

Service
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6493B

Service Manual

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For an explanation of the operation and the repair method of the control section, refer to Service Manual N4418, Part 1, Chapter "Operation of the control section" and Part 2, Chapter "Repair method"

Safety regulations require that the set be restored to its original condition and that parts which are identical with those specified, be used.



REMOVING THE CABINET (see Figs. 1 and 3)

- The cover plate can be removed after the 3 screws A have been removed. For replacing the heads, pressure roller etc. the frontmost head cover B must also be removed.

To prevent that the cover plate vibrates, rubber strips are fitted on the rearmost ornamental frame. Check that these are correctly positioned when the cover plate is fitted.

- After the 4 screws C have been removed, the complete amplifier board can be hinged to the right (the p.c. board must first slightly be lifted).

The p.c. board can be retained in the hinged out position with the aid of the hook which is clamped in position at the bottom of the cabinet.

For this, the hook must be hooked into the hole of the metal support of the amplifier board.

The tape deck remains connected to the amplifier board via the two wire forms, so that the recorder operates normally. When the board is to be removed from the cabinet, the connectors at either side of the tape deck must be detached. Moreover, the loudspeaker and supply voltage connections must be detached (connectors).

Attention:

When the amplifier board and/or tape deck is hinged out or removed from the cabinet, the drive belt must be taken off the pulley of the counter and for example be positioned around the left-hand tape tension comparator.

- After the 5 screws D have been removed the complete tape deck may be upended in the cabinet. For this purpose, recesses have been made in the rear of the cabinet, in which the two winding motors can rest. Again the tape deck remains connected to the amplifier board via two wire forms, so that the equipment is operative. When the connectors at either side of the tape deck are detached, the complete tape deck can be taken out of the cabinet.

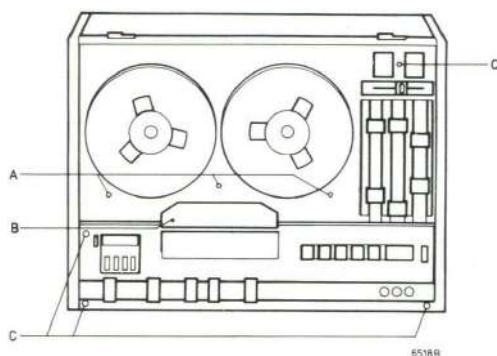


Fig. 1

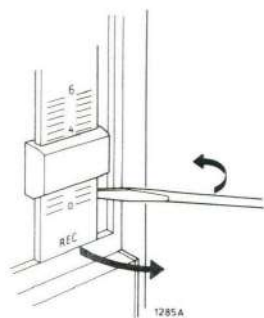


Fig. 2

REPAIR INSTRUCTIONS (see Figs. 2, 4, 15 and 16)

Replacing switches and levers

- Remove rail 228 with controls 227 by pulling it forwards.
- Remove the shouldered bolt 213.
- Tilt lever 217, 218 away from the p.c. board and remove it from the amplifier board.
- Remove leaf spring 214, pin 216 and coupling piece 215.
- The switch can now be unsoldered from the p.c. board.

Replacing the control buttons 245...250

- Remove control board 2 (3 screws).
- Remove spindle 536.
- The control buttons can now be replaced.

Replacing the indication strips with slide controls 237 (Fig. 2)

- Insert a screwdriver at the small side at the bottom between the panel of the slide control and the edge of the front panel or the adjacent strip and lever the panel forwards.
- During mounting check that the slide of the slide control engages the cam of the potentiometer.

Replacing the potentiometers (Fig. 4)

- Remove the 2 screws A.
- Carefully bend the plastic tags B back, pull the p.c. board up and swing it to the right.
- The potentiometers may now be replaced.

Attention:

The indication on the potentiometers is always at the side where the recorder is provided with the indication "O". The recorder employs both single and tandem potentiometers. However, Service supply only tandem potentiometers. When replacing a single potentiometer by such a tandem potentiometer, the soldering tags which are not used must be removed.

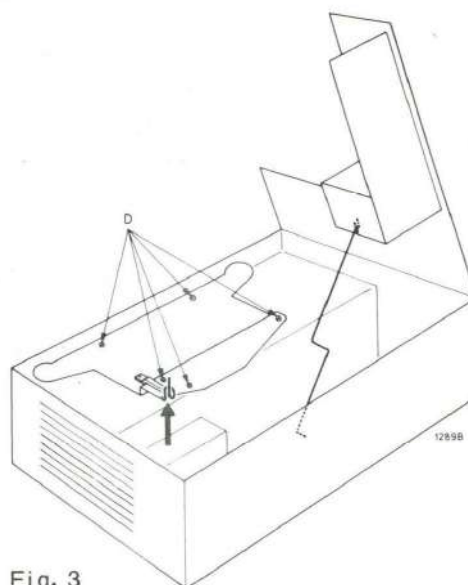


Fig. 3

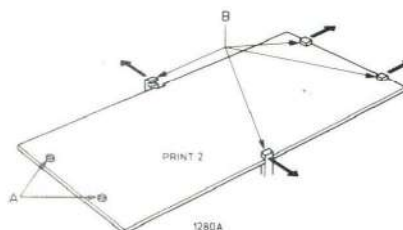
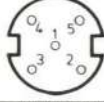


Fig. 4

TECHNICAL SPECIFICATION

Mains voltages	: 110-127-220-240 V
Mains frequencies	: 50-60 Hz (no adaptation necessary)
Power consumption	: approx. 60 W
Number of tracks	: 4
Tape speeds	: 4.75 cm/sec. $\pm 2\%$ 9.5 cm/sec. $\pm 1\%$ 19 cm/sec. $\pm 1\%$
Max. reel diameter	: 18 cm
Number of heads	: 3 (1 recording, 1 playback, 1 erase head)
Number of motors	: 3 (1 d.c. motor for capstan drive, 2 d.c. motors for turntable drive)
Wow and flutter at:	
4.75 cm/sec	: $\leq 0.35\%$
9.5 cm/sec	: $\leq 0.2\%$
19 cm/sec	: $\leq 0.15\%$
Winding time for an 18 cm reel with LP tape (540 m)	: ≤ 180 secs.
Input sensitivities:	
micro	: 0.15 mV/ $> 2\text{ k}\Omega$
tape	: 100 mV/ $1\text{ M}\Omega$ (3,5) 2 mV/ $20\text{ k}\Omega$ (1,4)
phono	: 1.5 mV/ $47\text{ k}\Omega$ (Magn./ceramic Hi-Fi)
tuner	: 100 mV/ $100\text{ k}\Omega$
aux.	: 2 mV/ $20\text{ k}\Omega$ (1,4) 100 mV/ $1\text{ M}\Omega$ (3,5)
Output voltages:	
tape	: 1 V/ $> 50\text{ k}\Omega$
monitor	: 1 V/ $> 50\text{ k}\Omega$
headph.	: 3 V/ $400\text{-}600\ \Omega$
Frequency range (acc. to DIN45500)	: 4.75 cm/sec. 60-8000 Hz 9.5 cm/sec. 40-15000 Hz 19 cm/sec. 40-23000 Hz 40-15000 Hz (with stereo filter at inputs AUX and TUN)
Erase frequency	: 100 kHz ($\pm 10\%$)
Dimensions (incl. transparent cover)	: 515x380x200 mm
Weight (incl. transparent cover)	: approx. 9.5 kg

INPUTS AND OUTPUTS

Designation	For connection of	Sensitivity	Impedance	Connector type	Connections	Location
MICRO L+ST BU1	a microphone with a 3-pole 180° DIN plug for recording via each channel in position 1-4 and 3-2 and for recording via the left channel in position stereo a microphone with a 5-pole, 180° DIN plug for stereo recording	0.15 mV *	> 2 kΩ	5p, 180°, DIN 	1 - left 4 - right 2 -  5 - right 3 - left	front
MICRO R BU2	a microphone with a 3-pole or a 5-pole 180° DIN plug for recording via the right channel in position stereo	0.15 mV *	> 2 kΩ	5p, 180°, DIN 	1 - right 4 -  5 -  3 -	front
HEADPH BU9	a stereo headphone	3 V	400-600 Ω	5p, sym. DIN 	1 -  2 -  3 -  4 - left 5 - right	front
TUNER BU3	a tuner	100 mV	100 kΩ	5p, 180°, DIN 	1 -  4 -  5 - right 3 - left	back
TAPE IN/OUT BU4	a second recorder or other equipment provided with 5-pole 180° DIN input and output socket input: pins 1 and 4 pins 3 and 5 output: pins 3 and 5	2 mV 100 mV 1 mV	20 kΩ 1 MΩ > 50 kΩ	5p, 180°, DIN 	1 - left 4 - right 2 -  5 - right 3 - left	back
AUX BU5	any type of electronic musical instrument, such as an electronic organ, a recorder, a record player with crystal element input: pins 1 and 4 pins 3 and 5	2 mV 100 mV	20 kΩ 1 MΩ	5p, 180°, DIN 	1 - left 4 - right 2 -  5 - right 3 - left	back
PHONO BU6	a record player with a ceramic Hi-Fi or a magnetic element	1.5 mV	47 kΩ	5p, 180°, DIN 	1 - right 4 -  2 -  5 - right 3 - left	back
- BU12	test points	-	-	5p, 180°, DIN 	1 - MP2 (playback left) 4 - MP102 (playback right) 2 -  5 - MP101 (recording right) 3 - MP1 (recording left)	back
MONITOR BU11	a monitoring amplifier	1 V	> 50 kΩ	5p, 180°, DIN 	1 -  4 -  2 -  5 - right 3 - left	back
REMOTE BU10	a remote control unit N6719	-	-	10p 	1 - recording 2 - stop 3 - fast winding, left 4 - fast winding, right 5 - pause 6 -  7/9 - -22V 8/10 - play back	back

* If only a mono microphone is connected and the track selector is in position 1-4 or 3-2 (mono), the sensitivity will be 0.3 mV at > 2 kΩ

Tape deck

1	Screw M3x5	4822 502 10558	121	Head mounting bracket	4822 403 50663
2	Ring	4822 532 50692	122	Tension spring	4822 492 31083
3	Screw M2.6x10	4822 502 10814	123	Pressure bracket assy.	4822 403 50673
4	Retaining ring 2	4822 530 70114	124	Brake bracket, right	4822 403 10124
5	Screw M2x6	4822 502 10745	125	Tension spring	4822 492 31084
6	Screw M3x4	4822 502 10865	126	Stop	4822 466 60611
7	Washer 4.2x8x0.5	4822 532 50725	127	Relay RE201	4822 280 70152
8	Grub screw M3x8	4822 502 10174	128	Flywheel	4822 528 60075
9	Nut M5	4822 505 10513	129	Drive belt	4822 358 30135
10	Washer 3.2x5.5x0.2	5322 532 54255	130	Relay RE202	4822 280 70152
11	Retaining ring 3	4822 530 70115	131	Pulley	4822 528 80522
12	Lock washer 3.2x5.5x0.45	4822 532 10668	132	Grommet	4822 528 80545
13	Screw M3x10	4822 502 10689	133	Pulsing head K4	4822 249 20025
14	Lock washer 3.2x6x0.4	4822 530 80082	134	Motor flange	4822 290 80249
15	Curved ring 4.2x9x0.1	4822 530 80076	135	Switch SK15	4822 278 90035
16	Washer 4.2x7x0.3	4822 532 50971	136	Motor bracket	4822 403 50662
17	Screw M2x10	4822 502 11061	137	Switch SK16	4822 278 90035
18	Nut M2.5	4822 505 10464	138	Motor M3	4822 361 20096
19	Nut M2	4822 505 10397	139	Pivot bearing	4822 520 30281
20	Screw M2.5x18	4822 502 10869	140	Round slotted nut	4822 505 10446
21	Nut M2.6	4822 505 10471	141	Sleeve	4822 532 20103
22	Screw M2.5x12	4822 502 11055	142	Sleece	4822 532 10528
23	Spring washer	4822 530 80163	143	Pressure spring	4822 492 50314
24	Screw M4x50	4822 502 11324	144	Playback head K3	4822 249 10085
25	Screw M3x18	4822 502 10559	145	Recording head K2	4822 249 20037
26	Washer 3.2x9x1	4822 532 10582	146	Head mount, right	4822 402 60284
27	Screw M3x16	4822 502 10691	147	Round slotted nut	4822 505 10199
28	Screw M2x4	4822 502 11059	148	Head mount, left	4822 402 60285
29	Self-tapping screw 2.9x9.5	4822 502 30103	149	Pressure spring	4822 492 50312
30	Screw M3x2	4822 502 11004	150	Tension spring	4822 492 31019
31	Screw M3x6	4822 502 11064	151	Tape tension comparator	4822 403 50657
32	Washer	4822 310 40003	152	Switch SK10	4822 278 90316
33	Nut M2	4822 505 10323	153	Pulley	4822 528 80521
34	Washer 2.2x5.5x0.5	4822 532 10331	154	Tension spring	5322 492 30915
35	Nut M3	4822 505 10325	155	Soldering tag	4822 290 30059
36	Retaining ring 1.5	4822 530 70121	156	Pressure spring	4822 492 50923
37	Spring washer 3.2x8x0.1	4822 530 80075	157	Tension spring	4822 492 31017
38	Retaining ring 4	4822 530 70116	158	Nut	4822 505 10522
39	Screw M4x16	4822 502 10049	159	Roller	4822 528 90223
40	Washer 4.3x12x6.1	4822 532 10333	160	Motor M2	4822 361 20091
41	Screw M3x4	4822 502 11069	161	Screw	4822 502 11218
42	Lock washer 2.2x4.5x0.3	4822 530 80079	162	Carrier	4822 532 20578
43	Washer 2.2x4.5x0.5	4822 532 14461	163	Pressure spring	4822 492 51002
44	Washer	4822 532 20619	164	Stop	4822 403 10125
101	Screw	4822 502 11218	165	Washer (PVC)	4822 532 50904
102	Carrier	4822 532 20578	166	Felt ring	4822 532 50964
103	Pressure spring	4822 492 51002	167	Drive belt	4822 358 30145
104	Drive belt	4822 358 30145	168	Bearing	4822 520 10328
105	Tension spring	4822 492 31019	169	Pressure spring	4822 492 50152
106	Tape tension comparator	4822 403 50657	170	Pressure roller	4822 528 70018
107	Tension spring	4822 492 31018	171	Pressure felt assy.	4822 403 50656
108	Switch SK9	4822 278 90316	172	Bracket assy.	4822 403 50655
109	Brake bracket, left	4822 403 10123	173	Hook	4822 535 90888
110	Tension spring	4822 492 31084	174	Pressure spring	4822 492 50983
111	Tension spring	4822 492 31016	175	Pressure roller lever	4822 403 20095
112	Pulley	4822 528 80521	176	Bush	4822 532 30256
113	Motor M1	4822 361 20091	177	Bush	4822 529 50094
114	Socket, 17-pole	4822 267 50187	178	Tape lifter assy.	4822 403 50661
115	Connector, 17-pole	4822 265 40116	179	Hook	4822 535 90889
116	Pulley	4822 528 80478	180	8-pole pin connector	4822 265 40115
117	Drive belt	4822 358 30142	181	8-pole socket connector	4822 267 50186
118	Pivot bearing	4822 502 10765	182	17-pole socket connector	4822 267 50187
119	Turntable assy.	4822 528 10265	183	17-pole pin connector	4822 265 40116
120	Erase head K1	4822 249 40064	184	Washer	4822 532 30253
			185	Pivot bearing	4822 502 10765

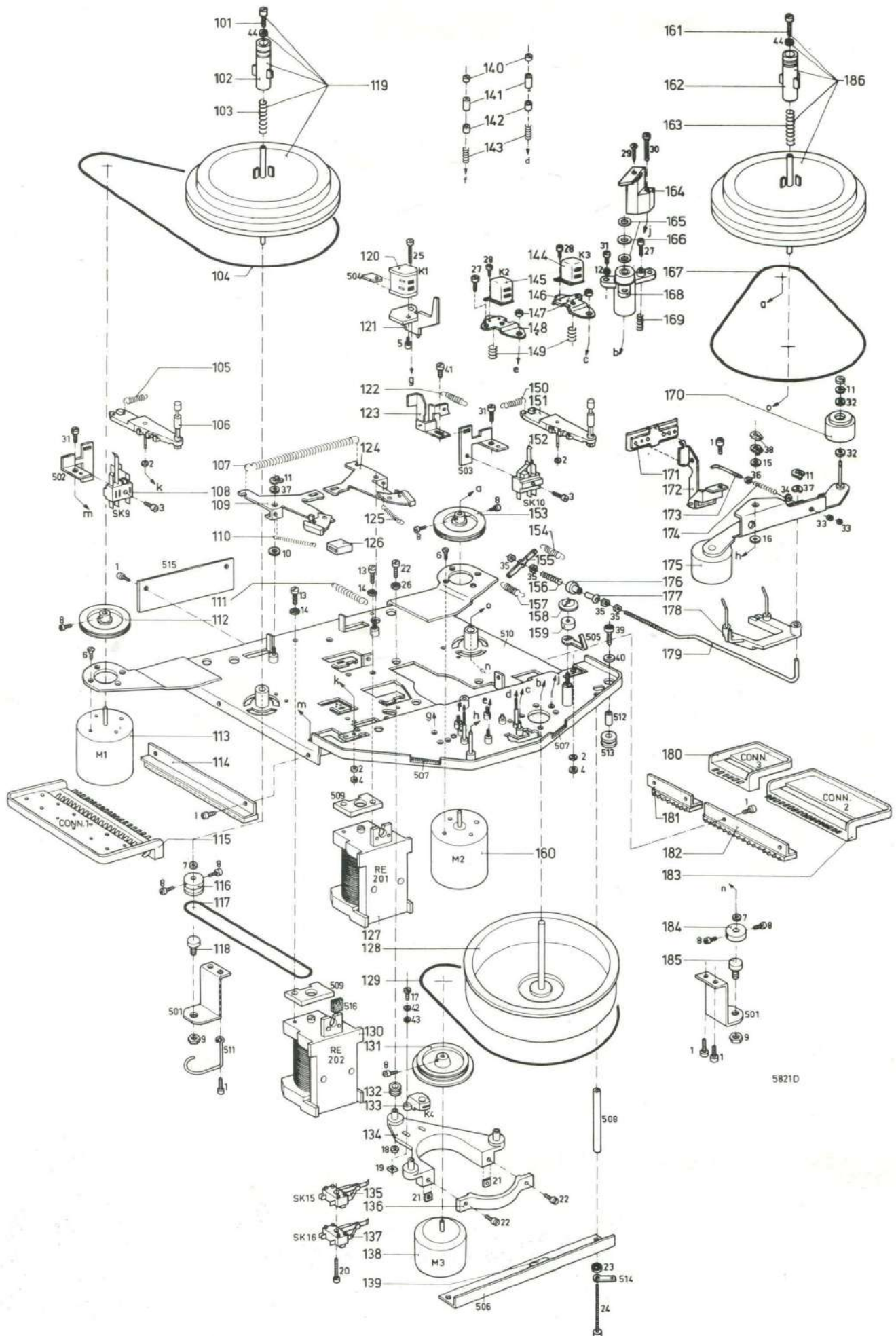


Fig. 15

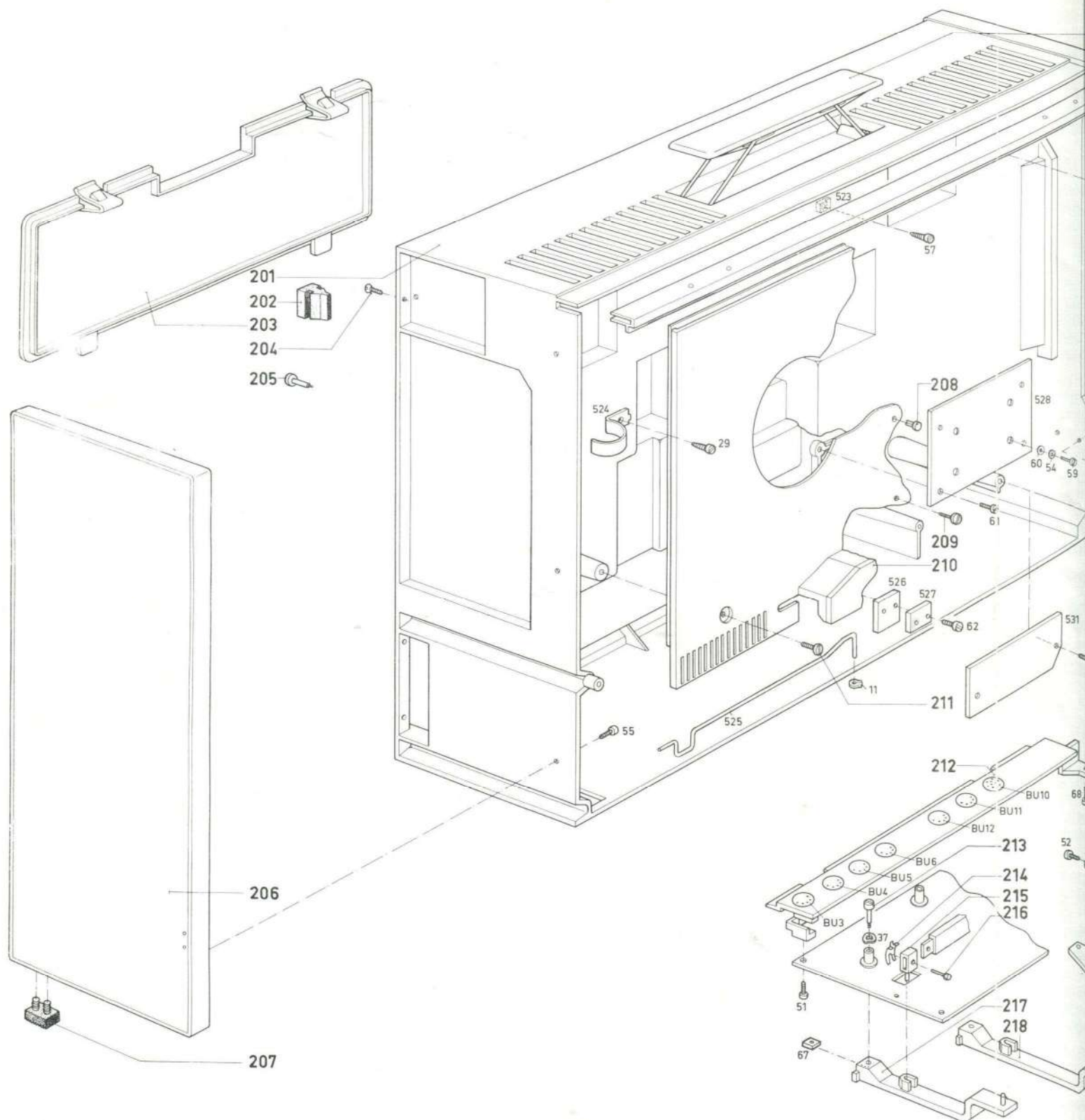


Fig. 16

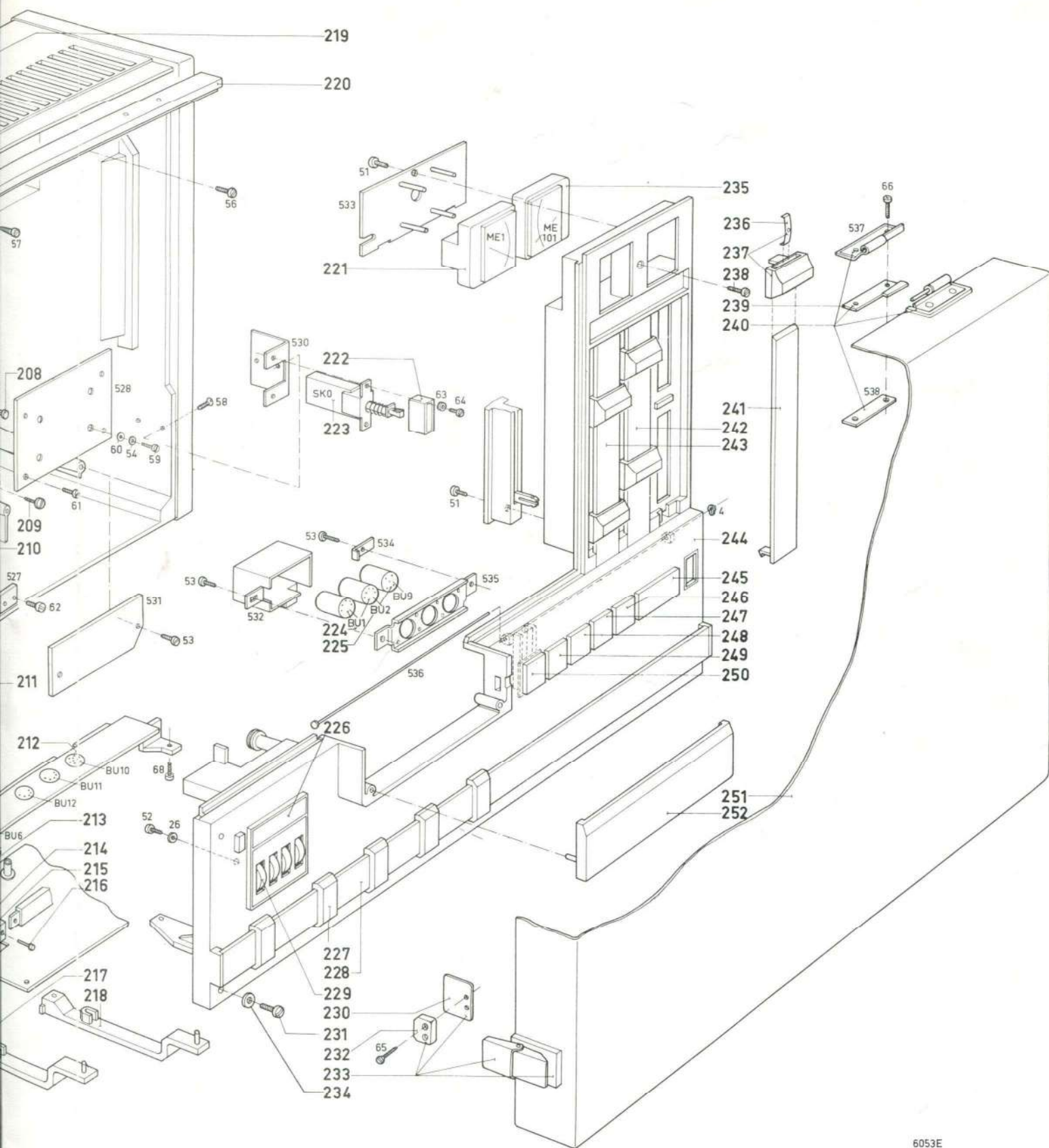


Fig. 16

Erase head K1

Check that the surface of the core near the core gap is smooth. When it has become rough, the erase head must be replaced so as to prevent the tape from being damaged.

A new erase head requires no adjustment. The tape guides of the erase head are a fixed point in the tape path. It is therefore recommended to check the lace-up after replacement of the erase head and, if necessary, to correct the adjustment of the other tape guides. Checking is possible by means of the head alignment jig.

Pressure felts

Check the condition of the pressure felts. When they have become hard, they must be replaced. Check the pressure. The pressure of the felt in front of the erase head must be 5...10 grammes and is measured at the top of bracket 123. By shortening or extending spring 121 this force can be adjusted. The pressure of the felts for the recording and playback head must be 20...40 grammes and is measured at the top of bracket 171. The force can be increased by adding rings (2.2 mm dia) under spring 174; the force is reduced by shortening the spring. The clearance between the pressure roller bearing bracket and the nuts on drawing rod 173 must be approx. 1.5 mm (pressure roller solenoid energized). Check that the drawing rod can move freely.

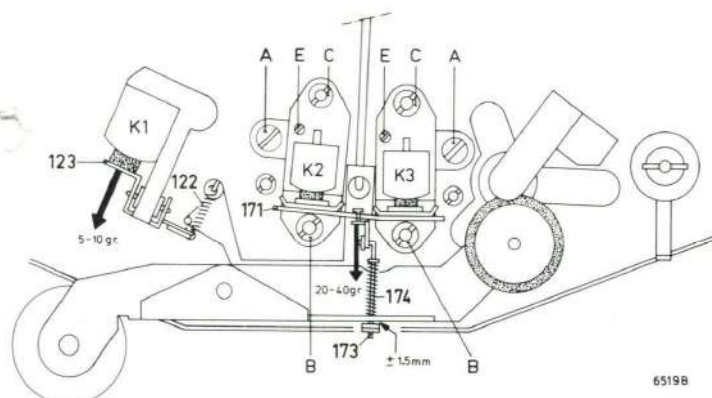


Fig. 5

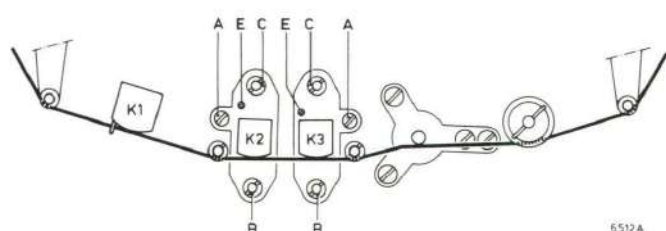


Fig. 6

B. TAPE PATH ADJUSTMENTS

Adjusting the turntable (Fig. 7)

- The height of turntable 119 (186) should be adjusted so that the tape runs exactly between the two reel flanges. Adjustment is possible by turning pivot bearing 118 (185) after nut 9 has been loosened. After the adjustment, lock the pivot bearing by tightening nut 9.
- The axial play of the turntable must be ≤ 0.2 mm. To be adjusted by shifting pulley 116 or ring 184.

Adjusting the pulley of the reel motors (Fig. 15)

- The height of pulley 112 (153) on the motor shaft must be adjusted so that the groove is at the same height as the groove in the turntables. To be adjusted by moving the pulley on the motor shaft after screws 8 have been loosened. After adjustment lockpaint the screws.

Adjusting the pressure roller (Fig. 15)

The axial play of pressure roller 170 must be ≤ 0.2 mm. To be adjusted by moving retaining ring 11.

Adjusting the capstan bearing (Fig. 8)

- Capstan bearing 168 must be adjusted so that the tape runs flat between capstan and pressure roller. To be adjusted as follows:
 - . Tighten screws A
 - . Insert a DP tape in the recorder
 - . Turn screw B until the tape runs flat between capstan and pressure roller.
 - . Tighten screw C to preserve this adjustment
 - . Lock-paint screws A, B and C

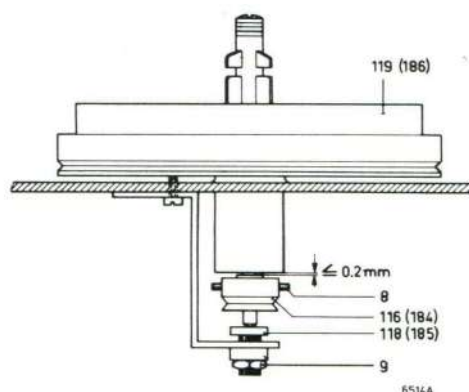


Fig. 7

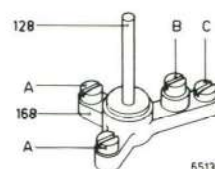


Fig. 8

C. ADJUSTING THE SOLENOIDS

Adjusting the pressure roller solenoid (Fig. 9, 10 and 15)

- When the solenoid is energized the clearance between bush 177 and the lower nuts 35 on drawing rod 179 must be approx. 0.2 mm. To be adjusted by turning the lower nuts 35.
- With energized solenoid the force at the top of the pressure roller bearing bracket 175 must be approx. 1300 grammes. This force should exist at the instant that there is a visible clearance between pressure roller and capstan. Adjustment of this tensile force is possible by turning the upper nuts 35.
- When the solenoid is de-energized the clearance between capstan 128 and pressure roller 170 must be approx. 10 mm. Adjust this clearance by bending tag A.
- When the solenoid is de-energized the clearance between the opened contacts of switches SK15/SK16 (135/136) must be 0.3-0.55 mm. To be adjusted by bending the contacts (Fig. 10).
- When the solenoid is de-energized the clearance between the stop plate of solenoid RE201 (127) and the centre contact of switches SK15/SK16 (135/136) must be greater than 0.3 mm. To be adjusted by bending tag A.

Adjusting the brake solenoid and brakes (Fig. 11)

- When the solenoid is energized the clearance between the brake shoes at brackets 109 and 124 and the turntables must be 0.6-0.7 mm. To be adjusted by bending tag A. Make sure that the clearance at the left is equal to that at the right.
- With the brake shoes applied the clearance between tags B and the brake brackets must be 0.2-0.25 mm. To be adjusted by bending tags B.
- With the brake shoes reversed (rounded surface of brake shoes against the turntable) the clearance between the solenoid armature and brake brackets 109 and 124 must be 0.3-0.4 mm. To be adjusted by bending tag C.
- The braking force of the left and the right turntable should be approx. 600 gcm. This force can be measured with the aid of a full reel and a spring pressure gauge, as shown in Fig. 12. The gauge should indicate the following values for different reel diameters:

Reel diameter	Gauge reading
13 cm	95 g
15 cm	80 g
18 cm	65 g

The braking force equals the gauge reading x radius of the wound tape. To be adjusted by shortening, extending or replacing spring 107

D. ADJUSTING THE TAPE TENSION CONTROL SYSTEM (fig. 13)

- The clearance between the centre contact of switch SK9/SK10 (108,152) and the edge of the slot in tape tension sensor 106 or 151 (in the neutral position) must be 0.1-0.2 mm. To be adjusted by bending tag A.
- The force on the pin of the tape tension comparator 106, 151 must be 15-20 grammes when the contact just opens. To be adjusted by bending tag B.
- The current for the left and right reel motor M1/M2 (113/160) must be 100 mA (= 50 mV across resistors R605//R606 and R607//R608 at the mounting strip at the rear of the tape deck).

This voltage is to be measured whilst the turntable is blocked and the tape tension comparator is in the neutral position. To be adjusted by turning potentiometers R7 at the tape tension units U203/U204.

E. ADJUSTING THE CAPSTAN MOTOR (Fig. 15)

- The clearance between pulsing head K4 (133) and the magnet ring on pulley 131 must be exactly 0.1 mm. To be adjusted by loosening screws 17, adjusting the head correctly and tightening the screws again. Lockpaint the screws after the adjustment.
- The magnet ring on pulley 131 should be at the same height as the core of the pulsing head. To be adjusted by loosening screws 8, adjusting the pulley to the correct height, and tightening the screws again. Lockpaint the screws after the adjustment.

F. ADJUSTING THE TAPE SPEED

- Connect the wow-and-flutter meter to BU4 TAPE IN/OUT
- Play back a test tape with a frequency of 3150 Hz. This test tape must have been recorded at a speed of 4.75, 9.5 or 19 cm/sec, depending on the speed to be adjusted.
- Adjusting the tape speed is effected by turning on of the preset potentiometers at unit U8 (see Table below and Fig. 14).

Speed	Preset potentiometer	Max. speed deviation
19 cm/sec.	R15	$\pm 1\%$
9.5 cm/sec.	R14	$\pm 1\%$
4.75 cm/sec.	R13	$\pm 2\%$

Attention:

The tape speed can also be adjusted with the aid of a stroboscope which is placed beside the recorder.

MAINTENANCE

It is recommended to clean and lubricate the recorder at regular intervals. The following parts may be cleaned with for example alcohol:

- tape guides
- erase, playback and recording head
- capstan
- pressure roller
- grooves in pulleys, turntables and flywheel
- brake shoes

The pressure felts for the heads may be cleaned with a brush.

Lubricating instructions

- Shell Clavus 17 - 4822 390 10048
Bearings of flywheel 128, turntables 119 and 186, tape tension comparators 106 and 151, and pressure roller 170. The part of the capstan which projects from seals 165, 166 should be thoroughly cleaned after lubrication.
- Shell Alvania 2 - 4822 389 10001
The various pivots such as those of the pressure-felt brackets 172 and 173, brake brackets 109 and 124, pressure roller bearing 175, pivot bearings of turntables 119 and 186 and flywheel 128, pressure felt bracket 123.

Replacing the feet of the functional units

The functional units are fitted on the p.c. boards 1 and 2 by means of multi-way connectors. The connectors are used in 3 sizes, namely for 3 contacts, for 8 contacts and for 14 contacts. Depending on the circuit arrangement of the units, a number of contacts may have been dispensed with, so that a large number of versions exist. For service purposes only 3 versions are supplied, viz. the 3-pole, the 8-pole and the 14 pole versions in which all contacts are fitted. Contacts that are not used can be simply removed with the aid of pliers.

MECHANICAL CHECKS AND ADJUSTMENTS

Required tools and test equipment:

- Set of feeler gauges 0.1...2 mm
- Spring pressure gauge 3...55 g 4822 395 80029
- Spring pressure gauge 1500 g
- Head alignment jig 4822 403 50718
- Test tape 1 kHz-10 kHz 4822 397 30014
 - 3150 Hz, 4.75 cm/sec. 8222 304 11170
 - 3150 Hz, 9.5 cm/sec. 8222 305 11190
 - 3150 Hz, 19 cm/sec. 8222 305 11550
- Millivoltmeter
- Double beam oscilloscope
- LF generator
- Wow and flutter meter

A. ADJUSTING THE RECORDING, PLAYBACK AND ERASE HEAD (Figs. 5 and 6)

For an optimum sound reproduction and minimal head wear, it is necessary that the recording and playback heads are correctly adjusted. The tape transport may vary per recorder, whilst the heads are also manufactured with certain tolerances. As a result of this, it is necessary to readjust the heads after replacement.

Height of the heads and azimuth can be adjusted by means of one test tape. This test tape contains a 10 kHz signal over the full width. Approx. 1.2 mm from the top edge of the tape a track of 1 mm width is provided on which a 1 kHz signal is recorded.

When the height of the heads is correctly adjusted, the 1 kHz track will be located just below the upper core. The 1 kHz signal may then just be audible above the noise. When the azimuth adjustment of the head is correct, the core gaps are perpendicular to the direction of tape transport. The reproduction of the 10 kHz signal is then maximum.

Adjusting the inclination of the recording and playback head (Fig. 5)

Accurately check that the front of the head is at right angles to the mounting plate. To be adjusted with nuts C.

Adjusting the height of playback head K3

- Coarse adjustment with jig
 - . Position the jig in the recorder as shown in Fig. 6
 - . The top of the upper core must be located just below the top of the alignment jig. To be adjusted with nuts B and C and screw A
 - . The jig must be freely movable between the guide pins of erase head K1 and the tape guides
- Fine adjustment with 1 kHz - 10 kHz test tape
 - . Insert the test tape in the recorder
 - . Set the recorder to position: "1-4" - "NOR" - "9.5" - "PLAY"
 - . By means of nuts B and C and screw A adjust the height of the head so that the 1 kHz signal is just audible above the noise.

Attention:

When adjusting the height of the head with nuts B and C and screw A, these must be given the same number of turns in order not to change the inclination of the head.

Adjusting the azimuth of playback head K3

- Connect a milli-voltmeter to socket MONITOR (BU11, point 5/2).
- Insert the 1 kHz - 10 kHz test tape in the recorder.
- Set the recorder to: "1-4" - "NOR" - "9.5" - "PLAY".
- By means of screw A adjust the azimuth of the head in such a way that the reproduction of the 10 kHz signal is maximum. It may happen that the 1 kHz signal then becomes audible more strongly. The height of the head must then be corrected again.

Adjusting the head mirror of playback head K3

- Connect a millivoltmeter to socket MONITOR (BU11, point 5/2).
- Insert the 1 kHz - 10 kHz test tape in the recorder.
- Set the recorder to: "1-4" - "NOR" - "9.5" - "PLAY"
- Withdraw the pressure felt pad in front of the head. The meter reading should not drop more than 1 dB. When the difference is greater, loosen screw E, and turn the head until the difference is ≤ 1 dB.
- Check the azimuth adjustment of the head.

Attention:

When a new head is mounted, it must be advanced as far as possible.

Adjusting the height, azimuth and head mirror of recording head K2

- Unsolder the wiring from recording head K2.
- Solder the wiring from playback head K3 to recording head K2.
- Adjust the head height, azimuth and head mirror of K2 in accordance with the method described for playback head K3.
- Restore the wiring to the original state after the adjustment.

Adjusting the phase difference recording/playback head

This adjustment must be carried out only after the other head adjustments have been checked.

- Connect an LF generator to socket "TAPE IN/OUT" (points 3/2 and 5/2) and apply a 1 kHz signal
- Connect a double-beam oscilloscope to socket MONITOR (for example output of right channel, point 5 to Ya input and output left channel, point 3 to Yb input)
- Set the recorder to position "TAPE" - "A" - "ST" - "19" - "REC" - "PLAY".
- By means of screw A adjust the recording head so that the two signals are in phase.
- Also check the phase difference at higher frequencies and, if necessary correct the adjustment of the recording head.

Notes:

- Coarse adjustment of the heads is also possible using a normal tape. However, a proviso is then that the tape guides correctly adjusted and are in a perpendicular position.
- After the adjustment has been completed, nuts B and C and screw A must be lock-painted.

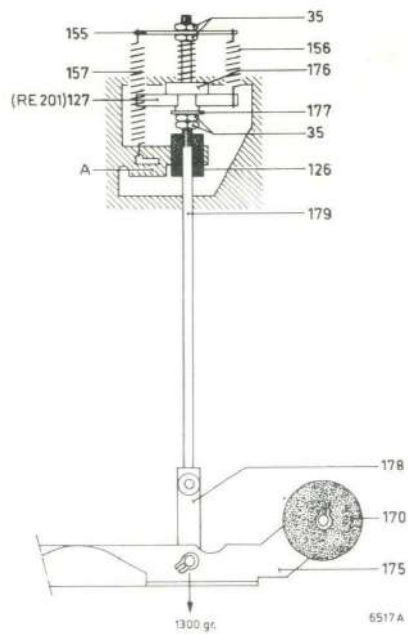


Fig. 9

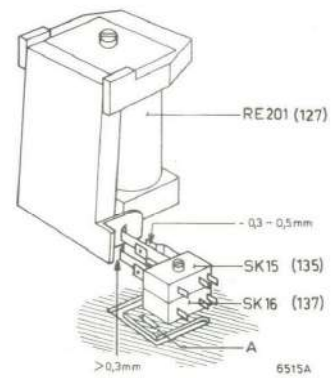


Fig. 10

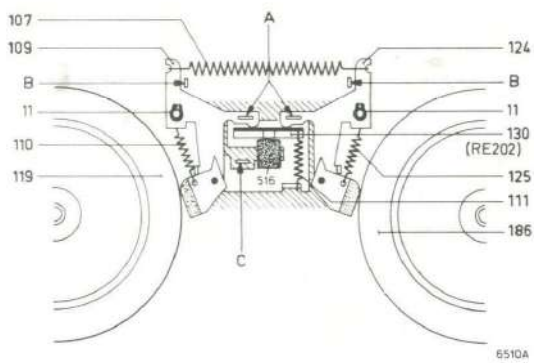


Fig. 11

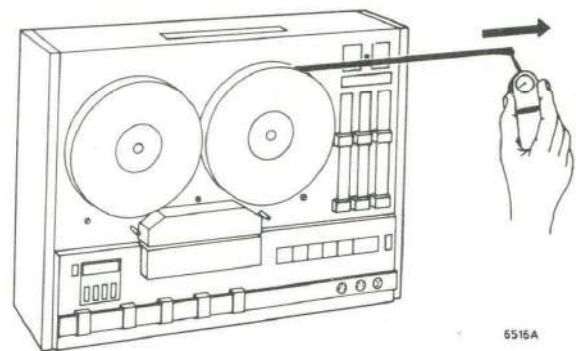


Fig. 12

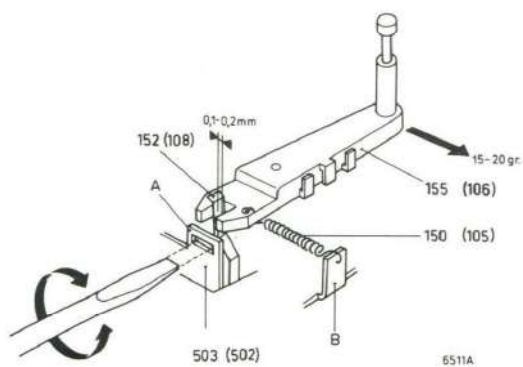


Fig. 13

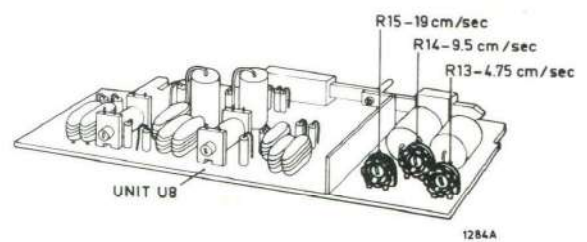


Fig. 14

Cabinet and amplifier

4	Retaining ring 2	4822 530 70114	209	Screw M4	4822 502 11215
11	Retaining ring 3	4822 530 70115	210+209	Cover plate assy.	4822 443 30291
26	Washer 3.2x9x1	4822 532 10582	211	Screw M4x12x10	4822 502 10487
29	Self-tapping screw 2.9x9.5	4822 502 30103	212	Strip with connection sockets	4822 267 20142
37	Spring washer 3.2x8x0.1	4822 530 80075	213	Shouldered bolt	4822 502 11259
51	Self-tapping screw 2.9x6.5	4822 502 30124	214	Leaf spring	4822 492 61812
52	Self-tapping screw 2.9x12.3	4822 502 30091	215	Coupling piece	4822 535 70419
53	Self-tapping screw 2.9x7.54	4822 502 30001	216	Pin	4822 535 90912
54	Lock washer 3.2x6x0.4	4822 530 80146	217	Lever	5322 414 24828
55	Wood screw 3x13x9	4822 502 30054	218	Lever	4822 403 50658
56	Self-tapping screw 3.9x9.13	4822 502 30105	219	Handle	4822 498 40326
57	Self-tapping screw 3.5x9.5	4822 502 30004	220	Profile	4822 466 80619
58	Countersunk screw M3x6	4822 502 10657	221	Indicator ME1	4822 347 10079
59	Screw M3x8	4822 502 11053	222	Push-button assy.	4822 410 21617
60	Washer 3.2x7x0.5	4822 532 10332	223	Mains switch SK0	4822 276 10483
61	Screw M4x8	4822 502 10693	224	Connection socket BU1,2	4822 267 40039
62	Self-tapping screw 3.9x12.3	4822 502 30044	225	Connection socket BU9	4822 267 40192
63	Washer 2.8x7x0.5	4822 532 10215	226	Lens	4822 381 10388
64	Screw 2.6x5	4822 502 11084	227	Control knob	4822 411 60418
65	Screw 2.4x17	4822 502 30048	228	Rail	4822 454 20341
66	Screw M3x10	4822 502 11149	229	Counter	4822 349 50076
67	Square nut M2	4822 505 10397	230	Plate	4822 459 80053
68	Screw M3x8	4822 502 11053	231	Screw M4x12x10	4822 502 10487
201+202+ 220+239+ 66+522+ 537+ 538	Cabinet assy.	4822 443 50196	232	Lock, lower part	4822 403 50683
202	Foot	4822 462 40282	233	Lock assy.	4822 417 60094
203	Lid	4822 443 60474	234	Washer	4822 532 10479
204	Countersunk self-tapping screw	4822 502 30091	235	Indicator ME101	4822 347 10081
205	Bolt (for endless tape)	4822 500 10181	236	Leaf spring	4822 492 61791
206+207+ 230+232+ 65	Side panel assy (left + right)	4822 443 40095	237	Slide knob assy.	4822 411 60419
207	Foot	4822 462 40309	238	Screw M4x35	4822 502 10985
208	Pin	4822 462 71031	239	Spring	4822 492 40502
			240	Hinge assy.	4822 417 10295
			241	Indication strip	4822 454 20343
			242	Indication strip	4822 454 20344
			243	Indication strip	4822 454 20342
			244	Amplifier board	4822 454 20339
			245	"STOP"-button	4822 410 21615
			246	"REC"-button	4822 410 21611
			247	"PAUSE"-button	4822 410 21612
			248	"PLAY"-button	4822 410 21613
			249	"F.FORW"-button	4822 410 21614
			250	"REW"-button	4822 410 21616
			251	Lid	4822 443 20074
			252	Head cover	4822 443 60473

ELECTRICAL CHECKS AND ADJUSTMENTS

Required test equipment

- . Multimeter 40 k Ω /V
- . HF milli-voltmeter
- . LF generator

Below the checks and adjustments for the right-hand channel are described. The connection points and adjusting elements for the left channel are indicated in brackets

I. MEASUREMENTS TO FUNCTIONAL UNITS (Fig. 17)

U1/U101 UNIVERSAL INPUT UNIT

Recorder in position : "PAUSE" - "REC" - "TUN" - "B" - "ST" - "NOR" - "19"
Recording level control "REC" set to maximum; other controls to minimum

Rejection 19 kHz signal

Input : BU3 TUNER 5/2 19 kHz - 1 V (3/2)

Output : BU11 MONITOR 5/2 Adjust U101 (U1) (3/2) for minimum voltage with the aid of L1

The unit supplied for service purposes has already been factory-adjusted for maximum rejection of the 19 kHz signal

U2/U102 PLAYBACK UNIT

Recorder in position : "PLAY" - "ST" - "9.5"
All controls set to minimum
Input : BU12 test points 333 Hz - 330 mV 4/2 (1/2)
Output : BU11 MONITOR Adjust for a voltage of 1 V by means of R4 at U102 (U2)

Check:

	Input: BU12 test points 4/2 (1/2)	Output: BU11 MONITOR 5/2 (3/2)
9 5 cm/sec.	40 Hz- 100 mV 10 kHz-1000 mV	0.6 -1 V 0.57-0.69 V

19 cm/sec.	40 Hz- 100 mV	0.45-0.7 V
	333 Hz- 100 mV	0.27-0.33 V
	10 kHz-1000 mV	0.32-0.38 V
4.75 cm/sec.	40 Hz- 100 mV	0.6 -1 V
	333 Hz- 100 mV	0.28-0.34 V
	10 kHz-1000 mV	0.9 -1 V

Rejection of erase oscillator signal (100 kHz)

Recorder in position	: "PLAY" - "REC" - "TAPE" - "A" - "ST" - "NOR" - "9.5"	
	Recording level control "REC" to maximum, other controls to minimum, no tape in the recorder	
Output	: BU11 MONITOR 5/2 (3/2)	Adjust HF voltage to minimum (< 60 mV) with L2 at U102 (U2)

The unit supplied for service purposes has been factory-adjusted for maximum rejection of the erase oscillator signal

U3/U103 RECORDING UNIT

Recorder in position	: "PAUSE" - "REC" - "TAPE" - "B" - "ST" - "NOR" - "19"	
	Remove the oscillator unit U6 from the recorder. Recording level control "REC" set to maximum; other controls set to minimum	
Input	: BU4 TAPE IN/OUT 5/2 (3/2)	333 Hz - 100 mV
Output	: BU11 MONITOR 5/2 (3/2)	Adjust R4 at BEFORE TAPE UNIT U104 (U4) for a voltage of 1 V
Input	: BU4 TAPE IN/OUT 5/2	333 Hz - 1 V
Output	: BU11 MONITOR 5/2	Adjust for 1 V with recording level control "REC"
Input	: BU4 TAPE IN/OUT 3/2	333 Hz - 1 V
Output	: BU11 MONITOR 3/2	Value to be measured $1 V \pm x V$ ($x = \max. 0.8 V$); halve the difference with respect to 1 V with R4 at U4
Output	: BU12 test points 3/2	Adjust for 1.5 mV with R9 at U3
Input	: BU4 TAPE IN/OUT 5/2	333 Hz - 1 V
Output	: BU11 MONITOR 5/2	Value to be measured $1 V \pm y V$ ($y = \max. 0.8 V$); reduce the difference with respect to 1 V to half by means of R4 at U104. If after this $\frac{x}{2} \neq \frac{y}{2}$, halve the difference voltage with respect to 1 V again
Output	: BU12 test points 5/2	Adjust R9 at U103 for 1.5 mV

Attention:

After this adjustment do not forget to refit oscillator unit U6 and the screening

Rejection of the 38 kHz signal

Recorder setting	: "PAUSE" - "REC" - "TUN" - "B" - "ST" - "NOR" - "9.5"	
	Recording level control "REC" set to maximum; other controls set to minimum	

Input	: BU3 TUNER	38 kHz - 1 V
Output	: Connection point 2 of unit U103 (U3)	Minimize the amplitude of the 38 kHz signal with L1 at U103 (U3) (<600 mV)

The unit supplied for service purposes has been factory-adjusted to maximum rejection of the 38 kHz signal

U4/U104 BEFORE TAPE UNIT

Recorder in position	: "PAUSE" - "REC" - "TAPE" - "B" - "ST" - "NOR" - "19"	
	Recording level control "REC" set to maximum; other controls to minimum	
Input	: BU4 TAPE IN/OUT 5/2 (3/2)	333 Hz - 100 mV
Output	: BU11 MONITOR 5/2 (3/2)	Adjust for a voltage of 1 V with R4 at U104 (U4)

For further adjustments see "RECORDING UNIT" U3/U103

U5/U105 INDICATOR UNIT

Recorder in position	: "STOP"	
	Adjust R3 at U105 (U5) so that the right (left) indicator just deflects.	
Recorder in position	: "PAUSE" - "REC" - "TAPE" - "B" - "ST" - "NOR" - "19"	
	Adjust R3 at U105 (U5) so that the right (left) indicator just deflects.	
Input	: BU4 TAPE IN/OUT 5/2 (3/2)	333 Hz - 1 V
Output	: BU11 MONITOR 5/2 (3/2)	Adjust for 1 V with recording level control "REC"

Adjust R5 at U105 (U5) so that the right (left) indicator just reads (100 % (0 dB).

U6 OSCILLATOR UNIT

This unit need not be adjusted.	
Oscillator frequency	100 kHz $\pm$ 10 %
Voltages measured at erase head K1	approx. 30 V

U7 SPEED CONTROL UNIT

This unit need not be adjusted.

U8 PRE-EMPHASIS/SPEED SELECTOR UNIT

Recorder in position	: "PAUSE" - "REC" - "TAPE" - "B" - "ST" - "NOR" - "4.75"	
	Recording level control "REC" set to -20 dB (6); other controls to minimum	
Input	: BU4 TAPE IN/OUT 5/2 (3/2)	10 kHz - 100 mV
Output	: BU12 test point 5/2 (3/2)	Adjust for 1 mV with L1 (L101) at U8

For adjusting the tape speed, see "MECHANICAL CHECKS AND ADJUSTMENTS"

Adjusting the bias

For this adjustment preferably use a new unmodulated tape of first-rate quality. Check that the heads are clean.

Recorder in position	: "PAUSE" - "REC" - "TAPE" - "B" - "ST" - "NOR" - "19"	
	Adjust for 1 mV with L1 (L101) at U8	
Input	: BU4 TAPE IN/OUT 5/2 (3/2)	1 kHz - 1 V

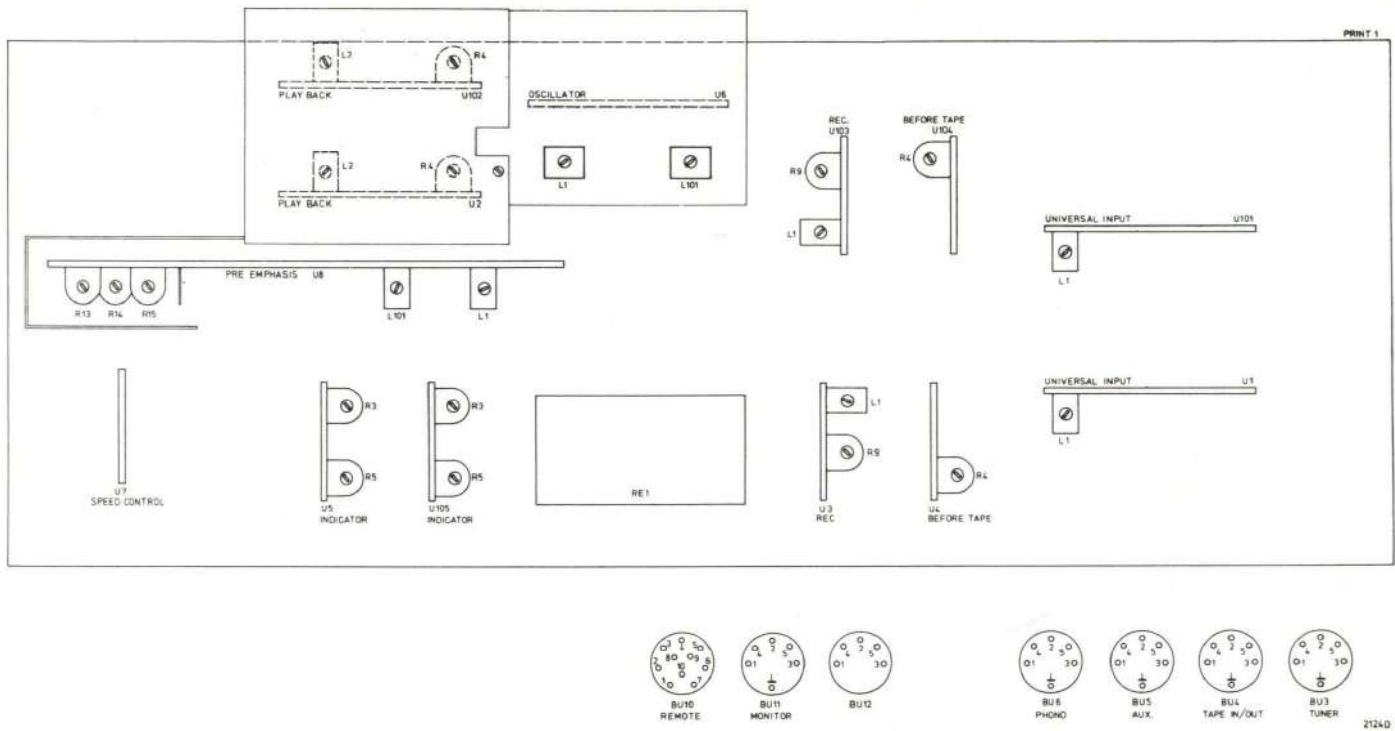


Fig. 17

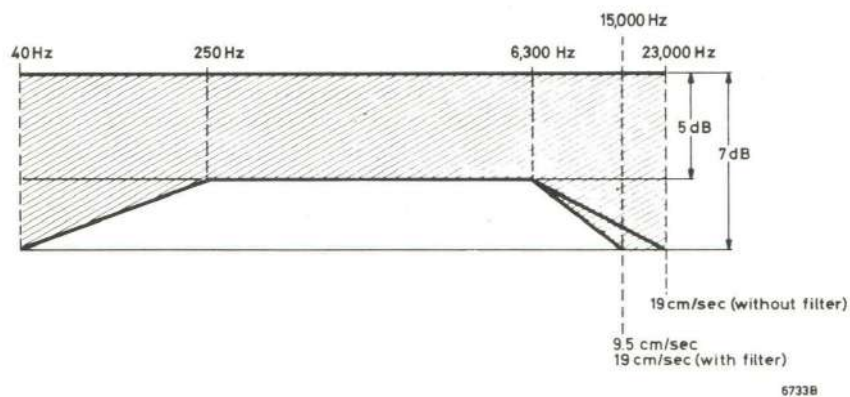


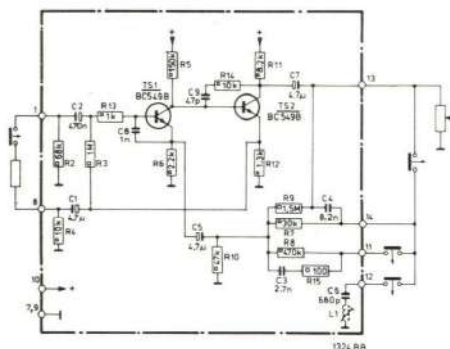
Fig. 18

UNITS

U1/U101

UNIVERSAL INPUT UNIT

4822 218 30055



Connections:

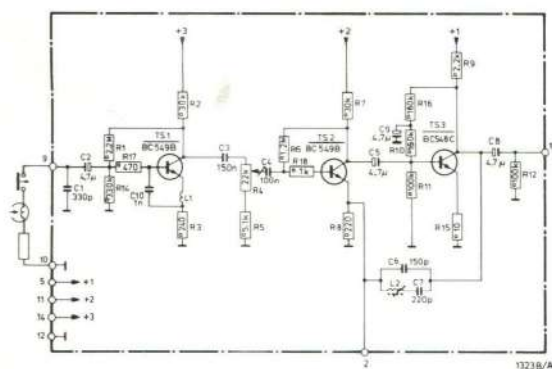
- 1 - input
- 7 -
- 8 - input
- 9 -
- 10 - supply G (+14.5 V)
- 11 - feedback - phono
- 12 - 19 kHz suppression - tuner/aux.
- 13 - output
- 14 - feedback - tuner/tape/aux.

Fig. 19

U2/U102

PLAYBACK UNIT

4822 218 30152



Connections:

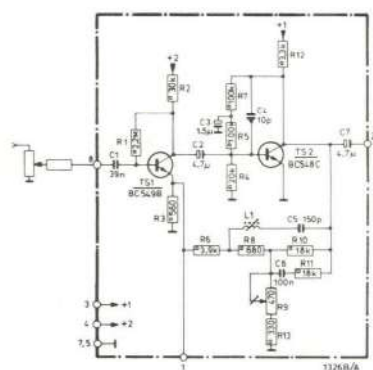
- 1 - output
- 2 - output to pre-emphasis unit U8
- 5 - supply E (+22.5 V)
- 9 - input
- 10 -
- 11 - supply F (+17.5 V)
- 12 -
- 14 - supply L (+16 V)

Fig. 20

U3/U103

RECORDING UNIT

4822 218 30057



Connections:

- 1 - output to pre-emphasis unit U8
- 2 - output
- 3 - supply E (+22.5 V)
- 4 - supply F (+17.5 V)
- 5 -
- 7 -
- 8 - input

Fig. 21

Output : BU11 MONITOR Adjust for 1 V
with recording
level control "REC".
The indicator should
give a reading of
100 %

- . Remove the core from coil L101 (L1) at p.c. board 1
- . Slide the core so far into the coil that the output voltage no longer increases
- . Seal the core with wax
- . Recorder in position: "PLAY" - "REC" - "TAPE" - "A" - "ST" - "NOR" - "19"

For the purpose of checking, the distortion of a recording and the frequency response may be measured after this adjustment.

The after-tape distortion may be $\leq 3\%$ at 1 kHz (100 % modulation).

For the correct values of the frequency response, see "MEASUREMENT OF THE FREQUENCY RESPONSE".

II. MEASURING THE FREQUENCY RESPONSE

Recorder in
position : "PAUSE" - "REC" - "TAPE" - "A" -
"ST" - "NOR" - "19"
All controls set to minimum
Input : BU4 TAPE IN/OUT 1 kHz - 1 V
5/2 (3/2)
Output : BU11 MONITOR 5/2 (3/2)

Adjust the voltage to 1 V with the aid of the recording level control (the indicators should give a reading of 100 %). Subsequently, reduce the input voltage to 0.1 V (≈ -20 dB). Then record the following frequencies: 40 Hz - 250 Hz - 1 kHz - 6 kHz - 23 kHz (the input voltage should remain constant).

The frequency response which is now measured during playback relative to the 1 kHz level should comply with the curve shown in Fig. 18. In a similar way the frequency response at 9.5 cm/sec. can be measured.

The highest frequency should now be 15 kHz, see curve in Fig. 18. In position "TUN" and "AUX" a filter for rejection of the stereo pilot signal is included in the circuit.

As a result of this, the frequencies above 15 kHz are strongly attenuated, as is shown by the curve of Fig. 18.

At the speed of 4.75 cm/sec. the frequency response ranges from 60 to 8000 Hz within 7 dB.

III. MEASURING THE INPUT SENSITIVITY

Recorder in
position : "PAUSE" - "REC" - "B" - "ST" -
"NOR" - "19"
Recording level control "REC" set to
-20 dB (6).

Input:	Output:
"TUN"	BU11 MONITOR
BU3 TUNER	5/2 (3/2)
5/2 (3/2) 333 Hz - 1 V	0.75 - 1.25 V
"AUX"	
BU5 AUX	
5/2 (3/2) 333 Hz - 1 V	0.75 - 1.25 V
"PHON"	
BU6 PHONO	
3/5 40 Hz - 1.2 mV	0.6 - 1.65 V
333 Hz - 12 mV	1.55 - 2.55 V
10 kHz - 12 mV	0.13 - 0.35 V
"1-4" - "3-2"	
recording regulator "MICRO R"	
maximum	
BU2 MICRO R	
1/2 333 Hz - 0.15 mV	0.3 - 0.7 V
"ST"	
recording regulator "MICRO R"	
maximum	
BU2 MICRO R	
1/2 333 Hz - 0.15 mV	0.75 - 1.25 V

IV. CHECKING FOR CROSSTALK

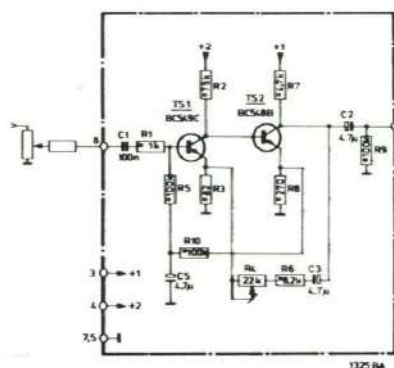
Recorder in
position : "REC" - "PAUSE" - "TAPE" - "B" -
"ST" - "NOR"
Recording level control "REC" set to
maximum; other controls set to minimum
Input : BU4 TAPE IN/OUT 10 kHz - 100 mV
5/2 (3/2)
Output : BU11 MONITOR < 50 mV
3/2 (5/2)

Crosstalk of inputs which are not used

Input : BU4 TAPE IN/OUT 10 kHz - 2 V
5/2 (3/2)
BU5 AUX 5/2 (3/2) 10 kHz - 2 V
BU6 PHONO 5/2 (3/2) 10 kHz - 50 mV
BU1/BU2 MICRO 4/2 (1/2) 10 kHz - 0.15 mV
Output : BU11 MONITOR 5/2 (3/2)
The voltage at points 5/2 (3/2) of the monitor socket owing to cross-talk of the signal at connection sockets which are not used should not exceed 30 mV

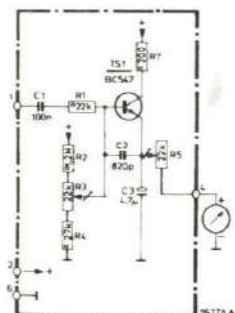
Crosstalk in position "1-4" - "3-2"

Track 1-4
Input : BU12 test point 4 15 kHz - 1 V
Output : Connection point 2 of U103 ≤ 20 mV
Track 3-2
Input : BU12 test point 1 15 kHz - 1 V
Output : Connection point 2 of U3 ≤ 20 mV

**Connections:**

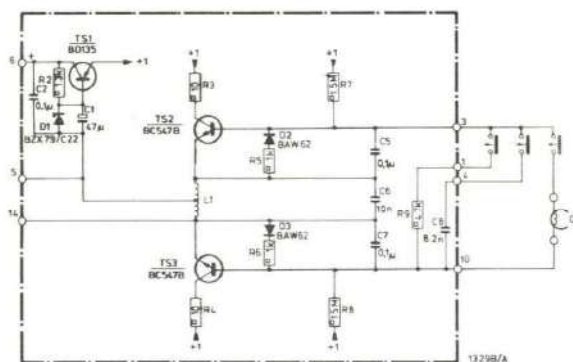
- 1 - output
- 3 - supply E (+22.5 V)
- 4 - supply F (+17.5 V)
- 5 -
- 7 -
- 8 - input

Fig. 22

**Connections:**

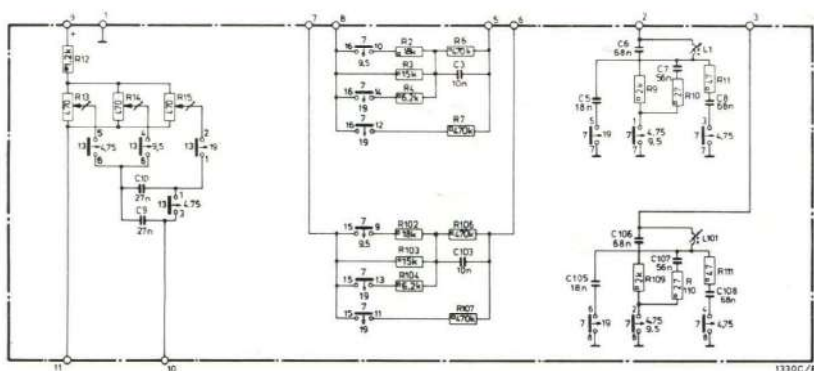
- 1 - input
- 2 - supply (+14.5 V)
- 4 - output to indicator ME1/ME101
- 6 -

Fig. 23

**Connections:**

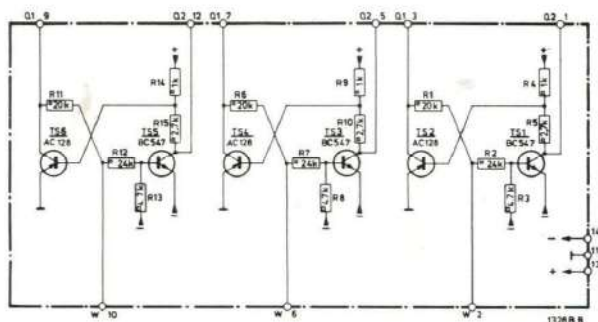
- 1 - adaption for pos. 1-4/2-3
- 3 - output
- 4 - stereo adaption
- 5 - connection for bias supply
- 6 - supply H (+40 V)
- 10 - output
- 14 - connection for bias supply

Fig. 24

**Connections:**

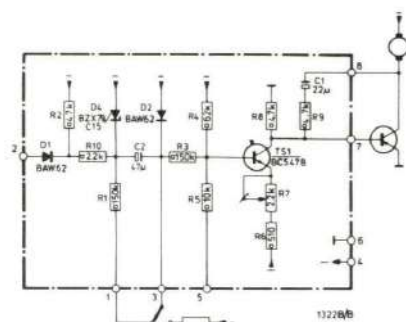
- 1 -
- 2 - pre-emphasis micro (R-hand channel)
- 3 - pre-emphasis micro (L-hand channel)
- 5 - pre-emphasis playback (R-hand channel)
- 6 - pre-emphasis playback (L-hand channel)
- 7 - pre-emphasis playback (L-hand channel)
- 8 - pre-emphasis playback (R-hand channel)
- 9 - supply A (+22 V)
- 10 - output to speed control unit
- 11 - input from speed control unit

Fig. 25

**Connections:**

- 1 - output Q2
- 2 - input W
- 3 - output Q1
- 5 - output Q2
- 6 - input W
- 7 - output Q1
- 9 - output Q1
- 10 - input W
- 11 -
- 12 - output Q2
- 13 - supply A1 (+2 V)
- 14 - supply B (-22 V)

Fig. 26

**Connections:**

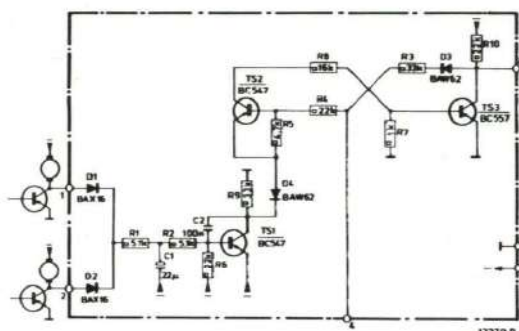
- 1 - tape tension comparator (SK9/10)
- 2 - input from Q1/FF-B
- 3 - tape tension comparator (SK9/10)
- 4 - supply B (-22 V)
- 5 - input from Q.FF-FL resp. Q.FF-FR
- 6 -
- 7 - output
- 8 - output

Fig. 27

U205

MOTOR STOP UNIT

4822 214 30144



Connections:

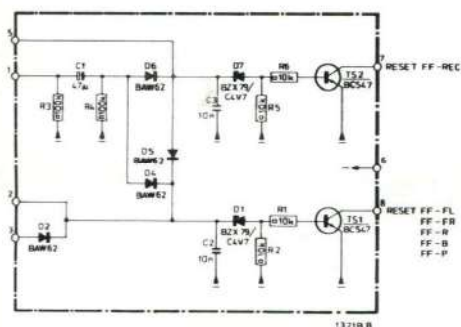
- 1 - input from winding motor M1
- 2 - input from winding motor M2
- 4 - input from tape transport switches (reset)
- 6 - 
- 7 - supply B (-22 V)
- 8 - output

Fig. 28

U206

RECORDER STOP UNIT

4822 214 30145



Connections:

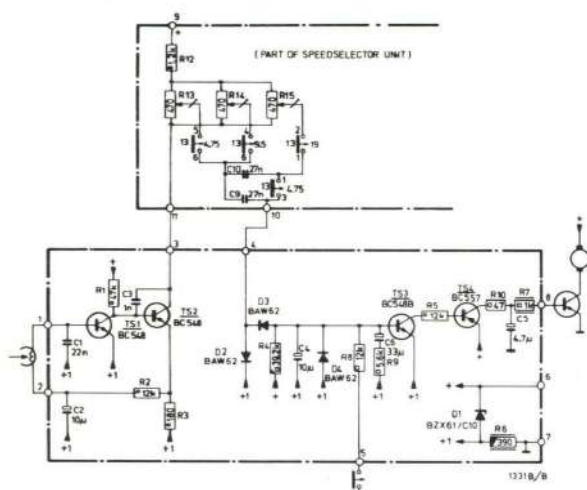
- 1 - connection to tape contact
- 2 - connection to motor stop unit, counter and tape transport switches
- 3 - connection to motor stop unit
- 5 - connection to STOP-switch
- 6 - supply B (-22 V)
- 7 - output to W/FF.REC.
- 8 - reset output

Fig. 29

U7

SPEED CONTROL UNIT

4822 218 30062



Connections:

- 1 - input from puls recording head
- 2 - input from puls recording head
- 3 - output to speed selector unit
- 4 - input from speed selector unit
- 5 - connection to SK5 (AMP)
- 6 - supply A (+22 V)
- 7 - 
- 8 - output

Fig. 30



	128	107	108	8		109	9	127	27		25	6	26	18	106	126		20	21	17	16		R																		
	28	7			2	102		112	12	113	13	24	3	103				10	29	11	110	14	111	114	15	115		R													
	110	10					102	1	101	3	103	2		504	503									508	507	8	5	505		C											
U104	U4	SK3	L102	L2	BU3	U103	T1	U3		BU4		L101	RE1	BU5	SK4	SK5	L1	U6	Z502	BU6	D502		U105	D101	BU12	U102	D1	U2	5	D503	D504	BU11		U8	U7	BU10	D3	D501	Z501		MISC

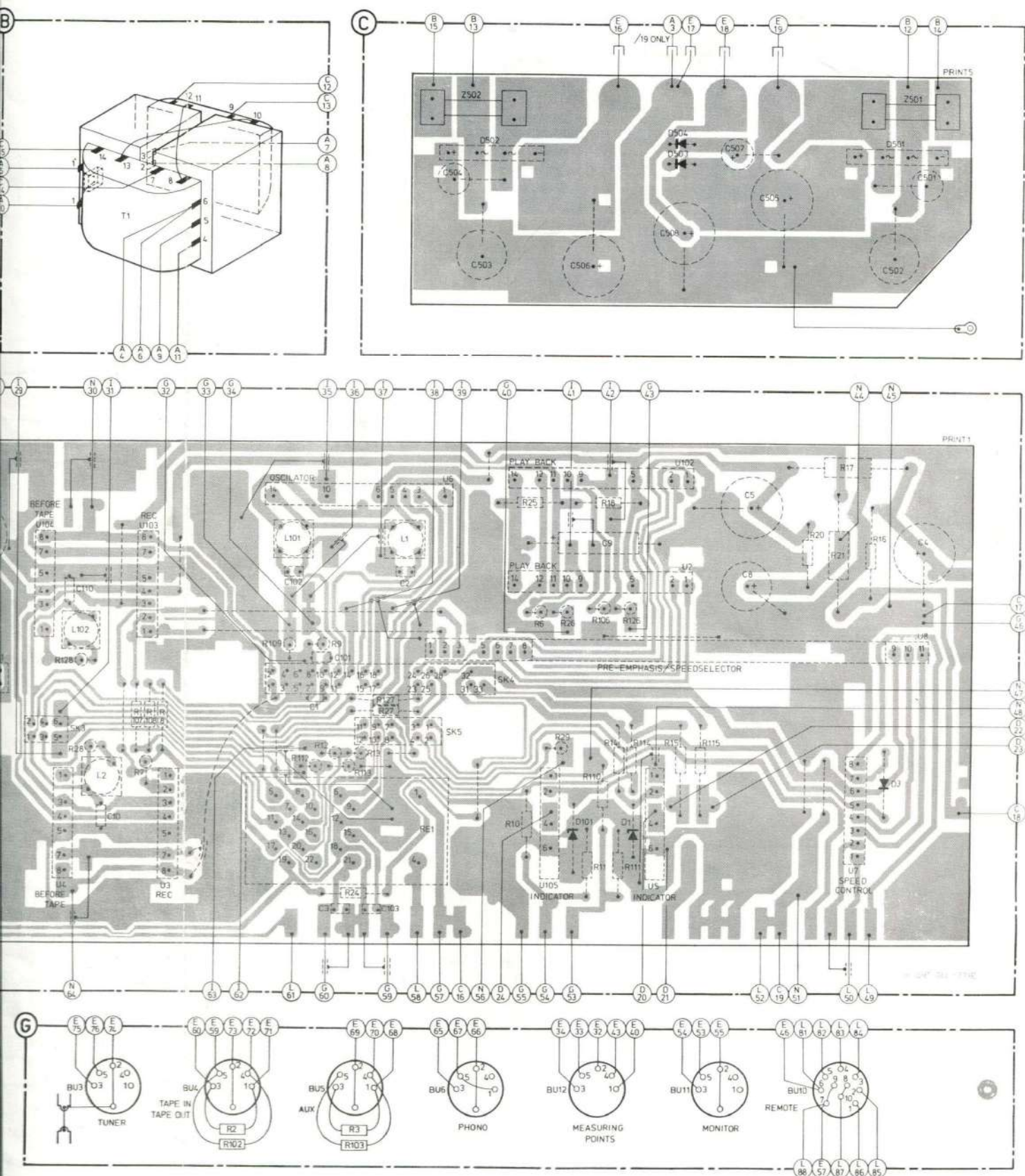


Fig. 31

R	202-206 213-217	218-221 207-212 201 222-225	605-608	612	360.311.361.310
C	203-206 209	208.202	601	602 604	352.302
MISC.	D237.201-203 K1 D205-215.217-228 K4 K2 LA201-205 U203.201.204.202.205.206 D229-236 K3		M1 SK15.16 CONN.1 M2		RE201.202 SK9 L608.607

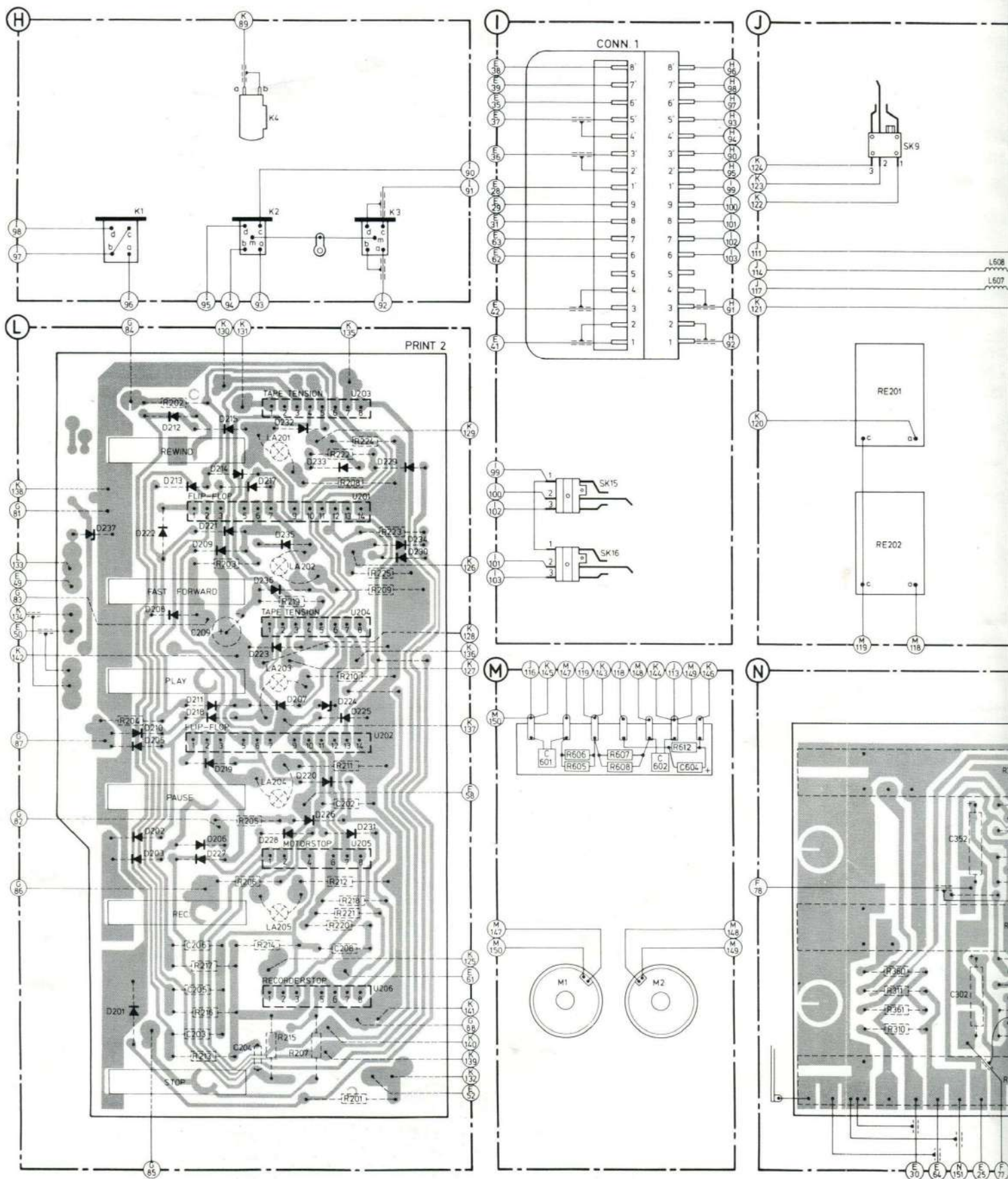


Fig. 32

360,311,361,310	378,301-309,328,351-359	363,366,313,316	609,370,367,320,317,365,368	315,318,322,362,312	369,319	323	321	R		
352,302	351,301	354,304	353,303	356,306,357,307	358,308	309		C		
RE201,202,SK9	L608,607	TS351,352,302,301,M3	TS601,L606,605,609	TS353,303	602,603	SK12	SK10	TS354,304	CONN 2,3	MISC.

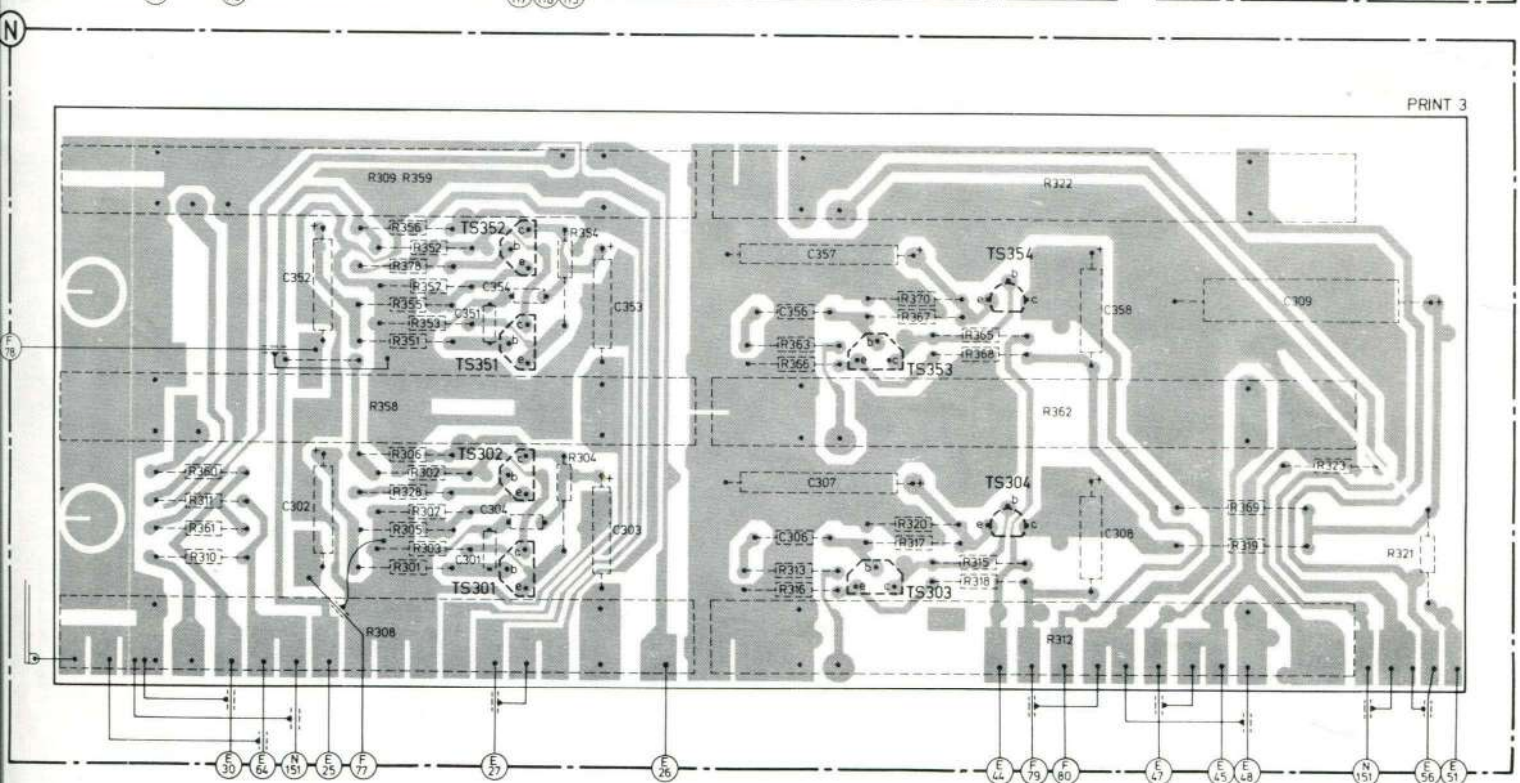
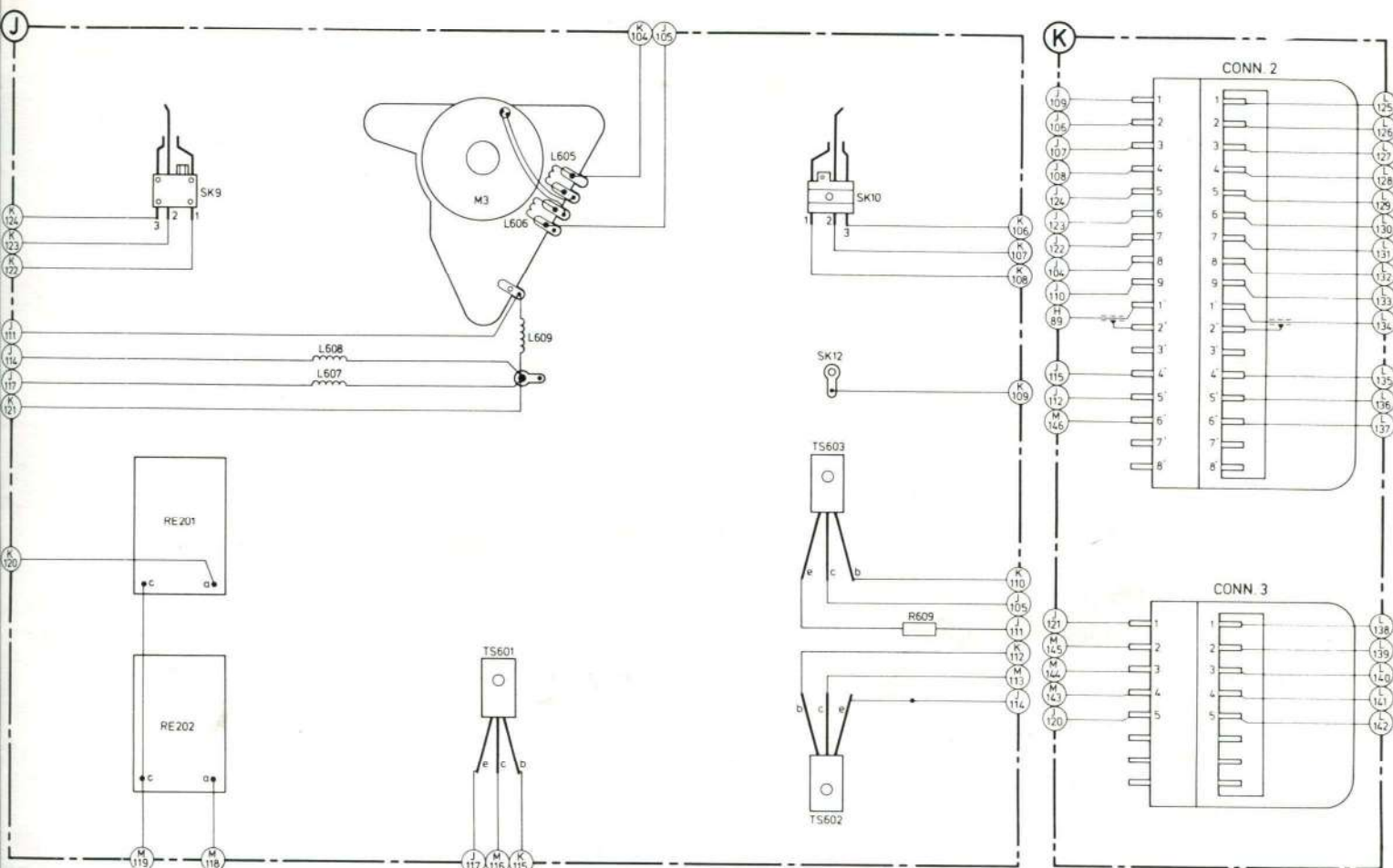


Fig. 32

6772 E

CS53195

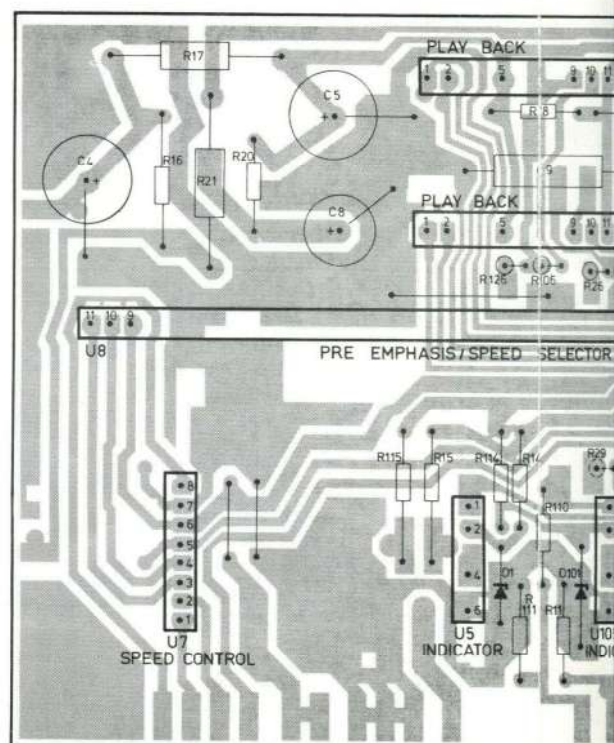
LIST OF ELECTRICAL PARTS

Amplifier

U1,101	Universal input unit	4822 218 30055
U2,102	Playback unit	4822 218 30152
U3,103	Recording unit	4822 218 30057
U4,104	Before tape unit	4822 218 30058
U5,105	Indicator unit	4822 218 30059
U6	Oscillator unit	4822 218 30061
U8	Pre-emphasis/speed selector unit	4822 218 30153
TS301,303, 351,353	Transistor BC549C	5322 130 44216
TS302,352	Transistor BC549B	4822 130 40936
TS303,353	Transistor BC548	4822 130 40938
TS304,354	Transistor BC337	4822 130 40855
D1,101	Zener diode BZX79/C15	5322 130 30781
L1,101	Coil	4822 156 40557
L2,102	Coil	4822 156 20618
	Core for L1,101 (25 mm)	4822 526 10014
R15,115	Safety resistor 180 Ω	4822 111 30159
R308,309, 312,323, 358,359, 362	Potentiometer 22 k Ω -log.	4822 105 10066
R321	Safety resistor 27 Ω	4822 111 30408
C302,303, 352,353	Electrolytic capacitor 4.7 μ F, 63 V	4822 124 20494
C307,357	Electrolytic capacitor 330 μ F, 4 V	4822 124 20448
C308,358	Electrolytic capacitor 68 μ F, 16 V	4822 124 20469

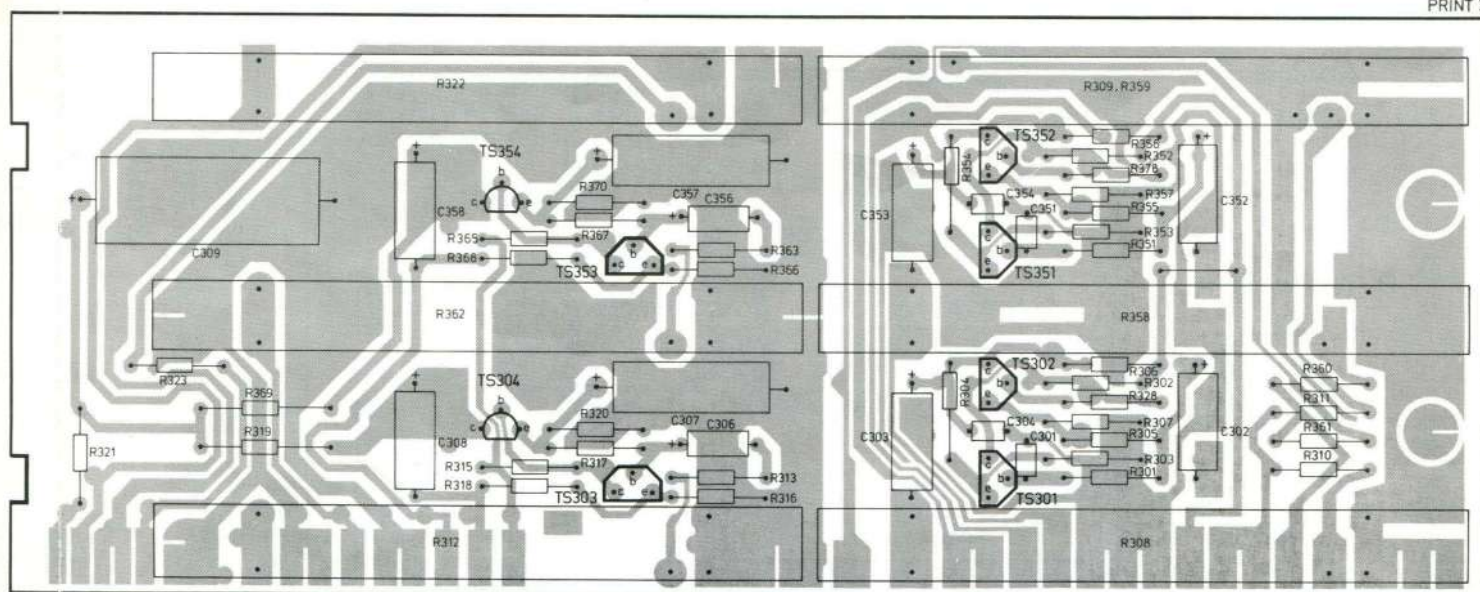
C309	Electrolytic capacitor 1000 μ F, 25 V	4822 124 20529
SK1	Slide switch (TUN-TAPE-AUX-PHON)	4822 277 30494
SK3	Slide switch (B-A)	4822 277 30576
SK4	Slide switch (1-4, ST,3-2)	4822 277 30523
SK5	Slide switch (AMP-NOR-MP)	4822 277 30524
SK15,16	Switch	4822 278 90035
BU1,2	5-pole socket	4822 267 40039
BU3+4+5+6+10+11+12	Socket strip	4822 267 20142
BU9	Connection socket for headphones	4822 267 40198
ME1	Indicator, left	4822 347 10079
ME101	Indicator, right	4822 347 10081
K1	Erase head	4822 249 40064
K2	Recording head	4822 249 20037
K3	Playback head	4822 249 10085
LA1,2	Lamp 19 V - 40 mA	4822 134 40178
	Connector for functional units, 14-pole	4822 267 50151
	Connector for functional units, 8-pole	4822 267 50156
	Connector for functional units, 3-pole	4822 267 50161

MISC.	U8	U7	U5.	D1	D101 U10
C	4		8 5		9
R		16 17 21 20	115 15	114 126 14 10 6 18 11 110 11 2	



R	321	322	369,319	315,318,365,368	370,367	320,317	361,366,311,316	304,354,351-353,355-359,328,378,305-309	360,311,361,310
C		309		358,308	307,357	356,306		303,353,304,354,351,301	302,352
M				TS,54,TS,304	TS,53,TS,303			TS,301,TS,302,TS,352,TS,351	

PRINT 3

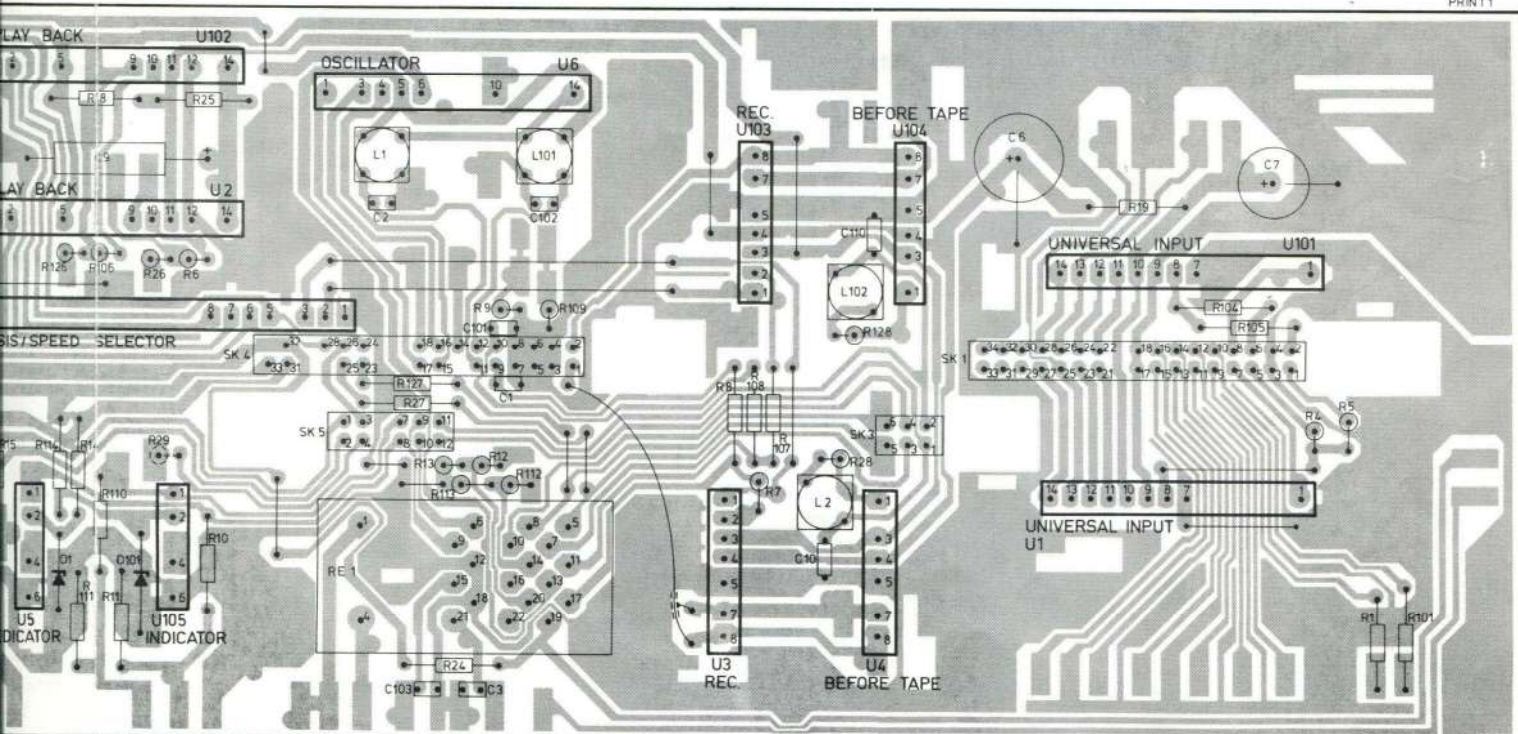


21250

Fig. 33

U5	D1	D101	U105	U102	U2	SK4	RE1	SK5	L1	L101	U6	U3	U103	L2	L102	U4	SK3	U104	SK1	U1	U101
9									2	103	3, 101, 1	102			10	110			6		7
114, 126, 14, 105, 18, 111, 110, 11, 26, 29, 6, 25, 10									127, 27, 13, 24, 113, 12, 9, 112	109		8, 108, 7, 107		28, 128					19	104, 105	4, 5, 1, 101

PRINT 1



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Fig. 34

8	12	13	9	10	11		14	15		312	313		316	315	318	317	319	320	
108	112	113	109	110	111		114	115		362	363		366	365	368	367	321	369	370
10	3	1		2								306					307	309	308
110	103	101		102								356					357		358
BU12	BU11	MP1 MP101	K2	L1 L101		U6	U5 U105	D1 ME1 D101 ME101	LA1 LA2 K1				TS303 TS353				TS304 TS354		BU9

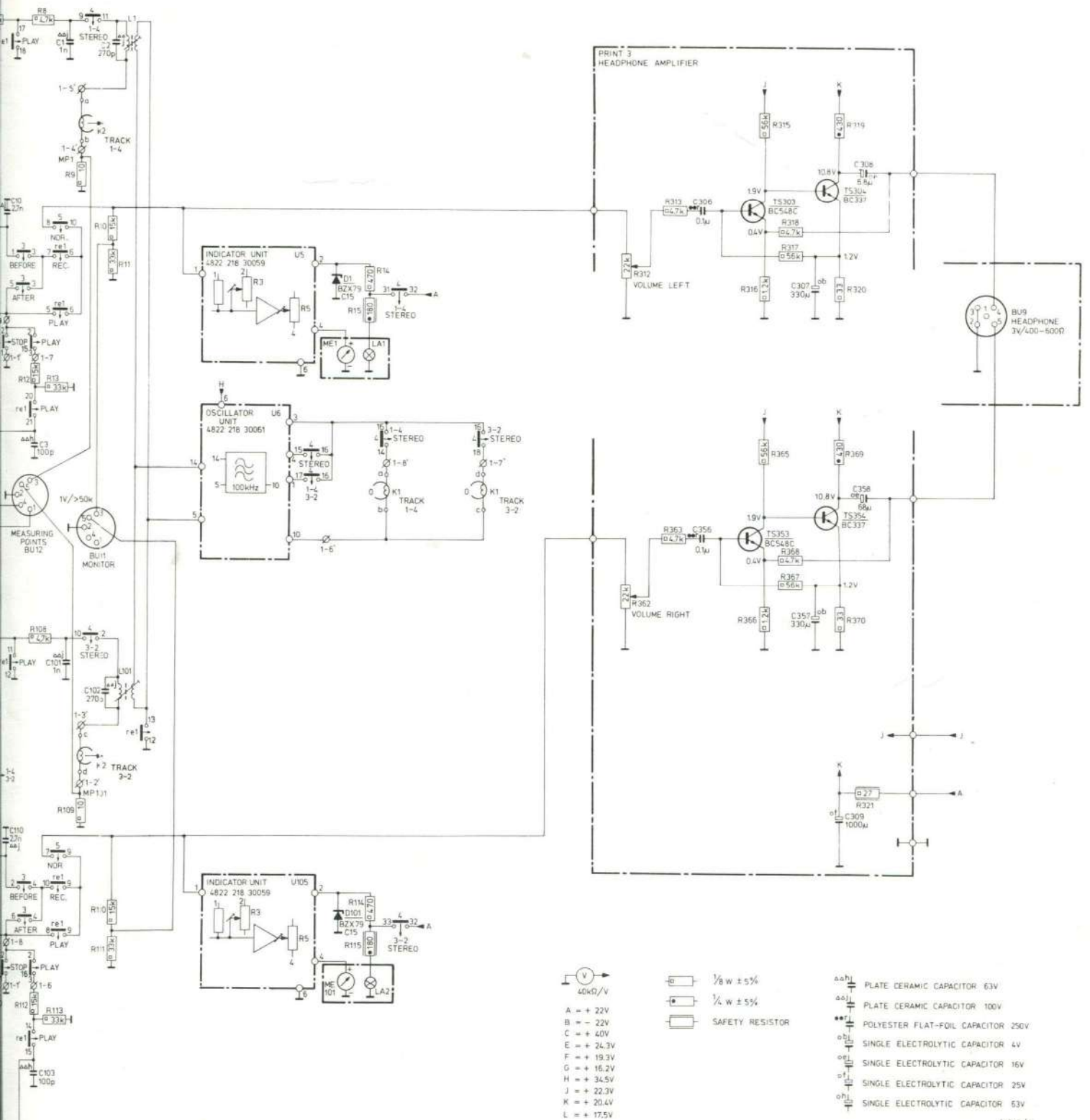


Fig. 35

CONNECTION VIA MULTIWAY CONNECTOR

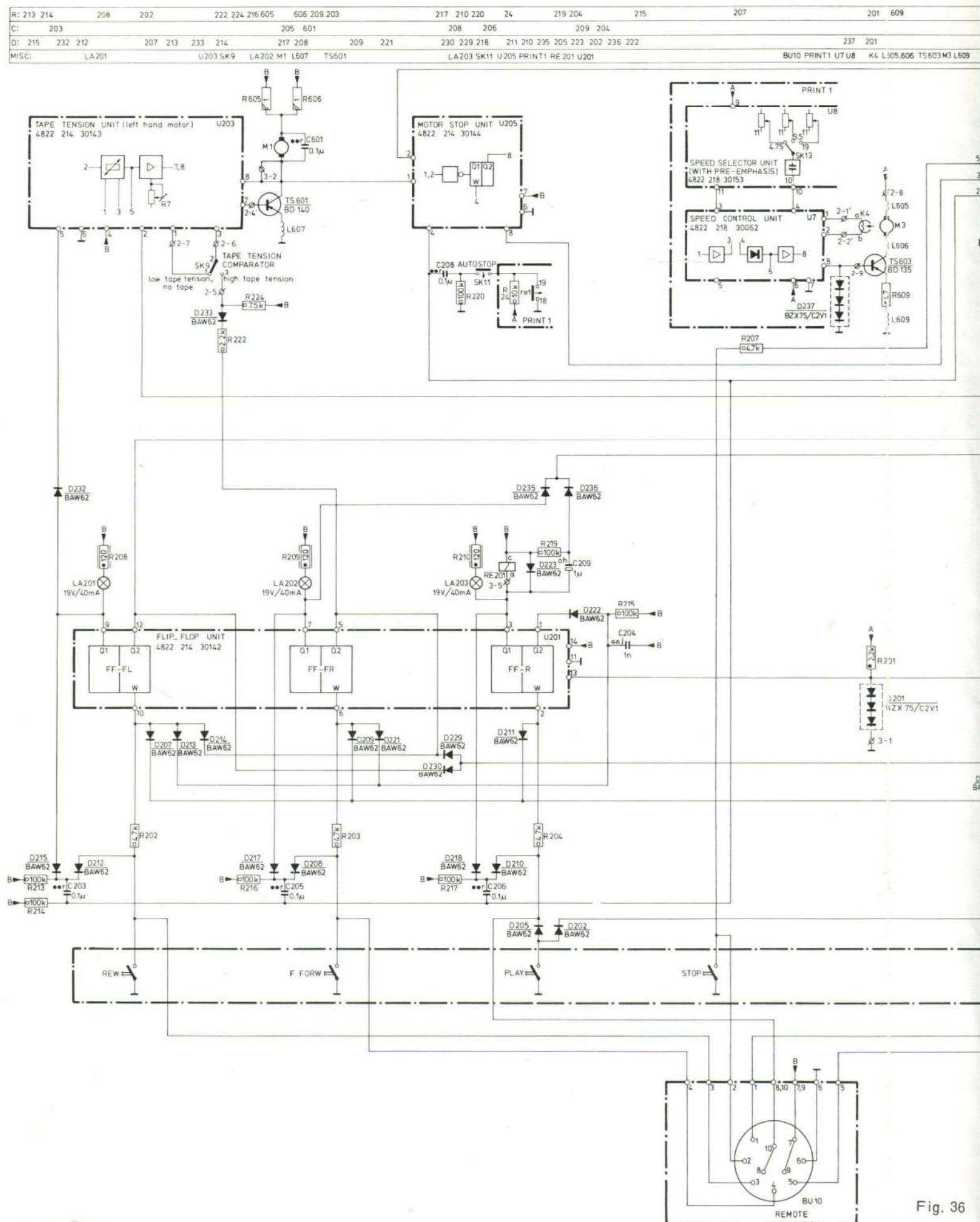
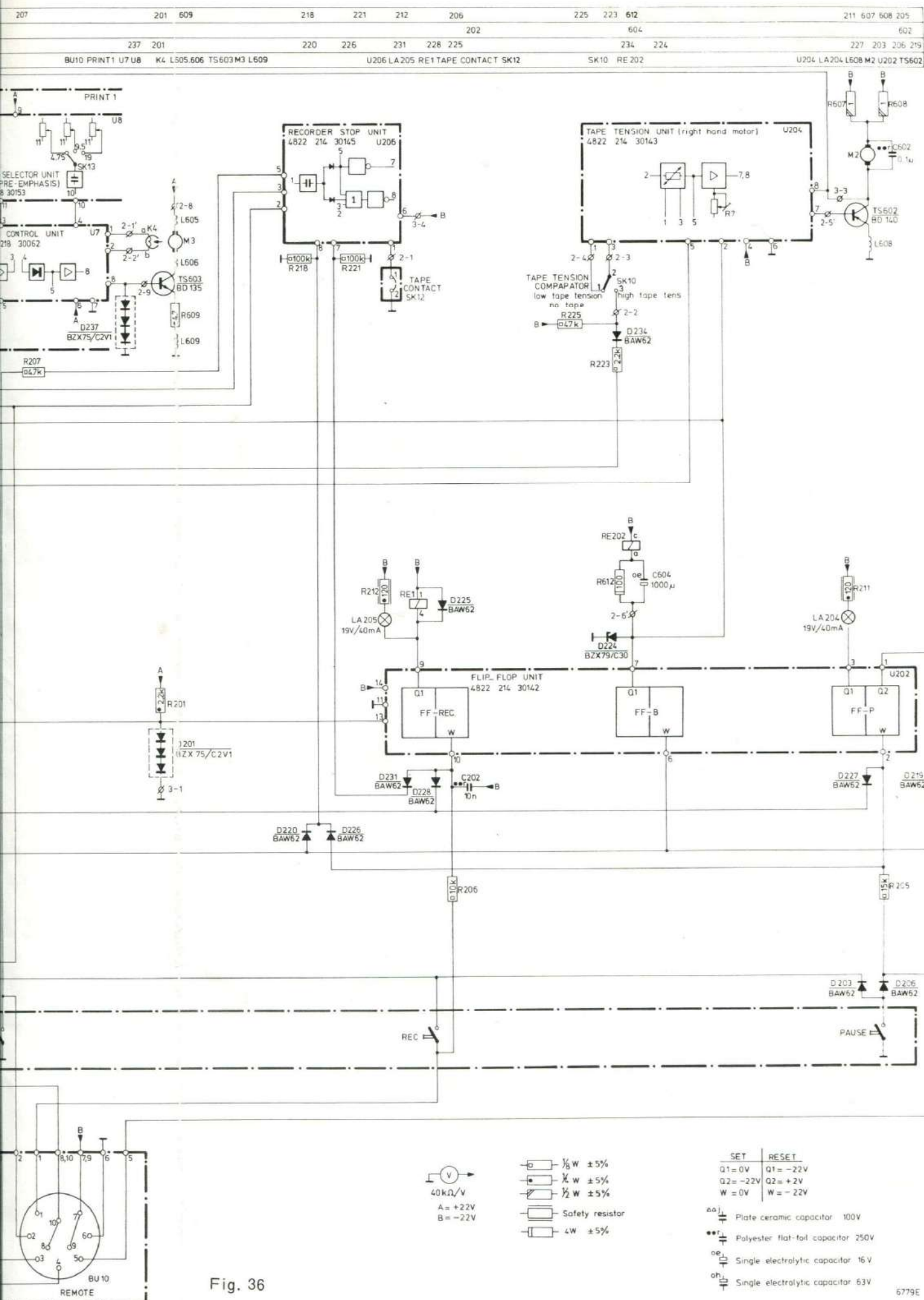


Fig. 36



Control section

U7	Speed control unit	4822 218 30062	C209	Electrolytic capacitor	4822 267 50156
U8	Pre-emphasis/speed selector unit	4822 218 30153	C604	1 μ F, 63 V	
U201,202	Flip-flop unit	4822 214 30142		Electrolytic capacitor	4822 124 20524
U203,204	Tape tension unit	4822 214 30143	SK9,10	1000 μ F, 16 V	
U205	Motor stop unit	4822 214 30144		Switch (TAPE TENSION COMPARATOR)	4822 278 90316
U206	Recorder stop unit	4822 214 30145	SK11	Counter + switch (AUTOSTOP)	4822 349 50076
TS601,602	Transistor BD140	5322 130 40824	BU10	Socket strip	4822 267 20142
TS603	Transistor BD135	5322 130 40645	K4	Pulsing head	4822 249 20025
D3,202,203, 205...215, 217...223, 225...236	Diode BAW62	5322 130 30613	LA201...205	Lamp 19 V - 40 mA	4822 134 40178
D201,237	Diode BZX75/C2V1	5322 130 34049	RE1	Relay	4822 280 60177
D224	Zener diode BZX79/C30	5322 130 30652	RE201,202	Solenoid	4822 280 70152
L605,606	Coil	4822 158 10224	M1,2	Winding motor	4822 361 20091
L607,708, 609	Coil	4822 158 10375	M3	Capstan motor	4822 361 20096
R208...212	Safety resistor 120 Ω	4822 111 30138		Connector for functional units, 8-pole	4822 267 50156
R612	Wire-wound resistor 100 Ω	4822 112 21081		Connector for functional units, 14-pole	4822 267 50151

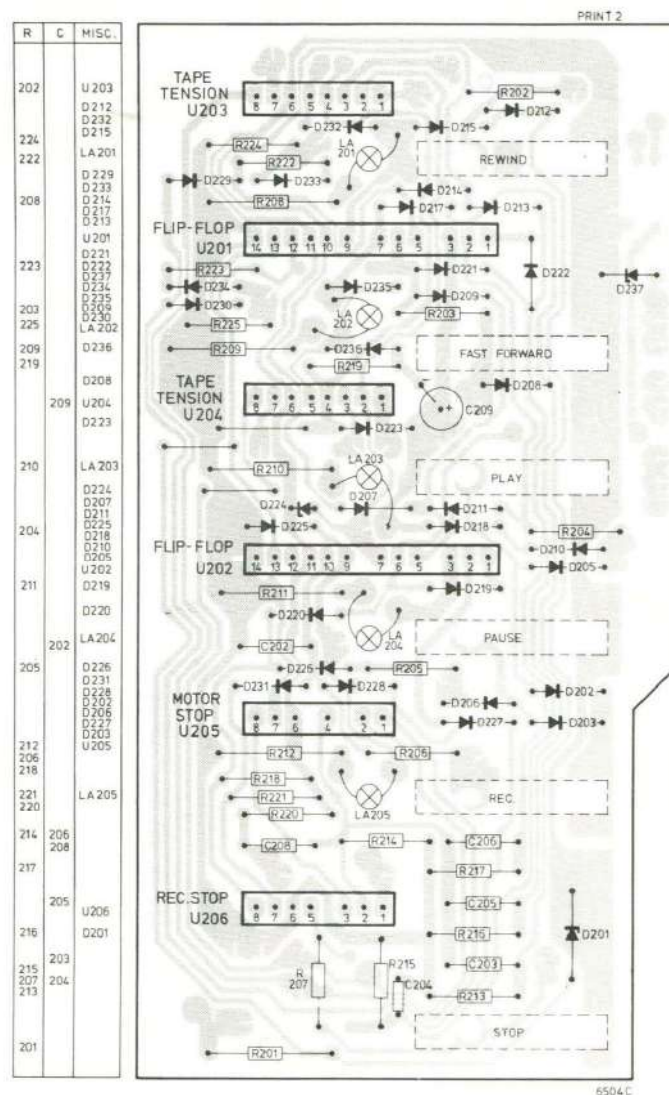
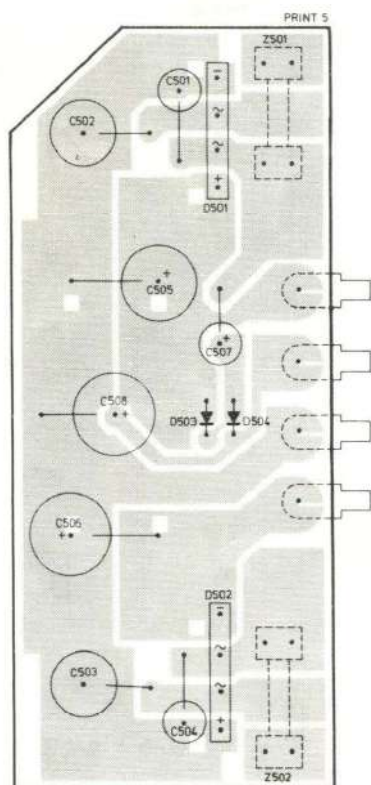


Fig. 37

[illegible]

C	MISC
501	Z501
502	
	D501
505	
507	
508	D503 D504
506	
	D502
503	
504	
	Z502 MISC
C	

67810