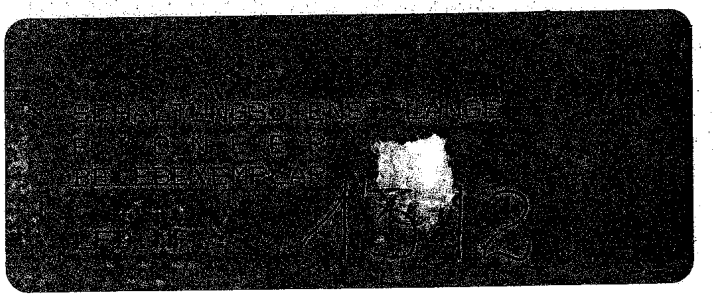
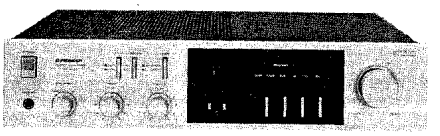
PIONEER®

Service Manual



CIRCUIT DESCRIPTIONS



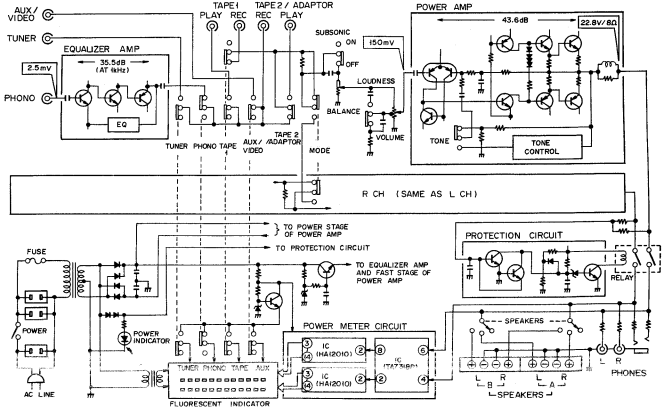
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ART-765-0

STEREO AMPLIFIER

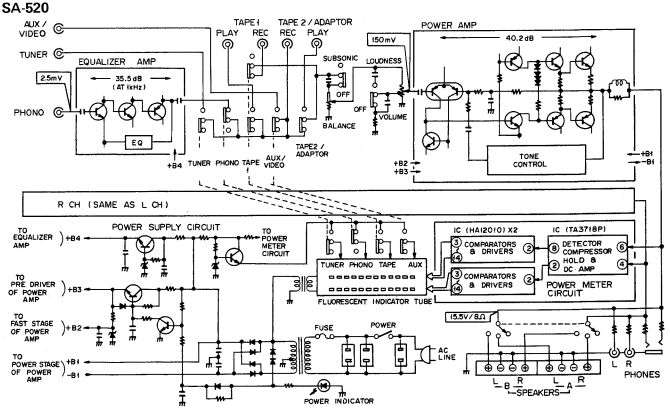
SA-720
SA-620
SA-520
SA-420

BLOCK DIAGRAM

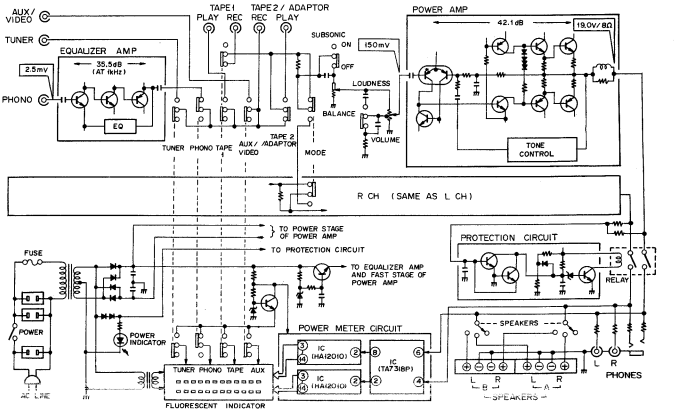
SA-720



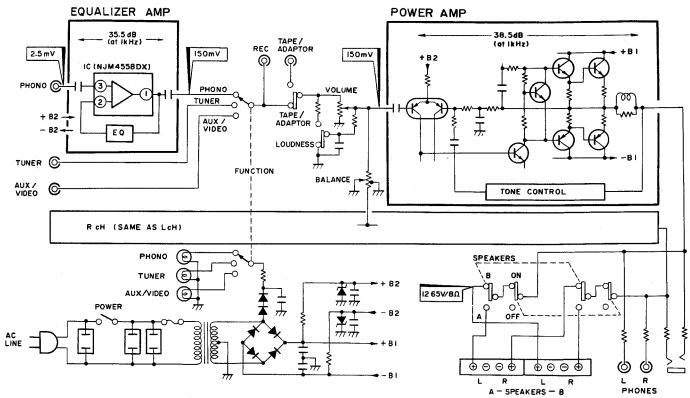
SA-520



SA-620


AUX/ VIDEO
TUNER
PHONO
2.5mV
EQUALIZER AMP
35.5dB (AT 1kHz)
EQ
TAPE1 PLAY REC
TAPE2 / ADAPTOR REC PLAY
SUBSONIC ON OFF
150mV
LOUDNESS
BALANCE
VOLUME
TUNER PHONO TAPE
TAPE 2 / ADAPTOR AUX / VIDEO
MODE
POWER AMP
42.1dB
19.0V/8Ω
TONE CONTROL
R CH (SAME AS L CH)
TO POWER STAGE OF POWER AMP
TO PROTECTION CIRCUIT
TO EQUALIZER AMP AND FAST STAGE OF POWER AMP
PROTECTION CIRCUIT
RELAY
FUSE
POWER
POWER INDICATOR
AC LINE
POWER METER CIRCUIT
IC (HA12010)
IC (TA7318P)
IC (HA12010)
TUNER PHONO TAPE AUX
FLUORESCENT INDICATOR TUBE
SPEAKERS
PHONES
L R
L R
B A
SPEAKERS

SA-420


EQUALIZER AMP
35.5 dB (at 1kHz)
2.5mV
IC (NJM4558DX)
PHONO
+B2
-B2
EQ
TUNER
AUX / VIDEO
150mV
PHONO
TUNER
AUX / VIDEO
REC
TAPE / ADAPTOR
150mV
VOLUME
TAPE / ADAPTOR
LOUDNESS
FUNCTION
BALANCE
POWER AMP
38.5dB (at 1kHz)
+B2
+B1
-B1
TONE CONTROL
R cH (SAME AS LcH)
PHONO
TUNER
AUX/VIDEO
POWER
AC LINE
+B2
-B2
+B1
-B1
SPEAKERS
B ON
A OFF
12.65V/8Ω
L R L R
A – SPEAKERS – B
L R
PHONES

CIRCUIT DESCRIPTIONS

Equalizer Amplifier

The SA-720, SA-620 and SA-520 feature a 3-stage direct coupled amplifier with emitter-to-emitter feed-back. An S/N ratio of 82dB (at 2.5mV input, IHF-A) has been achieved by using an ultra-low-noise NPN transistor (2SC2602) at the first stage, and reducing the input resistance and equalizer circuit impedance. The second stage load has been reduced, a large output voltage obtained, and the output impedance lowered by using an emitter follower at the output stage.

The maximum allowable input level of this circuit is 120mV (at 1kHz) and equalizer deviation ±0.3dB (20Hz — 20kHz).

The circuit of SA-420 is an NFB type equalizer amplifier, with one high-performance IC (NJM 4558DX) in both L and R channels.

This IC is a low-noise type, and provide an open-loop gain of 70dB. The main performance specifications for this circuit include a voltage gain of 35.5dB (at 1kHz), a phono dynamic margin or overload level of 120mV (at 1kHz), and equalization within ±0.5dB (30Hz — 15kHz).

Power Amplifier

This all-stage direct-coupled pure complementary SEPP circuit features a differential amplifier in the first stage, and in corporates the tone control circuits in the NFB loop.

Although the incorporation of the tone control circuits in the power amplifier stage reduces the number of elements that the signal has to pass through, and thereby further reduces noise, distortion, and cost, the power stage does require a higher gain and a higher degree of stability. In SA-720, SA-620 and SA-520, this high gain and high stability are achieved by a current mirror load differential amplifier in the first stage and by the use of a constant current circuit for the load of the pre-driver stage. In the SA-420, this high gain and high stability are achieved by a differential amplifier in the first stage and by the use of a bootstrap circuit for the load of the pre-driver stage.

The power amplifier stage is a complementary 2-stage Darlington connection.

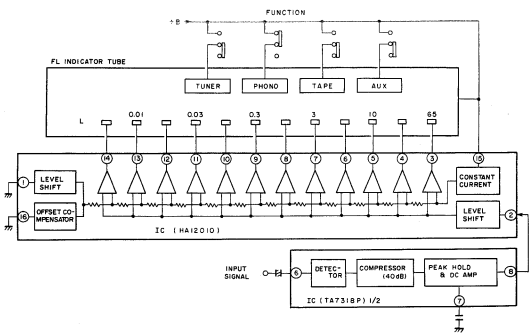


Fig. 1 Indicator circuit (SA-720, 620, 520)

Indicator Circuit (SA-720, SA-620 and SA-520)

The SA-720, SA-620 and SA-520 output power and function indicators feature fluorescent indicator tube (FL tube). In this tube, thermionic emissions from the cathode are accelerated into the fluorescent substance of the segmental anodes, resulting in the emission of light. This tube is used to indicate numerals, letters, and other symbols.

An outline of the FL tube drive circuit is shown in Fig. 1. The output circuit signal is applied to pin no.6 (4) of the IC (TA7318P-A). The IC contains a detector circuit, compressor (40dB), and peak hold circuit for both left and right channels. The dynamic range of the signal is thus contracted by 40dB to obtain a "peak held" DC voltage.

The output power indicator segments of the FL tube are driven by the HA12010 ICs (one for each channel) equipped with 12 pairs of differential amplifiers. These amplifiers are biased at increasing levels, so each amplifier will commence to operate separately as the input level increases. And since these amplifiers apply the voltages to the output power indicator segments, each successive segment will light up in turn as the input level rises.

The function indicators are lit up as a result of a voltage being applied to the corresponding function indicator segment according to the selected positions of the FUNCTION switch.

Muting Circuit (SA-520)

The purpose of this circuit is to mute the noise when the power switch is turned on and off.

With reference to Fig. 2, when the power switch is turned on, since the +B1 level is established more rapidly than the −B2 level, Q20 will initially be turned on (The time constant of +B1 circuit is shorter than the −B2 circuit). Therefore, the rise of Q21 emitter voltage (+B2) is delayed. Consequently, power amplifier is held in the cut off state.

As the −B2 level is gradually established, Q20 will be turned off, resulting in the Q21 emitter voltage (+B2) increase. This supplies (+B2) to the power amplifier first stage and pre-driver stage, and normal operation begins.

When the power switch is turned off, C60 discharges rapidly via D5 and R95 resulting in Q20 being turned on (The discharge time constant of the −B2 circuit is made shorter than that of the +B1 circuit by inserting D5 to make the discharge time of C60 faster). Therefore, C61 discharges rapidly via R115 and Q20, and thus Q21 emitter voltage (+B2) decreases by discharge time constant of C61, R115.

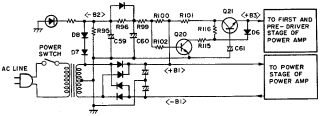


Fig. 2 Muting and power supply circuit (SA-520)

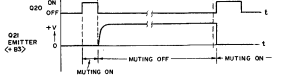


Fig. 3 Timing chart

Protection Circuit (SA-720, SA-620)

Besides protecting the speakers if a DC voltage should happen to appear at the power amplifier stage outputs, this circuit also mutes the signal path when the power switch is turned on and off. (See Fig. 4).

If for any reason a DC voltage (in excess of about ±5V) should happen to appear in the output of the power amplifier stage, it is detected immediately by either Q19 or Q20. Q19 is turned on by a positive voltage, and Q20 by a negative voltage. In either case, Q21 is also turned off, thereby opening the relay contact to disconnect the power amplifier stage from the speakers.

The muting action when the power switch is turned on is achieved by delaying the rise of the Q21 base potential by means of the R96/C60 time constant circuit. When the power switch is turned on, C60 is charged up via R96, thereby increasing the voltage across both ends of this capacitor. When this voltage exceeds the zener voltage of the D6 zener diode, Q21 is biased in the forward direction, and is thereby turned on to close the relay contact.

When the power switch is turned off, C60 discharges rapidly via D5, resulting in Q21 being turned off, thereby opening the relay contact.

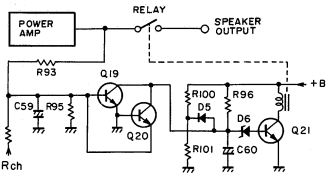


Fig. 4 Protection circuit (SA-720, SA-620)