ULTIMATE HIGH FIDELITY STEREO COMPONENT

LUXMAN

M-2000

OWNER'S MANUAL

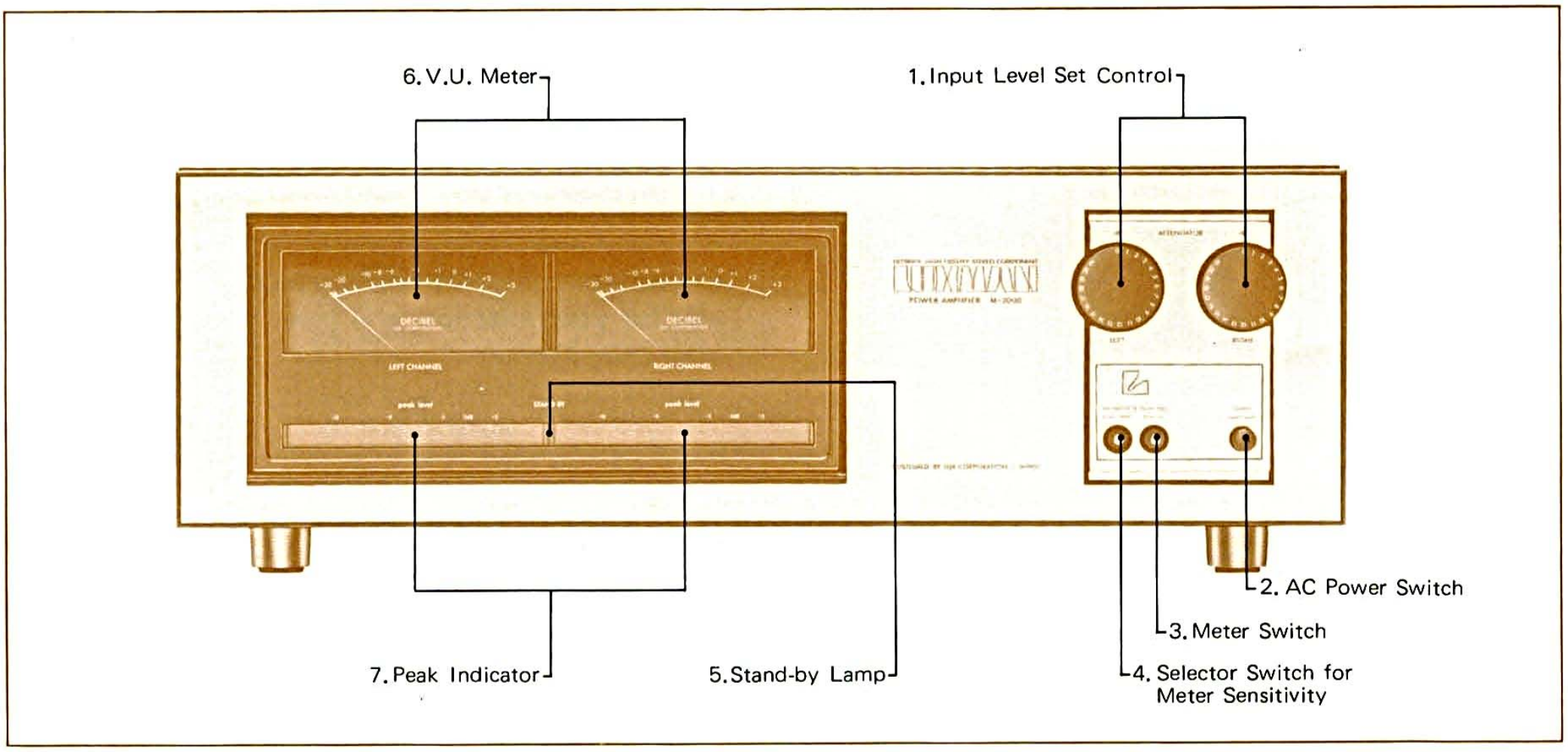
SOLID STATE POWER AMPLIFIER

Thank you for your purchasing one of our quality products, the LUXMAN M-2000. With natural care, it will give you many years of outstanding performance and personal delight.

Please read this owner's manual carefully before operating the unit, which will give detailed descriptions and operating procedures for the electronic and mechanical components of the M-2000. Again, thank you for your selection, and may "good listening" be your daily pleasure.

M-2000

SWITCHES & CONTROLS



1. Input Level Set Control

This volume control permits adjustment of the signal available at the input terminals of both Right and Left channels. Separate level set of each channel is feasible. A precision detent-volume control of metalized film type offers an accurate adjustment. Adjustable range is between 0dB and -20dB with 1dB decrement and further the ∞ position is provided.

2. AC Power Switch

Push alternately for push-on, push-off. A delay-time relay is incorporated to prevent rush current. When switched on, the stand-by lamp, using L.E.D., begins to blink and will go out in about 7 seconds, and the meter lamps light up at the same time indicating that all the circuits are in perfect operational condition.

3. Meter Switch

Press-in of this switch makes the meter circuit operate, and the V.U. meter (6) and the peak indicator (7) will function. The next press-in of this switch turns off the circuit.

4. Selector Switch for Meter Sensitivity

When the meter sensitivity is set at 0dB indication for maximum output of 120W/ch, the V.U. meter will not move at low output level, nor will the peak indicator light up. Therefore, this set is equipped with a sensitivity selector switch so that both of the indicators may be utilized even at low output level by increasing only the meter sensitivity by 10dB independent of the gain of the power amp circuit itself. When this switch is set at the "off" position 0dB indication is equivalent to 120W/ch, while at the "on" position 0dB is equivalent to 12W/ch.

5. Stand-by Lamp

Switch-on of the AC power switch (2) makes this stand-by lamp begin to blink, which will go out in about 7 seconds, and the meter amplifier lamp lights up at the same time. This shows all the circuits are in perfect operational condition. The M-2000 is equipped with double protection circuits which are the over-current limitter for amplifier protection, and the D.C.-drift sensing for protection of speakers.

The stand-by lamp will also begin to blink when D.C. drift sensing circuit is operated. In case the lamp blinks over 1 minute, a certain accident may possibly happen, therefore disconnect the AC line cord (8) from the wall socket and check the cause.

6. V.U. Meter

On these two meters you can easily read an average output level. Press in the Meter Switch (3) and this meter is put into operation. The Selector Switch for Meter Sensitivity is provided so that this meter works even at low output level.

7. Peak Indicator

A peak level of output power can be read on this L.E.D. indicator instantaneously. This indicator operates when the Meter Switch (3) is pressed in. Like the V.U. Meter (6) the sensitivity of this indicator is selectable by the Selector Switch for Meter Sensitivity (4).

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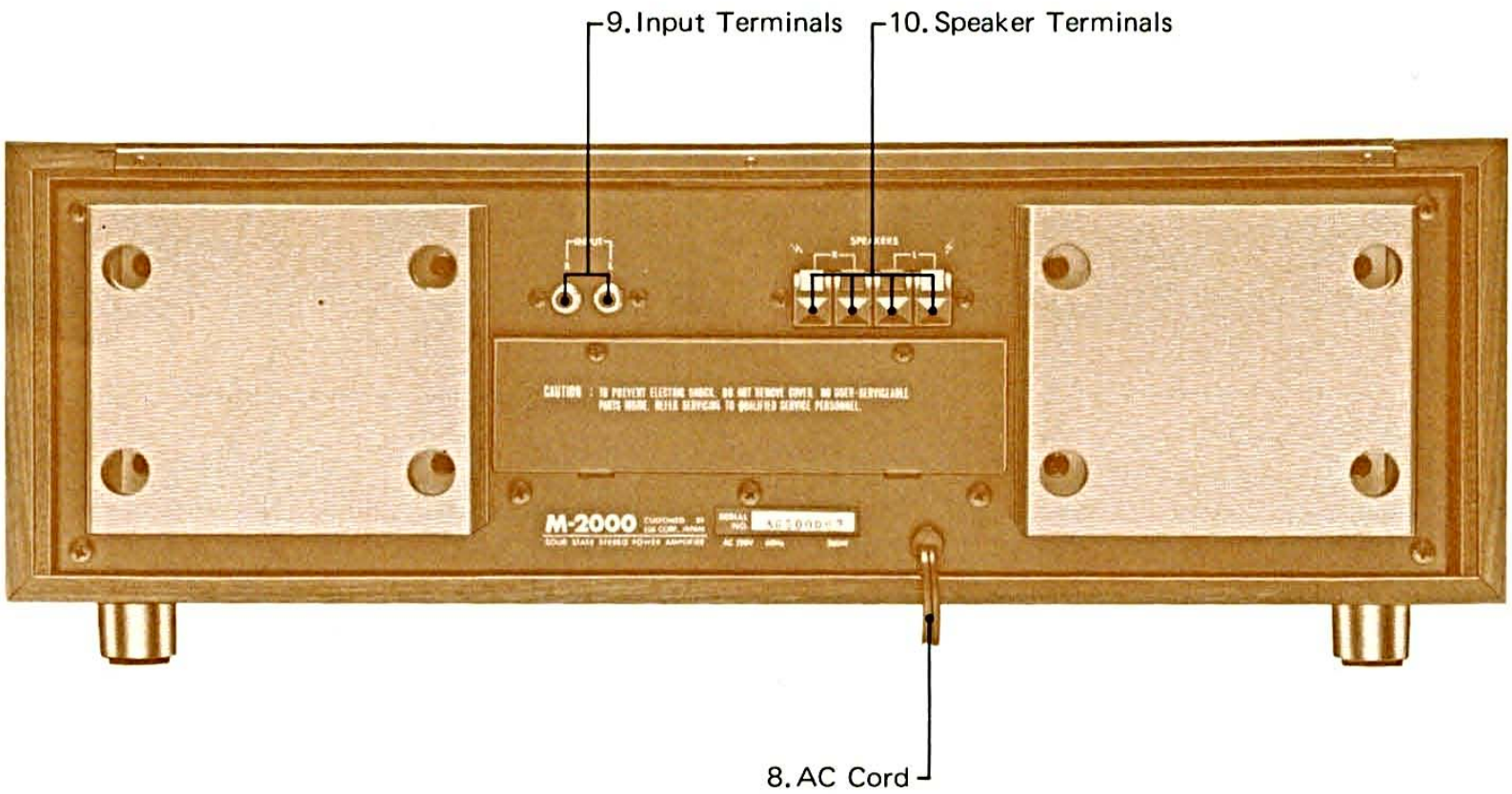
INPUT & OUTPUT TERMINALS



8. AC Power Cord

The end of this cord should be connected to the AC power supply source.

9. Input Terminals

The output of the pre-amplifier to be used with this set should be connected to this terminal. Free adjustment of each left and right input sensitivity is feasible by the Input Level Set Control (1). When set at the max. position (0dB, extreme clockwise direction) the maximum output power is obtained if an input signal 800mV is supplied to the input terminal. Counter-clockwise turn from the 0dB position reduces the input sensitivity from 800mV down to -20dB by 1dB decrement. At the extreme counter-clockwise position (or ∞), no sound reproduction is possible even if input signal is given to the input terminal.

Bear in mind that the control amplifier, which is going to be used with this set, should be a quality one that can supply output voltage of 1.5V throughout the audio frequency range when 50K-ohm loads are connected to the output terminals. The chart is to show the change of input voltage in relation to alteration of input level set control under the fixed input voltage.

Indication	Attenuation	Input sensitivity
0	1 : 1	800mV
1	1 : 0.89	899mV
2	1 : 0.79	1.01V
3	1 : 0.71	1.13V
4	1 : 0.63	1.27V
5	1 : 0.56	1.43V
6	1 : 0.50 (= 1/2)	1.60V
7	1 : 0.45	1.70V
8	1 : 0.40	2.00V
9	1 : 0.35	2.29V
10	1 : 0.31	2.58V
11	1 : 0.28	2.86V
12	1 : 0.25 (= 1/4)	3.20V
13	1 : 0.22	3.64V
14	1 : 0.20	4.00V
15	1 : 0.18	4.44V
16	1 : 0.16	5.00V
17	1 : 0.14	5.71V
18	1 : 0.125 (= 1/8)	6.40V
19	1 : 0.11	7.27V
20	1 : 0.10 (= 1/10)	8.00V
∞	0	∞

10. Speaker Terminals

Connect the speaker system to these terminals. Use speaker connection cable of suitable capacity. It is recommended to make use of the attached cord in every case. Be sure to connect the speaker cord correctly in phase, right to right and left to left ascertaining (+) and (—) on each channel.

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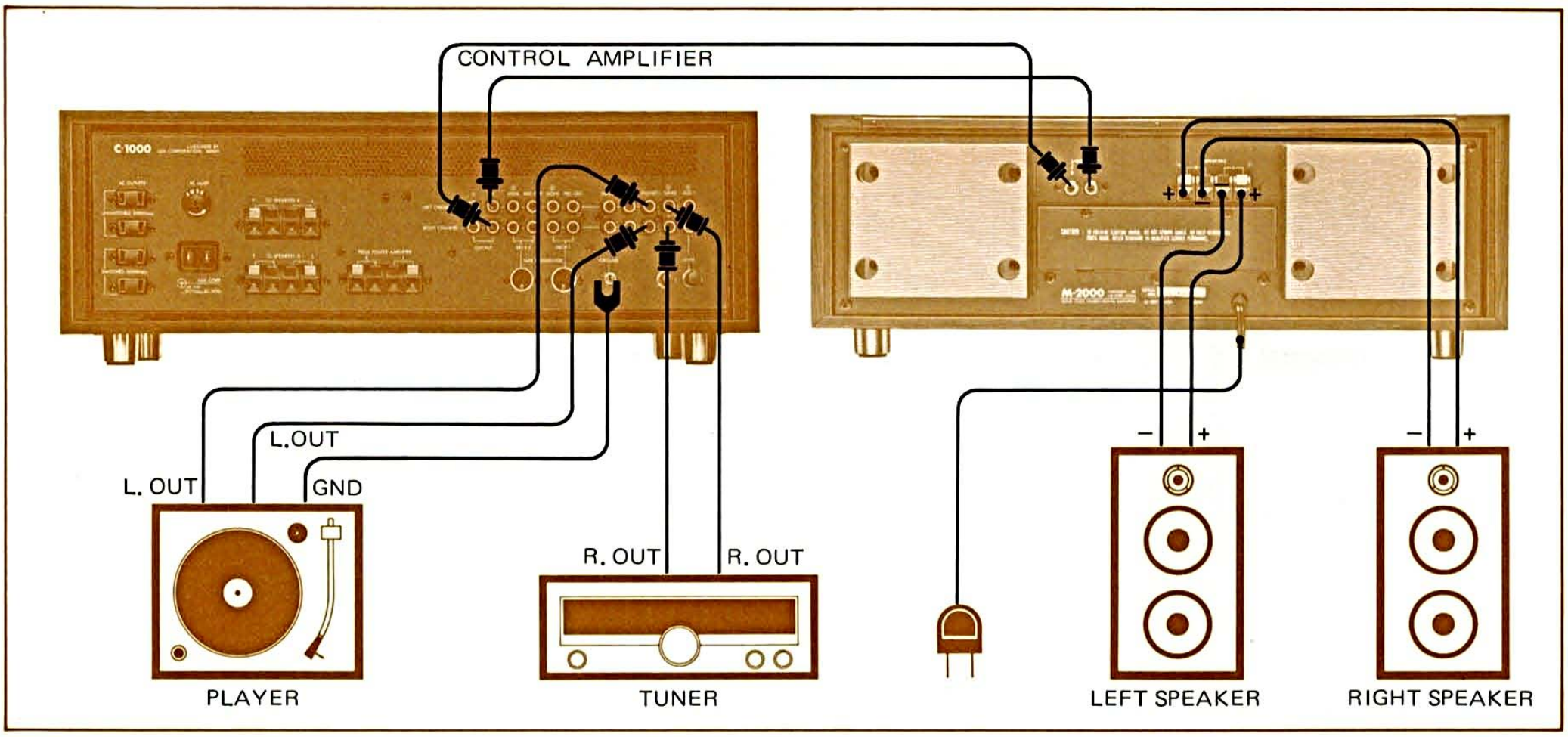
CONNECTION PROCEDURE



Connection to each input terminal of the control amplifier

Output of a turntable, a tuner, or a tape deck should be connected to the corresponding input terminals of the control amplifier.

Connection between the input terminals of the M-2000 and the control amp

Connect the output terminals of the control amplifier to the input terminals (9) of the M-2000, using a pin-plug cord. Be careful not to misconnect the right channel and the left channel.

Connection between the speaker terminals of the M-2000 and the speaker systems

Stereophonic playback is made with a pair of speaker systems for the right and left channels. The right speaker system should be connected to the Right speaker terminals, and the left speaker system to the Left terminals.

Note that perfect sound reproduction cannot be expected if the phase is not matched between both channels. To match the phase is to connect the (+) terminal of the right speaker to the (+) terminal (red cap) in the right channel of this amplifier, and the (–) terminal to the (–) one (black cap). Do the same with the left speaker. If mismatched for some reason (e.g., misconnection of speakers), the low frequency range is subdued and stable playback cannot be realized.

To firmly connect the speaker terminals, strip off the end of the speaker wire by 15mm (5/8") and insert it into the terminal hole by pressing the terminal head and then release it.

Connection of Power Supply Source

The AC Cord (8) should be plugged into the wall socket in the listening room. When the AC Power Switch (2) is pressed in, the Stand-by Lamp (5) will begin to blink and will go out in about 7 seconds, and the meter lamps will light up at the same time. All circuits are now in operational condition.

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OPERATION PROCEDURE

When all the preparation work stated in "Connection Procedure" is finished, the program source you are going to listen to can be reproduced. But in order to operate the M-2000 with the best condition, the following procedure should be achieved.

1. Set both of the two Input Level Set Controls (1) at the "∞" position. Also the main volume of the control amp at the counter-clockwise (lowest volume level) position.
2. Press the AC Power Switch (2) to ON. Some 7 seconds are necessary for the time-delay operation. The stand-by lamp will blink during the operation. When the stand-by lamp goes out and the meter-lamps light up, the entire circuit is in operational condition. Then switch ON the AC power switch of the control amplifier, and set the input selector switch at the same time to the program source you are going to listen to.
3. Turn both of the two Input Level Set Controls (1) in a clockwise direction to an appropriate position. Then turn the main volume of the control amplifier in a clockwise direction to the easy-to-use position. Again adjust the Input Level Setter (1) to obtain appropriate sound level reproduced from the speaker system.
4. Press in the Meter Switch (3) to ON. Now the V.U. Meters (6) and the Peak Indicators (7) are operationable. In case high power output is not necessary, press in the selector switch for meter sensitivity (4) to ON.

Power Output

The power supply for the output stage of parallel push-pull stage utilizes independent 2 power supplies by adopting separate power transformers for the right channel and the left channel. Therefore, the power output of 120W per channel into 8-ohm loads is possible when input signal of 800mV is applied to the input terminal of the power amplifier section.

In case the STAND-BY lamp lights up for a long period

The double protection circuits are incorporated in the M-2000. When even one of these operates, the STAND-BY lamp will light up for over 1 minute, and the output power is shut off at the same time. In this case, remove the AC Cord (8) from the wall socket and check the following items; since some accident may possibly take place.

1. Check if there may be any short circuit at the speaker terminals of the M-2000 or at the speaker system, or the speaker cord itself. When short circuited, the excessive current flows to the power transistors, and the transistors are broken. To protect the transistors, the protection circuit will operate.
2. Plug-out the pin-plug cord connected to the input terminals of the M-2000. When the ground-side wire is cut off or floated, the protection circuit will operate.
3. In case no trouble is found on checking above stated 1 & 2, the power transistor circuit may possibly be damaged. In this case consult the nearest audio shop for the servicing, since no user-serviceable parts are provided inside.

RMS Output Level

Meter Reading		Meter Sensitivity 0dB			Meter Sensitivity −10dB		
		Output Voltage (V)	8-ohm load (W)	4-ohm load (W)	Output Voltage (V)	8-ohm load (W)	4-ohm load (W)
1	+3dB	(43.8)	(240)	(480)	13.9	24	48
2	0dB	31.0	120	240	9.8	12	24
3	−3dB	21.9	60	120	6.9	6	12
4	−6dB	15.5	30	60	4.9	3	6
5	−9dB	11.0	15	30	3.5	1.5	3
6	−12dB	7.7	7.5	15	2.4	0.75	1.5
7	−15dB	5.5	3.75	7.5	1.7	0.375	0.75

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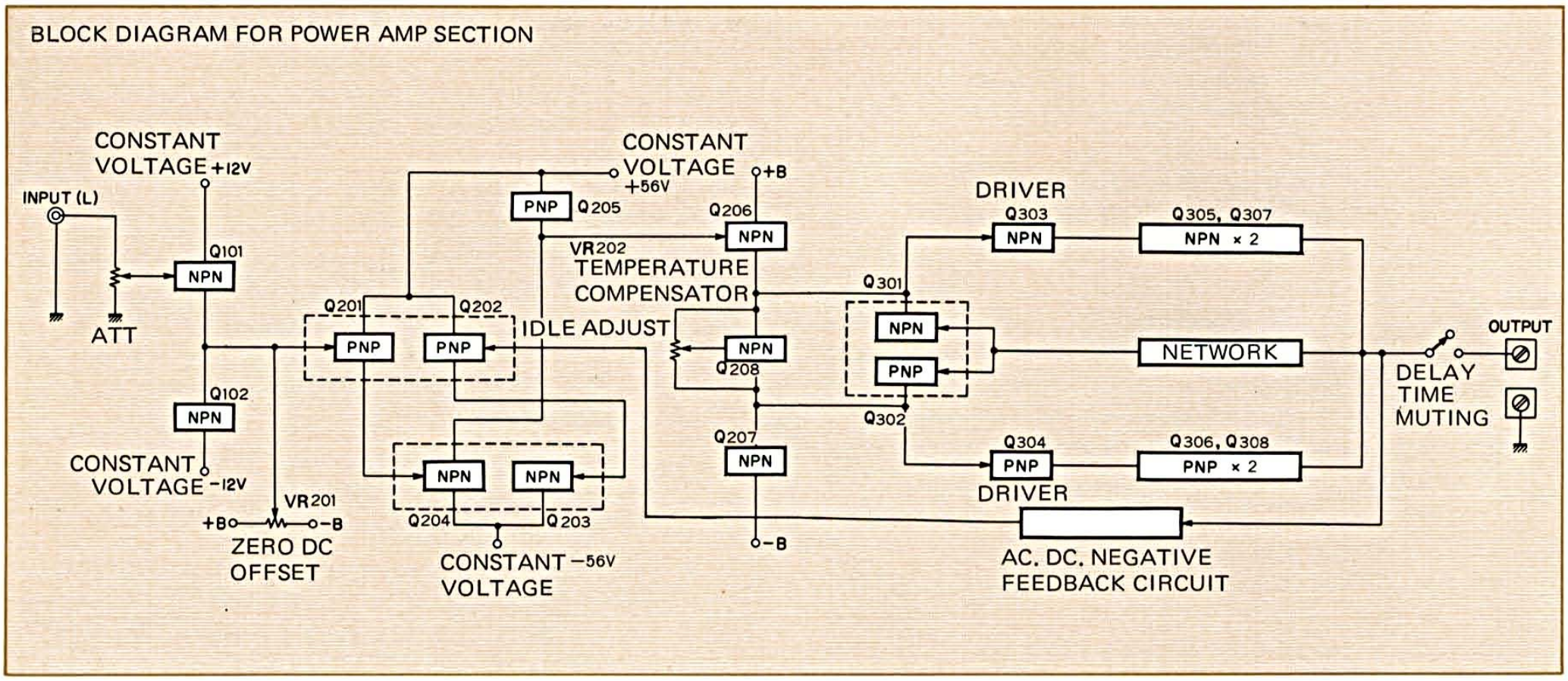
CIRCUIT DESCRIPTION

BLOCK DIAGRAM FOR POWER AMP SECTION



We are sure that you could understand an entire circuitry more precisely by use of the diagram of power amp section together with the whole block diagram.

As for the signal paths, both channels are identical with only the difference of the TR number. Therefore only the left channel diagram is shown, and explanation is made accordingly. Transistors are marked with Q.

1. Emitter Follower Circuit

Output signals of a control amplifier etc. are led to the input terminals (MAIN IN) of this power amp, and level-controlled at the input level control of a detent volume equivalent to the high-grade attenuator with 22 contact-points of 1dB decrement. Then fed into the Emitter Follower Circuit, which is, different from the ordinary one, composed by two transistors Q101 and Q102. The former is for emitter follower and the latter is for the constant current drive of the emitter follower of Q101.

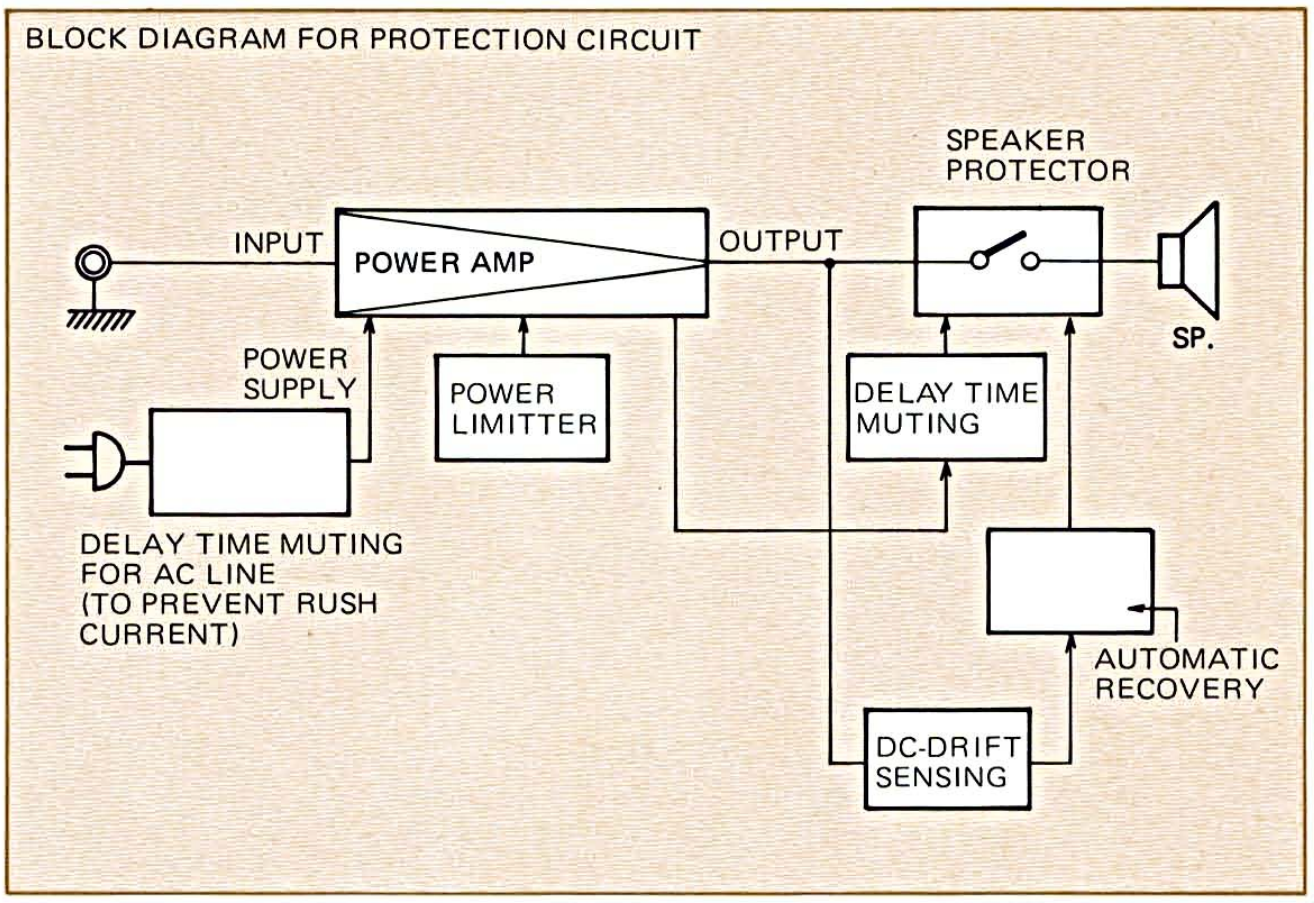
Signals are impedance-converted through this circuit, and therefore electrical isolation is made between the output stage of a control amp and the pre-driver circuit of this amplifier to eliminate interference between both circuits. Thus stable amplification with low distortion is attained.

2. Pre-Driver Circuit

Signals converted into low impedance at emitter follower circuit are then fed to the two-stage differential amplifier, a kind of balanced DC amplifying circuit, to meet voltage amplification. The differential amplifier is always stable against possible fluctuation of mains voltage and temperature drift, and has been widely used as Operational Amplifier with IC's in computors or measurement instruments etc. The two PNP transistors Q201, Q202 for the 1st stage differential amplifier are arranged quite symmetrically, and the emitter of the both transistors are connected to (+) power supply through a common resistor. The base of Q201 accepts the input signal, while that of Q202 accepts the feed back signal. Due to adoption of the two transistors of the same standard, equivalent current is available at collector and emitter when the same signals are fed to the base of the both transistors. As emitter current for two pieces of resistors will flow through the emitter resistor, the emitter potential will rise up accordingly, which corresponds to negative feedback. On the other hand, if subtle (+) potential may appear at the speaker terminals by the drift of transistors caused by other factors but signals, for instance, the raise up of temperature, this (+) potential is led to the base of Q202 via the feedback circuit, when (+) signal of the same phase will appear at the emitter resistor. In this case, the potential at the emitter resistor of Q201 varies to (+), which reduces the collector current to have (−) potential at collector. The voltage is amplified by the 2nd differential amplifier Q203, Q204, which makes the (+) potential stable at the speaker terminals, and makes it possible to keep balanced 0 potential.

The 2nd differential amplifier operates same as the 1st one, though not perfectly symmetrical. The constant current drive by Q205 is applied, since this stage aims at voltage amplification. The emitter follower circuit is arranged annexed to the differential amplifier with a pair of Q206 and Q207. (Q206 is for the emitter follower and Q207 is for its constant current driving.) Therefore, impedance fluctuation caused by the speaker loads would not affect the pre-driver stage.

With this pre-driver circuit, stable driving with low distortion is feasible up to high frequency range with smaller phase compensation comparing with conventional high power amplifiers. As for the power supply circuit for "Class A" operation sections up to the differential stage, a real automatic voltage regulator is adopted to avoid bad influence which may possibly be caused by the fluctuation of AC mains voltage or the current fluctuation in the power amplifier section.



Power Output Circuit

Adopted is a pure complementary push-pull circuit composed by the power transistors of NPN group and PNP group. In order to produce such a high power of 120W/ch, parallel push-pull stages utilizing 4 power transistors designed for high power output are arranged at the final stage. Thus sufficient driving of various type of the speaker systems is feasible.

The parallel configuration of the power transistors at the final stage allows the instant collector-dissipation increase in accordance with the number of the transistor, which produces enough margin, and at the same time makes it possible to utilize better linearity portion of the hfe-ic characteristics of each transistor to lower the distortion characteristic.

Further the quiescent current of 35mA in the single push-pull configuration will be doubled into 70mA in the parallel push-pull configuration, which means the distortion characteristic is improved even at the low output level.

Bias Circuit

The adjustment of the quiescent current at the final stage is made by a thermal diode and the transistor Q208. The diode compensates the excessive heat and the temperature drift.

Protection Circuit

The OCL circuit, in which the speaker system is directly connected to the amplifier, is ideal in the point that the input signal is delivered most faithfully. But this circuit is always accompanied by the danger that any abnormal factors aroused in the amplifier will be delivered to the speaker system without barrier. On the other hand, electronic components will increase in its number in proportion with improvements of the circuit design, and it is hard to foresee every trouble that may happen, even if the most severe selection is made for the superior components. Necessity is here to have the protection circuits. The most important in the operation of the protection circuitry is reliability and speed. Therefore the sensitivity should be as high as possible in the range of the safety operation.

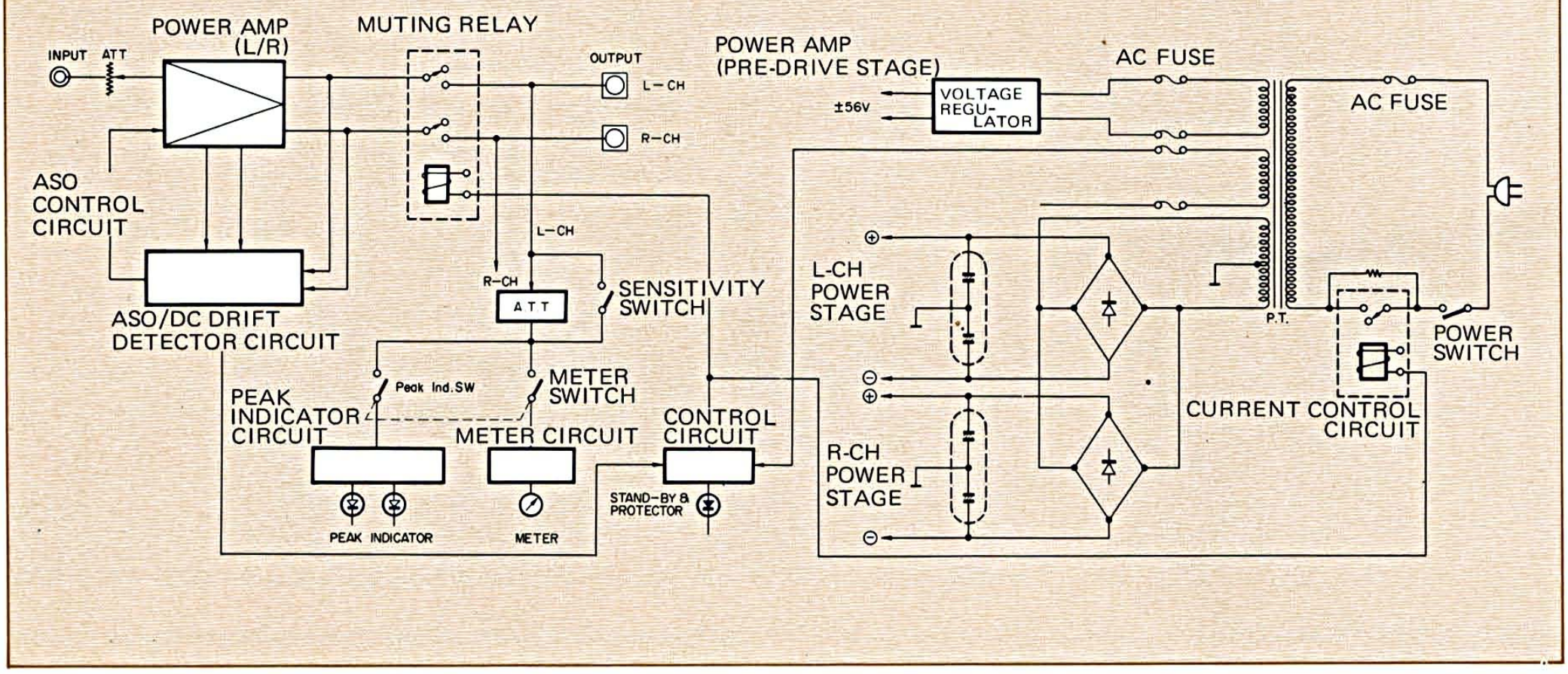
The protection circuits of the M-2000 have to be designed not to be mis-functioned by the current of music reproduction signal. The block diagram will help you understand the outline of the protection circuits.

As to the over-current sensing, when excessive current, which may break the power transistors, appears, the current is once restrained electronically to keep the operation of the power transistors in the S.O.A. (Safe Operation Area). And in case the restraint time lasts over a certain time, the mains power is shut off by fuses.

Furthermore the D.C.-Drift Sensing is adopted, which protects the speaker system by cutting off the output when some ±3V D.C. is detected at the speaker terminals. This also operates as the muting circuit which protects the speaker system from transient phenomena caused by the AC power being turned on.

Thus the M-2000 is equipped with double protection circuits. One is for protection of speaker systems, and another is for protection of the amplifier.

BLOCK DIAGRAM

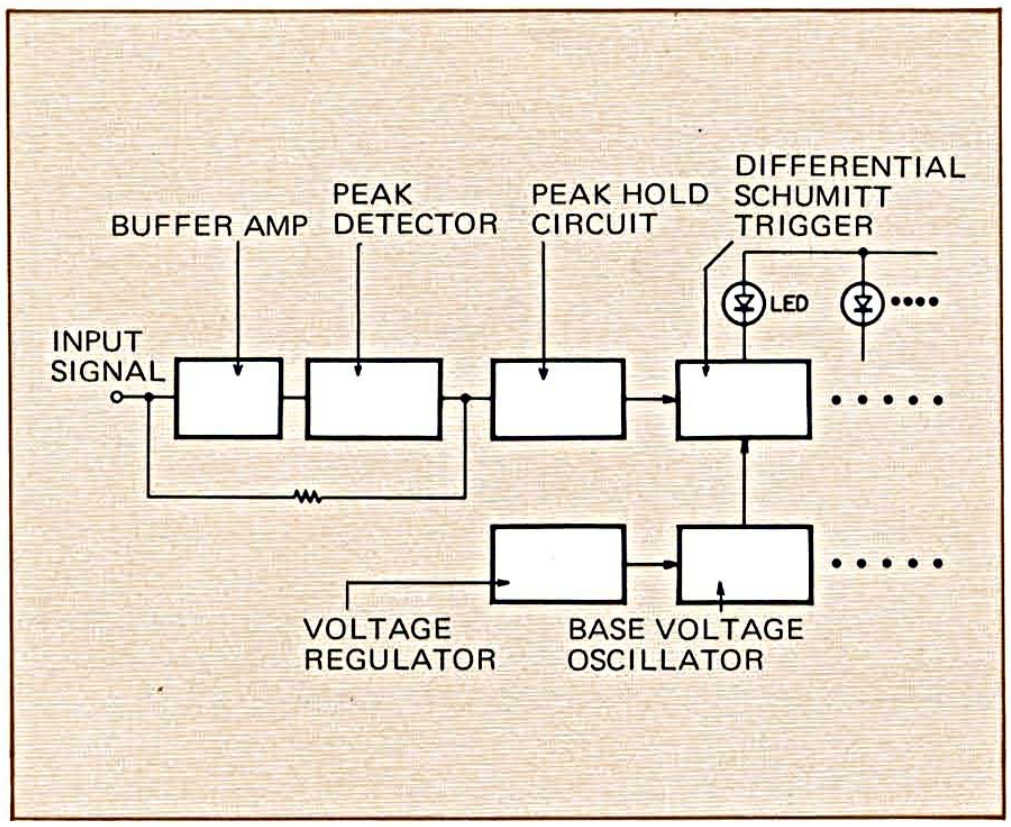


V.U. Meter & Peak Indication Circuit

The purpose of the V.U. meter originally was just to show the reproduced signal visually, but today peak meters of high attack-speed and slow recovery etc. have been adopted to indicate the precise signal level. But the mechanical meters have difficulty to indicate accurately the pulse signals which are usually contained in the musical signals. In this sense the electronic display method is necessary. Thus the. M-2000 is equipped with electronic peak indicator together with the mechanical V.U. meter to make it easy to visually compare the difference between the avarage level and the peak level.

V.U. meter amp circuit, different from the ordinary V.U. meters in which the needle is directly moved by the detection of signal current, adopts 2 transistors, and the meter is inserted in the Negative Feed-back loop of the meter amp circuit and is driven by constant current. Therefore the scale is made linear and easy-reading is attained.

In the peak indication circuit, after the output signal is rectified, the signals flow into the differential Schumitt Circuit, on which the voltage equivalent to the standard level is given, with a certain holding time of the peak level, and the indication is made according to the standard level. For the peak indication, Light Emitting Diodes are adopted, which ensures high speed response against the pulsive input signals.



PEAK INDICATION CIRCUIT

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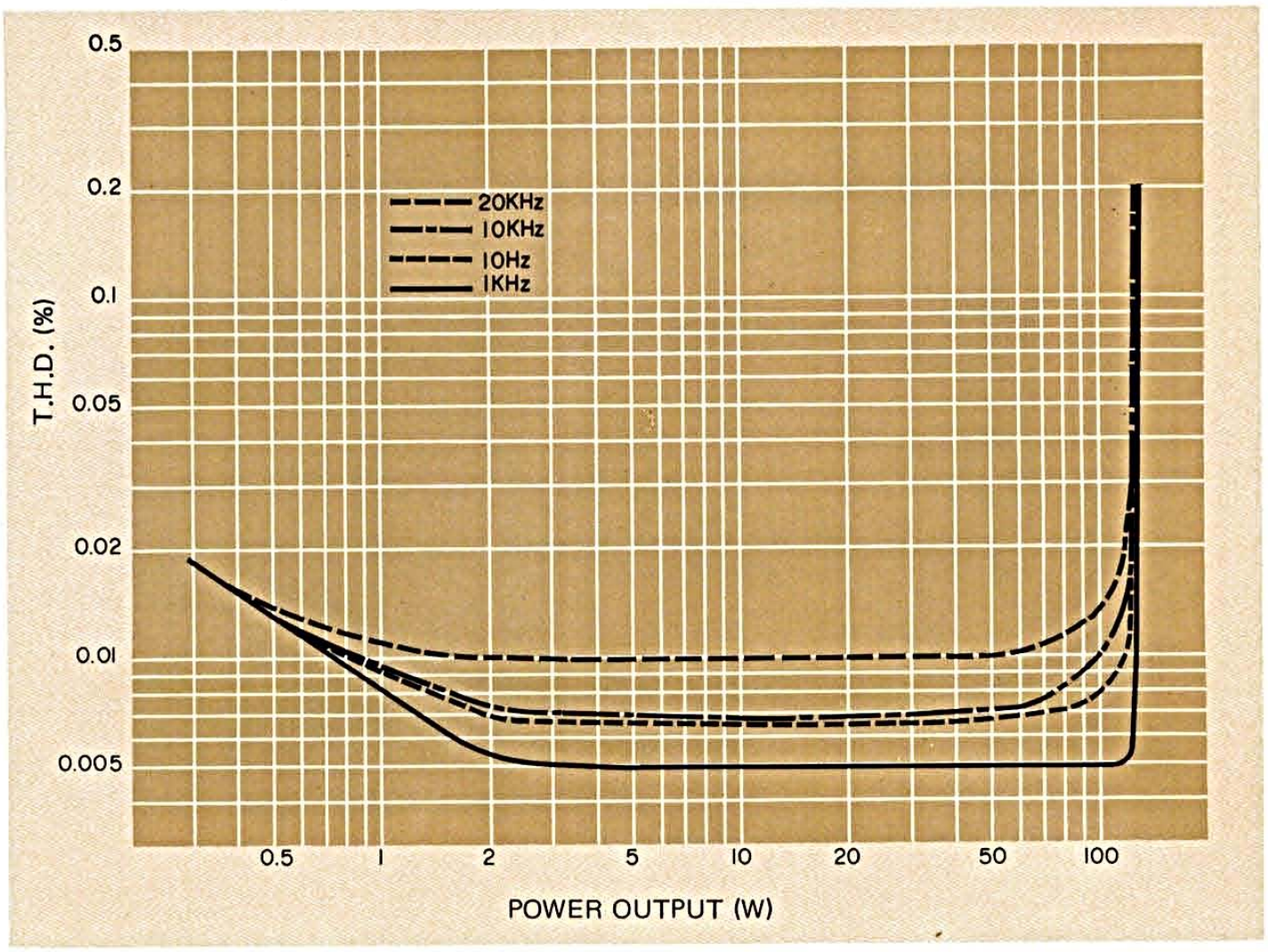
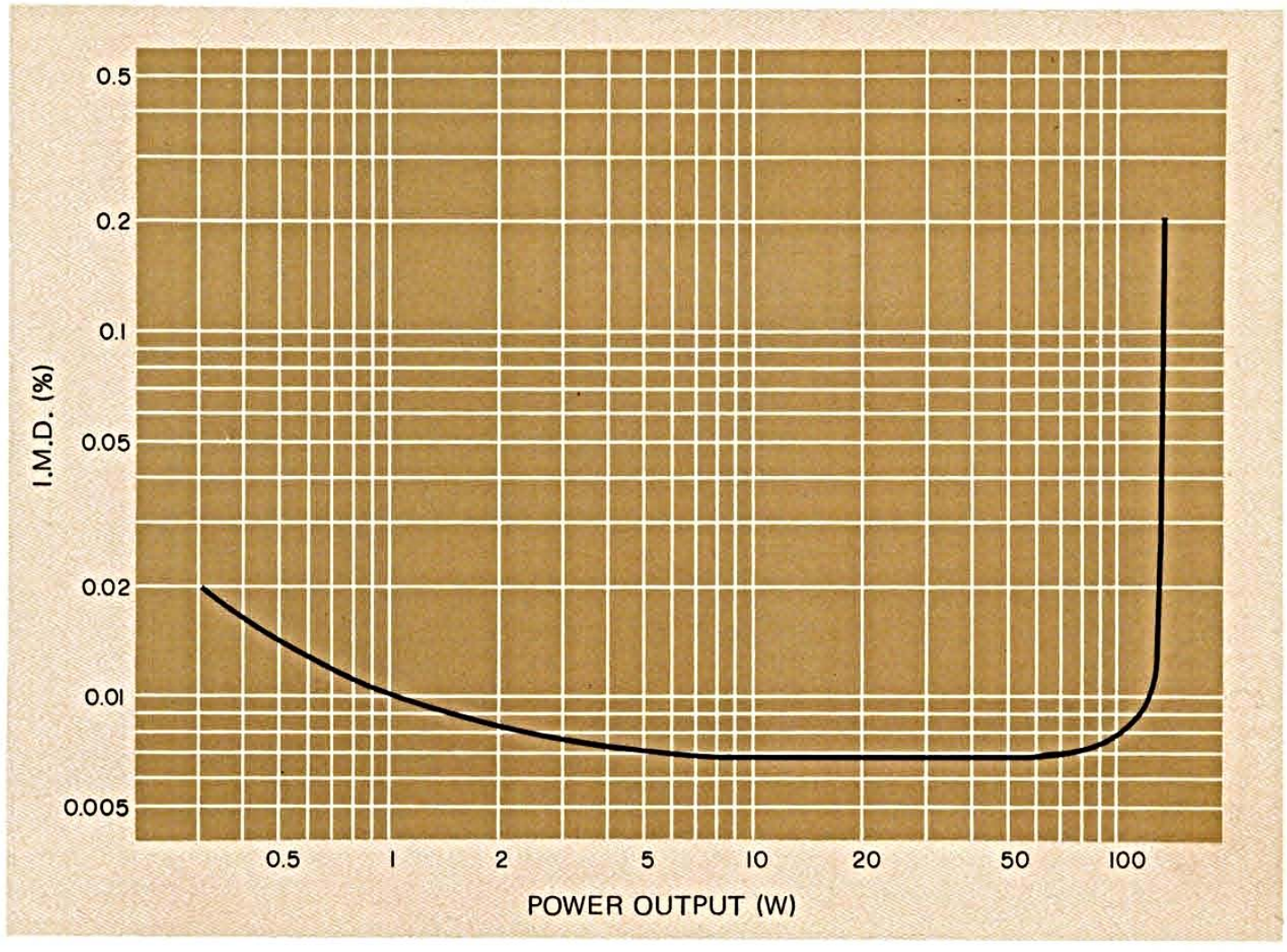
STANDARD CURVES

T.H.D. Vs. POWER
(OUTPUT : 8Ω LOAD, BOTH CH. DRIVEN)



I.M.D. Vs. POWER
(OUTPUT : 8Ω LOAD, BOTH CH. DRIVEN)



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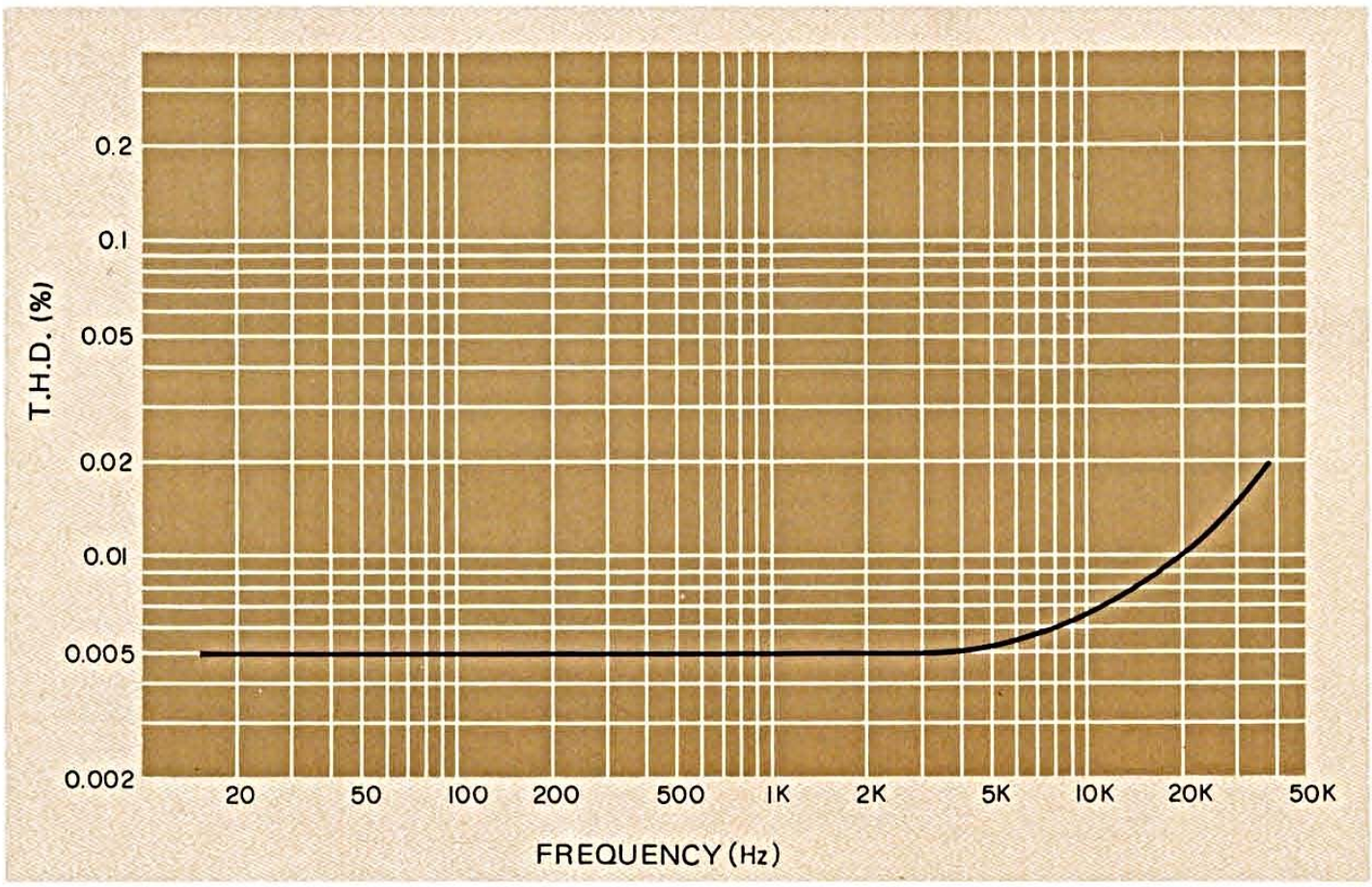
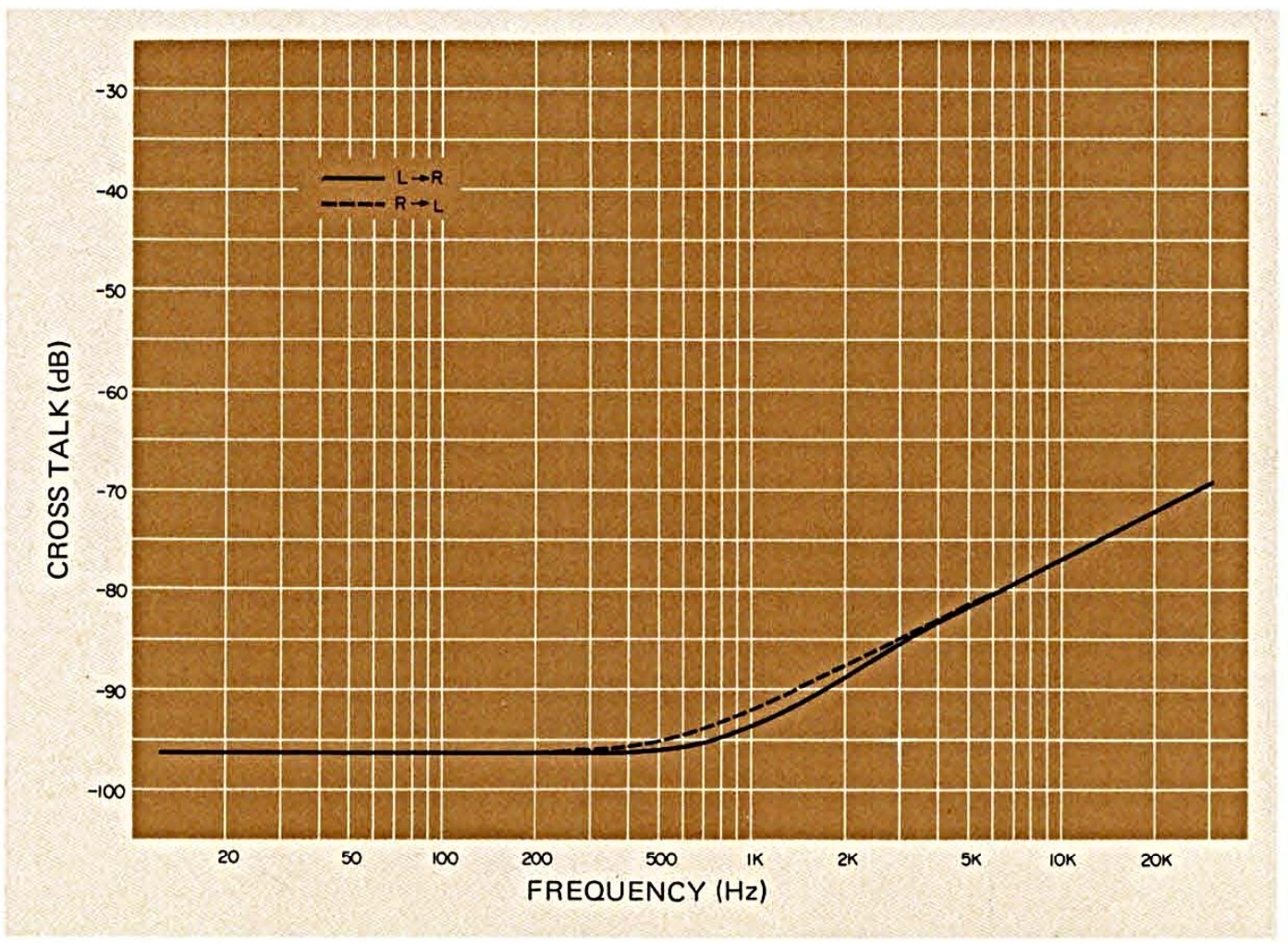
STANDARD CURVES

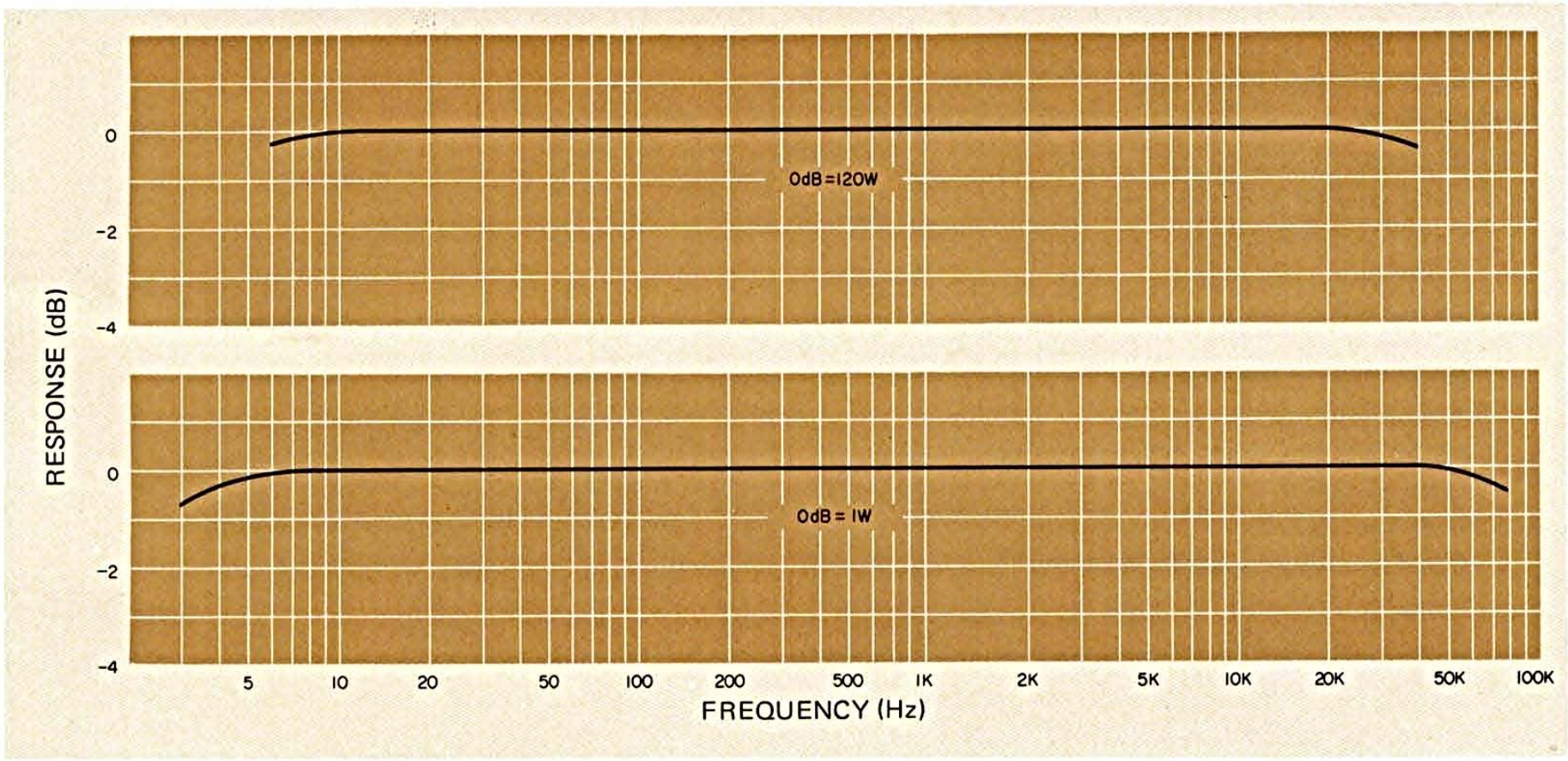
T.H.D. Vs FREQUENCY
(OUTPUT : 8Ω LOAD, BOTH CH. ORIVEN, 60W)



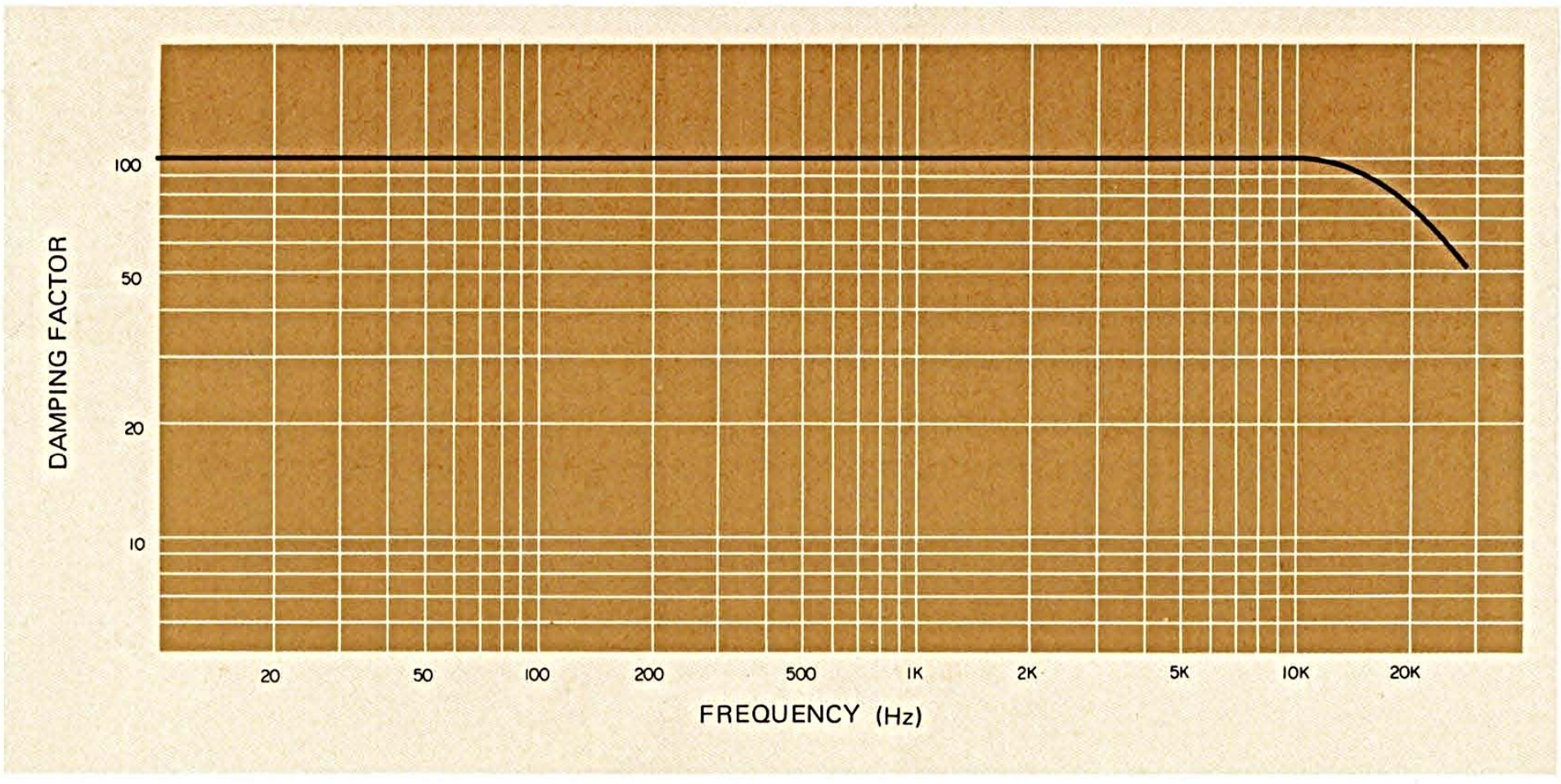
CROSS TALK CHARACTERISTIC
(OUTPUT : 8Ω LOAD, 120W, VOL MAX.)



FREQUENCY CHARACTERISTIC
(OUTPUT : 8Ω LOAD)



DAMPING FACTOR
(OUTPUT : 8Ω LOAD)



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SPECIFICATIONS

Power Output:	120 watts minimum continuous per channel, into 8-ohm loads both channels driven, from 20Hz to 20,000Hz, at no more than 0.05% total harmonic distortion.
Rated I.M.:	no more than 0.05% (8-ohms, 120W/ch., 60Hz : 7KHz = 4 : 1)
Frequency Response:	5 - 100,000Hz (-1dB)
Input Sensitivity:	800mV
Input Impedance:	50K ohms
Residual Hum & Noise:	-108dB
Crosstalk:	better than 90dB (vol. max 1KHz)
Damping Factor:	100 (8-ohm loads)
Power Consumption:	450W (8-ohm, both channels driven, rated output) 55W (no signal)
Dimensions:	485(W) x 295(D) x 175(H) mm (19-1/8" x 11-5/8" x 6-7/8")
Weight:	Net 18kgs (40 lbs.) Gross 21kgs (44 lbs.)

Specifications and appearance design subject to possible change without notice.