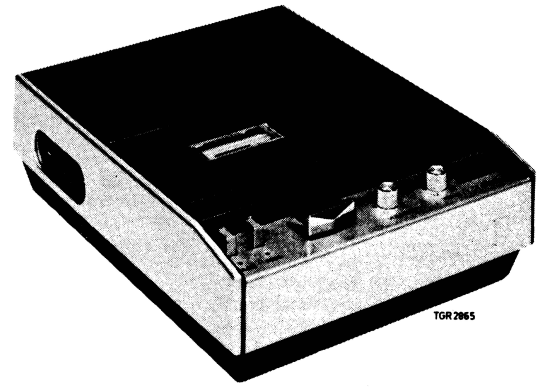
RECORDERS N 2204

00/15/16/19/22/23

SERVICE MANUAL



TECHNICAL DATA

Tape speed	: 4.76 cm/sec. (1 7/8 "/sec)
Supply voltages	: 110-127 V/220-240 V ~ 9 V = (6 x R14 TR)
Output power	: 600 mW (d = 10 %)
Loudspeaker	: 4822 240 30047 - 8 Ω
Remote-controlled microphone	: N8209
Dimensions	: 215 x 171 x 58 mm
Weight	: 1.62 kg
Input sensitivity	: 0.2 mV across 2 kΩ
Maximum current at no load	: approx. 90 mA
Maximum current at 400 mW	: approx. 230 mA
Frequency range	: 60-10.000 Hz within 6 dB
Track width	: 1.5 mm
Number of bracks	: 2

LIST OF CABINET PARTS

Item	Code number	Description
13	4822 530 70115	Circlip 3 mm
14	4822 532 10215	Washer 2.8 mm
21	4822 502 10909	Screw M2.5 x 8
22	4822 502 10037	Screw M2.5 x 23
100	4822 443 60363	Cassette cover
101	4822 492 30919	Tension spring
102	4822 459 10289	Strip over heads
103	4822 411 40012	Knob
104	4822 413 30495	Knob
106	4822 466 80009	Plate
107	4822 443 30213	Cabinet
108	4822 410 21084	Recording button
109	4822 462 70753	Locking plate
110	4822 410 21083	Cassette button
111	4822 403 50598	Lever
112	4822 492 30921	Tension spring
113	4822 403 50607	Locking bracket

Item	Code number	Description
114	4822 443 50191	Bottom plate
115	4822 290 80229	Battery spring
116	4822 290 80228	Battery spring
117	4822 492 61694	Battery spring
118	4822 492 61311	Battery spring
119	4822 347 10068	Meter
120	4822 443 60362	Battery cover
-	4822 600 70023	Carrying case

LUBRICATING INSTRUCTIONS (see Fig. 2)

Shell Alvania 2 (4822 389 10001)

Ball 62
Grooves and sunk parts in slide 300

Shell Tellus 33 (4822 390 10048)

Spindle 61 of reel disc 53
Spindle of roller 67
Spindle of flywheel 72
Hub and bearing of winding friction wheel 87
Hub and spindle of rope pulley 76

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MARCH 1971

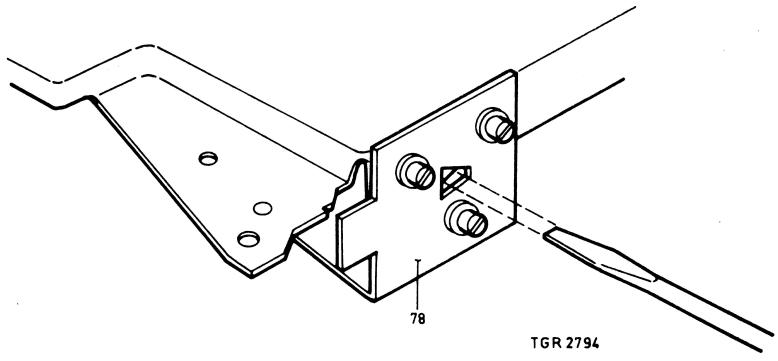


Fig.4

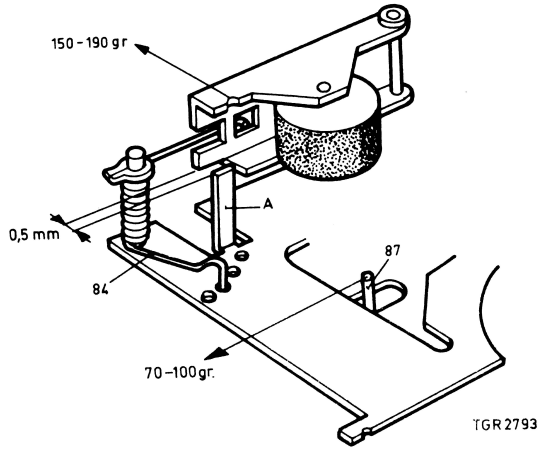


Fig.5

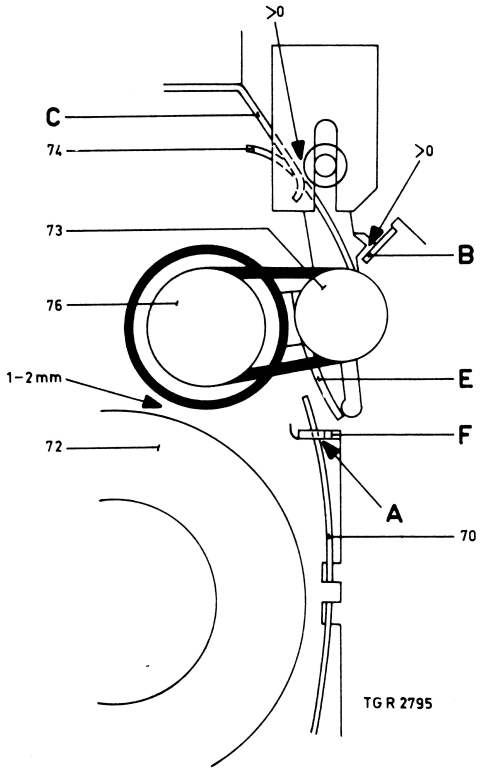


Fig. 6

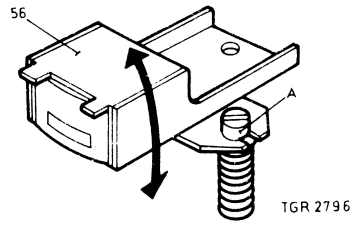


Fig. 7

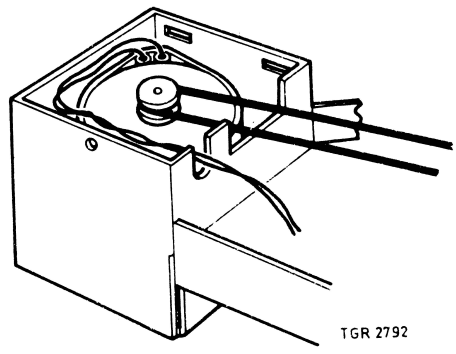


Fig. 8

LIST OF MECHANICAL PARTS

Item	Code number	Description
1	4822 502 10951	Screw M2,5x5
2	4822 592 10679	Screw M2x5
3	4822 502 10682	Screw M2x12
4	4822 532 50265	Ring
5	4822 532 50648	Ring
6	4822 532 50268	Ring
7	4822 532 50043	Ring
8	4822 530 70043	Clamping ring 2.3 mm
9	4822 530 80079	Toothed washer 2.2 mm
10	4822 532 10331	Washer 2.2 mm
11	4822 530 80075	Spring ring 3.2 mm
12	4822 530 80087	Retaining ring 3.1 mm
13	4822 530 70115	Clamping ring 3 mm
14	4822 532 10215	Washer 2.8 mm
15	4822 532 50648	Ring
16	4822 532 50262	Ring
17	4822 530 70121	Clamping ring 1.5 mm
18	4822 532 10332	Washer 3.2 mm
51	4822 492 60925	Battery spring
52	4822 462 70107	Cap over reel disc
53	4822 528 10032	Reel disc
54	4822 492 60342	Leaf spring
55	4822 249 40046	Erase head
56	4822 249 10032	Recording-playback head
57	4822 492 50273	Pressure spring
58	4822 492 60343	Leaf spring
59	4822 535 90129	Spindle
60	4822 532 50329	Roller
61	4822 535 90062	Spindle
62	4822 520 40005	Ball
63	4822 403 50009	Lever
64	4822 403 20085	Bracket
65	4822 492 30254	Tension spring
66	4822 492 60927	Leaf spring
67	4822 528 90081	Roller
68	4822 492 60344	Wire spring
69	4822 403 50599	Bracket assy
70	4822 492 60912	Wire spring
71	4822 492 60341	Leaf spring
72	4822 528 60013	Flywheel
73	4822 404 20123	Idler wheel bracket assy
74		
75	4822 358 30076	Drive belt
76	4822 528 80147	Pulley
77	4822 358 30077	Drive belt
78	4822 520 10297	Flywheel bracket
79	4822 267 20127	Socket plate assy
80	4822 492 61186	Battery spring
81	4822 492 40438	Wire spring
82	4822 403 10112	Brake bracket
83	4822 403 40041	Pressure roller bracket assy
84	4822 492 40117	Torsion spring
85	4822 492 60926	Leaf spring
86	4822 492 60345	Torsion spring
87	4822 528 20162	Winding friction assy
87a	4822 532 50855	Felt disc
87b	4822 528 70231	Friction wheel
87c	4822 492 50911	Pressure spring
88	4822 466 40102	Strip
89	4822 532 70078	Rubber strip round motor
90	4822 361 20035	Motor
91	4822 403 30089	Switch plate
92	4822 278 90223	Switch
93	4822 532 60543	Rubber buffer
94	4822 492 61313	Contact spring
95	4822 268 20033	Contact spring
96	4822 268 20032	Contact spring
97	4822 520 30225	Bearing bush
300	4822 403 50601	Mounting plate

LIST OF ELECTRICAL PARTS

TS404	AC187/01	4822 130 40089
TS426	BC149B	4822 130 40313
TS427	BC148B	4822 130 40318
TS428	BC148C	4822 130 40361
TS429	BC148A	4822 130 40317
TS430	AC187	4822 130 40314
TS431	BC148A	4822 130 40317
TS432	BC148C	4822 130 40361
TS433a-b	AC187/01 + AC188/01	4822 130 40319
D434	OF162	4822 130 30266
D435	OF162	4822 130 30266
D436	OF156	4822 130 30265
D437	OF173	4822 130 30301
D441	OF162	4822 130 30266
D442	OF162	4822 130 30266
D451	OF160	4822 130 30313
D452	BY126	4822 130 30192
D453	BZY88C10	4822 130 30402
D454	BY164	4822 130 30414
R405	22 kΩ log.	4822 101 30046
R406		
R438	10 kΩ	4822 100 10024
R566	130 Ω NTC	4822 116 30016
R577		4822 157 50013
R580	100. Ω	4822 100 10073
C727	10 µF 25 V	4822 124 20355
C731	0,64 µF 64 V	4822 124 20092
C733		
C737	100 µF 10 V	4822 124 20382
C741	2,5 µF 64 V	4822 124 20095
C745		

T407	Mains transformer	4822 145 30103
ME408	Indicator	4822 347 10068
LS409	Loudspeaker 8 Ω	4822 240 30047
L439	Coil	4822 156 20459
SK0	Voltage adapter	4822 272 10095
SK1	Record/playback	4822 277 30508
	Mains socket	CZ 365 241
SK3	Battery switch	4822 278 90223
F1-F2	Ferrite bead	4822 526 10085
M	Motor	4822 361 20035
Z1	Transformer fuse	4822 252 20007
	Mains lead	CZ 360 573
	Motor p.c.board	4822 214 30036

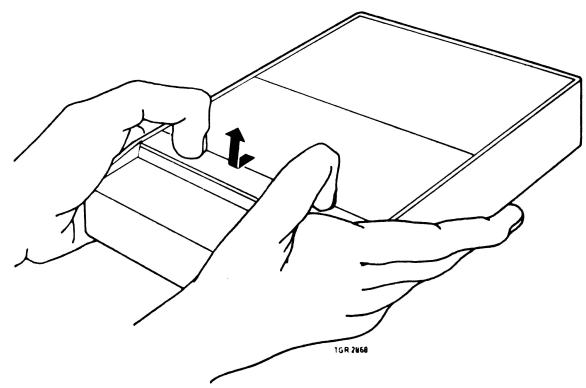


Fig.1

HINTS FOR REPAIR

Replacing drive belt 75 (Figs. 2 and 4)

! Remove the three screws with which the lower bearing bracket 78 of the flywheel is fitted to the chassis
. Remove this lower bearing bracket 78
. Remove the screw with which the cover plate is fitted to the screening bush
. Remove this cover plate
. The belt can now be removed

Note: When fitting the lower bearing bracket 78 of the flywheel, be sure that the axial play of flywheel 72 is minimum (0.1-0.2 mm).
Adjust this play by inserting a screwdriver in the hole in the lower bearing bracket (see Fig. 4)

Replacing the flywheel and the capstan idler wheel 87, Fig. 2

. Remove the three screws by which the lower bearing bracket 78 of the flywheel is fitted to the chassis
. Remove the lower bearing bracket 78
. Remove the motor p.c. board
. Disconnect the drive belt on the side of the flywheel
. Remove the nylon clamping ring from idler wheel bracket 87
. Flywheel 72 and capstan idler wheel bracket 87 must now be removed simultaneously

Note: During assembly care must be taken that the pin of the idler wheel bracket engages with the hook of wire spring 86.

Replacing the motor (Fig. 2)

. Remove the screw with which the cover plate is fitted to the screening bush of the motor
. Remove the cover plate
. The motor can now be removed from the screening bush
. To prevent interferences, the anti-interference beads should be slid as far as possible along the connecting wires of the motor and be placed in the correct corner of the motor housing (see Fig. 8).

Replacing the reel discs 53 (Fig. 2)

. Pull the cap from reel disc spindle 61
. Now reel disc 53 can be simply removed

MECHANICAL ADJUSTMENTS

Capstan idler wheel (Fig. 5)

. Switch the set to "Playback"
. The pressure of the pulley against the right-hand reel disc must be 70-100g
. Adjust this pressure by slightly bending the wire spring below idler wheel lever

Recording/playback head (Fig. 7)

The air gap of the recording/playback head should be adjusted as follows:
. Remove the cover over the heads 108 (see Fig. 1)
. Place a cassette with a 6300-Hz test tape (code-number 8945 600 11501) in the recorder
. Switch the recorder to "Playback"
. Connect a valve voltmeter to points 2 and 3 of BU1
. Adjust for maximum output voltage by means of screw A
. Paint the screw with cellulose lacquer after this adjustment

Pressure-roller lever (Fig. 5)

. Switch the recorder to "Playback"
. The force required for pulling the pressure roller just off the capstan should be between 150 and 190 g
. This force can be adjusted by slightly displacing torsion spring 84

Checking winding friction 87 (Fig. 5)

It may occur that the tape in the cassette is not wound by the right-hand reel disc, or only irregularly. As the tape is fed by the capstan, the tape will be damaged; in some cases the drive will even be blocked.

This fault may have several causes:
a. The winding friction is too small
b. The pressure of the pulley of idler wheel bracket 87 against the right-hand reel disc is not correct. This pressure should be between 70 and 100 g; its adjustment depends, among other things, on the winding friction.

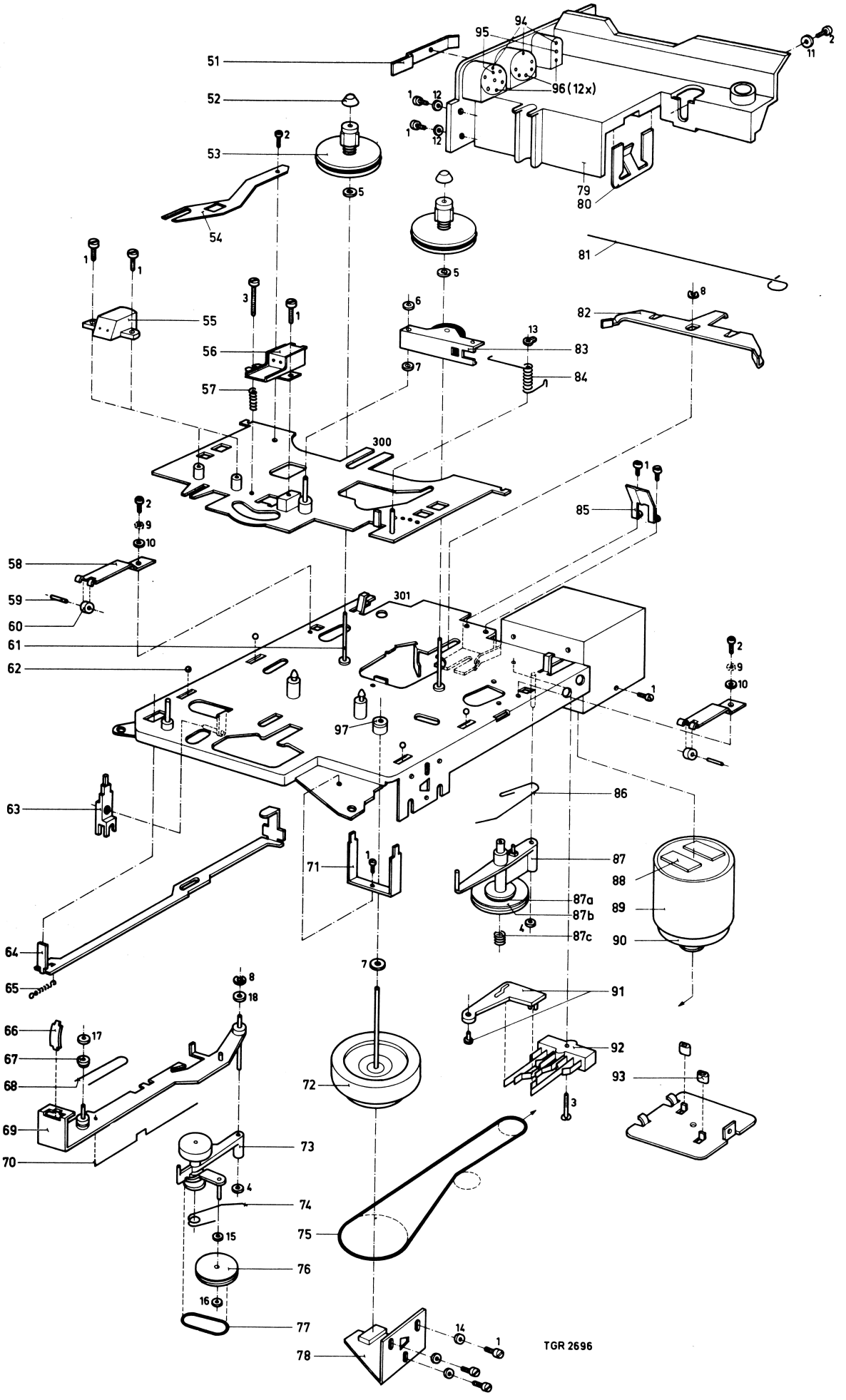
This friction is measured as follows:
Connect the set to an external supply source via an ammeter. Switch the set without a cassette to "Playback" and read the current consumption. Block the right-hand reel disc and read the current increase, which should be 8-16 mA. If the current increase is less than 8 mA, the pressure of the pulley of idler wheel bracket 87 against the right-hand reel disc must be decreased to maximum 70 g. This can be adjusted by slightly bending wire spring 86 (see Figs. 2 and 5).
If the current increase exceeds 16 mA, the pressure of the pulley against the right-hand reel disc should be increased to up to a maximum of 100 g; this can be adjusted by slightly bending wire spring 86 (see Figs. 2 and 5).
If in this way (by blocking the right-hand reel disc) no current increase of 8-16 mA can be obtained, the friction felt disc and, if necessary, the spring and the friction wheel should be replaced.

Adjusting the pulley lever (see Fig. 6)

Switch the recorder to "Playback". Tag B should now be just clear of the cam of the pulley lever. Wheel 76 should be 1-2 mm away from the flywheel. This can be adjusted by bending tag E. Spring 74 should than be clear of lever 73. This can be adjusted by bending tag C.
In position "Rewind" spring 70 should be clear of tag F; in position "Fast Forward" spring 70 should be clear of lever 73. These two settings can be affected by slightly bending spring 70.

Checking speed

Checking the speed is performed by means of test tape 8945 600 11501 on which a 800-Hz signal is modulated at every 4,75 m.
Place the cassette with a test tape in the recorder. Switch the recorder to "Playback". The time between two 800-Hz signals must be between 95 and 103 seconds. If the time is < 95 seconds, the speed is too high; if the time is > 103 seconds, the speed is too low.
The speed is adjusted with R580.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87a
87b
87c
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93
94
95
96 (12x)
97
300
301
TGR 2696

Fig.2

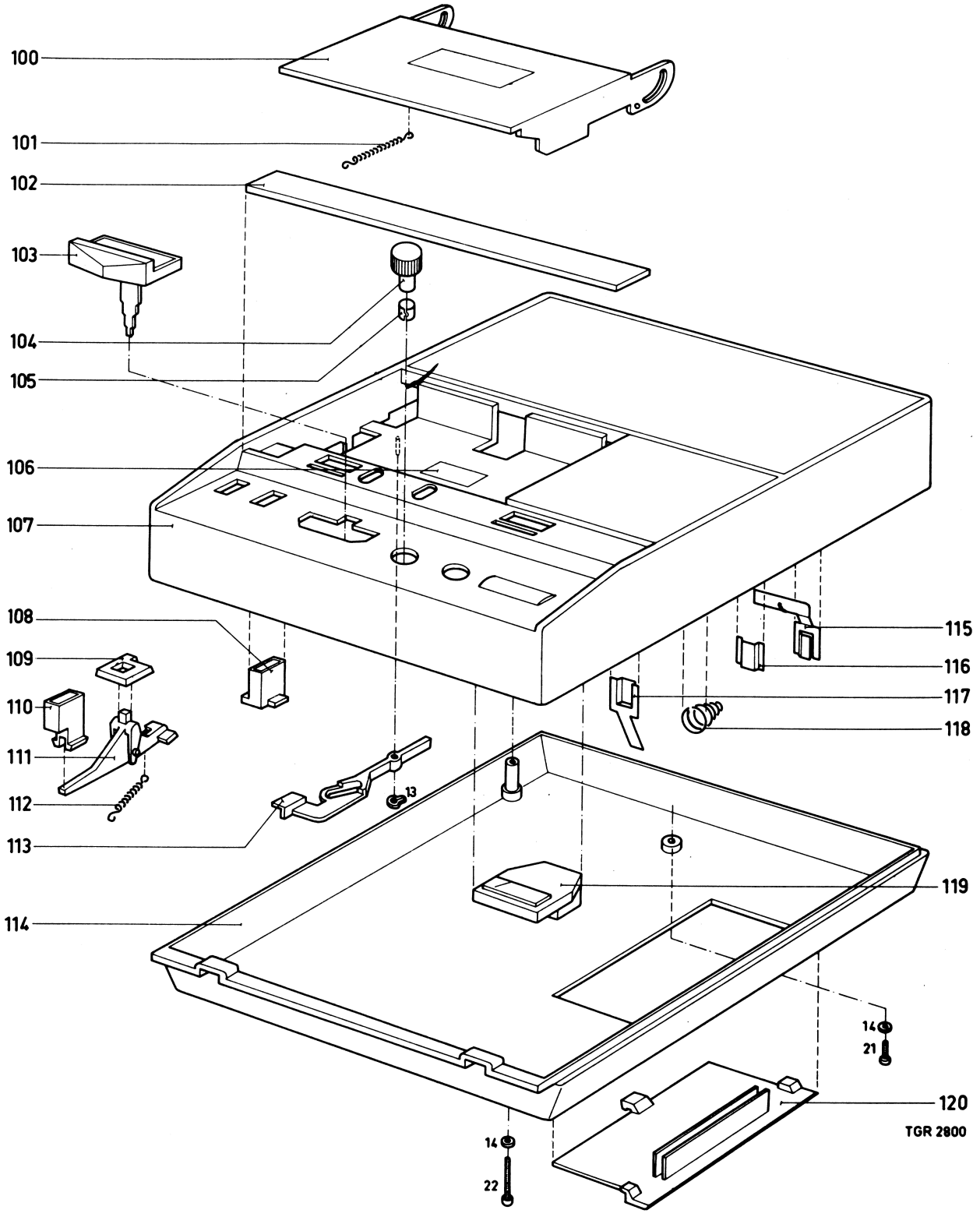

Fig.3

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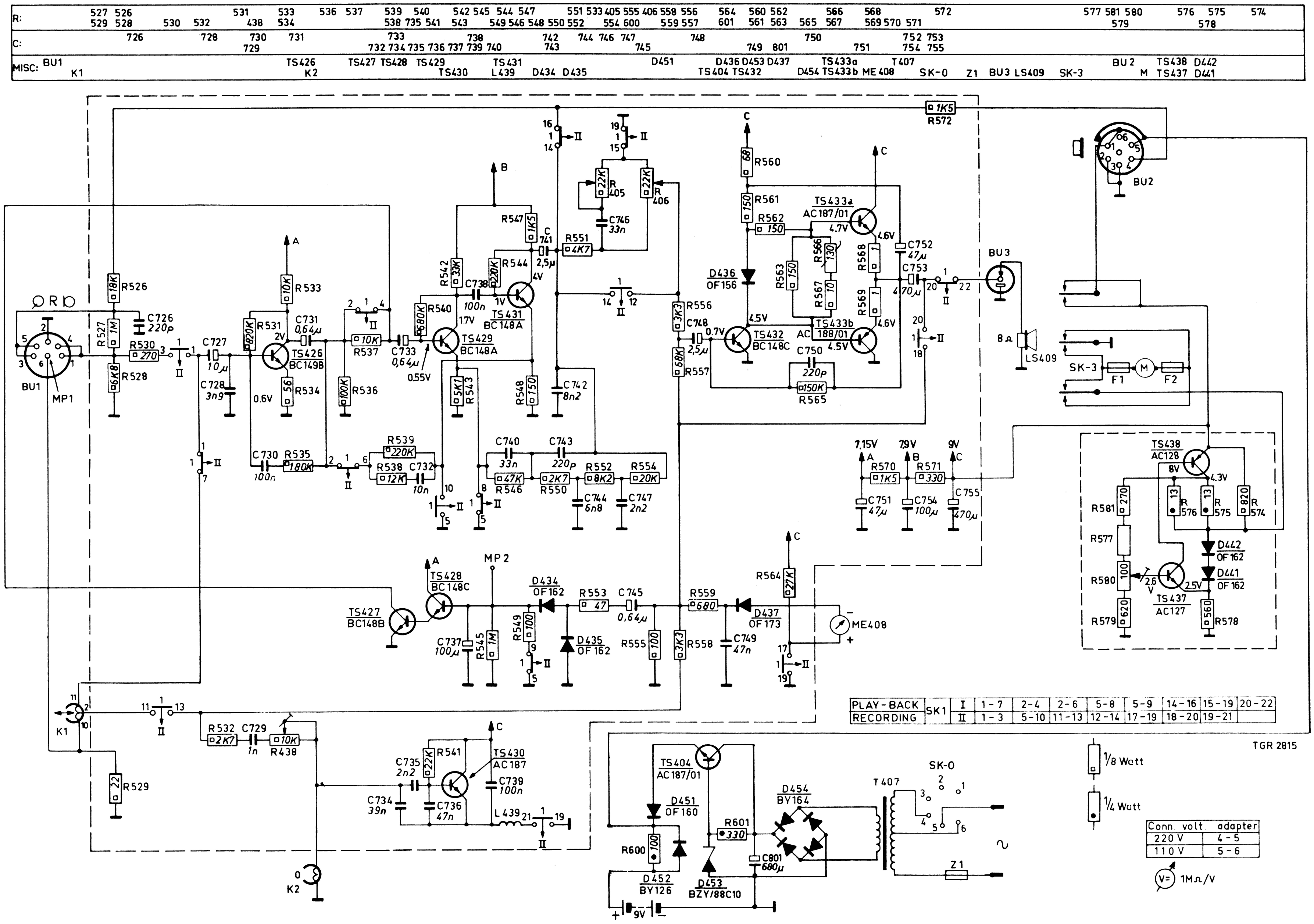
R: 527 526 529 528 530 532 531 438 533 534 536 537 539 540 538 735 541 542 545 544 547 543 549 546 548 550 551 533 405 555 406 558 556 552 554 600 559 557 564 601 560 562 561 563 565 566 567 568 569 570 571 572 577 581 580 579 576 575 578 574
C: 726 728 730 729 731 733 732 734 735 736 737 738 739 740 742 743 744 746 747 745 748 749 801 750 751 752 753 754 755
MISC: BU1 K1 TS426 K2 TS427 TS428 TS429 TS430 TS431 L439 D434 D435 D451 D436 D453 D437 TS404 TS432 TS433a D454 TS433b ME408 T407 SK-0 Z1 BU3 LS409 SK-3 BU2 M TS438 TS437 D442 D441
PLAY-BACK SK1 I 1-7 2-4 2-6 5-8 5-9 14-16 15-19 20-22
RECORDING II 1-3 5-10 11-13 12-14 17-19 18-20 19-21
TGR 2815
1/8 Watt
1/4 Watt
Conn. volt. adapter
220 V 4-5
110 V 5-6
V= 1MΩ/V

Fig.9

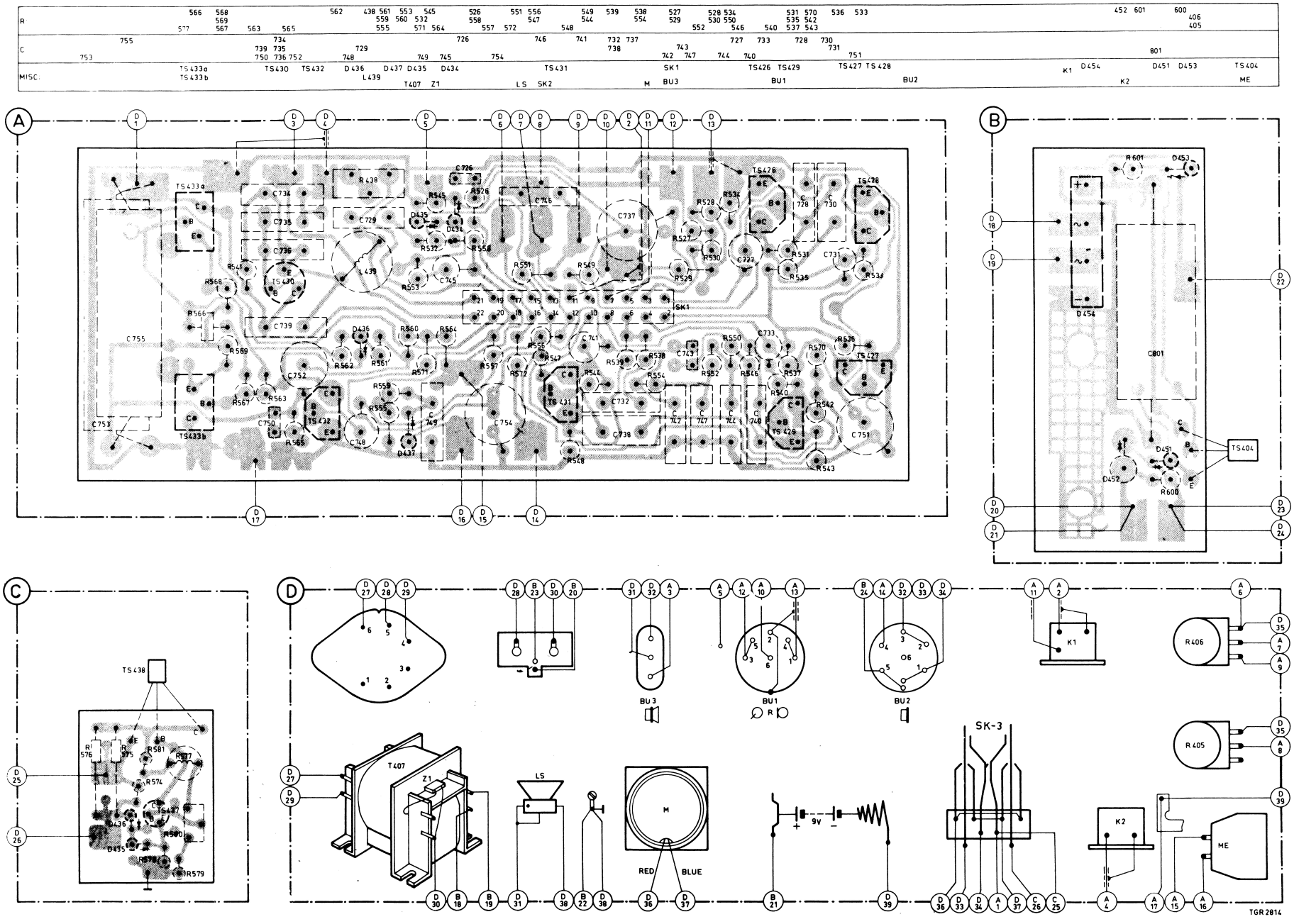

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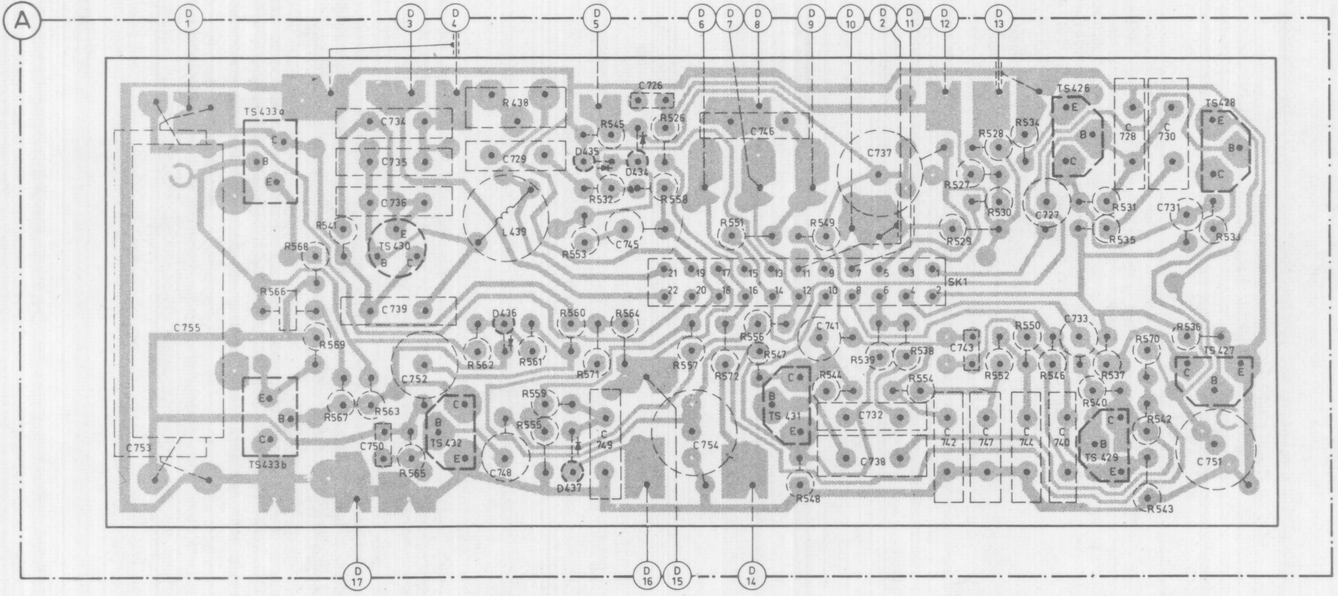
Fig.10


A
D 1
D 3
D 4
D 5
D 6
D 7
D 8
D 9
D 10
D 2
D 11
D 12
D 13
D 14
D 15
D 16
D 17
TS433a
TS433b
TS426
TS428
TS427
TS429
TS430
TS431
TS432
SK1
C726
C727
C728
C729
C730
C731
C732
C733
C734
C735
C736
C737
C738
C739
C740
C741
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C743
C744
C745
C746
C747
C748
C749
C750
C751
C752
C753
C754
C755
R438
L439
D434
D435
D436
D437
R526
R527
R528
R529
R530
R531
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R571
R572

The recorder must be powered from the mains or with new batteries.

Playback sensitivity

Replace the loudspeaker by an 8-ohm resistor.
Set the volume control and tone control to max.
Apply a 1 kHz signal to the test point (point 6 of BU1) via a 22 kΩ resistor.
Adjust the input voltage so that a voltage of 630 mV is measured across the 8-ohm resistor.
The input voltage should now be 45-72 mV.
The voltage on the line output (point 3 of BU1) should be 50-85 mV.

Recording level control

For this measurement interconnect the base and the emitter of TS430, so that the oscillator is inoperative in position recording.
Set the recorder to position "recording" and apply a 1 kHz signal to the microphone input (point 1, BU1) via a 1 MΩ - resistor.
Adjust the input voltage so that the voltage on the test point (point 6, BU1) is 4 mV. The input voltage should then be approx. 80 mV. Increase the input voltage to 800 mV. The voltage on the test point should then be 4.3 mV. Reduce the input voltage to 80 mV. After 15 secs. the voltage on the test point must be 1.8...2.8 mV.

Erase head

The voltage measured across the erase head in position "recording" should be approx. 16 V, measured with a meter of 1 MΩ/V.
The oscillator frequency is 48 to 58 MHz.

Bias current

This current is adjusted with R438, so that the voltage across measuring resistor R529 is approx. 25 mV. To be measured on point 6 of BU1.

In this recorder the recording level is automatically controlled.
The working principle is as follows:
In position "recording" output transistors TS433a and b are loaded with R555. The voltage across R555 is fed to the modulation indicator circuit via R559 and via C745 to the control circuit.
During the negative half-cycles of the voltage across R555 diode D435 is conductive so that C745 is charged to the peak value of this voltage. During the positive half-cycles diode D434 is conductive so that C737 is charged. Due to the voltage already present on C745, which is added to the positive half-cycles, C737 is charged to the peak-peak value of the signal minus the forward voltage of D434.
The base of TS428 then becomes positive and a current arises in TS428 via the base-emitter junction of TS427. This current causes a reduction of the impedance between the collector and emitter of TS427.
As a result, voltage division is effected across R537 and the collector-emitter impedance of TS427, so that the signal from TS426 is attenuated.
The amplitude of the signal to the output stage is thus reduced so that the signal fed from R555 via R558 to head K1 assumes a value at which no overmodulation occurs.
When a strong input signal is followed by a weak passage, C737 slowly discharges across R545 to a value which is proportional to the new signal strength.
When setting the recorder to "stop" after a loud passage, the charge of C737 is rapidly drained via R549. If the recording is continued immediately after this, starting is effected at max. sensitivity. Thus effective automatic recording-level control is achieved.

NOTES