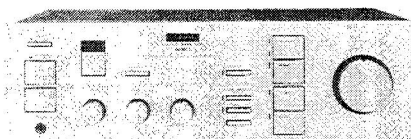




# Service Manual

**CIRCUIT DESCRIPTIONS  
REPAIR & ADJUSTMENTS**



**ORDER NO.  
ARP-318-0**

**STEREO AMPLIFIER**

# A-60

**MODEL A-60 COMES IN FIVE VERSIONS DISTINGUISHED AS FOLLOWS:**

| Type | Voltage                               | Remarks                  |
|------|---------------------------------------|--------------------------|
| KU   | AC120V only                           | U.S.A. model             |
| HE   | AC220V, 240V (Switchable)             | European continent model |
| HB   | AC220V, 240V (Switchable)             | United Kingdom model     |
| YP   | AC240V only                           | Australia model          |
| HEZ  | AC220V, 240V (Switchable)             | West Germany model       |
| S    | AC110V, 120V, 220V, 240V (switchable) | General export model     |

- This service manual is applicable to the KU type. For servicing of the HE, HB, YP and S types, please refer to the pp. 27~29. For servicing of the HEZ type, please refer to the additional service manual.
- Ce manuel d'instruction se réfère au mode de réglage, en français.
- Este manual de servicio trata del método de ajuste escrito en español.

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**PIONEER ELECTRONICS AUSTRALIA PTY. LTD.** 178-184 Boundary Road, Braeside, Victoria 3195, Australia

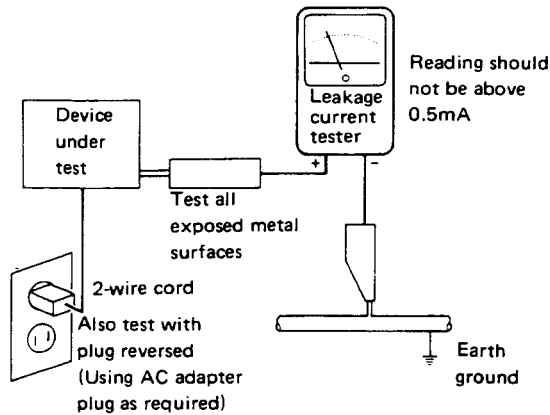
# 1. SAFETY INFORMATION

## 1. SAFETY PRECAUTIONS

The following check should be performed for the continued protection of the customer and service technician.

### LEAKAGE CURRENT CHECK

Measure leakage current to a known earth ground (water pipe, conduit, etc.) by connecting a leakage current tester such as Simpson Model 229-2 or equivalent between the earth ground and all exposed metal parts of the appliance (input/output terminals, screwheads, metal overlays, control shaft, etc.). Plug the AC line cord of the appliance directly into a 120V AC 60Hz outlet and turn the AC power switch on. Any current measured must not exceed 0.5mA.



AC Leakage Test

ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND MUST BE CORRECTED BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

## 2. PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in the appliance have special safety related characteristics. These are often not evident from visual inspection nor the protection afforded by them necessarily can be obtained by using replacement components rated for voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Service Manual.

Electrical components having such features are identified by marking with a ⚠ on the schematics and on the parts list in this Service Manual.

The use of a substitute replacement component which does not have the same safety characteristics as the PIONEER recommended replacement one, shown in the parts list in this Service Manual, may create shock, fire, or other hazards.

Product Safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult the current PIONEER Service Manual. A subscription to, or additional copies of, PIONEER Service Manual may be obtained at a nominal charge from PIONEER.

## 2. SPECIFICATIONS

### Amplifier Section

Continuous average power output is 100 watts\* per channel, min. at 8 ohms from 20 hertz to 20,000 hertz with no more than 0.007% total harmonic distortion\*\*.

Continuous Power Output at 1 kHz (both channels driven)

T.H.D. 0,007%, 8 ohms ..... 120 watts per channel  
 T.H.D. 1%, 8 ohms ..... 130 watts per channel (DIN)  
 Damping Factor (20 hertz to 20,000 hertz, 8 ohms) ..... 60

Input (Sensitivity/Impedance)

PHONO MM ..... 2.5 mV/50 kilohms  
 PHONO MC ..... 0.2 mV/100 ohms  
 TUNER, CD/AUX, TAPE PLAY 1, 2 ..... 150 mV/50 kilohms

Phono Overload Level (T.H.D. 0.005%, 1,000 Hz)

PHONO MM ..... 200 mV  
 PHONO MC ..... 17 mV

Output (Level/Impedance)

TAPE REC 1, 2 ..... 150 mV/2.2 kilohms

Frequency Response

PHONO MM (RIAA Equalization) ..... 20 Hz to  
 20,000 Hz  $\pm$ 0.2 dB  
 TUNER, CD/AUX, TAPE PLAY 1, 2 ..... 5 Hz to  
 100,000 Hz  $\pm$ 3 dB

Tone Control

BASS .....  $\pm$  10 dB (100 Hz)  
 TREBLE .....  $\pm$  10 dB (10 kHz)

Filter

LOW (SUBSONIC) ..... 15 Hz(-6 dB/oct)  
 Loudness Contour (Volume control set at -40 dB) .....  
 +6 dB (100 Hz), +3 dB (10 kHz)

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

PHONO MM ..... 86 dB (2.5 mV)  
 PHONO MC ..... 70 dB (0.25 mV)  
 TUNER, CD/AUX, TAPE PLAY 1, 2 ..... 105 dB (150 mV)

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

PHONO MM ..... 74/61 dB  
 TUNER, CD/AUX, TAPE PLAY 1, 2 ..... 88/62 dB

### Miscellaneous

Power Requirements ..... KU model; AC 120 V, 60 Hz  
 HB, YP models; a.c. 240 Volts~, 50 Hz  
 HE model; a.c. 220 Volts~, 50 Hz  
 S model; 110/120/220/240 V (switchable), 50/60 Hz

Power Consumption ..... KU model; 170 W (UL)  
 HE, HB, YP models; 700 W (max.)  
 S model; 220 W

Dimensions ..... 420 (W)  $\times$  130 (H)  $\times$  331 (D) mm max.  
 16-9/16 (W)  $\times$  5-3/16 (H)  $\times$  13-1/16 (D) in.

Weight (without package) ..... 9.4 kg (20 lb 12 oz)

### Furnished Parts

Operating Instructions ..... 1

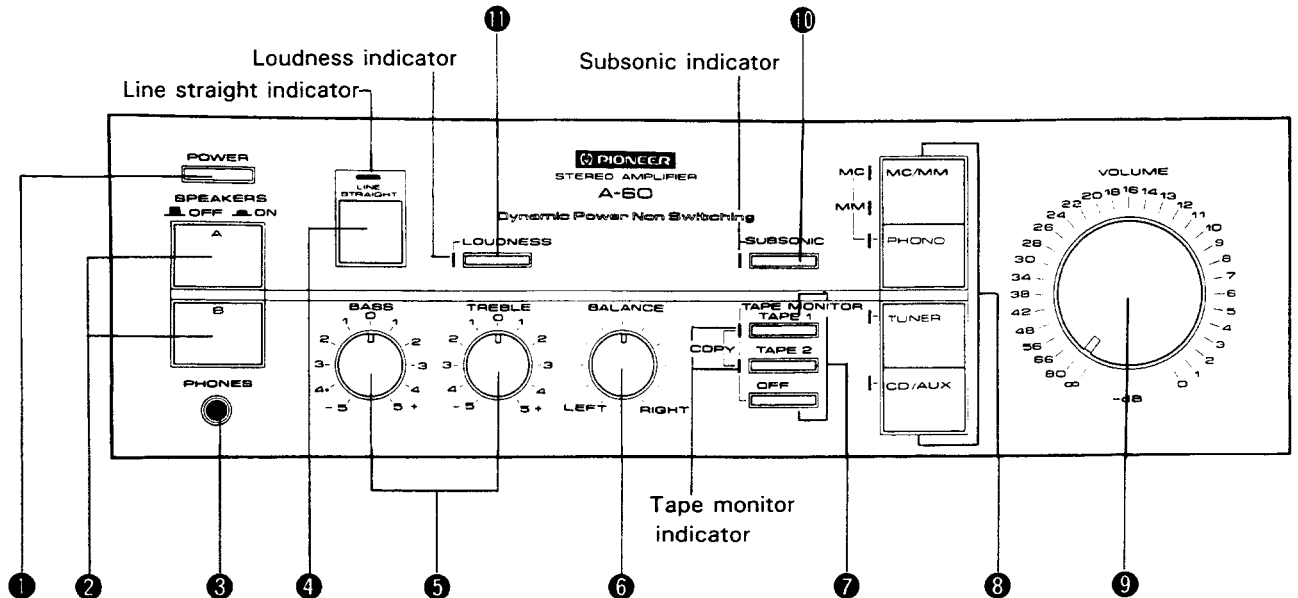
\* Measured pursuant to the Federal Trade Commission's Trade Regulation rule on Power Output Claims for Amplifier.

\*\* Measured by Audio Spectrum Analyzer.

NOTE:

Specifications and design subject to possible modification without notice due to improvements.

### 3. FRONT PANEL FACILITIES



#### 1 POWER SWITCH

Power is supplied to the stereo amplifier when the switch is depressed. When the switch is released, the power is turned off.

#### 2 SPEAKER SWITCHES

Two sets of speakers can be used. Depress the switches to turn ON. Release to turn OFF.

A ..... Sound is heard from the speakers connected to the Speaker A terminals.

B ..... Sound is heard from the speakers connected to the Speaker B terminals.

- Speakers A and B can also be used simultaneously. If using both, depress both Speaker A and B switches.

#### NOTE:

When only one set of speakers is used, the impedance is different from that obtained when two sets are used.

#### 3 PHONES JACK

Connect the plug on your headphones to this jack. To listen to a program through the headphones, turn both the SPEAKER A and B switches to OFF position.

#### 4 LINE STRAIGHT SWITCH

When the switch is depressed to the ON position, (the Line Straight indicator lights up) the signal from the input jacks is sent directly to the power amplifier, without passing through the tone control circuit or the loudness circuit, and consequently a flat frequency is obtained.

#### 5 TONE QUALITY (BASS AND TREBLE) CONTROLS

The controls can be adjusted when the LINE STRAIGHT switch is set to OFF position. (The Line Straight indicator turns off)

**BASS CONTROL** ..... Adjusts the quality of the Bass (Low frequency range) sound.

When the control is turned counter-clockwise from the central "0" position, the bass is attenuated. When turned clockwise, the bass is stressed.

**TREBLE CONTROL** .. Adjusts the treble (high frequency) sound.

When the control is turned counter-clockwise from the central "0" position, the treble is attenuated, when turned clockwise, the treble is stressed.

#### 6 BALANCE CONTROL

This control is used to balance the volume of the left and right channels. If the sound appears to be weaker from the right speaker, turn the BALANCE control clockwise (↻). If the sound is weaker from the left speaker, turn the control counter-clockwise (↺).

## 7 TAPE MONITOR SWITCHES

Used when playing back a tape or monitoring a recording. The stereo amplifier has tape jacks for 2 systems. Recording and playback are possible with 2 tape decks connected. Furthermore, both simultaneous recording using both tape decks or copying from one tape to another are possible.

- TAPE 1** ..... Depress this switch when playing back a tape or monitoring a recording on the tape deck attached to TAPE 1 jack on the rear panel.  
Also, depress this switch when copying a tape from the tape deck attached to TAPE 1 jack to the tape deck attached to TAPE 2 jack on the rear panel.
- TAPE 2** ..... Depress this switch when playing back a tape or monitoring a recording on the tape deck attached to TAPE 2 jack on the rear panel.
- OFF** ..... Leave in OFF normally.

## 8 FUNCTION SWITCHES


These switches select the program source. A function indicator is attached to the left side of each FUNCTION switch. When pressed, the indicator lights up.

- MC/MM** ..... When playing a record on the turntable, adjust the switch to correspond to the cartridge being used. Confirmed by the MC or MM indicator that lights up.
- PHONO** ..... Depress for playing records on a turntable connected to the PHONO jack on the rear panel.
- TUNER** ..... Depress for listening to a program on a tuner connected to the TUNER jacks on the rear panel.
- CD/AUX** ..... Depress for listening to the sound from a stereo component connected to the CD/AUX jacks on the rear panel. (for eg. Compact Disk Player or TV tuner, which can be bought separately).

**NOTE:**

Since the TAPE MONITOR switches have priority over the FUNCTION switches, turn the TAPE MONITOR switches to OFF.

## 9 VOLUME CONTROL

This is used to adjust the volume of sound heard through the speakers or headphones. No sound is heard when the control is at the " $\infty$ " position. To increase the volume, turn the control slowly clockwise ()

## 10 SUBSONIC SWITCH

When this switch is depressed, the Subsonic Filter indicator lights up and the subsonic filter is activated. The filter serves to attenuate frequencies lower than 15 Hz with a 6 dB/oct slope, and can therefore be used to suppress the ultra low range noise, generated by record warp. This noise cannot actually be heard by the ear, but it can cause intermodulation distortion and even speaker damage. Use the switch as required during record play.

## 11 LOUDNESS SWITCH

Depress this switch under low volume listening conditions. The Loudness indicator lights up and the bass and treble sound is emphasised.

When the volume of sound is low, the capability of the ear to pick up the bass and treble sound drops off, compared with high volume listening conditions. The loudness circuit compensates for this characteristic of the ear. The bass and treble are emphasised when the switch is set to ON and the sound comes alive, even when the volume is low.

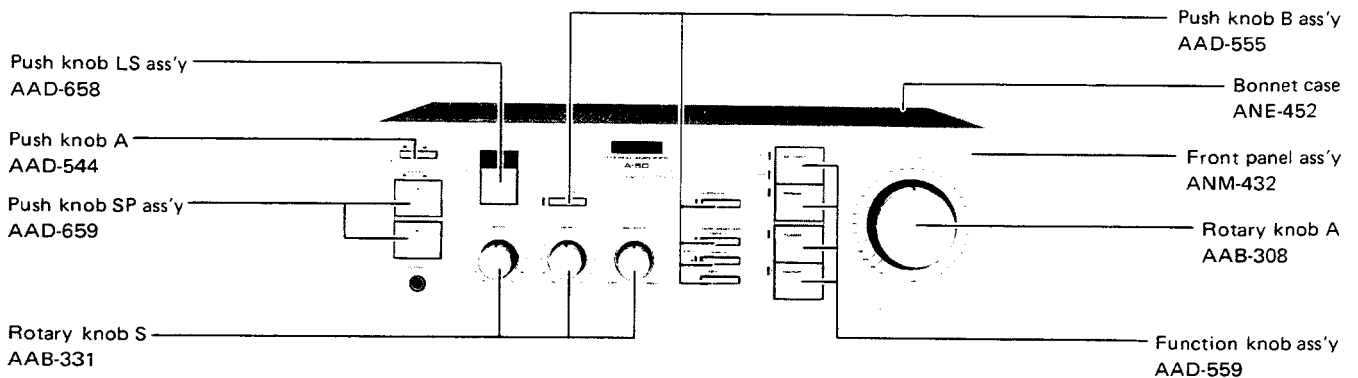
**NOTE:**

The LOUDNESS switch does not operate if the LINE STRAIGHT switch is ON.

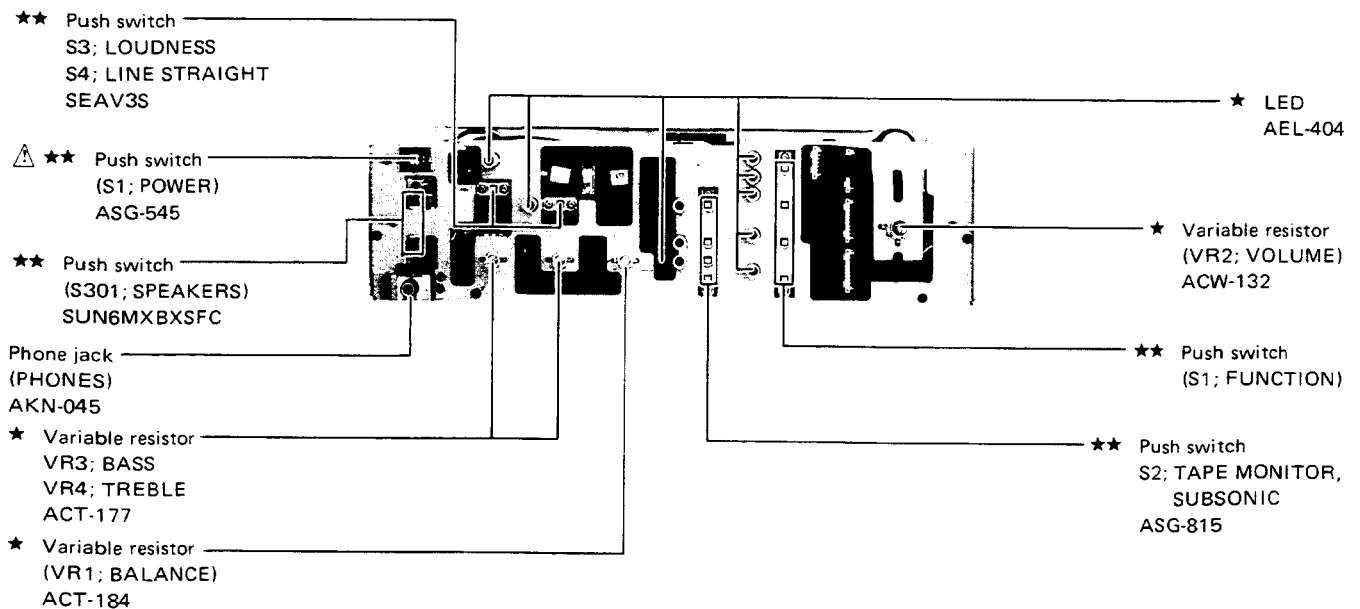
## 4. PARTS LOCATION

- Parts without part number cannot be supplied.
- The  $\triangle$  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.
- For your Parts Stock Control, the fast moving items are indicated with the marks **★★** and **★**.  
**★★ GENERALLY MOVES FASTER THAN ★.**  
*This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.*

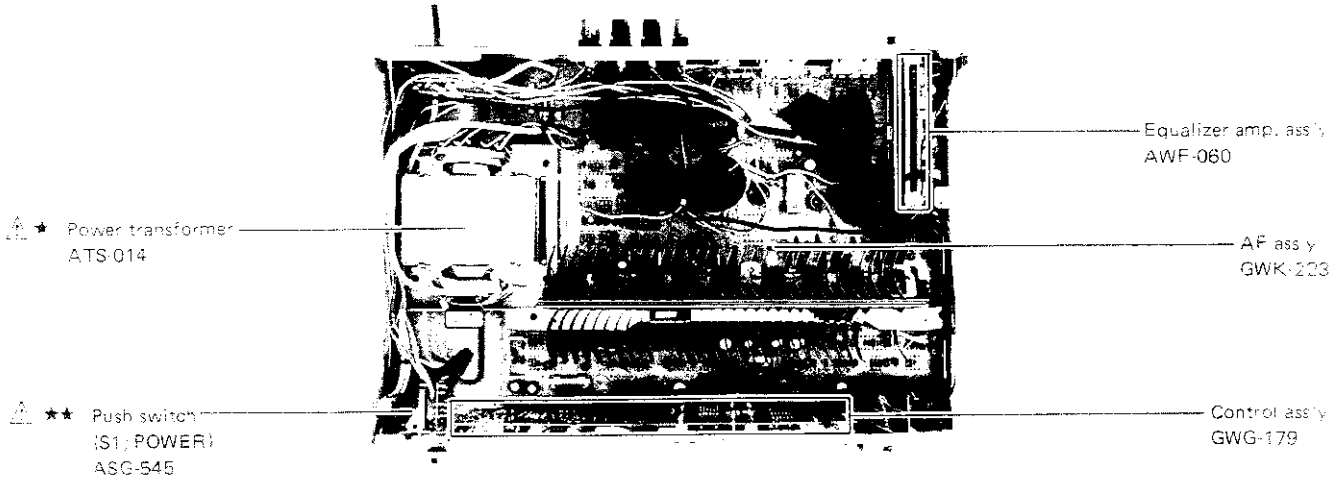
### Front Panel View



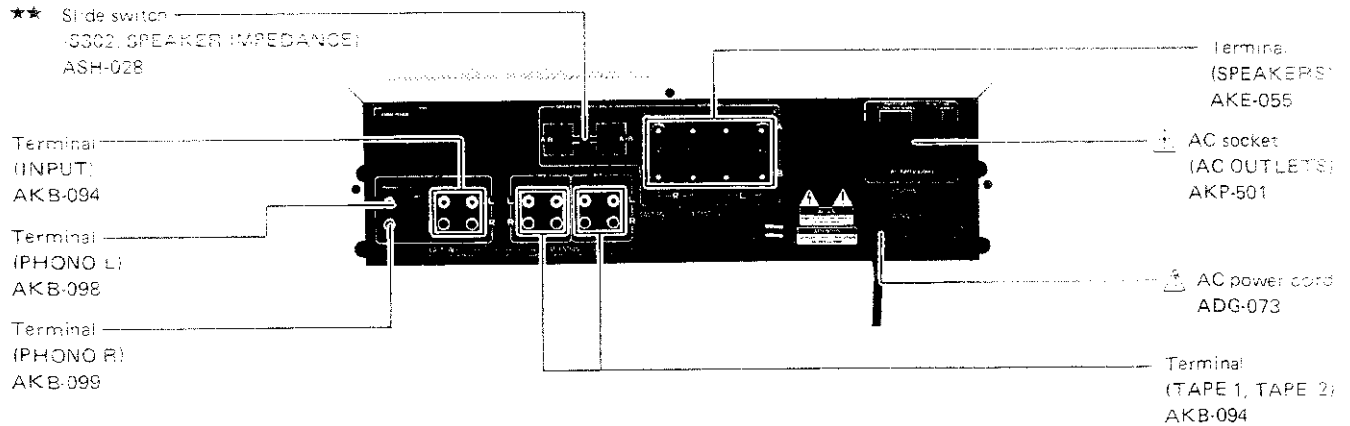
### Front View with Panel Removed



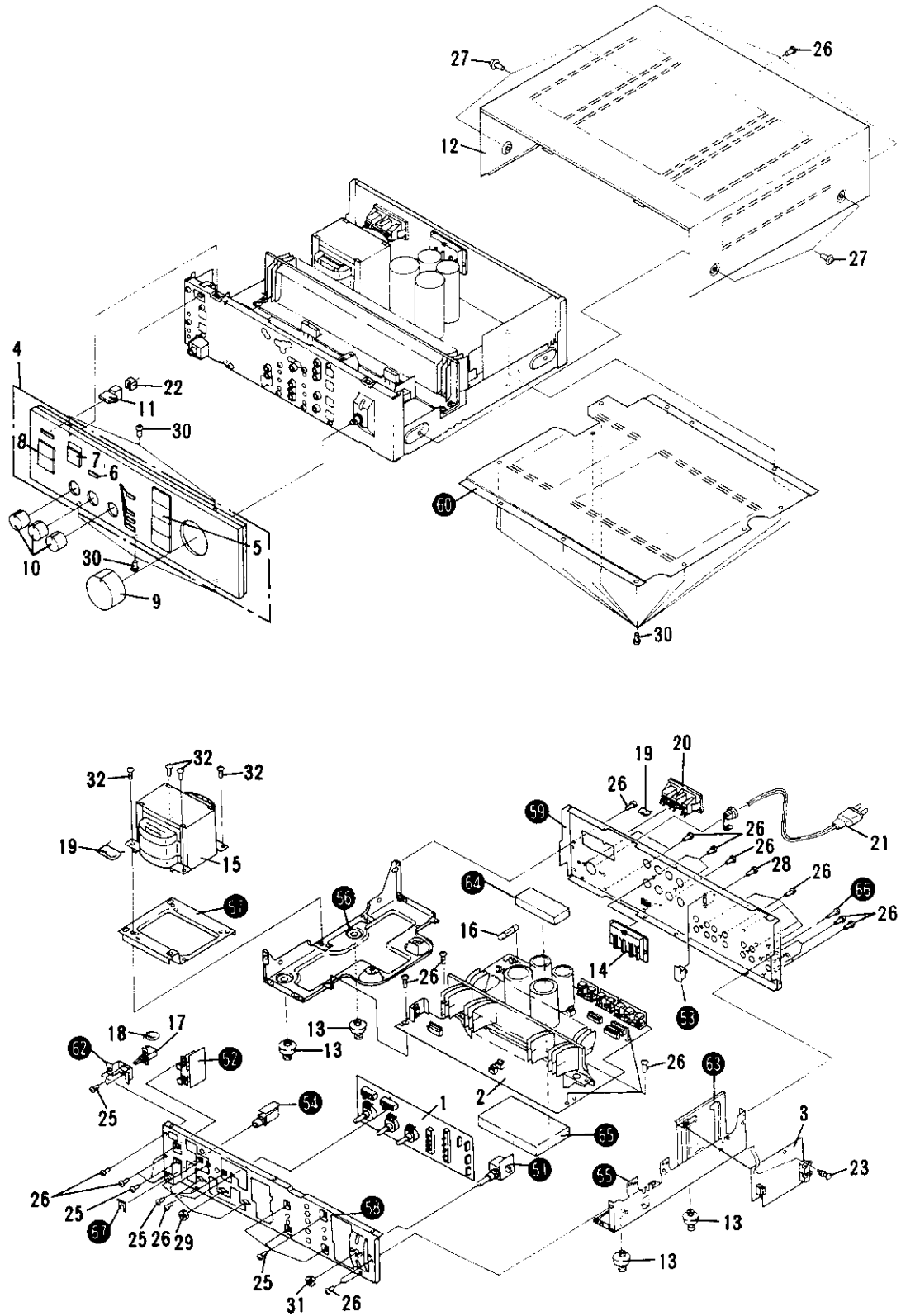
**Top View with Bonnet Removed**



**Rear Panel View**



# 5. EXPLODED VIEW

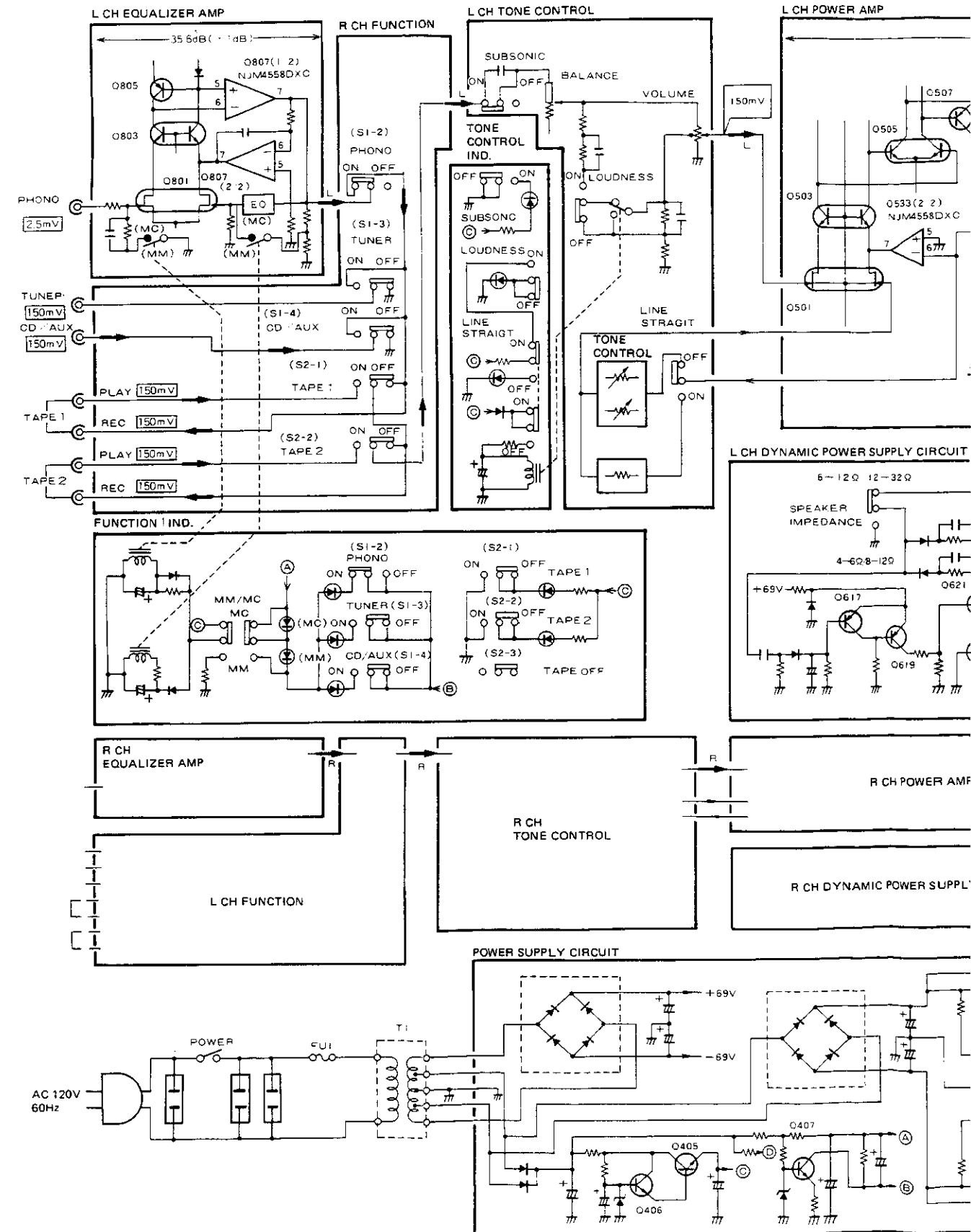




- Parts without part number cannot be supplied.
- The  $\Delta$  mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
- For your Parts Stock Control, the fast moving items are indicated with the marks **\*\* and \***.  
**\*\* GENERALLY MOVES FASTER THAN \***.  
This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

| Mark        | No. | Part No.     | Description              | Mark | No. | Part No. | Description    |
|-------------|-----|--------------|--------------------------|------|-----|----------|----------------|
|             | 1.  | GWG-179      | Control ass'y            |      | 61. |          | .....          |
|             | 2.  | GWK-223      | AF ass'y                 |      | 62. |          | SW holder      |
|             | 3.  | AWF-060      | Equalizer amp. ass'y     |      | 63. |          | Shielding case |
|             | 4.  | ANM-432      | Front panel ass'y        |      | 64. |          | Cushion A      |
|             | 5.  | AAD-559      | Function knob ass'y      |      | 65. |          | Cushion B      |
|             | 6.  | AAD-555      | Push knob B ass'y        |      | 66. |          | Terminal (GND) |
|             | 7.  | AAD-658      | Push knob LS ass'y       |      | 67. |          | Mounting plate |
|             | 8.  | AAD-659      | Push knob SP ass'y       |      |     |          |                |
|             | 9.  | AAB-308      | Rotary knob A            |      |     |          |                |
|             | 10. | AAB-331      | Rotary knob S            |      |     |          |                |
|             | 11. | AAD-544      | Push knob A              |      |     |          |                |
|             | 12. | ANE-452      | Bonnet case              |      |     |          |                |
|             | 13. | AEC-383      | Foot ass'y               |      |     |          |                |
|             | 14. | AKE-055      | Terminal (SPEAKERS)      |      |     |          |                |
| $\Delta$ *  | 15. | ATS-014      | Power transformer (120V) |      |     |          |                |
| $\Delta$ ** | 16. | AEK-309      | Fuse (6.3A)              |      |     |          |                |
| $\Delta$ ** | 17. | ASG-545      | Push switch (POWER)      |      |     |          |                |
| $\Delta$    | 18. | ACG-001      | Capacitor (0.01/AC250V)  |      |     |          |                |
| $\Delta$    | 19. | ACE-214      | Capacitor (0.22/AC125V)  |      |     |          |                |
| $\Delta$    | 20. | AKP-501      | AC socket (AC OUTLETS)   |      |     |          |                |
| $\Delta$    | 21. | ADG-073      | AC power cord            |      |     |          |                |
|             | 22. | AEC-800      | Flexible ring            |      |     |          |                |
|             | 23. | AEC-525      | Nylon rivet              |      |     |          |                |
|             | 24. | .....        | .....                    |      |     |          |                |
|             | 25. | VMZ30P060FZB | Screw (3 x 6)            |      |     |          |                |
|             | 26. | BBZ30P080FZK | Screw (3 x 8)            |      |     |          |                |
|             | 27. | FBT40P080FCR | Screw (4 x 8)            |      |     |          |                |
|             | 28. | VMZ30P060FZK | Screw (3 x 6)            |      |     |          |                |
|             | 29. | NK70FUL      | Nut                      |      |     |          |                |
|             | 30. | VBZ30P080FMC | Screw (3 x 8)            |      |     |          |                |
|             | 31. | ABN-028      | Nut                      |      |     |          |                |
|             | 32. | VCZ30P060FMC | Screw (3 x 6)            |      |     |          |                |
|             | 51. |              | VR ass'y                 |      |     |          |                |
|             | 52. |              | Push switch ass'y        |      |     |          |                |
|             | 53. |              | Slide switch ass'y       |      |     |          |                |
|             | 54. |              | Headphone jack ass'y     |      |     |          |                |
|             | 55. |              | Right frame              |      |     |          |                |
|             | 56. |              | Transformer frame        |      |     |          |                |
|             | 57. |              | Transformer stay         |      |     |          |                |
|             | 58. |              | Panel stay               |      |     |          |                |
|             | 59. |              | Rear panel               |      |     |          |                |
|             | 60. |              | Bottom plate             |      |     |          |                |

## 6. BLOCK DIAGRAM



## 7. CIRCUIT DESCRIPTIONS

### DYNAMIC POWER SUPPLY CIRCUIT

The dynamic power supply system featured in the final stage of the A-60 power amplifier varies the voltage applied to the power transistor in accordance to the signal level. The result is reduced heat loss and higher efficiency.

#### Operating Principles

The basic circuitry is outlined in Fig. 7-1. There are two  $V_H$  and  $V_L$  power lines. The signal output  $v_o$  is compared with final stage power voltage  $v_a$  by differentiator,  $v_a$  being obtained by controlling  $V_H$ . With the  $v_a$  input applied to the differentiator being offset by  $E_s$  (several volts), the  $v_a$  waveform is traced,  $v_a$  being several volts larger than  $v_o$ . If, however,  $v_o$  is less than  $V_L - E_s$ ,  $v_a$  is fixed at the  $V_L$  level (see Fig. 7-2).

The purpose of the high-region ON circuit is to avoid irregularities from occurring where  $v_a$  can no longer follow  $v_o$  at high signal frequencies, and to prevent high-speed continuous operation in the control transistor. That is, when high frequency signals appear at the output, the control transistors (Q3 and Q4) are turned fully on, and  $v_a$  is fixed at the  $V_H$  level.

#### A-60 Dynamic Power Supply Circuit

The overall circuit structure is outlined in Fig. 7-3.  $V_L$  is fixed so as to obtain the rated output (about 75W) for a 4Ω load, and the high region ON circuit is designed to operate at frequencies above 3kHz. The SPEAKER IMPEDANCE switch set to the 4Ω ~ 6Ω position fixes the power supply to the final stage transistor at the  $V_L$  level.

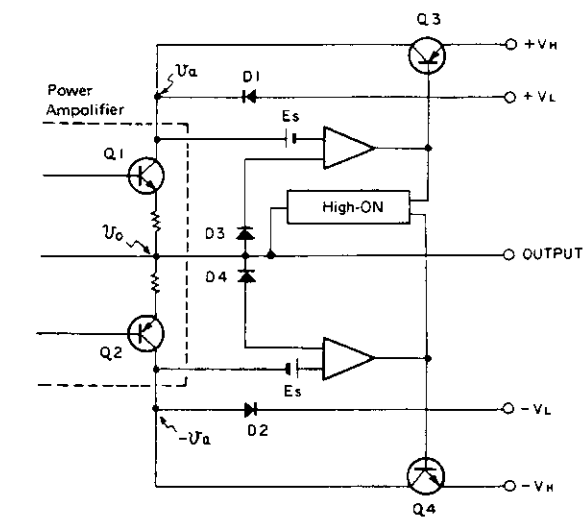
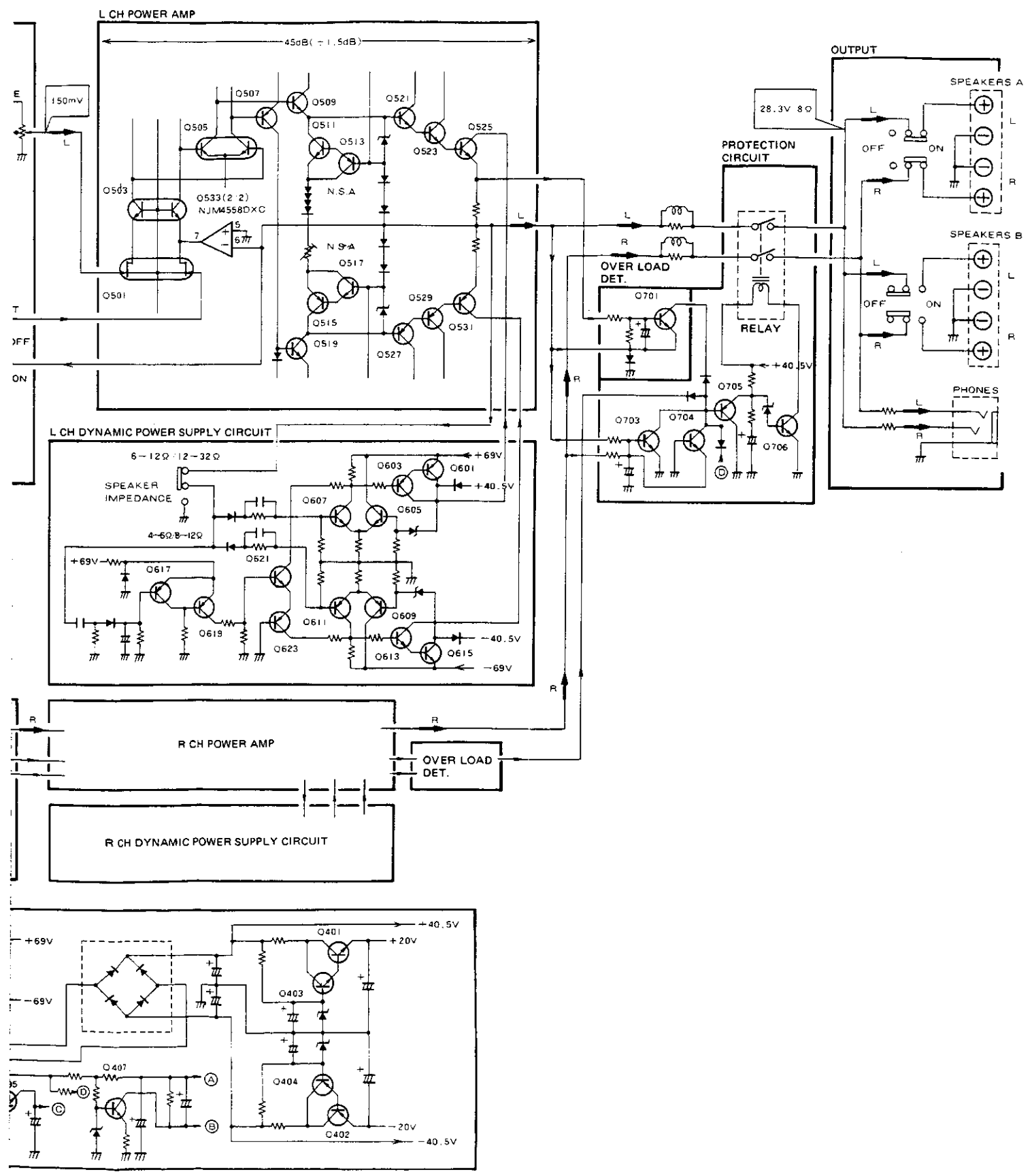


Fig. 7-1 Basic circuitry

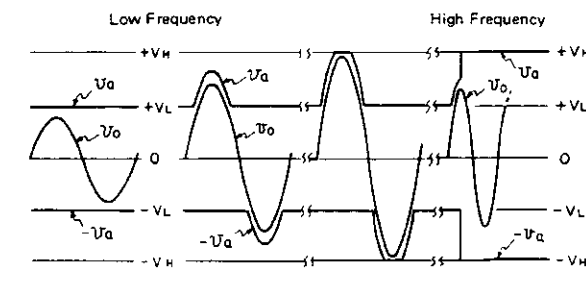


Fig. 7-2 Operating waveforms

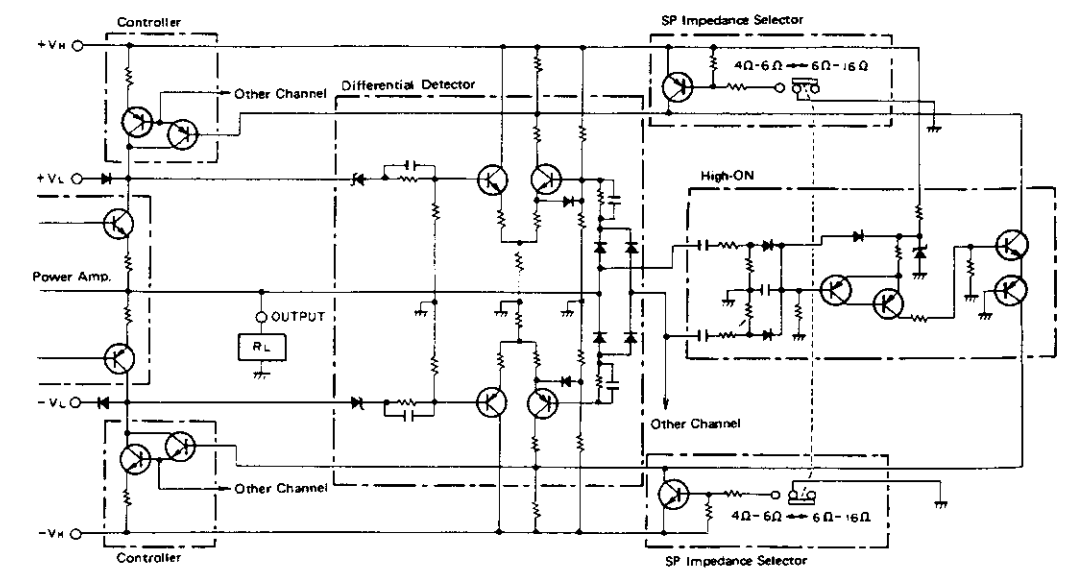


Fig. 7-3 A-60 Dynamic power supply circuit

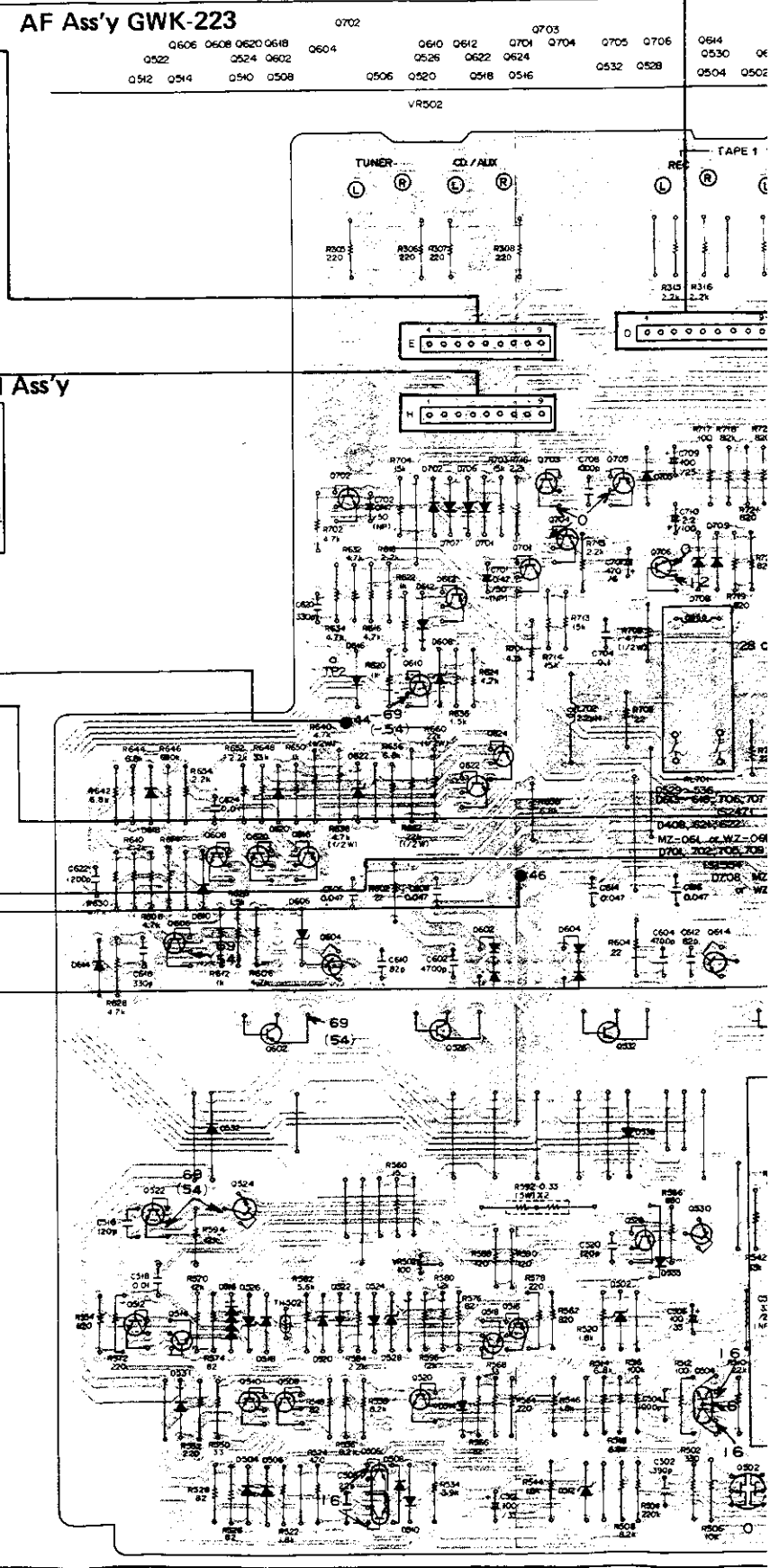
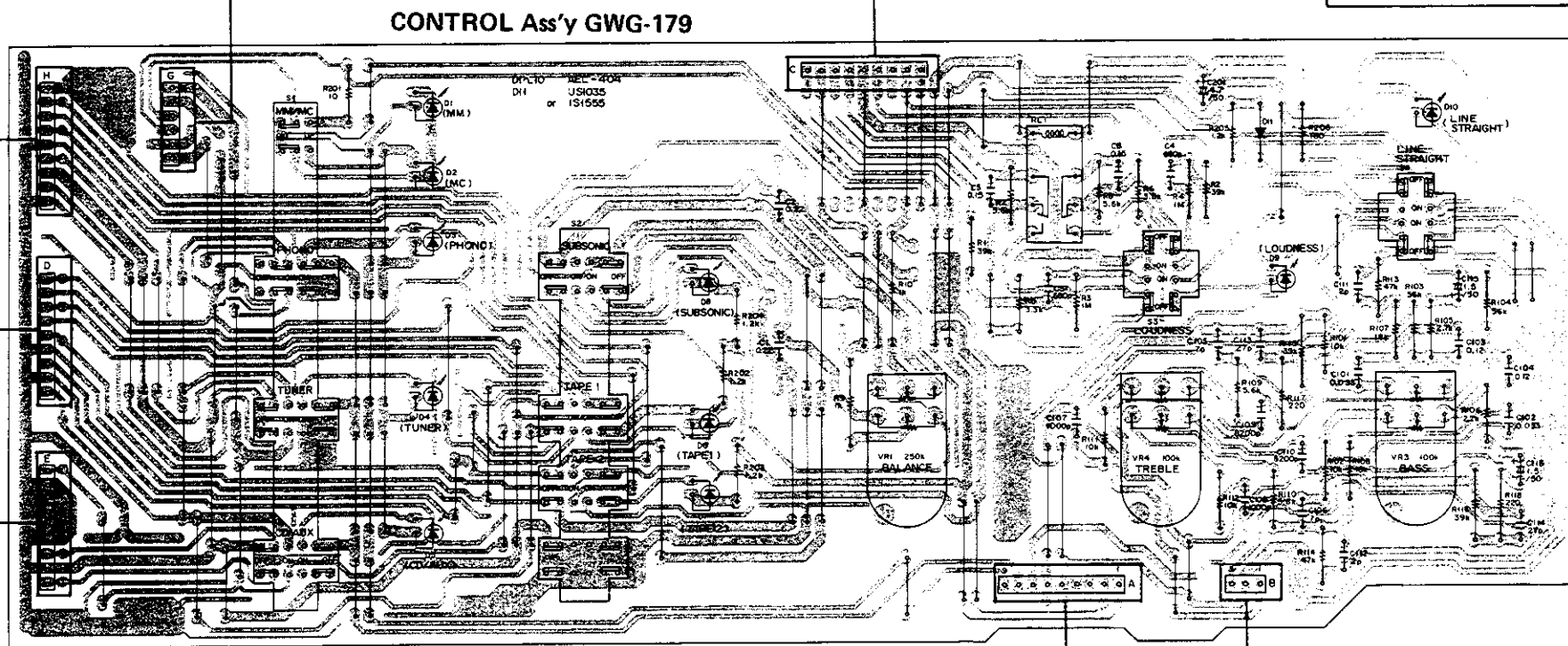
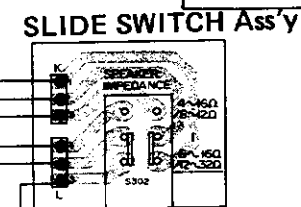
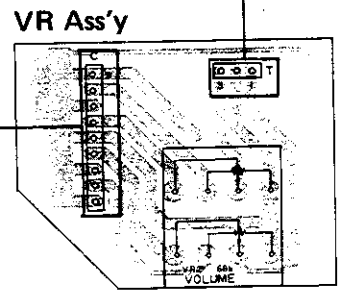
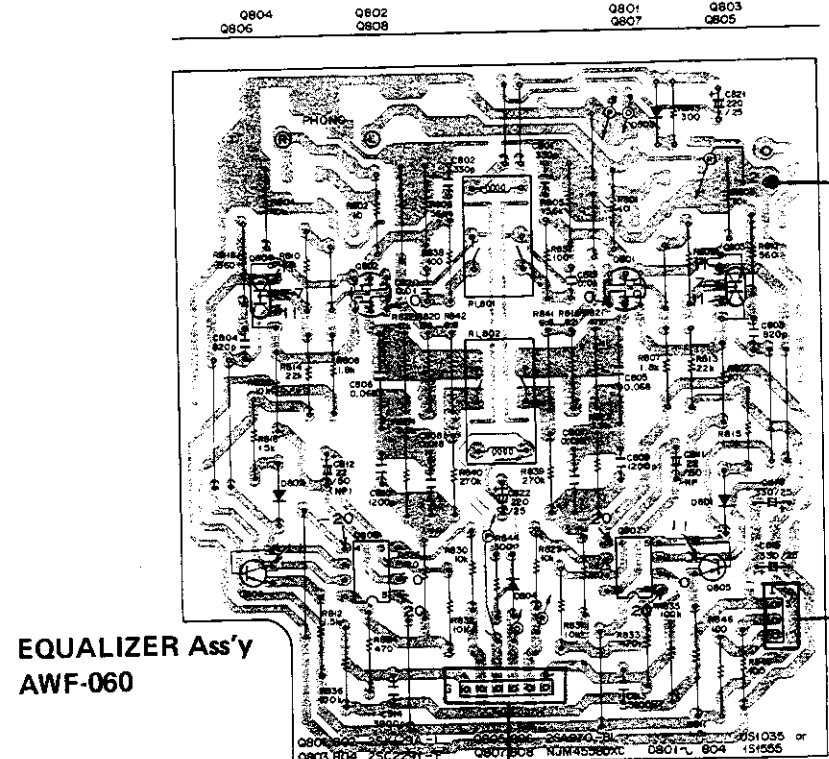
# 8. P.C.BOARDS CONNECTION DIAGRAM

A

B

C

D



7

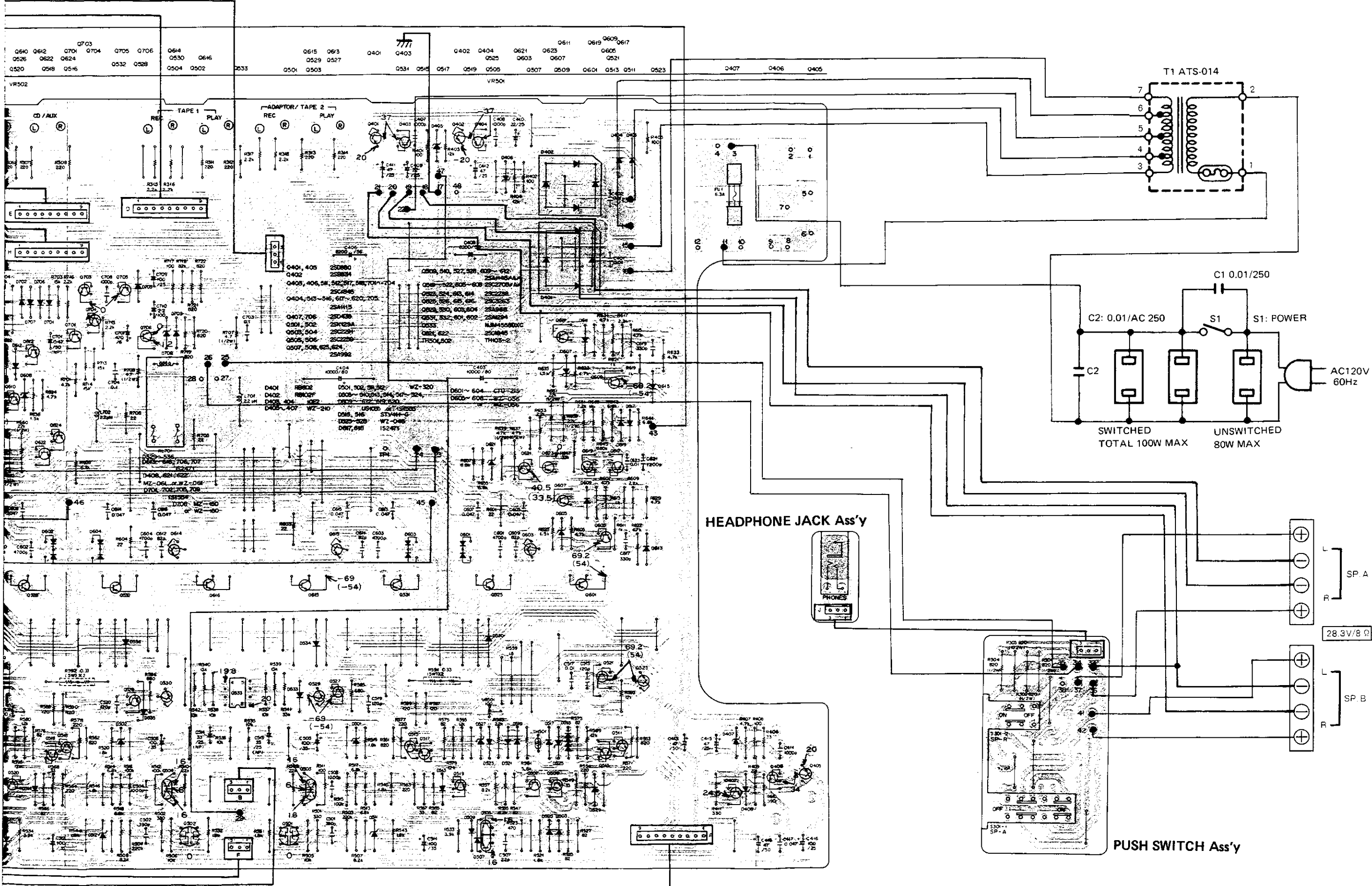
8

9

10

11

12



A

B

C

D

7

8

9

10

11

12

# 9. SCHEMATIC DIAGRAM

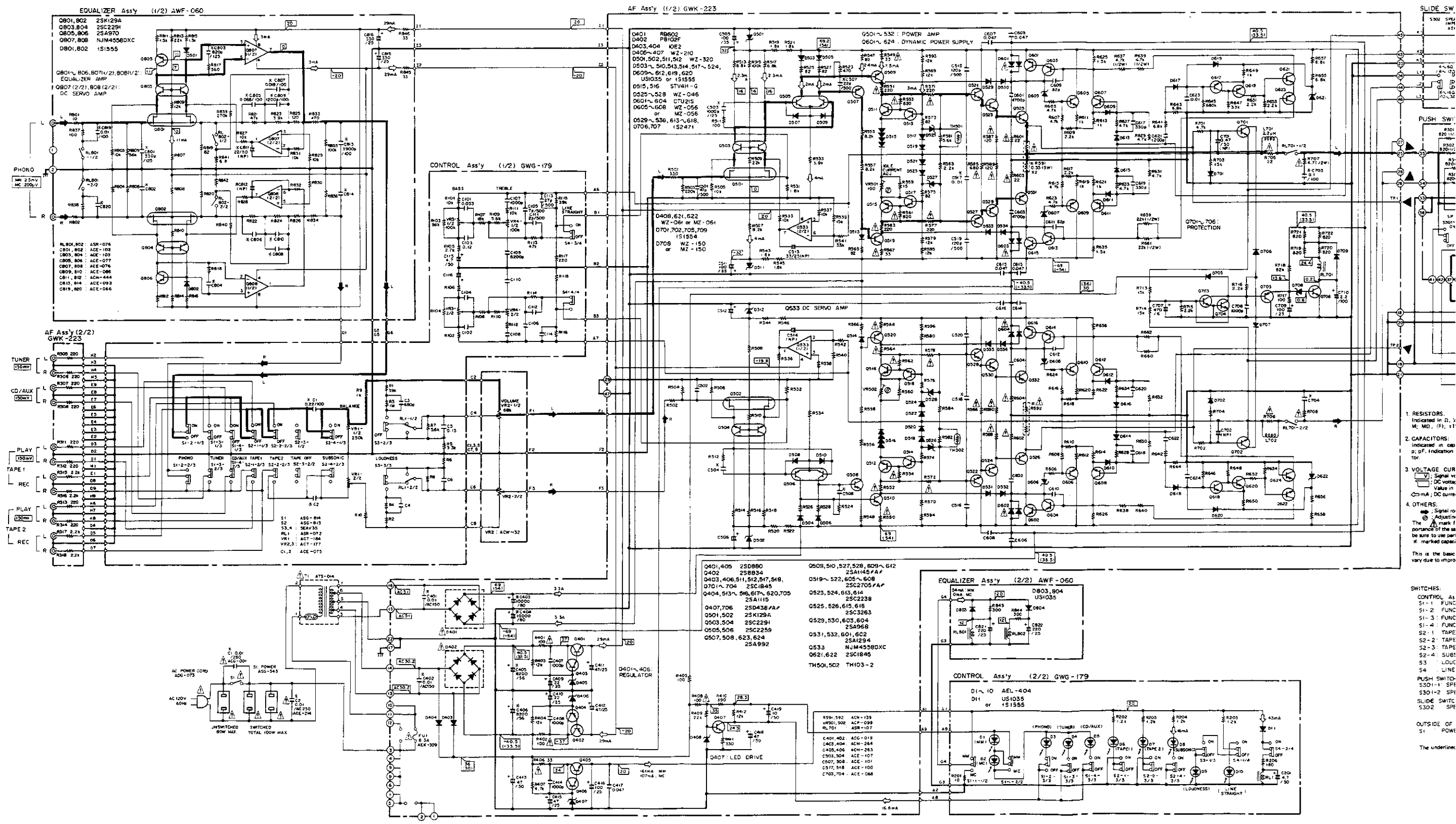
**NOTE:**  
The indicated semiconductors are n  
Other alternative semiconductors  
listed in the parts list.

A

B

C

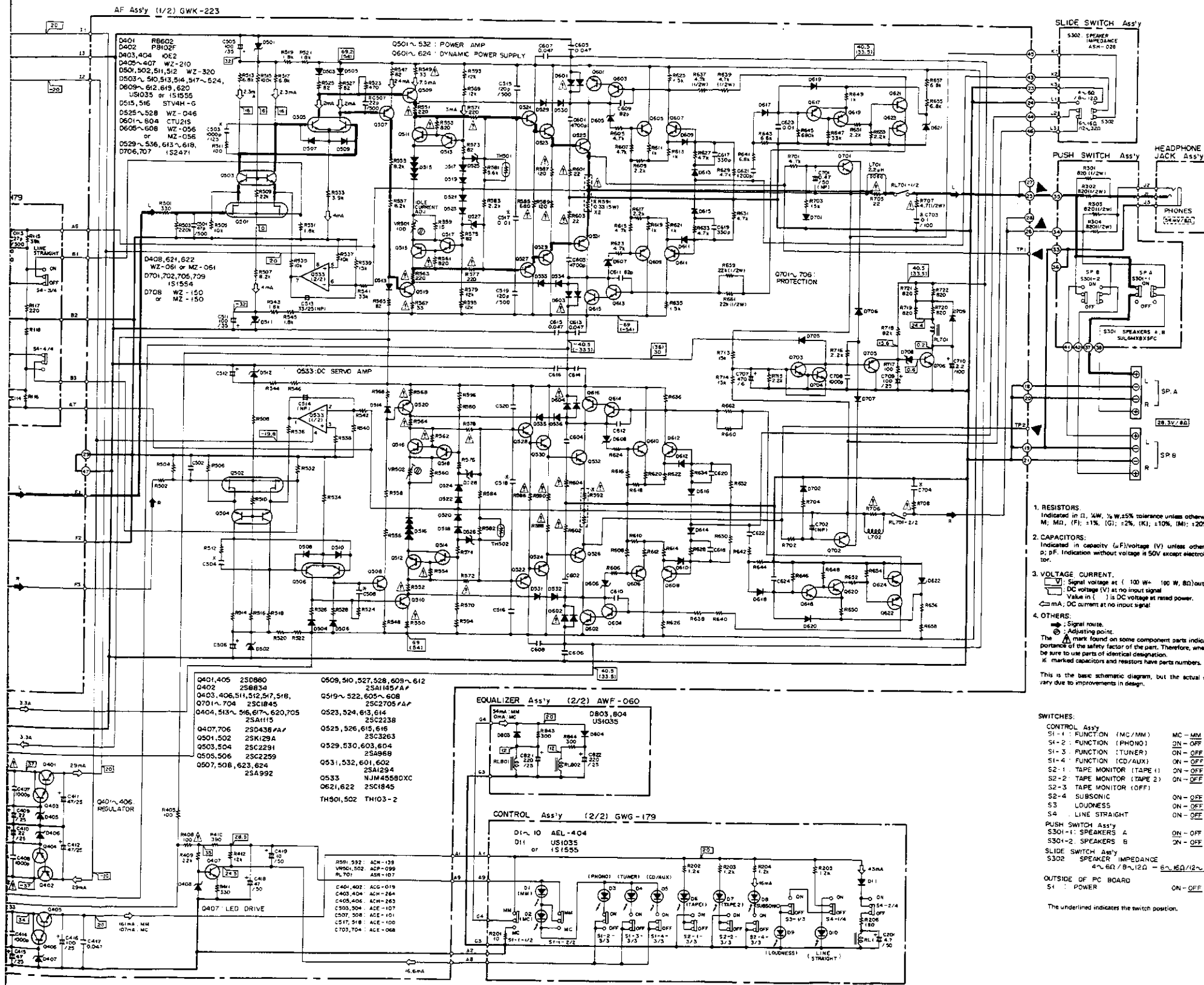
D



1. RESISTORS:  
Indicated in Ω, k, M, MD, (F), 1k
2. CAPACITORS:  
Indicated in μF, pF, indication for:
3. VOLTAGE CUR:  
Signal voltage  
DC voltage  
Value in  
mA, DC current
4. OTHERS:  
Signal  
Adjusting  
The mark I  
importance of the  
be sure to use part  
marked capacitor  
This is the basic  
vary due to impuro
- SWITCHES:  
CONTROL AS  
S1-1 FUNC  
S1-2 FUNC  
S1-3 FUNC  
S1-4 FUNC  
S2-1 TAPE  
S2-2 TAPE  
S2-3 TAPE  
S2-4 SUBT  
S3 LOUJ  
S4 LINE  
PUSH SWITCH  
S301-1 SPS  
S301-2 SPS  
SLIDE SWITC  
S302 SPS
- OUTSIDE OF  
S1 POWER  
The underline

3 | 4 | 5 | 6 | 7 | 8 | 9

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



External Appearance of Transistors and IC's

2SA970 Type No. Lot No. hFE

2SC2291 Type No. Lot No. hFE

2SA1145/A/  
2SC2705/A/ Type No. Lot No. hFE

2SB834  
2SA968  
2SC2238  
2SD880 Type No. Lot No. hFE

2SD438/A/ Type No. Lot No. hFE

2SA1294  
2SC3263 Type No. Lot No. hFE

2SK129A Lot No. Type No. Mark

2SA1115  
2SC2603 Type No. Lot No. hFE

2SA992  
2SC1845 Type No. Lot No. hFE

NJM4558DXC Index

- RESISTORS: Indicated in Ω, kW, % W, 5% tolerance unless otherwise noted; k: kΩ, M: MΩ, (F): 1%, (G): 2%, (K): 10%, (M): 20% tolerance.
  - CAPACITORS: Indicated in capacity (μF)/voltage (V) unless otherwise noted; p: pF. Indication without voltage is 50V except electrolytic capacitor.
  - VOLTAGE CURRENT: Signal voltage at (100 W, 8Ω) output (1 kHz); DC voltage (V) at no input signal; Value in ( ) is DC voltage at rated power; mA: DC current at no input signal.
  - OTHERS: Signal route; Adjusting point.
- 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.
- K: marked capacitors and resistors have parts numbers.
- This is the basic schematic diagram, but the actual circuit may vary due to improvements in design.

- SWITCHES:
- CONTROL Ass'y
- |                             |          |
|-----------------------------|----------|
| S1-1: FUNCTION (MC/MM)      | ON - ON  |
| S1-2: FUNCTION (PHONO)      | ON - OFF |
| S1-3: FUNCTION (TUNER)      | ON - OFF |
| S1-4: FUNCTION (CD/AUX)     | ON - OFF |
| S2-1: TAPE MONITOR (TAPE 1) | ON - OFF |
| S2-2: TAPE MONITOR (TAPE 2) | ON - OFF |
| S2-3: TAPE MONITOR (OFF)    | ON - OFF |
| S2-4: SUBSONIC              | ON - OFF |
| S3: LOUDNESS                | ON - OFF |
| S4: LINE STRAIGHT           | ON - OFF |
- PUSH SWITCH Ass'y
- |                    |          |
|--------------------|----------|
| S301-1: SPEAKERS A | ON - OFF |
| S301-2: SPEAKERS B | ON - OFF |
- SLIDE SWITCH Ass'y
- |                         |                                 |
|-------------------------|---------------------------------|
| S302: SPEAKER IMPEDANCE | 4Ω, 8Ω, 16Ω, 32Ω - 8Ω, 16Ω, 32Ω |
|-------------------------|---------------------------------|
- OUTSIDE OF PC BOARD
- |           |          |
|-----------|----------|
| S1: POWER | ON - OFF |
|-----------|----------|
- The underlined indicates the switch position.

3 | 4 | 5 | 6 | 7 | 8 | 9



# 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 x 10 <sup>1</sup> | 561   | ..... | RD½PS | ⓂⓂⓂ J |
| 47kΩ | 47 x 10 <sup>3</sup> | 473   | ..... | RD½PS | ⓂⓂⓂ J |
| 0.5Ω | 0R5                  | ..... | ..... | RN2H  | ⓂⓂⓂ K |
| 1Ω   | 010                  | ..... | ..... | RS1P  | ⓂⓂⓂ K |
  - Ex.2 When there are 3 effective digits (such as in high precision metal film resistors).
 

|        |           |      |       |       |        |
|--------|-----------|------|-------|-------|--------|
| 5.62kΩ | 562 x 100 | 5621 | ..... | RN½SR | ⓂⓂⓂⓂ F |
|--------|-----------|------|-------|-------|--------|
- 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.
- For your Parts Stock Control, the fast moving items are indicated with the marks **★★** and **★**.  
**★★ GENERALLY MOVES FASTER THAN ★.**  
 This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

**Miscellaneous Parts List**

| Mark | Part No.  | Symbol & Description        | Mark | Part No.   | Symbol & Description                                    |
|------|-----------|-----------------------------|------|------------|---|
|      |           |                             |      | 2SD438/A/  | Q407, Q706  |
|      |           |                             |      | 2SB834     | Q402  |
|      | GWK-223   | AF ass'y                    |      | NJM4558DXC | Q533  |
|      | AWF-060   | Equalizer amp. ass'y        |      | 2SC1845    | Q621, Q622, Q701, Q702                                  |
|      |           |                             |      | 2SA992     | Q507, Q508, Q623, Q624                                  |
|      | no supply | VR ass'y                    |      | 2SC2603    | Q403, Q406, Q511, Q512, Q517, Q518, Q703, Q704          |
|      | no supply | Push switch ass'y           |      | 2SA1115    | Q404, Q705, Q513-Q516, Q617-Q620                        |
|      | no supply | Slide switch ass'y          |      |            |   |
|      | no supply | Headphone jack ass'y        |      |            |   |
| ⚠ ★  | ATS-014   | T1 Power transformer (120V) | ⚠    | RB602      | D401  |
| ⚠ ★★ | AEK-309   | FU1 Fuse (6.3A)             | ⚠    | PB102F     | D402  |
| ⚠ ★★ | ASG-545   | S1 Push switch (POWER)      |      | 10E2FD     | D403, D404  |
| ⚠    | ACG-001   | C1 Capacitor (0.01/AC 250V) |      |            |   |
| ⚠    | ACE-214   | C2 Capacitor (0.22/AC 125V) | ⚠    | CTU-21S    | D601-D604   |
|      |           |                             |      | STV4H-G    | D515, D516  |
| ⚠    | AKP-501   | AC socket (AC OUTLETS)      |      | WZ-056     | D525-D628   |
| ⚠    | ADG-073   | AC power cord               |      | WZ-046     | D605-D608   |
|      |           |                             |      | WZ-061     | D408, D621, D622  |
|      |           |                             |      | (MZ-061)   |   |
|      |           |                             |      | WZ-150     | D708  |
|      |           |                             |      | (MZ-150)   |   |
|      |           |                             |      | WZ-210     | D405-D407   |
|      |           |                             |      | WZ-320     | D501, D502, D511, D512                                  |
|      |           |                             |      | US1035     | D503-D510, D513, D514, D517-D524, D609-D612, D619, D620 |
|      |           |                             |      | (1S1555)   |   |
|      |           |                             |      | 1S1554     | D701, D702, D705, D709                                  |
|      |           |                             |      | 1S2471     | D529-D536, D613-D618, D706, D707                        |
|      |           |                             |      | TH103-2    | TH501, TH502  |

**AF Ass'y (GWK-223)**

**SEMICONDUCTORS**

| Mark | Part No.   | Symbol & Description              |
|------|------------|-----------------------------------|
|      | 2SD880     | Q401, Q405                        |
|      | 2SK129A    | Q501, Q502                        |
|      | 2SC2291    | Q503, Q504                        |
|      | 2SC2259    | Q505, Q506                        |
|      | 2SC2705/A/ | Q519-Q522, Q605-Q608              |
|      | 2SA1145/A/ | Q509, Q510, Q527, Q528, Q609-Q612 |
|      | 2SC2238    | Q523, Q524, Q613, Q614            |
|      | 2SA968     | Q529, Q530, Q603, Q604            |
|      | 2SC3263    | Q525, Q526, Q615, Q616            |
|      | 2SA1294    | Q531, Q532, Q601, Q602            |

**CAPACITORS**

| Mark | Part No.      | Symbol & Descriptions      |
|------|---------------|----------------------------|
|      | ACG-019       | C401, C402 (0.01/AC150V)   |
|      | ACH-264       | C403, C404 (10000/80V)     |
|      | ACH-263       | C405, C406 (8200/56V)      |
|      | CQSA 391J 50  | C501, C502                 |
|      | CMA 121J 500  | C515, C516, C519, C520     |
|      | CMA 220J 500  | C507, C508                 |
|      | ACE-071       | C503, C504 (1000p/125V)    |
|      | ACE-092       | C517, C518 (0.0068/100V)   |
|      | ACE-067       | C703, C704 (0.1/100V)      |
|      | CEANP R47M 50 | C701, C702                 |
|      | CEANP 330M 25 | C513, C514                 |
|      | CKDYF 103Z 50 | C623, C624                 |
|      | CEA 2R2M 100L | C710                       |
|      | CEA 220M 25L  | C409, C410                 |
|      | CEA 470M 25L  | C411, C412, C415           |
|      | CEA 470M 50L  | C413, C418                 |
|      | CEA 101M 25L  | C416, C709                 |
|      | CEA 101M 35L  | C505, C506, C511, C512     |
|      | CEA 471M 6L   | C707                       |
|      | CCDSL 820J 50 | C609-C612                  |
|      | CKDYB 331K 50 | C617-C620                  |
|      | CKDYB 102K 50 | C407, C408, C414, C708     |
|      | CKDYB 122K 50 | C621, C622                 |
|      | CKDYF 472Z 50 | C601-C604                  |
|      | CKDYF 473Z 50 | C417, C605-C608, C613-C616 |

**RESISTORS**

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

| Mark | Part No.      | Symbol & Description   |
|------|---------------|--|
|      | ACP-099       | VR501, VR502   |
|      | ACN-139       | R591, R592   |
| ⚠    | RD½PMFL □□□ J | R553, R554, R561, R562, R585, R586   |
| ⚠    | RFA½PS □□□ J  | R551, R552, R563, R564, R571, R572, R577, R578   |
|      | RDH1/8P □□□ J | R501-R504, R531, R532  |
|      | RD½PSF □□□ J  | R707, R708   |
|      | RFA½PS □□□ J  | R705-R706, R587-R590   |
| ⚠    | RFA½PS □□□ J  | R401, R402, R405, R406, R549, R601-R604, R550-R552, R563, R564, R567, R571, R572, R577, R578 |
|      | RD½PS □□□ J   | R637-R640, R659-R662   |
|      | RD½PM □□□ J   | Other resistors  |

**OTHERS**

| Mark | Part No.     | Symbol & Description      |
|------|--------------|---------------------------|
|      | AKB-094      | 4P Pin jack (INPUT, TAPE) |
|      | ATH-054      | L701, L702 AF choke coil  |
|      | ASR-107      | RL701 Relay               |
|      | ABA-258      | Screw                     |
|      | BBZ30P080FZK | Screw                     |
|      | PBZ30P060FMC | Screw                     |
|      | AEC-818      | Screw                     |

**Push Switch Ass'y**

**RESISTORS**

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

| Mark | Part No. | Symbol & Description  |
|------|----------|-----------------------|
|      |          | RD½PS □□□ J R301-R304 |

**OTHERS**

| Mark | Part No. | Symbol & Description                    |
|------|----------|---|
|      |          | SUN6MXBXSFC S301 Push switch (SPEAKERS) |

**Slide Switch Ass'y**

| Mark | Part No. | Symbol & Description      |
|------|----------|---------------------------|
|      |          | ASH-028 S302 Slide switch |

**Headphone Jack Ass'y**

| Mark | Part No. | Symbol & Description        |
|------|----------|-----------------------------|
|      |          | AKN-045 Phone jack (PHONES) |

**Equalizer Amp. Ass'y (AWF-060)**

**SEMICONDUCTORS**

| Mark | Part No. | Symbol & Description  |
|------|----------|-----------------------|
|      |          | 2SK129A Q801, Q802    |
|      |          | 2SC2291 Q803, Q804    |
|      |          | NJM4558DXC Q807, Q808 |
|      |          | 2SA970 Q805, Q806     |
|      |          | US1035 D801-D804      |
|      |          | (1S1555)              |

**CAPACITORS**

| Mark | Part No. | Symbol & Description            |
|------|----------|---------------------------------|
|      |          | ACE-102 C801, C802 (330p/125V)  |
|      |          | ACE-076 C807, C808 (0.018/100V) |
|      |          | ACE-077 C805, C806 (0.068/100V) |
|      |          | ACE-086 C809, C810 (1200p/100V) |
|      |          | ACE-093 C813, C814 (3900p/100V) |
|      |          | ACE-066 C819, C820 (0.01/100V)  |
|      |          | ACH-444 C811, C812 (22/50V, NP) |
|      |          | ACE-103 C803, C804 (820p/125V)  |
|      |          | CEA 331M 25L C815, C816         |
|      |          | CEA 221M 25L C821, C822         |

### RESISTORS

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

| Mark | Part No.     | Symbol & Description   |
|------|--------------|------------------------|
|      | RD¼PM □□□J   | R843, R844             |
|      | RDH1/8P □□□J | R819--R824, R841, R842 |
|      | RDH1/8P □□□J | Other resistors        |

### OTHERS

| Mark | Part No. | Symbol & Description |
|------|----------|----------------------|
|      | ASR-076  | RL801, RL802 Relay   |
|      | AKB-098  | 1P Pin jack (White)  |
|      | AKB-099  | 1P Pin jack (Red)    |

### Control Ass'y (GWG-179)

### SEMICONDUCTORS

| Mark | Part No.           | Symbol & Description |
|------|--------------------|----------------------|
|      | AEL-404            | D1--D10              |
|      | US1035<br>(1S1555) | D11                  |

### SWITCHES

| Mark | Part No. | Symbol & Description           |
|------|----------|--------------------------------|
|      | ASG-814  | S1 Push switch (FUNCTION)      |
|      | ASG-815  | S2 Push switch (TAPE SUB)      |
|      | SEAV3S   | S3 Push switch (LOUDNESS)      |
|      | SEAV3S   | S4 Push switch (LINE STRAIGHT) |

### CAPACITORS

| Mark | Part No.      | Symbol & Description |
|------|---------------|----------------------|
|      | ACE-075       | C1, C2 (0.22/100V)   |
|      | CQMLA 124K 50 | C103, C104           |
|      | CQMLA 154K 50 | C5, C6               |
|      | CMA 020D 500  | C111, C112           |
|      | CMA 070D 500  | C105, C106           |
|      | CMA 270J 500  | C113, C114           |
|      | CQSA 681J 50  | C3, C4               |
|      | CEA 4R7M 50L  | C201                 |
|      | CQMA 102K 50  | C107, C108           |
|      | CQMA 822K 50  | C109, C110           |
|      | CEA 1R5M 50L  | C115, C116           |
|      | CQMA 333K 50  | C101, C102           |

### RESISTORS

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

| Mark | Part No.     | Symbol & Description           |
|------|--------------|--------------------------------|
|      | ACT-184      | VR1 Variable (250k, BALANCE)   |
|      | ACT-177      | VR3, VR4 Variable (100k, TONE) |
|      | RDH1/8P □□□J | R9, R10, R115--R118            |
|      | RD¼PM □□□J   | Other resistors                |

### OTHERS

| Mark | Part No. | Symbol & Description |
|------|----------|----------------------|
|      | ASR-072  | RL1 Relay            |

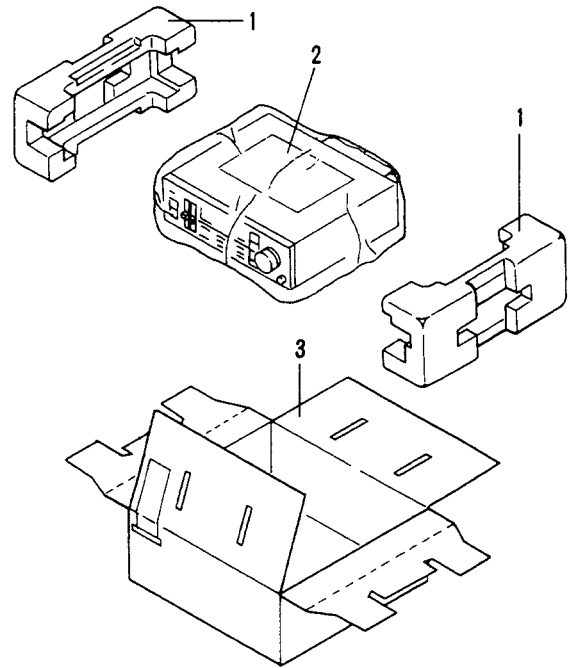
### VR Ass'y

| Mark | Part No. | Symbol & Description                |
|------|----------|-------------------------------------|
|      | ACW-132  | VR2 Variable resistor (68k, VOLUME) |



# 11. PACKING

| Mark | No. | Part No. | Description            |
|------|-----|----------|------------------------|
|      | 1.  | AHA-344  | Side pad               |
|      | 2.  | ARB-555  | Operating instructions |
|      | 3.  | AHE-221  | Packing case           |

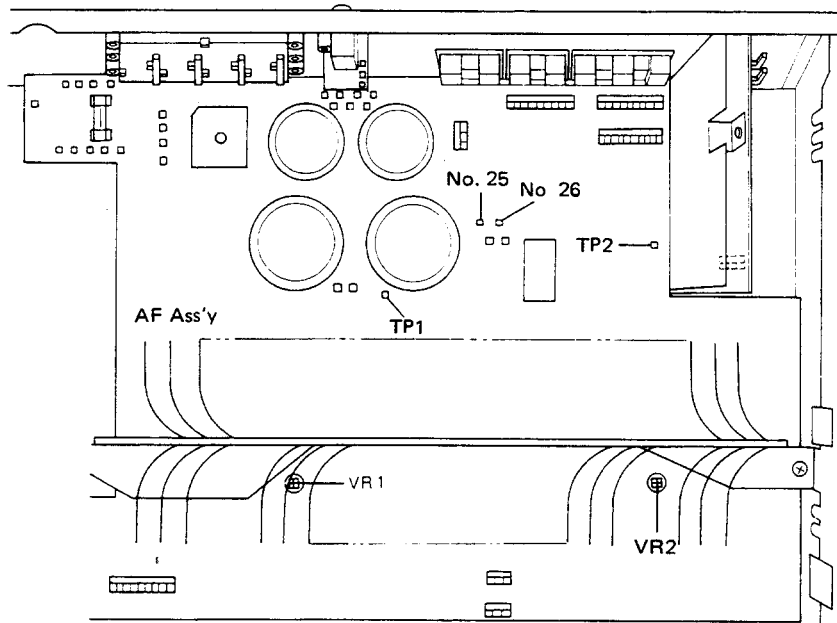


## 12. ADJUSTMENTS

### Idle Current Adjustment

- Turn VR1 (L) and VR2 (R) fully around in the counter-clockwise direction.
- Without any load or input signal, turn POWER switch ON and let stand for 10 minutes.

| Adjustment point | Prescribed value | Measuring terminal |
|------------------|------------------|--------------------|
| VR1 (L)          | 0.5mV~5mV        | TP1 (+) and No. 25 |
| VR2 (R)          | 0.5mV~5mV        | TP2 (+) and No. 26 |

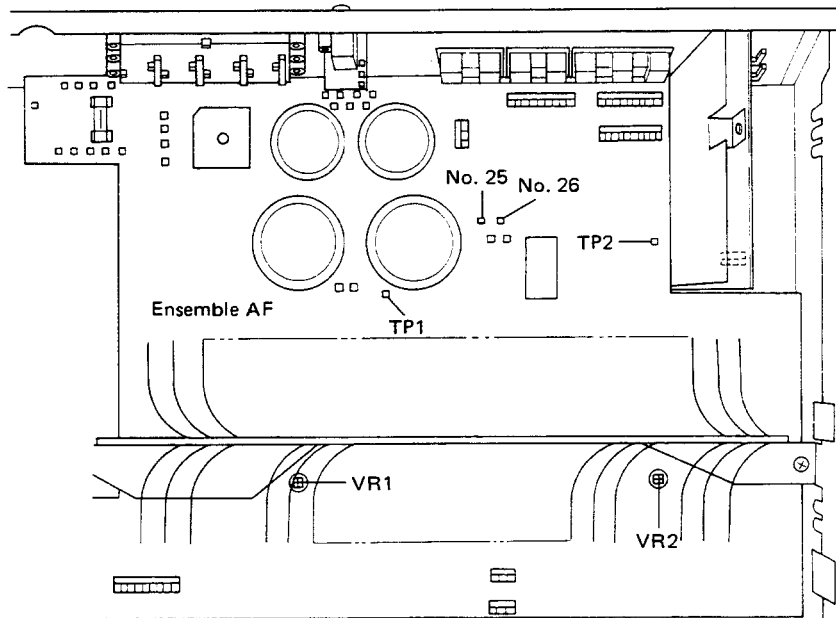


## 12. RÉGLAGE

### Réglage du courant déwatté

- Tourner à fond VR1 (L, gauche) et VR2 (R, droite) en sens inverse des aiguilles d'une montre.
- Sans charge ni signal d'entrée, allumer l'interrupteur POWER et le maintenir 10 minutes.

| Point de réglage | Valeur prescrite | Terminal de mesure |
|------------------|------------------|--------------------|
| VR1 (L)          | 0,5mV~5mV        | TP1 (+) et N° 25   |
| VR2 (R)          | 0,5mV~5mV        | TP2 (+) et N° 26   |

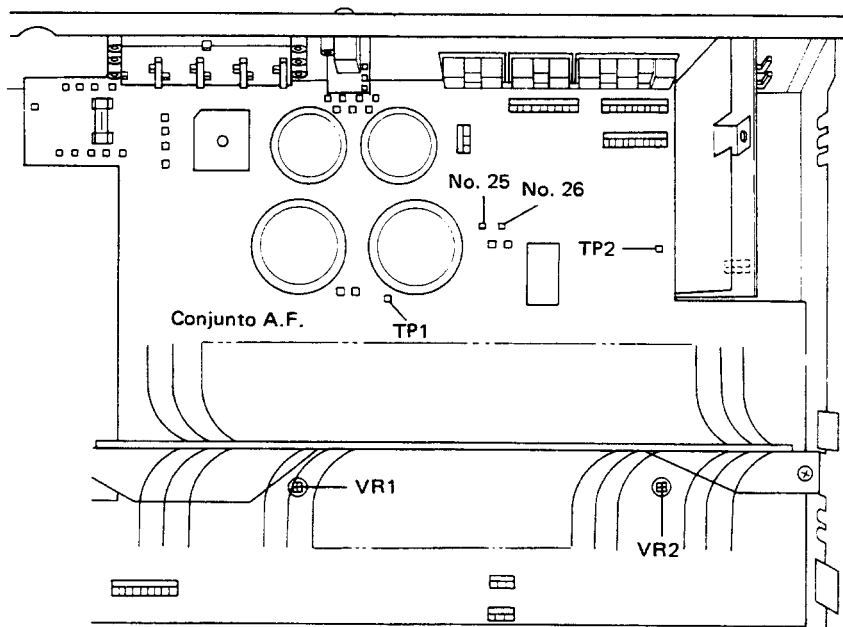


## 12. AJUSTE

### Ajuste de la corriente la corriente devatiada

- Girar la VR1 (L, izquierda) VR2 (R, derecha) totalmente en la dirección hacia la izquierda.
- Sin ninguna carga o señal de entrada, girar el interruptor de la alimentación (POWER) a ON y manténgalo por 10 minutos.

| Punto de ajuste | Valor determinado | Terminal de medida |
|-----------------|-------------------|--------------------|
| VR1 (L)         | 0,5mV~5mV         | TP1 (+) y no. 25   |
| VR2 (R)         | 0,5mV~5mV         | TP2 (+) y no 26    |



### 13. FOR HE, HB AND YP TYPES

The HE, HB, and YP types are the same as the KU type with the exception of the following sections.

#### Contrast of Miscellaneous Parts

| Mark | Symbol & Description              | Part No. |         |         |         | Remarks |
|------|-----------------------------------|----------|---------|---------|---------|---------|
|      |                                   | KU type  | HE type | HB type | YP type |         |
| ⚠ ★  | T1 AF ass'y                       | GWK-223  | GWK-231 | GWK-231 | GWK-231 |         |
|      | Power transformer (120V)          | ATS-014  | .....   | .....   | .....   |         |
| ⚠ ★★ | FU1 Power transformer (220V/240V) | .....    | ATS-027 | ATS-027 | ATS-027 |         |
|      | Fuse (6.3A)                       | AEK-309  | .....   | .....   | .....   |         |
|      | Fuse (T500mA)                     | .....    | AEK-401 | AEK-401 | .....   |         |
| ⚠ ★★ | FU2 Fuse (T3.15A)                 | .....    | AEK-042 | AEK-042 | .....   |         |
|      | FU3 Fuse (T500mA)                 | .....    | AEK-401 | AEK-401 | .....   |         |
| ⚠    | C1 Capacitor (0.01/AC250V)        | ACG-001  | .....   | .....   | .....   |         |
|      | Capacitor (0.01/AC125V)           | .....    | ACG-502 | ACG-502 | ACG-502 |         |
| ⚠    | C2 Capacitor (0.22/AC125V)        | ACE-214  | .....   | .....   | .....   |         |
|      | Capacitor (0.22/AC250V)           | .....    | ACE-215 | ACE-215 | ACE-215 |         |
|      | AC socket                         | AKP-501  | AKP-502 | AKP-505 | .....   |         |
|      | AC power cord                     | ADG-073  | ADG-068 | ADG-063 | ADG-064 |         |
|      | Operating instructions (English)  | ARB-555  | .....   | ARB-555 | ARB-555 |         |
|      | (English French, German, Italian) | .....    | ARE-073 | .....   | .....   |         |
|      | Packing case                      | AHE-221  | AHE-252 | AHE-221 | AHE-221 |         |

#### AF Ass'y (GWK-231)

The AF ass'y GWK-231 (for HE, HB and YP types) is the same as the GWK-223 (for KU type) with the exception of following sections.

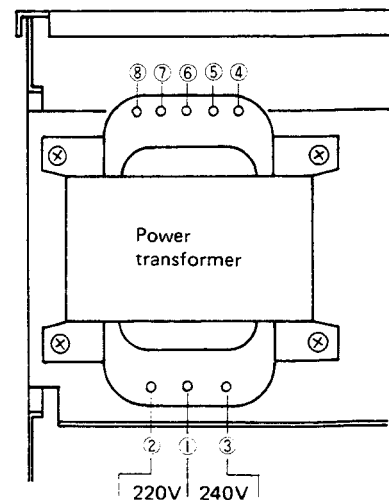
| Mark | Symbol & Description                               | Part No.   |             | Remarks |
|------|--|------------|-------------|---------|
|      |  | GWK-223    | GWK-231     |         |
|      | R410 R533, R534, R607-R610<br>R615-R618, R625-R636 | RD%PM □□□J | RD%MFL □□□J |         |

#### Line Voltage Selection

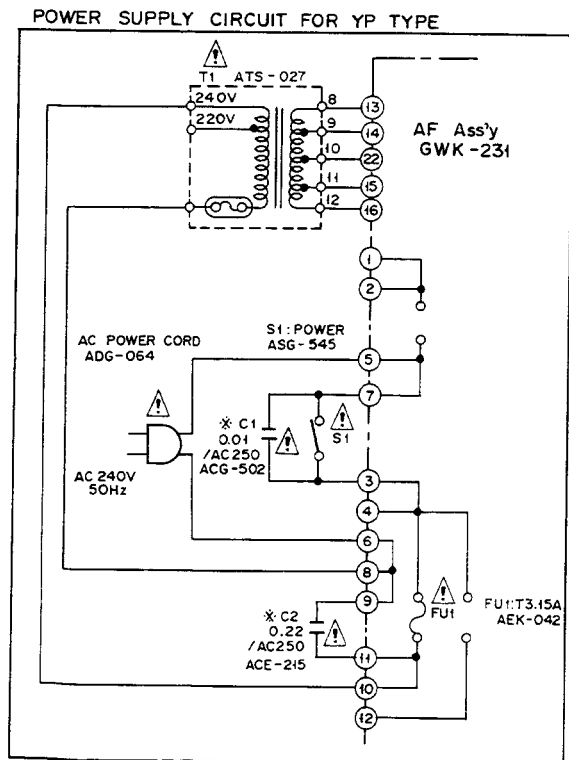
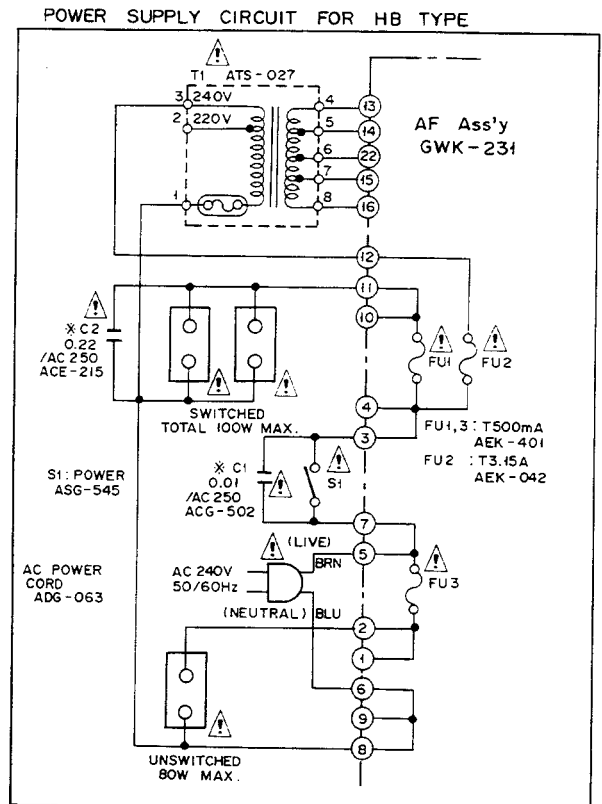
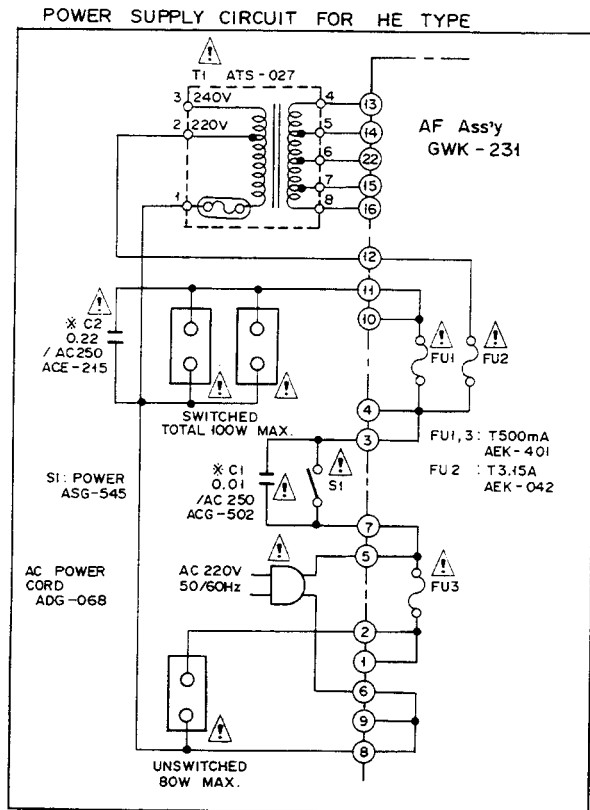
Line voltage can be changed with following steps.

1. Disconnect the AC power cord.
2. Remove the top cover.
3. Change the connection of the power transformer primary taps.
4. Stick the line voltage label on the rear panel.

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



## Schematic Diagram



# 14. FOR S TYPE

The S type is the same as the KU type with the exception of the following sections.

## Contrast of Miscellaneous Parts

| Mark | Symbol & Description                                       | Part No. |         | Remarks |
|------|--|----------|---------|---------|
|      |  | KU type  | S type  |         |
| ⚠ ★  | T1 Power transformer<br>(120V)<br>(110V, 120V, 220V, 240V) | ATS-014  | .....   |         |
|      |  | .....    | ATS-049 |         |
| ⚠ ★★ | FU1 Fuse (6.3A)<br>Fuse (3.15A)                            | AEK-309  | .....   |         |
|      |  | .....    | AEK-124 |         |
| ⚠ ★★ | FU2 Fuse (3.15A)   | .....    | AEK-124 |         |
| ⚠    | S2 Line voltage selector                                   | .....    | AKX-503 |         |
| ⚠    | C2 Capacitor (0.22/AC125V)<br>Capacitor (0.22/AC250V)      | ACE-214  | .....   |         |
|      |  | .....    | ACE-215 |         |
| ⚠    | AC power cord  | ADG-073  | ADG-060 |         |
|      | Operating instruction<br>(English)                         | ARB-555  | ARB-555 |         |
|      | (Spanish)  | .....    | ARC-058 |         |

POWER SUPPLY CIRCUIT FOR S TYPE

