GM-120 U, C, E

COMPONENT CAR STEREO
HIGH POWER MAIN AMPLIFIER

SERVICE MANUAL

SPECIFICATIONS

Power source	DC 13.8V (11～16V allowable)
Grounding system	Negative type
Dimensions (W × H × D)	180 × 60 × 212 mm
	(7-1/8 × 2-3/8 × 8-3/8 in.)
Weight	2.3 kg (5.1 lbs.)
Max. current consumption	10A
Power output (max.)	60W + 60W
(continuous)	35W + 35W (1 kHz, 1%)
	30W + 30W (30 Hz～20 kHz, 0.3%)
Load impedance	4Ω (4～8Ω allowable)
Frequency response	30～30,000 Hz (−3 dB)
Signal-to-noise ratio	More than 75 dB
Distortion	No more than 0.04% (at 25W, 1 kHz)
Input level	70 mV/22 kΩ

Note:
Specifications and the design subject to possible modification without notice due to improvements.

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CONTENTS

1. PARTS LOCATION

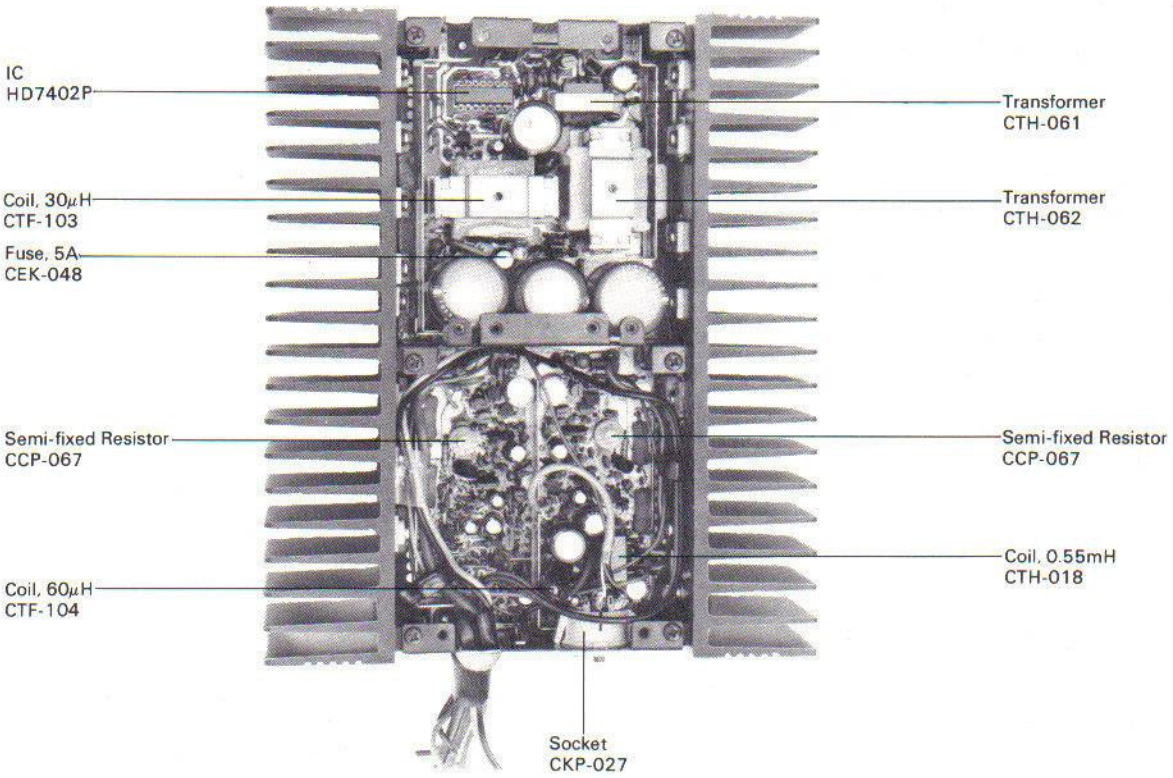


Fig. 1

2. CIRCUIT DESCRIPTION

2.1 BLOCK DIAGRAM

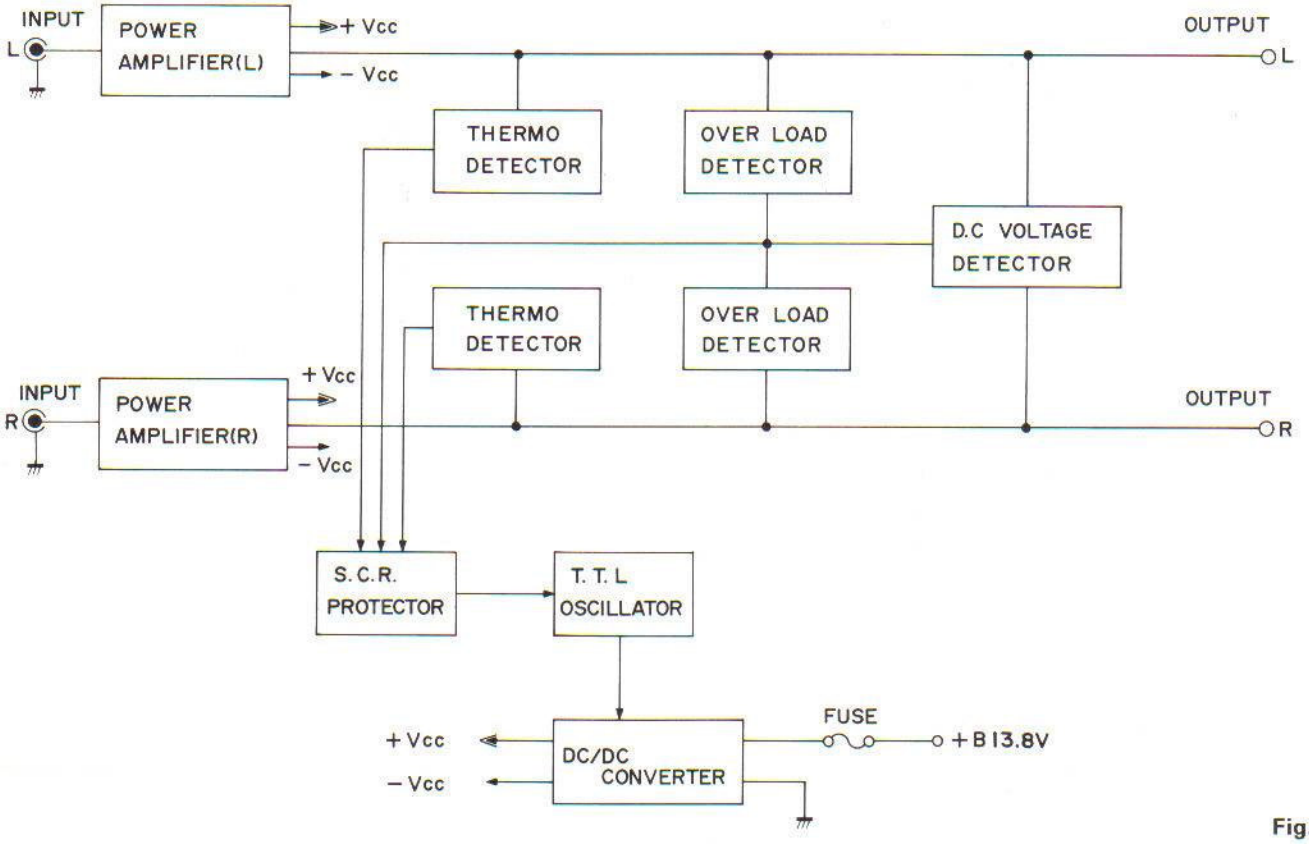


Fig. 2

2.2 POWER SUPPLY CIRCUIT

- The high-efficiency DC-DC converter boosts a DC voltage of 13.8V to ±24V (at no load) to obtain high power. The circuit is completely of a separately excited system, and its oscillation frequency is set outside of the audible zone (approximately 29 kHz) for improving the power rise characteristics and switching waveforms. The power to the power stage is supplied by bridge rectifying by an RF rectifier silicon diode, and two large-capacitance capacitors (3,300 μF each).
  Pioneer's exclusive DC feedback circuit used for improved power regulation assures stabilized output voltage at all times.
- A special booster circuit is provided for the memory circuit of your deck or tuner so that the deck or tuner will not be adversely affected at all by voltage drops.
- The power amplifier is automatically switched on and off by a built-in electronic switch synchronously with your deck or tuner.
  When the deck or tuner is switched on, Q38 is equivalently grounded, and switched on, thereby supplying the power to the T.T.L. oscillator to operate it. (Fig. 3)

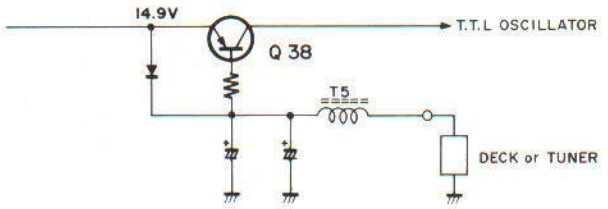


Fig. 3

2.3 POWER AMPLIFIER (FIG. 4)

The first stage is a differential amplifier (Q1), which is a PNP dual transistor with the current mirror circuit (Q3) as its load, and provides stabilized high gains up to the high range.
The voltage amplifiers (Q7, Q9) are Darlington-connected, operating with the constant current circuit (Q5) as a load. They are characterized by high-gain amplification with good linearity.
The output stage consists of Darlington-connected dual SEPP circuits of Class B operation, by which high power outputs are produced with high efficiency.

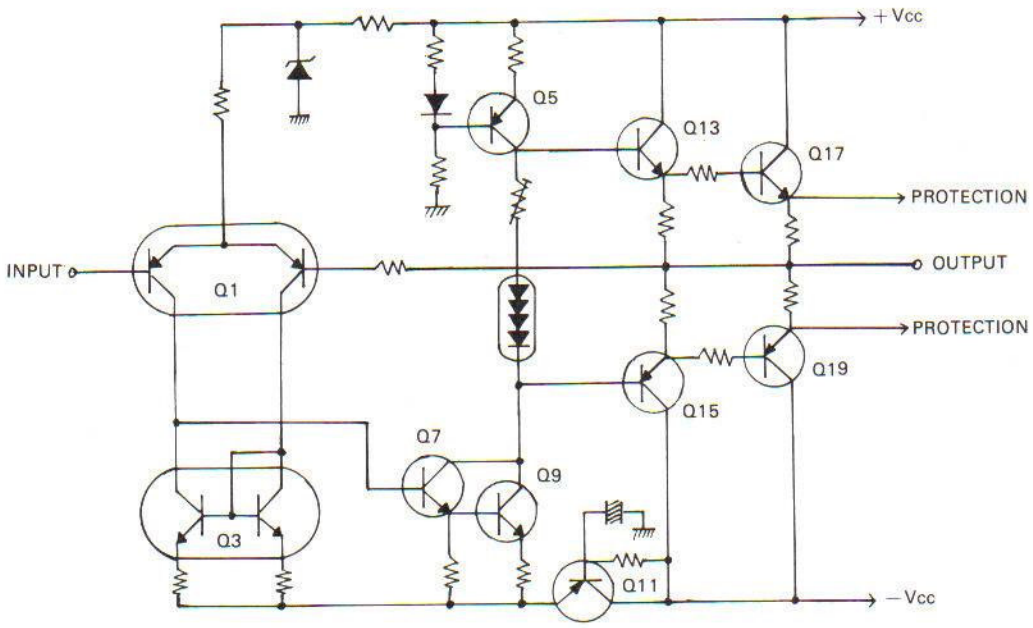


Fig. 4

2.4 PROTECTION CIRCUIT (FIG. 5)

The protection circuit instantly switches off the high-voltage circuits of the set to protect the final stage amplifier and speaker.

The protection circuit consists of the following four parts.

- **Overload Detector Circuit (Q21)**
  This circuit detects output terminal shortcircuits, and unduly small load resistance. It forms a bridge circuit with the load serving as one of its sides, and generates a protection signal if the bridge circuit becomes unbalanced, or if Q21's VBE voltage exceeds 0.6V.
- **DC Voltage Detector Circuit (Q26, Q27)**
  This circuit detects the DC voltage generated at the amplifier output (center) point. The two bases are connected to each other with a capacitor, and one of the terminals is connected to the output center point. AC signals are erased at the same level, and DC voltages only are detected out of balance.

  If the DC balance of the power stage is lost due to some cause, a potential difference develops between the two bases of the differential amplifier so that the collector currents of Q26 and Q27 become unbalanced, thereby energizing either of the two diodes (D19, D20). As a result, a protection signal is generated.
- **Thermo Detector Circuit (TH1)**
  This circuit detects abnormal rise of the heat sink panels. The heat sink panel is fitted with a posistor (TH1), by which a protection signal is generated if the heat sink temperature reaches about 95°C.
- **SCR Protector Circuit (SR1)**
  The above-mentioned protection signals are applied to the SCR (SR1) gate by the diode OR circuit.
  This SCR (SR1) operates to switch off the power applied to the oscillator of the DC-DC converter and thus stops the power supply to the secondary winding of the transformer.

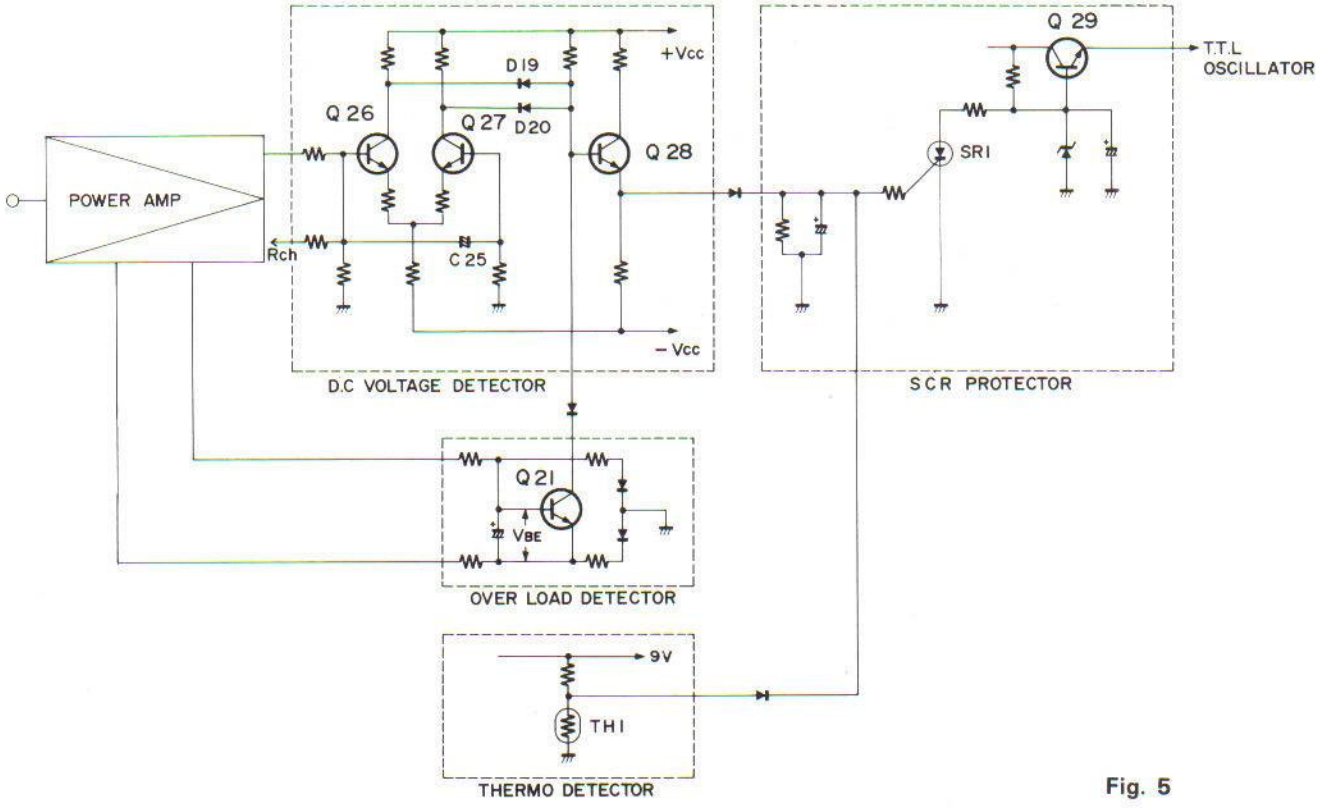


Fig. 5

3. ADJUSTMENT

3.1 IDLE CURRENT ADJUSTMENT

1. Connect your deck or tuner, and turn the volume control to the minimum position.
   If you have neither a deck or tuner, connect a resistor of 200 to 300 ohms (3 to 5W) to Pin 6 of the socket and the ground, and set the power amplifier in operating condition.

Note: No load need be connected.

2. Connect a DC voltmeter (with a range of up to 1.0 mV) to both ends of the emitter resistors (R43, R45 for the left channel; R44, R46 for the right channel) in the power stage.
3. Adjust the semi-fixed resistors (VR1 for the left channel, VR2 for the right channel) until the DC voltmeter reads 13 to 14 mV.
4. After a few minutes of power supply, readjust the semi-fixed resistors (VR1 for the left channel, VR2 for the right channel) until the DC voltmeter reads 13 to 14 mV.

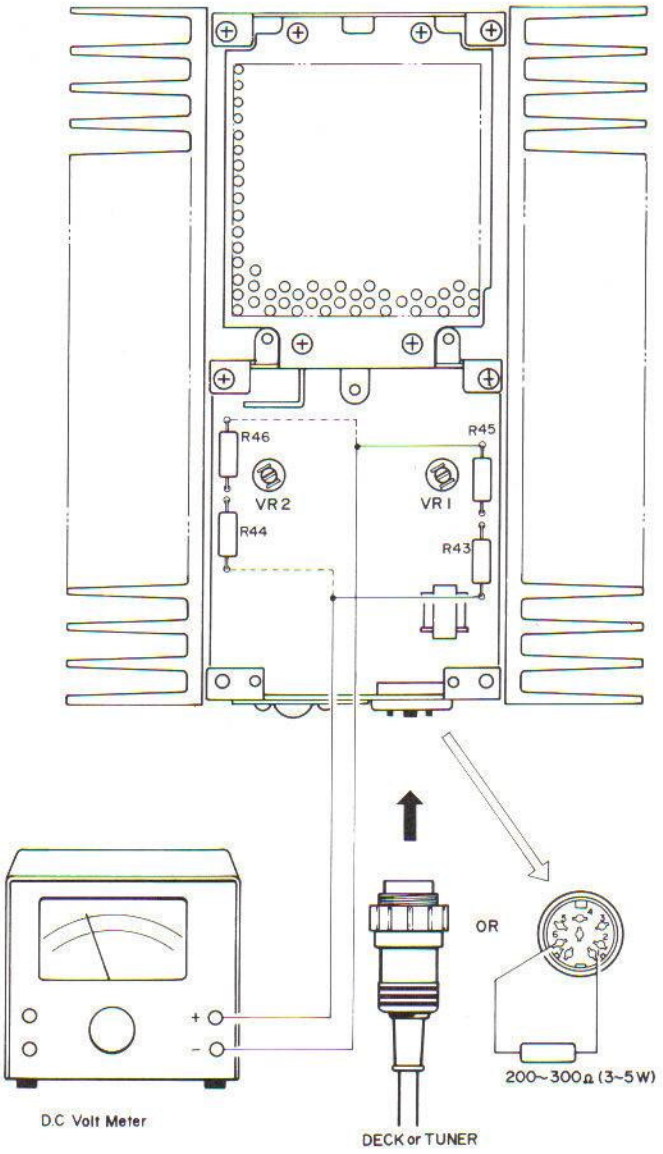
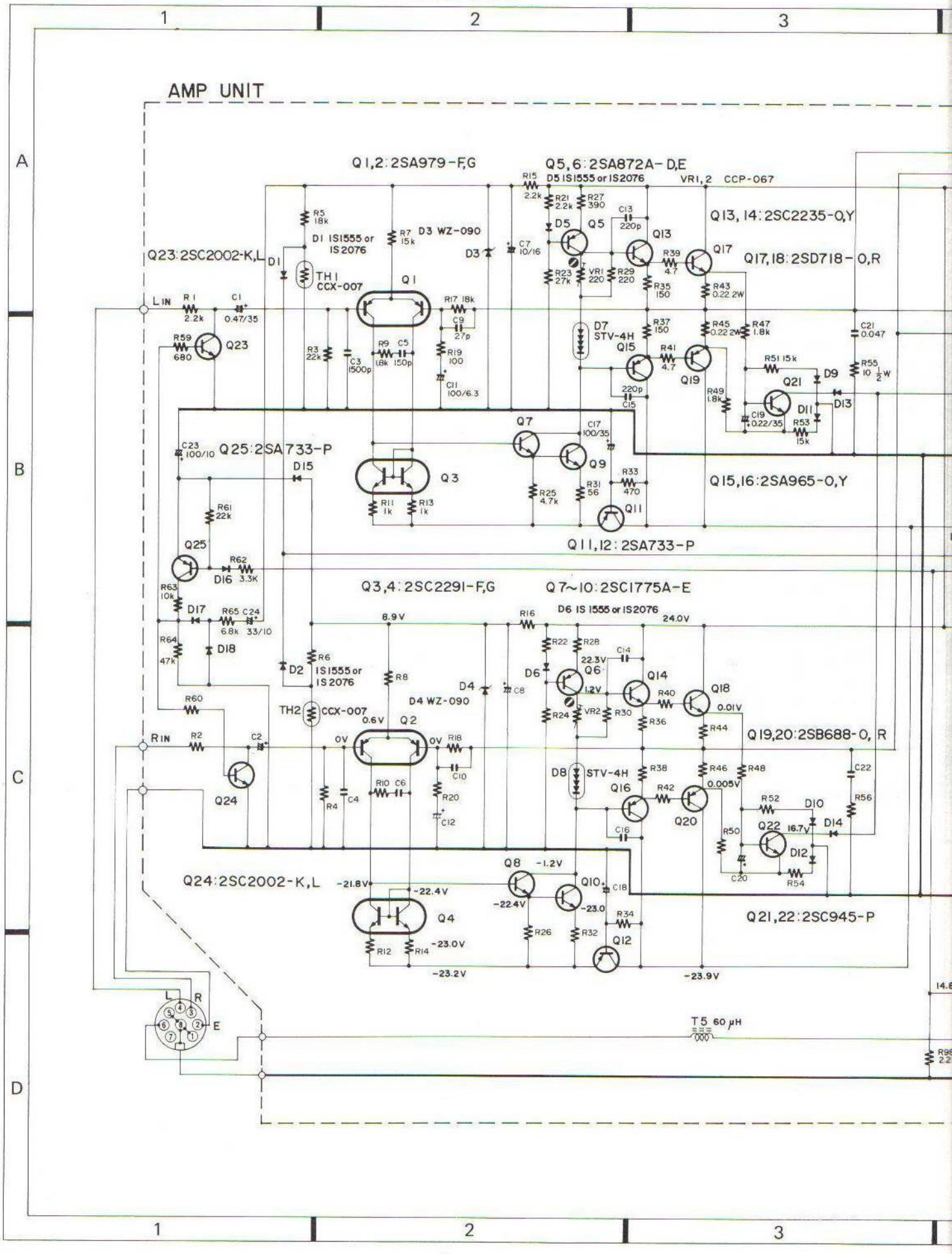


Fig. 6

4. SCHEMATIC CIRCUIT DIAGRAM



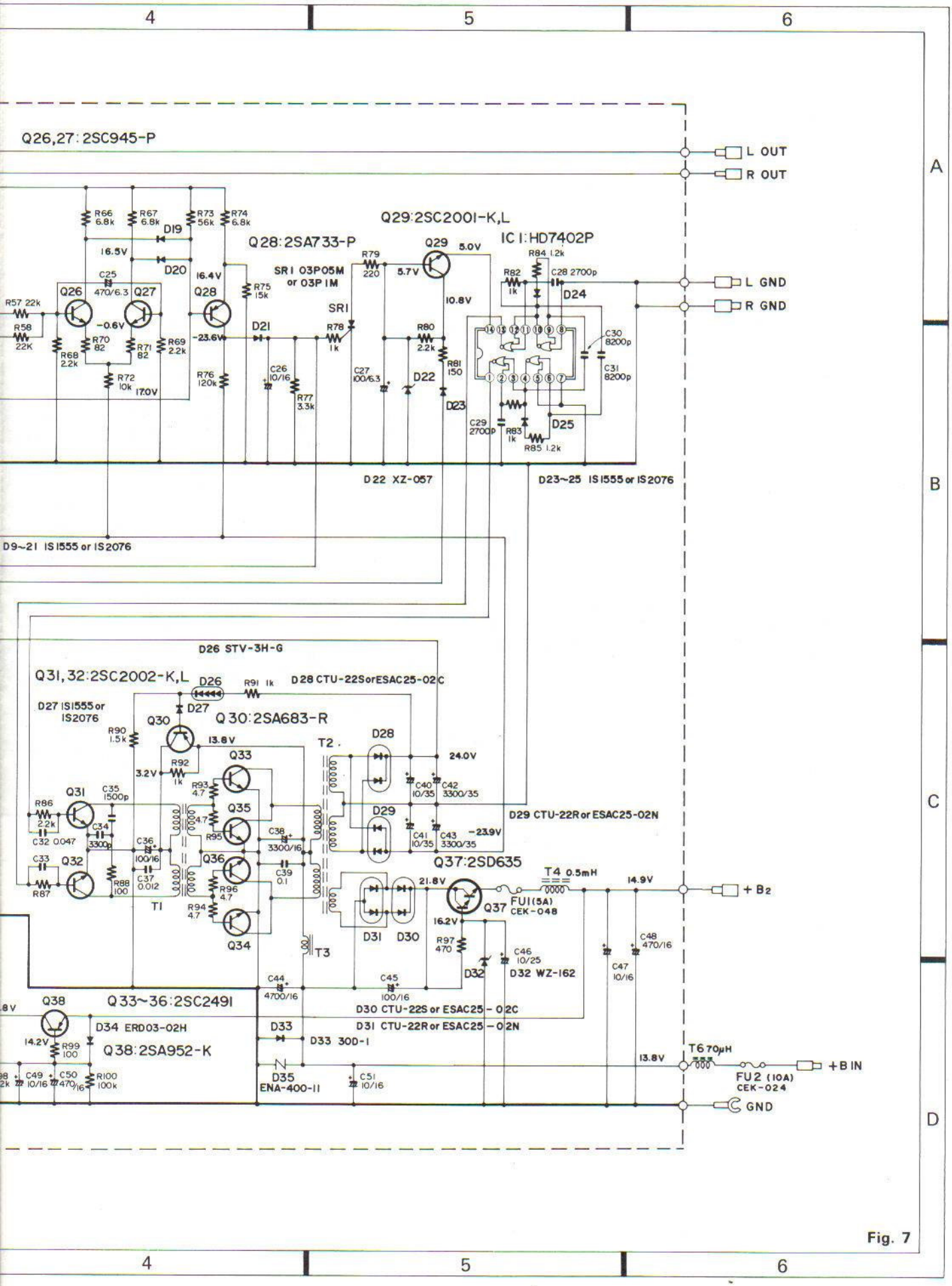
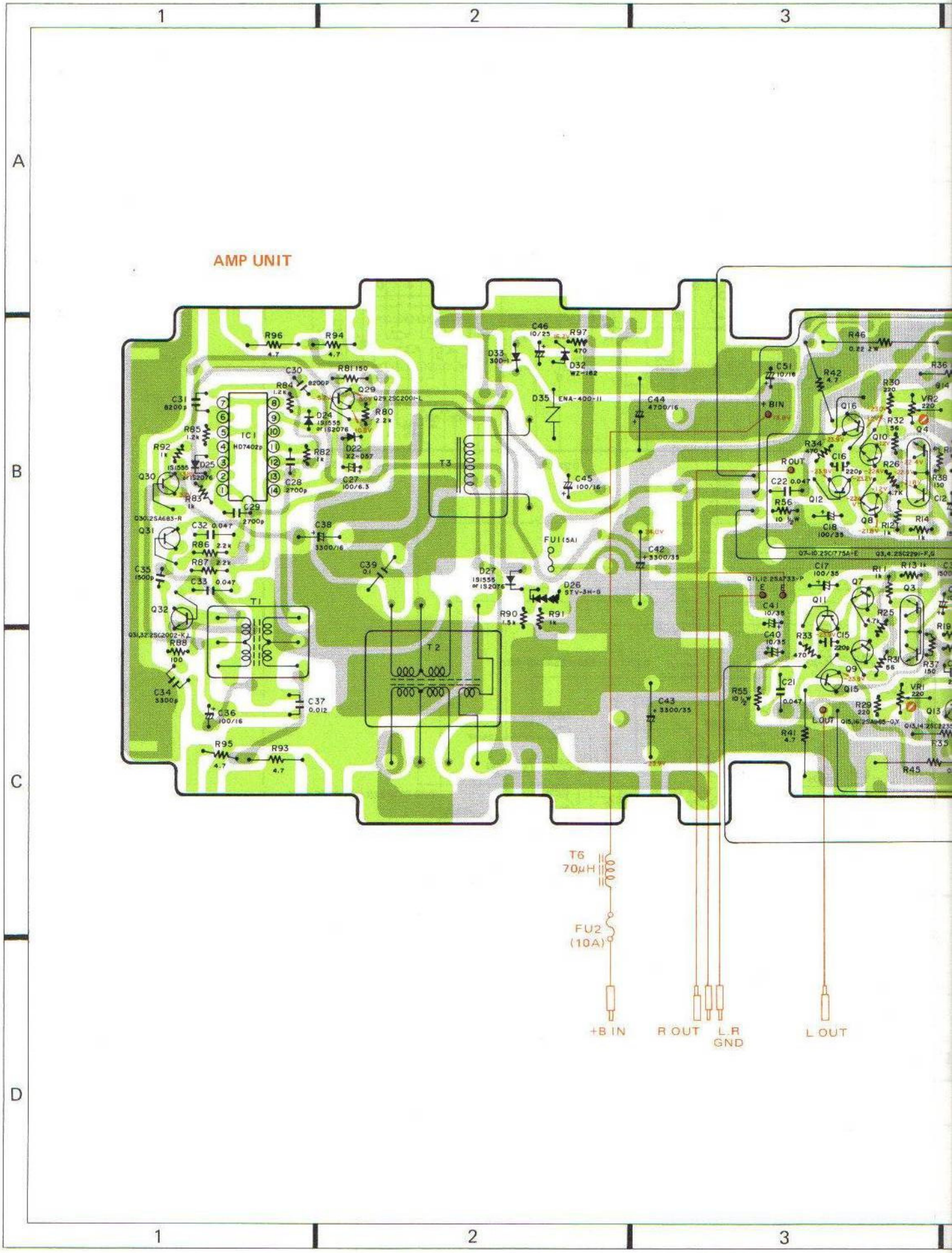

4
5
6
A
B
C
D
Q26,27: 2SC945-P
L OUT
R OUT
L GND
R GND
Q29:2SC2001-K,L
IC 1:HD7402P
Q28:2SA733-P
SR1 03P05M or 03P1M
D22 XZ-057
D23~25 IS1555 or IS2076
D9~21 IS1555 or IS2076
D26 STV-3H-G
Q31,32:2SC2002-K,L
D28 CTU-22S or ESAC25-02C
D27 IS1555 or IS2076
Q30:2SA683-R
D29 CTU-22R or ESAC25-02N
Q37:2SD635
T4 0.5mH
+B2
FU1(5A) CEK-048
D32 WZ-162
Q33~36:2SC2491
D30 CTU-22S or ESAC25-02C
D31 CTU-22R or ESAC25-02N
Q38:2SA952-K
D34 ERD03-02H
D33 30D-1
D35 ENA-400-11
T6 70μH
+B IN
FU2 (10A) CEK-024
GND

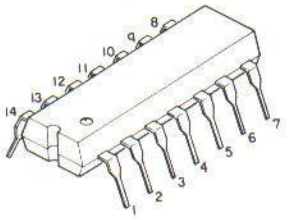
Fig. 7

5. CONNECTION DIAGRAM



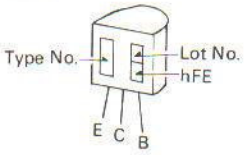
2SC1775A
2SA872A
2SA733
2SC945

HD7402P

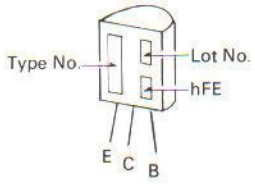


2SA979

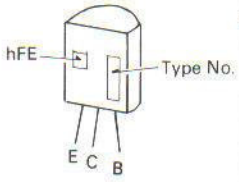
2SA952
2SC2001
2SC2002



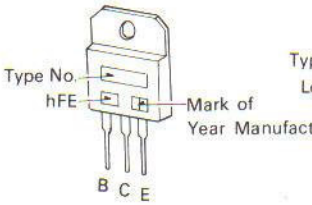
2SA965
2SC2235



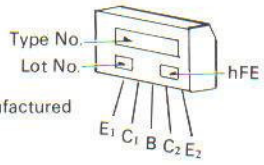
2SA683



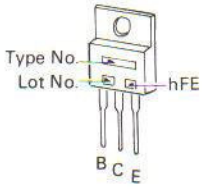
2SB688
2SD718



2SC2291



2SC2491



2SD635

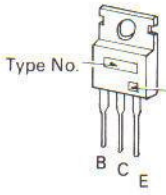


Fig. 8