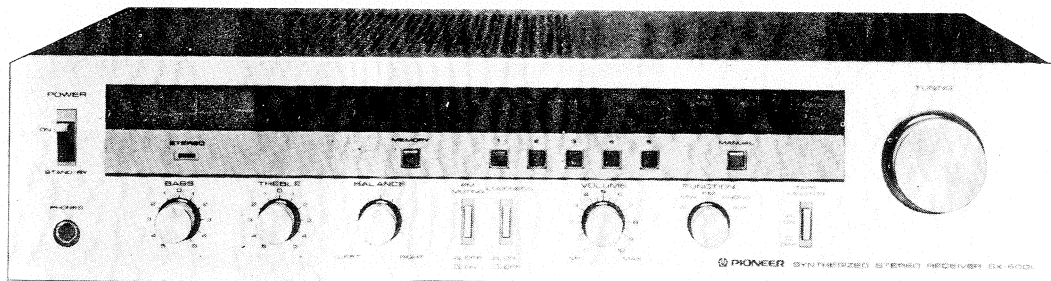


SYNTHESIZED
STEREO RECEIVER

SX-600L

SERVICE MANUAL



 PIONEER®

MODEL SX-600L COMES IN TWO VERSIONS DISTINGUISHED AS FOLLOWS:

Type	Voltage	Remarks
HE	220V and 240V (Selectable)	Europe model
HB	220V and 240V (Selectable)	United Kingdom model

• This service manual is applicable to the HE type. When repairing the HB type, please see page 26.

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Line Voltage Selection

Line voltage can be changed with following steps.

1. Disconnect the AC power cord.
2. Remove the bonnet cover.
3. Take out the fuse (T 630mA) from the fuse assembly.
4. Re-install the fuse in the correct voltage indication (see Fig. 1).
5. Stick the line voltage label on the rear panel.

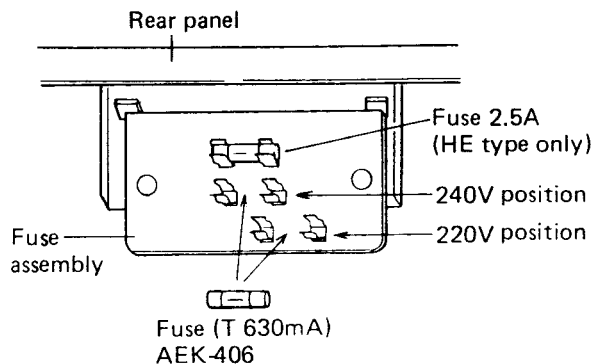


Fig. 1

Part No.	Description
AAX-193	220V label
AAX-192	240V label

1. SPECIFICATIONS

Amplifier Section

Continuous power output of 20watts* per channel, min., at 8ohms from 40Hertz to 20,000 Hertz with no more than 0.3% total harmonic distortion.

Continuous Power Output at 1kHz (both channels driven)
T.H.D. 0.3%, 8 ohms 21 watts per channel

Total Harmonic distortion (40 Hertz to 20,000 Hertz, 8 ohms, from AUX)
10 watts per channel power output
. No more than 0.07%

Intermodulation Distortion (50 Hertz : 7,000 Hertz = 4 : 1, 8 ohms, from AUX)
continuous rated power output . . . No more than 0.3%
10 watts per channel power output
. No more than 0.07%

Damping Factor (1,000 Hertz, 8 ohms) 30

Input (Sensitivity/Impedance)

PHONO 2.5mV/50 kilohms

AUX, TAPE PLAY 150mV/50 kilohms

Phono Overload Lever (T.H.D. 0.1%, 1,000Hz) . . 150mV
Output (Level)

TAPE REC 150mV

Frequency Response

PHONO (RIAA Equalization)
. 30Hz to 15,000 Hz±0.5dB

AUX, TAPE PLAY 7Hz to 60,000Hz⁺¹₋₃ dB

Tone Control

BASS ±8dB (100Hz)

TREBLE ±8dB (10kHz)

Loudness Contour (Volume control set at -40dB position)
. +10dB (100Hz)

Hum and Noise (IHF, short-circuited, A network)

PHONO 70dB

AUX, TAPE PLAY 98dB

Hum and Noise (DIN, continuous power/50mW)

PHONO 66dB/62dB

AUX, TAPE PLAY 85dB/66dB

FM Tuner Section

Usable Sensitivity (IHF) 12dBf (2.2 μV)

50dB Quieting Sensitivity

MONO 17.2dBf (4μV)

STEREO 37.2dBf (40μV)

Sensitivity (DIN)

MONO 2μV

STEREO 80μV

Signal-to-Noise Ratio

MONO 78dB (at 60dBf)

STEREO 72dB (at 75dBf)

Signal-to-Noise Ratio (DIN)

MONO 75dB (at 60dBf)

STEREO 60dB (at 75dBf)

Distortion (at 65dBf)

MONO 1kHz 0.5%

STEREO 1kHz 0.3%

Capture Ratio 2.5dB

Alternate Channel Selectivity (400kHz) 50dB

Stereo Separation

1kHz 45dB

Frequency Response 30Hz to 15kHz±0.5dB

Spurious Response Ratio 70dB

Image Response Ratio 45dB

IF Response Ratio 90dB

AM Suppression Ratio 50dB

Antenna Input

. 300 ohms balanced, 75 ohms unbalanced

MW Tuner Section

Sensitivity (IHF, ferrite antenna) 270μV/m

(IHF, ext. antenna) 10μV

Selectivity 25dB

Signal-to-Noise Ratio 52dB

Image Response Ratio 32dB

IF Response Ratio 40dB

Antenna Ferrite loopstick antenna

LW Tuner Section

Sensitivity (IHF, ferrite antenna) 450μV/m

(IHF, ext. antenna) 20μV

Selectivity 25dB

Signal-to-Noise Ratio 52dB

Image Response Ratio 20dB

IF Response Ratio 30dB

Antenna Ferrite loopstick antenna

Miscellaneous

Power Requirements HE model . . . a.c. 220V, 50/60Hz

HB model . . . a.c. 240V, 50/60Hz

Power Consumption 130W

Dimensions 420(W) x 94(H) x 361(D) mm

16-9/16(W) x 3-11/16(H) x 14-3/16(D) in

Weight (without package) 6.2 kg(13 lb 11oz)

Furnished Parts

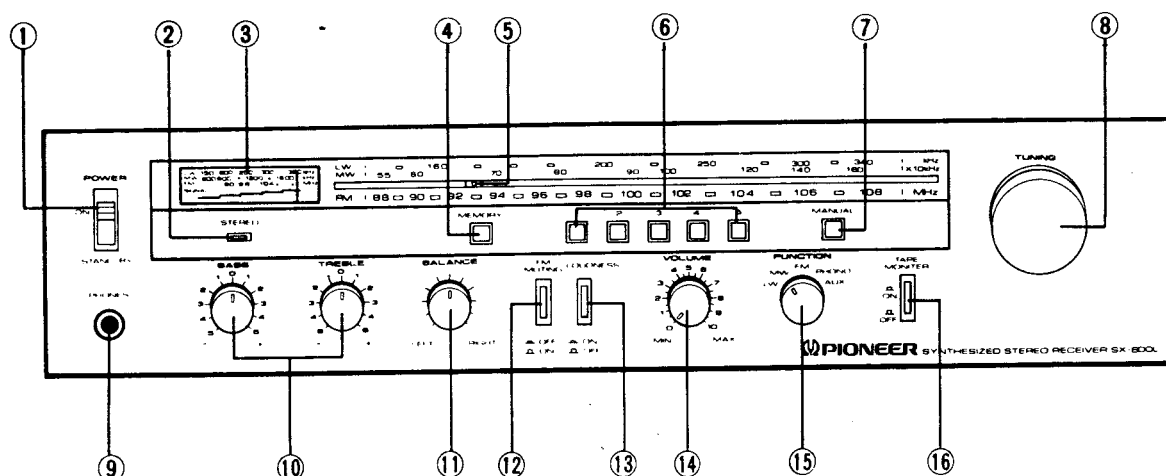
Operating instructions 1

FM T-type antenna 1

**Measured pursuant to the Federal Trade Commission's Trade Regulation rule on Power Output Claims for Amplifiers.*

*NOTE:
Specifications and the design subject to possible modifications without notice due to improvements.*

2. FRONT PANEL FACILITIES



① POWER SWITCH

When this switch is set to ON position, power is supplied to the receiver's main circuits. The unit's power switch is geared to selecting the transformer's secondary and so even at STAND-BY position, the unit's circuitry will work as long as the power cord is connected to the power outlet. For this reason, the programmed broadcasting stations will not be erased.

Disconnect the power cord from the power outlet when you do not plan to use the unit for a long period of time. When it has been disconnected, the broadcasting stations remain programmed for about 3 days.

② FM STEREO INDICATOR

This indicator lights up when receiving an FM stereo program.

③ SIGNAL METER/PRESET FREQUENCY DISPLAY METER

This is a dual-purpose meter. During manual tuning it serves as a signal meter and with preset tuning it serves to indicate the frequencies of the broadcasting stations. With manual tuning, rotate the tuning knob, align the dial pointer near the frequency of the station you want to tune in, and adjust the tuning knob so that the signal meter pointer deflects as far to the right as possible.

With preset tuning, the pointer moves to the frequency of the preset station in line with the preset switch which has been depressed.

④ MEMORY SWITCH

This is depressed to preset a broadcasting station in a preset switch (memory operation). When presetting the frequency of a station in one of the preset switches, depress the preset switch with this switch in the depressed position.

⑤ DIAL POINTER

This pointer indicates the broadcasting stations.

⑥ PRESET SWITCHES

Depress these switches when calling out preset broadcasting stations and when presetting these stations. When one of the switches is depressed, it lights and it remains lighted during call-out.

One switch can be used to preset one FM station and one LW or MW station. To call out the preset station, first set the function selector to the frequency band and then depress the preset switches. The broadcasting station can be checked by the position of the pointer on the preset frequency display meter.

Depress one switch only to call out a station. If two or more switches are depressed simultaneously, the broadcasting station may not be called out.

⑦ MANUAL SWITCH

This switch is depressed when tuning in a station with the tuning knob. When it is depressed when changing from preset tuning to manual tuning, the preset switch light goes off and the dial pointer lights.

NOTE:

When one of the preset switches is depressed, it is not possible to tune in a station using the tuning knob. (When the dial pointer illumination goes off, it means that tuning is not possible with the tuning knob.)

⑧ TUNING KNOB

Use this knob to tune in to broadcasting stations.

⑨ HEADPHONE JACK

Plug your headphones into this jack when you want to listen to a program source in private.

NOTE:

When the headphones plug is connected to this jack, the sound will no longer be heard through the speakers.

⑩ BASS AND TREBLE CONTROLS

Use these controls to adjust the bass and the treble. If you turn the bass control to the right from its center position, you will be able to emphasize the sound in the low-frequency range. Conversely, turning this control left from the center position, you will attenuate the sound in the low-frequency range.

You can use the treble control to adjust the sound in the high-frequency range.

⑪ BALANCE CONTROL

Use this control to balance the volume of the left and right channels. If the sound appears to be louder on the right, it means that the volume of the right channel is higher. Turn the balance control to the left and adjust.

Conversely, if the sound appears to be louder on the left, it means that the volume of the left channel is higher. Therefore, turn the balance control to the right and adjust.

⑫ FM MUTING SWITCH

When this switch is released and an FM broadcast tuned in the muting circuit is activated to suppress the annoying interstation noise between the broadcasting frequencies for noise-free reception. When the broadcasting station is far away or when receiving a station in a fringe area, set the switch to the OFF position and then tune in. If there is a broadcasting station with a strong signal level on the air next to a station whose program you want to receive, you may not be able to tune in satisfactorily because the sound will be drowned out by the stronger signals. In cases like this, set the FM muting switch to OFF (depressed position) and tune in. The muting circuit does not work when the tuner is receiving AM (LW, MW) broadcasts.

⑬ LOUDNESS SWITCH

When listening to a performance with the volume control turned down, depress this switch and the bass will be accentuated.

When the volume is low, the human ear finds it harder to hear the bass than when the volume is high. The loudness switch is thus designed to compensate for this deficiency. By setting it to ON, the bass comes through much more strongly and the sound takes on a punch even when the volume control is turned down.

⑭ VOLUME CONTROL

Use this control to adjust the output level to the speakers and headphones. Turn it clockwise to increase the output level. No sound will be heard if you set it to "0".

⑮ FUNCTION SELECTOR

This is used to select the program source.

When selecting between the LW, MW or FM position, the sound will be cut off momentarily. This is in order to suppress the noise which is generated usually when the function selector is selected.

LW Set here when receiving an LW broadcast.

MW Set here when receiving an MW broadcast.

FM Set here when receiving an FM broadcast.

PHONO Set here when playing records on a turntable connected to the PHONO jacks.

AUX Set here when listening to a program source which is connected to the AUX jacks.


⑯ TAPE MONITOR SWITCH

Depress this switch when monitoring a tape performance on a tape deck which you have connected to the TAPE jacks or when monitoring a recording.

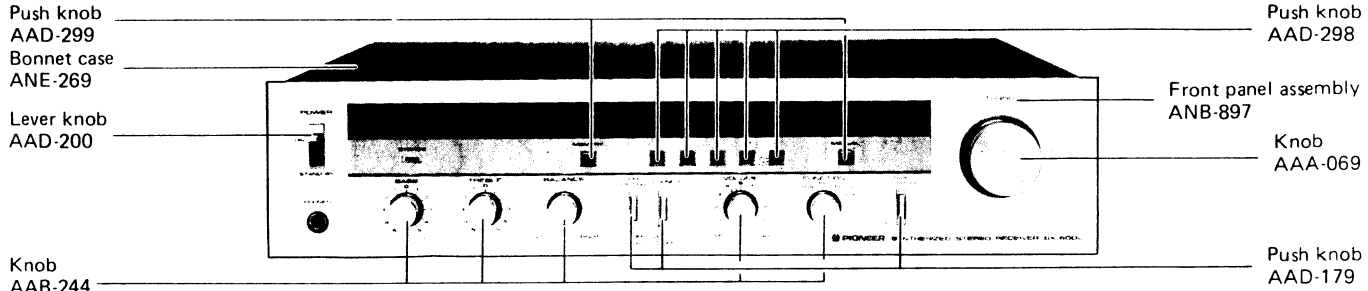
NOTE:

Set the switch to the OFF position when listening to records or broadcasts, etc. selected by the function selector.

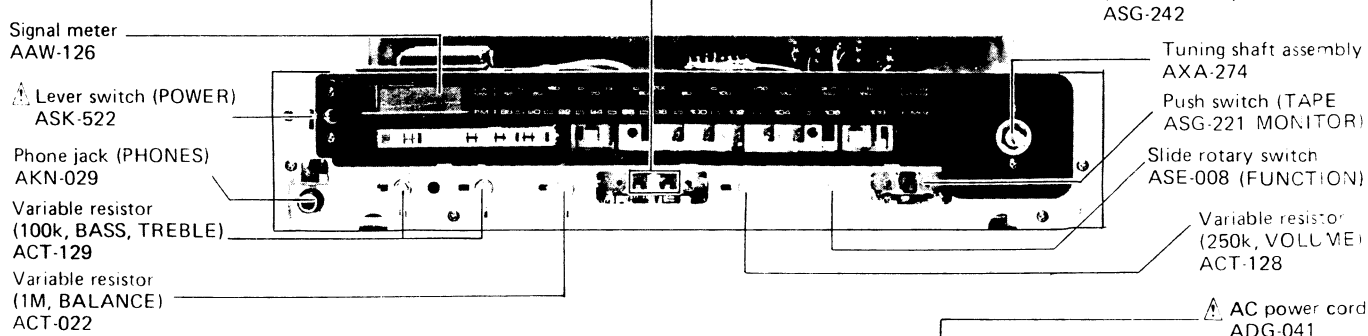
3. PARTS LOCATION

- The  mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.

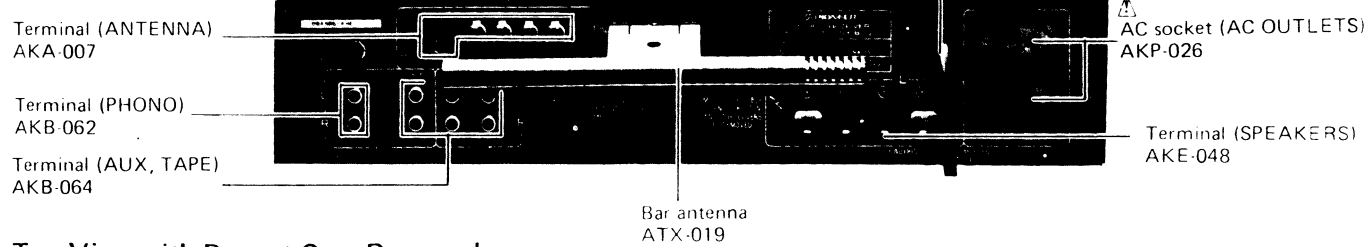
Front Panel View



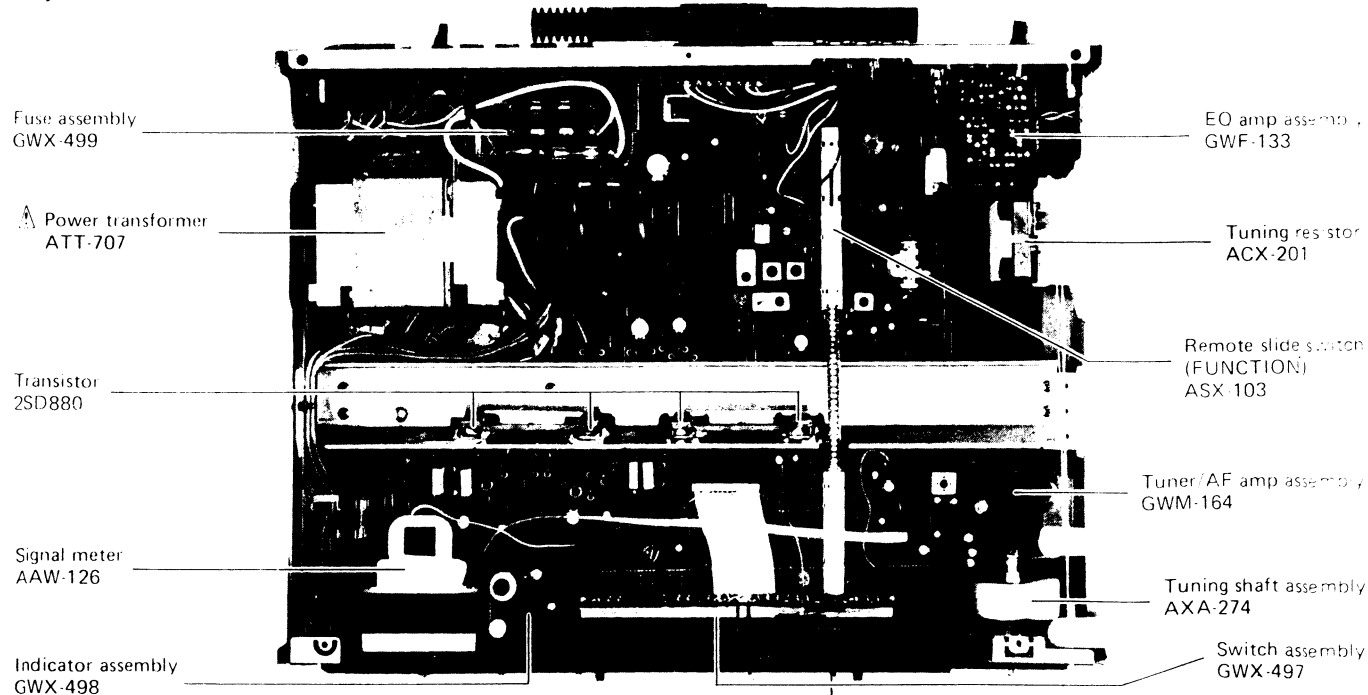
Front View with Panel Removed



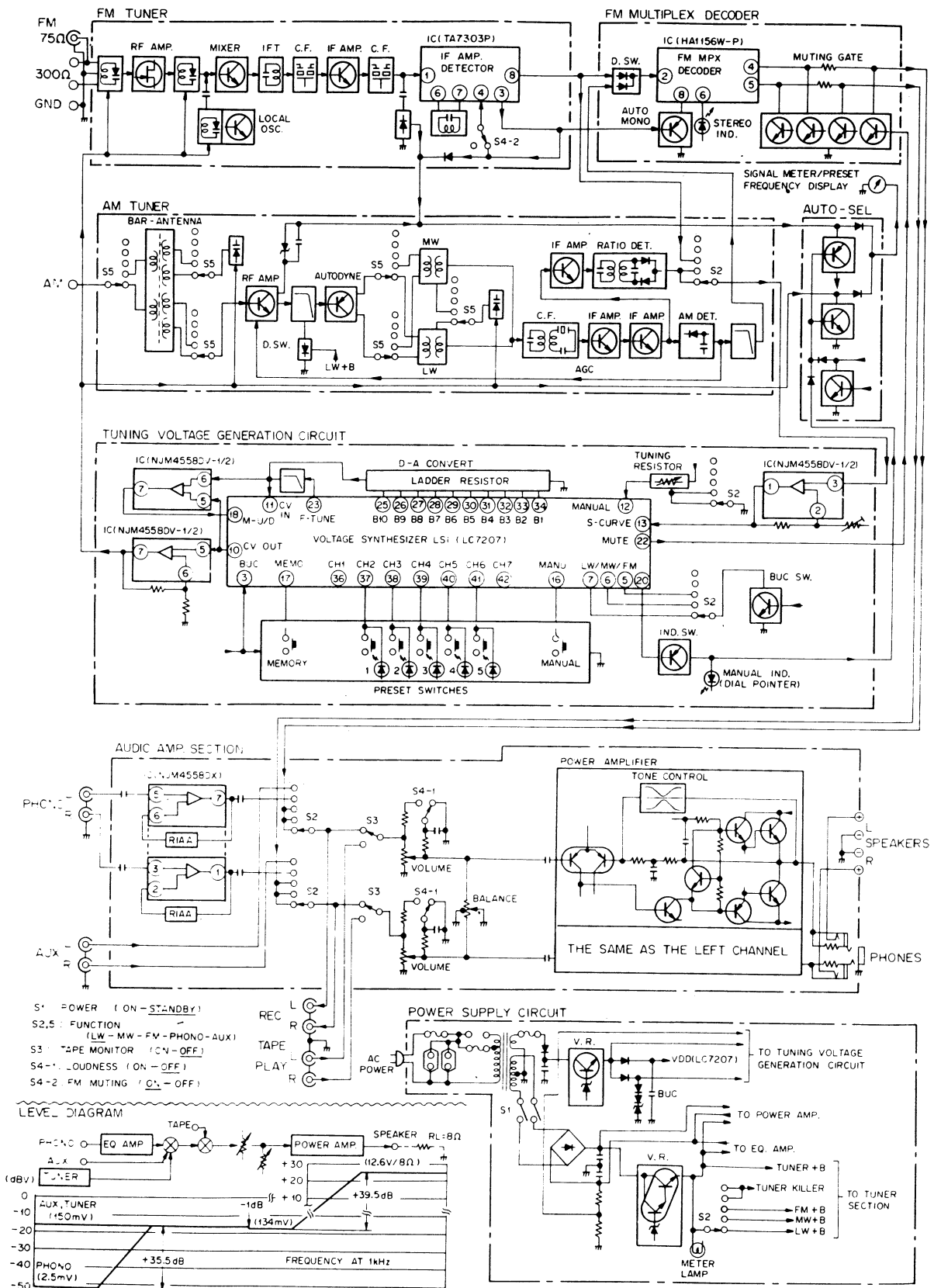
Rear Panel View



Top View with Bonnet Case Removed



4. BLOCK DIAGRAM



5. CIRCUIT DESCRIPTIONS

5.1 TUNER CIRCUIT

The tuner section of the SX-600L features an electronic tuning system where the conventional tuning capacitor has been replaced by variable capacitance diodes (vari-caps). In addition to manual tuning, it is also possible to preset 5 FM stations and 5 AM stations (including MW and LW stations).

FM Tuner

The front-end consists of a J-FET RF amplifier (single stage), and also includes 3 vari-caps in a tuning circuit corresponding to a 3-ganged tuning

capacitor. DC voltages generated in the tuning voltage generator circuit are applied to these vari-caps, and are modified by the variable resistor coupled to the TUNING knob during manual tuning. During preset tuning, the required DC voltage level is read out from the voltage synthesizer LSI (LC7207).

The IF stage consists of 2 dual-element ceramic filters, a single-transistor IF amplifier, and an IC (TA7303P). This stage is used in the amplification and detection of the IF signal.

The stereo decoder stage incorporates the PLL MPX IC (HA1156W-P).

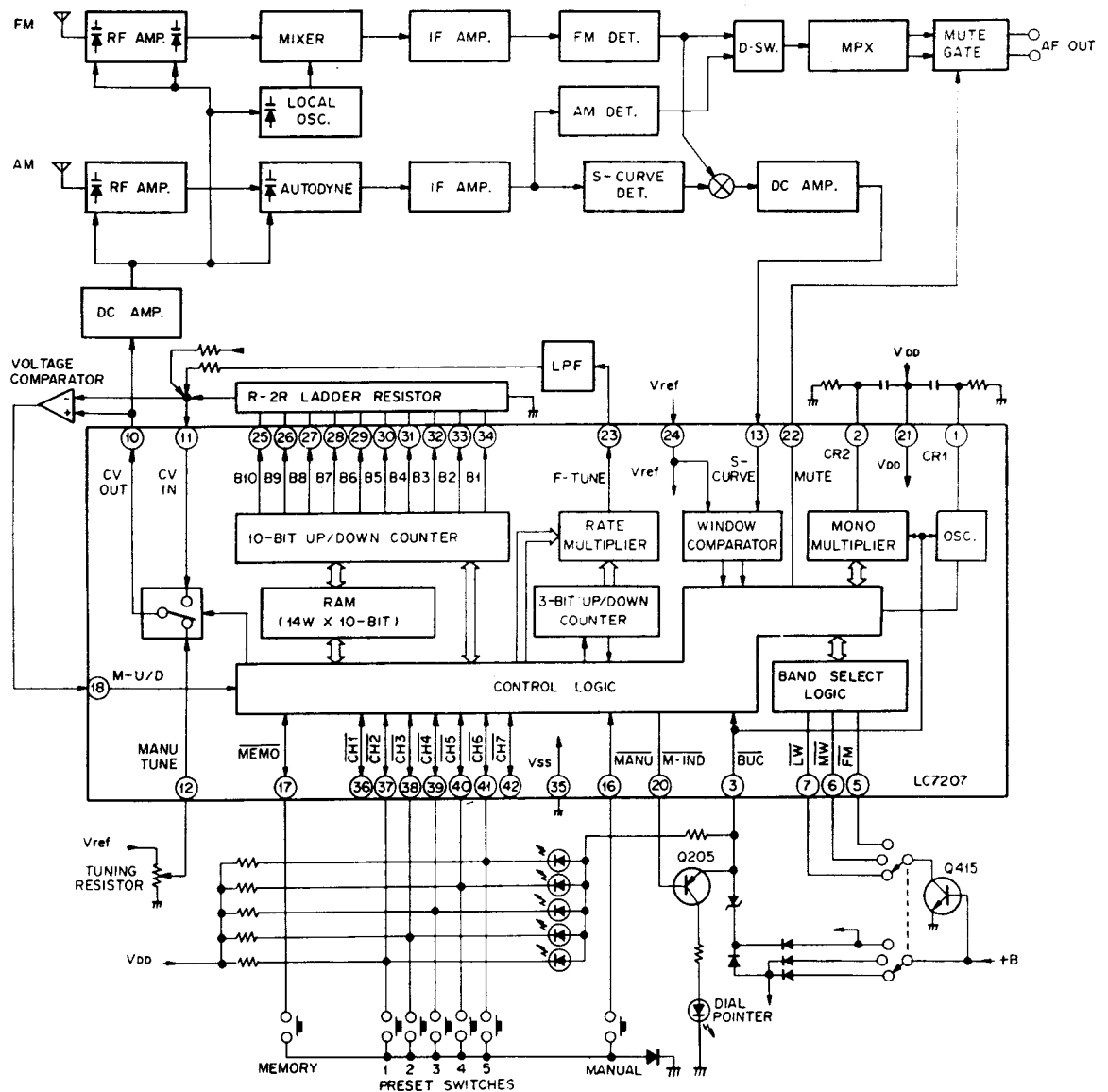


Fig. 5-1 Electronic tuning system

AM Tuner

The AM tuner consists of 4 transistors, and includes 2 vari-caps in a tuning circuit corresponding to a 2-ganged tuning capacitor to cope with the 2 bands (LW: 150kHz – 350kHz, and MW: 525kHz – 1605kHz).

5.2 ELECTRONIC TUNING SYSTEM

The LSI (LC7207) incorporated in the SX-600L electronic tuning system outlined in Fig. 5-1 is a special 42-pin DIP package C-MOS LSI developed expressly for use in the LW/MW/FM tuner voltage synthesizer electronic tuning system.

The major terminal functions are summarized below.

- CR1 (pin 1)

The oscillator circuit used to determine the fundamental clock pulse for the system is formed by connecting an RC time constant circuit to this pin.

- CR2 (pin 2)

The timer circuit is formed by connecting another RC time constant circuit to pin 2. This circuit is then used in determining the pulse width of the MUTE output signal employed during band switching.

- $\overline{\text{BUC}}$ (pin 3)

This is the LSI memory backup control terminal. All functions apart from memory hold are inhibited when a low level input signal is applied.

- $\overline{\text{FM}}$ (pin 5)

The SX-600L is switched to FM reception mode when a low level input signal is applied to this terminal. This FM mode is maintained even if the terminal is subsequently switched to high level (low level hold time: 5ms. minimum).

- $\overline{\text{MW}}$ (pin 6)

Likewise, the SX-600L is switched to AM-MW reception mode when a low level signal is applied to pin 6. This reception mode is maintained even if the terminal is subsequently switched to high level (low level hold time: 5ms. minimum).

- $\overline{\text{LW}}$ (pin 7)

Furthermore, switching to the AM-LW reception mode is achieved by applying a low level signal to pin 7, and is maintained even if the terminal is subsequently switched to high level (low level hold time: 5ms. minimum).

- CV out (pin 10)

An analog switch output terminal where the tuning voltage output signal appears.

- CV in (pin 11)

An analog switch input terminal to which the R-2R ladder output voltage is applied.

- Manu Tune (pin 12)

An analog switch input terminal to which the tuning voltage modified by the manual tuning variable resistor is applied.

- S-Curve (pin 13)

The AFC (Automatic Frequency Control) control signal input to which the FM and AM S-curve voltages are applied. (This S-curve describes the variation in DC level for the FM detector while tuning to and away from a particular station).

- $\overline{\text{MANU}}$ (pin 16)

The SX-600L is switched to manual tuning mode when a low level input signal is applied to this terminal, but switched back to preset tuning mode if any one of the $\overline{\text{CH2}}$ to $\overline{\text{CH6}}$ terminals is switched to low level.

- $\overline{\text{MEMO}}$ (pin 17)

This terminal is switched to memory enable mode while the input signal is maintained at low level.

- M-U/D (pin 18)

10-bit data is counted up when a high level input signal is applied, resulting in an increase in the ladder output voltage. When a low level signal is applied, the 10-bit data is counted down, and the ladder output voltage consequently decreased.

- $\overline{\text{M-IND}}$ (pin 20)

This output terminal is switched to low level during manual tuning mode, resulting in the appearance of an indicator output signal.

- V_{DD} (pin 21)

The LSI power supply terminal.

- MUTE (pin 22)

This is the muting control signal output terminal where a high level output signal appears during preset tuning and band switching operations.

- F-Tune (pin 23)

An 8-step PWM (Pulse Width Modulation) output signal is generated at this terminal during fine tuning operations (while a T=1.5ms duty ratio 50% signal is generated at all other times), and passed via an external low-pass filter to supply the compensatory voltage for fine tuning purposes.

- Vref (pin 24)

Reference voltage.

- B10 — B1 (pin 25 — pin 34)

The 10-bit up/down counter output terminals connected to the R-2R ladder resistor for D-A (digital-analog) conversion.

- V_{SS} (pin 35)

The LSI ground terminal.

- $\overline{\text{CH2}}$ — $\overline{\text{CH6}}$ (pin 37 — pin 41)

Broadcasting frequencies already stored in the memory are selected when the corresponding $\overline{\text{CH}}$ terminal is switched to low level. If the $\overline{\text{MEMO}}$ terminal is also switched to low level while one of the $\overline{\text{CH}}$ terminals is switched to low level, the presently tuned broadcasting frequency will be stored in that channel (low level hold time: 20ms. minimum).

Note:

The automatic search tuning function incorporated in the LC7207 LSI is not used in the SX-600L. Furthermore, description of functions of non-used terminals has been deleted.

Band Switching (LW/MW/FM)

FUNCTION switch operation results in one of the band designator terminals pin 5 ($\overline{\text{FM}}$), pin 6 ($\overline{\text{MW}}$), or pin 7 ($\overline{\text{LW}}$) being connected to ground (i.e. switched to low level), thereby switching the SX-600L to the selected band. Although Q415 remains on during normal operation, it is turned off when the POWER switch is set to STAND BY, or when the AC line power supply is cut. So current is stopped during memory hold mode, thereby reducing the power consumption level.

Manual Tuning

The SX-600L is switched to manual tuning mode when pin 16 ($\overline{\text{MANU}}$) is switched to low level by turning the MANUAL switch on.

When the TUNING knob is turned, the variable resistor coupled to the TUNING knob is activated, resulting in a change in the DC voltage applied to pin 12 (Manu Tune). This input voltage is passed via an analog switch incorporated inside the LSI, and appears again at pin 10 (CV out) as an output signal which is subsequently applied to a DC amplifier and the tuning circuit vari-caps in order to change the tuning frequency. During manual tuning mode, pin 20 ($\overline{\text{M-IND}}$) is switched to low level, resulting in Q205 being turned on to light up the dial pointer LED.

Preset Tuning

When the MEMORY switch and PRESET switch are both turned on together, the presently tuned broadcasting frequency will be stored in the SX-600L memory. And when the PRESET switch

only is turned on, a broadcasting frequency already stored in the memory will be selected (i.e. tuned automatically). The SX-600L has been designed to store up to 5 FM frequencies and 5 AM frequencies (including both MW and LW broadcasting frequencies).

- Preset Memory

The preset memory for manually tuned stations involves A-D conversion (to a 10-bit digital code), and the storage of an approximate value in the LSI (obtaining a resolution of approx. 1/4000 when the fine tuning function described later is included).

Digital encoding of the tuning voltage is achieved in the following way. The LSI 10-bit up/down counter output obtained from pin 25 to pin 34 (B10 — B1) is D-A converted (digital code converted into analog quantity) by the R-2R ladder resistor, and then compared with the tuning voltage (during manual tuning mode) by a voltage comparator, the result being applied to pin 18 (M-U/D).

If the ladder resistor output voltage is lower than the tuning voltage (manual tuning), the pin 18 input is switched to high level, resulting in the LSI 10-bit up/down counter counting up and the ladder resistor output voltage being increased. If the ladder resistor output voltage is higher than the tuning voltage, a low level input is applied to pin 18, resulting in the 10-bit up/down counter counting down, and the ladder resistor output voltage being decreased. In this way, the up/down counter 10-bit code is immediately approximated to the tuning voltage (manual tuning), and then subjected to A-D conversion.

When the MEMORY and PRESET switches are turned on together, the up/down counter 10-bit code is stored in the LSI RAM (Random Access Memory), thereby storing the tuning voltage corresponding to the presently tuned broadcasting frequency.

- Direct Tuning by Memory Read-Out

When any one of the PRESET switches (1 to 5) is turned on, the designated memory 10-bit data is read out from the LSI RAM by the up/down counter, and the resultant output thus appears at pin 25 to pin 34. These outputs are then D-A converted by the ladder resistor, and applied to pin 11 (CV in). After being passed through an LSI analog switch, the pin 11 input appears again at pin 10 (CV out), and is then applied to a DC amplifier and tuning circuit vari-caps. In addition, in order to compensate the point of optimum tuning, the AFC (Automatic Frequency Control)

circuit is activated by applying the S-curve voltage to pin 13 (S-Curve). (This S-curve represents the variation in DC level in the FM detector while tuning to and away from a particular frequency). Since the AM tuner cannot obtain an S-curve voltage from the detector, a separate FM ratio detector is employed to provide the S-curve voltage.

• **Fine Tuning**

This function involves fine tuning adjustment apart from the AFC 10-bit data compensation. The output from pin 23 (F-Tune) is obtained as an 8-step pulse width modulation signal corresponding to the pin 13 input. This signal is then integrated and added to the ladder resistor output voltage for fine tuning purposes. Note that the AFC circuit is not activated during manual tuning mode.

• **Fetch Mode**

This function is used to re-align the center of the S-curve with the preset voltage by “swinging” the voltage when the preset voltage is displaced from the S-curve AFC range as a result of tuner drift. This voltage swing is gradually increased in both directions up to a maximum of ± 8 steps (approx. $\pm 56\text{mV}$) to retrieve the S-curve. If the S-curve is not retrieved by this measure, the voltage is returned to the original preset voltage.

• **Memory Hold**

When pin 3 ($\overline{\text{BUC}}$) of the LSI is switched to low level, all functions except internal memory hold are inhibited. The memory is held by a very small current (approx. $50\mu\text{A}$) in this case. Since the POWER switch in the SX-600L is connected to the secondary side of the power transformer, the LSI is still supplied with power with the POWER switch in the STAND BY position. In this case, pin 3 is switched to low level, resulting in the memory contents being preserved by a very small current. Furthermore, if the AC power mains is cut off altogether, the memories will be preserved for about 3 days by charge stored in a capacitor in the LSI power supply circuit.

Muting Control

The muting output signal obtained from pin 22 (MUTE) is used in eliminating unwanted noise generated during band switching and preset tuning operations. The SX-600L employs a ground-connected muting gate transistor connected to the tuner section output circuit to mute out these unwanted noises.

Note:

The muting circuit employed in muting the inter-station noise during FM tuning is incorporated in the TA7303 IC, and is turned on and off by the FM MUTING switch.

Preset Frequency Display Meter

Since the tuning frequencies selected during preset tuning mode are set irrespective of the tuning dial position, an independent method is used in the SX-600L to show the frequency of the selected preset frequency. Since the tuning voltage is used to determine the tuning frequency, it may also be used to drive the signal strength meter, the reading in this case indicating the tuned frequency. By incorporating an automatic selection circuit in this meter, the meter will operate as a single strength meter during manual tuning, and as the preset frequency display meter during preset tuning mode.

• **Automatic Meter Selection Circuit**

The operating principle of this circuit is outlined in Fig. 5-2. During manual tuning, pin 20 (M-IND) is switched to low level, resulting in Q205 being turned on. The Q205 collector voltage is consequently increased, resulting in the base voltage for Q412 and Q413 being switched to high level via D426. Q413 will be turned off since it is a PNP transistor, while Q412, an NPN transistor will be turned on. The tuning voltage is thereby blocked, and the meter thus employed as a signal strength meter.

During preset tuning mode, Q205 is turned off, resulting in a drop in the collector voltage. D426 will thus become non-conductive, resulting in the base voltage for Q412 and Q413 being switched to low level. Q412 will thus be turned off and Q413 turned on, resulting in the meter operating as the preset frequency display meter.

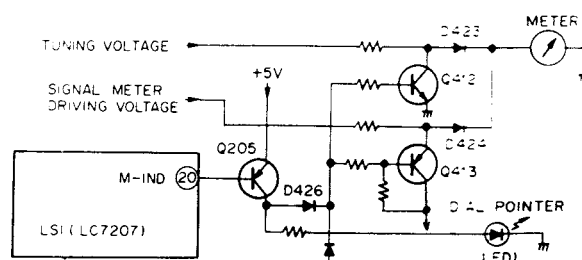


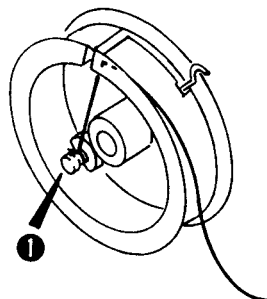
Fig. 5-2 Automatic meter selection circuit

5.3 AUDIO AMP SECTION

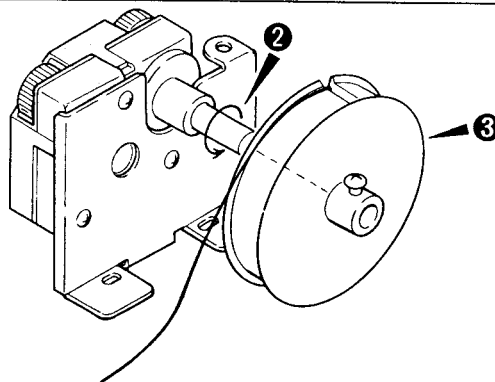
The EQ amplifier is an NFB type with one IC (NJM4558DX) in both L and R channels.

The power amplifier is quasi-complementary SEPP circuit features a differential amplifier in the first stage, in incorporates the tone control circuits in the NFB loop.

6. DIAL CORD STRINGING

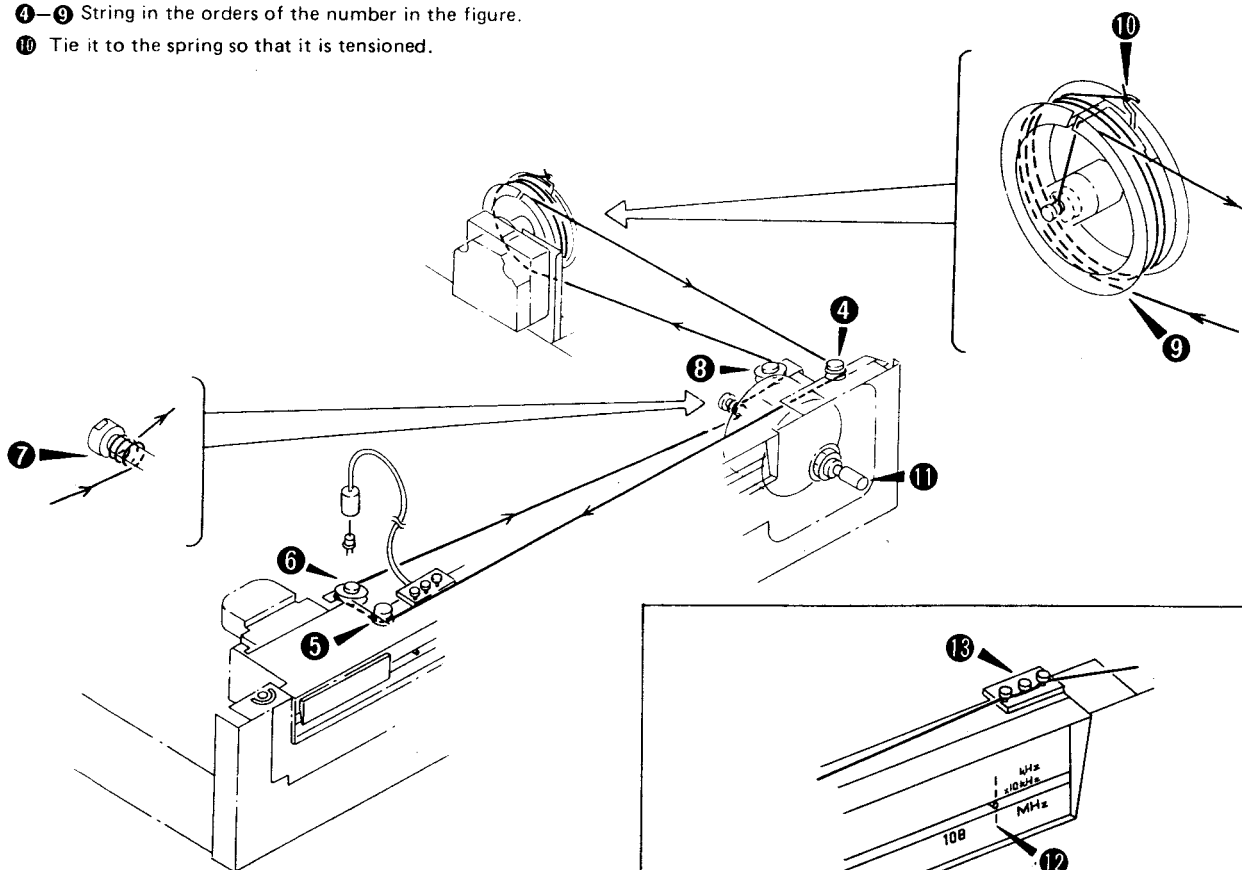


① Tie one end of the dial cord.



② Turn the tuning resistor shaft fully counter-clockwise.
③ Fix the tuning drum to the tuning resistor shaft so that the set-screw is uppermost.

④—⑨ String in the orders of the number in the figure.
⑩ Tie it to the spring so that it is tensioned.



⑪ Turn the tuning shaft clockwise as far as it will go.
⑫ Align the dial pointer with the ending point of the dial scale. ⑬ Pass the cord over it.

Finally apply the locking paint to the knot of the cord and the dial pointer connection.

7. ADJUSTMENTS

7.1 TUNER SECTION

Tuning Voltage

- The MANUAL switch to the ON position.
- Turn the TUNING knob counter-clockwise as far as it will go.

Step	FUNCTION	Adjustment point	Adjustment method
1	MW (no input)	VR201-b	Obtain a reading of DC 1.5V (within $\pm 50\text{mV}$) between terminal no.42 and ground.
2	FM (no input)	VR201-c	Obtain a reading of DC 6V (within $\pm 50\text{mV}$) between terminal no.42 and ground.

FM Tuner

- Connect the FM SG (FM signal generator) to the FM ANTENNA 300 Ω terminal via 300 Ω dummy.
- Set the FUNCTION selector to the FM position, FM MUTING switch to the OFF position.

Step	FM SG (400Hz, $\pm 75\text{kHz}$ DEV.)		Position of dial pointer	Adjustment point	Adjustment method
	Frequency	Level			
1	106MHz	106dB	106MHz	CT403	Obtain maximum deflection of the signal meter.
2	106MHz	106dB	106MHz	T402	Obtain maximum demodulated output (at TAPE REC terminal).
3	106MHz	20dB	106MHz	CT403	
4				CT401	
5				CT402	
6				T401	
7	90MHz	20dB	90MHz	L403	
8				L401	
9				L402	
10	Repeat steps 3 to 9 until the maximum sensitivity is obtained.				
11	98MHz (Fine tune to SX-600L)	66dB	98MHz	T402	Obtain minimum distortion in the demodulated output (TAPE REC terminal).
12	No signal		98MHz	VR203	Obtain a reading of DC 4.75V (within $\pm 50\text{mV}$) between terminal no.9 and ground.

FM Multiplex Decoder Circuit

- Connect the MPX SG (FM multiplex signal generator) to the FM SG external modulator terminal.
- Set the FM SG output to 98MHz and 66dB (modulation mode to external), and tune the SX-600L to this position.

Step	FM MPX SG	Adjustment point	Adjustment method
1	No signal (unmodulated)	VR401	Obtain a 19kHz (within $\pm 50\text{Hz}$) signal at terminal no.6..
2	Main: 1kHz, L+R, $\pm 67.5\text{kHz}$ DEV. Pilot: 19kHz, $\pm 7.5\text{kHz}$ DEV.	T401 (by up to 90° in either direction)	Reduce distortion in the output (TAPE REC terminal) to a minimum.

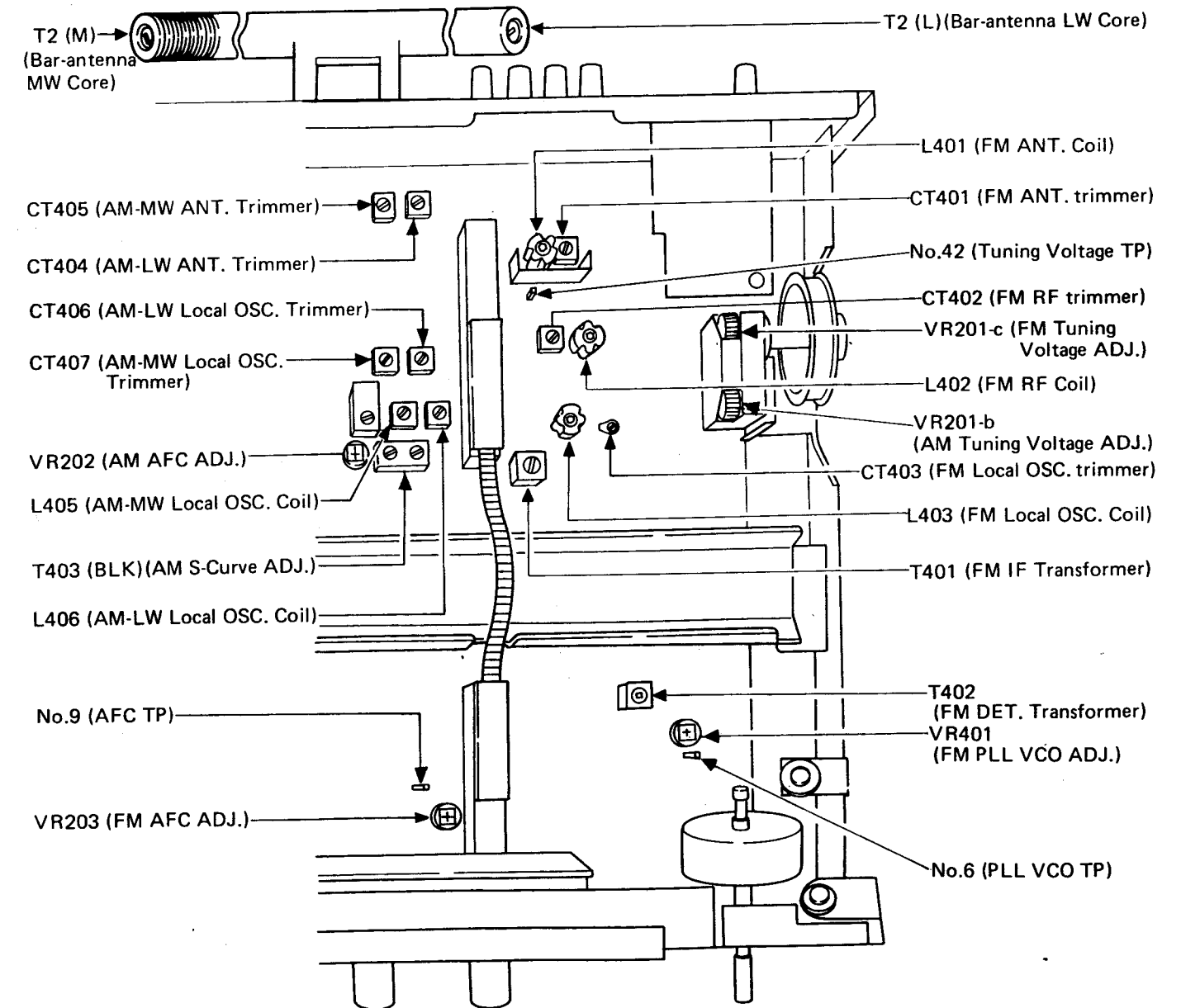


Fig. 7-1 Tuner Adjustment point

FM Multiplex Decoder Circuit

- Connect the MPX SG (FM multiplex signal generator) to the FM SG external modulator terminal.
- Set the FM SG output to 98MHz and 66dB (modulation mode to external), and tune the SX-600L to this position.

Step	FM MPX SG	Adjustment point	Adjustment method
1	No signal (unmodulated)	VR401	Obtain a 19kHz (within ±50Hz) signal at terminal no.6..
2	Main: 1kHz, L+R, ±67.5kHz DEV. Pilot: 19kHz, ±7.5kHz DEV.	T401 (by up to 90° in either direction)	Reduce distortion in the output (TAPE REC terminal) to a minimum.

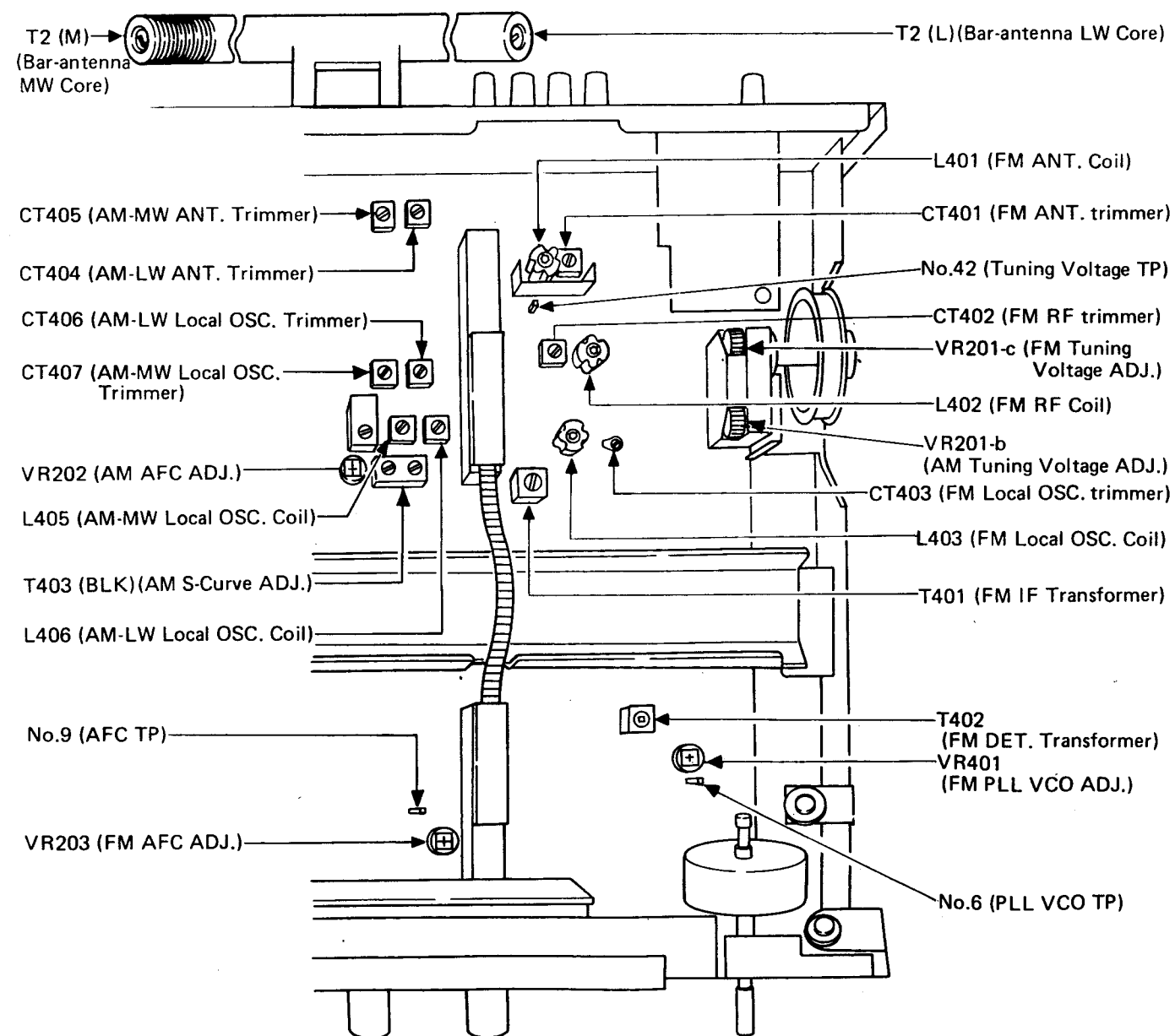


Fig. 7-1 Tuner Adjustment point

AM Tuner LW Band

- Connect the AM SG (AM signal generator) to the AM ANTENNA terminal via 1kΩ resistor.
- Set the FUNCTION selector to the LW position, the MANUAL switch to the ON position.

Step	AM SG (400Hz, 30% MOD.)		Position of dial pointer	Adjustment point	Adjustment method
	Frequency	Level			
1	150kHz	40dB	150kHz	L406	Obtain maximum demodulated output (at TAPE REC terminal).
2				T2(L)*	
3	350kHz	40dB	350kHz	CT406	
4				CT404	
5	Repeat steps 1 to 4 until the maximum sensitivity is obtained.				
6	No signal		250kHz	VR202	Obtain a reading of DC 4.75V (within ±50mV) between terminal no.9 and ground.
7	250kHz (Fine tune to SX-600L)	40dB	250kHz	T403 (BLK)	

* Bar-antenna LW core

AM Tuner MW Band

- Connect the AM SG (AM signal generator) to the AM ANTENNA terminal via 1kΩ resistor.
- Set the FUNCTION selector to the MW position, the MANUAL switch to the ON position.

Step	AM SG (400Hz, 30% MOD.)		Position of dial pointer	Adjustment point	Adjustment method
	Frequency	Level			
1	600kHz	40dB	600kHz	L405	Obtain maximum demodulated output (at TAPE REC terminal).
2				T2 (M)*	
3	1400kHz	40dB	1400kHz	CT407	
4				CT405	
5	Repeat steps 1 to 4 until the maximum sensitivity is obtained.				

* Bar-antenna MW core

7.2 POWER AMPLIFIER

- Without any load or input signal, turn the VOLUME control to minimum position.
- Check that the voltage between terminals no. 16 and no. 15 (L ch.) lies within 2.5mV – 120mV range. Then make a similar check for the R ch. (between no. 17 and no. 18).
- If the voltage is less than 2.5mV, cut Jumper A (L ch.), and Jumper B (R ch.).
- If the voltage exceed 120mV, check for circuit failure.

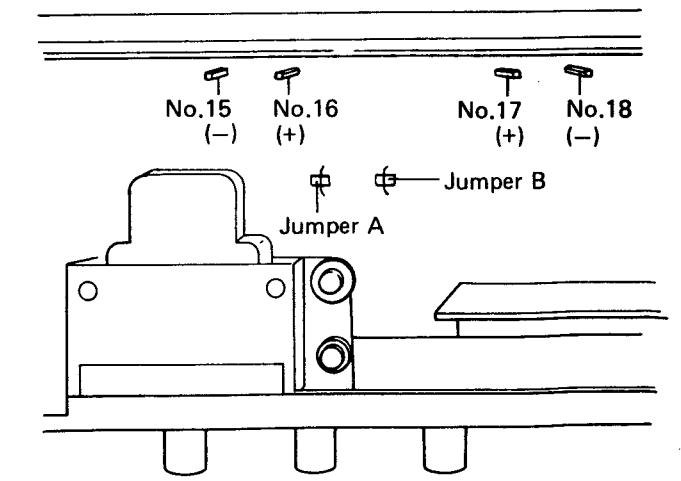
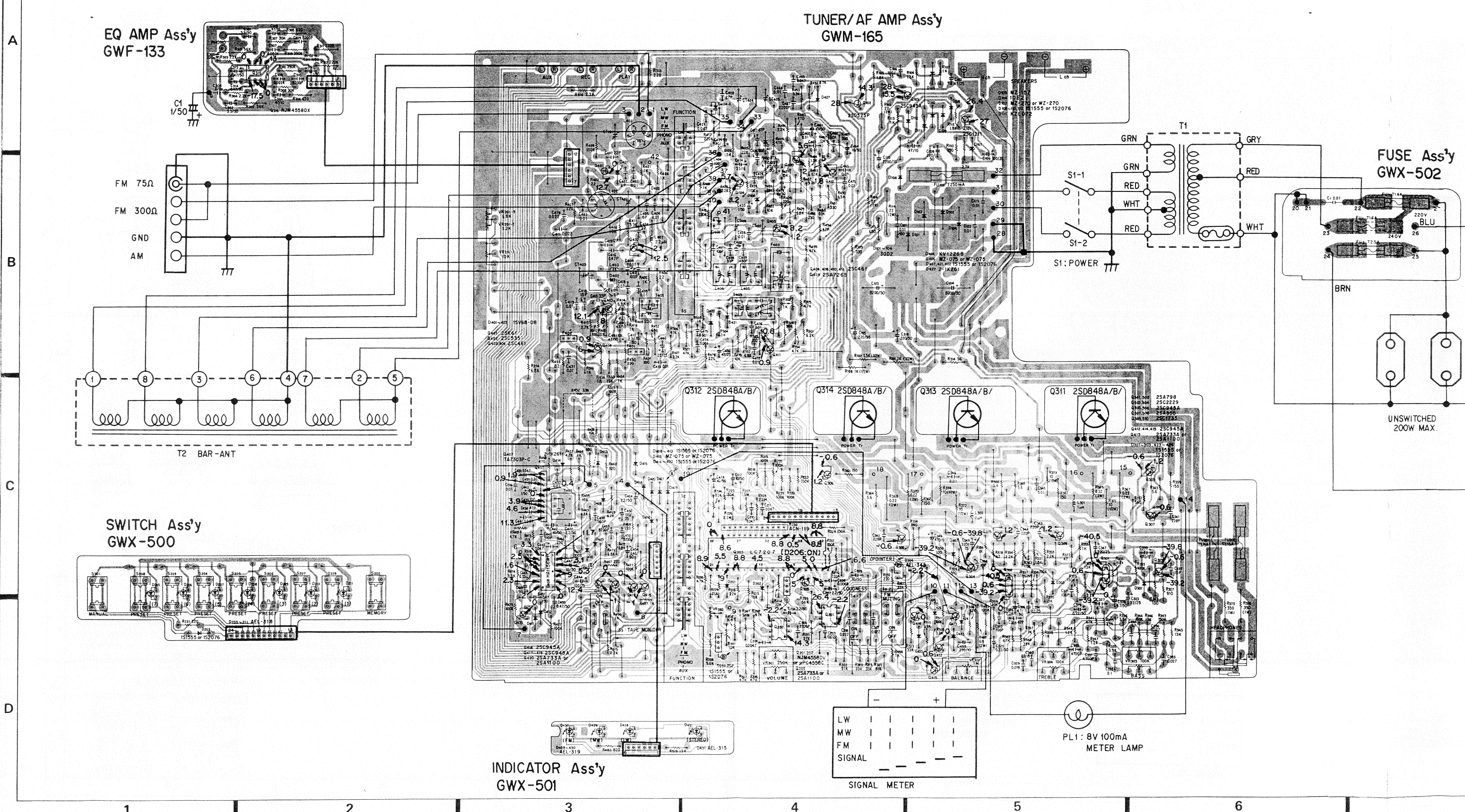


Fig. 7-2 Power Amp. Adjustment

8. P.C. BOARD CONNECTION DIAGRAM



EQ AMP Ass'y
GW-133

TUNER/AF AMP Ass'y
GWM-165

FUSE Ass'y
GWX-502

FM 75Ω
FM 300Ω
GND
AM

T2 BAR-ANT

SWITCH Ass'y
GWX-500

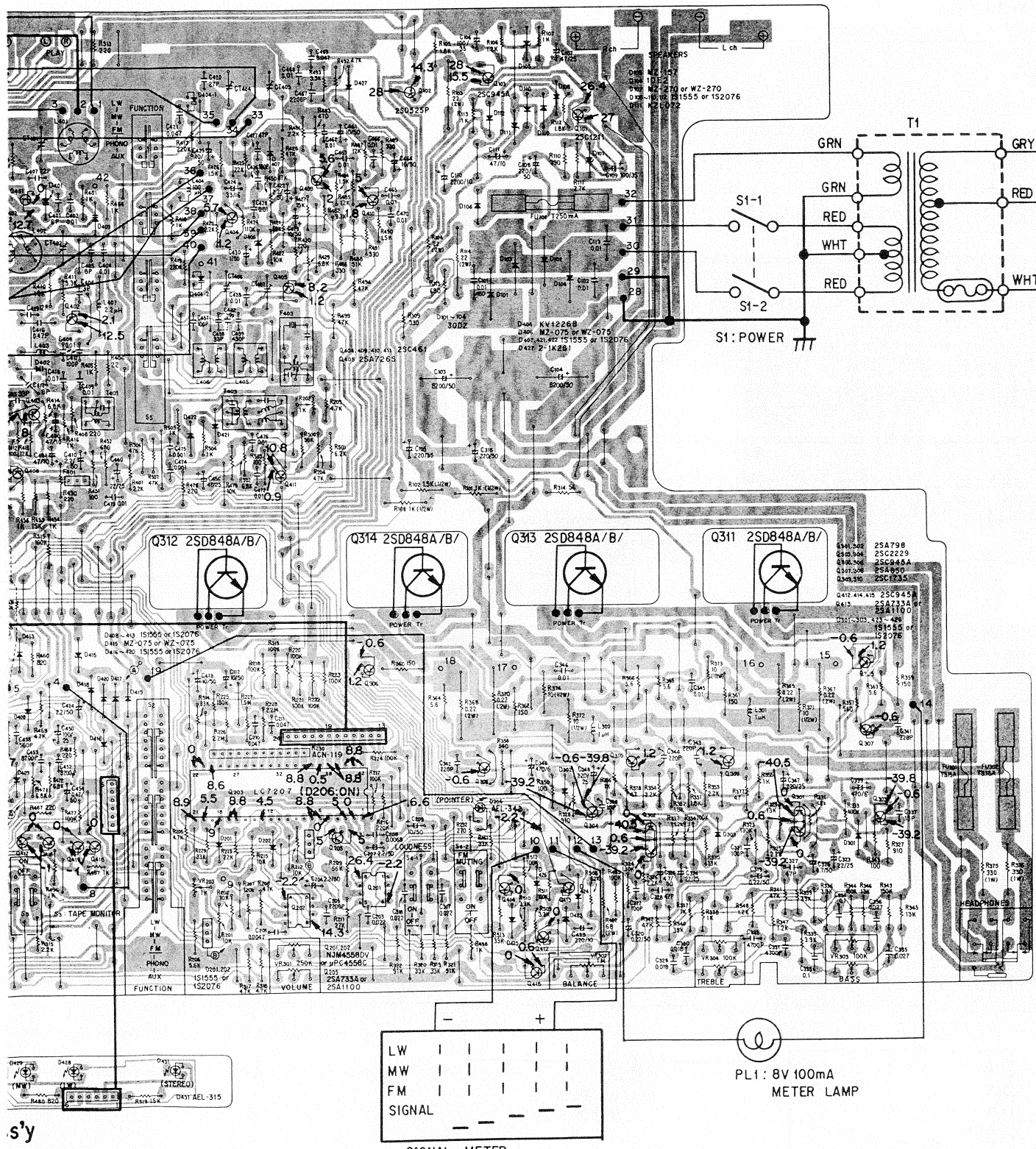
INDICATOR Ass'y
GWX-501

SIGNAL METER

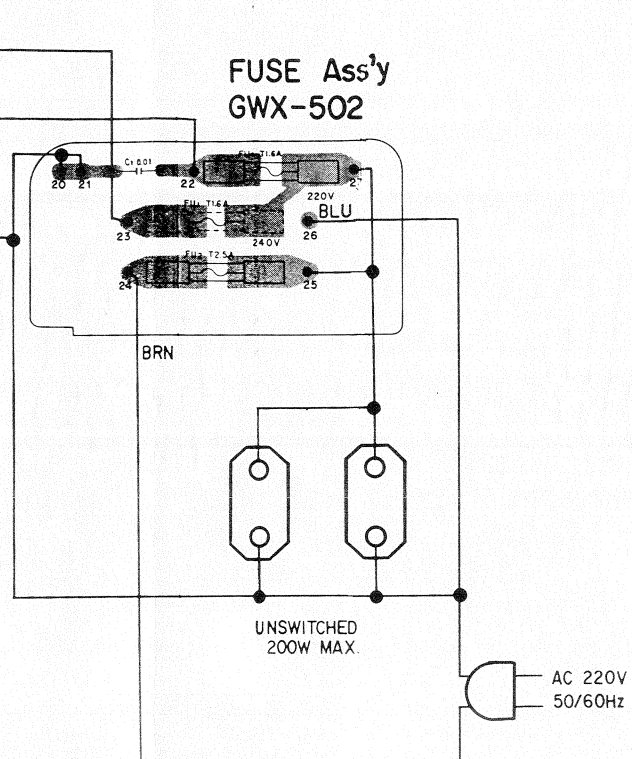
PL1: 8V 100mA
METER LAMP

UNSWITCHED
200W MAX

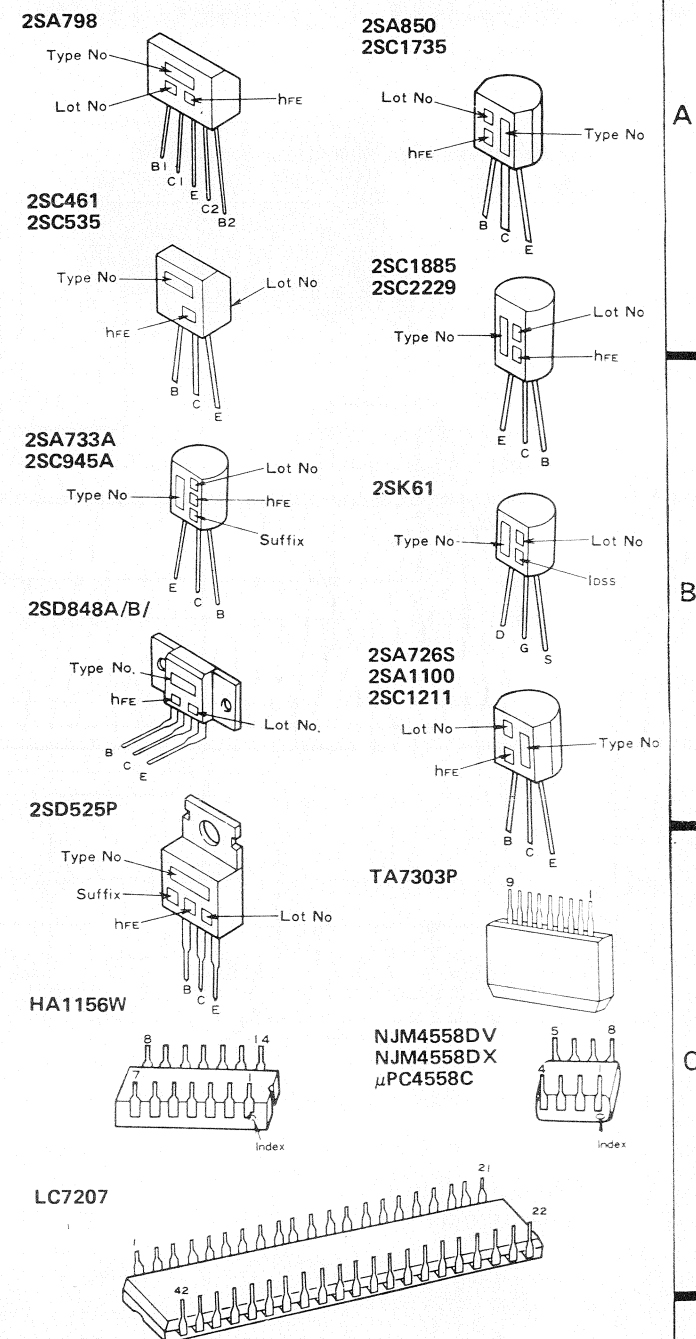
TUNER/AF AMP Ass'y
GWM-165



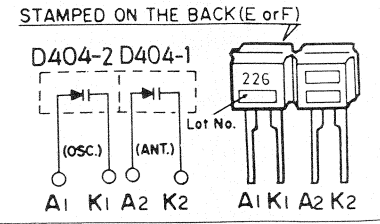
FUSE Ass'y
GWX-502



External Appearance of Transistors and ICs



• D404 (KV1226B) in the Tuner/AF assembly (GWM-165) consists of two vari-cap diodes with the identical characteristics. When replacing either of them, first split the new D404 into two pieces (D404-1 and D404-2), and replace both of them by new D404-1 (for the AM antenna tuning circuit) and D404-2 (for AM local oscillator circuit) at the same time in order to match their characteristics.



s'y

D880 2x
18

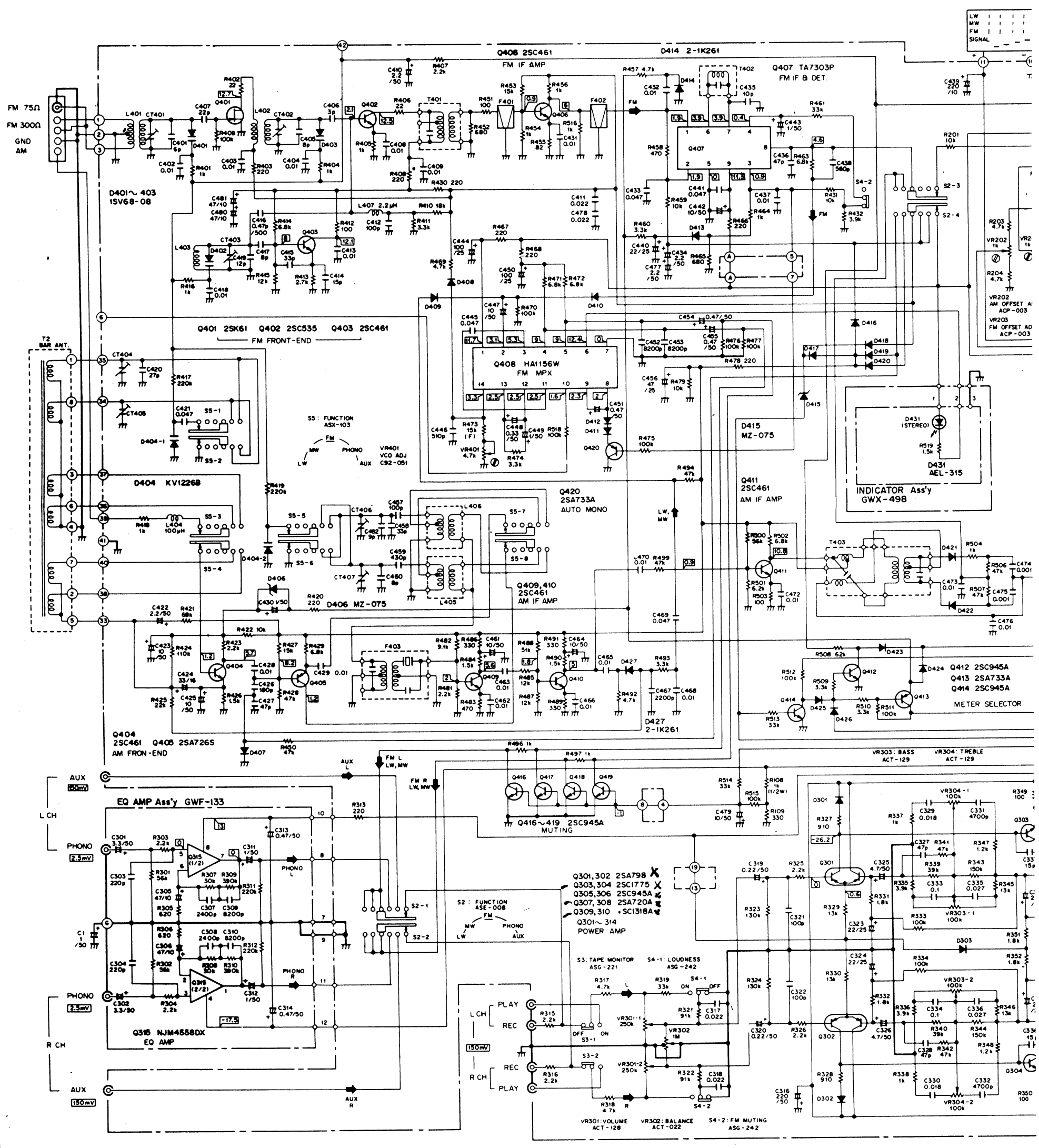
9. SCHEMATIC DIAGRAM

A

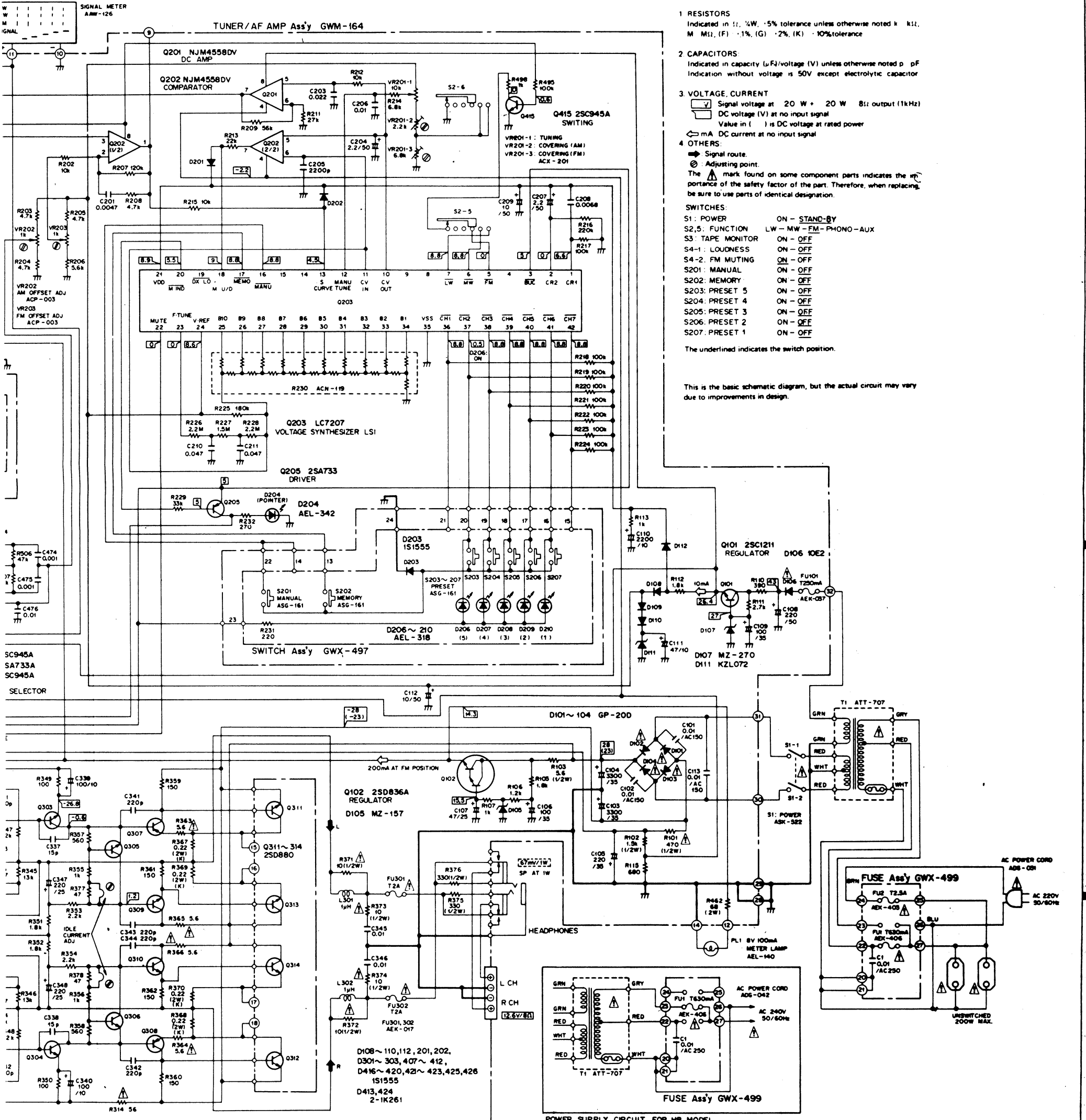
B

C

D



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



- 1 RESISTORS**
 Indicated in Ω, $\frac{1}{4}$ W, $\pm 5\%$ tolerance unless otherwise noted k, K Ω , M, M Ω , (F) $\pm 1\%$, (G) $\pm 2\%$, (K) $\pm 10\%$ tolerance
- 2 CAPACITORS**
 Indicated in capacity (μ F)/voltage (V) unless otherwise noted p, pF. Indication without voltage is 50V except electrolytic capacitor
- 3 VOLTAGE, CURRENT**
 [Symbol] Signal voltage at 20 W + 20 W 8 Ω output (1kHz)
 [Symbol] DC voltage (V) at no input signal
 [Symbol] Value in () is DC voltage at rated power
 [Symbol] mA DC current at no input signal
- 4 OTHERS**
 [Symbol] Signal route.
 [Symbol] Adjusting point.
 The Δ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
- SWITCHES:**
 S1: POWER ON - STAND-BY
 S2.5: FUNCTION LW - MW - FM - PHONO - AUX
 S3: TAPE MONITOR ON - OFF
 S4-1: LOUDNESS ON - OFF
 S4-2: FM MUTING ON - OFF
 S201: MANUAL ON - OFF
 S202: MEMORY ON - OFF
 S203: PRESET 5 ON - OFF
 S204: PRESET 4 ON - OFF
 S205: PRESET 3 ON - OFF
 S206: PRESET 2 ON - OFF
 S207: PRESET 1 ON - OFF
- The underlined indicates the switch position.

This is the basic schematic diagram, but the actual circuit may vary due to improvements in design.

10. ELECTRICAL PARTS LIST

NOTES:

- When ordering resistors, first convert resistance values into code form as shown in the following examples.

Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J = 5%, and K = 10%).

560Ω	56 × 10 ¹	561	RD¼PS	561J
47kΩ	47 × 10 ³	473	RD¼PS	473J
0.5Ω	0R5		RN2H	055K
1Ω	010		RSIP	010K

Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).

5.62kΩ	562 × 10 ¹	5621	RN¼SR	5621F
--------	-----------------------	------	-------	-------

- The Δ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.

Miscellaneous Parts

Part No.	Symbol & Description
Δ ATT-707	T1 Power transformer
Δ ATX-019	T2 Bar-antenna
Δ ASK-522	S1 Lever switch (POWER)
Δ AEK-406	FU1 Fuse (630mA)
Δ AEK-403	FU2 Fuse (2.5A)
Δ AEK-037	FU101 Fuse (250mA)
Δ AEK-017	FU301, FU302 Fuse (2A)
CEA 010M 50L	C1
AEL-140	PL1 Lamp with wire (8V, 100mA)

2SD880-Y Q311 – Q314 Transistor
(2SD880-O)

* hfe of Q311 – Q314 should have the same value.

EQ AMP Assembly (GWF-133)

CAPACITORS

Part No.	Symbol & Description
CEANL 3R3M 50	C301, C302
CEA 470M 10L	C305, C306
CEA 010M 50L	C311, C312
CEA R47M 50L	C313, C314
CCDSL 221J 50	C303, C304
CKDYA 822J 50	C309, C310
CQMA 242J 50	C307, C308

Note: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

RESISTORS

Part No.	Symbol & Description
RD1/4PM □□□J	R301 – R312

SEMICONDUCTOR

Part No.	Symbol & Description
NJM 4558DX	Q315

OTHER

Part No.	Symbol & Description
AKB-062	Terminal (PHONO)

Switch Assembly (GWX-497)

Part No.	Symbol & Description
ASG-161	S201 – S207 Tact switch
RD1/4PM221J	R231
AEL-318	D206 – D210 LED (Green)
1S1555	D203

Indicator Assembly (GWX-498)

Part No.	Symbol & Description
AEL-315	D431 LED (Red)
RD¼PM 152J	R519

Fuse Assembly (GWX-499)

Part No.	Symbol & Description
Δ ACG-001	C1 Ceramic capacitor (0.01/250V)

Tuner/AF AMP Assembly (GWM-164)

COILS AND TRANSFORMERS

Part No.	Symbol & Description	
ATC-112	L401	FM ANT coil
ATC-121	L402	FM RF coil
ATC-115	L403	FM OSC coil
ATB-071	L405	AM OSC coil
ATD-008	L406	LW OSC coil
T24-028	L407	RF choke coil
ATE-039	T401	FM IFT
ATE-051	T402	FM DET
ATB-070	T403	AM DET
ATF-053	F401, F402	FM ceramic filter
ATF-087	F403	AM ceramic filter

SWITCHES

Part No.	Symbol & Description	
ASE-008	S2	Slide rotary switch (FUNCTION)
ASG-221	S3	Push switch (TAPE MONITOR)
ASG-242	S4	Push switch (FM MUTING, LOUDNESS)
ASX-103	S5	Remote slide switch (FUNCTION-AM BAND)

CAPACITORS

Part No.	Symbol & Description	
ACM-008	CT401, CT402, CT404, CT406, CT407	Film trimmer
ACM-006	CT403	Ceramic trimmer
ACM-009	CT405	Film trimmer
ACG-004	C101, C102, C113	Ceramic (0.01/150V)
ACH-218	C103, C104	Electrolytic (3300/35V)
CEA 222M 10L	C110	
CEA 221M 50L	C108	
CEA 101M 35L	C106, C109	
CEA 221M 35L	C105	
CEA 470M 25L	C107	
CEA 470M 10L	C111	
CEA 100M 50L	C112	
CKDYF 472Z 50	C201	
CEA 2R2M 50L	C204, C207	
CEA 100M 50L	C209	
CKDYB 222K 50	C205	
CKDYB 682K 50	C208	
CKDYF 473Z 50	C210, C211	

Part No.	Symbol & Description	
CKDYF 223Z 50	C203, C207	
CKDYF 103Z 50	C206	
CEA 221M 50L	C316	
CEANL 4R7M 50	C325, C326	
CEANL R22M 50	C319, C320	
CEA 221M 25L	C347, C348	
CEA 101M 10L	C339, C340	
CEA 220M 25L	C323, C324	
CCDSL 101J 50	C321, C322	
CCDSL 150J 50	C337, C338	
CCDSL 470J 50	C327, C328	
CCDSL 221J 50	C341-C344	
CKDYB 472K 50	C331, C332	
CKDYF 223Z 50	C317, C318	
CKDYF 103Z 50	C345, C346	
CQMA 104K 50	C333, C334	
CQMA 273K 50	C335, C336	
CQMA 183K 50	C329, C330	
CCDRH 060D 50	C401	
CCDRH 080D 50	C405, C417	
CCDCH 030D 50	C406	
CCDSL 101J 50	C412	
CCDSL 220J 50	C407	
CCDCH 150J 50	C414	
CCDCH 330J 50	C415	
CCDSL 470J 50	C427, C436	
CCDSL 100D 50	C435	
CCDSH 270J 50	C420	
CKDYB 222K 50	C467	
CKDYB 561K 50	C438	
CKDYF 473Z 50	C421, C433, C441, C445, C469	
CCDPH 120J 50	C419	
CKDYB 102K 50	C474, C475	
CKDYB 822K 50	C452, C453	
CKDSL 181J 50	C426	
CCDUJ 090D 50	C482	
CCDUJ 330J 50	C458	
CKDYF 103Z 50	C402, C403, C404, C408, C409, C413, C418, C428, C429, C431, C432, C437, C462, C463, C465, C466, C468, C470, C472, C473, C476	
CQSH 431J 50	C459	
CGSH 101J 50	C457	
CCDTH 080 D50	C460	
CQSH 511J 50	C446	
CKDYF 223Z 50	C411, C478	
CGB R47K 500	C416	
CEA 101M 25L	C444, C450	
CEA 330M 16L	C424	
CEA 220M 25L	C440	
CEA 100M 50L	C423, C425, C442, C447, C461, C464, C479	
CEA 221M 10L	C439	
CEA 2R2M 50L	C410, C422, C434, C477	

Part No.	Symbol & Description
CEA 010M 50L	C430, C443
CEA R47M 50L	C454, C455
CEA 470M 25L	C456
CEANL 010M 50	C449
CEANL R47M 50	C451
CEANL R33M 50	C448
CEA 470M 10L	C480, C481

Note: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

RESISTORS

Part No.	Symbol & Description
ACX-201	VR201 Tuning resistor
ACP-007	VR202, VR203 Semi-fixed (1k)
ACT-128	VR301 Variable (250k, VOLUME)
ACT-022	VT302 Variable (1M, BALANCE)
ACT-129	VR303, VR304 Variable (100k, BASS, TREBLE)
C92-051	VR401 Semi-fixed (4.7k)
ACN-119	R230 Ladder resistor
ACN-039	R367-R370 Wire wound (0.22/2W)
RD1/2PSF □□□ J	R101, R371 - R374
RD1/4PMF □□□ J	R314, R363 - R366
RD1/2PS □□□ J	R102, R103, R108, R359 - R362, R375, R376
RD1/4PM □□□ J	R105 - R107, R109 - R113, R115, R201 - R209, R211 - R229, R232, R313, R315 - R358, R377, R378, R401 - R432, R450 - R461, R463 - R466, R468 - R472, R474 - R496, R498 - R518
RS2P □□□ J	R462
RN1/4PQ □□□ F	R473
RD1/4VM □□□ J	R467, R497

SEMICONDUCTORS

Part No.	Symbol & Description
2SC1211	Q101
2SD836A	Q102
NJM4558DV (μPC4558C)	Q201, Q202
LC7207	Q203
2SA733A (2SA1100)	Q205
2SA798	Q301, Q302
2SC1775A	Q303, Q304
*2SC1318A-R (2SC1318A-Q)	Q309, Q310
*2SA720A-R (2SA720A-Q)	Q307, Q308

* hfe of Q307 - Q310 should have the same value.

Part No.	Symbol & Description
2SC945A	Q305, Q306
2SK61-Y	Q401
2SC535	Q402
2SC461	Q403, Q404, Q406, Q409, Q410
2SA726S	Q405
2SC945A	Q412, Q414 - Q419
2SA733A (2SA1100)	Q413, Q420
2SC461	Q411
TA7303P-C	Q407
HA1156W-P	Q408
GP-20D	D101 - D104
10E2	D106
(SIB01-02)	
1S1555 (1S2076)	D108 - D110, D112, D201, D202, D301 - D303
MZ-270 (WZ-270)	D107
MZ-157	D105
KZL072	D111
AEL-342	D204 LED (Orange)
1SV68-08	D401 - D403
**KV1226B	D404
1S1555	D407 - D412, D416 - D423, D425, D426
2-1K261	D413, D414, D426, D427
MZ-075 (WZ-075)	D406, D415

NOTE:

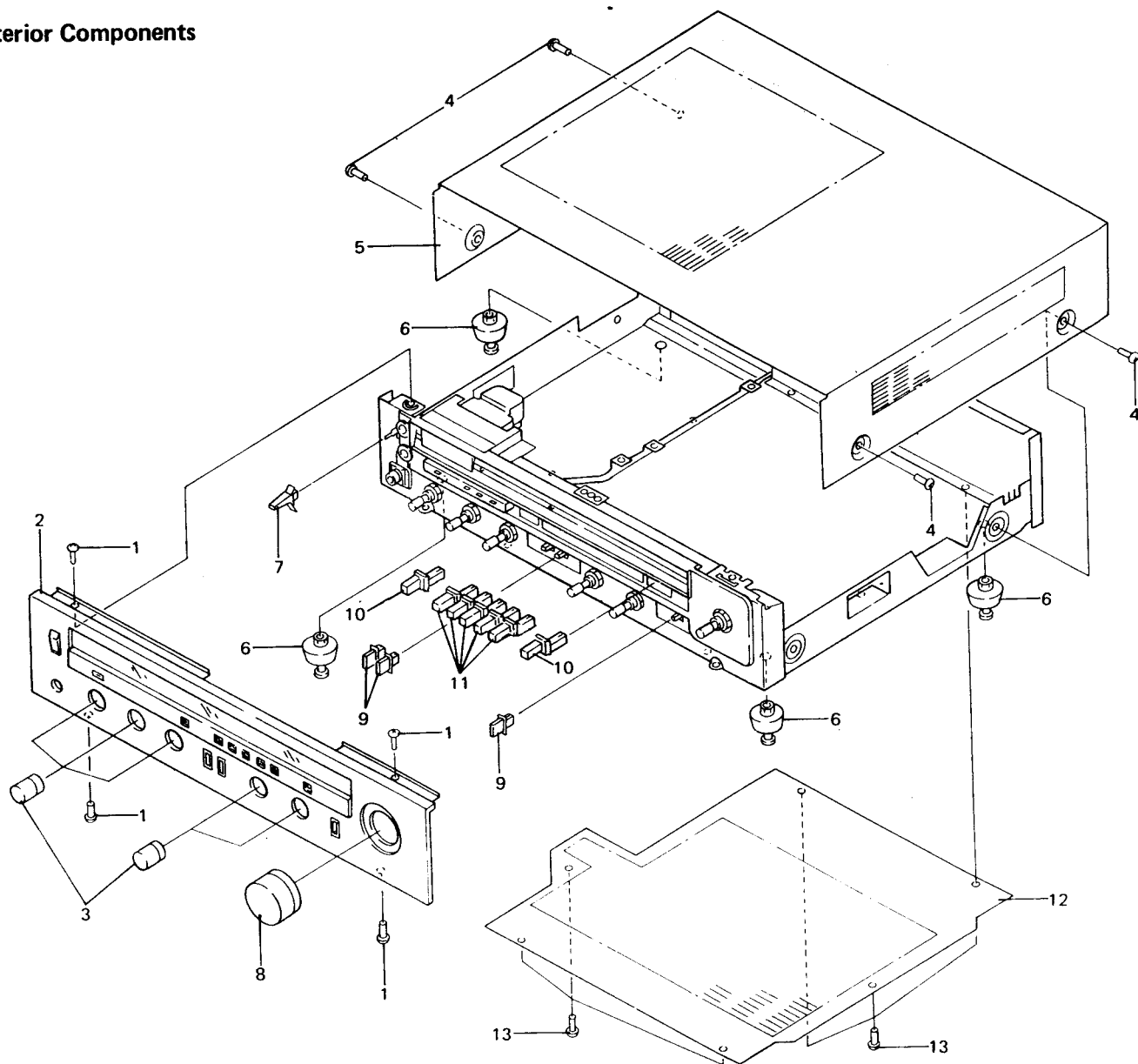
** D404 (KV1226B) consists of two vari-cap diodes with the identical characteristics. When replacing either of them, first split the new D404 into two pieces (D404-1 and D404-2), and replace both of them by new D404-1 (for the AM antenna tuning circuit) and D404-2 (for AM local oscillator circuit) at the same time in order to match their characteristics.

OTHERS

Part No.	Symbol & Description
AKB-064	Terminal (AUX, TAPE)
AKE-048	Terminal (SPEAKERS)
AKN-029	Phone jack (PHONES)
VBZ30P060FMC	Screw (3x6)
PMZ25P040FMC	Screw (2.5x4)

11. EXPLODED VIEW

Exterior Components

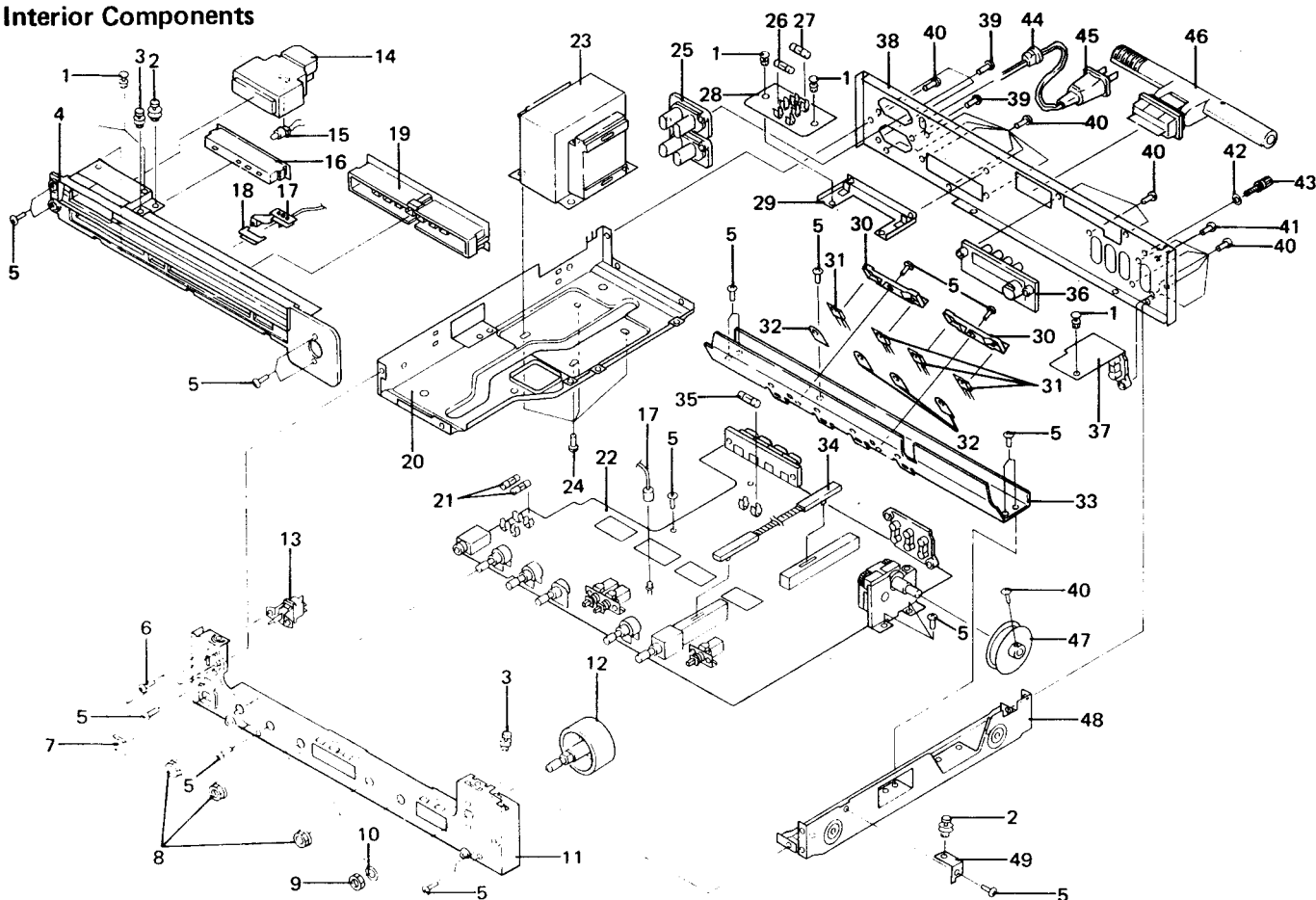


NOTES:

- Parts without part number cannot be supplied.
- The Δ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.

Key No.	Part No.	Description	Key No.	Part No.	Description
1.	BCZ30P080FMC	Screw (3x8)	8.	AAA-069	Knob (TUNING)
2.	ANB-897	Front panel assembly	9.	AAD-179	Push knob (FM MUTING, LOUDNESS, TAPE MONITOR)
3.	AAB-244	Knob (BASS, TREBLE, BALANCE, VOLUME, FUNCTION)	10.	AAD-299	Push knob (MEMORY, MANUAL)
4.	FBT40P080FZK	Screw (4x8)	11.	AAD-298	Push knob (PRESET)
5.	ANE-269	Bonnet case	12.		Bottom plate
6.	AEC-672	Foot assembly	13.	VBZ30P060FMC	Screw (3x6)
7.	AAD-200	Lever knob (POWER)			

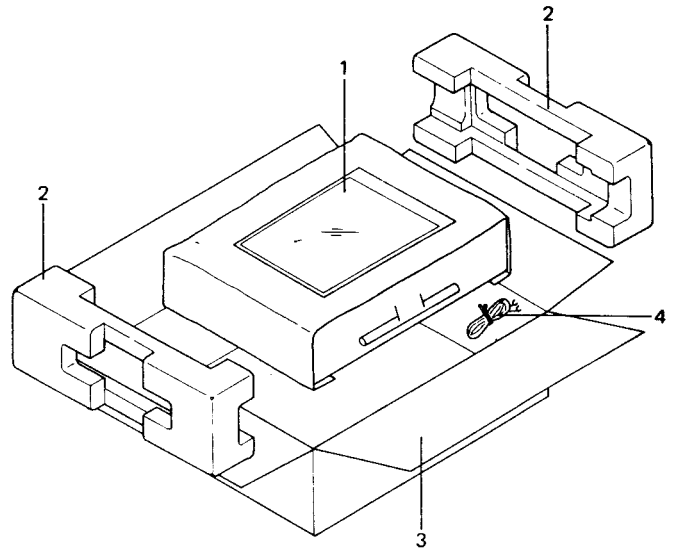
Interior Components



Key No.	Part No.	Description	Key No.	Part No.	Description
1.	AEC-384	Nylon rivet	26.	AEK-406	Fuse (630mA)
2.		Pulley assembly	27.	AEK-403	Fuse (2.5A)
3.		Pulley assembly (small)	28.	GWX-499	Fuse assembly
4.		Dial panel	29.		P.C. Board holder
5.	VBZ30P060FMC	Screw (3x6)	30.		Transistor supporter
6.	PMZ30P060FMC	Screw (3x6)	31.	2SD880-Y (2SD880-O)	Transistor
7.		Lock plate	32.	AEC-248	Mica wafer
8.	ABN-024	Nut (M9)	33.		Heat sink
9.	NK90FUC	Nut (M9)	34.		Remote wire
10.	WA92F140U100	Washer	35.	AEK-037	Fuse (250mA)
11.		Front stay	36.	AKA-007	Terminal (ANTENNA)
12.	AXA-274	Tuning shaft assembly	37.	GWX-133	EQ amp assembly
13.	ASK-522	Lever switch (POWER)	38.		Rear panel
14.	AAW-126	Signal meter	39.	MTZ30P100FZK	Screw (3x10)
15.	AEL-140	Lamp with wire (8V, 100mA)	40.	BBT30P080FZK	Screw (3x8)
16.	GWX-498	Indicator assembly	41.	ABA-176	Screw (3X8)
17.		Dial pointer assembly	42.	WA35F100N080	Washer
18.		Smoother	43.		Terminal (GND)
19.	GWX-497	Switch assembly	44.	AEC-327	Strain relief
20.		Frame	45.	ADG-041	AC power cord
21.	AEK-017	Fuse (2A)	46.	ATX-019	Bar-antenna
22.	GWM-164	Tuner/AF amp assembly	47.		Tuning drum assembly
23.	ATT-707	Power transformer	48.		Frame (R)
24.	VXZ40P080FMC	Screw (4x8)	49.		Pulley holder
25.	AKP-026	AC socket (AC OUTLETS)	50.	

12. PACKING

Key No.	Part No.	Description
1.	ARB-367	Operating instructions (English)
	ARD-149	Operating instructions (German/French)
2.	AHA-254	Side pad
3.	AHD-778	Packing case
4.	ADH-004	T-type FM antenna



13. SUPPLEMENTS FOR HB TYPE

HB type is the same as the HE type with exception of description in this supplements.

CONTRAST OF MISCELLANEOUS PARTS

Symbol	Description	Part No.		Remarks
		HE type	HB type	
△FU2	Fuse (2.5A)	AEK-403	for AC socket
△	AC socket (AC OUTLETS)	AKP-026	
△	AC power cord	ADG-041	ADG-051	
	Screw (3x10)	MTZ30P100FZK	
	Operating instructions (German/French)	ARD-149	