

5. CIRCUIT DESCRIPTIONS

The SP-101 is a synthesized surround processor that produces four effects based on the surround data included in surround encoded Laser discs and ordinary stereo broadcasts to give the listener the impression of being in different listening environments. It also has a super bass synthesizer section to allow the listener to really "feel" the music.

5.1 SUPER BASS SYNTHESIZER CIRCUIT

This circuit increases the feeling of volume by synthesizing lower harmonics of low range signals to add extra power and depth to low frequency sounds. These lower harmonics are produced by dividing the frequency of the input signal in half.

The input signal is first routed through a 150Hz lowpass filter and then four band-pass filters with poles at 63Hz, 80Hz, 100Hz and 125Hz respectively. The output of each band-pass filter is split into two routes, one to a level detector circuit and the other to a limiter circuit. The level detector circuit is an absolute value detector circuit using an operation amp that converts the signal level into a DC voltage. The limiter circuit changes the signal into a square wave by causing the operation amp to operate at saturation.

The frequency of the limiter circuit output signal is divided in half by the T flip-flop and sent to VCA (an amp in which gain can be changed with a control voltage). The gain of each VCA is controlled by the output voltage of the corresponding level detector circuit so that the signal level (of the square wave obtained after dividing the input signal frequency in half) is always proportional to the level of the original input signal. All four VCA output signals are mixed and the upper harmonics of the square wave are removed by a low-pass filter so that the signal contains only lower harmonics. After the level of this signal is adjusted by the SYNTHE. LEVEL control (a double volume), it is routed through a low-pass filter amp before being mixed with the FRONT L/R and SURROUND L/R signals.

Input to the 63Hz and 80Hz circuits can be shut out with the front panel 30Hz and 40Hz CUT switches (the front panel frequency indication rounds off the halved frequencies to the nearest ten). These two switches are provided to allow the user to reduce the super bass effect when desired to avoid the unpleasant effect that can result when too much bass is added to some kinds of music.

The output of each level detector circuit causes each front panel frequency indicator LED to light.

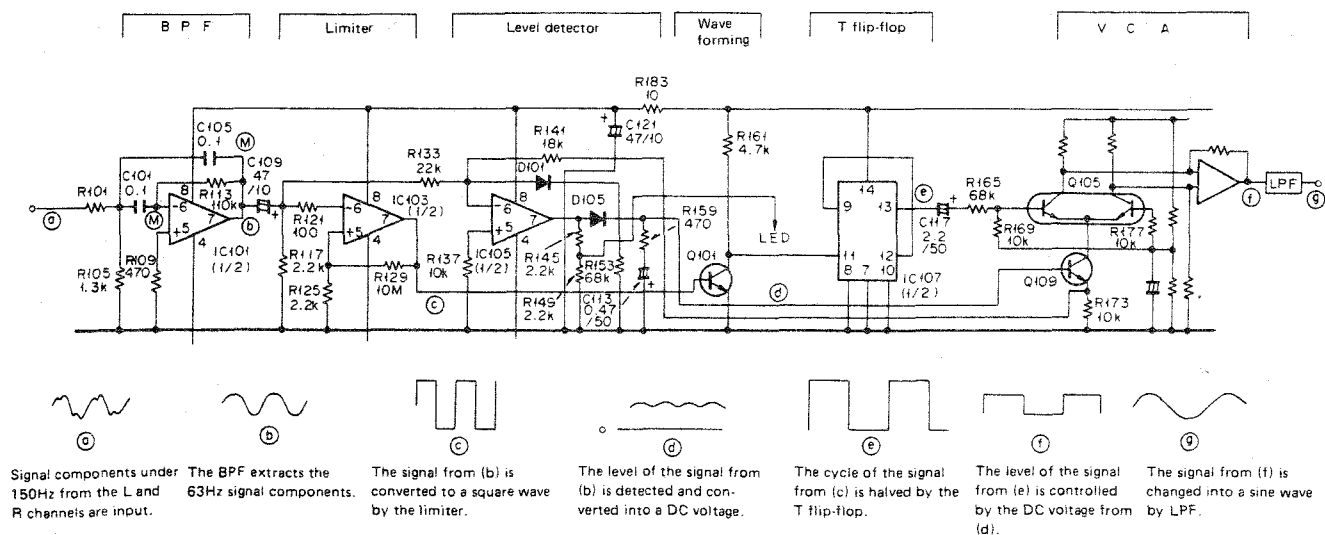


Fig. 5-1 The Super Bass Synthesizer Circuit

5.2 SURROUND PROCESSOR CIRCUIT (Fig. 5-3)

This circuit synthesizes signals for two more channels by processing the original L and R channel signals to produce the desired feeling of ambience. The signals of the two additional channels are created by making different combinations of the positive and reverse phases of the L and R channel input signals and the two delay ICs, each having a different delay time. This allows the circuit to produce four different effects.

The delay circuit is composed of a 4096-stage BBD IC (MN3005) and a 2048-stage BBD IC (MN3008). Both ICs are driven by a 33 kHz 2-phase clock signal. To minimize the degradation of the S/N ratio caused by the use of BBDs, compander ICs (NE571) are used to compress the dynamic range of the signal on the input side of the delay circuits. The dynamic range is then returned to its original width on the output side by an expander, thereby reducing noise.

Simulated Stereo Mode

The SURROUND L output signal is the L channel signal that has passed through the 4096-stage BBD delay circuit. The SURROUND R output signal is obtained by reversing the phase of the original R channel signal and then passing that signal through the 2048-stage BBD delay circuit. When listening to bilingual and monaural sources, this mode gives sound a feeling that resembles stereo reproduction.

Studio Mode

The SURROUND L and R output signals are used to produce L and R channel differential signals (L-R, mono).

Theater Mode

The SURROUND L output signal is the L and R channel differential signal (L-R) that has passed through the 4096-stage BBD delay circuit. The SURROUND R output signal is the differential signal (L-R) that has passed through the 2048-stage BBD delay circuit.

Stadium Mode

The SURROUND L output signal is the L and R channel differential signal (L-R) that has passed through the 4096-stage BBD delay circuit. The SURROUND R output signal is the differential signal (L-R) without any delay added. Both of these signals are output at a higher level than in the other three modes.

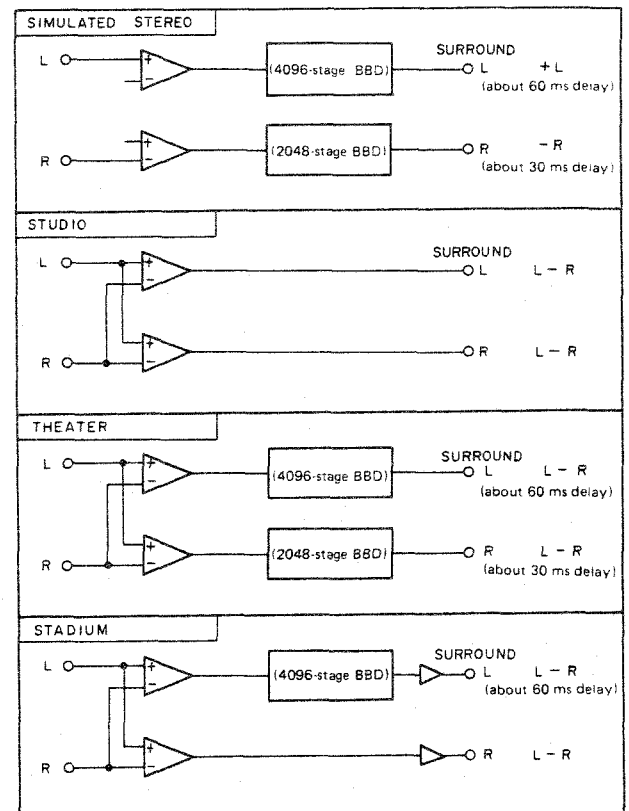


Fig. 5-2 Signal Processing in the Four Surround Decoder Modes

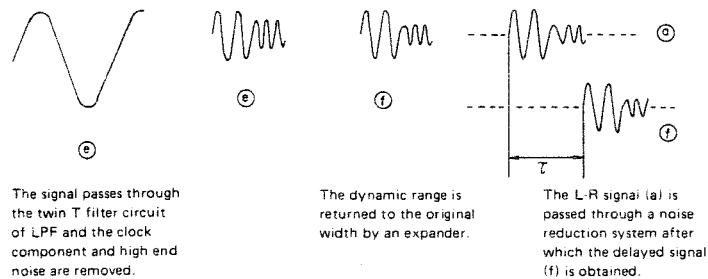
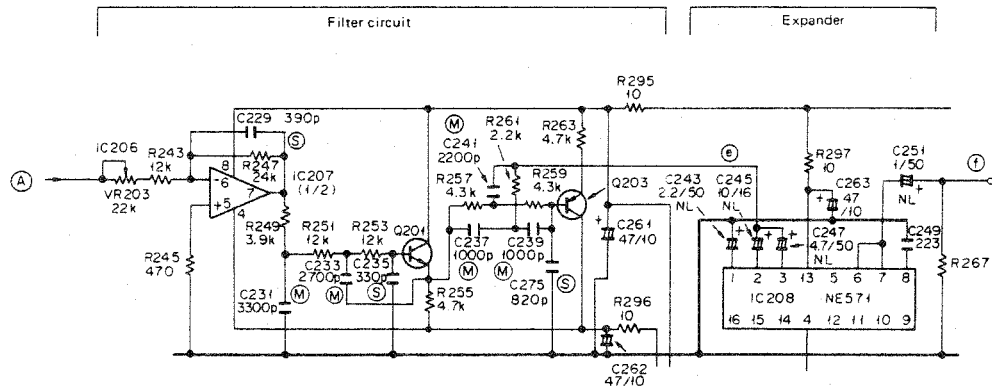
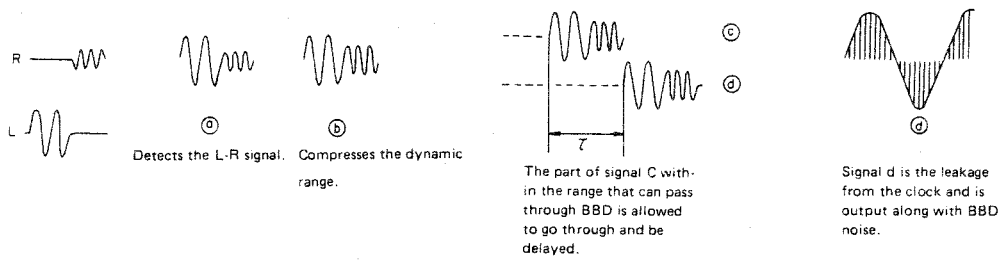
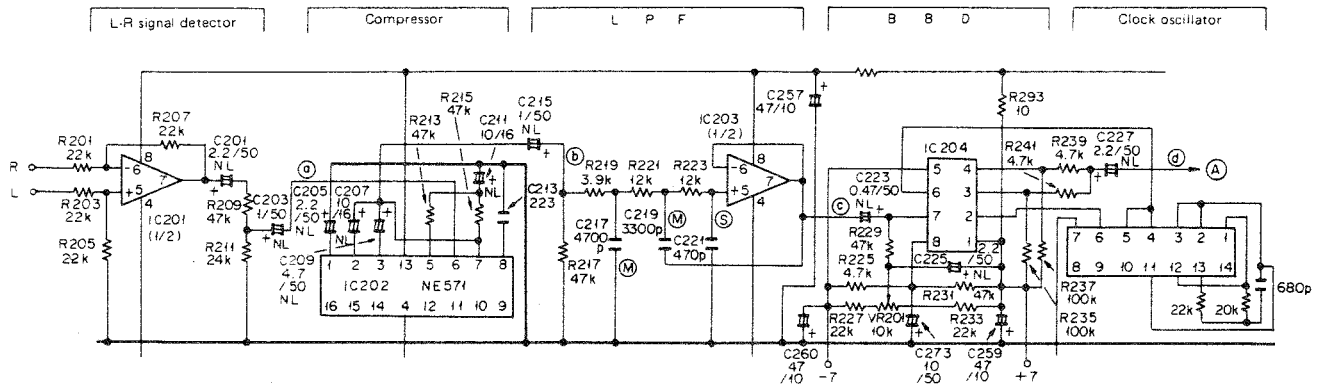
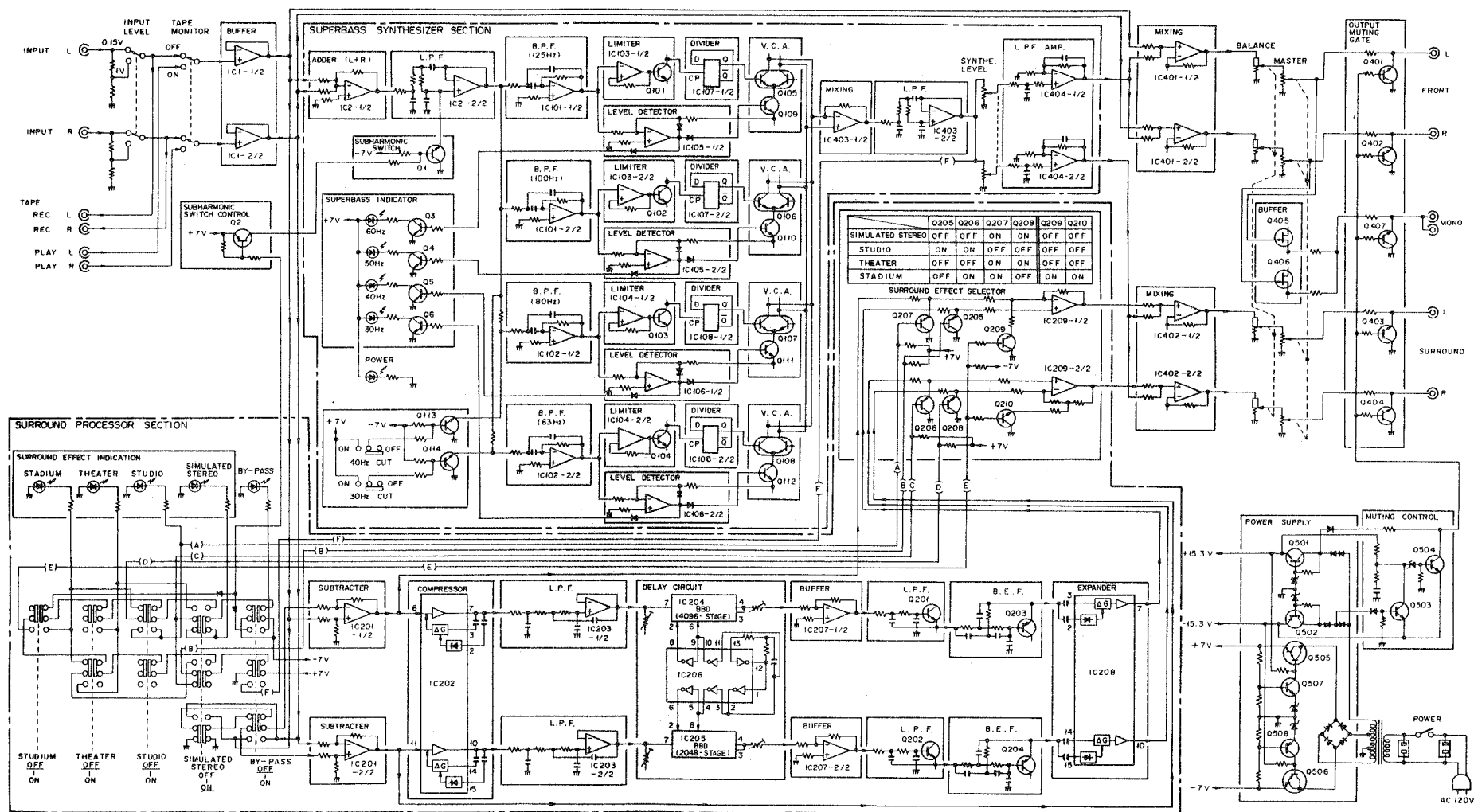
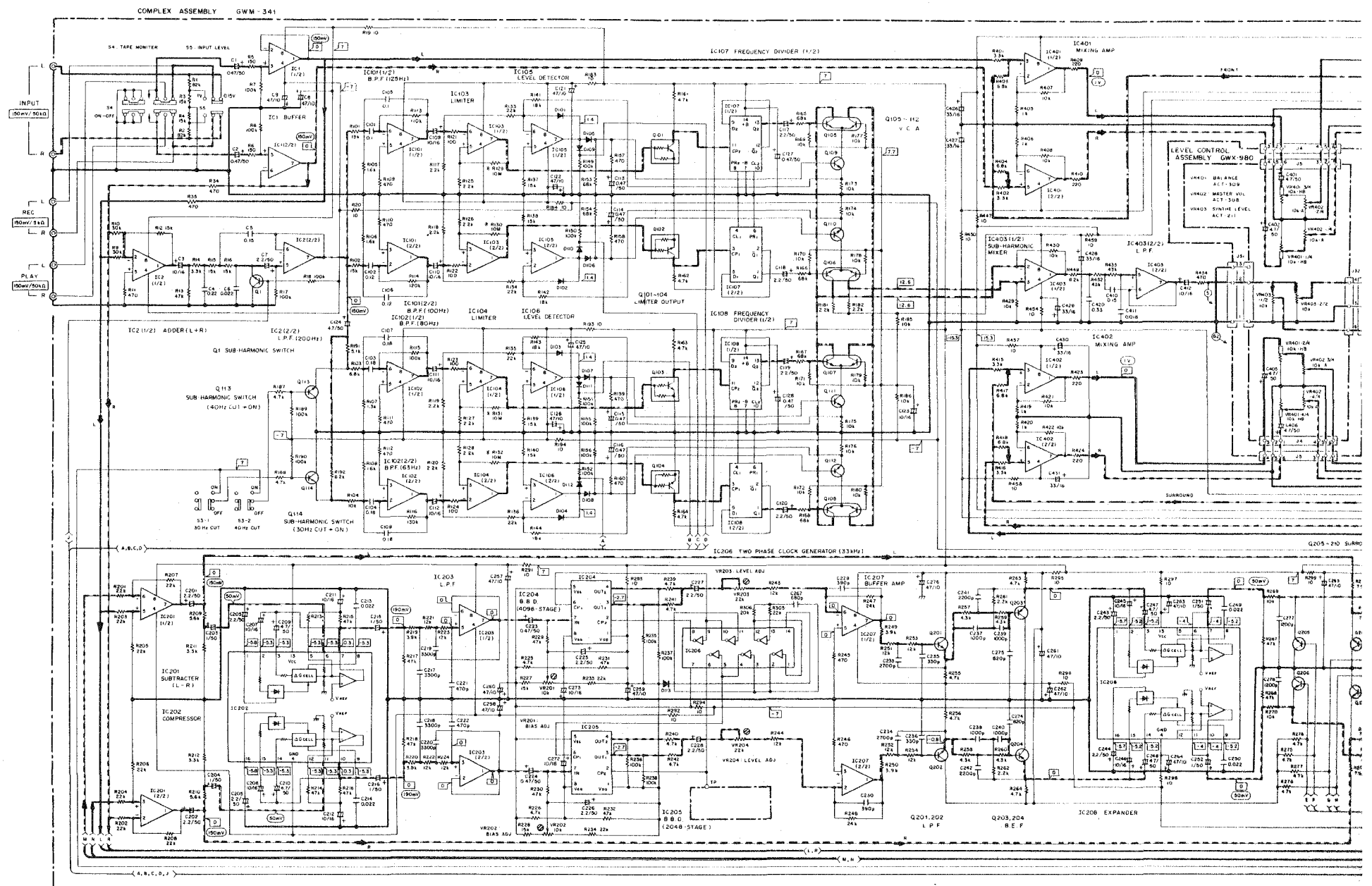


Fig. 5-3 The Sound Processor Circuit

6. BLOCK DIAGRAM

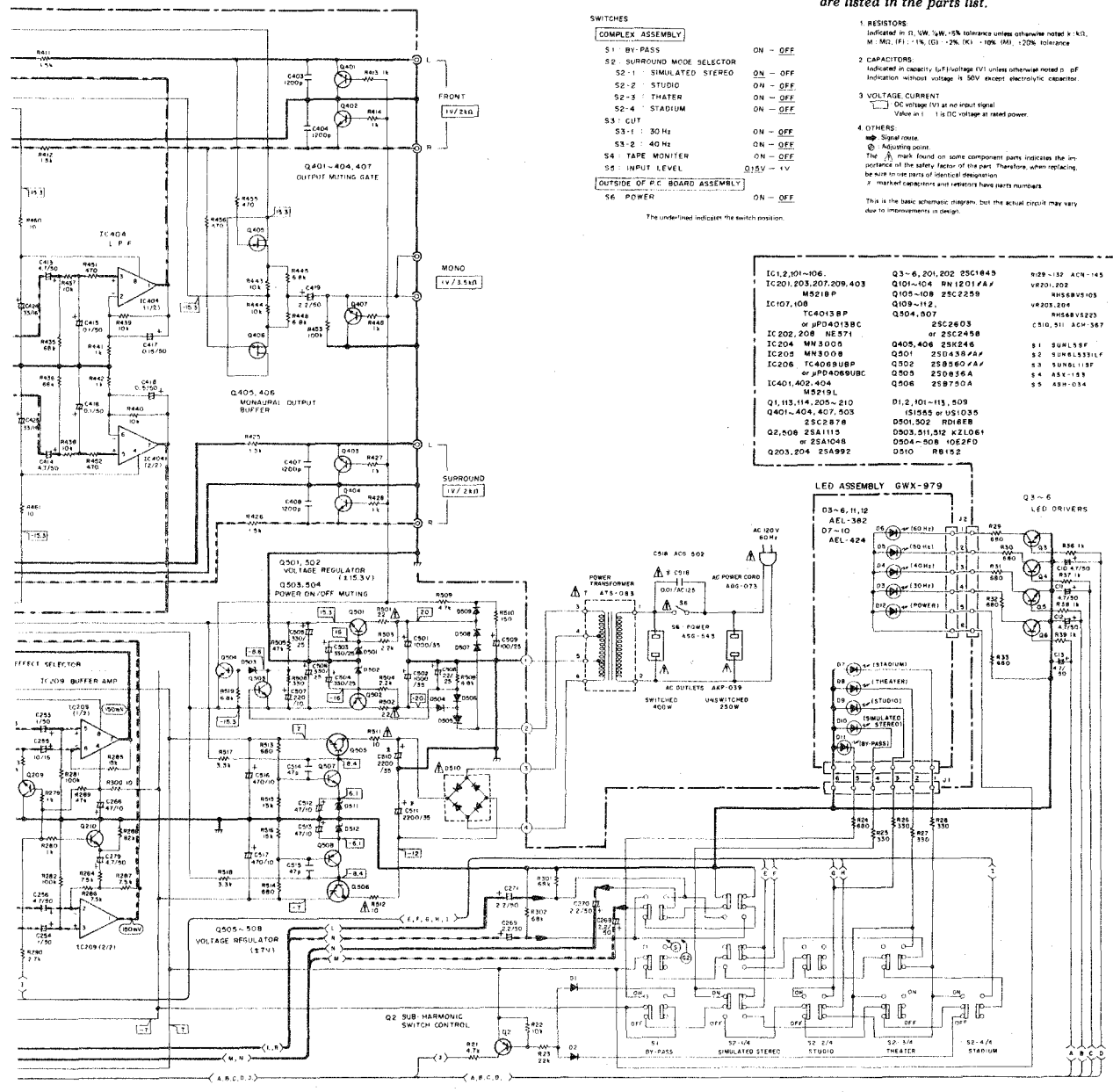


10. SCHEMATIC DIAGRAM



NOTE:

The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts list.

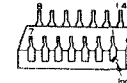


M5218P

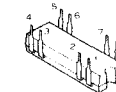


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μPD4013BC
TC4069UBP
μPD4069UBC

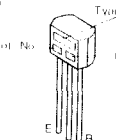
NE571



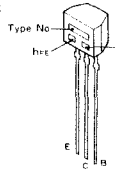
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MN3008



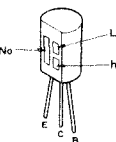
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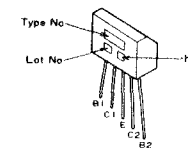
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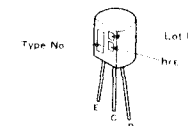
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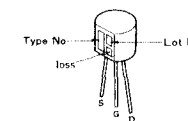
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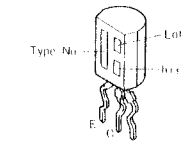
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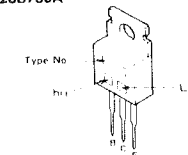
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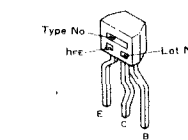
2SD438/A/
2SB560/A/



2SD836A
2SB750A



RN1201/A/



M5219L

