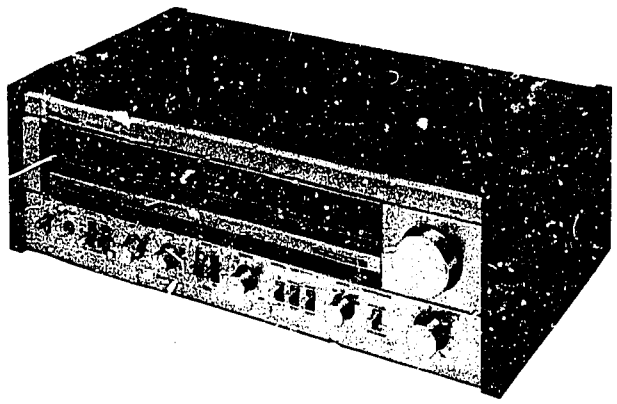
ORDER NO. SD8C06-1766

Service Manual

FM/AM Stereo Receiver

SA-401

[M], [MC]



Simulated wood cabinet

Areas

* [M] is available in U.S.A.
* [MC] is available in Canada.

TECHNICAL SPECIFICATIONS (Specifications are subject to change without notice for further improvement.)

AMPLIFIER SECTION

Rated minimum sine wave RMS power output
20 Hz ~ 20 kHz both channels driven
0.04% total harmonic distortion

50 W per channel (8 ohms)

1 kHz continuous power output both channels driven 0.04% total harmonic distortion	55 W per channel (8 ohms) 60 W per channel (4 ohms)
Dynamic headroom	1.4 dB (8 ohms)
Total harmonic distortion	
rated power at 20 Hz ~ 20 kHz	0.04% (8 ohms)
half power at 20 Hz ~ 20 kHz	0.02 % (8 ohms)
half power at 1 kHz	0.009% (8 ohms)
SMPTE intermodulation distortion	0.04 % (8 ohms)
Frequency response	
PHONO	RIAA standard curve +0.3 dB
TUNER, AUX, TAPE	7 Hz ~ 45 kHz, −1 dB 20 Hz ~ 20 kHz, +0.2 dB, −0.2 dB
Input sensitivity	
PHONO	0.4 mV (2.5 mV, IHF '66)
TAPE 1, 2	20 mV (150 mV, IHF '66)
S/N (IHF, A)	
PHONO	72 dB (80 dB, IHF '66)
TUNER, AUX, TAPE	78 dB (95 dB, IHF '66)
Maximum input voltage	
PHONO	120 mV (150 mV, 1 kHz)
Input impedance	
PHONO	47 kilohms
TAPE 1, 2	27 kilohms
Tone controls	
BASS	50 Hz, +10 dB ~ −10 dB
TREBLE	20 kHz, +10 dB ~ −10 dB
Acoustic controls (at tone "0" position)	
LOW BOOST	100 Hz, +6 dB
HIGH BOOST	10 kHz, +6 dB
Low filter	100 Hz, −6 dB/oct.
High filter	7 kHz, −6 dB/oct.
Loudness control (volume at −30 dB)	50 Hz, +9 dB
Output voltage	
REC OUT	150 mV
Low frequency damping factor	34 (8 ohms) 17 (4 ohms)
Load impedance	
MAIN or REMOTE	4 ~ 16 ohms
MIAN and REMOTE	8 ~ 16 ohms

FM TUNER SECTION E(500 ~ 599)

Frequency range	88 ~ 108 MHz
Sensitivity	10.8 dBf (1.9μV, IHF '58)
50 dB quieting sensitivity	
MONO	13.7 dBf (2.7μV IHF '58)
STEREO	37.2 dBf (39.7μV IHF '58)
Total harmonic distortion	
100 Hz	0.15 % (MONO), 0.3 % (STEREO)
1 kHz	0.15 % (MONO), 0.3 % (STEREO)
6 kHz	0.3 % (MONO), 0.4 % (STEREO)
S/N MONO	75 dB
STEREO	70 dB
Frequency response	20 Hz ~ 15 kHz, +1 dB, −2 dB
Alternate channel selectivity	70 dB
Capture ratio	1.2 dB
Image rejection at 98 MHz	60 dB
IF rejection at 98 MHz	75 dB
Spurious response rejection at 98 MHz	82 dB
AM suppression	55 dB
Stereo separation	
1 kHz	45 dB
10 kHz	35 dB
Carrier leak	
19 kHz	−40 dB
38 kHz	−50 dB
Antenna terminals	300 ohms (balanced) 75 ohms (unbalanced)

AM TUNER SECTION

Frequency range	525 ~ 1605 kHz
Sensitivity	30μV, 300μV/m
Selectivity	30 dB
Image rejection at 1000 kHz	50 dB
IF rejection at 1000 kHz	40 dB

GENERAL

	(E (700 ~ 799)
Power consumption	300 W, 345 VA
Power supply	AC 120V, 60 Hz
Dimensions (W x H x D)	480 x 160 x 293 mm (18-29/32" x 6-5/16" x 11-17/32")
Weight	8.4 kg (18.5 lb.)

Weights and dimensions shown are approximate.

Technics

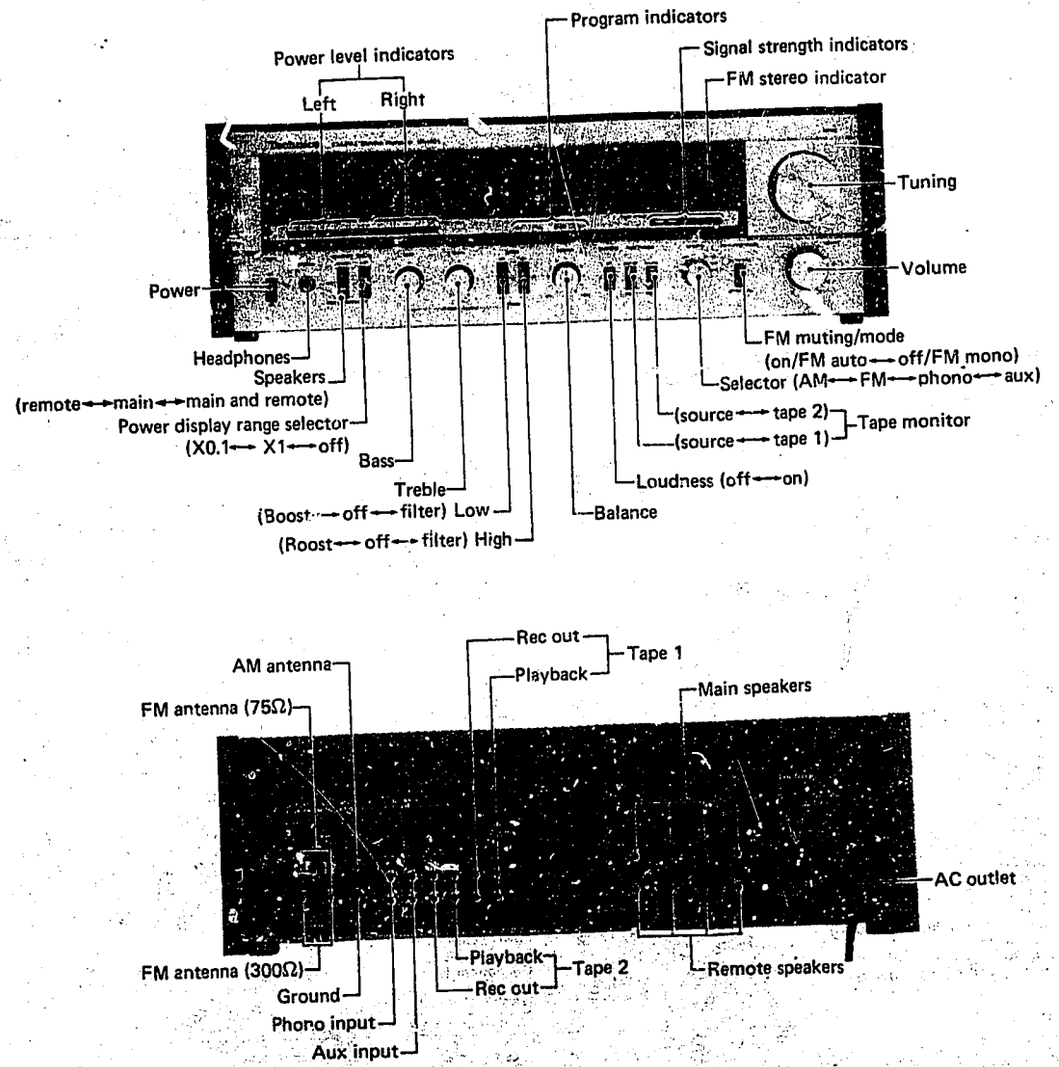
Panasonic Company
Division of Matsushita Electric Corporation of America
One Panasonic Way, Secaucus, New Jersey 07094

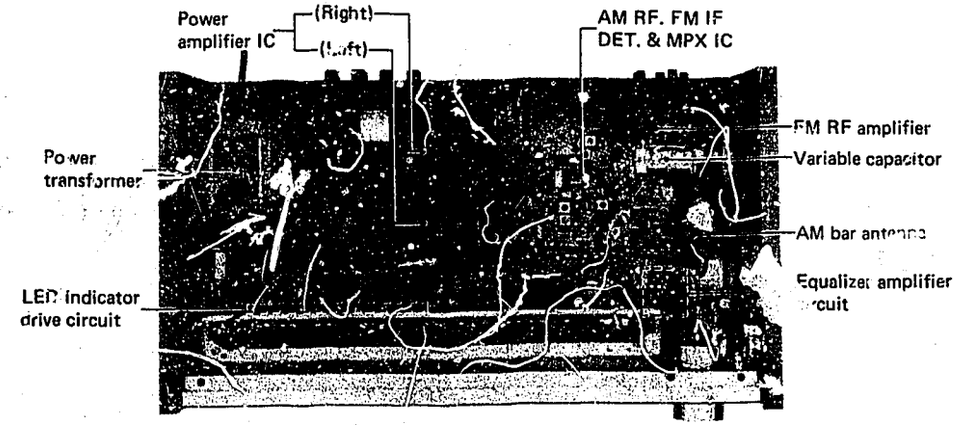
Panasonic Hawaii, Inc.
320 Walakamilo Road, Honolulu, Hawaii 96817

Matsushita Electric of Canada Ltd.
5770 Ambler Drive, Mississauga, Ontario L4W 2T3

■ CONTENTS

■ LOCATION OF CONTROLS

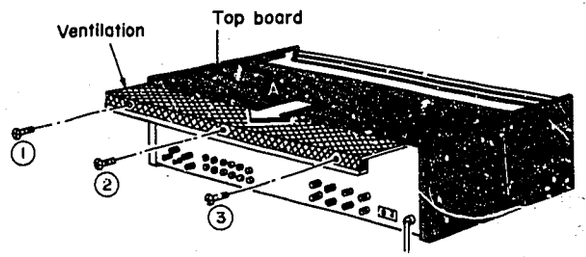




■ DISASSEMBLY INSTRUCTIONS

*** How to remove the top board**

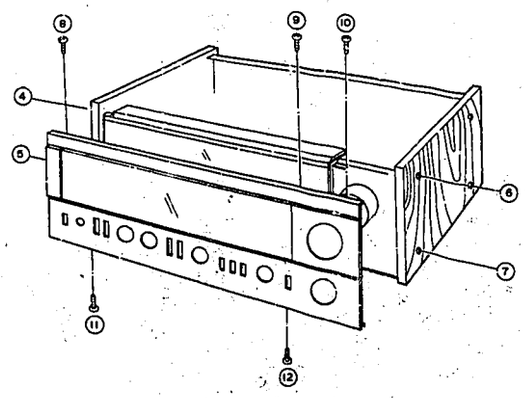
1. Remove the 3 setscrews (Fig. 1 : ①~③) holding the top board and ventilation.
2. Move the top board and ventilation slightly toward the rear of the unit (Fig. 1 : Ⓐ).



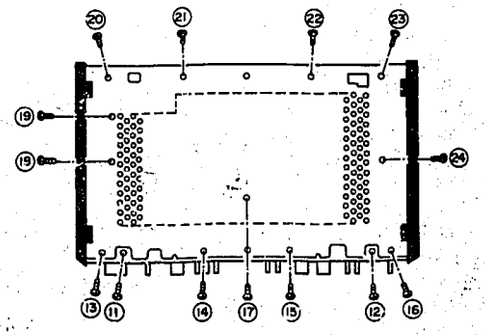
[Fig. 1]

*** How to remove the front panel and the bottom board**

1. Loosen the 4 setscrews (Fig. 2 : ④~⑦) holding the side boards.
2. Remove the 5 setscrews (Fig. 2 : ⑧ ~ ⑫) holding the front panel and remove the 2 setscrews (Fig. 3 : ⑭ , ⑮) holding the bottom board.
3. Pull the front panel outward from the front of the unit.
4. To remove the bottom board, remove the 12 setscrews (Fig. 3 : ⑬ ~ ㉔) holding the bottom board.



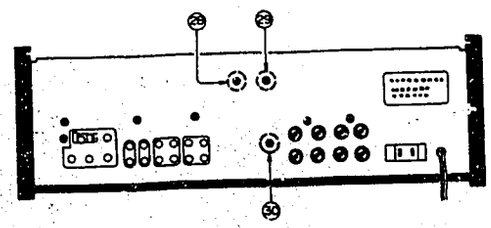
[Fig. 2]



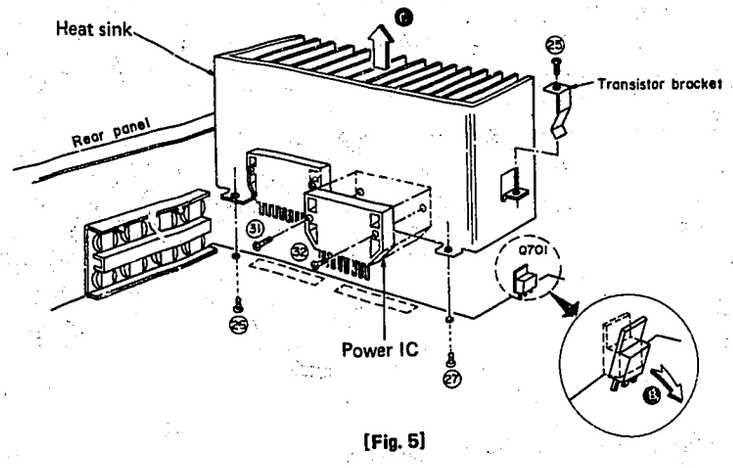
[Fig. 3]

*** How to remove the power IC**

1. Remove the top board and bottom board. (Refer to the sections "How to remove the top board" and "How to remove the front panel and the bottom board".)
2. Remove the solder of power IC for both Lch and Rch.
3. Remove the transistor bracket setscrew (Fig. 5 : ㉕) to detach the transistor bracket.
   Unsolder the transistor Q701 and bend it down in the direction of the arrow Ⓑ. (Refer to Fig. 5)
4. Remove the 2 setscrews (Fig. 5 : ㉖, ㉗) at the bottom of the heat sink and the 3 setscrews (Fig. 4 : ㉘ ~ ㉚) at the rear panel, and then remove the heat sink along with the power IC in the direction of the arrow Ⓒ. (Refer to Fig. 5.)
5. Remove the 2 setscrews (Fig. 5 : ㉛, ㉜) used to secure the power IC on the heat sink, and then pull the power IC.
6. When mounting the power IC, apply silicone compound (or equivalent heat diffuser) to the rear side of power IC, and then follow the steps 1 ~ 5 reversely.



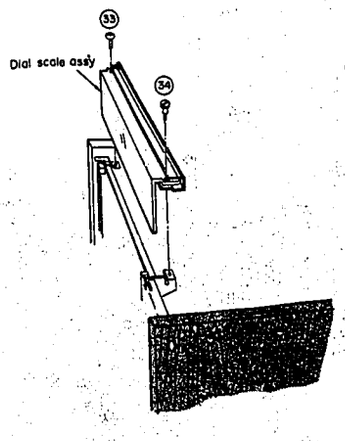
[Fig. 4]



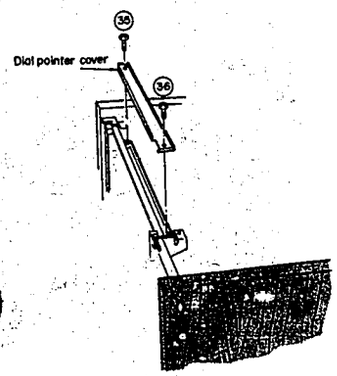
[Fig. 5]

• How to remove the LED indicator P.C.B. and LED indicator drive circuit P.C.B

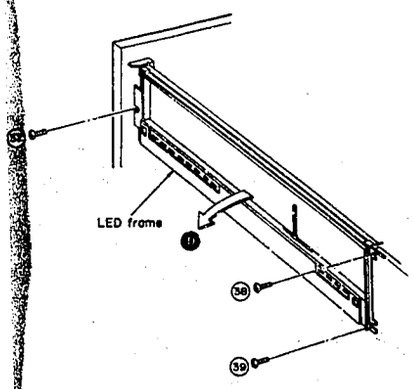
1. Remove the top board (Refer to the section "How to remove the top board".)
2. Remove the 2 setscrews (Fig. 6 : ㉝ , ㉞) holding the dial scale ass'y and remove the dial scale ass'y.
3. Remove the 2 setscrews (Fig. 7 : ㉟ , ㊱) holding the dial pointer cover and remove the dial pointer cover.
4. Remove the 3 setscrews (Fig. 8 : ㊲ ~ ㊴) which fasten the LED frame in the direction of the arrow Ⓓ (Fig. 8)
5. The LED indicator P.C.B. ass'y is secured with the lug projected from the LED frame. So, bend the lug down (Ⓔ in Fig. 9) to remove the LED indicator P.C.B.
6. Remove the setscrew (Fig. 9 : ㊵) which fastens the LED indicator drive circuit P.C.B. Then the LED indicator drive circuit P.C.B. can be detached.
7. When re-assembling, reversely follow the steps 1 through 7.



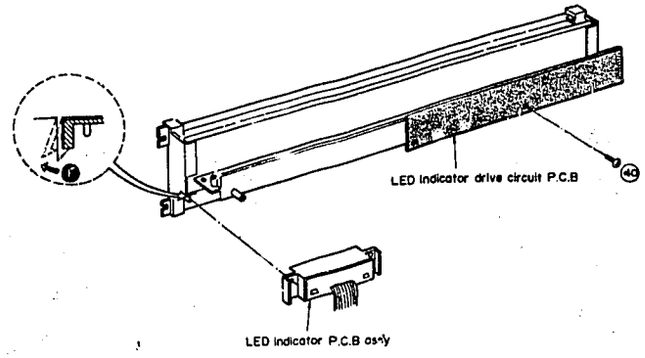
[Fig. 6]



[Fig. 7]



[Fig. 8]



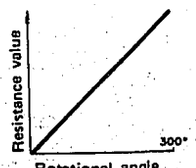
[Fig. 9]

VARIABLE RESISTORS

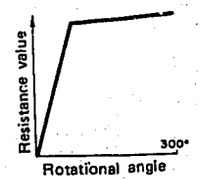
• Alteration of resistance values according to the rotational angles of variable resistors

Alteration characteristics as shown below are often used for sets. All are intended to keep the frequency response of the set at optimum levels, and are used according to the types of circuits. For example, characteristic (B) is used for sound volume adjustment; (A) and (C) are for bass and treble sound quality adjustment; (G) is for medium sound quality adjustment; and (BH) is for the adjustment of sound balance between the right and left.

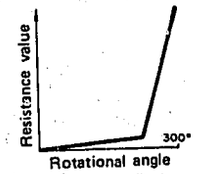
In the case of this unit, variable resistor with characteristic (C) which is short-circuited between its ends at rotational angle of 150° (center) is used for bass adjustment. Also, variable resistor with characteristic (C) whose resistance is zero at rotational angle of 150° (center) is used for treble adjustment.



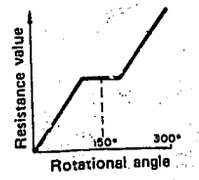
Characteristic (B)



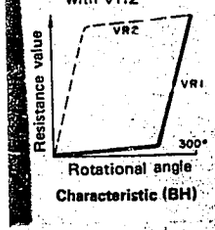
Characteristic (C)



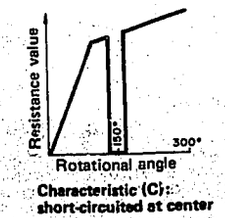
Characteristic (A)



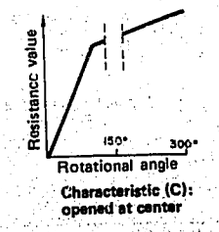
Characteristic (G)



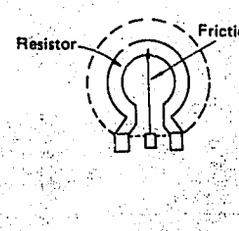
Characteristic (BH)



Characteristic (C): short-circuited at center



Characteristic (C): opened at center



■ ALIGNMENT INSTRUCTIONS

Notes:
1. Band selector switch . . . . . {AM (AM Alignment) / FM (FM Alignment)}
2. FM muting & mode switch . . . off/mono
3. Fix the bottom board to chassis before adjustment.
4. Connect stereo modulator to FM-SG
5. Maintain line voltage at 120 volts.
6. 300Ω dummy antenna
7. Output of signal generator should be no higher than necessary to obtain an output reading.

	AM/FM SIGNAL GENERATOR CONNECTION	AM/FM SIGNAL GENERATOR FREQUENCY	DIAL SETTING	INDICATOR (VTVM or SCOPE)	ADJUSTMENT POINTS	REMARKS
	AM ALIGNMENT					
1	High side through 0.001μF to **AM** antenna trimmer terminal. (point, A). Common to chassis.	450kHz (30% Mod. with 400Hz)	Point of non-inter ference	Connect AC VTVM or scope to "SPEAKER" terminals.	T201 (1st IFT) T202 (2nd IFT)	Adjust the input frequency and adjustment points so that the output becomes maximum.
2	Fashion loop of several turns of wire and radiate signal into loop of receiver	600kHz (30% Mod. with 400Hz)	600kHz	Connect AC VTVM or scope to "SPEAKER" terminals.	L202 (OSC Coil) L201 (ANT Coil)	Adjust for maximum output. Adjust L201 by moving coil bobbin along ferrite core.
3	Fashion loop of several turns of wire and radiate signal into loop of receiver.	1500kHz (30% Mod. with 400Hz)	1500kHz	Connect AC VTVM or scope to "SPEAKER" terminals.	CT5 (OSC Trimmer) CT4 (ANT Trimmer)	Adjust for maximum output. Repeat steps 2 and 3.
	FM IF ALIGNMENT					
4		No-Signal.	Point of non-inter ference	Connect DC VTVM to TP102, TP103 terminals. (Refer to fig. 14)	T101 (DISCRI IFT) A	• FM muting/mode switch to "on/auto" position. • Adjust T101 (A) core so that voltage measured in signal mode is 0V in 300mV range.
	FM RF ALIGNMENT					
5	Connect to FM 300Ω antenna terminal through 300Ω FM dummy antenna.	90MHz (100% Mod. with 400Hz) weak input	90MHz	Connect scope to "SPEAKER" terminals.	L5 (OSC Coil) L3 (RF DET Coil) L1 (ANT Coil)	• Add weak input so that noise is included in the output wave form. • Make the adjustment so that the output wave form is vertically symmetrical. (Fig. 15) • Repeat the steps 5 and 6 until the frequency correctly matches the dial scale.
6		106MHz (100% Mod. with 400Hz) weak input	106MHz	Connect scope to "SPEAKER" terminals.	CT3 (OSC Trimmer) CT2 (RF DET Trimmer) CT1 (ANT Trimmer)	
	FM MONO DISTORTION ALIGNMENT					
7	Connect to FM 300Ω antenna terminal through 300Ω FM dummy antenna.	100MHz (100% Mod. with 400Hz)	100MHz	Connect distortion meter to "SPEAKER" terminals.	T102 (DISCRI IFT) B	• Set the FM muting/mode switch to "on/auto" and then check step 4 in no signal mode. • If it is deflected, re-adjust A (primary side) of T101. • Adjust T102 core so that distortion of right and left channels are minimized. • Repeat steps (4) and (7).
	LED SIGNAL METER LIGHT UP LEVEL ALIGNMENT					
8	Connect to FM 300Ω antenna terminal through 300Ω FM dummy antenna.	100MHz (100% Mod. with 400Hz)	100MHz	Connect scope to "SPEAKER" terminals.	VR102 (LED LIGHT UP LEVEL)	• With weak input signal (noise produced) at 100MHz (100% Mod. with 400Hz) applied, make tuning so that the upper and lower wave forms are symmetrical. • With the input set at 45dB (signal generator at 57dB), adjust VR102 so that all the signal strength LED's light up.
	FM MUTING LEVEL ALIGNMENT					
9	Connect to FM 300Ω antenna terminal through 300Ω FM dummy antenna. Apply 16dB (6.3μV) to receiver.	100MHz (100% Mod. with 400Hz)	100MHz	Connect AC VTVM or scope to "SPEAKER" terminals.	VR101 (MUTING LEVEL)	FM muting/mode switch to "on/auto". Adjust so that output can be obtained.

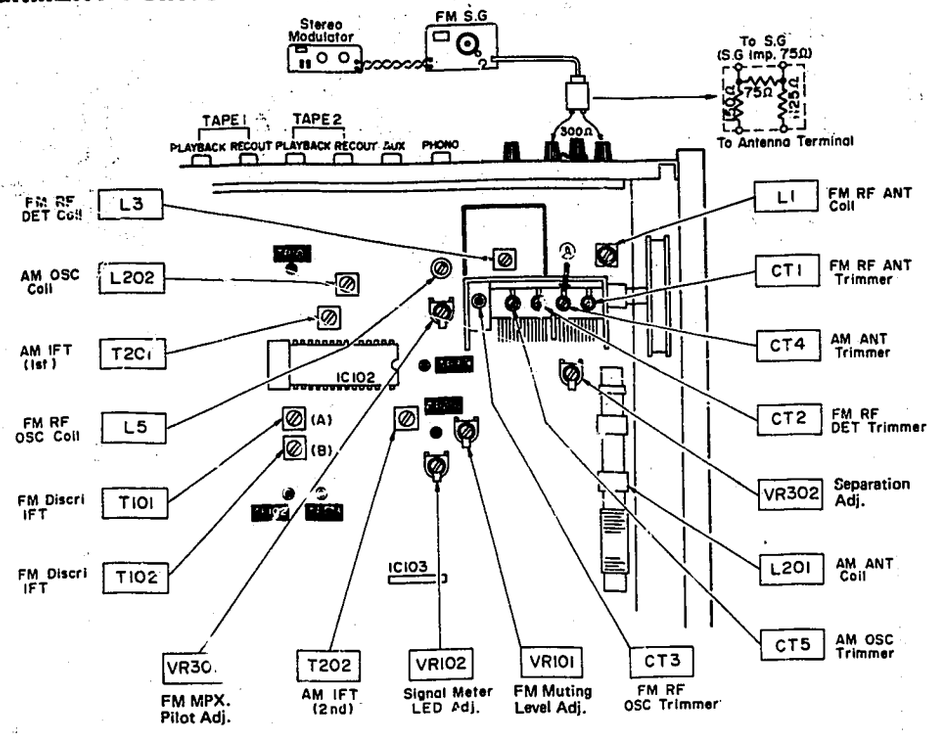
FM MPX PILOT ALIGNMENT

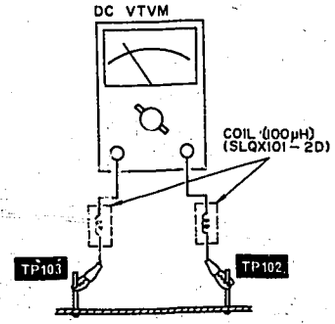
	USING FREQUENCY COUNTER	USING ALTERNATE SYSTEM
10	1 100MHz Non-modulated mono signal applied to set. 2 FM muting/mode switch to "on/FM auto". 3 Connect frequency counter to **TP301** through resistor (100kΩ). 4 Adjust **VR301** to 19kHz, ± 30Hz.	1 Apply stereo signal from generator or stereo station to receiver. 2 Adjust **VR301** until stereo indicator lights up. Cement arm of **VR301** as shown in fig. 16.

SEPARATION ALIGNMENT

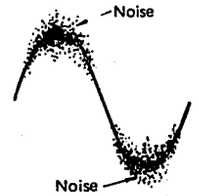
PREPARATIONS	ADJUSTING PROCEDURE
Add 100MHz, 1kHz, 30% pilot 10% modulation, 60dB stereo signal to the receiver. 2 Connect AC VTVM or scope to speaker terminals through low pass filter. Refer to fig. 17.	1 FM muting/mode switch to "on/auto". 2 Adjust **VR302** so that **R** output is minimized when stereo modulator is in **L** (Lch.modulation) mode and that **L** output is minimized in **R** mode.

ALIGNMENT POINTS



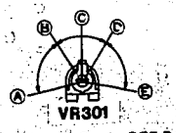


[Fig. 14]



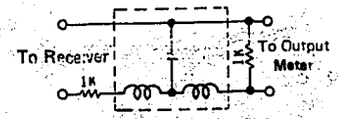
AF output wave form

[Fig. 15]



A – B, D – E: Stereo OFF Position.
B – D: Stereo ON Position (Indicator Lighting).
C: Adjust Point of Pilot Circuit.

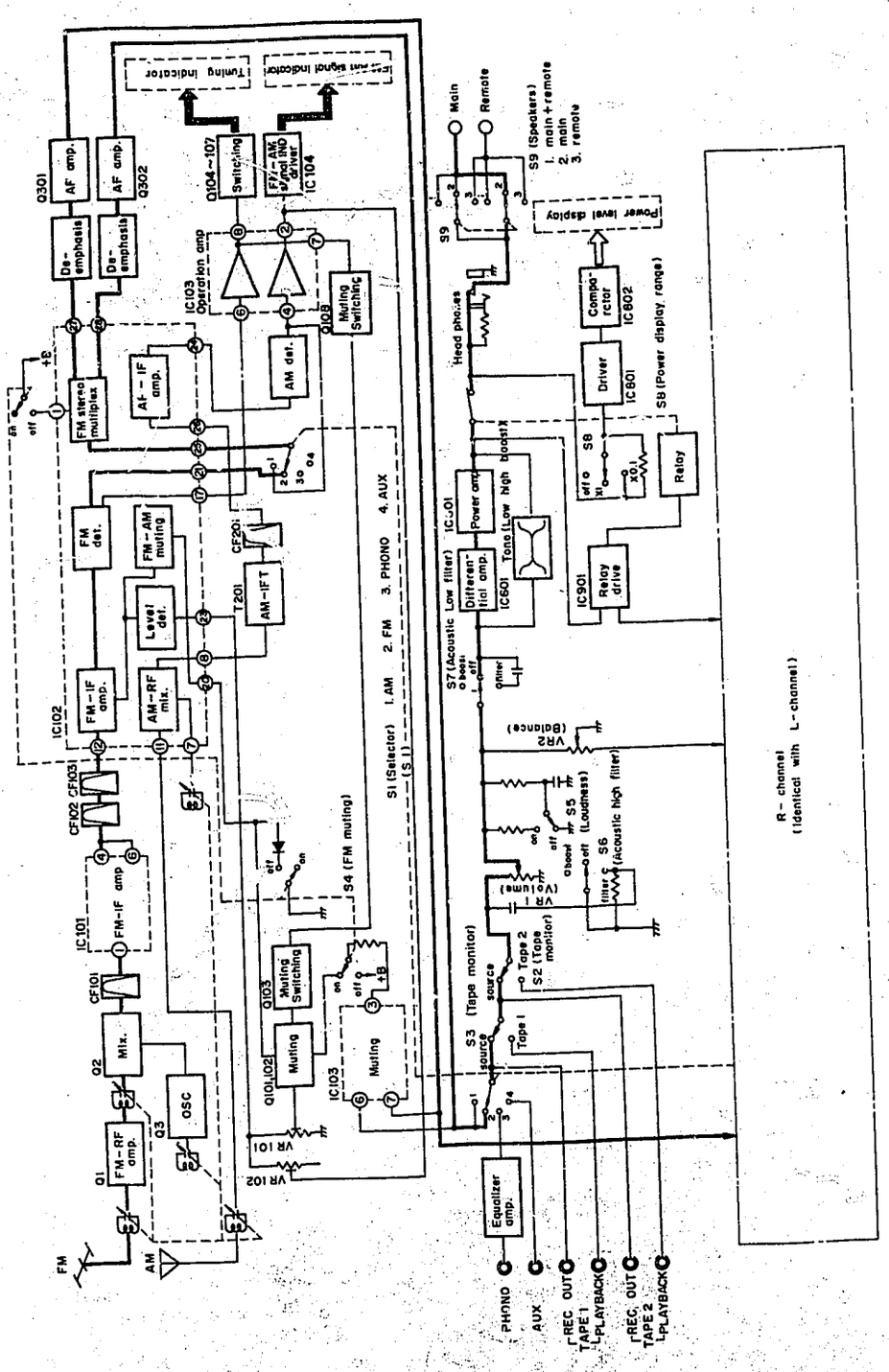
[Fig. 16]



Low Pass Filter (fc=15kHz ~ 19kHz)

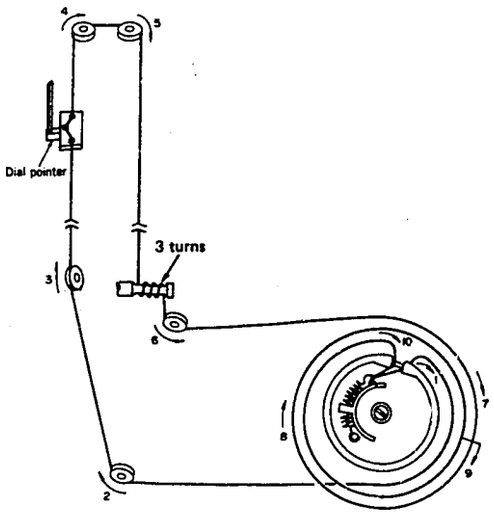
[Fig. 17]

■ BLOCK DIAGRAM



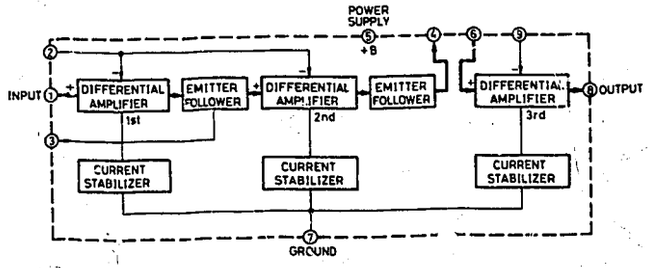
■ DIAL CORD INSTALLATION GUIDE

* For threading a fresh cord, proceed as follows.
1. Prepare a fresh cord more than 180cm (70-15/16") in length.
2. Bring the variable capacitor into a state where the drum is completely turned to the right (maximum capacity and lowest frequency for the variable capacitor.)
3. Direct the cord in the order from 1 to 10.
4. Stretch the cord in such a tension as the spring length is elongated by 1.5 times that of the original state.
5. Fix the knot of the cord with the adhesive.

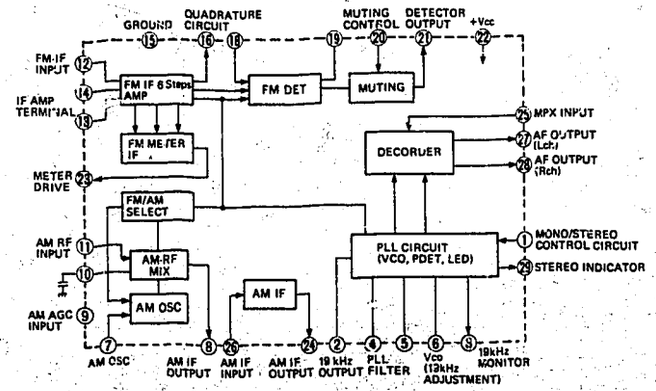


■ BLOCK DIAGRAM OF IC'S

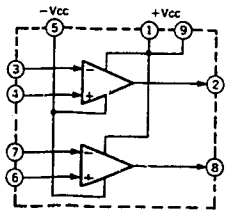
* This is the basic block diagram of the inside circuit of IC. In an actual circuit, there may be sometimes idle terminals or some different functions other than the basic circuit.



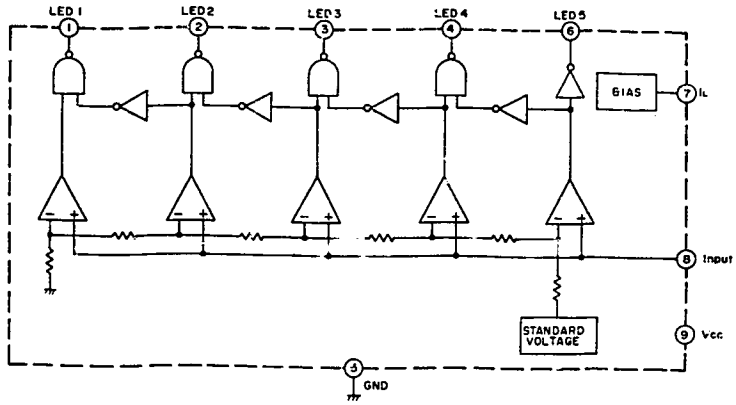
IC101 (AN278)
FM IF amplifier



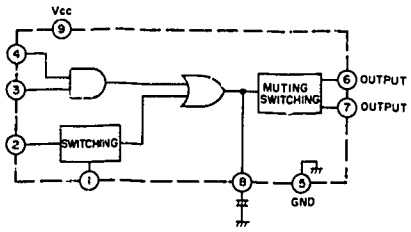
IC102 (AN7001)
AM converter, FM IF amplifier
FM detector & stereo decoder (MPX)



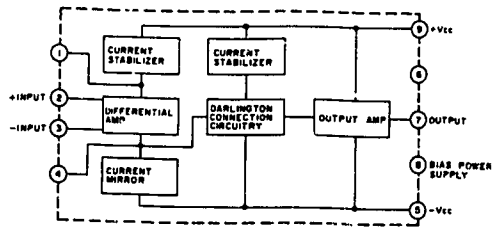
IC103, 801 (AN6551)
Operation amplifier



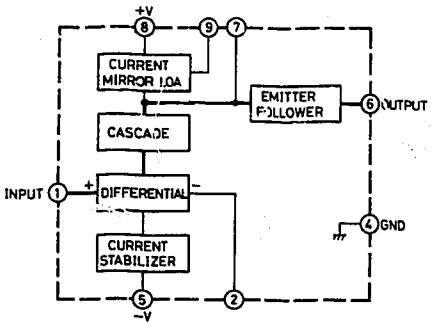
IC104 (AN6876)
FM AM signal indicator driver



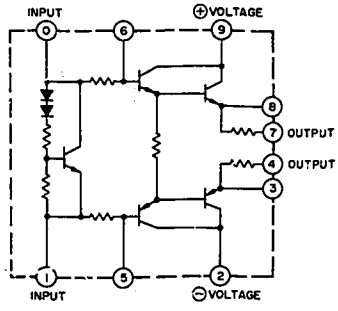
IC301 (AN6136)
AF muting



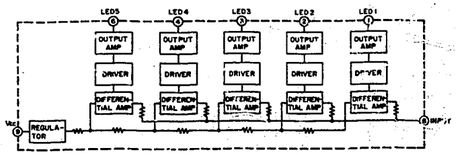
IC401, 402 (SVITA7322P)
Equalizer amplifier



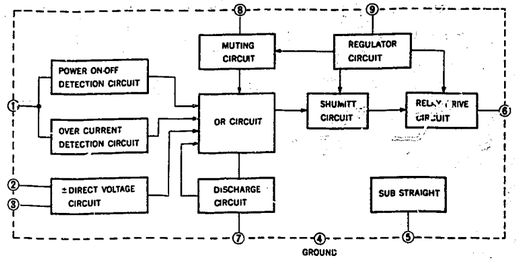
IC601, 602 (AN7060F)
Differential amplifier



IC603, 604 (SVISTK1050K)
Power amplifier



IC802, 803 (AN6875)
LED comparator

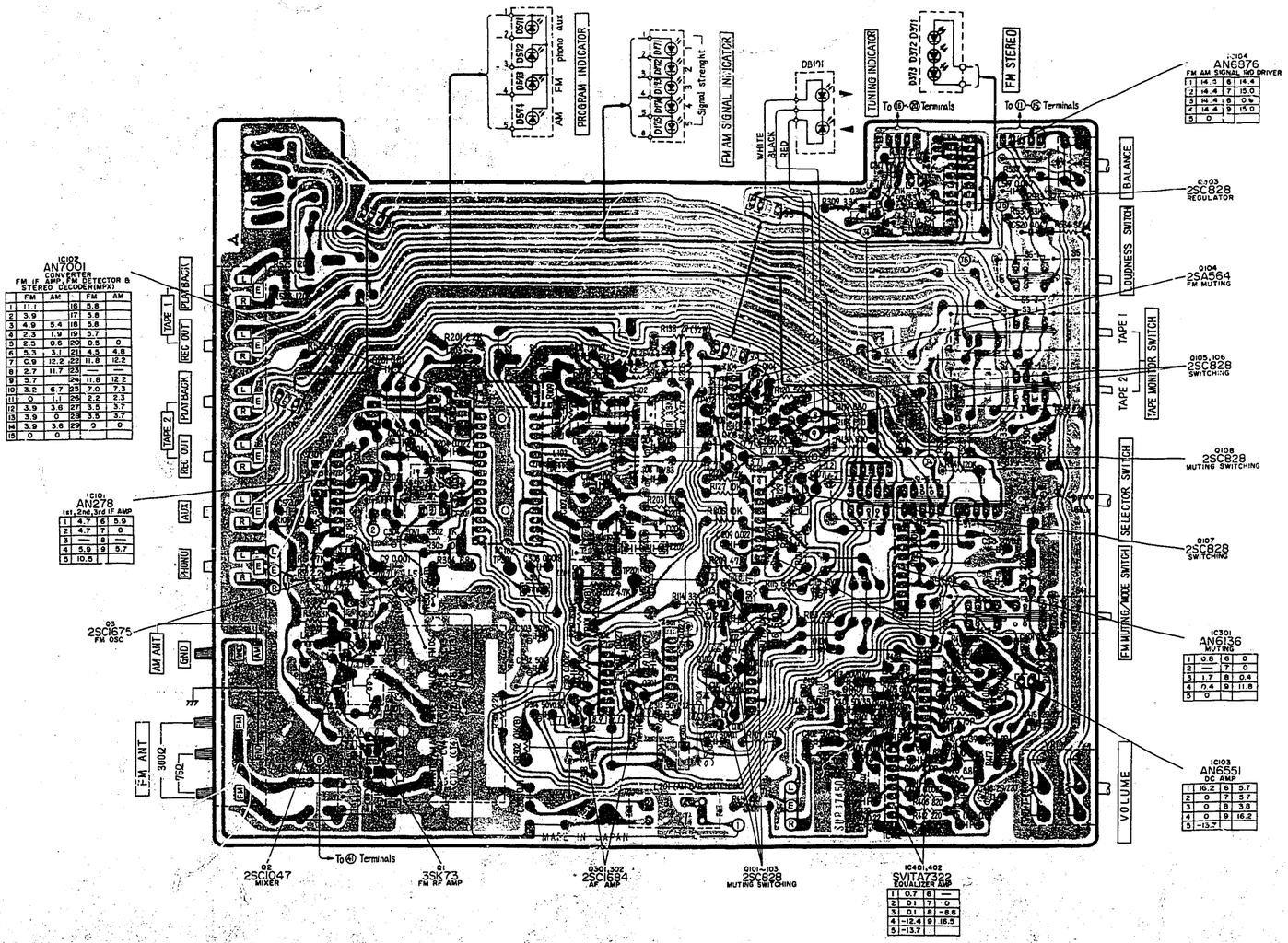


IC901 (SVITA7317P)
Speaker protection operation amplifier

■ PRINTED CIRCUIT BOARD WIRING VIEW

(FM/AM tuner and equalizer circuit board)

Ground (Earth) Lines



17 (4 ohms)	
Weight	8.4 kg (18.5 lb.)

Weights and dimensions shown are approximate.

Technics

Panasonic Company
Division of Matsushita Electric Corporation of America
One Panasonic Way, Secaucus, New Jersey 07094

Panasonic Hawaii, Inc.
320 Walakamilo Road, Honolulu, Hawaii 96817

Matsushita Electric of Canada Ltd.
5770 Ambler Drive, Mississauga, Ontario L4W 2T3

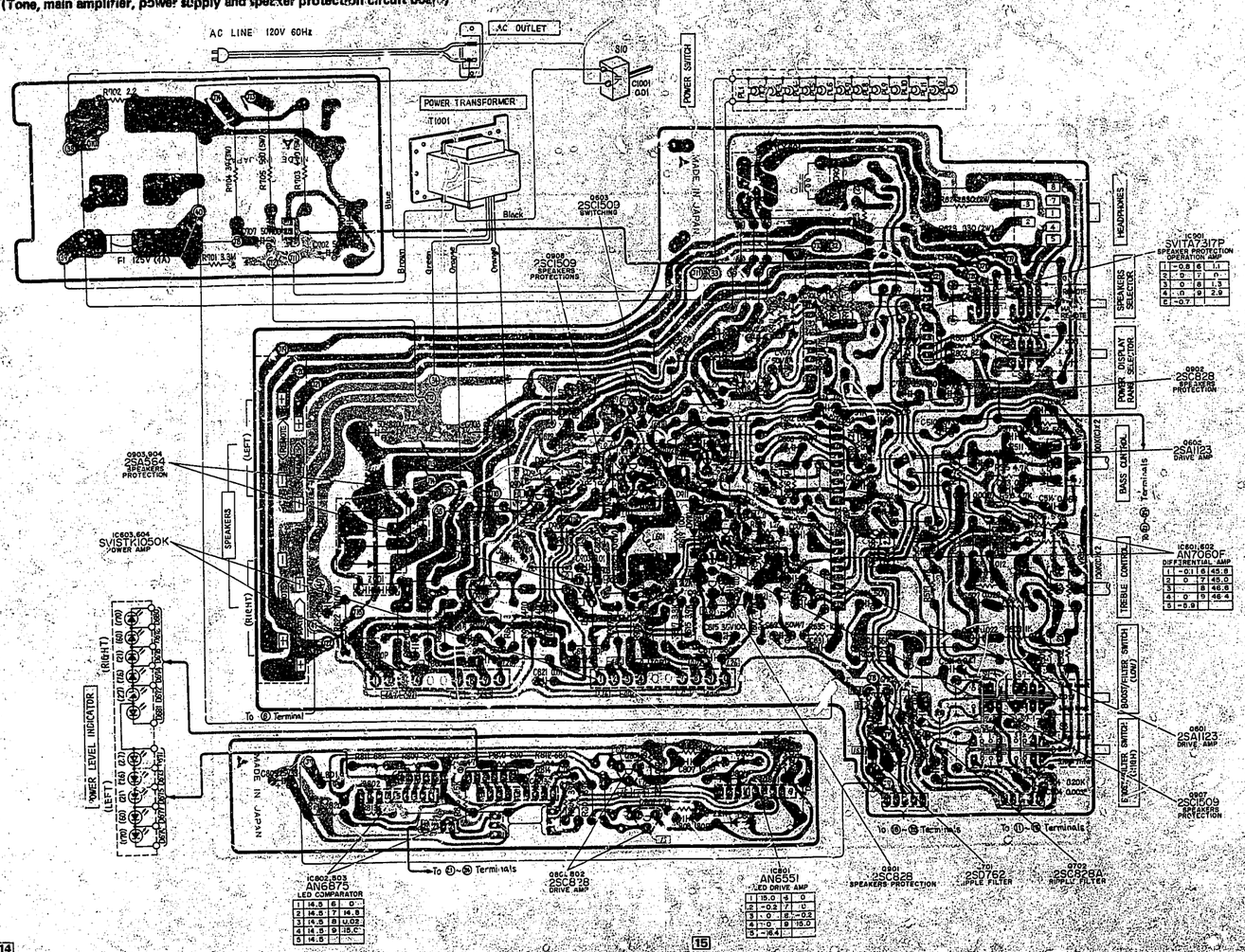
Ground
Phono input
Aux input

[Fig. 2]

SA-401

■ PRINTED CIRCUIT BOARD WIRING VIEW

(Tone, main amplifier, power supply and speaker protection circuit board)

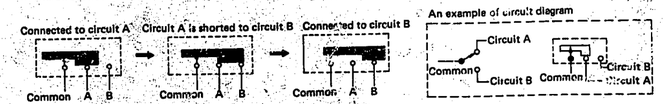


Notes:

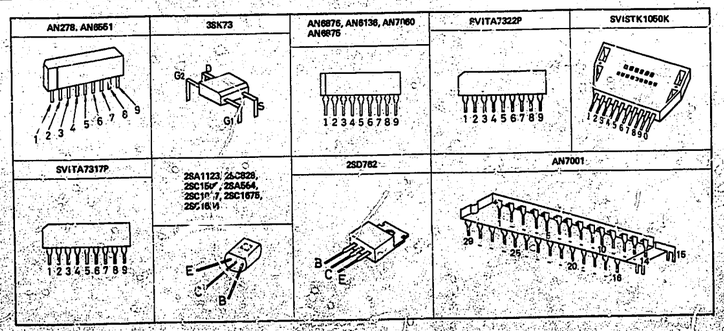
1. **S1-1 ~ S1-6:** Selector switch in **"FM"** position.
   ① AM ↔ ② FM ↔ ③ phono ↔ ④ AUX
2. **S2-1, S2-2:** Tape monitor switch in **"SOURCE"** position.
   source ↔ tape 2
3. **S3-1, 3-2:** Tape monitor switch in **"SOURCE"** position.
   source ↔ tape 1
4. **S4-1 ~ S4-3:** FM muting/mode switch **"ON/FM AUTO"** position.
   on/FM auto ↔ off/FM mode
5. **S5-1, 5-2:** Loudness switch in **"OFF"** position.
   off ↔ on
6. **S6-1 ~ S6-4:** Boost/filter switch (high) in **"OFF"** position.
   ① high boost ↔ ② off ↔ ③ high filter
7. **S7-1 ~ S7-4:** Boost/filter switch (low) in **"OFF"** position.
   ① low boost ↔ ② off ↔ ③ low filter
8. **S8:** Power display range selector switch in **"X1"** position.
   ① X0.1 ↔ ② X1 ↔ ③ off
9. **S9:** Speaker selector switch in **"MAIN"** position.
   ① remote ↔ ② main ↔ ③ main + remote
10. **S10:** Power source switch in **"ON"** position.
11. Indicated voltage values are the standard values for the unit measured by the DC electronic circuit tester (high-impedance) with the chassis taken as standard. Therefore, there may exist some errors in the voltage values, depending on the internal impedance of the DC circuit tester.
    ▭ Not apply signal to set and muting switch to OFF condition.
    ( ) AM signal reception.
12. ➡ AF signal lines ⇨ FM signal lines ➡ AM signal lines.

Shorting Switch

This unit uses a shorting switch. As illustrated below, the circuit is shorted to the next circuit without being opened in the circuit diagram; the shaded area represents the common terminal.

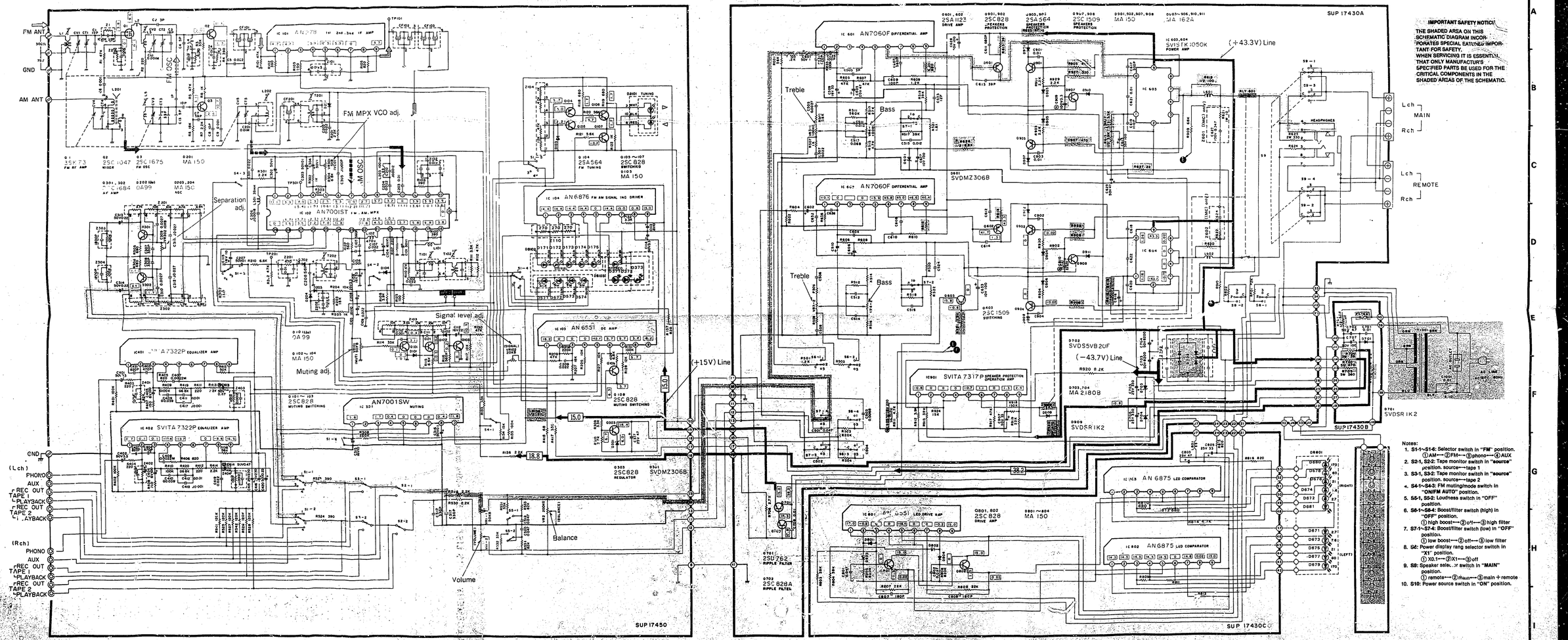


■ TERMINAL GUIDE OF TRANSISTORS AND IC'S



■ SCHEMATIC DIAGRAM ..... MODEL SA-401

(This schematic diagram may be modified at any time with the development of new technology.)



IMPORTANT SAFETY NOTICE!

THE SHADED AREA ON THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR SAFETY. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURER'S SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SHADED AREAS OF THE SCHEMATIC.

Notes:

1. S1-1~S1-6: Selector switch in "FM" position. ①AM←②FM→③phono←④AUX
2. S2-1, S2-2: Tape monitor switch in "source" position. source←tape 1
3. S3-1, S3-2: Tape monitor switch in "source" position. source←tape 2
4. S4-1~S4-3: FM muting/mode switch in "ON/FM AUTO" position.
5. S5-1, S5-2: Loudness switch in "OFF" position.
6. S6-1~S6-4: Boost/filter switch (high) in "OFF" position. ①high boost←②off→③high filter
7. S7-1~S7-4: Boost/filter switch (low) in "OFF" position. ①low boost←②off→③low filter
8. S8: Power display rang selector switch in "X1" position. ①X0.1←②X1→③off
9. S9: Speaker selector switch in "MAIN" position. ①remote←②main→③main+remote
10. S10: Power source switch in "ON" position.