National **Technics**

STEREO POWER AMPLIFIER

SE-9200

OPERATING INSTRUCTIONS

Before operating this set, please read these instructions completely.

HELPFUL HINTS

Thank you for selecting the "Technics" model SE-9200 power amplifier.
The model SE-9200 is the result of the combined efforts of "Technics" engineers who have devoted many long years of research to improving the efficiency and sound reproduction of audio equipment, and each unit is designed so as to assure maximum reliability and high quality performance.
In order to assure that you will receive maximum benefit from the many features of this unit, we urge you to carefully read and follow the operating instructions in this booklet.

1. Keep this unit away from electrical noise-generating devices such as motors and fluorescent lamps.
2. The set should not be exposed to direct sunlight and should be kept free from dust, moisture and vibration.
3. The set is ventilated through vents on the top and bottom of the cabinet. Do not place any object on the top or place the set on a soft surface which might block the ventilation holes and result in too much internal heat.
   Place the amplifier in a position away from any heat source.
4. The cabinet of this unit should be given the same care which you would give any piece of fine furniture. The front panel should be cleaned with a soft cloth moistened with a mild soap-and-water solution.
   NEVER USE A SOLUTION CONTAINING BENZOL OR PETROLEUM.

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STAR FEATURES

■ Main amplifier section with high stability and ultra-low distortion ratio with low transient non-linear distortion

Actuated by a high voltage of ±42 volts between the first differential amplification stage and the large-amplitude voltage amplification stage, the power circuitry of the voltage amplification stage is true constant-voltage circuitry which is completely independent of and separated from the power circuitry of the output stage. In addition, because there are two large-capacity (10,000μF) electrolytic condensers in the output stage, power is well regulated and, therefore, ideal characteristics—without transient non-linear distortion caused by fluctations of the amplification point (produced by the power source), and without interference between circuits or between channels—can be obtained.

Moreover, because the voltage of the voltage amplification stage is high, a large maximum output voltage of high-range frequency can be obtained, and, by applying a stable negative feedback depending upon the appropriate high-range phase compensation, low-distortion ratio amplification is realized over a wide frequency range of 5 Hz to 70 kHz at a total higher harmonic distortion ratio of 0.08%.

The main amplifier circuitry of this unit consists of all-stage direct-coupled OCL circuitry: the differential amplification stage—the emitter follower stage—the voltage amplification stage (with constant current circuitry)—the driver stage —the pure complementary output stage.

Because the OCL circuitry has no output condenser, the power band width in the low range is wide, and the damping factor in the low range is not reduced, assuring that sufficient damping can be applied to the speakers. In addition, because the output stage consists of pure complementary circuitry which includes PNP and NPN transistors in combination, higher-harmonic distortion and intermodulation distortion are improved, and characteristics in the high range are also improved.

Furthermore, because the emitter follower stage is added after the differential amplifier of the first stage, the bare characteristics of the amplifier are greatly improved, and the voltage amplification stage (which excites the voltage amplification section) is operated by a constant current, making possible an ultra-low distortion ratio of 0.08% at the rated output. In addition, because diodes are used for the input bias of the voltage amplification stage and for the bias of the constant current circuitry, high DC stability is realized at any operating temperature.

■ Output impedance changeover. circuitry

For high-quality amplifiers, stationary speakers are often used. Among these, there are many of which the most suitable damping factor is small.

Accordingly, in order to obtain the best performance from any type of speaker system connected, this unit incorporates a switch which can change the output impedance in 4 steps: 0.08 ohms, 0.8 ohms, 2.7 ohms, and 8 ohms. (The damping factor, when connecting an 8-ohm speaker, then becomes 100, 10, 3, 1 respectively)

Furthermore, this unit has bridge-type circuitry whereby the gain will not change even if the output impedance is changed, making it convenient to use when checking changes in the tone color.

■ Peak-detection type of power meter gives direct reading of output value in watts

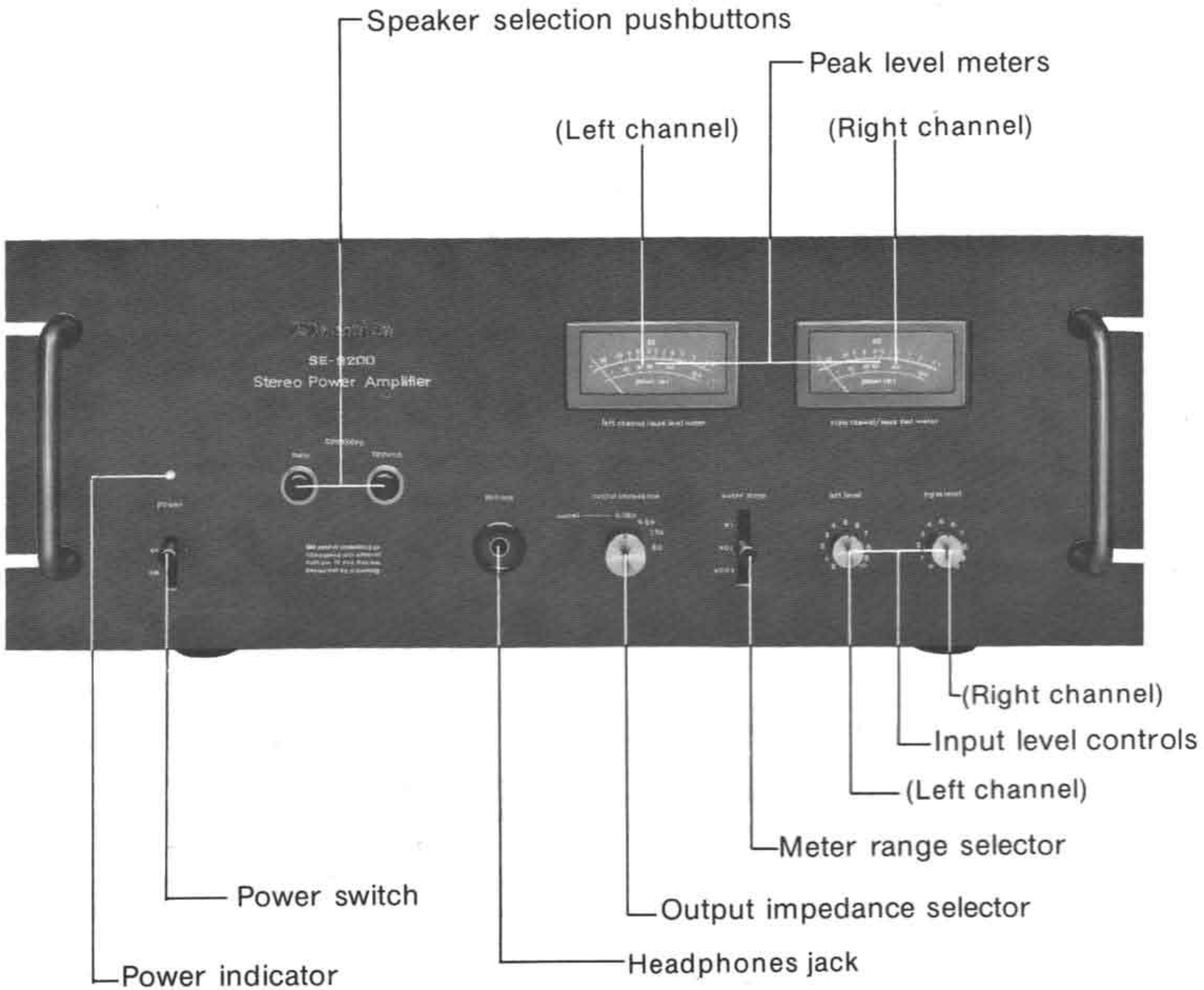
Because this unit has a peak-detection type power meter which shows a direct reading of the output value in watts, the dynamic range of the program source can be determined at a glance. This reading can be used in many ways, and, because the meter sensitivity can be changed in three steps, the peak value of music signals from 0.01W to full power can be precisely determined.

■ Perfect speaker protection circuitry

This unit is engineered with high-performance circuitry which features high DC stability and highly reliable components. In addition, by adopting electronic protection circuitry originally developed by Technics engineers, the DC component is automatically detected even if DC voltage should be present at the speaker output terminals, and the output stage power source of the main amplifier is interrupted by a relay.

CONTROLS AND THEIR FUNCTIONS

Figure 1



Power switch
This switch is used to turn the power on and off.

Power indicator
When the power switch is turned on, this indicator illuminates to indicate that the unit is in operation.
This indicator remains illuminated during operation.

Speaker selection pushbuttons
The speakers are selected by pushing one or both buttons and are turned off by repushing. Only the speaker system which is switched on operates. It is possible to operate both speaker system by pushing both buttons. In addition, sound reproduction can be enjoyed by using only the headphones, even when both speakers systems are switched off.

Input level controls
These controls are for adjustment of the input level.
The input sensitivity is 1V at the "10" position, the maximum setting. By turning the control counterclockwise from the "10" position, the input sensitivity will decrease. If the input level is reduced, residual noise will become lower, although, if reduced too much, there is the possibility that the sound in the final stage of the pre-amplifier may become distorted.
Operation within a range from "5" to "10" is recommended.
The left and right levels can be adjusted individually.

Output impedance selector
This switch is used to change the output impedance of this unit.
The impedance should be changed depending upon the speaker systems to be used.
The figures on the panel shown the output impedance of this unit.
The use of this switch is explained in more detail on page 8.

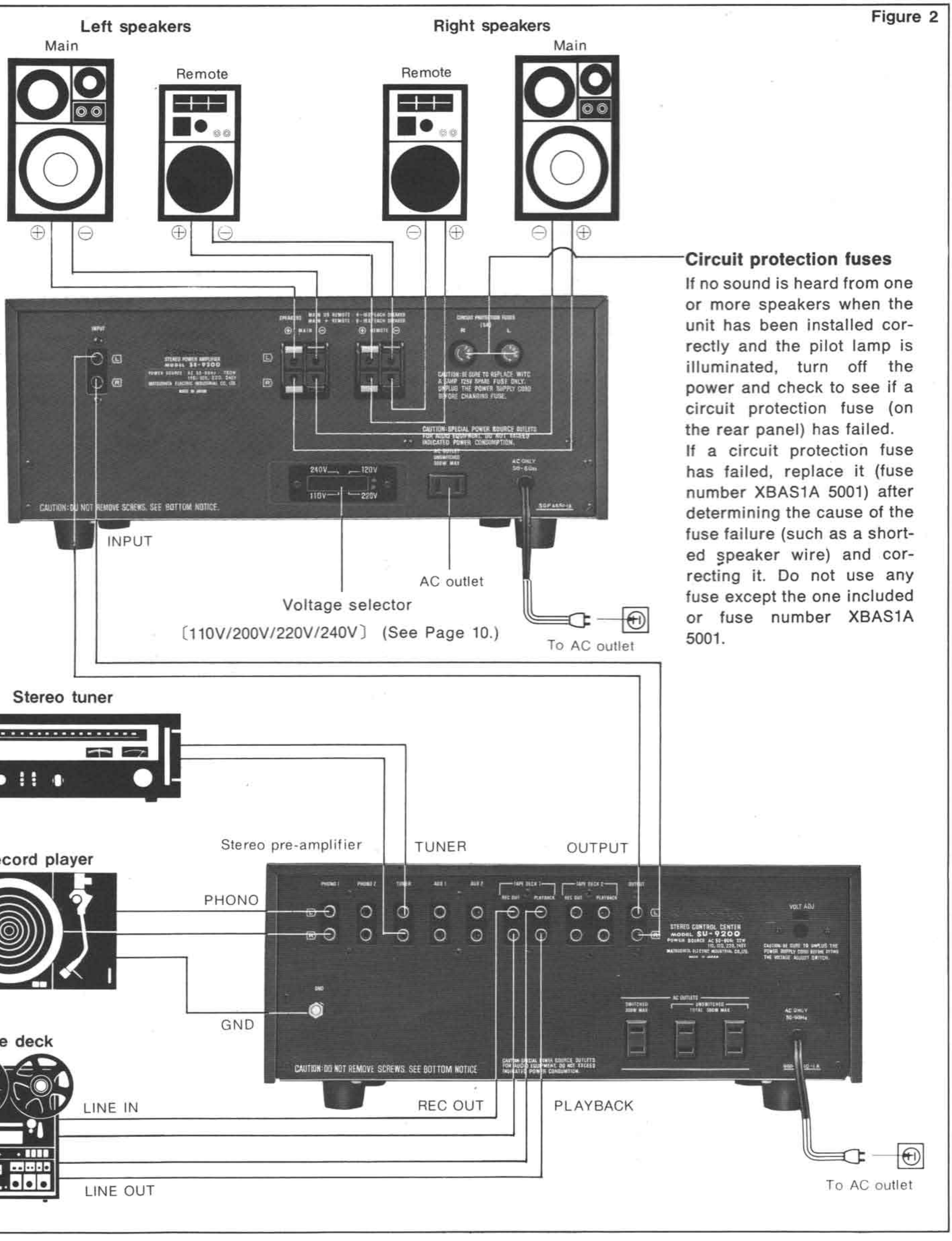
Peak level meters
The indication needles of the meters fluctuate in accordance with the output which is emitted from the speaker output terminals.
The meter at the left indicates the left channel operation, and the meter at the right indicates the right channel operation.
The outer (upper) scale of each meter is the dB scale.
The inner (lower) scale is arranged so that the output can be directly read when the load is 8 ohms.
Because these meters are the peak-indication type, they indicate the peak output of the program source, and, therefore, it is possible to easily determine at any time what wattage is being emitted.

Meter range selector
This selector is for selection of the sensitivity of the output meters. With an 8-ohm load, the output is adjusted to be 80W at the speaker output terminals by using a continuous sine wave, and the meter needle will indicate 80W when this selector is set to the "×1" position.
When the needle movement is small, that is to say, the output is small, this selector set to either the "×0.1" or the "×0.01" position.
This selector can be used to change the indicated value on the meter at 0 dB to 10W and 1W, respectively.

Cautions concerning operating and changing connections	After switching on the power, do not attempt to use the controls for a few moments. The output of this unit is large, and, if excessive input is applied, damage to the speakers may result. For this reason, be sure to decrease the input level controls before making connections or disconnections of the input terminals.

CONNECTION WIRING FOR A STEREO SYSTEM

Figure 2



Circuit protection fuses

If no sound is heard from one or more speakers when the unit has been installed correctly and the pilot lamp is illuminated, turn off the power and check to see if a circuit protection fuse (on the rear panel) has failed.

If a circuit protection fuse has failed, replace it (fuse number XBAS1A 5001) after determining the cause of the fuse failure (such as a shorted speaker wire) and correcting it. Do not use any fuse except the one included or fuse number XBAS1A 5001.

CONNECTIONS AND OPERATION

Do not plug the amplifier into a power outlet until all other connections have been made. Keep the power switch to the "OFF" position.

SPEAKER CONNECTIONS AND OPERATION

This unit has two pairs of speaker terminals, marked MAIN and REMOTE, making connection of two speaker systems possible. Selection of the speaker system to be used is made by pushing one, or both, of the speaker selection pushbuttons on the front panel, thereby activating either the main or remote speaker system, or both systems at the same time.

Impedance of speakers

Use speakers with a voice coil impedance of 4～16Ω with this unit.
If, however, the main and remote speaker systems are both used at the same time, speakers of 4-ohm impedance cannot be used. Use speakers with an impedance of 8～16Ω.

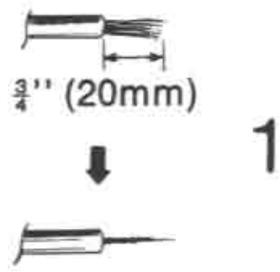
Speaker connection wire

Use medium gauge wire, such as AC power cord, for speaker connections so as not to decrease the damping factor.

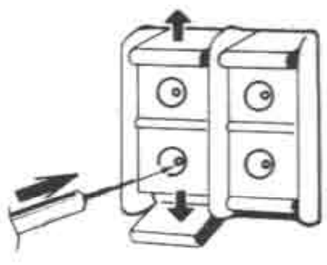
Connections

For perfect connections, follow the procedure shown in figure 2 and figure 3. Note that the upper terminals are for the left channel, and the lower terminals are for the right channels; the red terminals are ⊕ and the black terminals are ⊖.

Figure 3



1 Strip off about 3/4 inch (20mm) of the connection cord insulation and twist the strands together.



2 As shown in the illustration, push the lever of the speaker terminal, and insert the core of the wire completely into the hole until it is no longer visible. Then release the lever.
Be sure, however, not to insert the covered part of the wire into the hole.

Speaker placement

In general, it is advisable to place the speakers on a hard wall surface. Soft surfaces can often ruin the deep tones of the reproduced bass.
Also avoid placing the speakers facing a solid surface because an echo effect may result and distort the quality of the reproduced sound.

In summary, place the speakers on a very hard surface, and, if a hard surface such as window panes or panels happens to face the speakers, cover it with soft material such as curtains.

Note

Be extremely careful that the terminals or speaker wires do not short each other out.
Never use the minus terminal for ground wire.

PRE-AMPLIFIER CONNECTIONS AND OPERATION

This unit is a power amplifier, and should always be used in conjunction with a pre-amplifier.
The pre-amplifier should have an output voltage of 1V or more and should have low distortion characteristics.

Connection

Connect the input terminals of this unit with the output terminals of the pre-amplifier, using the shielded cable (included).
The input sensitivity of these terminals is 1V, and the input impedance is 40kΩ.

Operations

1. Reduce the volume of the pre-amplifier to "−∞" or "0" and then turn on its power.
2. Turn on the power of this unit.
3. Set the input level controls to the "10" position, and begin operation of the program source.
4. The sound source can be heard by increasing the volume of the pre-amplifier being used.

CONNECTION AND USE OF HEADPHONES

Connection

Connect the headphones to the headphones jack at the left of the front panel. Use headphones with a voice-coil impedance of 4 to 16 ohms.

Operation

A signal is constantly supplied to the headphones jack regardless of the on/off setting of the speaker selection pushbuttons.
When listening only by headphones, release the speaker selection pushbuttons to the "off" position.

AC OUTLET (UNSWITCHED)

Any equipment connected to this outlet is always on, regardless of the position of the power switch on the front panel. Use this as a power source for other audio equipment. The total capacity is 300W.

HOW TO READ THE PEAK LEVEL METERS

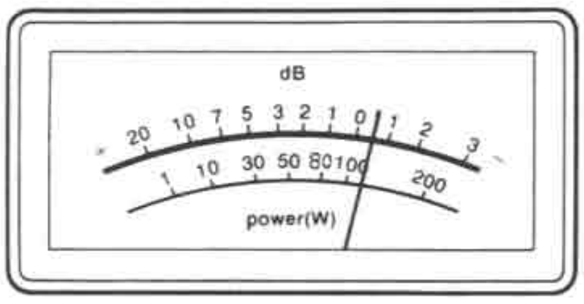
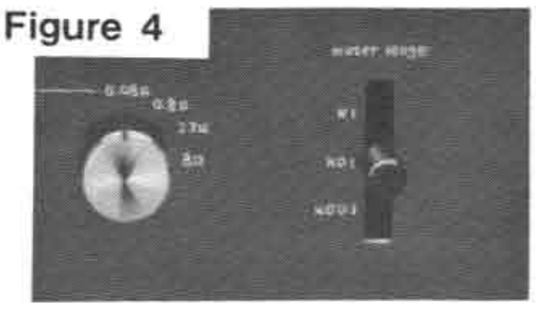


Figure 4



These meters are designed so that the output wattage value can be directly read at a load of 8 ohms.
When this selector is set to the "×1" position, read the figure directly from the meter scale.
When this selector is set to either the "×0.1" or "×0.01" position, the figures should be read, respectively, as 1/10 or 1/100 of the meter reading.
When the peak level meters are used, first determine the fluctuation of the indication needles by setting the meter range selector to the "x 1" position. If their fluctuation is small (less than 20W), set the meter range selector to the "x 0.1" position or to the "x 0.01" position, whichever position results in the reading which can be read most easily.
This scale is based on an 8-ohm load. If, therefore, the load is 4-ohm or 16-ohm, the indication needles' fluctuation cannot be directly read as is. For a 4-ohm load, the value is twice that shown. For a 16-ohm load, the value is one-half that shown to give the actual output wattage value. If, for instance, the indication needles indicate 30W with a 4-ohm load, the actual output at the speaker output terminals is 60W.
If the indication is 30W with a 16-ohm load, the output at the speaker output terminals is 15W.

HOW TO USE THE OUTPUT IMPEDANCE SELECTOR

Relationship between output impedance and damping factor

The damping factor is a measure of the output impedance of a power amplifier. If the output impedance of a power amplifier does not change when the load impedance at the output terminal of the speaker connected to the amplifier differs, the load voltage will change.
The influence of an output impedance of 0.8 ohms connected with a load impedance of 8 ohms is different from the influence when connected with a load impedance of 4 ohms, and the influence with the 8-ohm load is smaller than with the 4-ohm load. The degree of this influence can be shown by obtaining DF, which is the load impedance divided by the output impedance.

$$\text{Damping factor (DF)} = \frac{\text{load impedance}}{\text{output impedance}}$$

As shown in the formula above, the value of DF increases for a decrease in the output impedance, and decreases for an increase in the output impedance.
The higher the value of DF, the smaller the load influence on the output becomes. The lower the value of DF, the more the output is influenced.

Function of output impedance

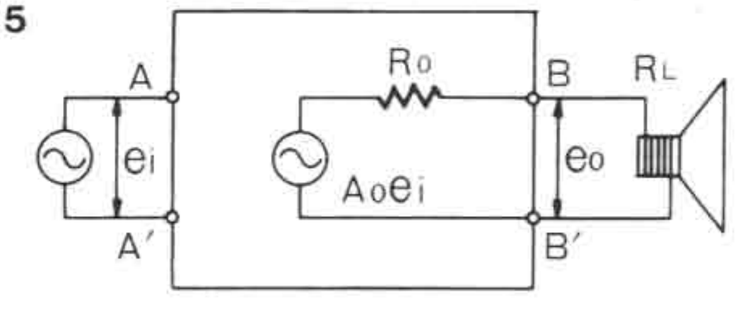
1. How the load voltage changes according to a change in the load resistance

In figure 5, when the input voltage is e_i, the output voltage, $A_o e_i$, will appear at the amplifier output terminals B, B' under open-output-circuit conditions.
However, if connected with a load, $A_o e_i$ is divided by the output impedance, Ro, and load impedance, RL, at output terminal B, B':

$$e_o = \left(\frac{RL}{Ro + RL} A_o e_i\right)$$

Therefore, when the output impedance is zero (damping factor is ∞), e_o does not change, even if the load impedance changes, and remains constant at $A_o e_i$. However, when the output impedance, Ro, is larger than zero, e_o approaches $A_o e_i$ for increases in RL, and e_o will become smaller for decreases in RL. (When RL changes, e_o increases according to the increase of Ro.)

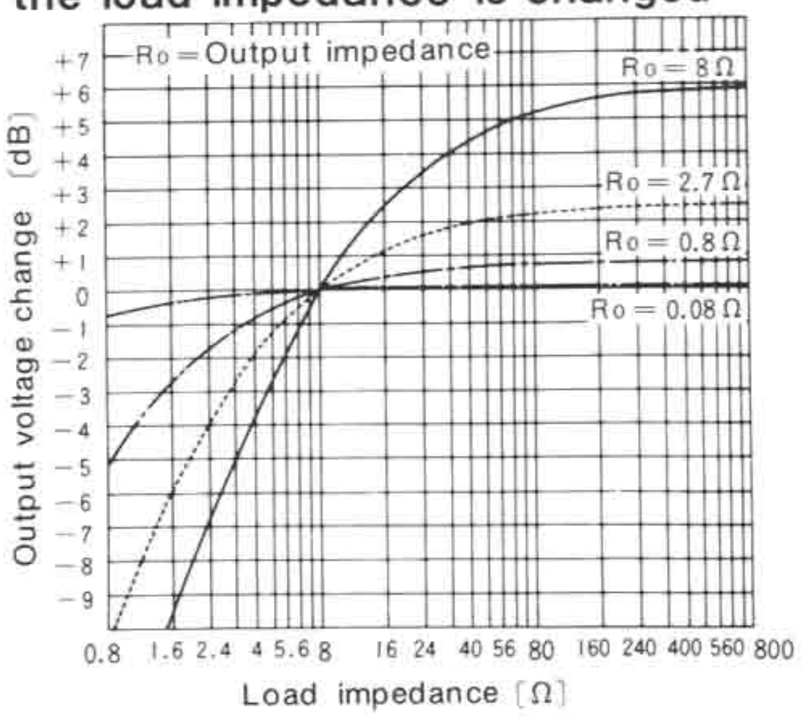
Figure 5



2. Change of the voltage with the load, according to differences in the output impedance (for a constant load)

As understood from the previous sections, the voltage to the load changes when the output impedance changes, even if the load value is constant.
This means that if the output impedance varies when connecting speakers, the sound pressure level will change, and therefore it is inconvenient to check the change in the tone quality according to the difference in the output impedance.
Accordingly, this unit utilizes Technics' original bridge-type, output-impedance changeover circuit, whereby the ratio of the voltage to the load won't change even if the output impedance varies when connected to the specified load, RLo (8 ohms).
Figure 6 shows the relationship between the load impedance, RL, and the voltage, eo, to the load when changing the output impedance, Ro, by using the output impedance selector of this unit.

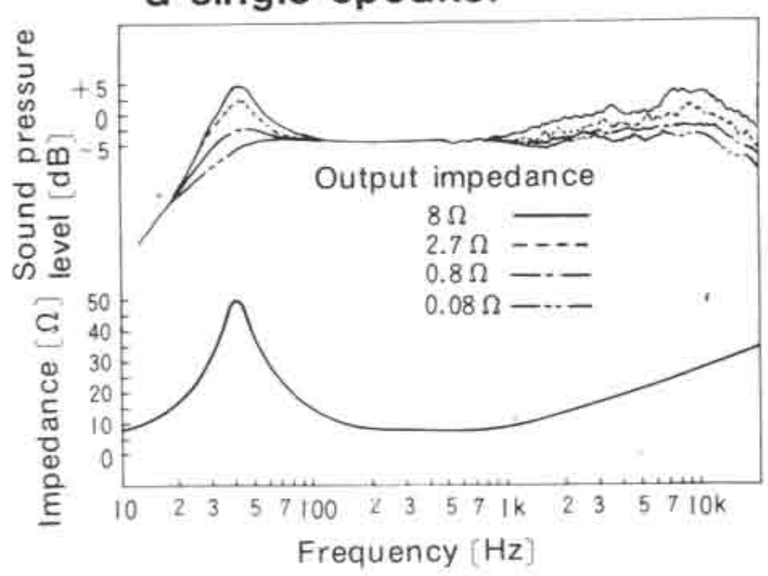
Figure 6 **Change in the output voltage when the load impedance is changed**



3. Impedance characteristics of the speaker

The impedance value of the speaker is not constant. It changes greatly according to the frequency, as shown in figure 7. (Regarding ordinary speakers, the impedance at 400 Hz is considered the nominal impedance.)
As a result, due to the influence of the output impedance of the amplifier, the output voltage of the amplifier, when connecting speakers, will change according to the frequency.
Moreover, as seen from figure 6, the amount of change in the output voltage differs according to the output impedance level and, therefore, the sound pressure frequency characteristics of the speaker will change, as shown in figure 7.

Figure 7 **Characteristic variations of a single speaker**



How to use the output impedance selector

As you can see from the above, the playback tone quality of the speaker changes with changes in the output impedance of the amplifier (changing the damping factor).
For 2-way and 3-way speaker systems, in many cases, there is a large change in speaker impedance characteristics between the low-frequency range and the middle- and high-frequency ranges.
Accordingly, for many speaker systems, if the output impedance of the amplifier is increased (the damping factor is decreased), the damping of large signal changes in the low-frequency range becomes weak, causing the sound to become soft; and, if the output impedance is decreased (the damping factor is increased), damping will be easily performed, causing the sound to become crisp.
Depending upon the speakers, sometimes the most suitable damping factor is specified. Refer to table 1 for changes of the output impedance of this unit.
Table 1 shows the damping factors for 16-ohm, 8-ohm and 4-ohm speakers when the output impedance is changed.

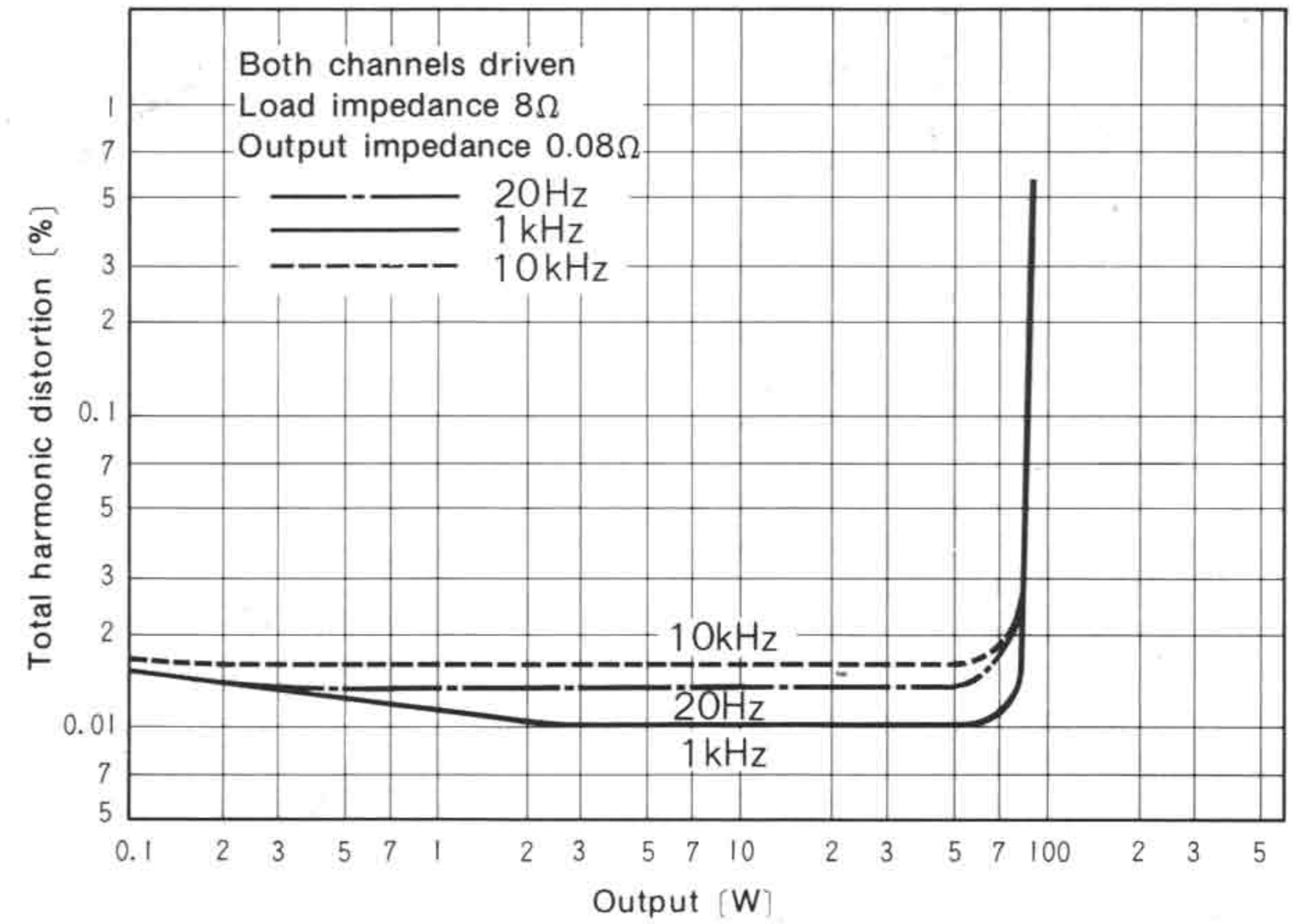
(Table 1)

Output impedance	Damping factor		
	16 Ω	8 Ω	4 Ω
0.08 Ω	200	100	50
0.8 Ω	20	10	5
2.7 Ω	≒ 6	≒ 3	≒ 1.5
8 Ω	2	1	0.5

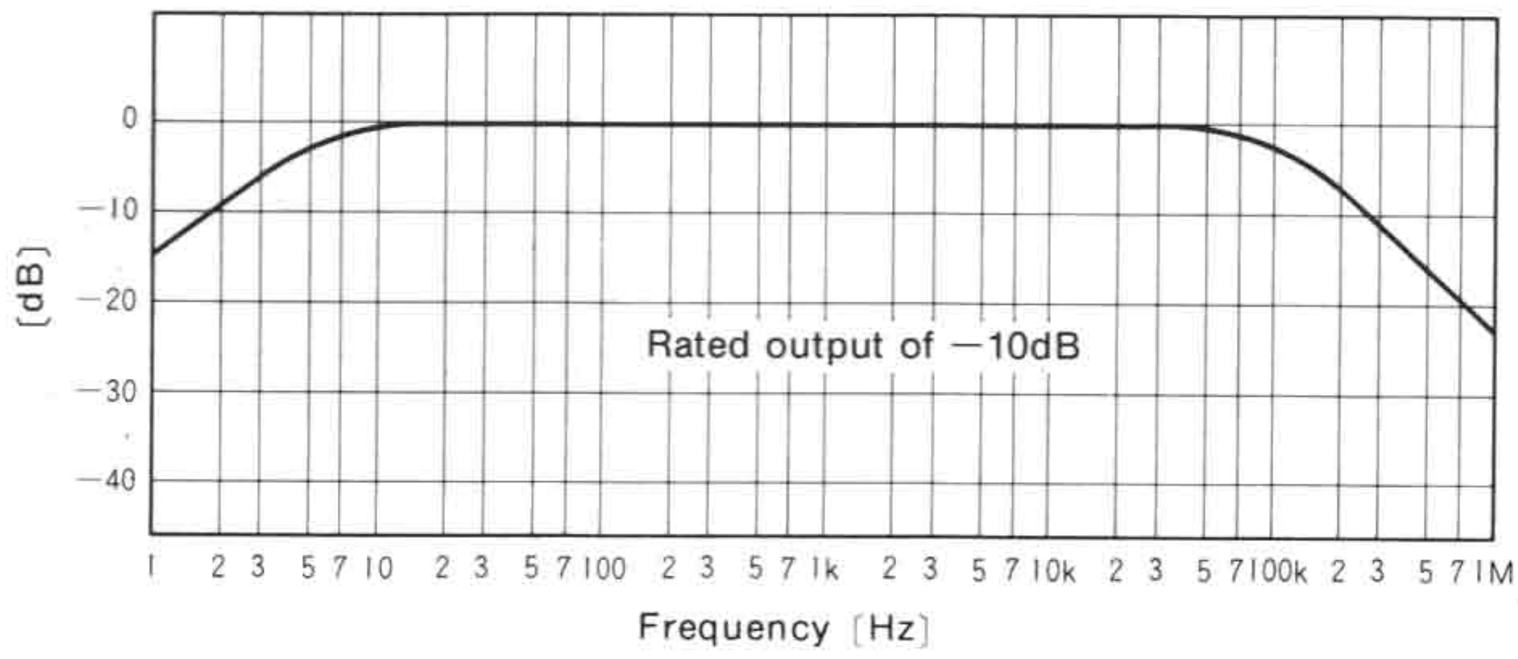
Regarding speakers whose damping factors are not specified, change the output impedance after first actually listening to the sound.

RESPONSE CURVES

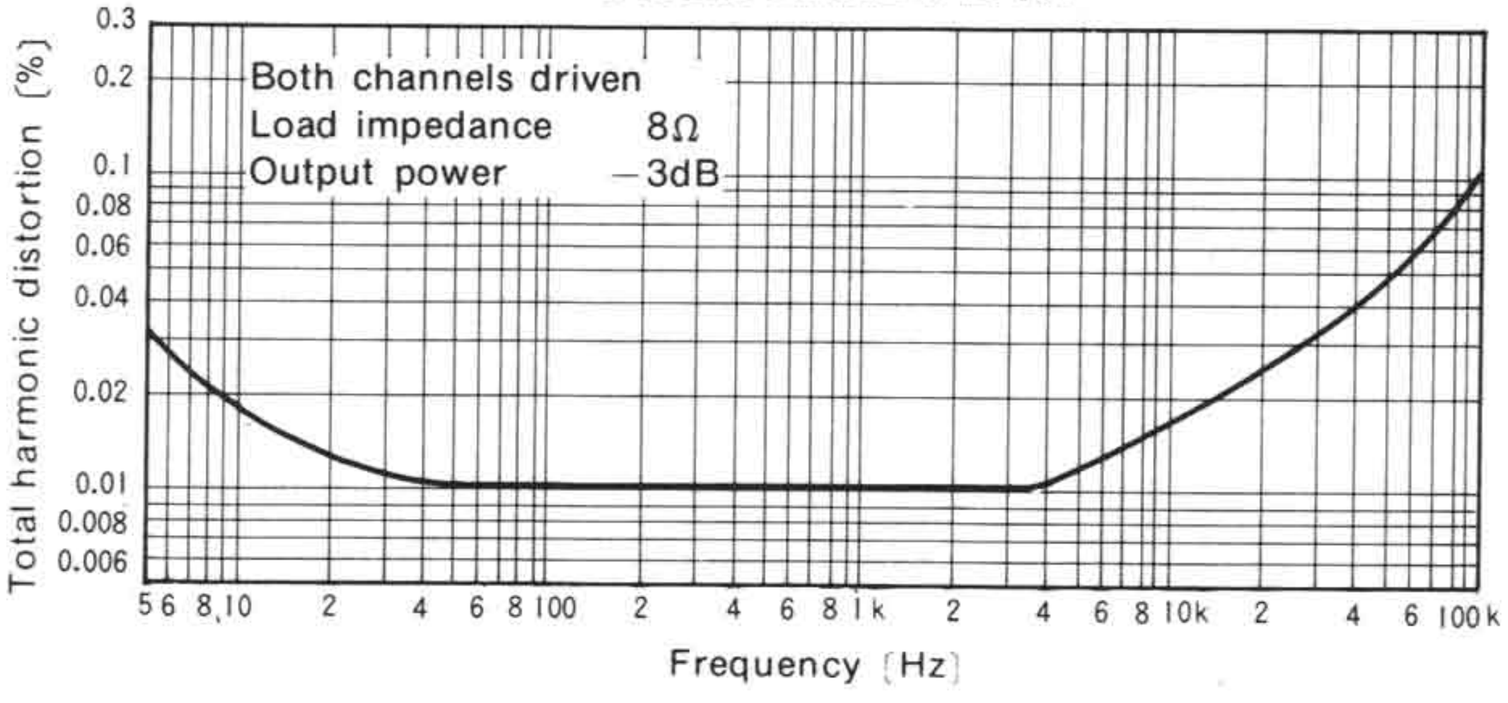
TOTAL HARMONIC DISTORTION VS. OUTPUT



FREQUENCY RESPONSE



POWER BANDWIDTH



TECHNICAL SPECIFICATIONS

AMPLIFIER SECTION

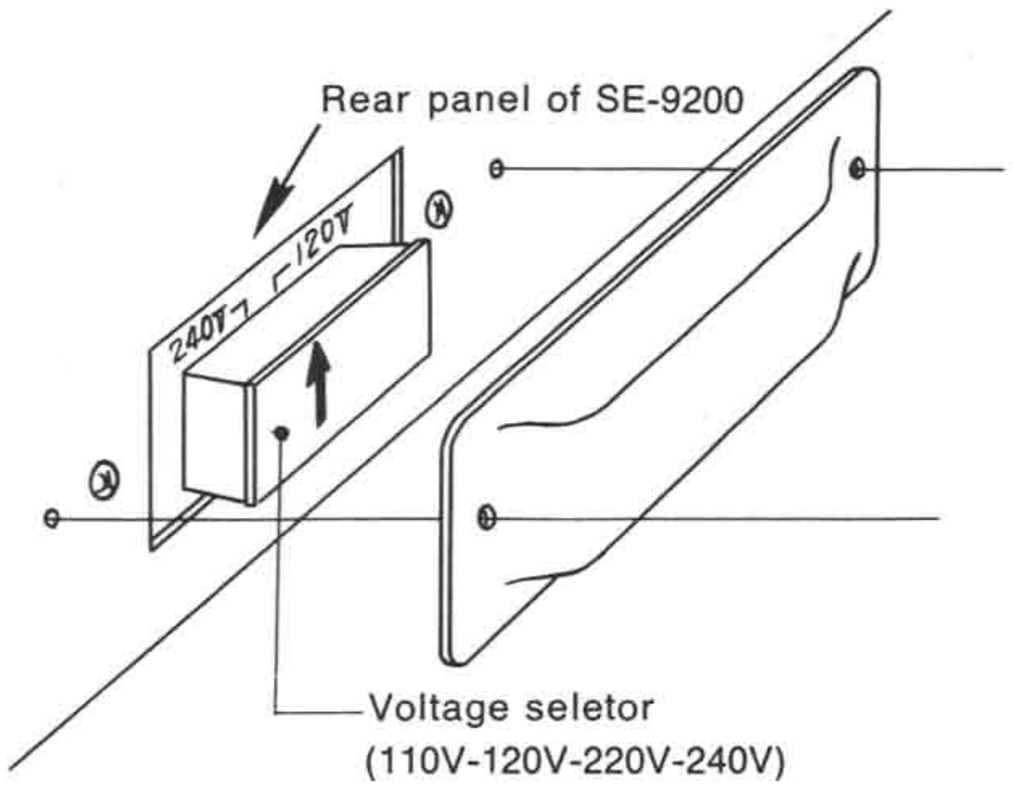
1 kHz continuous power	
each channel driven	110W/110W (4Ω)
	83W / 83W (8Ω)
both channels driven	103W + 103W (4Ω)
	82W + 82W (8Ω)
20 Hz~20 kHz continuous power	
both channels driven	93W + 93W (4Ω)
	76W + 76W (8Ω)
Total harmonic distortion	0.08%
Intermodulation distortion	0.08%
Power bandwidth	
(both channels driven at 8Ω)	5 Hz~70 kHz, −3 dB
Frequency response	5 Hz~100 kHz, +0 dB, −3 dB
Signal-to-noise ratio	110 dB
Residual hum & noise	0.3mV
Damping factor	
Load impedance 8 ohms	100, 10, 3, 1
Load impedance 4 ohms	50, 5, 1.5, 0.5
Input sensitivity and impedance	1V/40kΩ
Load impedance	
MAIN or REMOTE	4~16Ω
MAIN + REMOTE	8~16Ω

GENERAL

Power supply	110V/120V/220V/240V
Power consumption	760W
Dimensions (W × H × D)	$17\frac{23}{32}$'' × $6\frac{13}{16}$'' × $14\frac{31}{32}$''
	(450 × 173 × 380.5 mm)
Weight	33.1 lb. (15 kg)

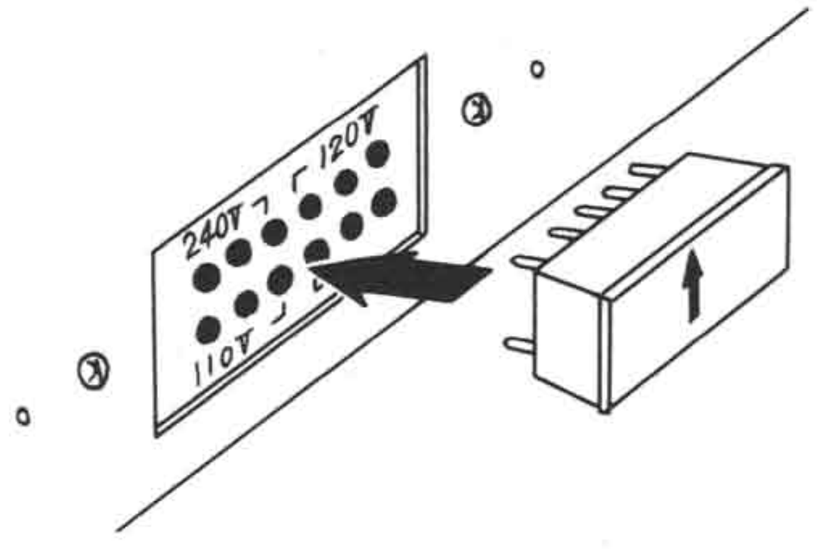
Be sure to confirm power voltage before use

This unit includes a voltage selector which permits the unit to be used on AC 110V, 120V, 220V or 240V.
The voltage to which it has been pre-set is shown on the label attached to the power plug.
If the voltage in your area is different from the indicated voltage, ask the store where it was purchased, or an authorized serviceman, to make the change.



Attention serviceman

The part of the selector with the arrow on it should be pulled out and re-inserted with the arrow pointing to the voltage for the area in which this unit will be used.



Matsushita Electric Industrial Co.,Ltd.
MATSUSHITA ELECTRIC TRADING CO., LTD.
P.O. Box 288 Central, Osaka, Japan

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