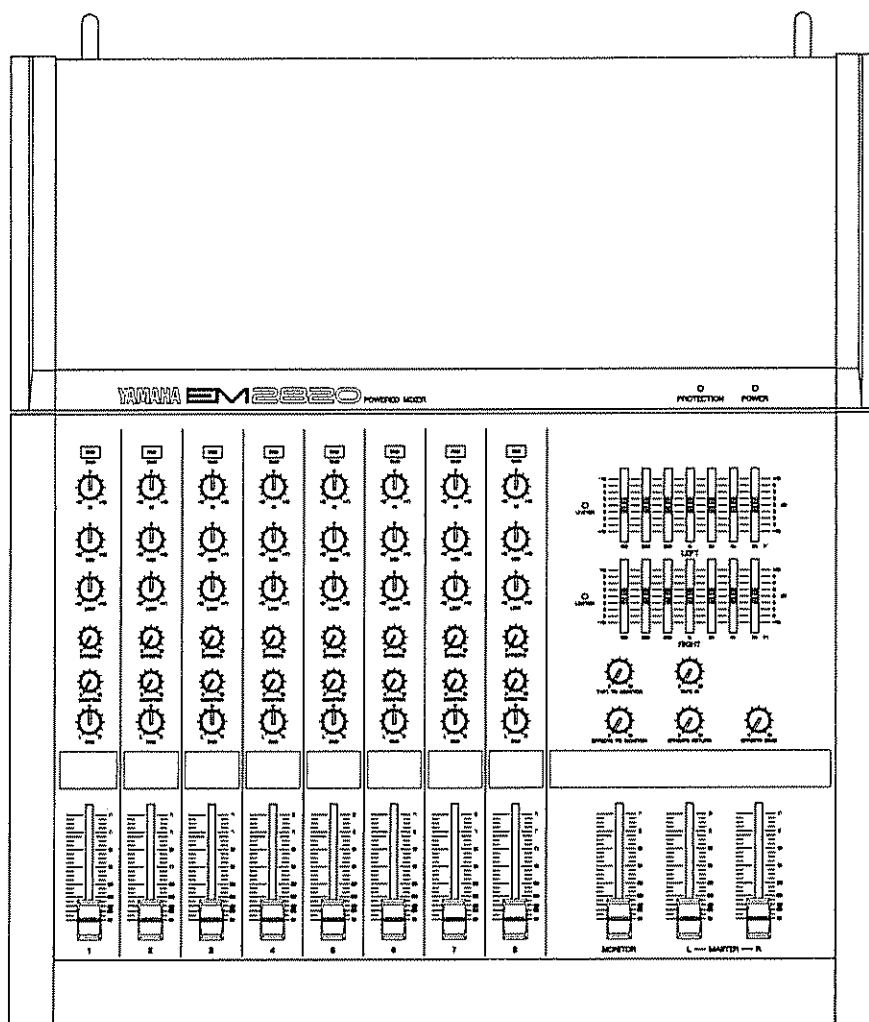


YAMAHA

POWERED MIXER
TABLES DE MIXAGE AMPLIFIEE
AKTIV-MISCHPULT

EM2820

OPERATION MANUAL
MODE D'EMPLOI
BEDIENUNGSANLEITUNG



With your purchase of the YAMAHA EM2820 Powered Mixer, you have entered into the fine world of advanced Yamaha powered mixer technology. The EM2820 represents a new level of refinement for stereo output mixers dedicated to superior performance in small to midsize PA and sound reinforcement applications. In addition to stereo output powered by a built-in 200 watt amplifier into 4 ohm loads, the EM1620 features three-band equalization on each one of the eight input channels, a left and right master seven-band graphic equalizer, and an internal limiter circuit that prevents distortion of the output signal. As a result, shaping channel signals and overall output mix is versatile, convenient, and safe. Input channels offer a choice of XLR-type or phone jack connectors, and stereo output can be easily configured with the accessible front panel controls and incorporation of external effects, speakers, and monitoring systems. A Phantom Master switch is also included to supply +48 V when needed for smooth integration of condenser microphones.

You can be assured of reliable performance day in and day out for even the most demanding applications. To fully benefit from the exceptional capabilities of your EM2820 Powered Mixer, please read this manual thoroughly and keep it in a safe place for future reference.

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PRECAUTIONS

1. Avoid Excessive Heat, Humidity, Dust and Vibration

Keep the unit away from locations where it is likely to be exposed to high temperatures or humidity — such as near radiators, stoves, etc. Also avoid locations which are subject to excessive dust accumulation or vibration which could cause mechanical damage.

2. Avoid Physical Shocks

Strong physical shocks to the unit can cause damage. Handle it with care.

3. Do Not Open The Case Or Attempt Repairs Or Modifications Yourself

This product contains no user-serviceable parts. Refer all maintenance to qualified Yamaha service personnel. Opening the case and/or tampering with the internal circuitry will void the warranty.

4. Make Sure Power Is Off Before Making Or Removing Connections

Always turn the power OFF prior to connecting or disconnecting cables. This is important to prevent damage to the unit itself as well as other connected equipment.

5. Handle Cables Carefully

Always plug and unplug cables — including the AC cord — by gripping the connector, not the cord.

6. Clean With a Soft Dry Cloth

Never use solvents such as benzine or thinner to clean the unit. Wipe clean with a soft, dry cloth.

7. Always Use the Correct Power Supply

Make sure that the power supply voltage specified on the rear panel matches your local AC mains supply. Also make sure that the AC mains supply can deliver more than enough current to handle all equipment used in your system.

Dette apparat overholder det gældende EF-direktiv vedrørende radiostøj

Cet appareil est conforme aux prescriptions de la directive communautaire 87/308/CEE

Diese Geräte entsprechen der EG-Richtlinie 82/499/EWG und/oder 87/308/EWG

This product complies with the radio frequency interference requirements of the Council Directive 82/499/EEC and/or 87/308/EEC

Questo apparecchio è conforme al D M 13 aprile 1989 (Direttiva CEE/87/308) sulla soppressione dei radiodisturbi

Este producto está de acuerdo con los requisitos sobre interferencias de radio frecuencia fijados por el Consejo Directivo 87/308/CEE

YAMAHA CORPORATION

IMPORTANT NOTICE FOR THE UNITED KINGDOM

Connecting the Plug and Cord

WARNING : THIS APPARATUS MUST BE EARTHED

IMPORTANT: The wires in this mains lead are coloured in accordance with the following code:

GREEN-AND-YELLOW	: EARTH
BLUE	: NEUTRAL
BROWN	: LIVE

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug proceed as follows:

The wire which is coloured GREEN-AND-YELLOW must be connected to the terminal in the plug which is marked by the letter E or by the safety earth symbol \perp or coloured GREEN or GREEN-AND-YELLOW.

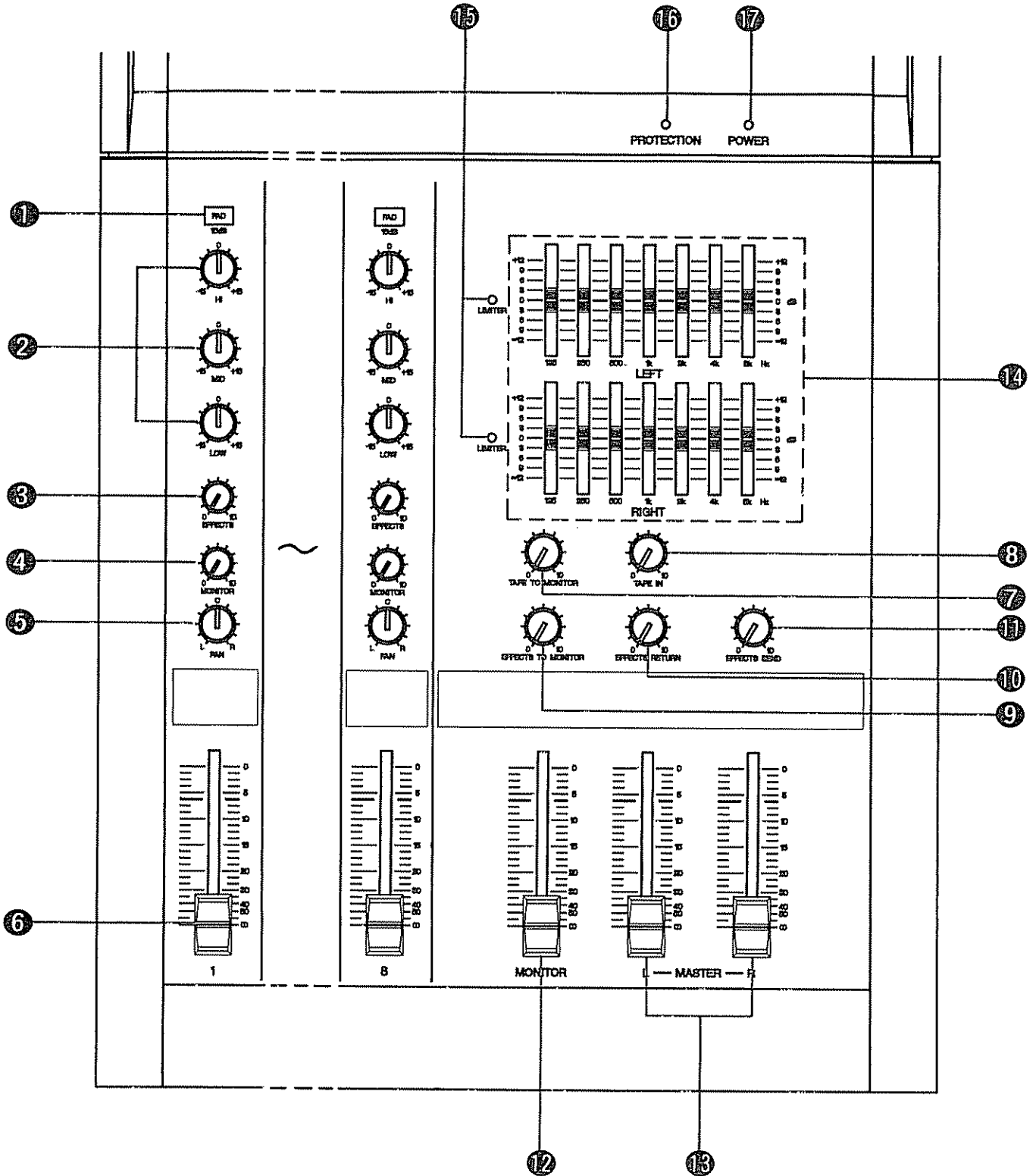
The wire which is coloured BLUE must be connected to the terminal which is marked with the letter N or coloured BLACK.

The wire which is coloured BROWN must be connected to the terminal which is marked with the letter L or coloured RED.

* This applies only to products distributed by YAMAHA - KEMBLE MUSIC (U K) LTD

OPERATION

FRONT PANEL CONTROLS



INPUT CHANNELS

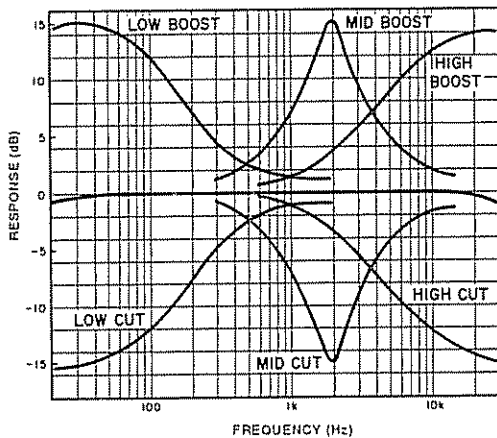
① PAD switch

This switch attenuates the signal applied to the corresponding channel input by 15 dB prior to the head amplifier. The 15 dB switch effectively increase the range of input signal levels that can be handled by the mixer, preventing overloading of the input circuitry when receiving high-level signals. The pad is ON when the 15 dB switch is in the (lower) position.

② HIGH, MID and LOW EQUALIZER controls

These three controls permit selective modification of the frequency response for each channel. The HIGH, MID, and LOW EQUALIZER controls have the following characteristics:

Control	Range	Freq.	Control
HIGH	±15 dB	10 kHz	Shelving
MID	±15 dB	2 kHz	Peaking
LOW	±15 dB	100 Hz	Shelving



③ EFFECTS control

The EFFECTS control determines the level of the signal sent from the corresponding channel to the EFFECTS mixing bus. At the bus, the EFFECTS signals from all channels are mixed and fed to the EFFECTS SEND control and the rear panel EFF SEND jack. The EFFECTS control configuration is factory preset to post-EQUALIZER/post-VOLUME. As a result, the EFFECTS signal is directly dependent on the settings of the channel EQUALIZER and VOLUME controls.

④ MONITOR control

The MONITOR control determines the level of the signal sent from the corresponding channel to the MONITOR mixing bus. At the bus, the MONITOR signals from all channels are mixed and fed to the master MONITOR control and the rear panel MON OUT jack. The MONITOR control configuration is factory preset to pre-EQUALIZER/pre VOLUME. As a result, the MONITOR signal is independent of the settings of the channel EQUALIZER and VOLUME controls.

⑤ PAN control

The PAN control determines the position in the stereo sound field at which the sound from that channel is heard. Rotated fully counterclockwise the channel signal will be delivered from the left output only, and will be heard at the far left of the stereo sound field. If the PAN control is turned fully clockwise, the sound from that channel will appear at the far right of the stereo sound field. If the PAN control is set at its center position, the channel signal will be sent equally to both the left and right channels, causing the sound to appear at the center of the sound field. Intermediate PAN control settings cause the sound to be heard at the corresponding position.

⑥ Channel fader

This is the main level control for each input channel. The setting of the fader control determines the level of the channel signal in the overall master stereo output signal. As a precaution, if the channel is not being used, the fader control should be set to the lowest level to prevent unwanted noise from being added to the main signal.

Master Control Section

⑦ TAPE TO MONITOR control

The TAPE TO MONITOR control adjusts the level of the signal received from the rear panel TAPE IN inputs (RCA pin jacks TAPE IN R and L).

The adjusted signal is then fed to the master MONITOR control and the rear panel MON OUT jack. The TAPE TO MONITOR control selectively determines the output level of tape recorders or other such devices in the MON OUT signal.

⑧ TAPE IN control

The TAPE IN control regulates the level of the signal sent from rear panel TAPE IN inputs. The regulated signal is then added to the SP OUT, REC OUT, and LINE OUT signals. The TAPE IN control sets the output level of tape recorders or other such devices in the main program signal.

When recording from the REC OUT jacks, this control must be set at a minimum to avoid electronic feedback. As a result, recording and playback cannot be accomplished at the same time with one tape machine.

⑨ EFFECTS TO MONITOR control

The EFFECTS TO MONITOR control adjusts the level of the combined signal received from the rear panel EFF RTN inputs (1/4" phone jacks EFF RTN R and L) before the signal is fed to the rear panel MON OUT jack. The EFFECTS TO MONITOR control selectively determines the output level of external effects in the MON OUT signal.

⑩ EFFECTS RETURN control

The EFFECTS RETURN control regulates the level of the combined signal sent from the rear panel EFF RTN inputs. The regulated signal is then added to the main program signal. The EFFECTS RETURN control sets the output level of external effects in the main program signal.

⑪ EFFECTS SEND control

This control adjusts the output level of the overall mix derived from the input channel EFFECTS controls and feeds the signal to the rear panel EFF SEND jack. The EFFECTS SEND control should be used to optimally match the mixer EFF SEND output level to the input sensitivity of the connected external effect or signal processor.

⑫ MONITOR fader

The independent monitor bus features a master MONITOR control for adjustment of the overall monitoring level. This control adjusts the output level of the overall mix derived from the input channel MONITOR controls and feeds the signal to the rear panel MON OUT jack.

⑬ STEREO L and R MASTER faders

The output level of the main program signal is regulated by the MASTER faders. The regulated signal is fed directly to the rear panel LINE OUT L and R jacks and via the graphic equalizer to the rear panel SP OUT L and R jacks.

⑭ Graphic Equalizers

For precise response shaping of the SP OUT signals, the seven-band graphic equalizers provides 12 dB of boost or cut in each band. There are seven independent linear controls at the standard ISO center frequencies of 125, 250, 500, 1k, 2k, 4k, and 8k Hz peaking.

⑮ LIMITER indicator

The EM2820 is equipped with a limiter circuit which limits the maximum level of the signal at SP OUT L and R to prevent the signal from distorting. The LIMITER indicator is lit when the limiter circuit is activated.

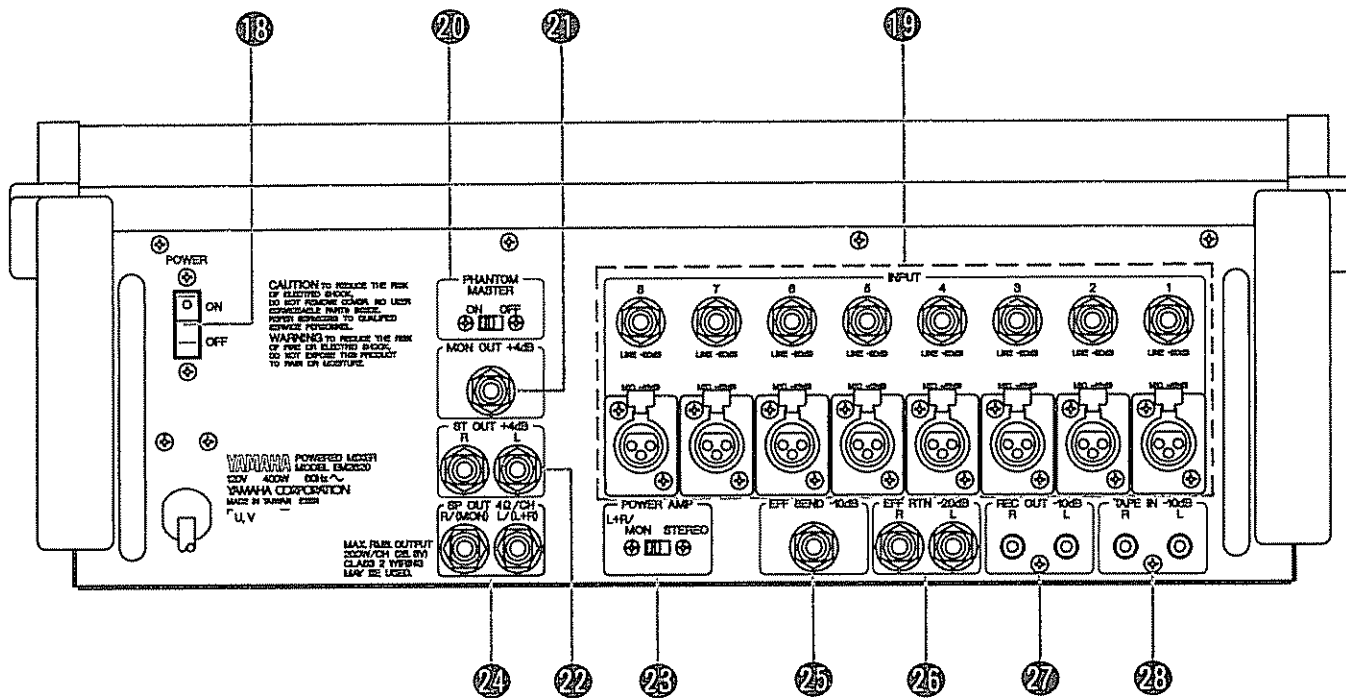
⑯ PROTECTION indicator

The PROTECTION indicator lights for approximately 6 seconds after the POWER switch is pressed to indicate that the protection circuitry is operating. No sound is output at SP OUT L and R while this indicator is lit. This indicator will also light and the sound will be cut off at SP OUT L and R when the protection circuitry is activated at any other time during the amplifier operation due to factors such as a detection of excessive DC voltage at SP OUT or a thermal overload. When the problem is corrected, the protection circuitry is automatically deactivated, the indicator goes out, and the amplifier resumes normal operation.

⑰ POWER ON/OFF indicator

When the power is ON (—), the POWER indicator LED will be lit.

REAR PANEL



18 POWER ON/OFF switch

The power switch turns the power ON or OFF. It is recommended that all fader controls be set to their lowest levels before the power is switched ON. This will prevent sudden power surges to any external equipment.

19 LINE and MIC INPUT connectors

Each input channel offers a choice of two input connectors: a MIC IN connector, a balanced 4 kohm impedance XLR-3-31 connector; and a LINE IN connector, an unbalanced 10 kohm impedance 1/4" phone jack. The MIC connectors are primarily intended for use with professional low-impedance microphones or electronic instruments having low-impedance balanced outputs. The LINE connectors will accept unbalanced signals from musical instruments or other such source equipment.

20 PHANTOM MASTER switch

This switch applies built-in standard +48 V power to all MIC (XLR) input connectors for biasing Phantom powered condenser microphones.

MICROPHONE CABLES AND MICROPHONES CONNECTION

TO PREVENT HAZARD OR DAMAGE, ENSURE THAT ONLY MICROPHONE CABLES AND MICROPHONES DESIGNED TO THE IEC268-15A STANDARD ARE CONNECTED.

21 MON OUT jack

This mono 1/4" phone jack (unbalanced) delivers the monitor output. This output can be used to feed the external monitor system. The output impedance is 150 ohms and the nominal output level is +4 dB. This signal is not amplified.

22 ST OUT L and R jacks

The EM2820 is equipped with unbalanced 1/4" phone jacks which deliver a stereo mix of the input channel signals. The ST OUT signal can be used to drive a power amplifier and speaker system, powered keyboard speakers, or a main mixing console. Nominal output level/load impedance for the phone jack outputs is +4 dB/10 k-ohms.

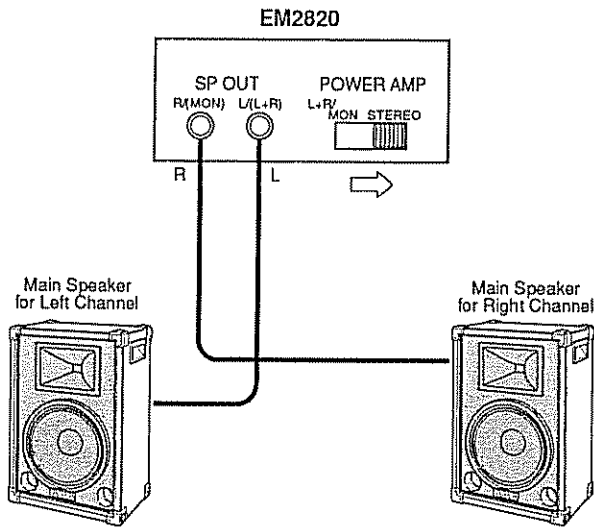
23 POWER AMP mode switch

The POWER AMP switch changes the mode of the SP OUT signals. When the switch is in the STEREO position, the SP OUT L and R jacks deliver stereo signal output with 200 watt amplification into 4 ohm loads. When the switch is set to the MON (MONITOR) position, the SP OUT L jack delivers an amplified monaural L+R signal. The SP OUT R jack provides an amplified +4 dB MON signal with 150 ohm impedance. (Amplification is 200 watt into 4 ohm loads.)

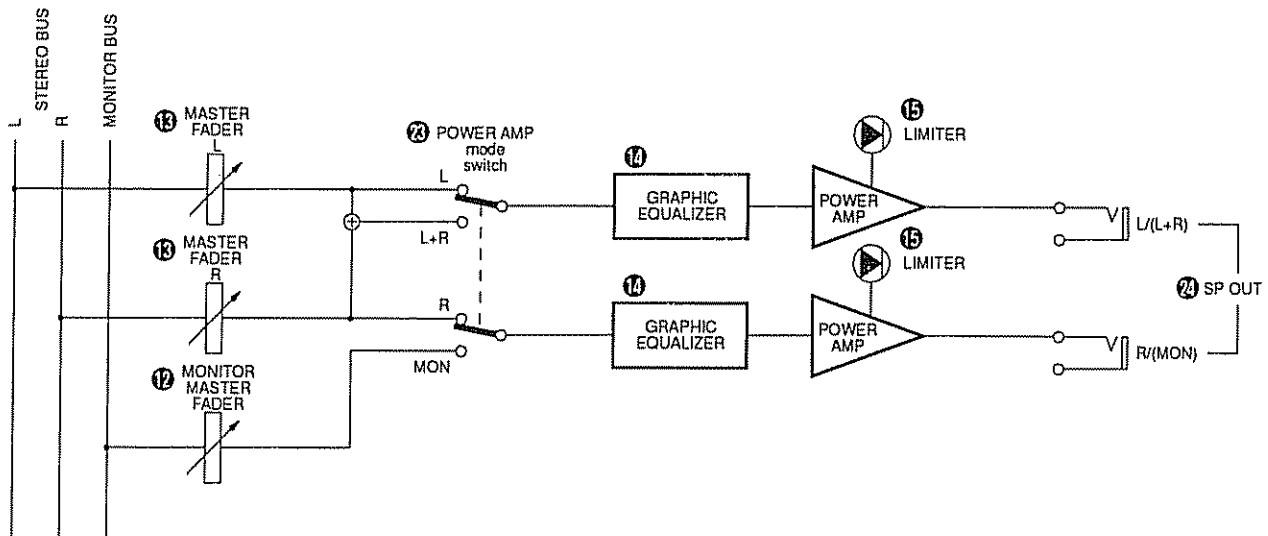
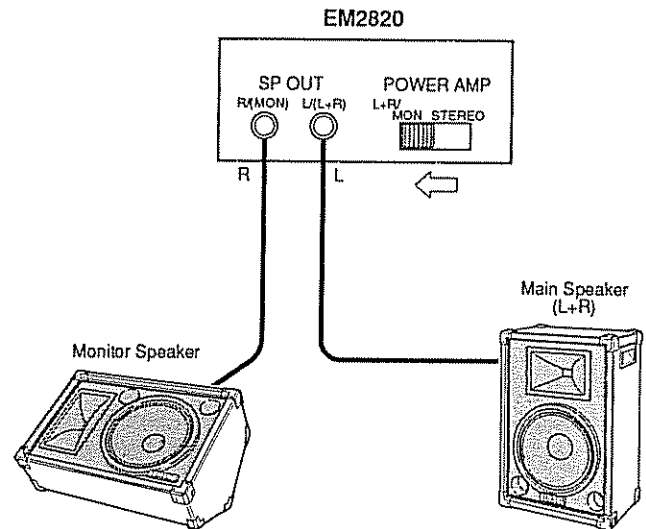
24 SP OUT L and R jacks

SP OUT 1 and SP OUT 2 are standard mono 1/4" phone jacks. The jacks are wired in parallel and, as a result, if you connect a speaker system to only one of the two jacks, then the total load impedance of the speaker system may be no less than 4 ohms. If you plug speaker systems into both of the SP OUT jacks, the total load impedance of each speaker system must be no less than 8 ohms.

STEREO mode



L+R/MON mode



②⑤ **EFF SEND jack**

The signal adjusted by the EFFECTS SEND control is delivered to this 1/4" phone jack (unbalanced). Its output impedance is 150 ohms and the nominal output level is -10 dB.

②⑥ **EFF RTN jacks**

The output from an external signal processing device fed by the EFF SEND output can be returned to the main program and monitor signals via the EFF RTN jacks. These 1/4" phone jacks (unbalanced) have an input impedance of 10 kohms and a -20 dB nominal input level.

②⑦ **REC OUT jacks**

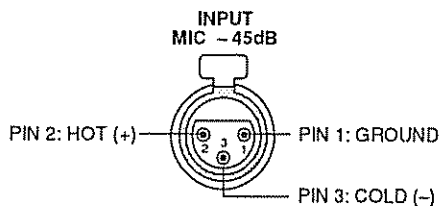
The REC OUT RCA pin jacks deliver a -10 dB line-level signal which has not been affected by the MASTER level control. The REC OUT signals can be fed to a tape or cassette recorder for convenient recording of the main program. The jacks have an output impedance of 600 ohms.

②⑧ **TAPE IN jacks**

These -10 dB RCA pin jack inputs are ideal for receiving the signals from tape recorders or any other line-level sources. The TAPE IN jacks have an input impedance of 10 kohms.

OPERATING TIPS

CONNECTING SOURCES



- * MAKE SURE THE MIXER'S POWER SWITCH IS OFF WHEN CONNECTING OR DISCONNECTING ANY CABLES.
- * ALWAYS TURN THE MIXER'S POWER ON AFTER TURNING ON CONNECTED SOURCES SUCH AS ELECTRONIC INSTRUMENTS, ETC.

CONNECTING SPEAKERS

The EM2820 powered mixers have two 1/4" phone jack speaker outputs which are internally connected in parallel. This place some restrictions on their use.

- * IF YOU CONNECT SPEAKER SYSTEMS TO ONLY ONE OF THE AVAILABLE SPEAKER OUTPUTS, THE TOTAL IMPEDANCE OF THE CONNECTED SPEAKER SYSTEM MAY BE NO LESS THAN 4 OHMS.
- * IF YOU CONNECT SPEAKER SYSTEMS TO BOTH OF THE AVAILABLE SPEAKER OUTPUTS, THE TOTAL IMPEDANCE OF THE SPEAKER SYSTEM CONNECTED TO EACH OUTPUT MAY BE NO LESS THAN 8 OHMS (equalling a total of 4 ohms).

While a higher total load impedance than the recommended impedance will only result in a loss of power output, a total load impedance that is too low can actually damage the powered mixer. With a total load impedance of 8 ohms, the maximum output power of EM2820 mixers is 120 watts. With a total load impedance of 4 ohms, maximum output power is 200 watts.

- * NEVER CONNECT OR DISCONNECT SPEAKERS WHILE THE MIXER'S POWER IS TURNED ON!!

SOUND LEVEL BALANCE AND CONTROL

Before turning ON the mixer AC power switch, connect all inputs, outputs, and speakers, and be sure the monitor control is at "0". If other electronic equipment or electronic instruments are connected to the inputs of the EM2820, turn ON that equipment before turning on the mixer. This will not only avoid annoying hum, it will also prevent power-on transients from damaging speakers or other equipment.

To obtain a good S/N ratio with little noise and wide dynamic range, it is important to establish a proper balance between each channel fader control and the MASTER control. Generally speaking, to set the volume of the signals at SP OUT and to obtain a good S/N ratio, the channel fader control should be set as high as possible and the MASTER fader controls should be set low. However, if the channel fader is set too high, the signal will clip, and the sound will become distorted.

Initially, set the channel fader to "0", and the MASTER fader controls to about "3". Increase channel sensitivities one at a time until the desired mix balance is achieved; the fader of the channel with the lowest signal level should be set somewhere between "8" and "9". At this point, if the overall sensitivity is too high or too low, readjust the MASTER faders accordingly.

The same considerations apply to the MONITOR output. Although the LIMITER circuitry is capable of handling reasonable signal overranges without distortion, excessively large power signals will be distorted. The best policy for stable signal output is to keep the signal turned down to avoid situations that activate the limiter circuitry.

CHANNEL EQ

The HIGH, MID and LOW equalization controls on each channel of the mixer make it possible to independently equalize the channel signals to some degree. The basic rule of thumb is that equalization should NOT be used unless it is absolutely necessary. Always put some effort into proper microphone selection, careful microphone placement, and/or setting of source instrument controls to achieve the desired sound before resorting to equalization. When you've set everything up as best you can, but still need to modify a sound, then go ahead and equalize. Channel EQ can be most useful in tonally separating one sound from another or from a group.

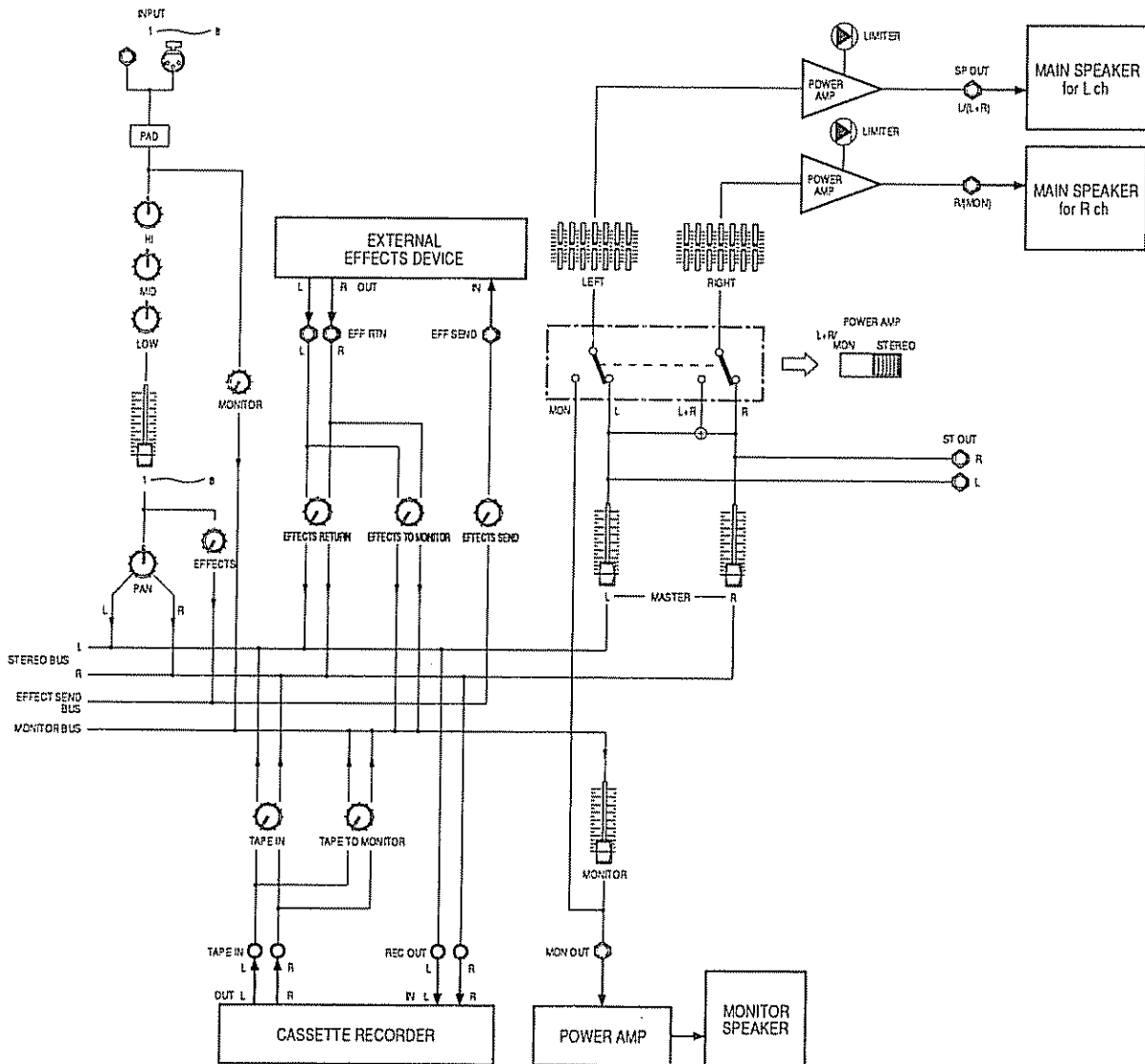
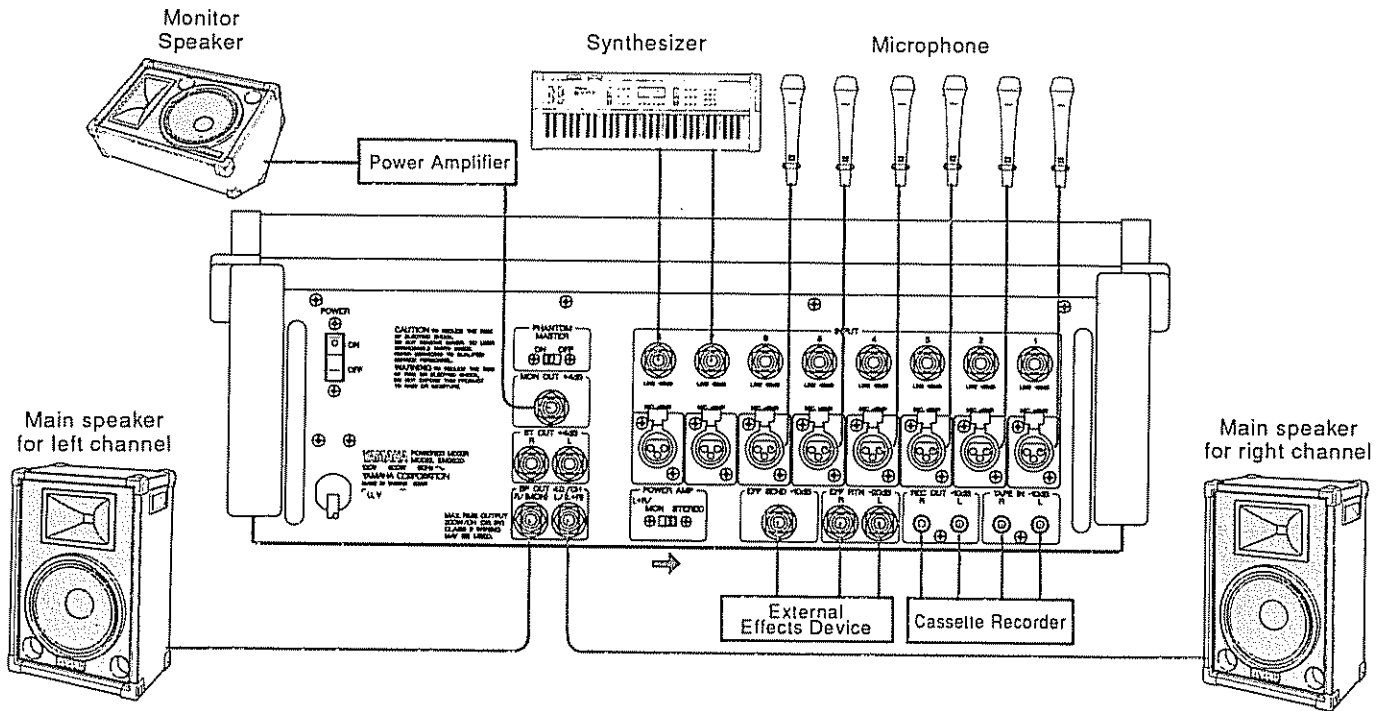
A bit of extra HIGH EQ added to a guitar sound, for example, can give it a bit more "bite" and help it to stand out more clearly from the background. Vocals tend to stand out nicely if given a bit of boost in the MIDDLE range. Speech generally benefits from a reduction in the low frequencies—to prevent that "boomy" sound that occurs when the speaker gets too close to the microphone. Experimentation and experience will tell you how much EQ is right for different types of sound.

GRAPHIC EQUALIZATION

Graphic equalization has two main uses in powered mixers like the EM2820: compensation for acoustic deficiencies in the listening area; and feedback control. Like the channel equalizers, the graphic equalizer should be left alone unless it is absolutely necessary. The more equalization you use, the more phase deviation you introduce into the program signal, and this can result in an unnatural sound. There are many instances, however, in which the listening area itself causes response anomalies due to its acoustic characteristics. Large areas of uncovered glass or tiled floors, for example, are extremely effective reflectors of high-frequency sound. Sound produced in environments like this can sound painfully sharp, and some reduction in the high frequency range may be called for. Smaller symmetrical rooms (a square room being the worst case) can actually have resonant frequencies within the audible low-frequency range. A bit of reduction in the low frequencies can help to make the sound more intelligible. Note that in almost all cases good equalization practice demands a cut in the offending frequency range rather than a boost in ranges where response is lacking.

The graphic equalizer can also be used—although to a limited degree—for feedback control. Proper microphone placement is the primary tool for prevention of feedback, but this can be extremely difficult if you're working in a tight stage area. Simply cut response in the frequency range where the feedback is occurring (this will have to be found by experimentation). This will compromise the overall frequency response of the program, but it's better than facing the possibility of squealing feedback in the middle of an important performance.

A BASIC SYSTEM



GENERAL SPECIFICATIONS

MAXIMUM OUTPUT POWER

200 W + 200 W @ 4 ohms 0.5 % (THD) at 1 kHz
120 W + 120 W @ 8 ohms 0.5 % (THD) at 1 kHz

MAXIMUM OUTPUT LEVEL

+ 20 dB (MON OUT) @ 600 ohms 0.5 % at 1 kHz
+ 20 dB (EFF SEND) @ 10 kohms 0.5 % at 1 kHz

TOTAL HARMONIC DISTORTION (CH fader at nominal level)

Less than 0.3 % 20 Hz — 20 kHz @ 100 W/4 ohms
(MIC IN to SP OUT)
Less than 0.2 % 20 Hz — 20 kHz @ + 4 dB/600 ohms
(MIC IN to ST OUT, MON OUT)

FREQUENCY RESPONSE

+ 1, - 3 dB 20 Hz — 20 kHz @ 1 W/8 ohms (SP OUT)
+ 1, - 3 dB 20 Hz — 20 kHz @ + 4 dB/600 ohms (ST OUT)

HUM & NOISE (20 Hz — 20 kHz) $R_s = 150$ ohms, Input PAD = 0 dB (Input sensitivity = -45 dB)

- 117 dB Equivalent Input Noise

- 70 dB Residual output noise (SP OUT)
- 97 dB Residual output noise (ST OUT/MON OUT)
- 105 dB Residual output noise (EFF SEND)

- 77 dB (81 dB S/N) ST OUT
Master fader at maximum level and all CH faders at minimum level.
- 71 dB (75 dB S/N) ST OUT
Master fader at nominal level and one CH fader at nominal level.

- 77 dB (81 dB S/N) MON OUT
Master fader at maximum level and all CH MONITOR level controls at minimum level.
- 71 dB (75 dB S/N) MON OUT
Master fader at nominal level and one CH MONITOR level control at nominal level

- 93 dB (83 dB S/N) EFF SEND
Master level control at maximum level and all CH EFF SEND level controls at minimum level
- 85 dB (75 dB S/N) EFF SEND
Master level control at nominal level and one CH EFF SEND level control at nominal level

CROSSTALK (at 1 kHz)

60 dB adjacent input channels
60 dB input to output

MAXIMUM VOLTAGE GAIN

82 dB MIC IN to SP OUT
55 dB MIC IN to ST OUT
41 dB MIC IN to REC OUT
55 dB MIC IN to MON OUT
47 dB MIC IN to EFF SEND
30 dB LINE IN to ST OUT
30 dB EFF RTN to ST OUT
30 dB EFF RTN to MON OUT
20 dB TAPE IN to ST OUT
20 dB TAPE IN to MON OUT
76 dB MIC IN to SP OUT(L)
@ Power amp select: L+R/MON

INPUT CHANNEL EQUALIZATION

± 15 dB maximum boost or cut in each of three bands
HIGH : 10 kHz shelving
MIDDLE : 2 kHz peaking
LOW : 100 Hz shelving

GRAPHIC EQUALIZATION

± 12 dB maximum boost or cut in each of seven bands
125, 250, 500Hz, 1 k, 2 k, 4 k, 8 kHz : peaking

LIMITER

Input overload : 15 dB

INDICATOR LEDS

POWER	Red LED is lit when power is "ON"
PROTECTION	Red LED is lit when protection circuitry is activated
LIMITER	Red LED is lit when limiter circuitry is activated

PROTECTION CIRCUIT

Power on mute	6 ± 2 sec Muting time
DC sense	DC ± 2 V Output shut off
PC limiter	less than 2 ohms @ Load impedance

PHANTOM POWER

+ 48 Vdc is applied to electrically balanced XLR inputs (via 6.8 kohms current limiting/isolation resistors) for Phantom powered condenser microphones

POWER REQUIREMENTS

UL/CSA model	120 V AC 60 Hz
General model	230/240 V AC 50/60 Hz

POWER CONSUMPTIONS

UL/CSA model	400 W (450 VA)
General model	400 W

DIMENSIONS (W x H x D)

500 x 172 x 550 mm (19-11/16" x 6-3/4" x 21-5/8")

WEIGHT

19.5 kg (43 lbs)

-
- * 0 dB = 0.775 Vrms
 - * Specifications and appearance subject to change without notice

INPUT CHARACTERISTICS

Input Terminals			Actual Load Impedance	For Use With Nominal	Input Level			Connector In Mixer
					Sensitivity	Nominal	Max. before clip	
CH Input (1 — 8)	MIC IN	OFF	4 kohms	50 — 600 ohms Mics	- 51 dB (2.18 mV)	- 45 dB (4.36 mV)	- 15 dB (138 mV)	XLR-3-31 type
		ON			- 36 dB (12.3 mV)	- 30 dB (24.5 mV)	- 5 dB (436 mV)	
	LINE IN	OFF	10 kohms	600 ohms Lines	- 26 dB (38.8 mV)	- 20 dB (77.5 mV)	+ 10 dB (2.45 V)	Phone Jack
		ON			- 11 dB (218 mV)	- 5 dB (436 mV)	+ 20 dB (7.75 V)	
EFFECTS RETURN (L, R)			10 kohms	600 ohms Lines	- 26 dB (38.8 mV)	- 20 dB (77.5 mV)	+ 10 dB (2.45 V)	Phone Jack
TAPE IN (L, R)			10 kohms	600 ohms Lines	- 16 dB (123 mV)	- 10 dB (245 mV)	+ 15 dB (4.36 V)	RCA Pin Jack

- (1) Sensitivity is the lowest level that will produce a full power output, or the nominal output level when the unit is set to maximum gain.
- (2) XLR-type connectors are balanced; Phone Jacks and RCA Pin Jacks are unbalanced.
- (3) In these specifications, when dB represents a specific voltage, 0 dB is referenced to 0.775 Vrms.

OUTPUT CHARACTERISTICS

Output Terminals	Actual Source Impedance	For Use With Nominal	Output Level		Connector In Mixer
			Nominal	Maximum	
SPEAKER OUT (L, R)	0.08 ohms	4 ohms speakers	200 W	200 W	Phone Jack
		8 ohms speakers	120 W	120 W	
ST OUT (L, R)	150 ohms	600 ohm lines	+ 4 dB (1.23 V)		Phone Jack
MONITOR OUT	150 ohms	600 ohm lines	+ 4 dB (1.23 V)	+ 20 dB (7.75 V)	Phone Jack
EFFECTS SEND	150 ohms	10 kohm lines	- 10 dB (245 mV)	+ 20 dB (7.75 V)	Phone Jack
REC OUT (L, R)	600 ohms	10 kohm lines	- 10 dB (245 mV)	+ 20 dB (7.75 V)	RCA Pin Jack

- (1) All connectors are unbalanced.
- (2) In these specifications, when dB represents a specific voltage, 0 dB is referenced to 0.775 Vrms.

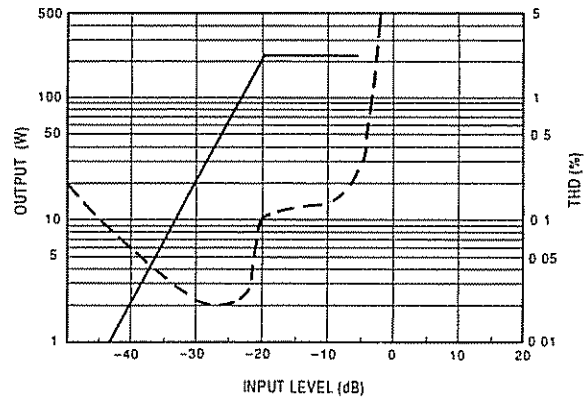
LIMITER OPERATION

The LIMITER protection circuitry is activated when the maximum power rating of the SP OUT signal (i.e., 200W into 4 ohm loads) is exceeded. The LIMITER is effective to 15 dB overrange. When the signal is less than 15 dB overrange, the LIMITER activates and the output signal is sent to SP OUT with minimal distortion. However, when the power of the input signal is greater than 15 dB overrange, the LIMITER is no longer as effective and the signal delivered to SP OUT will become distorted.

INPUT - OUTPUT (LIMITER) RESPONSE

INPUT - THD (LIMITER) RESPONSE

INPUT(-20 dB, $R_s=600\Omega$) — SP OUT(4 Ω)
 GEQ: flat
 CH VOLUME and MASTER volume: Max
 Frequency: 1 kHz

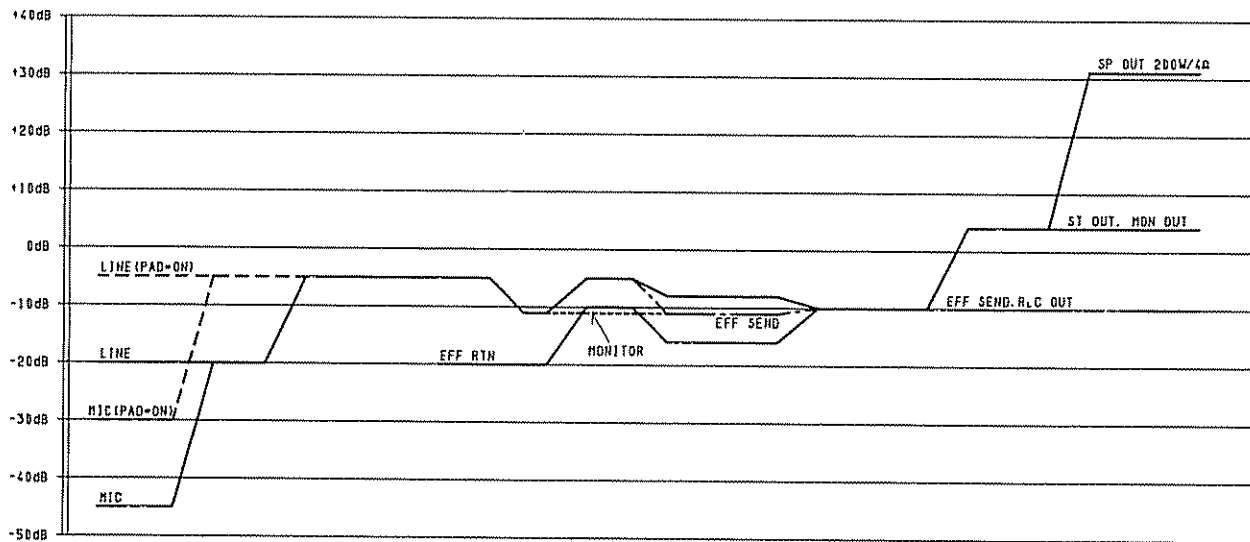
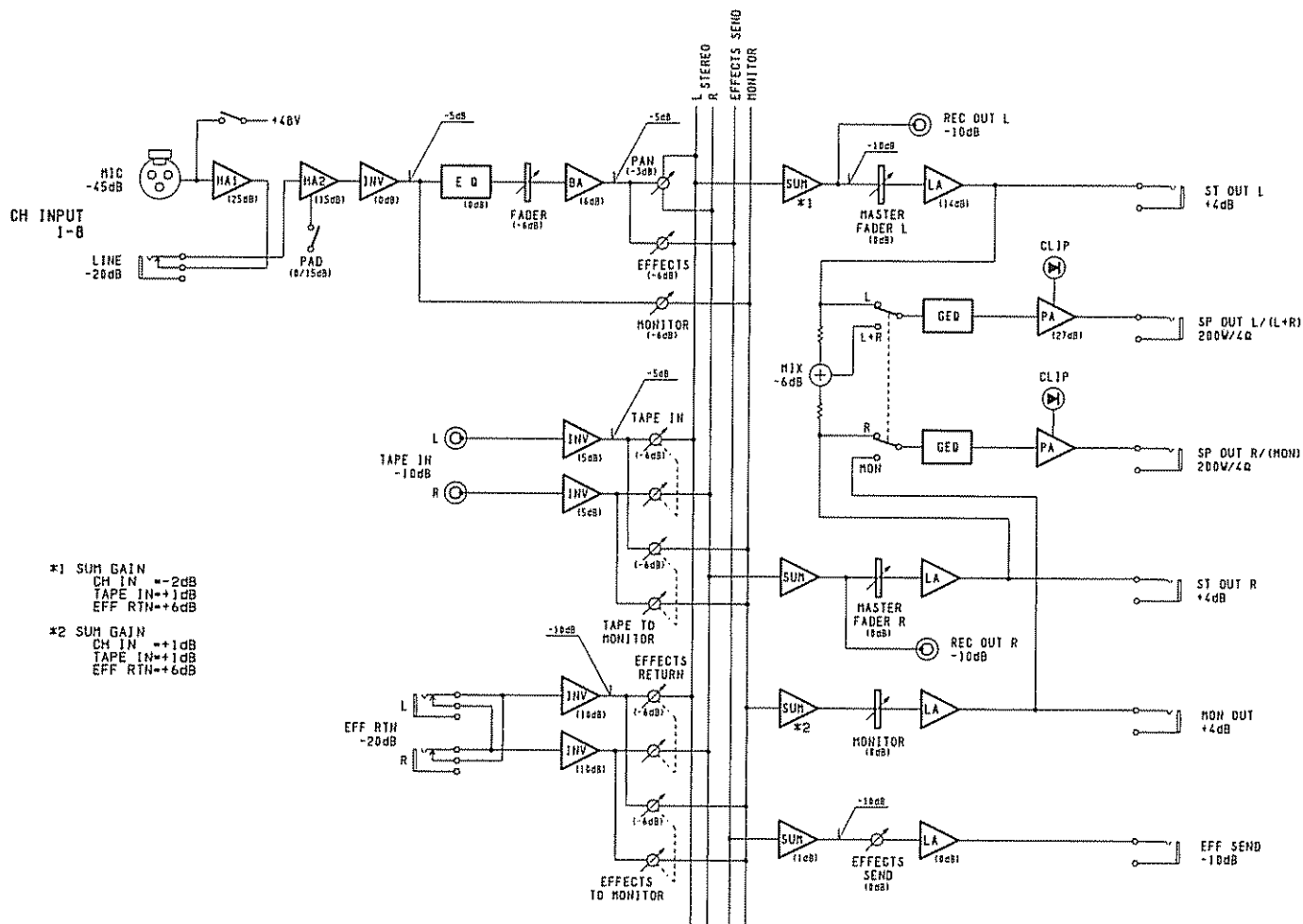


TROUBLESHOOTING

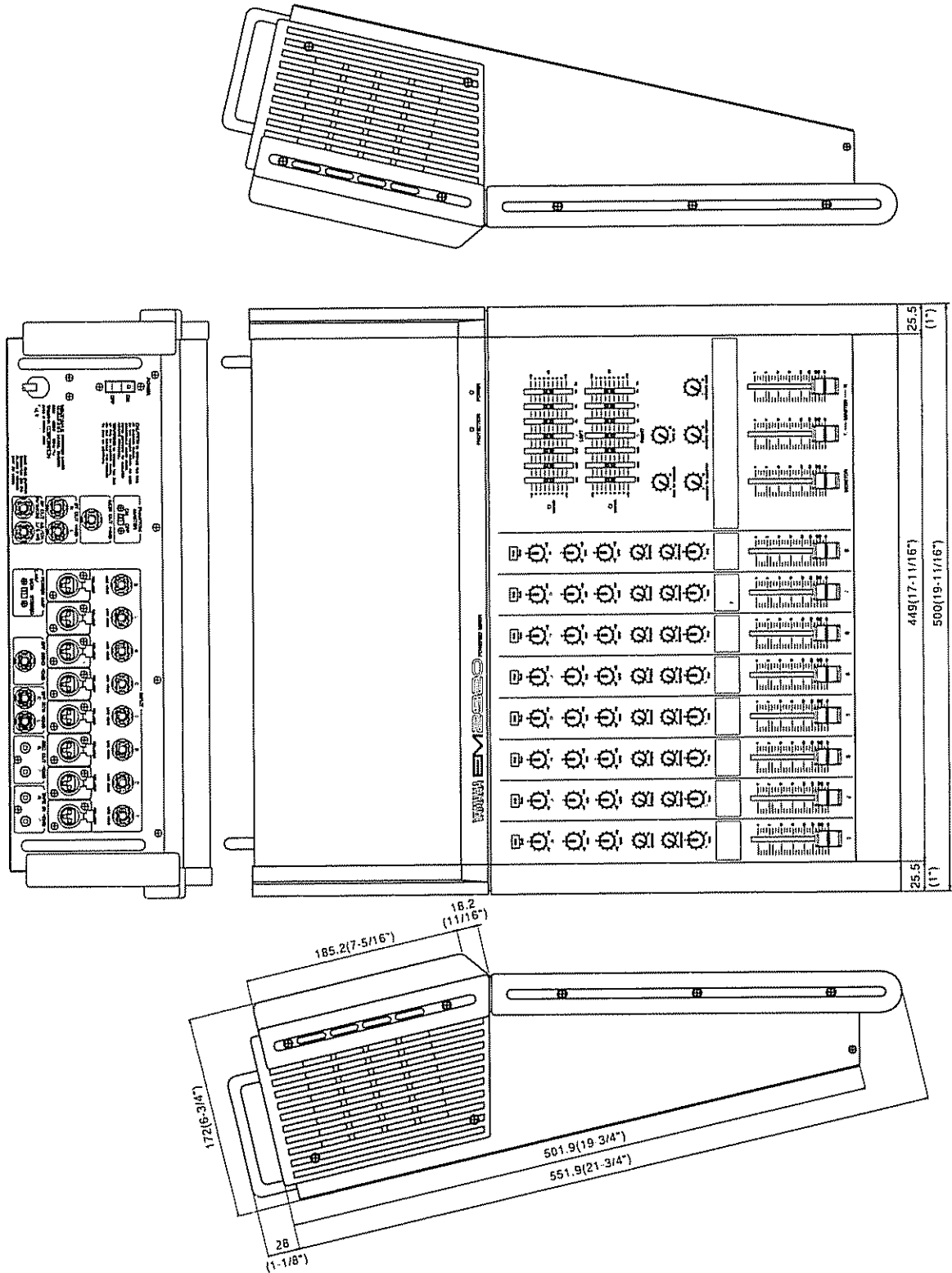
The following table lists the main causes of abnormal operation and the corrective measures required, as well as the protective circuit operation in each case.

Indicator display	Probable cause	Remedy
Sound is distorted	Input signal strength is too high. Limiter overrange protection (+15dB) has been exceeded.	Turn the channel VOLUME control counter-clockwise to decrease the input signal level or decrease the output level connected to the INPUT jacks.
	The amplifier load is excessive.	Use a speaker system with the correct load impedance. (Refer to page 8 for details.)
PROTECTION indicator is lit and no sound comes from the speakers.	A DC voltage of +/-2V or greater was generated in the power amplifier's output circuit.	Consult your dealer or nearest Yamaha service center.

BLOCK & LEVEL DIAGRAM



DIMENSIONS



Unit: mm (inch)