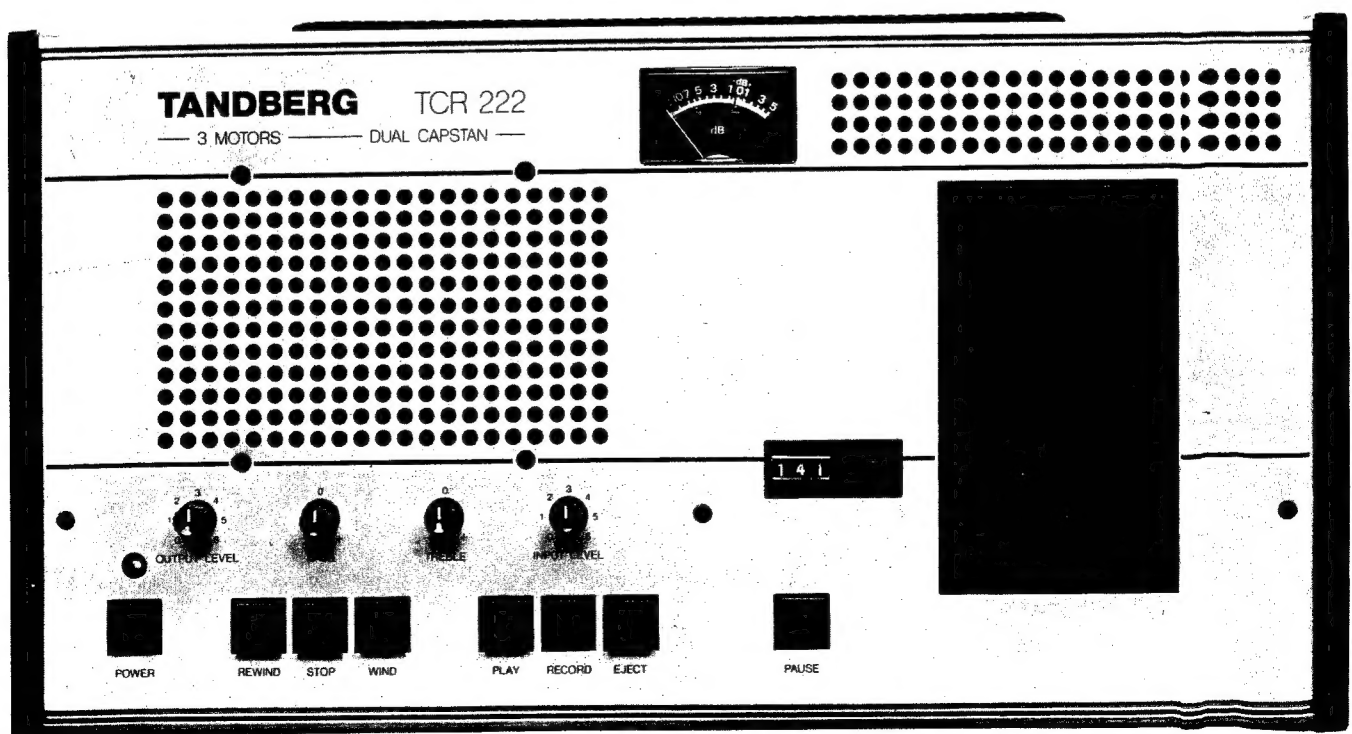


# TCR 222 Service Manual

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**General specification:**

Adjusted for Tandberg Tape or any other high equal quality tape. Can be used in a vertical position or mounted on the wall.

Dimensions: Breadth 16 7/8" (43.5 cm), height 4 1/8" (10.5 23 cm). Weight: 13.5 lb (6 kg).

**Technical specification:**

**Power requirements:** 230 V, 50 Hz.

**Power consumption:** 60 watts max.

**Tape speed:** 1 7/8 ips (4.75 cm/s).

**Speed tolerance** with nominal mains voltage and normal operating temperature:  $\pm 1\%$ .

**Wow and flutter**, max: DIN 45500 peak value better than 0.2%.

**Frequency response**, Tandberg XD tape: 40 — 14 000 Hz (DIN 45500).

**Signal/tape noise ratio**, DIN 45500: Better than 58 dB (Geräuschspannung), A-curve and better than 55 dB (Fremdspannung).

**Distortion**, max.: From tape at 0 dB record level: 3%.

**Inputs:**

**MIC:** Suitable for dynamic microphone with impedance less than 700 ohms. Sensitivity 0.1 mV to 17 mV at 200 ohms.

**RADIO:** Input impedance 47 k ohms. Sensitivity 10 mV to 2 V.

**PHONO:** Input impedance 3 M ohms. Sensitivity 45 mV to 5.0 V.

**Outputs:**

**RADIO:** Output voltage 0.8 V.

**EXT. SPEAKER** 4 - 8 ohms. Output power 12 watts in 4 ohms.

**Tone controls:**

Treble control: -8 dB to + 8 dB at 10 000 Hz.

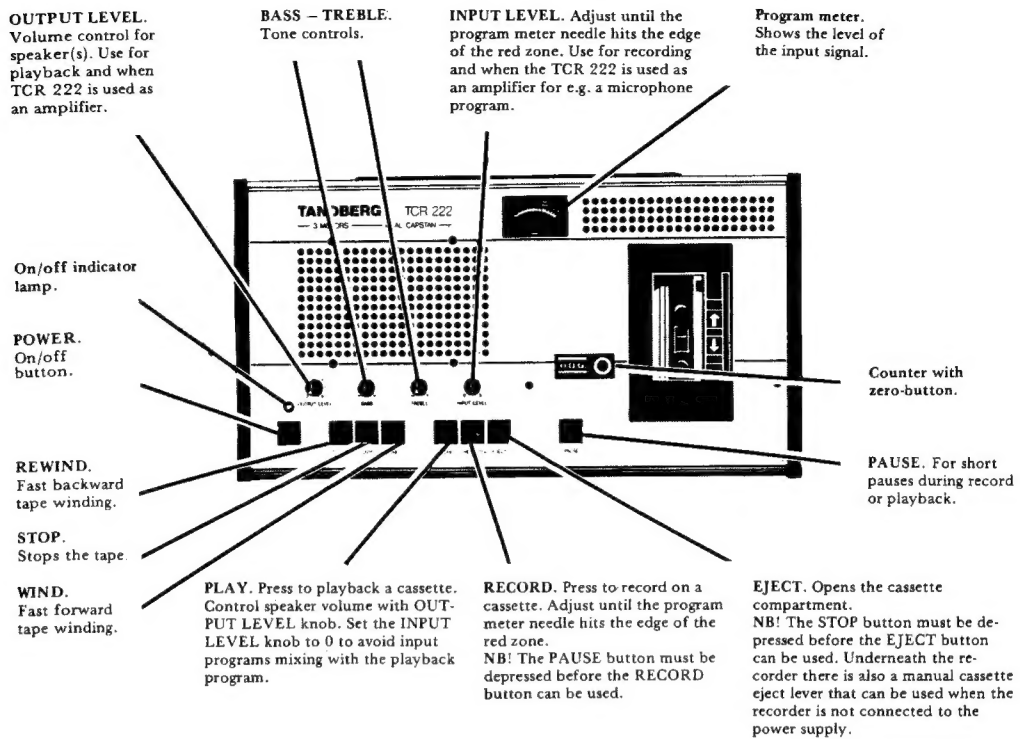
Bass control: -8 dB to + 8 dB at 100 Hz.

**Transistors:** 39.

**Motors:** 1 hysteresis synchronous motor 115 V, 50 Hz. 2 DC winding motors, 14 V.

IN ANY COMMUNICATION PERTAINING  
TO THE EQUIPMENT, PLEASE SPECIFY  
TYPE NUMBER AND SERIAL NUMBER

# 1. CONTROL FUNCTIONS



# 2. DISMANTLING

## 2.1 REMOVAL OF TOP PANEL

1. Release the cassette compartment by pressing the EJECT button, or operate the manual cassette release lever as shown in fig. 2.1.
2. Remove the plastic lid from the cassette compartment by pulling it upwards. Push the compartment down to closed position.
3. Remove 3 screws on the top panel, and 3 screws at the top of the rear panel according to fig. 2.2.
4. Remove the top panel by lifting the right edge first. **IMPORTANT!** Note the position of the colored wires before disconnecting the loudspeaker and the mains indicator LED.

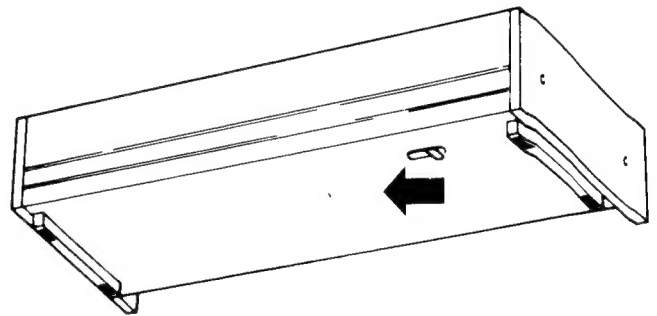


Fig. 2.1 Manual cassette release lever

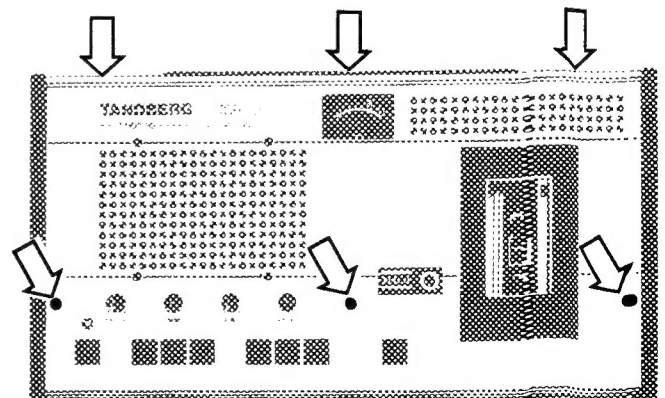


Fig. 2.2 Removal of top panel

## 2.2 REMOVAL OF SWITCH ASSEMBLY/ AMPLIFIER 2 BOARD

The Amplifier 2 Board is soldered onto the switch assembly, and the switch assembly is mounted on a bracket which is fastened to the front panel with 2 screws.

To remove the switch assembly/ Amplifier 2 Board, see figures 2.3 and 2.4.

Proceed as follows:

1. Remove Amplifier 1 Board.
2. Remove 3 screws marked A1-A3.
3. Remove bracket B.
4. Remove the PAUSE switch button C.
5. Remove the switch assembly.

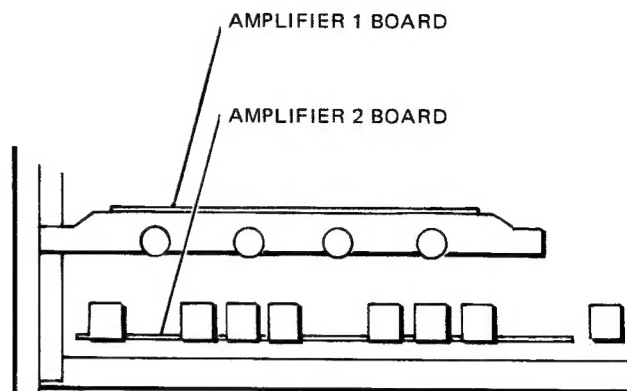


Fig. 2.3 Position of printed circuit boards

## 2.3 MOUNTING THE SWITCH ASSEMBLY/ AMPLIFIER 2 BOARD

Before mounting the switch assembly, make sure that the transistor leads of Q 207 is not shorted. Q 207 is positioned at the right side edge of the board.

See fig. 2.4 and proceed as follows:

1. Re-install the assembly by plugging the connectors at the bottom of the board. Fasten assembly with screws A1 and A2.
2. Place the lugs of lever D into slots E.
3. Re-install the PAUSE switch button C.
4. Operate the PAUSE switch button several times to make sure that nylon slide F moves far enough to allow the RECORD switch to be operated.
5. Re-install bracket B and fasten with screw A3.
6. Re-install Amplifier 1 Board.

## 2.4 SERVICING THE AMPLIFIER 1 AND AMPLIFIER 2 BOARDS

A special service kit consisting of two extender boards is available, to simplify the servicing of Amplifier 1 and Amplifier 2 Boards.

The extender boards can be ordered under Part No. 994 178.

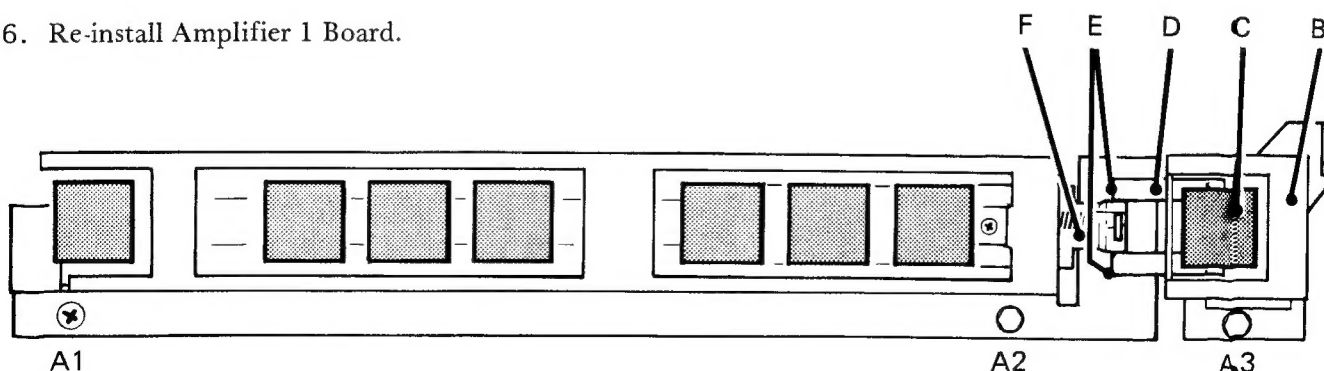


Fig. 2.4 Switch assembly

## 3. REGULAR MAINTENANCE

### 3.1 CLEANING

The parts of the cassette deck that are in contact with the tape surface should be cleaned regularly, otherwise the sound quality will be greatly reduced. **Cleaning of capstans and pinch rollers is particularly important to avoid wow and flutter.**

If the cassette deck is used every day, cleaning should be performed at least once a month.

The cleaning can be done with cotton wool or a piece of flannel wrapped around a small stick and moistened with pure alcohol or methylated spirit.

A kit intended for this purpose, "Tandberg Professional Tape Head Cleaner", is available under part no. 352 156.

#### NOTE!

Do not use solvents, such as acetone or trichloroethylene, as these may damage the heads.

#### How to clean

1. Release the cassette compartment by pressing the EJECT button or operate the manual cassette release lever. Remove the plastic lid from the cassette compartment by pulling it upwards. Push the cassette compartment down to closed position.
2. Clean the record/playback head (A), erase head (B), tape guide (C), capstans (D) and pinch rollers (E). Do not use too much cleaning liquid on the pinch rollers, and dry them afterwards.

**DO NOT USE ANY SHARP OBJECTS WHEN CLEANING. DO NOT TOUCH THE ADJUSTMENT SCREWS.**

3. Check the surrounding area for dust and deposits from the tape. Clean if required.

Cleaning should be performed both before and after adjustments.

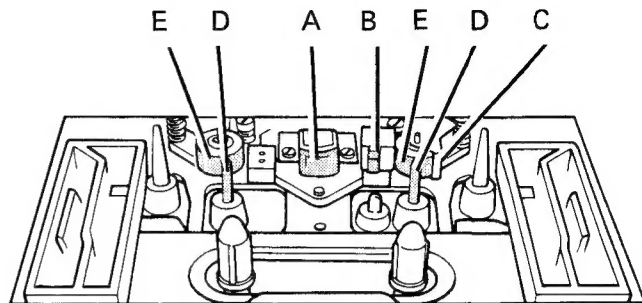


Fig. 3.1 Parts to be cleaned

### 3.2 DEGAUSSING

A marked increase in background noise from the tape may indicate that the heads or other parts in the tape path should have the residual magnetism removed (degaussing).

If required, degaussing should be carried out as follows. Switch off the deck. **Remove the cassette from the deck.** Remove the plastic cassette compartment lid and move the degausser slowly past each one of the metal parts normally in contact with the tape. Take great care not to let the degausser touch the heads or metal parts in the tape path. Do not switch off the degausser until it is at least 3 ft away from the recorder.

Degaussing should be performed both before and after adjustments.

### 3.3 LUBRICATION

The capstan motor and the reel motors may require lubrication from time to time. The interval between each lubrication should be at least 3000 hours of operation.

Use the following types of oil:

**Capstan motor:** ANDEROL 465 from Tenneco Chemicals, USA., or oil supplied by Tandberg, under part no. 713 368.

**Reel motors:** NUTO H36 (also called SPINNESSO 34) from Esso.

#### NOTE!

Use only one drop of oil for each motor.

## 4. MECHANICAL SERVICING

### 4.1 MICROSWITCH MS 1

#### Pinch rollers released:

Check that there is a gap of about 1 mm between the connecting arm and the middle leaf of the switch. See fig. 4.1.

#### Pinch rollers operated:

Check that the left and the middle leaf are pressed together.

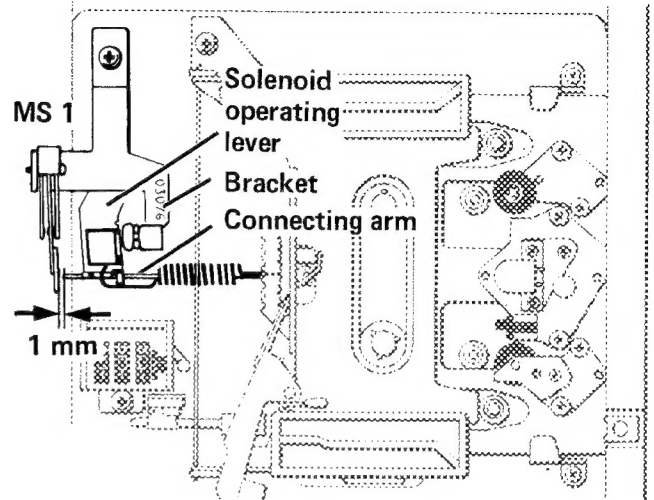


Fig. 4.1 Pinch rollers released

### 4.2 TAPE PATH ADJUSTMENTS

If parts in the tape path have to be replaced, a more or less complete adjustment procedure should be carried out. This adjustment procedure requires the use of special tools, and should be carried out by a Tandberg representative.

If the tape path only needs minor adjustments, only visual inspection and one single electric measurement is ordinarily needed. Then see 4.2.1, "Outline of the adjustment procedure".

**IMPORTANT! DO NOT USE MAGNETIC TOOLS WHEN ADJUSTING PARTS IN THE TAPE PATH!**

#### 4.2.1 Outline of the adjustment procedure

The following equipment is needed:

- Tandberg Test Tape No. 23 (Azimuth)
- Tandberg Test Tape No. 29 (Open cassette)

Instead of the Tandberg Test Tape No. 29, one may use an ordinary high quality cassette which has been cut open, so that the tape is visible. See fig. 4.2.

Insert Tandberg Test Tape No. 29.

Check that the tape does not "climb" on the capstans and is not bent or folded at the tape guides. Also check that the tape does not "bulge" at the heads ("bulging" indicates wrong azimuth adjustment of the heads). When viewed from above the tape should be seen as an almost invisible line.

Also check that the top of the erase head (Japanese heads only) is flush with the top edge of the tape. The erase head should not be visible above the tape.

If the erase head is made by Tandberg, and marked with a Tandberg label, the top of the erase head should be 0,82 mm above the top edge of the tape. See fig. 4.3.

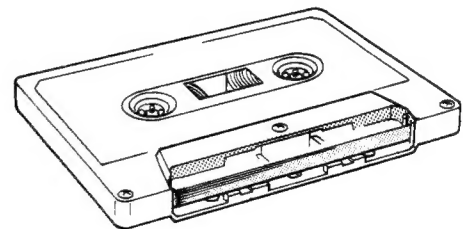


Fig. 4.2 Tandberg Test Tape No. 29 Open cassette

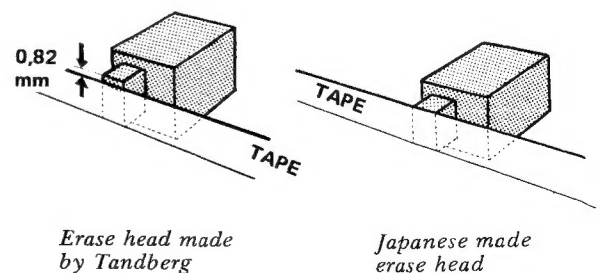


Fig. 4.3 Adjusting the height of the erase head

If erratic tape motion is observed, try to eliminate it by turning the adjustment screws for heads or pinch rollers.

Insert a Tandberg test tape No. 23 and adjust with the screw AZ on the record/playback head to maximum output signal on a VTVM, connected to the RADIO socket. See fig. 4.4.

#### 4.2.2 Adjustment procedure

The following equipment is needed:

- Tandberg Adjustment Plate, part No. 713 537
- Adjustment Tool No. 2, part No. 716 391
- Adjustment Tool No. 3, part No. 716 406
- Adjustment Tool No. 4, part No. 716 502
- Tandberg Test Tape No. 23 (Azimuth)
- Tandberg Test Tape No. 29 (Open cassette)

Adjustment Tool No. 2 is packed with the adjustment plate.

**IMPORTANT!** Take great care not to damage the head fronts when using the tools No. 2 and 3. Ferrite heads are easily damaged.

**DO NOT** depress the PLAY-button when the tools are in use.

When adjusting, first move the mounting plate with the pinch rollers and the heads by hand, then hold the mounting plate with one hand and move the tool towards the head with the other.

Be sure to move the mounting plate strictly horizontally, not pressing it downwards nor lifting it. This is of great importance to the result of the adjustments.

##### 4.2.2.1 Pinch rollers

**Height.** Insert the Tandberg Adjustment Plate and move the mounting plate inwards until the pinch rollers almost touch the capstans. Holding the mounting plate in position with one hand, place Tool No. 2 on the Adjustment Plate as shown in fig. 4.8.

Adjust with the screw P on roller 1 so that the tip of Tool 2 fits into the tape guide of the roller. Also adjust the two screws H if necessary. Turn both screws equal amounts. Also turn the azimuth screw AZ correspondingly in the opposite direction to keep the roller roughly in correct azimuth position.

**Parallellity.** Remove pinch roller 1 and look at figures 4.6 and 4.8.1. for the following procedure: Install Tool No. 4 as shown in the figure. The capstan should fit into the gap of the tool. Put a miniature bulb down into the cylindric hole of the tool. The light from the bulb shines through the gap to simplify the adjustments.

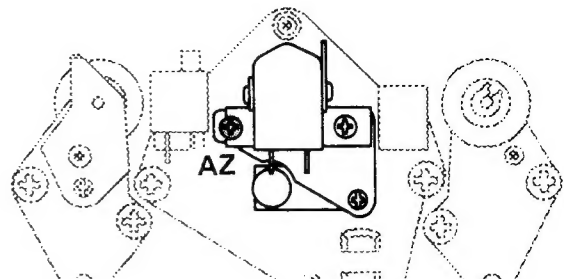


Fig. 4.4 Position of Azimuth adjustment screw

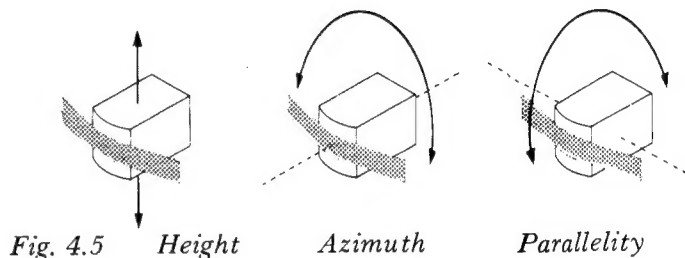


Fig. 4.5 Height Azimuth Parallellity

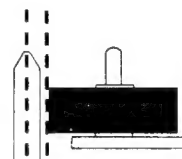


Fig. 4.6 Parallellity of pinch roller

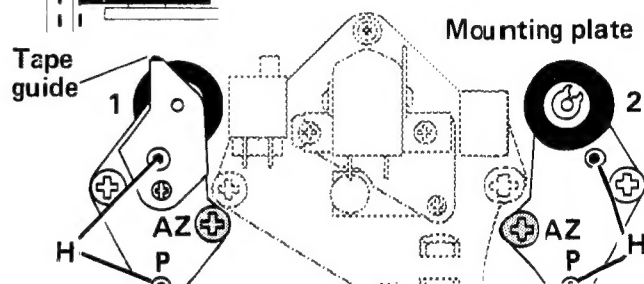


Fig. 4.7 Adjustment screws for pinch rollers

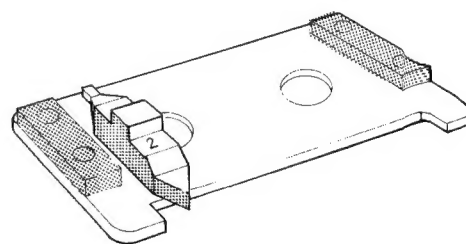
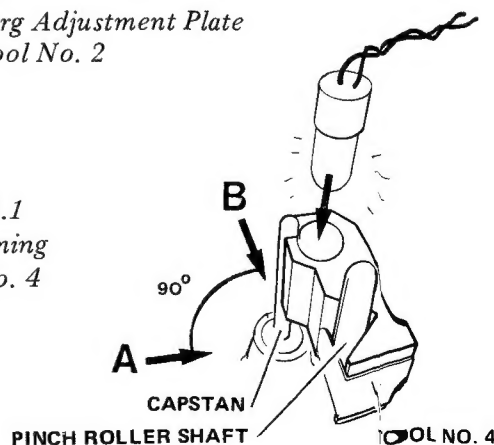


Fig. 4.8 Tandberg Adjustment Plate with Tool No. 2

Fig. 4.8.1 Positioning Tool No. 4



Move the mounting plate inwards. Adjust the screws H to minimize the gap as viewed from direction A. Observe the gap from direction B and adjust the screw AZ so that the capstan is perfectly parallel to the tool, or at least minimize the gap as far as possible.

By adjusting the screws H and AZ several times the capstan should be perfectly parallel to the tool.

Adjust pinch roller 2 following the same procedure.

**Adjusting height and parallelity without using Tool No. 4.** Insert Tandberg Test Tape No. 29, the open cassette. Move the mounting plate inwards. Look at fig. 4.7 and adjust with the screw P on roller 1 so that the tape fits into the tape guide of the roller. Also adjust the two screws H if necessary. Turn both screws equal amounts. Also turn the azimuth screw correspondingly in the opposite direction to keep the roller roughly in correct azimuth position.

Adjust pinch roller 2 to corresponding height. This adjustment is not critical.

See figures 4.6 and 4.7, and adjust with the screws P, so that both rollers are in parallel with the capstans.

A white piece of paper can be inserted behind the pinch rollers and the capstans to make it easier to observe the gap between them. See fig. 4.6.

Check that the tape is not bent or folded at the tape guides, or climbs the capstans. If necessary, adjust the screw AZ.

**Pinch roller operation.** Remove the Adjustment Plate or the cassette. Move the mounting plate inwards. Check that both pinch rollers touch the capstans at exactly the same time. The pinch rollers will start rotating when they meet the capstans. If required, adjust the eccentric screw shown in fig. 4.9.

#### 4.2.2.2 Erase head

**Preadjustment of head mounting plate.** Adjust with the screws H and AZ shown in fig. 4.12 so that the head mounting plate is parallel to the underlying mounting plate. The gap between them should be approx. 1 mm. To check this the right chassis plate must be removed.

**Adjustment of erase head made by Tandberg.** Insert the Tandberg Adjustment Plate and move the mounting plate inwards. Keep the mounting plate in position with one hand. Place Tool No. 3 on the Adjustment Plate according to fig. 4.11.

See also fig. 4.12 and adjust the screws H and AZ so that the top of the erase head is flush with the tool. The front of the erase head should be parallel to the front of the tool.

**Adjustment of Japanese made erase head.** Replace tool No.3 with Tool No. 2 and carry out the adjustment described above.

**Adjusting the erase head using Tandberg Test Tape No. 29.** In this case, insert the cassette and move the mounting plate inwards. If the erase head is Japanese made, adjust with the screws H and AZ as shown in fig. 4.12, so that the top of the erase head is flush with the top edge of the tape.

If the erase head is made by Tandberg, and marked with a Tandberg label, the top of the erase head should be 0.82 mm above the top edge of the tape. See fig. 4.3.

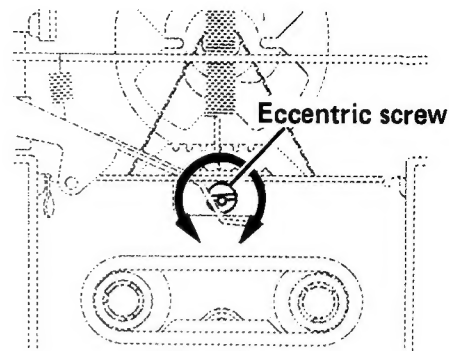


Fig. 4.9 Adjustment screw for pinch roller operation

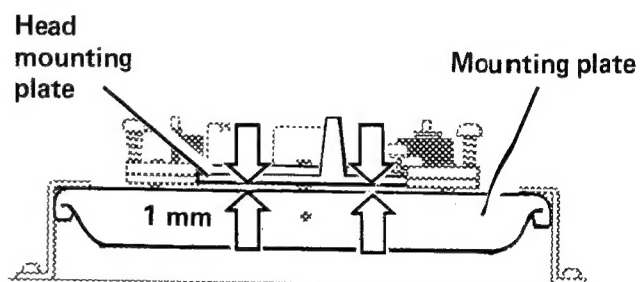


Fig. 4.10 Preadjustment of head mounting plate

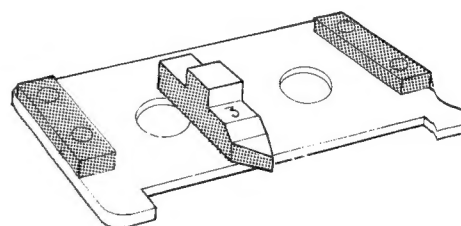


Fig. 4.11 Tandberg Adjustment Plate with Tool No. 3.

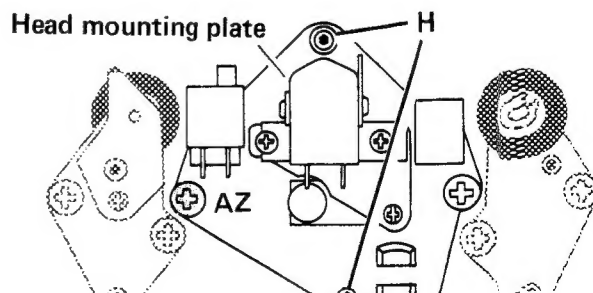


Fig. 4.12 Adjustment screws for the erase head



### 4.2.2.3 Record/ Playback head

The position of the record/ playback head is adjusted by turning the screws on the head bracket shown in fig. 4.13. Do not touch the adjustment screws on the head mounting plate, as it is assumed that this plate has already been correctly adjusted according to 4.2.2.2 "Erase head".

**Height and parallelity.** Insert the Tandberg Adjustment Plate and move the mounting plate inwards. Hold the mounting plate in position while placing Tool No. 2 as shown in fig. 4.14. See also fig. 4.13, and adjust with the screws H and P so that the tool fits into the tape guide on the head.

The front of the head should be parallel with the tip front of the tool.

**Adjusting height and parallelity using Tandberg Test Tape No. 29.** After having inserted the cassette, move the mounting plate inwards. See fig. 4.13 and adjust with the screws H and P so that the tape fits exactly into the tape guide of the head. The front of the head should be parallel to the tape.

If not already done, insert Tandberg Test Tape No. 29, the open cassette shown in fig. 4.2.

Set the recorder to PLAY. Check that the tape is not bent nor folded at the tape guides and does not bulge at the heads.

**Azimuth.** Insert Tandberg Test Tape No. 23 (6300 HZ). Connect a VTVM to the RADIO socket at the rear panel. Set the recorder to PLAY and adjust with the screw AZ as shown in fig. 4.13 to maximum output reading on the VTVM.

Finally, check the height and parallelity again. Readjust if necessary. If any readjustment is made, azimuth must also be checked.

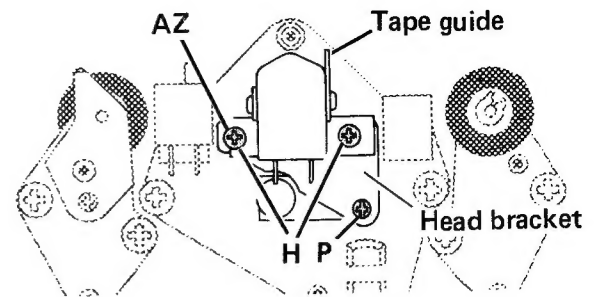


Fig. 4.13 Adjustment screws for record/playback head

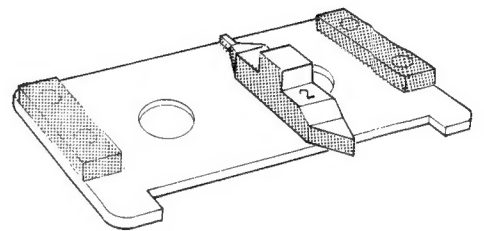


Fig. 4.14 Tandberg Adjustment Plate with Tool No. 2.

## 4.3 REPLACING THE DRIVE BELT

Before starting this operation remove the top plate and the cassette compartment lid.

1. Wind a piece of sellotape a few times around each capstan (see fig.). This is done to ensure that the capstans and flywheels will stay in place during the dismantling.
2. Unhook the connecting spring from the mounting plate. Be sure to note which notch the spring is fastened to, so that you will be able to replace it correctly.
3. Unhook the drive belt from the pulley.
4. Remove the circlip on the front side of the cassette compartment (see fig.).
5. Unhook the locking lever from the cassette compartment. The cassette compartment can now swing upwards.

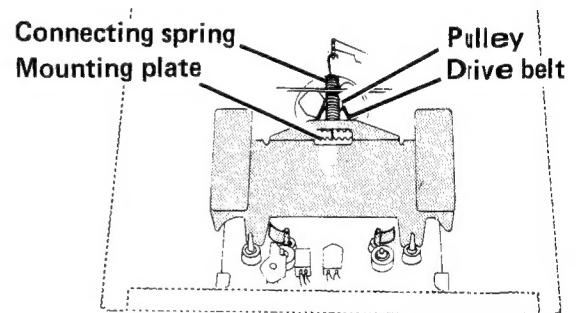


Fig. 4.15

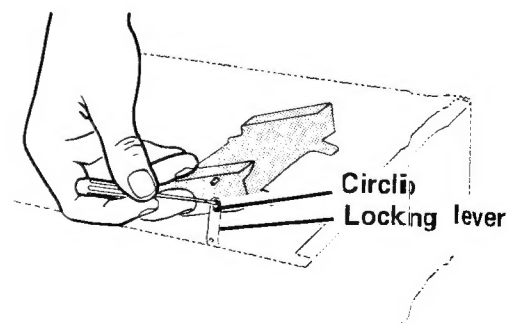


Fig. 4.16 Removing circlip from cassette compartment

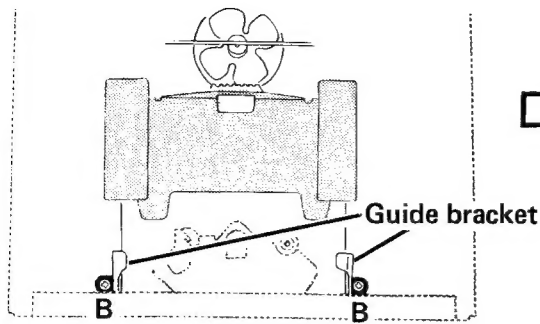


Fig. 4.17 Position of the guide brackets

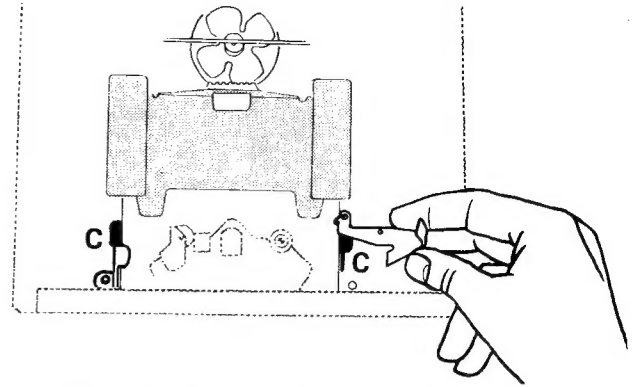


Fig. 4.18 Unhooking of guide brackets

6. Unscrew the two screws (B) holding the guide brackets for the mounting plate.

7. Unhook the two guide brackets and pull them out through the holes (C).

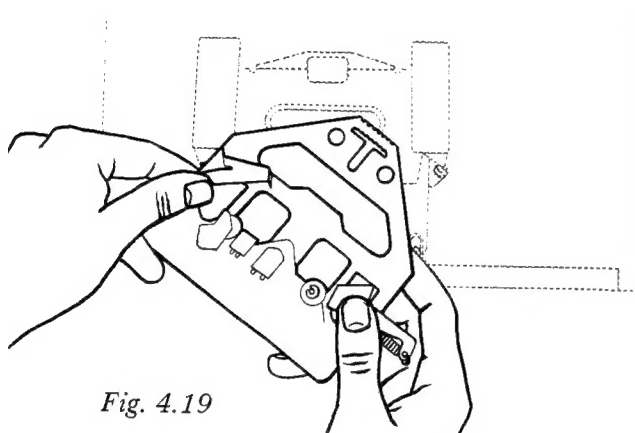


Fig. 4.19

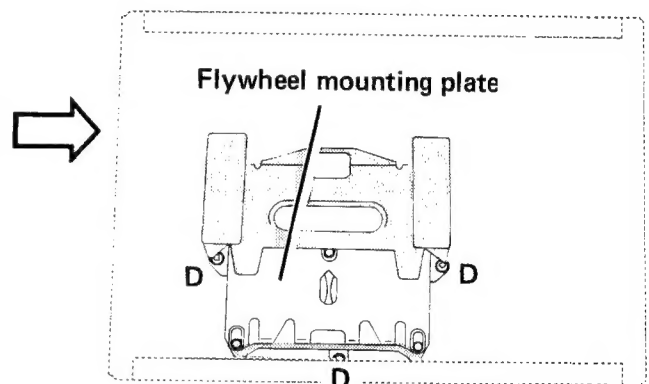


Fig. 4.20

8. Remove the mounting plate carefully.

9. Unscrew the three screws (D) holding the flywheel mounting plate and –

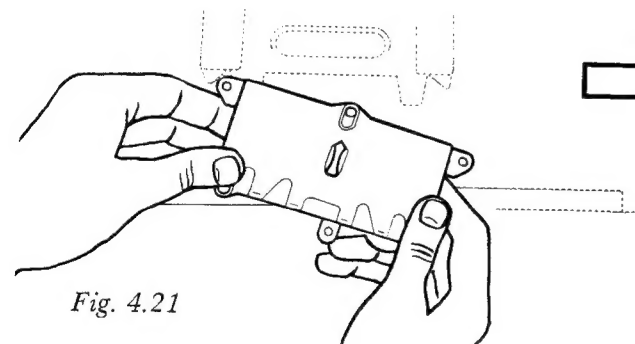


Fig. 4.21

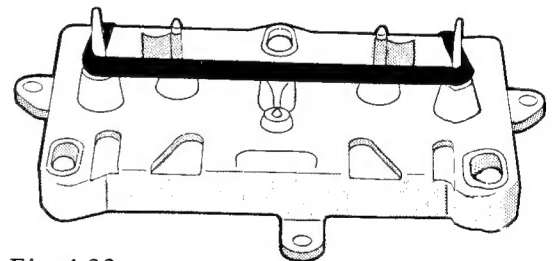


Fig. 4.22

– lift out the flywheel mounting plate with capstans and flywheels.

12. Replace the flywheel mounting plate and hook the drive belt around the pulley. **NOTE!** The drive belt should pass under the counter drive belt.

10. Remove the old drive belt.

13. Replace the mounting plate and check that it runs freely back and forth. Add a little grease on the ball bearings if required. Use Mobilplex grease No. 47 or equivalent.

11. Place the new drive belt around the flywheels and hook it around the cassette guides (see fig.) **TAKE CARE NOT TO GET OIL OR GREASE ON THE DRIVE BELT.**

14. Replace all other parts. Remove the slitotape from the capstans and **CLEAN THE CAPSTANS THOROUGHLY.** Insert a cassette and check that the tape does not stick to the capstans.

#### 4.4 CASSETTE ARM

The cassette arm can be adjusted by bending the end which normally rests against the cassette. See fig. 4.23.

Insert a cassette, close the cassette compartment and check the following:

- The cassette should rest against the cassette guides.
- Microswitch MS 3 should be closed. (If necessary, MS 3 can be adjusted by bending the support bracket for the microswitch).

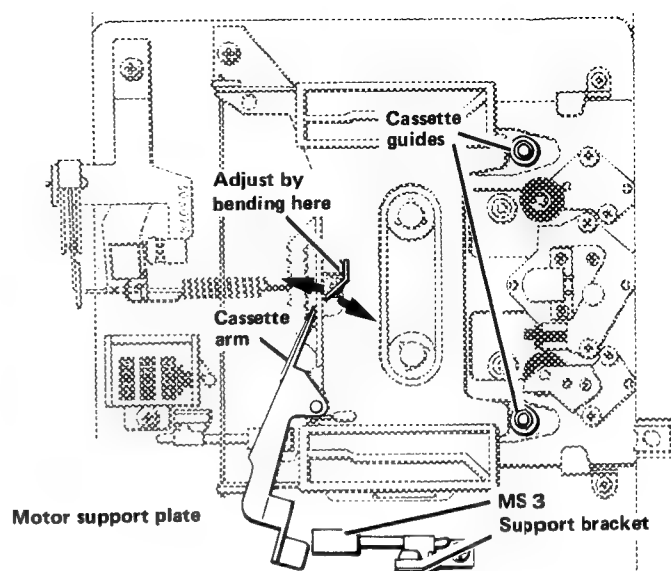


Fig. 4.23 Adjustment of cassette arm

NOTE! If the cassette arm is bent too much to the right, the locking lever will be moved so far to the left that it will not lock the cassette compartment in the lower position.

- When the cassette compartment is released, the cassette arm should push the cassette half-way out of the compartment.

#### 4.5 PINCH ROLLER SOLENOID

1. Set the deck to play.
2. Check that the connecting spring is stretched approximately 0.5 - 0.7 mm. The figure shows how this check is made. (The microswitches are not shown in fig. 4.24.)
3. If necessary, adjust by turning the nylon screw in the armature of the solenoid. To reach this screw: Switch off the power, lift the inner top plate (with the indicators) to vertical position. Adjust by angling the screwdriver towards the armature from the left.
4. Check with a gauge that the force needed to lift the pinch rollers away from the capstans is 1000 - 1200 grams.
5. If necessary, this force can be adjusted by moving the connecting spring to another notch. If the spring is moved, the spring tension must be checked again as explained in 2.

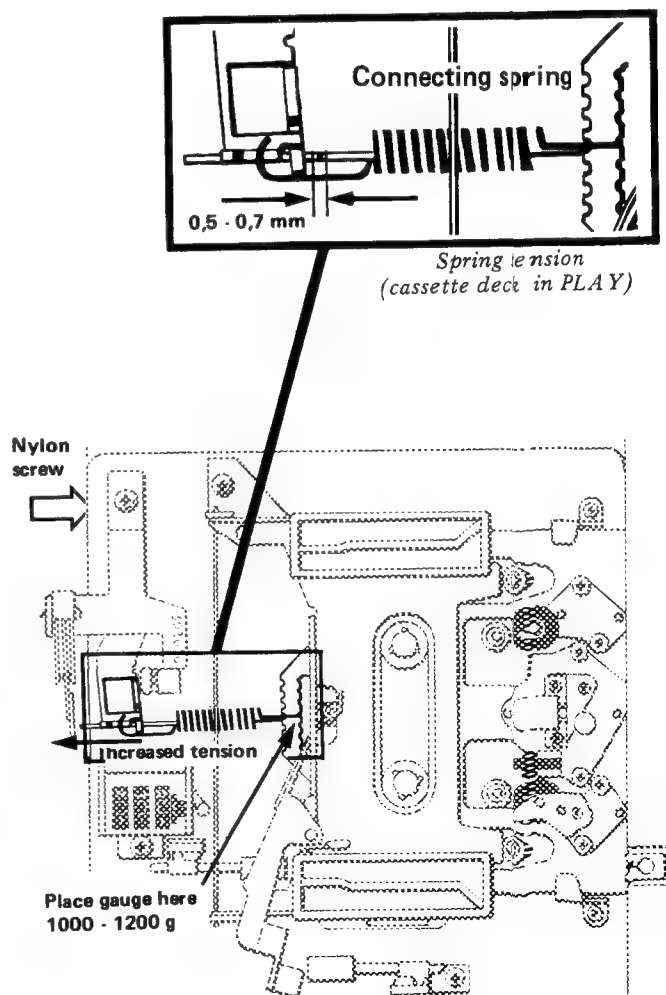


Fig. 4.24 Pinch roller pressure

## 4.6 PAUSE SWITCH OPERATION

When the PAUSE button is depressed, the gap between pinch rollers and capstans should be approx. 0,5 mm, which can be adjusted with the screw marked "PAUSE ADJUST". See fig. 4.25. The screw can be reached by removing the right side wall. Use a 1,5 mm ALLEN key when adjusting.

Insert a cassette and set the deck to PLAY. Depress the PAUSE button a few times, and check the following:

- The PAUSE lever should move freely, without touching the motor support plate or the bracket of the PAUSE switch. If required, this bracket can be bent a little with a screwdriver.
- When the PAUSE button is depressed, the tape should stop, and the pinch rollers should be lifted away from the capstans. The gap must be wide enough that neither of the pinch rollers touch the capstans under any circumstance. If required, adjust with the PAUSE ADJUST screw.
- At the same time, the gap must be so narrow that the pinch roller solenoid will pull the pinch rollers in again when the PAUSE button is released, both during PLAY and RECORD.

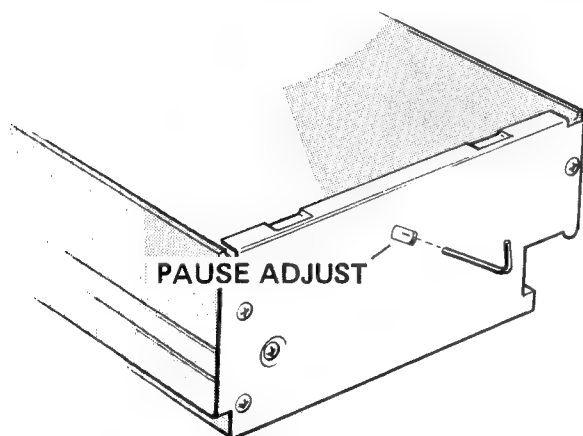


Fig. 4.25 Position of the PAUSE ADJUST screw

**IMPORTANT!** With the deck in PLAY, release the PAUSE button and check that the PAUSE lever can be moved a little up and down (as indicated with an arrow in the figure). If the lever cannot be moved, the reason is probably that the PAUSE ADJUST screw butts against the lever, and the force of the pinch roller solenoid is transferred to the lever. The pressure of the pinch rollers is then correspondingly reduced.

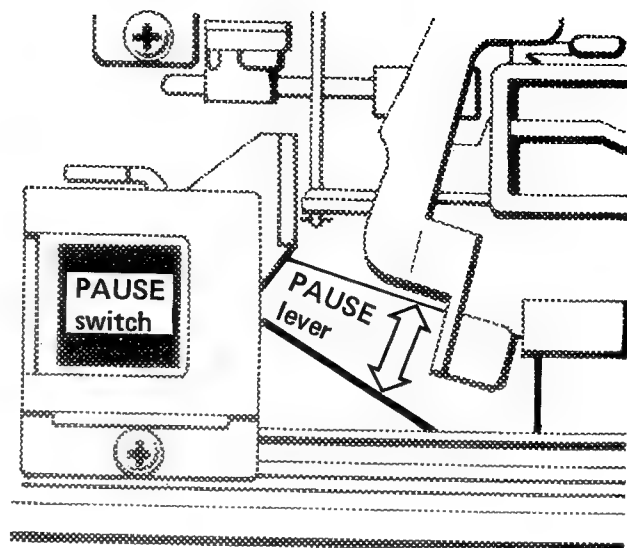


Fig. 4.26 Checking the pause lever

## 4.7 ADJUSTING THE POSITION OF A REEL MOTOR

Insert a high quality cassette and close the cassette compartment. Check that the tape spindle on the motor is exactly in the center of the corresponding hub on the cassette. Try the recorder in play, wind and rewind. Check that the hub runs easily and does not wobble.

If necessary, adjust by loosening the two screws holding the reel motor. This will be easier if you remove the circlip on the left side of the cassette compartment and swing the cassette compartment upwards. See fig. 4.16, page 9.

The reel motor can now be moved slightly.

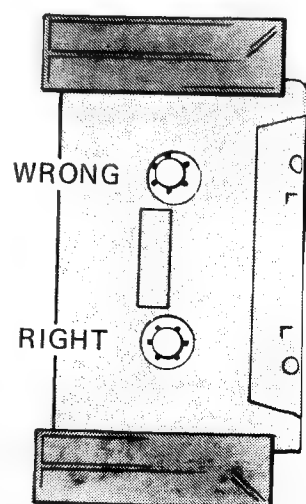


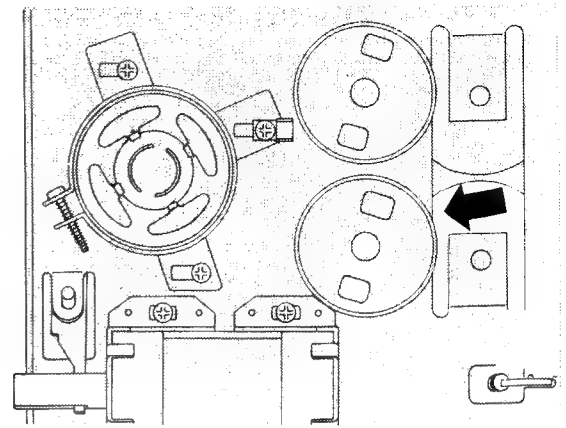
Fig. 4.27

## 4.8 SALVAGING TANGLED TAPE

Occasionally the tape will wind itself around the last of the two capstans.

To salvage the tape proceed as follows:

1. Remove the bottom plate of the deck.
2. Turn the flywheel of the entangled capstan slowly against its normal rotation. Use your finger to turn the flywheel.
3. When the tape has been untangled from the capstan, wind it manually onto the hubs of the cassette.



*Fig. 4.28 Turning the flywheel in order to salvage tangled tape*

## 4.9 REPLACING THE FLYWHEEL'S UPPER BEARING

A special tool can be used to simplify replacement of the upper bearings for the flywheels. The worn-out bearing can be hammered downwards on the capstan. It needs not to be removed.

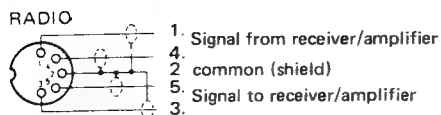
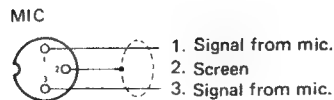
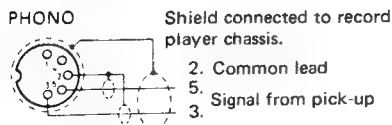
After being installed onto the capstan, the new bearing can be pressed downwards by means of the tool.

The tool is available under part No. 716 409.

# 5. CIRCUIT DESCRIPTION

## 5.1 HOW TO WIRE THE DIN PLUGS

The plugs are seen from the wiring side.



## 5.2 A SHORT EXPLANATION OF THE SOLENOID OPERATING CIRCUIT Q201, Q202.

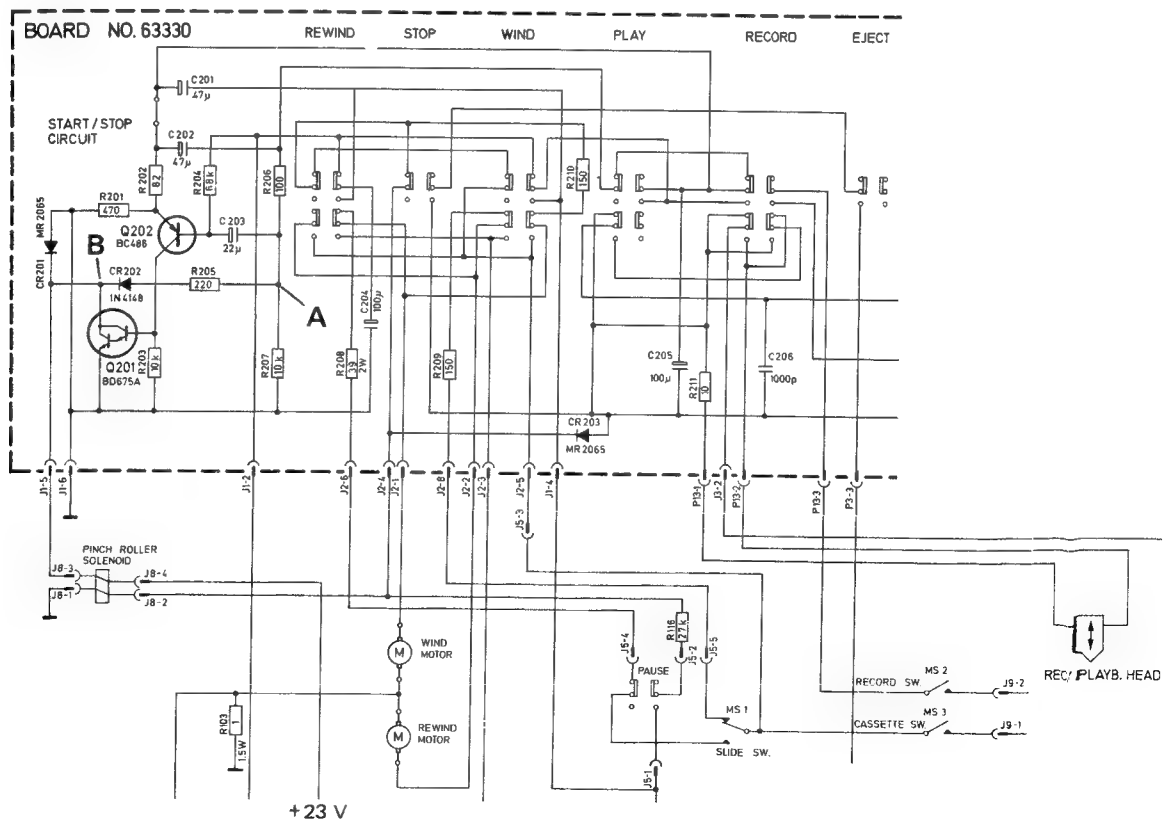
Operation of the pinch roller (start) solenoid should be slightly delayed, to give the reel motors time to remove any slack in the tape, before the pinch rollers are pulled in.

When both PLAY and RECORD buttons are released, C202 has no voltage and Q202(PNP) is cut-off. Q201(NPN) has a base voltage of 0 V and is also cut-off.

When the PLAY or RECORD button is depressed the following sequence is started:

1. 13,5 V is connected to the + side of C202. The voltage drop over R202 gives Q202 an emitter voltage of about 11 V. The transistor requires a base voltage which is 0,7 V more negative than the emitter to start conducting. The transistor will therefore still be in the cut-off state.
2. C202 is charged through R206/R207. The positive voltage at point A is connected via C203 to the base of Q202. This voltage is gradually reduced as C202 is charged.

3. After a short period of time the voltage at point A has been reduced so much that the base of Q202 drops lower than 10,3 V, and the transistor starts conducting.
4. When Q202 starts conducting, the collector voltage increases, driving Q201 into conducting state. Point B is connected to ground, current passes through the "activate" coil, JB-3, JB-4, of the start solenoid and the pinch rollers operate.
5. When Q201 is conducting, the current to C203 passes through R205 and Q201. C203 will therefore be fully charged in a very short time.
6. When C203 is fully charged, there will be no voltage at point A. C203 is now charged through R204. The current through R204 will keep Q202 in conducting state.
7. After a little while the current to C203 has been reduced so much that Q202 goes cut-off, Q201 also goes cut-off, stopping the current through the "activate" coil.



### 5.3 A SHORT EXPLANATION OF THE MOTOR CONTROL CIRCUITS

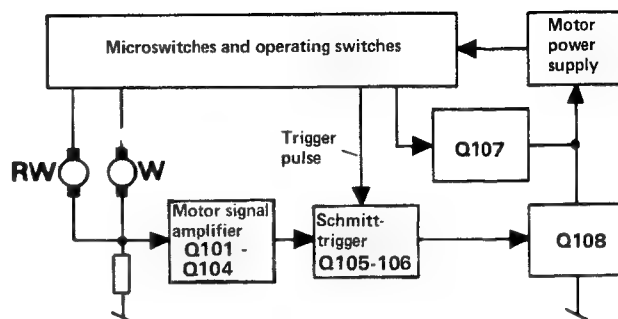
When the reel motors revolve, they generate pulses. These pulses are used to control the motor power supply.

When both motors are stationary, no pulses are fed to the motor signal amplifier. Q 104 of the Schmitt-trigger is cut-off, and Q105 is conducting. Q 107 is also conducting, and the motor power supply is connected to ground. Therefore, no voltage is fed to the motors.

When the **REWIND, WIND, PLAY** or **RECORD** button is depressed, one of the capacitors C201, C204 or C205 will give a trigger pulse to the Schmitt-trigger. Q104 starts conducting and Q105 goes cut-off. Q107 also goes cut-off, and the motor power supply feeds a voltage to the motors (via microswitches and operating switches). The motors start revolving, feeding pulses to the motor signal amplifier. The output from this amplifier will keep Q104 in conducting state.

During wind or rewind the supply motor works as a generator, feeding a negative voltage to transistor Q106 which regulates the motor power supply. The voltage from the power supply is therefore dependent on the speed of the supply reel.

When the tape stops (for instance at the end of the tape) the input to the motor signal amplifier drops to zero, and the Schmitt-trigger reverts to unoperated state after a short delay (determined by C104/R109). Q107 starts conducting and the voltage from the motor power supply drops to zero.



Block diagram of motor control circuits

### 5.4 CONTROL OF MOTOR VOLTAGES

Remove the bottom plate, insert a cassette in the deck and check that the voltages across the motors are as specified below:

	WIND motor	REWIND motor
Depress PLAY	2.5 V – 3 V	0 V
Depress STOP	0.7 V – 0.8 V Drops to 0 after a short while	0.7 V – 0.8 V Drops to 0 after a short while
Depress WIND and run tape to end stop	10 V – 3.5 V Drops to 0 a little while after the end stop is reached	
Depress REWIND and run tape to end stop		10 V – 3.5 V Drops to 0 a little while after the end stop is reached

## 6. ELECTRICAL ADJUSTMENTS

### EQUIPMENT NEEDED:

- High impedance voltmeter (VTVM)
- AF signal generator
- DC voltmeter
- Distortion meter
- Tandberg Test Cassettes:
  - Test Tape No. 23 Azimuth 6300 Hz
  - Test Tape No. 24 1000 Hz
  - Tandberg XD cassette or equivalent

### GENERAL

Clean the tape path before making adjustments. Carry out adjustments in the order described here, since the adjustments affect one another.

### NOTE

Apply 10 mV, 1000 Hz to the RADIO socket when record current (sensitivity) is adjusted. When playing back set the INPUT LEVEL to min. so that the input signal does not disturb the playback signal.

### AZIMUTH, RECORD/ PLAYBACK HEAD

Play back Test Tape No. 23 or a standard azimuth cassette. Adjust the azimuth screw on the record/playback head for maximum voltage on a VTVM connected to the RADIO socket.

### OVERALL RESPONSE CURVE (BIAS ADJ.)

Use a Tandberg XD cassette or equivalent. With 1000 Hz as reference, adjust C112 BIAS ADJ. to obtain the correct curve 40- 14000 Hz, -3 dB.

### RECORD CURRENT (SENSITIVITY)

Play back Test Tape No. 24. Measure the output voltage on the RADIO socket with the VTVM and make a note of the reading. With the INPUT LEVEL set to maximum, apply 10 mV signal, 1000 Hz, to the RADIO socket. Record on a Tandberg XD cassette. Play back the recorded signal.

The level now measured should be within 2,5 dB of the level obtained with the No. 24 Test Tape. If not, adjust R 312 REC.LEVEL ADJ. and try again.

When this level is correct, adjust R321 METER LEVEL ADJ. to obtain 0 dB deflection on the level meter. Maximum permissible distortion for a record/ playback signal at 0 dB is 3 %.

### QUIESCENT CURRENT

The quiescent current can be adjusted in one of two ways:

1. **Using a DC-voltmeter:**  
With no input signal, measure across R 174 and adjust R 171 to obtain 3-4 mV. See fig. 6.1.

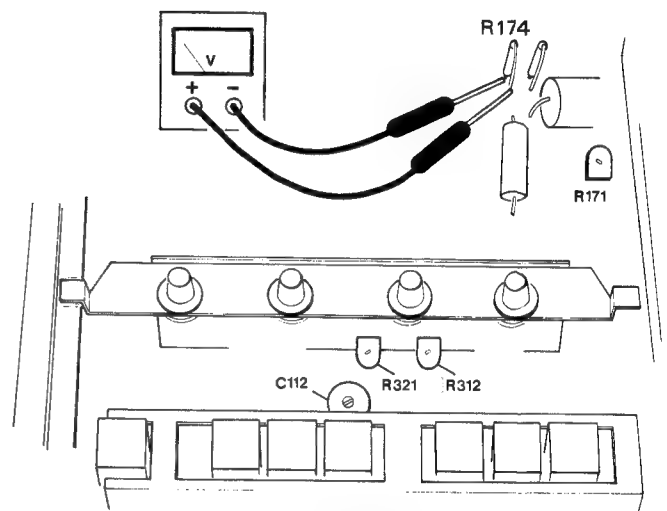


Fig. 6.1 Location of test point and adjustable components

2. **Using an AMP-meter:**  
Unsolder one end of the jumper that is connected in series with the collector of Q 165. See fig. 6.2 to identify the jumper.

Connect the two leads of an AMP-meter to either side of the jumper. With no input signal, adjust R 171 to 15-20 mA.

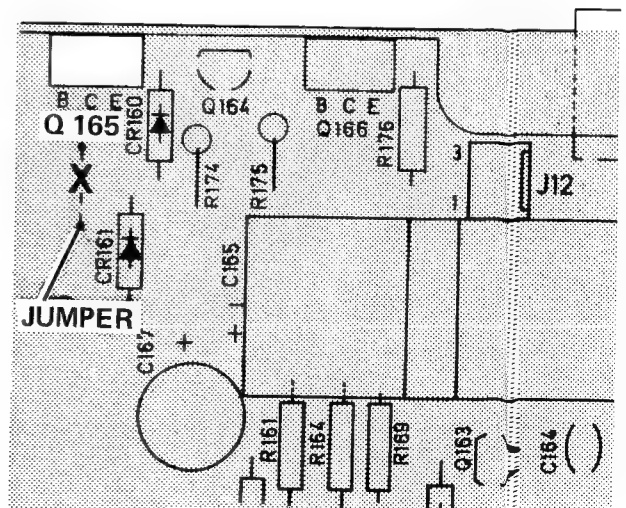


Fig. 6.2 Location of the jumper connected in series with collector of Q 165



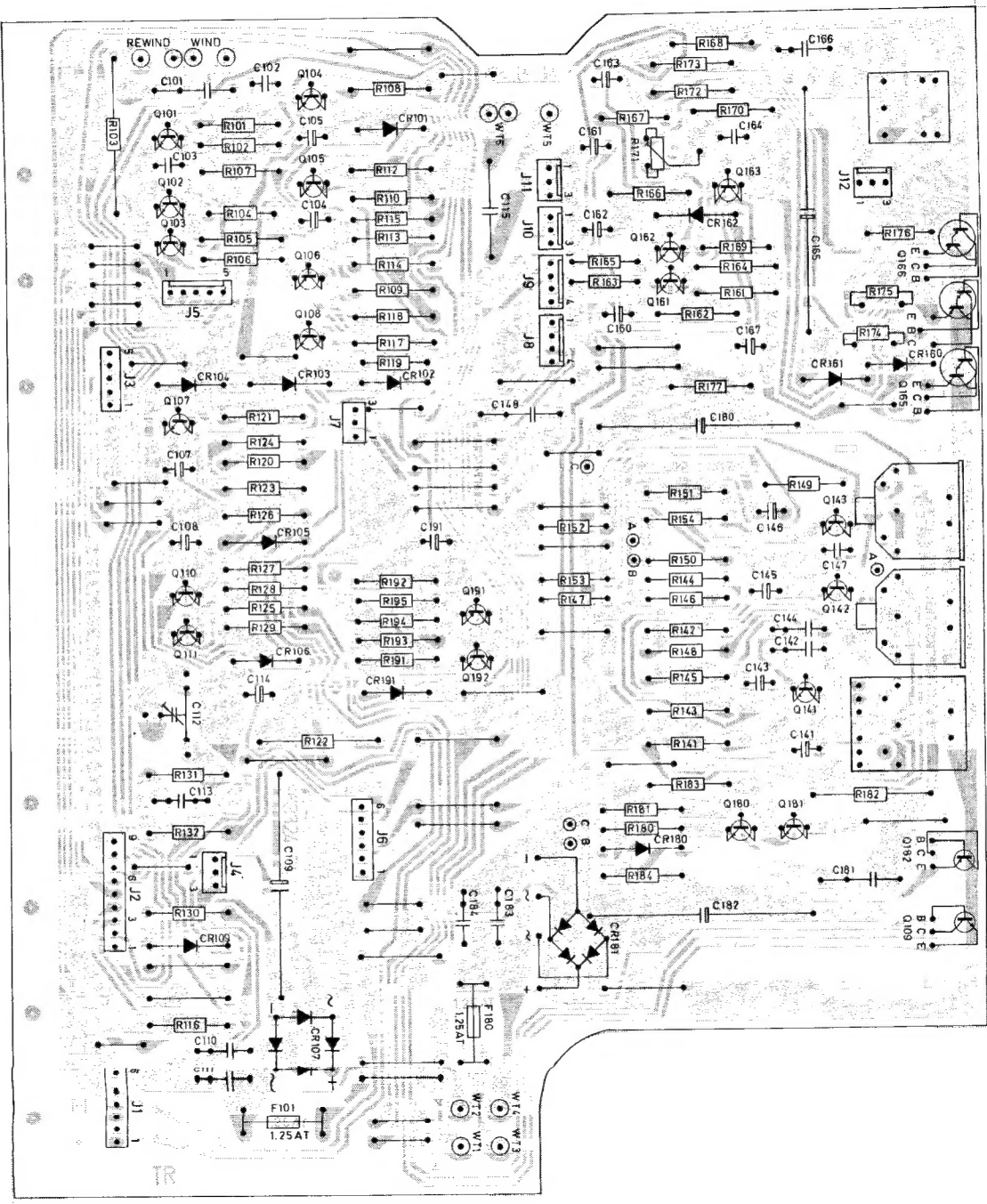


Fig. 6.3 Main Board, seen from the foil side

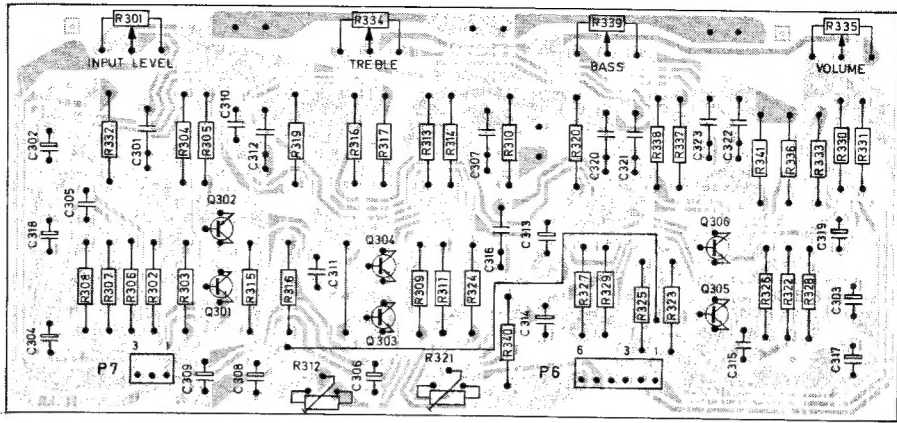


Fig. 6.4 Amplifier 1 Board, seen from the foil side

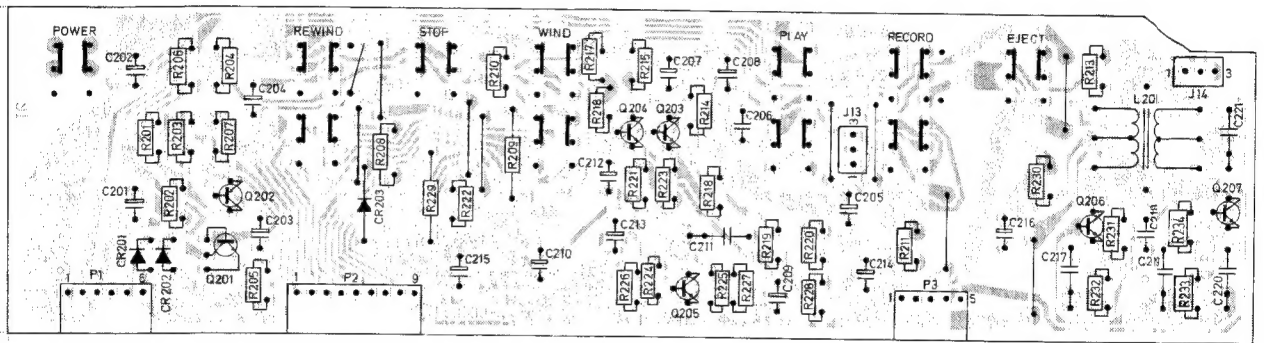


Fig. 6.5 Amplifier 2 Board, seen from the foil side

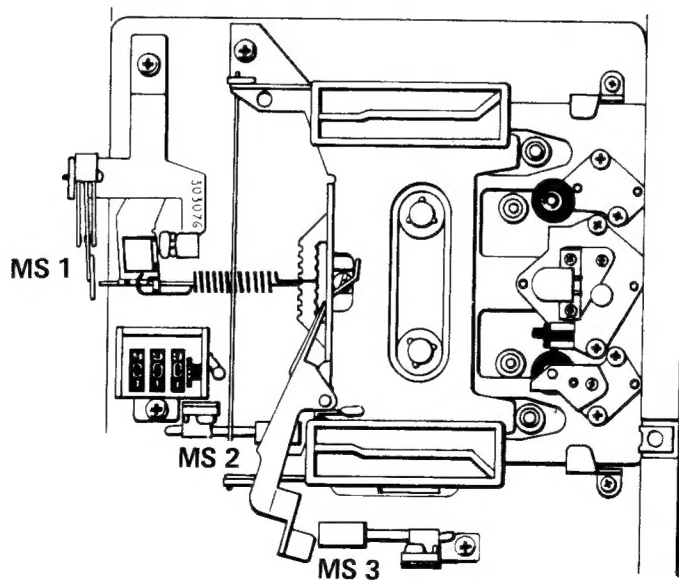
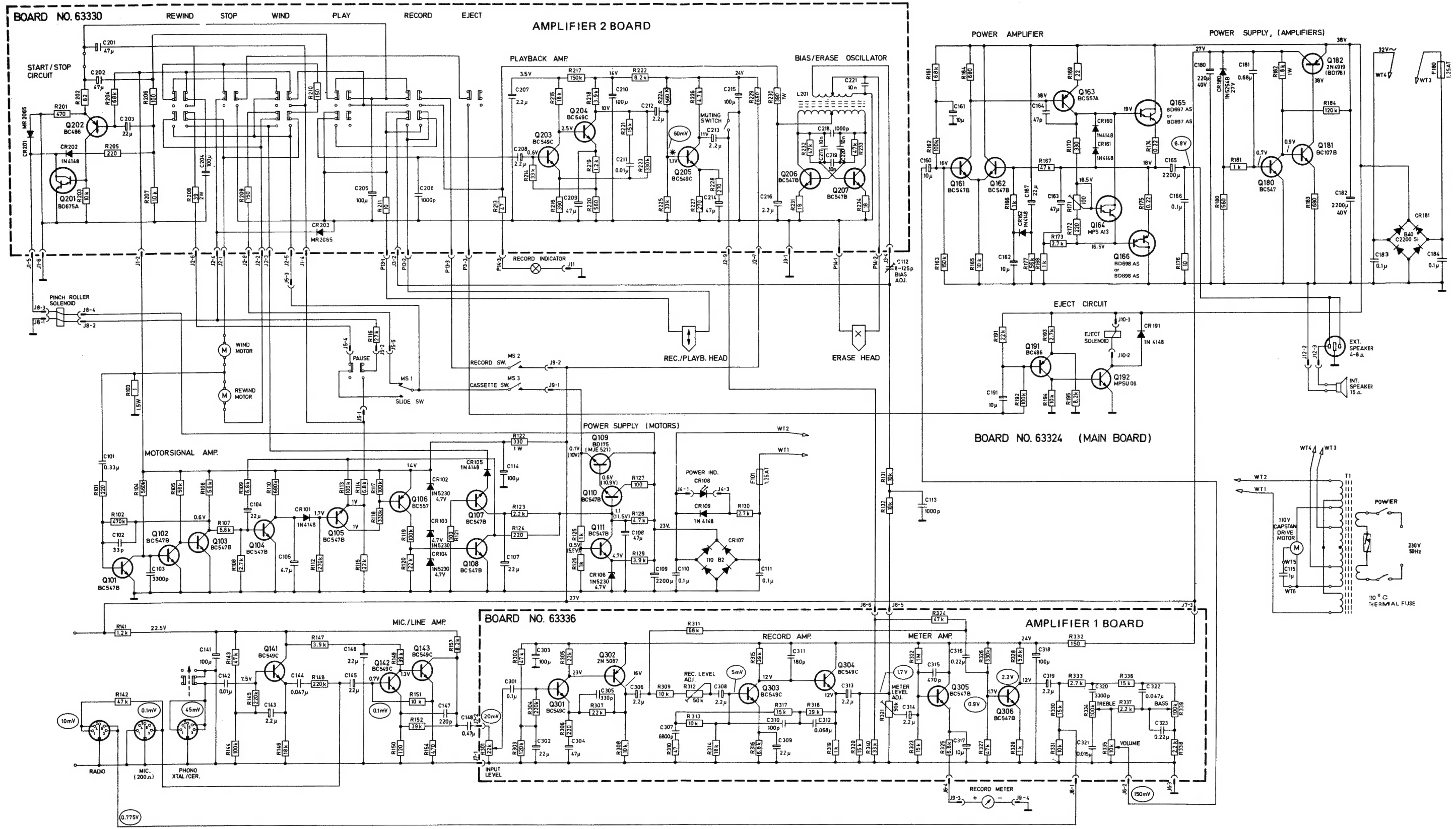
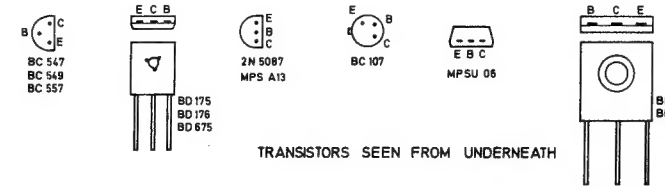


Fig. 6.6 Position of the microswitches MS1 - MS3



ALL DC VOLTAGES MEASURED WITHOUT SIGNAL.  
 (1mV) DENOTES SIGNAL VOLTAGES (1000Hz).  
 1mV DENOTES DC VOLTAGES.  
 (10V) DENOTES DC VOLTAGES IN OPERATED MODE.  
 \* MEASURED WITH TANDBERG TEST TAPE NR. 24.

THE POSITION OF THE MICROSWITCHES IS SHOWN IN FIG. 6.6 AT PAGE 18.



TCR 2/2

IN ANY COMMUNICATION PERTAINING TO THE EQUIPMENT PLEASE SPECIFY TYPE NUMBER AND SERIAL NUMBER

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