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MIXER

SAMSON[®]

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PL 2404

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Congratulations on purchasing the Samson PL 2404 four-bus line mixer! The PL 2404 is optimized for use as a keyboard submixer in both live performance and recording applications, and it can be used wherever there are a number of stereo or mono line-level sources that need to be mixed down to two or four outputs. Although the PL 2404 is designed for easy operation, we suggest you first take some time to go through these pages so you can fully understand how we've implemented a number of unique features.

In this manual, we'll provide you with an overview of PL 2404 features, followed by a guided tour of its front and rear panels. Then we'll describe how the PL 2404 should be connected to your existing equipment (including wiring diagrams) and talk about the important topics of gain structure and grounding techniques. Next, we'll cover a number of specific PL 2404 features (such as busing, submixing, channel muting, as well as using balance, equalization, auxiliary sends and returns, channel inserts, and PFL/AFL) in detail. Finally, we'll wrap things up with a series of applications notes describing a number of ways to use the PL 2404 for both recording and live performance, plus reference Appendices and full specifications. You'll also find a warranty card enclosed—please don't forget to fill it out and mail it so that you can receive online technical support and so we can send you updated information about other Samson products in the future.

SPECIAL NOTE: Should your unit ever require servicing, a *Return Authorization* number (RA) is necessary. Without this number, the unit will not be accepted. Please call Samson at 1-800-372-6766 for a Return Authorization number prior to shipping your unit. Please retain the original packing materials and, if possible, return the unit in its original carton and packing materials.

PL 2404 Features

“PL” stands for “Program/Line” and the name describes the broad range of signals which can be handled by this powerful four-bus mixer. In fact, the compact design of the PL 2404 belies an extraordinary versatility. Add excellent sound quality to the equation, and you've got a product which is equally useful in live performance and for recording (you'll find descriptions of each application at the conclusion of this manual). Here are some of the PL 2404's main features:

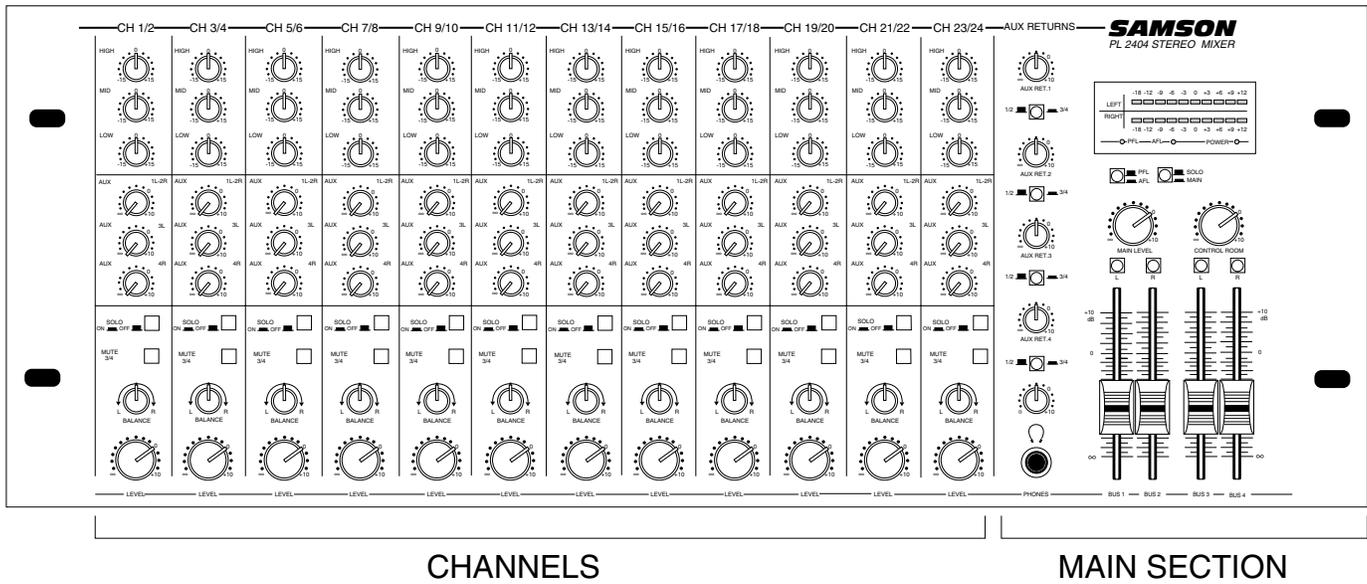
- Twenty-four input channels, which can be used as twelve stereo channels. All channels provide electronically balanced line-level inputs, and are ideal for line-level sources such as keyboards and MIDI tone modules; drum machines; outboard signal processors; CD players; and tape or cassette recorders. In addition, channels 1 and 3 provide electronically balanced XLR mic inputs so that you can connect one or two microphones to the PL 2404.
- Four *bus* outputs (a “bus” is simply a pathway through which a signal can be routed) and an electronically balanced main stereo output, with dedicated front panel control. Any channel input can be routed to either of the two bus pairs (1/2 or 3/4), and any of the buses can be routed to the Left/Right mix output with the touch of a button. This flexible design allows you to easily mute selected channels and/or to create submixes within your main mix.

PL 2404 Features

- An independent electronically balanced Control Room output (with dedicated level control) for connection to a power amplifier and studio monitors.
- Four Bus faders enable easy control of bus output levels.
- Input trims for the mic inputs of channels 1 and 3 are continuously adjustable from +4 to -50 dB, making it possible to use the PL 2404 with a wide variety of microphone types.
- Four auxiliary sends and four stereo auxiliary returns (which can be routed to any of the four buses). All aux sends are post-fader and post-equalizer.
- Independent 3-band equalization for each channel, with 15 dB of cut or boost for low (80 Hz), mid (1 kHz) and high (10 kHz) frequencies.
- Balance controls for each channel that allow you to blend the relative levels of stereo inputs.
- Center detents for all Balance and EQ controls, making it easy to use the PL 2404 even in low-light situations such as live performance.
- Selectable *Pre Fade Listen (PFL)* or *After Fade Listen (AFL)* soloing for each channel. PFL allows headphone monitoring of individual channels, pre-fader (but post-EQ), while AFL enables headphone monitoring of individual channels, post-fader and post-EQ, with the channel in its proper stereo position. Both types of solo function are non-mix-destructive in that they do not affect the signal being output either by the Main, Bus, or Control Room outputs.
- A flexible front panel metering system includes a ten-segment level meter and allows you to view at a glance the levels of the main Left/Right output, as well as power and PFL or AFL status.
- An independent front-panel headphone output with dedicated volume control and Main/Solo switch for selective monitoring of either the Main output or of channels that are soloed.
- Channel inserts are provided for channels 1 - 4, enabling you to use outboard signal processors such as equalizers, compressor/ limiters, or noise gates in a standard "effect loop."
- Bus inserts allow external signals to be submixed into any or all of the four buses and also enables linking of multiple mixers.
- The PL 2404 can be mounted in any standard 19" rack (taking four rack spaces), making it easy to integrate into any existing system.
- Last but certainly not least, affordability. The PL 2404 has been designed from the ground up to provide versatility and excellent sound quality at a cost-conscious price.

Guided Tour - Overview

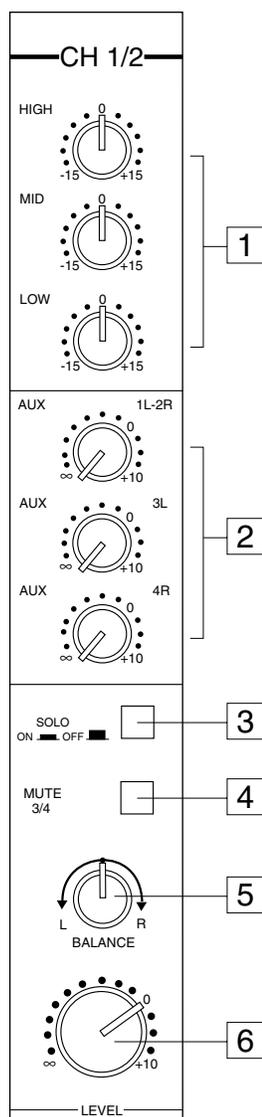
The following illustration shows an overview of the front panel of the PL 2404:



CHANNELS

MAIN SECTION

Guided Tour - Channels



1: Equalizer (violet) - These knobs determine the amount of boost or attenuation in each of three frequency areas (up to 15 dB for each area). The mid frequency control (centered at 1 kHz) utilizes a resonant (“bell”) peaking curve, while the high and low frequency controls (centered at 10 kHz and 80 Hz, respectively) utilize shelving curves. The EQ setting affects both the odd- and even-numbered channel inputs, although the signals remain separate. A center detent in each knob (at the “0” position) indicates no boost or attenuation (that is, flat response). As each knob is turned clockwise from the “0” position, the frequency area is boosted; as it is turned counterclockwise from the “0” position, the frequency area is attenuated. For more information on the application of EQ, see the “Using Equalization” section on page 19.

2: Auxiliary sends (blue) - These knobs (labeled “Aux 1L-2R,” “Aux 3L,” and “Aux 4R”) allow you to route signal to any of the PL 2404’s four Auxiliary outputs. These are typically used to route signal to outboard effects devices. When a pair of channel inputs (that is, both odd-numbered and even-numbered) are connected, the odd-numbered (left) input signal can only be routed to Aux 1L and Aux 3L, while the even-numbered (right) input can only be routed to Aux 2R and Aux 4R. In this case, the Aux 1L-2R send acts as a stereo auxiliary send, with the left side of the input signal routed to Aux 1L and the right side routed (at equal level) to Aux 2R. When only the even-numbered (right) input is connected, the signal can only be routed to Aux 2R or Aux 4R. When only the odd-numbered (left) input is connected, the signal can be routed to any of the four Aux sends. When an Aux send knob is at the “0” (2 o’clock) position, the signal is routed with unity gain (that is, no boost or attenuation). As each Aux send knob is turned clockwise towards the “+10” position, the signal is boosted (by a maximum of 10 dB); as it is turned counterclockwise towards the “∞” position, it is attenuated (at the very bottom, it is attenuated infinitely—in other words, no signal is routed). All four Aux sends are *post-fade*; that is, the level of the signal is determined by the position of the channel’s Level control, its EQ settings, the position of the main Level control, and (in the case of channels 1 and 3) Trim control. For more information, see the “Using Auxiliary Sends and Returns” section on page 20.

3: Solo On/Off switch - When pressed in, the channel is soloed (in headphones only, and only when the Solo/Main switch in the PL 2404 main section is in the Solo position). Soloing will be in either PFL (Pre Fade Listen) or AFL (After Fade Listen) mode, depending upon the setting of the PFL/AFL switch in the PL 2404 main section. See #7 and #8 on page 7 and the “Using PFL/AFL” section on page 22 for more information.

4: Mute 3/4 switch - When up, the channel’s signal is routed to the Bus 1/2 faders and then on to the Bus 1/2 and, optionally, Main and Control Room output jacks (if, as described in #10 on page 7, the Bus “L/R” switches for those buses is pressed in). When pressed in, the channel’s signal is instead routed to the Bus 3/4 faders and then on to the Bus 3/4 and, optionally, Main and Control Room output jacks (if, as described in #10 on page 7, the Bus “L/R” switches for those buses is pressed in). If you set the Bus 3/4 faders all the way down (to their “∞” position), this switch can be used for channel muting. See the “Busing, Submixing and Channel Muting” section on page 17 for more information.

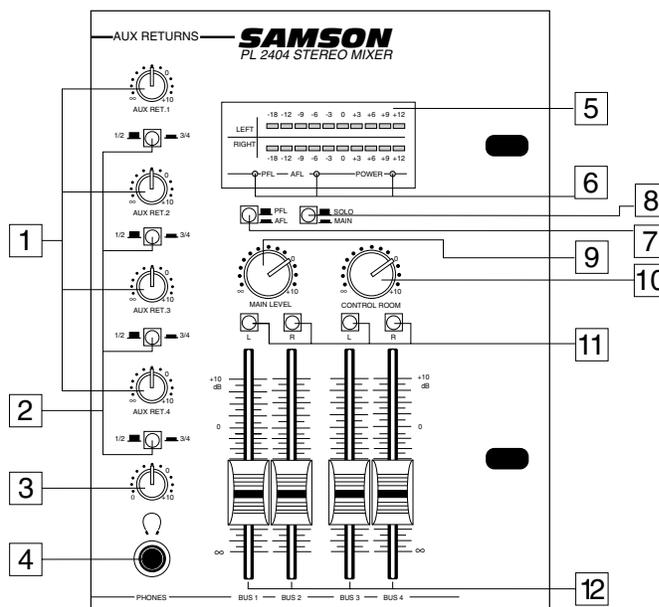
5: Balance (brown) - When a pair of channel inputs (that is, both odd-numbered and even-numbered) are connected, the odd-numbered (left) input signal is automatically panned hard left and the even-numbered (right) input signal is automatically panned hard right. In this case, the “Balance” knob controls the relative levels of the paired input signals. When the knob is placed at its center detented position, both signals are at equal strength. When moved left of center, the odd-numbered (left) input signal remains at the same strength but the even-numbered (right) input signal is attenuated; when the knob is moved right of center, the even-numbered (left) input signal remains at the same strength but the odd-numbered (right) input signal is attenuated. When placed fully counterclockwise, only the odd-numbered (left) input signal is heard (panned hard left); when placed

fully clockwise, only the even-numbered (right) input signal is heard (panned hard right). When only the odd-numbered (left) input is connected, the Balance knob functions as a constant level Pan control, allowing you to continuously place the incoming signal anywhere in the left-right stereo field. For more information, see the “Using the Balance Control” section on page 18 in this manual.

6: Level (white) - This knob (purposely made a little bigger than the others so you can find it easily in low-light situations) simultaneously controls the volume of both the odd- and even-numbered channel inputs (the *relative* volumes of the two can be adjusted with the Balance knob, as described in #5 above). In practice, you will use the Level controls to continuously adjust the loudnesses of the various signals being blended together by the PL 2404. The “0” (2 o’clock) position of the knob indicates unity gain (no level attenuation or boost). Moving the knob counterclockwise from the “0” position (towards “∞”) causes the signal to be attenuated (at the very bottom, it is attenuated infinitely—in other words, there is no sound). Moving it clockwise from the “0” position (towards “+10”) causes the signal to be boosted by as much as 10 dB.

For best signal-to-noise ratio, all Level controls for channels carrying signal should generally be kept at or near the “0” position. Channels that are unused should have their Level controls kept fully counterclockwise at their “∞” (minimum) level. See the “Setting the Correct Gain Structure” section on page 13 in this manual for more information.

Guided Tour - Main Section



1: Auxiliary Return Level (orange) - These knobs determine the input level of signal arriving via the PL 2404's four stereo Auxiliary returns. The "0" (2 o'clock) position of each knob indicates unity gain (no level attenuation or boost). Moving each knob counterclockwise from the "0" position (towards " ∞ ") causes the signal to be attenuated (at the fully counterclockwise position, it is attenuated infinitely—in other words, there is no sound). Moving each knob clockwise from the "0" position (towards "+10") causes the signal to be boosted by as much as 10 dB. For information on how to properly set these, see the sections in this manual entitled "Setting the Correct Gain Structure" and "Using the Aux Sends and Returns" (pages 13 and 20).

2: Auxiliary Return Bus switch - These switches determine which of the two pairs of stereo buses (1/2 or 3/4) the Aux return signal is routed to. When up, the Return's signal is routed to the Bus 1/2 faders and then on to the Bus 1/2 jacks as well as (if the Bus "L/R" switch is pressed in—see #10 on page 7) the Main and Control Room output jacks. When pressed in, the channel's signal is instead routed to the Bus 3/4 faders and then on to the Bus 3/4 jacks as well as (if the Bus "L/R" switch is pressed in) the Main and Control Room output jacks. If you set the Bus 3/4 faders all the way down (to their " ∞ " position), this switch can be used for selective muting of Aux returns. See the "Busing, Submixing and Channel Muting" and "Using the Aux Sends and Returns" sections on page 17 and page 20 in this manual.

3: Headphone Level - This knob sets the level of the signal sent to the headphone jack (see #4 below). **WARNING:** To avoid possible damage to connected headphones (or, worse yet, to your ears!), always turn this all the way off (to the fully counterclockwise "0" position) before plugging in a pair of headphones—then raise the level *slowly* while listening. The Headphone Level has no effect on the final Main output level or on the Control Room output level.

4: Headphone jack - Connect any standard stereo headphones to this jack (via a 1/4" TRS plug) for private monitoring of the Main output (including all connected Aux returns). The built-in PL 2404 headphone preamp delivers 120 mw at 33 ohms.

Guided Tour - Main Section

5: Meter - This ten-segment bar meter shows the continuous output level of the Main left/right output. For optimum signal-to-noise ratio, try to adjust all levels so that program material is usually at or around 0 VU, with occasional but not steady excursions to the red “+” segments. See the “Setting the Correct Gain Structure” section on page 13 in this manual for more information.

6: Meter LEDs - These show the status of various conditions within the PL 2404. The leftmost LED (labeled “PFL”) lights steadily green when the PL 2404 is in PFL mode (see #7 below). The center LED (labeled “AFL”) lights steadily red when the PL 2404 is in AFL mode (see #7 below). The rightmost LED (labeled “Power”) lights steadily red whenever the PL 2404 is powered on.

7: PFL/AFL switch - This determines whether the PL 2404 is in PFL mode (switch up) or AFL mode (switch pressed in). For more information, see the “Using PFL/AFL” section on page 22 in this manual.

8: Solo/Main switch - This switch affects headphone monitoring only. When the switch is up (Solo mode), the headphones receive signal from only those channels whose Solo switches are currently pressed in; when the switch is pressed in (Main mode), the headphones always receive the Main output regardless of the settings of any channel Solo switches. For more information, see #3 on page 4 and the “Using PFL/AFL” section on page 22.

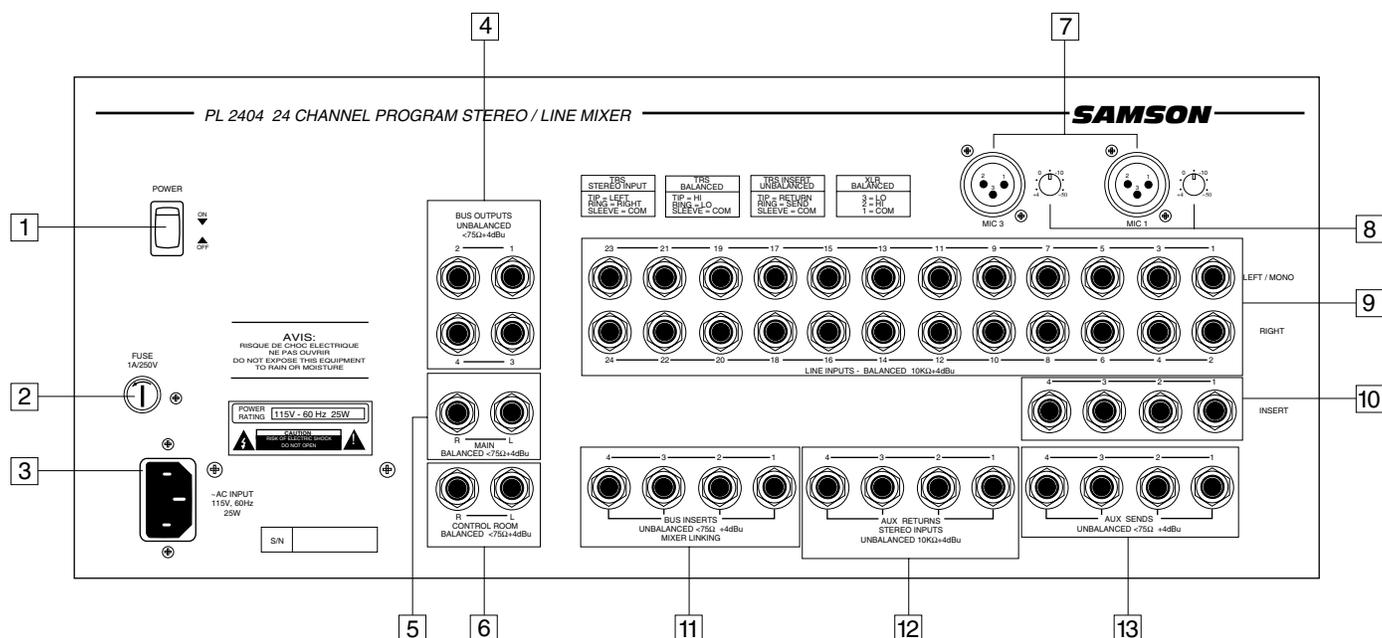
9: Main Level - This knob determines the final signal level of the rear panel Main output—you can think of this as being the “master fader.” The 2 o’clock “0” position of the knob indicates unity gain (no level attenuation or boost). Moving the knob counterclockwise from the “0” position (towards “∞”) causes the signal to be attenuated (at the very bottom, it is attenuated infinitely—in other words, there is no sound). Moving it clockwise from the “0” position (towards “+10”) causes the signal to be boosted by up to 10 dB. For more information, see the “Setting The Correct Gain Structure” section on page 13 in this manual.

10: Control Room Level - This knob determines the signal level of the rear panel Control Room output, allowing independent monitoring of the Main output signal. The 2 o’clock “0” position of the knob indicates unity gain (no level attenuation or boost). Moving the knob counterclockwise from the “0” position (towards “∞”) causes the signal to be attenuated (at the very bottom, it is attenuated infinitely—in other words, there is no sound). Moving it clockwise from the “0” position (towards “+10”) causes the signal to be boosted by up to 10 dB.

11: Bus L/R switches - These switches allow you to route the output from any of the four buses to the Main left/right output jacks and Control Room left/right output jacks on the rear panel (see #5 and #6 on page 8). When up, the signal from that bus is not routed to the main outputs and terminates at its Bus out jack (see #4 on page 8). When pressed in, the signal from that bus is routed to the main outputs as well as its Bus out jack.

12: Bus Faders (white with blue line) - These linear sliders determine the relative level of the four bus outputs. The “0” position of each fader indicates unity gain (no level boost or attenuation). Moving the fader below this position (towards the “∞” position) causes the signal to be attenuated (at the very bottom, it is attenuated infinitely—in other words, there is no sound). Moving it above this position (towards the “+10 dB” position) causes the signal to be boosted by up to 10 dB. For best signal-to-noise ratio, all Bus faders should generally be kept at or near the 0 level. For more information, see the “Setting The Correct Gain Structure” section on page 13 in this manual .

Guided Tour - Rear Panel



1: Power on-off switch - As you may have guessed, this is what you use to turn the PL 2404 on and off. To avoid potential damage to your speakers, turn the PL 2404 on *before* you turn on any connected power amps—and turn it off *after* the power amps are turned off.

2. Fuse - Contains a 1 amp, 250 volt fuse.

3. AC input - Connect the supplied standard 3-pin “EEC” plug here.

4: Bus out (1 - 4) - These unbalanced outputs allow you to route signal from each of the four discrete buses to external devices such as a multitrack digital or analog tape recorder. The signal is post-bus fader but pre-Main control. See the “Busing, Submixing, and Channel Muting” section in this manual for more information.

5: Main Out (L, R) - These are the PL 2404’s main outputs. In live performance applications, you’ll usually use these to connect the PL 2404 to a power amp and speakers; in recording applications, these will normally be connected to the inputs of a two-track recorder. The Main out jacks are electronically balanced, so you should use balanced three-conductor cabling and 1/4" TRS plugs wherever possible (unbalanced two-conductor plugs can also be inserted into these outputs, but you’ll get better signal quality and less outside noise and hum if you use balanced lines). See the “Connecting the PL 2404” section on page 10 for more information.

6: Control Room Out (L, R) - In recording applications, these will normally be connected to a power amplifier and loudspeakers. The Control Room out jacks are electronically balanced, so you should use balanced three-conductor cabling and 1/4" TRS plugs wherever possible (unbalanced two-conductor plugs can also be inserted into these outputs, but you’ll get better signal quality and less outside noise and hum if you use balanced lines). See the “Connecting the PL 2404” section on page 10 in this manual for more information.

Guided Tour - Rear Panel

7: Mic inputs (channels 1 and 3) - Use these electronically balanced XLR jacks to connect a microphone to channel 1 and/or channel 3. These are intended to accept signal from low-level, low-impedance mics but can also be used for signal from other sources (such as direct injection boxes) if the channel's Trim control (see #8 below) is turned down. **WARNING:** Do not connect a channel's microphone input if you already have something connected to its line input (see #9 below); these channels are designed to accept only one source or the other.

8: Trim control (black) - This knob determines the input level of the mic signal connected to channel 1 and/or channel 3. Continuously adjustable from +4 dB to -50 dB, the trim control is at unity gain (no boost or cut) when set to the "0" (9 o'clock) position. The input signal is boosted when the trim is turned to the right of "0" and attenuated when turned to the left of "0." For information on how to properly set this, see the section on page 13 entitled "Setting The Correct Gain Structure."

9: Line inputs - Use these electronically balanced 1/4" jacks to connect line-level sources such as synthesizers, drum machines, CD players, tape decks, or effects processors to any of the PL 2404's twenty-four channels. Use balanced three-conductor cabling and Tip/Ring/Sleeve (TRS) plugs wherever possible (unbalanced two-conductor plugs can also be inserted into these inputs, but you'll get better signal quality and less outside noise and hum if you use balanced lines). When connecting monophonic (as opposed to stereo) signal sources, use the left (odd-numbered) inputs; the Balance control for that channel pair will then act as a constant level pan control—see the "Using the Balance Control" section on page 18 for more information. The "Connecting the PL 2404" section on page 10 provides more information on how best to use channel inputs. **WARNING:** Do not connect the channel 1 or 3 line input if you already have something connected to that channel's microphone input (see #7 above); these channels are designed to accept only one source or the other.

10: Channel Inserts (1 - 4) - Use these to insert an external effects processor (such as outboard equalizer, compressor/limiter or noise gate) into any of the PL 2404's channels 1 - 4 in an "effects loop" configuration. These jacks accept 1/4" TRS plugs, with the ring carrying the send signal and the tip carrying the return signal. Normally, this will be connected to a Y-cord; see the "Connecting The PL 2404" section on page 10 for more information and a wiring diagram.

11: Bus Inserts (1 - 4) - Connect the output from another device to these in order to "submix" in their signal to the PL 2404 at unity gain. This can be used to link multiple PL 2404s or to add the output from another mixer to the PL 2404 without taking up channel line inputs. The Bus Insert jacks accept unbalanced 1/4" plugs. See the "Linking the PL 2404" Application on page 26 for more information.

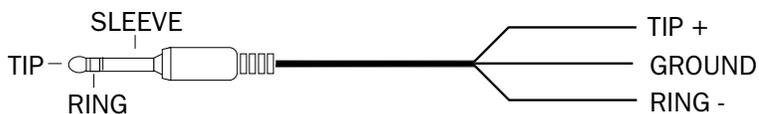
12: Aux Returns (1 - 4) - These unbalanced 1/4" inputs allow you to route signal from external devices such as effects processors to any of the four stereo Aux Returns. These jacks accept 1/4" TRS plugs, with the tip carrying the left signal and the ring carrying the right signal (sleeve is common ground). See the "Using Aux Sends and Returns" section on page 20 for more information.

13: Aux Sends (1 - 4) - These unbalanced 1/4" outputs allow you to route signal from any of the four discrete Aux Sends to external devices such as effects processors. All four PL 2404 Aux sends are post-fade. See the "Using Aux Sends and Returns" section on page 20 for more information.

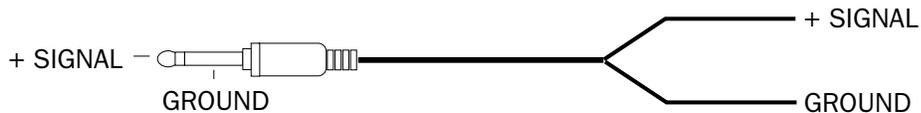
Connecting The PL 2404 - General Suggestions

The actual connections you'll make to and from the PL 2404 will vary according to the environment you use it in and the particular equipment you have. In the "PL 2404 Applications" sections at the rear of this manual, you'll find some suggested setups. Here are a few basic rules concerning PL 2404 connections that will apply in most situations:

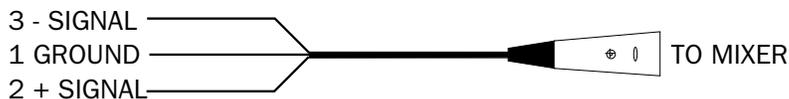
- In general, it's best to make all connections with the PL 2404 and any connected power amplifiers turned off. If you must make connections with the power on, make sure that the Main and Control Room Level knobs are completely counterclockwise and that all four bus faders are completely down (at their "∞" position). Whenever powering down, bring the Main and Control Room Level knobs completely counterclockwise and set all four bus faders completely down, turning off the main power amps *first*. Wait a few seconds for their power supplies to discharge and then turn off all connected equipment, turning the PL 2404 off *last*.
- Try to use balanced connectors and cabling wherever possible. These kind of connections do a better job of rejecting extraneous noise and hum and generally provide a cleaner signal. Although the PL 2404 will accept unbalanced connectors throughout, it specifically provides electronically balanced inputs for all line inputs and for its Main and Control Room outputs. The wiring diagram below shows how 1/4" TRS (Tip/Ring/Sleeve) connectors should be wired for use with these inputs and outputs:



Unbalanced cables use standard 1/4" phone connectors, wired as follows:



- Make one connection at a time and then monitor the incoming signal. If you hear a distinct hum or buzz, you may have a grounding problem with that particular device. See the "Grounding Techniques" section on page 15 in this manual for information on how to avoid grounding problems.
- When using channels 1 and 3, be sure not to connect both a microphone and line level input simultaneously—use one or the other. The diagram below shows how your mic connectors should be wired:

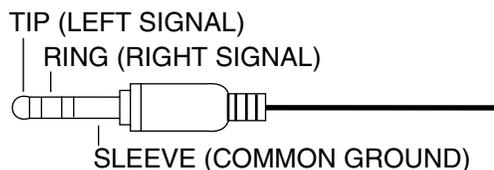


Connecting The PL 2404 - General Suggestions

- Matched signals (i.e. the stereo left-right outputs of a keyboard, drum machine, tone generator, effects processor, CD player, or tape recorder), should always be connected to the PL 2404's paired odd/even channels (i.e. 1L/2R, 3L/4R, etc.). The channel Balance control will allow you to adjust the relative levels of the two inputs, and you can also equalize the stereo signal, with the same EQ settings applied to both inputs.
- There are four more "hidden" (or at least not so obvious) stereo inputs to the PL 2404; these are the Auxiliary returns. Use these whenever you want to bring in stereo signals that will not need to be equalized.
- When connecting only one monophonic signal to a stereo channel, always use the left (odd-numbered) input. When only the left input is connected, the PL 2404 treats that channel as if it is a mono channel and the signal can then be panned (using the Balance control) and routed to all four Aux sends. See the "Using the Balance Control" and "Using Aux Sends And Returns" sections in this manual (pages 18 and 20) for more information.
- Signals that are likely to require "in-line" processing (such as compression/limiting or expansion/noise gating) should be connected to channels 1 - 4, since these channels provide an insert connection. Insert cables (sometimes called "Y-cords") should terminate in standard 1/4" TRS jacks (ring to send and tip to return), wired as follows:



- The PL 2404 Aux return jacks are unbalanced stereo inputs, with the tip carrying the left input signal and the ring carrying the right input signal (with the sleeve carrying common ground), as shown below. Insertion of a monophonic 1/4" jack into an Aux return will result in the incoming signal being automatically routed to the left input only (and therefore panned hard left).



Setting the Correct Gain Structure

You're now ready to establish the correct gain structure—the key to getting the best performance from the PL 2404, or from any mixer, for that matter. This is a simple procedure that ensures optimum input and output levels so that no unnecessary noise (caused by too low a signal) or overload distortion (caused by too high a signal) is created. Here's a step-by-step description of how to do so:

- a. With all connections made (as described above) but with *the power amplifier and PL 2404 off*, start by setting the power amplifier volume to minimum. On the PL 2404, turn all channel Level controls fully counterclockwise (to their “∞” position) and set all four bus faders to their “∞” position. If the Main output jacks are connected to a power amplifier and loudspeakers (as described in #2 on page 12), set the Main Level knob to its 2 o'clock “0” position. If the Control Room output jacks are connected to a power amplifier and loudspeakers (as described in #2 on page 12), set the Control Room Level knob to its 2 o'clock “0” position.
- b. If you have a microphone connected to channel 1 and/or channel 3, set the rear panel Trim knobs to their fully counterclockwise (+4) position.
- c. Set all channel EQ and Balance knobs to their center detent “0” positions.
- d. Set all channel Aux send knobs and all Aux return Level knobs to their fully counterclockwise (“∞”) position.
- e. Turn on all devices connected to channel line inputs and Aux returns and set their output level controls to unity gain or, if there is no unity gain indicated on their output control, to maximum. If you've got outboard effects processors connected to Aux returns, make sure they are sending completely “wet” (processed) signal, with no “dry” (unprocessed) signal mixed in.
- f. Turn on the PL 2404's rear-panel Power switch—the Power LED in the main section will light up. Finally, turn on your power amplifier.
- g. Play an instrument connected to one of the PL 2404's line inputs* and, while doing so, slowly raise the corresponding channel Level control to the 2 o'clock “0” position. Then slowly raise the power amplifier volume until you reach the level you want to hear. If the incoming signal sounds distorted, you may need to lower the output level of the instrument, though this will rarely occur. Conversely, if the signal is too low even with the output level of the instrument all the way up, something's definitely wrong: in all likelihood, the connecting audio cable is faulty and should be replaced.
- h. Repeat step (g) above for each instrument connected to the PL 2404 channel line inputs.

*** If you're using an instrument such as electric guitar or bass, we recommend that you connect it to the PL 2404 with a direct injection box to ensure correct impedance.*

Setting the Correct Gain Structure

i. If you have a microphone connected to channel 1 or channel 3, the procedure for setting optimum microphone levels is as follows: sing or speak into the mic at the level you expect to use in performance while slowly raising the Level control for that channel to its 2 o'clock "0" position. Again, slowly raise the power amplifier volume until you reach the level you want to hear. Then raise the rear panel Trim control for that channel to a point at which you get a strong, clear signal that doesn't distort even at the highest singing or speaking levels. For best signal-to-noise ratio, always keep the Trim control as high as possible short of distortion.

j. If you have any outboard signal processors connected to the Aux send and return jacks on the rear panel, follow this step. Because outboard effects processors can sometimes be quite noisy, it's particularly important to maximize the amount of signal being sent to them via the PL 2404 Aux sends. The idea is to drive these devices as hot as possible (short of overloading them) and then to use the corresponding Aux return level to carefully adjust the amount of processed signal being blended with the dry signal. To set optimum Aux send levels, use a channel that has already had its gain structure adjusted in step (g) or (i) above. Turn all Aux send knobs for that channel to their "0" (unity gain) position (bear in mind that, when a pair of channel inputs are connected, the odd-numbered [left] input signal can only be routed to Aux 1L and Aux 3L, while the even-numbered [right] input can only be routed to Aux 2R and Aux 4R; when only the odd-numbered [left] input is connected, the signal can be routed to any of the four Aux sends). Then play the instrument (or sing into the microphone) connected to that channel. Adjust the input levels of connected outboard effects processors so that their meter shows incoming signal normally in the 0 vu range (with only occasional higher excursions). Finally, optimize the Aux return levels: While continuing to play your instrument (or continuing to sing into the microphone), slowly raise each Aux return level control until you hear the desired amount of processed signal added to the dry signal. For more information, see the "Using Aux Sends and Returns" section on page 20.

k. At this point, if you want to route any channel or Aux return signal(s) to any of the four bus outputs at optimum level, simply set the channel's "Mute 3/4" or Aux return's Bus switch correctly and raise the corresponding bus fader to its "0" (unity gain) position.

l. The gain structure is now correctly set—you've optimized the level of all signals coming into and out of the PL 2404, and the end result will be minimum noise and distortion and maximum clean sound. You'll now find that the majority of your mixes can be accomplished with the Main or Control Room Level knobs and with most channel Level controls at or near their 2 o'clock "0" (unity gain) position. If you need to make adjustments to the overall level, use the level control of your power amplifier.

If you encounter difficulty with any aspect of setting up or using your PL 2404, you can call Samson Technical Support (1-800-372-6766) between 9 AM and 5 PM EST.

Hum and buzz are the biggest enemies you face when interconnecting a large number of different pieces of equipment to a central audio mixer. This is because each piece of equipment may operate at a marginally different voltage (this difference is called *potential*) and, when two devices at slightly different potential are physically connected with audio cabling, the end result can be nasty, extraneous noise (mind you, connecting two devices at *very* different potential can result in a major electrical shock!).

However, there are several steps you can take to avoid grounding problems. First, assuming you have an isolated electrical circuit that can handle the electrical demands of your mixer and all connected audio equipment (these needs will usually be modest), you should always plug your mixer and all connected equipment into the same circuit. If possible, nothing else but this equipment should be connected to that circuit. If you can't do this, at least avoid plugging your mixer and audio equipment into the same circuit that is already powering things like heavy machinery, air conditioners, heaters, refrigerators, washing machines, neon signs or fluorescent light fixtures. One particular culprit that will almost certainly create problems is the standard light dimmer (the kind that uses silicon controlled rectifiers). Where low-level lighting is desired, use incandescent fixtures with autotransformer-type dimmers (sometimes called *Variacs*) instead—these cost considerably more than the standard dimmer you'll find at your local hardware store, but are well worth the extra expense.

Three-prong plugs (such as the one used by the PL 2404) should always be used as is; don't use adapters to lift the ground (unless you're using a "star ground network"—see below). If you hear hum or buzz from a device that uses a two-prong plug (or an external two-prong AC/DC adapter), you can try reversing the plug in the socket. If that doesn't work, you may need to physically ground that device's chassis by connecting a wire (called a *strap*) from it to a grounded piece of metal such as rack ears. Some pieces of equipment have a screw-type ground post to which the strap can be connected; if not, you can attach some kind of metallic binding post to the case itself. If you are using rack-mounted audio devices and are experiencing hum or buzz, there's a simple test to determine the source of the problem: while keeping all devices powered on and connected with audio cabling, physically remove each device, one by one, from the rack. If the hum disappears when a particular device is removed, you'll know that device is the culprit.

We also recommend that you use balanced audio cabling and connectors wherever possible. The PL 2404 provides electronically balanced inputs for all line channel inputs and for its Main outputs. The wiring diagram in the "Connecting The PL 2404" section of this manual (page 10) shows how 1/4" TRS (Tip/Ring/Sleeve) connectors should be wired for use with these inputs and outputs.

In addition, you can minimize possible interference by planning your audio, electrical, and computer cable runs so that they are as far apart from one another as possible and so they don't run parallel to one another. If they have to cross, try to ensure that they do so at a 90° angle (that is, perpendicular to one another). In particular, try to keep audio cabling away from external AC/DC adapters.

Grounding Techniques

If you're using the PL 2404 in a fixed location such as a recording studio, you may want to invest the time and money into creating a *star ground network*. This is by far the best technique for avoiding grounding problems. It involves using a formidable ground source such as a cold water pipe or a copper spike driven into the earth. A thick grounding cable is connected to that source and then brought to a central distribution point; from there, individual cables are connected to each piece of equipment. This setup also requires that you lift the ground plug of all three-prong AC connectors, so there is the possibility of danger if it is done incorrectly. We strongly recommend that you contract with a qualified professional to carry out this or any kind of electrical work.

Another, less common problem you may encounter is that of *oscillation* (a ringing tone), which, apart from being annoying, is potentially dangerous to your speakers. This is generally caused either by poor outside wiring or by returning a signal out of phase (most commonly from an outboard signal processor). If audible oscillation occurs, try isolating each input signal by turning down all other inputs. If one signal alone is causing the problem, you should be able to eliminate the oscillation by reversing that signal's phase (many signal processors have a switch that allows you to do this).

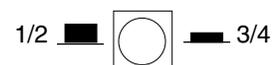
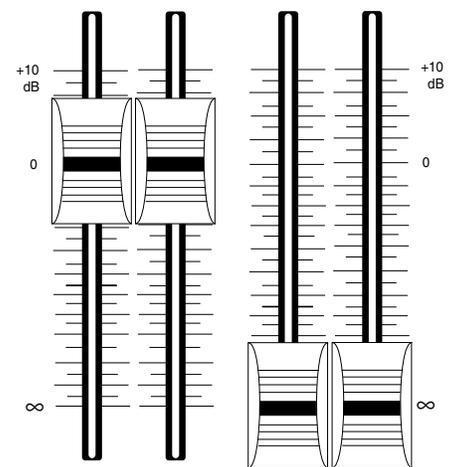
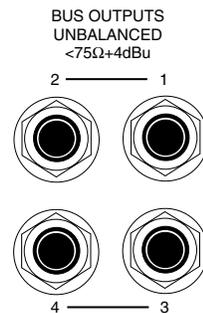
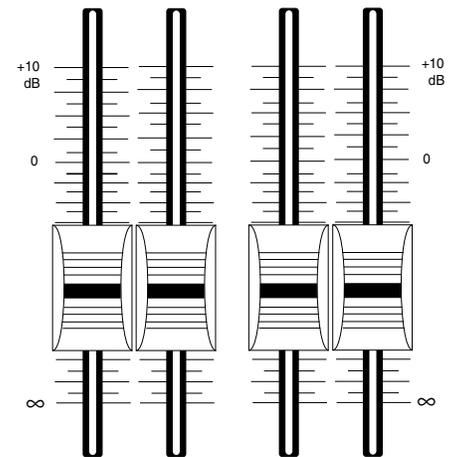
Busing, Submixing and Channel Muting

As we've seen, the PL 2404 uses a system of four *buses*—pathways through which signal can be routed. The four PL 2404 bus faders control the overall level of the signal being output through the four buses. When the “L/R” switches above each bus fader are pressed in, the signal from that bus is also routed to the Main and Control Room outputs. In the case, buses 1 and 3 are automatically routed to the left side of the Main and Control Room outputs and buses 2 and 4 are automatically routed to the right side of the Main and Control Room outputs. This four-bus system (which can eventually mix down to a single stereo output) gives you a great deal of flexibility in terms of signal flow.

For example, you may want to connect the PL 2404 to a four-track cassette or open-reel tape recorder. One good way to do this is to route each of the four individual bus outputs to a tape input, and to bring each of the four tape outputs back to individual channels. With this setup, to record onto track 1, you'd route one or more instrument or microphone channels to bus 1 (via the channel “Mute 3/4” switch); to record onto track 3, you'd route them to bus 3, etc. To connect the PL 2404 to an eight-track digital recorder (such as the Alesis ADAT™ or Tascam DA88™ system), simply use signal splitters or patchbay mults to combine the signal from buses so that bus 1 is routed to tape inputs 1 and 5; bus 2 to tape inputs 2 and 6; bus 3 to tape inputs 3 and 7; and bus 4 to tape inputs 4 and 8. See the “Applications” section at the conclusion of this manual for more information on using the PL 2404 as a recording mixer.

Another important plus is that you can use each bus to set up a *submix* within your overall mix. For example, let's suppose that you're using the PL 2404 to do live sound and you have eight microphones on the drum kit—separate mics for the bass and snare drums as well as for the hi-hat, another mic for each of three tom-toms, and an overhead pair for picking up cymbals. To get all this signal into the PL 2404, you're going to have to use eight mono channels. During a sound check, you'll usually start with the drums, working to get the blend of the eight different drum mics just right. After that's done, the next step is typically to start bringing in the other instruments. During the gig, however, you may need to raise or lower the overall level of the drums, but you surely won't want to upset the blend you so carefully set up. This won't be easy to do if you have to move eight faders at once! The solution is to use the busing system provided by the PL 2404—route the eight drum channels to one pair of buses and all other instruments to the other pair. Now you can adjust the overall level of the entire drum mix by moving just two bus faders!

You can also use the PL 2404 bus switches to *mute* particular channels (that is, remove them temporarily from the overall mix without having to change their fader position). To do this, keep bus faders 3 and 4 down at their “∞” position (no signal) and use buses 1 and 2 for your overall mix. Then, to mute a signal, all you have to do is press that channel's “Mute 3/4” switch; the signal will be rerouted to buses 3 and 4 (which are off) and will be removed from the mix you hear. To restore the signal (that is, *unmute* it), all you have to do is press that channel's “Mute 3/4” switch again—since its fader hasn't been moved, the sound will come back at the same level as before.



Using the Balance Control



The final Main output of the PL 2404 is stereo—that is, there are two discrete Main output jacks (and two discrete Control Room output jacks), labeled “left” and “right,” which will normally be routed to two discrete speakers.* Because of this, you will usually be working with a stereo field that ranges from hard left to hard right. The PL 2404 provides twenty-four stereo channels, each with two inputs—an odd-numbered (left) input and an even-numbered (right) input. When only the odd-numbered (left) input is connected, the Balance control in that stereo channel acts like a panning control, allowing you to place each individual sound at any point within this left-right field, while keeping the overall level constant.

You can use stereo panning creatively in a variety of ways: For example, you might want to have guitars coming from one speaker and keyboards from another, or you might use panning to “spread” the signal from a piano miked with two microphones—one over the bass notes (panned left) and the other over the treble notes (panned right). In live performance, you may want to resist the temptation to pan anything completely hard left or right, since some members of the audience not seated in the center of the venue may miss some signal altogether. In these circumstances, you’re best to use modest panning, with signals routed no further than the 9 o’clock and 3 o’clock positions.

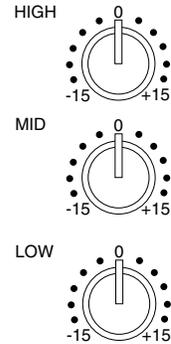
In channels where both the odd-numbered (left) and even-numbered (right) inputs are connected, the odd-numbered (left) input signal is automatically panned hard left and the even-numbered (right) input signal is automatically panned hard right. The Balance knob in these channels then controls the *relative* levels of the two input signals. When the knob is placed at its center (detented) position, both the odd-numbered (left) and even-numbered (right) input signals are at equal strength. When moved left of center, the signal of the odd-numbered (left) input remains the same but the signal of the even-numbered (right) input is attenuated; when the knob is moved right of center, the the signal of the even-numbered (right) input remains the same but the signal of the odd-numbered (left) input is attenuated. When placed fully counterclockwise, only the odd-numbered (left) input is heard; when placed fully clockwise, only the even-numbered (right) input is heard.

* You can, of course, also use the PL 2404 monophonically—simply route the same signal to both the left and right outputs.

Using Equalization

One of the most exciting aspects of using a mixer such as the PL 2404 is the ability to shape a sound, using a process called *equalization*. But there are few areas of sound engineering more misunderstood than equalization, and, just as good EQ can really help a sound, bad EQ can really hurt it, so read on...

Every naturally occurring sound consists of a broad range of pitches, or *frequencies*, combined together in a unique way. This blend is what gives every sound its distinctive tonal color. The EQ section in a mixer allows you to alter a sound by boosting or attenuating specific frequency areas. The PL 2404 provides independent three-band equalization controls for each of its channels (the same equalization is applied to both the odd-numbered [left] input and the even-numbered [right] input). Each EQ knob is labeled with the maximum amount of cut or boost provided (± 15 dB). The Mid frequency control utilizes a resonant (“bell”) peaking curve, while the Low and High frequency controls utilize *shelving* curves. This means that, in the case of the Mid EQ control, frequencies around 1 kHz are affected; in the case of the Low EQ control, frequencies around or below 80 Hz are affected; and, in the case of the High EQ control, frequencies around or above 10 kHz are affected. We provided these particular frequency areas because they have maximum impact on musical signals—that’s why they are sometimes known as “sweet spots.”

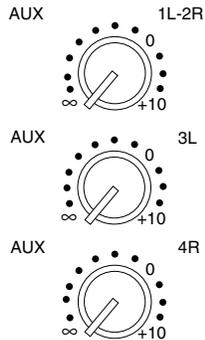


When an EQ knob is in its center detented position (“0”), it is having no effect. When it is moved right of center, the frequency area is being boosted; when it is moved left of center, the frequency area is being attenuated. In all channels, the EQ setting always affects both the odd- and even-numbered inputs the same way, although the two signals remain separate.

In most instances, the best way to approach equalization is to think in terms of which frequency areas you need to attenuate, as opposed to which ones you need to boost (boosting a frequency area also has the effect of boosting the overall signal; too much EQ boost can actually cause overload). Be aware of the phenomenon of *masking*, where loud sounds in one frequency range obscure softer sounds in the same range; by cutting EQ “notches” in a loud signal, you can actually make room for a softer one to shine through. And try not to think of EQ as a miracle worker—no amount of equalization can put a singer in tune or remove the distortion from an overloaded input signal! The key is to get the signal right in the first place, by using correct gain structure and mic placement.

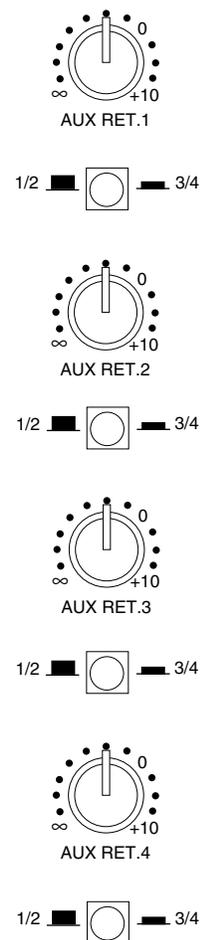
Although the specific EQ you will apply to a signal is very much a matter of personal taste, here are a few general suggestions: Boosting the low frequency of instruments such as bass drums or bass guitar will add warmth and make the sound “fatter”; conversely, you may want to attenuate the low frequency component of instruments such as cymbals, high-hats, and shakers so as to “thin” them out. Boosting Mid frequencies can be used to help bring out vocals or guitars, while attenuating them can help to reduce “boxiness.” Be careful not to boost high frequencies too much or you risk adding hiss to the signal, though just a touch can help add “shimmer” to an acoustic guitar, ride cymbal, or high-hat. Finally, because the PL 2404 High and Low EQ utilize shelving curves, attenuated High settings can be used to reduce hiss (which is composed almost exclusively of high frequencies) or attenuated Low frequencies can be used to reduce rumble (which is composed almost exclusively of low frequencies).

Using Aux Sends and Returns



The PL 2404's four Auxiliary sends allow you to combine the signal from multiple channels and send the resulting mix to external devices such as effects processors. When an Aux send knob is at its 2 o'clock "0" position, the signal is routed with unity gain (that is, no boost or attenuation). As it is turned clockwise from the 0 position, the signal is boosted; as it is turned counterclockwise from the 0 position, it is attenuated. All Aux sends are *post-fade*; that is, the level of the signal is affected by the channel Level control and equalizer settings, as well as (in the case of channels 1 and 3), the mic Trim control.

The PL 2404 can accommodate up to twenty-four stereo channels, so we've designed the Aux sends so that, when a "matched" pair of consecutive channel inputs (that is, both odd-numbered and even-numbered) are connected, the odd-numbered (left) input signal can only be routed to Aux 1L and Aux 3L, while the even-numbered (right) input can only be routed to Aux 2R and Aux 4R. In this case, the Aux 1L/2R control acts as a true stereo Aux send, simultaneously setting the level of both sends equally. When only the even-numbered (right) input is connected to a channel, the signal can only be routed to Aux 2R and 4R. When only the odd-numbered (left) input is connected to a channel (the recommended way to connect monophonic devices to the PL 2404), the signal can be routed to any of the Aux sends.

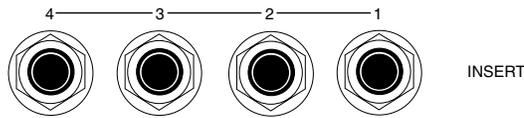


The PL 2404 also provides four stereo Auxiliary returns. These allow you to return signal from outboard devices in stereo pairs. In practice, you'll probably want to use the Auxiliary returns to bring in signal from connected effects processors. Signal arriving at the left input is automatically panned hard left and signal arriving at the right input is automatically panned hard right. The PL 2404 Aux return jacks are unbalanced stereo inputs, with the tip carrying the left input signal and the ring carrying the right input signal (the sleeve carries common ground), as shown in the wiring diagram on page 11 of this manual. Insertion of a monophonic 1/4" jack into an Aux return will result in the incoming signal being automatically routed to the left input only (and therefore panned hard left). Each of the stereo Auxiliary returns is somewhat similar to a stereo channel, except that a signal being brought into to a channel can be equalized if necessary and optionally sent on to other outboard devices (via Aux sends or channel inserts).

The signal arriving at each of the four stereo Aux returns can be routed to either of the two bus pairs (1/2 or 3/4) with the use of the associated Aux Return bus switch (as described in #2 on page 6). The signal can then be routed to the Master and Control Room outputs by pressing in the associated bus L/R switch (as described in #10 on page 7). Note that signal arriving via the PL2404 Aux returns can be monitored over headphones only when the Solo/Main switch is set to "Main" (Aux Returns cannot be soloed). See the "Using PFL/AFL" section on page 22 in this manual for more details.

Using Channel Inserts

In addition to using Auxiliary sends and returns to access outboard devices, the PL 2404 also provides *channel inserts* for the first four input channels. These should be used when you want to affect just one input signal, as opposed to signal from several inputs—most often, this will be for dynamic processing purposes (such as outboard equalization, compression/limiting, or noise gating). You can also use the channel insert sends as post-eq (but pre-fade) *direct outputs*, if you need to route a single monophonic signal to an external device such as a tape deck.



The channel insert jacks on the rear panel accept 1/4" TRS plugs, with the ring carrying the send signal and the tip carrying the return signal; this will normally be connected to a Y-cord (see the “Connecting The PL 2404” section on page 10 in this manual for a wiring diagram). This configuration is sometimes known as an “effects loop,” since the signal is sent and returned over the same cable.

If nothing is plugged into the channel insert jacks, they have no effect—but if you connect them to a passive device like a patchbay, you’ll need to *normal* (permanently connect) or *half-normal* (connection is made unless overridden by a patch cord) the send to the return. The insert signal is returned just before the channel Gain control. For this reason, you’ll have to be careful to set the output of external devices connected this way to unity gain.

Using PFL/AFL



The PL 2404 provides two options for soloing input signals in headphones connected to the front panel headphone jack—*Pre Fade Listen (PFL)* and *After-Fade Listen (AFL)*. The PFL/AFL switch in the main section allows you to choose between these two modes of operation. Although they may at first glance appear similar (and both are non-mix-destructive), there are in fact several significant differences between the two.



The main function of PFL is to allow you to check that a signal is actually arriving at a particular input. When the PL 2404 is in PFL mode and a channel Solo switch is pressed in, the pre-fader (but post-EQ) signal of that channel alone is routed to the headphone output if the Solo/Main switch is up (set to Solo mode).* The Bus outputs, Main outputs, and Control Room outputs are *not* interrupted during a PFL solo, so you can press any channel Solo switch even during recording or live performance without affecting the main signal flow. This also makes it possible for you to correctly cue up a tape or CD before bringing it into the main mix.

The main drawback to using PFL mode, however, is that it does not allow you to hear a signal *in context*. For one thing, because the PFL soloed signal is monitored pre-fader, it may sound considerably louder or softer than it actually is in the main mix (depending upon the current position of the channel Level control and, for channels 1 - 3, the mic Trim control). Also, the Balance control has no effect during a PFL solo—if the soloed channel has both its odd- and even-numbered inputs connected, you'll hear both inputs, panned hard left and right; if only the odd-numbered input is connected, you'll hear the signal monophonically.

Therefore, you may in some circumstances prefer to use AFL mode, which provides in-context soloing. When the PL 2404 is in AFL mode and a channel Solo switch is pressed in, the post-fader, post-EQ signal of that channel alone is routed to the headphone output if the Solo/Main switch is up (set to Solo mode).* Like PFL, AFL is non-destructive to your mix—the Bus outputs, Main outputs, and Control Room outputs are *not* interrupted during an AFL solo. However, over the headphones, you'll hear the AFL soloed signal at its current level and in its current pan position (if only the odd-numbered input is connected) or with the correct relative levels of its two inputs as set by the Balance control (if both the odd- and even-numbered inputs are connected). By pressing the Solo/Main switch during an AFL solo, you can quickly compare the soloed signal on its own with its impact on the overall mix.

In both PFL and AFL modes, you'll hear the soloed channel with its EQ settings and (if the soloed channel is one of channels 1 - 4) all effects being applied and returned via the channel insert. Note that there is no provision for soloing signal arriving via the PL2404 Aux returns.

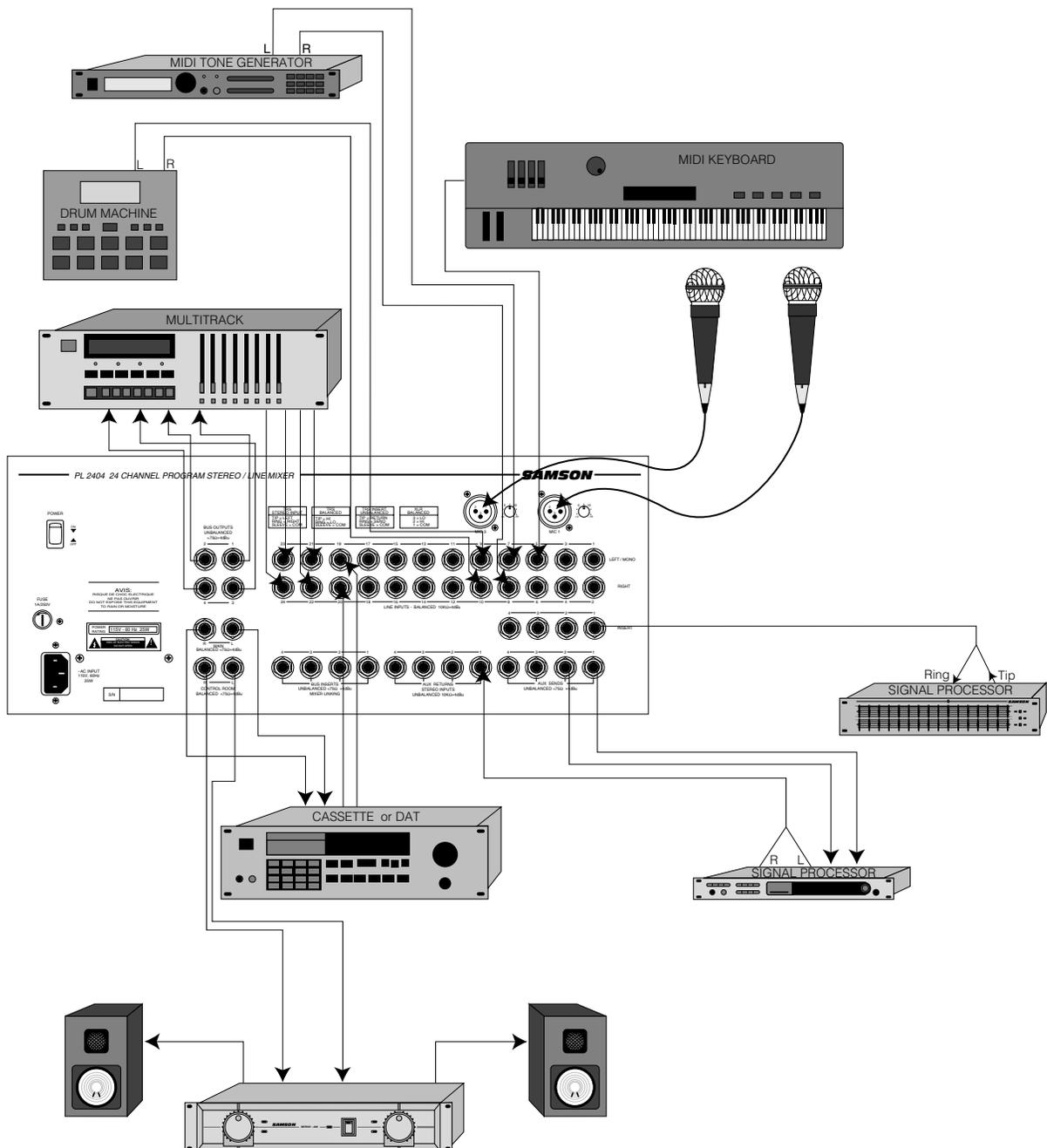
LEDs in the meter section allow you to see at a glance which mode the PL 2404 is in. The leftmost LED (labeled "PFL") lights steadily green when the mixer is in PFL mode, while the center LED (labeled "AFL") lights steadily red when the mixer is in AFL mode.

* If the Solo/Main switch is pressed in (Main mode), connected headphones will always receive the complete Main mix (including signal from the Aux Returns) whether or not any channel Solo switches are pressed in.

Here are four suggested applications for the PL 2404; bear in mind that your particular circumstance may dictate changes in these suggested signal connections and routings.

Application 1 - Using The PL 2404 As A Recording Mixer

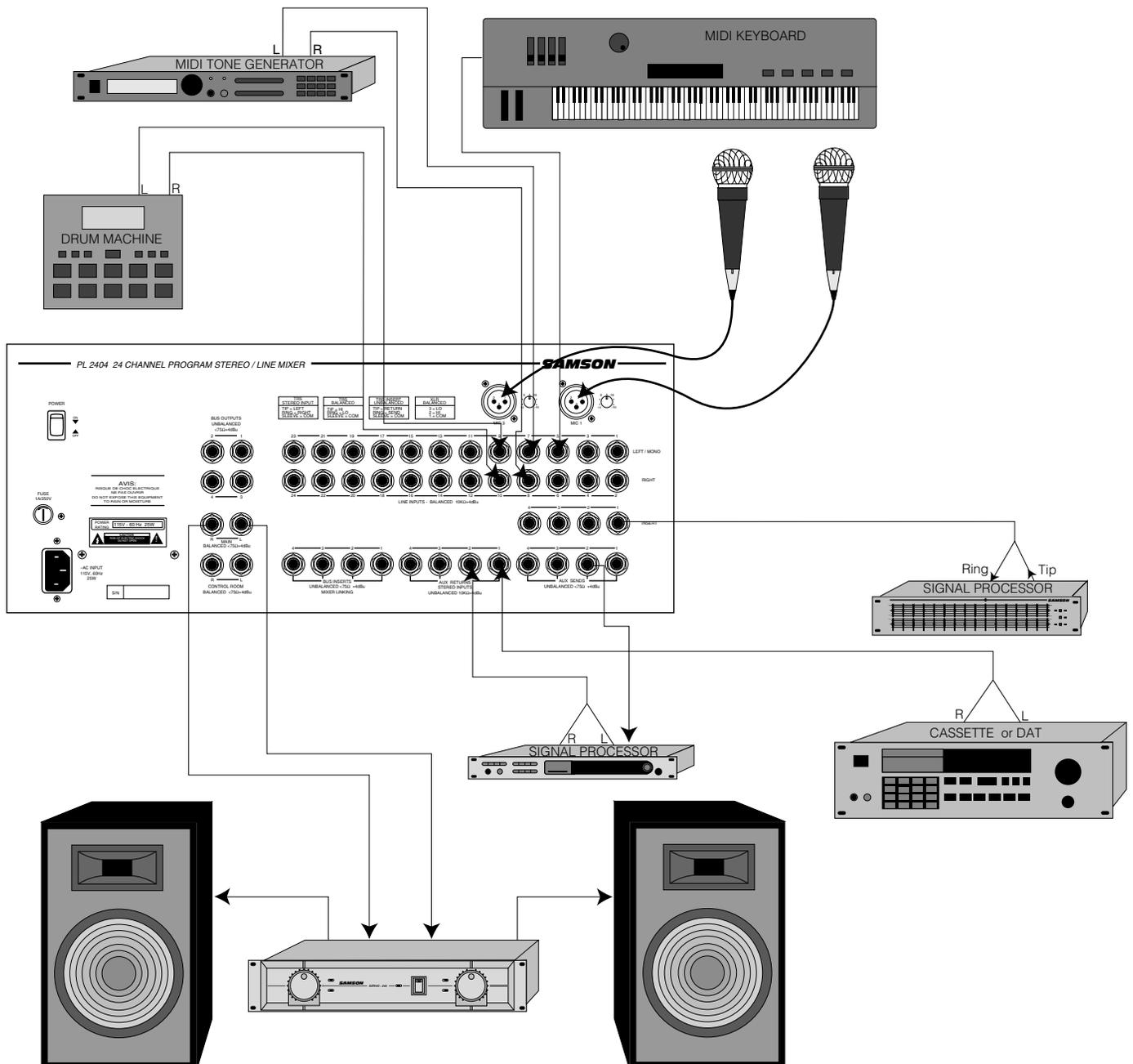
The PL 2404 is optimized for use as a recording mixer with multitrack digital or analog recorders. As shown in the illustration below, microphones and line level signals are connected to various channel inputs. Signal processors are connected to Aux sends and returns and to channel inserts as required. The Control Room outputs are connected to a power amplifier driving studio monitors. The Main outputs are connected to the inputs of a two-track or DAT recorder, with the outputs of the two-track or DAT recorder connected to a PL 2404 stereo channel. The four Bus outputs are connected to the inputs of a multitrack recorder, with the multitrack outputs connected to two PL 2404 stereo channels. During mixdown, those channels carrying the multitrack outputs are routed to bus 1/2 (via their channel "Mute 3/4" switches), with buses 1 and 2 routed to the Main L/R outputs (by pressing in their Bus "L/R" switches). To listen back to the mix, the channel carrying the two-track outputs is routed to bus 3/4 (via its channel "Mute 3/4" switch); then simply connect buses 3 and 4 to the Control Room outputs by pressing in their Bus "L/R" switches.



Applications

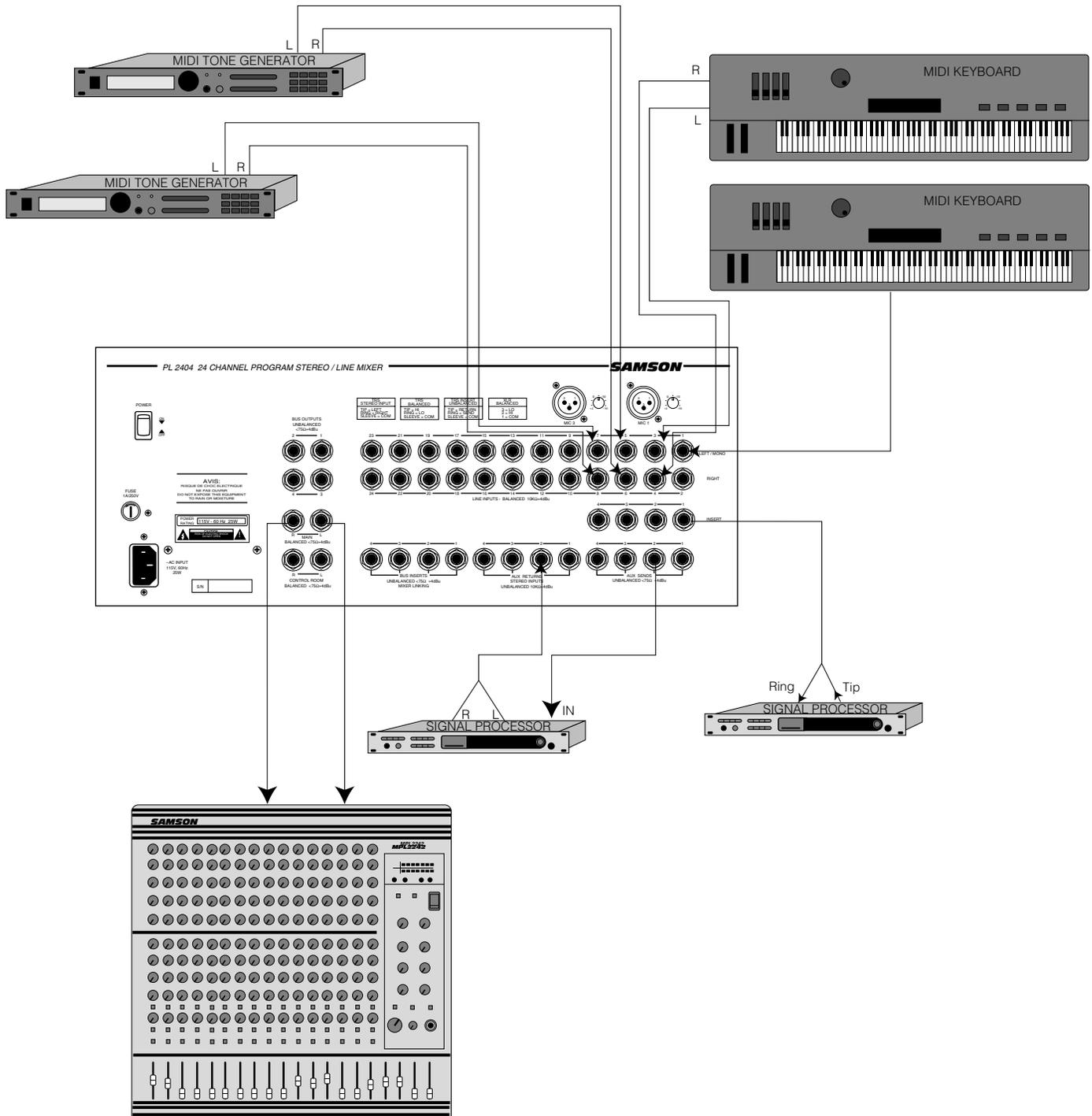
Application 2 - Using The PL 2404 As A Main Live Mixer

Here, the PL 2404's Main output is connected to the input of a power amplifier, and, from there, to PA speakers. Microphones are connected to channels 1 and 3, while line level signals are connected to other channel inputs (stereo signals are routed to "matched" consecutive odd- and even-numbered inputs). A two-track tape deck is connected to stereo Aux return 1, while a signal processor is connected to Aux return 2, with signal being sent to that signal processor from Aux send 2. Another signal processor is connected to channel insert 1 so as to affect the signal coming from the mic connected to channel 1.



Application 3 - Using The PL 2404 As A Keyboard Submixer

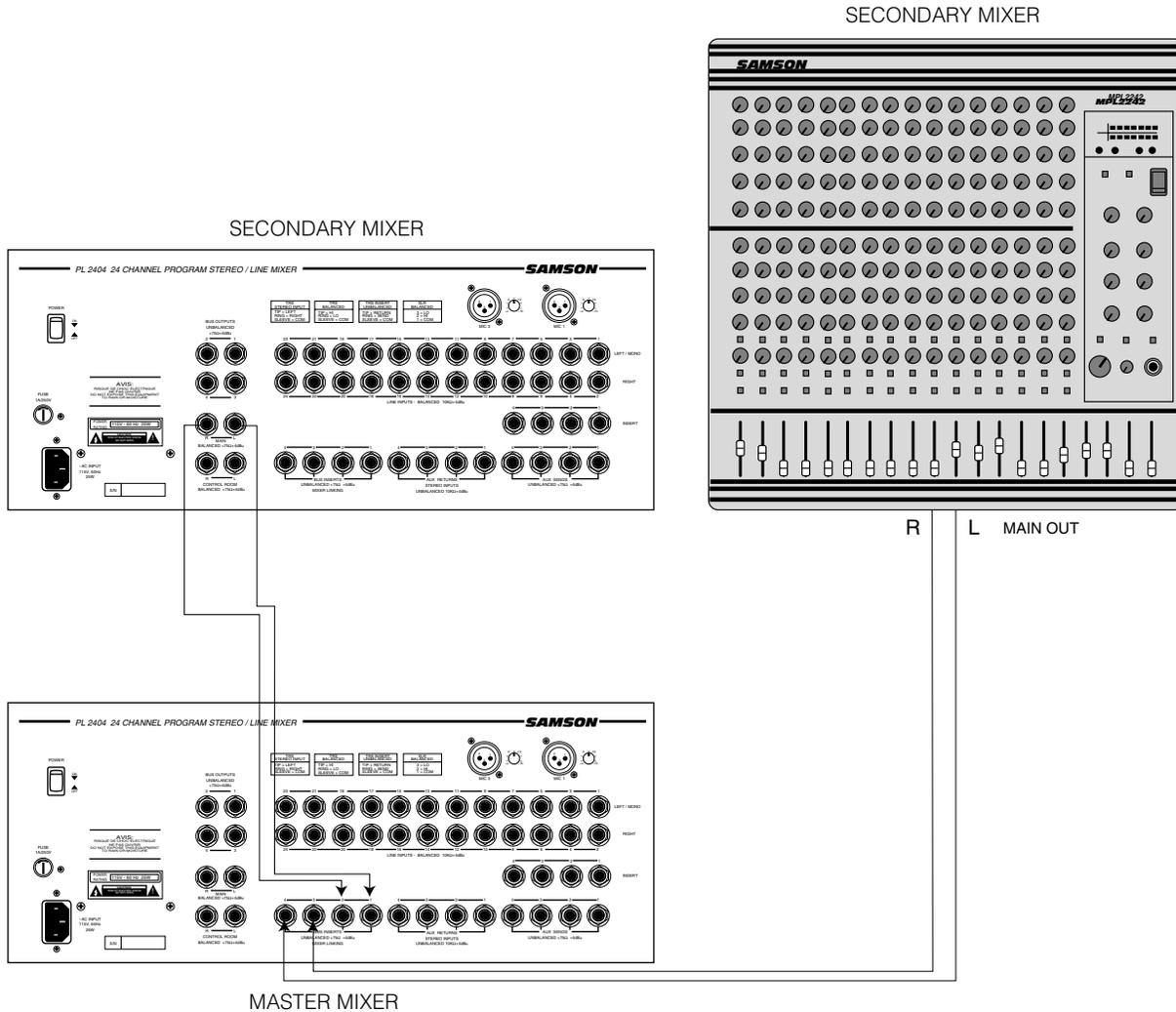
Here, various keyboards and MIDI tone generators are connected to the channel line inputs of the PL 2404, with stereo signals routed to “matched” consecutive odd- and even-numbered inputs. Signal processors are connected to Aux sends and returns and to channel inserts as required. The Main output can then be routed to a stereo input channel of a live performance or recording mixing console, with the performer having complete control over the blend of signals being provided to the sound engineer.



Applications

Application 4 - Linking The PL 2404 With Other Mixers

The provision of four rear-panel Bus Inserts makes it easy to link multiple PL 2404s or to link the PL 2404 with other mixers, without the need to use up channel line inputs. As shown in this illustration, simply connect the main output of another mixer to the PL 2404 Bus Inserts. The signal from that mixer will then be “submixed” in at unity gain; you can then use the main output faders of the secondary mixer to blend its relative level with that of the PL 2404.



Specifications

- 1. Frequency Response** (unity gain, line input 0 dB)

Mic in to Main out	20 Hz to 30 kHz \pm 1 dB
Line in to Main out	15 Hz to 70 kHz \pm 3 dB
Aux return to Main out	15 Hz to 70 kHz \pm 3 dB
Mic in to Control Room out	20 Hz to 30 kHz \pm 1 dB
Line in to Control Room out	15 Hz to 70 kHz \pm 3 dB

- 2. THD+N** (unity gain, line input 0 dB, with 30 kHz LPF)

Line in to Main out	Less than 0.02 %
Line in to Aux send	Less than 0.02 %
Line in to Control Room out	Less than 0.02 %

- 3. Maximum Gain**

Mic in to Main out	75 dB
Line in to Main out	85 dB
Line in to Control Room out	35 dB
Aux return to Main out	35 dB
Line in to Aux send	24 dB

- 4. Crosstalk** (Ch - to - Ch, 1 kHz, with 30 kHz LPF) -70 dB

- 5. Residual Noise** (with 30 kHz LPF, all faders down)

Main out	-96 dB
Aux send	-87 dB
Control Room	-96 dB

- 6. Headphone Output Level** 120 mW (33 Ω loaded)

- 7. Equalizer**

High	10 kHz \pm 15 dB
Mid	1 kHz \pm 12 dB
Low	80 Hz \pm 15 dB

- 8. Dimensions** 19 in (w) x 7.9 (d) x 7 (h)
482 mm (w) x 200 (d) x 177 (h)

- 9. Weight** 16.5 lbs • 7.5 kg

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