

# LUXOR

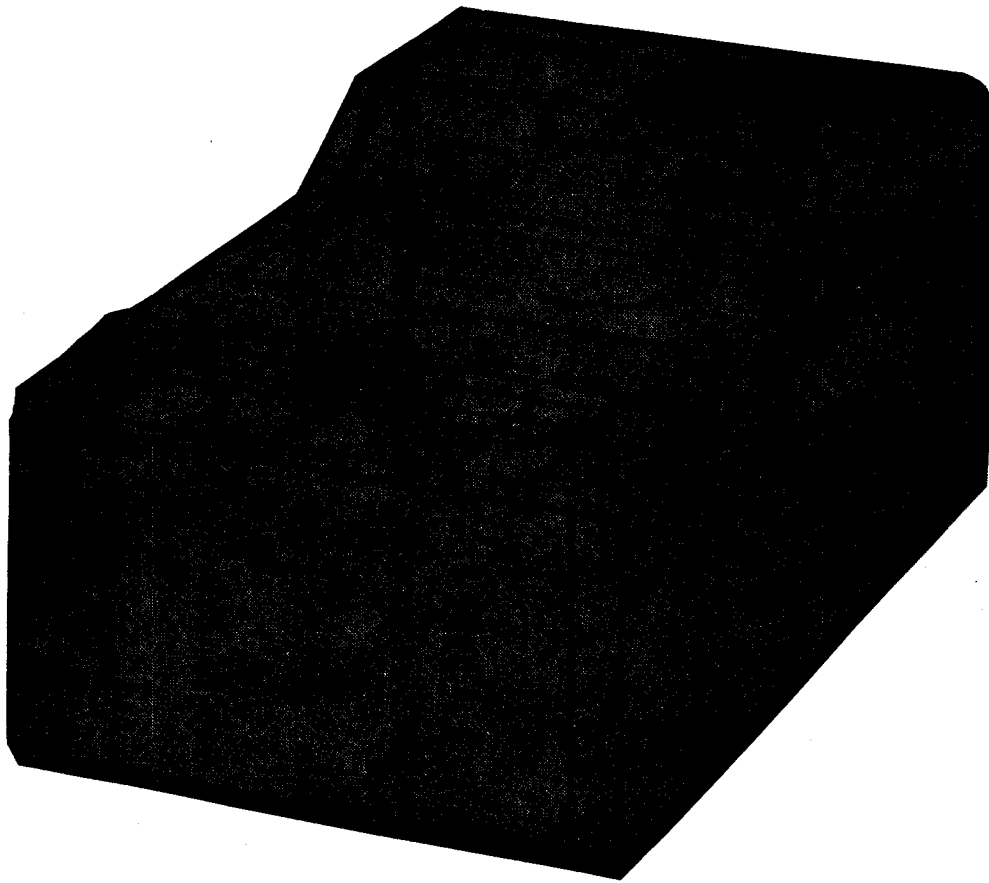
Preliminary  
edition

## ABC 820 Cassette Memory

190 9313

### Service Manual

Edition 1.0 August 1981



ABC<sup>®</sup>800

LUXOR  
Computers

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## TECHNICAL DATA

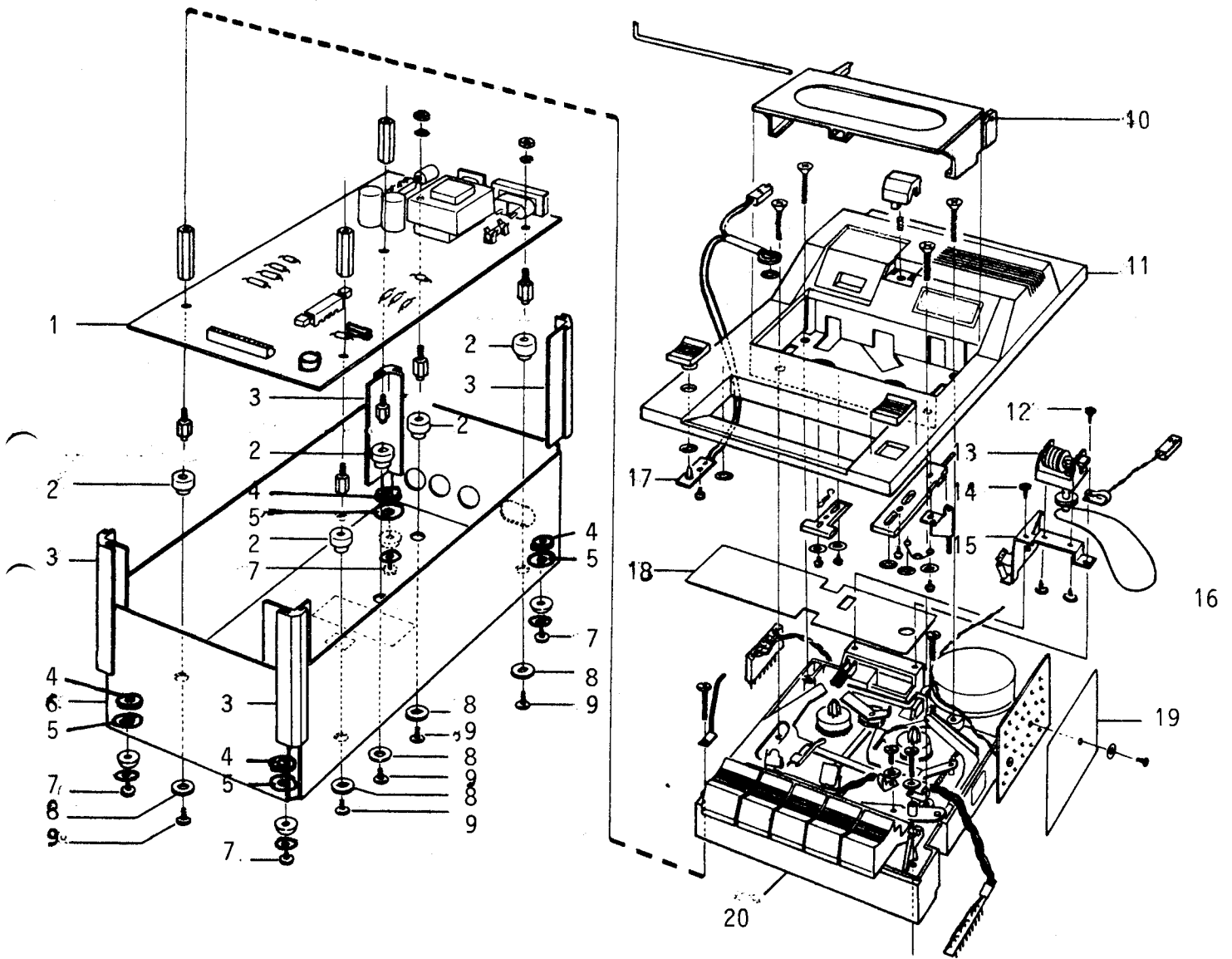
Recording mode	Direct recording with saturation of the magnetic tape.
Coding mode	FM
Tape speed	4.75 cm/s (1.7/8 i.p.s.)
Speed deviation	± 1.5 %
Data transfer speed	Up to 2400 baud
Input signal - output signal	TTL compatible
Vow and flutter	< 0.3 %
Fast wind (independent of motor control)	C-60 < 90 seconds C-30 < 50 seconds C-15 < 35 seconds
Monitoring	Via the loudspeakers of the ABC 800
Erasure	Separate erasure head, RF erasure
Erase efficiency, 1000 Hz	55 dB
Sockets	Mains supply socket, DIN socket for signal and motor control
Mains supply voltage	220/240 V, 50 Hz switchable
Power consumption	< 5 W
Fuses	50 mA (slow), 500 mA (slow)
Size	300 x 140 x 110 mm
Weight	2.5 kilos

## DISASSEMBLY

Remove the five screws (9) with yellow brackets on the underside. The cassette mechanism can now be lifted out.

NOTE: The middle screw must not be tightened too hard when reassembling.

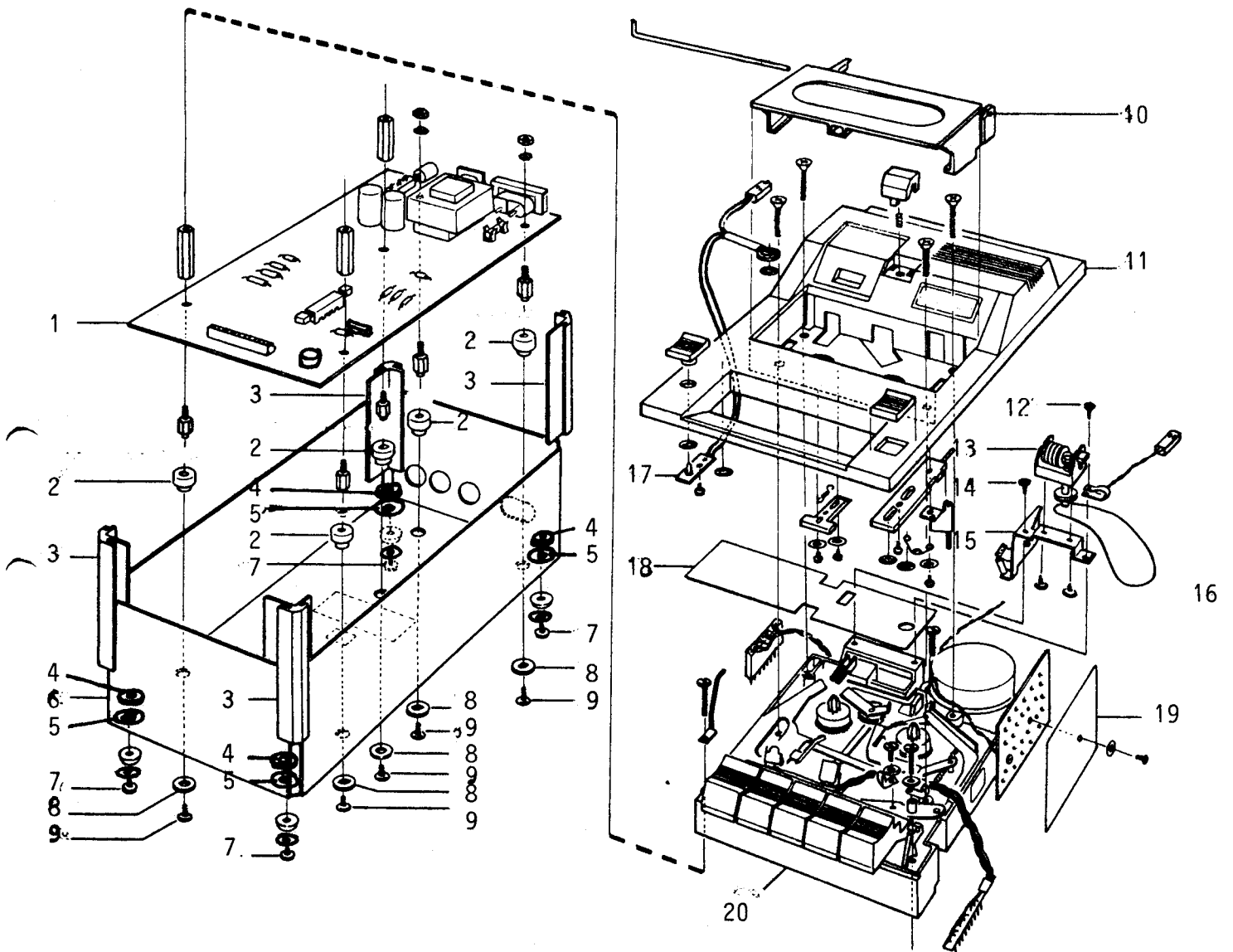
EXPLODED VIEW



SPARE PARTS LIST

1	55 20823-01	11	53 30312-02
2	43 80068-01	12	51 10476-10 (RXK B6x6.5)
3	53 30433-01	13	57 30014-01
4	50 12111-10	14	51 10478-10 (RXK B6x8)
5	49 11039-11	15	57 20674-01
6	44 20581-01	16	57 20552-01
7	50 10105-10 (MRX 4x10)	17	55 10446-01
8	49 11247-05	18	53 30279-01
9	50 10072-10 (M3x6)	19	57 20717-01
10	53 30355-01	20	57 40050-01

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# MECHANICAL ADJUSTMENT INSTRUCTIONS

## FUNCTION DESCRIPTION

### 1. Drive mechanism

The control circuit governs the motor speed. The motor drives the flywheel, reel pulley wheel and fast pulley wheel by rubber belt in playback mode, the take-up reel is driven by a gear-wheel from the reel pulley wheel, which is adjustable to give constant torque.

In FF/REW mode the torque-limiting pulley wheel moderates the increased tension which occurs at the end of a tape. When switching to FF mode the order of drive is rubber belt, fast pulley wheel, transfer gear-wheel and take-up reel/right hub/. When switching to REW mode the order of drive is rubber belt, fast pulley wheel and take-off reel/left hub/.

The characteristics of the transmission system are: The torque limiting pulley wheel is common to both FF and REW. On playback the reel clutch wheel ensures correct tape tension.

When the press-buttons are operated, the lever assembly holding the gear and pulley wheels is pulled by springs to the precise spot positions which ensures correct engagement of the gear-wheels. The head holder assembly, moving on two steel balls, ensures a proper tape run.

### 2. Motor circuit

The motor control circuit, /shut-off/end stop/circuit and the rectifier circuit are located on the motor P.C. board.

A motor with electronic speed control drives the mechanism. If voltages or load change within specified limits, the motor speed will still remain virtually constant.

Constant speed is achieved by a two-transistor control circuit. Transistor Q4 2N2905 is controlled by transistor Q1 BC183B which is influenced by the counter electromotive force of the motor. This force is proportional to motor speed. If the motor is loaded so that the speed decreases, the counter electromotive force will decrease. The transistor Q1 senses this and increases the current through transistor Q4 so that correct speed is maintained.

In later production, the motor control is located under the motor cover. Speed is adjustable by the potentiometer accessible from the top of the motor.

### 3. Auto-stop and rectifier circuit

When the set is switched on, voltages are produced and the charging current of capacitor C2 saturates the transistor Q2.

When the take-up reel turns, the rotating sensor switch K-3 discharges capacitor C1 through resistor R1, then switches the discharged capacitor to capacitor C2. The charge level of the two capacitors is held at such a value that the transistor Q2 becomes saturated. When the take-up reel stops rotating, capacitor C2 is discharged within approximately 1 second and the voltage on the base of the transistor Q2 sinks below the switch value. Q2 is cut off and Q3 is saturated, and the traction magnet pulls. If the push-buttons should not return to normal position the first time the magnet pulls, the switch circuit will repeat pulling until the buttons return to the normal position.

### 4. Additional functions

The cassette drive mechanism SM-1 also includes the following functions:

#### Electric erasure blocking device

This function is obtained by a 2-way switch with free contacts. When a cassette is inserted on which the recessed cover plates have been removed, the contacts

remain in normal position, i.e. no erasure can take place. When cassettes with cover plates are used, switching will occur, i.e. erasure can be made.

#### Motor Control switch

The mechanism contains a double contact switch which switches off the current to the motor when the motor control lead is connected.

Consequently the switch will open in playback position and close in normal position, i.e. switches on current to the motor at fast wind as well as at CUE and REVIEW. The current to the motor is further switched on at pause when only the recording button is pressed.

In position playback, and with the motor control lead connected, the mechanism is started and stopped from the computer.

### 5. Maintenance

It is recommended that the mechanism is cleaned regularly after approx. 50 hours use.

The following parts should be cleaned (in the order stated):

- recording/playback head
- pinch roller
- capstan shaft
- erase head

Cleaning is made by small pieces of cotton cloth, slightly moistened with alcohol. It is important that the parts mentioned are not scratched or otherwise damaged and therefore hard (i.e. metallic) material must not be used for cleaning and neither must other cleaning-agents that pure alcohol or special solutions intended for cleaning of heads be used.

The use of any other types of solvent may cause serious damage.

## ADJUSTMENT INSTRUCTIONS

Faults in the SM1 mechanism may develop due to wear and tear and the following procedure should be adopted.

The numbers used refer to the exploded view.

Note: After each repair and specially when the flywheel mechanism has been serviced, it is necessary to clean heads, pinch roller and capstan shaft as described under "Maintenance".

#### Tape speed check

- a. Insert test cassette 3.150 Hz (Part No. 57 10017-01) and switch to playback position.
- b. Connect a frequency meter to the recorder output. Correct tape speed is when the frequency counter shows  $3.150 \pm 45$  Hz at both ends of the tape.
- c. Should the reading be outside this value, adjust potentiometer P1 (in later mechanisms, by the potentiometer in the motor).
- d. Cassette decks with Sanwa motor, type TE-436. This motor type has a built-in control board. The adjustment potentiometer is accessible through a hole in the bottom of the motor.

#### Wow and flutter (measured according to DIN 45507, weighted value)

- a. Connect the wow-meter to the DIN-socket of the recorder.
- b. Insert a test cassette 3.150 Hz (part No. 57 10007-01) and record for approx 1 minute. Then rewind and play back.
- c. The wow and flutter value is acceptable if the reading is not higher than  $\leq 0,3\%$ , also after repeated starts.

## ADJUSTMENT CHART (Fig see pages 7 - 11)

Reliable performance of the SM-1 mechanism depends on certain correct adjustments which must be carefully carried out according to the following instructions and sketches.

Adjustments showing tools required	Purpose and Description of adjustment	Mode of Mechanism
<p>1.</p> <p>Brake arms (38) and (40) under the rubber-cover end.</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Pointed pliers</li> </ul>	<p>The tongue of the right brake arm should lie in the middle of the fork of the left brake arm.</p> <p>(Fig. 1)</p>	<p>Push-buttons should be in released position.</p>
<p>2.</p> <p>Right, rear tongue on the right brake arm (40).</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Pointed pliers</li> </ul>	<p>Release of brakes and operation of motor switch on fast forward. Play between the arm FF (51) and right read of the right brake arm should be 0,2 - 0,4 mm.</p> <p>(Fig. 2 - 3)</p>	<p>Push-buttons should be in released position. To be carried out after adjustment 1.</p>
<p>3.</p> <p>Left, rear tongue or the right brake arm (40)</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Pointed pliers</li> </ul>	<p>Release of brakes and operation of motor switch on playback. Play between head arm (61) and the left tongue of right brake arm should be 3,2 - 3,5 mm.</p> <p>(Fig. 2 - 3)</p>	<p>Push-buttons should be in released position. To be carried out after adjustment 1.</p>
<p>4.</p> <p>Tongue of fast wind arm REW (42) in relation to the left brake arm (38)</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Pointed pliers</li> </ul>	<p>Release of brakes and operation of motor switch on fast rewind. Movement of left clutch arm (54) should be 1,8 - 2,2 mm when the REW-button is pressed down.</p> <p>(Fig. 4)</p>	<p>Push-buttons should be in released position. To be carried out after adjustment 1.</p>
<p>5.</p> <p>Tongue of fast wind arm REW (42) in relation to shaft of conveyor arm (88)</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Flat pliers</li> </ul>	<p>When using REW-function, the conveyor arm should turn so that the motor switch moves sufficiently and that the right contact arm (58) is always moved by the arm of the pinch roller (56). Play between the shaft of the conveyor arm and fast wind arm REW should be 0,2 - 0,3 mm.</p> <p>(Fig. 5)</p>	<p>Playback button should be in pressed down position.</p>
<p>6.</p> <p>Tongue of fast wind arm REW (42) in relation to drive wheel arm REW (43).</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Flat pliers</li> <li>- Measuring tool</li> </ul>	<p>The distance between the fast wind drive wheel (19) and the left tape cog wheel (26) should be 1,5 - 1,8 mm.</p> <p>(Fig. 6)</p>	<p>Push-buttons should be in released position.</p>
<p>7.</p> <p>End of arm for drive wheel (43) in relation to stop on base plate (11).</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Flat pliers</li> </ul>	<p>Adjustment of play between the gear of the fast wind drive wheel (19) and the left tape reel (26). The play should be 0,4 - 0,6 mm.</p> <p>(Fig. 7)</p>	<p>Rewind button in pressed down position.</p>

<p>8.</p> <p>Tongue of fast wind arm FF (51) in relation to shaft of the conveyor arm.</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Flat pliers</li> <li>- Screwdriver</li> </ul>	<p>When using the CUE function, the conveyor arm should turn so that the motor switch moves sufficiently for the right contact arm (58) to always move the arm of the pinch roller (56). Play between the shaft of conveyor arm and fast wind arm FF (51) should be 0,2 - 0,3 mm.</p> <p>(Fig. 8)</p>	<p>The playback button should be in pressed down position.</p>
<p>9.</p> <p>Slot in the arm of the drive wheel FF (92).</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Pointed pliers with rounded jaws</li> <li>- Screwdriver</li> </ul>	<p>Play between gears of pulley wheel FF (93) and right tape wheel (16) should be 0,4 - 0,6 mm.</p> <p>(Fig. 9)</p>	<p>The fast forward button should be in pressed down position.</p>
<p>10.</p> <p>Tongue of the drive wheel arm in relation to the pin on the base plate.</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Pointed pliers</li> <li>- Screwdriver</li> </ul>	<p>Play between gears of fast wind drive wheel (19) and pulley wheel (93) should be 0,4 - 0,6 mm.</p> <p>(Fig. 10)</p>	<p>The fast forward button should be in pressed down position. This adjustment should be carried out after adjustment point 9.</p>
<p>11.</p> <p>Eccentric cam (22)</p> <ul style="list-style-type: none"> <li>- Screwdriver</li> </ul>	<p>Adjustment of play between gears of the drive wheel play (21) and the right tape wheel (16) Adjust by inserting a 0,6 mm feeler gauge between the eccentric cam (22) and the clutch arm (58), and turn the cam until the tips of the gears touch. The cam should be locked in this position.</p> <p>(Fig. 11)</p>	<p>Playback button should be in pressed down position. Drive voltage must be present.</p>
<p>12.</p> <p>The right clutch arm (58). Relationship between the roller (97) and the arm for the pinch roller (56).</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Flat pliers</li> </ul>	<p>Bend the lower part of the clutch arm (58) until the play between the roller (97) and the forward-moving part of the arm of the pinch roller (56) becomes max. 0,2 mm (the parts must not touch).</p> <p>(Fig. 12)</p>	<p>Playback button in pressed down position. The clutch arm should touch the eccentric cam. (See point 11.) The head holder must be removed. Adjustment is made after adjustment of pinch roller has been carried out.</p>
<p>13.</p> <p>The end of the right clutch arm (58) in relation to the clutch arm switch assembly (13).</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Flat pliers</li> </ul>	<p>Bend the end of the clutch arm until, in playback mode, it just touches the right plastics arm of the switch assembly. Movement in excess of 0,3 mm is permitted, but always check that the switches function. When the adjustments in points 11, 12 and 13 have been carried out, the following controls should be made: The two muting switches must switch on as soon as the pinch roller is pulled away, by hand, from the capstan shaft so that the tape stops. The take-up reel must then also stop.</p> <p>(Fig. 16)</p>	<p>Playback button in pressed down position. The clutch arm should touch the eccentric cam. (See point 11.)</p>
<p>14.</p> <p>Shut-off magnet (28)</p> <ul style="list-style-type: none"> <li>- Screwdriver</li> </ul>	<p>The magnet should be secured so that the arm II for end stop (36) touches both ends of the magnet.</p> <p>(Fig. 14)</p>	<p>The push-buttons should be in released position.</p>



<p>15.</p> <p>Tongue of arm II (36) that moves arm I (35).</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Screwdriver</li> <li>- Flat pliers</li> </ul>	<p>When the armature is moved slowly towards the magnet, the playback button should release at the moment when the armature touches the magnet.</p> <p>(Fig. 15)</p>	<p>To be carried out after adjustment (see point 14). Power off.</p>
<p>16.</p> <p>Fork of the arm (89) which affects the shaft of the conveyor arm (88).</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Screwdriver</li> <li>- Flat pliers</li> </ul>	<p>When switching from playback position to stop (by pressing the stop button), the fork of the arm (89) should assist the conveyor arm (88) in swinging over to its end position. However, the shaft of the conveyor arm must not prevent the arm (89) returning to its normal position. The fork of the arm (89) should therefore be adjusted so that a play of 0,1 - 0,2 mm exists between the underside of the fork and the shaft of the conveyor arm (88).</p> <p>(Fig. 13)</p>	<p>Push-buttons should be in released position.</p>
<p>17.</p> <p>Right reel hub spring</p>	<p>The right reel hub spring and hub cap must be preset so that their gears just release contact by a torque, during take-up wind, of 40 - 50 pcm.</p> <p>(Fig. 17)</p>	<p>Remove hub cap from the shaft.</p>
<p>18.</p> <p>Adjustment of knurled nut on pulley wheel for playback (7)</p>	<p>Adjust the torque to <math>40 \begin{smallmatrix} +15 \\ 0 \end{smallmatrix}</math> pcm, during take-up wind, by means of a torque meter cassette. The adjustment is correct when, using a normal cassette, the angle of lag of the right reel hub lies between <math>30-90^{\circ}</math> (when switched to pause). The torque increases when the nut is turned clockwise.</p> <p>(Fig. 18 &amp; 19)</p>	<p>Playback button should be in pressed down position. Power should be switched on. The adjustment should be carried out at the beginning of the tape.</p>
<p>19.</p> <p>Adjustment of knurled nut on pulley wheel for fast wind (8)</p>	<p>Adjust the torque on FF and REW to <math>70 \begin{smallmatrix} +30 \\ 0 \end{smallmatrix}</math> pcm by means of a torque meter cassette. The torque is increased by turning the nut clockwise.</p> <p>(Fig. 18 &amp; 19)</p>	<p>Button for FF or REW should be in pressed down position. Power on.</p>
<p>20.</p> <p>Leaf spring for REW (84).</p> <ul style="list-style-type: none"> <li>- Screwdriver</li> </ul>	<p>Slackening the retaining screw of the spring a distance of 0,2 - 0,3 mm should be set between the hook and the arm of the spring for drive wheel REW (43). Check: If button REW is carefully pushed, the pulley wheel for fast wind (8) must move slightly.</p> <p>(Fig. 20)</p>	<p>To be carried out after adjustment point 6. Push-buttons should be in released position.</p>
<p>21.</p> <p>Brake (74)</p> <ul style="list-style-type: none"> <li>- Screwdriver</li> <li>- Flat pliers</li> </ul>	<p>Take-off torque in playback mode should be approx. 10 - 12 pcm.</p> <p>(Fig. 21)</p>	<p>Playback button should be in pressed down position. Power on.</p>
<p>22.</p> <p>Shaft of the recording arm (85) which affects the pressure arm II (32).</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Screwdriver</li> <li>- Flat pliers</li> </ul>	<p>Shaft should be so adjusted that the fork affected by it has a play of approx. 0,3 mm.</p> <p>(Fig. 22)</p>	<p>Push-buttons should be in released position.</p>

<p>23.</p> <p>Arm of the pinch roller (56).</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Special bending tool</li> </ul>	<p>The shaft of the pinch roller can be adjusted by bending the plate so that the centre of the pinch roller touches the capstan shaft. The capstan shaft should be loaded with approx. 200 p.</p> <p>(Fig. 23)</p>	<p>Playback button should be in pressed down position.</p>
<p>24.</p> <p>Arm of the pinch roller (56).</p> <ul style="list-style-type: none"> <li>- Bending</li> <li>- Special bending tool</li> </ul>	<p>The shaft of the pinch roller can be adjusted to the left or right by bending the plate. The pinch roller should reach its lower position when given 3 - 5 turns by hand.</p> <p>By bending the shaft towards head, the pinch roller moves downwards; if the shaft is bent backwards, the pinch roller goes upwards.</p> <p>(Fig. 24)</p>	<p>Playback button should be in pressed down position. Power on. It is recommended that during this adjustment the right end of the pinch roller arm is held fast by hand.</p>
<p>25.</p> <p>Tongue of the pinch roller (56) which moves the shaft of the conveyor arm (88).</p>	<p>If the distance between the shaft of the conveyor arm and the pinch roller arm has been over-adjusted, the pinch roller will in the position CUE and/or REW not move sufficiently away from the capstan shaft. If there is no distance, the pinch roller cannot touch the capstan shaft correctly, which causes very great wow and flutter. Therefore the distance between the shaft of the conveyor arm and the pinch roller plate must be adjusted to 0,2 - 0,3 mm.</p> <p>(Fig. 25)</p>	<p>Playback button in pressed down position. To be carried out after adjustment point 23.</p>
<p>26.</p> <p>The azimuth adjustment screw (72).</p> <ul style="list-style-type: none"> <li>- Screwdriver</li> </ul>	<p>Measure the signal at the pin 1 of IC 101. Adjust the head until max. signal is obtained. (approx. 15-20 mV)</p>	<p>Use a test cassette "10 kHz". The playback button should be in pressed down position.</p>

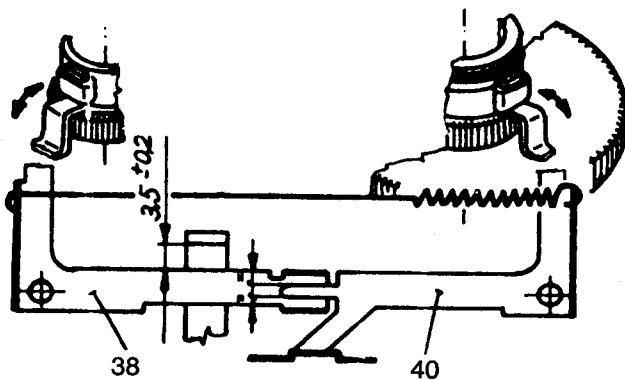


Fig. 1

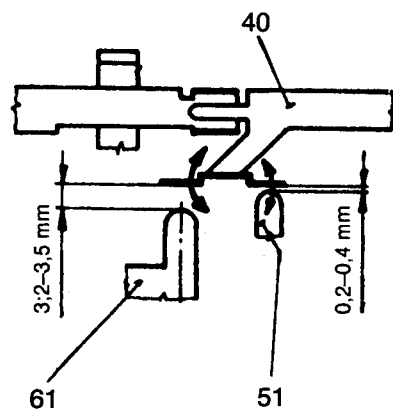


Fig. 2-3

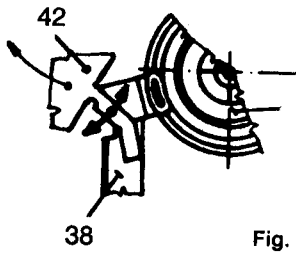
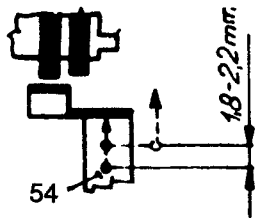


Fig. 4

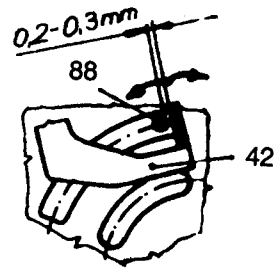


Fig. 5

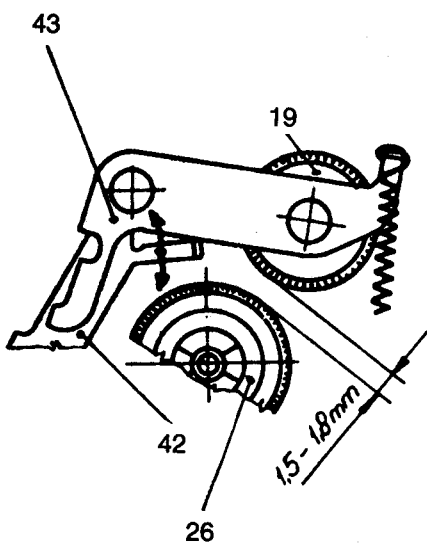


Fig. 6

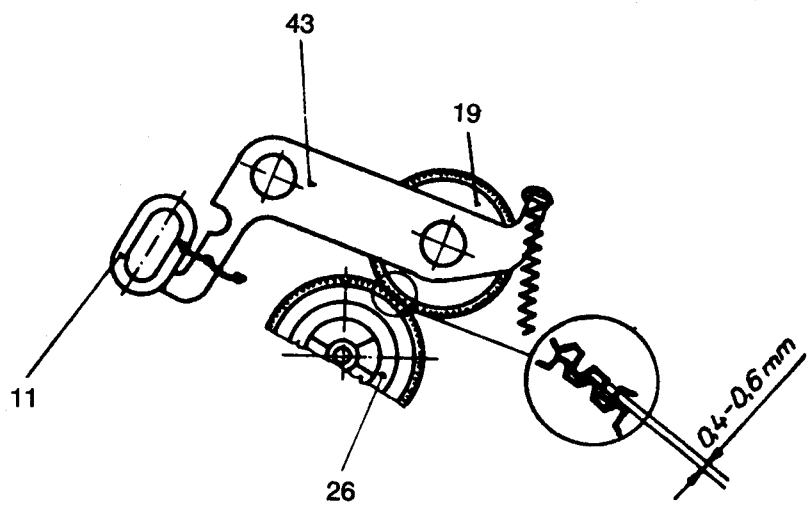


Fig. 7

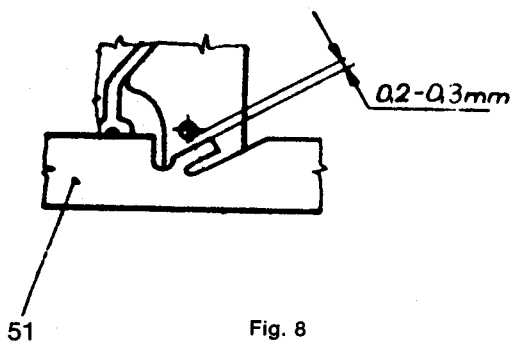


Fig. 8

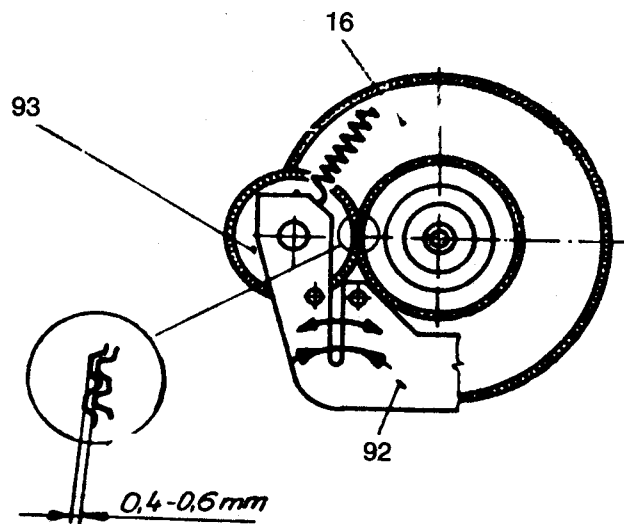
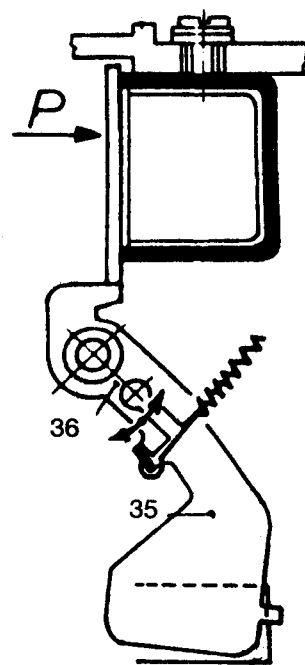
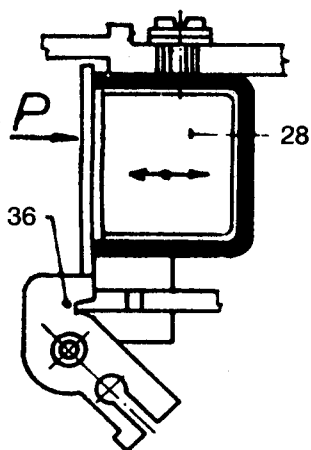
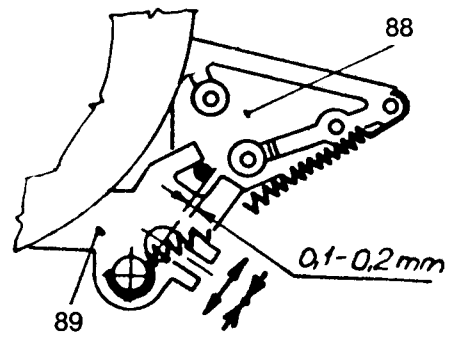
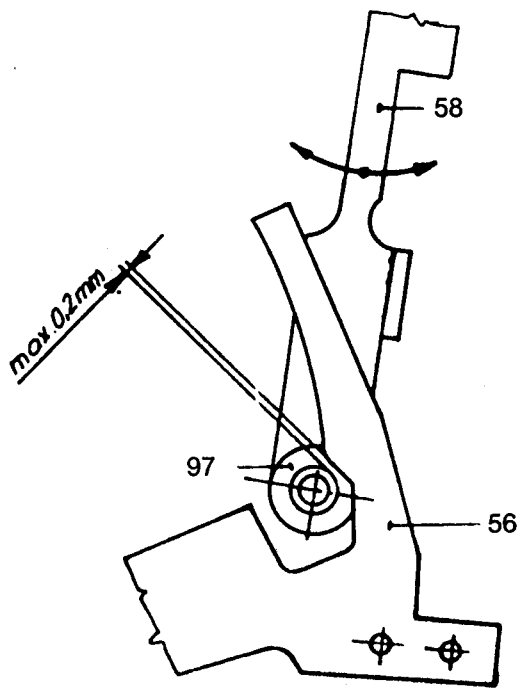
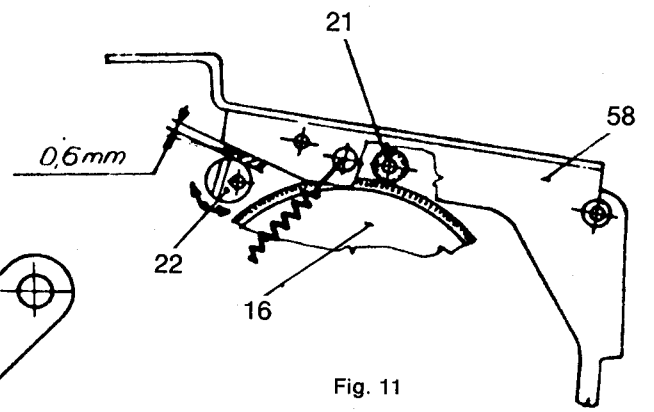
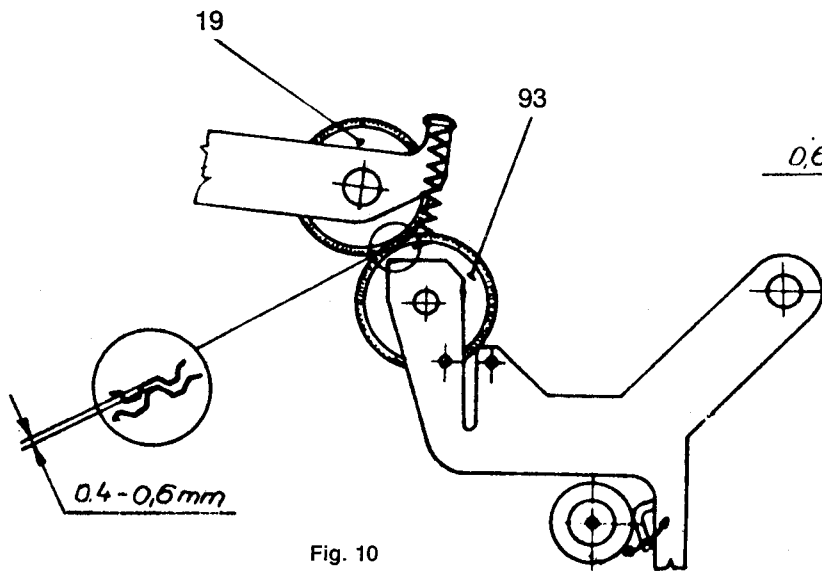


Fig. 9



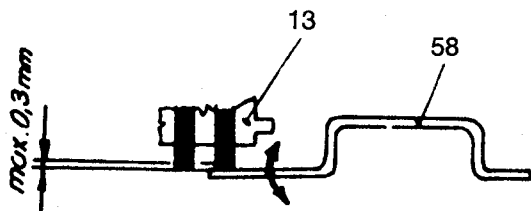


Fig. 16

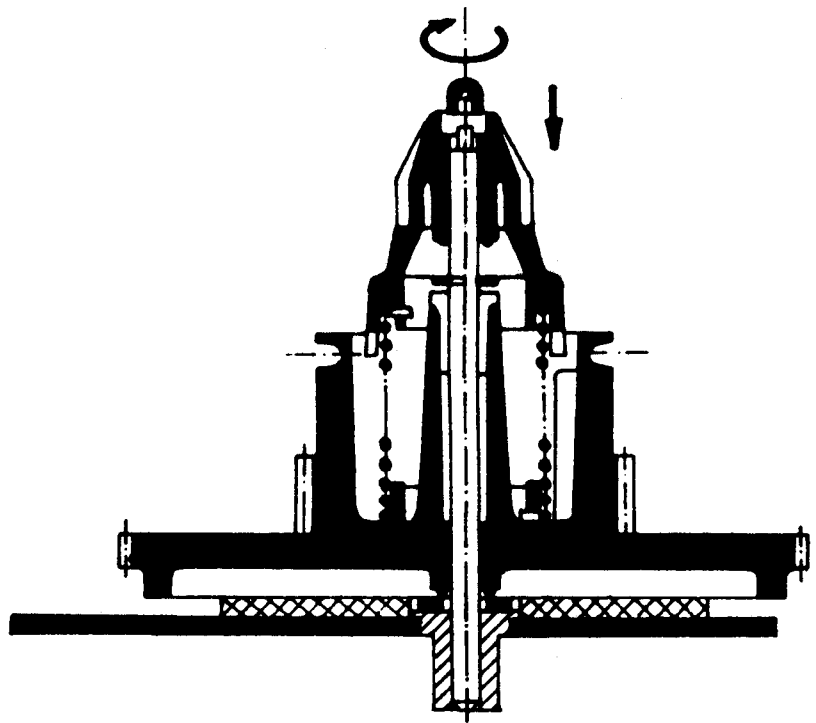


Fig. 17

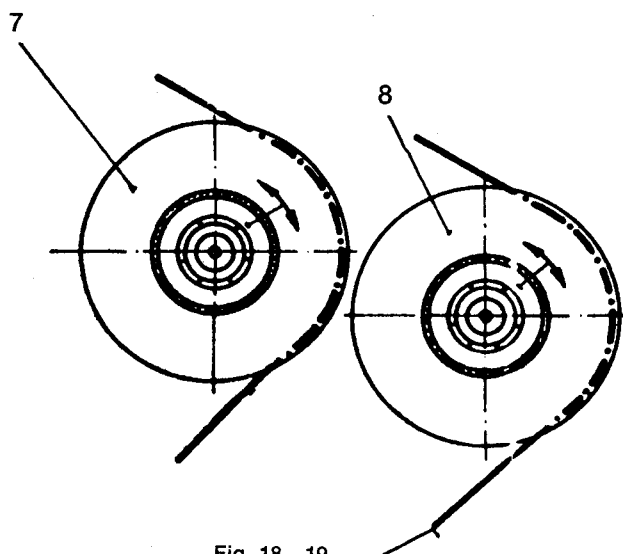


Fig. 18—19

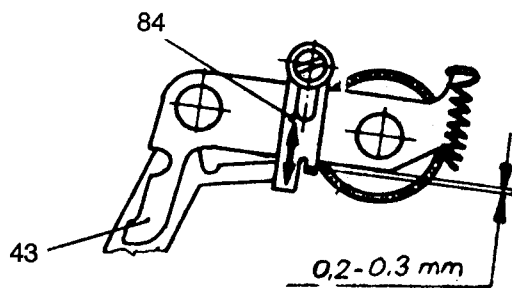


Fig. 20

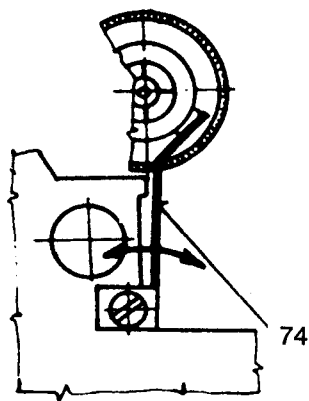


Fig. 21

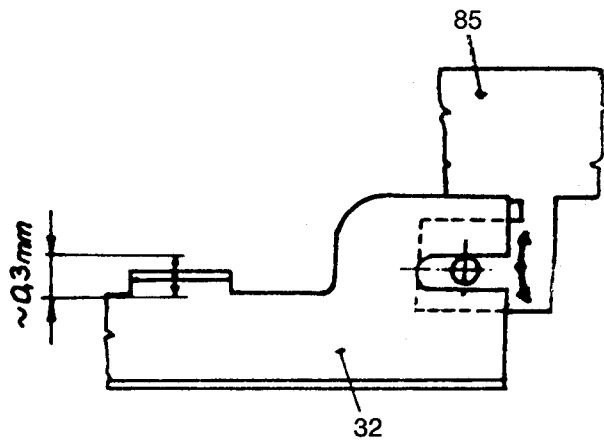


Fig. 22

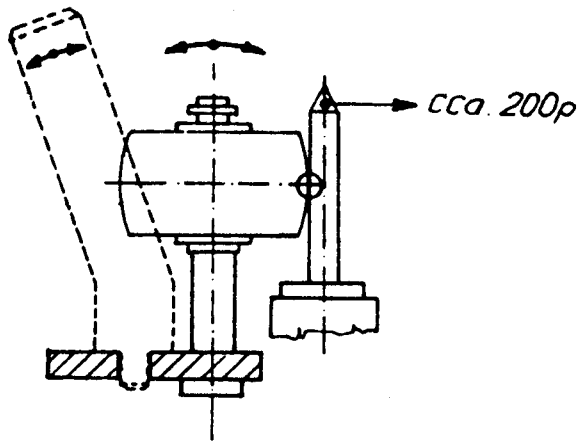


Fig. 23

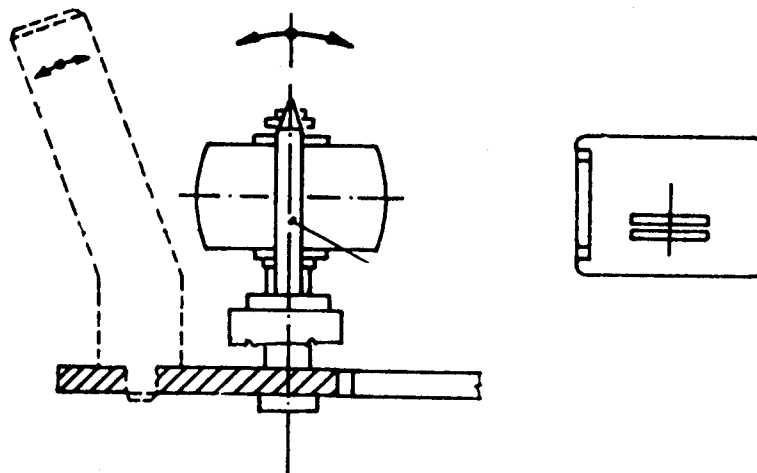


Fig. 24

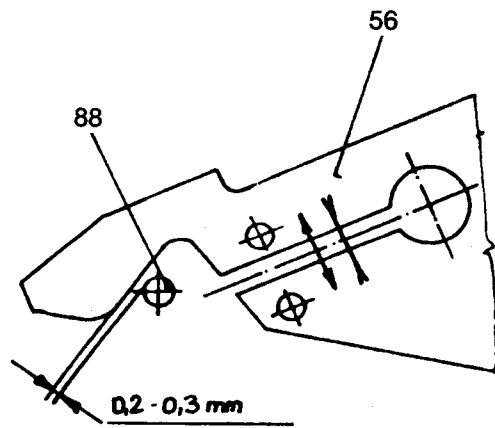


Fig. 25

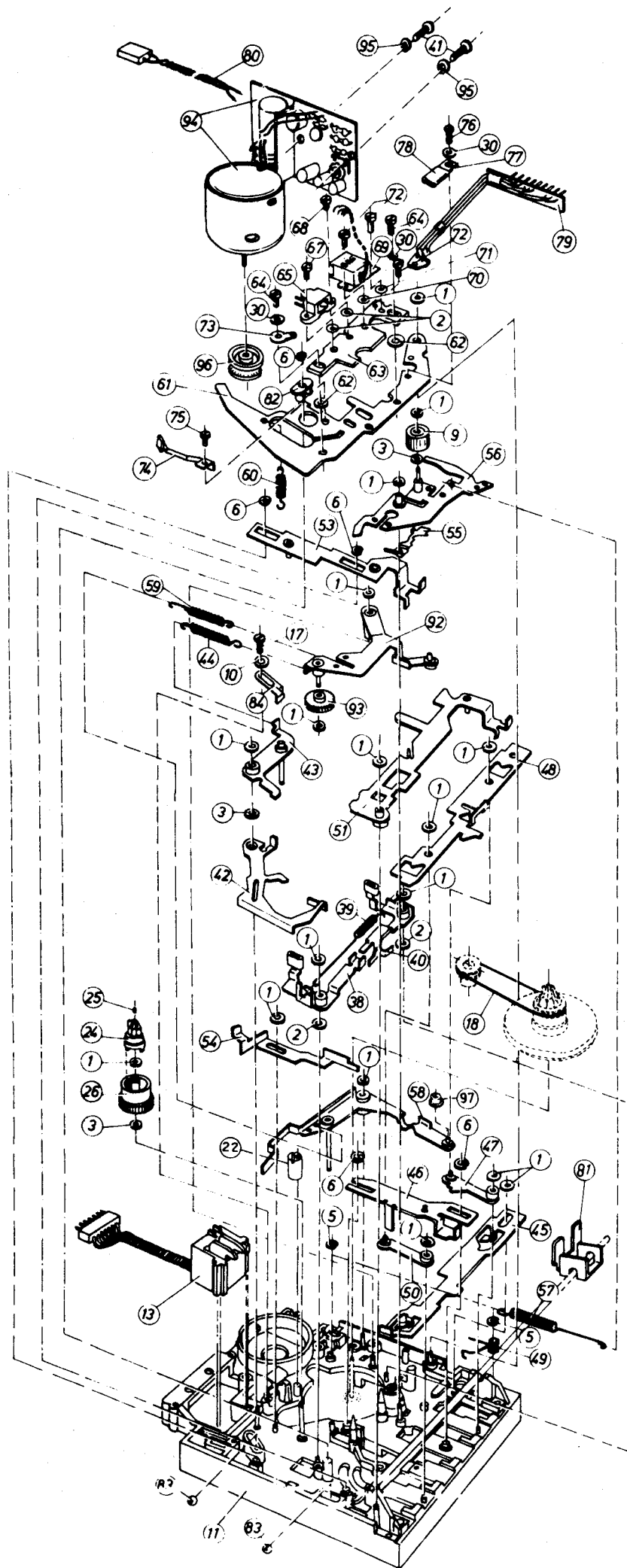
# SERVICE KEY

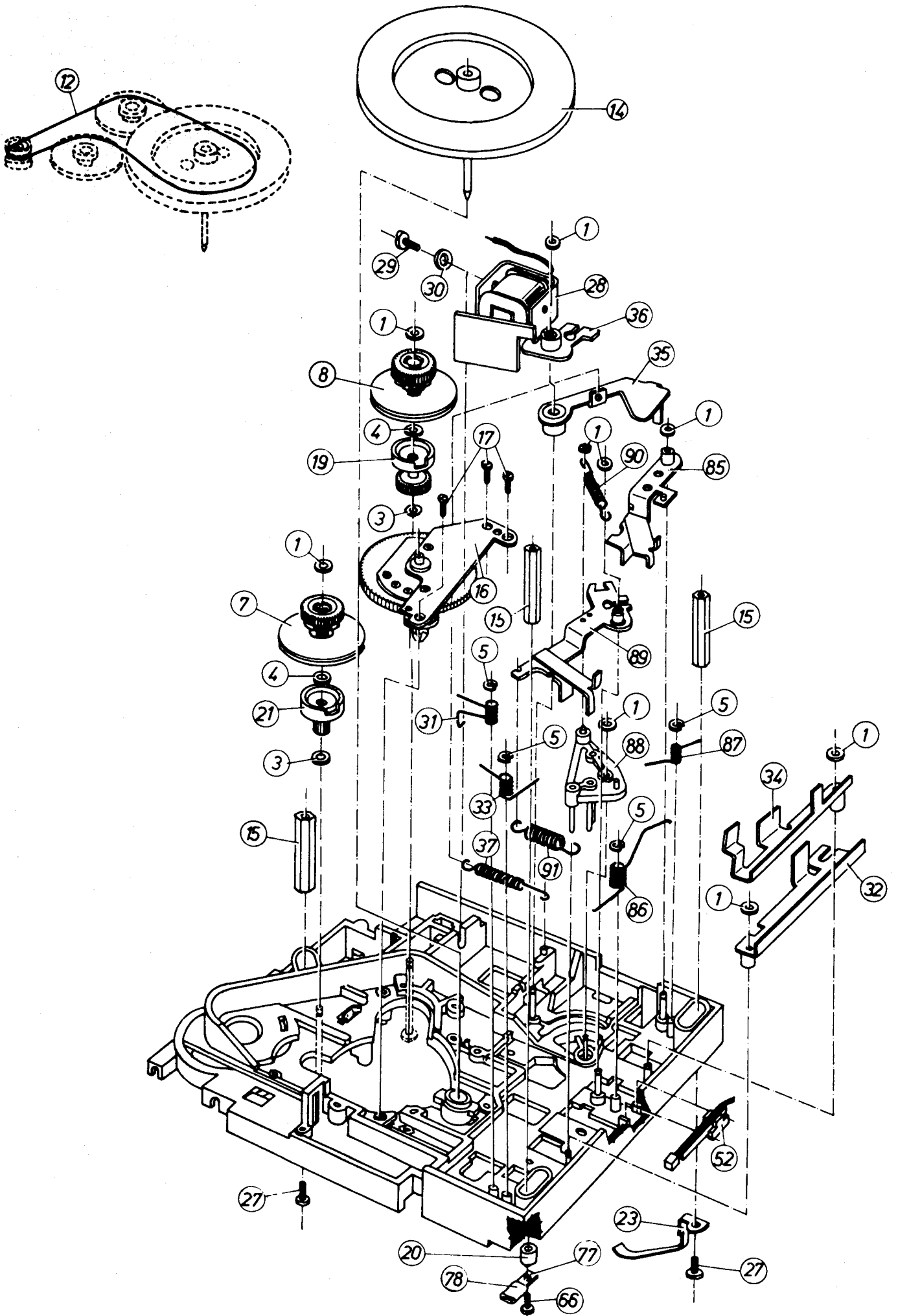
Fault	Cause	Measure	
The motor does not run.	Defective motor cable.	Replace.	
	The motor switch S2 does not make contact.	Check points 2, 3, 4 in the Adjustment Instructions. The switch S2 must close in positions P/B, FF, REW, CUE, PAUSE, REVIEW. In other positions the switch should be open.	
	Motor defective.	Replace.	
Tape does not move.	All functions	Drive belt off.	Refit.
		The motor drive wheel, drive belt or pullies slip due to oil or dirt.	Clean.
	Applies to the P/B function only	The torque of the pulley wheel 7 is too small.	Check point 18 in the Adjustment Instructions.
		The head arm does not move all the way.	Check adjustment of the erase- and P/B heads.
Tape does not move.	Applies to the REW-function only	REW traction spring 44 adrift.	Reattach.
		Incorrect adjustment of the REW leaf spring 84.	Check point 20 in the Adjustment Instructions. Replace possibly faulty parts.
Too high wow and flutter.		Oil or dirt on the pinch roller or the capstan shaft.	Clean.
		Oil on the drive belt.	Clean.
		Binding of moving parts or drive belt.	Check free movement.
		The pinch roller incorrectly aligned with capstan shaft.	Check and adjust according to point 25 in the Adjustment Instructions.
			Check and adjust according to point 12 in the Adjustment Instructions.
			Check the bearing pressure of the pinch roller. At the end of the pinch roller holder plate 56 the force should be $75^{+20}_0$ p. Replace spring 57 if necessary.
		Incorrect play between gear wheels of take-up clutch and right tape reel.	Check and adjust as point 11 in the Adjustment Instructions.
Playback failure.	No playback sound at all.	R/P head 69 defective.	Replace.
		Head cabling assy 79 defective.	Replace.
		Incorrect adjustment of the motor control switch S1.	Check points 12 and 13 in the Adjustment Instructions. The contact between the points 1-2 and 4-5 of the switch S1 may be open only in P/B and REC/P/B mode. In all other modes the contact must be closed.

Fault	Cause	Measure	
Switch off failure.	Switch off occurs during REC or PLAY.	The rotation sensor S3 does not switch. Open or incorrectly soldered wires on the rotation sensor P.C. board.	Replace take-up assy (right hub) 16. Resoldering or replacement.
	Switch off occurs at PAUSE.	The S4 contact assy 52 does not open when the P/B button is pressed.	Adjust. The S4 contact assy must open when the P/B button is pressed.
		The switch S1 does not open when the pinch roller is pulled back.	Check points 12 and 13 in the Adjustment Instructions. The switch S1 must close only in PLAY and REC/PLAY mode.
	Switch off does not function.	Open circuit in the solenoid coil 28.	Replace.
		Defective switch off circuit.	Replace.
	Switch off does not work in PLAY mode.	Points 5-6 of the S1 switch do not make contact when the P/B button is pressed.	Check and adjust as points 12 & 13 in the Adjustment Instructions.
Switch off does not work in FF and REW mode.	The S4 contact assy 52 does not switch when the P/B button is in normal position.	Adjust.	
Playback failure.	Solenoid repeatedly pulling but will not release.	Conveyor arm 48 binding.	Locate and rectify cause of binding.
Abnormal mechanical noise.	Incorrect adjustment.	Check and adjust according to points 7, 9 and 10 in the Adjustment Instructions.	
	Part incorrectly fitted.	Check and fit and fasten correctly.	
	Motor defective.	Replace.	
An error message, ERROR 21 or ERROR 35, appears on the display.	The R/P head 69 displaced.	Check and adjust as point 26 in the Adjustment Instructions.	
	The R/P head 69 dirty.	Clean.	



EXPLODED VIEW

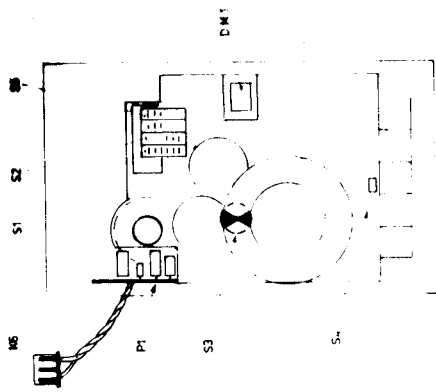




SPARE PARTS LIST

1	49 00052-01	25	57 20562-01	52	56 90061-01	82	57 20588-01
2	49 00064-01	26	57 20563-01	53	57 20580-01	83	45 90058-01
3	49 00073-10	27	50 10077-10	54	57 20581-01	84	47 40033-01
4	49 20035-01	28	57 20564-01	55	47 40032-01	85	57 20589-01
5	49 80026-01	29	50 10072-10	56	57 20582-01	86	47 20025-01
6	49 80020-01	30	49 00082-01	57	47 00103-01	87	47 20026-01
7	57 20548-01	31	47 20022-01	58	57 20583-01	88	57 20590-01
8	57 20549-01	32	57 20565-01	59	47 00104-01	89	57 20591-01
9	57 20550-01	33	47 20023-01	60	47 00105-01	90	47 00106-01
10	49 11176-10	34	57 20566-01	61	57 20584-01	91	47 00107-01
11	57 20551-01	35	57 20567-01	62	49 00083-01	92	57 20592-01
12	57 20552-01	36	57 20568-01	63	57 20585-01	93	57 20593-01
13	43 80071-01	37	47 00100-01	64	50 10070-10	94	60 00021-01
14	57 20553-01	38	57 20569-01	65	57 00018-01	95	49 10016-01
15	57 20554-01	39	57 20570-01	66	50 10089-10	96	57 20594-01
16	57 20555-01	40	57 20571-01	68	50 10007-10	97	57 20661-01
17	50 10009-10	41	50 10898-10	69	57 00017-01		
18	57 20556-01	42	57 20572-01	70	49 00065-01		
19	57 20557-01	43	57 20573-01	71	49 00066-01		
20	57 20558-01	44	47 00101-01	72	50 10935-10		
21	57 20559-01	45	57 20574-01	73	54 00016-01		
22	57 20560-01	46	57 20575-01	74	57 20586-01		
23	47 40031-01	47	57 20576-01	76	50 10067-10		
24	57 20561-01	48	57 20577-01	77	57 20587-01		
		49	47 00102-01	79	43 80072-01		
		50	57 20578-01	80	43 80073-01		
		51	57 20579-01	81	44 20221-01		

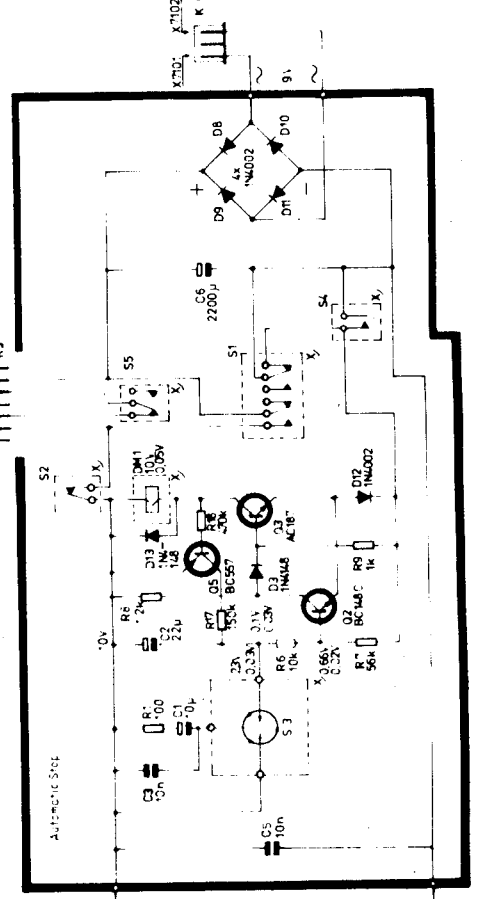
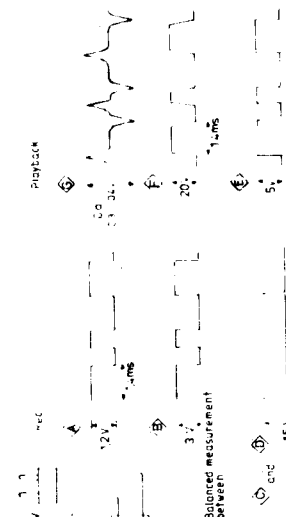
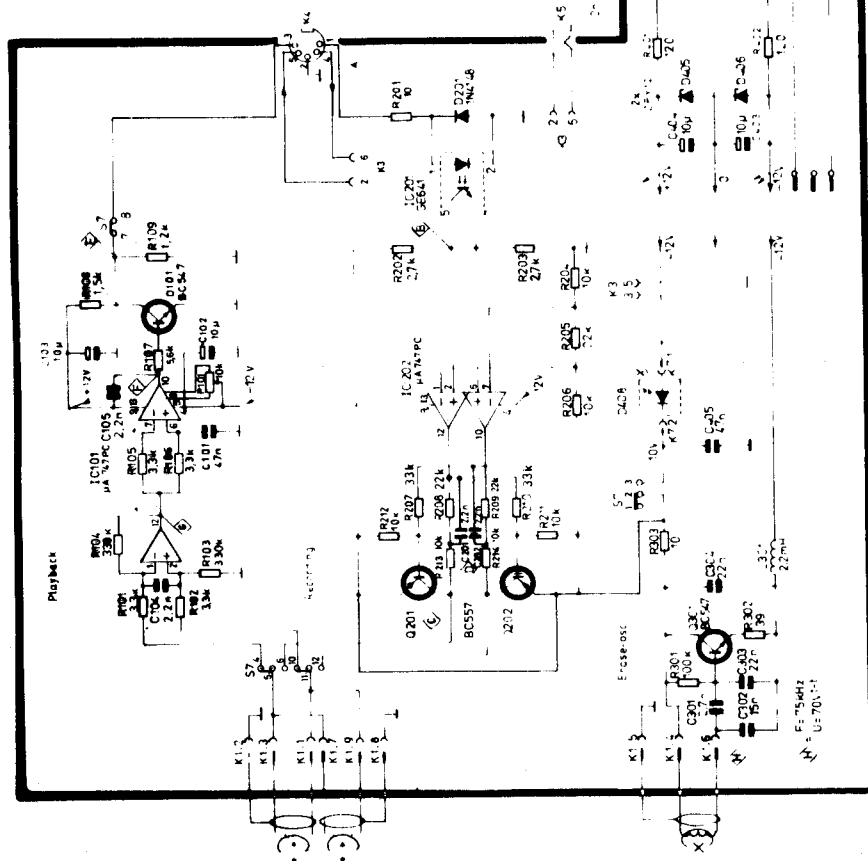
# CIRCUIT DIAGRAM



Bottom view

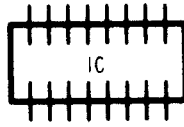
LOCATED OUTSIDE P.C BOARD

SWITCH SHOWN IN POSITION - PLAYBACK

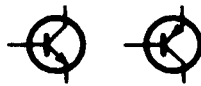


Motor with built-in control circuit and speed adjustment

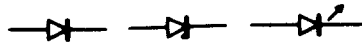
CIRCUIT COMPONENTS



IC 101,202	64 90155-01	μA747PC
201	64 40121-01	TIL111



Q 101,301	63 10011-01	BC547
201,202	63 10013-01	BC557✓
2	63 09042-01	BC148C
3	63 10039-01	AC187
5	63 10013-01	BC557✓



D 201	63 08824-01	1N4148✓
401-404	63 40004-01	1N4001✓
405,406	63 08748-01	ZPY12
408	63 40057-01	LED
3,13	63 08824-01	1N4148✓
8-12	63 40068-01	1N4002



