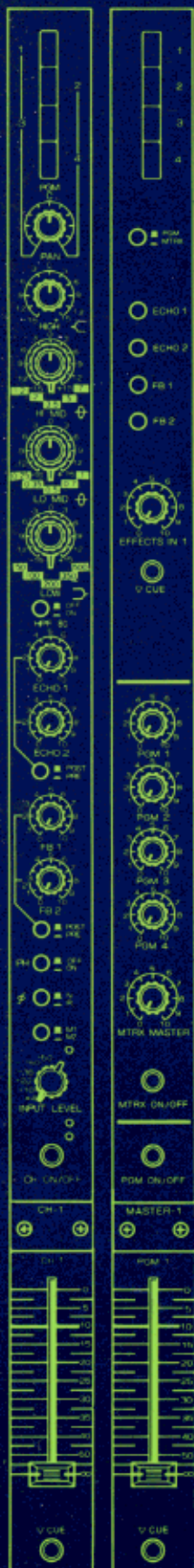
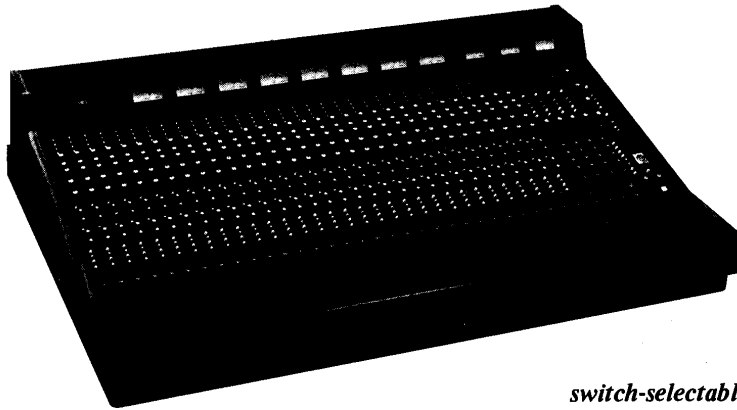


YAMAHA PROFESSIONAL SERIES MIXER

M1524 M1532

OPERATING MANUAL





The Yamaha M1524/M1532 is a sophisticated professional mixing console intended for fixed or portable sound reinforcement, as well as recording, broadcast production, or any critical sound mixing application. It makes an excellent main mixing boards for large scale sound reinforcement, complex nightclub, theatrical and broadcast work. The M1524/M1532 has 24/32 input channels. Each channel has a pair of

switch-selectable inputs, either of which is usable with mic or line level sources. The input channels have interstage patch points (EQ Out/Fader

in jacks), and similar insert points are provided for the program, echo and foldback busses. The M1524/M1532 has 13 mixing busses (including a 5 x 4 matrix), and 17 outputs (plus patch outputs).

The M1524/M1532 is built of only the finest components such as smooth, quiet conductive plastic faders, and multi-brand equalizers with center-tapped "flat" position detents. These controls are calibrated accurately, in dB, for precise, repeatable settings that save valuable set-up time. To minimize hum and ensure the greatest reliability in critical environments, the M1524/M1532 is equipped with a separately packaged bipolar 25 volt power supply that affords a generous margin of headroom (a full +24dBm output). For the utmost in serviceability, the M1524/M1532 has the convenience of plug-in modules, removable via the front panel and electrically connected to the power and signal busses with ribbon cables. You'll appreciate the extra refinements in the M1524's/M1532's advanced technology, reliability and human engineering. For example, the pick-off points for the switch selectable pre-post echo and foldback sends may be changed by means of simple jumper rewiring. Likewise, 10dB of gain can be added to the mixer's program, echo and/or foldback outputs. Extra convenience is afforded by front-panel input polarity reversal switches, individual channel and master phantom power switches, a relay actuated cue/solo system, channel and master On/Off switches, and a built-in test/calibration oscillator. Two-stage peak-indicating LEDs on the inputs, and Output VU meters with peak LEDs together give an accurate picture of signal levels and headroom. To take full advantage of your M1524/M1532 mixer's many features, please read this manual carefully.

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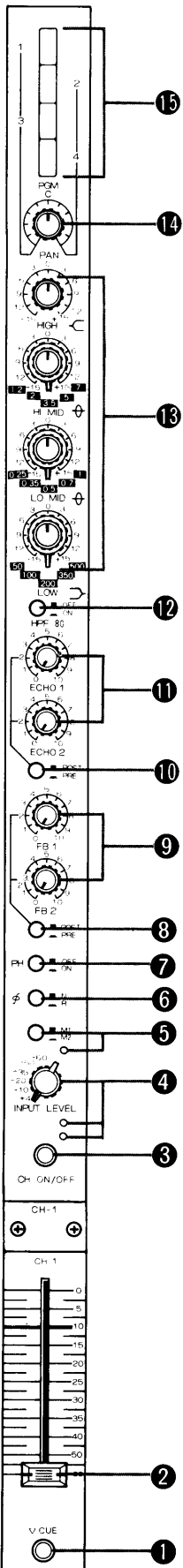
BLOCK DIAGRAM 24

LEVEL DIAGRAM 25

OPERATING INSTRUCTIONS-FRONT PANEL

INPUT CHANNELS

NOTE: It is not necessary that you be able to read a block diagram in order to understand and use this mixer. However, the block diagram on page 24 can be thought of as a "road map" to the mixer, one that can give you a wider perspective to evaluate the following descriptions.



1 CUE SWITCH

Pressing the Cue button applies the channel input signal to the cue bus for preview or "solo" monitoring with the headphones and/or the Cue/TB VU meter. Any other signals being monitored in the headphones are automatically disconnected by a relay when this button is pressed down.

Press the Cue button part way down for a momentary preview, or press it all the way down to engage the button; the Cue button changes color when it is engaged to remind the channel(s) is in cue mode. Although the cue signal is not affected by the Fader, it is affected by the Input Level Selector, Filter, Channel EQ, and anything connected in between the channel's Interstage Patch Out/In jacks.

2 CHANNEL FADER

The Fader continuously varies the channel output level to the four program mixing busses. It affects the channel's Foldback and Echo bus sends only when their respective Pre-Post switches are in Post position. The nominal setting is "-10" position, as indicated by a heavier calibration line. When the input signal is the same level as the Input Level switch setting, the nominal Fader setting applies an optimum level to the mixing busses; if the Master Fader is also at nominal, the mixer output level will be +4 dB. The Fader is calibrated in dB of attenuation.

3 CHANNEL ON/OFF SWITCH

When this button is up, the input signal to the channel is not applied to any mixing busses or to the channel patch jacks; pressing the button in activates the channel outputs. The button changes from black to yellow-green when engaged, indicating the channel is On. The On/Off switch can be used to quickly and completely mute a channel without disturbing level settings, and for "instant fades" up to the level previously established with the channel Fader, FB and Echo level controls.

4 INPUT LEVEL SWITCH AND LED PEAK INDICATORS

The Input Level switch changes the input sensitivity to accommodate nominal input levels of -60, -50, -35, -20, -10 or +4 dB. Respectively, these levels correspond to low level dynamic or ribbon mics, medium and high level condenser mics, preamplified electric instruments, and low or high line level audio processing or mixing equipment.

Adjacent are two LED indicators that help the operator determine the proper setting of the Input Level switch. The green LED shows when the preamplified input signal is peaking in a safe range by turning On when the level reaches or exceeds 13 dB below clipping. The red LED turns On, warning of impending distortion, when the level reaches or exceeds 3 dB below clipping.

To establish the Input Level switch setting that yields the best combination of maximum headroom and minimum noise characteristics, first set it at +4 dB position. Then apply a typical input signal to that channel (e.g., talk or sing into the microphone, play the instrument to which the channel is connected, etc.). Turn the Input Level switch to more sensitive settings (toward the "-60" end of the scale) until the green LED begins to flash during most peaks, or until the green LED remains On and the red LED flashes occasionally. If the red LED flashes often or stays On, reduce the Input Level switch sensitivity (turn it up toward the "+4" end of the scale).

5 INPUT SELECTOR & INDICATOR

Two identical but separate inputs are provided for each channel, making it unnecessary to unplug and reconnect cables in order to change the input source. Instead, the Input Selector pushbutton determines which of the channel's two XLR connectors, M1 or M2, actually supplies the audio signal to the channel; the adjacent amber LED turns On when the M2 input is active. As an example, the mixer's M1 inputs might be used for "live" microphones, while the M2 inputs could be used for playback from a multi-track tape machine; this will generally require resetting the Input Level switches to the appropriate sensitivity, but no cables need be moved around. In some instances, the M1 inputs could be used for one set of microphones, and M2 for another set, corresponding to two different "scenes" in a given production.

6 PHASE (POLARITY) REVERSAL SWITCH

When the switch button is up, the polarity of the incoming signal is Normal; i.e., the selected M1 or M2 input connector is wired so that Pin 2 is audio high, Pin 3 is audio low, and pin 1 is grounded. When the button is pressed down, the polarity is reversed so that pin 3 is high and pin 2 is low. This eliminates the need to rewire connectors or use adapters for out-of-phase (reversed polarity) audio sources. Sometimes intentional polarity reversal can be helpful in canceling leakage from adjacent microphones, or in creating electro-acoustic special effects by mixing together out-of-phase signals from mics picking up the same sound source.

7 PHANTOM POWER ON/OFF SWITCH

This button has no effect when the rear-panel Master Phantom Power switch is Off. When the Master switch is On, this button turns the channel's phantom power On (button down) and Off (button up). When On, +48 volts (40V for U.L. & C.S.A. approved models) is applied to both pins 2 & 3 of the channel input XLR connector, via 6.8kohm isolation/current limiting resistors, for remote powering of condenser microphones. Although phantom power will not harm most dynamic and other non-phantom powered microphones or line-level devices, connection of an unbalanced source to the channel input could partially short the mixer's phantom supply, cause undue loading, and induce hum. Therefore, it is a good practice to turn off the channel's phantom power unless it is actually in use.

NOTE: The mixer's microphone power supply is not intended for 12 volt or A-B powered microphones. External supplies may be used with these devices, in which case the mixer's phantom power should be turned OFF on the appropriate channels.

8 FOLDBACK PRE-POST SWITCH

The mixer is factory wired to derive the foldback signal from either of two points, depending on the setting of this switch. PRE position (button down) takes the foldback send ahead of the channel Fader and Equalizer. This is done because program changes intended for house feed could distract performers who use the foldback circuit for stage monitoring (hearing themselves). POST position (button up) derives the foldback signal after the Fader and EQ, as may be desired for special effects, or where the foldback busses instead serve as additional echo/effects busses or auxiliary mixing busses. The Pre-Post switch simultaneously affects both the FB1 and FB2 sends.

NOTE: In some applications, it is preferable to have the PRE position be Pre-Fader/Post-EQ rather than Pre Fader & EQ. The M1524/M1532 is equipped with internal jumpers that make it easy for a qualified service technician to change the "Pre" function in this manner. The modification can be performed on a channel-by-channel basis; a given channel's FB1 and FB2 sends both will be affected by the jumper change. Refer to page 13 of this manual for additional information.

9 FOLDBACK MIX LEVEL CONTROLS (FOLDBACK SEND LEVEL)

The mixer has two foldback mixing busses. The channel's FB1 and FB2 controls adjust the amount of channel signal applied to the corresponding foldback mixing busses.

10 ECHO PRE-POST SWITCH

The mixer is factory wired to derive the echo signal from either of two points, depending on the setting of this switch. POST position (button down) derives signal after the channel Equalizer and Fader. Because the feed is post EQ, it sends the echo/effects device the same tonal balance sent to the program busses. Because the feed is post Fader, the channel contribution to the echo or effects device always tracks the channel output level to the program busses. PRE position (button up) still derives the echo send after the Equalizer, but it is ahead of the channel Fader. This makes it possible to fade a channel in the main program mix, but have it "linger" in the echo mix. PRE is also useful where the echo busses are being used as auxiliary program mixing busses. The Pre-Post switch simultaneously affects both the Echo 1 and Echo 2 sends.

NOTE: In some applications, it is preferable to have the PRE position be Pre-Fader & -EQ rather than Pre Fader/Post EQ. The M1524/M1532 is equipped with internal jumpers that make it easy for a qualified service technician to change the "Pre" function in this manner. The modification can be performed on a channel-by-channel basis; a given channel's E1 and E2 sends both will be affected by the jumper change. Refer to page 13 of this manual for additional information.

11 ECHO MIX LEVEL CONTROLS (ECHO SEND LEVEL)

The mixer has two echo mixing busses. The channel's Echo 1 and Echo 2 controls adjust the amount of channel signal applied to the corresponding echo mixing busses.

12 HIGH PASS FILTER (HPF 80) SWITCH

The channel circuitry includes an 18 dB per octave High Pass Filter with an 80Hz turnover frequency. Pressing down the HPF 80 button engages the filter. When the button is up, the filter is bypassed. The filter is useful for eliminating unwanted low frequency sounds without significantly affecting the rest of the program. Typical applications including cutting wind noise, vocal "P" pops, stage rumble, and low frequency leakage from adjacent instruments. In general, it is a good practice to use the filter to protect woofers from unnecessary over-excursion due to the presence of unneeded low frequency or sub-sonic components, especially if a microphone is dropped or kicked; the filter should be bypassed (switch up) only when low frequencies are intentionally sought, as with an organ, drum, bass guitar, and so forth.

13 EQUALIZER (EQ)

Each M1524/M1532 channel Equalizer can be adjusted for up to 15dB of boost or cut at four different frequency ranges. However, separate switches provide a choice of the frequencies affected, so there are actually 16 EQ points per channel. The Low and Low Mid ranges overlap to give a choice of shelving or peaking EQ, as may be desired. The controls are calibrated in dB; centering them in the detented "0" position ensures flat audio response by grounding the equalizer control.

The LOW EQ control provides shelving type equalization with a knee at 50Hz, 100Hz, 200Hz, 250Hz or 500Hz, depending on the setting of the concentric frequency selector knob.

The LOW MID EQ control provides peaking type equalization at 250Hz, 350Hz, 500Hz, 700Hz or 1,000Hz, depending on the setting of the concentric frequency selector knob.

The HIGH MID EQ control provides peaking type equalization at 1.2kHz, 2kHz, 3.5kHz, 5kHz, or 7kHz, depending on the setting of the concentric frequency selector knob.

The HIGH EQ section provides shelving type equalization at 10kHz.

In many mixes, EQ is used to modify tonal characteristics for better separation; for instance, given similar-sounding instruments on two channels, you might boost one channel's Low Mid control and boost the other's High Mid control. EQ can be used to correct certain acoustic imbalances, such as using High boost to liven up a "dead" room, or Low cut to avoid the boominess in some rooms. Another use of EQ is to avoid leakage and excess noise without significantly changing the sound. For example, if a base drum is the only sound on a given channel, you might wish to cut the High control and thus eliminate background hiss as well as leakage from high frequency instruments such as strings. Since bass drums don't produce much high frequency sound, the EQ does not drastically change the instrument's sound.

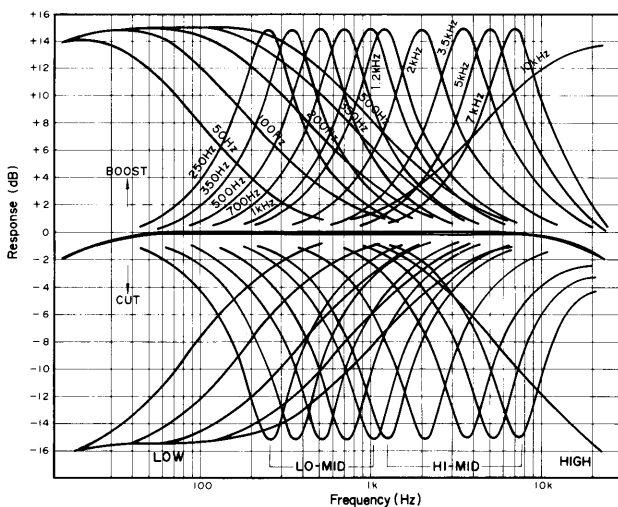
14 PAN POT

This rotary control adjusts the relative output level available to the four program mixing busses. Panning to the left gradually lowers the level applied to bus 2 and/or 4, and increases the level applied to bus 1 and/or 3. Conversely, panning to the right gradually lowers the level applied to bus 1 and/or 3, and increases the level applied to bus 2 and/or 4. Panning to the center position provides equal output to all four busses for a centered acoustic image; center position feeds the Left and Right busses signals that are 3dB below the maximum full-Left or full-Right panned level. This ensures that the combined output power remains constant as the signal is panned across a stereo pair.

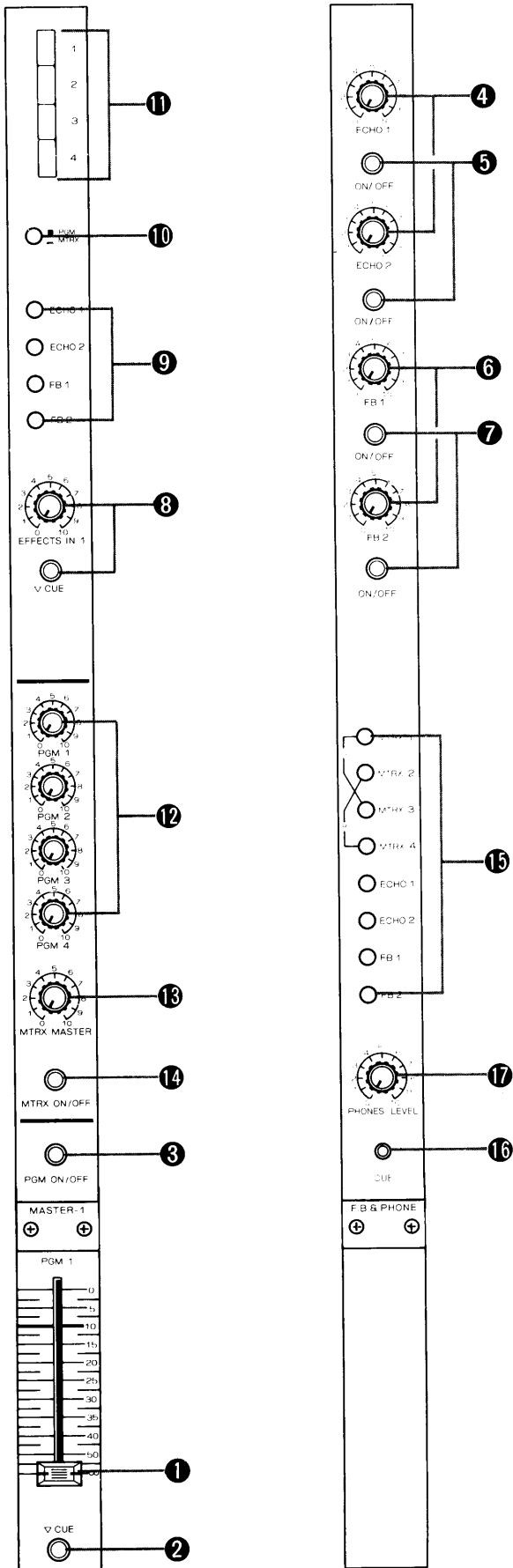
15 BUS ASSIGN SWITCHES

Pressing down any of these four pushbuttons applies the channel output to the corresponding program mixing bus, 1 through 4 (given that the Pan pot, channel Fader and channel On/Off switch are set appropriately).

■ EQUALIZER RESPONSE



MASTER MODULES FB & PHONES MODULES



1 PROGRAM MASTER FADERS

The four Master Faders adjust the overall level of their respective Program mixing busses prior to feeding the Program outputs. These Faders control all signals from the channel Pan controls and Assign buttons, Talkback In and Effects In (when assigned to PGM), and Program Sub Inputs. The nominal Fader setting is -10dB.

2 PROGRAM CUE SWITCHES

The Cue button beneath each Master Fader is similar to the Cue button beneath the Input faders, assigning the signal, before the Master Fader, to the cue bus for monitoring via the headphones and/or TB/Cue VU meter.

3 PROGRAM MASTER ON/OFF SWITCHES

Pressing the button in activates the corresponding Program A & B Outputs, and a bright color appears in the button. When the button is up, the post-Master Fader signal is not applied to the Program A or B outputs, or to the Mix Matrix. Regardless on On/Off setting, signal is always applied to the corresponding Program Insert Output jack.

4 ECHO MASTER LEVEL CONTROLS

These two rotary controls adjust the overall level of their respective Echo 1 and 2 mixing busses prior to feeding the Echo outputs. They control all signals from the channel Echo controls, Talkback In (when assigned to Echo), and the Echo Sub Inputs.

5 ECHO MASTER ON/OFF SWITCHES

Similar to the Program Master On/Off switches, these buttons turn the Echo Outputs On and Off. They do not affect the Echo Insert Output jacks.

6 FOLDBACK 1 & 2 MASTER LEVEL CONTROLS

These two rotary controls function just like the Echo Master Level Controls, except they affect the Foldback 1 & 2 Output Level.

7 FOLDBACK MASTER ON/OFF SWITCHES

These two buttons function just like the Echo On/Off switches, except they affect the Foldback 1 & 2 Outputs.

EFFECTS RETURN SECTION (LOCATED ON THE MASTER MODULES)

These are four Effects Inputs, each of which may be used for "return" of echo/reverb signals, or of other special effects that were "sent" out of the mixer's echo or foldback outputs. Alternately, the Effects inputs can be used as auxiliary line inputs. Each effects Input can be assigned to a variety of busses, and adjusted for different levels, as determined by the following controls:

8 EFFECTS IN LEVEL CONTROLS & CUE BUTTONS

These rotary controls adjust the level of the incoming signal from the respective effects Inputs (1 - 4). The Cue button beneath each Effects In control is similar to the Cue button beneath the Input faders, assigning the Effects In signal to the cue bus for monitoring via the headphones and/or the TB/Cue VU meter.

9 EFFECTS INPUT FOLDBACK & ECHO ASSIGN SWITCHES

These pushbuttons assign the signal from the Effects Input channel (1 – 4) to the mixing bus corresponding to the button label, i.e., FB 1, FB 2, Echo 1 or Echo 2. Any or all buttons may be engaged at the same time.

CAUTION: If an effects input is assigned to a mixing bus whose output is feeding the external effects device, severe feedback (howling) can result. In some cases a time delay can be “assigned to itself,” provided the effects return level is kept down so that decaying regeneration (fading repeats) will be obtained.

10 EFFECTS TO PROGRAM/MATRIX SWITCHES

In addition to the FB and Echo busses, each Effects In channel may be assigned either directly to the Program mixing busses, or to the Mix Matrix Master controls; the PGM/MTRX button determines which set of 4 busses is fed (down = Matrix, up = Program); the specific assignment also depends on which Effects Master Assign buttons are engaged. When the Effects Input is assigned directly to the Mix Matrix, the Effects In level control actually serves as a fifth Mix Matrix level control. (When an Effects Input is assigned to PGM, the signal will ultimately be fed to the Mix Matrix also, but only after first being routed through the Program Insert jacks, Master Fader, Master Program On/Off switch, and the appropriate Matrix Level control/s).

11 EFFECTS MASTER ASSIGN SWITCHES

In order to actually apply the Effects In signal to the designated busses, program or matrix, these individual bus assign Master switches, 1 through 4, must be pressed down.

MIX MATRIX (LOCATED ON THE MASTER MODULES)

Each channel of the Mix Matrix is a vertical row of level controls that can be used to create a discrete mono combination of various signal sources. The Mix Matrix is really a 4-input by 4-output “mixer-within-a-mixer” (9-in x 4-out when Effects and Talkback inputs are assigned to matrix), and some of its many uses are described in the Applications discussions, beginning on page 14.

12 PROGRAM MIX LEVEL CONTROLS

These four rotary level controls apply signals from the correspondingly numbered Program Outputs, 1 through 4, to the Mix Matrix channel. When a control is turned all the way down (fully counterclockwise), no Program signal is applied to its matrix channel. The program feed is derived after the Program Master Faders, so master fades do affect matrix levels.

NOTE: Additional inputs to the Matrix do not appear with the Mix Matrix controls; they come from the Effects Return inputs, and the Talkback input, which are applied directly to the Matrix Master controls. Because each Effects Return signal, and the Talkback signal, can be applied to any combination of the four Mix Matrix channels, it is actually possible to set up a quasi 9 x 4 matrix, 5 of the 9 mix controls being the Effects In level and TB level controls.

13 MATRIX MASTER LEVEL CONTROL

Each matrix channel can be used to develop a unique balance of the four Program mixing busses (plus any assigned Effects inputs). These rotary controls set the overall output level of their corresponding matrix channels.

14 MATRIX ON/OFF SWITCHES

The Matrix On/Off switches serve a similar purpose to the Program Master On/Off switches; pushing a button in turns On the corresponding Mix Matrix Output.

HEADPHONE MONITOR SECTION (LOCATED ON THE FB & PHONES MODULE)

Eight pushbuttons select various signal sources to feed the headphones. Any combination of buttons may be engaged simultaneously. The functions are described in chart form.

15 HEADPHONE MONITOR SELECTOR

SELECTOR BUTTON	WHERE IT APPEARS IN THE PHONES
MIX MATRIX CHANNEL 1	Left earpiece
MIX MATRIX CHANNEL 2	Right earpiece
MIX MATRIX CHANNEL 3	Left earpiece
MIX MATRIX CHANNEL 4	Right earpiece
ECHO 1 OUTPUT	Both earpieces (center mono)
ECHO 2 OUTPUT	Both earpieces (center mono)
FOLDBACK 1 OUTPUT	Both earpieces (center mono)
FOLDBACK 2 OUTPUT	Both earpieces (center mono)

NOTE: While the program mix busses cannot be assigned directly to the Phones, it is nonetheless easy to monitor them in stereo. Assign any “Left” program bus (1 and/or 3) to Matrix channel 1 and any “Right” bus (2 and/or 4) to Matrix channel 2. Then engage Headphone Selector buttons 1 & 2 to hear the program in stereo. (Matrix channels 3 & 4 could be used similarly, or they can be used for stereo monitoring of the Foldback busses when FB is used for an auxiliary stereo mix.)

16 CUE-ASSIGNED INDICATOR

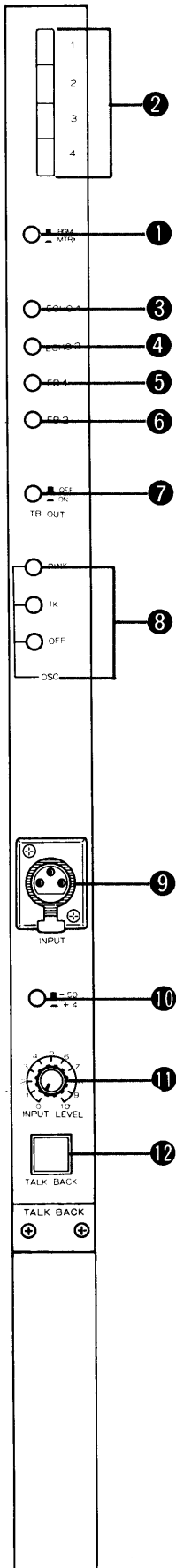
There is a ninth signal source that feeds the headphones, the Cue bus. However, no Cue selector button is associated with the headphone monitor section. Instead, whenever any Input, Master or Effects Cue button is pressed, a relay automatically applies the Cue signal to both earpieces; this red LED also turns On. At the same time, any signal or signals that had been assigned to the phones are temporarily muted.

17 PHONES LEVEL CONTROL

This two-gang rotary control simultaneously adjusts the level in the left and right earpieces. Adjusting the Phones Level control affects only the level in the Phones output jack, not the mixing bus or other mixer output levels.

NOTE: The Headphone output, not illustrated here, is a standard 1/4” (6.3mm) stereo phone jack on the right front edge of the mixer. It will drive conventional 8-ohm or higher impedance stereo phones. However, it can be used to drive a power amplifier and monitor speakers for studio applications (a splitter cable could be necessary to drive the left and right amplifiers).

TALKBACK MODULE



Talkback, when used with a microphone, is useful for communicating with performers, for identifying recordings (voice slating), and for making announcements from the mixing area. The talkback feature can be used for pre-recorded music during intermissions and for setups. Talkback is further useful for introducing tones or noise, from the built-in test oscillator or an external source, for calibration and testing. Talkback also can be used as an auxiliary direct-to-bus microphone or line input.

1 TALKBACK TO PROGRAM/MATRIX SWITCH

In addition to the FB and Echo busses, Talkback may be assigned either directly to the Program mixing busses, or to the Mix Matrix Master controls; the PGM/MTRX button determines which set of 4 busses is fed (down = Matrix, up = Program); the specific assignment also depends on which Talkback Master Assign switches are engaged.

When Talkback is assigned directly to the Mix Matrix, the Talkback level control essentially serves as a fifth Mix Matrix level control (it continues to serve as the Talkback Out level control). When Talkback is assigned to PGM, the signal will ultimately be fed to the Mix Matrix also, but only after first being routed through the Program Insert jacks, Master Fader, Master Program On/Off switch, and the appropriate Matrix Level control(s).

2 TALKBACK MASTER ASSIGN SWITCHES

In order to actually apply the Talkback signal to the designated busses, program or matrix, these individual bus assign Master switches, 1 through 4, must be pressed down.

3 ECHO BUS 1 ASSIGN SWITCH

4 ECHO BUS 2 ASSIGN SWITCH

5 FOLDBACK BUS 1 ASSIGN SWITCH

6 FOLDBACK BUS 2 ASSIGN SWITCH

Pressing down any of these four pushbuttons assigns the Talkback input (or Test Oscillator) to feed the corresponding bus. Any combination of these switches, plus the Talkback Master Assign switches, may be engaged simultaneously.

7 TB OUTPUT ON/OFF SWITCH

When this button is down, the Talkback Input and the built-in Test Oscillator are fed to the rear-panel XLR Talkback Output connector. When the button is up, the TB Out connector is muted, but Talkback assignments to any mixing busses are not disturbed. A jumper cable connected to the TB Output can be used to test or calibrate any of the mixer's inputs, or to check external equipment.

8 TEST OSCILLATOR

Two pushbuttons activate the built-in Test Oscillator so it generates either (a) pink noise or (b) a 1kHz sine wave tone at nominal +4dB level (not subject to the TB Level Control). Whenever the oscillator is not in use, the third pushbutton, Off, should be pressed down to deactivate the circuitry and avoid any possible tone or noise leakage.

9 TALKBACK INPUT CONNECTOR

This 3-pin female XLR connector is a balanced, transformer-isolated input which accepts a low impedance microphone or a line level source, and applies it to the mixing busses selected with the Talkback Assign switches (and to the Talkback Output when the TB On/Off switch is On).

10 TALKBACK INPUT LEVEL SWITCH

When this button is up, the nominal Talkback Input level is -50dB, suitable for a microphone. When the button is down, the nominal level is +4dB; this is suitable for most line-level sources since there is adequate sensitivity in "+4" position to obtain +4 output with input levels as low as -16dB. "+4" position creates a true line input by means of both a pre-transformer pad and a preamp gain change.

11 TALKBACK INPUT LEVEL CONTROL

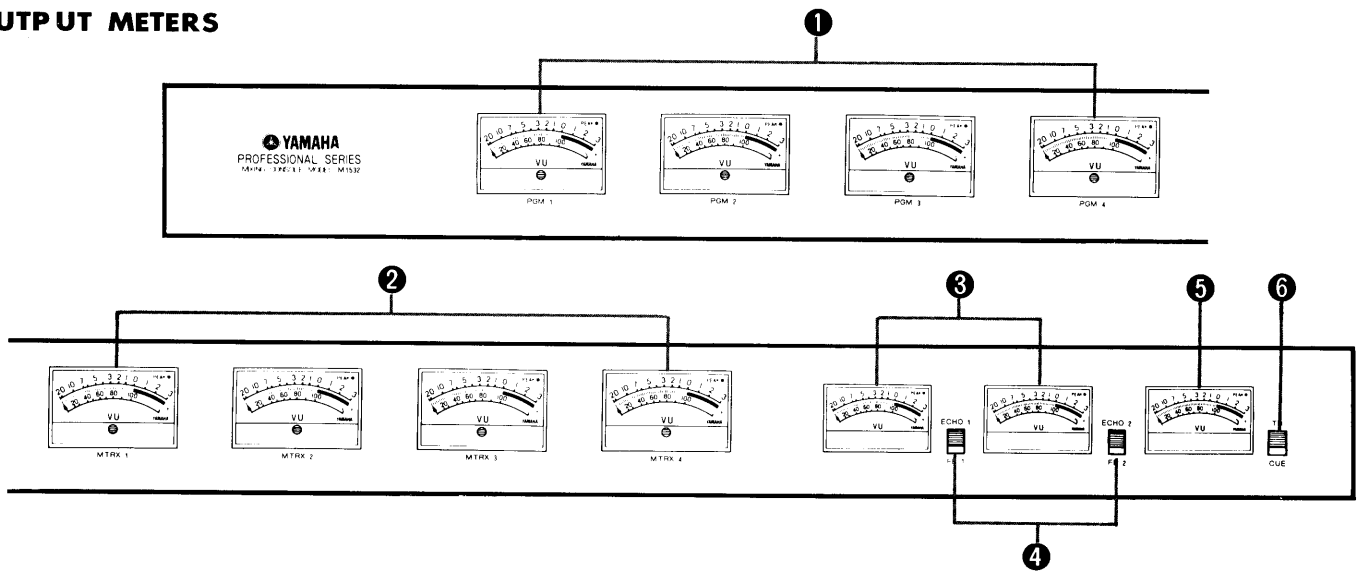
This rotary control adjusts the level of the talkback signal. It should be used in conjunction with the proper Input Level switch setting, +4 or -50. Attempting to use a line level source by turning down this control with the Talkback sensitivity set at -50dB will cause excess distortion (due to transformer saturation), and will restrict the useful control range.

12 TALKBACK ON/OFF SWITCH

When the button is up, it is Off, preventing the Talkback Input from going anywhere. Pressing it down applies Talkback to whatever bus(es) have been selected with the Talkback Assign switches, and to the Talkback Output when it is switched On. (It is a push-to-talk switch.)

The switch is wired so that when it is up, the built-in Test Oscillator feeds those busses to which Talkback is assigned; when the button is down, the Talkback Input replaces the Test Oscillator signal.

OUTPUT METERS



1 PGM VU METERS (1 through 4)

These four illuminated meters have standard VU ballistics, designed to provide a good indication of average perceived Program Output level. The meters are calibrated so a "0" indication represents a +4dB (1.23V) output level. To monitor any brief peaks that are too fast for accurate meter response, a red LED is installed in the upper right corner of each meter. A peak detection circuit turns on the LED when the signal level reaches or exceeds 10dB below clipping (i.e., +14dBm output). This warns the operator of impending clipping and provides an opportunity to adjust levels before distortion becomes noticeable.

2 MTRX VU METERS (1 through 4)

These four illuminated meters are identical to the adjacent PGM meters, except they monitor the four MATRIX outputs. As with the program meters, signals are derived before the transformer, so output loading will be less likely to affect the meter readings.

3 ECHO/FB VU METERS (1 and 2)

These two meters are nearly identical to the PGM and MTRX VU meters, but are slightly smaller in size. They also include peak LEDs, and are calibrated to the same reference levels as the larger meters.

4 ECHO/FB METER ASSIGNMENT SWITCHES

The two adjacent VU meters can be assigned to monitor either of two signal sources, depending on the setting of these lever switches. FB position (switch down) monitors the corresponding Foldback 1 or 2 Output, and ECHO position (switch up) monitors the Echo 1 or 2 Output. Signals are derived before the transformer, so output loading will be less likely to affect the meter readings.

5 TB/CUE VU METER

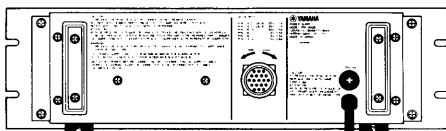
This meter is identical to the ECHO/FB VU meters, but monitors different busses: Cue or Talkback. When the Meter is displaying TB Out level, it derives the signal ahead of the rear-panel TB output level switch. Thus, a 0 VU indication may correspond to either +4dB or -50dB, and the peak LED will be scaled accordingly.

6 TB/CUE METER ASSIGNMENT SWITCH

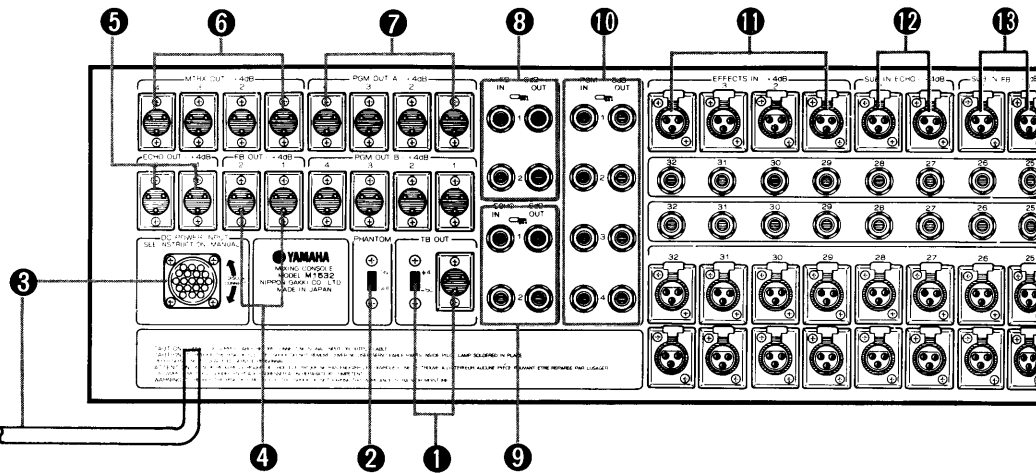
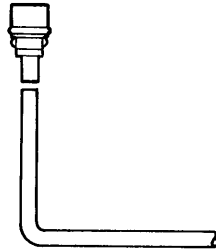
The adjacent VU meter can be assigned to monitor either of two signal sources, depending on the setting of this lever switch. CUE position (switch down) monitors the Cue mixing bus, and TB position (switch up) monitors the Talkback Output. In TB position, the meter will only show the signal fed to the Talkback Output; if the TB On/Off switch is Off, the meter will be inactive.

INSTALLATION & REAR PANEL FEATURES

PW1500B



U.S. & Canadian models



NOTE: ALL XLR connectors in the M1524/M1532 are wired as follows: pin 2=signal high, pin 3=signal low, pin 1=shield.

1 TB OUT CONNECTOR AND LEVEL SWITCH

This Talkback output is a male XLR connector, transformer-isolated (floating), and is switchable to either of two nominal levels with the adjacent recessed slide switch: +4dBm (1.23V) for line-level feeds or -50dBm (2.5mV) for microphone-level feeds. The actual source impedance is 150 ohms, and the output will drive 600 ohm or higher impedance loads. The output is only "live" when the front-panel TB OUT switch is engaged. Voice signals from the Talkback microphone may be used to feed intercoms. Tone signals from the built-in test oscillator may be patched into the various mixer inputs, or into external equipment, for testing and calibration.

2 MASTER PHANTOM POWER SWITCH

When On, the switch applies +48V DC (+40V for U.L. & C.S.A. approved models) to the phantom switches on each input channel. Only when those individual channel switches are On does the mixer apply the voltage across pins 2 & 3 of the active channel input jack (M1 or M3), via a pair of 6.8 kohm isolation/current limiting resistors, for remote powering of condenser microphones.

3 MIXER INPUT FROM POWER SUPPLY UMBILICAL CABLE

This 19-pin connector applies the various DC voltages and ground references necessary for operation of the M1524/M1532. To attach the umbilical cable from the PW1500B power supply, align the keyways in the mating connectors, press the cable into the chassis connector, and turn the locking collar clockwise.

4 FB OUT CONNECTORS

These post Foldback 1 & 2 Master Fader outputs are male XLR connectors, transformer-isolated (floating) with +4dBm (1.23V) nominal level.) the actual source impedance is 150 ohms, and the outputs will drive 600 ohm or higher impedance loads, including virtually all professional graphic equalizers, electronic crossovers, and power amplifiers.

5 ECHO OUT CONNECTORS

These post Echo 1 & 2 Fader outputs are male XLR connectors, transformer-isolated (floating) with +4dBm (1.23V) nominal level. The actual source impedance is 150 ohms, and the outputs will drive 600 ohm or higher impedance loads, including virtually all professional echo and reverb devices. If no or other effects are not required, the outputs may be used as additional foldback sends or for making a stereo tape recording.

6 MATRIX OUT CONNECTORS

These post Matrix 1 - 4 Master Level Control outputs are male XLR connectors, transformer-isolated (floating) with +4dBm (1.23V) nominal level. The actual source impedance is 150 ohms, and the outputs will drive 600 ohm or higher impedance loads, just like the PGM outputs. The difference between MTRX OUT and PGM OUT really depends on the application. In the sound reinforcement system for a large house, MTRX OUT can be more useful because different mixes can be fed to near stage and house fill speakers. In a simultaneous recording/reinforcement application, PGM might feed the tape recorder and MTRX feed the house speakers. In broadcast work, MTRX can be used to do mono feeds and mix-minus feeds, whereas PGM can be used for stereo feeds. The many uses will depend on the requirements of the particular installation.

8 FB MASTER INSERT IN/OUT JACKS (1 & 2)

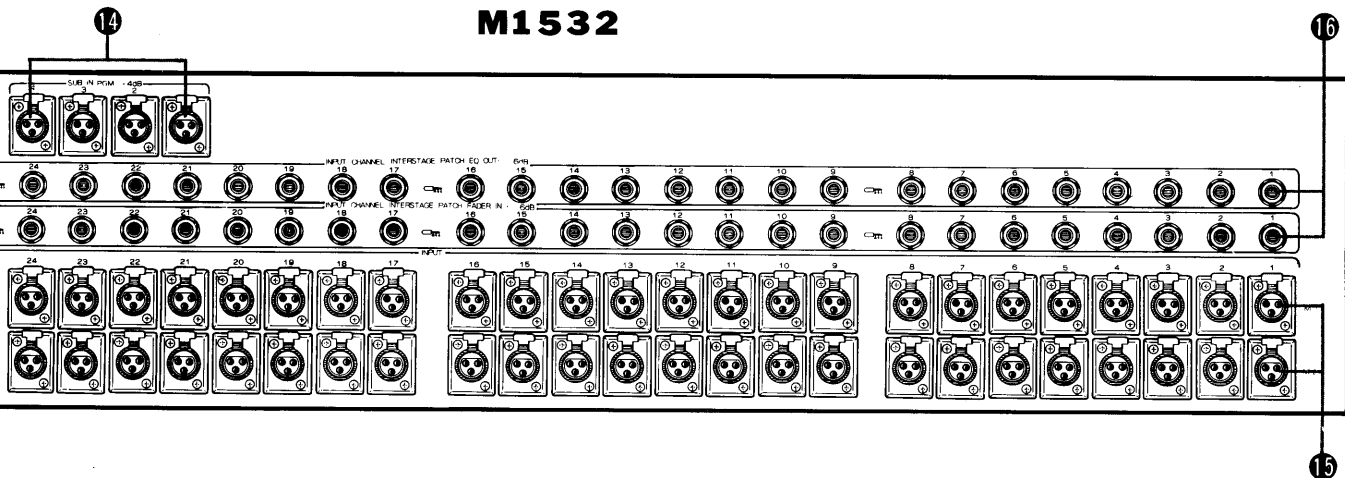
These 4 standard 1/e" (6.3mm) phone jacks form 2 pair of unbalanced outputs and inputs, one for Foldback 1 and the other for Foldback 2. The jacks are intended as patch points for insertion of auxiliary signal processing equipment. The nominal level is -6dB (388mV); output source impedance is 100 ohms (for feed to 10 kohm or higher impedance inputs); input impedance is 10 kohms (for use with 600 ohm sources).

The patch points come just before the Foldback 1 & 2 Master Level controls. The signal normally flows from the Out jack to the In jack via internal jumpers (the jacks are "normalised"). A plug can be inserted in the Out jack without disturbing the internal signal flow, so the Insert Out jack can be used to "split" the pre-Master signal for feed to high impedance circuits. When a plug is inserted in the Insert In jack, the internal jumper is disconnected, and the external signal is fed to the Master Level control.

7 PGM OUT A & PGM OUT B CONNECTORS

These are post Master Fader Program outputs for mixing busses 1 through 4. PGM A and PGM B are simply two parallel-wired sets of 4 male XLR connectors; both connectors for a given bus output are wired to the same output transformer (floating) with +4dBm (1.23V) nominal level. The actual source impedance is 150 ohms, and the outputs will drive 600 ohm or higher impedance loads, including virtually all professional graphic equalizers, electronic crossovers, power amplifiers, and tape recorders. The twin outputs (A & B) provide extra convenience by avoiding the need for "Y" adaptors or splitters.

M1532



9 ECHO MASTER INSERT IN/OUT JACKS

These four phone jacks are identical to the FB Master Insert In/Out jacks, except they are located in the Echo 1 & 2 output circuitry.

10 PROGRAM MASTER INSERT IN/OUT JACKS

These eight phone jacks are identical to the FB Master Insert In/Out jacks, except they are located in the Program 1 – 4 output circuitry, just ahead of the Master Faders.

11 EFFECTS IN CONNECTORS

These four female XLR connectors are transformer-isolated (floating) inputs that apply signal to the Echo, Foldback, Cue, Program or Matrix mixing busses, as selected with front-panel assign switches. The signals are subject to the respective Effects 1 – 4 Level controls. Actual input impedance is 5 kohms, and nominal level is +4dB (1.23V). These inputs are intended for nominal 600 ohm sources, such as the return from echo or reverb devices, the output of a tape recorder, or the line output of another mixer. Thus, while suitable for return of special effects, these connectors are equally useful as auxiliary line input channels.

12 ECHO SUB IN CONNECTORS

These two female XLR connectors apply a nominal +4dB (1.23V) signal to the Echo 1 & 2 mix busses via transformers and pre-transformer attenuation pads. Actual input impedance is 1 kohm, and the inputs are intended for nominal 600 ohm sources.

Sub Inputs may be used for linking the echo outputs of another mixer to those of the M1532 for expansion of the mixing system, or for applying any suitable line-level source(s) to the mixer subject only the M1532 Echo Master Level Controls.

13 FB SUB IN CONNECTORS

These two female XLR connectors are identical to the Echo Sub Inputs, except they apply signals to the Foldback 1 & 2 mix busses.

14 PROGRAM SUB IN CONNECTORS

These four female XLR connectors are identical to the Echo and Foldback Sub Inputs, except they apply signals to the Program 1 through 4 mix busses. Like the Echo and FB Sub Inputs, the Program Sub Inputs are useful for linking two or more mixers for expanded input capability. Another use of the Program Sub Inputs is for introducing a pre-recorded program from a stereo or 4-channel tape recorder without "using up" input channels.

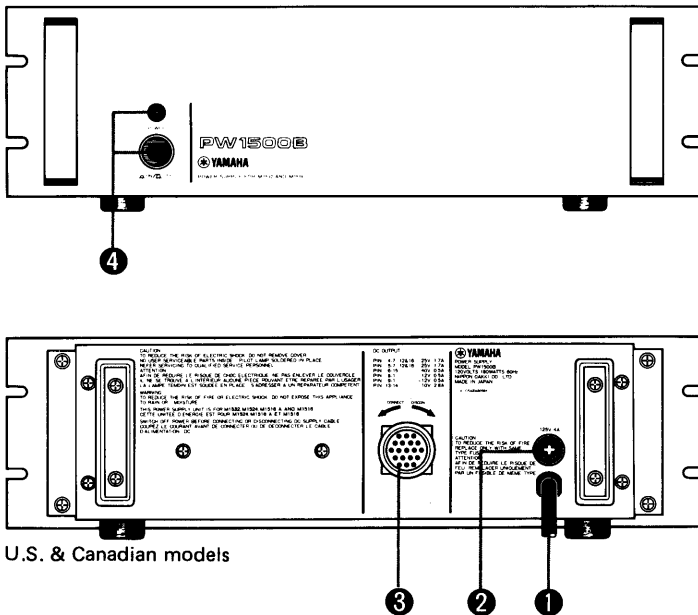
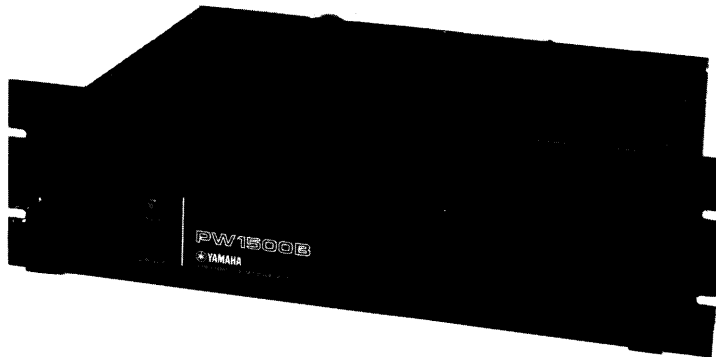
15 CHANNEL INPUT M1 & M2 CONNECTORS

These forty-eight/sixty-four female XLR connectors are arranged in two banks of 24/32 channels; whether a given channel's M1 or M2 connector is "live" depends on the setting of the channel's front panel M1/M2 switch. These XLR's are balanced, transformer-isolated inputs that apply nominal –60dB (0.78mV) to +4dB (1.23V) signals (depending on Input Selector settings) to their respective input channels. The actual input impedance is between 900 ohms and 1.3 kohms, depending on the Input Selector setting. This accommodates nominal 50 to 250 ohm (low impedance) professional microphones as well as 600 ohm line level sources. Phantom power for condenser microphones is applied to XLR pins 2 & 3 when (a) the Phantom Power switch is On, and (b) the corresponding input, M1 or M2, is selected on the front panel.

16 INPUT INTERSTAGE PATCH POINTS (EQ OUT/FADER IN)

Forty-eight/sixty-four standard 1/4" (6.3 mm) phone jacks are arranged in two banks of 32 channels, forming pairs of unbalanced outputs and inputs. They are intended as patch points for insertion in the input channels of auxiliary signal processing equipment such as compressor/limiters, graphic or parametric EQ, noise gates, etc. The interstage patch points come just after their respective channel equalizers (EQ OUT) and just before the channel Faders (FADER IN). The signal normally flows from the EQ Out to the Fader In jack via an internal jumper; a cable can be plugged into the EQ Out jack without disturbing that jumper. Thus, the EQ Out jack can be used to "split" the channel signal for direct feed to high impedance circuits, such as the input to a multi-track tape recorder, or the line input of an auxiliary mixer. When a plug is inserted in the Fader In jack, the internal jumper is disconnected, and the external signal then feeds the channel Fader. The nominal level is –6dB (388mV); output source impedance is 600 ohms (for feed to 10 kohm or higher impedance inputs); input impedance is 10 kohms (for use with 600 ohm sources).

POWER SUPPLY



U.S. & Canadian models

POWER SUPPLY

The PW1500B power supply for the M1524/M1532 is housed separately from the mixer, and is interconnected with a multi-conductor umbilical cable (supplied). The umbilical cable connectors have screw-on locking collars to prevent inadvertent disconnection. The power supply should be connected to the mixer and to the AC mains before switching the supply On.

1 AC POWER CORD

The AC power cord has a 3-pin plug (grounded type). In the U.S. and Canada, the PW1500B power supply is wired for 110 to 120V AC mains, 50 or 60Hz, and uses a maximum of 150 Watts. Because the power supply is fully regulated, typical line voltage variations will not adversely affect performance.

The console should be AC grounded for safety and for proper shielding; the 3-wire power cord is provided for this purpose. If a 3-wire outlet is not available, or if there is any chance the outlet may not be grounded, a separate jumper wire must be connected from the mixer chassis to an earth ground. Cold water pipes generally provide good grounds; however, if they are insulated by a length of PVC pipe or by a water meter, cold water pipes are not good grounds. (An electrical wire bypasses some meters, supplying ground continuity for the cold water pipes.) Avoid hot water pipes and gas pipes. When in doubt, use a length of copper pipe driven into moist, salted earth, burying at least 1.5m (5') of pipe, or one of the newer chemical ground rods.

2 FUSE

The fuse should only be replaced with the same type and rating: 3AG, 4A in the U.S. and Canada.

3 POWER SUPPLY OUTPUT TO UMBILICAL CABLE

This 19-pin connector provides the various DC voltages and ground references necessary for operation of the M1524/M1532. To attach the umbilical cable, align the keyways in the mating connectors, press the cable into the chassis connector, and turn the locking collar counterclockwise.

4 AC POWER SWITCH AND INDICATOR LAMP

This pushbutton turns On the power supply, and thus turns On the mixer. When power is On, the pilot light above the switch is illuminated.

Hook-up Cables & Hum Avoidance

The mixer's primary input and output circuits are equipped with transformer-isolated XLR connectors. When used with the appropriate mating 2-conductor shielded cables (e.g., standard microphone cables), these circuits afford the optimum protection against hum, buzz, and other noise pick-up. Belden No. 8412, or its equivalent, is an excellent cable due to its heavy construction, and should be used for all portable applications. "Snake" cables containing multiple shielded pairs must be handled very carefully because the leads tend to be fragile, and a broken conductor cannot be repaired.

The M1524/M1532 XLR connectors are wired with pin 2 as "audio high" and pin 3 as "audio low", in accordance with DIN and JIS standards. Some professional equipment and microphones are wired with pins 2 & 3 reversed; generally this will cause no problem, other than a polarity reversal. However, if such a piece of equipment uses an XLR connector for an unbalanced input, or if an M1524/M1532 XLR is connected, via an adapter cable, to an unbalanced phone jack, the "high" side of the audio circuit might be grounded. In this case, invert the wiring of pins 2 & 3 in one XLR of the interconnecting cable, use a suitable polarity-reversal adapter, or on an M1524/M1532 input channel, engage the Phase Reversal switch. Regardless of XLR polarity, if hum is encountered, try cutting the shield connection at one end of the XLR cable.

All phone jacks (except the stereo headphone jack) are intended for use with standard Tip/Sleeve 1/4" (6.3mm) phone plugs and single-conductor shielded cable. Hum reduction should not be attempted by cutting the shield on these cables. Instead, restrict unbalanced cables to 10 feet (3.1 meters), and try to set up the system so that either (a) the equipment involved is all connected to the same AC circuit, or (b) the third-wire AC mains ground is used on only one piece of equipment, typically the mixer. Remember, breaking a ground path can create a shock hazard.

When routing any cables, especially unbalanced cables, avoid strong sources of electro-magnetic interference (EMI) or radio frequency interference (RFI) such as electric motors, fluorescent lights, dimmer panels, and so forth. To avoid crosstalk-induced feedback, never bundle microphone input cables with mixer output cables; these cables should cross at right angles where practical.

More About the Theory of Grounding

Careful grounding procedures are essential for proper operation, not only of the mixer, but of the entire audio system. Many grounding techniques exist, and certainly there are several ways to achieve a satisfactorily grounded audio system. Several books have been written on the subject. For further information, consult the following sources: THE AUDIO CYCLOPEDIA by Howard M. Tremaine (Pub. Howard W. Sams); SOUND SYSTEM ENGINEERING by Don and Carolyn Davis (Pub. Howard W. Sams); GROUNDING AND SHIELDING IN INSTRUMENTATION by Ralph Morrison (Pub. John Wiley & Sons).

Ground loops (also called "hum loops"), are often caused by multiple paths from equipment grounds to the AC main ground ("earth") ground. Ground loops tend to induce hum and allow noise to develop in an audio system; in severe instances, equipment may begin to oscillate due to ground loops. This oscillation can cause distortion and even damage to amplifiers and loudspeakers. One way to avoid ground loops is to make sure that there is just one path to the AC ground (earth ground) for the entire audio system. One popular method, though not necessarily the best or only one, is to cut the shield ground of XLR cables at the input side of the cable. Another technique is to ground all shields at one piece of equipment, typically the mixer, and to cut the shields at the other ends of the cables. (With unbalanced phone jack cables, the shield must be connected at both ends.)

Connect the mixer to the power mains ONLY AFTER CONFIRMING THAT THE VOLTAGE AND LINE FREQUENCY ARE CORRECT. (By all means, USE A VOLTMETER . . . it can save your equipment and the show.) It is also a good idea to check for proper polarity in the AC outlet. The Power Switch on the mixer power supply should be Off before connecting the supply to the mains. As a further precaution, disconnect the mixer from the supply (or unplug the supply from the mains) while audio cables are being installed.

Mixer Placement

The M1524/M1532 is a fully portable, self-contained mixer built in a hard, protective case. It may be placed on a table top or a shelf at any convenient working height, or it can be recessed for permanent, low profile mounting. Whether recessed, or table top mounted, the mixer should be on a level surface, with sufficient rear panel clearance for the input and output cables.

Pull-out carrying handles are located just below the wood panels on both sides of the mixer. Because the mixer is heavy, when shipping it use a sturdy auxiliary shipping case.

WARNING

In any audio system installation, governmental and insurance underwriters' electrical codes must be observed. These codes are based on safety, and may vary in different localities; in all cases, local codes take precedence over any suggestions contained in this manual. As set forth in the Mixer Warranty, Yamaha International Corporation shall not be liable for incidental or consequential damages, including injury to persons or property, resulting from improper, unsafe or illegal installation or use of the Mixer or of any related equipment; neither shall the Corporation be liable for any such damages arising from defects or damage resulting from accident, neglect, misuse, modification, mistreatment, tampering or any act of nature.

OPTIONAL FUCTIONS OF THE M1524 / M1532

Several circuits in the M1524/M1532 have been designed so that an optional function may be obtained by means of a simple internal wiring change (installation, removal or moving of a jumper wire). In all cases, the work can be done in minutes, using only a soldering iron and a short jumper wire. However, the work should be done only by a qualified audio technician. Your Yamaha dealer or authorized Yamaha repair center will be happy to assist.

NOTE: Whenever a given circuit is modified as described in the following paragraphs, we recommend that a descriptive label be attached to the mixer. In this manner, faster setups and/or better mixing will be aided by displaying the mixer's current functional status to the operator.

Adding 10dB of Gain to the Output Stages

The M1524/M1532 Program, Echo and Foldback output stages are designed so that the overall gain can be increased by 10dB simply by installing a jumper wire on the respective line amplifier. This extra 10dB of gain can be useful in situations where microphones must be used at a distance, such as in churches or theatrical performances. The mixer is supplied in the lower gain configuration because in other cases the gain is not required, and it would merely amplify noise unnecessarily.

Changing the Point Where Pre-Fader Signal is Derived for the Input Channel's Echo and Foldback Sends

A Pre-Post switch below the pair of Foldback send controls, and another below the Echo sends, on each input channel determine whether the associated controls derive signal after the Fader and Equalizer (POST) or before the Fader (PRE). As factory wired, however, the specific location of the Pre-Fader Echo and Foldback sends differ; Echo is Pre-Fader and Pre-EQ, whereas Foldback is Pre-Fader but Post-EQ. The M1524/M1532 is designed so that the Echo PRE send can be changed to be Pre-Fader/Post-EQ by means of a simple jumper change on the channel circuit board. Similarly, the Foldback PRE send can be changed to be Pre-Fader & Pre-EQ.

APPLICATIONS

The following are but a few of the many ways the M1524/M1532 can be used. As you become familiar with this versatile mixer, you will undoubtedly devise your own unique setups and operating techniques.

General Sound Reinforcement and the Mix Matrix

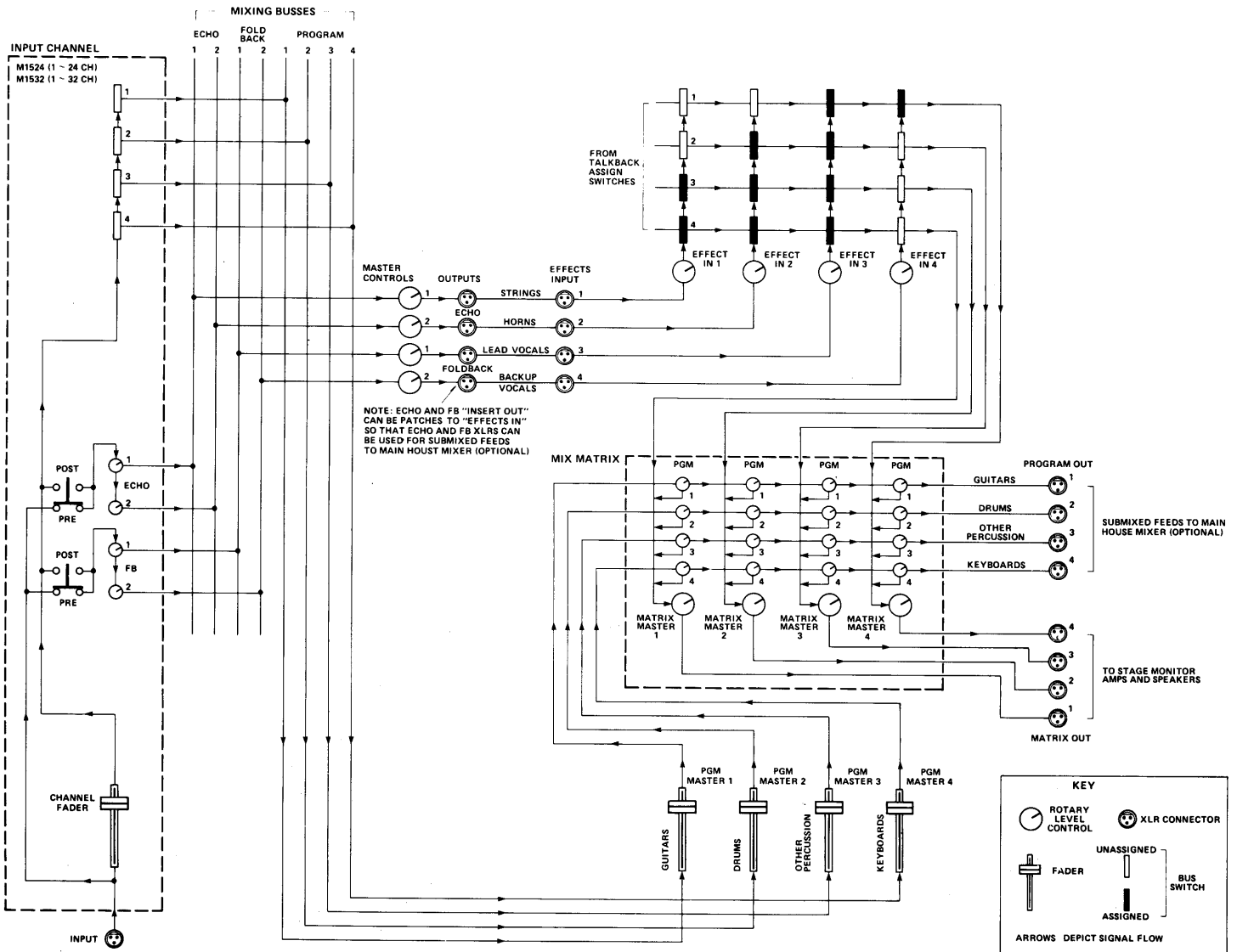
Microphones and preamplified electric instrument outputs can be connected to the M1524/M1532 channel inputs. Equipment or mics used exclusively by separate acts or in different "scenes" can be connected alternately to the M1 and M2 inputs for fast changeovers. If echo/reverb needs are minimal, one or both echo busses can be used for additional foldback (stage monitoring).

Master Insert Out/In patch points can be used for compressors, although a single loud sound can "duck" the entire mix; a good alternative is to compress only those few inputs which really require the gain riding (via their channel interstage patch points). Master patch points are also good places to connect parametric and/or graphic EQ for house tuning, or digital delay lines for distributed speaker systems. To get the most out of the Mix Matrix, the program busses may be used for sub-grouping different sources; i.e., brass, drums/percussion, vocal backup, lead vocal, etc. The Mix Matrix outputs are then used

to feed power amps (& speakers) for various zones in the main house, the stage, and other areas. With all Program Master Faders at nominal settings, a basic balance of the sub-groups can be established independently for each zone of the sound system (each Mix Matrix channel) by using the Matrix level and Master controls.

There are a number of advantages to the approach just outlined. For instance, if the brass level is too high in all outputs, only one Master Fader need be adjusted (the brass subgroup), and the balance will simultaneously change in all matrix outputs. For program fades, all Program Masters may be brought down; the previously established balance for each zone of the sound system reappears as soon as the Master Faders are again brought back to nominal setting. If a recording is being made directly from the program outputs, then do house fades with the Matrix Masters and recording levels will be unaffected.

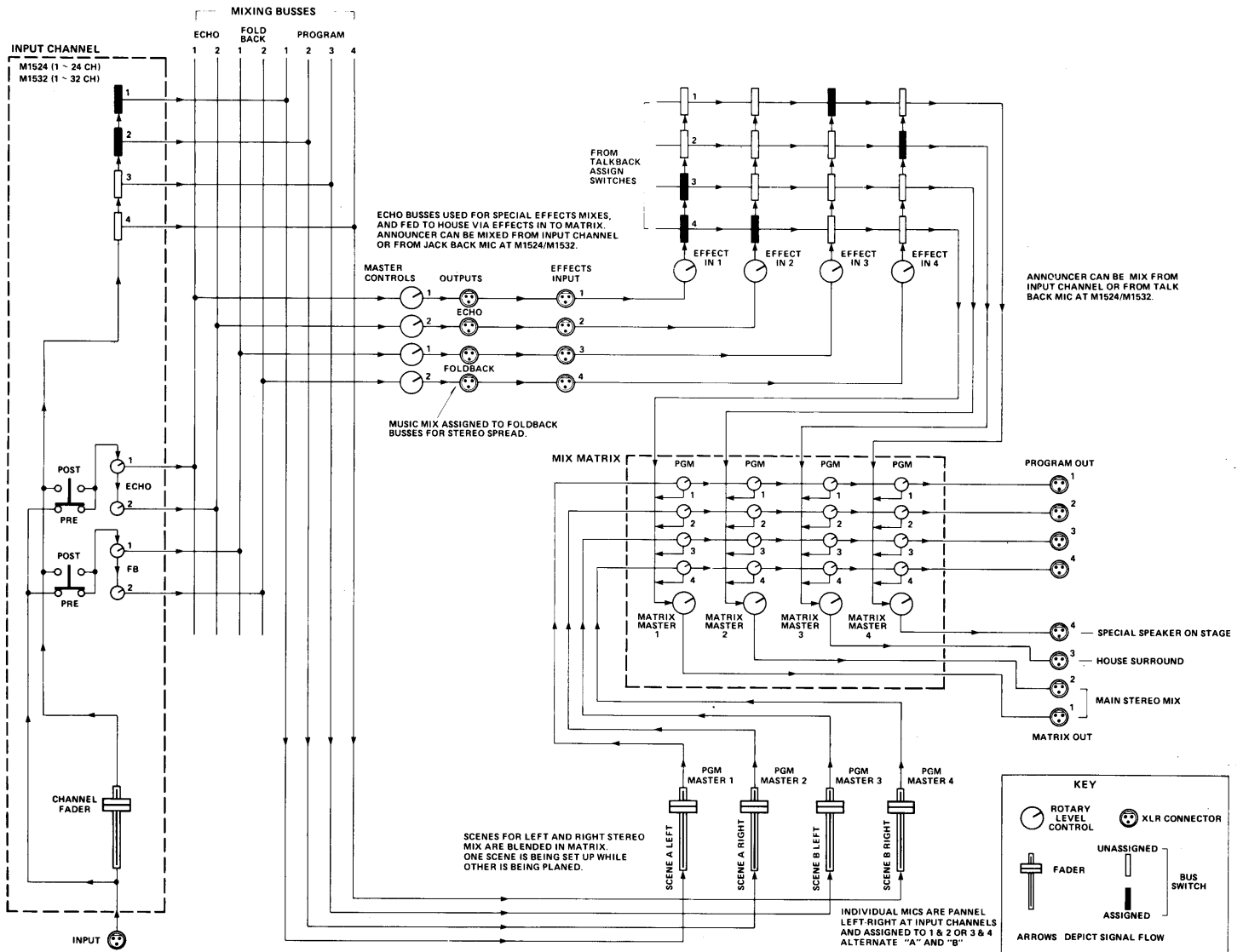
USING THE M1524/1532 AS A DEDICATED MONITOR MIXER.



In the absence of a dedicated stage monitor mixer, the M1524's/ M1532's foldback and echo busses may be used to obtain a different monitor mixes. If the echo busses are needed for echo and effects, and the 2 foldback busses alone are inadequate for monitoring, try this; feed the house sound system from the M1524/M1532 program

outputs, and use the Mix Matrix to create 4 different stage monitor mixes. If the house sound is mono, use the program busses for subgroups; an outboard 4 : 1 or 4 : 2 mixer can drive the amp(s) & speaker(s).

USING THE MATRIX TO FEED MULTI-CHANNEL THEATRICAL SOUND REINFORCEMENT SYSTEM.

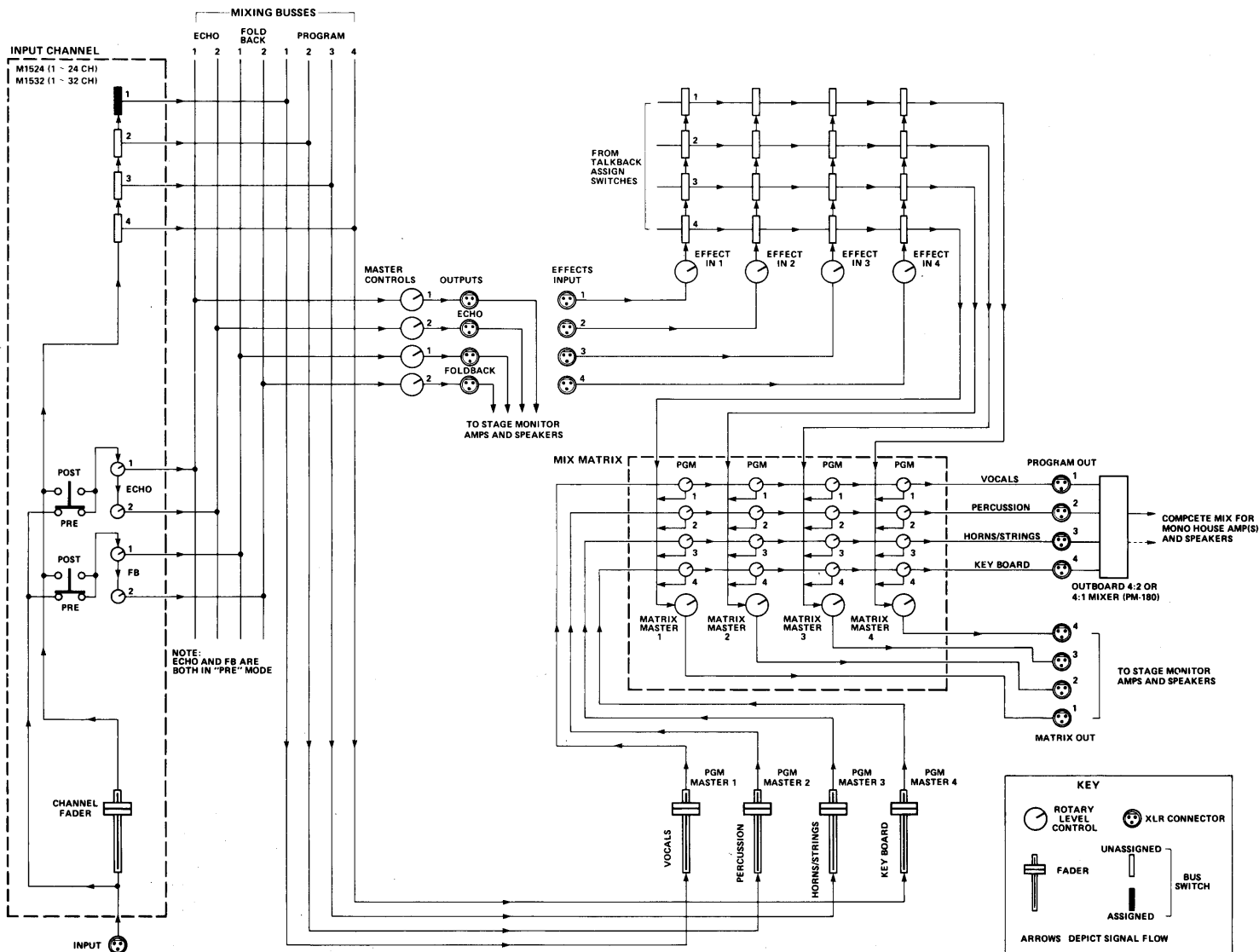


Stage Monitoring

In a stage monitor mixer, it is generally desirable to obtain many different output mixes. The M1524/M1532, while not specifically designed for this purpose, can be used advantageously. The 2 foldback outputs and 2 Echo outputs alone can provide 4 monitor mixes. Instead, however, these busses and the 4 program busses, can be used for vocal and instrumental subgroups. While the Echo and FB busses do not directly appear on the Mix Matrix, those bus outputs can be patched into the Effects Inputs and assigned to the Matrix. (Of course, if a performer prefers "wet" monitors, one or both echo sends can be used to feed echo or reverb equipment.) This total of 8 sub-

groups can then be combined on the Mix Matrix to achieve 4 distinct monitor mixes. In addition, a few subgroups can be used directly for stage monitor feeds, such as a stereo keyboard feed from two of the program busses. The subgrouped outputs (program, foldback and echo) can be fed to the main mixing console for incorporation in the house mix. (By using the Echo and Foldback Insert Outputs to feed the Effects In, the respective Echo and FB main outputs are free to feed the house mixer.) The channel Interstage Patch outputs can be used to feed the preamplified individual channel inputs to the house mixer, although the cable lengths should be kept short to avoid hum.

USING THE ECHO AND FOLDBACK OUTPUTS PLUS THE MIX MATRIX FOR 8 MONITOR MIXES. AND EXTERNALLY MIXING THE PROGRAM OUTPUT (SUBGROUPS) FOR A MONO OR STEREO

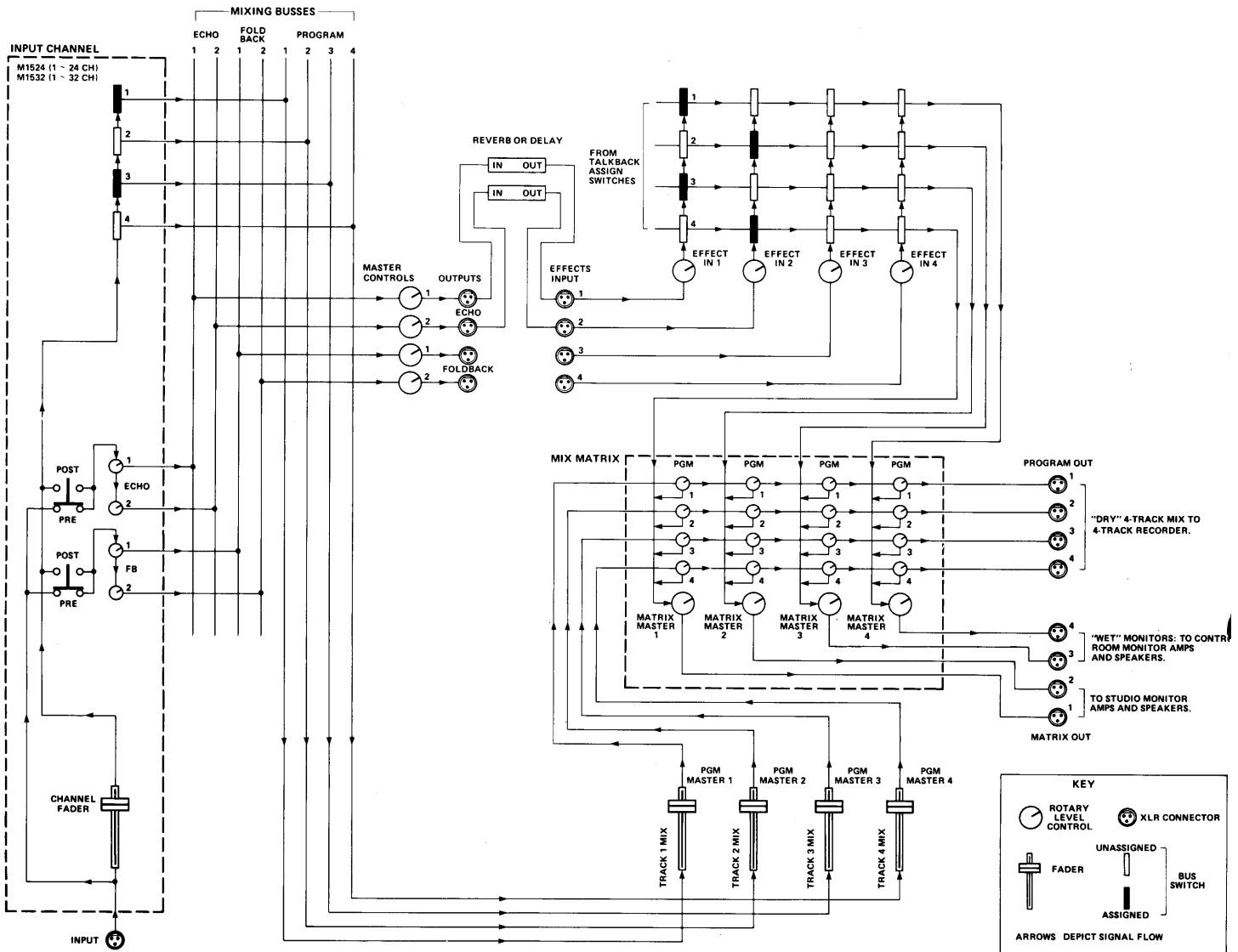


Recording

When a multi-track tape recording is being made, the recorder can be fed directly from the channel Interstage Patch Out jacks. Microphones and instruments being recorded can be connected to the M1 channel inputs, and the multi-track recorder line output can be connected to the M2 channel inputs (for later remixing). Foldback outputs can be used for studio monitoring, and any pair of odd and even numbered program outputs for control room monitoring. On the other hand, using the headphone output for control room monitoring is advan-

tageous because the Cue bus can be used to solo inputs and mixing busses. The parallel A & B program outputs can be used for making a 4-track recording (PGM Out A) and monitoring it (PGM Out B). Alternately, one set of program outputs can be used for recording a "dry" mix (no echo), while the four matrix outputs are used for monitoring; assigning the effects inputs to the matrix then allows "wet" monitoring (with echo) and dry recording.

USING THE MIX MATRIX FOR "WET" STUDIO AND/OR CONTROL ROOM MONITORING WHILE MAKING "DRY" (NO ECHO/REVERB) RECORDINGS.



Television Production

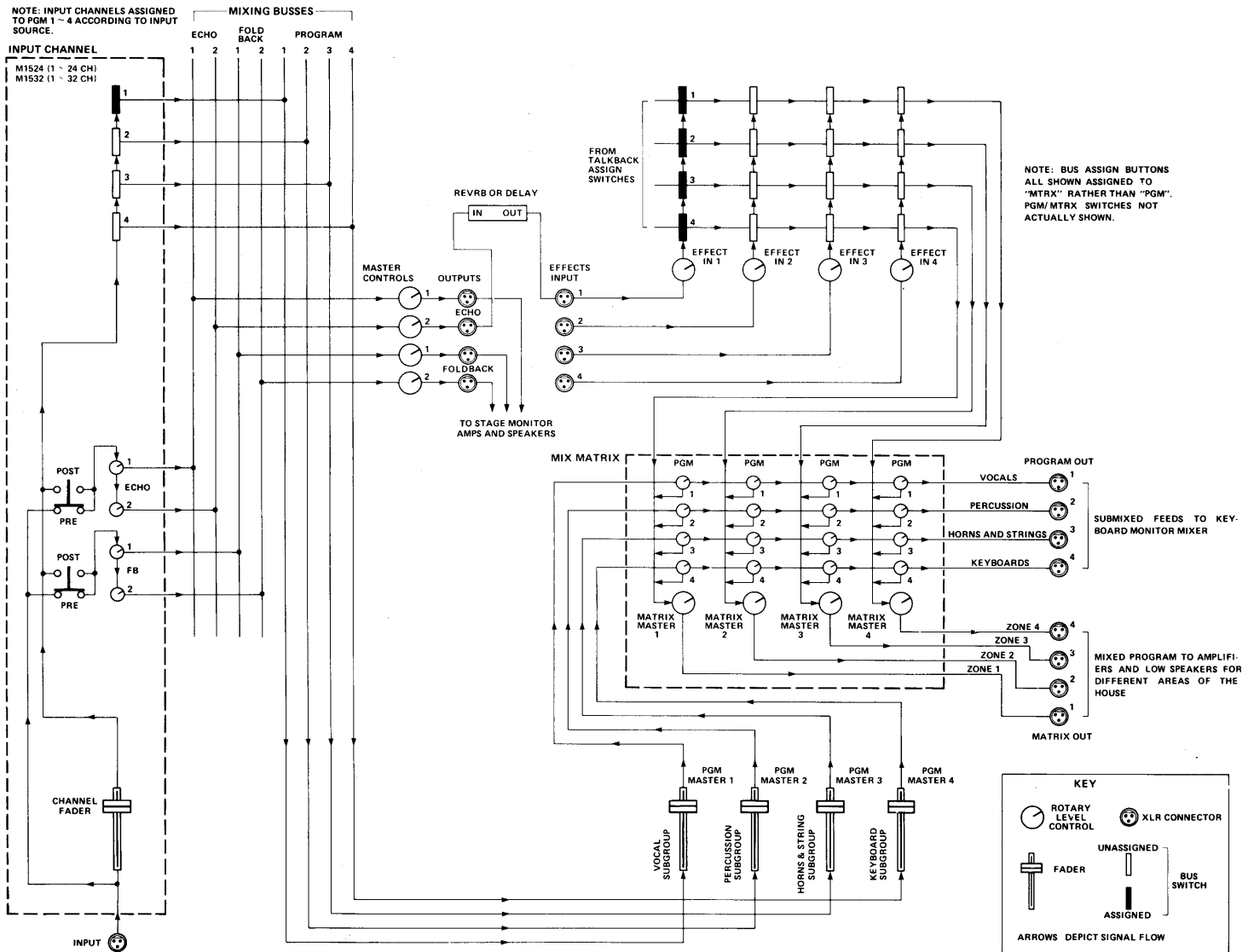
The input channel Interstage Patch outputs are useful for "splitting" preamplified mic signals to feed other mixers, such as a separate foldback mixer. These patch Out/In points also may be used for compressors or, in the case of telephone remote inputs, for special equalizers.

Program busses can be used for subgroups (e.g., emcee, contestant A, contestant B, announcer), and the Mix Matrix is then helpful in creating mix-minus feeds. These are sent to boom mic and camera operator's IFB systems (interruptible foldback intercoms), as well as to contestants or separated groups of people who must not hear

certain portions of the program. The Mix Matrix is also useful in creating a mono mix of the show for a VTR feed, and a simultaneous stereo mix when this format is adopted.

For remote production, pre-production, or post-production work, the Mix Matrix might best be used to feed various VTR's with different audio mixes, to provide primary and secondary feeds to transmission, or even to mix a reference tape (mono or stereo cassette). The Effects Inputs, if not needed for reverb, can be used as auxiliary line inputs from other studios, tapes, remotes, and so forth.

USING THE MIX MATRIX FOR MULTIPLE ZONE CONCERT SOUND REINFORCEMENT

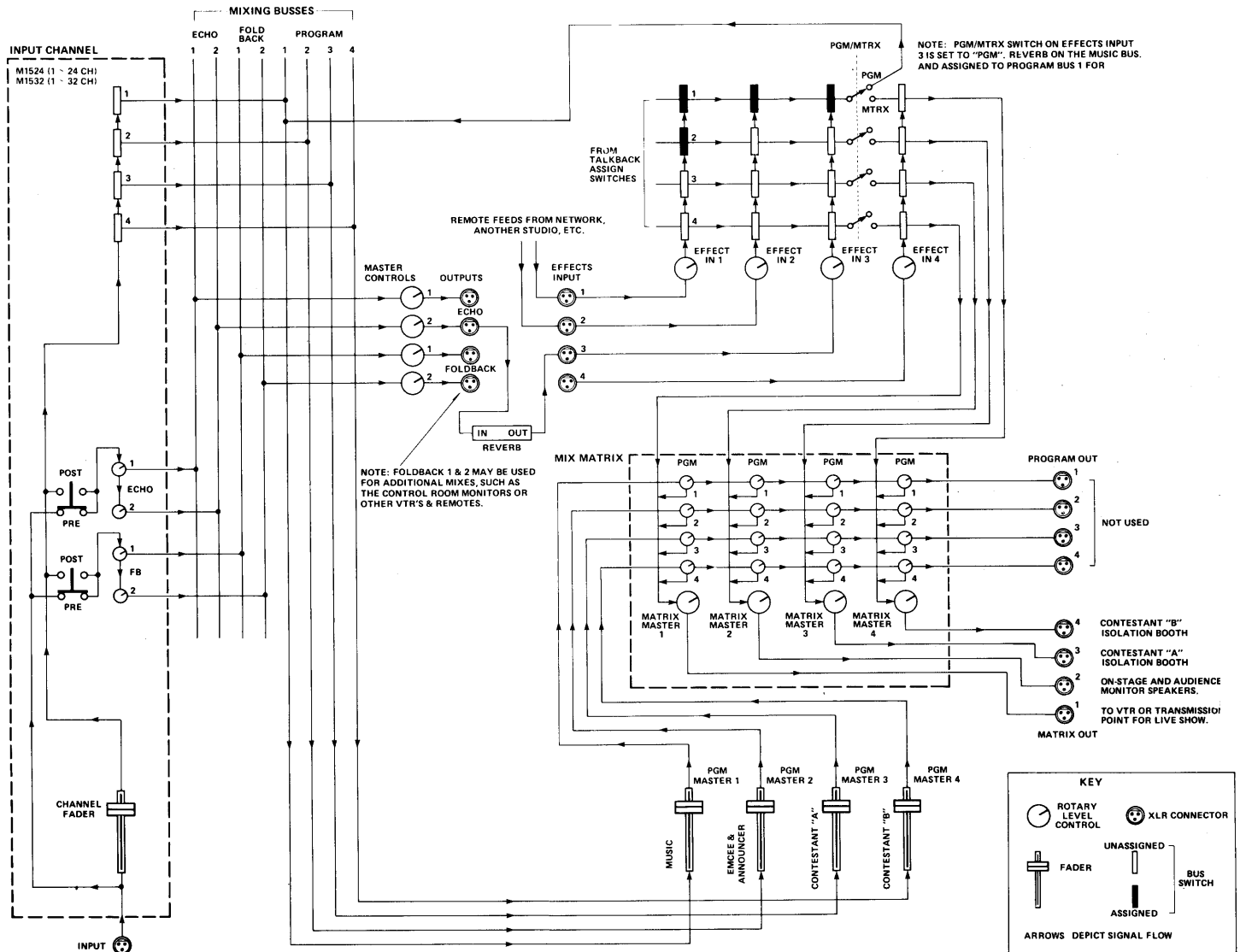


Theatrical Production

The typical production has several scenes, each with different mic setups, and some with special effects. The twin XLR's per input channel may aid in quick changeover of some mic or line inputs. Where the main reinforcement system is monaural, the 4 program busses can be utilized to mix different scenes, and can be combined in

the Mix Matrix (or via an external 4 : 1 mixer) for feed a mono power amp. The next scene may be preset on an unused program bus, and the transition made gradually by using the PGM Master Faders, or quickly using the PGM On/Off switches.

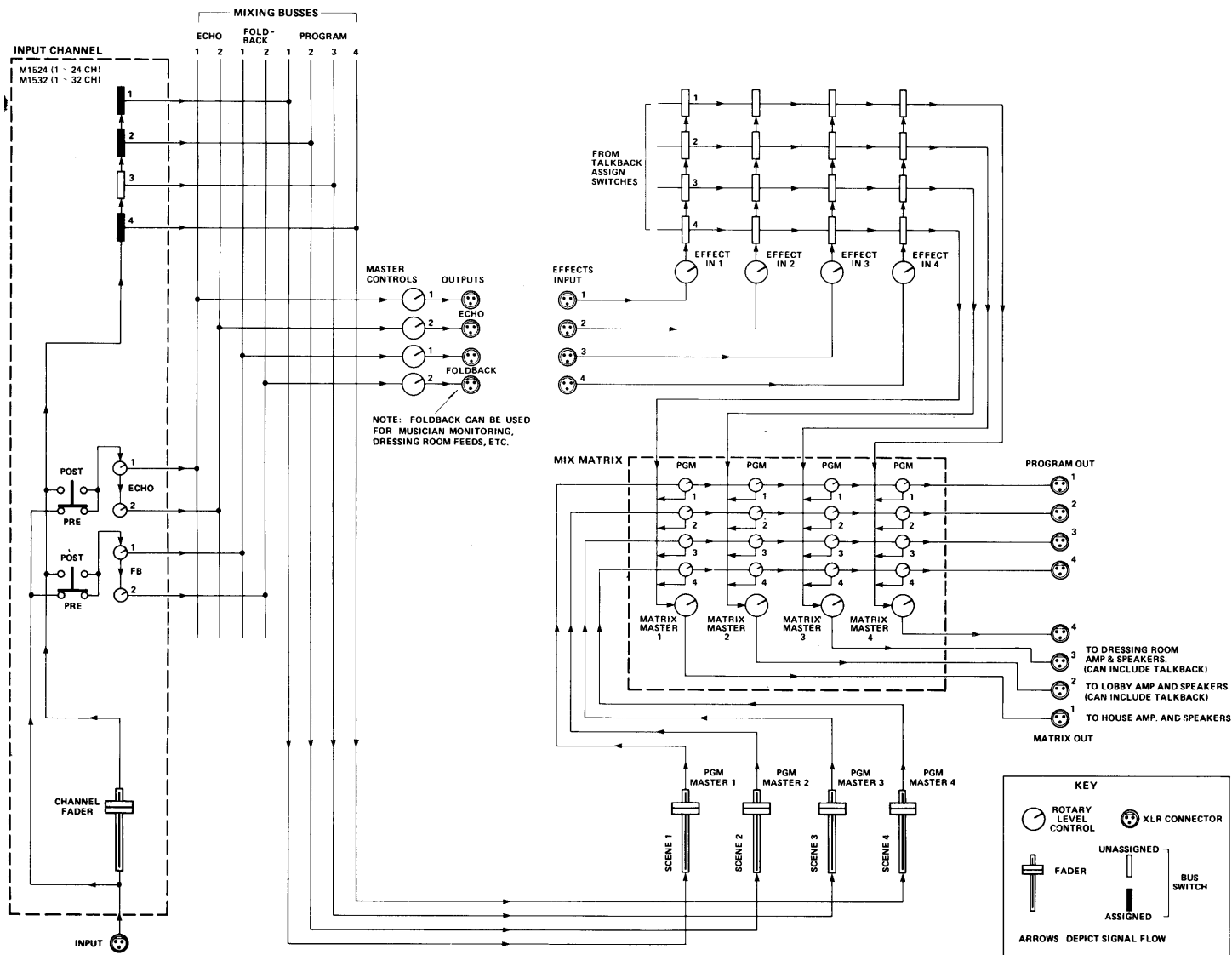
MIX MATRIX IN VIDEO GAME SHOW PRODUCTION FACILITATES MIX-MINUS MONITOR FEEDS.



In some setups, each scene may be required to drive different combinations of house speakers; this is where the Mix Matrix is invaluable. The 4 program busses can be used as performer/music/effects subgroups, or for different scenes. Effects inputs can be used for taped effects, and assigned to the matrix. The busses are remixed or rebalanced in the matrix for a spread across the stage, across audience fill channels, or into special effects speakers. The Mix Matrix and/or Program Output On/Off switches may be used to activate the "effects" speakers on cue.

It may be useful to restrap the mixer for the available 10dB of extra output gain, especially if ceiling mics or floor-mounted "mic mics" are used.

THE FLOOR PROGRAM MASTERS ARE USED FOR DIFFERENT SCENES AND ARE BLENDED FOR THE MONO THEATRE SOUND SYSTEM WITH ONE CHANNEL OF THE MIX MATRIX.



MAINTENANCE

Panel and Cabinet Cleaning

The Black panels should be cleaned with a damp sponge. Stubborn soil can be removed with a mild detergent solution, such as dishwashing detergent. Strong detergents or chemical solvents may damage the plastic fittings.

The wood veneer cabinet will retain its beautiful finish with very little care. When it looks dull or soiled, apply any liquid or paste furniture polish and buff with a soft cloth; aerosols should be avoided because the solvents may attack adjacent portions of the mixer, especially the meter faces.

Spare Parts

The M1524/M1532 is built for high reliability, but accidents and failures may occur. A spare circuit card or power supply can save the show in just seconds. We recommend that in all critical applications, one spare of each major circuit card, and one spare power supply be kept handy. These items are available through your Yamaha dealer.

Fuse Replacement

The power supply is fitted with a fuse holder for the AC line. The fuse should be replaced with one of the identical value and type. If a fuse continues to fail, do not install a higher value fuse; find the cause of the failures and correct it. Secondary fuses are located inside the supply. In the event the problem cannot be located, see the "Service" directions at the end of this section.

Meter Lamp Replacement

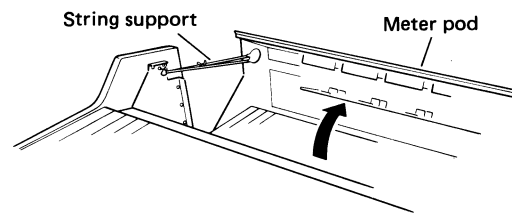
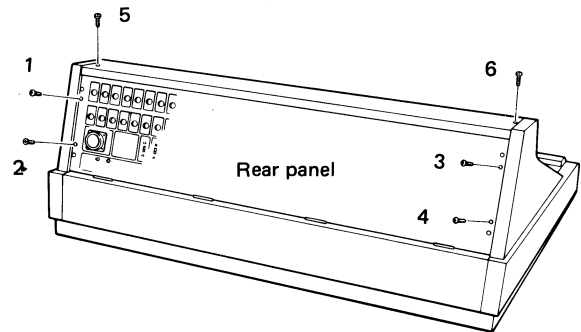
WARNING: There are no user-serviceable parts inside the mixer. Only qualified service personnel should attempt to open the unit for any purpose. Lethal voltages are present inside the mixer, and the AC line cord (or power supply umbilical cable) should be disconnected prior to opening it.

Two meter lamps are provided for each VU meter, one on either side. A lamp may be removed by pulling its lamp holder out of the rubber grommet, replacing the lamp, and reinserting the lamp into the grommet. Access to the meters is obtained by removing the two screws from the top of the meter pod and the four screws from rear panel, as shown in the illustration, and tilting the meter pod backward.

Make sure the string supports are in place so the meter pod does not tilt all the way backward.

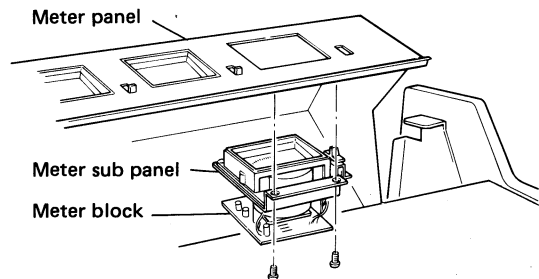
●HOW TO OPEN METER POD

Remove screws ① through ④ from the rear panel and screws ⑤ and ⑥ from the top of the meter pod, and tilt the meter pod backward.



●HOW TO REPLACE METER LAMP

To replace the VU meter lamp, pull the lamp holder out of the rubber grommet and reinsert the replacing lamp into the grommet.



Module Removal and Replacement

It is recommended that power be shut off and the AC cord (or power supply umbilical) be unplugged prior to removing or replacing a module. The meter pod must first be tilted back, (see the instructions in the previous paragraph on meter lamp replacement). Also, lift off the wrist pad at the front edge of the console by pulling straight up on it.

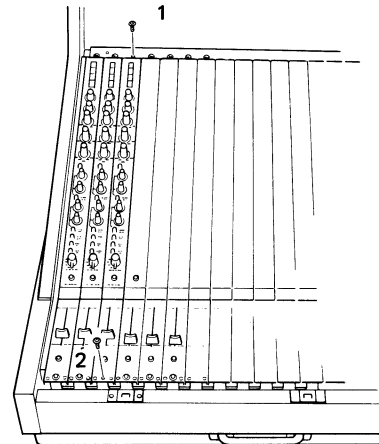
The screws which secure the top and bottom of each module to the mainframe are now accessible. Loosen the top screw, and remove the bottom screw (near the CUE button) from the module you wish to lift out of the mixer.

On the back of the module, you will find 1 or 2 edge connectors (depending on the type of module); unplug these connectors from the module's circuit card. **NOTE THE LOCATION FROM WHICH EACH CONNECTOR IS REMOVED FOR EASE OF FUTURE REPLACEMENT.**

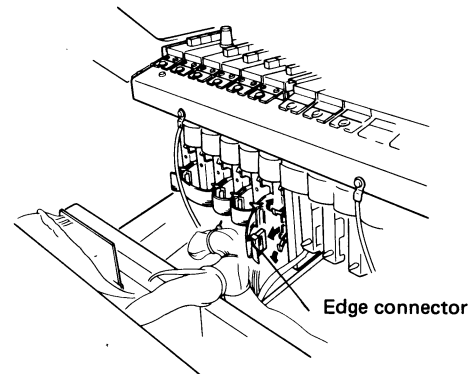
Then slowly lift the module up and forward. You will find from 2 to 6 additional connectors along the bottom of the module. Unplug these and the module may now be completely removed from the console.

Replacement follows the inverse order of removal. Be sure to properly match and firmly mate the connectors. The mixer may be operated minus one or more modules if repairs are being made, but the meter pod should be closed for safety.

- c. Remove screws ① and ② of the module to be removed.

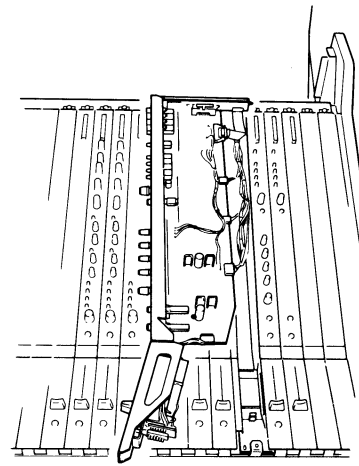
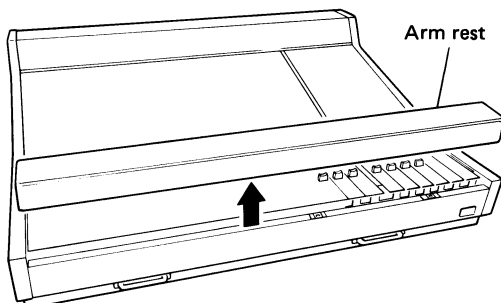


- d. Unplug the edge connectors connected to the rear panel side and take out the module. With the module thus taken out, module check and its parts replacement are possible.



●HOW TO REMOVE MODULE

- a. Turn off the power switch and unplug the AC cord.
b. Remove the arm rest from the unit.



GENERAL SPECIFICATIONS, INPUT / OUTPUT SPECIFICATIONS

M1524/M1532

FREQUENCY RESPONSE	+0, -3dB, 20Hz to 20kHz; +0, -0.5dB, 30Hz to 15kHz.
TOTAL HARMONIC DISTORTION (THD)*	Less than 0.5%, @+10dB, 20Hz to 20kHz; Less than 0.1%, @+20dB, 50Hz to 20kHz.
HUM AND NOISE* (20Hz to 20kHz, 150 ohm source)	-128dBm Equivalent input noise (EIN); -95dB residual output noise with all faders down.
(Input Selector set at "-60")	-70dB PROGRAM OUT; Master fader at nominal level and all Input faders down.
(")	-64dB PROGRAM OUT (68dB S/N); Master fader and one Input fader at nominal level.
(")	-70dB MATRIX OUT; Matrix Mix and Master controls at maximum, one PGM Master Fader at nominal level, and all input Faders down.
(")	-64dB MATRIX OUT (68dB S/N); Matrix mix and Master controls at maximum, one PGM Master Fader and one input Fader at nominal level.
(")	-67dB FB or ECHO OUT; Master level control at nominal level and all FB or ECHO mix controls at minimum level. (Pre/Post Sw. @ PRE.)
(")	-64dB FB or ECHO OUT (68dB S/N); Master level control and one FB or ECHO mix control at nominal level. (Pre/Post Sw. @ PRE.)
MAXIMUM VOLTAGE GAIN (Input Selectors set at "-60" dB, where applicable)	PROGRAM 84dB; Channel In to the corresponding output. FB & ECHO** 94dB; Channel In to FB/ECHO Out. EFFECTS 20dB; Effects In to PGM Out. SUB IN 10dB; Sub In to PGM Out.
EQUALIZATION (±15dB Maximum)	LOW 50, 100, 200, 350, 500Hz, shelving. LOW MID 250, 350, 500, 700, 1000Hz, peaking. HIGH MID 1.2, 2, 3.5, 5, 7kHz, peaking. HIGH 10kHz, shelving.

HIGH PASS FILTER TALKBACK	18dB/octave roll off below 80Hz. Mic or line input XLR, preamp, level control, push-to-talk switch, & assign buttons for Pgm/Mtrx busses, FB & Echo busses; TB Out On/Off switch on front panel, TB Out +4/-50dB level switch on rear panel.
TEST OSCILLATOR	Built-in generator of either 1kHz sine wave (1% THD) or pink noise, +4dB nominal level internally (switchable to -50dB at TB Out). Signal slates onto PGM/MTRX busses, FB & ECHO busses, and TB Out via Talkback system.
INPUTS TO MIXER (M1524 CH1 ~ CH24) (M1532 CH1 ~ CH32)	64 x Channel In (32 M1, 32 M2, both mic/line). 8 x Sub In (2 ea. Submixer Input to PGM, FB & ECHO busses). 4 x Effects In (Auxiliary program input and effects return). 1 x Talkback (Mic/Line in). 32 x Channel Insert In (patch in). 8 x Master In (2 ea. for PGM, FB & ECHO).
MIXING BUSES	4 x Main Program (L&R); 4 x Matrix; 2 x Foldback; 2 x Echo; 1 x Cue (solo.preview).
MIXER OUTPUTS	8 x Program (parallel A & B banks of 4); 4 x Matrix; 2 x Foldback; 2 x Echo; 2 x Headphone (one 2-channel jack); 32 x Channel Insert; 8 x Master Out (4 PGM/2 FB/2 ECHO).
CROSSTALK	-60dB @1kHz, adjacent inputs; -60dB @1kHz, input to output.
VU METERS	8 large illuminated meters, four for PGM 1-4 and four for MTRX 1-4; 3 smaller meters switchable for FB 1 & 2 or ECHO 1 & 2, and TB or CUE (0 VU = +4dBm).
PEAK INDICATORS	2 LEDs built into each input module and one in each VU meter. Input LEDs are 2-colors; green turns On when post-input selector signal reaches or exceeds 13dB below clipping, red at 3dB below clipping, VU meter LEDs turn on 10dB below clipping.

PHANTOM POWER	For remote powering of condenser microphones, +48V DC can be switched on via a rear panel Master phantom power switch (40V for UL & CSA approved models). When an individual input Phantom switch is also On, voltage is applied to pins 2 and 3 of that input's XLR connector via a pair of 6.8kΩ isolation/current-limiting resistors that feed each balanced input transformer.
FINISH	Black painted panels, rosewood veneer cabinet, color coded knobs.
DIMENSIONS (W x D x H)	55-13/16" x 36-11/16" x 14-9/16" (1418mm x 932mm x 370mm)
WEIGHT	M1524 213 lbs (97kg) M1532 231 lbs (105kg)
POWER REQUIREMENTS	U.S. & Canadian Models: 120V 180W General Model: 240V 190W, Selectable (110/120/220/240V)
POWER SUPPLY PW1500B	
POWER REQUIREMENTS	U.S. & Canadian Models: 120V, 50/60Hz General model: 110, 120, 220 or 240V, 50/60Hz
POWER CONSUMPTION	U.S. & Canadian Models: 180W Canadian Model: 150VA General Model: 190W
DIMENSIONS (W x D x H)	18-7/8" x 13-3/16" x 5-1/2" (480 x 335 x 140mm)
WEIGHT	21.2 lbs (9.6kg)

* Hum and noise are measured with a 6dB/octave filter @12.47kHz; equivalent to a 20kHz filter with infinite dB/octave attenuation.

** Maximum voltage gain (Echo) measured with channel fader at nominal level.

INPUT SPECIFICATIONS

CONNECTION	LEVEL SWITCH	ACTUAL LOAD IMPEDANCE	FOR USE WITH NOMINAL	SENSITIVITY**	INPUT LEVEL		CONNECTOR IN MIXER***
					NOMINAL	MAX BEFORE CLIP	
INPUT CHANNELS (1-24) or (1-32)	-60dB	900Ω	50Ω to 250Ω mics or 600Ω line level sources	-80dB (0.08mV)	-60dB (0.78mV)	-30dB (25mV)	XLR-3-31
	-50dB	900Ω		-70dB (0.25mV)	-50dB (2.5mV)	-20dB (78mV)	
	-35dB	900Ω		-55dB (1.4mV)	-35dB (14mV)	-5dB (436mV)	
	-20dB	1kΩ		-40dB (7.8mV)	-20dB (78mV)	+10dB (2.45V)	
	-10dB	1.3kΩ		-30dB (24.5mV)	-10dB (245mV)	+20dB (7.75V)	
EFFECTS IN (1-4)	+ 4dB	5kΩ	600Ω lines	-16dB (123mV)	+ 4dB (1.23V)	+24dB (12.3V)	XLR-3-31
SUB IN PGM (1-4)							
SUB IN FB (1, 2)		1kΩ	600Ω lines	- 6dB (388mV)	+ 4dB (1.23V)	+24dB (12.3V)	XLR-3-31
SUB IN ECHO (1, 2)							
TB IN	-50dB + 4dB	800Ω 5kΩ	50-250Ω microphones 600Ω lines	-70dB (0.25mV) -16dB (123mV)	-50dB (2.5mV) + 4dB (1.23V)	-20dB (78mV) +24dB (12.3V)	XLR-3-31
CH. INSERT (1-24) (1-32)		10kΩ	600Ω lines	-26dB (39mV)	- 6dB (388mV)	+24dB (12.3V)	Phone jack
PGM INSERT (1-4)							
FB INSERT (1, 2)		10kΩ	600Ω lines	-16dB (123mV)	- 6dB (388mV)	+24dB (12.3V)	Phone jack
ECHO INSERT (1, 2)							

OUTPUT SPECIFICATIONS

CONNECTION	LEVEL SWITCH	ACTUAL SOURCE IMPEDANCE	FOR USE WITH NOMINAL	OUTPUT LEVEL		CONNECTOR IN MIXER**
				NOMINAL	MAX. BEFORE CLIP	
PGM OUT (1-4)*** MTRX OUT (1-4) FB OUT (1, 2) ECHO OUT (1, 2)		150Ω	600Ω lines	+ 4dB (1.23V)	+24dB (12.3V)	XLR-3-32
PGM INSERT OUT (1-4) FB INSERT OUT (1, 2) ECHO INSERT OUT (1, 2) CH. INSERT OUT (1-24) (1-32)		600Ω	10kΩ lines	- 6dB (388mV)	+24dB (12.3V)	Phone jack
HEADPHONES		25Ω	8Ω phones; 600Ω lines	- 6dB (388mV); + 8dB (1.95V)	+ 4dB (1.23V); +18dB (6.16V)	TRS phone jack
TALKBACK OUT	+ 4dB -50dB	150Ω	600Ω lines	+ 4dB (1.23V) -50dB (2.5mV)	+24dB (12.3V) -30dB (24.5mV)	XLR-3-32

* In these specifications, when dB represents a specific voltage, 0dB is referenced to 0.775 volts RMS.

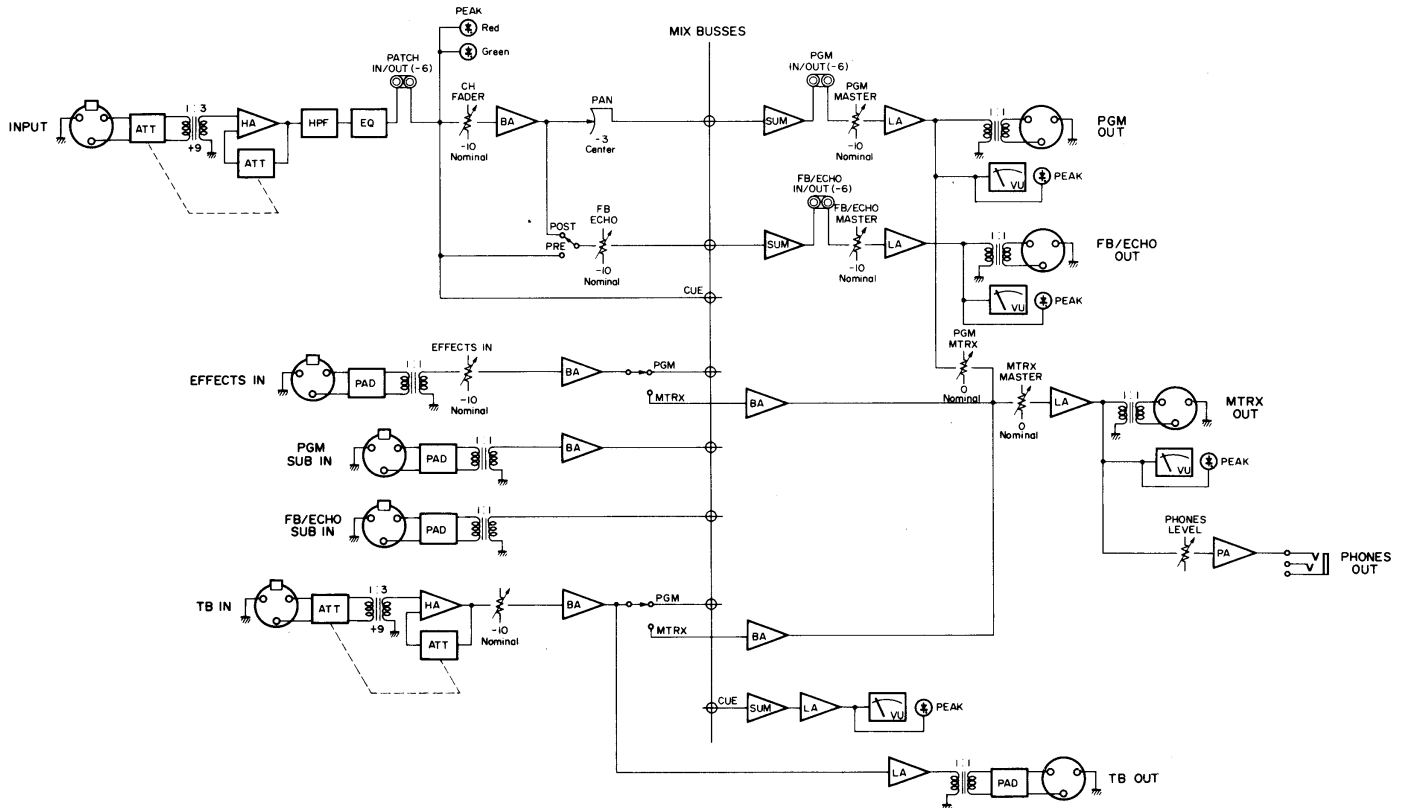
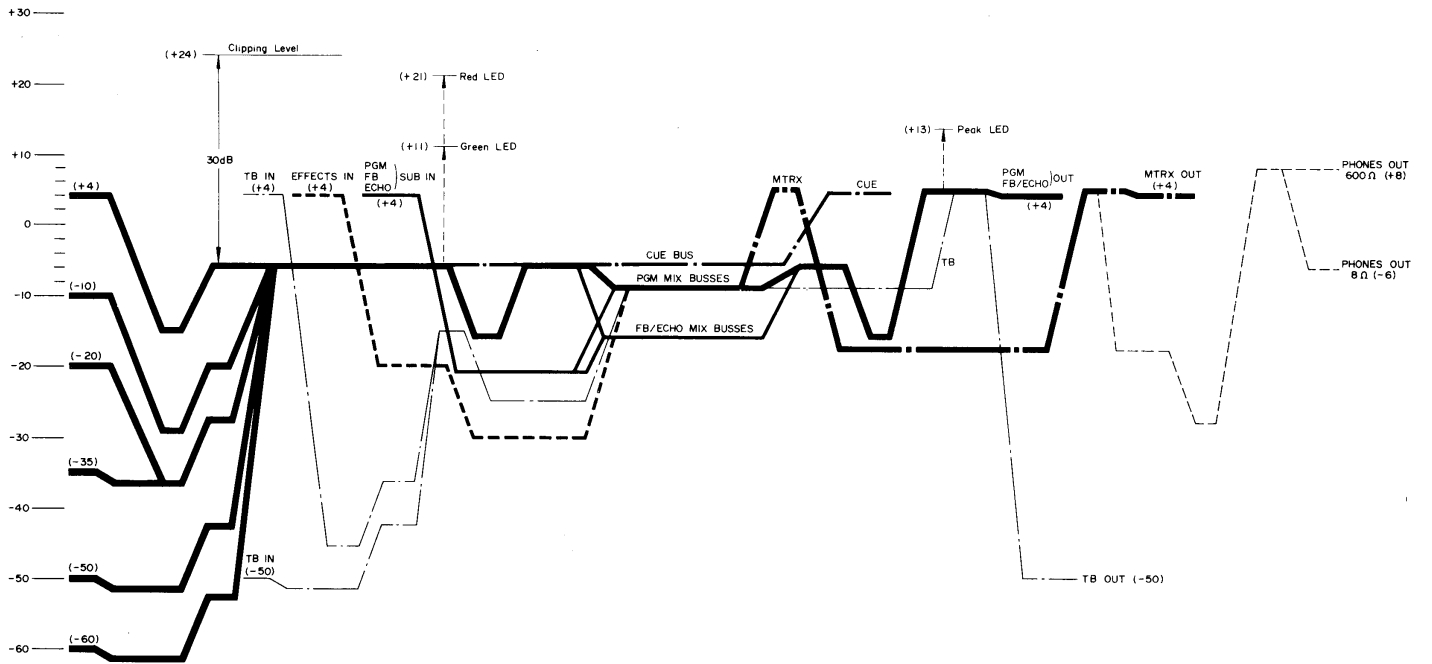
** Sensitivity is the lowest level that will produce an output of +4dB (1.23V), or the nominal output level when the unit is set to maximum gain.

*** All XLR connectors are floating (balanced) and transformer-isolated. Phone jacks are unbalanced.

**** "A" and "B" Program outputs are parallel wired; combined load on both connectors of a given bus output should not be less than the nominal 600 ohms.

All specifications subject to change without notice or obligation.

LEVEL DIAGRAM



SERVICE

The M1524/M1532 mixer is supported by Yamaha's worldwide network of factory trained and qualified dealer service personnel. In the event of a problem, contact your nearest Yamaha dealer.



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