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Service Manual

C 839 RC



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Technical data (typical values)

The unit exceeds the requirements of DIN 45 500 for domestic HiFi equipment.

Tape speed	4.75 cm/s
Pitch	Control range $\pm 4\%$
Flutter and wow	
W.R.M.S.	$\pm 0.03\%$
to DIN, playback only	$\pm 0.06\%$
to DIN, recording/playback	$\pm 0.09\%$
Frequency response (referring to DIN tolerances)	
Standard Fe tape	30 – 18 000 Hz
CrO ₂ tape	30 – 19 000 Hz
FeCr tape	30 – 19 000 Hz
Pure metal tape	30 – 20 000 Hz
Signal-to-noise ratio (with Dolby NR)	
Fe	64 dB
CrO ₂	64 dB
FeCr	67 dB
Met	67 dB

Channel separation at 1000 Hz	
between stereo channels	35 dB
between channels in opposite direction	60 dB
Erasure at 1000 Hz	70 dB
Oscillator frequency (push/pull oscillator)	105 kHz
Inputs (sensitivity at 0 dB)	
Microphone (1/4" coax jack)	0.25 mV/10 kOhm
Receiver/amplifier (DIN jack)	0.5 mV/ 6.3 kOhm
Receiver/amplifier (RCA jacks)	40 mV/82 kOhm
Outputs (adjustable)	
Receiver/amplifier (DIN jack)	0 – 580 mV/10 kOhm
Receiver/amplifier (RCA jacks)	0 – 580 mV/ 2 kOhm
Headphones (1/4" coax jack)	4 – 2000 Ohm
Fast wind time for C 60 cassette	65 sec.
Line voltage	115 volt and 230 volt
Line frequency	50/60 Hz
Power consumption	40 W

Functional description AF section

Playback

The voltage from the magnetic head (approximately 300 μV when playing back the DIN reference level) is amplified by low-noise transistor T 4010. L 4002 in the base circuit serves as an RF trap. During operation with fade-edit, no stray RF signals should reach the playback amplifier. The playback amplifier is formed by IC 4003. Equalisation is performed by negative feedback network R 4088, C 4034, R 4049 and C 4033 constant at 70 μs . When switch S 5 is in position 1 or 2, R 4087 and C 4035 are connected via diode D 4010. The time-constant increases by 50 μs so that 120 μs are now available.

The playback level when playing back the Dolby reference level is set for each magnetic head with the aid of trimmers R 4052 and R 4054. This setting ensures that the Dolby processor functions perfectly. The Dolby unit is a self-aligned component. L 4201 (for filtering the high frequency) and L 4202 (alignment to 19 kHz) must not be adjusted. (This is carried out at the factory). The output signal (Stp. 3) is supplied to the output jacks, the display amplifier and headphone amplifier via relay contact. The maximum output level of 580 mV may be reduced by means of trimmer R 4035.

Muting circuit

In order to prevent starting and switching noises from reaching the output jacks, the device is provided with two separate muting circuits. When the unit is switched on, capacitor C 4052 ensures that transistor T 4006 remains blocked until the voltage is increased. The reed relay does not respond.

- 1.) When the unit is in normal condition, a high signal is applied to the output of the muting circuit. This signal is applied to the base of T 4007 which drives, blocking T 4006. The relay is unable to operate. Simultaneously, the muting signal is applied to the base of the limiter transistor T 4003 via D 4020 and R 4055. Transistor T 4003 drives, applying the input signal to 0 V. When the capstan motor is started either anti-clockwise or clockwise, the high pulses are switched to the NAND gate (IC 4006) by the motor electronic system. The output of the muting circuit goes to low after a time-lag of approximately 1 second (C 4026 or C 4063), thereby releasing the muting function. When the motor is started or the direction is reversed, the muting circuit remains operational until a constant speed is reached. The RF generator is also blocked by the muting signal (high) (Stp. A 7).
- 2.) If switch S 1 is in record position (sections 8 and 9), transistor T 4008 becomes conductive in the forward direction and 0 V is applied to the DIN output via R 4039.

Recording

Three different sources are available for recording (Mic, Line, Din). The Mic-signal is amplified by low-noise transistor T 4000 and is supplied to IC 4002 for the purposes of impedance conversion. The DIN signal (current supply complying with DIN 45 511; 0,1 – 2 μA) is amplified by IC 4000 and supplies excellent noise values.

The Line-signal reaches the input selector switch S 4 via IC 4001 (impedance transformer). Depending upon the switch position, the input signals reach the mixing amplifier formed by T 4001 and T 4002 via modulation regulators R 4020 (Line) and R 4008 (Mic). Transistor T 4013 serves to filter the +12 V. From the mixing stage, the AF signal is supplied to the limiter (T 4003 and T 4004) via R 4026. When the limiter is switched on, the level is limited at 30 mV.

The signal reaches the input of the Dolby unit (section 9) via the record/playback switch S 1. In position "h" switch S 7 (MPX/Dolby) connects +12 V to point 1, thereby rendering the Dolby circuit inactive. In position "g" (S 7), the MPX filter is switched on (suppression of pilot frequency). C 4025 is coupled to 0 V via the bilateral switch (13). Transistor T 4005 becomes biased in the forward direction and the bilateral switch (5) opens, isolating the connection between points 8 and 7 on the Dolby unit. The LED display D 4301 is activated by switch S 7.

With the Dolby circuit, the AF signal branches to two outputs.

The signal which has not been influenced by the Dolby processor is available at point 5 for monitoring purposes. It is supplied to the Line-output, the display amplifier and the headphone amplifier via switch S 1. The dolbyised signal is supplied to the record amplifier via the output (point 3). Transistor T 4014 is blocked. If, however, switch S 1 is positioned to play position, T 4014 becomes biased in the forward direction, biasing the record signal with 0 V. The record level for each magnetic head is set separately with trimmers R 4062 and R 4064. The record amplifier is constituted by IC 4004. L 4001 is aligned at the factory (resonating at 18.5 kHz) and must not be adjusted. With the aid of switch S 5 (tape selector), equalisation is matched to the particular type of tape by transistor T 4011 and sensitivity is matched by T 4012. The record signal is supplied to the magnetic head via the track selector switch S 2 after having previously been set to RF voltage minimum via the RF wave trap with L 4000.

RF generator

The RF generator is a push-pull oscillator with a frequency of approximately 105 kHz. The RF for the erased heads is tapped via L 4001 and biasing for the particular magnetic head is set by means of R 4082 and R 4084. The oscillator is influenced via switch S 5 and transistor T 4102 in such a way that, depending on the position of the tape selector switch S 5, the optimum operating point is achieved. A high signal at the base of T 4104 effectively biases transistor T 4103 in the reverse direction, blocking the generator. If a high signal is applied to the input E 2 (record mode), transistor T 4105 becomes biased in the forward direction, the base of T 4104 becomes low, T 4104 becomes biased in the forward direction, switching on the generator. A high signal at the output E 1 (music cassette) effectively biases T 4104 in the reverse direction, having the same effect as the high muting signal via input A 7. Capacitor C 4104 in the base circuit of T 4103 ensures that the oscillator starts up smoothly and with no click.

Fade Edit

Low is applied to the base of T 4104 via input D by switches S 9 and S 10. The transistor becomes biased in the forward direction, releasing the generator.

When capacitor C 4301 discharges via switch S 10 to the base of T 4103, this transistor slowly becomes biased in the forward direction and the generator slowly starts to operate (fade-out procedure).

Display and limiter

Both during record and playback, the AF signal reaches the display amplifier formed by IC 4100. In order to allow for increased saturation at high frequencies, frequency correction is carried out by means of S 5. Boosting by 400 Hz at 10 kHz results in approximately 10 dB. The display is comprised of a 12-stage LED chain, driven by IC 4301. The control signal for IC 4301 is tapped at the output of the display amplifier and the level is set to 0 dB during playback of the reference level with R 4127. The control signal is rectified by D 4316, C 4302 ensures damped return (approximately 0.5 s) of the LED display. The -20 dB mark is set by means of R 4303. The inertialess display may be switched off by switch S 11.

Zero of the limiter operating range is set by means of R 4121. The control signal is amplified by transistor T 4106 and is supplied to the base of T 4004 via switch S 6 (limiter). T 4004, in turn, drives transistor T 4003 which acts as a differential resistance, forming a voltage divider together with R 4026. The settling time (approximately 3 – 5 s) of the limiter after it has responded is formed by means of C 4115. Limiter transistor T 4003 is used to mute the input signal. This is performed by applying a high signal to the base when the following functions are operative: switch S 1 in position (play) and in the case of all muting functions.

Headphone amplifier

The unit is provided with a separate headphone amplifier (IC 4101). Headphones with an impedance of between 4 and 2000 ohms may be connected. An incorporated volume control facility for each channel (R 4128) permits the volume to be matched independently of the output signal.

Control

All functions of the unit and drive mechanism are controlled by a processor. By connecting a separate infrared receiver RE 120 and using the infrared transmitter RC 152, all functions of the unit may be remotely controlled. If connected to amplifier CV 1500 RC, RE 120 may be dispensed with. The infrared commands, converted into electrical pulses, are switched to a bus line via an infrared evaluation circuit. The bus line is then processed by the processor. The processor takes over the following tasks:

1. Scanning the pulse train
2. Filtering out interference
3. Identifying device-specific commands
4. Executing the command which has been identified.

The processor is accommodated in a separate assembly. The L-plug forms the interface between the processor and the subsequent device electronic system. The levels may be checked at plug L by means of the status matrix.

Inputs

All locally controlled functions and keys issue their information as active low. The contacts record lock \triangleleft and record lock \triangleright (music cassette inserted = contacts open) issue their information as a high signal to two series-connected 8-bit shift registers IC 4503 and IC 4504. The data is then supplied serially to the processor via plug L 3. The shift clock pulse is issued via L 2 and switchover from parallel to serial input is issued by the processor at L 8. The signal "rewind motor stopped or operating" is input as a serial input to the shift register IC 4505, pin 11. The pulsating voltage at the emitter of T 4518 is converted by the circuitry, consisting of transistor T 4524 and T 4525, into a logic, static signal. Low = rewind motor operating and high = rewind motor stop. The contact, cassette sensor closed = cassette inserted, is arranged in series with the DLLS contacts. Contact closed = DLLS not actuated = DLLS off. This signal is scanned by the processor via plug L 7 directly (low). The infrared signals of the bus line are applied to plug L 9.

Outputs

The data for the LED displays are issued serially by the processor via plug L 2 to two 4-bit shift registers (IC 4505 pin 7). The relevant shift pulse is applied to pins 1 and 9 from L 1. The signals which are now applied in parallel are applied to an 8-segment constant current driver IC 4506 which drives the individual LED's. The LED register acknowledges a music cassette in the form of a low signal at transistor T 4526 via pin 5. This transistor T 4526 via pin 5. This transistor becomes biased in the reverse direction, blocking the RF generator with its high level at the collector via plug T 2.

The capstan motor is a dc rotor which is maintained at constant speed by means of a speed regulator IC 4501. A generator is located in one of the two capstan flywheels. The pulses which it generates, proportionate to the speed, are amplified by transistor T 4500 and supplied to IC 4501 at pin 3. Via the analog circuit

IC 4500 8/9, R 4506 and trimmer R 4505 form a voltage divider between pins 11 and 5 of IC 4501 together with trimmer R 4503 and R 4504. The set speed during playback mode is set by means of R 4505 and, during record mode, by means of R 4503. It is imperative that its sequence be observed. A high signal at plug L 13 (record) in conjunction with the service plug being in position N, means that the analog switch 4/3 operates, applying 0 V to switch 10/11. This switch opens and the pitch control at plug point K 1 and K 2 is isolated from the voltage divider. This guarantees that, during record, absolute tape speed is maintained even if the pitch control is adjusted. The high record signal also reaches plug 1 in order to start the RF generator and plug R 8 in order to maintain the magnet record in hold condition.

The dc voltage is alternately connected to the motor by means of the H circuit, formed by transistors T 4504, T 4506, T 4505 and T 4507. A high signal at plug L 12 (capstan motor clockwise) causes transistor T 4503 to become biased in the forward direction, applying a high signal to the base of T 4507, applying 0 V to the motor and biasing the PNP transistor T 4504 in the forward direction. This applies the positive voltage to the motor. Transistor T 4502 readjusts the operating current on the basis of the switching pulses issued by the speed regulator IC 4501.

The rewind motor, comprising a dc rotor, is operated in two directions and at two speeds. Once again, an H circuit consisting of switching transistors T 4515, T 4521, T 4517 and T 4522 are central to reversing the direction of rotation. A constant current source supplies the operating current by means of transistor T 4518. A high signal at the base of T 4512 causes it to be biased in the forward direction. The high signal reaches the base of T 4520 which now couples the constant current source to the H circuit. When the direction is fed in, the motor operates in fast mode. On the other hand, if transistor T 4511 becomes conductive owing to a high signal, (command: rewind motor slowly), transistor T 4514 becomes biased in the forward direction, decreasing the operating current supplied by the constant current source via R 4534. The motor now operates in slow mode and tape tension is set by means of trimmer R 4524. The direction of rotation is preset by connecting transistors T 4513 (wind motor left) and T 4519 (wind motor right). Transistors T 4523 and T 4516 serve to delay connection.

When transistor T 4511 (wind motor slowly) is activated, T 4510 becomes biased in the forward direction and the solenoid "play" (in the drive system) located in the collector circuit thereby responds. A high signal at the base of T 4509 causes the solenoid "pause" (in the drive system) to respond via T 4508.

The solenoid drivers are also driven by high signals via plug R 7 for solenoid track \triangleright and R 6 for solenoid track \triangleleft . Solenoid record requires two operator commands. A high signal at plug R 5 applies -12 V to the solenoids. When there is a high signal at plug R 8 (solenoid record hold), the +12 V are applied causing the solenoid to respond rapidly. When the signal at R 5 (solenoid operative) is removed, the record solenoid remains at hold status via diode D 4415 with 0 V applied.

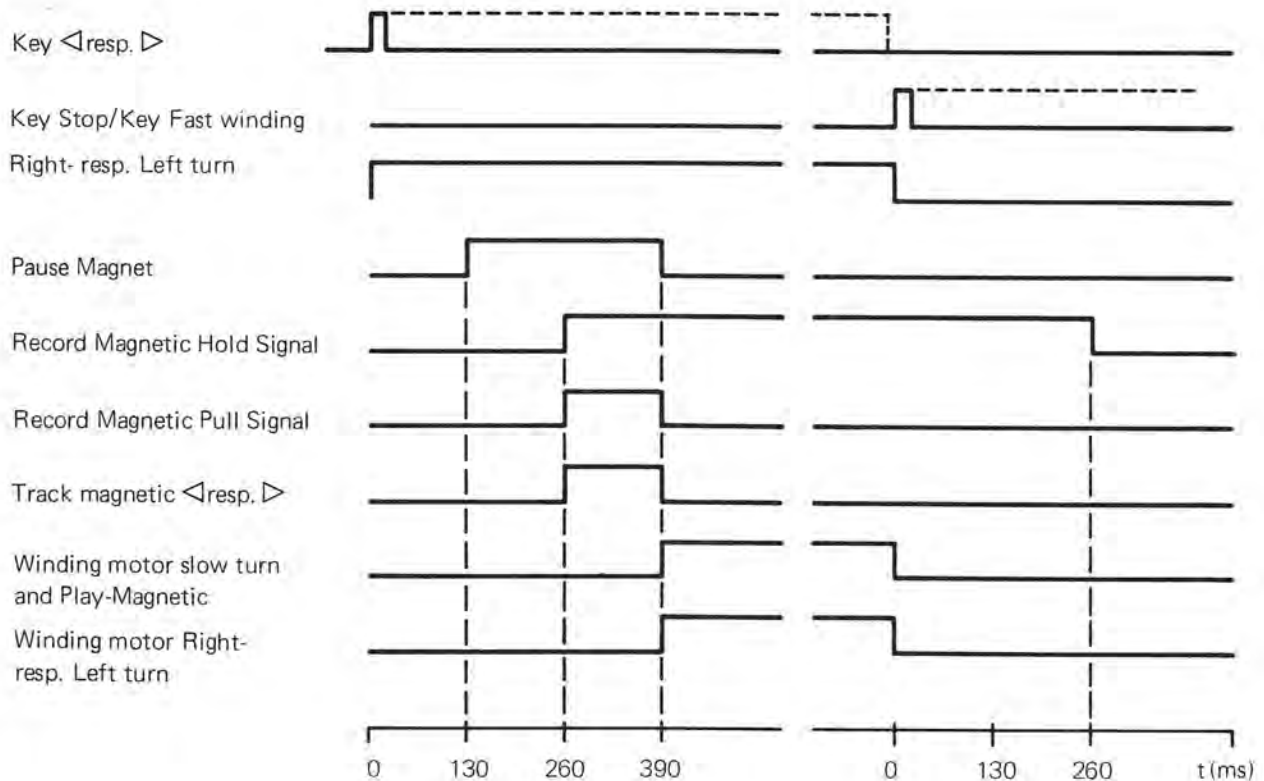
Level state matrix for unit control

- ↑ Data high-aktiv
- ↓ Data low-aktiv
- high $\leq +12\text{ V}$
- low $\hat{=} 0\text{ V}$
- high Puls ($\leq +12\text{ V}$) for certain time

State Number Unit State	Checkpoint on plug L Checkpoint on plug E	Puls LED Register																					AF-Generator	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	1	2
1 Stop		—	↑	↓																			●	—
3 Play▷		↑	↑	↓																			—	—
3 Play▷ + Recordblock▷		↑	↑	↓																			●	—
10 Play▷ + Pause		↑	↑	↓																			—	—
2 Play△		↑	↑	↓																			—	—
2 Play△ + Recordblock◁		↑	↑	↓																			●	—
9 Play△ + Pause		↑	↑	↓																			—	—
5 Record▷		↑	↑	↓																			—	—
12 Record▷ + Pause		↑	↑	↓																			—	—
4 Record△		↑	↑	↓																			—	—
11 Record△ + Pause		↑	↑	↓																			—	—
7 FAST WINDING ◁◁		↑	↑	↓																			●	—
6 FAST WINDING ▷▷		↑	↑	↓																			●	—
14 DLLS on (Cassette removed)		↑	↑	↓																			●	—

Record and Recordblock (with music rec. cassette) = Play + Recordblock
 When DLLS on (Cassette removed) the contacts „record blocked“ ◁ and ▷ are operating.

Time graphic for unit control



Function status matrix

The matrix is designed to represent the device statuses and device functions possible by means of manual input or automatic operation. The specific device statuses are numbered (status number). The changed status is indicated each time a separate operation function is changed.

Example: The device is operating in rapid wind mode ◀◀ this

corresponds to status number 6. The device should then be changed to play status ▷ by means of the controls on the unit. You should then check the operating panel on the unit in the section play ▷. The point of intersection of this vertical line with the horizontal status number line (number 6) indicates the new status, which, in this case number 3, signifies play ▷. In order to check the AF recording current, the AF voltage may be measured at test point 1 or test point 1' via a filter.

State and Funktion List
OPERATING OF UNIT

STATE NUMBER	UNIT STATE	LED DISPLAY	CLOSE CONTROL	REMOTE CONTROL	AUTOMATIC CONTROL							
					TAPE END	MEMORY	TIMER					
					STOP PLAY ◁ PLAY ▷ RECORD FAST WINDING ◀◀ FAST WINDING ▷▷ PAUSE	STOP PLAY ◁ PLAY ▷ RECORD REC. ◁+ REC. BLOCK ◁ REC. ▷+ REC. BLOCK ▷ FAST WINDING ◀◀ FAST WINDING ▷▷ PAUSE DIRECTOMATIC ON DIRECTOMATIC OFF	STOP PLAY ◁ PLAY ▷ FAST WINDING ◀◀ FAST WINDING ▷▷ PAUSE MASTER OFF	+ + + REC. BLOCK ◁ + REC. BLOCK ▷ + REC. BLOCK ◁ + REC. BLOCK ▷	MEMORY OFF MEMORY ON MEMORY PLAY	TIMER OFF TIMER PLAY ◁ TIMER REC ▷	TAPE END	
1	STOP	•	1 2 3 4 5 2 3 6 7 8 14	1 2 3 6 7 8 1	-	-	-	-	-	-	-	-
2	PLAY ◁	•	1 2 3 4 5 2 3 6 7 8 14	1 2 3 6 7 8 1	1 1 1 1	-	-	-	-	-	-	-
3	PLAY ▷	•	1 2 3 4 5 2 3 6 7 8 14	1 2 3 6 7 8 1	1 2 2 2 3 3	-	-	-	-	-	-	-
4	RECORD	•	1 4 3 4 5 2 3 6 7 10 16	1 4 3 6 7 10 1	1 1 5 5	-	-	-	-	-	-	-
5	RECORD ◁	•	1 2 3 4 5 2 3 6 7 12 16	1 2 5 6 7 12 1	1 4 2 4 2 3	-	-	-	-	-	-	-
6	RECORD ▷	•	1 2 3 4 5 2 3 6 7 6 17	1 2 3 6 7 6 1	-	-	-	-	-	-	-	-
7	FAST WINDING ◀◀	•	1 2 3 4 5 2 3 6 7 7 18	1 2 3 6 7 7 1	-	-	-	-	-	-	-	-
8	FAST WINDING ▷▷	•	1 2 3 4 5 2 3 6 7 7 18	1 2 3 6 7 7 1	-	-	-	-	-	-	-	-
9	PAUSE	•	1 9 10 11 12 9 10 6 7 1 19	1 9 10 6 7 1 1	-	-	-	-	-	-	-	-
10	PLAY ◁+ PAUSE	•	1 9 10 11 12 9 10 6 7 2 20	1 9 10 6 7 2 1	-	-	-	-	-	-	-	-
11	PLAY ▷+ PAUSE	•	1 9 10 11 12 9 10 6 7 3 21	1 9 10 6 7 3 1	-	-	-	-	-	-	-	-
12	RECORD ◁+ PAUSE	•	1 11 10 11 12 10 6 7 4 20	1 11 10 6 7 4 1	-	-	-	-	-	-	-	-
13	RECORD ▷+ PAUSE	•	1 9 12 11 12 9 6 7 5 21	1 9 12 6 7 5 1	-	-	-	-	-	-	-	-
14	POWER ON	•										1 1
14	STOP	•	14 15 16 15 16 17 18 19 1	14 15 16 17 18 19 14	-	-	-	-	-	-	-	-
15	PLAY ◁	•	14 15 16 15 16 17 18 20 2	14 15 16 17 18 20 14	-	-	-	-	-	-	-	-
16	PLAY ▷	•	14 15 16 15 16 17 18 21 3	14 15 16 17 18 21 14	-	-	-	-	-	-	-	-
17	FAST WINDING ◀◀	•	14 15 16 15 16 17 18 17 6	14 15 16 17 18 17 14	-	-	-	-	-	-	-	-
18	FAST WINDING ▷▷	•	14 15 16 15 16 17 18 18 7	14 15 16 17 18 18 14	-	-	-	-	-	-	-	-
19	PAUSE	•	14 20 21 20 21 17 18 14 8	14 20 21 17 18 14 14	-	-	-	-	-	-	-	-
20	PLAY ◁+ PAUSE	•	14 20 21 20 21 17 18 15 9	14 20 21 17 18 15 14	-	-	-	-	-	-	-	-
21	PLAY ▷+ PAUSE	•	14 20 21 20 21 17 18 16 10	14 20 21 17 18 16 14	-	-	-	-	-	-	-	-

Memory works on fast winding
Mode works on slow winding
Timer works on mains connection

Alignment instructions motor electronic system

Test instruments and test cassettes required

- 1 wow meter
- 1 tape tension test cassette (KDW 231, item no. 232 797)
- 1 tape speed test cassette 3150 Hz

Take-up friction and tape speed

All trimmers set to centre position or pre-aligned.
Servicing plug in position "N" (normal mode)
Pitch control set to centre position (engaged)
Insert Sony TORQUE METER cassette

- ▶ Set tape tension to 50 ± 5 pcm with R 4524
- ◀ Tape tension must lie between 45 and 65 pcm.
Insert Dual cassette 3150 Hz.
- ▶ Set tape speed to $\pm 0.5\%$ with R 4505.
Wow less than $< 0.1\%$.
- ◀ Tape speed must be within the tolerance range of $\pm 0.5\%$
Wow less than $< 0.1\%$.
Servicing plug in position "S" (servicing).
- ▶ Set tape speed to $\pm 0.5\%$ with R 4503.
Wow less than $< 0.1\%$.
- ◀ Tape speed must lie within the tolerance range of $\pm 0.5\%$.
Wow less than $< 0.1\%$.
Servicing plug "N" (normal)

Alignment instructions analog section

Test instruments and test cassette required

- 2 millivoltmeters
- 1 AF oscillator
- 1 oscilloscope
- 1 frequency counter
- 1 test cassette 400 Hz -20 dB, 10 kHz -20 dB
- 1 test cassette Fe₂O₃ reference medium section, CrO₂ reference medium section
- 1 test cassette 400 Hz Dolby level 200 nWb/m

General notes

Before alignment, the magnetic head and all ferrous components contacting the tape must be demagnetised!

Realignment must be carried out in the sequence stated.

When aligning the coils, two core positions are possible. However, the outer core position should always be chosen.

Caution: the adjustment controls for the LED display must not be altered.

Playback

Level and LED modulation display

Set R 4035 and 4035' to fully counterclockwise position (when viewed from the front).
Apply the Dolby reference level (400 Hz).

Fe, ▶

Set a playback level of 580 mV ± 0.25 dB while the Dolby reference signal tape is running, measured at MP.3 (left channel) and MP.3' (right channel)

Set track 1 (left channel) with R 4054

Set track 2 (right channel) with R 4054'

Set track 3 (left channel) with R 4052

Set track 4 (right channel) with R 4052'

Set the LED modulation displays to 0 dB while the Dolby reference signal tape is running.

For the left LED display, use R 4127

For the right LED display, use R 4127'

Magnetic head adjustment

Insert the test cassette section determined for gap adjustment (noise or 10 kHz).

Fe, ▶ (track 1–2) or ◀ (track 3–4)

With the set screw at the left, adjacent to the magnetic head, align for maximum voltage. Average the voltage at outputs L

and R or switch both channels in parallel and align to maximum. Average the setting for both tape directions.

Frequency response

Insert the test cassette, section for determining frequency response (400 Hz -20 dB -10 kHz -20 dB).

Fe, ▶ (track 1–2) or ◀ (track 3–4)

The output voltage at output L/R should be 0 dB with reference to 400 Hz.

With reference to 10 kHz = +4 to -3 dB

Deviations between channels at 10 kHz less than < 3 dB.

When switching over to CrO₂ or FeCr, the 10 kHz level must be characterised by a voltage jump of -4 dB ± 1 dB.

Background noise

Screened amplifier, ensure that the magnetic head is free of hum. Insert the wow test cassette.

PAUSE, DOLBY, ▶ or ◀

Background noise at OUTPUT L/R less than < 2 mV rms, measured with low-pass filter 20 Hz -3 dB

RF generator

Preset R 4084, R 4084', R 4082 and R 4082' for RF biasing or set to centre position.

Measure the generator frequency with an absorption frequency meter near the erase head or with a frequency counter at the erase head via a 1 M Ω series resistor.

Set 105 kHz ± 2 kHz with L 4100.

When switching over to Fe or FeCr, frequency deviation must not exceed a maximum of 2 kHz.

RF wave traps

Connect a thermionic voltmeter to test point 1 or test point 1' and align to minimum voltage (105 kHz) with L 4000 or L 4000'.

Maximum permissible difference of alignment in the other direction is 1/2 revolution.

Bias switching

The following voltage change must be measured with the aid of a capacitive voltage divider at the record/playback head, with reference to E_{HIF} (105 kHz)

Fe = 0 dB

Fe 1, FeCr = +2 dB ± 0.5 dB

Cr 2, Cr = +4.5 dB ± 0.5 dB

Met, = +8.5 dB ± 0.5 dB

Erase head voltage

Measured at the erase head in position CrO₂ greater than > 35 V \approx

Recording

Connect AF oscillator to INPUT and amplifier, voltmeter and harmonic distortion meter to OUTPUT. Input switch to LINE.

RF biasing

Insert test cassette CrO₂ DIN reference medium section

CrO₂, RECORD, ▶ or ◀

Record 400 Hz and 10 kHz with -20 dB (LED display).

Compare levels on reproduction.

If there is no uniform level, correct RF biasing.

Decreased RF = treble emphasis

Increased RF = treble de-emphasis

Any changes of the RF level can be measured directly at the head via a capacitive voltage divider (1 pF coupling capacity), test point 2 or test point 2'.

For alignment of track 1 with R 4084

For alignment of track 2 with R 4084'

For alignment of track 3 with R 4082'

For alignment of track 4 with R 4082

Level

Insert CrO₂ DIN tape reference medium section.

RECORD, ▶ or ◀

Record 400 Hz at 0 dB (LED display) and then compare with playback level (LED display). If the levels are unequal, alter the record current until the playback level = record level.

Correction For track 1 use R 4062

For track 2 use R 4062'

For track 3 use R 4064'

For track 4 use R 4064

To check NF-recording currence, the NF voltage may be measured with filter on check p. 1 and chekp. 2

Harmonic distortion

When recording at 333 Hz with 0 dB level (LED display), harmonic distortion K_3 must not exceed 2 % for Fe DIN tape and must not exceed 3 % for CrO₂ DIN tape.

Erasure

RECORD, CrO₂, supply 1 kHz at 0 dB (LED display)
Erasure (measured selectively) greater than 62 dB

Limiter

Set R 4121 and R 4121' (on switchboard) to fully counterclockwise.

LIMITER ON, RECORD, ►

Supply 400 Hz at the DIN input (+3 dB LED display). Slowly rotate R 4121 or 4121' clockwise until the LED displays indicate 0 dB.

When the voltage is briefly increased 10-fold (20 dB) at the input, it should take between 4 and 6 seconds (decay time) for the LED display to reach -10 dB.

Fade Edit

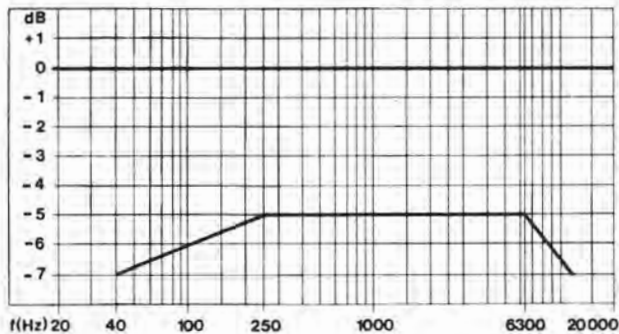
Insert a recorded cassette. Switch the tape selector switch to the relevant position. When FADE EDIT is operated, the level must fade out within 3 - 5 seconds and the tape must be fully erased after 10 seconds.

With the MPX filter switched off and FADE EDIT key depressed, set minimum voltage at the output using L 4002 and L 4002'.

Overall frequency responses

For Fe₂O₃ DIN tape and CrO₂ DIN tape, the overall frequency responses must be within the specified tolerances stipulated in DIN 45 500, sheet 4.

Recordings must be made at -26 dB (LED display). The units must meet the requirements of DIN 45 500, sheet 4 with Dolby NR.



Lower limiting frequency = 40 Hz, upper limiting frequency = 12.5 kHz
0.1 mNm = 1 pcm

Supply friction: (basic brake)

Left reel 0.8 - 1.2 mNm
Right reel 0.6 - 1 mNm (without counter belt)
0.8 - 1.2 mNm (with counter belt)

Tape tension at the supply reel:

By means of slow braking of the reel in question (both directions) 7 mNm

Braking the motor at end of tape:

During play or rapid wind/rewind, the motor must stop immediately when a wind spindle is braked.

Tape tension between the capstans:

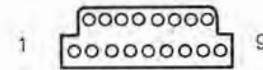
The capstan leading at any time must run more quickly than the trailer capstan. (Tested by means of wow measurement - Dual cassette 3150 Hz).

Briefly brake the front pressure roller so that a tape loop is formed between the capstans. Tape speed must now measure 0.1 - 0.3 % higher than previously.

Static tests on C 839 tape drive

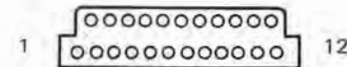
(Tape drive not connected)

	Test point	DC resistance ± 20 %
1. Magnetic heads		
1.1. Record/playback head	track 1 9/7	340 Ω
	track 2 6/4	340 Ω
	track 3 5/7	340 Ω
	track 4 8/4	340 Ω



1.2. Erase heads	1/3	4.25 Ω
	2/3	4.25 Ω

2. Tape drive



2.1. Wind motor	7/8	12/10.5 Ω* 60/50 Ω*
-----------------	-----	------------------------

At points 2.1 and 2.2., the motor must be turned over **very slowly** at 1 rpm and inspected for interruption (R∞)

* This value must be measured 10 times per revolution of the motor at minimum angle of rotation.

2.3. Tacho generator	11/1	±7 Ω ± 40 %
----------------------	------	-------------

2.4. Solenoids

(Kaltwiderstand) = initial, cold resistance

M 4	2/6	30 Ω
M 5	3/6	

2.5. Cassette compartment lighting	6/±	20 - 60 Ω
------------------------------------	-----	-----------

2.6. Safety levers/sensors

	without cassette	with cassette
Cassette sensor	12/1	
Record safety lever 1	5/±	∞ < 0.2 Ω
Record safety lever 2	4/±	

2.7. Ground line	Plug/rear printed circuit board	< 0.2 Ω
------------------	---------------------------------	---------

Safety regulations

Servicing work on electronic devices may only be carried out by trained personnel. During servicing, the device should be driven via an isolating transformer. The safety regulations stipulated in VDE 0860 H should always be observed.

Amongst other things, the design characteristics of the device must not be changed in a way which would reduce its safety (i.e. covering panels, mechanically secured lines, leakage paths and air gaps etc.). Replacement parts must be equivalent to original replacement parts and be correctly fitted. After repair work has been carried out, you must ensure that all exposed conductive sections carry no line voltage.

Fig. 1 Alignment positions

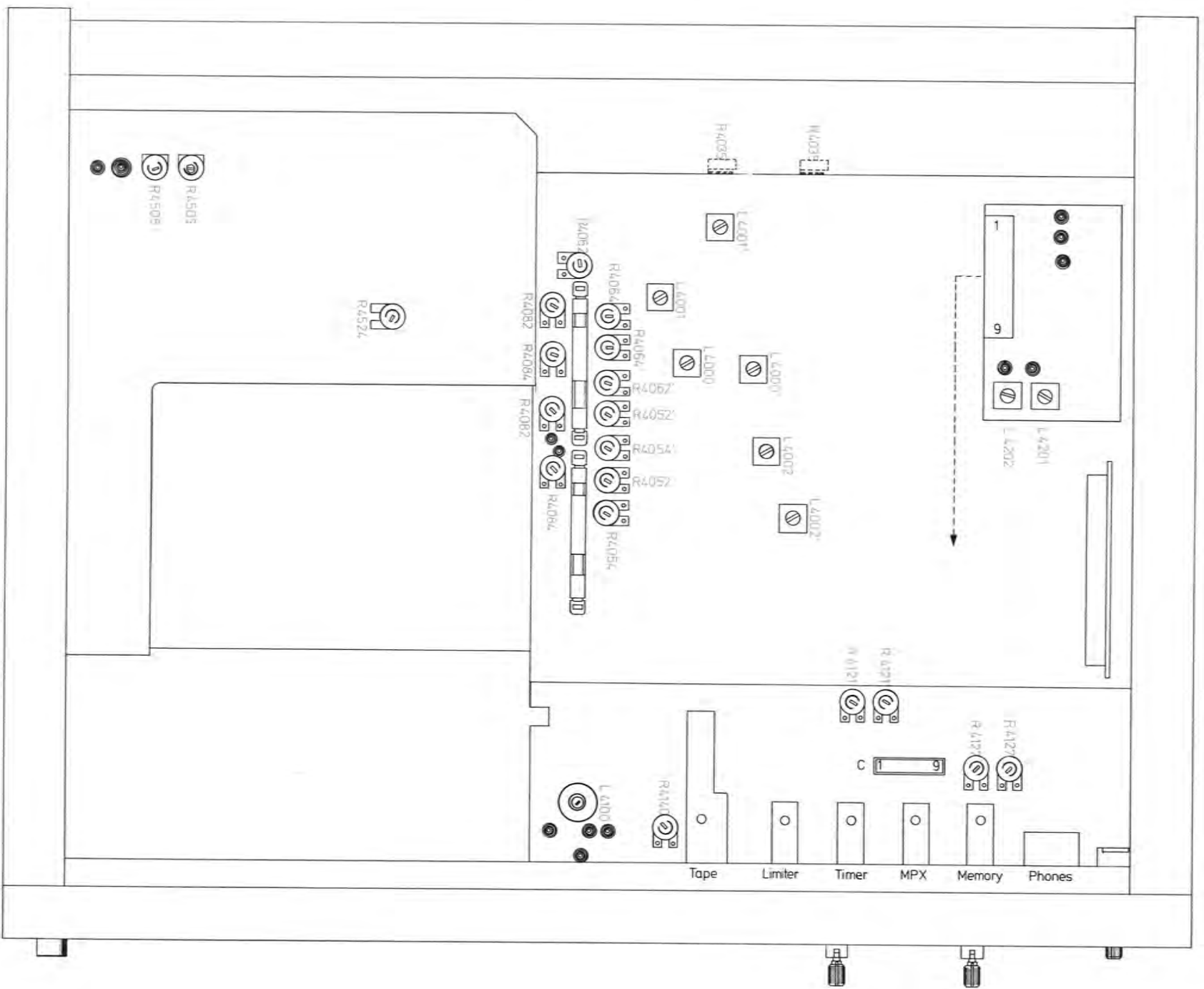
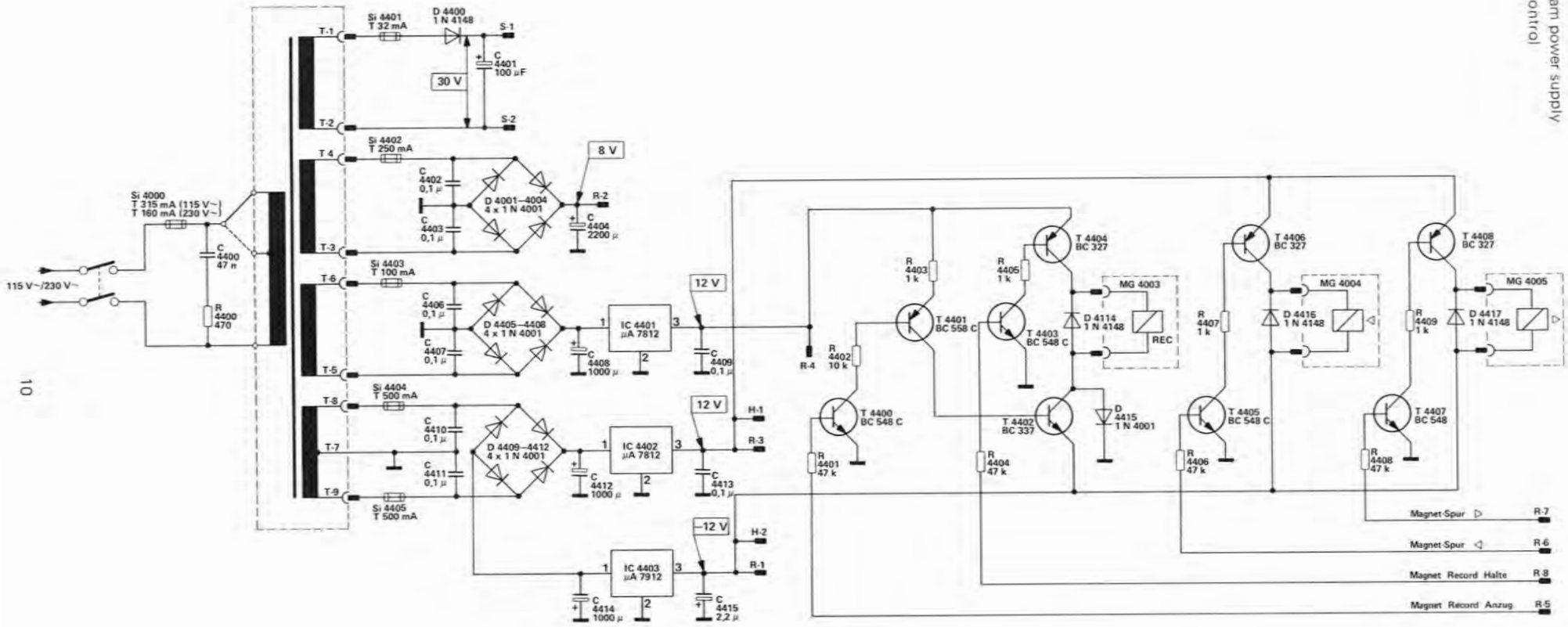


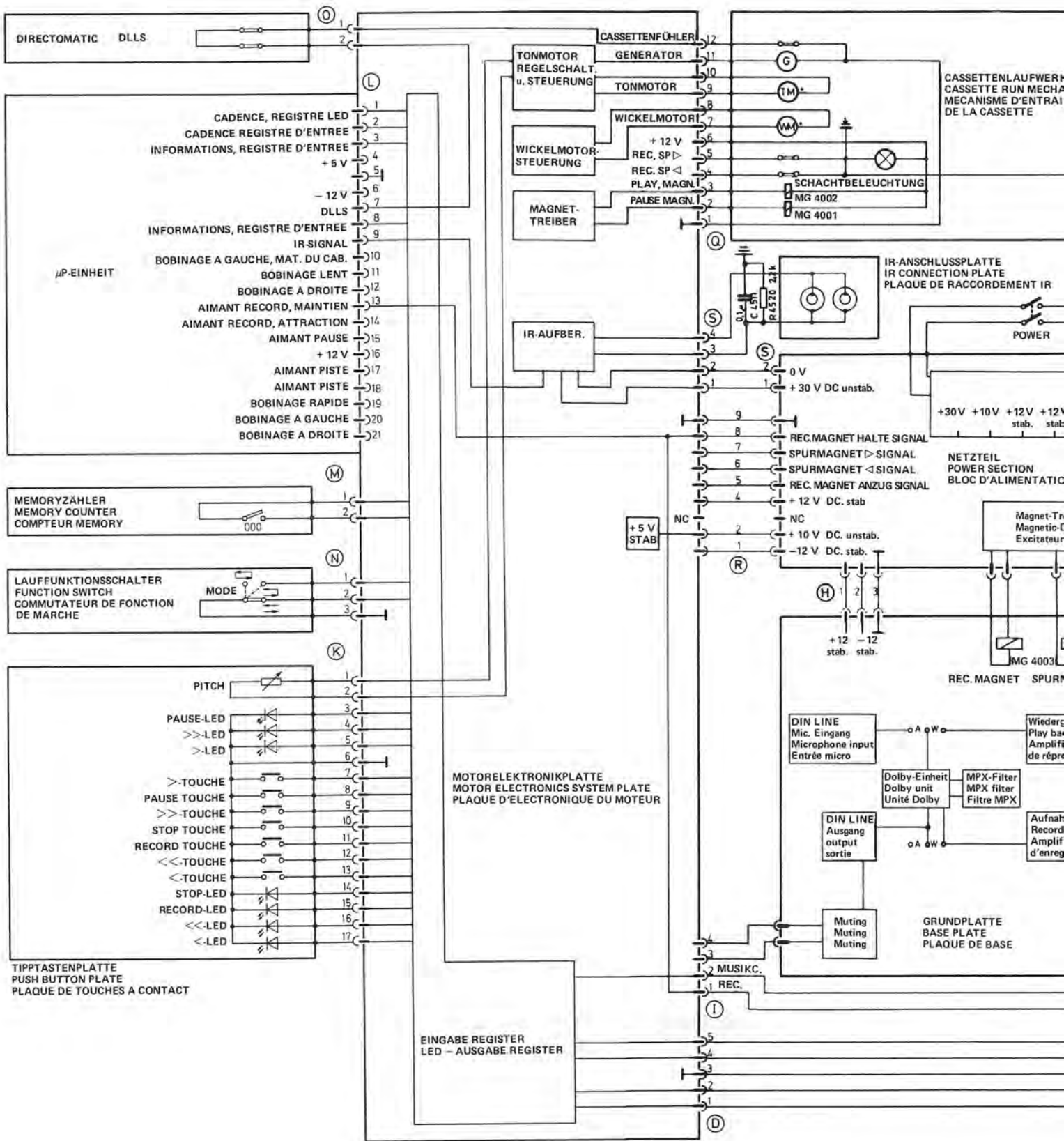
Fig. 2 Wiring diagram power supply and relaise control

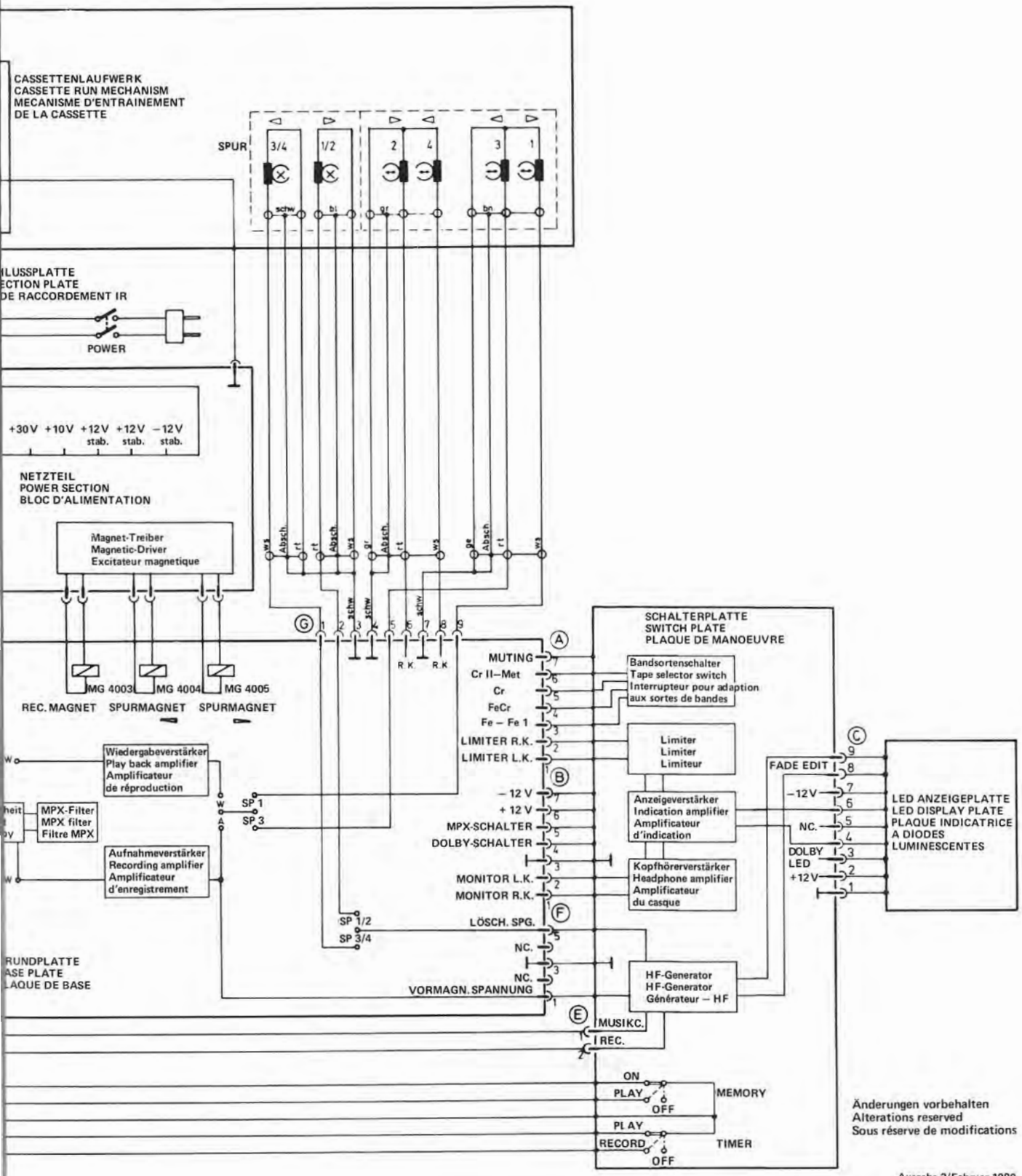


10

R	4400				4401	4402	4403	4404	4405	4406	4407	4408	4409
C	4400	4402 4407	4403 4410	4404 4408	4409	4411	4412	4413	4414	4415			

Fig. 3 Block diagram

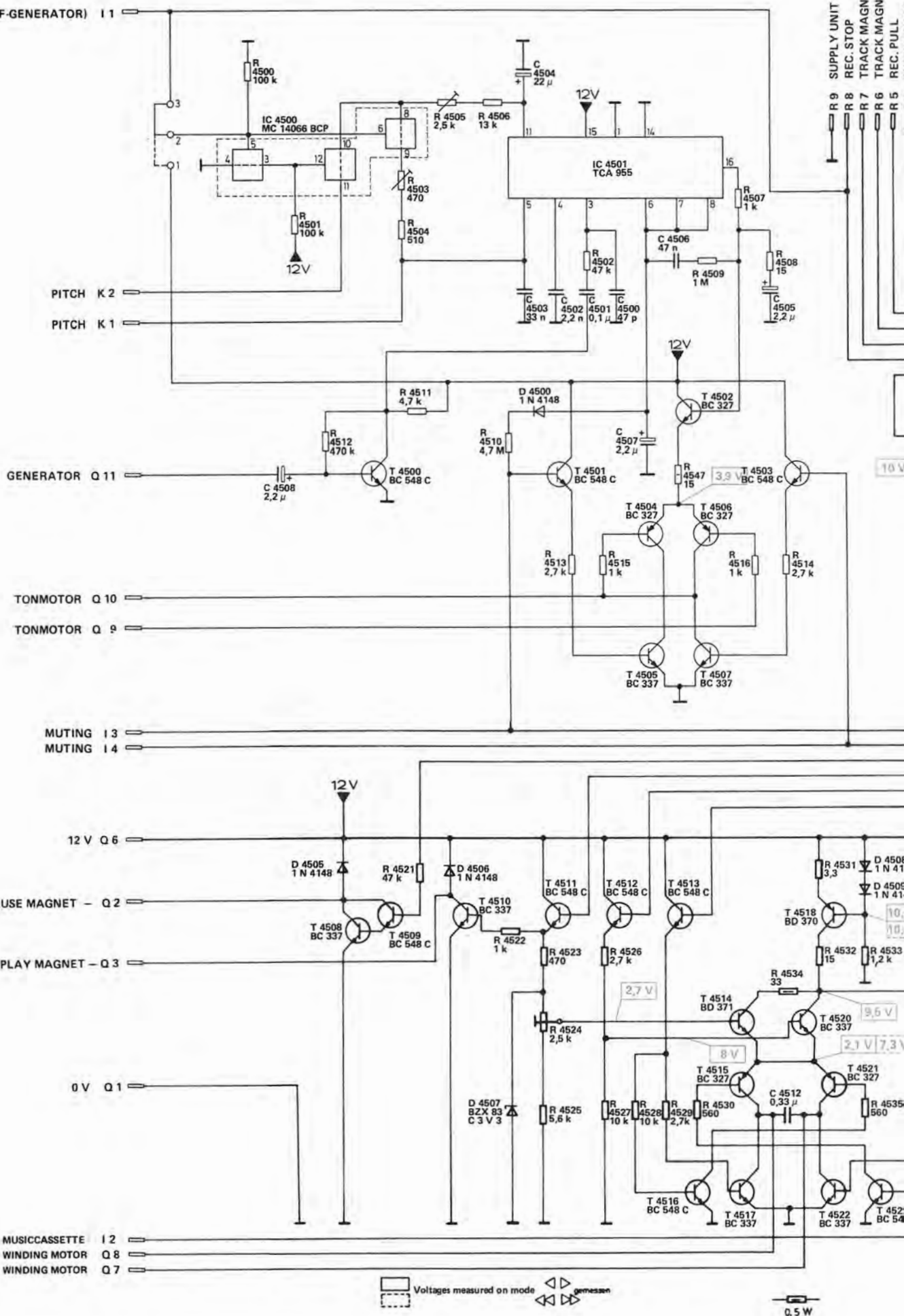




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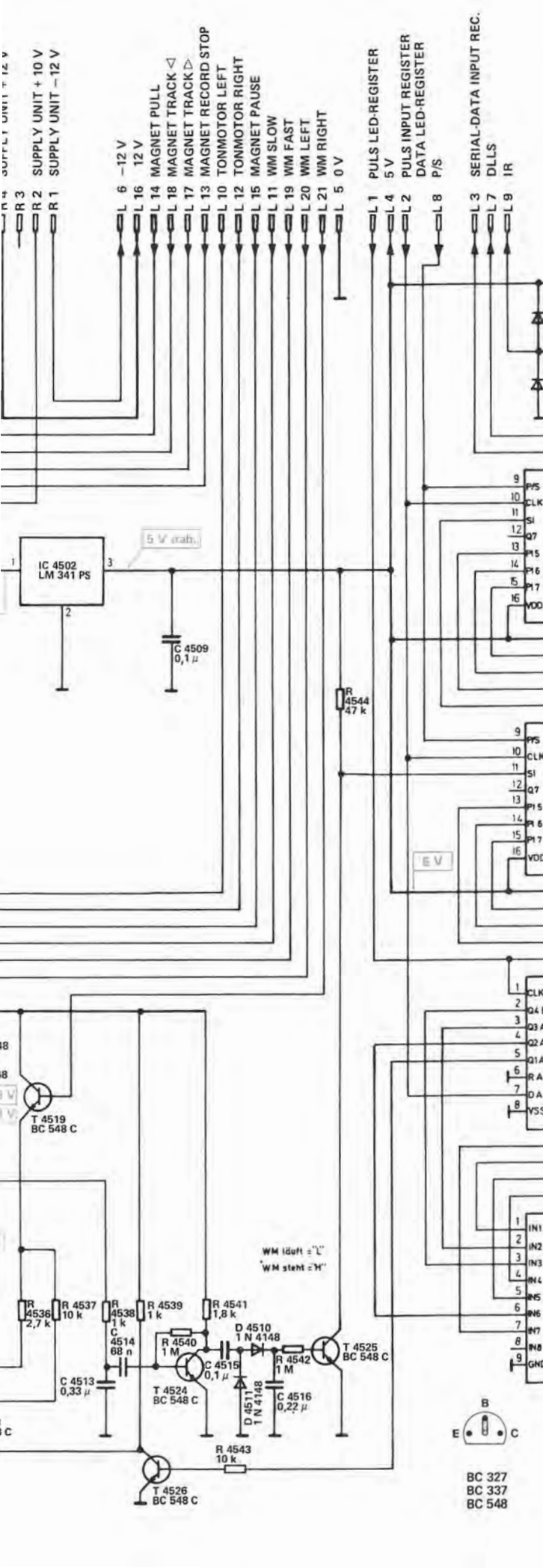
Fig. 4 Motor electronic

RECORD (HF-GENERATOR) I 1

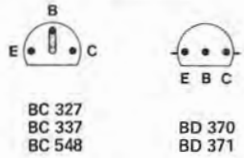


Voltages measured on mode \triangleleft gemessen \triangleright

0,5 W



Signalnamen, die am Ende der Bezeichnung ein „-“ tragen,
 (z.B. Taste Δ -) sind aktiv low, ohne Bezeichnung aktiv high.
 Signs of operating functions, which are marked at the end with „-“
 (for instance: key Δ -) are active low, other ones without a mark are active high.
 Les signaux qui sont marqués à la fin par un trait „-“ (p.ex.: „touche Δ -“),
 sont „active low“, sans ce trait „active high“.



Transistoren von der Anschlußseite gesehen
 Transistors as seen from the connecting side
 Transistors vus du côté des connexions

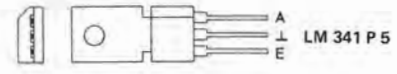
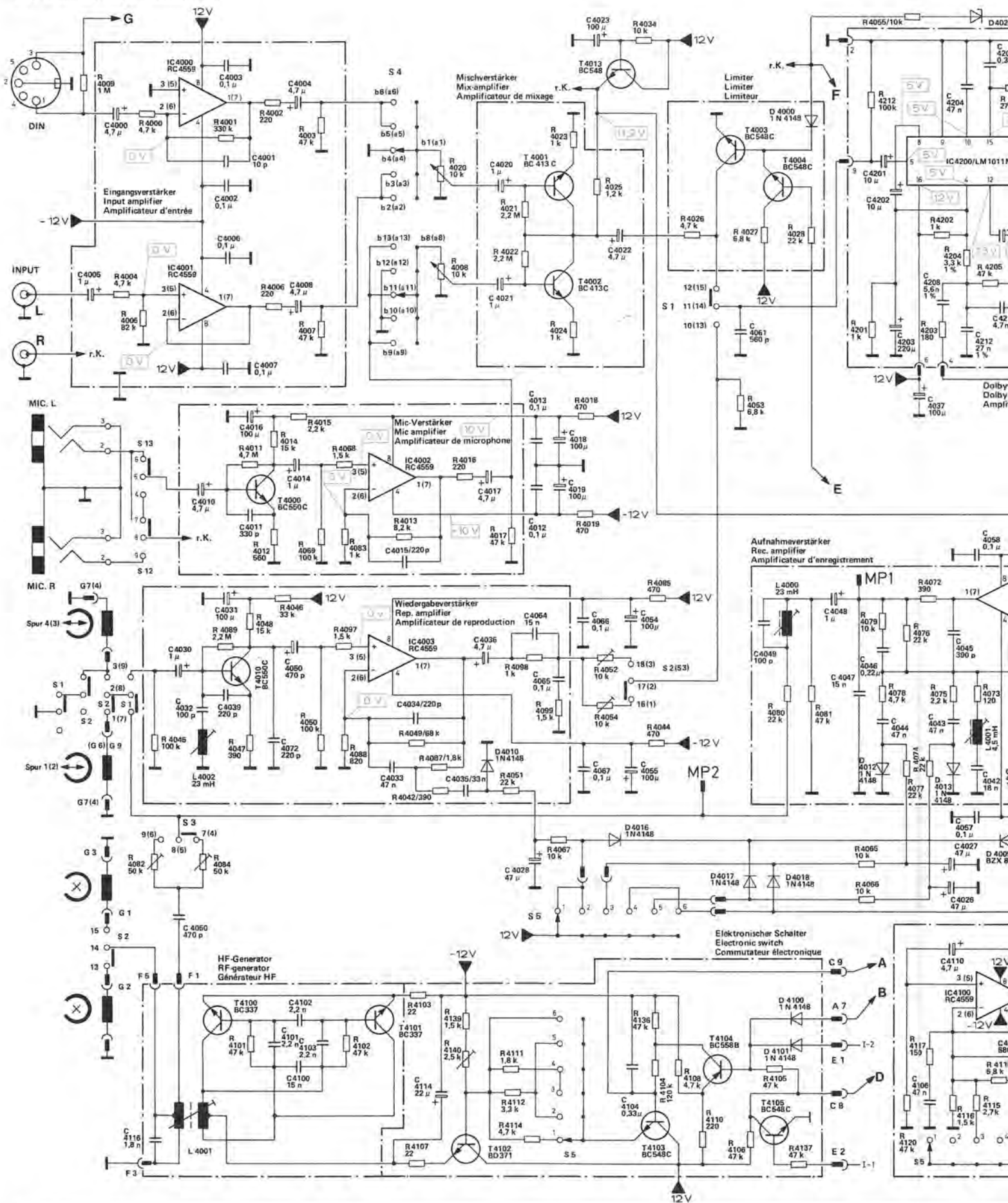
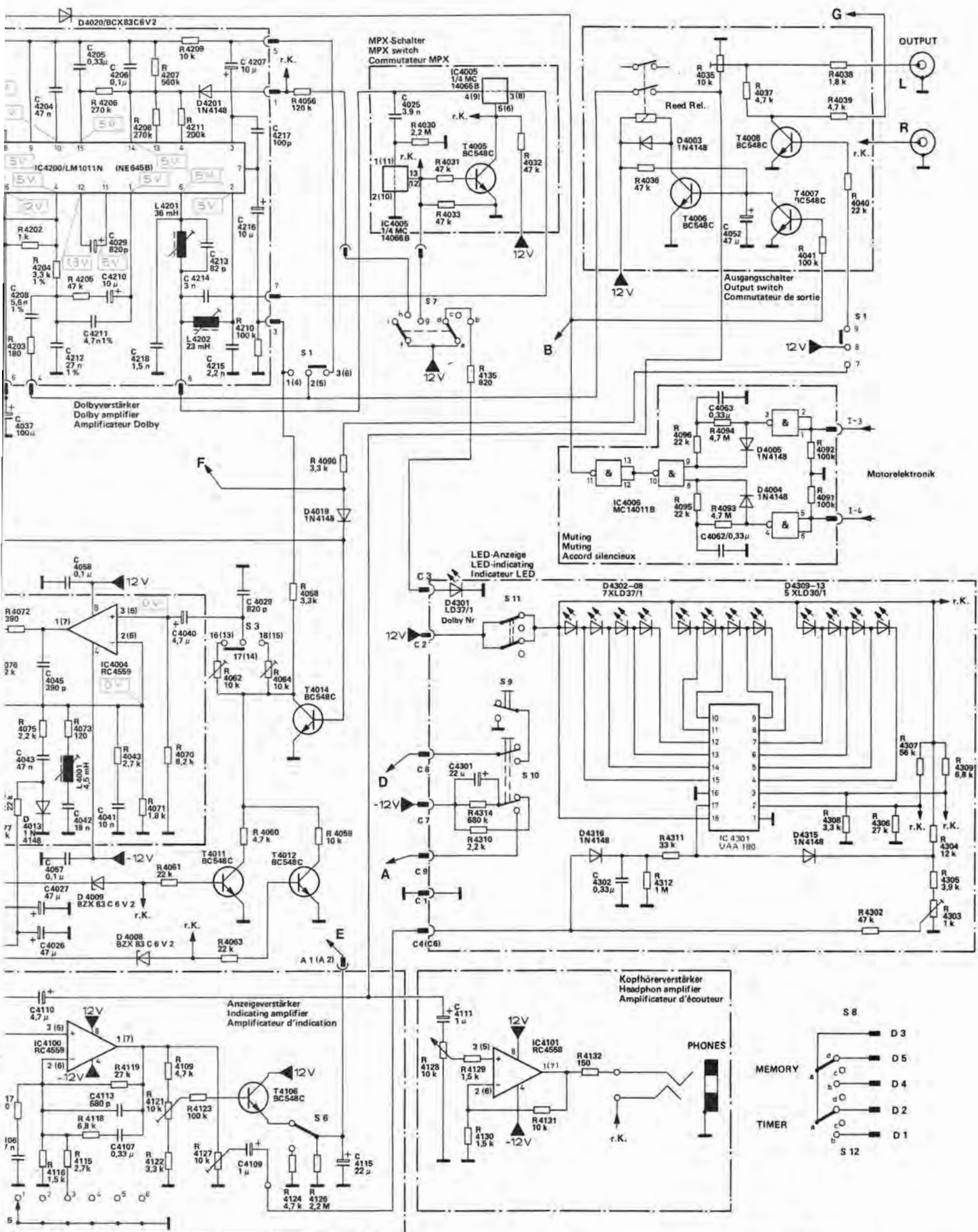


Fig. 5 Wiring diagram analog part



R	4009	4004 4000	4011 4002 4014 4003 4008 4015	4013 4020 4068	4016	4020 4021	4023 4024 4025	4034	4026	4053	4037 4028	4212 4201	4055	4202 4203 4204	4056 4081	4079 4078 4076 4077 4072 4074 4073
C	4005 4000	4002 4003 4001 4016 4004 4008	4050 4010 4006 4007 4072 4050	4015 4017 4020	4021 4013 4012 4018 4023 4022 4019	4061	4049	4048	4201 4202 4203 4208 4204 4205 4212 4211 4214	4116 4030 4032 4031 4039 4101 4102 4100 4103	4114	4047	4108 4110 4026 4027 4057			



Änderungen vorbehalten
 Alterations reserved
 Sous réserve de modifications
 Ausgabe 2/Februar 1980

4202	4203	4204	4206	4207	4208	4209	4211	5210	4056	4030	4031	4033	4032	4036	4035	4037	4048	4038	4039				
4076	4077	4072	4074	4075	4073	4043	4071/4109	4121	4070	4062	4064	4060	4068	4096	4095	4094	4093	4081	4092	4306			
4117	4116	4115	4118	4119	4061	4122	4123	4127	4063	4124	4126	4128	4130	4129	4312	4311	4308	4302	4304	4305	4303		
4203	4208	4204	4205	4029	4206	4218	4213	4214	4207	4216	4217	4025	4030	4031	4033	4032	4036	4035	4037	4048	4038	4039	
4037	4212	4211	4210	4058	4042	4041	4040	4029	4109	4115	4111	4301	4131	4132	4302	4052	4063	4062	4063	4062			
4110	4026	4027	4057	4113	4107	4109	4115	4111	4131	4132	4302	4052	4063	4062									

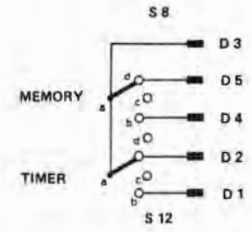


Fig. 6 Base plate 262 451 equipment side

Transistoren von der Anschlußseite gesehen
 Transistors as seen from the connecting side
 Transistors vus du côté des connexions



- BC 337
- BC 413
- BC 548
- BC 550
- BC 558

BD 371

IC's von der Bestückungsseite gesehen
 IC's as seen from the top side
 IC's vus du côté éléments



- RC 4558
- RC 4559

MC 14011 B



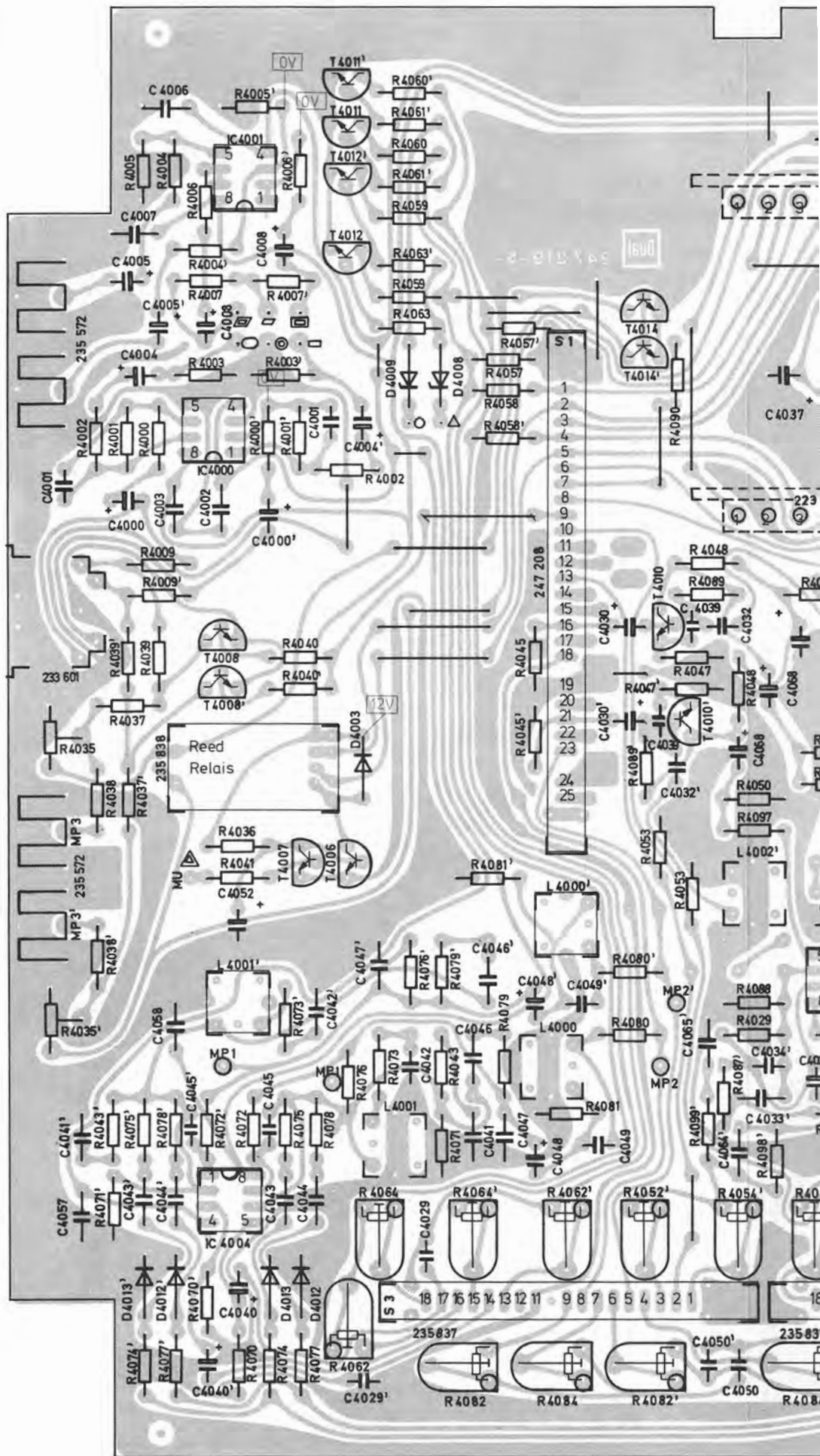
LM 1011

UAA 180

- S 1 A/W-Schalter
- S 2 Spurschalter
- S 3 Spurschalter
- S 4 Eingangswahlschalter
- S 5 Bandsortenschalter
- S 6 Limiter
- S 7 Dolby MPX
- S 8 Memory
- S 9 Fade Edit
- S 10 Fade Edit
- S 11 Anzeige Ein/Aus
- S 12 Timer

- S 1 Rep/Play-switch
- S 2 Track switch
- S 3 Track switch
- S 4 Input selector switch
- S 5 Tape selector switch
- S 6 Limiter
- S 7 Dolby MPX
- S 8 Memory
- S 9 Fade-Edit
- S 10 Fade-Edit
- S 11 Indicating On/Off
- S 12 Timer

- S 1 ENR/Rep. commutateur
- S 2 Trace commutateur
- S 3 Trace commutateur
- S 4 Selecteur d'entrée
- S 5 Commutateur selecteur de bande
- S 6 Limiter
- S 7 Dolby MPX
- S 8 Memory
- S 9 Fade-Edit
- S 10 Fade-Edit
- S 11 Indicateur On/Off
- S 12 Timer



247 220

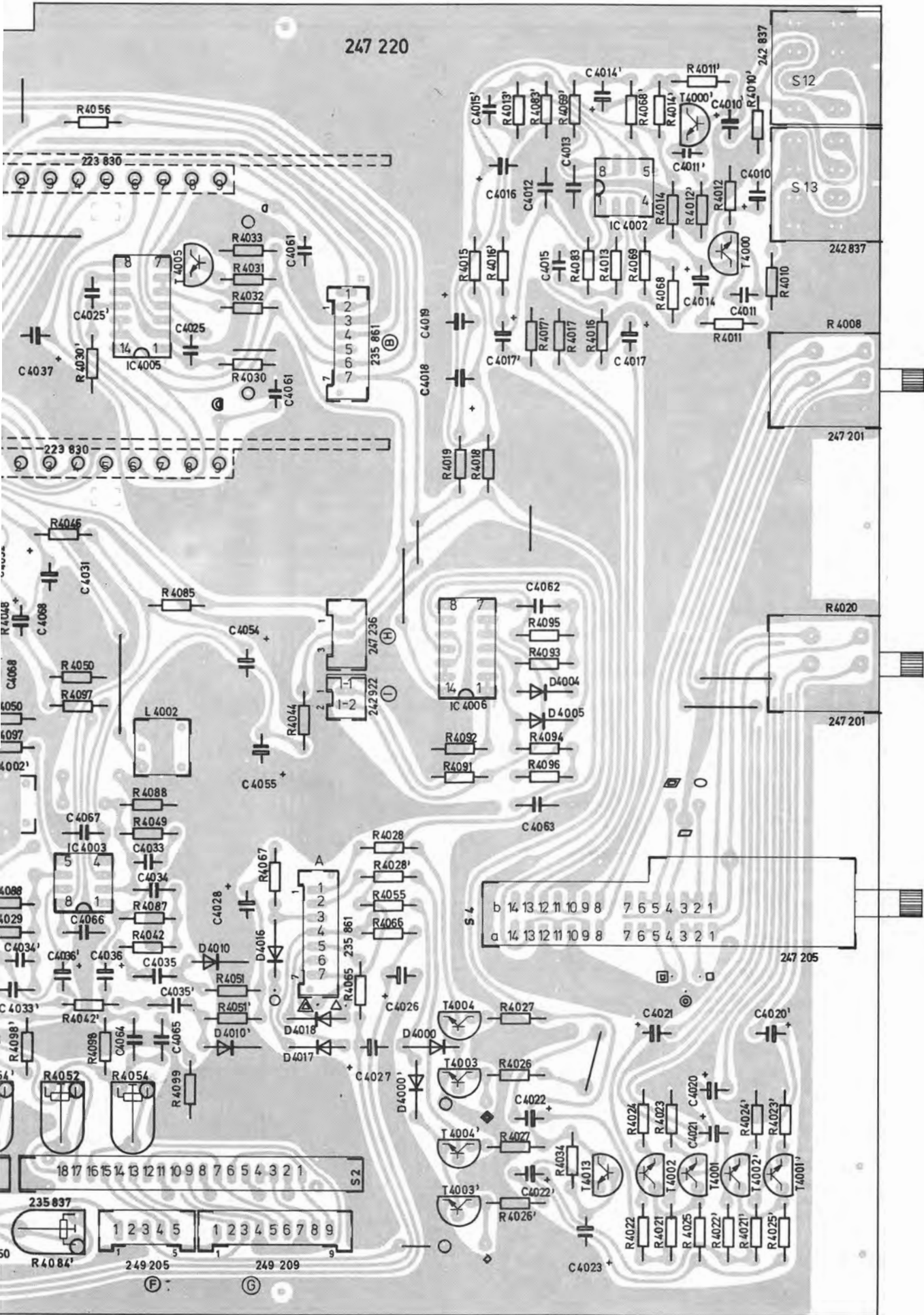


Fig. 7 Motor electronic 262 460 equipment side

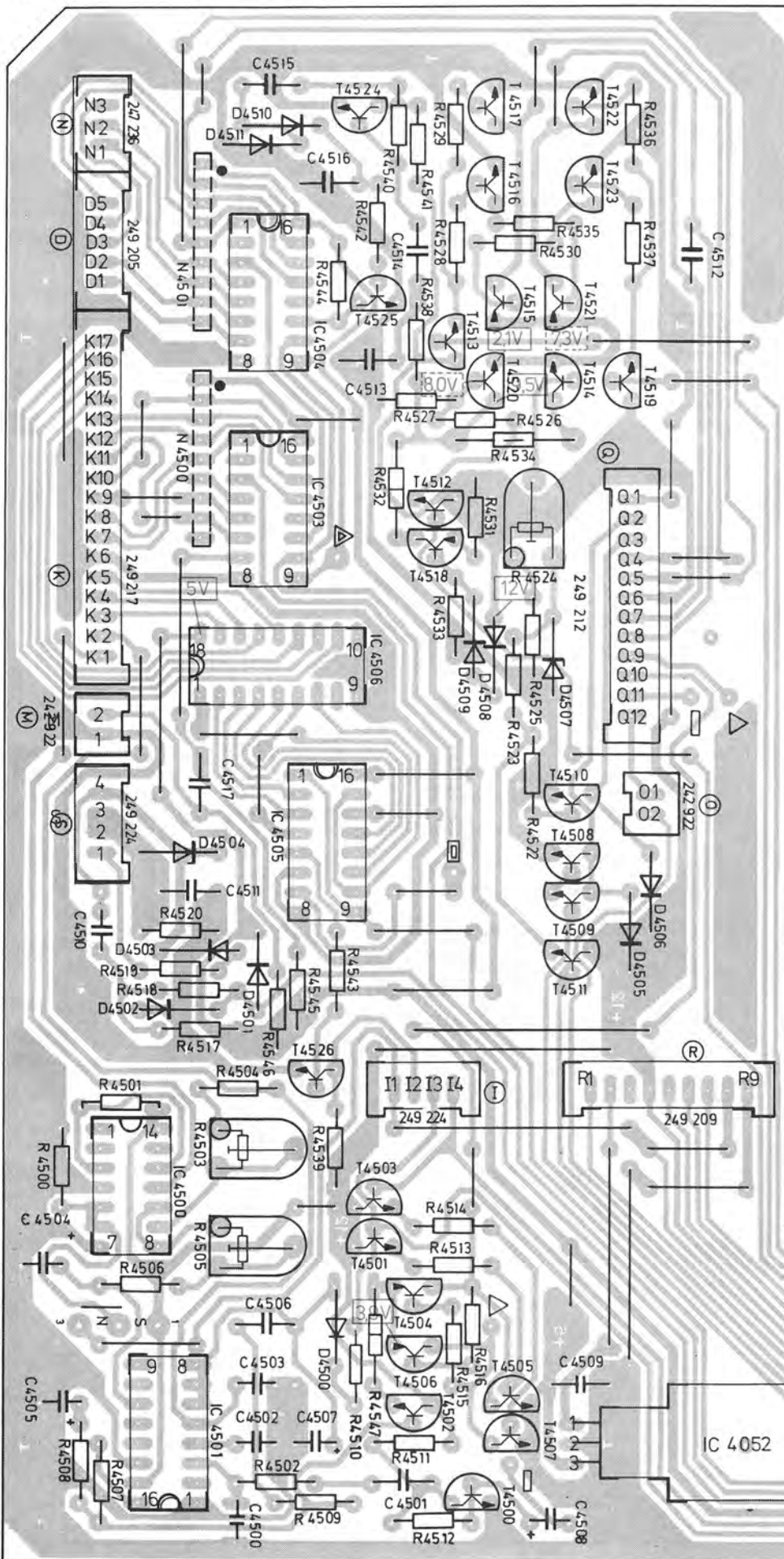


Fig. 8 Power p

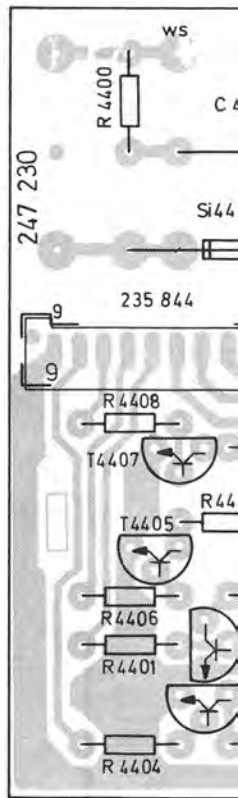


Fig. 8 Power part 262 461 equipment side

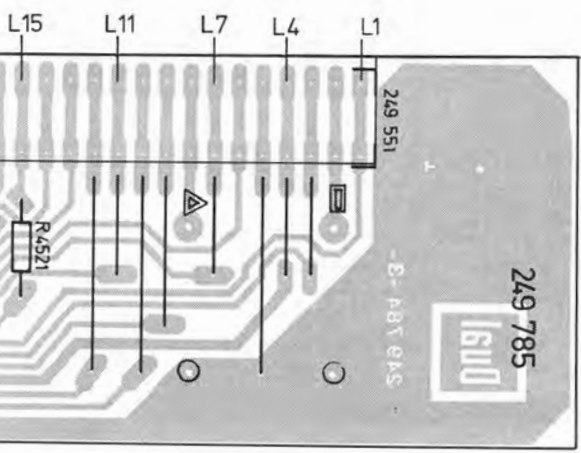
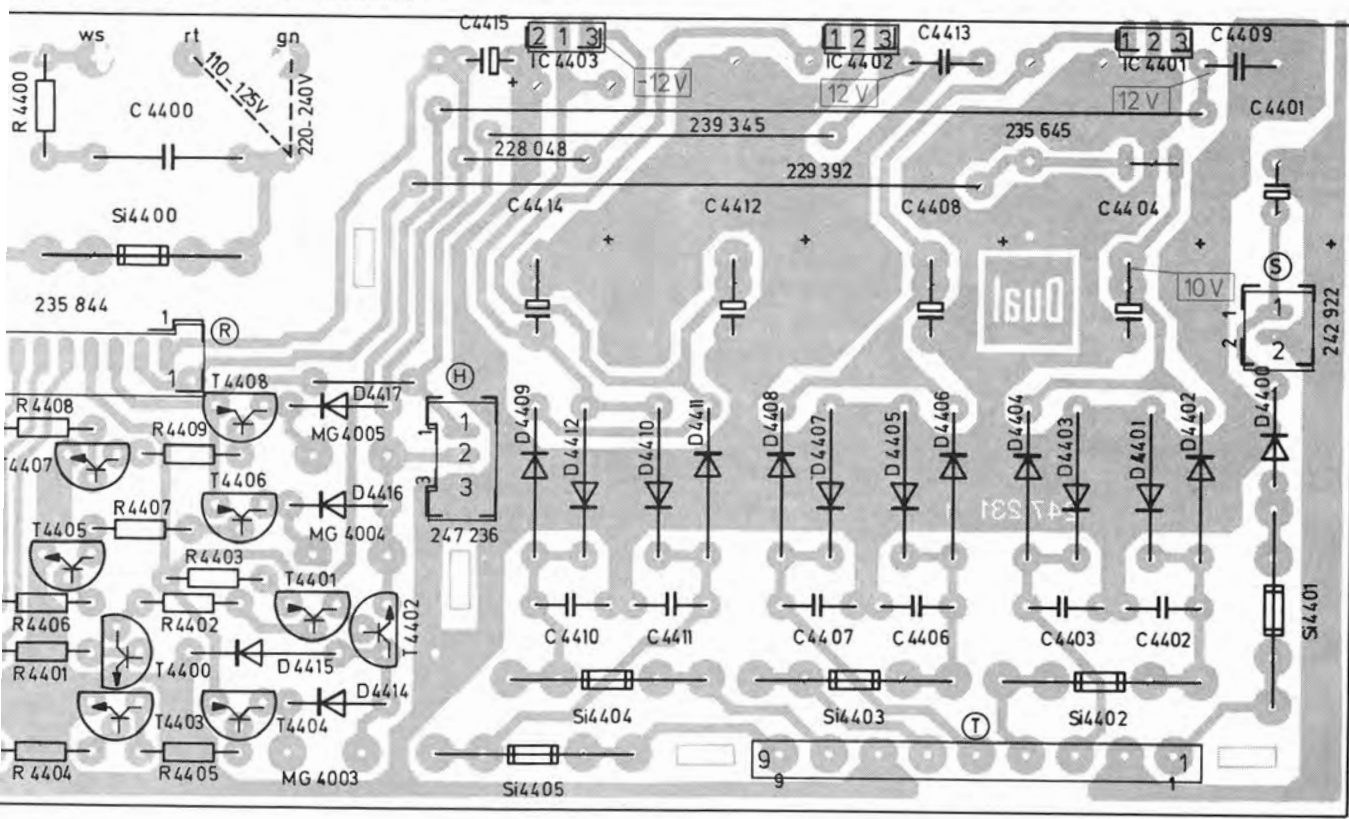


Fig. 9 Switch plate 262 464 equipment side

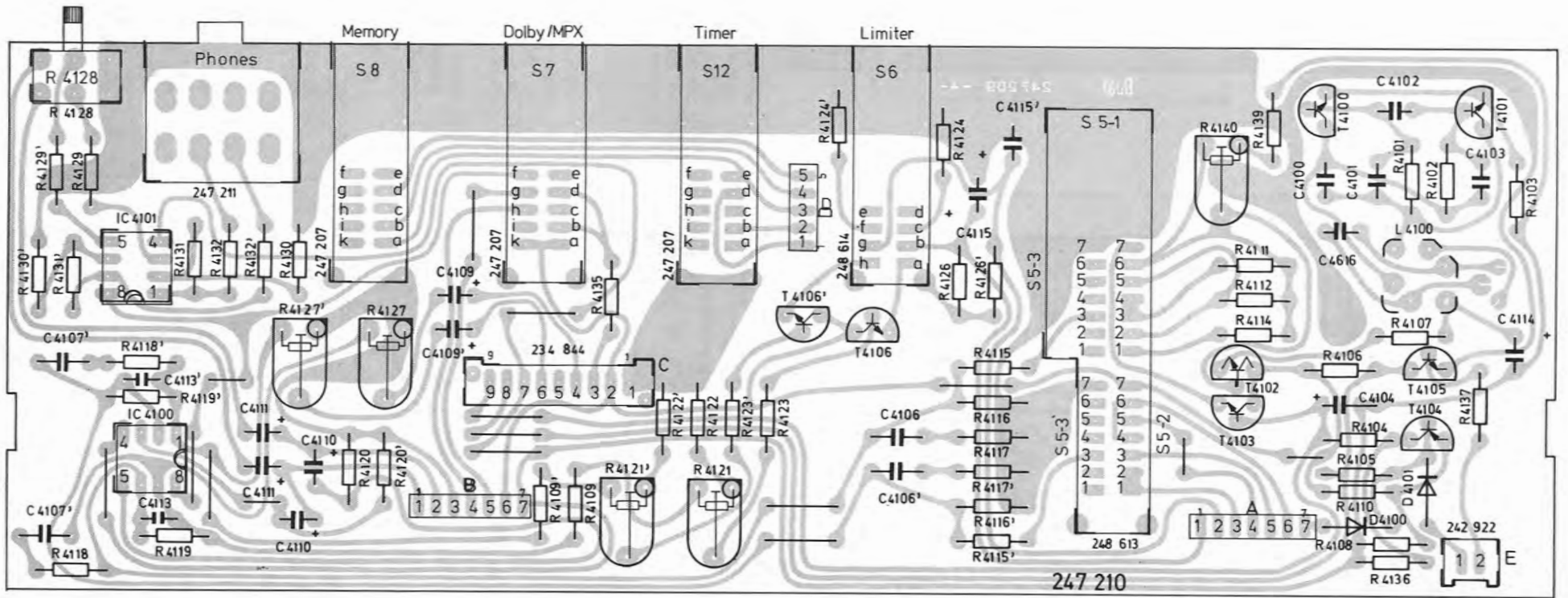


Fig. 10 LED-indicating 262 458 equipment side

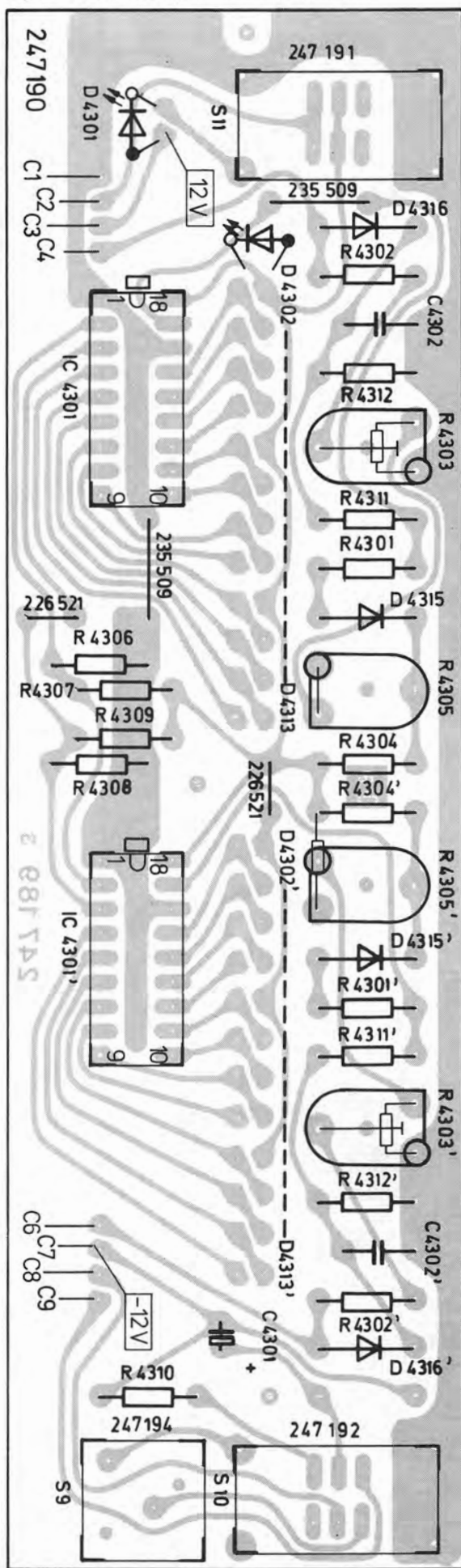


Fig. 11 Dolby amplifier 262 448 equipment side

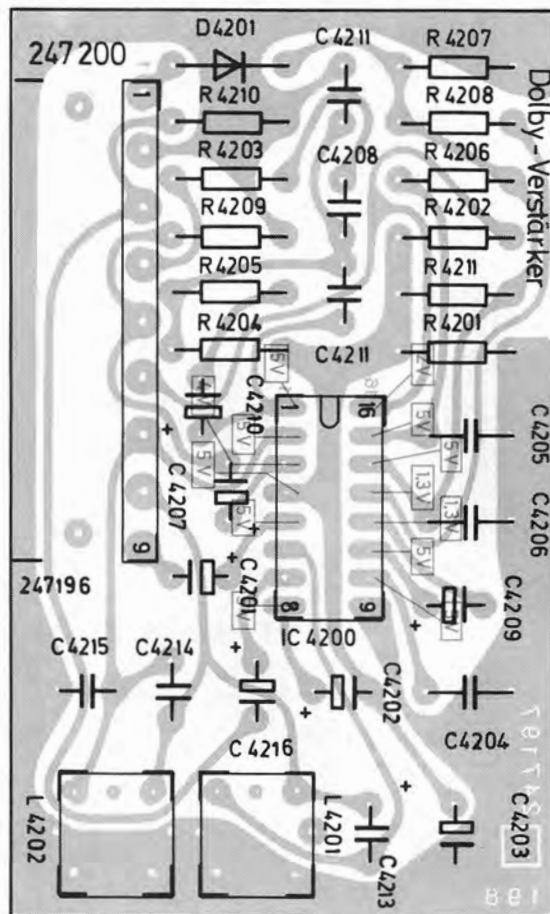
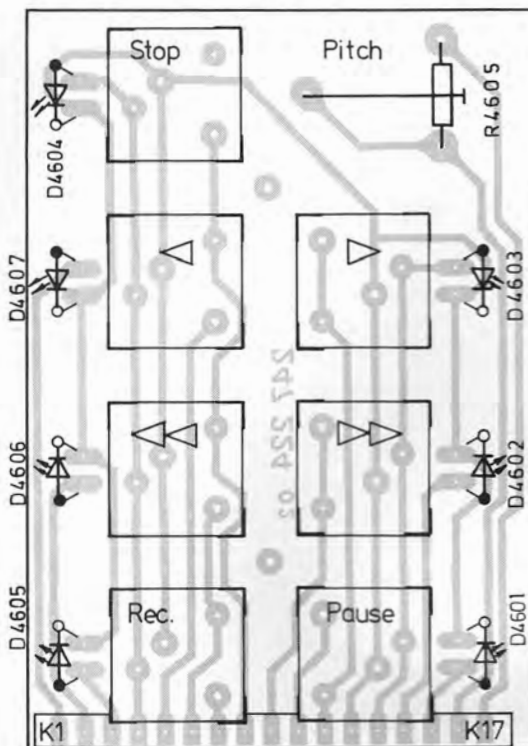


Fig. 12 Touch key plate 262 469 equipment side



Mechanical section

General information

The item numbers listed refer to the list of spare parts below and to the exploded diagrams. Before removing the various assemblies, the power switch must be switched off.
Removal or replacement of assemblies and adjustment.

1. Top cover plate

Remove the two fillister-head self-tapping screws **114** at the rear of the unit and remove the top cover plate **113**.

2. Bottom cover plate

Remove both fillister-head self-tapping screws **114** and the hexagonal self-tapping screw **98** at the base of the unit and remove the bottom cover plate **112**.

3. Head cover plate

Loosen the two screws **78** and remove the complete head cover plate **77**.

4. Frame together with stop keys, visor

Press the complete frame **75** to the right and left lightly to the centre and then remove it from below. Remove the frame, withdraw plug **0** from the motor electronic system. Withdraw the visor **50** from the front. When refitting, ensure that the bearing **42** is correctly positioned.

5. Front trimplate

Remove the head cover and frame as described above. Remove all rotary switches, pushbuttons and the two lock washers **146**. Unscrew the 3 fillister-head self-tapping washers **114** from the base of the unit and then withdraw the front trimplate **100** from the front.

6. Drive mechanism complete

Remove the cover plate, head cover and frame as described above. Remove the counter belt and withdraw the female multi-point connector **Q** from the motor electronics and **G** from the baseplate. Unscrew the 4 machine screws **135**, lift the drive mechanism approximately 10 cm, withdraw the black earth lead from the power section board and remove the drive mechanism from the top.

7. Motors

When the drive mechanism has been removed, remove the 4 machine screws **3** and remove the cover panel. Remove the drive belt (capstan). Unscrew the 3 machine screws **25** and remove the motor fixture. Unscrew the machine screw **30**, remove the motor leads from the multi-point connector and wiring harness and then remove the motors.
When refitting, ensure that the motors are correctly positioned (figure 14). The tape wind belt must be pressed downwards (refer to figure 15) through the tape wind motor drive pulley. Refitting involves the reverse procedure.

8. Drive belts

Replacing capstan belts: refer to the description of the motors.
Replacing the tape wind belt: remove the complete motor fixture by removing the 3 machine screws **25**. The tape wind belt should then be replaced (refer to figure 15).

9. Flywheels

Note: flywheels must only be replaced in pairs. Remove the motor fixture as described in the section entitled "motor". Replace the flywheels. When refitting, ensure that the washers are replaced in the correct order (figure 16). Fit the flywheel using the adhesive magnetic ring at the right. The axial play of the flywheels, 0.2 – 0.5 mm, may be set at the screws **29**.

10. Bulb (cassette compartment lighting)

Loosen the machine screw **32**, remove the retaining bracket and replace the bulb **34**.

Fig. 14

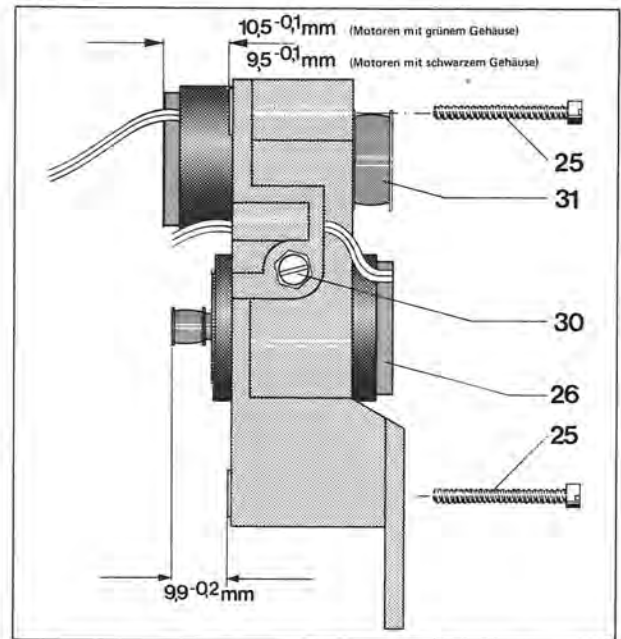


Fig. 15

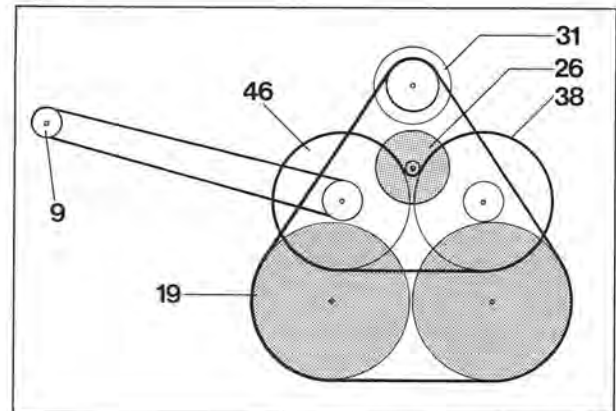
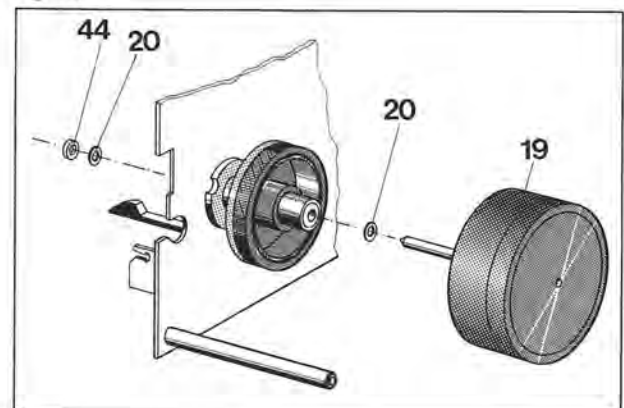


Fig. 16



11. Record/playback head

Remove the head cover **77** as described above. Solder off the leads to the head. Remove the screws **72** and **73** and spring **71** and then remove the record/playback head. Insert the new magnetic head. The screw at the right **72** must only be screwed in approximately 4 revolutions. Using the left screw, adjust the head so that the tape on a tape motion test cassette runs smoothly. Final adjustment must be carried out as described in the section entitled "electrical alignment".

12. Erase heads

Remove the head cover **77**. Erase heads **68** must only be replaced in pairs.

13. Magnets

With the drive mechanism removed from the unit, remove the 4 machine screws **3**. Remove the covering panel and withdraw the magnet fixture **12** by loosening the grip screws **10**. Remove grip screw **17** and unscrew the magnets.

When refitting the magnets ensure that magnet **4** at its stop position positions the head slide 0.75 ± 0.25 mm in front of its final position. Tighten magnet **5** so that the steel pin on the lever **15** deflexes the wire strap **62** 0.3 – 0.7 mm in its operating position.

14. Bearing flange for flywheels, drive pulleys

Remove the flywheels as described above. Unscrew the 4 machine screws **40** and remove the covering panel **49**.

Caution: do not twist the set of springs **35** on the record safety levers. Remove the relevant bearing flange or drive pulley after unscrewing the countersunk head screws **47**.

When refitting, take careful note of the description of the various assemblies. Recheck axial play of the flywheels and, if necessary, correct it to 0.2 – 0.5 mm.

15. Tape guide (up to unit no. 18000)

Remove the head cover **77** as described above. Remove the clamping ring **67** and the spacing pulley **66**. Raise the pressure roller together with tape guide approximately 1 mm and rotate it 1/4 revolution and then remove it from above (lift the cover slightly).

Tape guide synchronisation should be between 30 and 60 mN measured at the tape guide front edge. If necessary, bend the tape guide limb with a pair of flat-nose pliers. By bending both limbs by different amounts on each side, the height of the tape guide and, therefore, tape motion may be adjusted (figure 18).

16. Tape guide (from unit number 18001)

Unscrew the machine screw **M 2** and remove the complete tape guide fixture. Remove the adjustment bushing after removing the grub screw.

Remove the tape guide and pressure roller.

Adjust tape guide synchronisation to between 30 and 60 mN as described above.

Adjust the height of the tape guide for tape motion at the adjustment screw (the screw should afterwards be secured with locking lacquer).

The erase head tape guides use for aligning the guides flush serve as fixed reference points. The tape must not bend at any tape guide to such an extent that damage results.

Set the axial play of tape guide and pressure roller at the adjustment bushing (0.02 – 0.05 mm).

17. Take-up friction and tape speed

(Refer to alignment instructions for motor electronic system, page 7).

18. Cleaning/lubrication

Always clean the unit when servicing or repairing it. In order for the record/playback head **70** to function properly, the erase heads **68**, the pressure rollers **65** and the capstan should always be kept in a perfectly clean condition.

We recommend the use of a cloth or cotton wool bud dipped in methylated spirit in order to clean these sections. Never use metal objects. The surface of the head must never be touched with bare hands.

Fig. 17

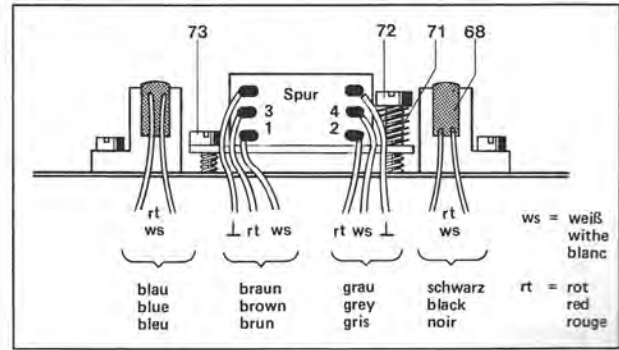
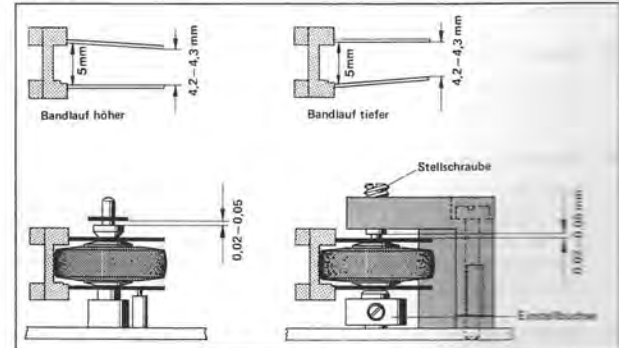


Fig. 18



All bearings and sliding points on the unit are adequately lubricated at the factory. Re-lubrication is normally not required for several years since the most important bearing points are provided with oil retainers. The motor bearings are designed as long-life oil retainers and, therefore, require no maintenance.

10 mN = 1 p

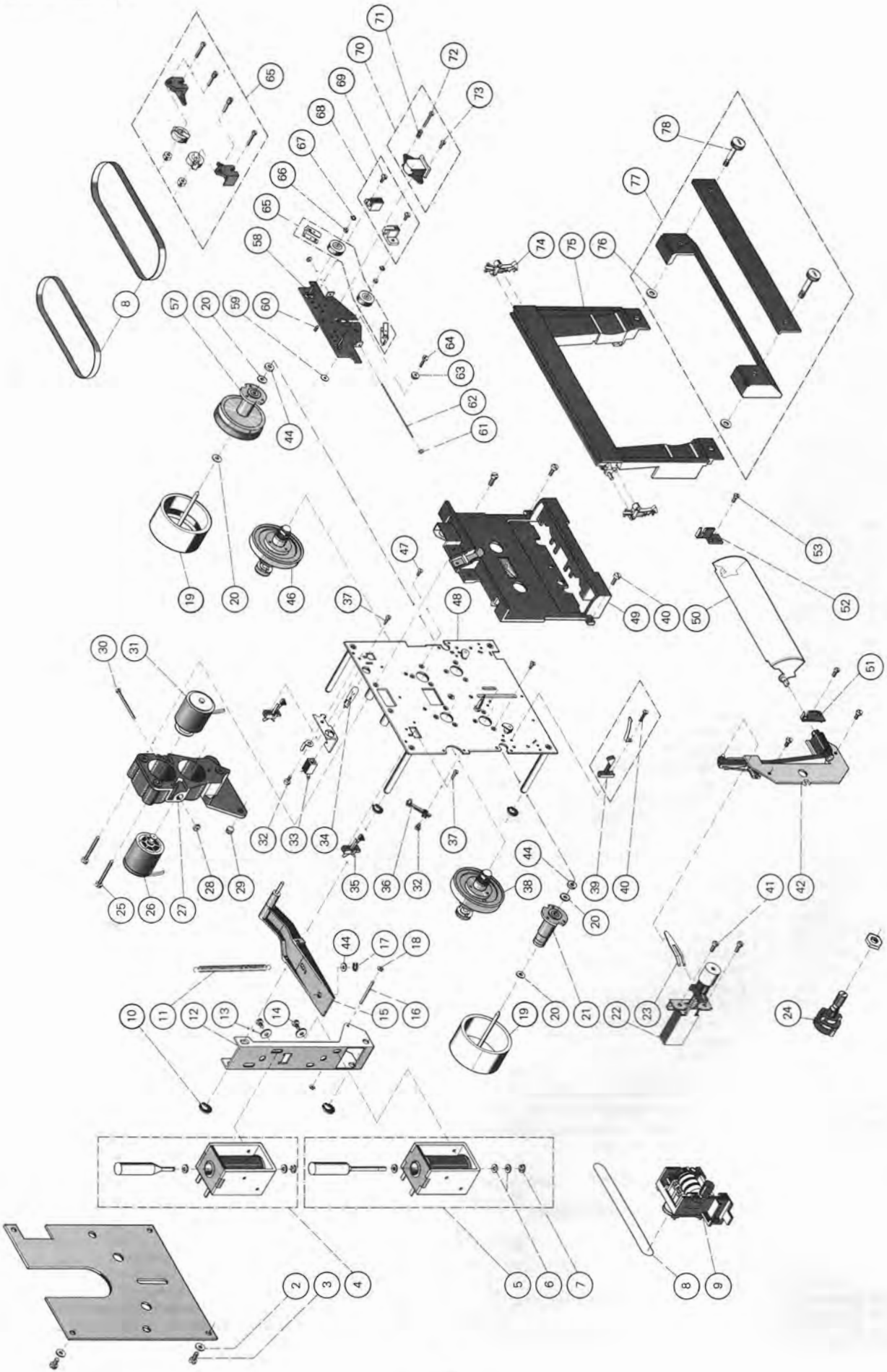
Lubrication chart (C 839 – drive mechanism)

Lubrication points	Lubricant
Flywheels (Capstans around bearings)	Isoflex PDP 40
Pressure rollers (with sintered bearings) (with synthetic bearings)	Isoflex PDP 40 adhesive oil, Renotac
Head slide 3 guide slide bearings	Molykote paste
Levers	
Bearing in strap	adhesive oil, Renotac
Pin, points of contact with wire and head slide	adhesive oil, Renotac
Bearing surface of locking washers on magnet 5	adhesive oil, Renotac

Replacement parts

Pos.	Part.No.	Qty	Description	Pos.	Part.No.	Qty	Description
2	236 070	4	Machine screw M 2.5 x 6	77	262 455	1	Head cover complete
3	237 518	4	Washer 2.7/6.5/0.5	78	243 427	2	Screw
4	262 452	1	Lift solenoid 1	98	229 807	1	Hexagonal, self-tapping screw 2.9 x 16
5	262 453	1	Lift solenoid 2	100	262 450	1	Front trimplate (metallic silver)
6	210 597	5	Washer 3.2/7/0.5	100	262 449	1	Front trimplate (metallic brown)
7	210 145	2	Locking washer 2.3	101	243 432	1	Front panel
8	262 475	1	Belt (set)	102	243 311	4	Damping strip
9	262 459	1	Memory counter complete	103	243 433	1	Rear panel
9	243 326	1	Knob	104	243 434	1	Side panel left
10	210 198	4	Seeger clamping ring 5 φ	105	243 435	1	Side panel right
11	262 170	1	Tension spring	106	241 515	2	Rubber strip
12	262 166	1	Fixture	107	218 043	8	Burnished washer 3.2
13	210 597	4	Washer 3.2/7/0.5	108	243 096	8	Machine screw AM 3 x 8
14	210 477	4	Machine screw M 3 x 5	109	244 101	2	Hexagonal self-tapping screw B 2.9 x 9.5
15	262 198	1	Lever	110	210 155	2	Tooth washer
16	262 161	1	Bearing needle 2 x 24.8	111	229 816	4	Elastic buffer, grey
17	210 196	1	Seeger clamping ring 3 φ	112	243 450	1	Bottom cover plate
18	210 194	2	Seeger clamping ring 2 φ	113	243 425	1	Top cover plate
19	262 472	1	Flywheel	114	218 055	8	Burnished fillister-head self-tapping screw B 2.9 x 9.5
20	262 159	4	Washer 3.1/5/0.1	115	243 428	3	Toggle switch
21	262 457	1	Bearing flange for left flywheel	116	243 431	1	Knob
22	260 267	1	Power switch complete 230 V	117	245 972	4	Rocker switch
22	243 478	1	Power switch complete 115 V	118	243 430	2	Rotating collar
23	243 444	1	Leaf spring	119	243 429	2	Rotary switch
24	247 206	1	Motion function switch	120	262 471	2	Pull magnet
25	262 157	3	Machine screw M 2.5 x 25	121	210 469	6	Machine screw AM 3 x 3
26	262 473	1	Motor (tape wind)	122	243 449	1	Toggle lever complete
27	262 163	1	Motor fixture	123	243 464	1	Lift magnet
28	210 353	1	Hexagonal nut M 2	124	243 459	1	Cover panel
29	262 201	2	Bearing bolt M 5	125	262 465	1	Switch frame (jog switch panel)
30	262 156	1	Machine screw M 2 x 25	126	243 458	1	Adjustment knob
31	262 474	1	Motor (capstan)	127	262 444	1	Display frame complete (LED display)
32	239 565	2	Machine screw M 2.5 x 3	128	243 454	1	Lift spring
33	262 162	1	Socket	129	243 455	1	Pushbutton
34	209 443	1	Screw-in bulb	130	243 463	2	Dust shield
35	262 167	2	Set of springs (record safety lever)	131	262 462	1	Power transformer complete
36	262 168	1	Set of springs (cassette switch)	132	243 750	1	Power lead complete
37	210 535	2	Countersunk head machine screw BZ 2.2 x 6.5	132	232 995	1	UAP power lead
38	262 207	1	Left drive pulley complete	133	237 548	1	Cable entry
39	262 445	1	Support complete (set of two)	134	243 477	1	Infrared connection board
40	236 070	2	Machine screw M 2.5 x 6	135	248 194	10	Machine screw M 2.5 x 10
41	210 485	5	Machine screw M 3 x 7	136	210 487	3	Machine screw M 3 x 10
42	243 437	1	Bearing plate complete	137	210 485	4	Machine screw AM 3 x 7
44	262 160	3	Washer 2.8/6/1	210 472	4	Machine screw AM 3 x 4	
46	262 443	1	Right drive pulley complete	210 480	1	Machine screw AM 3 x 6	
47	210 376	12	Countersunk head screw M 2 x 5	218 155	4	Hexagonal screw M 4 x 6	
48	262 197	1	Riveted circuit board	139	210 362	3	Hexagonal nut BM 3
49	262 206	1	Cover plate complete	140	227 467	22	Hexagonal self-tapping screw 2.9 x 6.5
50	262 470	1	Visor	141	227 470	5	Hexagonal self-tapping screw 2.9 x 9.5
51	243 490	1	Left bearing bracket	142	228 529	3	Hexagonal self-tapping screw 3.5 x 9.5
52	243 491	1	Right bearing bracket	143	227 443	7	Hexagonal screw 3.5 x 13
53	236 069	2	Machine screw M 2.5 x 4	144	210 607	1	Washer 3.2/10/0.5
57	262 456	1	Right bearing flange with tachogenerator	145	210 597	4	Washer 3.2/ 8/0.5
58	264 025	1	Head slide up to unit number 18000	249 443	4	Washer 7.2/12/1.2	
58	264 571	1	Head slide from unit number 18001	146	210 146	2	Locking washer 3.2
59	210 555	1	Washer	147	235 319	2	Felt washer
60	262 479	2	DIN 553 grub screw M 2 x 4	148	260 212	5	Female multi-point connector 2pole
61	262 480	1	Quick-lock locking washer	149	262 485	3	Female multi-point connector 3pole
62	262 481	1	Spring clip	150	260 213	2	Female multi-point connector 4pole
63	262 484	1	Guide bolt	151	243 190	1	Female multi-point connector 5pole
64	210 434	1	Machine screw M 2 x 6	152	243 191	2	Female multi-point connector 7pole
65	262 447	1	Tape guide complete (set of two)	153	243 192	2	Female multi-point connector 9pole
65	264 501	1	Tape guide complete from unit no. 18001	154	245 776	1	Female multi-point connector 12pole
65	264 500	2	Machine screw M 2 x 12	155	262 486	1	Female multi-point connector 17pole
66	262 200	2	Spacing ring	156	240 861	9	Support
67	217 602	2	Clamping ring	157	247 804	1	Circuit diagram
68	262 476	1	Erase heads (set of two)	158	247 802	1	Operating instructions
69	211 361	2	Machine screw M 2 x 3	248 554	1	UAP operating instructions	
70	262 446	1	Record/playback head complete	159	262 487	1	Shipping carton complete
71	262 204	1	Pressure spring				Baseplate
72	210 433	1	Machine screw M 2 x 8	200	262 451	1	Baseplate complete
73	228 783	1	Machine screw M 2 x 4	201	233 601	1	Fitted jack 5pole
74	242 862	2	Microswitch	201	235 572	4	Fitted cynch jack
75	262 463	1	Frame complete (for locating cassette)	202	242 837	2	Microphone jack with nut
76	210 618	2	PS washer 3.7/8/0.5	203	247 205	1	Rotary switch

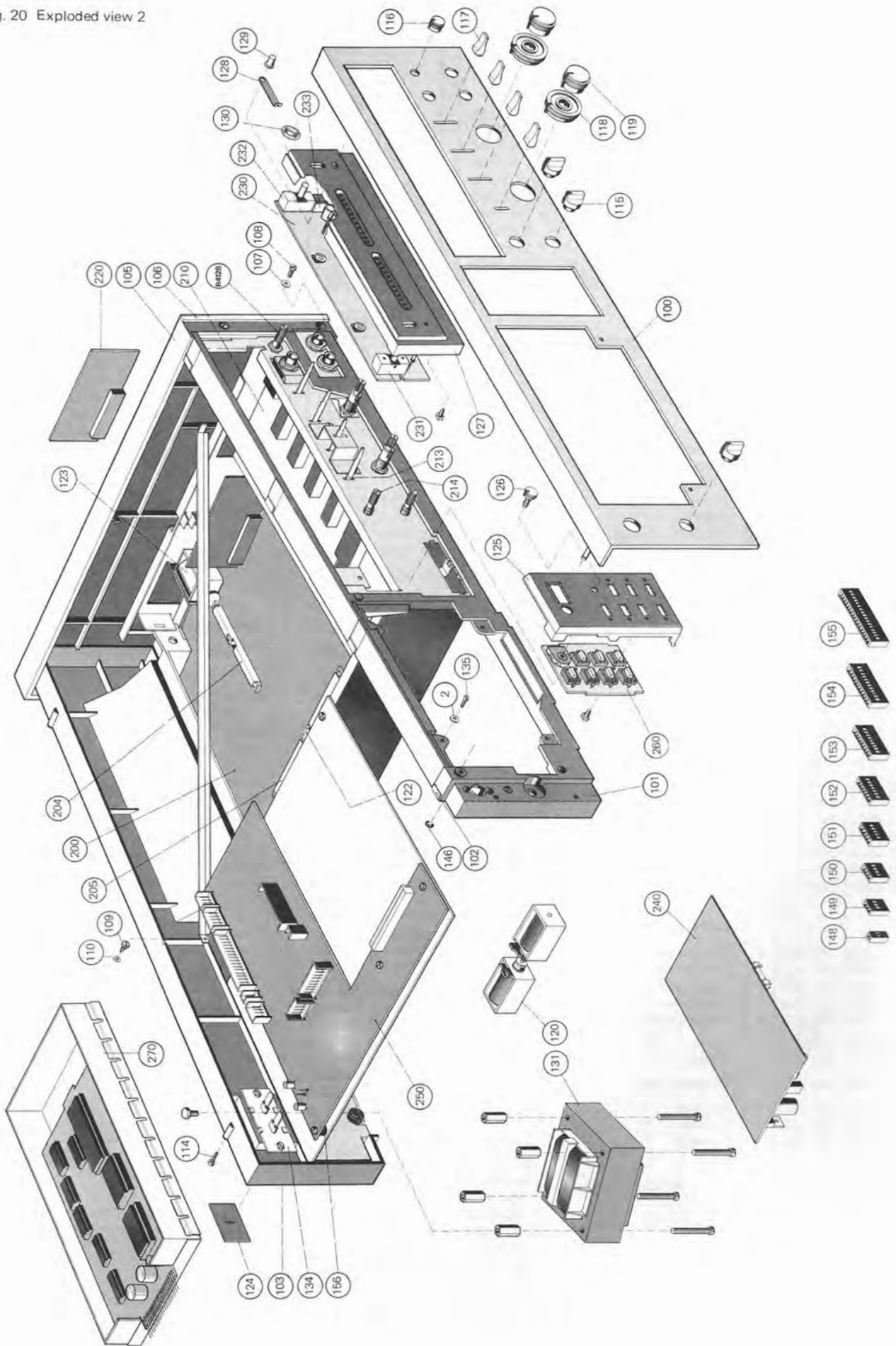
Fig. 19 Exploded view 1



Pos.	Part.No.	Qty	Description
	204	1	Switch
	205	2	Switch
	206	1	Reed relay
D	4000	14	1 N 4148
D	4003	14	1 N 4148
D	4004	14	1 N 4148
D	4005	14	1 N 4148
D	4008	2	BZX 83 C 6 V 2
D	4009	2	BZX 83 C 6 V 2
D	4010	14	1 N 4148
D	4012	14	1 N 4148
D	4013	14	1 N 4148
D	4016	14	1 N 4148
D	4017	14	1 N 4148
D	4018	14	1 N 4148
L	4000	2	Coil
L	4001	2	Coil
L	4002	2	Coil
R	4008	2	Potentiometer (input)
R	4020	2	Potentiometer (input)
R	4035	2	Trimmer 10 k Ω lin.
R	4052	8	Trimmer 10 k Ω lin.
R	4054	8	Trimmer 10 k Ω lin.
R	4062	8	Trimmer 10 k Ω lin.
R	4064	8	Trimmer 10 k Ω lin.
R	4082	4	Trimmer 50 k Ω lin.
R	4084	4	Trimmer 50 k Ω lin.
T	4000	4	BC 550 C
T	4001	4	BC 413 C
T	4002	4	BC 413 C
T	4003	16	BC 548 C
T	4004	16	BC 548 C
T	4005	16	BC 548 C
T	4006	16	BC 548 C
T	4007	16	BC 548 C
T	4008	16	BC 548 C
T	4010	4	BC 550 C
T	4011	16	BC 548 C
T	4012	16	BC 548 C
T	4013	16	BC 548 C
T	4014	16	BC 548 C
IC	4000	4	RC 4559 DN
IC	4001	4	RC 4559 DN
IC	4002	4	RC 4559 DN
IC	4003	4	RC 4559 DN
IC	4004	1	RC 4558 DN
IC	4005	1	▲ MC 14066 BCP
IC	4006	1	▲ MC 14011 BCP
			Switch panel
	210	1	Switch panel complete
	211	1	Coaxial jack
	212	3	Toggle switch
	213	1	Toggle switch (limiter)
	214	1	Rotary switch
D	4100	2	Diode 1 N 4148
D	4101	2	Diode 1 N 4148
L	4100	1	Generator coil
R	4121	4	Trimmer 10 k Ω lin.
R	4127	4	Trimmer 10 k Ω lin.
R	4140	1	Trimmer 2.5 k Ω lin.
T	4100	2	BC 337/16
T	4101	2	BC 337/16
T	4102	1	BD 371 A
T	4103	4	BC 548 C
T	4104	1	BC 558 B
T	4105	4	BC 548 C
T	4106	4	BC 548 C
IC	4100	2	RC 4558 DN
IC	4101	2	RC 4558 DN
R	4128	1	Trimmer 10 k Ω lin.

Pos.	Part.No.	Qty	Description
			Dolby amplifier
	220	1	Dolby amplifier complete
	221	1	Integrated circuit mount 16pole
D	4201	1	Diode 1 N 4148
L	4201	1	Coil 10 PA
L	4202	1	Coil 10 PA
IC	4200	1	LM 1011 N
			LED display
	230	1	LED panel complete
	231	1	Switch ON/OFF
	232	1	Switch FADE EDIT
	233	1	Pushbutton
D	4301	15	LED 37/I green
D	4302	15	LED 37/I green
D	4303	15	LED 37/I green
D	4304	15	LED 37/I green
D	4305	15	LED 37/I green
D	4306	15	LED 37/I green
D	4307	15	LED 37/I green
D	4308	15	LED 37/I green
D	4309	10	LED 30/I red
D	4310	10	LED 30/I red
D	4311	10	LED 30/I red
D	4312	10	LED 30/I red
D	4313	10	LED 30/I red
D	4315	4	1 N 4148
D	4316	4	1 N 4148
R	4303	2	Trimmer 1 k Ω lin.
IC	4301	2	UAA 180
			Power section
	240	1	Power section board complete
C	4404	1	2200 μ F
D	4400	4	Diode 1 N 4148
D	4401	13	Diode 1 N 4001
D	4402	13	Diode 1 N 4001
D	4403	13	Diode 1 N 4001
D	4404	13	Diode 1 N 4001
D	4405	13	Diode 1 N 4001
D	4406	13	Diode 1 N 4001
D	4407	13	Diode 1 N 4001
D	4408	13	Diode 1 N 4001
D	4409	13	Diode 1 N 4001
D	4410	13	Diode 1 N 4001
D	4411	13	Diode 1 N 4001
D	4412	13	Diode 1 N 4001
D	4414	4	Diode 1 N 4148
D	4415	13	Diode 1 N 4001
D	4416	4	Diode 1 N 4148
D	4417	4	Diode 1 N 4148
T	4400	4	BC 548 C
T	4401	1	BC 558 B
T	4402	1	BC 337/25
T	4403	4	BC 548 C
T	4404	3	BC 327/16
T	4405	4	BC 548 C
T	4406	3	BC 327/16
T	4407	4	BC 548 C
T	4408	3	BC 327/16
SI	4401	1	G-fuse T 32 mA
SI	4402	1	G-fuse T 250 mA
SI	4403	1	G-fuse T 1 mA
SI	4404	1	G-fuse T 0.5 mA
SI	4405	1	G-fuse T 0.5 mA
IC	4401	2	IC MC 7812 CT
IC	4402	2	IC MC 7812 CT
IC	4403	1	IC MC 7912 CT
			Motor electronic system
	250	1	Motor electronics complete

Fig. 20 Exploded view 2



Pos.	Part.No.	Qty	Description
D 4500	223 906	10	1 N 4148
D 4501	223 906	10	1 N 4148
D 4502	223 906	10	1 N 4148
D 4503	223 906	10	1 N 4148
D 4504	248 432	1	BZX 83 C 18
D 4505	223 906	10	1 N 4148
D 4506	223 906	10	1 N 4148
D 4507	209 840	1	Zener diode ZG 3.3
D 4508	223 906	10	1 N 4148
D 4509	223 906	10	1 N 4148
D 4510	223 906	10	1 N 4148
D 4511	223 906	10	1 N 4148
N 4500	248 791	2	Resistor network 8 x 47 k Ω
N 4501	248 791	2	Resistor network 8 x 47 k Ω
R 4503	249 788	1	Trimmer 470 k Ω /lin.
R 4505	248 426	1	Trimmer 2.5 k Ω /lin.
R 4524	235 543	1	Trimmer 2.5 k Ω /lin.
T 4500	244 715	13	Transistor BC 548 C
T 4501	244 715	13	Transistor BC 548 C
T 4502	220 537	7	Transistor BC 337/16
T 4503	244 715	13	Transistor BC 548 C
T 4504	220 538	4	Transistor BC 327/16
T 4505	220 537	7	Transistor BC 337/16
T 4506	220 538	4	Transistor BC 327/16
T 4507	220 537	7	Transistor BC 337/16
T 4508	220 537	7	Transistor BC 337/16
T 4509	244 715	13	Transistor BC 548 C
T 4510	220 537	7	Transistor BC 337/16
T 4511	244 715	13	Transistor BC 548 C
T 4512	244 715	13	Transistor BC 548 C
T 4513	244 715	13	Transistor BC 548 C
T 4514	247 241	1	Transistor BD 371 A
T 4515	220 538	4	Transistor BC 327/16
T 4516	244 715	13	Transistor BC 548 C

▲ Caution! Highly-sensition MOS components

Pos.	Part.No.	Qty	Description
T 4517	220 537	7	Transistor BC 337/16
T 4518	260 256	1	Transistor BD 370 A
T 4519	244 715	13	Transistor BC 548 C
T 4520	220 537	7	Transistor BC 337/16
T 4521	220 538	4	Transistor BC 327/16
T 4522	220 537	7	Transistor BC 337/16
T 4523	244 715	13	Transistor BC 548 C
T 4524	244 715	13	Transistor BC 548 C
T 4525	244 715	13	Transistor BC 548 C
T 4526	244 715	13	Transistor BC 548 C
IC 4500	261 871	1	▲ MC 14066 BCP
IC 4501	248 424	1	TVA 955
IC 4502	248 425	1	LM 341 P-5.0
IC 4503	263 374	1	CD 4014 CN
IC 4504	263 374	1	▲ CD 4014 CN
IC 4505	263 373	1	▲ CD 4015 CN
IC 4506	248 423	1	▲ DS 8867 N
Jog switch panel			
260	262 469	1	Jog switch panel complete
261	243 470	7	Jog switch
D 4601	235 851	1	green LED 37/1
D 4602	235 853	4	yellow LED 35/1
D 4603	235 853	4	yellow LED 35/1
D 4604	235 852	2	red LED 30/1
D 4605	235 852	2	red LED 30/1
D 4606	235 853	4	yellow LED 35/1
D 4607	235 853	4	yellow LED 35/1
R 4605	247 243	1	Trimmer 1.5 k Ω /10 %
Control electronic system			
270	265 615	1	Control electronics board complete up to unit number 14000
270	262 468	1	Control electronics board complete as from unit number 14001

Subject to modification