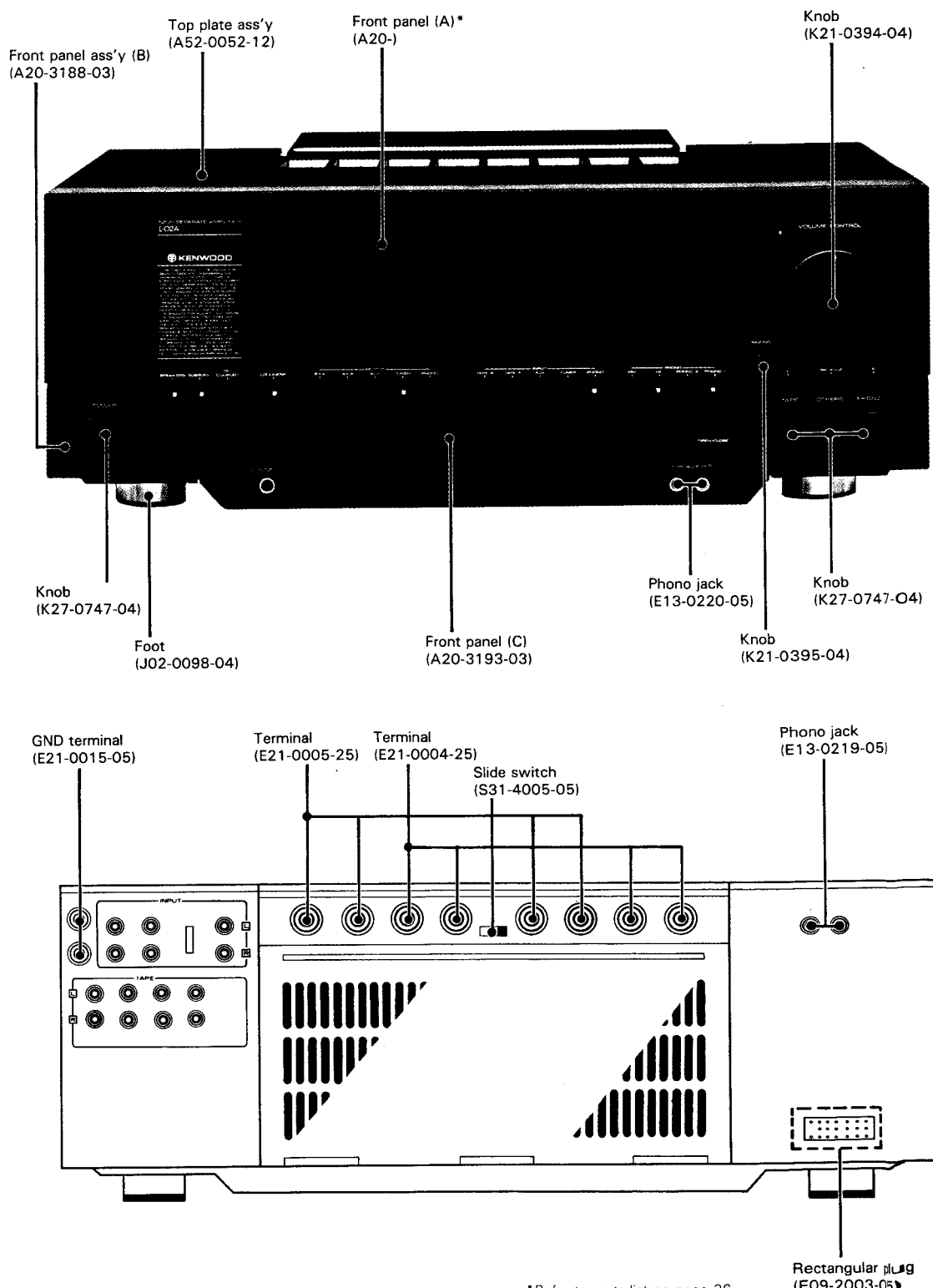
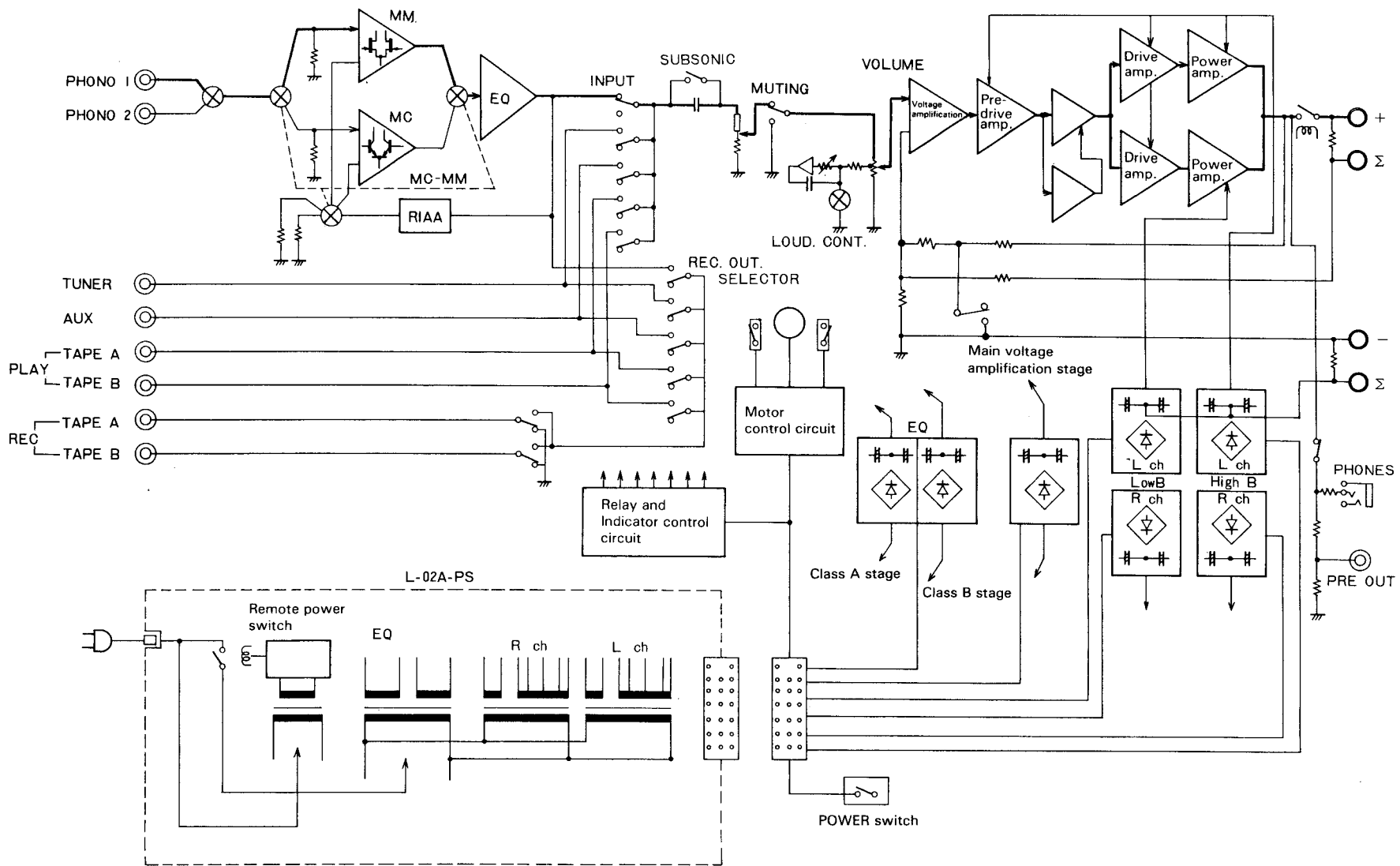


## NEW SEPARATE AMPLIFIER

# SERVICE MANUAL



\* Refer to parts list on page 36.



BLOCK DIAGRAM

## CIRCUIT DESCRIPTION

### POWER SWITCH CIRCUIT

When the power cord is plugged into an AC receptacle, power is applied to the relay driver circuit in the L-02APS and the circuit goes into the standby state. Setting the main power switch (S1) to ON sends the Q2 base current through D9 so that Q1 goes on. This activates relay RL1 to supply power to the amplifier. The Q2 base current normally ceases when the main power switch (S1) is set to OFF, de-energizing relay RL1 and turning off power to the amplifier. However, if the control unit is out, setting the main power switch to OFF causes it to be retracted; the Q2 base current continues flowing through the motor control circuit until retraction is complete. Full retraction of the control unit activates a detector switch (S2), turning off the Q2 base current. Power to the amplifier section goes off at this time.

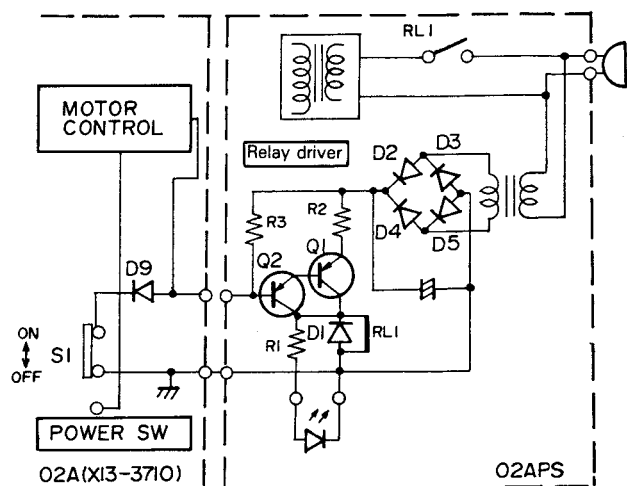


Fig. 1

### Equalizer (EQ) amplifier

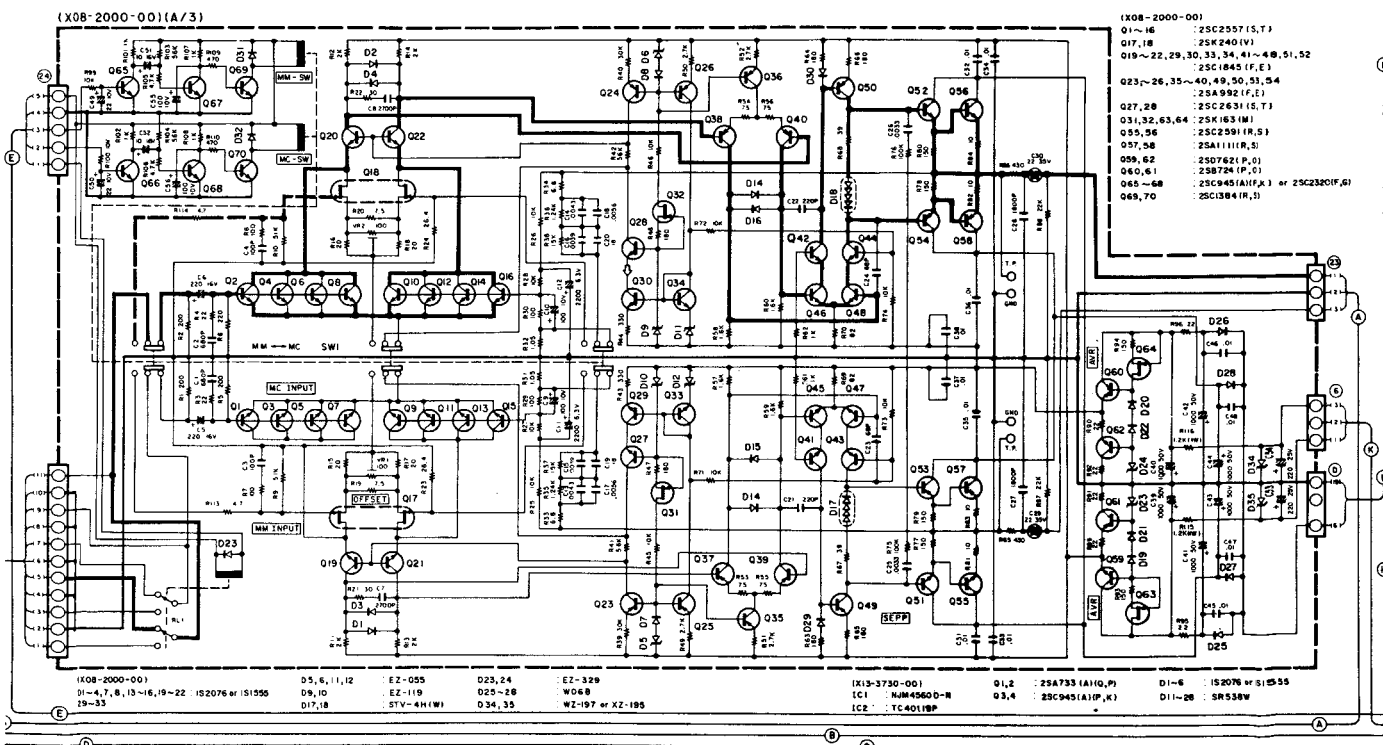


Fig. 2

The EQ board of the L-02A includes the following.

- An FET differential input circuit for the MM cartridge.
- A bipolar transistor differential input circuit for the MC cartridge.
- A driver circuit for MM/MC switching.
- A 3-stage differential voltage amplifier circuit.
- A Darlington power amplifier circuit.
- A regulated power supply for the stages of the voltage amplifier.
- A power supply for the power amplifier.

#### 1. Differential input circuits

The Hi-gm FET (Q18) is switched on for MM input by the solenoid switch. This results in a DC amplifier configuration with adjustable offset. Eight low noise transistors (Q2, Q4, Q6, Q8, Q10, Q12, Q14, and Q16) are connected in two parallel sets for MC input. Together with input elements which are matched to each type of cartridge, these act as EQ amplifiers for the MM/MC cartridges. The signals from these circuits are sent to the next stage via the common cascode loads (Q20 and Q22).

## CIRCUIT DESCRIPTION

### 2. Voltage amplifier circuit

A large common mode rejection ratio (CMRR), a large power supply rejection ratio (PSRR), and a differential amplifier configuration (Q38, Q40, Q46, and Q48) are used to achieve high stability. Further improvement in performance is provided by the constant current circuit (Q24, Q26, Q28, Q30, Q36, and Q50) and a temperature compensation circuit (D8, D30, and Q34).

### 3. Power amplifier circuit

A two-stage Darlington complementary output circuit is employed with an Hi- $f_T$  transistor in its final stage. A separate rectification circuit is used for the power amplifier power supply.

### 4. Power supply for the voltage amplification stages

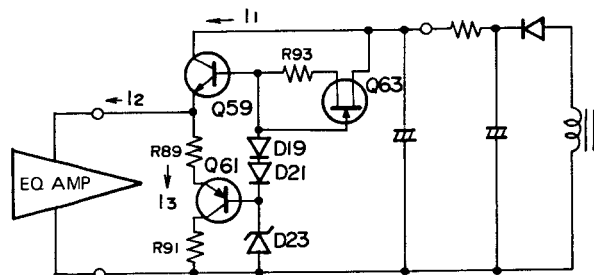


Fig. 3

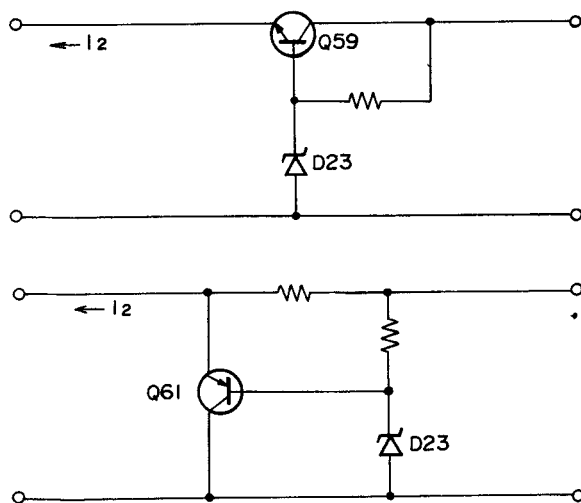


Fig. 4

A push-pull constant voltage circuit is employed to minimize variations in current as seen from the rectifier circuit. The constant current circuit consists of Q63. Zener voltage is output by D23 after its impedance has been reduced by Q59 and Q61. Q59 acts as an ordinary series-control constant voltage circuit, while Q61 is a parallel-control type circuit which operates as a current absorber. If  $I_2$  (see Figs. 3 and 4) is increased by a signal, the emitter voltage of Q59 and Q61

drop to reduce  $I_3$ . Conversely, the emitter voltages of Q59 and Q61 increase to raise  $I_3$  when  $I_2$  drops. Therefore,  $I_1$  (the current seen from the rectifier circuit) is less subject to variation; i.e., the power supply impedance is reduced.

### 5. Solenoid switch driver

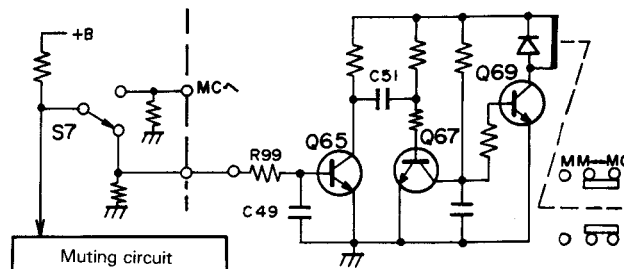


Fig. 5

A six-pole/double-throw solenoid switch is used to switch the input circuits of the EQ amplifiers. When the MM button (S7) on the control unit is depressed, current flows through Q65 and the level at its collector drops to "L." The "L" pulse passing through C51 turns off Q67 so that the Q67 collector voltage increases. This turns on Q69 so that the plunger is pulled to slide the switch to the MM position. If C51 is charged, the states of Q67 and Q69 are reversed so that the solenoid current ceases. Similarly, depressing the MC button actuates the MC plunger driver (Q66, Q68, and Q70), sliding the solenoid switch to the MC position. A delay circuit consisting of R99 and C49 is included on the input side of the solenoid switch driver so that a muting operation is first performed. This prevents shock noise from being produced when the input circuits of the EQ amplifiers are switched during operation.

# CIRCUIT DESCRIPTION

## MAIN AMPLIFIER

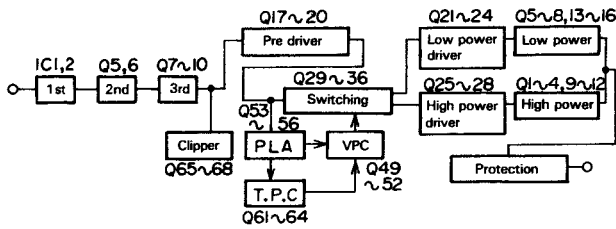


Fig. 6

### 1. Classe A voltage amplifier

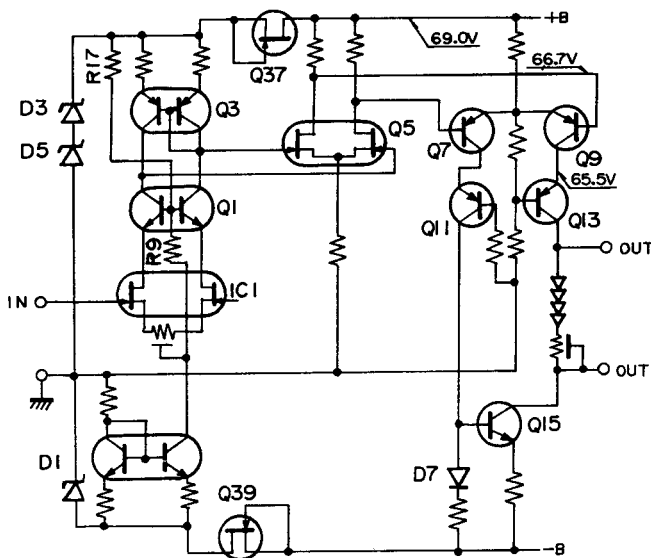


Fig. 7

A single-chip dual FET (IC1) with minimal drift is used together with a cascode bootstrap (Q1). The cascode bootstrap lowers the drain-source voltage of the FET; this is necessary because of the FET's low voltage rating. The drain voltage is determined by the voltage at the base of Q1. Approximately 9 volts is applied to the drain through a voltage divider consisting of R9 and R17. A current-mirror load (Q3) is added to achieve high gain.

The power supply for the first stage is regulated by a constant current circuit (Q37 and Q39) and the constant voltage elements (D1, D3, and D5). A dual FET (Q5) is also employed in the second stage to convert impedance and shift the signal level. This is necessary because of the high output impedance of the first stage. The third stage consists of a PNP differential circuit (Q7 and Q9), a cascode circuit (Q11 and Q13), and a current mirror load (D7 and Q15). This configuration provides high output with low drift over a wide range of frequencies.

### Cascode connection

The collector load on the input transistor (Q9) becomes the emitter input impedance of the output transistor (Q13); hence the low impedance load. Because of this, the amount of output signal feedback to the base of Q9 resulting from collector-base capacitance (Cob) is considerably reduced; this results in a considerable improvement in frequency response. Also, DC drift is minimized because the current leakage between the collector and base of Q9 is reduced by the low collector-base voltage.

### 2. Clipper circuit

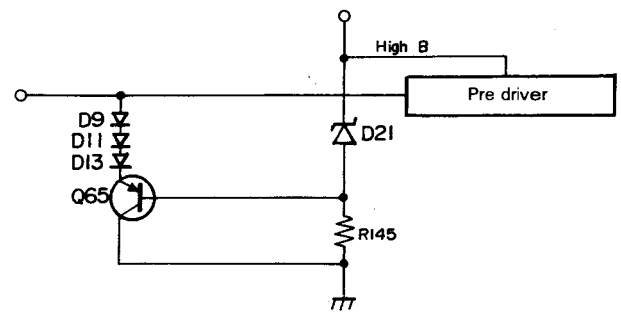


Fig. 8

A clipper circuit is added to the input side of the pre-driver. This limits the output voltage and eliminates clipping in the power stage. Although the amplifier can deliver more than 190 watts of output into an 8-ohm load if the clipper circuit is eliminated or not operational, the clipping waveform will be disturbed. If either the positive or negative clipping circuit is defective, the DC protection circuit operates due to imbalance in the output signal.

The voltage at the base of Q65 is 62 V, which is equivalent to the difference between the pre-driver power supply voltage (about 70 V) and the Zener voltage of D21 (about 8 V). Collector current starts to flow if the emitter voltage of Q65 exceeds 62.6 V; therefore, the input voltage to the pre-driver is limited to about 64.4 V. Diodes (D9, D11, and D13) are used to prevent reverse current flow from damaging Q65.

# CIRCUIT DESCRIPTION

## 3. Dynamic linear drive (DLD) circuit

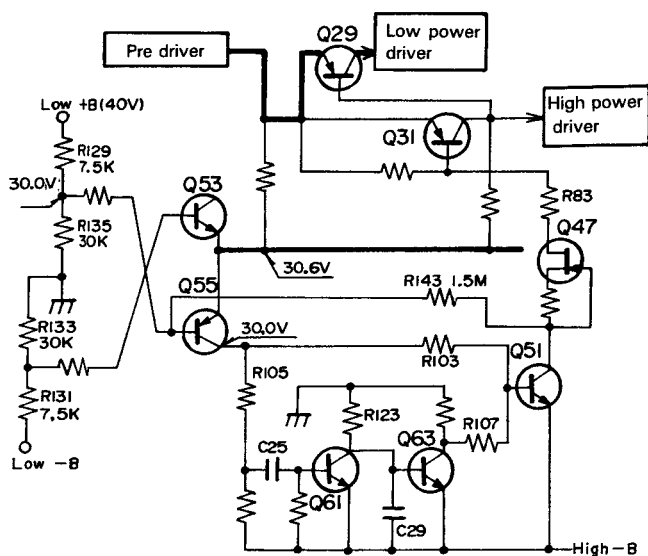


Fig. 9

This circuit is basically the same as that used in the KA-7X/9X series; however switching is performed between the pre-driver and the driver to achieve higher control speed. Transistors Q53 and Q55 detect the peak level for switching. The voltage at the base of Q55 is about 30 V: this is derived from a voltage divider consisting of R129 and R135. The emitter of Q55 is connected to the output. Q55 is turned on if the output voltage of the pre-driver exceeds a voltage of (30 + 0.6) volts; this turns on Q51 through R103. When Q51 goes on, Q31 is turned on via Q47 and R83 so that the high power circuit becomes operational. When Q31 goes on, Q29 is turned off so that the low power circuit is disconnected. Positive feedback is applied through R143 to Q55 from the collector of Q51, providing Q55 with the hysteresis characteristic necessary to ensure proper operation. When Q55 goes on, it turns on Q61 through R105 and C25. This turns off Q64 while turning on Q51. When Q61 goes off, Q63 stays off and Q51 is held on for about 2 mS by the time constant circuit (R123 and C29). Q47, which is connected to the collector of Q51, acts as a constant current element. The high impedance of Q47 protects switching transistor Q31 against power supply ripple and other undesirable effects produced when Q51 is turned on.

## 4. Protection circuit

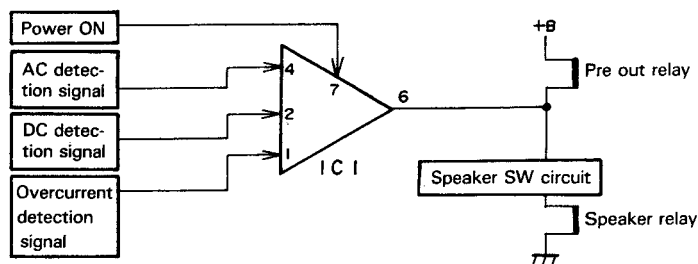


Fig. 10

IC1 (μPC 1237H) turns off the speaker relays to protect the power amplifier and the speakers if any of the following four signals is received: (1) the overcurrent detection signal, (2) the DC detection signal, (3) the AC detection signal, and (4) the power on signal.

The overcurrent detection circuit detects operation of the limiter circuit (see Fig. 11). With this limiter circuit, both Q1 and Q7 are turned on if voltage appears across R43 due to excess current through the power transistors; this lowers the pre-driver input voltage, limiting the current flow through the power transistors. Both Q9 and Q11 are turned on to deliver the overcurrent detection signal to IC1 when Q7 goes on.

A filter circuit consisting of R37 and C51 is used for DC detection. IC1 performs a protective operation if the DC voltage at its second pin exceeds 0.6 V or drops below -0.2 V.

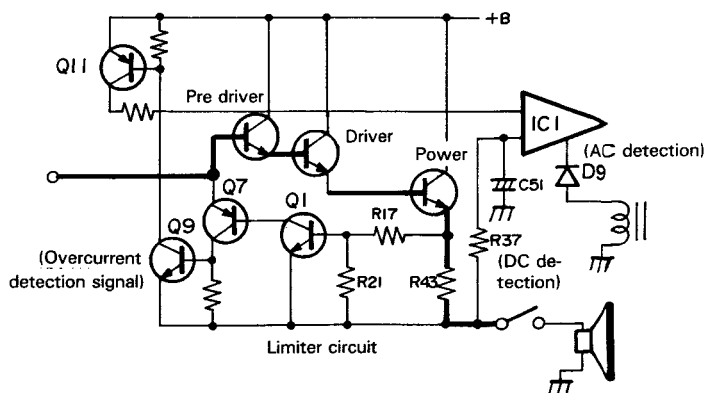


Fig. 11

The AC detection circuit causes IC1 to initiate its protective operation before amplifier operation is destabilized when AC voltage to the power transformer is cut off.

## CIRCUIT DESCRIPTION

IC1 protection is also provided when the power supply is turned on. This protection is maintained by the time constant circuit (R103 and C53) until power amplifier operation stabilizes. The output of IC1 is fed directly to the headphones and pre-out relay, to the speaker relays (RL1 to RL4) through the speaker switch, and to the NF relay (RL1 in X09) through the relay driver (Q14).

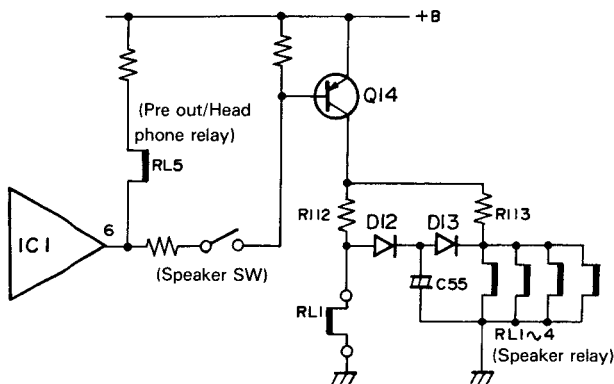


Fig. 12

The time lag circuit causes the speaker relays to go on before the NF relay, and the NF relay to go off before the speaker relays. Since negative feedback is applied through the speaker relays, amplifier gain increases when they are turned off. The NF relay acts to hold amplifier gain to a constant level.

See Fig. 12. Usually, Q14 is turned on and the speaker relays are (RL1 to RL4) activated when the speaker switch is set to ON. The time constant circuit (R112 and C55) delays activation of the NF relay. When the speaker switch is turned off (or when a protective operation is performed), Q14 goes off and the NF relay is deactivated. The speaker relays remain on for a short time due to the current flow through C55 and D19, then they are deactivated also. This time lag prevents uncomfortably loud signals produced by increased amplifier gain from reaching the headphones and pre-out.

## LOUDNESS CONTROL

The L-02A is not equipped with a tone control circuit; a variable frequency loudness control is used to control low frequencies.

The loudness level of this circuit is varied in 3 levels by selecting one of the three resistors. The section which corresponds to capacitor in an ordinary loudness control is a Miller circuit which uses a variable output operational amplifier.

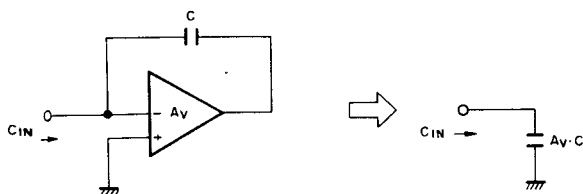


Fig. 13

In the above figure, when capacitor C is connected to the parallel negative-feedback circuit, response is lowered at higher frequency levels. The input impedance of the circuit is capacitive and its equivalent capacitance is given by

$$C_{IN} = A_V \cdot C$$

where  $A_V$ : gain of amplification

Thus, equivalent input capacitance is large even if the capacitor used is small.

The equivalent input capacitance can be varied by varying the gain of amplification. In the circuit of the L-02A, the gain of amplification is

$$A_V = \frac{R_7}{(R_5 + VR_1)}$$

Therefore, equivalent input capacitance is given by

$$C_{IN} = C \cdot \frac{R_7}{(R_5 + VR_1)} \quad (\mu F)$$

$C_{IN}$  corresponds to the capacitor in a conventional loudness control.

## CIRCUIT DESCRIPTION

### INPUT SELECTOR

The input selector circuit consists of a three key switch on the lower right of the front panel and the relating circuits in the control unit.

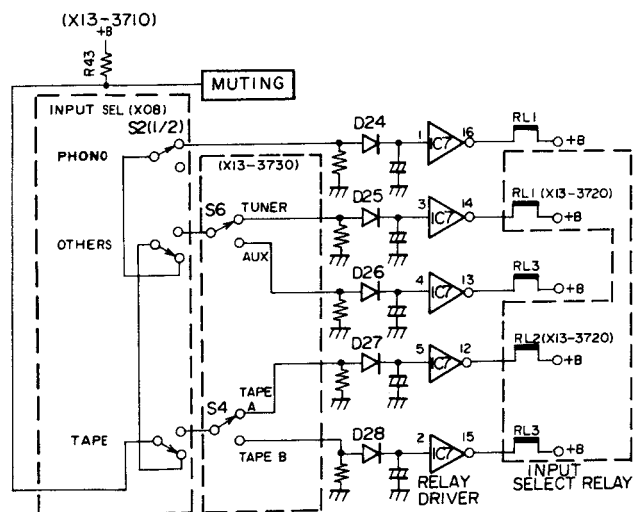


Fig. 14

#### • PHONO

The H level signal from R43 (muting circuit) in X13-3710 is applied to pin 1 of IC7 through S2 in X08-2000 so that RL1 is actuated. RL1 allows the EQ amplifier output signal to be fed to the SUBSONIC-DC switch.

#### • OTHERS

When the OTHERS position is selected with S2, an H level signal is applied to S6. When TUNER or AUX is selected by S6, RL1 (X13-3720) or RL3 is actuated by the driver (IC7) so that the selected input source is connected.

#### • TAPE

When the TAPE position is selected, TAPE A or TAPE B can be selected by means of S4 in X13-3730.

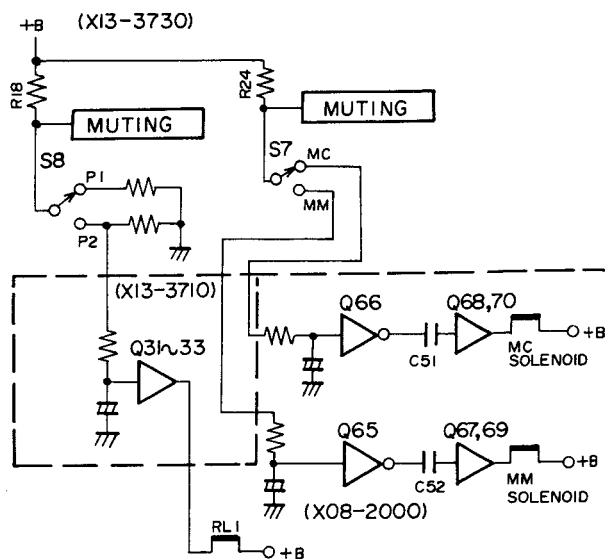


Fig. 15

#### • PHONO 1

When S8 is set to the PHONO 1 position, RL1 in X08-2000 is turned OFF and PHONO 1 is connected to the EQ amplifier.

#### • PHONO 2

When S8 is set to the PHONO 2 position, RL1 is actuated and PHONO 2 is connected to the EQ amplifier.

#### • MC

When S7 in X13-3730 is set to the MC position, Q66 in X08-2000 is turned ON to actuate the MC solenoid. The MC solenoid shifts the magnet relay to the MC position. After C52 has been charged, the solenoid current is cut off but the magnet relay is held in the MC position.

#### • MM

When S7 is set to the MM position, Q65 in X08-2000 is turned ON to actuate the MM solenoid. The MM solenoid shifts the magnet relay to the MM position.



## CIRCUIT DESCRIPTION

### REC OUT CIRCUIT

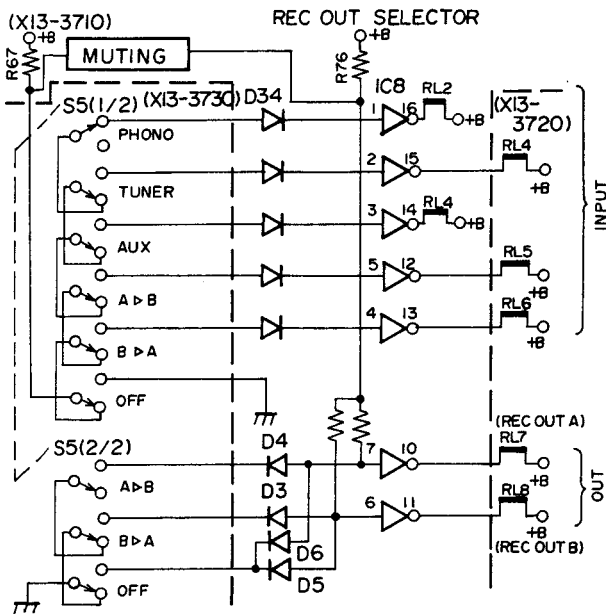


Fig. 16

The REC OUT circuit is similar to the input selector circuit.

#### • TAPE A

The H level signal from R67 in X13-3710 is applied to driver IC8 when TAPE A > B is selected by S5 (1/2). This actuates RL5 to select the TAPE A PLAY input terminals. Also, RL7 is turned OFF at this time by S5 (2/2).

#### • TAPE B

RL6 is actuated in the same manner as with TAPE A when TAPE B > A is selected by S5.

#### • OFF

All relays related to REC OUT are turned OFF when OFF is selected by S5.

# CIRCUIT DESCRIPTION

## MOTOR CONTROL UNIT

### 1) Initialization when the power is turned on

When power switch S1 is turned on, the relay in the power supply unit is turned ON at the same time. The circuits then starts operating when the power supply voltage reaches a certain level. The conditions of the circuits are initialized as follows before operation starts. The voltage applied to pins 8 and 9 of IC1 rises to H after the amount of time determined by R26 and C5 has elapsed to allow the power supply voltage to rise. During this period, an H level signal is output from pin 10 of IC1. This signal is applied to the R terminal of the JK-FF (IC2) to reset it. Therefore, its Q output becomes L and  $\bar{Q}$

becomes H. The level applied to the R terminal then drops and the JK-FF is enabled to receive data. S2 and S3 are the rear and front limit switches which are turned ON when the control unit is moved to the in and out positions. The control unit is normally in the in position when the power switch is turned ON. Therefore, the inputs to AND gate 1 are both L so that its output is L; the inputs to AND gate 2 are both H so that its output is H. Q3 goes ON and an L level signal is applied to pins 9 and 12 of IC3 so that the bases of motor drive transistors Q6 and Q7 become L. Therefore, the motor does not rotate. The initial state of the motor control unit is shown in Fig. 17.

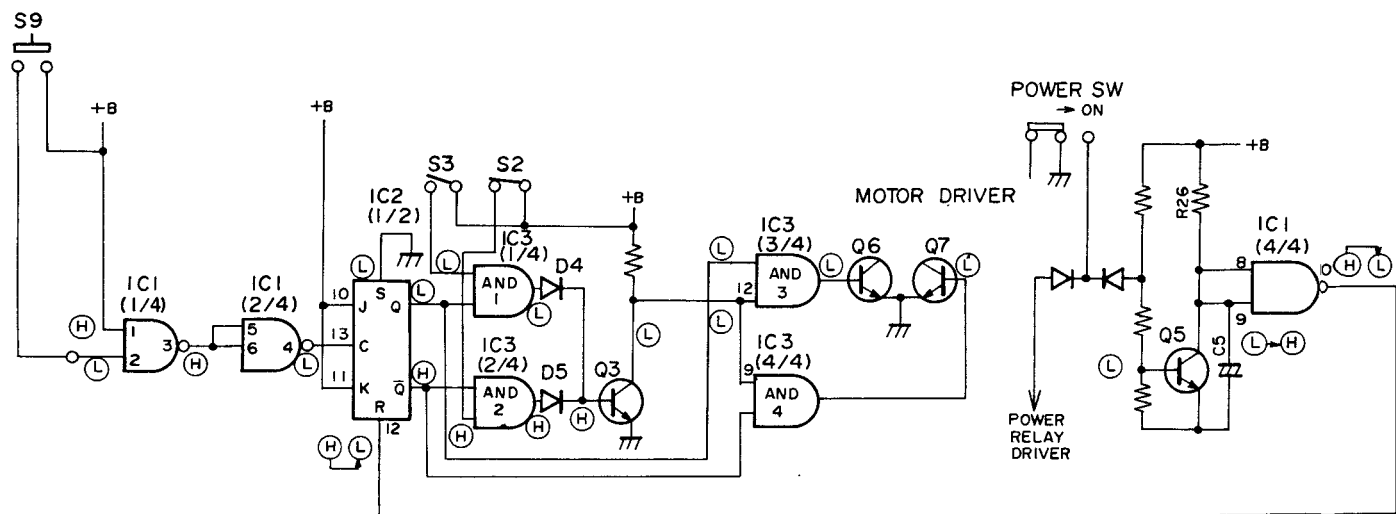


Fig. 17 Initial state of motor control circuit

## CIRCUIT DESCRIPTION

### 2) OPEN/CLOSE operation

When the control unit OPEN/CLOSE switch (S9 in X13-3730-10) is pressed once, H is applied to both pins 1 and 2 of IC1 (a NAND gate). The level at pin 4 of IC1 then becomes H. This level is applied to the C terminal of the JK-FF. Since H is applied to both the J and K terminals, the state of the flip-flop is reversed; that is the state of the JK-FF is inverted each time S9 is pressed.

When the JK-FF is set, the inputs to AND gate 1 are L and H, as are those to AND gate 2. Thus, the outputs of both gates are L and Q3 is turned OFF so that H is applied to one input of both AND gates 3 and 4.

H is applied to the other input of AND gate 3 and L is applied to the other input of AND gate 4 because the JK-FF is set. Therefore, H is applied to the base of Q6 and L is applied to the base of Q7. This causes motor current to flow from the power supply → Q11 → motor → Q8 → GND, so that the motor rotates to push out the control unit. S2 is then turned OFF, but this does not affect motor operation because the output level of AND gate 2 is held at L.

When the control unit reaches the fully projected position, S3 is turned ON. The inputs to AND gate 1 then both become H, so its output becomes H to turn Q3 ON. This causes AND gates 3 and 4 to close so that the base voltage of Q6 and Q7 drops to L and the motor stops.

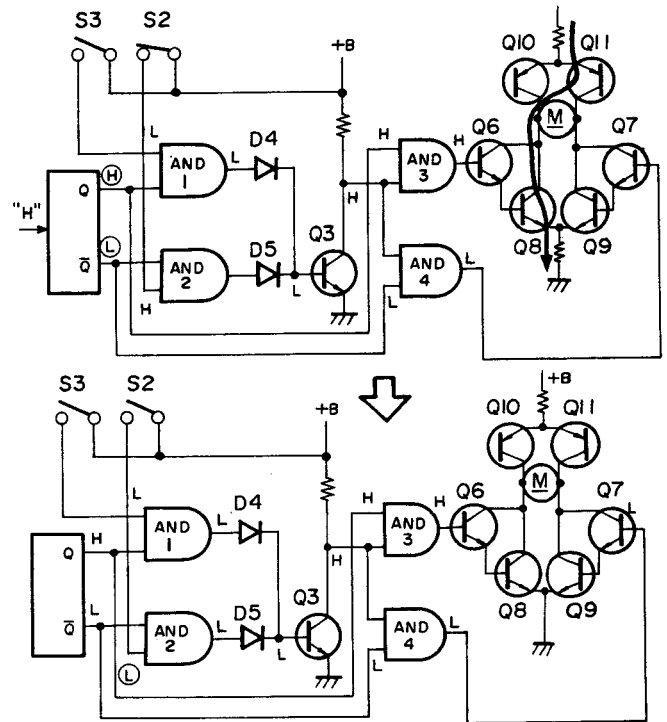


Fig. 18 Motor control circuit during OPEN operation

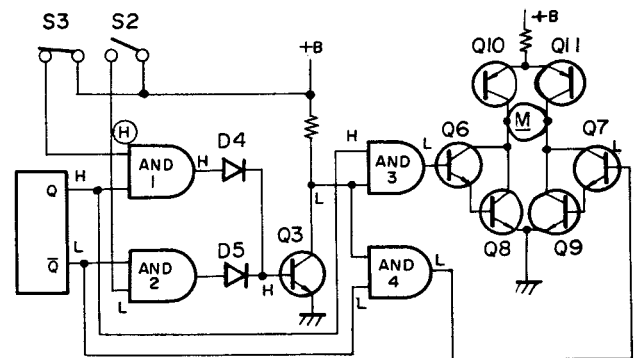


Fig. 19 Motor control circuit when control unit is in the fully projected position

## CIRCUIT DESCRIPTION

When S9 is pressed while the control unit is in the OUT position, the state of the JK-FF is inverted; that is, Q becomes L and  $\bar{Q}$  becomes H. Therefore, the output levels of both AND gates 1 and 2 drop to L. The output level of the NOR gate consisting of D4, D5 and Q3 rises to H because both inputs are L. This H level is applied to both AND gates 3 and 4 so that the outputs from the JK-FF are applied to the bases of Q6 and Q7. The motor now rotates in the opposite direction to retract the control unit. When retraction starts, the motor keeps rotating even though S3 is turned OFF because the output level of AND gate 1 is held at L.

When the control unit reaches the fully retracted position, S2 is turned ON. This causes the output level of AND gate 2 to become H. Both AND gates 3 and 4 are then closed to drop the levels at the base of Q6 and Q7 so that the motor stops. When S9 is pressed while the motor is rotating, the state of the JK-FF is reversed. At this time, both S2 and S3 are OFF and both AND gates 3 and 4 are open. Therefore, the outputs of the JK-FF are applied to the bases of Q6 and Q7 so that the direction of rotation is reversed.

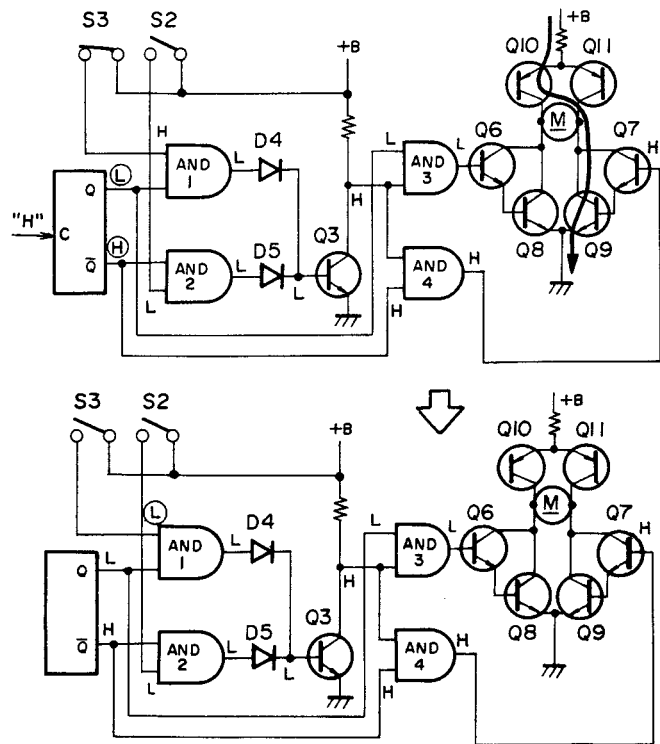


Fig. 20 Motor control circuit during CLOSE operation

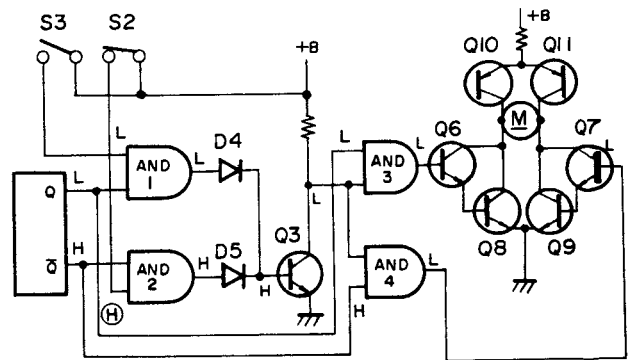


Fig. 21 Motor control circuit when control unit is in the retracted position

## CIRCUIT DESCRIPTION

### 3) Protection circuit

A large amount of current flows through the motor if it is forcibly stopped by some obstruction. This current produces a large voltage drop across R33. This voltage across R33 turns Q12 ON. If this condition lasts for a certain amount of time (the period determined by R4 and C3), Q1 is turned ON and

Q2 is turned OFF so that the collector level of Q2 rapidly rises. However, C4 cannot be charged instantaneously, so H is applied to pin 2 of IC1 (1/4). This causes a clock pulse to be applied to the JK-FF to reverse its state and the direction of motor rotation and prevent the motor and circuit from being damaged.

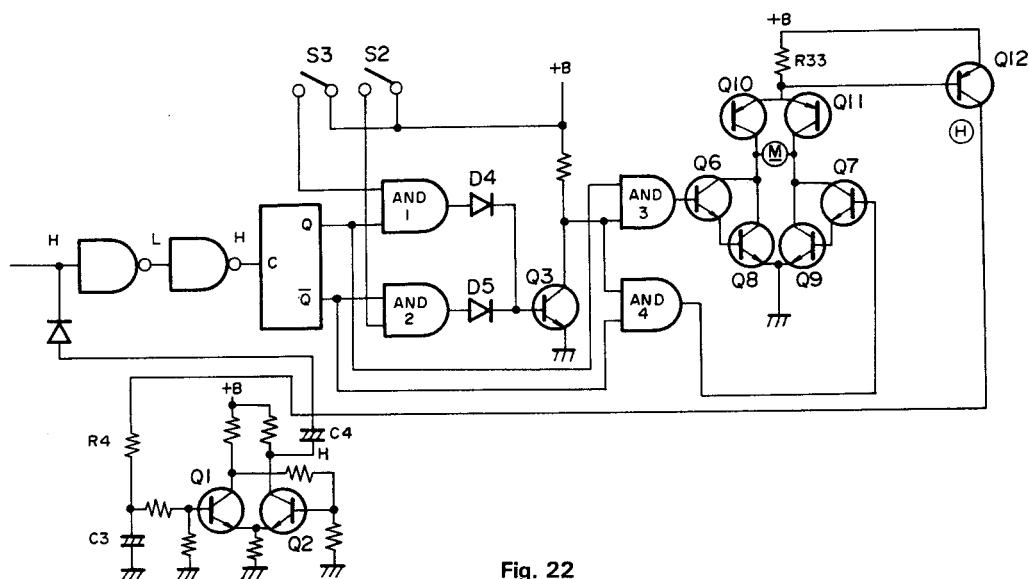


Fig. 22

## CIRCUIT DESCRIPTION

### 4) Power OFF operation

The power is not turned off immediately when the POWER switch is turned off if the control unit is not in fully retracted position.

#### (a) Power-off operation when the control unit is fully retracted position:

When the POWER switch is turned off, Q5 is turned ON to set the output level of NAND gate 4 to H. The output level of NAND gate 3 is L because S2 is ON; H is applied to its input through D6, then Q4 is turned OFF to turn off the power relay.

#### (b) Power-off operation when the control unit is in fully projected position or in motion:

When the POWER switch is turned OFF, the output level of NAND gate 4 becomes H. This H level is applied to both

NAND gate 3 and the JK-FF to retract the control unit. S2 is OFF while the control unit is being retracted, so the output level of NAND gate 3 is H. Since Q4 is ON, the power relay is kept ON. When the control unit reaches the fully retracted position, S2 is turned ON. Subsequent operation is as described in (a).

#### (c) Other operation:

If the motor is overloaded during the operation described in (b), Q12 is turned ON and the collector level of Q2 becomes H. This H level is applied to NAND gate 3 through D7. This turns off the power in the same manner as when S2 is turned ON. (The control unit will not be completely retracted.)

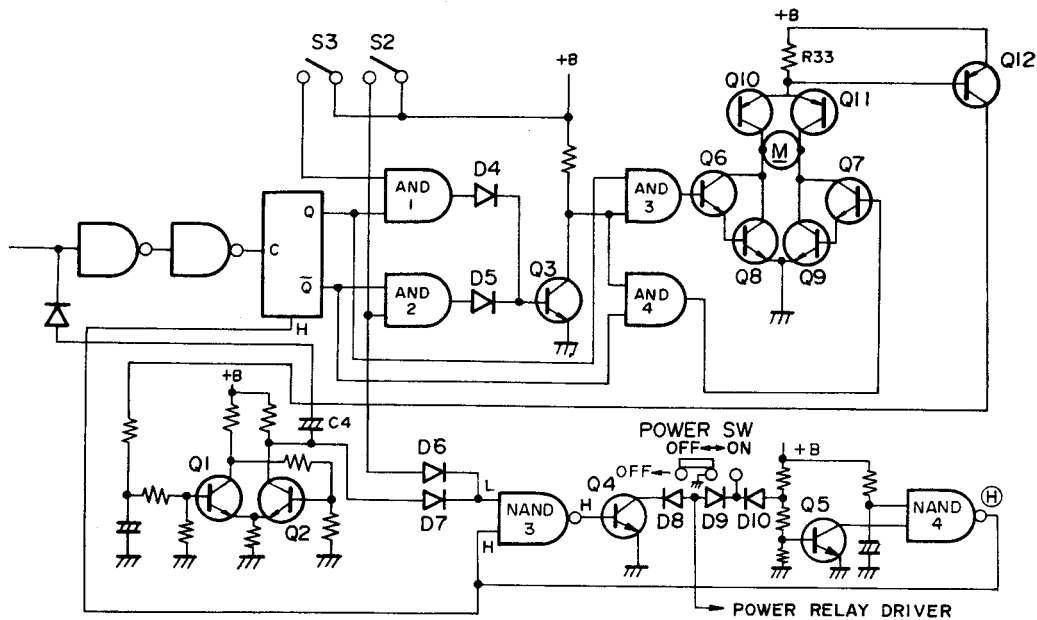


Fig. 23



## CIRCUIT DESCRIPTION

### 1) When the PHONO, OTHERS, or TAPE switch is operated

When the PHONO key (X08-2000-00 B/3 S2) is depressed, ④ and ⑤ of Figure 25 are connected so that both Q17 and Q15 go on. Since ③ is L when MM-MC is not being switched,

the output of IC4 1/4 (NAND gate 1) is H and the inputs to IC4 2/4 (NAND gate 2) are both H; thus, the output of NAND gate 2 is L. (See Figure 25(a).)

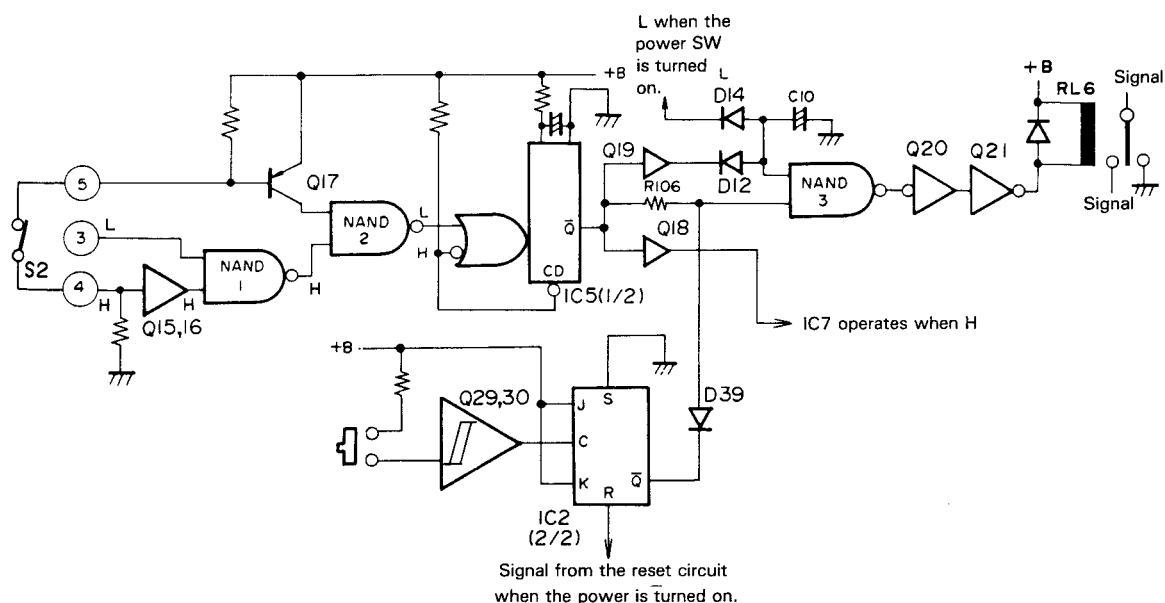


Fig. 25(a) During PHONO selection

When the OTHERS key is depressed, ④ is released and the input level at pin 1 of NAND gate 1 becomes L. This makes the output of the NAND gate H regardless of the state of pin 2. Since ⑤ is grounded either through R96 or R97, Q17 goes ON and both inputs to NAND gate 2 are H; therefore,

the output level of NAND gate 2 is L. When the TAPE key is pressed, ⑤ is grounded through either R94 or R95 and other conditions are the same as when the OTHERS key is pressed. (See Figure 25(b).)

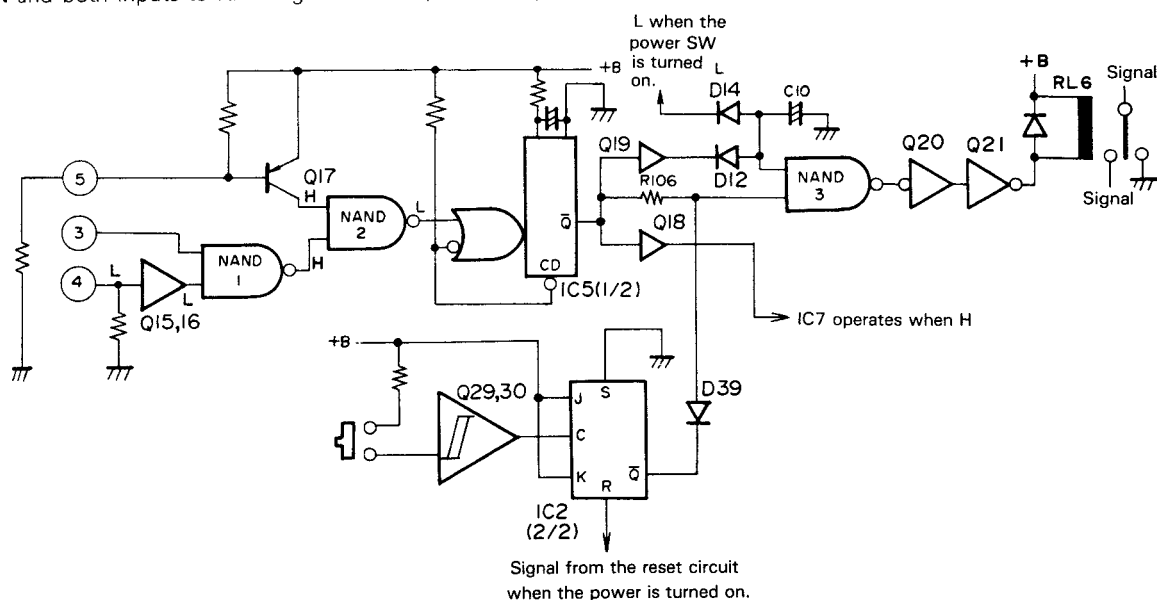


Fig. 25(b) During TAPE or OTHERS selection



## CIRCUIT DESCRIPTION

Since ⑤ is released whenever any of these keys is operated, Q17 goes off momentarily and the output level of NAND gate 2 momentarily goes to H. IC5 (1/2), the monostable multivibrator, is then triggered at the instant when the level at pin 5 (the trigger pin) goes from L to H. Since the  $\bar{Q}$  output of the monostable multivibrator is applied directly to pin 13 of NAND gate 3, the output level of NAND gate 3 momentarily

becomes H and the signal is blocked. When the  $\bar{Q}$  output of IC5 (1/2) becomes L, the emitter output level of Q19 also falls to L so that C10 is discharged and the input level at pin 12 of NAND gate 3 becomes L slightly later than that at pin 13. This serves to hold the output level of NAND gate 3 to H. (See Figure 26.)

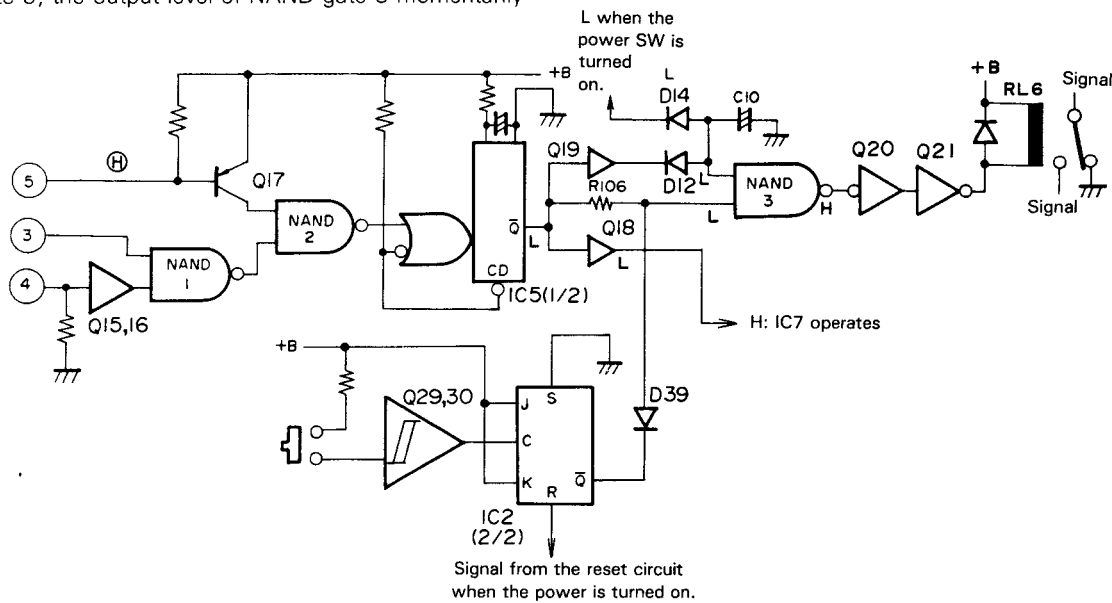


Fig. 26 Condition when the monostable multivibrator is activated

The time constant of the monostable multivibrator is fixed to approximately 0.5 seconds by R46 and C9. During this time (the time when the  $\bar{Q}$  output is L), the level at pins 1 to 4 of IC7 is L; thus, relays 1 and 3 and relays 1 and 3 of X13-3720-00 are all OFF and the input is released. When

the monostable multivibrator returns to its stable state, the output level of  $\bar{Q}$  becomes H, causing the output level of the emitter of Q18 to become H so that relay driver IC7 sets the relays ON according to the selector switch positions. (See Figure 27.)

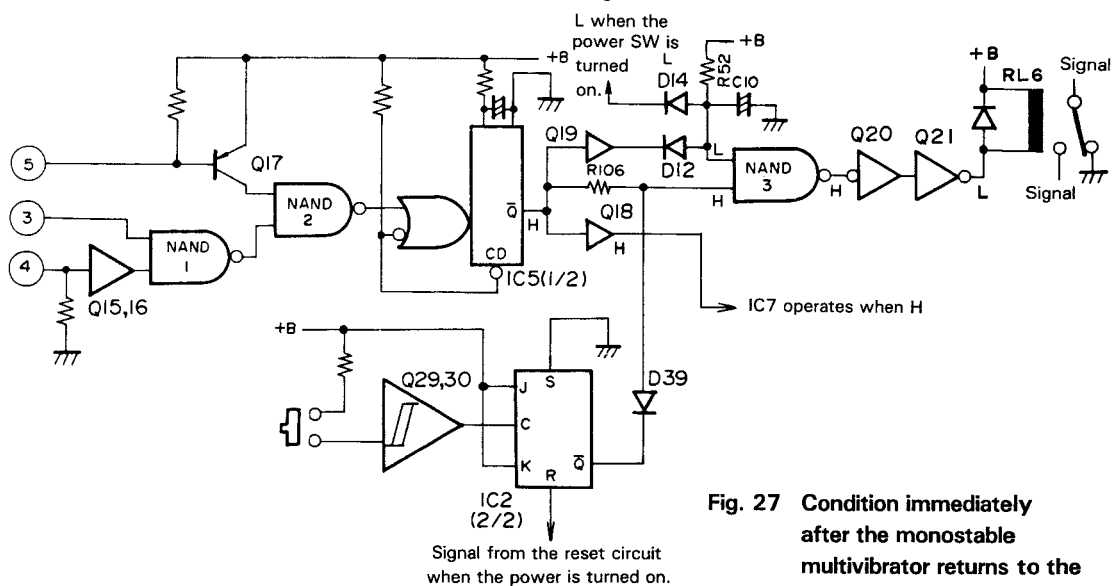
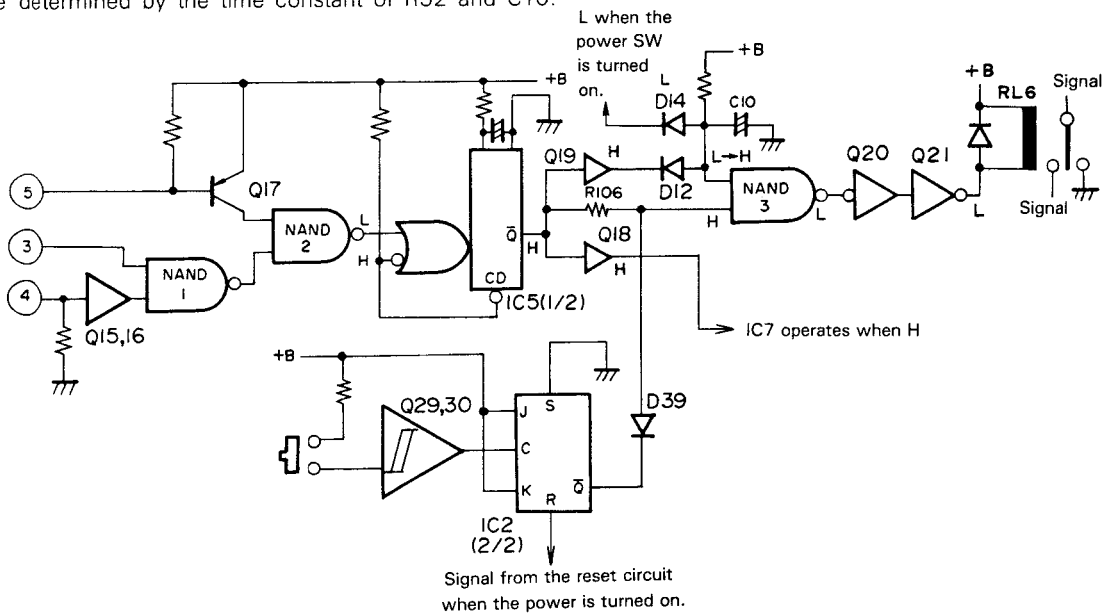


Fig. 27 Condition immediately after the monostable multivibrator returns to the stable condition

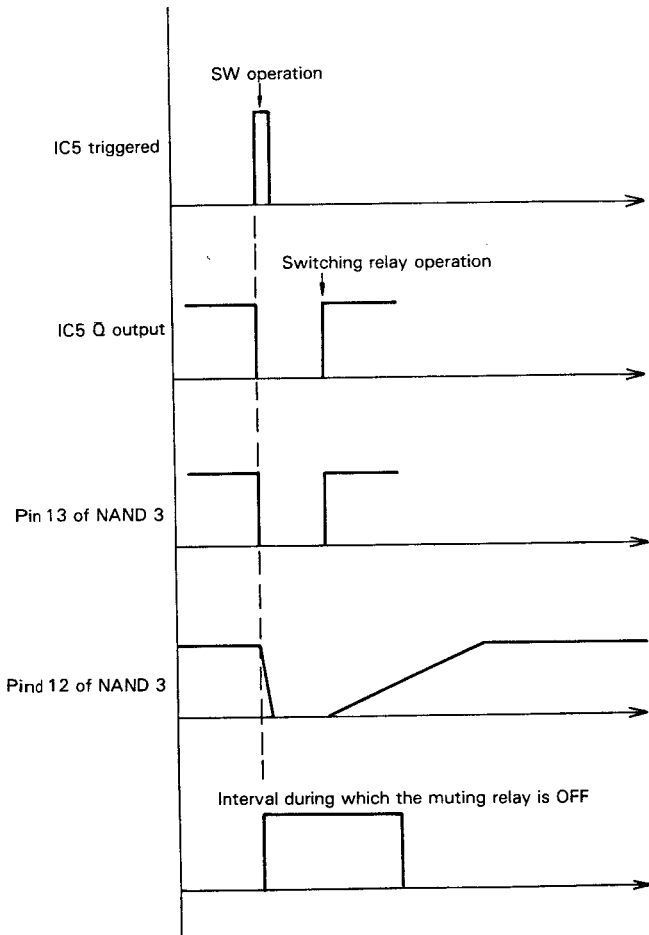
## CIRCUIT DESCRIPTION

Although the level at pin 13 of NAND gate 3 becomes H as soon as the monostable multivibrator returns to the stable condition (to H), the level at pin 12 remains H for the period of time determined by the time constant of R52 and C10.

Therefore, the muting relay is restored approximately 0.5 seconds after the input relay is switched so that switching noise is avoided.



**Fig. 28 Muting relay restoration**



**Fig. 29** Timing diagram for muting relay operation

## CIRCUIT DESCRIPTION

### 2) During switching between TAPE A → B or TUNER → AUX

When the OTHERS key is pressed, ⑤ is connected to R96 or R97 via selection switch S6 (1/2) or S4 (1/2) of X13-3730-00; when the TAPE key is pressed, it is con-

nected to R94 or R95 in the same manner. Since ⑤ is momentarily released when S6 or S4 operates, muting is performed in exactly the same manner as described in 1) above. (See Figure 28.)

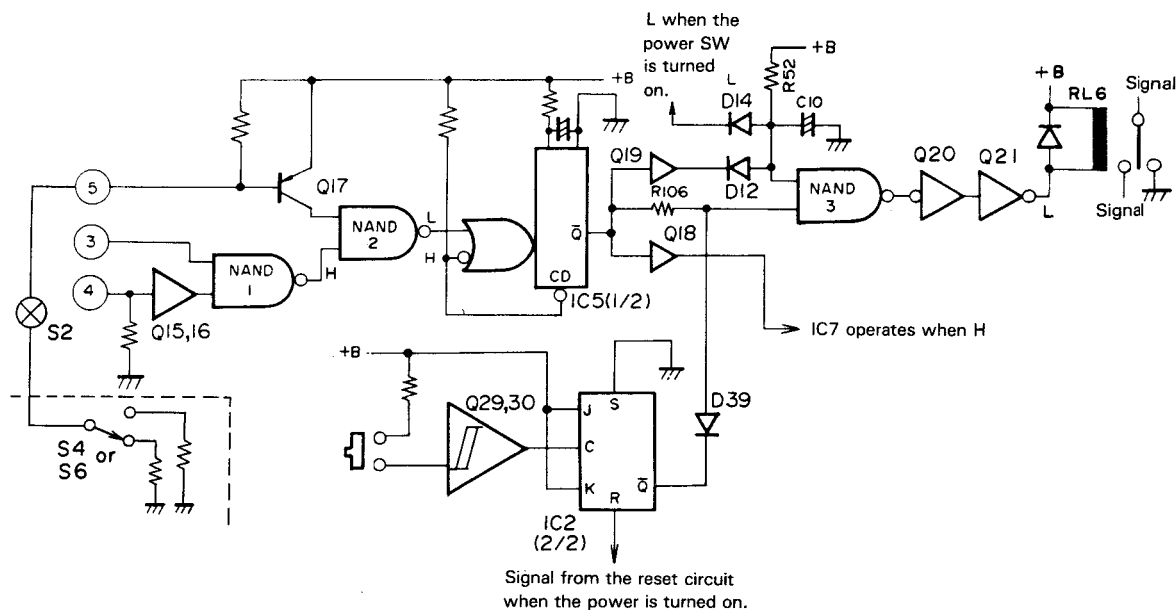


Fig. 30 Switching between TAPE A → B and TUNER → AUX

### 3) During switching between PHONO 1 → 2

Since the PHONO input is selected by S2 in X08-2000-00, ④ and ⑤ are connected by S2 so that Q15 and Q17 go ON and H is applied to pin 1 of NAND gate 1 and pin 12 of NAND

gate 2. Therefore, both NAND gates 1 and 2 are open. When the PHONO input is switched between 1 and 2, the level at ③ becomes H momentarily so that IC5 (1/2) is triggered and muting is performed as described in 1) above.

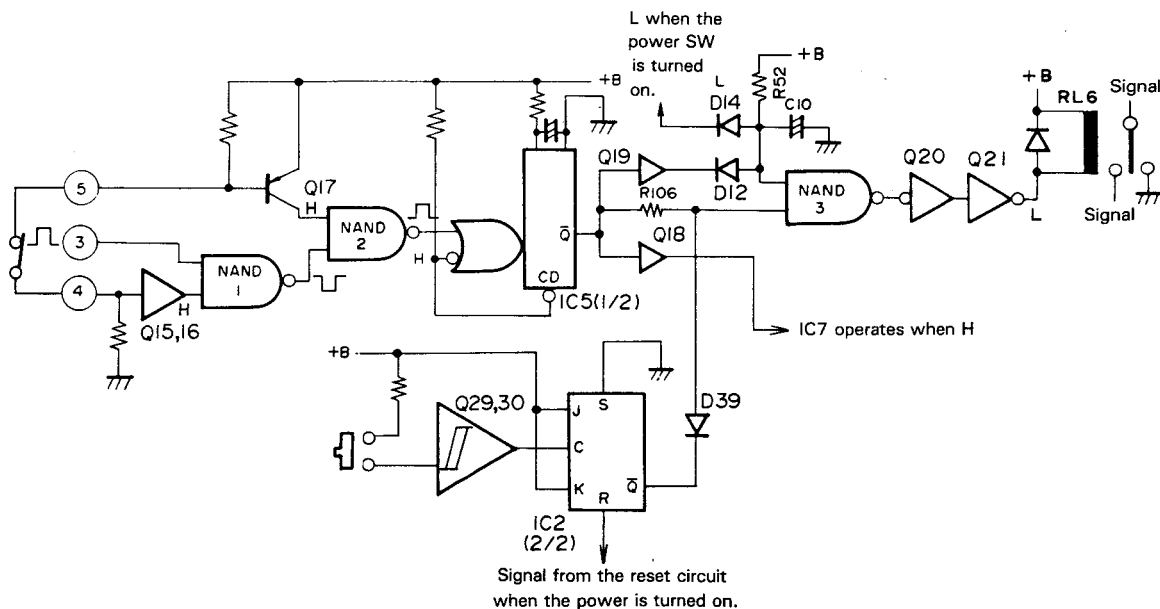


Fig. 31 Switching between PHONO 1 → 2

# CIRCUIT DESCRIPTION

## 4) During switching between MM→MC

Here, ④ and ⑤ are connected as described in 3) above so that both NAND gates 1 and 2 are open. During switching between MM and MC, the level at 3 becomes H while the switch is between contacts. Afterwards, a signal is added which produces a series of positive pulses (with a duration of about 3 seconds in the case of MM→MC and about 1.5 seconds in the case of MC→MM) with a period of 0.1 second and a duty ratio of 50. Therefore, the monostable multivibrator in IC5 (1/2) is triggered. Since the period of the pulse series is lower than the time constant of the monostable multivibrator, the vibrator remains active until the series has ended and for the period of time determined by the time constant following the rising edge of the last pulse. Thus, activation is different than in the case of other switching operations. The reason for the long active period is to prevent direct current in the output from reaching the final stage of the equalizer amp until the amplifier stabilizes following switching of its first stage. A considerable amount of time is required for stabilization because the MC equalizer in this unit is an AC amplifier.

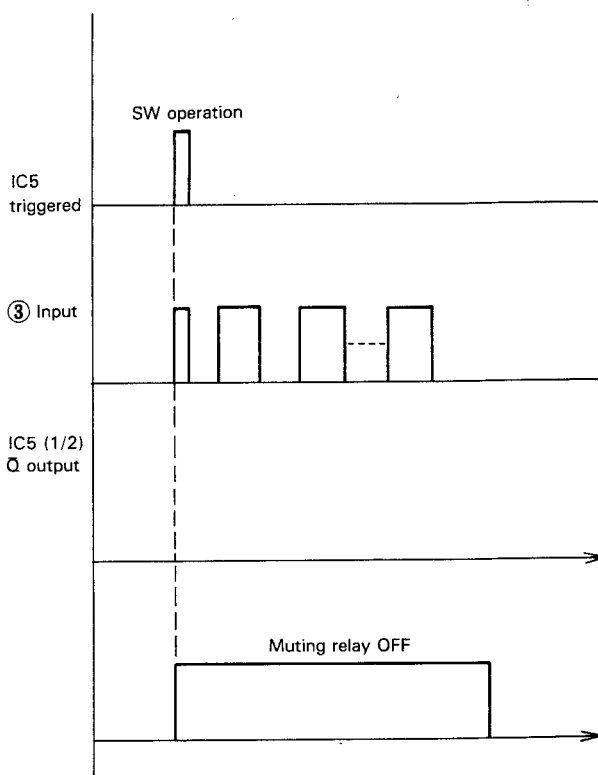


Fig. 32 Timing diagram for MM→MC switching

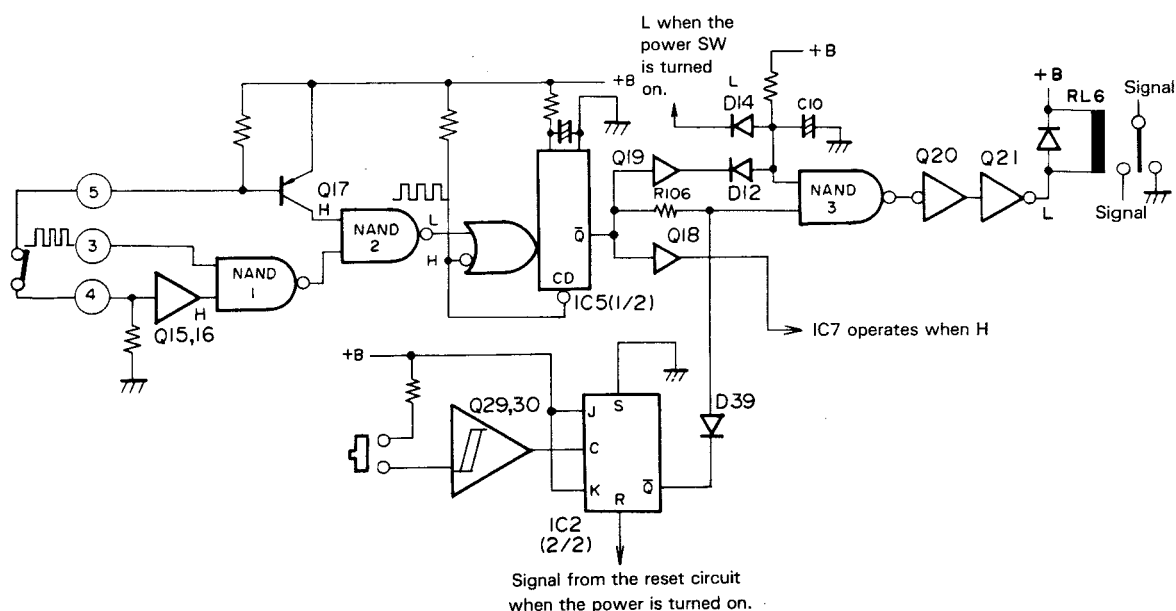


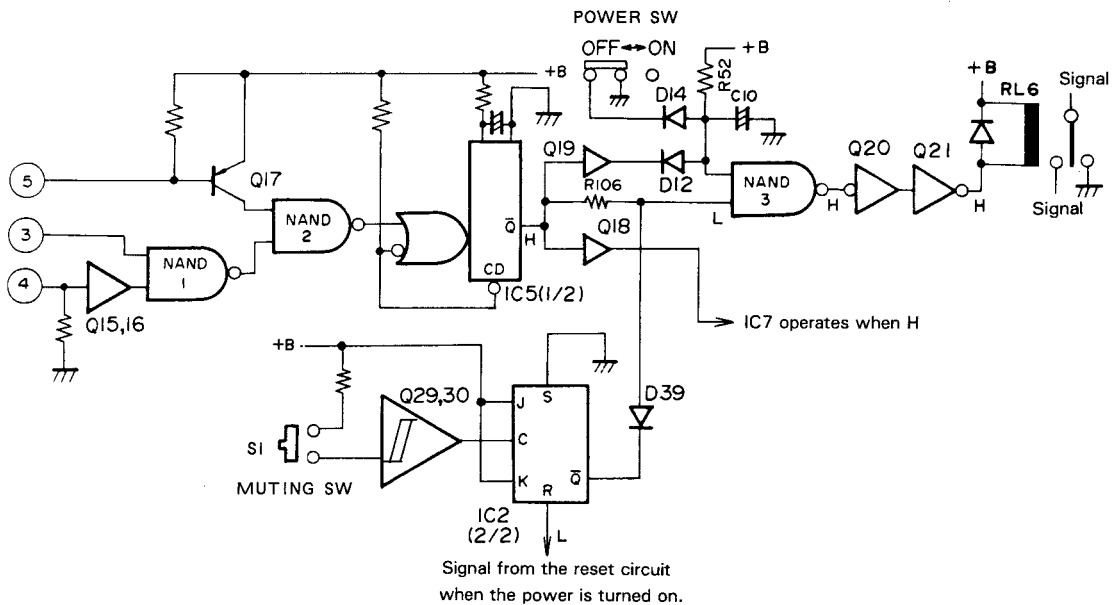
Fig. 33 Switching between MM→MC

## CIRCUIT DESCRIPTION

### 5) Muting switch and power switch operation

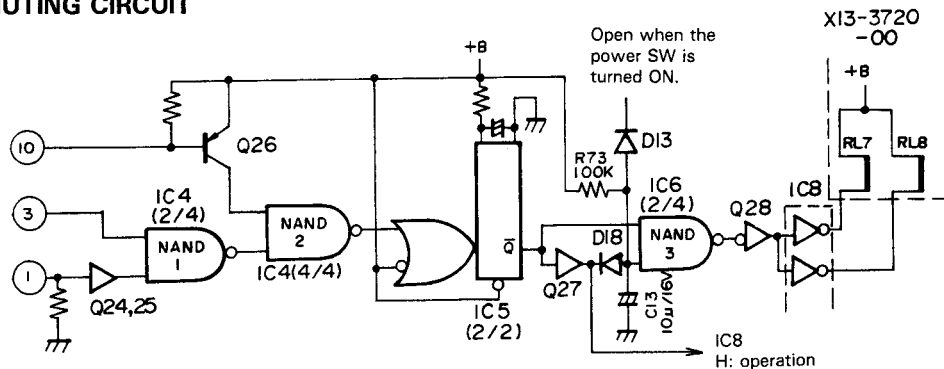
When muting switch S1 is set to ON, the clock is applied to the IC2 (2/2) JK-FF through a Schmitt circuit consisting of Q29 and Q30. Since both the J and K pins of the JK flip-flop are H, the element operates as a T flip-flop and the output is reversed each time S1 goes ON. When the power is turned on, IC1 (4/4) causes the level at the reset terminal to become H for a certain period of time; this resets the JK flip-flop to its initial condition. Since the  $\bar{Q}$  output is H, the flip-flop is

disconnected from the muting relay drive circuit by D39. When S1 goes ON at this time, the JK flip-flop reverses and the  $\bar{Q}$  output level becomes L. This causes the level at pin 13 of NAND gate 3 to become L so that the muting relay goes OFF to block the signal. When S1 goes ON again, the JK flip-flop is again reversed so that the signal is fully restored. Further, when the power is turned off, the level of pin 12 of NAND gate 3 is set to L through D14; this causes the muting relay to go OFF.



## CIRCUIT DESCRIPTION

## REC OUT MUTING CIRCUIT



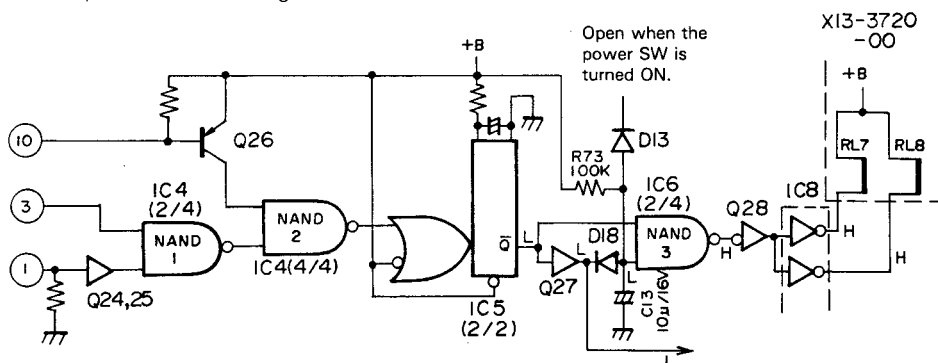
**Fig. 35 REC OUT muting circuit**

In the L-02A, the REC OUT circuit is muted along with the main signal system when switching is done. The REC OUT muting circuit is shown in Fig. 35. The following explanation is simplified because the principle is similar to that of the muting circuit for the main signal system. The REC OUT signals are turned ON and OFF by connecting terminal ⑩ (the base of Q26) to an IC8 input which corresponds to the relay to be turned ON.

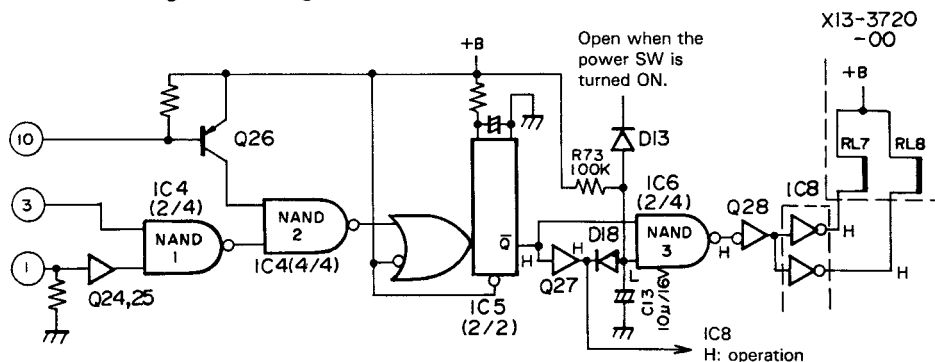
### 1) Muting when the REC OUT switch is operated

Terminal 10 is momentarily disconnected from all circuits when the REC OUT switch is operated. Therefore, Q26 is turned OFF and the output level of NAND gate 2 rises from L

to H. This triggers monostable multivibrator IC5 (2/2) so that the  $\bar{Q}$  output level drops to L. This L level sets the output level of NAND gate 3 to H, causing relays 7 and 8 to be turned OFF so that the REC OUT output is muted. The emitter level of Q27 is also set to L when  $\bar{Q}$  drops to L, so all gate inputs of IC 8 are set to L to disable the REC OUT selector being switched. The  $\bar{Q}$  output level returns to H after about 0.5 second (as determined by the 0.47 $\mu$ F capacitor and 100 k $\Omega$  resistor), then the REC OUT selector is set to the condition corresponding to the REC OUT switch setting. However, relays 7 and 8 are turned ON after an additional 0.5 seconds (determined by C13 and R73) has passed.



**Fig. 36** Muting circuit when monostable multivibrator is active



**Fig. 37 Muting circuit when monostable multivibrator is stable**

## CIRCUIT DESCRIPTION

### 2) Muting during switching between PHONO 1 and 2 or MM and MC

Terminals ① and ⑩ are connected when PHONO is selected. Therefore, both Q24 and Q26 are ON to set both pin 5 of NAND gate 1 and pin 8 of NAND gate 2 to H so that NAND gates 1 and 2 are open. When the input source is switched between PHONO 1 and PHONO 2 or MM and MC in this condition, the main signal system muting signal is applied to terminal 3. Thus, REC OUT is muted at the same timing as the main signal system.

### 3) Muting when REC OUT switch is switched from OFF to any other position

When the REC OUT switch is OFF, pins 6 and 7 of IC8 are grounded by D5 and D6 in X13-3730-00 so that REC OUT relays RL6 and RL7 are OFF. Terminal 10 is grounded through R15 in X13-3730-00 so that Q26 is ON. Therefore, when the REC OUT switch is switched from OFF to any other position, Q26 is turned OFF momentarily so the REC OUT circuit is muted in the same manner as when the REC OUT switch is switched normally. Thus, no shock noise is applied to the tape deck.

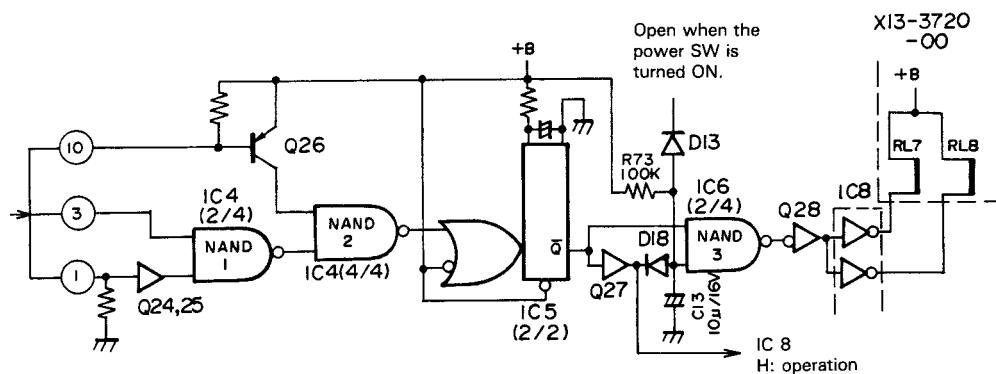


Fig. 38 Muting circuit when PHONO is selected

## ADJUSTMENT / REGLAGES / ABGLEICH

### ADJUSTMENT

Refer to PC BOARD on page 27, 30 and 31.

NO.	ITEM	INPUT SETTINGS	OUTPUT SETTINGS	AMPLIFIER SETTINGS	ALIGNMENT POINTS	ALIGN FOR	FIG.
1	OFFSET (PRE AMP)	—	Connect a DC voltmeter to T.P. (X08-2000)	PHONO: MM	VR1 (R) VR2 (L)	0 V	(a)
2	OFFSET (POWER AMP)	—	Connect a DC voltmeter to the CHECK terminal and GND (X07-1970)	VOLUME: 0	VR1 (L) VR2 (R) (X09-1870)	0 V	(b)
3	IDLE CURRENT	—	Connect a DC voltmeter to CHECK terminals (X07-1970)	VOLUME: 0	VR3 (L) VR4 (R) (X09-1870)	22 mV	(c)

### REGLAGE

N°.	ITEM	REGLAGE DE L'ENTREE	REGLAGE DE LA SORTIE	REGLAGE DE L'AMPLIFICATEUR	POINTS DE L'ALIGNEMENT	ALIGNER POUR	FIG.
1	DECALAGE (PRE-AMP.)	—	Connecter un voltmètre CC sur T.P. (X08-2000)	PHONO: MM	VR1 (R) VR2 (L)	0 V	(a)
2	DECALAGE (AMP. DE PUISSANCE)	—	Connecter un voltmètre CC au terminal CHECK et GND (X07-1970)	VOLUME: 0	VR1 (L) VR2 (R) (X09-1870)	0 V	(b)
3	REGLAGE DU COURANT DE POLARISATION	—	Connecter un voltmètre CC au terminal CHECK (X07-1970)	VOLUME: 0	VR3 (L) VR4 (R) (X09-1870)	22 mV	(c)

### ABGLEICH

NR.	GEGENSTAND	EINGANGS-EINSTELLUNG	AUSGANG-EINSTELLUNG	VORSTÄRKER EINSTELLUNG	ABGLEICH-PUNKTE	ABGLEICHEN FÜR	ABB.
1	VERSCHIEBUNG (VORVERSTÄRKER)	—	Einen Gleichspannungsmesser über T.P. anschließen (X08-2000)	PHONO: MM	VR1 (R) VR2 (L)	0 V	(a)
2	VERSCHIEBUNG (VERSTÄRKER)	—	Einen Gleichspannungsmesser zu Klemme CHECK und GND anschließen (X07-1970)	VOLUME: 0	VR1 (L) VR2 (R) (X09-1870)	0 V	(b)
3	LEERLAUFS	—	Einen Gleichspannungsmesser zu Klemme CHECK anschließen (X07-1970)	VOLUME: 0	VR3 (L) VR4 (R) (X09-1870)	22 mV	(c)

#### Note:

A self-restoring thermal switch is built into the power transformer. This switch is activated to cut output of the transformer when its temperature rises beyond 150°C. The amount of time required for recovery is approximately 5 minutes.

#### Remarque:

Un commutateur thermique à auto-déclenchement est incorporé au transformateur de puissance. Ce commutateur est activé pour couper l'alimentation du transformateur lorsque sa température s'élève au dessus de 150°C. Cinq minutes sont environ nécessaires pour que le transformateur soit de nouveau mis sous tension.

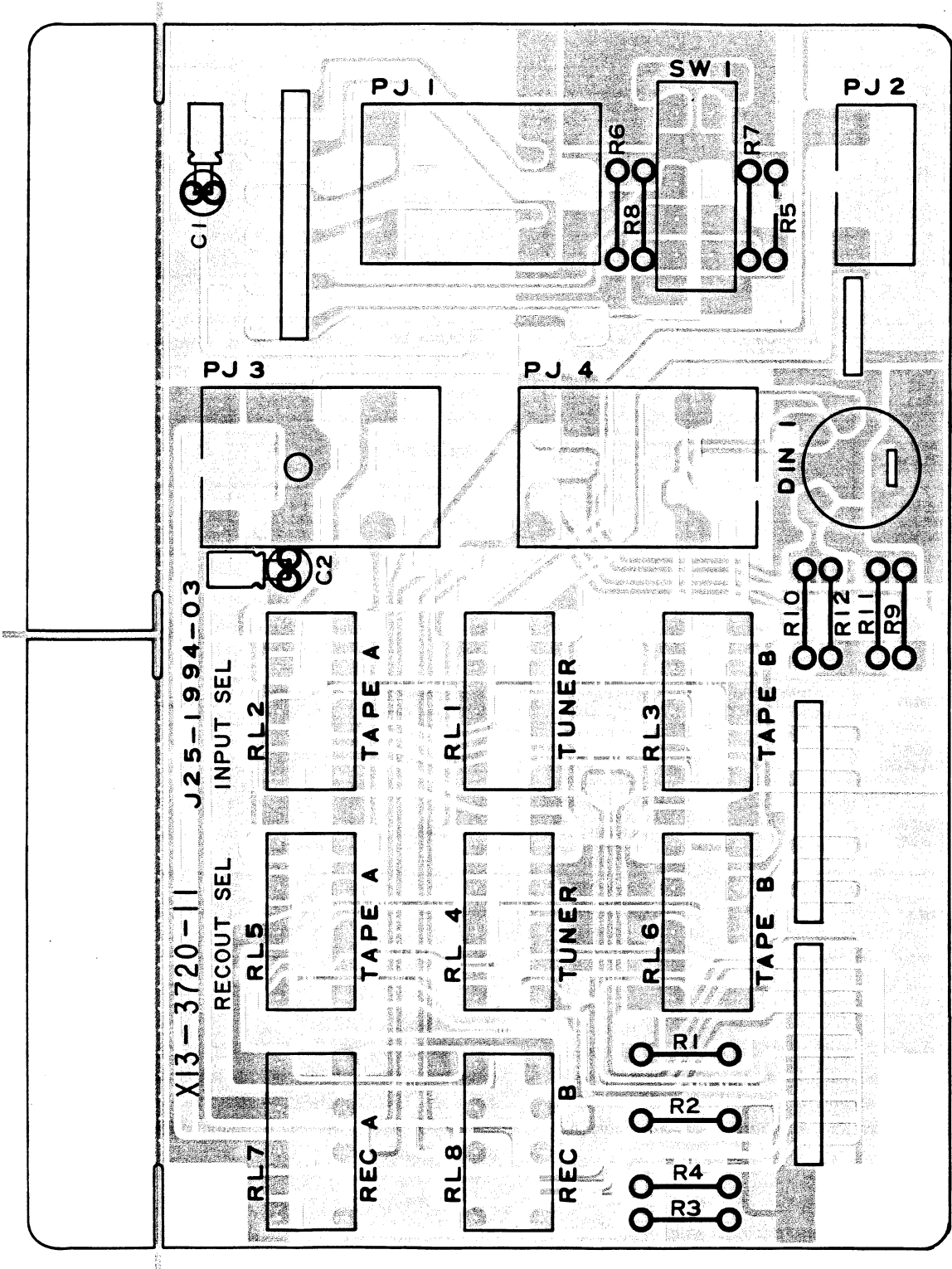
#### Bemerkung:

Ein Rückstell-Thermoschalter ist in den Netztransformator eingebaut. Der Schalter wird aktiviert, wenn seine Temperatur über 150° ansteigt, wobei der Transformatorausgang abgetrennt wird. Die zur Erholung erforderliche Zeit beträgt ca. 5 Minuten.



PC BOARD

SUB (X13-3720-11) Component side view

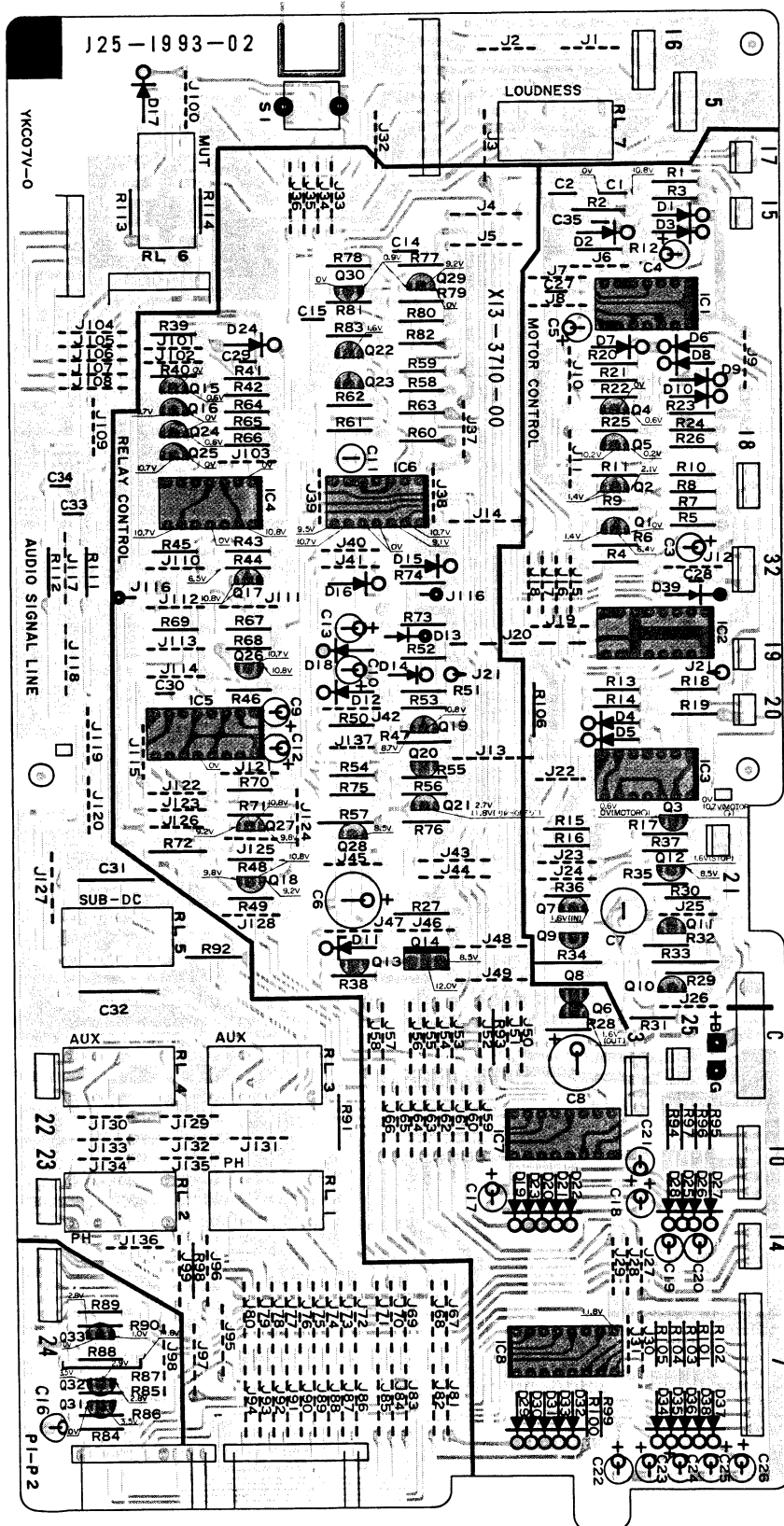


Refer to the schematic diagram for the values of resistors and capacitors.  
The PC board drawing is viewing from the side easy to check.



# PC BOARD

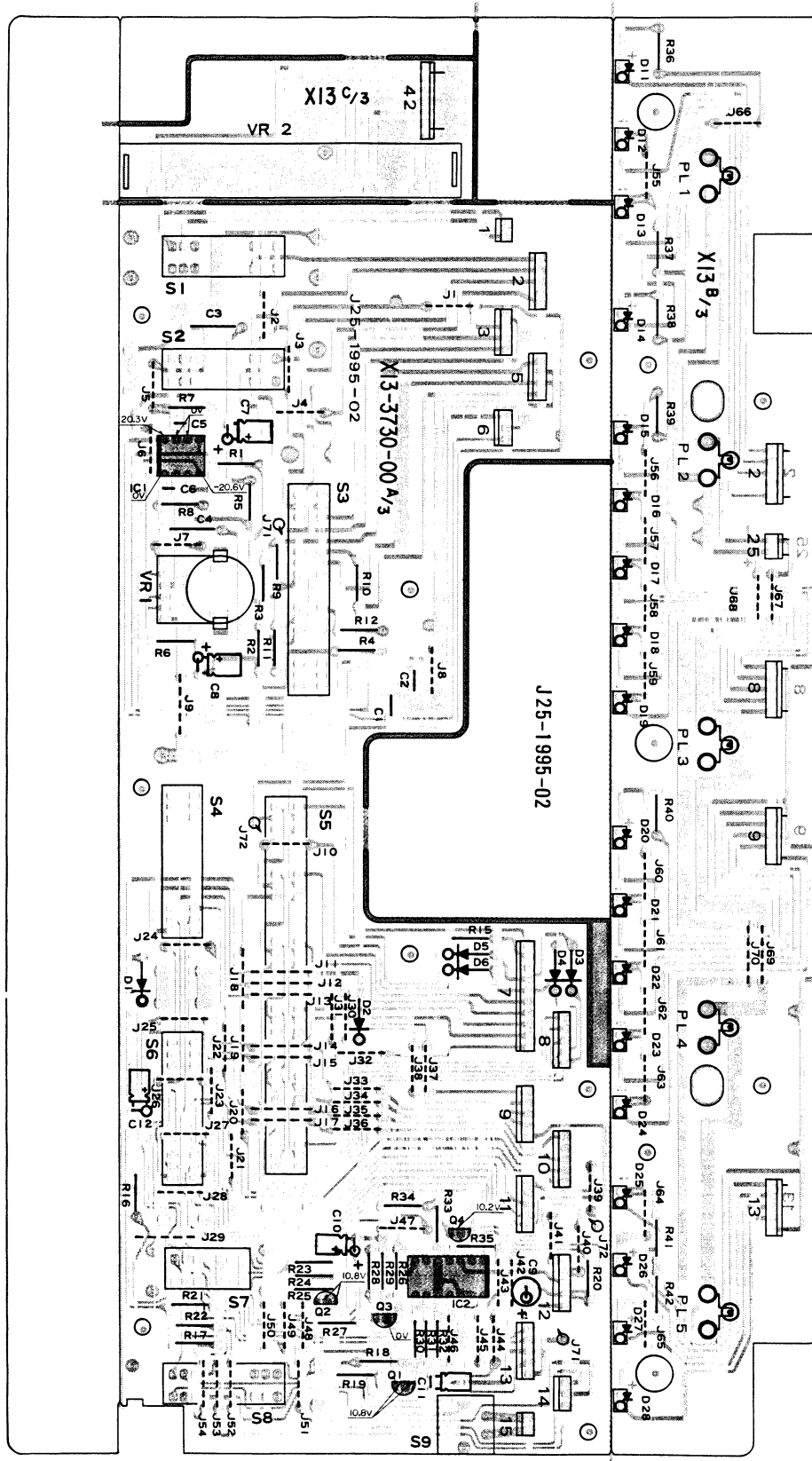
SUB (X13-3710-00) Component side view



Refer to the schematic diagram for the values of resistors and capacitors.  
The PC board drawing is viewing from the side easy to check.

# PC BOARD

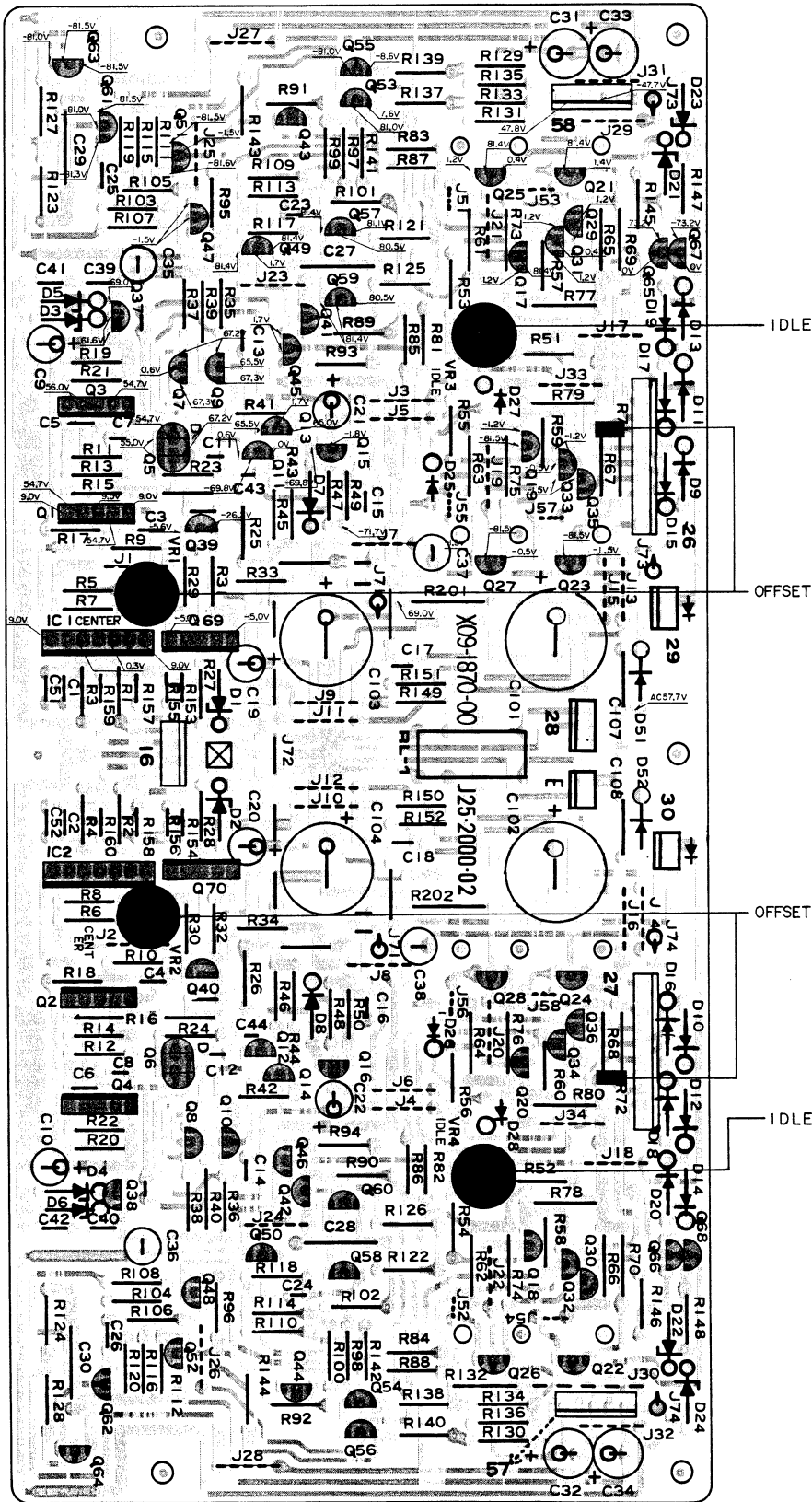
SWITCH (X13-3730-00) Component side view



Refer to the schematic diagram for the values of resistors and capacitors. The PC board drawing is viewing from the side easy to check.

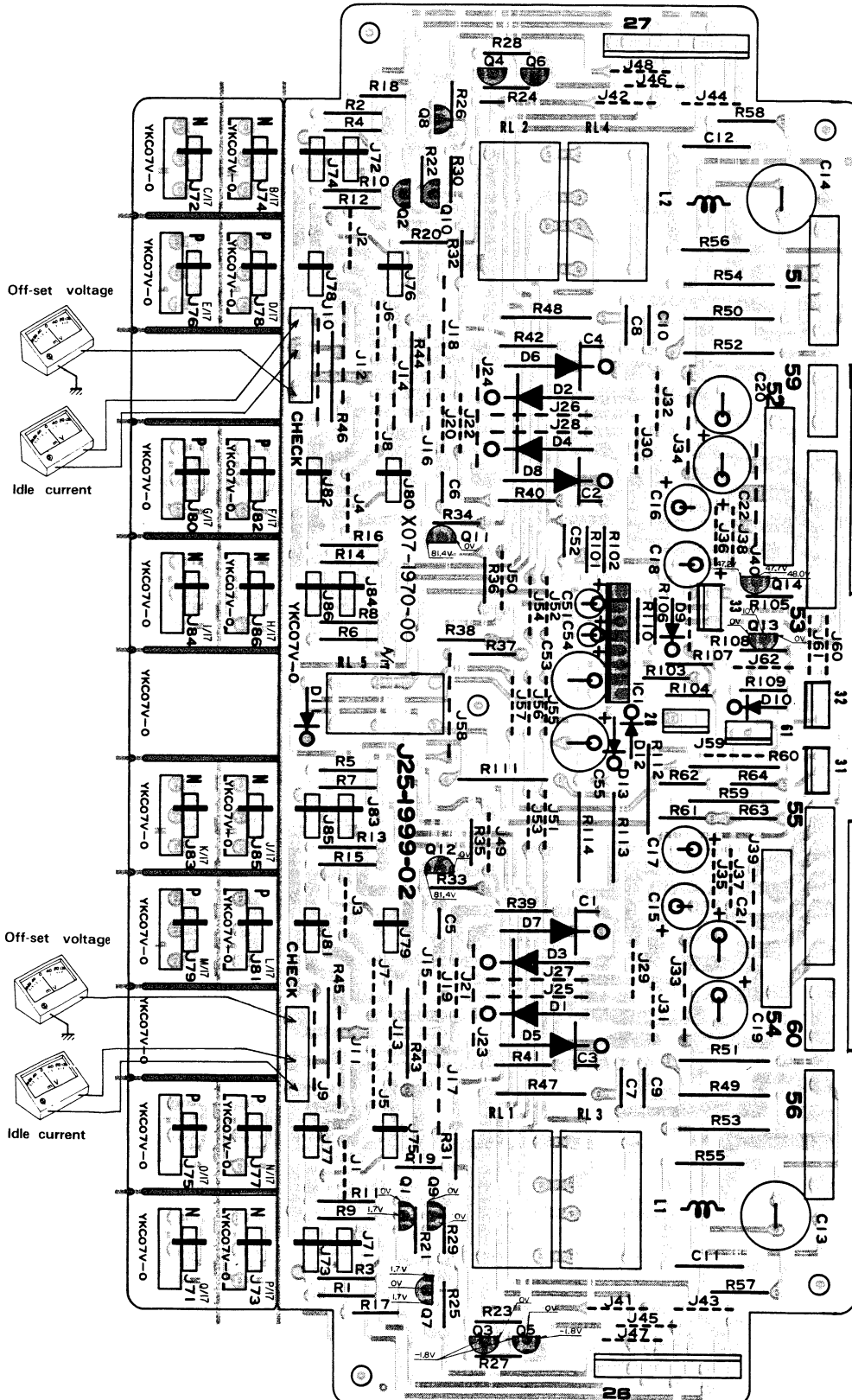
PC BOARD

AUDIO AMP (X09-1870-00) Component side view



# PC BOARD

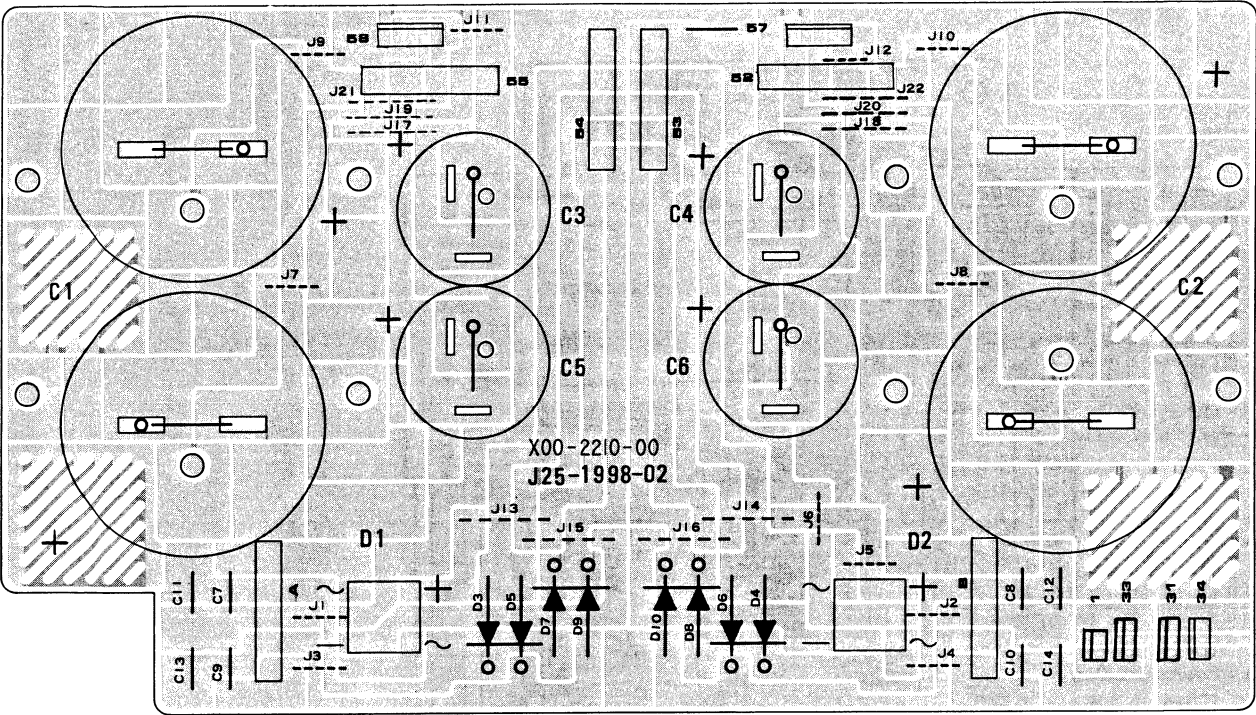
POWER AMP (X07-1970-00) Component side view



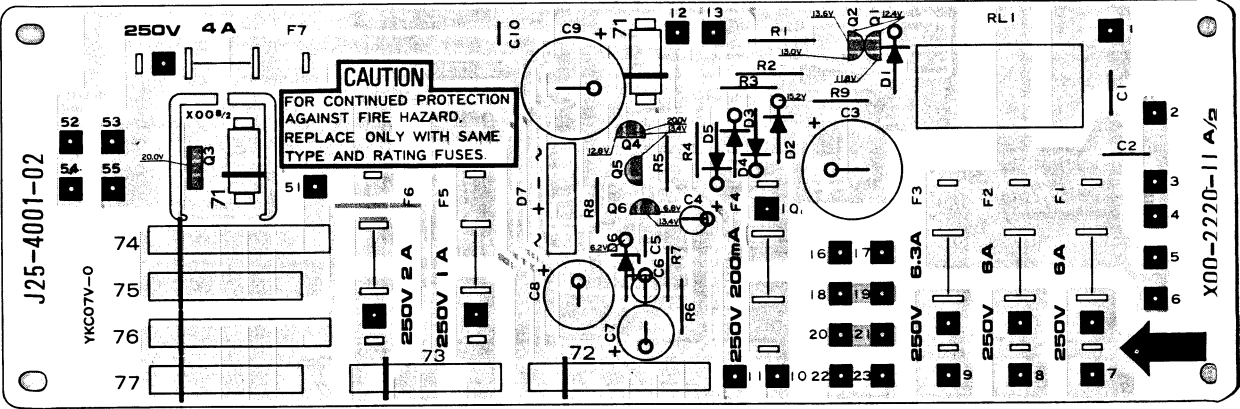
Refer to the schematic diagram for the values of resistors and capacitors.  
The PC board drawing is viewing from the side easy to check.

PC BOARD

POWER SUPPLY (X00-2210-00) Component side view

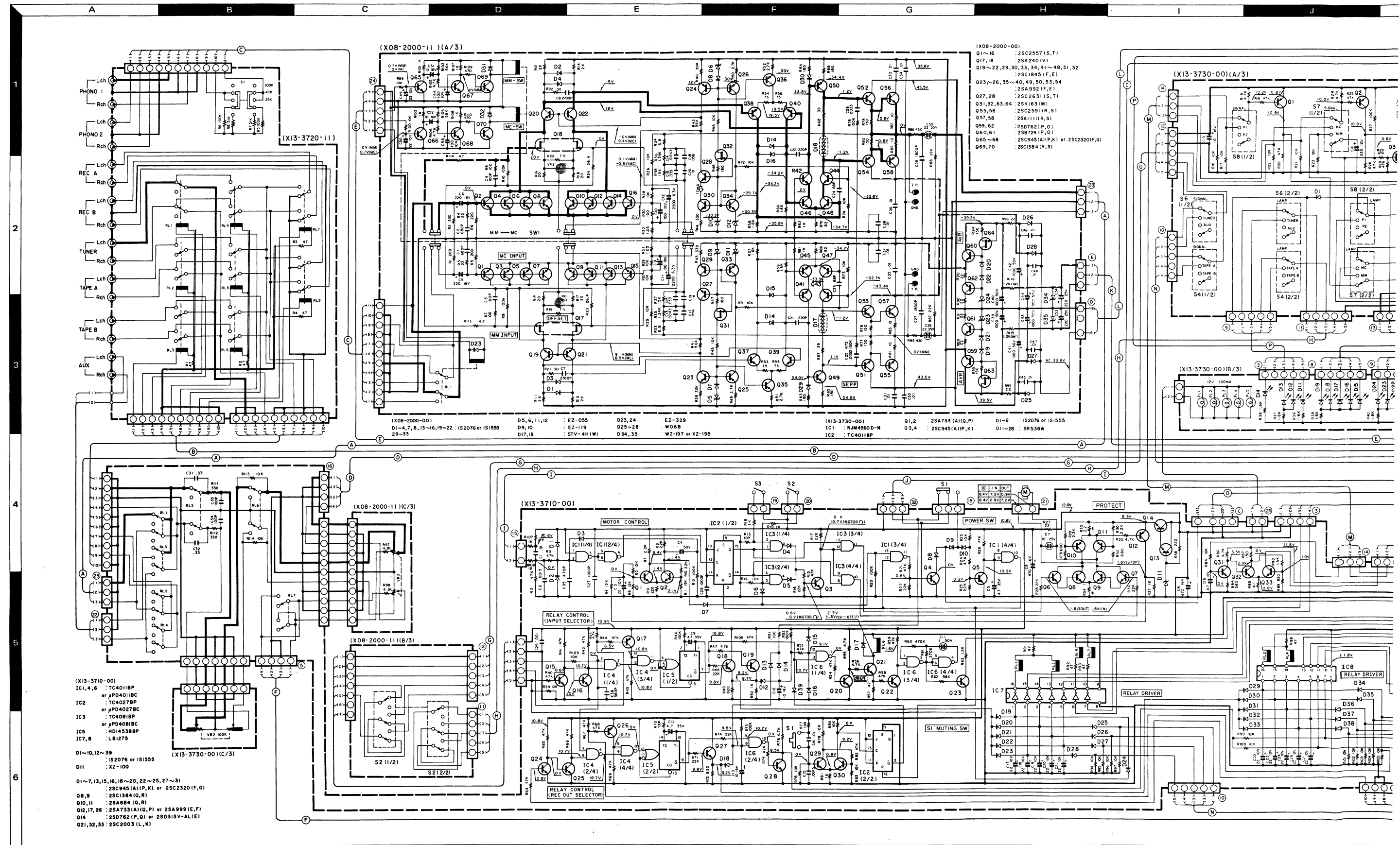


POWER SUPPLY (X00-2220-00) Component side view (L-02A-PS)



Refer to the schematic diagram for the values of resistors and capacitors.  
The PC board drawing is viewing from the side easy to check.



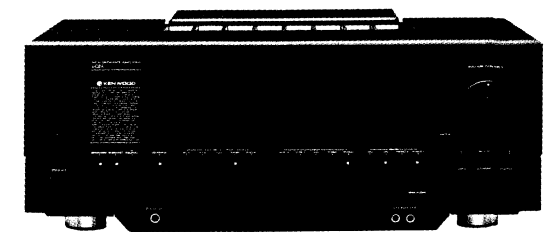
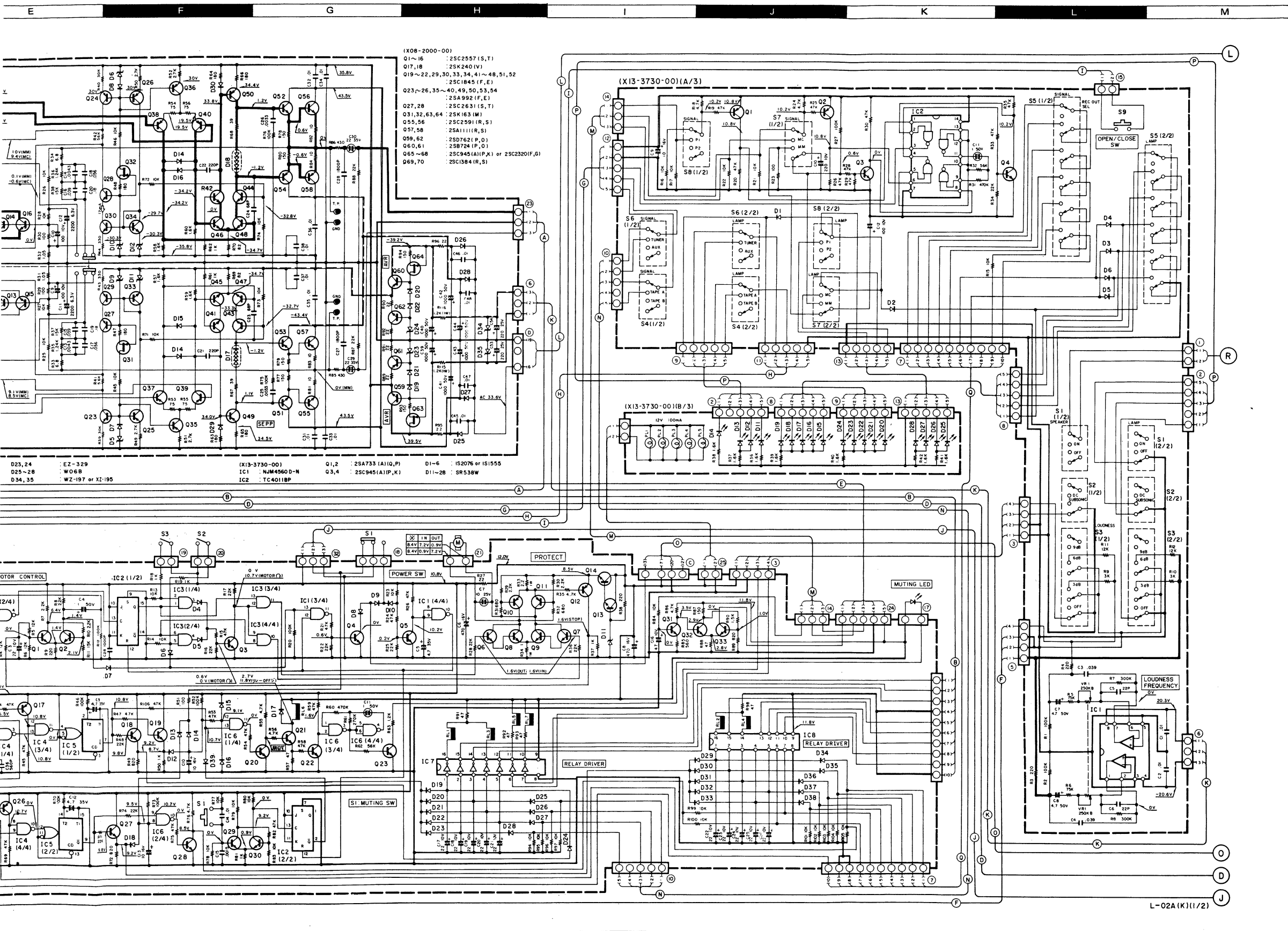


- DC voltages are measured by a VOM of 20 k $\Omega$ /V input impedance
- Les tensions de courant continu sont mesurées par un VOM d'une impédance d'entrée de 20 k $\Omega$ /V.



# NEW SEPARATE AMPLIFIER

# L-02A

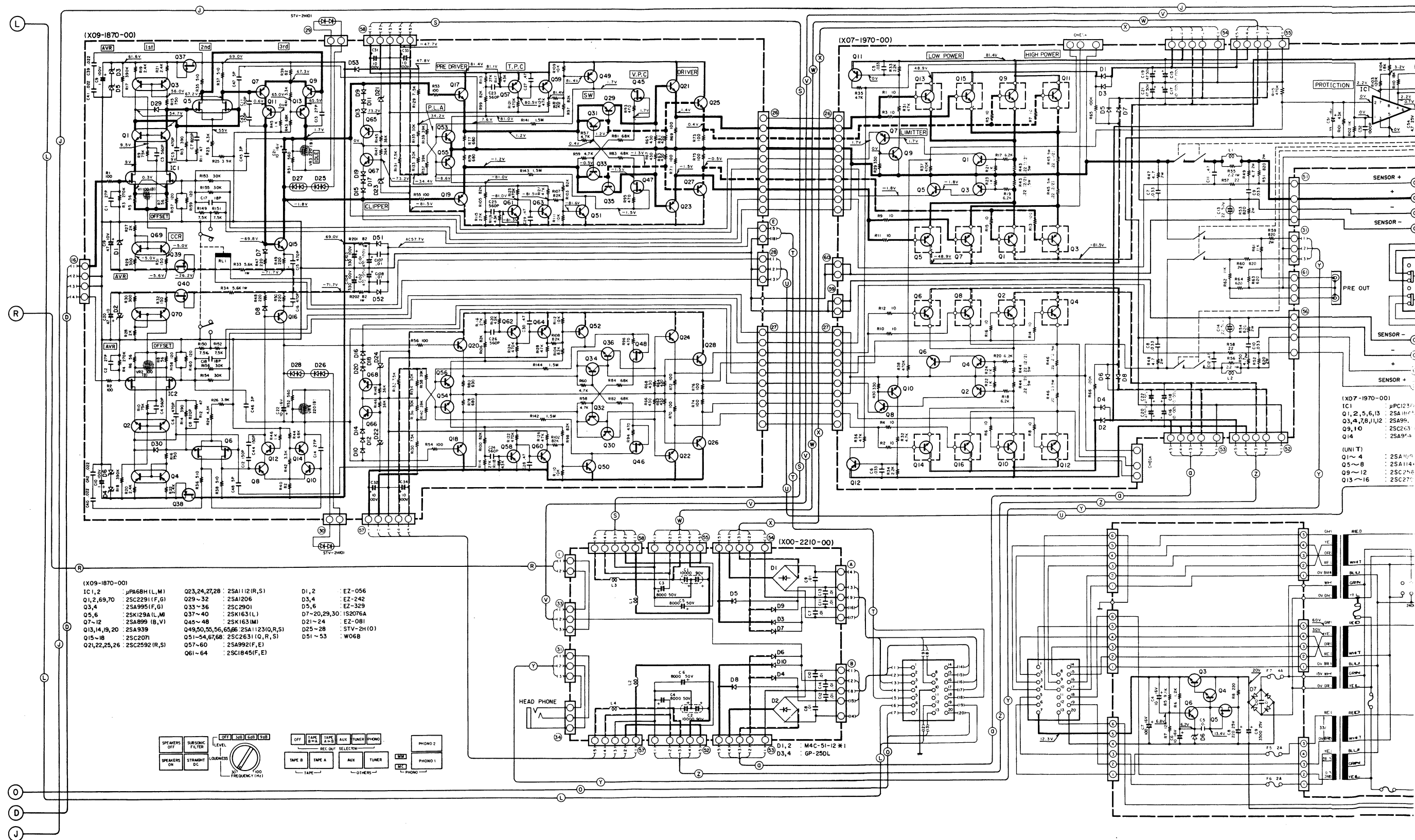


## Specifications

<b>Power output</b>	170 watts* per channel minimum RMS, both channels driven, at 8 ohms from 20 Hz to 20,000 Hz with no more than 0.003% total harmonic distortion.
<b>Total Harmonic Distortion</b> (20 Hz to 20,000 Hz)	AUX input to SPEAKER output: 0.003% at rated power into 8 ohms 0.003% at 1/2 rated power into 8 ohms 0.003% at 1 watt power into 8 ohms 0.003% at rated power with VOLUME - 20 dB 0.003% at rated power into 8 ohms
<b>Intermodulation Distortion</b> (60 Hz: 7 kHz = 4:1)	0.003% at rated power into 8 ohms
<b>Damping Factor</b>	10,000, at 55 Hz into 8 ohms
<b>Transient Response</b>	Rise Time: 1.0 μs Slew Rate: ±110 V/μs
<b>Frequency Response</b>	DC to 350 kHz, -3 dB
<b>Speaker Impedance</b>	Accepts 4 ohms to 16 ohms
<b>Input Sensitivity/Impedance</b>	Phono (MM): 2.5 mV/33 kohms, 47 kohms, 100 kohms Phono (MC): 0.1 mV/100 kohms Tuner, Aux, Tape Play (A, B): 150 mV/30 kohms
<b>Signal to Noise Ratio (IHF, A)</b>	Phono (MM): 91 dB for 2.5 mV input 97 dB for 5.0 mV input 103 dB for 10 mV input 73 dB for 0.1 mV input 110 dB for 150 mV input Maximum Input Level for Phono (MM): 350 mV (RMS), THD 0.0007% at 1,000 Hz (MC): 15 mV (RMS), THD 0.0007% at 1,000 Hz
<b>Output Level/Impedance</b>	Tape REC (Pin): 150 mV/430 ohms
<b>Frequency Response for Phono</b>	RIAA standard curve ±0.2 dB (20 Hz to 20,000 Hz)
<b>Loudness Control</b>	+3 dB, +6 dB, +9 dB variable from 30 Hz to 10,000 Hz (at -30 dB VOLUME Level)
<b>Subsonic Filter</b>	6 dB/Oct at 18 Hz
<b>General</b>	
<b>Power Consumption</b>	300 W
<b>AC Outlet</b>	Switched 2, Unswitched 1
<b>Dimensions</b>	Amplifier (L-02A) Power Supply (L-02A-PS) W 480 mm (18-7/8") W 480 mm (18-7/8") H 183 mm (7-3/16") H 183 mm (7-3/16") D 327 mm (12-7/8") D 163 mm (6-27/64")
<b>Net Weight</b>	17.5 kg (38.5 lb) 17 kg (37.4 lb)

\* Measured pursuant to Federal Trade Commission's Trade Regulation rule on Power Output Claims for Amplifier in U.S.A.

- DC voltages are measured by a VOM of 20 kΩ/V input impedance
- Les tensions de courant continu sont mesurées par un multimètre d'une impédance d'entrée de 20 kΩ/V.
- Die Gleichstrom-Spannungen werden durch ein Vielfachmeßgerät von 20 kΩ/V Eingangs-Impedanz gemessen.

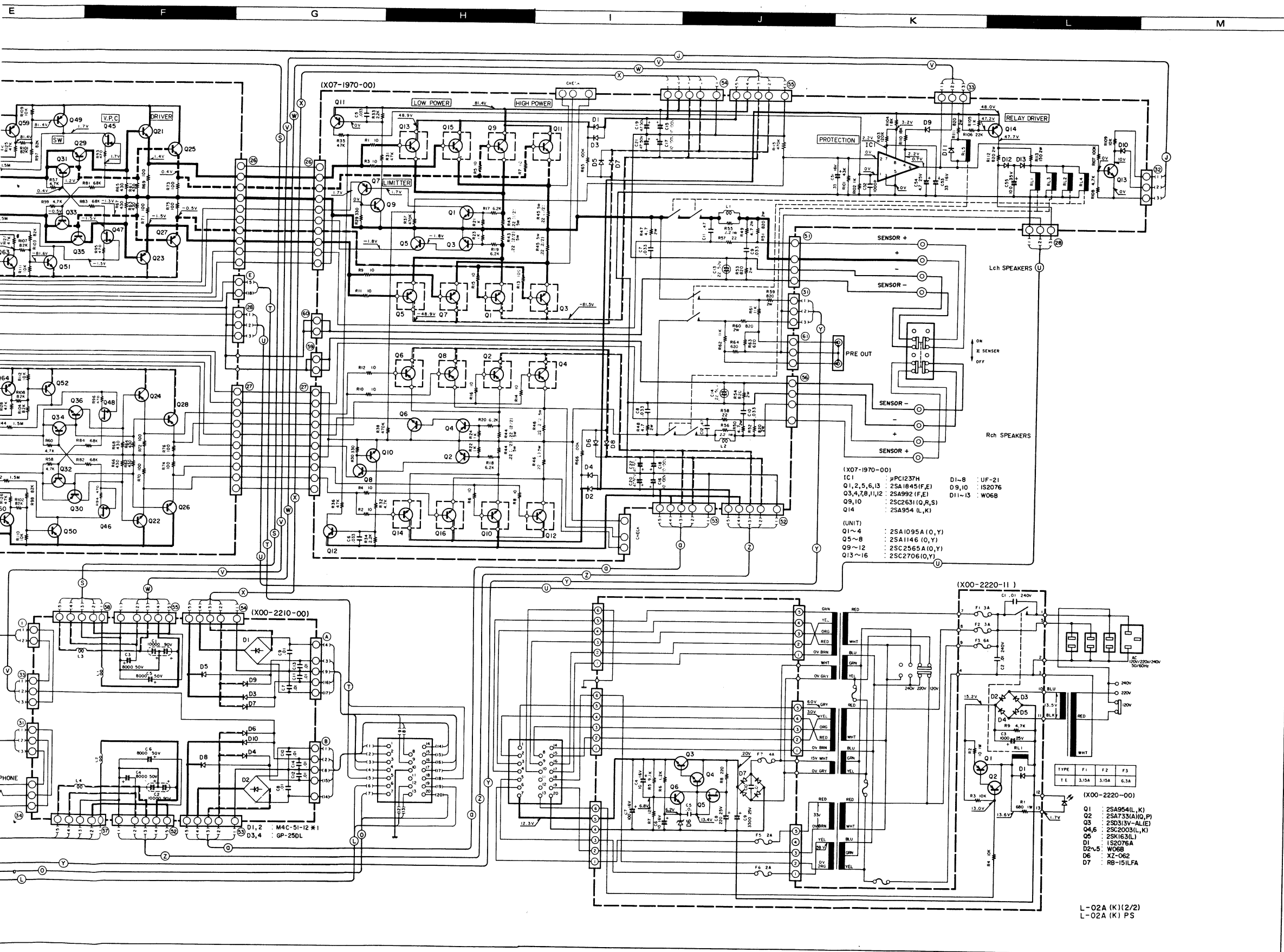


• DC voltages are measured by a VOM of 20 k $\Omega$ /V input impedance

• Les tensions de courant continu sont mesurées par un multimètre d'une impédance d'entrée de 20 k $\Omega$ /V.

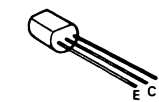
# NEW SEPARATE AMPLIFIER

# L-02A



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2SA954  
2SA992  
2SA1123  
2SC945  
2SC1384

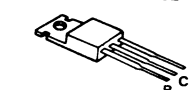
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2SC2003  
2SC2557  
2SC2631  
2SC2631



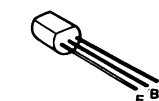
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2SA899  
2SC2071



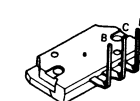
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2SA1112 2SC2592  
2SB724 2SD762



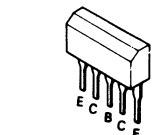
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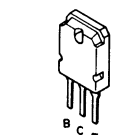
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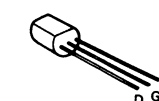
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2SA1146  
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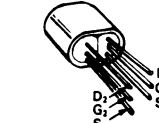
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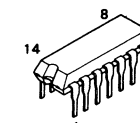
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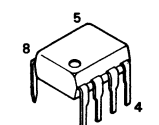
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2SK240



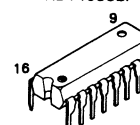
TC4011BP



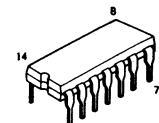
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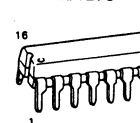
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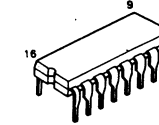
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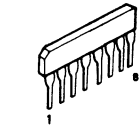
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TC4027BP



UPC1237H

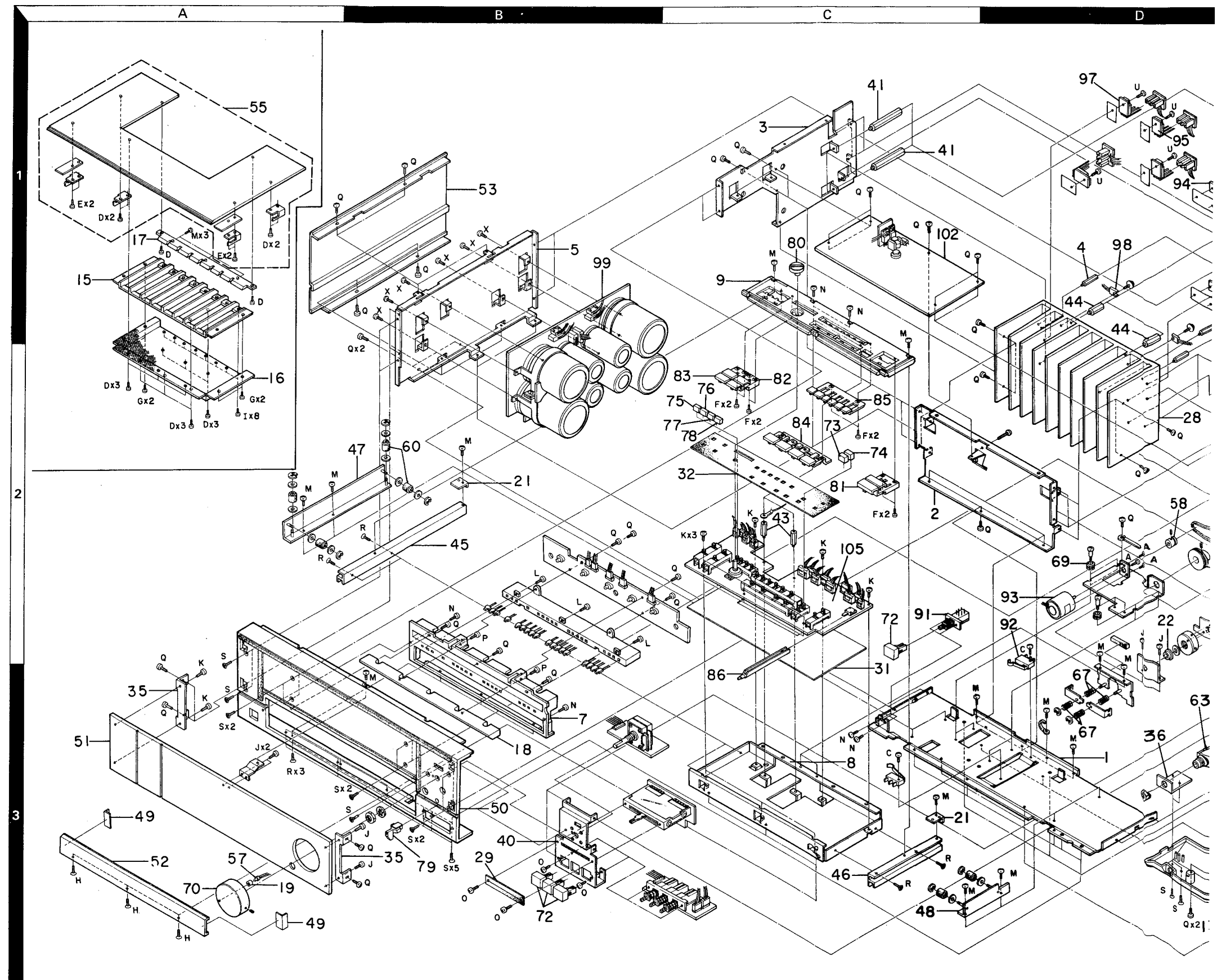


• DC voltages are measured by a VOM of 20 k $\Omega$ /V input impedance

• Les tensions de courant continu sont mesurées par un multimètre d'une impédance d'entrée de 20 k $\Omega$ /V.

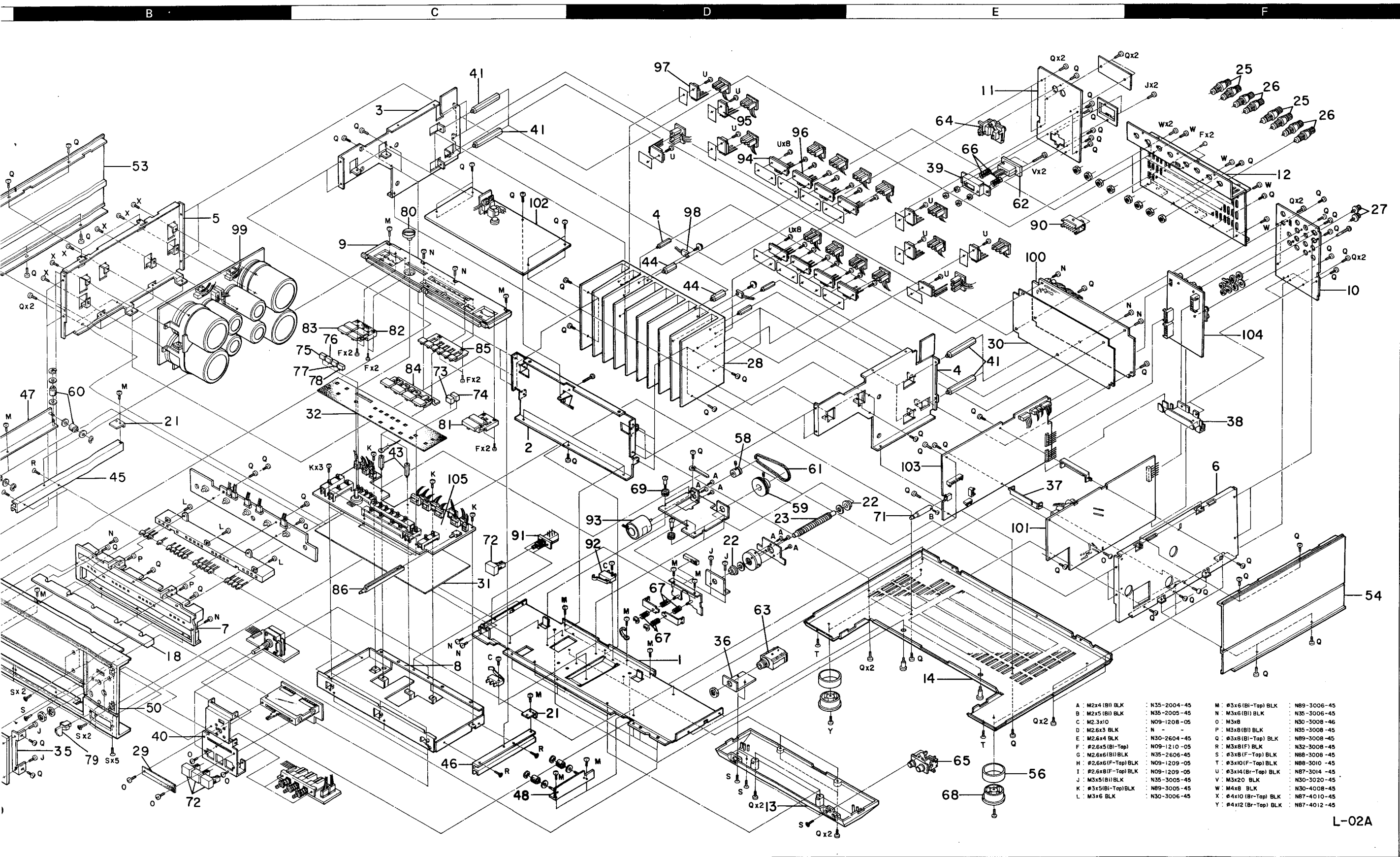
• Die Gleichstrom-Spannungen werden durch ein Vielfachmeßgerät von 20 k $\Omega$ /V Eingangs-Impedanz gemessen.

EXPLODED VIEW



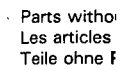


EXPLODED VIEW



L-02A

## PARTS LIST



Ref. No	参照番
101	2E
101	2E
102	1C
102	1C
102	1C
102	1C
103	2E
104	2F
104	2F
104	2F
104	2F
105	2C
106	1B
<b>POWI</b>	
C1	,2
C3	-6
C7	-14
L1	-4
D1	,2
D3	-10
<b>POW</b>	
C5	-10
C11	,12
C13	,14
C15	-18
C19	-22
C51	
C52	
C53	
C54	
C55	
L1	,2
R1	-10
R43	-40
R47	-50
R51	-50
R55	,50
R57	,50
R59	,60
R111	,10
R113	
RL1	-4
RL5	
D1	-8
D9	,10
D11	-10
IC1	
Q1	,2
Q3	,4
Q5	,6
Q7	,8
Q9	,10
Q11	,10
Q13	
Q14	
<b>PRE</b>	
C1	,2
C3	,4
C5	,6

E: S  
S: S  
**UE**

PARTS LIST

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Ref. No.	Parts No.	Description	Re- marks
参照番号	部品番号	部品名 / 規格	備考
L-02A UNIT			
1 3D	NO STOCK	MAIN CHASSIS	
2 2D	NO STOCK	METALLIC FRAME	
3 1C	NO STOCK	METALLIC FRAME	
4 2E	NO STOCK	METALLIC FRAME	
5 1B	NO STOCK	METALLIC FRAME	
6 2F	NO STOCK	METALLIC FRAME	
7 3B	NO STOCK	DRESSING PANEL	
8 3C	NO STOCK	MAIN CHASSIS	
9 1C	NO STOCK	DRESSING PANEL	
10 1F	NO STOCK	REAR PANEL	
11 1E	NO STOCK	REAR PANEL	
12 1F	NO STOCK	REAR PANEL	
13 3D	NO STOCK	BOTTOM PLATE	
14 3E	NO STOCK	BOTTOM PLATE	
15 1A	NO STOCK	DRESSING PLATE	
16 1B	NO STOCK	MESH PLATE	
17 1A	NO STOCK	ESCUTCHEON	
18 3B	NO STOCK	LIGHTING PLATE	
19 3A	NO STOCK	CAP	
21 3D	NO STOCK	STOPPER	
22 2D	NO STOCK	RETAINER	
23 2D	NO STOCK	SHAFT	
25 1F	NO STOCK	TERMINAL	
26 1F	NO STOCK	TERMINAL	
27 1F	NO STOCK	TERMINAL	
28 2D	NO STOCK	HEAT SINK	
29 3B	NO STOCK	SHIELDING	
30 2E	NO STOCK	INSULATING PLATE	
31 3C	NO STOCK	INSULATING PLATE	
32 2C	NO STOCK	CLOTH	
35 3B	NO STOCK	MOUNTING HARDWARE	
36 3D	NO STOCK	MOUNTING HARDWARE	
37 2E	NO STOCK	MOUNTING HARDWARE	
38 2F	NO STOCK	MOUNTING HARDWARE	
39 1E	NO STOCK	MOUNTING HARDWARE	
40 3B	NO STOCK	MOUNTING HARDWARE	
41 1C	NO STOCK	STUD	
42 1D	NO STOCK	STUD	
43 2C	NO STOCK	STUD	
44 1D	NO STOCK	STUD	
45 2B	NO STOCK	RAIL	
46 3C	NO STOCK	RAIL	
47 2B	NO STOCK	RAIL	
48 3C	NO STOCK	RAIL	
49 3A	NO STOCK	ESCUTCHEON	
50 3B	A20-3188-03	FRONT PANEL ASSY (B)	* *K
51 3A	A20-3194-02	FRONT PANEL (A)	UM
51 3A	A20-3194-02	FRONT PANEL (A)	XE
51 3A	A20-3194-02	FRONT PANEL (A)	*T
51 3A	A20-3316-02	FRONT PANEL (A)	
52 3A	A20-3193-03	FRONT PANEL (C)	*
53 1B	A50-0101-02	SIDE PLATE	*
54 3F	A50-0102-02	SIDE PLATE	*
55 1A	A52-0052-12	TOP PLATE ASSY	*
-	B46-0060-00	WARRANTY CARD	T
-	B46-0061-30	WARRANTY CARD	K
-	B46-0062-30	WARRANTY CARD	U
-	B46-0063-13	WARRANTY CARD(MILITARY)	U
-	B46-0064-20	WARRANTY CARD	X
-	B46-0078-03	WARRANTY CARD	E

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Ref. No.	Parts No.	Description	Re- marks
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101 2E	X08-2000-11	PRE AMP PCB ASSY	XT
101 2E	X08-2002-71	PRE AMP PCB ASSY	*E
102 1C	X09-1870-00	AUDIO AMP PCB ASSY	*K
102 1C	X09-1870-00	AUDIO AMP PCB ASSY	UM
102 1C	X09-1870-00	AUDIO AMP PCB ASSY	XT
102 1C	X09-1872-71	AUDIO AMP PCB ASSY	*E
103 2E	X13-3710-00	SUB PCB ASSY	*
104 2F	X13-3720-11	SUB PCB ASSY	*K
104 2F	X13-3720-11	SUB PCB ASSY	UM
104 2F	X13-3720-11	SUB PCB ASSY	XT
104 2F	X13-3722-71	SUB PCB ASSY	*E
105 2C	X13-3730-00	SWITCH PCB ASSY	*
106 1B	X00-2210-00	POWER SUPPLY PCB ASSY	*
POWER SUPPLY (X00-2210-00)			
C1 2	C90-1210-05	ELECTRO 10000UF 90WV	
C3 6	C90-1209-05	ELECTRO 8000UF 50WV	
C7 14	C54-2710-39	CERAMIC 0.01UF P	
L1 4	L33-0275-05	CHOKO COIL	
D1 2	V11-2101-40	M4C-51-12*1	
D3 10	V11-2401-50	GP25DL	
POWER AMP (X07-1970-00)			
C5 10	C46-1733-35	MYLAR 0.033UF J	
C11 12	C46-1747-45	MYLAR 0.47UF J	
C13 14	C26-1722-67	NP-ELEC 22UF 50WV	
C15 18	C90-1222-05	ELECTRO 10UF 100WV	
C19 22	C90-1221-05	ELECTRO 47UF 50WV	
C51	C24-1233-67	ELECTRO 33UF 16WV	
C52	C46-1710-25	MYLAR 0.001UF J	
C53	C25-1233-67	LL-ELEC 33UF 16WV	
C54	C24-1447-57	ELECTRO 4.7UF 25WV	
C55	C24-6510-77	ELECTRO 100UF 35WV	
L1 2	L39-0085-05	COIL	
R1 16	R43-1210-05	FL-PROOF RD10 J 2E	
R43 46	R90-0195-05	METAL-PLATE0.22 K 3H	
R47 50	R47-5547-95	FL-PROOF RS4.7 J 3D	
R51 54	R47-5582-15	FL-PROOF RS820 J 3D	
R55 56	R47-5422-95	FL-PROOF RS2.2 J 3A	
R57 58	R43-1222-05	FL-PROOF RD22 J 2E	
R59 60	R47-5582-15	FL-PROOF RS820 J 3D	
R111,112	R47-5582-15	FL-PROOF RS820 J 3D	
R113	R47-5515-15	FL-PROOF RS150 J 3D	
RL1 4	S51-2058-05	RELAY	
RL5	S51-2041-05	RELAY	
D1 8	V11-5102-30	UF-21	
D9 10	V11-0271-05	1S2076	
D11 13	V11-0295-05	W06B	
IC1	V30-0678-10	UPC1237H	
Q1 2	V03-1845-10	2SC1845(F,E)	
Q3 4	V01-0992-10	2SA992(F,E)	
Q5 6	V03-1845-10	2SC1845(F,E)	
Q7 8	V01-0992-10	2SA992(F,E)	
Q9 10	V03-2631-10	2SC2631(Q,R,S)	
Q11 12	V01-0992-10	2SA992(F,E)	
Q13	V03-1845-10	2SC1845(F,E)	
Q14	V01-0954-10	2SA954(L,K)	
PRE AMP (X08-2000-11)			
C1 2	C91-0098-05	POLYSTY 680PF J	
C3 4	C91-0088-05	POLYSTY 100PF K	
C5 6	C24-1222-77	ELECTRO 220UF 16WV	

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Ref. No. 参照番号	Parts No. 部品番号	Description 部品名 / 規格	Re- marks 備考
D25 -28 D29 -33 D34 ,35 Q1 -16 Q17 ,18  Q19 -22 Q23 -26 Q27 ,28 Q29 ,30 Q31 ,32  Q33 ,34 Q35 -40 Q41 -48 Q49 ,50 Q51 ,52  Q53 ,54 Q55 ,56 Q57 ,58 Q59 Q60 ,61  Q62 Q63 ,64 Q65 -68 Q69 ,70	V11-0295-05 V11-0271-05 V11-4100-30 V03-2557-10 V09-0153-20  V03-1845-10 V01-0992-10 V03-2631-40 V03-1845-10 V09-0144-11  V03-1845-10 V01-0992-10 V03-1845-10 V01-0992-10 V03-1845-10  V01-0992-10 V03-2591-30 V01-1111-30 V04-0762-30 V02-0724-20  V04-0762-30 V09-0144-11 V03-0945-41 V03-1384-10	W06B 1S2076 WZ-197 2SC2557(S,T) 2SK240(V)  2SC1845(F,E) 2SA992(F,E) 2SC2631(S,T) 2SC1845(F,E) 2SK163(M)  2SC1845(F,E) 2SA992(F,E) 2SC1845(F,E) 2SA992(F,E) 2SC1845(F,E)  2SA992(F,E) 2SC2591(R,S) 2SA1111(R,S) 2SD762(P,O) 2SB724(P,O)  2SD762(P,O) 2SK163(M) 2SC945(A)(P,K) 2SC1384(R,S)	*
<b>AUDIO AMP (X09-1870-00)</b>			
C1 ,2 C3 ,4 C5 ,6 C7 ,8 C9 ,10  C11 ,12 C13 ,14 C15 ,16 C17 ,18 C19 ,20  C21 ,22 C23 -26 C27 -30 C31 -34 C35 -38  C39 -42 C43 ,44 C45 ,46 C47 ,48 C51 ,52  C101,102 C103,104 C107,108  R1 ,2 R3 ,4 R5 -8 R33 ,34 R39 ,40  R61 -68 R69 -76 R77 -80 R153-156 R157-160  R201,202 VR1 ,2 VR3 ,4	C71-1727-05 C52-1756-16 C52-1747-16 C52-1782-16 C24-2010-57  C71-1715-15 C91-0171-05 C52-1747-16 C91-0169-05 C24-1047-67  C24-1210-67 C52-1756-16 C46-1747-45 C24-2010-67 C26-2010-57  C55-1722-38 C71-1715-15 C71-1703-01 C71-1705-01 C71-1702-01  C24-2047-77 C24-2033-77 C54-2710-39  R48-2210-15 R48-2227-45 R48-2256-05 R47-5456-25 R43-1282-05  R43-1243-15 R43-1210-15 R43-1268-15 R49-6230-33 R49-6212-13  R47-5482-05 R12-0502-05 R12-0511-05	CERAMIC 27PF J CERAMIC 560PF K CERAMIC 470PF K CERAMIC 820PF K ELECTRO 1UF 100WV  CERAMIC 150PF J POLYSTY 27PF K CERAMIC 470PF K POLYSTY 18PF K ELECTRO 47UF 10WV  ELECTRO 10UF 16WV CERAMIC 560PF K MYLAR 0.47UF J ELECTRO 10UF 100WV NP-ELEC 1UF 100WV  CERAMIC 0.022UF Z CERAMIC 150PF J CERAMIC 3PF C CERAMIC 5PF C CERAMIC 2PF C  ELECTRO 470UF 100WV ELECTRO 330UF 100WV CERAMIC 0.01UF P  RN 100 J 2E RN 270K J 2E RN 56 J 2E FL-PROOF RS5.6K J 3A FL-PROOF RD82 J 2E  FL-PROOF RD430 J 2E FL-PROOF RD100 J 2E FL-PROOF RD680 J 2E RN 30K F 2E RN 120 F 2E  FL-PROOF RS82 J 3A TRIMMING POTENTIOMETER TRIMMING POTENTIOMETER	
<b>SUB (X13-3710-00)</b>			
RL1  D1 ,2 D3 ,4 D5 ,6 D7 -20 D21 -24  D25 -28 D29 ,30 D51 -53 IC1 ,2 Q1 ,2  Q3 ,4 Q5 ,6 Q7 -12 Q13 ,14 Q15 -18  Q19 ,20 Q21 ,22 Q23 ,24 Q25 ,26 Q27 ,28  Q29 -32 Q33 -36 Q37 -40 Q45 -48 Q49 ,50  Q51 -54 Q55 ,56 Q57 -60 Q61 -64 Q65 ,66  Q67 ,68 Q69 ,70	S51-2041-05  V11-4109-90 V11-4109-40 V11-4109-70 V11-0273-05 V11-4114-80  V11-5101-70 V11-0273-05 V11-0295-05 V09-0145-30 V03-2291-20  V01-0995-10 V09-0163-10 V01-0199-05 V01-0939-00 V03-2071-00  V01-0939-00 V03-2592-40 V01-1112-40 V03-2592-40 V01-1112-40  V01-1206-00 V03-2901-00 V09-0144-60 V09-0144-11 V01-1123-10  V03-2631-10 V01-1123-10 V01-0992-10 V03-1845-10 V01-1123-10  V03-2631-10 V03-2291-20	RELAY  EZ-056 EZ-242 EZ-329 1S2076A EZ-081  STV-2H(O) 1S2076A W06B UPA68H(L,M) 2SC2291(F,G)  2SA995(F,G) 2SK129A(L,M) 2SA899(B,V) 2SA939 2SC2071  2SA939 2SC2592(R,S) 2SA1112(R,S) 2SC2592(R,S) 2SA1112(R,S)  2SA1206 2SC2901 2SK163(L) 2SK163(M) 2SA1123(Q,R,S)  2SC2631(Q,R,S) 2SA1123(Q,R,S) 2SA992(F,E) 2SC1845(F,E) 2SA1123(Q,R,S)  2SC2631(Q,R,S) 2SC2291(F,G)	*
C1 C2 C3 C4 C5  C6 C7 C8 C9 C10  C11 C12 C13 C14 C15  C16 C17 -26 C27 -30 C31 ,32 C33 ,34  C35 C36  R27 R33 R34 R38 R57	C46-1710-37 C46-1715-27 C24-1047-67 C24-1710-57 C24-6547-57  C24-1247-77 C26-1410-67 C24-1247-77 C24-6547-57 C24-1210-67  C26-1710-57 C24-6547-57 C24-1210-67 C46-1710-37 C46-1715-27  C24-1047-67 C24-1022-67 C55-1710-38 C49-2033-45 C91-0088-05  C52-1747-16 C52-1756-16  R43-1222-05 R47-5418-95 R47-5401-05 R42-1222-15 R43-1247-05	MYLAR 0.01UF M MYLAR 0.0015UF M ELECTRO 47UF 10WV ELECTRO 1UF 50WV ELECTRO 4.7UF 35WV  ELECTRO 470UF 16WV NP-ELEC 10UF 25WV ELECTRO 470UF 16WV ELECTRO 4.7UF 35WV ELECTRO 10UF 16WV  NP-ELEC 1UF 50WV ELECTRO 4.7UF 35WV ELECTRO 10UF 16WV MYLAR 0.01UF M MYLAR 0.0015UF M  ELECTRO 47UF 10WV ELECTRO 22UF 10WV CERAMIC 0.01UF Z MYLAR 0.33UF J POLYSTY 100PF K  CERAMIC 470PF K CERAMIC 560PF K  FL-PROOF RD22 J 2E FL-PROOF RS1.8 J 3A FL-PROOF RS1 J 3A FL-PROOF RD220 J 2E FL-PROOF RD47 J 2E	

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R87 R91 -93 R98 R111,112	R47-5415-15 R43-1247-05 R43-1247-05 R48-2233-15	FL-PROOF RS150 J 3A FL-PROOF RD47 J 2E FL-PROOF RD47 J 2E RN 330 J 2E	
RL1 -7 S1	S51-2056-05 S40-1052-05	RELAY PUSH SWITCH	
D1 -10 D11 D12 -39 IC1 IC2	V11-0271-05 V11-4104-10 V11-0271-05 V30-0301-70 V30-1050-06	1S2076 XZ-100 1S2076 TC4011BP TC4027BP	
IC3 IC4 IC5 IC6 IC7 ,8	V30-0299-10 V30-0301-70 V30-0806-10 V30-0301-70 V30-0759-10	TC4081BP TC4011BP HD14538BP TC4011BP LB1275	
Q1 -7 Q8 ,9 Q10 ,11 Q12 Q13	V03-0945-41 V03-0373-05 V01-0130-05 V01-0733-40 V03-0945-41	2SC945(A)(P,K) 2SC1384(Q,R) 2SA684(Q,R) 2SA733(A)(Q,P) 2SC945(A)(P,K)	
Q14 Q15 ,16 Q17 Q18 -20 Q21	V04-0762-30 V03-0945-41 V01-0733-40 V03-0945-41 V03-2003-30	2SD762(P,O) 2SC945(A)(P,K) 2SA733(A)(Q,P) 2SC945(A)(P,K) 2SC2003(L,K)	
Q22 -25 Q26 Q27 -31 Q32 ,33	V03-0945-41 V01-0733-40 V03-0945-41 V03-2003-30	2SC945(A)(P,K) 2SA733(A)(Q,P) 2SC945(A)(P,K) 2SC2003(L,K)	
<b>SUB (X13-3720-11)</b>			
C2 C3 -6	C26-1710-57 C71-1768-05	NP-ELEC 1UF 50WV CERAMIC 68PF J	
PJ1 PJ2 PJ3 ,4	E13-0440-05 E13-0219-05 E13-0440-05	PHONO JACK PHONO JACK PHONO JACK	
R1 -4 R5 ,6 R7 ,8	R42-1247-05 R48-2210-45 R48-2251-35	FL-PROOF RD47 J 2E RN 100K J 2E RN 51K J 2E	
RL1 -8 S1	S51-2056-05 S31-2059-05	RELAY SLIDE SWITCH	
<b>SWITCH (X13-3730-00)</b>			
D11 -28 PL1 -5	B30-0258-05 B30-0196-05	LAMP LAMP	
C1 ,2 C3 ,4 C5 ,6 C7 ,8 C9	C46-1710-36 C49-2039-35 C71-1722-05 C25-1747-57 C24-1210-67	MYLAR 0.01UF K POLYPRO 0.039UF J CERAMIC 22PF J LL-ELEC 4.7UF 50WV ELECTRO 10UF 16WV	
C10 C11 C12	C24-1022-77 C26-1710-57 C24-1010-77	ELECTRO 220UF 10WV NP-ELEC 1UF 50WV ELECTRO 100UF 10WV	
VR1 VR2	R06-6006-05 R13-5031-05	POTENTIOMETER POTENTIOMETER	* *
S1 ,2 S3 S4 S5 S6	S42-2072-05 S42-4023-05 S42-2073-05 S42-6013-05 S42-2073-05	PUSH SWITCH PUSH SWITCH PUSH SWITCH PUSH SWITCH PUSH SWITCH	

Ref. No. 参照番号	Parts No. 部品番号	Description 部品名 / 規格	Re- marks 備考
S7 S8 S9	S42-2071-05 S42-2072-05 S40-1052-05	PUSH SWITCH PUSH SWITCH PUSH SWITCH	
D1 -6 IC1 IC2 Q1 ,2 Q3 ,4	V11-0271-05 V30-0344-40 V30-0301-70 V01-0733-40 V03-0945-41	1S2076 NJM4560D-N TC4011BP 2SA733(A)(Q,P) 2SC945(A)(P,K)	

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<b>L-02A-PS</b>			
1 3B	NO STOCK	MAIN CHASSIS	
2 1B	NO STOCK	SHIELDING	
3 1B	NO STOCK	REINFORCING HARDWARE	
4 3A	NO STOCK	MOUNTING HARDWARE	
5 2B	NO STOCK	MOUNTING HARDWARE	
6 2A	NO STOCK	MOUNTING HARDWARE	
7 2A	NO STOCK	MOUNTING HARDWARE	
8 1A	NO STOCK	MOUNTING HARDWARE	
9 2B	NO STOCK	REINFORCING HARDWARE	
10 3A	NO STOCK	COVER	
11 1B	A01-0432-02	METALLIC CABINET	*
12 1B	A01-0433-03	METALLIC CABINET	*
-	B58-0260-04	CAUTION CARD	*
13 2B	B30-0191-05	LED	*
-	E30-0737-05	SPEAKER CORD	K
-	E30-0738-05	SPEAKER CORD	UM
-	E30-0738-05	SPEAKER CORD	XT
-	E30-0738-05	SPEAKER CORD	E
14A 2A	E03-0031-05	AC OUTLET	
14B 2A	E03-0058-05	AC INLET	*
15 3A	E09-2002-05	RECTANGULAR PLUG	*
16 3A	E09-2003-05	RECTANGULAR PLUG	*
17 3A	E30-0725-05	POWER CORD	KU
17 3A	E30-0725-05	POWER CORD	M
17 3A	E30-0726-05	POWER CORD	*E
17 3A	E30-0728-05	POWER CORD	*T
17 3A	E30-0729-05	POWER CORD	*X
18 3A	E30-0715-05	POWER CORD	*
19 3A	G01-0465-04	COIL SPRING	*
20 2A	G02-0092-04	FLAT SPRING	*
-	H01-3443-04	CARTON BOX	*K
-	H01-3443-04	CARTON BOX	UM
-	H01-3443-04	CARTON BOX	XE
-	H01-3444-04	CARTON BOX	*T
-	H10-1614-03	POLYSTYRENE FIXTURE	*
-	H10-1615-03	POLYSTYRENE FIXTURE	*
-	H12-0096-02	PACKING FIXTURE	*
-	H12-0101-04	PACKING FIXTURE	*
-	H12-1111-04	PACKING FIXTURE	*
-	H20-0464-04	COVER	*
-	H25-0067-03	BAG	*
-	H25-0194-04	BAG	*
21 3B	J02-0101-05	FOOT	
22 2B	J19-0509-04	LED HOLDER	
24 1A	K01-0073-05	HANDLE	*
25 2A	L01-2756-05	POWER TRANS	*
26 2B	L01-2731-05	POWER TRANS	*K
26 2B	L01-2736-05	POWER TRANS	*U
26 2B	L01-2736-05	POWER TRANS	MX
26 2B	L01-2736-05	POWER TRANS	TE
27 3B	L01-2741-05	POWER TRANS	*K
27 3B	L01-2746-05	POWER TRANS	*U
27 3B	L01-2746-05	POWER TRANS	MX
27 3B	L01-2746-05	POWER TRANS	TE
28 2B	L01-2766-05	POWER TRANS	*
30 1A	N09-1204-05	SCREW	*

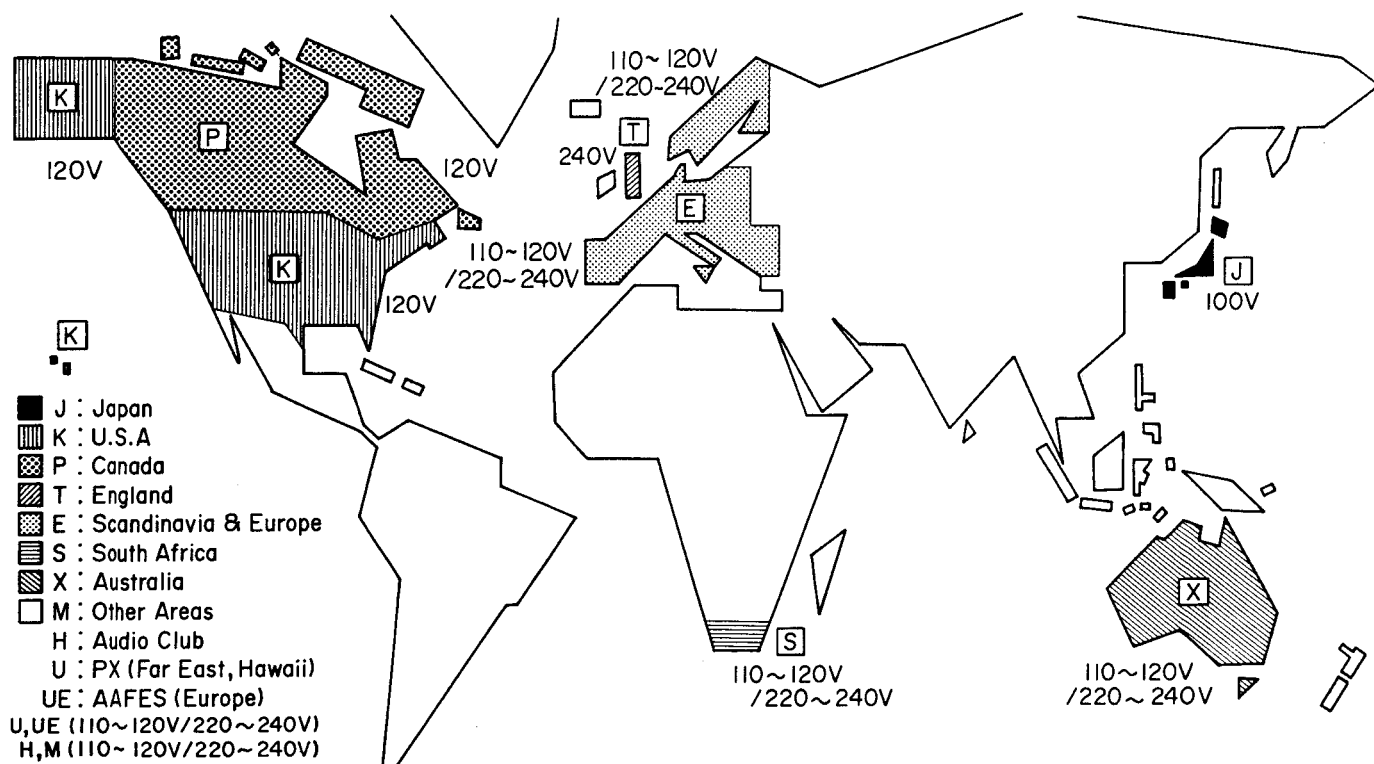
Ref. No. 参照番号	Parts No. 部品番号	Description 部品名 / 規格	Re- marks 備考
31 2A	S29-1134-05	ROTARY WAFER SWITCH	
-	W01-0087-05	SPANNER	
32 1A	W01-0323-04	SPANNER	
33 2B	X00-2220-11	POWER SUPPLY PCB ASSY	*K
33 2B	X00-2220-11	POWER SUPPLY PCB ASSY	UM
33 2B	X00-2220-11	POWER SUPPLY PCB ASSY	X
33 2B	X00-2222-71	POWER SUPPLY PCB ASSY	*T
33 2B	X00-2222-71	POWER SUPPLY PCB ASSY	E
<b>POWER SUPPLY (X00-2220-11)</b>			
C1	C91-0079-05	CERAMIC 0.01UF AC125V	
C3	C24-1410-87	ELECTRO 1000UF 25WV	
C4	C24-1210-67	ELECTRO 10UF 16WV	
C5	C55-1710-38	CERAMIC 0.01UF Z	
C6	C24-1210-67	ELECTRO 10UF 16WV	
C7	C24-1210-77	ELECTRO 100UF 16WV	
C8	C24-1422-77	ELECTRO 220UF 25WV	
C9	C24-1433-87	ELECTRO 3300UF 25WV	
C10	C55-1710-38	CERAMIC 0.01UF Z	
F1	F05-3121-05	FUSE 250V T3.15A	TE
F1	F06-4024-05	FUSE 250V 4A	KU
F1	F06-4024-05	FUSE 250V 4A	MX
F3	F05-6027-05	FUSE 250V 6A	KU
F3	F05-6027-05	FUSE 250V 6A	MX
F3	F05-6321-05	FUSE 250V T6.3A	TE
F4	F05-2015-05	FUSE 250V T200MA	TE
F5	F05-2029-05	FUSE 250V 2A	TE
F5	F06-2027-05	FUSE 250V 2A	KU
F5	F06-2027-05	FUSE 250V 2A	MX
F7	F05-4024-05	FUSE 250V F4A	TE
F7	F06-4024-05	FUSE 250V 4A	KU
F7	F06-4024-05	FUSE 250V 4A	MX
-	J13-0055-05	FUSE HOLDER	
R1	R47-5468-15	FL-PROOF RS680 J 3A	
R2	R43-1210-05	FL-PROOF RD10 J 2E	
R8	R43-1222-15	FL-PROOF RD220 J 2E	
RL1	S51-1036-05	RELAY	
D1	V11-0273-05	1S2076A	
D2	V11-0295-05	W06B	
D6	V11-4101-50	XZ-062	
D7	V11-5102-20	RB-151LFA	
Q1	V01-0954-10	2SA954(L,K)	
Q2	V01-0733-40	2SA733(A)(Q,P)	
Q3	V04-0313-60	2SD313V-AL(E)	
Q4	V03-2003-30	2SC2003(L,K)	
Q5	V09-0144-60	2SK163(L)	
Q6	V03-2003-30	2SC2003(L,K)	

E: Scandinavia &amp; Europe H: Audio Club K: USA P: Canada

S: South Africa T: England U: PX (Far East, Hawaii)

UE: AAFES (Europe) X: Australia M: Other Areas

# **WORLD MAP & AREA CODE**


**Note:**

Component and circuitry are subject to modification to insure best operation under differing local conditions. This manual is based on, the U.S. (K) standard, and provides information on regional circuit modification through use of alternate schematic diagrams, and information on regional component variations through use of parts list.

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