

# YAMAHA M-70

Natural Sound Stereo Power Amplifier

ZDR (Zero Distortion Rule Amplifier)

High-Efficiency Yamaha "X" Power Supply and "X" Amplifier Circuitry

Dual Range Peak Power Level Indicators

200 W/ch. RMS Output, 0.002% THD, 20 – 20,000 Hz



OWNER'S MANUAL

*Thank you for purchasing the YAMAHA M-70 stereo power amplifier.*

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**IMPORTANT!**  
Please record the serial number of your unit in the space below:  
Model : **M-70**  
Serial No. :  
The serial number is located on the rear of the chassis.  
Retain this Owner's Manual in a safe place for future reference.

**WARNING**  
To prevent fire or shock hazard, do not expose this appliance to rain or moisture.

## CAUTION (PREPARED IN ACCORDANCE WITH UL STANDARD 1270)

**1**

Read Instructions — All the safety and operating instructions should be read before the appliance is operated.

**2**

Retain Instructions — The safety and operating instructions should be retained for future reference.

**3**

Heed Warnings — All warnings on the appliance and in the operating instructions should be adhered to.

**4**

Follow Instructions — All operating and other instructions should be followed.

**5**

Water and Moisture — The appliance should not be used near water — for example, near a bathtub, wash-bowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.

**6**

Carts and Stands — The appliance should be used only with a cart or stand that is recommended by the manufacturer.

**7**

Wall or Ceiling Mounting — The appliance should be mounted to a wall or ceiling only as recommended by the manufacturer.

**8**

Ventilation — The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.

**9**

Heat — The appliance should be situated away from heat sources such as radiators, stoves, or other appliances that produce heat.

**10**

Power Sources — The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.

**11**

Grounding or Polarization — Precautions should be taken so that the grounding or polarization means of the appliance is not impeded.

**12**

Power-Cord Protection — Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.

**13**

Cleaning — The appliance should be cleaned only as recommended by the manufacturer.

**14**

Nonuse Periods — The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.

**15**

Object and Liquid Entry — Care should be taken so that objects do not fall into and liquids not spilled into the inside of the appliance.

**16**

Damage Requiring Service — The appliance should be serviced by qualified service personnel when:

- A. The power-supply cord or the plug has been damaged; or
- B. Objects have fallen, or liquid has been spilled into the appliance; or
- C. The appliance has been exposed to rain; or
- D. The appliance does not appear to operate normally or exhibits a marked change in performance; or
- E. The appliance has been dropped, or the cabinet damaged.

**17**

Servicing — The user should not attempt to service the appliance beyond those means described in the operating instructions. All other servicing should be referred to qualified service personnel.

**CAUTION: READ THIS BEFORE  
OPERATING YOUR M-70**

**1**

The M-70 is a sophisticated stereo power amplifier. To ensure proper operation for the best possible sound reproduction, please read this manual carefully.

**2**

Choose the installation location of your M-70 carefully. Avoid placing it in direct sunlight or close to a source of heat. Also avoid locations subject to vibration and excessive dust, heat, cold or moisture.

**3**

Do not operate the amplifier upside-down as it may overheat, possibly causing damage.

**4**

Do not open the cabinet as this might result in damage to the set or electrical shock. If a foreign object should get into the set, contact your dealer.

**5**

Do not place records or other objects against the amplifier so that the ventilation holes are blocked. This will cause the internal temperature to rise and may result in a failure.

**6**

When removing the power plug from the wall outlet, always pull directly on the plug; never yank the cord.

**7**

When moving the set be sure to first pull out the power plug and remove cords connecting to other equipment.

**8**

Before disconnecting input cords from either the M-70 or the control amp, the M-70 should be turned off.

**9**

Do not clean the M-70 with chemical solvents as this might damage the finish. Use a clean, dry cloth.

**10**

As the amplifier's power supply generates a certain amount of radio frequency noise, position your tuner so that its AM antenna is well away from the amplifier.

**11**

Be sure to read the "troubleshooting" section for advice on common operating errors before concluding that your M-70 is faulty.

**12**

Keep this manual in a safe place for future reference.

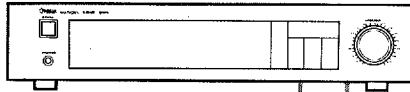
The following label is attached to the cabinet of the U.S.A. model.

WARNING—HAZARDOUS ENERGY,  
MAKE PROPER SPEAKER CON-  
NECTIONS, SEE OPERATING  
MANUAL BEFORE USING.

# M-70

## CONNECTION DIAGRAM

### CONTROL AMPLIFIER



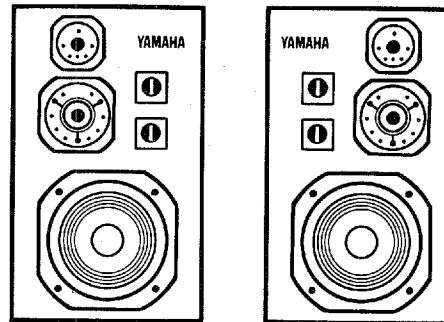
#### CONNECTING A CONTROL AMP

Connect the output cords of the control amp to the input phono-plug receptors on the rear panel of the M-70. Make sure that the L output terminal of the control amp is connected to the L input terminal of the M-70, and that the R output terminal of the control amp is connected to the R input terminal. The phono-plug pins on both ends of the connecting cords should be clean, and a firm, secure connection should be made. Make sure that both the control amp and the M-70 power amplifier are properly grounded. Always make sure that the power switches of both units are turned Off when connecting or disconnecting the power amp and control amp.

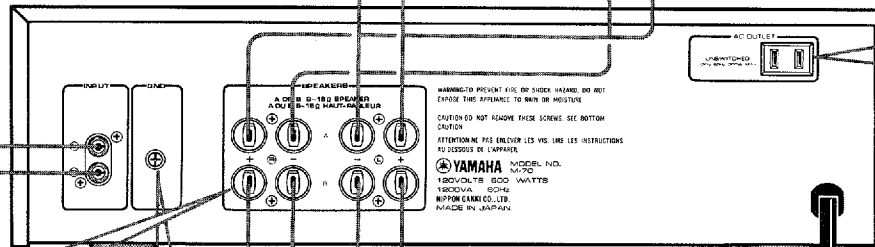
### SPEAKER SYSTEM "A"

#### LEFT SPEAKER

#### RIGHT SPEAKER



### M-70 REAR PANEL

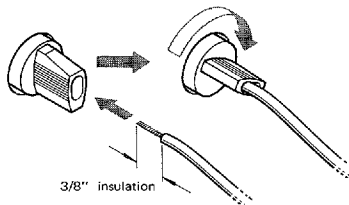


#### CONNECTING THE SPEAKERS

The matching impedance of this power amplifier is 8 ohms.

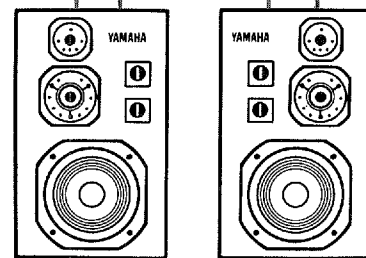
Either one or two pairs of speakers may be connected, but two pairs cannot be operated at one time. The recommended speaker impedance is anywhere between 4 and 16 ohms. Connect the cords going to the left speakers to the L terminals and the right speaker cords to the R terminals, making sure that the "+" and "-" markings are observed. If the "+" and "-" wires are reversed at either speaker, the sound will be unnatural and will lack bass. Speaker cords should be cut as short as possible; do not coil up excess wire on the floor. Also, do not bundle with cords from other system components.

#### CONNECTING THE SPEAKERS



Strip approximately 3/8" insulation from the speaker cords, insert exposed wire in rear panel connector openings, and rotate connector housing one half turn clockwise. The cord will be locked into position. If these connections are faulty, no sound will be heard from the speakers.

This is the Ground terminal. If hum or noise occurs during operation, try grounding the amplifier or connecting this terminal to the Ground terminal of the control amp.



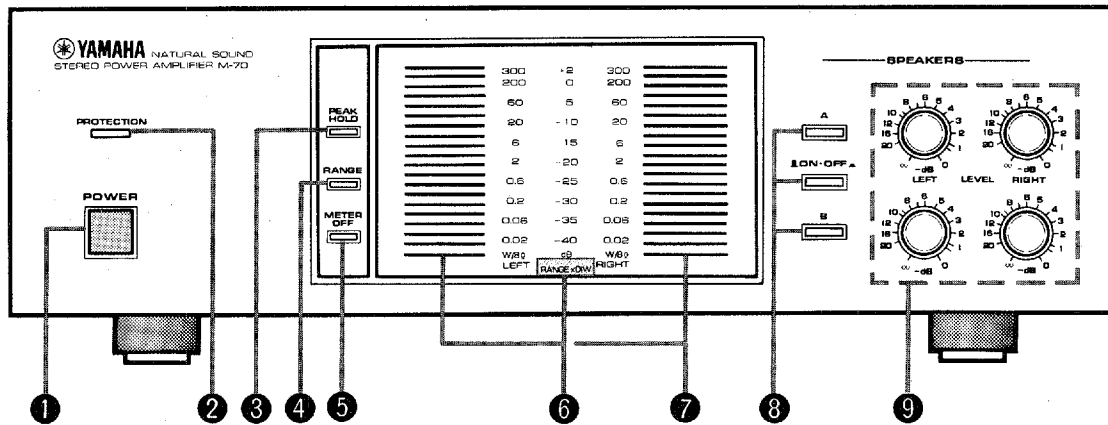
### LEFT SPEAKER RIGHT SPEAKER SPEAKER SYSTEM "B"

Power can be supplied to other components with a power consumption of up to 200 watts. This outlet is unswitched—it is unaffected by the position of the Power On/Off switch.

#### CONNECT TO AN AC POWER OUTLET

Because the peak current drawn by the M-70 when it is turned on or when the input signal is very large is several times the normal operating current, do not plug the M-70 into the AC outlet of your control amplifier.

- Make all connections securely. If connections are not secure, noise or loss of sound output may occur.
- When connecting the M-70 to a control amp, make sure that the power is turned OFF.



## FRONT PANEL PARTS AND FUNCTIONS

### 1 POWER SWITCH

Pushing this switch turns the power On, and the Power Switch lamp, Peak Power Indicator 7 and Protection Indicator 2 will light. Pushing the switch again shuts off the power.

- When turning the power On, be sure that the Volume control of the control amp is turned to the lowest position.
- In order to prevent sending a loud "pop" noise through the speakers when power is turned on, the built-in protection circuitry mutes all output signal for several seconds after power is turned on. While the Protection Indicator is lit, no signal is passed to the speakers.

### 2 PROTECTION INDICATOR

After the Power Switch is turned On, the Protection Indicator will light to inform you that the M-70's protection circuitry is operating. While this indicator is lit, output signal to the speakers is muted. The protection circuitry normally operates for several seconds after power is switched on, and ceases operation when the indicator is no longer lit.

- During operation of the M-70, should the Protection Indicator light and output signal be muted, disconnect the plug from the AC outlet at once and locate the cause.

### 3 PEAK HOLD SWITCH

When you push this button, peaks in output level as shown on the Peak Power Indicator 7 bar graphs are held giving you a clear, easy-to-read following of power peaks.

### 4 RANGE SELECTION SWITCH

When you push this button, the Range Indicator 6 lights, and the Peak Power Indicator level output reading (watts into 8 ohms) becomes a tenfold conversion of the numerical figures corresponding to the bar graphs. That is, when listening at low volume levels, the Range Selector Switch converts the output level indication on a 1/10 basis, so that a 20 watts peak power level reading actually indicates 2 watts of output. Pushing the button again returns the Peak Power Indicator to the normal operating scale.

### 5 METER OFF SWITCH

Pushing this button shuts off the Peak Power Indicators.

### 6 RANGE INDICATOR

This lights when the Range Selection Switch is pushed, indicating a range conversion of 1/10 on the Peak Power Indicator.

### 7 PEAK POWER INDICATORS

When the Power Switch is turned On, the Peak Power Indicator will light. The left and right bar-graph type indicators correspond to the left and right output channels, and indicate power output on a logarithmically compressed scale from 0.02W to 300W. Power output level readings are accurate based on an 8 ohms impedance load.

### 8 SPEAKER SELECTION SWITCHES

Pushing the top button selects Speakers A, and pushing the bottom button selects Speakers B. Both pairs of speakers can not be operated at the same time. Pushing the Speaker Off switch allows you to temporarily cancel the signal being passed to the speakers. (If the Protection Indicator is lit, no signal will be passed to the speakers regardless of the Speaker Selection Switch mode.)

### 9 SPEAKER LEVEL CONTROL

These controls give you independent L and R channel control over the output levels of both Speakers A and Speakers B. When turned fully to the right (0 dB), output level is unaffected. Attenuating the output level dial to the left allows you to independently regulate the output level of each channel of either speaker pair. This lets you compensate for different levels of efficiency between different pairs of speakers, change the effect by varying the output level between channels, and can serve as a protective measure by letting you attenuate output levels for speakers with less than full power handling capacity.

# M-70

## NOTES ON TECHNOLOGY

### ● ZDR (ZERO DISTORTION RULE AMPLIFIER)

The M-70 incorporates a revolutionary Yamaha circuit which completely eliminates distortion occurring in the final amplifier stage. This circuit consists of a distortion detector and a summing circuit. The real-time bridge detector monitors the input voltage, output voltage and output current of the final stage in real time, and detects any harmonic distortion, instantaneous changes in output or impending instabilities. Because the bridge elements are pure resistances, there is absolutely no distortion from this source. The bridge circuit is designed so that variations in load impedance have no effect on the detector, for extreme accuracy and stability.

The distortion detector compares the amplifier's output waveform with a reference waveform from the amplifier's input to generate a distortion waveform 180° out of phase with the distortion waveform of input signal. This is fed back and added into the amplifier in exactly the correct proportion to completely cancel distortion. This circuit is effective in eliminating most audible types of distortion (including crossover distortion, for example). Even the undesirable effects of back EMF from the speakers are eliminated, so the speakers are always working at 100% efficiency. The overall result is that you get extraordinarily clear, accurate music reproduction.

### ● X-POWER SUPPLY

The M-70 employs Yamaha's X-Power Supply, which controls the amount of power fed from the AC line to the power supply to precisely match the amount of power consumed by the amplifier at any given instant. Average music listening levels require only a small amount of power, and high-level musical peaks (which generally occur only about 2% of the time) require only momentary

high levels of power. Conventional power supplies maintain consistently high power levels at all times, much of which is wasted in the form of dissipated heat. The X-Power Supply, however, automatically feeds the appropriate amount of power from the AC line to the power supply so that only the amount of power required is processed, and all the processed power is consumed. Virtually no power is wasted in the form of heat.

This is a tremendous benefit in that delicate amplifier components won't deteriorate due to excessive heat, and the power supply is exceptionally stable—no dropouts in power during sudden demand will occur. All this means that the M-70 provides optimum performance at all times, for pure, natural music reproduction.

### ● X-POWER AMPLIFIER

The M-70 also employs Yamaha's X-Power Amplifier—power amplifier stage circuitry which supplies power to the music signal itself. In a way similar to that of the X-Power Supply, Yamaha's X-Power Amplifier adjusts the amount of power fed from the power supply to the power amplifier stage according to the level of the music signal.

In operation, the X-Power Supply provides two DC power lines to the X-Power Amplifier Stage—low power and high power. Sophisticated circuitry in the X-Power Amplifier stage then selects the appropriate power level according to the music requirements. During average music levels, only the low power level is supplied, so power waste through heat dissipation is avoided, and components are not exposed to potentially damaging excess heat. When a high level peak comes along, the X-Power Amplifier instantaneously switches to the high power level supply in order to accurately reproduce the larger music waveform. The X-Power Amplifier is "smart" enough so that it never switches power levels too soon or too late causing distortion of the music signal. It means that the M-70 is more efficient and more accurate in reproducing your music.

### ● LINEAR-TRANSFER BIAS CIRCUITRY

Crossover distortion—the result of a lack of uniform linearity in the devices used in a push-pull amp—is dramatically reduced in the M-70 with Yamaha's exclusive Linear-Transfer Bias Circuit.

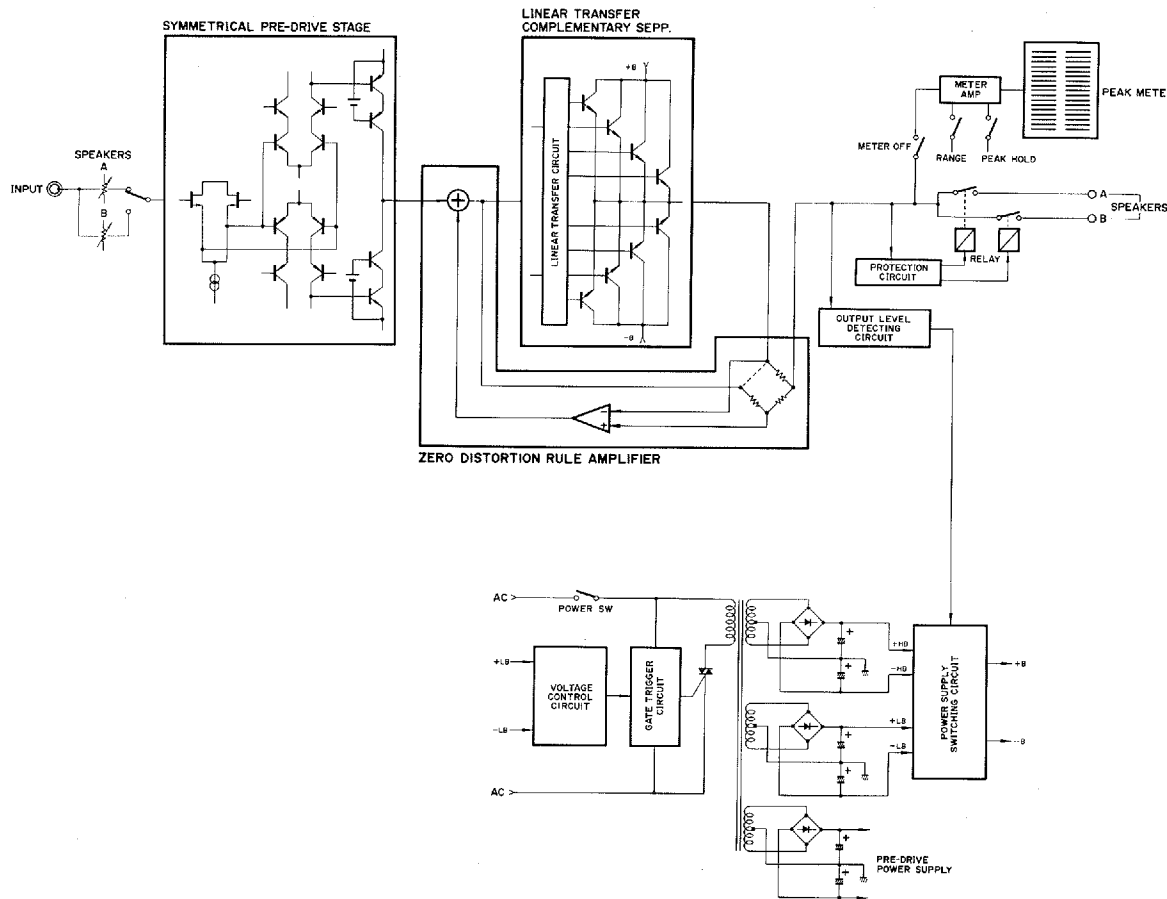
This circuitry biases the bipolar transistors such that the operating point of each transistor is slightly staggered, and the transistors' total transfer characteristic is converted to a square characteristic in the low-current region. The result is a perfectly linear composite transfer function which theoretically avoids crossover distortion entirely.

What this means is that the M-70, unlike ordinary push-pull type amplifiers, is dramatically free from crossover distortion, especially at low listening levels and in the high frequencies. Advanced circuitry like this enables the M-70 to achieve extraordinarily high performance.

### ● CASCODE PURE COMPLIMENTARY CIRCUITRY

The M-70 also employs special, advanced circuitry in the pre-driver stage—Cascode Pure Complimentary Differential Circuitry. This contributes to two main benefits in amplifier performance—an especially high slew rate, and extremely low overall amplification distortion. It's another reason why the M-70 provides exceptionally pure, natural music reproduction performance.

## BLOCK DIAGRAM



## SPECIFICATIONS

<b>Minimum RMS Output Power</b>	
8 $\Omega$ , 20Hz to 20kHz, . . . . .	200 W + 200 W (0.002% THD)
4 $\Omega$ , clipping power . . . . .	250 W + 250 W
<b>Total Harmonic Distortion</b>	
8 $\Omega$ , 1/2 rated power,	
20Hz . . . . .	0.0005%
1kHz . . . . .	0.0005%
20kHz . . . . .	0.001%
50kHz . . . . .	0.003%
100kHz . . . . .	0.006%
<b>IM Distortion Ratio</b>	
8 $\Omega$ , 1/2 rated power, . . . . .	0.002%
(50Hz : 7kHz = 4 : 1)	
<b>Slew Rate</b> . . . . .	200V/ $\mu$ sec.
<b>Power Bandwidth</b>	
8 $\Omega$ , 1/2 rated power, . . . . .	10Hz ~ 100kHz (0.006% THD)
<b>Damping Factor</b>	
8 $\Omega$ , 1kHz . . . . .	200
<b>Frequency Response</b>	
8 $\Omega$ . . . . .	DC--100kHz, -0.5dB
<b>Input Sensitivity/Impedance</b>	
8 $\Omega$ , 1/2 rated power, 1kHz . . .	1.41V/25k $\Omega$
<b>Signal-to-Noise Ratio</b>	
IHF A Network, 8 $\Omega$ , . . . . .	124dB
input shorted	
<b>Channel Separation</b>	
Input shorted	
20Hz . . . . .	100dB
1kHz . . . . .	95dB
20kHz . . . . .	70dB
<b>Power Supply</b> . . . . .	120V/60Hz
<b>Power Consumption</b> . . . . .	600W/1200VA
<b>Dimensions (W x H x D)</b> . . . . .	435 x 133 x 380mm (17-1/8"x5-1/4"x15")
<b>Weight</b> . . . . .	13.7kg (30.2 lbs)

Specifications subject to change without notice.

# M-70

## TROUBLESHOOTING

Before assuming that your amplifier is faulty, check the following troubleshooting list which details the corrective action you can take yourself without having to call a service engineer. If you have any doubts or questions, get in touch with your nearest Yamaha dealer.

Fault	Cause	Cure
Power is not supplied even though the Power switch is turned on.	The power plug is not securely plugged in.	Plug it in securely.
	A fuse is blown.	Consult your Yamaha dealer.
No sound is heard from one or both speakers.	The cords from the preamplifier to the M-70 are not connected securely.	Connect them securely.
	The speaker switch is turned off.	Turn the speaker switch A or B on.
	The balance control is rotated to the extreme left or right position on the control amplifier.	Turn the control amp's balance control to the center position.
The sound suddenly goes off. (The PROTECTION indicator is lit.)	The speaker protection circuit has activated because of DC flowing in the speaker circuit.	Turning the M-70 off and then on will reset the speaker protection circuit.
	The control amp is leaking DC into its output.	Use a control amp with no DC offset.
The sound suddenly goes off.	Driving speakers outside the rated impedance range at high power for an extended period has activated the speaker protection circuit.	Turning the M-70 off and then on will reset the speaker protection circuit. Use speakers inside the rated impedance range.
	There is a malfunction in the amplifier.	Consult your Yamaha dealer.
Unnatural bass with no ambience.	The speaker polarities are reversed.	Correct the speaker polarities.
A buzzing sound is heard from the M-70.	Sometimes vibrations are generated by the power transformer.	This does not indicate that there is any problem with the amplifier.