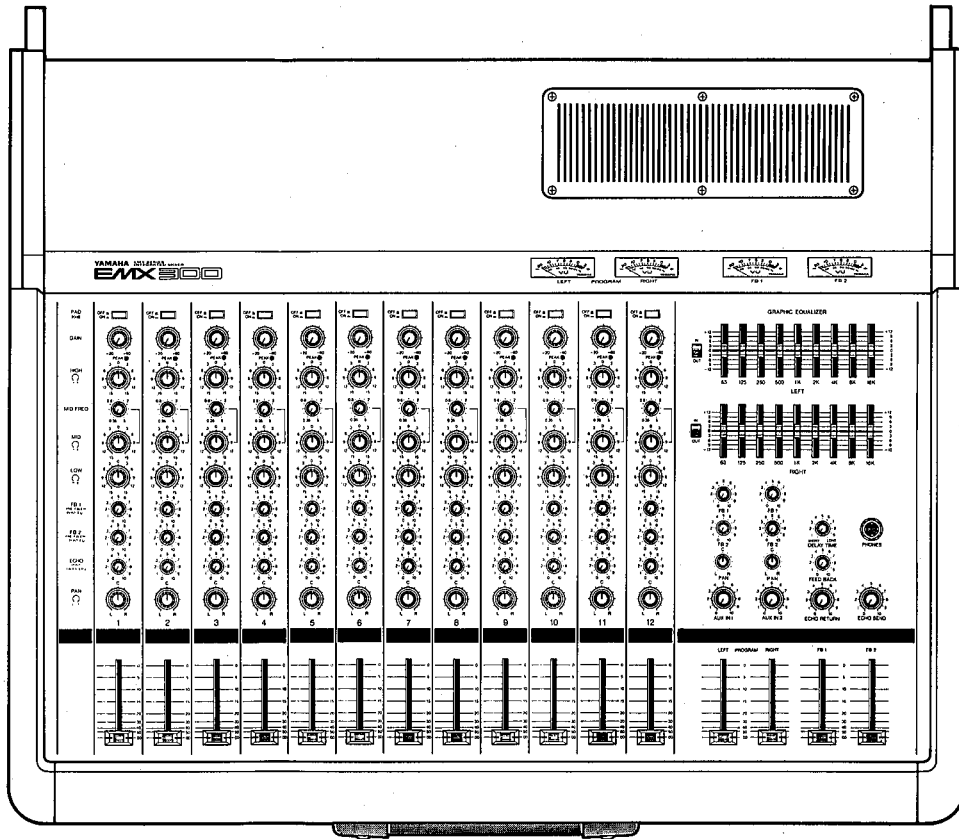


YAMAHA POWERED MIXERS

EMX150 EMX200 EMX300

OPERATING MANUAL



EMX300

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How to use this manual

Yamaha EMX-Mixers are equipped with features and capabilities unique among mixers in their price range. To take the best advantage of your mixer, we recommend careful reading of this Instruction Manual... even if you already have a good general understanding of mixers.

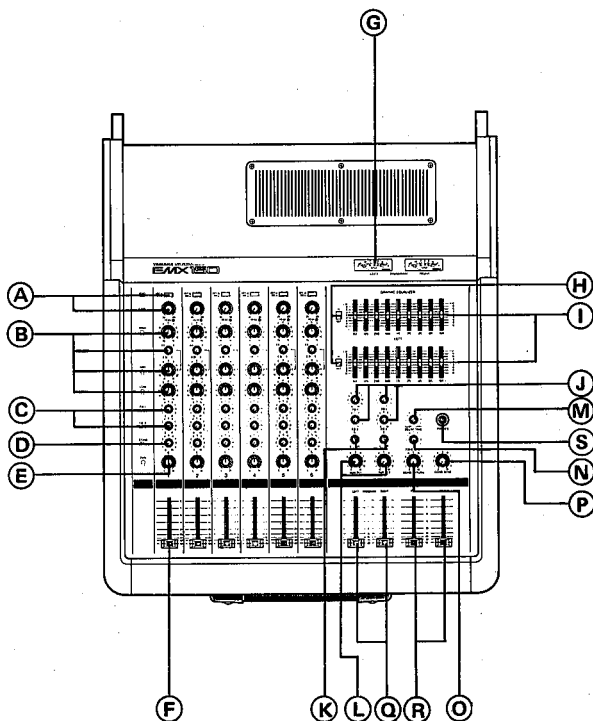
The setups on the following pages are meant only as guidelines. We have attempted to cover many applications. It would be impossible to cover all conceivable setups, which are infinite as your own imagination.

SECTION ONE

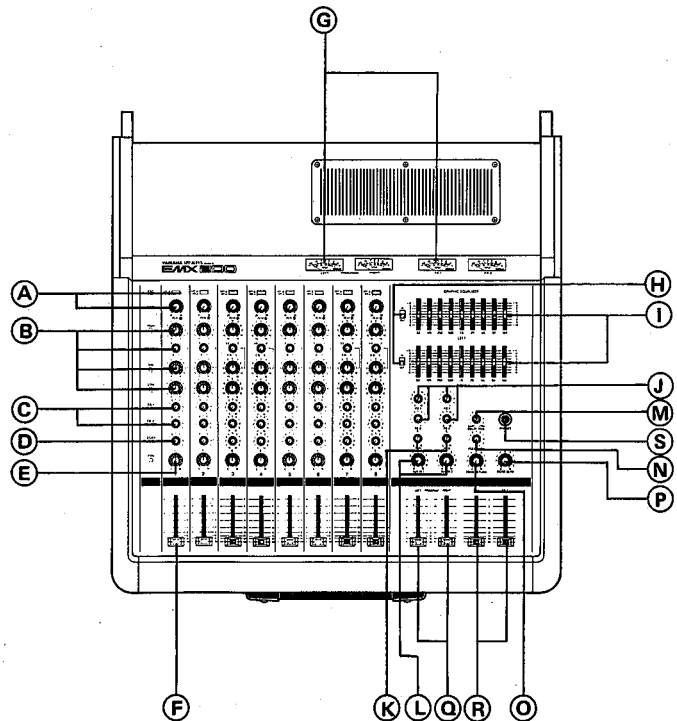
Brief Operating Instructions

NOTE: Be sure the AC POWER switch is turned OFF when making all signal and speaker connections.

EMX150 Front Panel



EMX200 Front Panel



FRONT PANEL

A. Pad switch, Gain control, & LED peak indicator

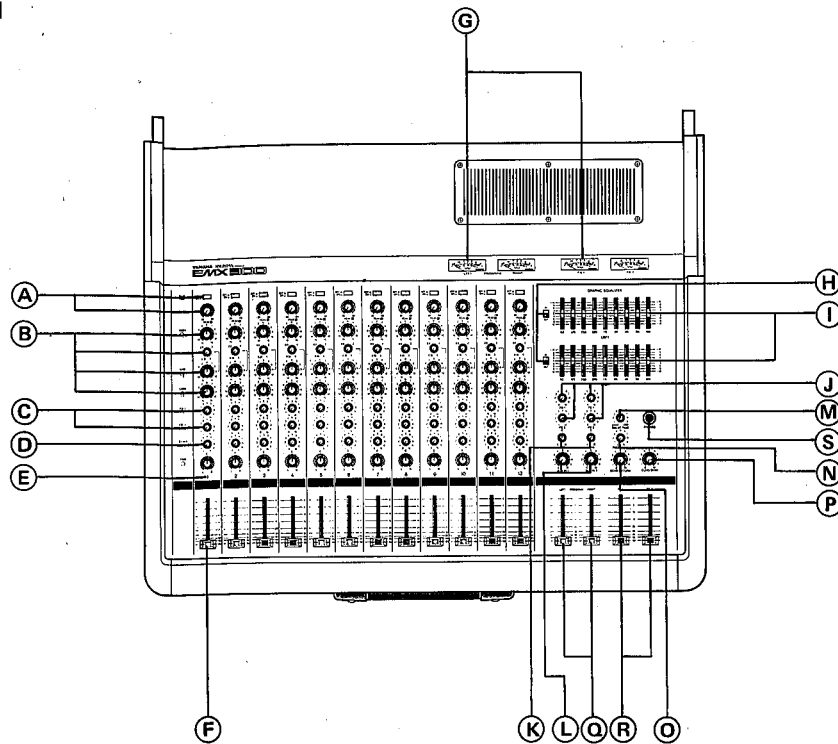
The Pad and Gain control adjust the input sensitivity of the EMX mixers over a wide range. The PAD switch inserts a 20 dB pad ahead of the pre-amplifier, and the GAIN control continuously adjusts the sensitivity of the preamplifier between -20 and -60 dB. The adjacent LED turns on to warn of impending distortion when the GAIN control level is 3 dB below clipping.

B. High, Mid/Frequency and Low EQ controls

These continuously variable knobs allow ± 15 dB equalization in the following frequency ranges:

HIGH	8 kHz shelving.
MID	0.35-5 kHz sweepable peaking.
LOW	100 Hz shelving.

Response is flat at center position.



C. FB1 and FB2 send controls

These controls feed a post-EQ, pre-fader signal to the FB1 and FB2 busses which feed the FB1 and FB2 outputs, respectively. These foldback sends may be used for stage monitoring, additional effects mixes, or mono or stereo recording mixes.

D. Echo control

Adjusts the amount of post EQ, post-fader signal fed from the channel to the internal analog delay (echo) unit or an external echo, reverb, or effects device.

E. Pan control

This knob feeds the input channel signal to the left and right stereo program mixing busses. The stereo program buss then feeds the SPEAKER, LINE and HEADPHONE outputs via the master program faders.

F. Channel Fader

These set the mix level of each channel. These smooth linear faders also provide a good visual indication of the overall mix levels.

G. VU Meters

Two meters on the EMX150 indicate average speaker power output level. On the EMX200 and EMX300 an additional pair of meters indicate the average output level of the two F.B mix busses. The meters are illuminated when AC power is ON.

H. EQ In/Out Switch

This switch by passes the channel equalizer for A-B comparisons during setup; quick changes in sound, and for the clearest, quietest sound when EQ is not needed.

I. Graphic Equalizer

Two banks of linear slide controls independently vary the frequency response of the left and right program outputs. There are nine GEQ controls per channel. Center detents mark the flat position (no EQ effect) for each control.

J. FB1 and FB2 Controls

These controls apply signals from the AUX inputs to the respective FB busses.

K. Aux Pan

These controls position the AUX 1 and AUX 2 input signals left-to-right on the stereo program buss.

L. Aux Volume

These controls set the level of any program fed to the mixer via the AUX 1 and AUX 2 input jacks. Following these controls, the AUX inputs are also affected by the master program faders.

M. Delay Time

Adjusts the delay time of the internal analog delay unit. If this control is adjusted while the delay is in use, pitch changes may occur during the time the control is actually being moved.

N. Feedback

Adjusts the amount of feedback applied to the internal analog delay unit, and therefore the number of "repeats" the delay unit produces. Careful adjustment of Delay Time and Feedback can produce reverb-like effects.

O. Echo Return

This control sets the level at which the output signal from the internal analog delay unit or from an external echo device is mixed into the stereo program buss. The echo signal is applied equally to the left and right program busses, and is therefore a "center" effects return. If the ECHO RETURN jack is used as an auxiliary monaural line input, ECHO RETURN adjusts the level of the "auxiliary" input source.

P. Echo Send

Adjusts the overall level of the echo mix sent to the ECHO SEND output jack. This control does not affect the level of the signal fed to the internal analog delay unit.

Q. Master Program Faders (Left and Right)

These controls adjust the level of the corresponding left and right program mixing busses which simultaneously feed the SPEAKER, GRAPHIC EQ, LINE and HEADPHONE outputs. The master program faders do not affect the mixer's FB or ECHO outputs.

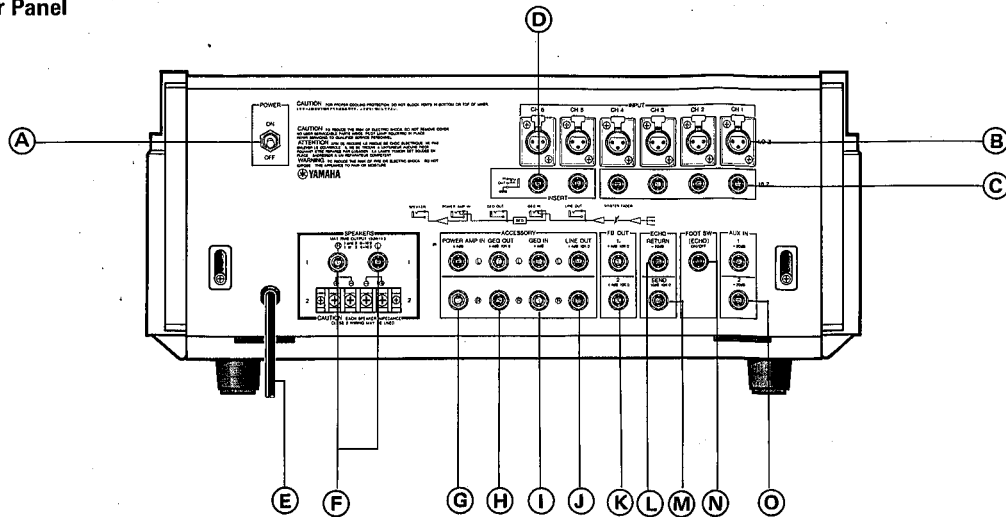
R. Master FB Faders (1 & 2)

These controls adjust the overall level of the FB (Foldback) outputs.

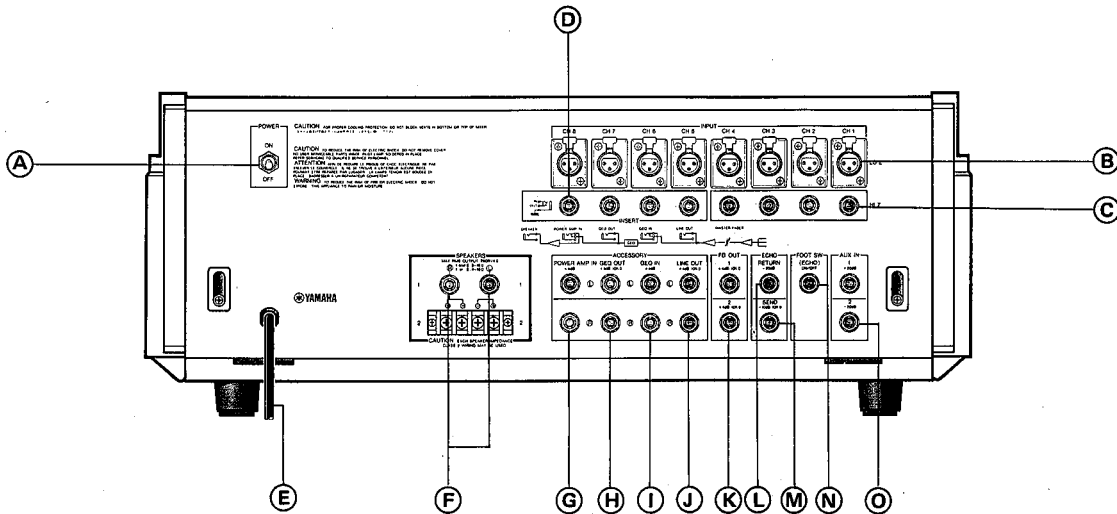
S. Headphone Jack

This jack accepts standard stereo headphones of 8 ohms or higher impedance. It carries the same signal as the speaker outputs.

EMX 150 Rear Panel



EMX 200 Rear Panel



REAR PANEL

A. Power Switch

Turns AC power to the mixer ON or OFF.

B. Low Impedance Channel Inputs

These low-impedance balanced XLR connectors accept inputs such as professional low-impedance microphones and electronic music instruments having low-impedance outputs.

C. High Impedance Channel Inputs

These balanced TRS (tip-ring-sleeve) phone jacks are designed for high or medium impedance microphones, low-level instruments (like electric guitars or instruments with pickups), or high level instruments (such as keyboards).

High impedance channel inputs are provided on channels 1 through 4 on the EMX 150 and EMX 200, and on channels 1 through 8 on the EMX 300.

D. Insert Jacks

These TRS (tip-ring-sleeve) jacks permit insertion of virtually any type of line-level signal processing equipment into the input channel between the head amplifier and equalizer stage.

Insert jacks are provided on channels 5 and 6 of the EMX 150, channels 5 through 8 on the EMX 200, and channels 9 through 12 on the EMX 300.

E. AC Power Cord

The 3-wire cord on the U.S. and Canadian model is for connection to any 110-120 V AC, 50 or 60 Hz grounded outlet. European models: 220—240V, 50/60Hz

F. Speaker Output Jacks

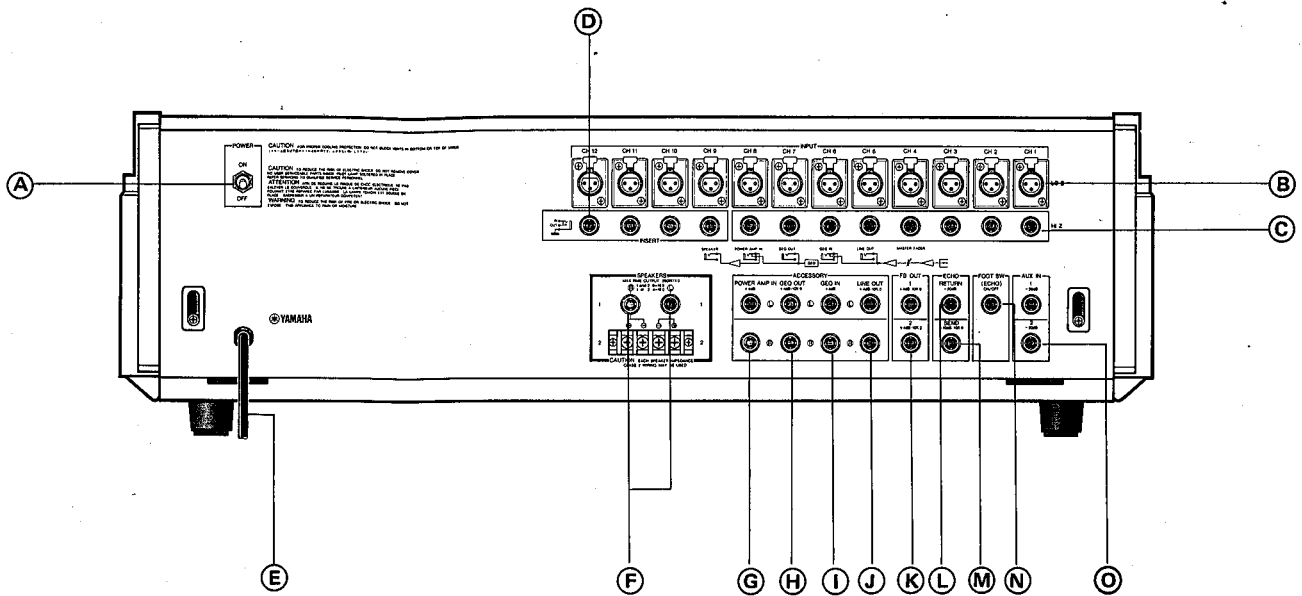
These standard phone jacks are left and right speaker-level outputs from the built-in stereo power amplifier. The phone jacks are parallel connected with barrier strip type speaker terminals for extra speaker connection versatility, and the ability to hook up two sets of speakers at once. In most installations the barrier strips are preferred due to better electrical contact and less chance of short circuit.

Normally, the program mixing busses feed the speaker output, and both terminals from each power amp channel are simultaneously controlled by the corresponding Master Program Faders. The POWER AMP IN jacks do permit other signal sources to feed the speaker outputs (in lieu of the stereo program mix), such as the FB mix busses or an external mixer.

G. Power Amp Inputs

These jacks permit the connection of any line-level low or high impedance signal directly to the mixer's power amplifier, replacing the internal signal flow from the stereo program mix. The jacks are useful for inserting a compressor/limiter ahead of the power amp.

EMX 300 Rear Panel



CAUTION: NEVER CONNECT THE MIXER'S SPEAKER OUTPUTS, OR ANY OTHER SPEAKER-LEVEL SIGNAL, TO THE POWER AMP OR GEO INPUTS.

H. Graphic EQ Outputs

These jacks feed the signal from the two Graphic Equalizers to any line-level high impedance input, for instance an external power amplifier or a compressor/limiter. The signals are also applied, internally, to the mixer's stereo power amplifier, regardless of whether the Line Out jacks are in use.

I. Graphic EQ Inputs

These standard phone jacks connect a line-level high impedance source into the left and right graphic equalizers, replacing the normal internal signal flow from the mixer's line outputs to the graphic EQ inputs.

J Line Output Jacks

These standard phone jacks are high impedance, line-level outputs carrying the left and right program mix. These outputs may be used to feed the stereo program to additional power amps and speakers, or to a tape recorder or an additional mixer.

K. FB Output Jacks

These standard phone jacks are high impedance line-level outputs carrying the respective FB 1 & 2 mixes. They are controlled by the Master FB Faders (the Master Program Faders have no effect here).

L. Echo Return Jack

This standard phone jack accepts the output from an external echo device or any other high-impedance line-level source. Return level is controlled by the Echo Return control. Use of this jack disconnects the internal analog delay system output so it no longer goes to the stereo mixing buss.

M. Echo Send Jack

This standard phone jack feeds the mixed signal from all channels' ECHO controls to an external echo, reverb, or digital delay device.

N. Echo Foot Switch Jack

This standard phone jack accepts any standard foot switch, permitting ON/OFF control of the internal analog delay system.

O. Auxiliary Input Jacks

These standard phone jacks apply line-level, high-impedance inputs to the left and right program mixing busses and FB busses. Incoming signal level is controlled by the Aux Volume controls, FB1 & FB2 controls, and the Master Program Faders.

SECTION TWO

Introduction

The Yamaha EMX 150, EMX 200 and EMX 300 are multi-input, stereo output mixers with built-in power amplifiers and adjustable analog delay units. They are compact and functional in design with many useful features: continuously variable input sensitivity, three-band equalization with sweep mid frequency, dual FB sends and an echo send on every input; a delay foot-switch jack, high and low impedance inputs, auxiliary inputs and outputs; graphic program equalization; and recessed carrying handles.

Patchable inputs and outputs to each major function provide the flexibility of separate components with the convenience of one compact unit. More gain than any previous EM Mixer, substantial output power from a clean, low distortion amplifier, tremendous versatility and proven Yamaha reliability make the EMX mixers exceptional values.

Inputs

The EMX 150 has 6 input channels, the EMX 200 has 8 and EMX 300 has 12 input channels. Each input channel includes the following controls: pad switch, gain control, high EQ, mid EQ with frequency control, low EQ, FB send 1, FB send 2, echo send, pan control and linear channel fader.

Auxiliary Inputs

All EMX mixers have one stereo auxiliary input circuit (Aux In) plus a monaural echo return input.

Insert Patch Points

Jacks are provided for insertion of outboard signal processing equipment into the input channel's (pre-EQ) signal path on channels 5 and 6 of the EMX 150, channels 5 through 8 of the EMX 200, and channels 9 through 12 of the EMX 300.

FB and Speaker Outputs

The monitor and speaker outputs are controlled by separate master faders that independently adjust the level from the program and FB mixing busses. The speaker output level is displayed by two VU meters on the EMX 150, while an additional pair of meters on the EMX 200 and EMX 300 display FB output level.

Linking Mixers and Recording

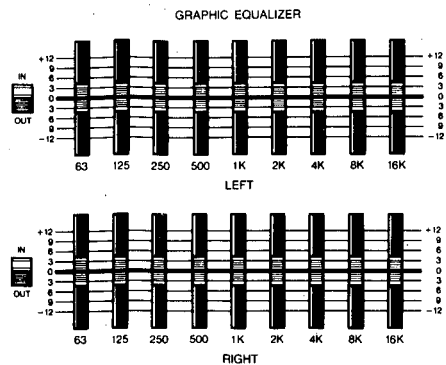
Two or more mixers may be linked or "cascaded" together to increase the total input capacity. For this purpose the Line Outputs of one mixer would be connected to the Aux Inputs of the next mixer. (Alternately, the Line out jacks may be used to feed a stereo tape recorder.)

The Echo Send jack may also be used to feed a mono tape recorder or other external device; this will not affect the operation of the internal analog delay unit.

Likewise, the FB Out jacks may be used to feed tape recorders, signal processors, remote lines or other high-impedance devices.

Graphic Equalizers

The EMX mixers' graphic equalizers are a unique tool, both for reducing acoustic feedback and for imparting limitless tonal variations to the Speaker Outputs. Nine linear controls "outline" any frequency response curve as it is created (hence, the term "graphic" equalizer). There are separate equalizers for each program channel (left and right). The graphic equalizers do not normally affect the FB Outputs, so corrections made for the "house" sound will not color the sound on stage. The Headphone Jack does carry the equalized program, as do the GEQ output jacks, which can be used to drive external amplifiers. Alternately, the FB Outputs can be patched into the GEQ Inputs, while (thus connecting them to the built in power amp) the Line Outputs are fed to an external amplifier/speaker system.



9 Band Graphic Equalizers

Power Supply

The power supply utilizes grounded (3 wire) cord for complete safety. The VU meters light to indicate that AC power is ON.

Flexibility

The many inputs and outputs on the EMX mixers simplify setup, increase their inherent flexibility, and safeguard against possible malfunctions by serving as alternate signal paths. If you're not sure whether a particular input or output is appropriate, try it — with this warning:

CAUTION: NEVER PLUG A SPEAKER OUTPUT INTO ANYTHING BUT A SPEAKER LOAD OR A DIRECT BOX MADE FOR HIGH POWER LEVELS. AND NEVER PATCH AN OUTPUT DIRECTLY BACK TO A CHANNEL INPUT UNLESS DIRECTED TO DO SO BY THIS MANUAL.

This simple precaution will protect your mixer and related equipment — failure to observe this caution may void the mixer Warranty.

Detailed Instructions

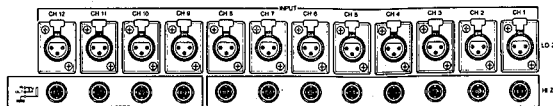
Detailed Instructions

The illustrations and callouts in Section 1 may serve as a useful reference while you read the following instructions. It also may be helpful to study the specifications, especially when considering how to use your mixer with an accessory device.

Input Channels

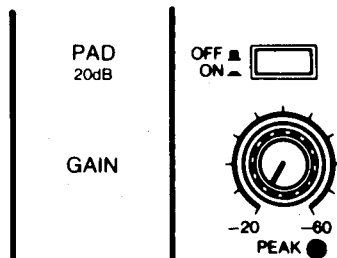
Each channel has a balanced low-impedance input jack, while balanced high-impedance input jacks are provided on channels 1 through 4 on the EMX 150 and EMX 200, and channels 1 through 8 on the EMX 300.

The XLR type connectors are intended for use with low-impedance (Low-Z) sources, while the TRS (tip-ring-sleeve) phone jacks can be used with medium and high-impedance (High-Z) sources.



Input jacks

NOTE: Most Low-Z microphones (nominal 150 ohms) are designed to work into loads of approximately 900-1500 ohms. These load values are provided by the Low-Z XLR connectors, but not by the phone jacks. Connecting your Low-Z mics to the wrong input (High-Z) can alter the microphone's frequency response. Conversely, connecting a High-Z mic to a Low-Z input can overload the mic, lower the level and adversely affect the mic's frequency and transient response.



Pad switch and gain control

Pad Switch and Gain Control

The pad switch and continuously variable gain control permit setting the input sensitivity of each channel anywhere between -60 dB and 0 dB. With the pad switch set at 0 dB (pad switch out) the gain control adjusts sensitivity between -60 and -20 dB, while with the pad switch set at -20 dB (pad switch in) the gain control adjusts sensitivity between -40 and 0 dB. This makes it possible to ideally match the mixer's input sensitivity with a broad range of input sources.

In general, an input sensitivity setting of about -50 dB is commonly used with low output dynamic microphones, -40 dB with medium output condenser microphones, -20 dB with electric instruments (preamplified) and low level (audio or hi-fi) line sources, and 0 dB with high level line sources (such as some professional equipment line outputs).

Set the input level switch to correspond to the type of device that is plugged into the corresponding Channel Input jack. Here is one suggested procedure:

1. Connect all input sources to their respective channels. Plug in and wear your headphones to hear the program mix. DO NOT CONNECT any speakers yet.

2. Set all channel faders at zero (minimum). Set each channel Pan control all the way to the Left, and raise the left Master Program fader to No. 9.

3. Start with the lowest input sensitivity (Pad in, Gain at -20). Bring the channel fader up to No. 7. If necessary, gradually increase sensitivity using the Gain control until the input is clearly audible and the channel PEAK LED is flashing occasionally. If sensitivity is still too low, return the Gain control to the -20 dB setting and set the pad switch to 0 dB, then gradually increase the Gain control setting once again. The Left VU meter should peak around 0 dB. If the meter consistently shoots past 0 dB, the input channel PEAK LED turns on or stays on, the signal sounds distorted in your headphones, the input sensitivity is set too high; decrease the GAIN until the levels are correct.

4. Repeat the procedure for each input channel, until all channels are set for proper input sensitivity. Turn the Mixer Power Off, and connect your speakers and outputs. Set both Master Program faders to about No. 7 and turn the mixer power ON again. You are now ready to adjust each channel fader, EQ, and stereo assignment (Pan).

CAUTION: DO NOT CONNECT THE SPEAKER OUTPUT OF ANY AMPLIFIER TO THE MIXER UNLESS A SUITABLE HIGH-LEVEL ATTENUATION PAD OR "DIRECT BOX" FIRST LOWERS THE LEVEL.

NOTE: Always turn Master faders (Program and F.B) all the way DOWN before turning the AC power ON.

Other Controls

The channel fader adjusts the level applied to the stereo program mix bus from whatever source is connected to the channel's input jack. This allows you to set precisely the level for various mics and/or instruments, thereby achieving just the desired mix (blend) of these sources.

The Low-EQ control adjusts the channel's frequency response through the low-frequency range. The control has no effect ("flat response") when centered. Low EQ boost (clockwise rotation) gives more "fullness" to vocals, guitars, etc., and more of a mellow character to horns and woodwinds. Low-EQ cut (counterclockwise rotation) removes boominess, avoids some of the excessive energy from drums, and reduces any low frequency noise, too.

The Mid-EQ control permits boost or cut equalization at the frequency determined by the setting of the concentric Frequency control ($0.35 - 5$ kHz). Boosting the midrange (especially at around 2.5 or 3 kHz) can greatly increase the overall "presence" of the sound. Vocalists will seem to come forward and stand out from the instrumental backing. Cutting the mid-frequencies has the opposite effect — vocals seem to recede and the overall sound becomes "thinner". It is often effective to cut the midrange response of the instrumental backing just slightly, and boost the vocal channel midrange a little in order to make the vocals stand out with exceptional clarity.

The High-EQ control adjusts the channel's frequency response through the high-frequency range. High-EQ boost (clockwise rotation) gives more "edge" or "bite" to string instruments and more "attack" to percussive instruments. High-EQ cut (counterclockwise rotation) removes some of the breath sound from wind instruments, reduces guitar-string fingering sounds, lessens hiss, and avoids sibilant (lispy) vocal sounds. High-EQ cut also helps to make a performer sound farther away, particularly if reverb is added. The equalizer can be helpful in avoiding feedback, too.

The FB controls determine the proportion of channel output that feeds each FB mix bus. Note that two FB busses are provided, making it possible to send different FB mixes to different performers with different monitoring requirements.

The Echo control feeds the echo mix buss, driving either the internal analog delay unit or an external echo/reverb device. The amount or "depth" of echo/reverb applied to the program is controlled by the Master Echo Return control.

The overall levels of the FB1 and FB2 mixes from all input channels, as applied to the FB1 & 2 outputs, are controlled by the Master FB1 & FB2 faders, respectively.

The FB controls allow you to set two different mixes for stage monitor speakers, or any other location away from the "main" speakers. Both the FB mixes are subject to the settings of the input channel EQ controls, but not the channel faders (post-EQ/pre-fader). "Pre-fader" means that even after a channel is faded out completely, its input signal may still be heard at the FB Outputs (at whatever level is set via the FB channel and Master controls). The pre-fader send on the FB busses is especially useful for feeding devices likely to have their own volume/EQ controls; such as external signal processors, remote mixing trucks, broadcast studios, or other mixing consoles.

The Pan control assigns the input signal to the Left and Right program mix busses, and thus pans the channel across the stereo perspective for the Speaker, Line, and G-EQ outputs; at 12 o'clock position ("0" on the Pan control scale), the signal is fed equally to the Left and Right sides of these outputs, and is thus "centered".

OUTPUT CHANNELS

The two phone jack speaker outputs and two barrier strip speaker terminals on each mixer are designed for 4-ohm or higher impedance speaker loads. The chart shows the nominal speaker power that each model EMX mixer can deliver at the speaker output jacks with a 4-ohm load on each channel. Attention must be paid to the choice of speakers; if a combined load of less than 4 ohms is connected to one channel via either or both of that channel's speaker terminals, the amplifier will be overloaded. Overload might occur, for example, when two 4-ohm speakers, wired in parallel, are connected to one speaker terminal, or when one 4-ohm speaker is connected to each terminal of the left or right channel.

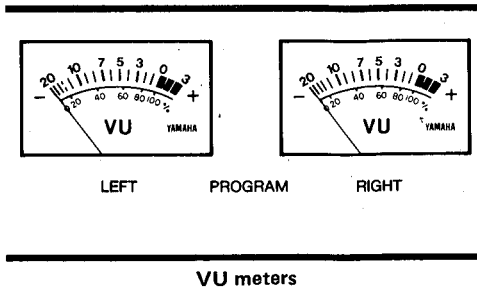
Speaker cables should also be chosen carefully. While phone jack outputs are provided, the coiled cords commonly used for guitars are **not acceptable**. In fact, the speaker cables need not be shielded. For short runs (under 25 feet), 18-gauge or larger diameter wire may be used. For long runs (over 25 feet), 16-gauge or larger diameter wire should be used. (#18 or #16 AC "zip" cord or similar cable is fine). Be sure to use only high quality phone plugs when using the phone jack outputs, and check the cables for possible short circuits before use; an internal short-circuit or a cracked plug insulator will blow a fuse on the mixer. To use the barrier strip speaker terminals, we recommend soldering appropriate eyelets to the speaker cables, which can then be easily and securely screwed into the terminals.

CAUTION: IF THE FUSE BLOWS AND THE AC MAINS ARE DELIVERING THE PROPER VOLTAGE, THE DIFFICULTY IS PROBABLY CAUSED BY EITHER A SHORT-CIRCUITED SPEAKER CABLE, A SHORT-CIRCUITED SPEAKER, OR USE OF A SPEAKER LOAD OF LESS THAN 4 OHMS IMPEDANCE. CORRECT THE CONDITION, AND ALWAYS REPLACE THE FUSE WITH ONE OF THE SAME RATING AND TYPE. LARGER FUSES DO NOT CURE PROBLEMS; THEY ONLY LEAD TO PERMANENT DAMAGE TO THE MIXER, AND WILL VOID THE WARRANTY.

EMX Mixer Model No.	Power output, 4-ohm load per channel
EMX 150	150 Watts
EMX 200	250 Watts
EMX 300	250 Watts

Power ratings are continuous RMS (or, more correctly, RMS voltage squared, divided by the load impedance) at 1 kHz.

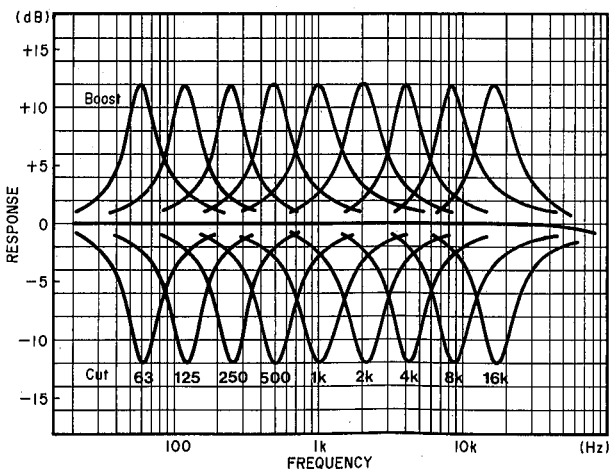
A pair of VU meters indicate the average power level at the Speaker Outputs. Actual mix levels should average several dB below 0, with occasional peaks as high as 0 VU. Clipping distortion begins when the VU meters reach full scale. The meters are illuminated, and the meter lamps also serve as AC power pilot lights.



The FB Output jacks are line-level-high-impedance outputs. They are designed to drive external monitor amplifiers, or they may also be used to make tape recordings. The Master FB faders set the level at the FB Outputs, and are independent of the Master Program faders.

Master Controls

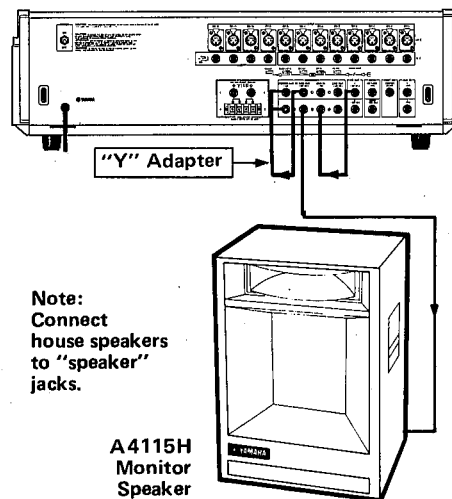
A special feature of the EMX Series Mixers is the Graphic Equalizers. Nine slider controls per channel alter the frequency response of the mixer's left or right Program Outputs. These sliders differ from the channel EQ controls in that they operate over a limited range of frequencies (one-octave band centers). Each GEQ slider is center detented; it "clicks" at the center (flat) point of its boost/cut range. These equalizers provide far more flexibility than conventional tone controls. Acoustic feedback can be reduced by lowering the slider which covers the frequency range where the feedback occurs.



Feedback control is actually a minor application for the Graphic Equalizers. Judicious use of the equalizers can help the PA to sound more natural in troublesome acoustic environments, and can add desired color, warmth or penetration in good acoustic environments. For example, some clubs have large amounts of sound-absorbing carpeting, draperies, furniture, etc. Since absorptive materials affect mostly the high frequencies, the sound may be too mellow or bassy. Other rooms with very hard walls or ceilings, or hard surfaced dance floors may sound too bright. Or perhaps the speaker system is deficient in one frequency band yet is peaky in another band. Adjusting the Graphic Equalizer can compensate partially for these problems in a way that would be difficult to achieve with the channel EQ controls.

The Graphic Equalizer may also be used for many special effects. As with any equalizer, greater amounts of boost or cut cause greater amounts of phase shift. Therefore, use graphic equalization sparingly; extreme settings should be reserved for solving severe problems, or for special effects. To keep distortion at a minimum, avoid excessive boost at a single frequency. Since removing feedback frequencies with the Graphic Equalizer can also remove portions of the desired program material, you should first attempt to solve feedback problems by careful speaker and microphone placement.

The GEQ IN and OUT jacks on the rear panel allow maximum flexibility in using the Graphic Equalizers. For example, the diagram below shows how you can assign one Graphic Equalizer to both program channels (when a mono program is all your need) using a "Y" cord, and then take advantage of the other Graphic Equalizer for the FB 1 mix.



G-EQ alternate patching for monitors and house.

The Left and Right Master Program faders simultaneously adjust the program level at the Speaker, Headphone, Line and GEQ Outputs. These controls operate optimally at about #7 on the scale (nominal setting). Mixing with the Master faders at maximum indicates that the individual channel faders may be set too low, that the channel input sensitivity is set incorrectly, that the input sources are of insufficient level to drive the mixer, or that the mixer's amplifier is not powerful enough to deliver the acoustic power levels you want. In the latter instance, you could use additional power amplifiers and speakers (driven from Line or GEQ OUT) or use more efficient speakers.

The Master FB faders (1 & 2) adjust the program level at the respective FB Outputs.

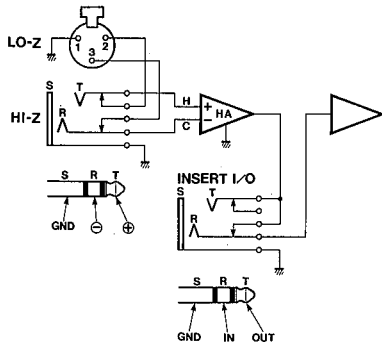
The Aux In Volume control affects how much of the Aux In signal is fed to the program mixing busses. The Master Program faders also affect the Aux In signal level, as well as the program mix from the input channels. In practice, the Aux In Volume controls determine the proportion of the Aux In signal to the mixed signal from the input channels. The Aux Pan controls determine where the corresponding Aux In signal appears in the left-to-right stereo sound field. Note that the Aux signal appears at the FB Outputs via the FB1 & FB2 level controls located directly above Aux.

OTHER FEATURES

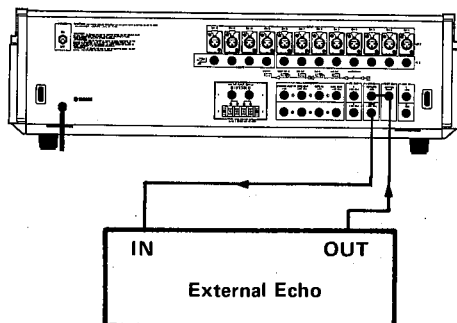
To use an external reverb or echo device, connect the mixer's Echo Send jack to the input of the external device, and connect the output from that device to the mixer's Echo Return jack. The level of the signal appearing at the Echo Send jack is controlled by the Master Echo Send control, and the return level is adjusted by the Master Echo Return control. Other types of accessory devices such as digital delays, or reverbs may be connected between the Echo Send and Echo Return jacks, as long as the input/output levels are compatible. Plugging an external device into the Echo Return jack automatically disconnects the mixer's internal analog delay system. To use the internal delay system plus an external device, feed the external device from the Echo Send jack as normal, but return the output from the device to one of the mixer's Aux In jacks and control the return level with the corresponding Aux Volume control.

External signal processing devices may also be patched into certain input channels of the EMX Series Mixers. Channel Insert jacks are available on channels 5 and 6 of the EMX 150, channels 5 through 8 on the EMX 200, and channels 9 through 12 on the EMX 300. Patching into these jacks inserts the external device between that channel's head amplifier and EQ stage. The jacks are TRS (tip-ring-sleeve) types, providing both the insert in and out lines in a single jack.

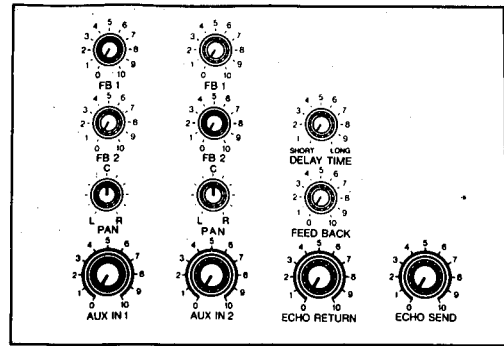
TRS Wiring Circuit Diagram



The Line Output jacks are line-level high-impedance outputs for feeding additional power amplifiers, tape recorders, delay lines or other devices with high-impedance, line-level inputs. The Line Out jacks are controlled by the Master Program faders, but are independent of the Master Monitor faders and the Graphic Equalizers.

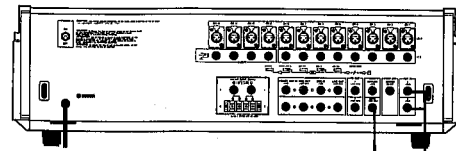


Use of external echo device only. (Built-in reverb automatically disconnected.)



Controls external effects level

Controls internal effects level



Optional "Y" adaptor or stereo echo return

Use of BOTH internal reverb and external echo device. (Alternately or simultaneously)

AC Power

Connect the AC power cord of the mixer to a properly grounded (three-wire) outlet. The mixers will draw the following maximum power from the AC mains:

EMX150	U.S. and Canadian Model: 500W
		European model: 800W
EMX200	U.S. and Canadian Model: 800W
		European model: 1500W
EMX300	U.S. and Canadian Model: 800W
		European model: 1500W

For maximum protection each mixer is fused. If a fuse blows, replace it with another of the same size and type. Repeated fuse failures suggest a problem with the mixer, speaker lines, speakers, auxiliary equipment, or power lines. Check the speaker lines for shorted circuits or too low impedance; measure the power line voltage with all equipment power ON; if these meet the listed specifications, consult a qualified repair technician.

NOTE: The FB and Echo sends can be set pre or post EQ and Fader by rewiring internal jumpers.

Meter sensitivity, Echo send level and Phantom Power + 15 V can be adjusted with simple circuit modifications.

SECTION FOUR Applications

Club Sound Reinforcement (PA) System

The EMX-Mixers are ideal for use as the main audio control board in a typical nightclub sound system. The diagram shows connections for one of the thousands of possible setups. Shown are microphones for vocals and each instrument's amplifier, a keyboard patched directly into the Mixer (no amplifier), and submixing using Yamaha's Model PM 180 rackmountable mixer. (The sub-mixer is used to obtain additional inputs, and may be used to pre-mix groups of instruments such as drums or several keyboards, before feeding the EMX-Mixer.)

Cables from high impedance microphones or high impedance instruments should be limited to 25' maximum length to avoid high frequency losses and excessive hum or noise. For low impedance submixing use Yamaha's Model PM 180.

The nightclub sound system illustrated here uses an external echo device, connected between the Mixer's Echo Send and Echo Return jacks. Other types of accessory devices may be connected between these jacks.

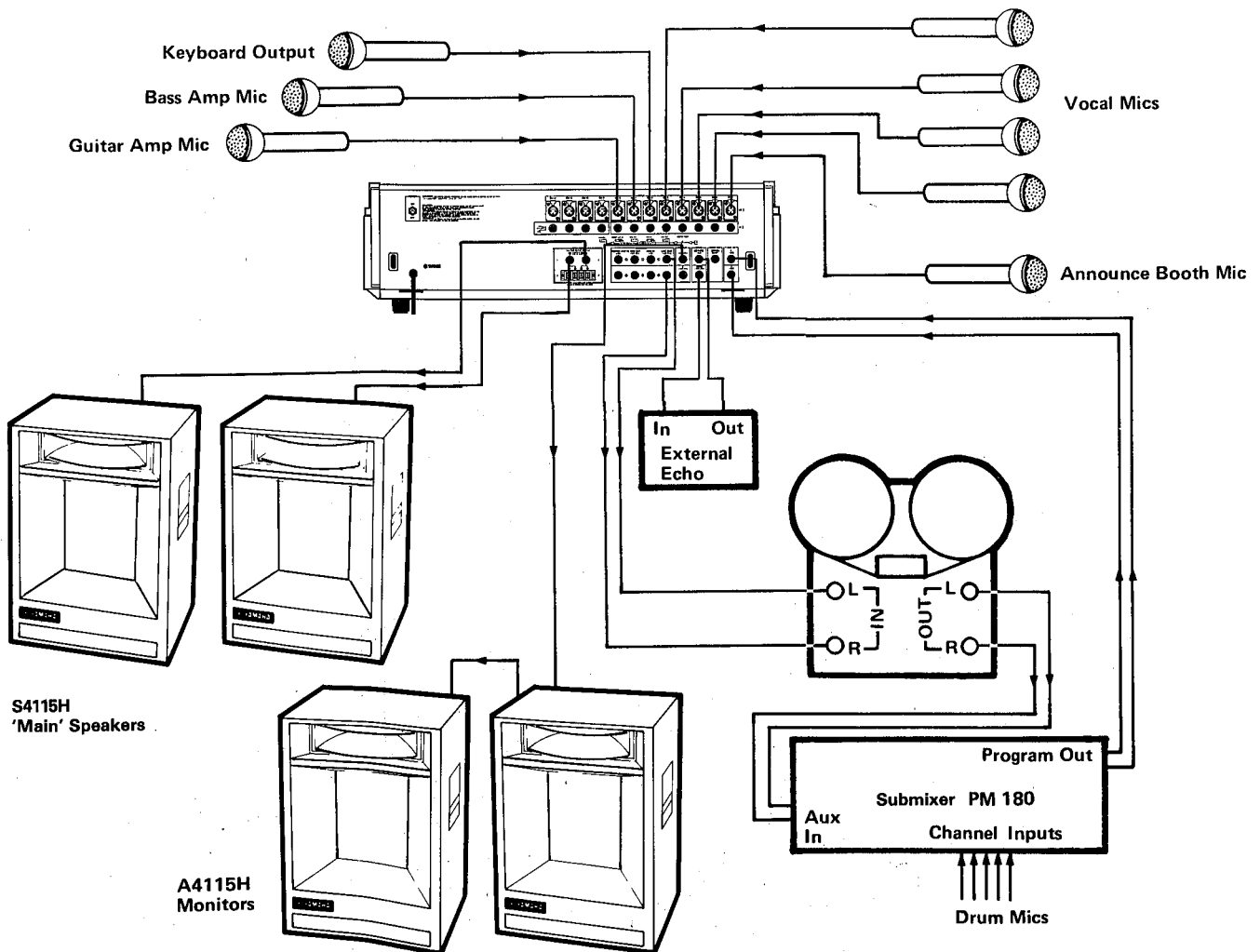
A stereo tape recorder may be used in this system both for music playback during set-up and intermissions, and for live program recording. The outputs of a recorder normally would be connected to the EMX-Mixer's Auxiliary inputs, or, if a submixer is in use, the recorder outputs can be patched to the submixer's aux inputs (as shown). Either approach permits tape playback without tying up an input channel on the EMX-Mixer.

To record live stereo program material, the Line Outputs from the EMX-Mixer would be patched to the record inputs of the tape machine.

Alternately, for a mono program, the EMX-Mixer's Monitor 1 or 2 Output could be connected to the recorder's input(s). This would send a pre-fader mix to the recorder, allowing you to set a different mix for the recording than for the house PA. If, for example, the on-stage instrument amplifiers were loud in the house you could keep their mix levels very low in the PA speakers, but you could pull those channels up in the recorded mix.

Any high-quality 4- or 8-ohm speaker system may be used with the EMX-Mixer, provided that the speakers' power capacity is compatible with the output power of the Mixer (See page 11). Each main speaker in this nightclub example is a Yamaha Model S4115H, chosen for its high efficiency, controlled dispersion, and natural sound. The S4115H has a 15" low-frequency woofer housed in a combination front-loaded horn/ducted-port bass reflex enclosure. Its high frequency section consists of a compression driver and radial horn.

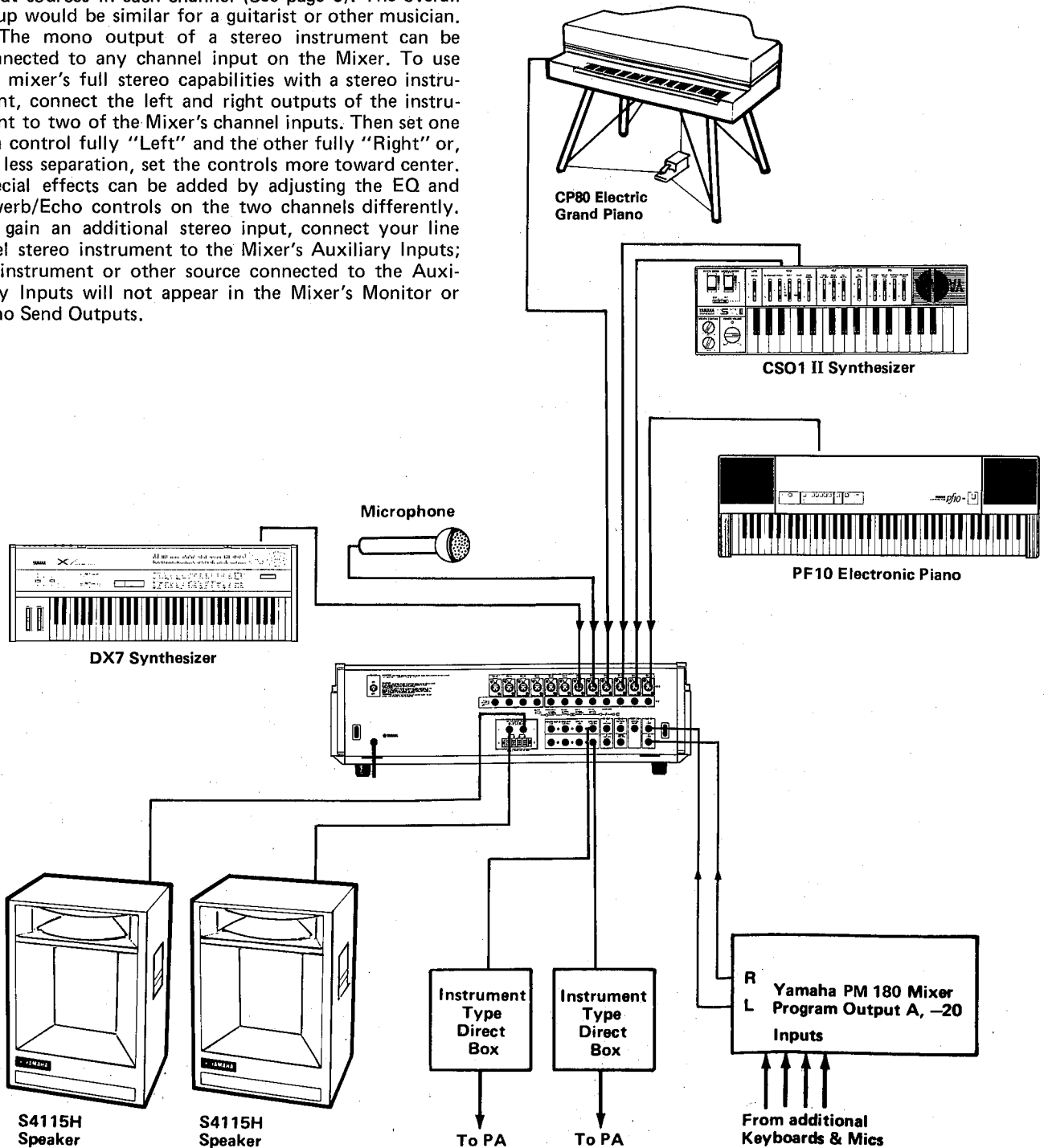
Yamaha Model A4115H speakers are shown as stage monitors, a good choice due to their built-in 100 Watt power amplifiers. Alternately, S0112T, S2115H, S0110T, or other speakers which do not have built-in power amplifiers can be used with a separate power amplifier such as the Yamaha P2050, P2100 or P2200.



Instrument Mixer

Contemporary musicians often use a multi-instrument approach to achieve a variety of sounds and effects. The diagram shows a typical setup for a player using several keyboards and mixing them on stage with the EMX300 mixer. Also illustrated are feeds to the house mixing console, and a Yamaha S4115H speaker system used as a stage monitor. By adjusting the individual channel Pan controls, the performer can feed two subgroups to the house mixer, or one stereo mix if his instruments require. (Note: When mixing live on stage in this manner, the performer would control the sound he hears on stage by changing the Monitor 1 controls. The channel faders would be pre-set during the sound check for optimum main house mixing levels.) The pad switch and gain control should be set to the proper position for the input sources in each channel (See page 6). The overall setup would be similar for a guitarist or other musician.

The mono output of a stereo instrument can be connected to any channel input on the Mixer. To use the mixer's full stereo capabilities with a stereo instrument, connect the left and right outputs of the instrument to two of the Mixer's channel inputs. Then set one Pan control fully "Left" and the other fully "Right" or, for less separation, set the controls more toward center. Special effects can be added by adjusting the EQ and Reverb/Echo controls on the two channels differently. To gain an additional stereo input, connect your line level stereo instrument to the Mixer's Auxiliary Inputs; an instrument or other source connected to the Auxiliary Inputs will not appear in the Mixer's Monitor or Echo Send Outputs.

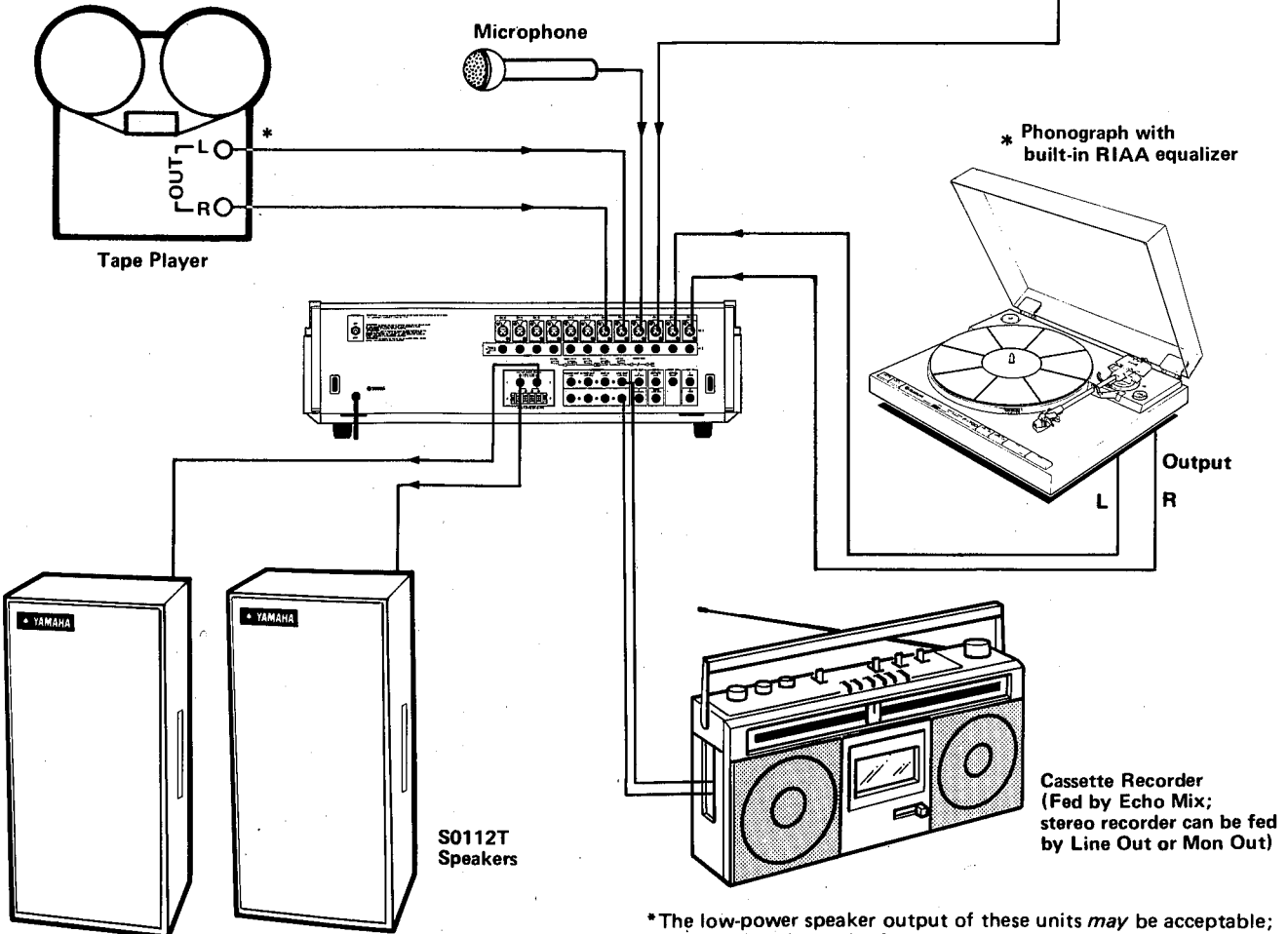
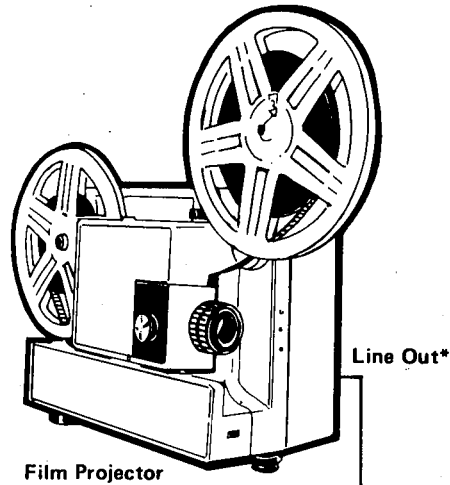


Other Reinforcement Uses

The EMX-Mixers can be used successfully in a wide variety of sound reinforcement applications. Combined with a pair of Yamaha S0112T or other compact speaker systems, and a roll-around podium, an EMX-Mixer makes a great portable sound system for a school, library, banquet hall or meeting room. Plug the line-level sound output from a portable film projector into one channel, and adjust the pad switch and gain control to suit the projector's output level. Connect microphones and/or a tape recorder's Play outputs (line out) to other input channels, and adjust each for the best tonal qualities.

The flexibility and economy of the EMX-Mixers make them attractive for permanent installations, too. Use connections similar to those diagramed for Club Sound Reinforcement Systems. These mixers are especially useful for permanent multi-projector/recorder setups (like slide, 16mm film, and filmstrip with additional cassette and reel-to-reel audio sources). To minimize hum and high-frequency losses, avoid long microphone cables, or use low-impedance balanced microphones. Always use heavy gauge speaker cable, and keep microphone, speaker, and AC power lines well separated.

You can feed another PA system (one with low or high impedance inputs) from the EMX-Mixer's Line Outputs or its Monitor Outputs. For a mono feed to a PA system with a low or high impedance input, use either Monitor Output. If you want a balanced feed to a remote mixer, use a "direct box," or a transformer.



*The low-power speaker output of these units *may* be acceptable; ask your Yamaha dealer for assistance.

Recording

When the Mixer is being used for vocal or instrument mixing, its Line Outputs can feed a tape recorder, or the inputs of a professional recording console. All EMX-Mixers work well for on-site recording.

The diagram shows one possible setup for tape recording. Two Yamaha S4115H speakers serve as monitors. To use the EMX-Mixer for recording, operate its Channel Inputs normally and feed the Left and Right Line Outputs to the tape recorder's line inputs. Connect the tape recorder's line outputs to the Mixer's Left and Right Auxiliary Inputs. (Keep Aux Volume at zero while recording . . . trying to monitor the tape as it is being recorded will create feedback.) For playback, fade the Aux In controls up to a comfortable listening level.

Broadcast Production

The EMX-Mixers can be used for broadcast studio production, or for location work. The input channel flexibility allows the engineer to use mics, tape machines, or external phono preamps. The announcer can use a Monitor (pre-fader) Output for previewing a mono mix, and the Left and Right Line Outputs for a program feed. Alternately, one of the Monitor Outputs may be used to feed a mono program to the transmission or recording point, with the Speaker outputs used as control room and/or studio monitors.

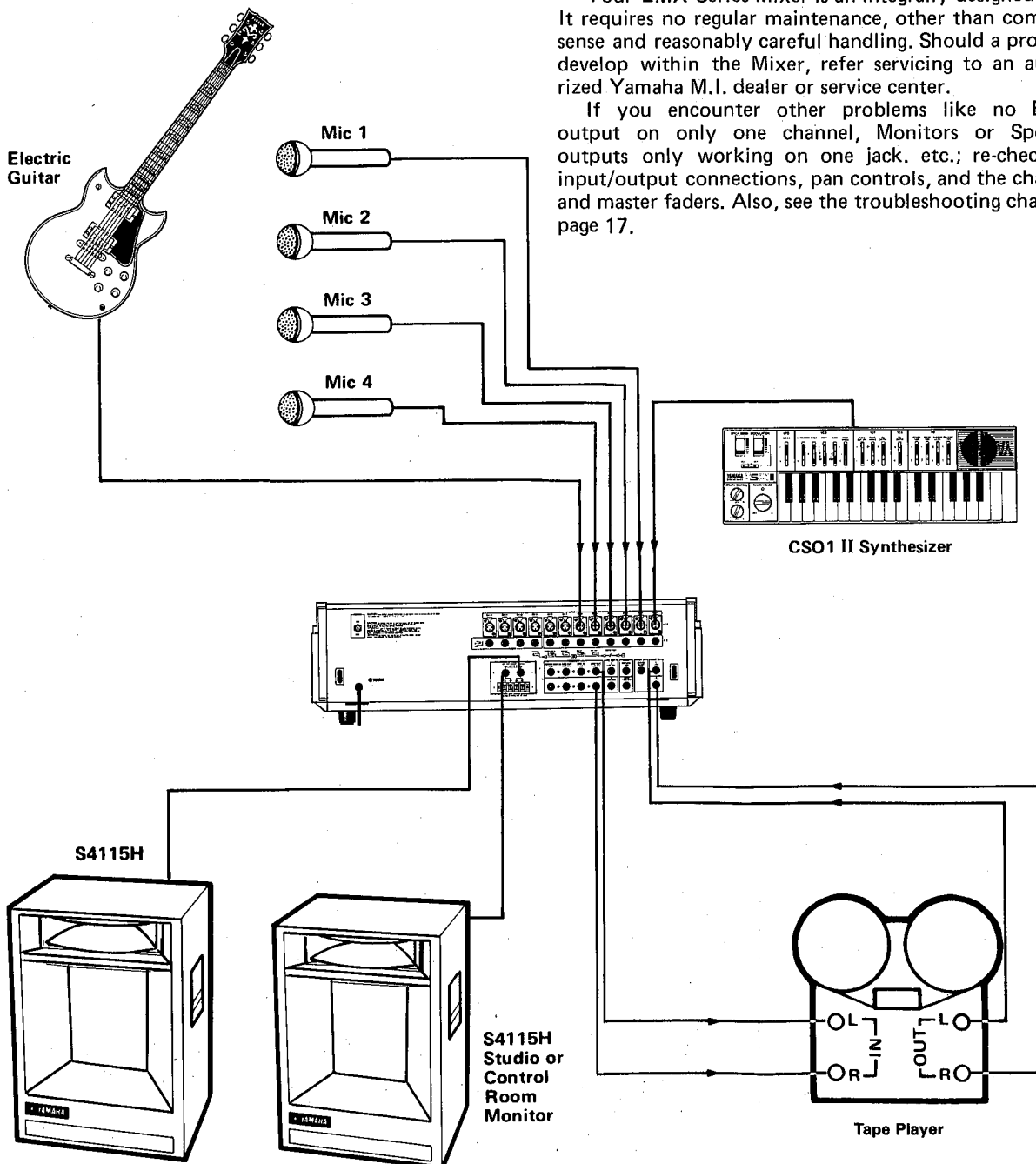
Maintenance

When operating your EMX-Mixer, never cover the air vents on the top or bottom panel. Constricting the air flow through these vents may cause overheating and damage to the mixer.

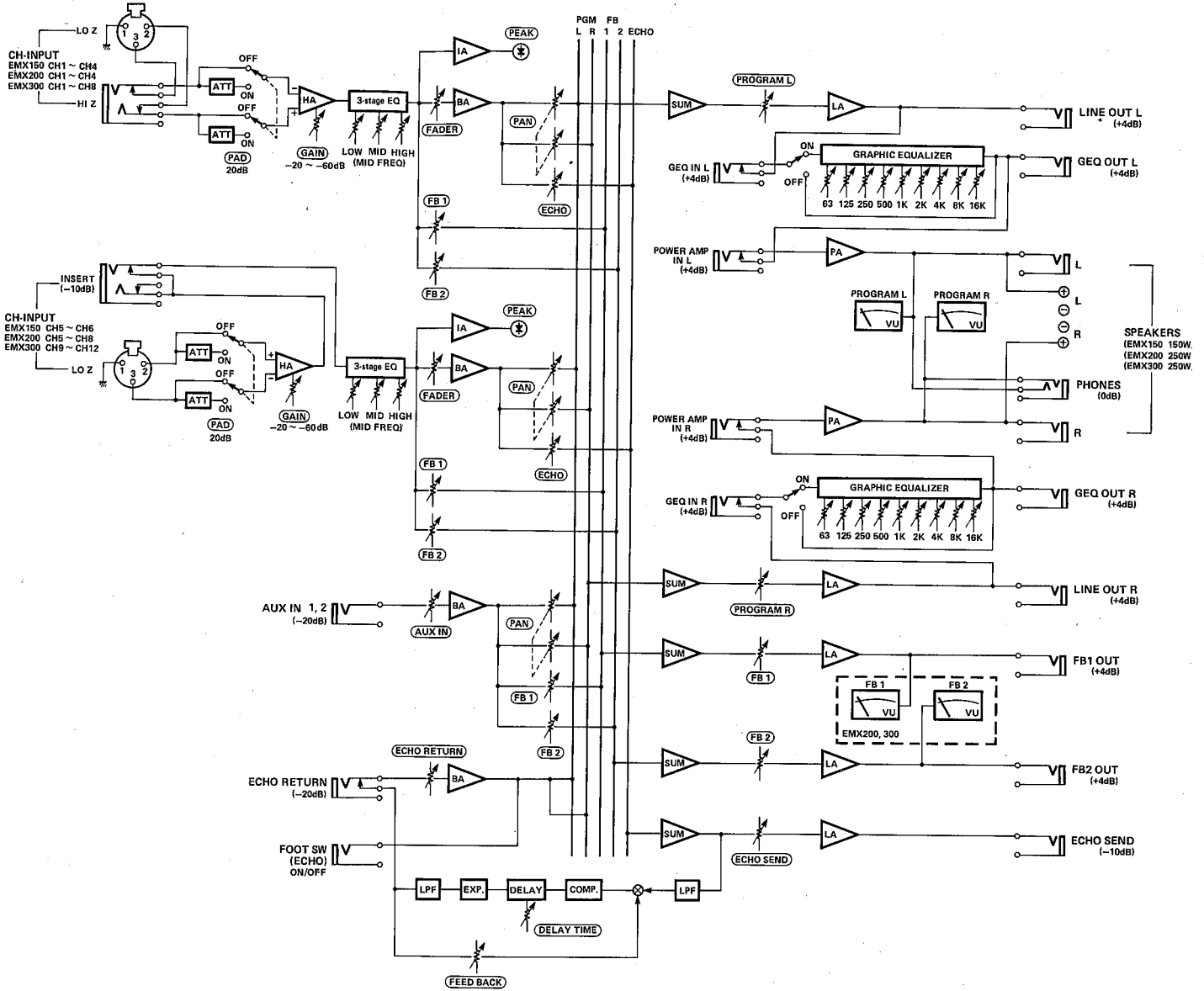
The use of solvents for cleaning the front panel may cause discoloration. Dust the panels and control knobs with a soft cloth; use a damp sponge with a mild dish detergent if necessary.

Your EMX Series Mixer is an integrally-designed unit. It requires no regular maintenance, other than common sense and reasonably careful handling. Should a problem develop within the Mixer, refer servicing to an authorized Yamaha M.I. dealer or service center.

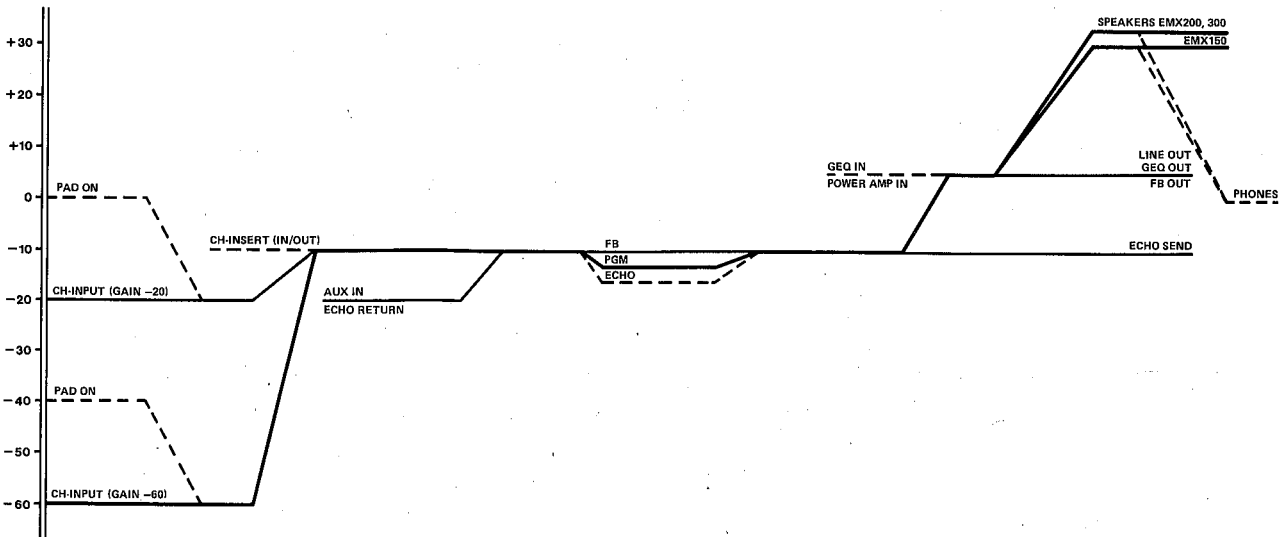
If you encounter other problems like no Echo, output on only one channel, Monitors or Speaker outputs only working on one jack. etc.; re-check all input/output connections, pan controls, and the channel and master faders. Also, see the troubleshooting chart on page 17.



Block Diagrams



Level Diagram



GENERAL SPECIFICATIONS

MODEL	EMX150	EMX200	EMX300	
MAXIMUM OUTPUT POWER 0.5% 20 Hz – 20 kHz	150 W + 150 W @ 4 ohms 110 W + 110 W @ 8 ohms	250 W + 250 W @ 4 ohms 170 W + 170 W @ 8 ohms	250 W + 250 W @ 4 ohms 170 W + 170 W @ 8 ohms	
MAXIMUM OUTPUT LEVEL (LINE OUT)	+20 dB @ 10k-ohms 0.5% 20 Hz–10 kHz			
T.H. Distortion (SPEAKER OUT) (LINE OUT)	Less than 0.05% 20 Hz – 20 kHz @ 75 W 4 ohms	Less than 0.05% 20 Hz – 20 kHz @ 125 W 4 ohms		
Frequency Response (SPEAKER OUT) (LINE OUT)	Less than 0.2% 20 Hz – 20 kHz @ +4 dB 10 k-ohms +1, –3 dB 20 Hz – 20 kHz @ 1 W 8 ohms +1, –3 dB 20 Hz – 20 kHz @ +4 dB 10 k-ohms			
Hum & Noise* (20 Hz – 20 kHz) Rg = 150 ohms Input GAIN = –50 dB	–64 dB residual output noise (SPEAKER OUT)	–62 dB residual output noise (SPEAKER OUT)		
	–126 dB Equivalent Input Noise (66 dB S/N) –90 dB residual output noise (LINE OUT) –77 dB (81 dB S/N) LINE OUT Master fader at maximum and all CH fader at minimum. –62 dB (66 dB S/N) LINE OUT Master fader at maximum and one Input fader at maximum. –77 dB (81 dB S/N) FB OUT Master fader at maximum and all Input FB volume at minimum. –62 dB (66 dB S/N) FB OTU Master fader at maximum and one Input FB volume at maximum. –85 dB (75 dB S/N) ECHO SEND Master level control at maximum and all Input ECHO volume at minimum level. –76 dB (66 dB S/N) ECHO SEND Master level control and one Input fader at maximum and one ECHO volume at nominal level.			
Crosstalk	–60 dB at 1 kHz : adjacent Input –60 dB at 1 kHz : Input to Output			
Maximum Voltage Gain	SP OUT (L, R) 90 dB CH IN to SP OUT	SP OUT (L, R) 92 dB CH IN to SP OUT		
	LINE OUT (L, R) FB OUT (1, 2) ECHO SEND ECHO RETURN AUX IN (1, 2) AUX IN (1, 2) CH INSERT OUT CH INSERT IN	64 dB CH IN to LINE OUT 64 dB CH IN to FB OUT 56 dB CH IN to ECHO SEND 24 dB ECHO RETURN to LINE OUT 24 dB AUX IN to LINE OUT 24 dB AUX IN to FB OUT 50 dB CH IN to CH INSERT OUT 14 dB CH INSERT IN to LINE OUT		
Ch Controls EMX150 (1-6) EMX200 (1-8) EMX300 (1-12)	Feder PAD (0 dB/–20 dB) GAIN (–20 dB ~ –60 dB) HI-EQ MID-EQ (Level/Freq.) LO-EQ FB (1, 2) ECHO Pan pot			
Master Controls	PGM Fader (L, R) FB Fader (1, 2) ECHO SEND ECHO RETURN ECHO (Feedback/Delay time) AUX IN (1, 2) (Volume/Pan pot/FB1/FB2) 9-band Graphic EQ (in-out sw.)			
Channel Equalization	+15, –15 dB maximum HIGH : 8 kHz shelving MID : 0.35 kHz–5 kHz peaking LOW : 100 Hz shelving			
Master Equalization (GEO)	+12, –12 dB maximum 63, 125, 250, 500, 1 k, 2 k, 4 k, 8 k, 16 kHz peaking			
VU meters (+3 VU full power) (0 VU = +4 dB)	2 illuminated meters, SPEAKER OUT (L, R)			
	—	2 illuminated meters, FB OUT (1, 2)		
Peak Indicators	LED (red) built into each Channel Input turns ON when pre-fader level reaches 3 dB below clipping.			
Finish	Black			
Dimension	(Width) (Depth) (Height)	538 mm (21-3/16") 672 mm (26-7/16") 240 mm (9-7/16")	618 mm (24-3/4") 672 mm (26-7/16") 272 mm (9-7/16")	778 mm (30-11/16") 672 mm (26-7/16") 240 mm (9-7/16")
Weight	26 kg (57 lbs. 3 oz.) 31 kg (68 lbs. 6 oz.) 35 kg (77 lbs.)			

* Hum and Noise are measured with 6 dB/octave filter at 12.47 kHz: equivalent to a 20 kHz filter with infinite dB/octave attenuation.

** 0 dB = 775mVrms.

INPUT CHARACTERISTICS

Connection		CH Controls		Actual Load Impedance	For Use with Nominal	Sensitivity** (at maximum gain)	Input Level		Connector in Console
		PAD	GAIN				Nominal	Max. before Clip	
CH INPUT	Lo-Z EMX150 1~6 EMX200 1~8 EMX300 1~12	0 dB	-60 dB	1 k Ω	50 Ω ~250 Ω Microphones or 600 Ω Lines	-60 dB (0.8 mV)	-60 dB (0.8 mV)	-30 dB (24.5 mV)	XLR Type (balanced)
		20 dB (on)	-20 dB			-20 dB (78 mV)	-20 dB (78 mV)	+10 dB (2.45 V)	
						0 dB (775 mV)	0 dB (775 mV)	+24 dB (12.3 V)	
	Hi-Z EMX150 1~4 EMX200 1~4 EMX300 1~8	0 dB (off)	-60 dB	10 k Ω	50 Ω ~10 k Ω Microphones or 600 Ω Lines	-60 dB (0.8 mV)	-60 dB (0.8 mV)	-30 dB (24.5 mV)	TRS Jack (unbalanced)
		20 dB (on)	-20 dB			-20 dB (78 mV)	-20 dB (78 mV)	+10 dB (2.45 V)	
						0 dB (775 mV)	0 dB (775 mV)	+24 dB (12.3 V)	
CH INSERT IN		EMX150 5~6 EMX200 5~8 EMX300 9~12		10 k Ω	600 Ω Lines	-10 dB (245 mV)	-10 dB (245 mV)	+20 dB (7.75 V)	TRS Jack (balanced)
AUX IN (1, 2)				15 k Ω	600 Ω Lines	-20 dB (78 mV)	-20 dB (78 mV)	+24 dB (12.3 V)	Phone Jack (unbalanced)
ECHO RETURN				15 k Ω	600 Ω Lines	-20 dB (78 mV)	-20 dB (78 mV)	+24 dB (12.3 V)	Phone Jack (unbalanced)
GEQ IN (L, R)				47 k Ω	600 Ω Lines	+4 dB (1.23 V)	+4 dB (1.23 V)	+20 dB (7.75 V)	Phone Jack (unbalanced)
POWER AMP IN (L, R)				25 k Ω	600 Ω Lines	+4 dB (1.23 V)	+4 dB (1.23 V)	N/A	Phone Jack (unbalanced)

OUTPUT CHARACTERISTICS

Connection		Actual Source Impedance	For Use with Nominal	OUTPUT LEVEL		Connector in Console (unbalanced)
				Nominal	Max. before Clip	
SPEAKER OUT (L, R)	EMX150	0.05 Ω	4 Ω	150 W	N/A	Phone Jack and Barrier Strip type
	EMX200 EMX300			250 W		
LINE OUT (L, R)		370 Ω	10 k Ω	+4 dB (1.23 V)	+20 dB (7.75 V)	Phone Jack
GEQ OUT (L, R)		370 Ω	10 k Ω	+4 dB (1.23 V)	+20 dB (7.75 V)	Phone Jack
FB OUT (1, 2)		150 Ω	10 k Ω	+4 dB (1.23 V)	+20 dB (7.75 V)	Phone Jack
ECHO SEND		560 Ω	10 k Ω	-10 dB (245 mV)	+20 dB (7.75 V)	Phone Jack
PHONES		25 Ω	8 Ω	0 dB (75 mW)	N/A	Stereo Phone Jack
CH INSERT OUT		EMX150 5~6 EMX200 5~8 EMX300 9~12	10 k Ω	-10 dB (245 mV)	+20 dB (7.75 V)	Phone Jack (TRS)

* 0dB = 775mVrms

** Sensitivity is the lowest level that will produce an output of full power or the output level when the unit is set to maximum gain
Specifications subject to change without notice.

Troubleshooting

The following chart may be helpful if you encounter difficulty with your EMX-Mixer.

DIFFICULTY	POSSIBLE CAUSES
NO POWER (VU Meters have no light or level)	<ol style="list-style-type: none">1. Mixer is not plugged into a "live" AC outlet.2. Fuse is blown. Replace with same size and type. If fuse blows again, see "Fuse Blown" below.
NO SIGNAL OUTPUT (VU Meters moving) (VU Meters light, but do not move)	<ol style="list-style-type: none">1. Speakers are incorrectly patched to outputs.2. Speaker cables or connectors are open/shorted.3. Input Channel Volume controls are at ∞.4. Input Level switch is set improperly for channel source.5. Inputs are incorrectly connected or connected to wrong impedance jack.6. Master faders are at ∞.
VERY LOW SIGNAL LEVEL (Channel and Master Volume controls turned up)	<ol style="list-style-type: none">1. Microphone or line input level is too low to drive Mixer (Needs matching transformer or preamplifier).2. Input Level switch is not set properly.3. Excessive EQ cut on Input Channel or Graphic Equalizers.
FUSE BLOWN	<ol style="list-style-type: none">1. Mixer output is patched back into a Mixer input.2. Hi-level amplified signal is fed to Mixer input.3. Short in Speaker, Monitor, Line Out, G-EQ out or other cables.4. Overheating due to covered top-panel vents.
Caution: Replace fuse with one of similar size and type. If second fuse blows refer to authorized Yamaha service center.	
Never use a fuse of higher rating than that specified. Doing so will only cause damage to your Mixer.	
SOUND IS DISTORTED	<ol style="list-style-type: none">1. Channel or Master Volume is too high (VU meter pinning).2. Input Level switch is too low.3. Input signal is too strong. (Use a "direct box" to lower the level).
FEEDBACK	<ol style="list-style-type: none">1. Microphones are placed in front of speakers.2. Channel EQ is set for too much boost.3. Graphic Equalizers are set for too much boost.
LOUD BUZZING	<ol style="list-style-type: none">1. Shorted cables or circuits. Turn off AC Power at once. Double check input and output connections, and replace damaged or suspect cables.2. Ground loop or input source problem. Unplug all inputs to Mixer and check each individually until buzzing starts. Buzz does not necessarily indicate a problem in the equipment, but may require the use of a common AC power line, addition or elimination of ground connections, or use of shorter cables.

