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INTRODUCTION:

The amplifier is an instrument which reproduces sound through speakers by amplifying feeble electric signals which come from electric musical instruments, such as electric guitars, combo organs, electric accordions, etc. The sound we get from such an electric musical instrument itself is too small in volume to serve as a solo instrument when it is used in a jazz band, etc. It is the amplifier that amplifies the small sound electrically so as to be large enough, to match with the sounds of other instruments.

There are a number of varieties in the form of bands and the style of performance of music, which require as many varieties in the output power, the tone color and the tone quality of the amplifiers. An individual player also has his own preference about these points. In this sense, it can be said that the amplifier is a musical instrument, rather than a mere amplifier.

Yamaha Amplifier Models TA-30, TA-60 and TA-120 which we are going to introduce to you are revolutionary new amplifiers with many outstanding features. The flat speakers incorporated have been developed by our technical staff, leaders in the development of the world's finest musical instruments. They have been designed specially for use with musical instruments and are highly efficient in reproducing "natural sound" or "live sound" with no distortion. The fully transistorized amplifier of high performance, the powerful and durable magnet used for the speaker, both of which have been developed by Yamaha, are outstanding features of Yamaha amplifiers.

Clear treble, powerful bass and rich tone color which expand equally in all directions, the fresh style, and the portability resulting from smaller size and lighter weight, we believe, will be sure to give the fullest satisfaction to the users of Yamaha amplifiers.

CHAPTER 1 DESCRIPTIONS OF TA-30, TA-60 & TA-120 AMPLIFIERS

1-1 OUTSTANDING FEATURES

a) **Speaker :**

Natural Sound Speaker specially designed for use with musical instruments featuring high, distortion-free performance and fine dampering. Offers unexcelled durability for high power or volume, and reproduces fuller, deeper and more powerful bass tones, and such clear and rich trebles which will give full display of its effectiveness in "rock and roll." The diaphragm is made of plastic of special shape, and the periphery is firmly fixed on the frame. Since the plastic diaphragm is highly moisture resistant, the speaker is entirely free from any deteriorating effects.

b) **Amp :**

Fully transistorized for much longer amplifier life, lighter weight and smaller size. The power consumption is reduced to less than one third of that used in other conventional amps. Eliminates hums and other noises. Ready for use the moment the amp is switched on.

c) **Reverb :**

Specially designed to offer fine distortion-free reverberation in clear tone and wider range, and to eliminate any hauling and noises which are a problem in other conventional amplifiers.

d) **Design :**

Fresh and unique style matching modern sense of beauty and featuring smaller size and lighter weight for their power output.

Despite the elongated design, it is very high in stability.

1-2 OUTLINE OF CIRCUITS OF YAMAHA AMPLIFIERS

As illustrated in the block diagrams in chapter 3, Yamaha Amps are divided into four blocks of circuit, each of which is a printed sheet.

a) PA-1 Sheet :

This sheet consists of Channel-1 preamplifier, tone controls, tremolo oscillator and reverb amplifier. The preamplifiers amplify the input voltage to the necessary voltage level for the main amplifier. The PA-1 sheet employs 15 silicon transistors, and one photoelectric semi-conductor and lamp unit for tremolo effects.

b) PA-2 Sheet :

This sheet is the same as PA-1, except that it has no tremolo and reverb. It employs seven silicon transistors. PA-1 and PA-2 sheets are commonly used both for TA-60 and TA-120, while the sheets for TA-30 are different in size from those for TA-60 and TA-120, but the same in circuit as the latter.

c) Main Amp :

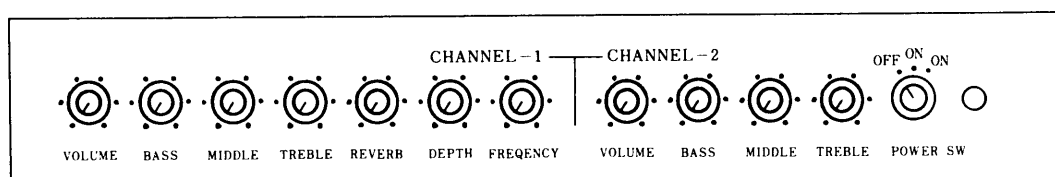
The input signal, amplified by the preamplifier, is further amplified through the main amplifier, to put out 30, 60 or 120 watts. For this purpose, larger-capacity transistors are used with aluminum plates attached for radiation. All parts except power transistors are placed on MA sheet.

The power amplifier for TA-30 employs six silicon transistors, two germanium transistors and four silicon diodes, while the one for TA-60 employs eight silicon transistors and two germanium transistors and four silicon diodes. TA-120 incorporates two of the main amps used for TA-60.

d) Power Circuit :

This circuit is one of the most important in the solid-state amplifier. Yamaha's power circuit is meticulously designed for an outstanding, distortionless performance. This circuit also employs silicon diodes.

1-3 HOW TO OPERATE THE YAMAHA AMPLIFIERS



For TA-30 and TA-60

Fig. 1

As illustrated at page 4 Yamaha Amplifiers TA-30, TA-60 and TA-120 employ dual channels. Note that reverb and tremolo effects are available only on Channel-1. Both channels have two inputs, marked H and L. Plug into input L and the volume is reduced to nearly one fourth, as compared to input H. Plug into both inputs and the sound is produced at the same volume level through both of them.

As for the tone control circuits, there is a difference between Channel-1 and Channel-2. Namely, more bass is obtained on Channel-2 than on Channel-1. Therefore, it is advisable to use Channel-2 when playing a bass guitar. Note that the amplifier will make no sound when all of the three tone controls are turned to minimum.

On Channel-1 of TA-120, there is a switch for switching from MICROPHONE to GUITAR (MUSICAL INSTRUMENT), and vice versa. Although TA-120 is usually used with "GUITAR" switched on, switch to "MIC" when using a low impedance microphone. In this case, you have to insert the plug into jack "MIC. H" or "MIC. L". The amplifier TA-120 can be used as a vocal amplifier too.

When using high impedance microphone (for example, 50 K Ω), plug into "L" or "H" on the front panel with "GUITAR" switched on. CH-2 has nothing to do with the switch mentioned above.

When a fuse is blown, check whether there is anything wrong in the amp, and if the amp is all right, open the lid of the fuse-inside door on the back panel and replace the blown fuse with a new one. You will find a vinyl bag pasted on the inside, containing the spare fuses.

FUSE CAPACITY
220, 240 V

	F1	F2
TA - 30	1 A	2 A
TA - 60	1 A	3 A
TA - 120	1 A + 2 A	3 A + 3 A

OTHERS

	F1	F2
TA - 30	2 A	2 A
TA - 60	2 A	3 A
TA - 120	3 A + 3 A	3 A + 3 A

For TA-120

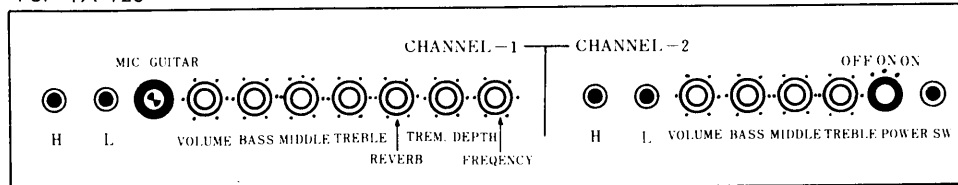


Fig. 3

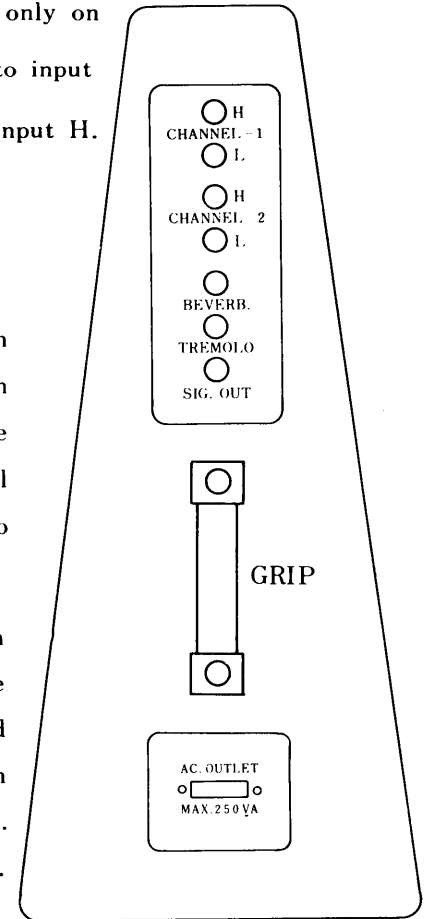


Fig. 2

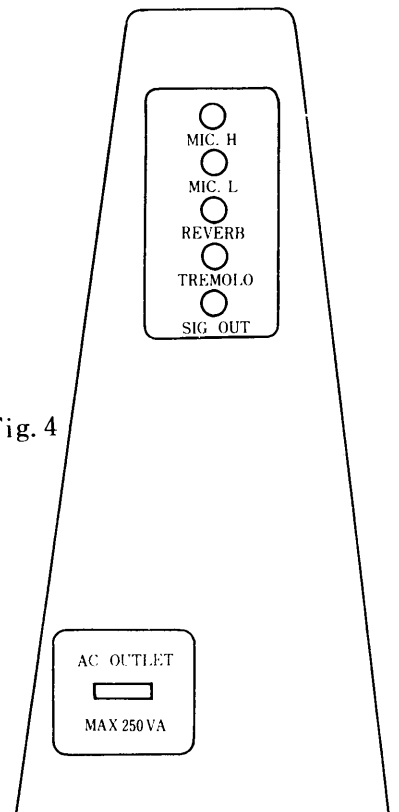


Fig. 4

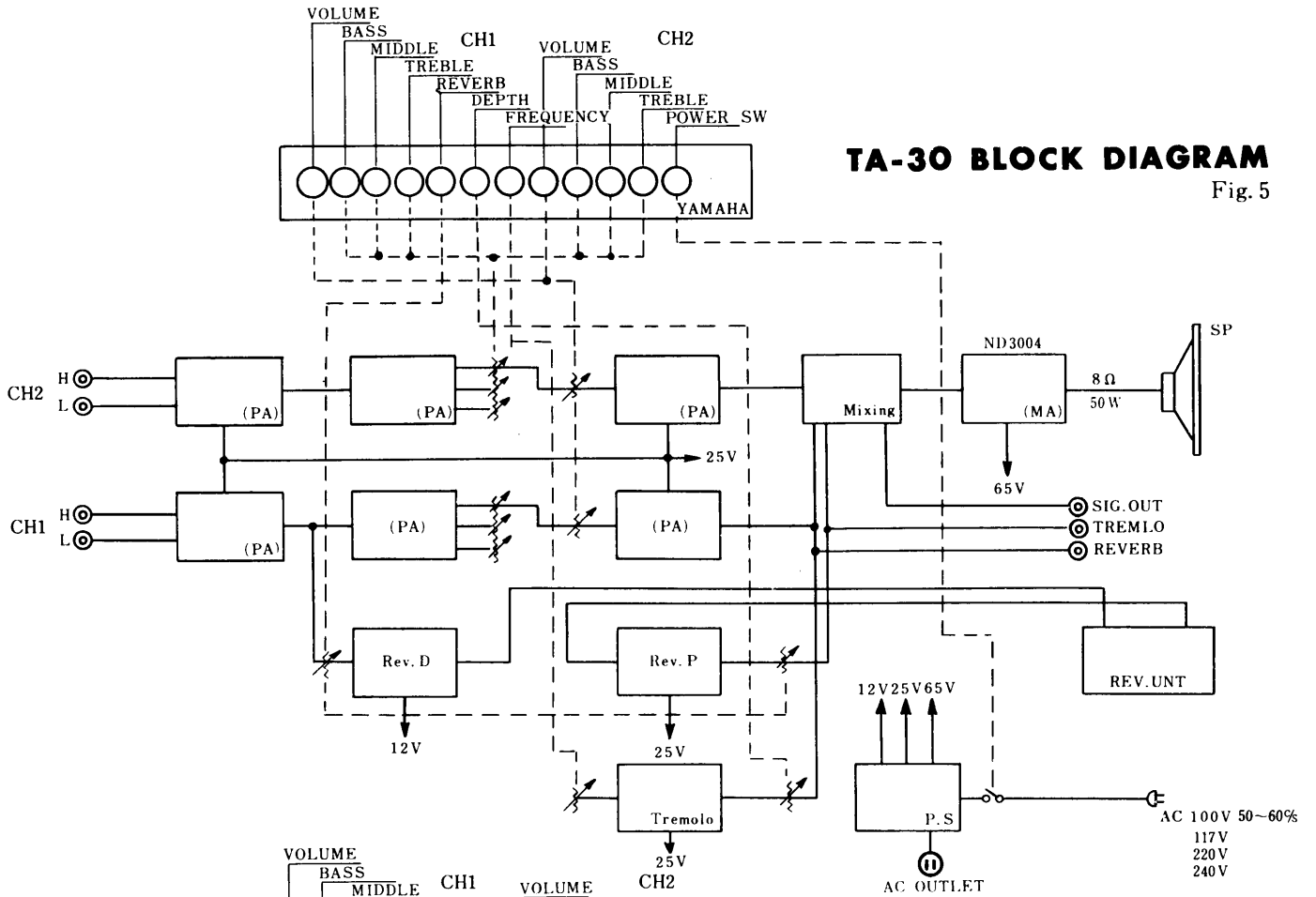
CHAPTER 2 SPECIFICATIONS

	Model TA-30	Model TA-60	Model TA-120
1. Channel	Two Channels (CH-1, CH-2)	Two Channels (CH-1, CH-2)	Two Channels (CH-1, CH-2)
2. Input Terminal	CH-1: H, L CH-2: H, L	CH-1: H, L CH-2: H, L	CH-1: H, L, Mic H, Mic L CH-2: H, L, Mic Select
3. Control	CH-1: Volume, Bass, Middle, Treble, Reverb, Tremolo Depth, Frequency CH-2: Volume, Bass, Middle, Treble, Power Switch	CH-1: Volume, Bass, Middle Treble, Reverb, Tremolo Depth, Frequency CH-2: Volume, Bass, Middle Treble, Power Switch	CH-1: Volume, Bass, Middle, Treble, Reverb, Tremolo Depth, Frequency CH-2: Volume, Bass, Middle, Treble, Power Switch
4. Output Terminal	Output Signal, Reverb Switch, Tremolo Switch	Output Signal, Reverb Switch, Tremolo Switch	Output Signal, Reverb Switch, Tremolo Switch
5. Transistors	28	30	38
6. Diodes	10	10	20
7. Main Amp	ND3004 2SD92 × 2 SEPP	ND6004 2SD92 × 4 SEPP	ND6004 × 2 2SD92 × 4 × 2
8. Reverb Unit	1	1	1
9. Music Power Output	50 Watts (distortion rate of less than 3%)	100 Watts (distortion rate of less than 3%)	200 Watts (distortion rate of less than 3%)
10. Speaker	Yamaha Natural Sound Speaker JA4001 (20½" × 15") (52 cm × 38 cm)	Yamaha Natural Sound Speaker JA4001 × 2 (20½" × 15") (52 cm × 38 cm)	Yamaha Natural Sound Speaker JA4001 × 4 (20½" × 15") (52 cm × 38 cm)
11. Power Switch	Ground position with 15' (4.5m) electric cord	Ground position, with 15' (4.5m) electric cord	Ground position, with 15' (4.5m) electric cord
12. Power Consumption	100V A.C. 50 – 60 % 70 VA	100V A.C. 50 – 60 % 130 VA	100V A.C. 50 – 60 % 260 VA
13. Covering	Black vinyl leatherette	Black vinyl leatherette	Black vinyl leatherette
14. Height	28" (72 cm)	34" (88 cm)	55½" (141 cm)
Width	22" (56 cm)	24½" (63 cm)	38½" (98 cm)
Depth	10" (26 cm)	11½" (29 cm)	15½" (40 cm)
15. Weight	35.5 lbs. (16 kg)	49 lbs. (22 kg)	125.5 lbs. (56.5 kg)
16. Accessories	Foot switches for Reverb and Tremolo	Foot switches for Reverb and Tremolo	Foot switches for Reverb and Tremolo

CHAPTER 3 BLOCK DIAGRAM

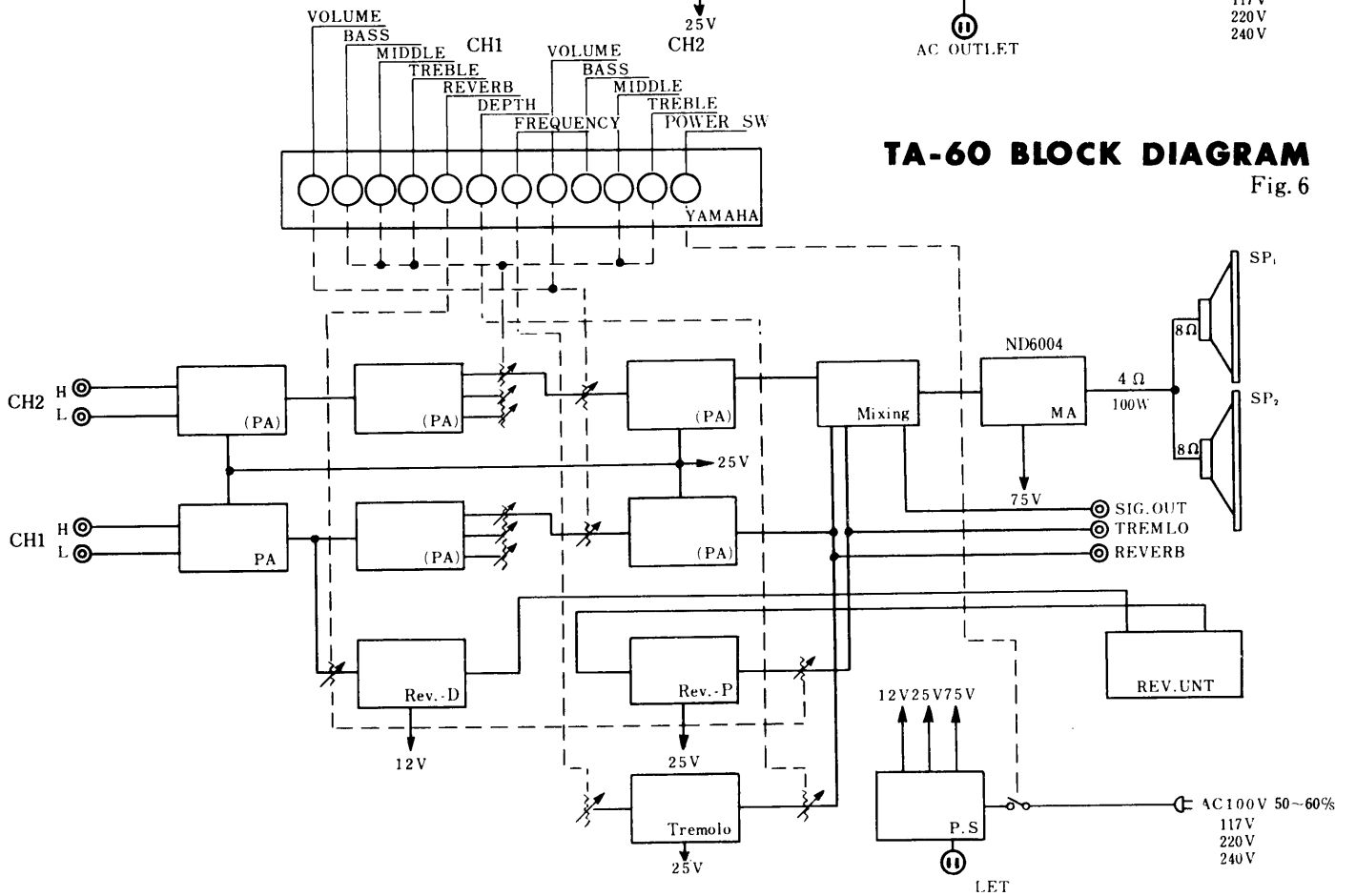
TA-30 BLOCK DIAGRAM

Fig. 5



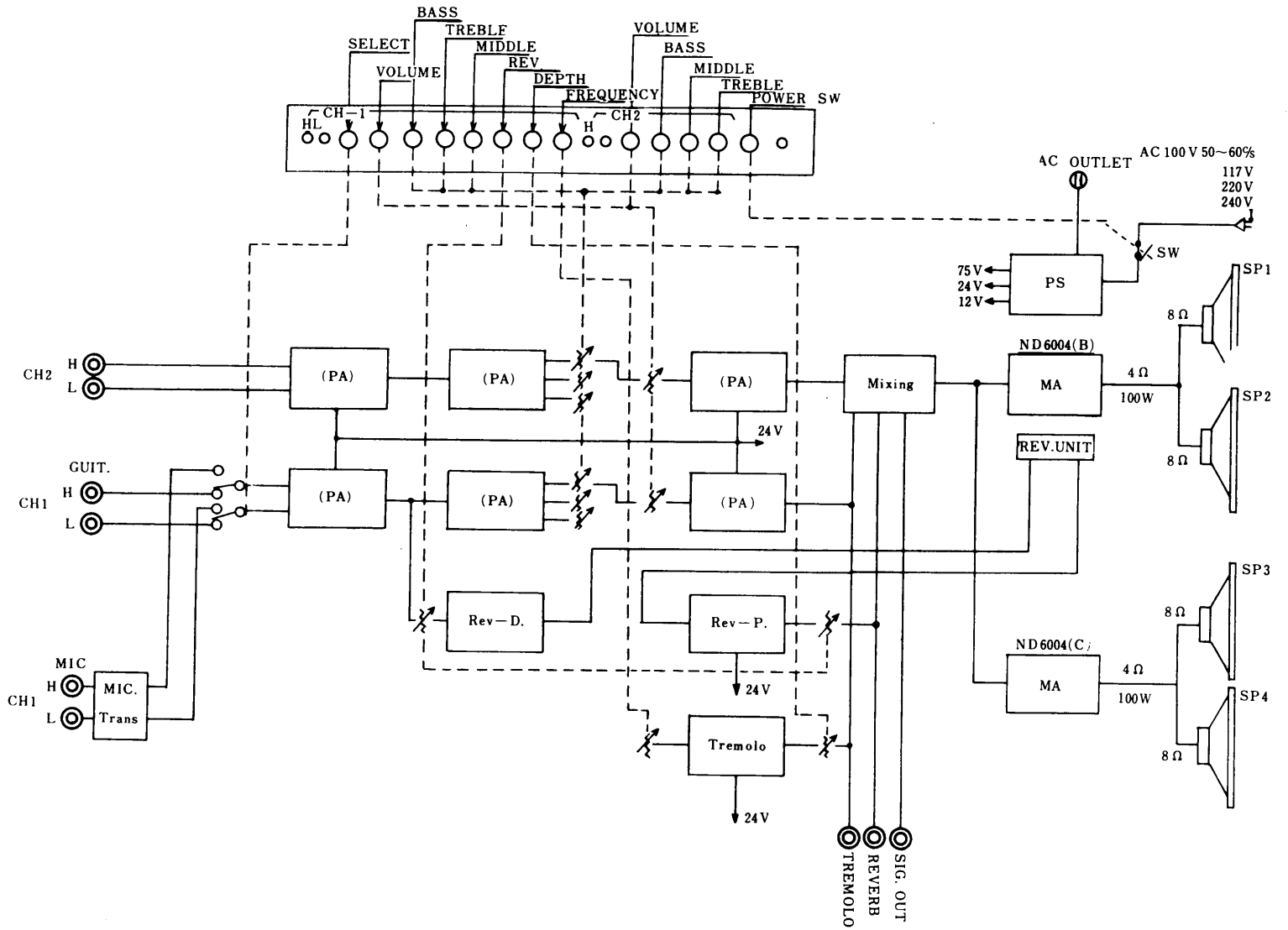
TA-60 BLOCK DIAGRAM

Fig. 6



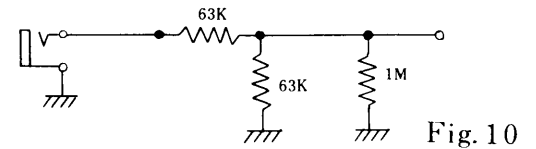
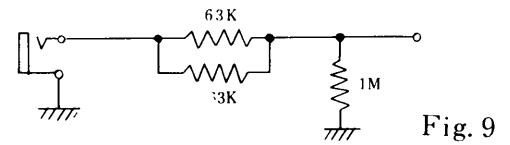
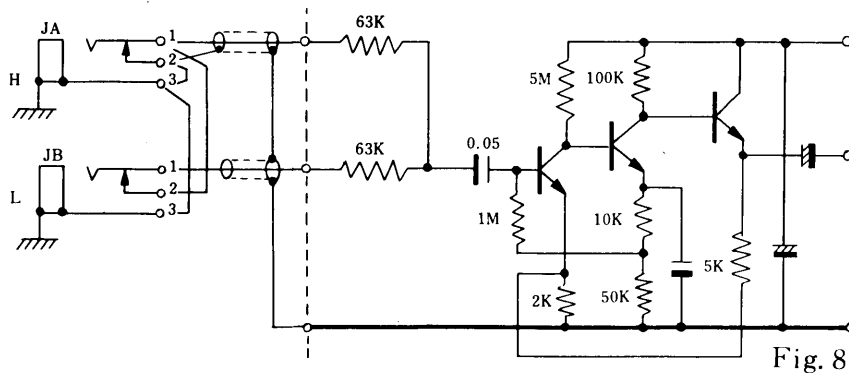
TA-120 BLOCK DIAGRAM

Fig. 7



CHAPTER 4 PRINCIPLES OF OPERATION

4-1 INPUT TERMINALS :



The circuit made by plugging into input H alone is shown in Fig. 9. The circuit made by plugging into input L is shown in Fig. 10. As indicated in the two circuits, input L has nearly half the volume level of input H at the same input power. The difference in input impedance between them results in difference in tone color. Though the inputs H and L have the same circuits for the two channels, Channel-2 has a rise in gain of 2 db at the final stage, as compared to Channel-1.

4-2 PREAMPLIFIER BLOCK :

The preamplifier block is composed of amplification circuits for the two channels, namely, CH-1 and CH-2. Each of them is divided into two stages by means of the tone control circuits (PA). The reverb and tremolo circuits are added to the CH-1.

a) Preceding Stage

This stage is a 3-transistor direct-coupled feedback amplifier having about 1 MΩ input impedance and 10 db gain. To minimize transistor noise, the transistor at the first stage has noise-free performance with minimum operating current ($I_c = 2.5 \mu A$).

b) Following Stage

The signal is fed from the preceding stage to this amplification circuit through the tone control circuit. This stage is a 3-transistor direct-coupled amplification circuit having about 100 KΩ input impedance and 40 db gain. This circuit's output is connected to the mixing amp fitted on the CH- 2 sheet.

c) Reverb Amplifier

This amplifier consists of the drive amplifier and pick-up amplifier. The input is sent from the preceding stage of CH-1 to the drive amplifier through the reverb controller and is amplified there to drive the reverb unit.

The output of the reverb unit is amplified about 40 db by means of a 2-transistor direct-coupled pick-up amplifier and then fed to the mixing amp.

The reverb unit in this amplifier is 63Ω (1 kc/s) on the drive amplifier side and $2 K\Omega$ or $1.5 K\Omega$ (1 kc/s) on the pick-up amplifier side.

Note: The semi-fixed VR is set to the standard level in the factory. Never attempt to readjust it except when the unit is replaced. The Reverb Jack is used to turn the reverberation signal ON-OFF by the remote control switch.

d) Tremolo Circuit

This circuit oscillates the sine wave of about 4 to 10 c/s CR phase-sift oscillator and changes the brightness of the lamp of Cds/lamp compound element in the emitter at the next stage and thus changes the resistance of Cds in the same unit. Since the Cds is connected to the sliders of Volume and Tremolo Depth on the panel, the output signal of CH-1 and Reverb is modulated by the frequency of the tremolo oscillator.

The frequency of the tremolo oscillator can be changed by means of the Frequency control on the front panel.

The modulation is variable from 0 to nearly 90% of the Tremolo Depth control on the front panel.

The Tremolo Jack (located at the side of this amp.) is used to turn the tremolo effect ON-OFF.

4-3 TONE CONTROL CIRCUIT :

Models TA-30, TA-60 and TA-120 amplifiers incorporate Bass, Middle and Treble Controls, respectively. The Bass control has the variable range of about 10 db around 320 c/s; and the Treble has the range of about 13 db around 7 KC.

In Fig. 11 the dotted line shows the tone control characteristics obtained when the settings of the three controls are MAX.; the dot-and-dash line shows the result obtained by setting both Treble and Bass to MIN., and the Middle to MAX.; and the solid line shows the settings of both Treble and Bass to MAX., and the Middle to MIN. The curve indicates that the Treble and Bass are accentuated. When all tone controls are set to MIN., the volume is reduced to Zero.

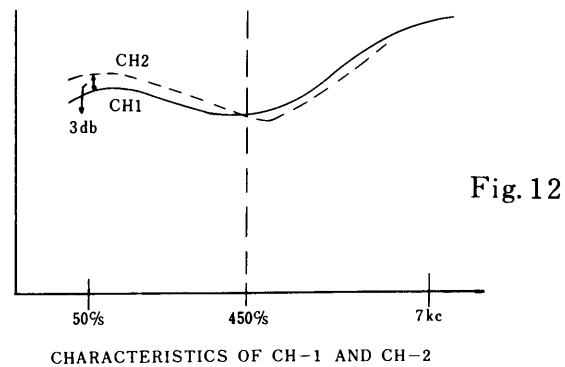
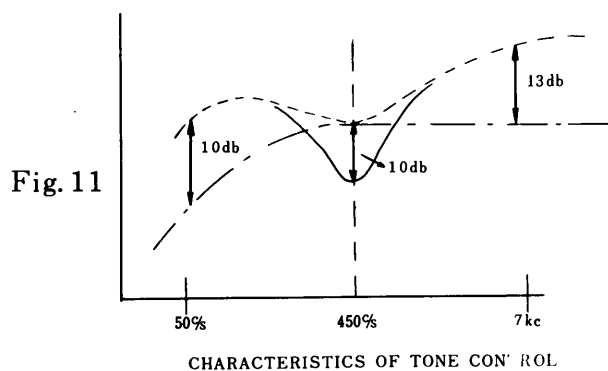


Fig. 12 shows the difference in character between Channel-1 and Channel-2. Since Channel-2 is 3 db higher than Channel-1 in the lower cycle range, it is fit for use for the bass guitar, or for use by the player who wants to play with accentuated bass tone.

4-4 MAIN AMPLIFIER BLOCK :

This amplifier circuit is of S.E.P.P. type, with an input transformer, Model TA-60 employs four power transistors as a parallel push pull. Model TA-120 employs two of the same amp as for TA-60. The input, in which the signals of CH-1, CH-2 and Reverb circuits are mixed together, is connected to the phase inversion circuit coupled with the transformer.

The opposite phases of signals are made in the two independent windings on the secondary side of the transformer and then they drive the following drive and power transistors. The output is fed to the speaker through the coupling capacitor of $1000 \mu/50V$ ($500 \mu/50V$ for TA-30).

The 50 B resistor connected to the secondary side of the transformer is a bias resistor to adjust the operating point of both drive and power transistors to the level of Class AB.

Note: Since this resistor has been set to the proper position, never attempt to readjust except when the drive or power transistor is replaced.

D1 to D4 stand for the diodes for temperature compensation. D2 and D4 (SM-150S) are fixed on main amp sheet and that is near the radiator plate for the drive transistors (2SC485 two each for TA-30 and TA-60), and D1 to D3 (SM-150S) are fixed on the chassis near the power transistors (2SD92, two for TA-30 and four for TA-60). The function of these diodes is to minimize the fluctuations in the operating point of the transistors due to temperature variations.

To minimize the distortion, the negative feedback of about 10 db is applied.

The SIG. OUT Jack is used when it is desired to give the signal to the input of another amplifier.

4-5 POWER SUPPLY CIRCUIT :

This circuit is to change the alternating line supply voltage into DC 75 volts (DC 65 volts for TA-30) for the power amplifier block, and DC 25 volts and DC 12 volts for the preamplifier block.

The switch interlocked with the power switch on the primary side of the power transformed and the capacitor of 0.005 / 600 volts connected to it function to eliminate any hum in this circuit by selecting one of the polarities of the AC power supply line and changing it alternately into ground voltage.

When the plug is removed from the US socket connected to the signal lines of the speaker and the reverb, the above-described DC 25 volts and DC 12 volts are not fed to the preamplifier block.

The white 9 pins connector (AL) can be connected to the speaker, power switch and pilot lam. AC outlet can be connected to the load at a maximum of 250 VA., which is connected direct to the AC power source without passing through the switch and the fuses. For your reference, AC outlet is not fitted on the amplifiers for European and African countries and Australia .

CHAPTER 5 TROUBLE SHOOTING

Case	Causes	Check Points
No sound	<ol style="list-style-type: none"> 1. All the tone controls are turned to minimum. 2. Speaker trouble <ol style="list-style-type: none"> a. Wiring breakage on the speaker circuit b. Breakage or "short" in voice coil 3. No electricity is carried to the amplifier. <ol style="list-style-type: none"> a. Electricity is not available at the power source. b. Power switch or connector trouble c. Cord or plug trouble d. Wiring breakage in the power transformer e. *Blown fuses 4. Power circuit trouble 5. Main amp trouble <ol style="list-style-type: none"> a. Transistors breakage b. Wiring breakage in the drive transformer 	<p>The amplifier will make no sound when all of the tone controls, Bass, Treble and Middle, are turned to the left-most position.</p> <p>* In case when the fuses are burnt out, replace burnt out fuses with new ones.</p> <ol style="list-style-type: none"> a. Short in chemical capacitors b. Short in power diodes c. Short in power transformers d. Wiring breakage in the power circuit e. Breakage of power transistors f. Short in the output terminal <p>Check the voltage of each part, and change the defective circuit components.</p> <p>As above</p>

In order to check if the main amp is alive or not, send a signal of AF Oscillator into the input of the main amp, or touch the input terminal of the main amp with the head of a screw driver. If the main amp makes a jarring noise, it is all right.

If everything after the main amp is all right, check the circuit boards of CH-1 and CH-2, or the wiring or the connector between them and the main amp. The signals of both CH-1 and CH-2 combine in the transistor 2SC372 located near VR AIOK on CH-2 circuit board. Check this circuit when both the channels do not work while the main amp is all right.

Case	Causes	Check Points
Noise	<ol style="list-style-type: none"> 1. Signal cord trouble 2. Signal source trouble 3. VR trouble 4. Noise coming from the environment, such as a fluorescent lamp, TV set, etc. 5. Transistor wear 6. Wiring breakage of resistors 7. Content leakage at the capacitor 	<p>Pull out the signal cord to check if it is the cause of noise.</p> <p>Do as above.</p> <p>Turn VR</p>
Distorted sound	<ol style="list-style-type: none"> 1. Power circuit trouble 2. Transistor wear 	<p>Check the voltage balance of the push-pull circuit, especially half of the paired transistors.</p>
The tone controls do not function.	Trouble in each part of the tone control circuit	
The tremolo does not function.	<ol style="list-style-type: none"> 1. Transistor wear on the tremolo circuit 2. Trouble in each part of the tremolo circuit 3. Wear or wiring breakage of Cds Unit 	
The reverb does not function.	<ol style="list-style-type: none"> 1. Wiring breakage or trouble in the reverb unit 2. Wiring breakage on the reverb unit circuit 3. Reverb circuit transistor trouble 4. Trouble on each part of the reverb circuit 	

Minor Model Changes of TA-30 and TA-60

1. TA-60 amplifiers following serial number 20634 are 20 mm higher in total height than the preceding ones, with a result that the total height of the current model is 880 mm (34"). Therefore, care is necessary in changing the back board, front board or aluminum sash.
2. TA-30 amplifiers following serial number 21010 and TA-60 following serial number 20919 have been changed as below.
 - a) The circuit board of the preamplifier has been moved from the inside of the side board to a position below the panel.
 - b) The main amplifiers have been changed as below :

Altere Parts	Old Parts	New Parts	Remarks
Main Amplifier	ND 3002(TA-30)	ND 3004	Interchangeable as Assembly
Main Amplifier	ND 6002(TA-60)	ND 6004	Interchangeable as Assembly
Preamplifier Sheets	LC 400(TA-30)	LC 505 CH-1 LC 506 CH-2	Non-interchangeable Non-interchangeable
	LC 400(TA-60)	LC 507 CH-1 LC 508 CH-2	Non-interchangeable Non-interchangeable

Altered Parts	Old Parts	New Parts	Remarks
Power Transistors	2SD45(Sony) 2SC793(Toshiba)	2SD92(Sanken)	Non-interchangeable
Drive Transistors	2SC293(Sony) 2SC756(Sony)	2SC485(Toshiba)	Interchangeable
Reverb	2SC293(Sony)	2SC893(Ten)	Interchangeable
Diode for Power Source	SP-02(Origin)	10D2(Nippon International)×4	Interchangeable
Fuse	Primary: Time-Lag Fuse 2.0A(Common) Secondary: Fast Fuse 2.0A(TA-30) Fast Fuse 3.0A (TA-60)	Normal Fuse 2.0A Normal Fuse 2.0A Normal Fuse 3.0A	

NOTES :

1) Main Amplifier

In changing the main amplifier of an old model to a new one, the connection of the US connector must be changed. Please see the illustrations below.

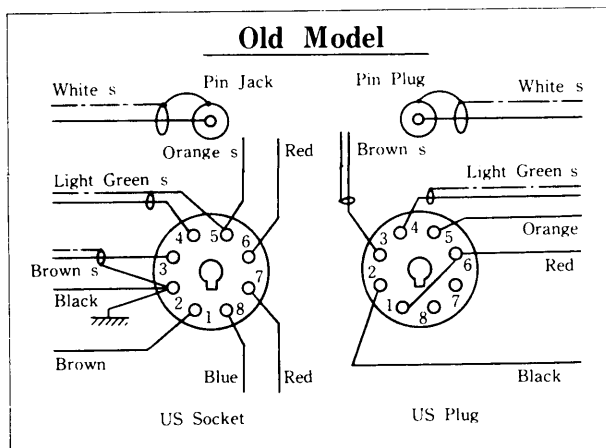


Fig. 13

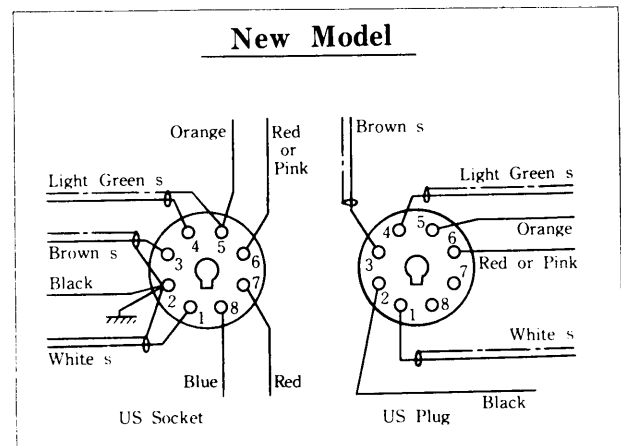


Fig. 14

2) Preamplifier

Although older model preamplifiers had one sheet, which was installed on the inside of a sideboard and covered by a metal cover, the new preamplifier consists of two sheets, one for Channel-1 and the other for Channel-2, and is installed under the control panel.

The VR is attached directly to the print sheet. These preamplifier sheets have no metal cover, but the aluminum foil fitted over the upper part of the back panel serves to shield the preamplifier sheets.

Caution when repairing :

Although there is no fundamental change in the circuits between the old and new TA-30 and TA-60 amplifiers, the new models have become more convenient in maintenance service, repairing, etc., because Channel-1 and Channel-2 are two separate sheets, and because transistors on the preamplifiers can be changed without removing the respective sheets, except for transistor 2SC893.

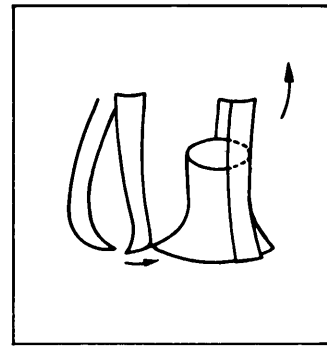


Fig. 15

CHAPTER 6 DRAWINGS

MODEL TA-30

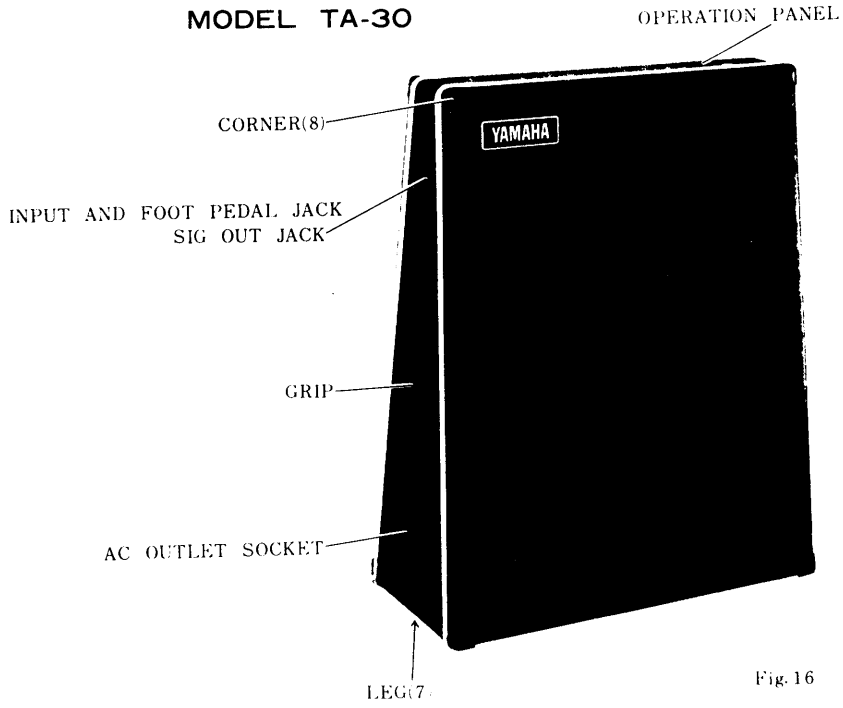


Fig. 16

MODEL TA-60

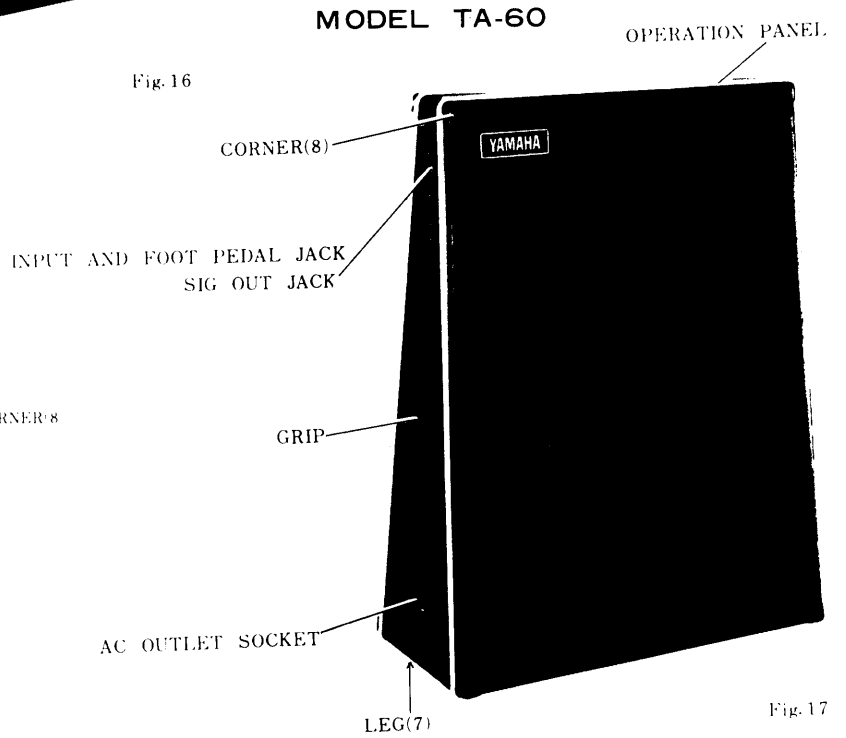


Fig. 17

MODEL TA-120

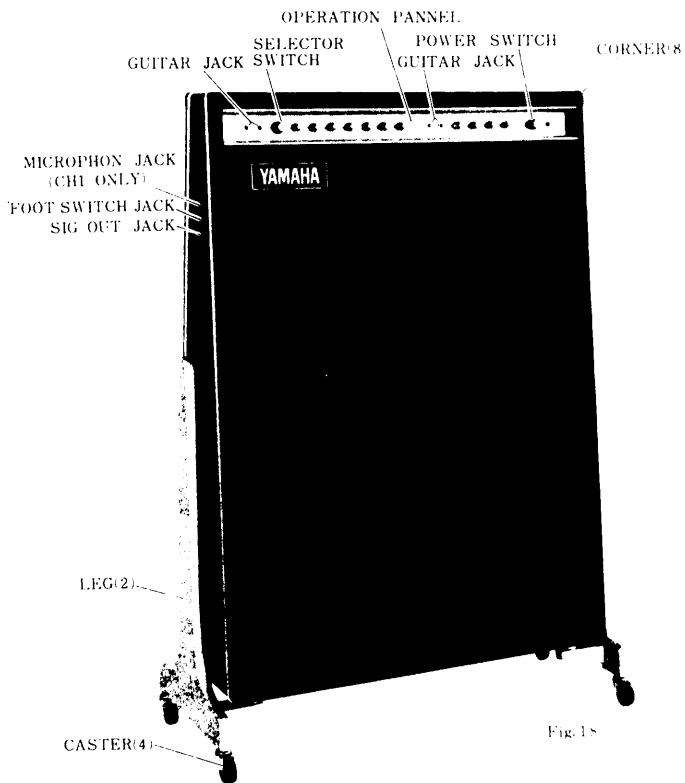
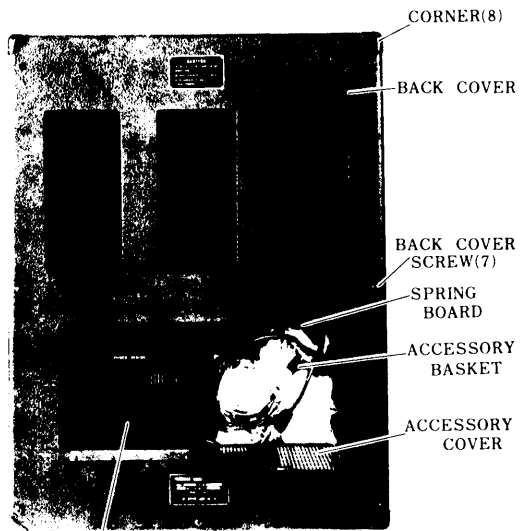
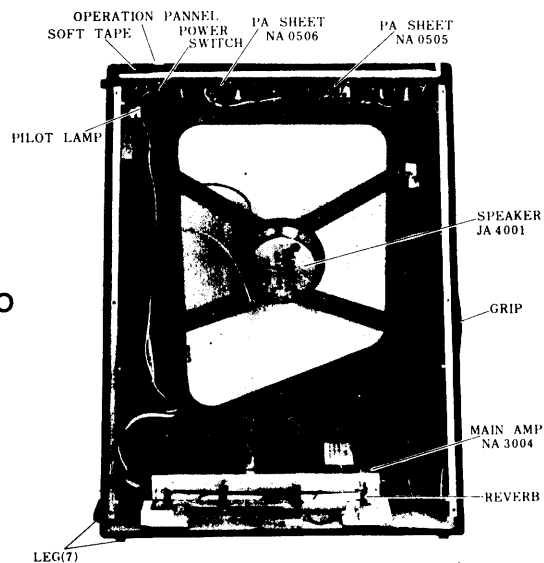


Fig. 18



FUSE INSIDE COVER (SAME AS ACCESSORY COVER)

Fig. 19



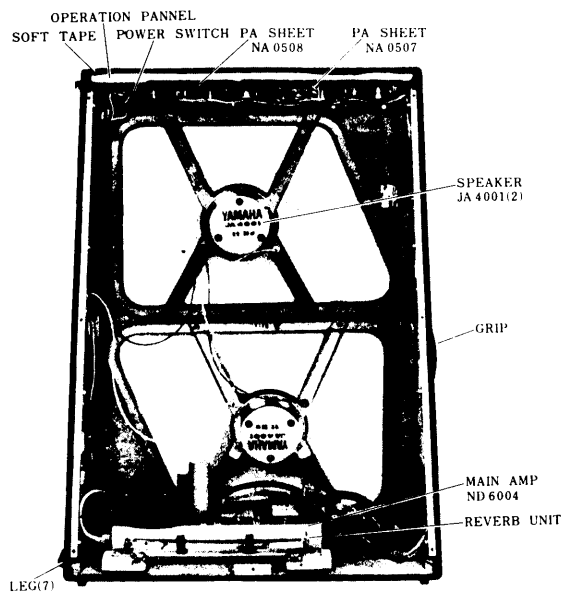
TA-30

Fig. 20



(ATTACHED PARTS ARE SAME AS TA-30)

Fig. 21



TA-60

Fig. 22

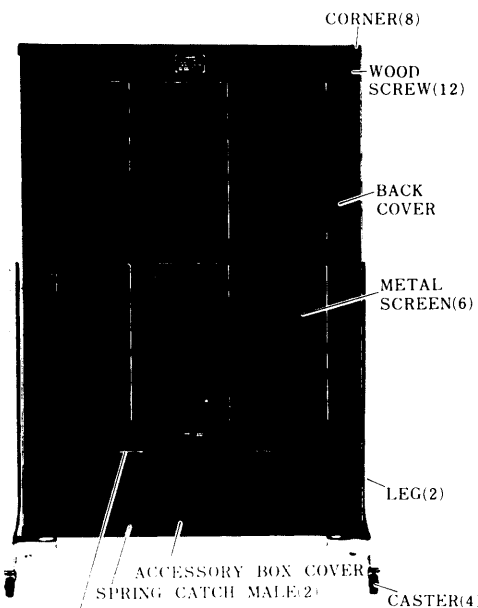
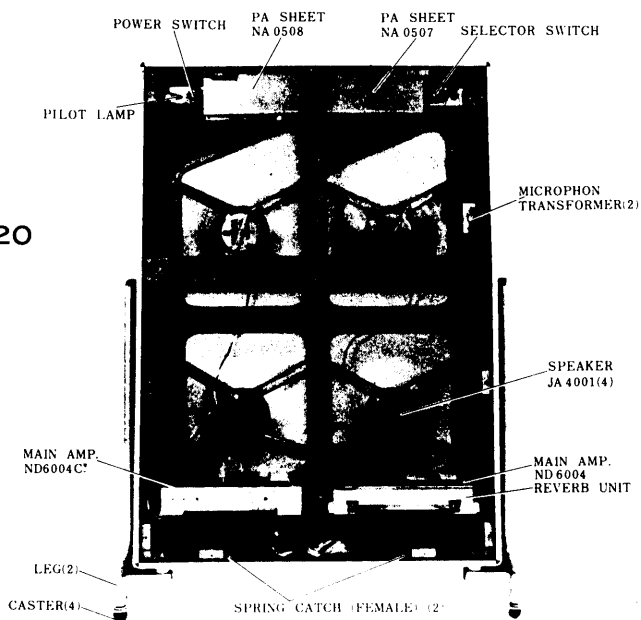


Fig. 23



TA-120

Fig. 24