**

All inputs to channel II are selected by means of the right hand input selector **18.**

The input selector should always be set to the position which is being used as input. For MIC two positions are available : LO for low impedance microphones without transformer, HI for microphones with built-in transformer or high output voltage (condenser types).

RECORD PRE-SELECTOR

The record pre-selector buttons which are situated beside the two level meters are for selecting the required track. (The level meter beside the button which has been depressed will be reading).

Channel I goes to the upper portion of the record head.
Channel II goes to the lower portion of the record head.

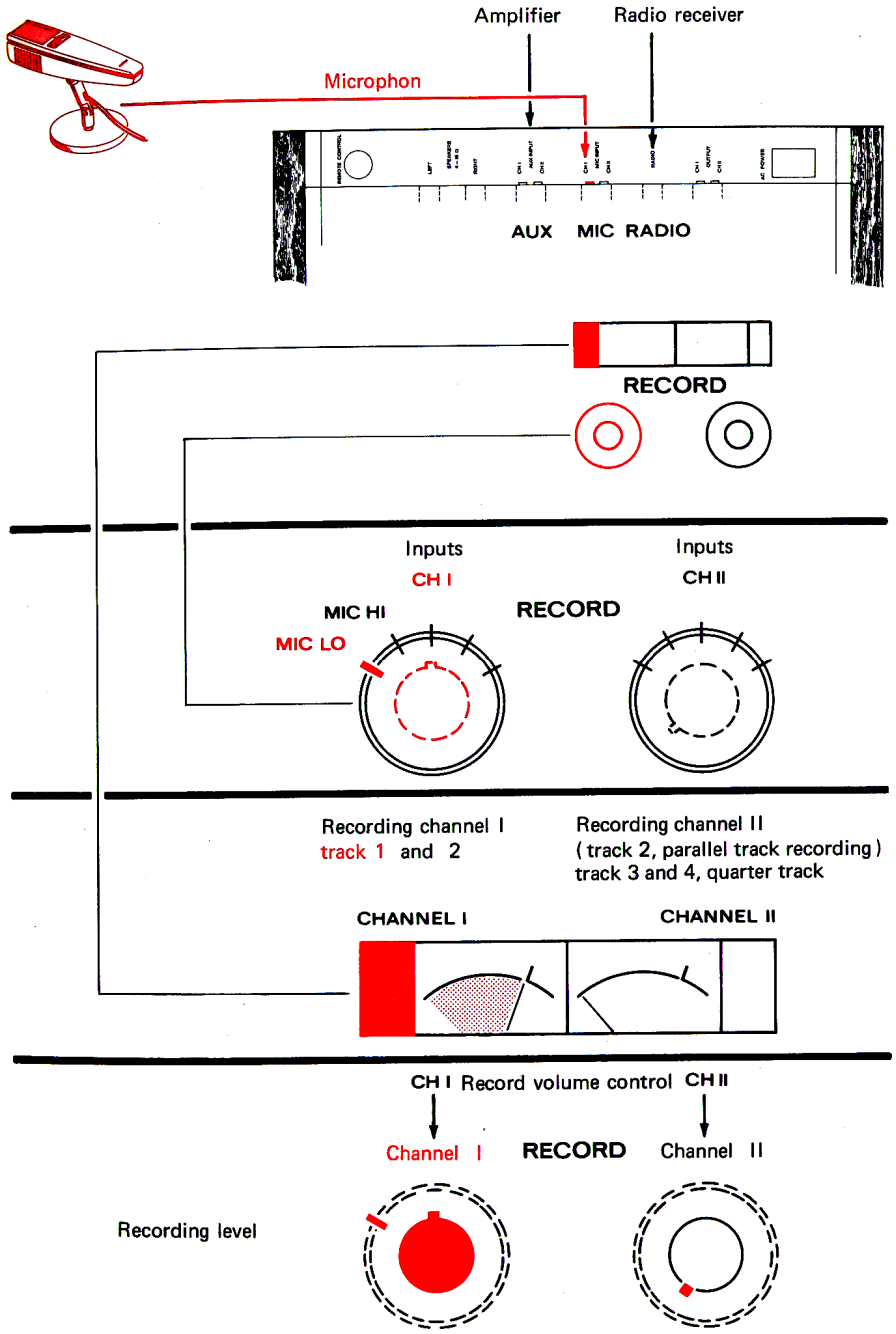
If only one key is depressed (mono) the inputs for channel I and channel II are linked together (mixer). Both keys = stereo.

Press the left hand record pre-selector button 32 for CHANNEL I.
A key which has been pressed can be released by pressing it again.

RECORD VOLUME CONTROL

The record level is controlled by means of the record volume controls. All inputs to channel I go via the input selector CHANNEL I **16** to the record volume control channel I **15** .

All inputs to channel II go via the input selector CHANNEL II **18** to the volume control channel II **17** .



RECORDING LEVEL (operating the record volume control)

The record volume controls enable the gain of the record pre-amplifier to be adjusted to the optimum level for the tape. For this purpose each channel has its own level meter. As the record pre-selector key determines the recording channel the level indication will always be beside the depressed key CHANNEL I or (and) CHANNEL II.

If only one key is depressed as in our example, both inputs will go to this channel. The level meter will then show the sum of both inputs (mixer). The record volume control of a channel which is not in use should therefore always be turned fully down.

Turn the record level control channel II 17 to zero (channel not in use). Now speak into the microphone and turn the record level control channel I 15 slowly up. Observe the left hand level meter 33 and turn the control in a clockwise direction until the pointer reads up to 0 db (100 %) at maximum volumes.

The level is now pre-set but the tape is not yet moving.

PRE–LISTENING

This pre-setting can also be checked accoustically :

With all models : with earphones (Jack socket **8** or external amplifier (via OUTPUT **30** or RADIO **29** socket)

With portable models : with built-in loudspeakers.

The operating controls (playback-MONITOR) are on the left hand side of the front panel.

Turn the before/after tape monitor switch 14 to INPUT (monitoring the input signal)

Turn the playback function switch 12 to CH I (monitoring CH I)

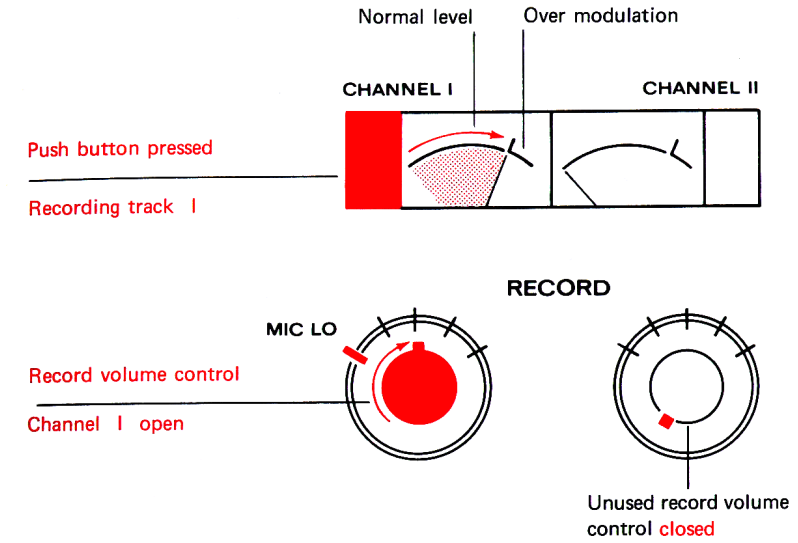
The monitoring volume is adjusted by means of the playback volume control **11** . (The setting of the record level control should not be altered again).

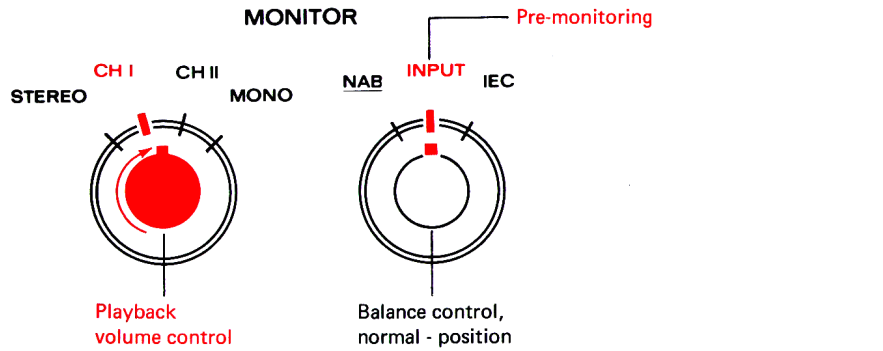
Turn the playback volume control up to get the required level on the built-in loud - speakers (or the earphones).

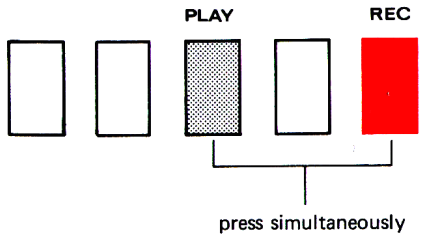
C a u t i o n : The microphone must not be too close to the loudspeakers otherwise accoustical feed-back will result (howl-back). It is therefore better to monitor the input by means of low impedance (5-400 ohms) earphones, (Jack socket PHONES **8**). Switch the built-in loudspeakers off by means of the SPEAKERS OFF button **41** (below the cover plate).

STARTING THE TAPE IN RECORD (REC)

Press the PLAY button 21 and the record button REC 23 simultaneously. (The left hand VU-meter **33** will light up)
Turn the before/after tape monitor switch 14 to NAB (monitor after tape).







The tape will now run in record (track 1). Any previous recording on track 1 is thereby automatically erased. By switching the before/after tape monitor switch **14** from NAB to INPUT the recording on the tape can be compared with the input signal.

STOP

When the recording is completed, press the STOP button 22
The tape is now stationary and the machine is no longer in the record mode.

FAST REWIND

For fast rewind to the beginning of the tape press the control button << **19** (The operating keys need only to be tapped lightly).
To stop the tape press the STOP button 22 again briefly.
To wind the tape FAST FORWARD the button **20** >> should be pressed.

PLAYBACK

With the before/after tape monitor switch **14** set to NAB and the playback function switch **12** set to CH I the tape is ready for playback.

When the tape is stationary press the PLAY button 21 . The playback level is adjusted by means of the volume control 11 .

For the reproduction of recordings from older REVOX machines or recordings which have been made to CCIR standard the before/after tape monitor switch **14** should be set to IEC.

The playback function switch **12** has the further switch positions :

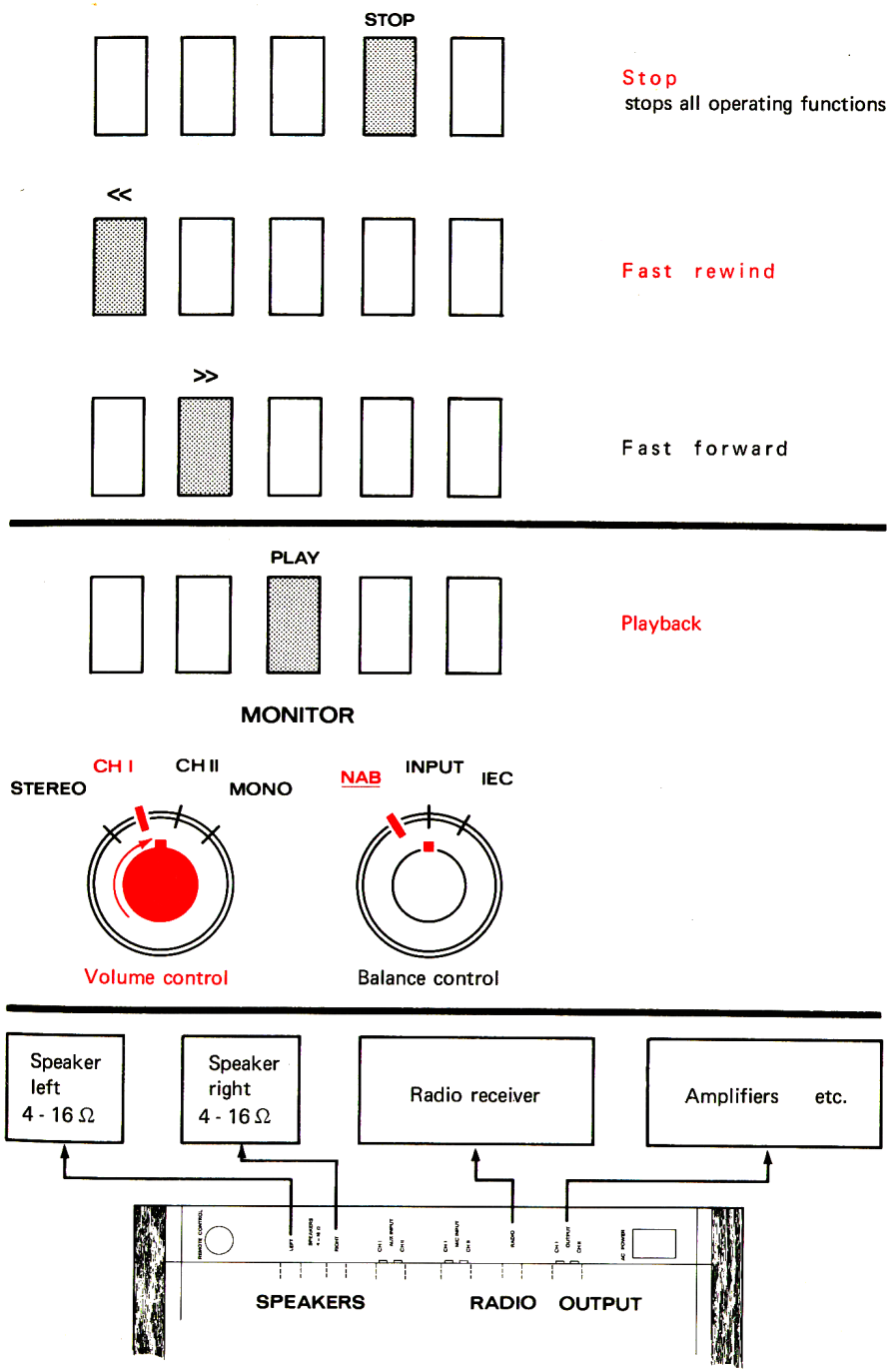
CH II	for playing from the lower track of the playback head
MONO	for playing the upper and lower track together onto all outputs.
STEREO	for the reproduction of stereo recordings (upper track to outputs CH I or left hand loudspeaker, lower track to outputs CH II or right hand loudspeaker). The balance control **13** enables the centre of the stereo image to be shifted. (This control should normally stand in the marked centre position).

CONNECTIONS FOR PLAYBACK
(and for monitoring the record input signal)

Apart from the above mentioned earphone socket, the following outputs can be found on the back panel :

OUTPUT	**30**	for HI -FI amplifiers or second tape recorder (to AUX input)
RADIO	**29**	for radio receivers (record and playback)
SPEAKERS	**26**	for loudspeakers (impedance 4-16 ohms). The built-in loudspeakers are thereby cut out automatically. This output is only in operation if the machine has been equipped with the plug-in output amplifiers.

Please note that the level of all outputs is dependent on the position of the volume control **11** (section PLAYBACK 8.6.)



2. HOW THE REVOX 77A WORKS

The design of the REVOX 77A is entirely new. The mechanics and electronics are built to the latest standards in professional engineering.

The entire mechanism and the electronics are held on a rigid die-cast chassis. Further die-castings have been used wherever the reliability of the machine depends on its rigidity. For example: for the headblock, for the capstan motor mounting or for the side panels.

Two powerful spooling motors ensure even winding of the tape and work at the same time as electrical tape brakes. An electro-magnetically operated servo-brake system effects the rapid stop.

The precision tape transport is effected in the REVOX 77A by means of a special capstan motor the speed of which no longer depends on the mains frequency (50 or 60 c/s). The basis of this drive is a strong and robust non-synchronous motor the speed of which is electronically controlled and governed. This combination provides a highly stable drive which is largely independent of mains voltage and frequency fluctuations.
The tape speed changeover switch is effected electronically.

The operating functions of the transport mechanism are effected via relays, are electrically interlocking and can be completely remote controlled.

All the electronics are transistorised. The REVOX 77A is therefore operational immediately on switching on and the current consumption and heat dissipation are low. All amplifiers are built on plug-in printed circuit cards and equipped with silicon transistors as in professional equipment. To facilitate servicing all important cable connections are made via plug connectors .

3.

MAGNETIC TAPE RECORDING EVEN FOR BEGINNERS

Magnetic tape is an almost perfect recording medium. A recording can be erased without any difficulty and the tape is then immediately available for a new recording. Tape can be cut and spliced again just as easily and a good splice is not audible.

Depending on the quality requipments the tape can be run faster or slower. Furthermore the width of a tape can be divided into tracks. It is usual nowadays to record two or four tracks onto a tape.

The recording is very simple from the operational point of view. All that is necessary is to set the volume control to get the correct recording level which can be read off on the meter.
The actual recording process is not quite so simple.

Although a knowledge of this complicated process is quite unnecessary for operating the REVOX 77A we would like to mention two fundamental concepts:
The high frequency bias and the equalization.

3.1. THE HIGH FREQUENCY BIAS

Magnetic recording relies on the fact that the molecular magnets in the magnetic coating of the tape are orientated in accordance with the magnetic field in the record head and remain in this position subsequently.

This process is linear only within a certain region so that the magnetic material must be biased into this linear region. This is effected by means of the so called high frequency bias (120 kc/s). The magnitude of this bias depends on the magnetic characteristics of the tape i.e. it is **determined by the type of tape used.**

The REVOX 77A is set at the factory for REVOX tape.

As the bias affects the frequency response and the distortion, we recommend the use of REVOX tape whenever possible.

The REVOX 77A can, of course, be adjusted to give optimum results with other types of tape. However, not every widely advertised tape is a high quality product. The use of reputable brands of tape will give the best assurance that the excellent qualities of your REVOX 77A will be exploited to the full.

3.2. THE EQUALIZATION

The equalization corrects, to put it simply, the inherent losses in the recording of high frequencies. In order to achieve favourable frequency response and signal to noise ratio (dynamic range) some frequencies are amplified more than others and the normal balance is restored in the replay amplifier. This process takes place automatically and is standardised in order to ensure the interchangeability of tapes.

They are marked on the before/after tape monitor control switch **14** NAB and IEC. NAB is an American standard, IEC, a European one. (IEC is practically identical with CCIR).

The REVOX 77A records in accordance with the NAB standards. Recordings made on the REVOX 77A should therefore always be played back in the NAB position.

Recordings made on older REVOX machines or CCIR recorded tapes should be played back in the IEC position. The above mentioned equalization (pre-emphasis of the high frequencies) must be borne in mind when taking frequency response measurements via tape. If a frequency response measurement is done at full modulation level, the high frequencies will be overloaded, thereby giving erroneous results.

Frequency response measurements should always be carried out at a level of -20 db (input voltage 1 / 10 of that required for 100 % modulation).

4. TRACK POSITIONS

In order to make the best possible use of the storage capacity of a magnetic tape, its width is divided up into two or four tracks. This is known as half or quarter track recording. Halving track width will give double the recording time for the same lenght of tape.

The division into several tracks has no influence on the frequency response. The dynamic range, however, i.e. the region between the maximum recording level and the tape background noise is reduced. Quarter track recording is also more critical regarding the cleanliness of the heads and the tape.

For mono recording two independent tracks are therefore available with a half track machine, and four with a quarter track machine.

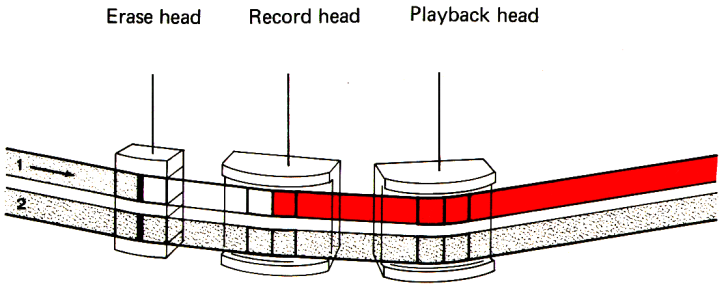
Stereo recording requires a track each for the left and right hand channels. Two tracks are therefore used simultaneously. With half track stereo recording the tape is therefore fully recorded in one go. In the case of quarter track machines only two of the four tracks are recorded when the tape is run through for first time.

The following illustration should clarify the processes on the record head.

4.1. MONO HALF TRACK

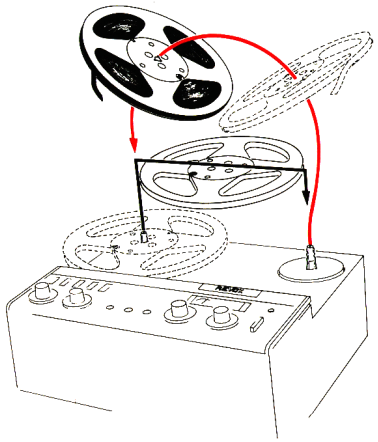
In order to ensure the interchangeability of tapes, the track positions are standardised. In half track mono recording, the upper half is called track 1 and the lower half, track 2.

In accordance with international standards, the upper track, i.e. track 1 is recorded first. (Pure mono machines are equipped with a record head for the upper half of the tape only).
It is therefore important that you should understand the following basic principles :



A possible existing recording on track 1 is **automatically erased** in the record position as it passes the erase head.

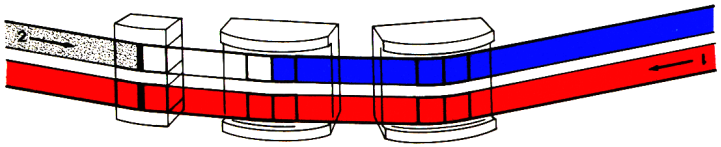
The now blank tape moves past the record head and is modulated again. The new recording moves further along past the playback head where the new recording can already be monitored via the playback amplifier. (Monitoring after tape).



This direct monitoring of a recording is only possible with the professional arrangement with three heads. This complete separation of the record and playback functions in the heads and amplifiers opens many interesting possibilities as well as enabling the monitoring via tape.

The tape which has been fully recorded on track 1 is now situated on the right hand spool. In accordance with international standards, the full reel of tape is now turned over, and placed back on the left hand spooling plate.

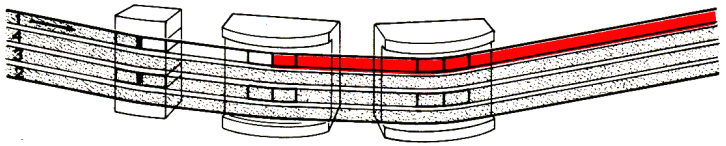
The recorded track 1 is now below. **Without switching** the record channels the second track can now be recorded with the upper half of the head.



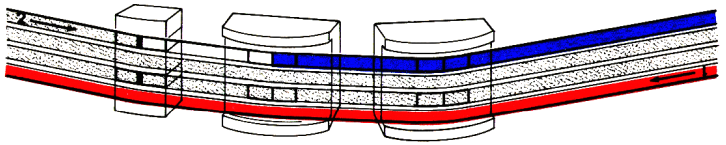
When the tape has been run through a second time, the tape is now fully recorded in the case of half track recording.

4.2. MONO QUARTER TRACK

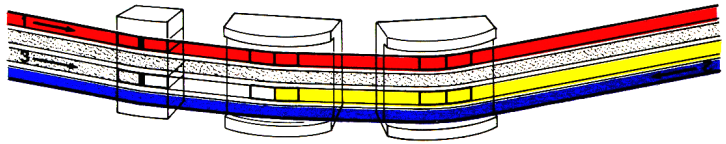
In the case of mono quarter track recording, track 1 is also recorded with the upper portion of the head when the tape is being run through for the first time.



The tape is then turned over as before and in the second run-through the second track is recorded **(without switching the record channel).**

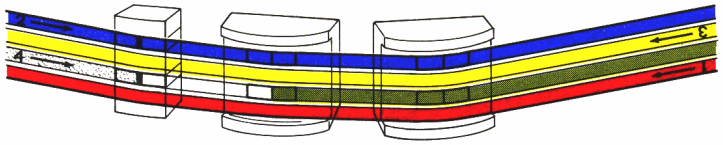


As only two of the four tracks have been recorded until now, the tape is turned over again.
At the same time the record channel is **switched over.** For this purpose the record preselector key CHANNEL II should be depressed. (The left hand key CHANNEL I should be released by pressing it again). The recording will now take place via the **record channel II and the lower portion of the head.**



Three of the four tracks have now been recorded. When the tape has gone through for the third time the tape is once more turned over.

The fourth track is recorded with the same setting of the record pre-selector key (CHANNEL II).



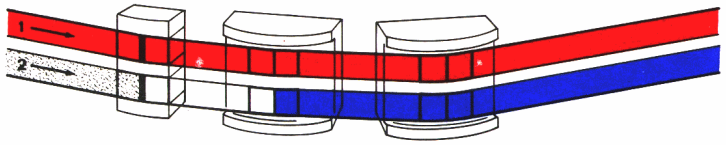
The tape is now fully recorded in the case of quarter track recording. If the tape is turned over again the beginning of the tape (track 1) is ready for playback. The upper portion of the playback head scans tracks 1 and 2, the lower portion the track 3 and 4. The corresponding positions of the playback function switch are :

CH I tracks 1 and 2
CH II tracks 3 and 4

For the reproduction of quarter track recordings the playback function switch should therefore be set to **CHANNEL II** for reproducing tracks 3 and 4, the same as for recording.

Recording contrary to international standards

Contrary to international standards it is possible in the case of mono recording to rewind the tape instead of turning it over after recording track 1. When the tape is rewound to its beginning, the machine is switched over to CHANNEL II
Track 2 is now recorded in the same direction as track 1.



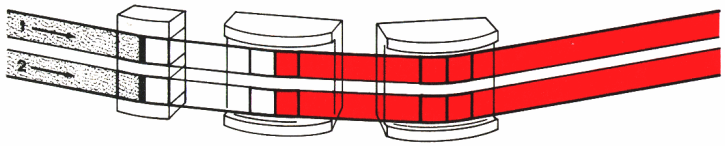
The same is possible in the case of quarter track recordings. The turning of the tape and switching of track is then done after the second track has been recorded.

During playback track 1 or track 2 (track 3 or track 4) can be selected by simply switching channels (CH I / CH II).

4.3. STEREO HALF TRACK

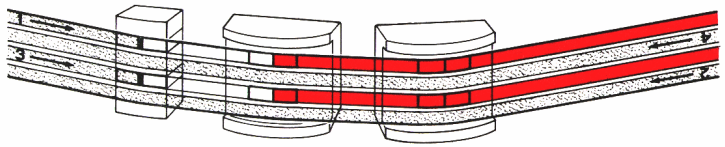
When recording stereophonic signals two tracks are always used simultaneously. The left-hand channel is recorded on track 1 (upper) and the right hand channel on track 2 (lower).

In the case of half track recording, the entire tape is therefore recorded in one go.



4.4. STEREO QUARTER TRACK

In the case of stereo quarter track recordings, the tracks 1 and 3 are recorded during the first go and the tracks 2 and 4 after turning the tape over.



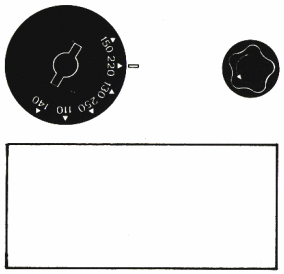
When filing tapes (see also section 16) it is advisable to make a note of the speed and track position of a recording as well as the title and duration.
This is particularly advisable for mono quarter track.

5. PREPARATIONS BEFORE OPERATION

The REVOX 77A may be operated in the horizontal or vertical position. For operation in the horizontal position the runners on the front edge may be removed.

5.1. CHECKS BEFORE OPERATION

The machine is set at the factory to a mains voltage of 220 V AC (USA 110 V AC). It can be adapted for the following AC mains voltages :



110 V	(117 V, pre-set value for USA)
130 V	
150 V	(145 V)
220 V	(Pre-set value)
240 V	(245 V)
250 V	

The voltage selector is accessible at the bottom of the machine.

If the setting does not correspond with the mains voltage, the voltage selector should be turned to the correct position by means of a coin after switching the machine off.

The mains fuse which is fitted at the factory is suitable for 220 to 250 V (220 V/.5 A). For mains voltages of 110 to 150 V a 1 A fuse should be substituted.

THE MACHINE MUST ONLY BE CONNECTED TO AC MAINS

Due to a new capstan drive system the mains frequency is not critical. The REVOX 77A can be used on 50 and 60 cycle mains without alterations.

Ascertain that the dummy plug **24** is plugged into the REMOTE CONTROL socket **25.**

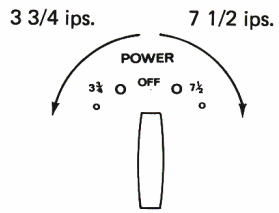
5.2. TAPE SPEED, SIZE OF TAPE SPOOLS

Mains connections :
Insert the line socket on the mains cable into the socket **31** on the machine and plug into the mains.

Switching on :
The machine is switched on by means of the switch **7** on the front panel.

Turning it to the right :

Tape speed 7,5" i.p.s. for high quality.

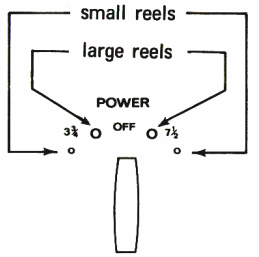


Turning it to the left :

Tape speed 3 3/4 i.p.s. for tape economy.

When the machine is switched on, this is shown by the pilot light **6** , lighting up.

There are two switch positions in each direction. The first switch position designated with a large circle is for operation with large tape spools (10,5").

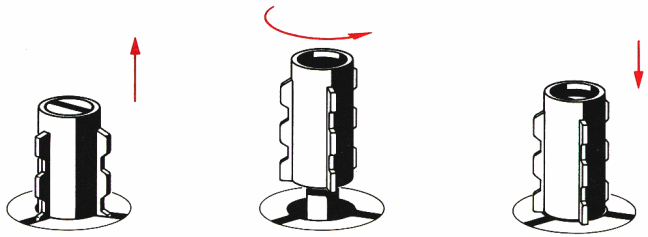


If tape spools with a diameter of (7") or less are used on the left-hand spooling plate, the switch should be turned to the second position marked with a small circle.

As far as possible spools of the same inner diameter should be used on both sides.

5.3. LOADING THE TAPE

The full reel of tape should be placed on the left hand spooling plate, the empty reel on the right hand spooling plate.



When the reels are properly seated on the spooling plates, they may be locked by lifting and turning the centre piece.
As the tape spools reach very high speeds during fast wind, they should always be locked in this way.
Tape spools of up to 10,5" diameter may be used.

For loading the tape the cover plate **5** should be lowered. The lowered head cover plate exposes the tape heads for loading, editing and for cleaning. The tape path is shown in the illustration page 5 (brief operating instructions). One should make sure that the tape is laced through behind the guide post **43** .

The beginning of the tape is attached to the empty spool and secured by a few revolutions.

After lifting the cover plate back up the machine is ready for recording or playback.

TAPE POSITION INDICATOR

When loading the tape the SET ZERO key **3** of the four digit tape position indicator, should be pressed. This will provide you with reliable reference numbers which will facilitate the location of certain recordings.

Compared with the previous REVOX machine, –model G 36 –the counter on the REVOX 77A will indicate double the value for the same length of tape.

Old position indicator notes in your tape library should therefore be multiplied by 2.

6. MECHANICAL OPERATING FUNCTIONS

In the following, the mechanical operating functions are described which are the same for record and playback.

For the following excersises, the machine should be set up as follows :

Tape loaded.
Tape speed-any.
Set the switch in accordance with the tape spool diameter in use. (Tape tension).

6.1. FUNCTION STOP **22**

When the machine is switched on it will be in position STOP. The amplifiers are switched on and the capstan motor is revolving at the pre-selected speed. The pressure roller **49** is in its rest position and the tape therefore remains stationary. The servo brakes for the tape spools are applied in the STOP position (and also when the machine is switched off).

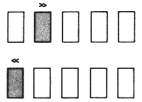
From the STOP position, any other mechanical operating function can be selected.

If during any mechanical operating function, the STOP key is pressed, the operating function is interrupted, the tape is brought to a standstill and the machine will be again in the above mentioned standby condition.

When the machine is switched off, by means of the automatic optical end of tape switch **36** , the same condition is brought about as by pressing the STOP key.

6.2. FUNCTION FAST WIND

FAST FORWARD **20**
FAST REWIND **19**



The key **20** >> causes the tape to be wound forward at high speed.
The key **19** << causes the tape to be wound backwards at high speed.

These keys can be worked directly from any operating mode. It is also possible to change directly from one spooling direction to the other. This will cause the tape to be slowed down particularly gently.

While the tape is being wound forward or backward the PLAY button **21** is electrically locked i.e. it is ineffective.

6.3. FUNCTION PLAY **21**

When the PLAY button is pressed the tape transport will start to run at the selected speed.

The PLAY button must only be operated when the tape is stationary.

If the tape is moving the STOP button should first be pressed and the PLAY button should not be operated until the tape has come to rest.

It is perfectly permissible to go from the PLAY position directly into FAST WIND.

If the tape is running in playback it is possible to go into record without going through STOP by simultaneously depressing the PLAY **21** and REC **23** buttons.

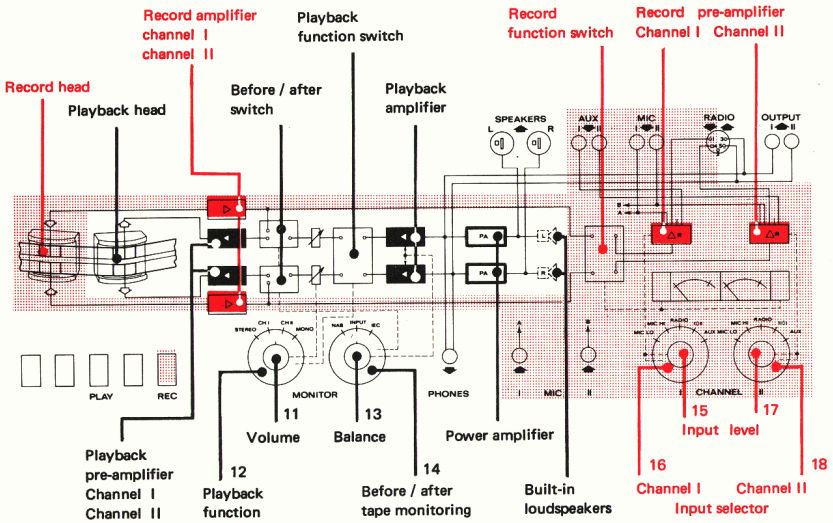
The above mentioned mechanical operating functions apply generally and in particular to recording as well as playback. Please do not go on reading until you are quite familiar with the tape loading procedure and the operation of the PLAY, STOP and FAST WIND buttons.

7. AMPLIFIER FUNCTIONS

The semi-professional machine REVOX 77A has completely separate record and replay amplifiers.

The following block schematic circuit diagram is divided into record and playback sections.

The red area shows the record section including inputs, amplifier and operating controls. The block schematic circuit is laid out in such a way that the inputs on the back and the operating controls on the front panel are in their natural positions. Later on the record channel will always be shown in red. In this way the block schematic will enable complicated processes to be explained quite simply. It will be used along with the explanations in order to facilitate an understanding of the operating processes for the technically minded. This is a particular advantage for special effects.



7.1. THE RECORD AMPLIFIER (red section)

The record channels have an input selector each for channel I (left) **16** and channel II (right) **18** which will connect the pre-amplifier to the various inputs.
From these pre-amplifiers the signals go through the two record volume controls CH I **15** (left) and CH II **17** (right) which serve to control the recording level.
The keys CH I **32** and CH II **35** enable the channels to be linked together via the record function switch and thereby to be recorded mixed on one track (mixer operation).
The record amplifiers finally amplify the signal to the appropriate level for the record head.

7.2. THE PLAYBACK AMPLIFIER

The playback amplifier is completely separate from the record amplifier. It serves to amplify the voltage which is induced in the separate playback head **47** regardless of the mode of operation of the machine. This enables a recording to be played back (monitored) directly from the tape during recording.

The playback amplifiers have a pre-amplifier per channel which is directly coupled to the playback head.
The output of these playback pre-amplifiers goes to the before/after tape monitoring switch **14** , from there via the playback volume control **11** and a function switch **12** which enables different kinds of playback.

Two further playback amplifiers with balance control **13** amplify the signal to line level which is available at the OUTPUT **30** , RADIO **29** or at the PHONES **8** sockets. The plug-in output amplifiers are also driven by this stage. Tone controls have been purposely omitted. This avoids a frequent source of trouble in the operation of the machine. Tone controls with accurate reproducable settings are furthermore very costly. (The REVOX HI FI amplifier is equipped with such tone controls.).

As the playback channels are always in operation, and as their operating controls are relevant for recording, the playback process will be explained first and in chronological sequence.

8. PLAYBACK-FACILITIES

The playback with the REVOX 77A can be effected in different ways.

With all models:

Playback via **headphones**
Stereo headphones with an impedance of 5-600 ohms can be plugged into the jack socket **8** on the front panel. (Optimum matching impedance 200-400 ohms).
These are particularly intended for direct monitoring during record, although they are also very suitable for first class stereo reproduction.

Reproduction via separate **HI FI amplifier**
Hi Fi amplifiers may be connected to the OUTPUT **30** sockets. The low impedance enables long lines to be used. The output voltage is max. 2.5 V (impedance 600 ohms).

Reproduction via radio **receivers**
Stereo radio receivers may be connected via the DIN socket **29** . This will provide the connections for playback via the radio receiver and for the recording of radio programmes.

With models with built-in output amplifiers:

Reproduction via **separate Loudspeaker**

Loudspeakers with impedances from 4 - 16 ohms may be connected to the DIN-sockets SPEAKERS **26** . It is important that the loudspeakers should be capable of handling the maximum output power of these output amplifiers of 16 W each.

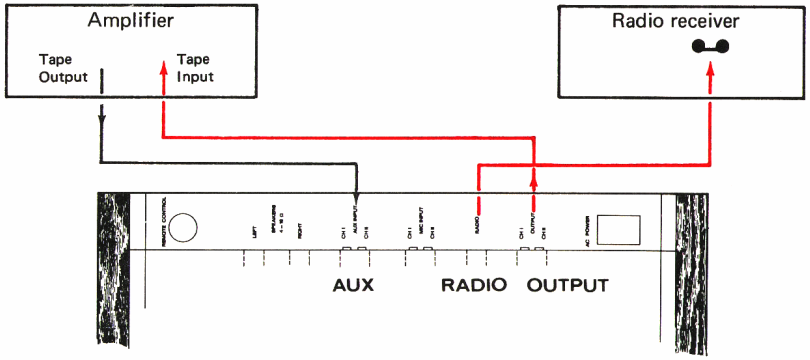
With portable models with internal loudspeakers:

Reproduction via **internal loudspeakers**

The built-in loudspeakers are directly connected to the plug-in output amplifiers. If external loudspeakers are connected to the SPEAKERS sockets **26** the internal loudspeakers are automatically disconnected.
When the machine is connected to a Hi Fi system the built-in output amplifiers and thereby the internal loudspeakers can be killed by pressing the SPEAKERS OFF button **41** .

8.1. CONNECTIONS

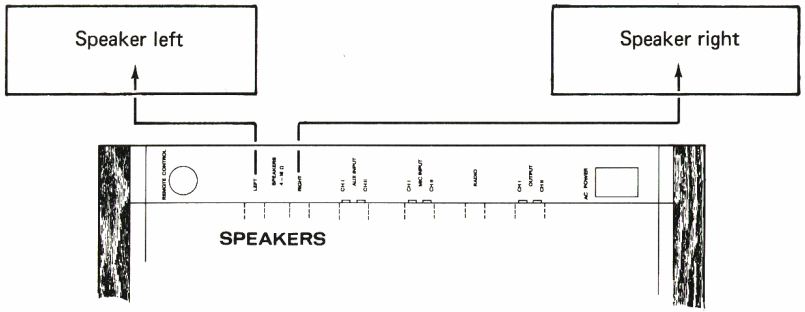
With models without output amplifier the connections to the separate Hi Fi amplifiers or to a radio receiver should be effected in accordance with the illustration below.



The connection with a separate amplifier must be made by means of a 2-core screened cable (REVOX cable C2C, various lengths).
It is important to observe polarity and to avoid interchanging the left and right hand channels.
The connection of a radio receiver is effected by means of a DIN-standard cable for record and playback (REVOX cable NWAN, various lengths).

The connection from the amplifier output to the AUX-input **27** may be made at the same time. (For recording from the amplifier).

To models with built-in output amplifiers, loudspeakers with an impedance of 4 - 16 ohms should be connected to the SPEAKERS socket **26** .



Loudspeakers with an impedance of less than **4** ohms must not be connected. When making the connection, care should be taken to avoid short circuits. In case of a short circuit the corresponding loudspeaker will be silent and with sufficient level the precision fuse (1,0 A slow-blow) in the output amplifier will blow.

Switch and volume control settings for p l a y b a c k

The volume controls and switches for the p l a y b a c k section are situated on the l e f t hand side of the control panel.

1. Set the POWER switch **7** to the desired tape speed and the required tape tension (spool diameter).

2. Load recorded tape.

3. Set the before/after tape monitor switch **14** to NAB.
For tapes which have been recorded on the previous REVOX model or to CCIR standards, set the switch to IEC.

4. Set the balance control **13** to the marked centre position.
This is the basic position of the balance control for stereo and mono reproduction.

5. The playback function switch **12** determines the mode of reproduction.

   A. STEREO : Both channels are amplified separately and are available separately at the outputs.

   B. CH I : The playback from track 1 (tracks 1 and 2 in the case of quarter track machines) is switched to all outputs.

   C. CH II : The playback from track 2 (tracks 3 and 4 in the case of quarter track machines) is switched to all outputs.

   D. MONO : Both tracks are linked together and connected to all outputs.

8.2. (5.A) Playback function switch **12** in position : **STEREO**

For the playback of stereophonic recordings.

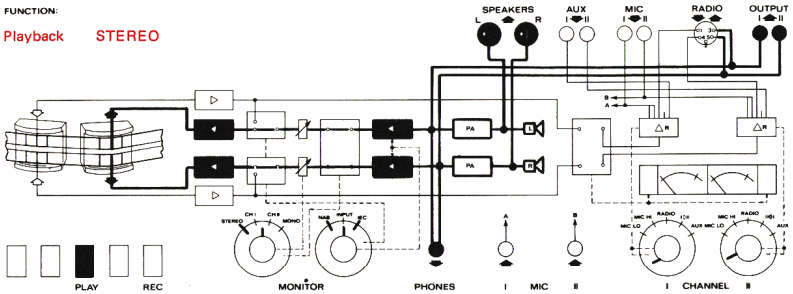
At the outputs CH I appears the signal from channel I (left)

Track 1 in the case of half track
Track 1 or 2 in the case of quarter track

At the outputs CH II is available the signal from channel II (right)

Track 2 in the case of half track
Track 3 or 4 in the case of quarter track

This setting should also be used if two mono recordings are to be played back simultaneously but separately (e.g. simultaneous separate commentaries in two different languages).



8.3. (5.B) Playback function switch **12** in position : **CH I**

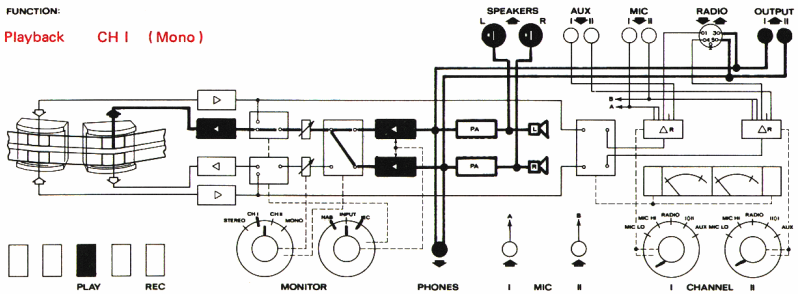
For the monophonic reproduction from the upper half of the head.

Track 1 or 2 in the case of half track
Track 1 or 2 in the case of quarter track

appearing at all outputs.

Thus mono reproduction can be obtained via both loudspeakers.

This is the standard setting for mono reproduction from half track recordings as well as for the first two tracks of quarter track recordings.



8.4. (5.C) Playback function switch **12** in position : **CH II**

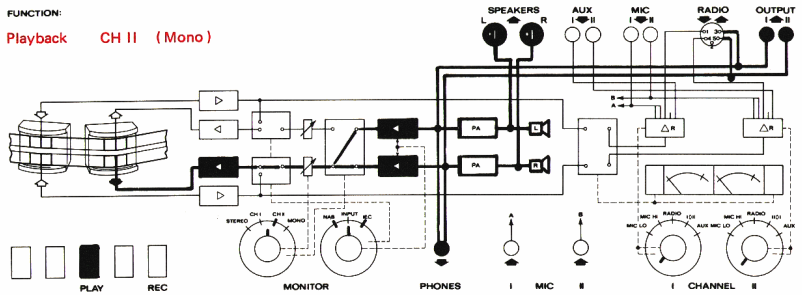
For reproduction from the lower half of the head.

Track 2 in the case of half track (for recordings in the same direction as track 1, contrary to international standard).
Track 3 or 4 in the case of quarter track

Available at all outputs.

Thus mono reproduction can be obtained via both loudspeakers.

This is the standard setting for mono reproduction of the third and fourth quarter track.

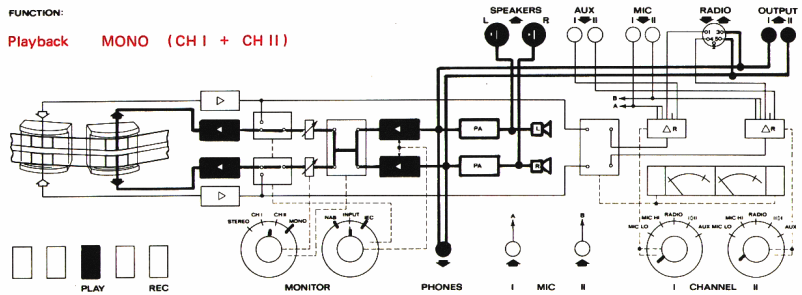


8.5. (5.D) Playback function switch **12** in position : **MONO**

The recordings of tracks 1 and 2 in the case of half track machines and 1 and 3 or 2 and 4 in the case of quarter track machines, are linked together and are available at all outputs, mixed together.

This switch position is primarily intended for the monophonic reproduction of stereo recordings.

Furthermore, it enables to record solo and backing separately and to reproduce them mixed in the MONO position.



6. To start the tape in playback mode depress the PLAY button **21** momentarily. Adjust the level by means of the volume control **11** .
The image centre in the case of stereo or the volume ratio of the two channels in the case of mono can be adjusted by means of the balance control **13** .

When playing back through a separate Hi Fi amplifier or a radio receiver, it must be remembered that the level at the OUTPUT and RADIO sockets depends on the position of the volume control.
The volume control **11** should always be turned up as much as possible and at least sufficiently to give the required volume with the volume control on the amplifier or radio receiver in its " normal " position.
As the output at the OUTPUT socket has the standard impedance of 600 ohms,the playback volume control **11** can be marked for professional use for a definite output voltage (e.g. 1.55 V / + 6 db).

8.6. SUMMARY Playback

1. Set the POWER switch **7** to the desired tape speed and the required tape tension (spool diameter)
2. Set the before/after tape monitor switch **14** to NAB.
For tapes which have been recorded on the previous REVOX model or to CCIR standards, set the switch to IEC.
3. Set the balance control **13** to the marked centre position.
4. Playback function switch **12** in position :

   STEREO for the playback of stereophonic recordings.

   CH I for the monophonic reproduction from the upper half of the head :
   Track 1 or 2 in the case of half track
   Track 1 or 2 in the case of quarter track

   CH II for reproduction from the lower half of the head.
   Track 2 in the case of half track (for recordings in the same direction as track 1, contrary to international standard)
   Track 3 or 4 in the case of quarter track.

   MONO This switch position is primarily intended for the monophonic reproduction of stereo recordings.
   - The recordings of tracks 1 and 2 in the case of half track machines, and 1 and 3 or 2 and 4 in the case of quarter track machines, are linked together and are available at all outputs, mixed together.

5. Adjust the level by means of the volume control **11**
6. To start the tape in playback mode depress the PLAY button **21** momentarily.

9. RECORD-FACILITIES

All usual signal sources can be connected to the inputs which have various sensitivities.

Input :		Signal source :
MIC	**28**	Microphone, two sensitivities for high and low impedance types.
RADIO	**29**	Radio receiver, standard DIN 5-pole connection for recording and playback in stereo.
AUX	**27**	Amplifier, tuner, record player with pre-amplifier, tape recorders, mixer.

All inputs are located on the socket bay at the rear of the machine. Only the microphone inputs are duplicated on the front panel. (Jack socket MIC CH I **9** and MIC CH II **10**).

The MIC inputs on the front panel and on the rear of the machine are indentical and are interchangeable.
The input selectors for channel I **16** (left) and channel II **18** (right) have two positions each for microphones : MIC LO and MIC HI.

MIC LO For low impedance microphones (without transformer) with low output voltage.

MIC HI For high impedance microphones (dynamic microphones with transformer and high output voltage).

The operating controls for recording are situated on the right hand side of the front panel, in two groups for the two channels.
The inputs for CH I and the inputs for CH II can be pre-selected separately by means of the left and right hand input selectors **16** and **18** .

The inputs to CH I are always controlled by means of the left hand record volume control **15** and the level for channel II is controlled by means of the right hand volume control **17** .

The recording level is shown on the VU meters **33** for CHANNEL I and **34** for CHANNEL II.

The track on which the recording is to be made is determined by the position of the two record pre-selector switches CHANNEL I **32** and CHANNEL II **35** .

CHANNEL I : Recording via channel I on the upper half of the head :
Track 1 or 2 with half track machines
Track 1 or 2 with quarter track machines

CHANNEL II : Recording via channel II on the lower half of the head :
Track 2 with half track machines (parallel track)
Track 3 or 4 with quarter track machines.

If one of the buttons is now depressed the inputs, which have been selected by means of the input selector switches, can be mixed into the corresponding record volume controls. (Mono mixer operation). The VU meter beside the button which has been depressed will show the sum of both signals i.e. the mixed signal.

The record volume control of an input selector switch which is not being used should always be turned fully down.

For stereo recordings both record pre-selector buttons CHANNEL I and CHANNEL II should be pressed simultaneously. The recording of the two channels will take place separately : the left hand channel CH I via the upper half of the head, the right hand channel CH II via the lower half of the head.

A record pre-selector button which has been depressed may be released by pressing it once more.

In the record position, any previous recording on the tape will be automatically erased. An erase head **45** is provided for this purpose which the tape passes before reaching the record head. This erase head only becomes operative if the record button REC **23** is pressed simultaneously with the PLAY button **21** . The VU meter illumination serves as record warning light. The fact that the PLAY and REC buttons have to be pressed simultaneously in order to start the tape in the record mode, acts as a reliable safeguard against accidental erasure of existing recordings.

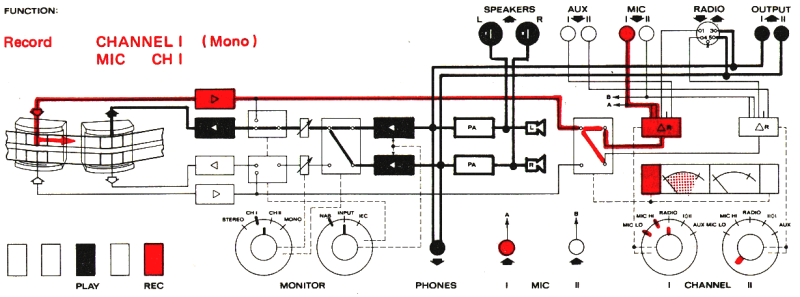
9.1. MONO - RECORDINGS

In the following the various record switch positions are explained for recording from microphones. The same will also apply for the RADIO and AUX inputs if the input selector switches are set accordingly.

To record TRACK 1 (track 2) / microphone on input **MIC CH I**

1. Connect microphone to the input MIC CH I, on the socket panel **28** at the rear or on the front panel **9** .
2. Set the input selector switch for channel I **16** to MIC LO or MIC HI (as appropriate).
3. Turn the record volume control **17** for channel II which is not in use, fully anti-clockwise. (The position of the input selector switch for channel II is thereby no longer relevant).
4. Press the record pre-selector button CHANNEL I **32** (release the CHANNEL II button).
5. Press the PLAY button **21** and the REC button **23** simultaneously.
   The tape will run in record at the pre-selected speed. A possible previous recording on track 1 (track 2) is thereby automatically erased.
   The illumination in the VU meter **33** indicates that channel I is in record.

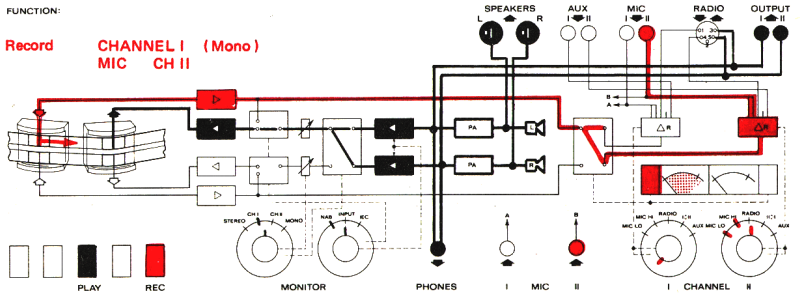
6. Turn the record volume control left **15** for channel 1 up sufficiently to get the necessary recording level. (Paragraph 12 will answer all your questions regarding correct recording level).



7. Monitoring the recording " via tape " : the recording can be monitored directly off the tape during the recording. The following switch settings (replay section) apply :
   Playback function switch **12** to CH I, before/after tape monitor switch **14** to NAB. The volume is adjusted by means of the playback volume control **11** monitoring via earphones, loudspeaker or external amplifier is possible.

To record TRACK 1 (track 2) / Microphone on input **MIC CH II**

1. Plug the microphone into the MIC CH II input on the back panel **28** or on the front panel **10** .
2. Set input selector switch channel II **18** to MIC LO or MIC HI as appropriate.
3. Turn the record volume control **15** for channel I which is not in use, fully down.
4. Press the record pre-selector button CHANNEL I **32**
5. Depress the PLAY button **21** and the REC button **23** simultaneously.
6. Turn the record volume control right **17** for channel II up until the correct recording level is obtained.

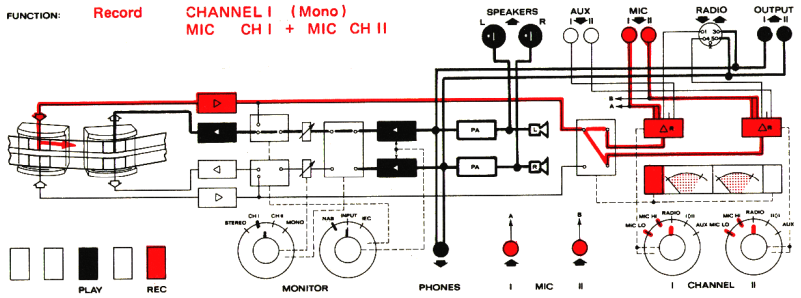


7. The switch settings for monitoring remain the same.

Recording TRACK 1 (track 2)

Microphones in the inputs **MIC CH I** and **MIC CH II**
MIXER OPERATION

1. Plug a microphone into each of the inputs MIC CH I and MIC CH II.
2. The input selector switches for channel I and channel II should be set to MIC LO or HI in accordance with the microphones in use. High and low impedance microphones may be used together.
3. Press the record pre-selector button CHANNEL I **32** **(release CHANNEL II button).**
4. Depress PLAY and REC buttons simultaneously.
5. The volume from each microphone can be controlled separately.
   The record volume control channel I **15** controls the microphone on CH I.
   The record volume control channel II **17** controls the microphone on CH II. The illuminated VU - meter reads the sum of the two channels.



6. The switch settings for monitoring remain the same.

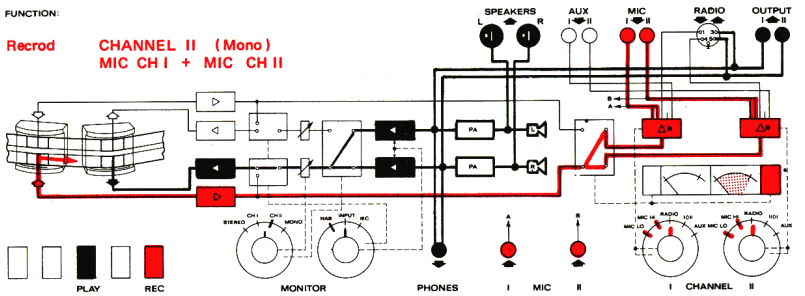
PARALLEL TRACK RECORDING

Recording of track 2 (track 3 in the case of quarter track machines) on the lower half of the head in the same direction as the upper track. (Contrary to international standard).

To record TRACK 2 (track 3)
Microphones in the input MIC CH I and MIC CH II
Mixer operation

The switch settings are the same as in the previous section (mixer operation / record track 1) except that for recording of track 2, the record pre-selector button **35** CHANNEL II must be pressed instead of CHANNEL I.
(Release channel I button).

Everything else is the same.
For monitoring the playback function switch **12** should be set to CH II.

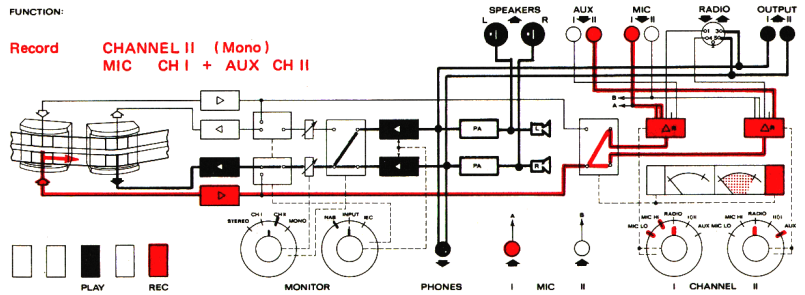


MIXER OPERATION with different signal sources.

The mixing facilities are not limited to the use of microphones.
Any input to channel I (CH I) may be mixed with any input to channel II (CH II).
All that is necessary is to set the input selector switches accordingly. The following sample should illustrate this :

Input MIC CH I : microphone
Input AUX CH II : record player or tape recorder
Record : TRACK 2 (or track 1)

1. Set the input selector switch left **16** for channel I to MIC LO or HI
2. Set the right hand input selector switch **18** for channel II to AUX.
3. Press the record pre-selector button CHANNEL II **35** (or CHANNEL I)
   (The record pre-selector button for the channel which is not being used should be released).
4. The mixing is carried out by means of the record volume control channel I **15** for the microphone and the record volume control channel II **17** for the AUX input.
5. The monitoring will depend on the record channel selected : set playback function switch **12** to CH II (or CH I).



9.2. STEREO RECORDINGS

Two simultaneous tracks are necessary for stereophonic recording. The left hand channel is recorded on the upper track 1, the right hand channel on the lower track 2. (Tracks 1 + 3 and 2 + 4 in the case of quarter track machines).
Stereo recordings can be made via any of the three inputs, both input selectors must be in the same position for this purpose : MIC, AUX or RADIO.
The left hand channel must always be connected to the selected input to channel I : CH I.
The right hand channel must always be connected to the selected input to channel II : CH II.

Example : Stereo recording from microphones.

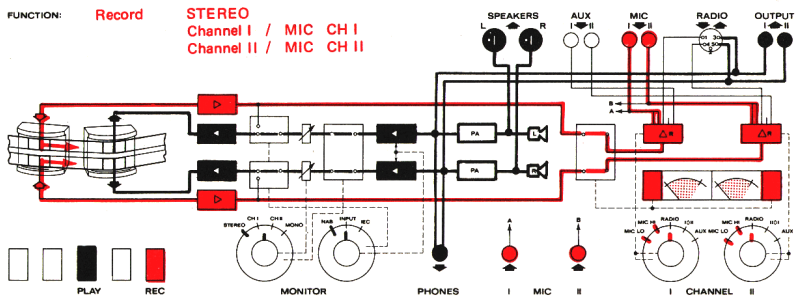
1. Connect two microphones of the same type or one stereo microphone to the MIC inputs. The left hand microphone to CH I, the right hand one to CH II

2. The input selectors should be set to MIC LO or MIC HI in accordance with the type of microphone in use.

3. The volume from the left hand microphone is controlled with the left hand record volume control channel I **15** . The volume from the right hand microphone is controlled with the right hand record volume control channel II **17** .

4. Depress the two record selector buttons CHANNEL I **32** and CHANNEL II **35** **simultaneously.**

5. The VU-meters will read the record level for the two channels separately.



6. Monitoring :

Set playback function switch **12** to : STEREO

It is absolutely essential for monitoring stereo recordings that the balance control **13** is set to the marked centre position. The balance of stereo recordings is acheived by means of the record volume controls (section 12, stereo record level).

9.3. SUMMARY RECORD

1. Set POWER switch **7** to the desired tape speed and the tape spool diameter in use.

2. Set the input selector switches channel I **16** (left) and channel II **18** (right) to the desired input.

3. Always turn the record volume control of a channel which is not in use fully down.

4. Press record pre-selector buttons :

MONO

CHANNEL I **32** = recording via channel I i.e. the upper part of the record head.
(track 1 or 2)

CHANNEL II **35** = recording via channel II i.e. the lower half of the record head.
(track 2, parallel track operation)
(track 3 or 4 with quarter track machines)

Always release the record pre-selector button of a channel which is not being used !

STEREO

Depress CHANNEL I **32** and CHANNEL II **35** buttons simultaneously.

Recording on both tracks simultaneously. Tracks 1 + 2, (tracks 1 + 3 or 2 + 4 in the case of quarter track machines). The left hand channel CH I corresponds with the upper half of the record head, the right hand channel CH II with the lower half of the record head.

5. The inputs CH I are controlled with the left hand record volume control **15.**
The inputs CH II are controlled with the right hand record volume control **17**

6. Depress the PLAY button **21** and the REC button **23** **simultaneously.**

7. Monitoring

Set the playback function switch in accordance with the type of recording.

Mono CHANNEL I **or** CHANNEL II : CH I **or** CH II
Stereo CHANNEL **and** CHANNEL II : STEREO

Set the before/after tape monitor switch **14** to NAB and the balance control **13** to the marked centre position.
Adjust the monitoring volume by means of the playback volume control **11.**

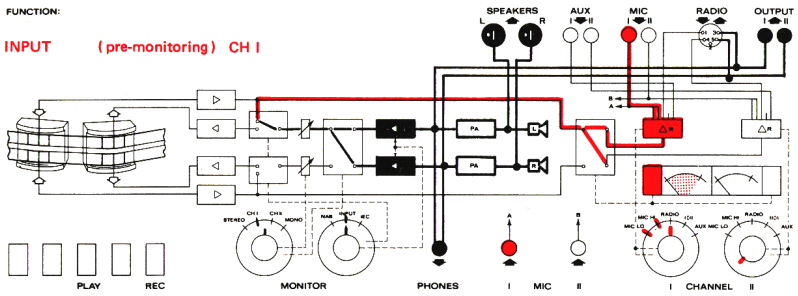
When monitoring with headphones switch the speakers off by pressing the SPEAKERS OFF button **41** .

10. MONITORING THE INPUT SIGNAL

When the machine is set up for recording, the input can be pre-monitored by setting the before/after tape monitor switch **14** to INPUT.

The signal which goes to the record channel via the record volume control is thereby switched directly onto the playback amplifier.

The block schematic below shows how a microphone on input MIC CHI switched to CHANNEL I may be direct monitored.



The tape may of course be started in record by simultaneously pressing the PLAY and REC buttons whilst monitoring the input signal directly.
By switching the before/after tape monitor switch **14** from INPUT to NAB, the quality of the recording may be compared directly with the input signal " before tape ".

11. OPERATION AS AMPLIFIER

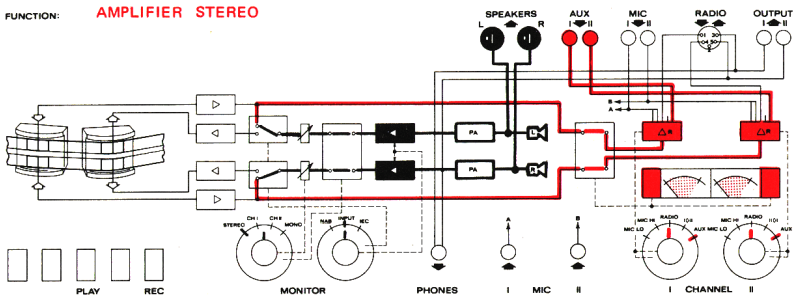
When monitoring the input the REVOX 77A operates as an amplifier only. With machines equipped with built-in output amplifiers, this operating mode can be employed usefully.

E x a m p l e : Amplifier for FM stereo tuner

The basic switch settings are the same as for recording except that the before/after tape monitor switch **14** must be set to INPUT and the PLAY and REC buttons are not depressed.

1. Connect tuner to the AUX input **27** . (CH I left, CH II right)
2. Set the input selector channel I **16** and channel II **18** to AUX.
3. Depress the record pre-selector button CHANNEL I **32** and CHANNEL II **35**
4. Adjust the record volume controls so that the VU meters show full modulation (zero db) at peak volume. (Stereo record level).

5. Set the before/after tape monitor control switch **14** to INPUT
6. Set the playback function switch **12** to STEREO
7. The volume should be controlled with the playback volume control **11** only. The setting of the record volume controls should not be altered (stereo balance !). The stereo balance should be corrected if necessary by means of the balance control **13** .

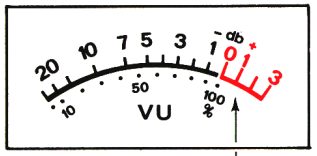


12. RECORDING LEVEL

Every magnetic tape has a certain useful range of recording levels. The minimum recording level is limited by the tape background noise, the maximum record level by the saturation point of the tape. The useful range of the tape determines therefore the maximum dynamic range that can be achieved.

In order to achieve the best possible dynamic range it is therefore important to set the recording level in such a way that the tape is fully modulated at maximum volume. For the accurate control of the recording level, the REVOX 77A has two calibrated VU meters.

VU meters measure volume units. Their characteristics are accurately defined by the ASA (American Standards Association) standards.



The upper portion of the scale is calibrated logorithmically in dbs, the lower portion has a linear scale in per cent.

F u l l m o d u l a t i o n corresponds to :
zero db or 100 %

The red region of the db scale indicates danger of **over-modulation.**

The record volume controls should be adjusted in such a way that a s u s t a i n e d fortissimo passage will give a reading of zero db (100 %).

It is important to note that the inertia of the meter movement makes it impossible to indicate very short pulses (transient volume peaks).
The instrument is therefore calibrated with a lead of 6 db.

Continuous over-modulation or very high peaks will cause distortion in the recording. On the other hand, if the recording level is too low the tape background noise will become noticeable and this is particularly serious if copies have to be made of the recording, because the tape background noise voltages are added to each other in copying. With a low recording level, the background noise will therefore soon become objectionable.

STEREO RECORD LEVEL

When making stereo recordings, it is particularly important to maintain the correct balance between left and right hand channels (centre image).
If one of the record volume controls is altered, the image centre will be shifted.

Once the sound image is in the centre, the record volume controls could only be moved together in the same sense and by the same amount.

Furthermore it is very important for the live monitoring of a recording before and during record that the balance control **13** in the playback side is set to the marked centre position.

13. SOMETHING ABOUT MICROPHONES AND RECORDING TECHNIQUES

When recording from a radio tuner or record player all that is necessary to obtain first class results, are proper connections and the correct level.

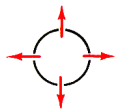
When making a live recording, the choice of the microphones and their positioning become additional vital factors.

13.1. DIFFERENT TYPES OF MICROPHONE

The characteristic of a microphone is its sensitivity to sound waves arriving from different directions in space.
The characteristic lays down the accoustical behaviour of a microphone.

An omni-directional microphone has the same sensitivity in all directions.
Microphones with cardiode characteristic are only sensitive in their forward direction and to either side of it.
Amongst condenser and ribbon microphones there are furthermore, microphones with figure-of-eight characteristic. As the name says, their sensitivity curve has the shape of the figure 8.

Which type of microphone should be used depends on the type of recording and on the accoustical conditions around the microphone.



Omni-directional microphones

For outdoor recording when all ambient sounds are required. (e.g. commentaries).
For recordings in rooms with good accoustic properties or where the room accoustics are desirable. (Small accoustically dead rooms).

Cardiode-microphones

Suitable for outdoor as well as indoor recording. For successful indoor recording in rooms which are accoustically unfavourable.
For X / Y stereo recordings.

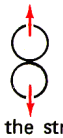


Figure-of-eight microphones

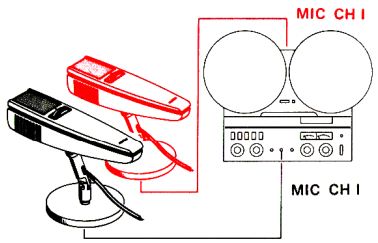
For the straight recording of dialogue. As presence microphone for solo instruments which are to be picked up specially. Together with a cardiode microphone for M / S stereo recording.

It will be seen from the above that cardiode microphones are true all purpose microphones. A highly recommended microphone of this type is the new REVOX microphone with adjustable bass cut.

Dynamic microphones without transformers have a low impedance output (50 - 600 ohms) and may be connected to the REVOX 77A via long cables.
(Position : MIC LO).
With microphones with built-in transformers the length of the cable should be kept as short as possible. (Position : MIC HI).
Condenser microphones have a built-in pre-amplifier and may be connected via long leads. (Position : MIC HI).

If more than two microphones are being used simultaneously they have to be mixed by means of a separate mixer. The high level output of the mixer is then connected to the AUX input **27** of the REVOX 77A.

In order to achieve a very directional characteristic two identical cardiode microphones may be connected in parallel to each channel of the REVOX 77A (CH I front / CH I rear, CH II front / CH II rear).



In this case the following conditions must be observed. The two microphones should be right beside one another and point in the same direction.

The two microphones must also be in phase.

If a severe loss of bass is noted when connecting two microphones in parallel, the phase of one microphone should be reversed in the plug.

13.2. ROOM ACCOUSTICS

In the case of indoor recordings the accoustics of the room are of vital importance. The sound which reaches the microphone is made up of two components, the direct sound which arrives in a straight line from the sound source and the reverberated sound which is reflected from the walls, floor and ceiling and which arrives a fraction later.

The frequency characteristic, the delay and the duration of the reverberation forms what is normally referred to as " room accoustics ".

The ratio of direct sound to reverberation can be varied as required and depends in a room with given properties, only on the distance between the sound source and the microphone.
Speech recordings are always made close up unless special effects are to be achieved. If very clear diction is desired the recording is done very close to the microphone

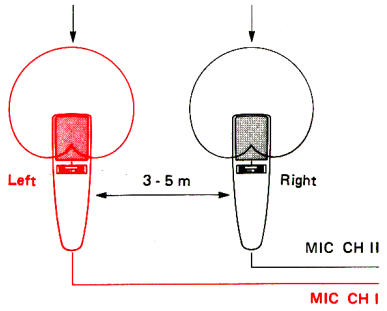
(4 - 8 inches) and with reduced speech level. This will also boost the low frequencies considerably. By contrasting these with large scale recordings which include room accoustics, it is possible to achieve impressive depth even with mono recordings.
In the case of music recording, the reverberation plays a fundamental part as it helps-if correctly used - to blend the sound of the individual instruments together.
If, however, the reverberation content is excessive, the crispness is lost and the recording will sound blurred.
A stereo recording can always stand more reverberation than a mono recording as the spacial resolution helps to differentiate the sounds. Stereo recordings will therefore tend to give better results in accoustically unfavourable rooms.

In the framework of an operating manual it is impossible to go beyond stating certain general rules about recording techniques as the microphone positioning is closely dependent on the local conditions. The best way of achieving good recordings is by training ones ear. Once a person can tell the faults and shortcomings of a recording set-up, their correction is just around the corner.

13.3. STEREO METHODS

Stereo recordings can be made in several ways. The different systems are known as AB, XY and MS stereo recording.

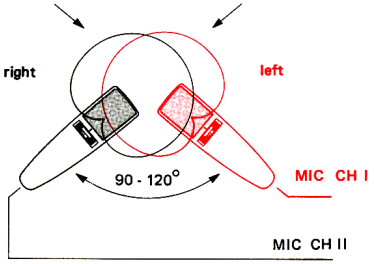
AB STEREO RECORDINGS



For " home recordings " the microphone positioning in accordance with the AB method is admirably suitable.
Two cardiode microphones with similar characteristics are placed about ten to fifteen feet apart.
For initial attempts, two omni-directional microphones of different types may also be used, the method will " work " even so. In the positioning of the microphones particular care should be taken that the centre image is not lost. The microphones should not be too close to the sound source. The microphone distances and the balance of the record volume controls should be chosen in such a way that a person speaking in the centre will appear to be in the centre. AB stereo recordings are not necessarily compatible. As intensity as well as phase angle differences contribute to the AB stereo effects, interference phenomena may occur if the two channels are connected together which would upset the linearity of the frequency response.

XY STEREO RECORDINGS

For the XY method two very similar cardiode microphones are again required.



conversion in MS :

L + R = sum signal
L – R = difference signal

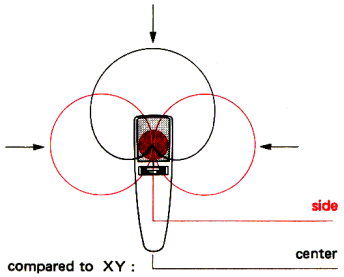
The microphones are however mounted as close beside or above one another as possible as shown in the adjacent illustration. Furthermore, the microphones are turned at an angle of 90 to 100° relative to one another.

The microphone arrangement in accordance with the XY system will produce compatible recordings . Both channels connected together will give an acceptable mono signal. (Pure intensity stereo) Soloist and auxilliary microphones can be mixed into both channels in proportion by means of stereo mixers with AB as well as with XY stereo systems. The apparent position of the soloist will then depend on the setting of the direction mixer.

Polarity : for correct operation, it is important that the two microphones are in phase. This can be checked very easily, as follows : set the microphones up. Press the record pre-selector button CHANNEL I **32** , set the playback function switch **12** to CH I and both record volume controls in the same position. (Mono setting). If when speaking closely into the microphone, the bass end appears to be heavily cut, the polarity of one of the microphones should be reversed in the plug.

MS STEREO RECORDINGS

The MS system is not directly usable for an amateur as the microphones do not provide a left and right hand signal as such.



compared to XY :

center = sum signal = L + R
side = difference signal = L – R

The basic microphone is a cardiode microphone. The second microphone must have a figure-of-eight characteristic. For this reason, switcheable condenser microphones are generally used for MS stereo recordings.

The polarity (phase) of the cardiode microphone will be independent of the direction of the sound source. The side microphone with the figure-of-eight characteristic however, will provide an output voltage which will be in phase with the centre microphone for signals coming from one side and out of phase for signals coming from the other side.

The left and right hand channel must then be obtained by means of a sum and difference network. The MS and XY systems are closely related. The centre signal of the MS set up is electrically identical with the sum signal L + R from an XY system. In the same way, the side signal is the same as the difference signal L - R. The magnitude of the side signal (difference signal) determines the spread of the sound source.

The centre signal (L + R) and the difference signal (L - R) are particularly important because they are the signals radiated by a stereo multiplex transmitter.
The main carrier is modulated with the centre (sum signal) the auxilliary carrier with the side (difference signal). The stereo detector in the receiver turns this back into left and right hand signals. A mono receiver can only receiver the main carrier i.e. the centre signal which will be a true mono signal in both cases.
The MS stereo system is therefore compatible the same as the XY system.

14. FURTHER POSSIBILITIES FOR THE EXPERIENCED

14.1. TAPE EDITING

Magnetic tape is the only recording medium which can be cut and spliced without any restrictions. All that is necessary is a pair of n o n - m a g n e t i c scissors and some special splicing tape.

Splicing is purely a matter of practise. The following instructions should therefore be regarded as a basic guide only. You will soon find your own personal ways to make the job quicker and easier. The REVOX 77A was designed with tape editing specially in mind.

Tape editing consists of three basic processes :

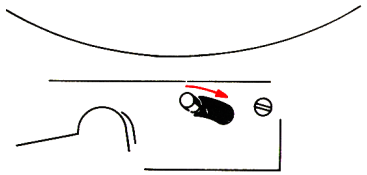
A. Switching the mechanism to editing
B. The editing itself, and
C. switching the machine back to the normal PLAY position.

A. S w i t c h i n g t h e m e c h a n i s m t o e d i t i n g

1. Press the SPOOLING MOTORS OFF button **42** .
   This will disconnect the spooling motors.

2. Press the Fast Rewind button ≪ **19**. This will release the spooling brakes.
   The tape spools can now be rotated freely.

3. Move the editing lever **40** to the right as far as it will go.
   This will move the pressure roller in sufficiently for the tape to contact the heads but not far enough for it to be gripped by the capstan.



The machine is now ready for the actual editing.

B. E d i t i n g

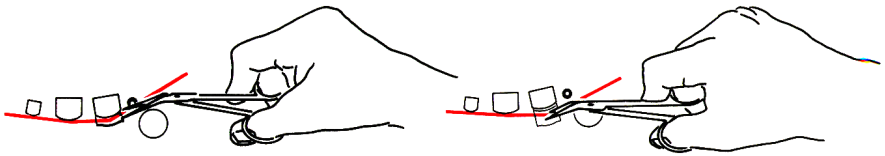
By turning the tape spools slowly by hand, the cutting position can be located accurately. The tape is thereby played back quite normally via headphones or loudspeakers.

The choice of the cutting point is very important. If spoken text, for instance, is to be joined to a piece of music, care should be taken that the music has faded out completely. One should therefore cut only beyond the point where the music has disappeared below the tape hiss. (Turn the volume up to make it easier to hear).

Once the cutting point has been located by moving the tape to and fro, it is situated over the gap in the playback head. The cutting may be done in two different ways.

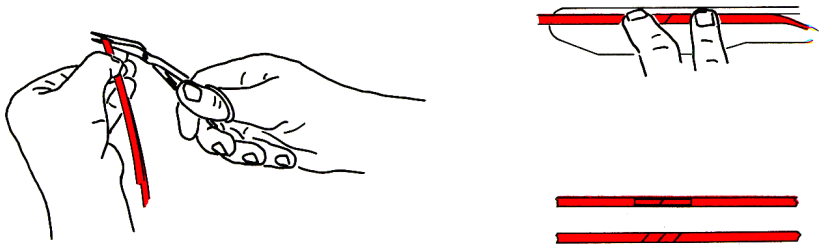
1. The back of the tape is marked with a chinagraph across the middle of the playback head **47** .
   The tape is then lifted out of the guides and cut. The remaining traces of grease must be removed afterwards. This method is particularly suitable if a short piece, e.g. a cough, is to be cut out.

2. The tape may also be cut directly across the playback head (remove the editing block **37** from the head block). For this purpose the open scissors are brought over the tape between the playback head **47** and the guide post **48** and is then moved along the tape until it is exactly in front of the playback head.



The tape is then pulled away from the head, by means of the scissors and cut at an angle of 45 degrees. This method is also very accurate and furthermore much quicker, but it requires more practise.

The two tape ends which are to be joined together must fit exactly. This can be achieved by placing the two tape ends on top of one another (emulsion side down) and trimming them at an angle of about 45 degrees.



The REVOX 77A is fitted with a special splicing block **37** for joining the tape. The tape ends are inserted into the groove, emulsion downwards and then pushed together with two fingers. The tape ends must not overlap and should be butt-jointed without any gap between them.
Special jointing tape should be used for splicing. The narrow splicing tapes are for jointing in the same direction as the tape.

If a wide jointing tape is used, the tape should be accurately trimmed on both sides. Under no circumstances must the jointing tape protrude beyond the edge of the magnetic tape.

C. Switching back to normal PLAY position

The spliced tape is laced in again and can be checked immediately.

1. Press STOP button **22**
2. Press the SPOOLING MOTORS OFF button **42** again in order to release the button.
3. Press the PLAY button **21** . The editing lever is thereby automatically released.

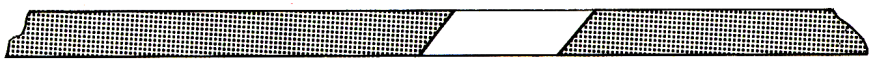
The contact arm must not be left in the editing position during fast wind otherwise the tape would remain in contact with the heads (head wear).

14.2. AUTOMATIC TAPE STOP

The REVOX 77A has an exclusive end of tape switch which functions optically. The control element **36** which does not touch the tape is mounted between the erase and the record head.

When the tape has come to its end or if a splice breaks, a beam of light falls on the photo resistance and the mechanism is automatically electronically switched back to STOP from any operating mode.

This automatic system can be easily adapted for other purposes.
By inserting a piece of transparent tape, the machine can be switched to stop at any desired point.



If the automatic STOP should only work from the PLAY position the transparent tape should have a length of about half an inch.

If, on the other hand, the automatic STOP should also work during fast wind, the length of the transparent tape should be about four inches.

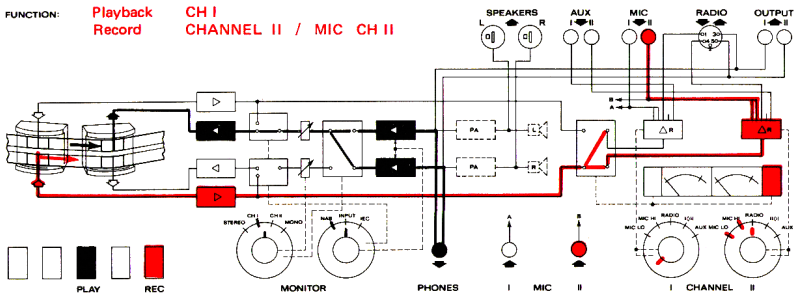
With some magnetic tapes, the magnetic emulsion can be removed by means of solvents (acetone) so that no transparent leader tape is required.

Special applications

Apart from the normal record and playback switch settings, the REVOX 77A can be used for a number of special applications. The straightforward construction with completely separate amplifier channels and three stereo heads provides particular advantages. The two tracks can be played back or recorded simultaneously and completely independently from one another.

14.3. DUO PLAY RECORDINGS

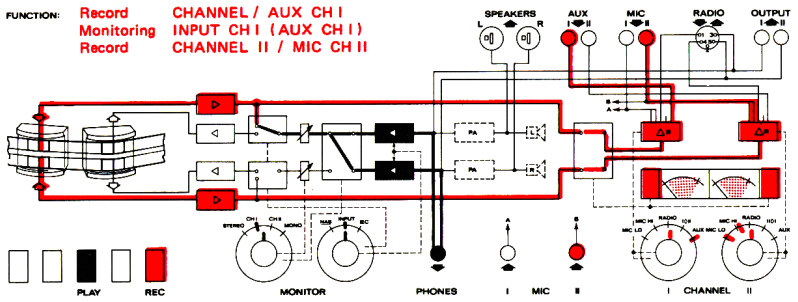
For studying languages for example, a speech record or a radio news bulletin is recorded onto track 1. Whilst monitoring track 1, one's own pronunciation is recorded on track 2. Subsequently both recordings can be monitored and compared simultaneously (duo-play) or alternately.



1. Set the playback function switch **12** to CH I
2. Turn the playback volume control **11** up.
3. Set the before / after tape monitor switch **14** to NAB and monitor track 1 with headphones.
4. Connect microphone to MIC CH II input.
5. Press the record pre-selector button CHANNEL II **35** (recording track 2)
6. Turn the volume control for channel II **17** up. Record level shown on VU meter CH II.
7. Depress PLAY button **21** and REC button **23** simultaneously.

14.4. SIMULTANEOUS RECORDING

For practising simultaneous translating track 2 (the translation) can be recorded simultaneously with track 1 (the original)



1. Connect the original speech from tuner, amplifier, record player (or radio) to AUX CH I (or RADIO CH I)
2. Set input selector switch channel I **16** to AUX (or RADIO)
3. Record volume control for channel I **15** controls the level of the original language.
4. Set the before / after tape monitor switch **14** to INPUT.
5. Set the playback function switch **12** to CH I.
   The original language can thereby be monitored on headphones without delay. (Kill the loudspeakers by means of the SPEAKERS OFF button **41**).
6. Connect the microphones for the translation to MIC CH II.
7. Switch the input selector switch channel II **18** to MIC LO or MIC HI.
8. The record volume control channel II **17** controls the recording level of the translation.
9. Depress the record pre-selector button CHANNEL I **32** and CHANNEL II **35** simultaneously (as for stereo recordings). Depress the PLAY **21** and REC **23** buttons simultaneously.

Commentator training for TV screen.
In a similar way it is possible to train as commentator.

1. Record television sound on track 1 (connect TV headphone output to AUX CH I input)
2. Turn the playback volume control fully down (or press SPEAKERS OFF button) for silent recording.
3. Record your own commentary on track 2 (MIC CH II).

Playback of duo play (simultaneous) recordings.

1. Set the before / after tape monitor switch **14** to NAB.
2. By setting the playback function switch **12** to CH I and CH II alternately, the two tracks can be compared with one another. In the STEREO position, both tracks will be heard simultaneously. With headphones, track 1 will be heard in the left ear and track 2 in the right ear.

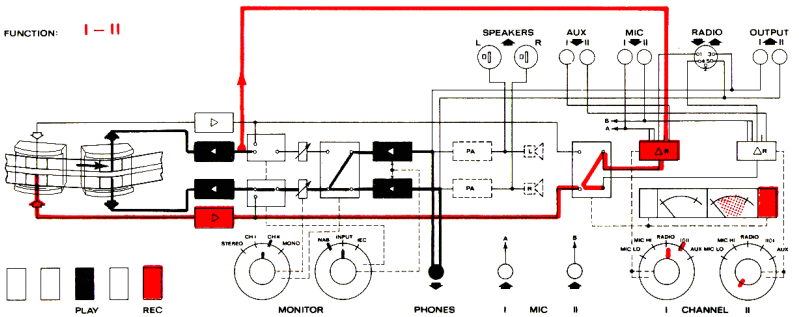
14.5. DUBBING FROM TRACK TO TRACK

As the REVOX 77A can simultaneously playback from one track and record on the other, it is of course, possible to re-record (dub) from one track to the other. No external connections are necessary for this purpose as the input selectors are provided with the special switch positions I - II and II - I.

For dubbing from track to track the same rules apply as for dubbing in general. The original recording should have a good level. If the level is low, the background noise from the original tape will be copied at high level and a serious noise increase will result.

The previous block schematic circuit diagrams did not show the internal connections for track dubbing for reasons of clarity. In the following diagrams these connections are included in the circuit.

DUBBING FROM TRACK I TO TRACK II (1 to 3 or 2 to 4 in the case of quarter track machines .)



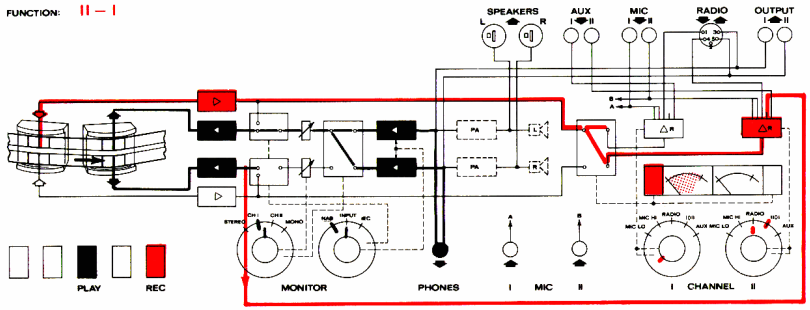
1. Set the input selector for channel I **16** to I - II.
2. The record level for track 2 is controlled by means of the record volume control for channel I **16** . (Turn the record volume control for channel II fully down).
3. Press the record pre-selector button CHANNEL II **35**
   (release CHANNEL I button)
4. Set the before / after tape monitor switch **14** to NAB.

5. Set the playback function switch **12** to CH II. Monitor via headphones (as shown in circuit diagram) or loudspeaker.

6. Depress the PLAY button **21** and REC button **23** simultaneously.

The copy of track 2 is displayed relative to the original on track 1 by the distance from the playback head to the record head i.e. it lags by about . 175 sec at 7 1/2 ips. or 35 sec at 3 3/4 ips.

DUBBING FROM TRACK II TO TRACK I (3 to 1 or 4 to 2 in the case of quarter track machines).



1. Set the input selector for channel II **18** to II - I.

2. The record level for track I is controlled by means of the record volume control for channel II **17** (turn the record volume control for channel I fully down).

3. Press the record pre-selector button CHANNEL I **32** **(release channel II button).**

4. Set the before / after tape monitor switch **14** to NAB.

5. Set the playback function switch **12** to CH I. Monitor via headphones (as shown in circuit diagram) or loudspeaker.

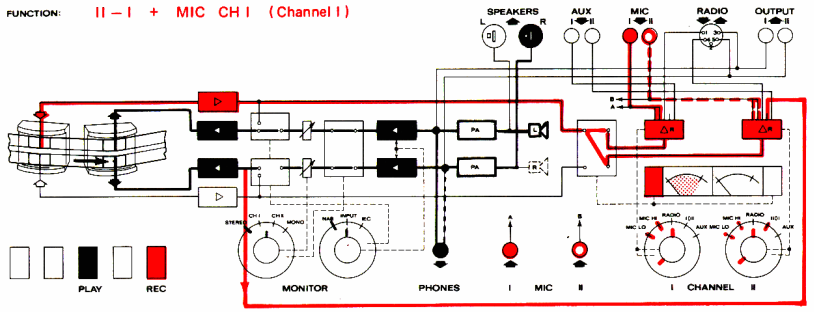
6. Depress the PLAY button **21** and REC button **23** simultaneously.

This dubbing arrangement can be elaborated in a variety of ways. Let us assume the following situation in making a radio play :

It is desired to fade across from a radio announcement (news, etc.) to a drawing room setting. The beginning of the announcement is taken directly. One then fades slowly over into the drawing room so that the end of the announcement is heard in the room via the loudspeakers and the scene can run on from there directly.

The radio announcement is acorded initially on track 2. It is then dubbed onto track 1 whilst fading over into the sitting room.

DUBBING FROM TRACK TO TRACK The track 2 is dubbed onto track 1 whilst fading over to MIC CH I.



1. Set the input selector for channel II **18** to II - I.

2. Connected the microphone to the MIC CH I input. If a second microphone is required after the cross fading, this may already be plugged into the MIC CHII input.

3. The level of track 1 (dubbing) is controlled by means of the record level control for channel II **17** .
The record level on the first microphone (dubbing) is controlled by means of the record volume control for channel I **15** .
(The record levels on the second microphone will later on be controlled with the record volume control for channel II **17** .)

4. Press the record pre-selector button channel I **32**
(release the channel II button).

5. Set the before / after tape monitor switch **14** to NAB.

6. Set the playback function switch **12** to STEREO

7. The loudspeaker for the radio announcement in the room is connected to the right hand speaker socket **26.**

8. The recording is monitored via the left hand loudspeaker or the left hand speaker socket **26** .
If the recording is monitored via the left hand earpiece, the loudspeaker can be cut out by means of the SPEAKERS OFF switch **41** when the cross fading is completed. At the same time the playback function switch **12** may be changed from STEREO to CH I. The recording can then be monitored through both earpieces of the headphones again.

The cross fading is carried out as follows :

1. Record volume control for channel I **15** is turned fully down, the record volume control channel II **17** is turned up to the required amount for the direct dubbing of the radio announcement (or it may be turned up just after starting the tape).

2. Press the PLAY **21** and REC **23** buttons simultaneously. (Recording track 1).

3. While the radio announcement is being dubbed from track 2 to track 1 which is also heard in the room, the first microphone is faded in by turning the record volume control for channel I **15** slowly up. At the same time the radio announcement is faded out by turning the record volume control for channel II **17** slowly down.

   After the cross fading the end of the radio announcement is only picked up by the microphone in the room and the scene can run on directly from there.

   It is advisable to rehearse the cross fading a few times as it is difficult to get the right speed of fading out and in the first time. The ratio of the loudspeaker volume in the room and the monitor volume can be adjusted by means of the balance control **13** .

4. After the cross fading when the record volume control for channel II **17** is turned fully down, the input selector switch for channel II **18** can be switched over to MIC. This makes two microphones available for recording the scene.

   This circuit arrangement is in fact a form of multiple recording. It can also be employed in reverse.

In this act an entertainer sings or whistles a tune. The orchestral part is to be mixed in slowly and in sync. For this purpose the tracking method is used which is best known from television. The entertainer hears the orchestral melody from track 2 via headphones. He will sing in sync with the orchestra and of course also in tune with it. The record volume control for channel II which controls the dubbing to track 1 is at first turned down. As soon as the orchestra is required this volume control is turned up and the record volume control for channel I (microphones) is turned down. (This volume control may also be left on if our entertainer wants to sing a duet with a singer on the original recording).

This method is used in the multiple tracking system. This method was made famous by the American guitarist Les Paul who produced the effect of a whole orchestra by means of his one instrument (Les Paul effect).

The amateur can achieve some very interesting effects by means of multiple tracking. The REVOX 77A is eminently suitable for this purpose as it has excellent signal to noise ratio as well as the basic facilities for track to track dubbing.

14.6. MULTIPLE TRACKING

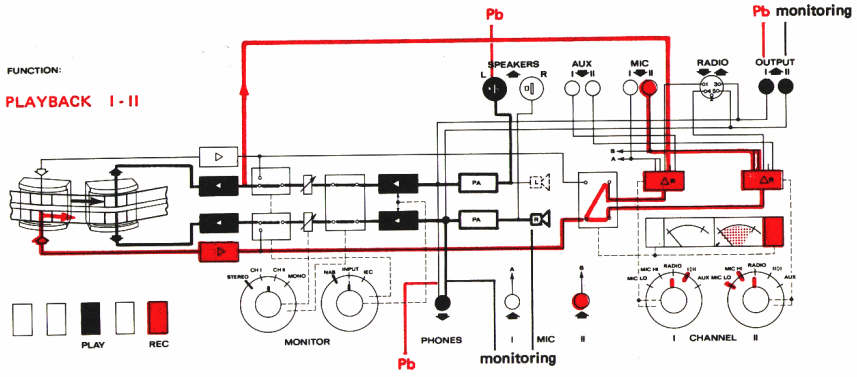
Multiple tracking enables one to sing or play duets, to record a voice or an instrument several times with itself to give you an effect of several voices or instruments.

The recording method is as follows :

The basic part or melody is recorded on one track with a full recording level. This track is then dubbed onto the other track in the usual manner. At the same time, the second part is mixed in and the performer keeps in time (sync) by listening to the first track via headphones (or loudspeaker).

The recording of the second track which now contains two parts is dubbed onto the first track. The third part is mixed in at the same time. It is synchronised by means of the recording on the second track which contains two parts. The three part recording on the first track may then be dubbed back onto the second track while mixing in a fourth part. The number of dubbings in this multiple tracking is only limited by the tape background noise which adds up with every dubbing and finally becomes noticeable.

Playback tracking from track 1 to track 2 I - II (Track 1 to track 3 or 2 to 4 in the case of quarter track machines).



1. To start with record the basic melody or part on track 1.
   (A good recording level is important).
2. Connect the microphone to the input MIC CH II.
3. Set the input selector switch for channel II **18** to MIC LO or HI.
4. The record volume control for channel II **17** controls the portion of the second part which is being added in.
5. Set the input selector switch for channel I **16** to I - II.

6. The record volume control channel I **15** controls the dubbing from track 1 to track 2.

7. Press the record pre-selector button CHANNEL II **35** (**release CHANNEL I button**). The record level will be shown on the VU-meter, CHANNEL II **34.** The VU-meter will show the sum of the dubbing and the microphone portion. During the dubbing it is again very important to maintain a good recording level.

8. Set the playback function switch **12** to STEREO

9. Set the before / after tape monitor switch **14** to NAB (for rehearsing this switch may be set to INPUT).

10. The playback loudspeaker for the recording room is connected to the left hand speaker socket **26** .
In the case of separate output amplifiers connect to OUTPUT CH I **30.** If the playback is monitored via headphones these should also be connected to the loudspeaker socket "left". (Loudspeaker plug). The headphones can also be connected on the jack socket PHONES **8** on the front panel, but in this case only the left hand earpiece should be used. (The right hand earpiece should be covered or turned the other way around).

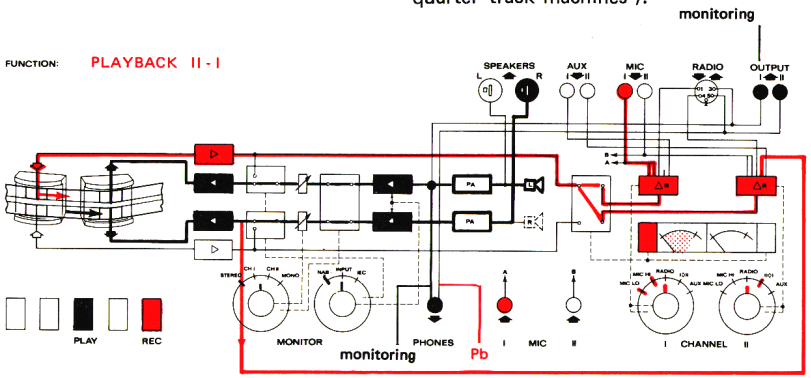
11. The monitoring before and during record is done via the right hand loudspeaker. In the case of separate output amplifiers via OUTPUT CH II **30** or with headphones " jack socket " via the right hand earpiece.

12. The playback and the record monitoring volume is adjusted by means of the volume control **11** .

13. The radio between the playback and the monitoring volume can be adjusted by means of the balance control **13** .

14. To record on track 2, depress the PLAY **21** and REC **23** buttons simultaneously.

Playback tracking from track 2 to track 1 (track 3 to 1 or 4 to 2 in the case of quarter track machines).



The first dubbing is now on track 2. When dubbing to track 1, the original recording on track 1 will be erased. The first dubbing on track 2 must therefore be final because it cannot be repeated later on without starting from the very beginning.

1. Plug the microphone into input MIC CH I.

2. Set the input selector switch channel I **16** to MIC LO or HI

3. The record volume control channel I **15** controls the level of the third part which is being added.

4. Set the input selector channel II **18** to II - I

5. The record volume control channel II **17** controls the dubbing level from track 2 to track 1.

6. Press the record pre-selector button CHANNEL I **32** (**release CHANNEL II button**). The VU meter CH I **33** will show the sum of the dubbing and the microphone. It is important to maintain a full recording level.

7. Set the playback function switch **12** to STEREO

8. Set the before / after tape monitor switch **14** to NAB (for rehearsing this switch should be set to INPUT).

9. Connect the playback loudspeaker or headphones to SPEAKERS right **26.** If separate output amplifiers are used, connect to OUTPUT CH II **30.** If headphones are used via the PHONES socket **8** use right hand earpiece.

10. Monitoring before and during record via left hand loudspeaker. In the case of separate output amplifiers via OUTPUT CH I **30.** If headphones are used via PHONES socket **8** left hand earpiece.

11. Adjust playback and monitoring volume by means of the volume control **11** . The ratio between playback and monitoring volume can be adjusted by means of the balance control **13** .

12. To record on track 1, press the PLAY **21** and REC **23** buttons simultaneously.

The recording on track 1 which now contains three parts (treble tracked) can be dubbed back to track 2 with the switching arrangement I - II. In this way it is possible with good tape and correct recording level to make recordings with up to about six parts.

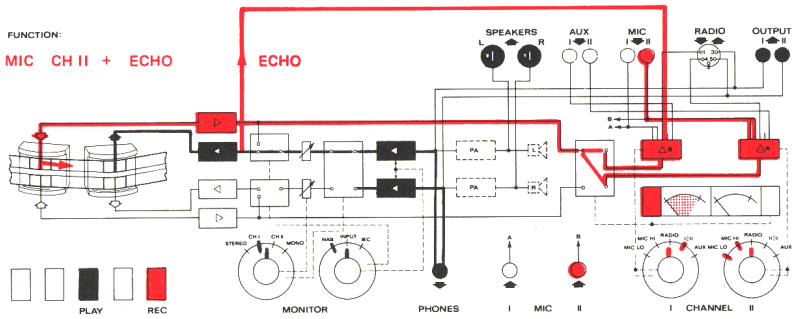
14.7. ECHO ARRANGEMENTS

Due to the separate record and replay heads it is possible to obtain true echo effects without additional equipment.

During recording the playback signal is available which is of course delayed. If this signal is fed back to the record head it is re-recorded with this delay. This first echo goes back to the playback head and will produce a second echo with the same delay. This is fed back again thereby producing a third echo, etc.
If the volume control for the echo is set in such a way that the signal is weakened, each echo will be weaker than the previous one and the echo will therefore fade out gradually.

The delay between the individual echos depends on the tape speed and is app. .175 seconds at 7 1/2 ips. and app. .35 seconds at 3 3/4 ips. The frequency of the echo will be lower at the lower tape speed.
The effect is different and one should experiment with it for best results.

Echo arrangement for recording



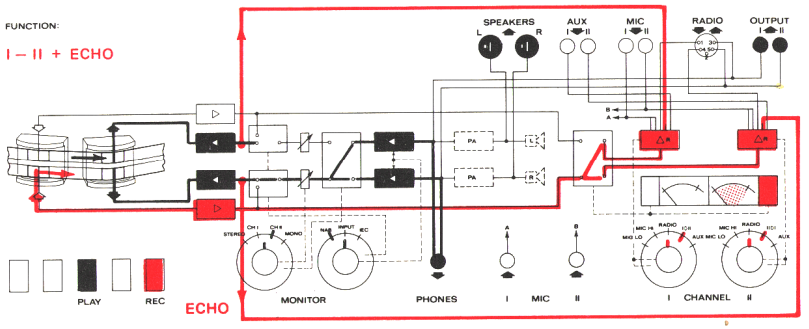
1. Connect microphones to input MIC CH II.
2. Set the input selector switch for channel II **18** to MIC LO or HI
3. The record volume channel II **17** controls the direct portion of the recording (microphone). This portion should always be as high as possible (without causing over modulation in combination with the echo).
4. Set the input selector switch channel I **16** to I - II.
5. Press the record pre-selector button CHANNEL I **32**
   (release CHANNEL II button).
6. The record volume control for channel I **15** will determine the amount of echo. If it is turned up only a little the echo will be weak and will fade away rapidly.

If the control is turned up too high, the level of the echo will become as strong or stronger than the microphone level and the strong feedback will cause oscillation. This may be desirable for special effects).

7. Set the before / after tape monitor switch **14** to NAB.
8. Set the playback function switch **12** to CH I

If the recording is to be made on track 2, the microphone should be connected to MIC CH I.
The input selector for channel II **18** should be set to II - I. The functions of the record volume controls will also be reversed (channel I **15** microphone / channel II **17** echo).
Press the record pre-selector button CHANNEL II **35** , record monitoring CH II **12** .

Echo arrangement for an existing recording



1. The recording to which the echo is to be added is on t r a c k 1. In order to add the echo it is dubbed onto track 2.
2. Set the input selector switch channel I **16** to I - II.
3. The record volume control channel I **15** will control the direct portion of the dubbing. This portion should always be kept as high as possible. (Without causing over modulation in combination with the echo).
4. Set the input selector switch channel II **18** to II - I.
5. The record volume control channel II **17** controls the echo portion.
6. Press the record pre-selector button CHANNEL II **35**
   (release CHANNEL I button).
7. Set the before / after tape monitor switch **14** to NAB.
8. Set playback function switch **12** to CH II.

If it is desired to dub from track 2 to track 1, the input selectors remain in the same position. The functions of the record volume controls are reversed i.e. the record volume control channel I **15** will control the echo portion and the record volume control channel II **17** will control the direct signal.
Press the record pre-selector button CHANNEL I **32** and set the playback function switch **12** to CH I.

I n v e r s e echo effect

Specially interesting electronic effects can be achieved by means of inverse echos. This means that the echo comes before instead of after the main sound. This can be achieved in the following way : (only possible with half track machines).

The passage for inverse echos is recorded in the normal way on track 2. This passage is now laced back into the machine the other way around so that it runs on track 1 back to front. It is then dubbed from track 1 to track 2 with echo as described above. If the tape is now turned round the recording will appear on track 1 the right way round but the echos will lie inverse i.e. before the direct sound.

14.8. REMOTE CONTROL

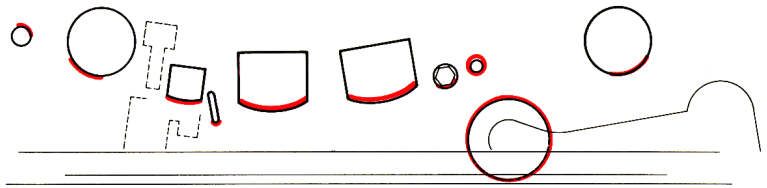
In order to connect the remote control the dummy plug **24** must be removed from the REMOTE CONTROL socket **25** .
The plug of the remote control unit is then inserted into the socket. All tape deck functions including playback and record can be remote controlled. The automatic end of tape switch will remain operative.

It is also possible to connect a start / stop remote control including rewind for use as dictating machine.

When going back to local control it is essential to re-fit the dummy plug into the socket.

15. CARE OF THE REVOX 77A

The only care the machine needs is keeping the tape path clean. This point is very important however as the machine will only give its optimum record and playback performance if all parts of the tape path are scrupulously clean. A soft cotton or linen cloth is most suitable for cleaning.



If necessary the cloth may be moistened with a little alcohol.

Hard instruments must not be used under any circumstances.

The heads should be cleaned particularly carefully. The capstan and pressure roller should be cleaned with a dry cloth if possible.

The REVOX 77A must not be oiled.
All bearings have life long lubrication.

16. CARE OF THE TAPES

The tape is a magnetic store and therefore needs very little attention but this does not mean that it cannot be damaged through improper treatment. If the following points are observed, the tape will live up to its reputation of being a reliable recording medium.

Use only good quality tapes.

We recommend the use of our special REVOX tape. The REVOX 77A is specially adjusted to the excellent characteristics of this tape.

Tapes which are not in use should not be left on the machine (not to collect dust). They should always be kept in their boxes.

The boxes should be stored vertically.

If tapes are stored for a long period of time, it is best if they are stored at a fairly constant temperature and moisture. Temperatures around 68° Fahrenheit and 40 - 60 % humidity are ideal.

If tapes are stored for a long period of time in a very high ambient temperature this will also increase the so-called " print through ". This means that the recording will " leak " from one layer to another.

Experience has shown that it is desirable to re-spool tapes which have been stored for a long period of time, before playing them.

Tapes should be protected from strong magnetic fields. It is for instance possible to damage a tape by putting a dynamic microphone directly onto a reel of tape or by placing a reel of tape right beside a toy transformer (while it is switched on).

17. POSSIBLE FAULTS AND THEIR CAUSES

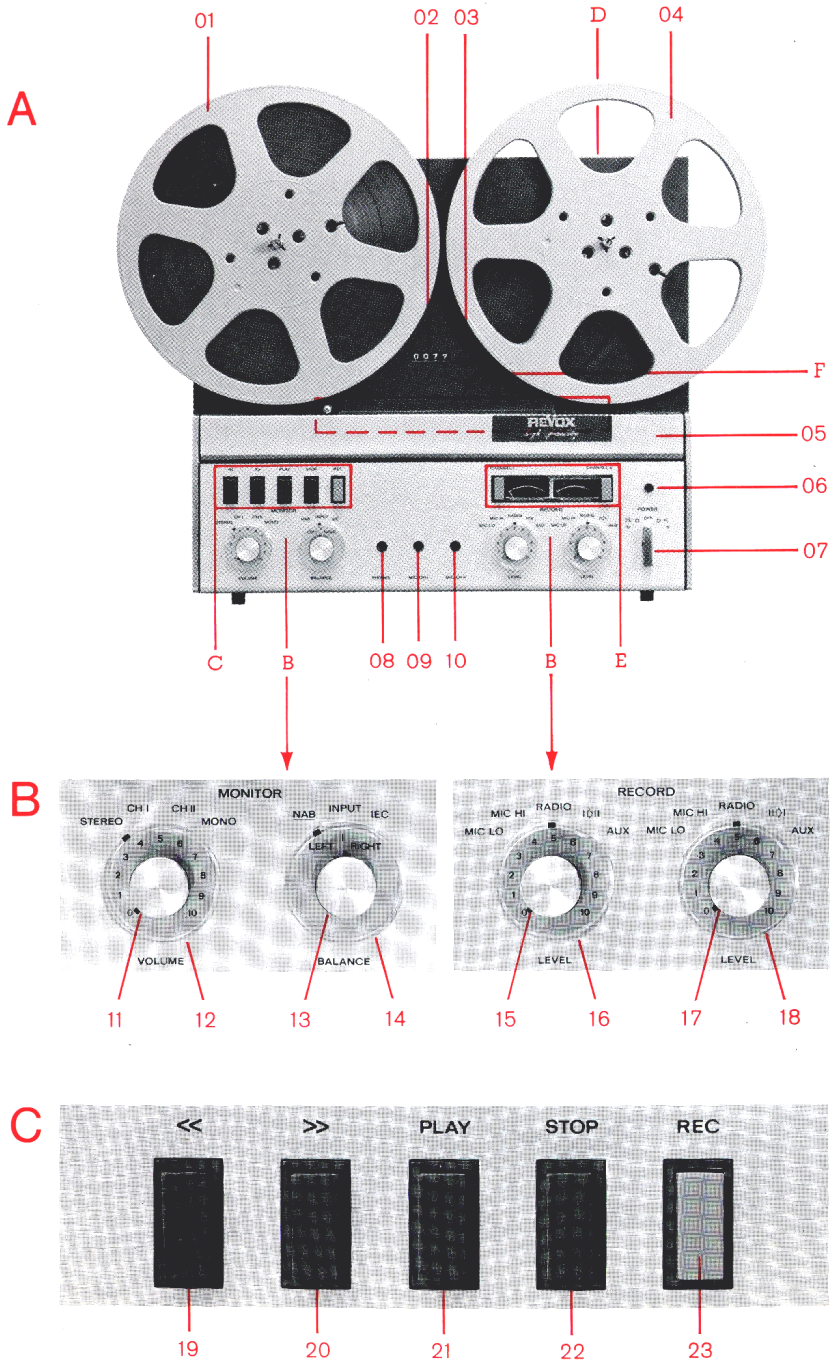
Playback distorted :	Over modulated : reduce record level. If distortion is already there before recording (INPUT) even at low levels the input voltage is too high for the particular input. (e.g. if a microphone with built-in transformer is switched to MIC LO).
Excessive hiss on playback :	Recording under modulated, increase record level. Even if after two or three successive dubbings for multiple tracking, the tape hiss becomes audible, this means that the recording level has been too low.
Playback " dull " (lack of top) :	Playback heads dirty, clean heads carefully. Tape laced the wrong way around - emulsion side out. Reverse tape.
Excessive hiss on playback even with full record level :	Tape guides or heads are magnetised. Send the machine to a service centre for demagnetising.
VU meter indication reversed :	Both record pre-selector keys are in off position. Press the necessary button (s).
Spooling motors not working :	The SPOOLING MOTORS OFF button **42** is depressed. Release button by pressing it again.
The tape deck operating functions fail to lock : (they only work while the relevent button is held down).	The dummy plug is not inserted into the REMOTE CONTROL socket **25** . Insert dummy plug.

No sound from loudspeakers (with machines with built-in output amplifiers) :	The SPEAKERS OFF button **41** is depressed. Release the button by pressing it again. Fuse in the output amplifier has blown.
The loudspeaker volume on the left and right hand speakers in not equal in mono reproduction :	The balance control **13** is not in the marked centre position. Adjust balance control by ear.
The tape tension with large tape reels is too small. The tape does not make proper contact with the heads :	The rotary POWER switch **7** is in the second switch position. (small circle). Switch to first position (large circle.)

TECHNICAL DETAILS

Tape transport :	3-motor deck. Electronically governed capstan motor. Electronic speed change.
Tape speeds :	3 3/4 and 7 1/2 ips. ± .2 %
Wow and flutter : (weighted)	max. .08 % at 7 1/2 ips. max. .1 % at 3 3/4 ips.
Tape slip :	less than .2 %
Tape spool diameter :	max. 10.5"
Operating position :	Horizontal or vertical
Amplifiers :	Equipped with silicon transistors throughout. Plug-in printed circuit cards
Frequency response via tape :	30 c/s - 20 kc/s + 2 / – 3 db 50 c/s - 15 kc/s ±1,5 db at 7 1/2 ips. 30 c/s - 16 kc/s + 2 / – 3 db 50 c/s - 10 kc/s ±1,5 db at 3 3/4 ips.
Distortion at full modulation at 1 kc/s :	max. 2 % at 7 1/2 ips. max. 3 % at 3 3/4 ips.
Equalisation :	Record : NAB Playback : NAB and IEC (switcheable)
Signal to noise ratio : (weighted, filter CCIF)	better than 58 db at 7 1/2 ips. better than 56 db at 3 3/4 ips.
Cross talk at 1 kc/s :	Mono better than 60 db, stereo better than 45 db
Oscillator frequency :	120 kc/s, push - pull oscillator
Inputs per channel : Cinch / Jack 5 - pole DIN Cinch	Microphone, switcheable LOW / HI LOW 50 - 600 ohms .15 mV HI up to 100 k - ohms 2 mV Radio 2 mV / 33 k - ohms Auxilliary 40 mV / 1 Meg - ohms
Outputs per channel : Cinch 5 - pole DIN Jack	Output max. 2.5 V / Rs 600 ohms Radio max. 1.2 V / Rs 2.5 k - ohms Headphones 200 - 600 ohms
Remote control :	Fully electric for all operating functions
Output amplifiers :	Plug - in optional
Output power : (8 - ohm load)	Music power 20W (10W per channel) Continuous power 16W (8W per channel) distortion better than 1 %
Output impedance :	4 - 16 ohms
Built - in loudspeakers : (portable model)	Two loudspeakers per channel (automatically disconnected when a plug is inserted into the DIN loudspeakers sockets)
Transistors, etc :	54 transistors, 32 diodes, 4 silicon rectifiers 1 photo resistor, 4 relays
Power supply :	electronically stabilised
Mains voltages :	110, 130, 150, 220, 240, 250 V / 50 - 60 c/s
Power consumption :	without output amplifiers 70 W with output amplifiers app. 70 - 100 W
Mains fuses :	220 - 250 V / .5 A 110 - 150 V / 1 A
Weight :	app. 34 lbs.

We reserve the right to make technical alterations in the interests of technical improvements.



A

01	Left hand spooling plate (supply reel)
02	Four digit tape position indicator
03	Re-set zero button for position indicator
04	Right hand spooling plate (take-up reel)
05	Cover plate
06	Pilot lamp
07	POWER switch for switching on, tape speed and spool size
08	PHONES socket for low impedance stereo headphones
09	Jack socket MIC CH I
10	Jack socket MIC CH II

B

11	Volume control for playback and for before and after tape monitoring		
12	Playback function switch		
13	Balance control		
14	Before/after tape monitor switch		
15	Record volume control channel I	(left)	CH I
16	Input selector channel I	(left)	CH I
17	Record volume control channel II	(right)	CH II
18	Input selector channel II	(right)	CH II

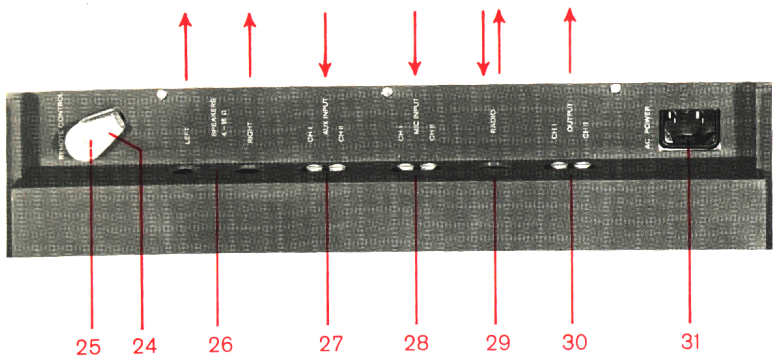
C

19	Fast rewind button
20	Fast forward button
21	PLAYback button
22	STOP button (stops all operating functions)
23	Record button (in conjunction with PLAY)

D	Socket field at the rear	inside back cover page
E	Level meters (VU meters)	
F	Headblock	

D

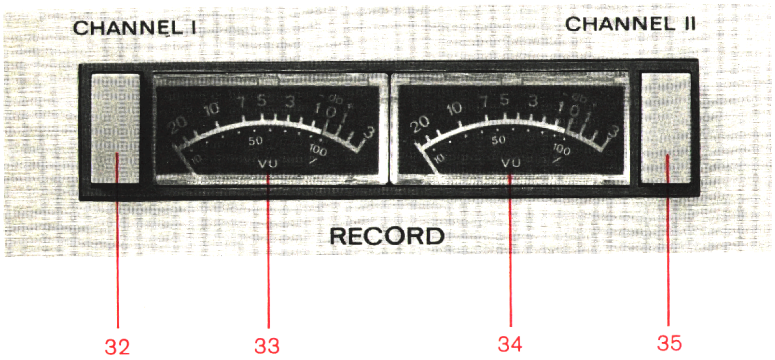
24 Remote control dummy plug
25 REMOTE CONTROL socket
26 Standard DIN sockets SPEAKERS for connecting loudspeakers
27 Cinch-sockets AUX (input) for amplifiers, tuners, etc.
28 Cinch-sockets MIC (input) for high and low impedance microphones
29 Standard DIN socket for radio receiver (input and output)
30 Cinch-sockets OUTPUT for amplifiers, tape recorders, ets
31 Mains socket for connecting the mains cable



D

E

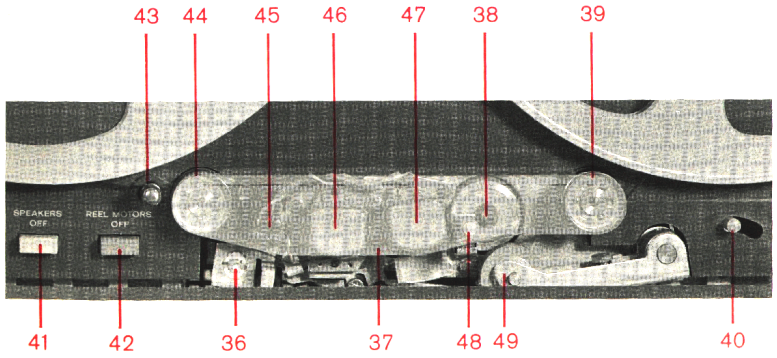
32 Record pre-selector button CHANNEL I
33 Level meter for channel I (VU meter)
34 Level meter for channel II (VU meter)
35 Record pre-selector button CHANNEL II



E

F

36 Optical electronic end of tape switch (light gate)
37 Splicing block
38 Capstan (tape drive)
39 Right hand guide roller
40 Editing lever (brings the pressure arm into the editing position)
41 SPEAKERS OFF button for switching off the output amplifiers
42 SPOOLING MOTORS OFF button for switching the spooling motors off
43 Guide pin
44 Left hand guide roller
45 Erase head (stereo)
46 Record head (stereo)
47 Playback head (stereo)
48 Tape guides
49 Pressure roller and arm



F