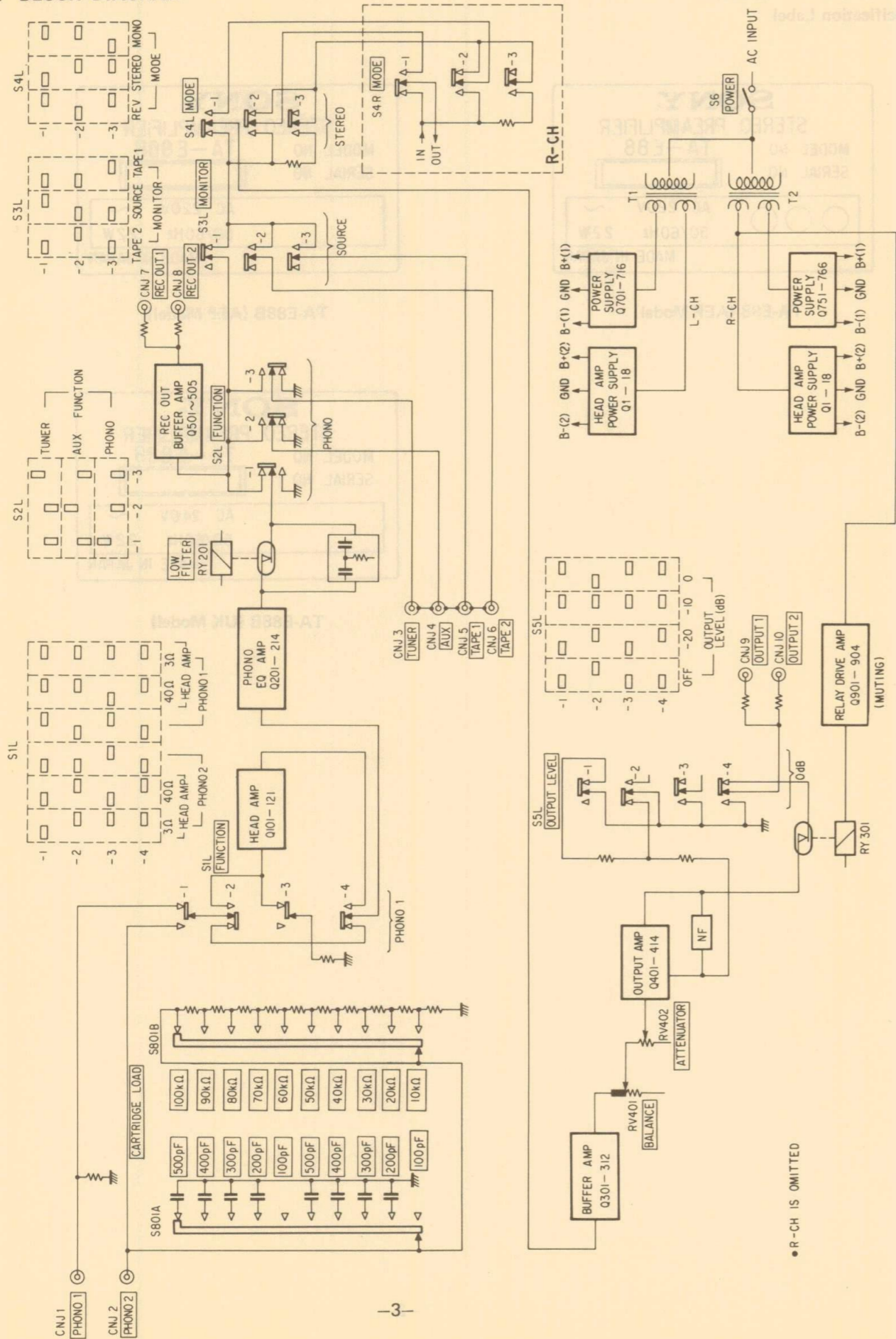


SECTION 1
OUTLINE

1-1. BLOCK DIAGRAM



1-2. CIRCUIT DISCRIPTION

1-2-1. Phono 1 and Phono 2 Input Circuits

The TA-E88/E88B is equipped with two phono inputs – PHONO 1 and PHONO 2.

PHONO 1

- When using high impedance cartridges (output about 2.5mV):
When the FUNCTION switch (S1) is set to the PHONO 1 position, the input impedance Z_{in1} (150k Ω , 100pF) of equalizer amplifier is connected in parallel with R1 (75k Ω) across the PHONO 1 input terminal. They serve as load impedance for the cartridge used. ($R = 50k\Omega$, $C = 100pF$)
- When using low impedance MC cartridges (output about 125 μ V):
The head amplifier is connected by switching S1. At the same time, either a 3 Ω or 40 Ω load impedance (depending on cartridge impedance) is also connected to the PHONO 1 input terminal. For the load of 40 Ω cartridge, the input impedance Z_{in2} (100 Ω) of head amplifier is employed, and for the load of 3 Ω cartridge R2 (33 Ω) is connected in parallel with Z_{in1} , resulting in a 25 Ω input resistance.

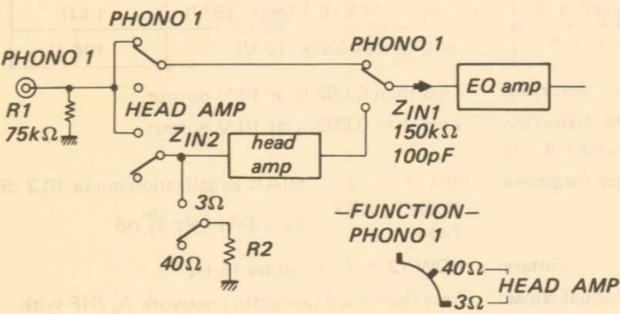


Fig. 1

PHONO 2

- The PHONO 2 input is basically the same as the PHONO 1 input, but also is equipped with a

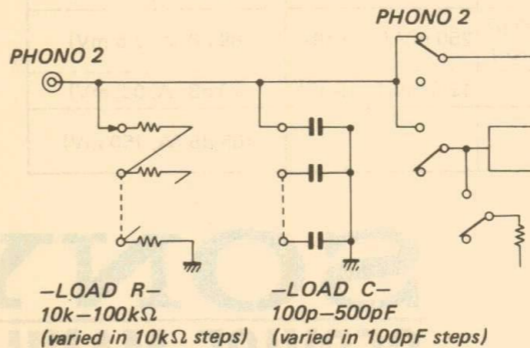


Fig. 2

cartridge load selector. It is adjustable over 10k Ω to 100k Ω and 100pF to 500pF ranges when using high impedance cartridge.

- This switch (S801) located on the top case is a kind of rotary switch.

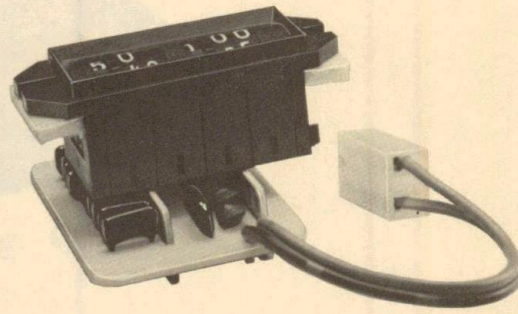


Fig. 3

1-2-2. Head Amplifier

Generally, the very low level signals produced by an MC (moving coil) cartridge are amplified by step-up transformer.

On the other hand, in the TA-E88/TA-E88B, this amplification is performed by a built-in head amplifier. Although the use of active amplification elements (rather than passive transformers) causes some deterioration of S/N ratio, these problems have been successfully overcome in the TA-E88/E88B by employing parallel-connected transistors in the head amplifier.

The head amplifier includes a main amplifier stage consisting of eight transistors (Q101 to Q108) connected in parallel, and another eight transistors (Q109 to Q116) differentially-connected to this main stage, achieving gain of 27dB with usually-low noise.

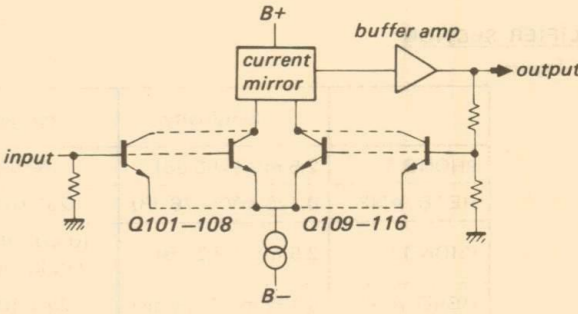


Fig. 4

• Parallel Connection

When a transistor is used for amplification purposes, the current flowing between the collector and emitter of the active transistor is placed under control. Signals from the base terminal pass through the internal resistance of the base spread

resistance $r_{bb'}$. (This base spread resistance is one of the critical factors which have to be considered in high frequency amplification). The detailed diagram is shown in Fig. 5.

The lower the $r_{bb'}$ resistance, the less the noise will become. This may be achieved by connecting transistors in parallel — n transistors connected in parallel reduce noise by $1/\sqrt{n}$.

This may also be considered as parallel-connected transistor collectors (noise output terminals), resulting in the averaging out of noise levels and phase differences of the noise elements in each transistor.

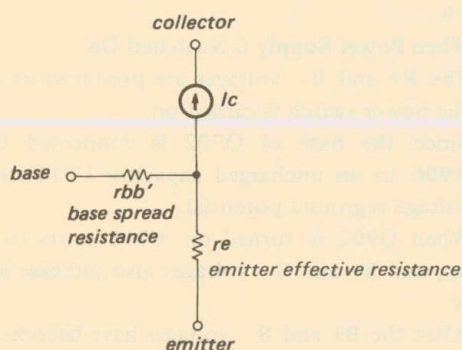


Fig. 5

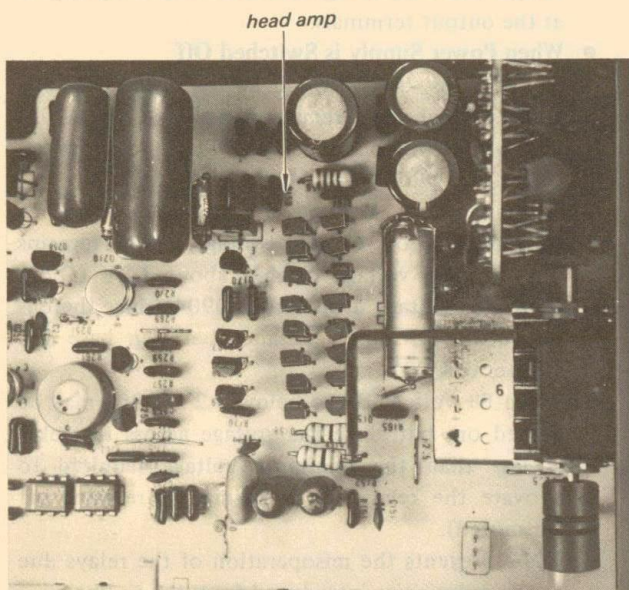


Fig. 6

1-2-3. Equalizer Amplifier

The phono equalizer amplifier stage consists of Q201 through Q214. In order to design the TA-E88/E88B as a direct-coupled dc amplifier, this stage includes the following features:

- An FET in the first stage

- The Miller effect by caused internal capacitance between drain and gate of FET in the first stage results in deterioration of high end frequency response due to high input impedance. To prevent this, the drain of FET in the first stage is connected to the source of the following low input impedance transistor (Q202).

The impedance of the equalizer components (R228 to R230) is kept low to further improve the S/N ratio. The equalizer amplifier output stage employed to drive these components consists of a 2-stage emitter-follower push-pull circuit. A dual transistor, featuring two pairs of elements mounted on a single wafer, is used to improve the thermal and pair characteristics for differential operation of Q201, Q202 and Q205.

1-2-4. Buffer Amplifier

The buffer amplifier (Q301 to Q312) up to the equalizer amplifier has a gain of 0dB. That is, there is 100% negative feedback of the output voltage from the output terminal to the input negative feedback terminal.

This amplifier is used to drive BALANCE control and ATTENUATOR.

Frequency response deterioration will occur if high-value resistors are used in the step attenuator. The TA-E88/E88B employs low resistance resistors ($3k\Omega$). This also results in decreased thermal noise. A buffer amplifier is used to drive the low resistance BALANCE control and ATTENUATOR. This amplifier uses a differential-cascode amplifier in the first stage.

Fig. 8 shows the location of the FET.



Fig. 7