

PROFESSIONAL AUDIO MIXING CONSOLE

PM 4000M

OPERATING MANUAL



IMPORTANT NOTICE FOR THE UNITED KINGDOM

Connecting the Plug and Cord

WARNING: THIS APPARATUS MUST BE EARTHED

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

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

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

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

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

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

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

Bescheinigung des importeurs

Hiermit wird bescheinigt, daß der / die / das

Professional audio mixing console Typ : PM4000M

(Gerät, Typ, Bezeichnung)

in Übereinstimmung mit den Bestimmungen der

82/499/EWG

(EG-Richtlinie)

funktentstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.

YAMAHA Europa GmbH

Name des Importeurs

How to Use This Manual

If you are an engineer or technician who is familiar with sound system design, much of this manual will serve as a review for you. The basic features are presented in the "BRIEF OPERATING INSTRUCTIONS" section. Check this and the "SPECIFICATIONS" section, and you will see most of what you need to know. The balance of this manual provides background information for better utilization of the console and auxiliary equipment.

If you would like to know more about AC power distribution and safety, grounding, balanced versus unbalanced cables, direct boxes, and so forth, this information is also presented. Check the TABLE OF CONTENTS.

There are internal preset switches within the console which can be configured to change the functions and/or signal paths in certain circuits. Refer to the OPTIONAL FUNCTIONS section for details.

Terminology and Typographic Conventions

Generally, where we refer to a particular control or function as it is actually labeled on the console, we will use all upper case type. That is, if we refer to an input channel's gain control, we may print "the input GAIN control." On the other hand, if the feature is not labeled, we will use upper case type only on the first letter; for example, "observe there is no identification of the input Fader." If the front panel label is incomplete or ambiguous, we may augment it. For example, the input channel controls labeled "1, 2, 3, 4, 5, 6, 7, 8, 9, ...18" may be accompanied by the parenthetical reference "(group bus assign controls)".

There are 18 groups (or subgroups, depending on your linguistic preference). The group faders are known as "Group Master Faders". Their function is to control the level on the 18 "Group Mixing Busses. The Stereo Bus 1 and Stereo Bus 2 Faders are actually two pair of closely spaced faders (L and R) for each stereo bus; when we refer to the general function, we use the term "Stereo Fader," but if the availability of separate left and right control is important, we may use the plural "Stereo Faders."

Particularly important information is distinguished in this manual by the following notations:

NOTE: A NOTE provides key information to make procedures or functions clearer or easier.

CAUTION: A CAUTION indicates special procedures or guidelines that must be observed to avoid damage to the console or related equipment, or to avoid an undesirable result while using the console.

WARNING: A WARNING indicates special procedures or guidelines that must be observed to avoid injury to the operator or others using or exposed to the console or related equipment.

In the BRIEF OPERATING INSTRUCTIONS section of this manual, each feature is provided with a numerical reference. Elsewhere, if we are referring to that feature, we may cite the reference number in square brackets for clarity. For example, on the input module, the sixth control group to be described is the high band of the equalizer. In other places on the console there are other equalizers. For clarity, then, if we are discussing this particular input set of equalization controls, we will describe it like this: "the EQ HIGH band [6]". Now, here's a real warning that Underwriters Laboratories says we have to print:

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

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Section 1.

Introduction

The PM4000M is closely related the popular PM4000, but it is designed for a different primary application – stage monitoring. However, as you will see, it has a wide range of features and tremendous flexibility that enable it to do a great job in TV production, theatrical production, house-of-worship mixing, and a number of other applications.

The is available with 44 or 52 input positions (or 36 outside the U.S.A.). There are eight VCA (Voltage Controlled Amplifier) Master Faders which can be assigned to control any combination of input channels (see Section 7 for a discussion of VCAs). In addition, there are 18 group mixing busses, as well as two pair of stereo mixing busses, to which any of the input channels can be assigned. Each input channel may be assigned directly to any of the 18 group busses or two stereo busses by means of *sealed* PRE/OFF/POST switches and rotary level controls. The stereo bus sends on each channel, which have PAN controls, may be switched individually to function as dual mono sends, for a total of 22 discrete audio mixing busses.

Input channel signals may be assigned directly to the stereo busses, or assignment can be made via any of the 18 Group Masters. Thus, the console can function in a sub-grouped mode with a stereo “grand master” fader [Section 8.12.2], or it can function with independent stereo and multi-channel output mixes. When doing complex stage monitor, theatrical, or TV productions, the large number of discrete mixes can be very helpful. On the other hand, the capability of creating up to 11 separate stereo mixes (the two stereo busses plus 9 pair of group busses) can be useful for big-band wireless headphone monitor systems, multiple-purpose productions, and so forth.

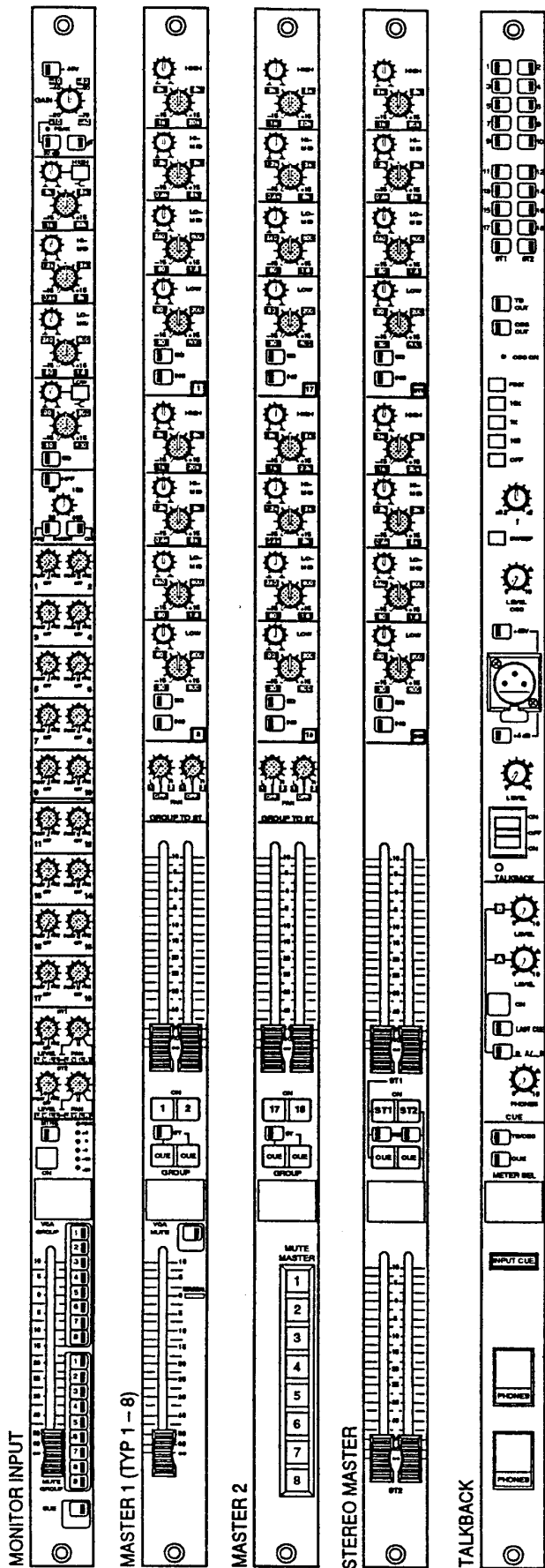
The PM4000M inputs are differentially balanced, and are equipped with a 30 dB attenuation PAD plus a continuously variable 50 dB range GAIN trim control so that literally any mic or line level signal can be accommodated with channel faders set at nominal level. Optional input transformers may be installed internally on a channel-by-channel basis when extra grounding isolation is required. While the console has ample headroom throughout, it is always possible to incorrectly set controls. For this reason, the PM4000M is equipped with level detection at several stages. Input LED meters and “PEAK” LEDs are provided. The latter not only monitor the input preamp level, they check for overboost in the EQ section, too. Metering can be front-panel switched to pre or post fader (actually, pre/post

VCA). Finally, if the mixed levels on the group, auxiliary, stereo, matrix or cue busses adds up to be too high, a “PEAK” LED in the output meters will flash on to warn of the impending danger of clipping.

The PM4000M master output section is arranged with 9 pair of Group Master faders (i.e., 18 faders). Each pair of sliders is close enough for single-finger adjustment of them when they are being used for a stereo mix, yet they are independent and can just as readily be adjusted independently when the outputs are not being used for stereo mixes. While each group mix can be used at its own direct output, or they can be used in stereo pairs, it can also be assigned to either (or both) of the stereo masters. Thus, the groups can be used as subgroups, with the stereo master fader(s) handling the “grand-master” function. This kind of flexibility is available at the push of a button, with no special patching required.

The PM4000M has a VCA grouping system which is separate from the audio grouping. Eight “VCA GROUP” switches next to each channel fader enable that channel to be assigned so it is controlled by one or more of the VCA Master Faders. When multiple input channels are assigned to a given VCA bus, those channels output levels can be raised or lowered by the single VCA Master Fader. Consider how this differs from the conventional groups. When multiple input channels are assigned to one of the 18 group (audio) mixing busses and two stereo mixing busses, those channels' combined signals can be raised or lowered in level with the Group or Stereo Master Faders. The audio result is the same as though the VCA Masters were used... with one exception; if signal processing of multiple inputs is required, it is necessary to run that combined signal through a single bus, which is why 18 full-length Group Master Faders are provided on the PM4000M. However, when the VCA Master Faders are used, more than one VCA Master can combine to alter the level of a single input channel. What's more, the VCA Master Fader, because it affects the input channel directly, can also alter that channel's post-Fader output to any of the 18 Group and two Stereo mixing busses (at least to those fed post-fader), something not possible with the conventional Group Master Faders. These VCAs are sonically superb. To insure reliable operation, all bus, VCA group and mute group assignments are via proven latching switches; Yamaha has avoided C-MOS switching and “glue-logic” for these vital functions.

The MASTER MUTE function facilitates scene



changes and complex cues. Each input channel has eight MUTE assign switches. These permit the channel's on/off function to be remotely controlled by the eight MASTER MUTE switches. Once a channel is switched on locally, it can be muted (turned off) or unmuted (turned on) if it is assigned to one or more of the mute groups. This permits multiple channels to be silenced or activated all at once, which expedites live sound mixing, band personnel or instrument changes, theatrical scene changes, and so forth. If, however, it is imperative that a certain channel never be inadvertently muted, or that muting temporarily be overridden, the input channel's MUTE SAFE switch can be engaged. Muting can also be controlled remotely, via a rear panel connector, so automation here, too, is possible. In addition to the master muting function, the VCA master faders have mute switches which mute the corresponding VCA group (or at least prevent the master from altering input levels); this provides another, different layer of master control of levels to facilitate tracking program changes with the mix.

For added flexibility, the INSERT in jack on any input module can be used for aux return purposes, and then the channel's INSERT ON switch can pick up the aux return instead of any signal which may remain connected to the main channel input. This allows a given channel to perform different functions at different times without patching cables.

An excellent feature of the PM4000M is its extensive cue capability. There is a CUE switch on every input channel and on the aux returns, and a CUE switch on every auxiliary send, the group outputs, the matrix outputs and the stereo master output. Cue replaces the signal in the headphones and the stereo cue XLR outputs with only those sources whose CUE switches are engaged.

The CUE system has input priority so that the operator may normally monitor the cue signal from the stereo bus or the group busses, and can instantly check one or more channel or aux return inputs without having to first release the bus CUE switches. This capability is great for troubleshooting, previewing a channel before applying it to the mix, or "touching up" the EQ on a channel during a performance. An annunciator light

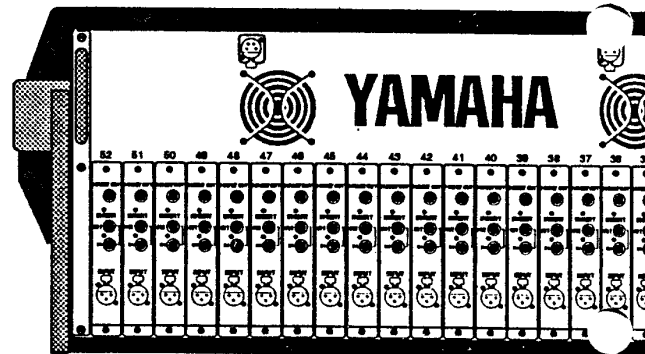


Figure 1-1. PM4000M Modules (Left-to-Right): Monitor Input (36, 44 or 52 in console), Master (1 of 8 in the console), Master 2, Stereo Master, and Talkback

signals the operator when the phones/cue outputs are in cue mode. There is also a LAST CUE mode in which the most recently selected cue cancels previously set cues.

The PM4000M has an excellent talkback system plus a useful test oscillator. An XLR input (with phantom power) can be set to accept any microphone or line level input, and is activated with the TALKBACK switch. That signal can be slated to any of the 18 group mixing busses, the two stereo mixing busses, and to a rear panel XLR TB output. The test oscillator can be set to 100 Hz, 1 kHz or 10 kHz fixed frequencies, or can be swept from 0.2 to 2x the set frequency, and its output level is adjustable. Pink noise may be selected, too. The oscillator can be slated to the same busses as the talkback, and also has its own rear panel output connector so the signal can be routed to other equipment or other console inputs for testing.

Extensive metering is provided with a total of 22 illuminated VU meters (or 18 meters on 36-channel mainframes), each with a peak LED. Several of these meters can be switched to monitor alternate busses, so the metering gives you a comprehensive view of signal levels in your system.

The highly advanced PM4000M, with its many internally switchable functions, is as close to a custom console as you can get... while retaining all the value and reliability of an off-the-shelf Yamaha console. Like the PM4000, the PM4000M is a straightforward console to use. Anyone who has used the PM4000, or even a PM3000, should immediately feel comfortable with the PM4000M. Take a while to study the panel, read the descriptions in this manual, and you'll find operating this console is very natural... and satisfying because you can make it do the job the way you need it done.

The applications discussions in Section 8 should give you a good idea of how to use the PM4000M features to accomplish your mixing goals. These are not meant to be comprehensive explanations, but rather to point you in the right direction. We are sure that many of you will find innovative and unique applications for this console which even the engineers who designed it may never have imagined.

**Heat is generated by electronic components, and is the enemy of them. In some segments of the industry (such as Las Vegas showrooms), it has been customary to leave equipment switched on 24 hours. This tradition grew out*

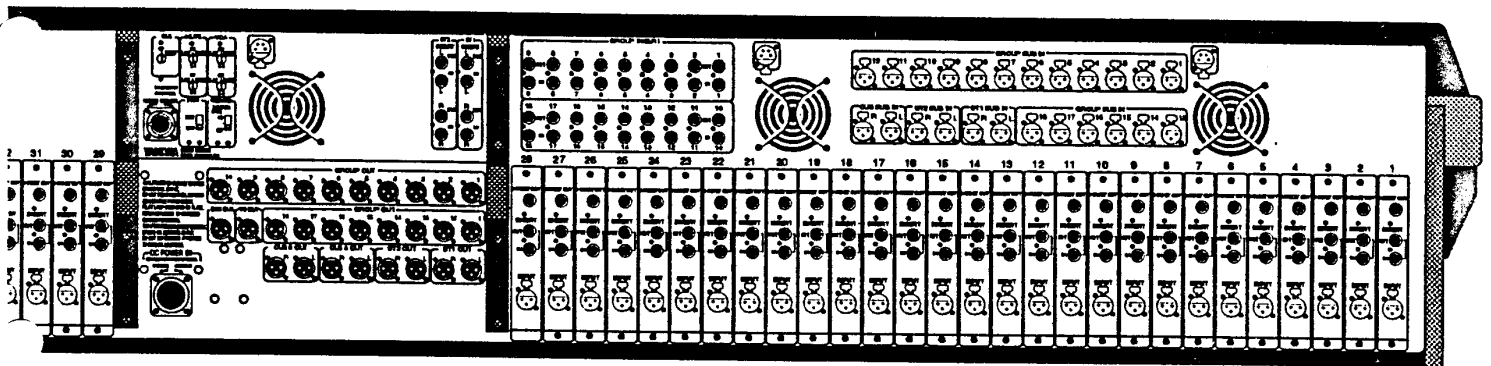


Figure 1-2. PM4000M-52 Rear Panel

PM4000M electronic performance is everything you'd expect from the people who developed the PM3000. It is even more advanced, with lower noise levels than ever. Wide headroom throughout, exceptionally low distortion, and quiet controls are the hallmark of this top quality mixing console. The specifications are honest and conservative. The performance is audibly superb.

Physically, the PM4000M chassis design features aircraft-style bracing with the high strength necessary to sustain repeated trips on the road. A gray finish and subtly color coded controls set the backdrop for the PM4000M's hundreds of illuminated switches and indicators. Multiple rear-mounted cooling fans reduce internal temperatures to prolong component life.*

of the days when vacuum tube equipment was prevalent, and vacuum tubes did last longer if they remained on rather than being switched. Solid state devices used in modern mixing consoles are less susceptible to damage from switching, but the heat build up sustained in continuous 24 hour operation will shorten component life. Therefore, it's a good idea to turn off your equipment when it is not in use (unless you are in a very humid environment where the heat of operation wards off corrosion-causing, short-circuit-promoting moisture condensation). While the PM4000M remains cooler than its predecessors, thanks to cooling fans, it remains a prudent practice to shut it off when it is not being used.

Section 2. Brief Operating Instructions

2.1 PM4000M Front Panel Features

NOTE: Features are numbered to correspond with the numbers on these module drawings. In the case of the Master 1 and Master 2 modules, where the upper portions of the modules are identical, we have illustrated only the bottom third or so of the Master 2 module to depict the features it has which differ from the Master 1 Module.

2.1.1 The Standard Monitor Input Module

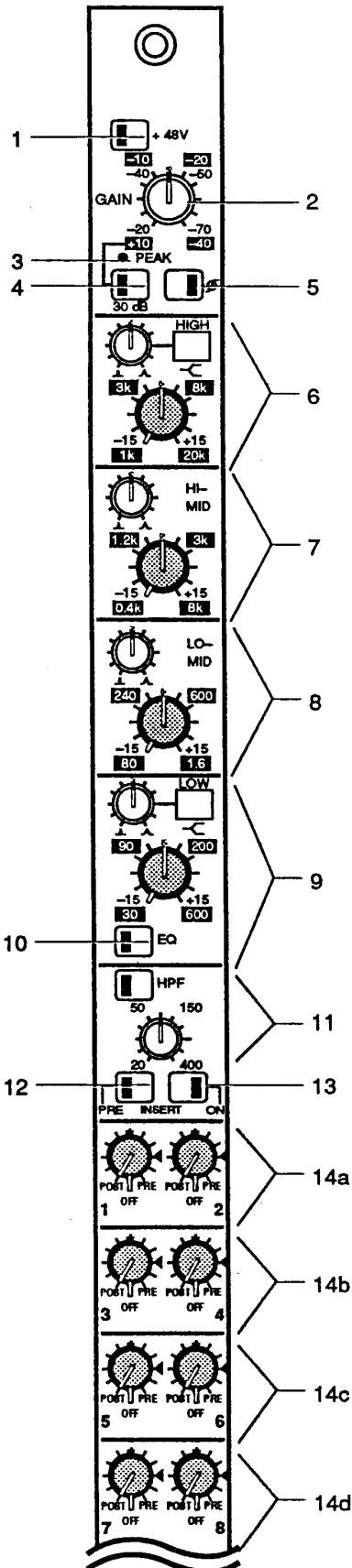


Figure 2-1a. PM4000M Monitor Input Module (upper portion of module)

1. +48V

This switch turns phantom power on and off at the channel's XLR input connector. Power can be turned on, however, only if the MASTER PHANTOM POWER switch is on. An LED in the switch turns on when phantom power is being applied to the channel input connector.

When both the Master and this switch are on, +48 volts is applied to both pins 2 & 3 of the channel input XLR connector 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 console'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 console's microphone power supply is not intended for A-B powered microphones. External supplies may be used with these devices, in which case the console's phantom power should be turned OFF on the appropriate channels. The optional input transformers, if installed, do not affect phantom power operation.

2. GAIN

This rotary knob provides 50 dB of continuously variable adjustment for the input preamplifier gain. A setting of -70 (full clockwise rotation) provides maximum gain for low-level mic inputs, whereas a setting of -20 provides minimum gain for low-level line inputs or "hot" mics. These settings provide 30 dB less overall gain when the 30 dB pad is engaged [4].

3. PEAK

This red LED turns on to indicate when the signal present after the channel preamp is too high in level. The LED triggers 3 dB below clipping, and should therefore flash on only occasionally.

This indicator measures signal from the XLR or from the INSERT IN jack, whichever is active, as well as after the equalizer. If necessary, use the PAD or decrease the GAIN setting to prevent the LED from remaining on any longer than momentarily; otherwise excessive distortion and insufficient fader travel will result.

4. 30 dB (pad switch)

Engaging this pushbutton switch attenuates the signal 30 dB and turns on an LED in the switch. The PAD should be used in conjunction with the GAIN control to obtain the precise channel sensitivity necessary for a given source. If you're not sure whether an input is high line level or mic level, begin with the pad engaged, and the GAIN control at -20 (+10) position. Then rotate the GAIN control clockwise. If you still don't get enough level, or if the signal is noisy with a lot of gain, then turn down the GAIN, disengage the pad and reset the GAIN control as necessary.

NOTE: By adjusting the GAIN control, you may be able to get the same overall level with or without the pad engaged. Listen for noise and distortion, though; if the signal is noisy, don't use the pad. If there is a lot of distortion, use the pad.

5. Ø (Phase)

This switch reverses the polarity of pins 2 and 3 of the channel's XLR input connector. In normal position (switch button up), pin 2 is the signal high conductor, and in reverse position (switch engaged), pin 3 is high. An LED in the switch is illuminated when polarity is reversed.

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.

EQUALIZER

The input channel equalizer is divided into four bands, each with sweepable filter frequencies. The high and low bands may be switched for a peaking or shelving type curve, whereas the high-mid and low-mid bands are of the peaking type. All four bands have adjustable Q, providing fully parametric type EQ. The level (gain) is adjustable over a range of 15 dB boost and 15 dB cut in each band.

6. HIGH (Peak/Shelf)

This locking switch selects peaking type EQ (switch out) or shelving type EQ (switch engaged). When the switch is engaged (shelving mode), the adjacent Q control is not operational.

Q

This rotary control adjusts the Q of this section of the equalizer from 3.0 (a half octave) to 0.5 (2.5 octaves bandwidth), with a center detent at a Q of 1.2 (also equal to a bandwidth of 1.2 octaves).

1 ~ 20 kHz

The outer concentric knob sweeps the EQ Frequency between 1,000 and 20,000 Hz.

-15 ~ +15 dB

The inner concentric knob adjusts the gain of the set frequency band by plus or minus 15 dB. A center detent is provided for unity gain.



7. HIGH-MID

Q

This rotary control adjusts the Q of this section of the equalizer from 3.0 (a half octave) to 0.5 (2.5 octaves bandwidth), with a center detent at a Q of 1.2 (also equal to a bandwidth of 1.2 octaves).

0.4 ~ 8 kHz

The outer concentric knob sweeps the EQ Frequency between 400 Hz and 8,000 Hz.

Front Panel	Q	Bandwidth (octave)
	3.0	0.5
	1.4	1.0
center position	1.2	1.2
	0.7	2.0
	0.5	2.5

Channel EQ "Q" Characteristics

-15 ~ +15 dB

The inner concentric knob adjusts the gain of the set frequency band by plus or minus 15 dB. A center detent is provided for unity gain.

8. LO-MID**Q**

This rotary control adjusts the Q of this section of the equalizer from 3.0 (a half octave) to 0.5 (2.5 octaves bandwidth), with a center detent at a Q of 1.2 (also equal to a bandwidth of 1.2 octaves).

80 Hz ~ 1.6 kHz

The outer concentric knob sweeps the EQ Frequency between 80 Hz and 1,600 Hz.

-15 ~ +15 dB

The inner concentric knob adjusts the gain of the set frequency band by plus or minus 15 dB. A center detent is provided for unity gain.

9. LOW (Peak/Shelf)

This locking switch selects peaking type EQ (switch out) or shelving type EQ (switch engaged). When the switch is engaged (shelving mode), the adjacent Q control is not operational.

Q

This rotary control adjusts the Q of this section of the equalizer from 3.0 (a half octave) to 0.5 (2.5 octaves bandwidth), with a center detent at a Q of 1.2 (also equal to a bandwidth of 1.2 octaves).

30 Hz ~ 600 Hz

The outer concentric knob sweeps the EQ Frequency between 30 and 600 Hz.

-15 ~ +15 dB

The inner concentric knob adjusts the gain of the set frequency band by plus or minus 15 dB. A center detent is provided for unity gain.

NOTE: PM3000 users will notice there is no EQ CLIP indicator. Clipping at this stage can occur even though the input signal is not clipping, due to boost (gain) applied with the EQ circuitry. In the PM4000M, clipping in the equalizer is detected and shown on the PEAK indicator [3] adjacent to the GAIN control.

10. EQ (In/Out switch)

This locking switch activates the channel EQ or bypasses it completely. The EQ is active when the switch is engaged (and the LED in it is on). Bypass allows for A-B comparison, and absolutely minimum signal degradation when EQ is not needed.

11. HPF (H.P. filter in/out switch and control)

This locking switch activates the input channel HIGH PASS FILTER or bypasses it. The filter is active when the switch is engaged (and the LED in it is on). This filter bypass function is independent of the EQ section, which has its own bypass switch.

20 ~ 400 Hz

This rotary control sweeps the cutoff frequency of a high pass filter (or "low cut" filter) from 20 Hz to 400 Hz. The filter slope is 12 dB per octave.

Typical applications including cutting wind noise, vocal "P" pops, stage rumble, and low frequency leakage from adjacent instruments. You can use higher frequency settings to reduce leakage into mics that are primarily handling high-frequency sources. 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. Bypass the filter (switch up) only when you want very low frequencies, as with an organ, drum, bass guitar, and so forth.

12. INSERT PRE

The insert in point is normally after the HPF and equalizer. Engaging this switch moves the insert point between the equalizer (pre-EQ) and the HPF. The LED in the switch is on when the insert point is pre EQ.

13. INSERT ON

This locking switch activates the channel's INSERT IN jack (see item [12] also). The INSERT OUT jack is always "live," and this switch does not affect it. The primary use of this switch is to select or de-select any signal processor or independent line input source which may be plugged into INSERT IN. When the switch is engaged, making the Insert In jack "live," the LED in the switch is on, and signal flows from INSERT IN to subsequent circuits in the module.

If nothing has been plugged into the INSERT IN jack, operating this switch has no effect.

NOTE: A signal processor (effects device) can be set up before it is needed, its levels adjusted using the always active INSERT OUT signal, and then the processor can be inserted on cue in the channel's signal path by pressing this switch.

14. Input -to-Group Mix Assign 1 - 18

(Send level controls & Pre/Off/Post switches)

There are 18 rotary level controls with concentric PRE/OFF/POST switches. These are arranged in pairs, and they assign the channel signal onto the

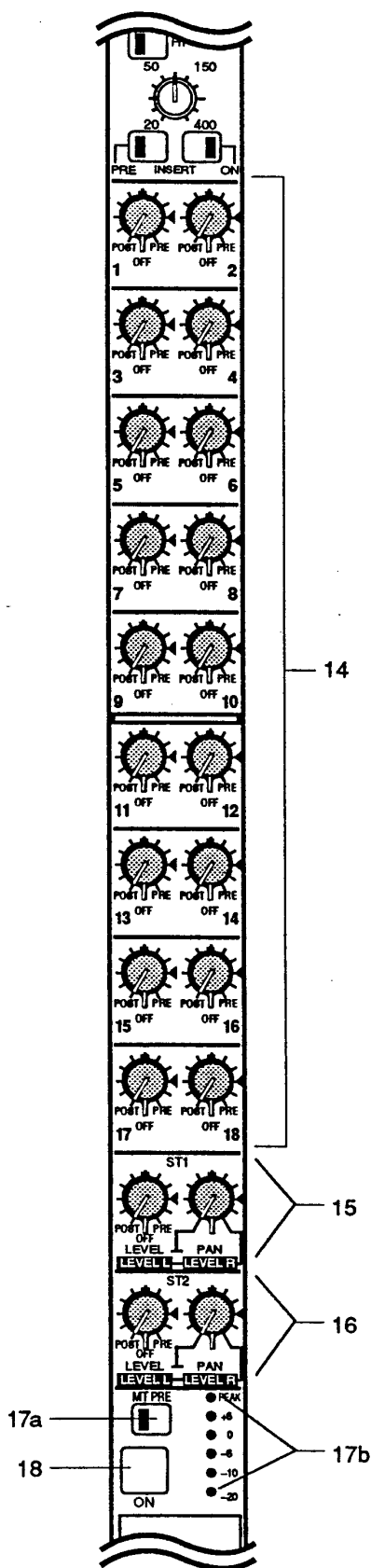


Figure 2-1b. PM4000M Monitor Input Module (middle portion of module)

correspondingly numbered group mixing busses. The switch mutes (turns off) the send, or derives signal before (PRE) or after (POST) the channel fader and equalizer. The inner rotary control determines how much of the selected signal source is applied to the correspondingly numbered mixing bus. When the switch is in the center (OFF) position, no signal is applied.

NOTE: In some applications, it is preferable to have the PRE position be Pre-Fader & Post-EQ rather than Pre-Fader & Pre EQ. The PM4000M is equipped with internal switches that make it easy to change the "Pre" of each assign switch in this manner. This functional modification can be performed on a channel-by-channel basis, and for any or all input-to-group mix controls within each channel. Refer to the OPTIONAL FUNCTIONS section of this manual for additional information.

NOTE: All eighteen controls perform identical functions, as shipped. If you reset the "Pre" function for the sends of some busses, or on some channels, it is a good idea to attach a note to the console indicating how you have set it up.



CAUTION: Any input module may be used as an auxiliary return. If a module is used in this way, DO NOT assign the return to the same group bus whose output is feeding the signal processor which is providing the return signal. This will almost certainly cause feedback which can damage circuits and/or loudspeakers. This caution applies to Group busses 1 through 18, and to the two Stereo busses.

15. ST 1

These are two pair of concentric level controls and switches. Depending on how you set the outer switch on the right-hand control, they can function as either an independent pair of bus mix assigns, similar to the eighteen individual controls above, or they can function as a single stereo mix assign with level and balance controls.

The outer PRE/OFF/POST switch on the left-hand control determines whether the assign is off, derives signal before the fader and equalizer, or after them (just as with the individual mix assigns). This function affects both "sides" of the ST 1 output, whether used for stereo or dual mono mixes.

The outer switch on the right-hand control determines whether ST 1 functions as a stereo

assign (switch set to the left "PAN" position) or as a pair of mono assigns (switch set to the right "LEVEL R" position).

When the send is set for stereo mode, the inner rotary control on the left determines the overall LEVEL applied to the Stereo 1 (L & R) mixing busses, and the inner rotary control on the right serves to PAN that signal between the L & R sides of that stereo pair.

When the send is set for dual mono mode, the inner rotary control on the left sets the LEVEL applied to the ST 1 L bus (i.e., LEVEL-L), and the inner rotary control on the right sets the LEVEL applied to the ST 1 R bus (i.e., LEVEL-R).

16. ST 2

These two pair of concentric controls and switches function just like ST 1, but affect the #2 stereo bus pair.

Note: By setting ST 1 and ST 2 to dual mono mode, you have a total of 22 discrete mixing busses. On the other hand, if you need multiple stereo mixes, you can use the Assign 1 through 18 controls in pairs to create up to 9 more stereo mixes. If desired, you can fold them into one or two master stereo mixes with the Group-to-Stereo assign switches in the Master Section of the console.

17. MT PRE (switch) and level meter

The channel level meter [17b] consists of 6 LEDs that display signal levels from -20 dBu to +6 dBu, plus PEAK (3 dB below clipping). The meter normally indicates the level after the EQ and the channel fader. Engaging the METER PRE switch [17a] causes the meter to indicate level ahead of the fader. An LED in the switch is illuminated when the meter is displaying pre-fader level.

18. ON switch (Channel On)

Pressing this switch turns the input channel ON, which means the channel output is potentially available to the 18 group mixing busses and the two pair of stereo mixing busses. Engaging the switch does not necessarily mean the switch will be illuminated or that the channel will turn on; muting logic may be dictating that the channel remain off. When the channel is OFF, the feed to the VU meter is also off, although the signal may still be previewed with the CUE switch [24].

19. Write-On Strip

This strip is provided so the operator can label the channel with its input source; use a pencil, removable marker, or masking tape.

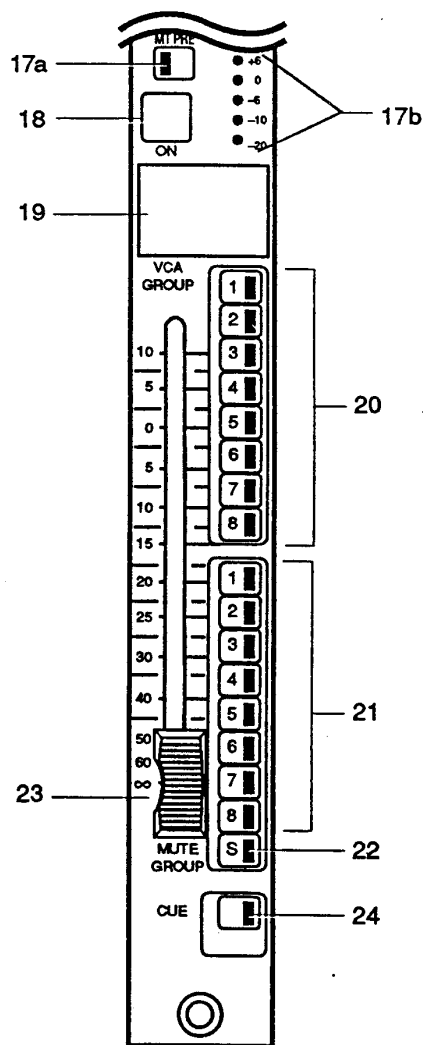


Figure 2-1c. PM4000M Monitor Input Module (lower portion of module)

20. VCA GROUP (Assign 1 - 8)

Engaging any of these 8 locking switches enables the corresponding VCA GROUP MASTER FADER(s) to also control the output level of this channel. When a VCA switch is engaged, the LED in the switch turns on.

CAUTION: If you assign (or deassign) an input channel to a VCA group during a performance, the channel gain will jump up or down unless the corresponding VCA MASTER Fader is set precisely to the nominal position (green "NOMINAL" LED illuminated).

21. MUTE (Assign 1 - 8)

Engaging any of these 8 locking switches enables the corresponding Group MUTE MASTER switch(es) to "kill" (turn off) this channel. An

exception exists when the channel MUTE SAFE switch [22] is engaged, in which case these MUTE switches can have no effect. When a MUTE switch is engaged, the LED in the switch turns on.

22. S (Mute safe)

The LED in this locking switch is illuminated when the switch is engaged. When MUTE SAFE is on, it overrides any combination of MASTER MUTE and channel MUTE switch settings, and prevents the channel from being muted. Engaging this switch ensures the channel will always be on so long as the channel ON switch is also engaged.

23. FADER

This long-throw fader sets the level applied to the 18 group mixing busses, and the two stereo buses when their bus assigns are set to post-fader position. The Fader does not pass audio, but instead controls a VCA through which the audio signal flows. The channel level may, therefore, also be controlled remotely from the 8 VCA Master Faders [39] or the VCA/MUTE CONTROL connector [99] if one or more of the VCA GROUP Assign switches [20] is engaged.

24. CUE

The console then has a dual-priority cue system, designed to give the engineer maximum control and speed when it is most important. Pressing the channel CUE switch causes the channel signal to replace any master signal in the Cue A and Cue B outputs and the Phones outputs.

The engineer can readily select any of 20 output mixes (Group 1–18, Stereo 1 and Stereo 2) by pressing the corresponding CUE switches. In most cases, once the individual output mixes have been established, the engineer will want to listen to the “most important output mix” during the performance — a stereo bus mix of various subgroups, possibly the star performer’s monitor mix (in stage monitor applications), or the main program feed (in theatrical or TV production). However, should feedback occur, or should any other condition require attention, the PM4000M enables the engineer to instantly check any input channel or channels by pressing the CUE switch(es). The input whose CUE switch is engaged then automatically replaces the selected output mix in the headphone and cue outputs. The engineer can make the necessary adjustment, and then return to monitoring the original output mix simply by unlatching the input CUE switch.

Pressing the CUE switch part-way down causes momentary contact; pressing it further locks it down. In either case, the LED in the switch is illuminated when the channel is being cue’d. Although the cue signal is not affected by the Fader or ON/off switch, it is affected by the Input PAD, GAIN control, Filter, channel EQ, and anything connected between the channel’s INSERT IN and OUT jacks (if the INSERT switch is engaged).

SUMMARY: Since the console operator may normally be listening to the stereo bus or one or more group busses by means of engaging their CUE switches, the PM4000M is set up for input cue priority. As soon as one or more input channel cue switches are engaged, any bus cue signal will be replaced by the input cue signal(s).

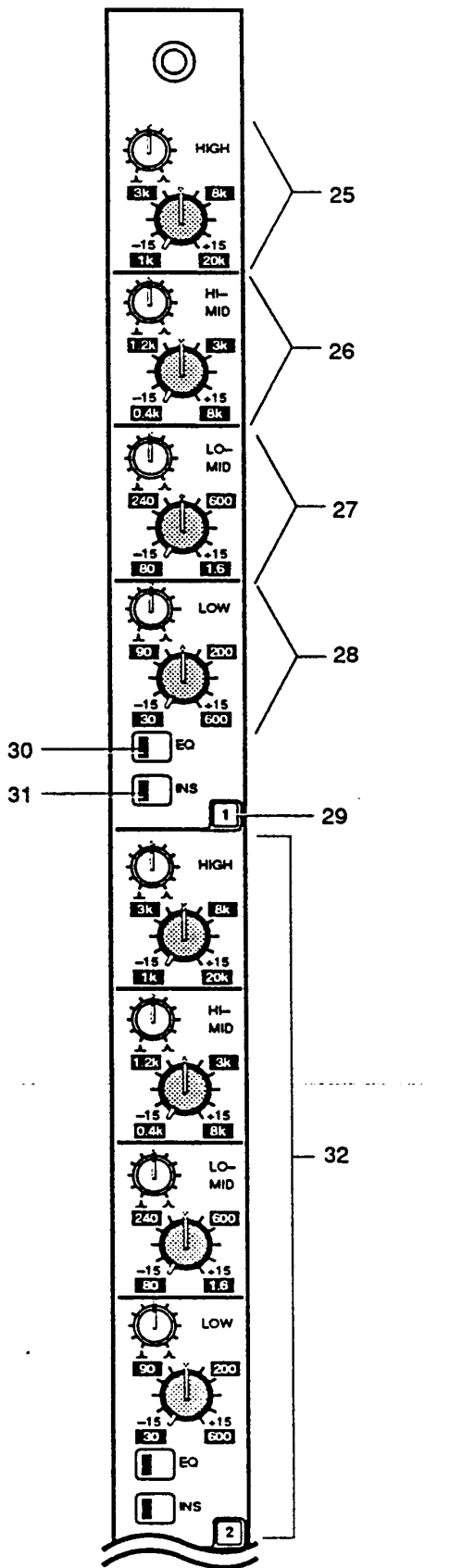


Figure 2-2a. PM4000M Master 1 Module (upper portion of module)

2.1.2 The Master 1 Module (1 - 8)

These eight modules are identical, except that each controls a differently-numbered set of Group Master and VCA Master Output channels.

GROUP EQ SECTION

The group section provides two identical equalizers per module, one per each of the two group busses handled by the module. The equalizer is divided into four bands, each with sweepable filter frequencies. All four bands have peaking-type characteristics with adjustable Q. The level (gain) is adjustable over a range of 15 dB boost and 15 dB cut in each band.

25. HIGH

Q

This rotary control adjusts the Q of this section of the equalizer from 3.0 (a half octave) to 0.5 (2.5 octaves bandwidth), with a center detent at a Q of 1.2 (also equal to a bandwidth of 1.2 octaves).

1 - 20 kHz

The outer concentric knob sweeps the EQ Frequency between 1,000 and 20,000 Hz.

-15 - +15 dB

The inner concentric knob adjusts the gain of the set frequency band by plus or minus 15 dB. A center detent is provided for unity gain.

26. HIGH-MID

Q

(Same as High band Q function.)

0.4 - 8 kHz

The outer concentric knob sweeps the EQ Frequency between 400 Hz and 8,000 Hz.

-15 - +15 dB

(Same as High band gain control function.)

27. LO-MID

Q

(Same as High band Q function.)

80 Hz - 1.6 kHz

The outer concentric knob sweeps the EQ Frequency between 80 Hz and 1,600 Hz.

-15 - +15 dB

(Same as High band gain control function.)

28. LOW

Q

(Same as High band Q function.)

30 Hz ~ 600 Hz

The outer concentric knob sweeps the EQ Frequency between 30 and 600 Hz.

-15 ~ +15 dB

(Same as High band gain control function.)

29. EQ/Insert Identification

This number identifies the group bus affected by the equalizer and INSERT switch to the left of and above the number.

30. EQ (In/Out switch)

This locking switch activates the corresponding Group bus EQ or bypasses it completely. The EQ is active when the switch is engaged (and the LED in it is on). Bypass allows for A-B comparison, and absolutely minimum signal degradation when EQ is not needed.

31. INSERT (ON)

This locking switch activates the Group bus' INSERT IN jack, from which it applies signal to the bus output(s). The INSERT OUT jack is always "live," and this switch does not affect it. The primary use of this switch is to select or de-select any signal processor or independent line input source which may be plugged into GROUP INSERT IN. When the switch is engaged, making the Insert In jack "live," the LED in the switch is on.

If there is nothing plugged into the INSERT IN jack, the INSERT switch has no effect.

NOTE: A signal processor (effects device) can be set up before it is needed, its levels adjusted using the always active INSERT OUT signal, and then the processor can be inserted on cue in the bus' signal path by pressing this switch.

32. EQ & INSERT for next Group Bus

This set of equalization controls and the INSERT switch perform exactly the same function as the one above it, but for the next higher-numbered group bus, as indicated in the strip's EQ Identification box.

33. GROUP TO STEREO Controls

These are two sets of concentric controls (the inner one is PAN pot, the outer one is a pan destination switch (Stereo Mix 1 / OFF/ Stereo Mix 2).

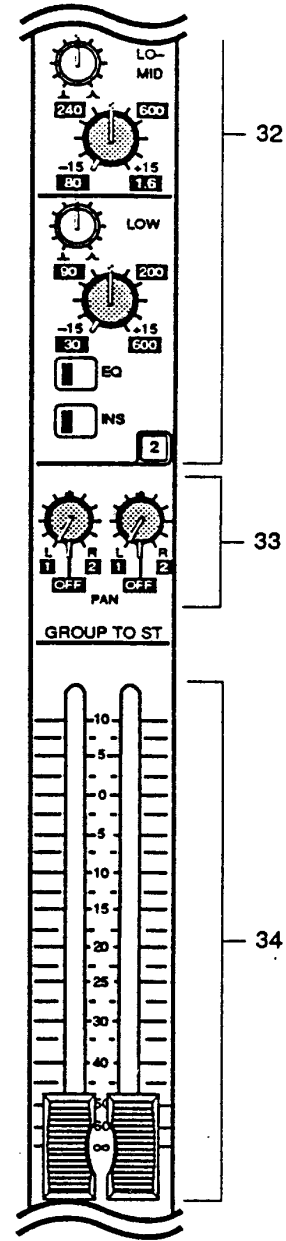


Figure 2-2b. PM4000M Master 1 Module (middle portion of module)

Each pan pot assigns signal from the associated Group Bus (as identified by the numbered switch immediately below the group fader under the switch) to one of the two Stereo Output mixes (ahead of the Stereo Master Faders).

When the outer concentric switch is in OFF position, the Group Bus is not assigned to either of the stereo mixes. In any case, the Group Bus signal continues to feed the Group output.

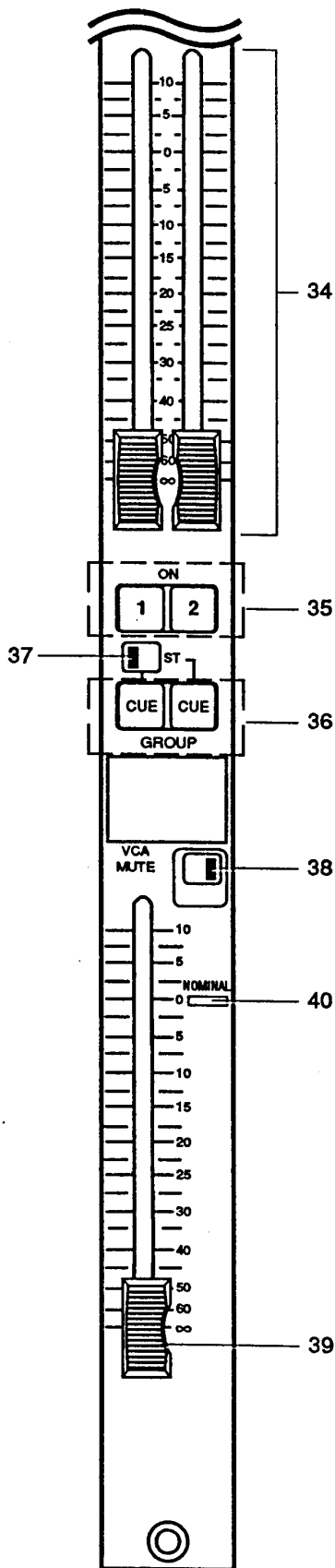


Figure 2-2c. PM4000M Master 1 Module (lower portion of module)

34. GROUP MASTER FADERS (Group Out Faders)

This pair of full-length faders control the audio signal levels applied to the corresponding GROUP OUT jacks from the two group mixing busses handled by the module (busses 1 and 2 in this illustration). The bus numbers are identified by the switches immediately below the two faders.

Because the group busses can be used to mix stereo pairs, the fader knobs are arranged so a single finger can move them together – or a pair of fingers can move them together but with the two bus levels offset. However, the two faders can be operated independently when the group busses are not set up as a stereo pair.

These are audio faders which control the actual mixed audio signal, not VCA controllers. The total of 9 Master 1 and 2 modules, each with two Group Master Faders, provide the 18 faders necessary for the 18 Group busses.

35. ON (Group On)

Pressing either of these locking, illuminated switches turns on the correspondingly numbered GROUP OUT. When the GROUP OUT is turned off, the feed to the VU meter is also off, although the signal may still be previewed with the CUE switch just below [36]. This switch does not affect the group output to the matrix or the stereo bus.

36. CUE (Group cue)

Pressing either of these illuminated momentary-contact switches locks logic that keeps the bus' CUE activated until one of two things occurs; you press the same switch again, or (when Last Cue mode [70] is engaged on the TB/OSC module) you subsequently press another input CUE switch. If the ST switch [37] is ON, pressing either CUE switch on the same module will not cancel (reset) the adjacent CUE, but pressing another input module's CUE switch will reset the source to that module. When a CUE switch is illuminated, the corresponding GROUP OUT signal (post Group Master Fader) replaces any other master signal in the Cue outputs and the Phones outputs.

Should an input CUE switch be engaged, the active Group bus cue(s) will be temporarily shut off since the console has input cue priority, but as soon as the input cue is released, the previously active group cue will be restored to active status.

37. ST (Stereo Group Cue)

Normally, the Group cue signals are mono, regardless of how many groups are cue'd. Engage both CUE switches on a given Master module, and you will get both Group Busses cued across both sides of the stereo cue outputs and phones outputs (i.e., center mono times two). However, if you are using the pair of Group Busses on a given Master Module to create a stereo mix, you will want to listen to a stereo cue mix. Engaging the ST switch changes that master module's cue mode so you will hear the cue in-place in a stereo cue mix.

more assigned input channels. The voltage applied to the VCA (voltage controlled amplifier) in a given input module will be the sum of the voltages from that module's channel fader, plus any assigned VCA Master faders. The higher the voltage, the greater the gain through the channel. VCA gain structure is calculated so that when a VCA Master Fader is set so its NOMINAL LED is on, then that Fader has no affect on any input channel levels. The VCA Master faders should be set to NOMINAL position when not in use so that, if an input is subsequently assigned to a VCA, there will be no sudden change in level due to an added (or subtracted) control voltage.

VCA SECTION

38. VCA MUTE

Engaging this switch is the equivalent of setting the VCA master fader at maximum kill. This affects all input channels assigned to the correspondingly numbered VCA group. The switch enables you to preset a VCA group level, then not bring up the level in that group until the appropriate cue.

Here are some additional VCA details

If a channel Fader is set at 0 dB, and it is assigned to a VCA Master that is set at -10 dB, then the channel level will be -10 dB ($0 + (-10) = -10$).

If the channel Fader is set at -10 dB, and is assigned to two VCA Masters, each set at -10 dB, then the channel level will be -30 dB ($-10 + (-10) + (-10) = -30$).

If the channel Fader is set at +10 dB, and is assigned to two VCA Masters, one of which is set at +10 dB, and the other at -20 dB, then the channel level will be 0 dB ($+10 + (+10) + (-20) = 0$).

NOTE: This is not the same as a MUTE MASTER function because the mute groups affect all outputs from assigned input channels, whereas this affects only post-fader channel outputs. Since the VCAs have a cumulative effect, a given channel's post-fader output is muted when ANY VCA group to which it is assigned is muted. Mute Master and VCA Mute together provide 16 mute groups.

When an input Fader or an assigned VCA Master Fader is pulled all the way down to "infinite" attenuation position, the voltage is sensed in the input module, and the channel on/off relay opens to completely kill the output from the VCA. The channel ON lamp will remain active, however, indicating that any pre-fader channel outputs are still "live."

39. VCA MASTER

This fader applies a DC control voltage to any input channels whose correspondingly numbered VCA group assign switch [20] is engaged. Raising or lowering this fader will raise or lower the post-input fader output level from those assigned input modules. The end result can be similar to using a Group Maser Fader, except that audio is not going through this fader. Because the VCA Master is controlling the level of each assigned input channel, it affects any of the 18 available post-fader Group bus sends and the two available post-fader STereo bus sends. See item [40] and the note below it.

If the console is set to the "SLAVE" rather than the "MASTER" mode with the rear-panel VCA SLAVE/MASTER switches [94], then the console's affected VCA MASTER Faders (1-4 and/or 5-8) will have no effect. Instead, any DC control signals applied to the VCA/MUTE CONTROL connector [99] will affect correspondingly assigned input channels.

40. NOMINAL Indicator

This indicator turns ON when the adjacent VCA Master fader is set to a point that will not affect the level of any inputs assigned to it. See note below.

NOTE: VCA Master faders apply DC voltage to one or

2.1.4 The Stereo Master Module

This module controls the output of the two stereo busses.

STEREO EQ SECTION

There are two identical STEREO equalizer, one for each of the two stereo busses handled by the module. The equalizer is nearly like that on the 18 Group outputs. Each of four bands has sweepable filter frequencies. All four bands have sweepable filter frequencies. All four bands have peaking-type characteristics with adjustable Q. The level (gain) is adjustable over a range of 15 dB boost and 15 dB cut in each band. The difference is that each control section simultaneously affects two outputs – the left and right sides of a given stereo bus output.

42. HIGH

Q

This rotary control adjusts the Q of this section of the Stereo 2 bus equalizer from 3.0 (a half octave) to 0.5 (2.5 octaves bandwidth), with a center detent at a Q of 1.2 (also equal to a bandwidth of 1.2 octaves).

1 - 20 kHz

The outer concentric knob sweeps the EQ Frequency between 1,000 and 20,000 Hz.

-15 - +15 dB

The inner concentric knob adjusts the gain of the set frequency band by plus or minus 15 dB. A center detent is provided for unity gain.

43. HIGH-MID

Q

(Same as High band Q function.)

0.4 - 8 kHz

The outer concentric knob sweeps the EQ Frequency between 400 Hz and 8,000 Hz.

-15 - +15 dB

(Same as High band gain control function.)

44. LO-MID

Q

(Same as High band Q function.)

80 Hz - 1.6 kHz

The outer concentric knob sweeps the EQ Frequency between 80 Hz and 1,600 Hz.

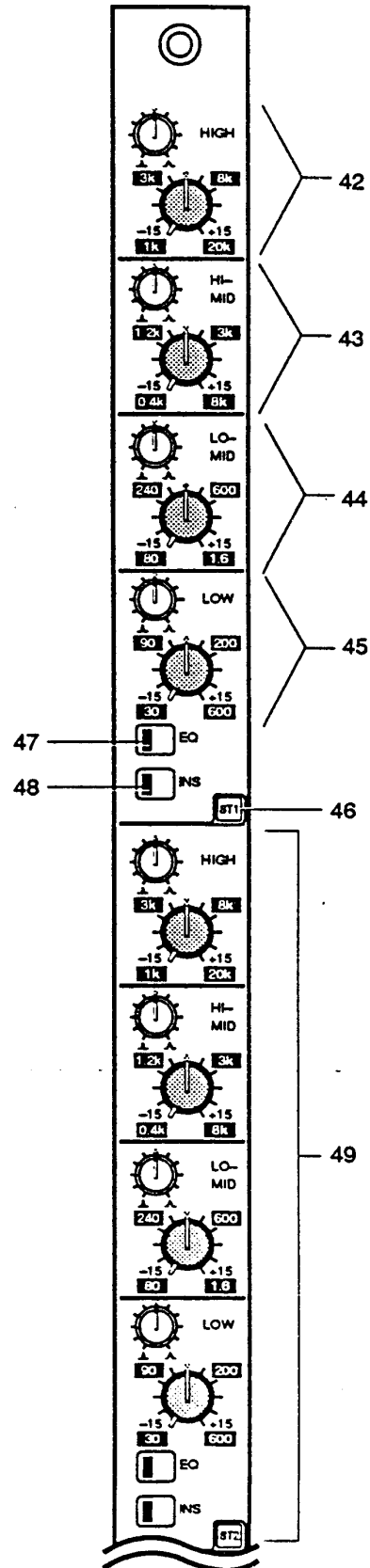


Figure 2-4a. PM4000M Stereo Master Module (upper portion of module)

-15 ~ +15 dB

(Same as High band gain control function.)

45. LOW

Q

(Same as High band Q function.)

30 Hz ~ 600 Hz

The outer concentric knob sweeps the EQ Frequency between 30 and 600 Hz.

-15 ~ +15 dB

(Same as High band gain control function.)

46. EQ/Insert Identification

This number identifies the stereo bus affected by the equalizer and INSERT switch to the left of and above the number [Stereo Bus 1 in this case.]

47. EQ (In/Out switch)

This locking switch activates the corresponding Stereo bus EQ or bypasses it completely. The EQ is active when the switch is engaged (and the LED in it is on). Bypass allows for A-B comparison, and absolutely minimum signal degradation when EQ is not needed.

48. INSERT (ON)

This locking switch activates the Stereo bus' left and right INSERT IN jacks, from which it applies signal to the bus L & R output. The INSERT OUT jacks are always "live," and this switch does not affect them. The primary use of this switch is to select or de-select any signal processor or independent line input source which may be plugged into STEREO INSERT INs. When the switch is engaged, making the Insert In jacks "live," the LED in the switch is on.

If there is nothing plugged into the INSERT IN jacks, the INSERT switch has no effect.

NOTE: A signal processor (effects device) can be set up before it is needed, its levels adjusted using the always active INSERT OUT signal, and then the processor can be inserted on cue in the bus' signal path by pressing this switch.

49. EQ & INSERT for the Stereo 2 Bus

This set of equalization controls and the INSERT switch perform exactly the same function as the one above it, but for the other stereo bus, as indicated in the strip's EQ Identification box.

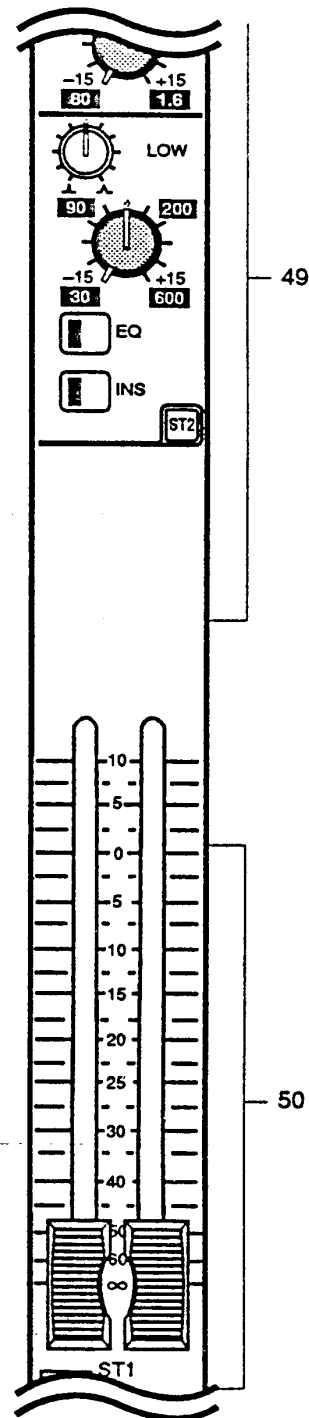


Figure 2-4b. PM4000M Stereo Master Module (middle portion of module)

50. STEREO 1 MASTER FADERS

This pair of full-length faders control the audio signal levels applied to the corresponding STEREO 1 OUT jacks from the ST 1 mixing bus.

Because each stereo bus can be used to mix stereo pair or two monaural signals, the fader knobs are arranged so a single finger can move them

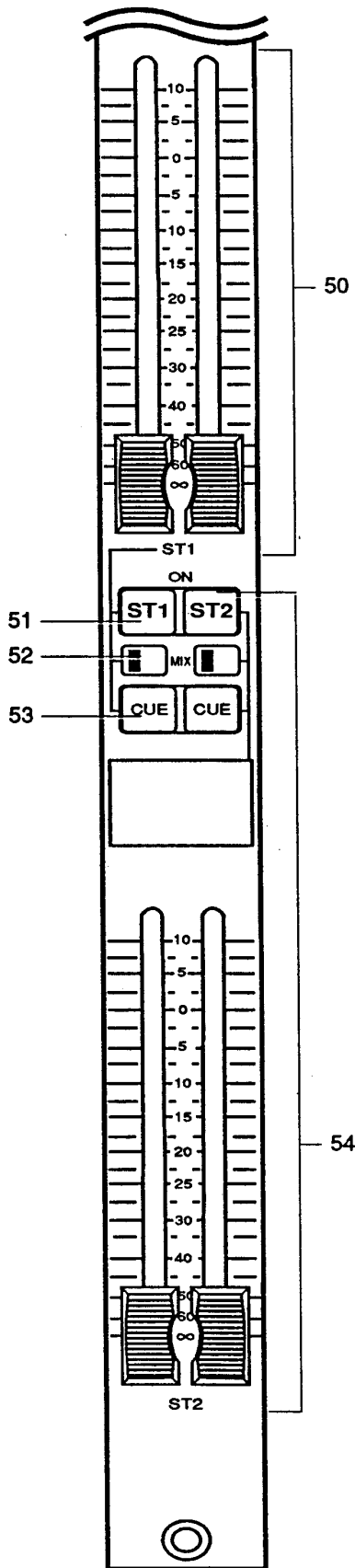


Figure 2-4c. PM4000M Stereo Master Module
(lower portion of module)

together – or a pair of fingers can move them together but with the two bus levels offset – or the two faders can be operated independently.

51. ST1 (ON)

Engaging this locking, illuminated switch turns on the ST 1 OUT (L & R). When the STEREO 1 OUT is turned off, the feed to the VU meter is also off, although the signal may still be previewed with the CUE switch just below [53].

52. MIX (ST1 Mono Mix Cue)

Pressing this switch combines the left and right sides of the Stereo 1 bus before it goes to the master cue mix and the subsequent cue outputs (including cue A & B, the stereo output jacks and the cue meters). This permits instant checking capability for out-of-polarity mic and line sources, or overall mono mix compatibility.

53. CUE (Stereo 1 Bus Cue)

Pressing this illuminated momentary-contact switch locks logic that keeps the bus' CUE activated until one of two things occurs; you press the same switch again, or (when Last Cue mode [70] is engaged on the TB/OSC module) you subsequently press the adjacent Stereo 2 Bus Cue switch or one of the Group Bus Cue switches. When this CUE switch is illuminated, the corresponding STEREO 1 OUT (L & R) signals (pre Stereo 1 Master Fader) replaces any other master signal in the Cue outputs and the Phones outputs.

Should an input CUE switch be engaged, the active Stereo bus cue(s) will be temporarily shut off since the console has input cue priority, but as soon as the input cue is released, the previously active stereo cue will be restored to active status.

54. Stereo 2 Master Output Controls

The ST 2 (ON) switch, ST 2 MIX switch, ST 2 CUE switch and ST 2 Master Faders perform the same functions as the ST 1 counterparts just described (items [50] through [53]), but for the Stereo 2 mix bus and output.

2.1.5 The TB (Talkback) Module

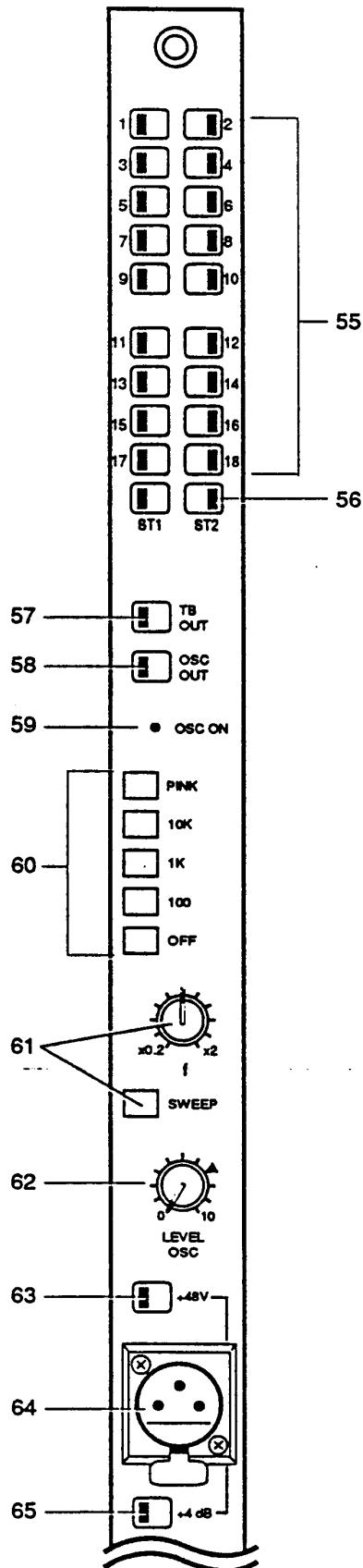


Figure 2-5a. PM4000M TB Module (upper portion of module)

55. 1 2 3 4 5 6 7 8... 18

(TB/OSC To Group Bus Assign)

These locking switches assign the Talkback or Oscillator signal to group mixing busses 1 through 18. An LED in each switch turns on when the signal is assigned to the bus.

56. ST1 (Stereo 1) and ST 2 (Stereo 2)

These locking switches assign the TB/OSC output directly to stereo 1 and stereo 2 mixing busses. An LED in each switch turns on when the signal is assigned to the bus.

57. TB OUT

This locking switch turns the TB OUT connector on and off. It affects only the feed to the VU meter and the output of the talkback system which appears at the TB OUT connector (the output being derived from the TB input when the TALKBACK ON switch is pressed, or otherwise from the oscillator). This switch does not affect any TB/OSC signal which may be switch-assigned to group mixing busses 1-18 or the two stereo busses.

58. OSC OUT

This locking switch turns the OSC OUT connector on and off. It affects only the feed to the VU meter and the output of the oscillator that appears at the connector. It does not affect any oscillator signal which may be switch-assigned to group busses 1-18 or the two stereo busses.

59. OSC ON

This red LED turns on when the oscillator is switched on. It is a reminder to turn off the oscillator when it is not actually in use.

NOTE: Even though the oscillator may not be assigned to any busses, it is still possible that you would inadvertently select it when preparing to use the talkback feature, or that some signal could leak into busses (albeit at low levels). Hence, leave the oscillator OFF when it is not actually being used for testing or calibration.

60. PINK • 10K • 1K • 100 • OFF

These 5 interlocking switches set the oscillator to 100 Hz, 1 kHz or 10 kHz operation when the nearby SWEEP switch is in fixed frequency position (disengaged). They also permit selection of a pink noise source, or turn off the oscillator/noise source altogether.

61. SWEEP (switch and rotary control)

Engaging the SWEEP switch removes the oscillator from its fixed frequency mode (i.e., generating exactly 100 Hz, 1 kHz or 10 kHz). The nearby rotary control then may be used to adjust the oscillator output from approximately 0.2 to 2 times the set "fixed" frequency. For example, when the oscillator is set for 10K Hz (switch [60]), the sweep mode enables you to adjust the actual oscillator frequency between 2 kHz and 20 kHz.

62. LEVEL OSC

This rotary control adjusts the oscillator output level applied to the OSC OUT connector as well as any mixing busses to which the signal may be assigned. This control does not affect the Talkback level.

63. +48V

This switch turns phantom power on and off in the XLR Talkback Input connector. Power can be turned on, however, only if the MASTER PHANTOM POWER switch is on. An LED in the switch turns on when phantom power is being applied to the TB input.

When both the Master and this switch are on, +48 volts is applied to both pins 2 & 3 of the TB input XLR connector for powering a condenser microphone. 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 console's phantom supply, cause undue loading, and induce hum. Therefore, it is a good practice to turn off the TB phantom power unless it is actually in use.

NOTE: The console's microphone power supply is not intended for A-B powered microphones. Use an external supply with an A-B powered mic, in which case you should turn off the TB 48V switch.

64. (TB INPUT)

This XLR-3 connector accepts a low-Z microphone or a line level signal, depending on the settings of the controls below it. Signal from this input is assigned to the TB OUT connector and to the various mixing busses by means of the assignment switches in the upper portion of this module [55] and [56].

65. +4 dB (attenuation pad)

This locking, illuminated switch inserts a 54 dB pad after XLR talkback input. The pad decreases

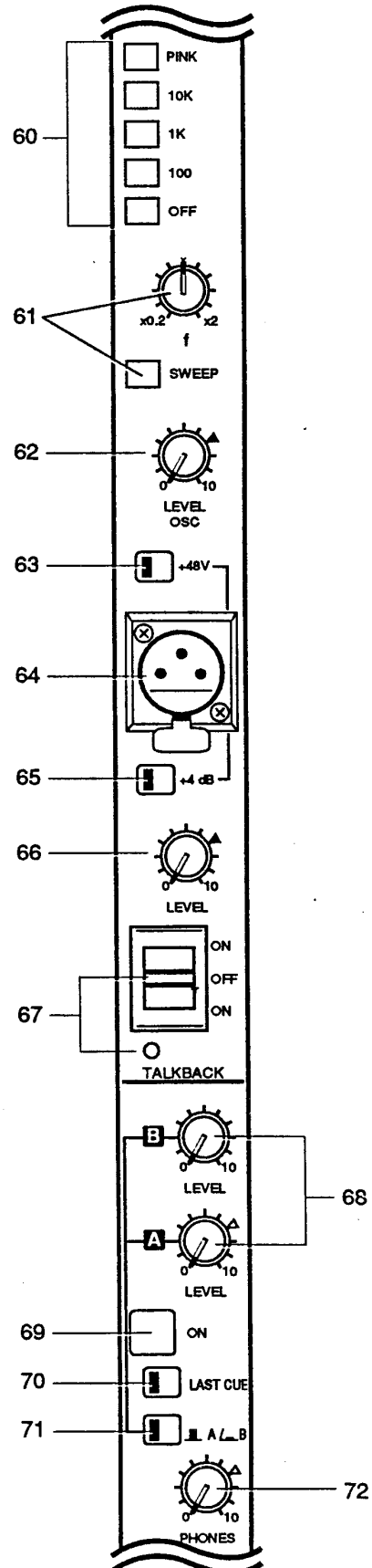


Figure 2-5b. PM4000M TB Module (middle portion of module)

the sensitivity of that input from nominal -50 dBu (for a microphone) to +4 dBu (for a line level input). When the LED in the switch is illuminated, the pad is in line, making TB in a line input.

66. LEVEL (TB Input)

This rotary control adjusts the signal level after the talkback preamplifier, thereby affecting the sensitivity of the TB input whether it is set for a mic or line source. This control affects the TB level applied to any busses and to the TB OUT connector; it does not affect the oscillator level.

67. TALKBACK ON (two-way lever switch and LED indicator)

Pulling this switch down (toward the arm rest) causes momentary contact; pushing it up (toward the meter bridge) locks it on; when on, the LED below the switch is illuminated. The switch activates the XLR talkback input and applies signal from that input to any assigned busses (and to the TB OUT connector if the TB OUT switch is also on). When the TALKBACK ON switch is off (centered), the oscillator output is instead routed to those busses (and to the TB OUT connector). This switch does not affect the OSC OUT connector.

68. A & B LEVEL controls

There is only one cue mix, but that same mix is brought to two pair of rear-panel outputs, Cue A and Cue B (both outputs have L & R components). Two controls, Cue A LEVEL and Cue B LEVEL independently set the overall mix level at the respectively labeled rear-panel CUE outputs.

69. ON switch (Cue On)

Engaging this switch applies the Cue signal to the Cue A or B output connectors, depending on how the A/B switch [71] is set. This switch is illuminated when the cue A or B output is on.

70. LAST CUE switch

The cue system normally enables the operator to press one, two or more bus CUE switches (either simultaneously or sequentially); all such switches will be illuminated, and the Cue Outputs and Phones outputs will carry a combined mix of these various bus cues (providing, of course, that no input CUE switch has been engaged).

Sometimes, however, it is desirable to have only one bus cue source at a time. In this case, the

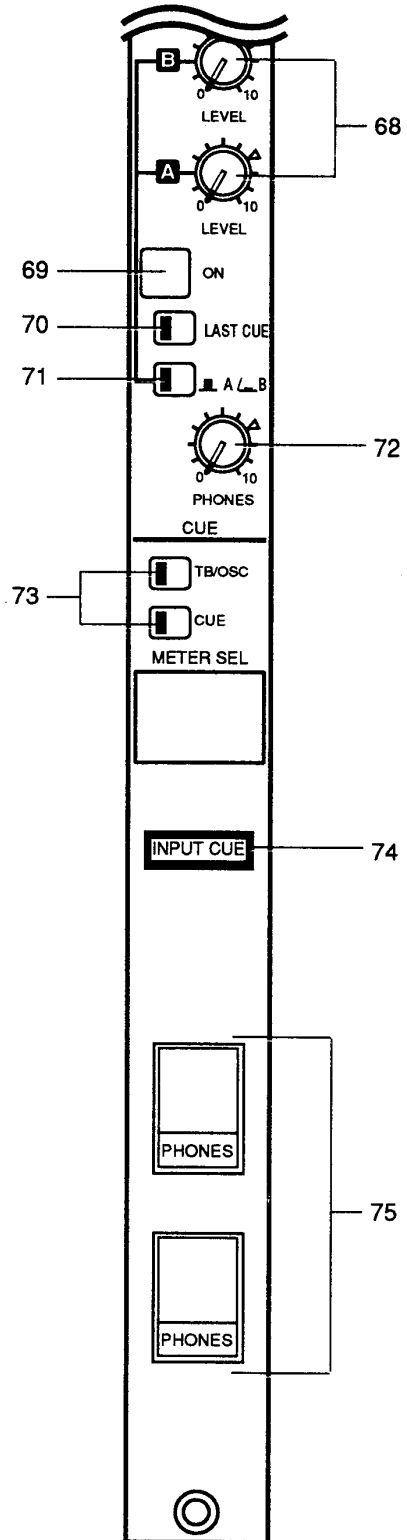


Figure 2-5c. PM4000M TB Module (lower portion of module)

operator can engage this LAST CUE switch. Doing so illuminates the LED in the switch and resets the cue logic so that pressing any output

cue switch activates that bus' cue and turns off the previously selected output bus cue.

71. A/B (Cue A or B output preselect)

There is only one stereo cue bus, but there are two stereo cue output pairs (A and B), each with its own level control. This switch determines which of the two Cue outputs will be activated when the cue ON switch [69] is engaged.

72. PHONES (Level control)

This 2-gang rotary control adjust the output level at both stereo PHONES output jacks. It affects any signals which may be fed to these outputs, whether from an input cue source or a bus cue source.

73. METER SEL (meter select switches)

These two switches determine the function of two correspondingly labeled VU meters on the meter bridge.

When a given meter has been switched, an illuminated indicator above the meter shows the signal being monitored, and the LED in the corresponding switch here is illuminated. See the meter bridge description in Section 2.1.6 for additional details.

74. INPUT CUE (Indicator)

This amber LED turns on when an input cue has been activated as a reminder that input cue signal has replaced whatever output signal you may have previously selected for the Phones.

75. PHONES (Output jacks)

This pair of 1/4" (6.33mm) stereo phone jacks can accommodate two pair of standard 8-ohm or higher impedance stereo headphones. The jacks are recessed behind spring-loaded cover panels which exclude dust when the jacks are not in use. The jacks are also angled to minimize strain on cables and connectors.

2.1.6 The Meter Bridge

The PM4000M is equipped with 22 large, illuminated VU meters (44 and 52 channel mainframes) or 18 meters (36 channel mainframe). The following descriptions are based on the 22-meter models; the 18-meter model is very similar, with a few more meters being switchable to view more than one bus so that all consoles permit monitoring of the same busses. Each meter has true VU ballistics to indicate approximate loudness, plus a red "PEAK" LED which responds to instantaneous levels that are beyond the scale of the meter. The PEAK LED turns on 3 dB below the clipping point. Assuming the meter is monitoring an output with +24 dBm maximum output capability, the PEAK LED will turn on when the instantaneous level reaches +21 dBm. Since the standard VU meter scale goes only to +3 VU (which corresponds roughly to +7 dBm with a steady-state signal), the PEAK LED turns on when the level is about 7 dB above maximum meter scale. Bear in mind, however, that a brief transient that may cause the PEAK LED to flash on may be too fast for the meter needle to respond. It is not unusual with plucked or percussive instruments, for example, for the peak level to be 20 to 30 dB above the average level.

Meter pairs 11/12 and 13/14 are switchable so they can monitor an alternate stereo signal source. When one of the METER SElect switches [73] on the TB module is engaged, an LED in the switch turns on to visually confirm the signal being monitored.

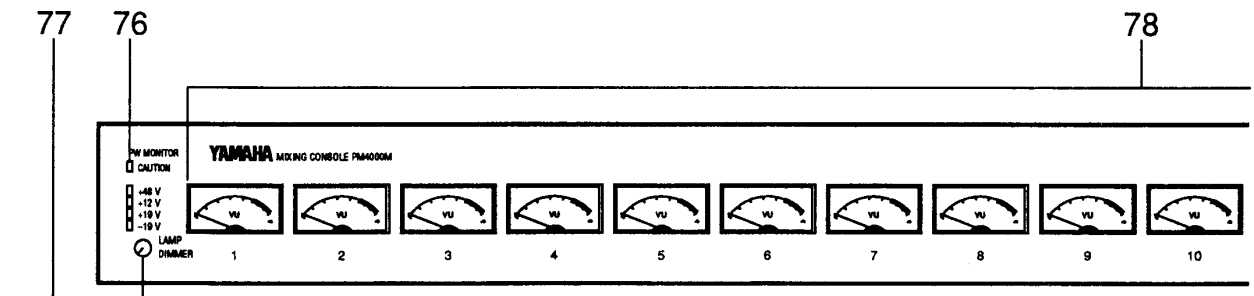
Meters 13/14 can be switched to monitor the CUE L & R mix signals (pre Cue LEVEL controls), while meters 11/12 can be switched to monitor the Talkback and Oscillator (TB/OSC) signals respectively.

The meter bridge also has indicators to display power supply condition, as well as a dimmer control for the lamp connectors on the rear of the bridge.

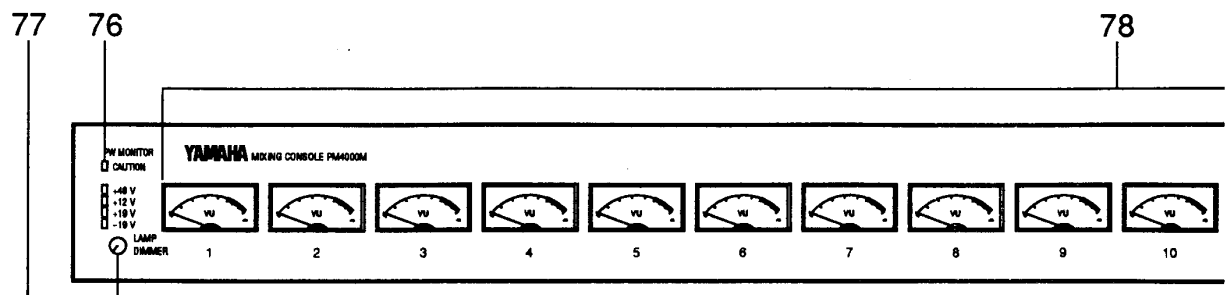
76. PW MONITOR, +48 V, +12 V, +19 V, -19 V (Power supply indicators)

These five LEDs monitor the condition of the remote power supply. The -19 V, +19 V, +12 V and +48 V LEDs should normally be on, indicating the corresponding voltages are being delivered to the console. If there is a fault and one of the voltages is low or dead, the PW CAUTION indicator will flash to warn of a problem.

Figure 2-6. PM4000M Meter Bridge
(44 & 52 channel mainframes)



(36 channel mainframes)



77. LAMP DIMMER

This rotary, dimmer turns the rear-panel lamp sockets off, or on to a variable intensity from low to high brightness. The console is shipped with standard incandescent lamps in the miniature lights on gooseneck fittings, but the hoods and power supply are designed so they can accommodate the higher intensity quartz lamps.

78. 1, 2... 18 (Group Bus meters)

These eighteen meters monitor the correspondingly numbered Group busses.

Meters 11/12

When the METER SElect TB/OSC switch is engaged, meter 11 displays the Talkback output signal and meter 12 displays the Oscillator signal; the indicator above the pair of meters turns on.

For 44 and 52 channel models, you engage the METER SElect TB/OSC switch only. However, for the 36 channel model, as well as engaging the TB/OSC switch, you must engage the TB OUT and TB ON switches to meter the Talkback output signal, and the OSC OUT and OSC ON switches to meter the Oscillator signal.

Note that when the METER SElect TB/OSC switch is engaged, both meters are readied to display the TB and OSC signals respectively, so group bus signals 11 and 12 are not displayed.

Meters 13/14

When the METER SElect CUE switch is engaged, these meters display the CUE L & R mix signals, and the indicator above the pair of meters turns on.

79. ST1 L - ST1 R (Stereo 1 Output meters and indicator)

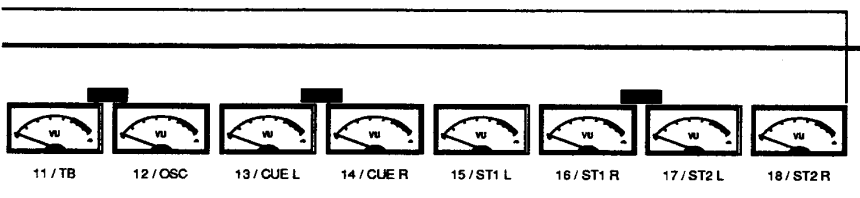
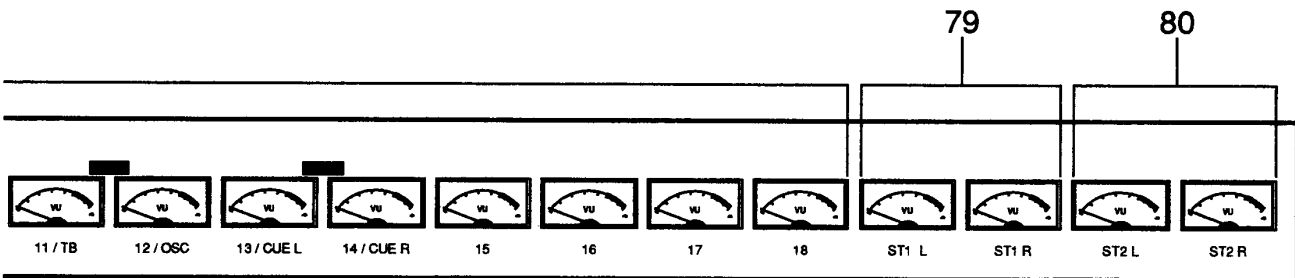
These two meters monitor the left and right sides of the Stereo 1 master output.

On the 36 channel model, when the METER SElect TB/OSC switch is engaged, they monitor the left and right sides of the Stereo 1 master output.

80. ST 2 L - ST 2 R (STEREO 2 meters and indicator)

These two meters monitor the left and right sides of the Stereo 2 master output.

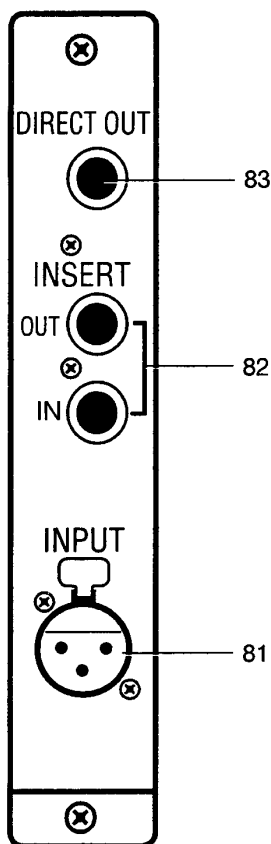
On the 36 channel model, when the METER SElect TB/OSC switch is engaged, they monitor the left and right sides of the Stereo 2 master output.



2.2 PM4000M Rear Panel Features

All XLR connectors and phone jacks are balanced. Outputs and patch points are +4 dBu level unless otherwise noted. Channel inputs, sub inputs, sub outputs, and primary outputs all rely upon XLR-3 type connectors wired Pin 2=high, Pin 3=low, Pin 1=ground. INSERT IN/OUT points are 1/4" (6.33mm) tip/ring/sleeve configuration, wired tip=low, ring=high, sleeve=ground.

Input channel XLRs are electronically balanced, as supplied. Optional input isolation transformers may be installed on a module-by-module basis; see Section 6. Output XLRs are also electronically balanced. Optional output isolation transformers are available in an external 19-inch rack mount package housing eight transformers. In this way, inputs and outputs can be provided with extra grounding isolation and common mode rejection where required, but one need not pay the price in direct costs, weight or signal quality where the transformers are not needed.



PHANTOM POWER WARNING
 To prevent hazard or damage, connect only microphones and cables that conform to the IEC268-15A standard.

Attention: alimentation fantôme
 Pour prévenir tout danger ou dommage, ne branchez que des microphones et des câbles répondant à la norme IEC268-15A.

MONO INPUT MODULE INPUT STRIPS

81. INPUT (connector)

This electronically balanced, female XLR-3 connector applies signal to the correspondingly numbered input channel. The nominal input level may vary from -70 dBu to +4 dBu depending on the settings of the channel input gain control and 30 dB pad switch.

82. INSERT OUT, INSERT IN (Jacks)

These phone jacks serve as a patch point for the signal from the correspondingly numbered input channel. Nominal output and input level is +4 dBu (1.23 V).

The OUT jack may be used as an auxiliary output to another console or as a direct output to a multitrack tape machine, although a separate DIRECT OUT jack is provided for this purpose [83]. It is most often likely to be used for sending the input channel signal to an auxiliary signal processor (compressor, graphic EQ, noise gate, etc.). INSERT OUT is always "live" whether or not the channel is on.

The IN jack applies signal to the input channel and is "normalled" so that inserting a plug interrupts the internal signal flow through the channel, instead bringing in the return from an auxiliary signal processor. However, there is an INSERT on/off switch in each channel [13] which can bypass the INSERT IN jack, regardless of whether an external source is plugged in or not.

NOTE: The insert patch point is nominally derived post-EQ, pre-Fader. When the Insert PRE switch is engaged [12], that point changes to pre-Fader and pre-EQ, just after the gain control, pad and polarity switch.

83. DIRECT OUT (Jack)

This phone jack outputs the correspondingly numbered input channel signal from a point pre-EQ, but after the pad and gain control. However, an internal jumper switch in the module may be set to change the direct output to a point just after the fader. See Section 6 for details.

Figure 2-7. PM4000M Rear Panel: Channel Input Strip

OTHER REAR PANEL FEATURES

84. Cooling Fan

The PM4000M contains multiple cooling fans distributed across the rear panel (four in the 36 channel console, five in the 44 or 52 channel console). These operate continuously to draw heat away from the internal circuits and prolong component life.

NOTE: The factory still recommends that you turn off the console when it is not to be used for prolonged periods. An exception is in high-humidity environments, or where a sudden temperature change is likely to produce condensation, in which case the console may be left on to avoid moisture accretion.

85. LAMP (4-pin XLR connector)

These four-pin female XLR connectors provide dimmer-controlled DC power for miniature lights that are supplied with the console. There are four lights on the 36 channel mainframe, and five on the 44 or 52 channel mainframe. Maximum output

is 12 volts. (Pins 1 and 2 of the XLR are not used, pin 3 is the 12 volt supply, and pin 4 is DC ground.)

86. GROUP SUB IN (1 - 18)

These 18 female XLR connectors apply signal directly to the group mixing busses (ahead of the Group Insert point and Group Master Fader). They are used for "chaining" another mixing console's group outputs into this console, with this console serving as the master for both consoles.

87. ST 1 SUB IN (L, R)

This pair of female XLR connectors apply signal directly to the Stereo 1 mixing busses (ahead of the Stereo 1 Insert point and Stereo 1 Master Faders). They are used for "chaining" another mixing console's stereo outputs into this console, with this console serving as the master for both consoles.

88. ST 2 SUB IN (L, R)

This pair of female XLRs is identical to the adjacent pair, but these apply signal to the Stereo 2 mixing busses.

89. CUE SUB IN (L, R)

This pair of female XLR connectors apply signal directly to the stereo cue mixing bus (ahead of the Cue Level controls). They are used for "chaining" another mixing console's cue (or solo) outputs into this console, with this console serving as the master for both consoles.

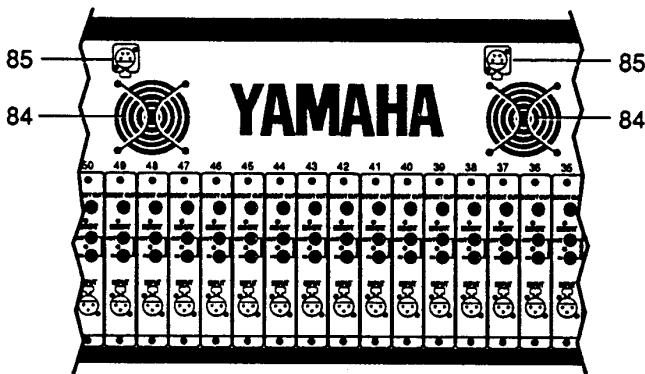


Figure 2-8. PM4000M Rear Panel: Cooling Fans and Lamp Connectors (2 shown)

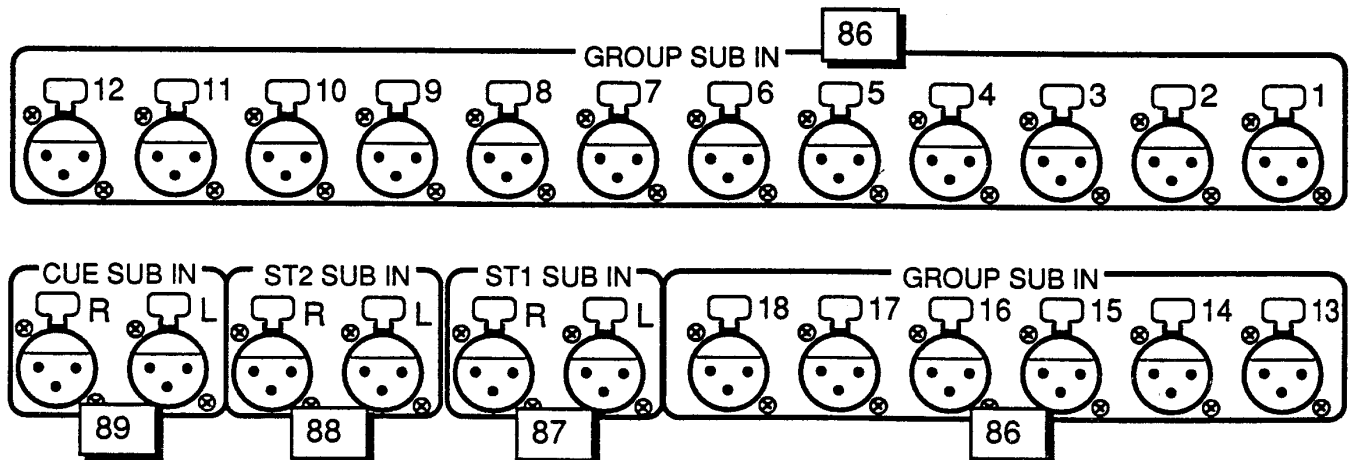


Figure 2-9. PM4000M Rear Panel: Sub In Connectors

90. GROUP INSERT 1 - 18 (IN, OUT)

These phone jacks serve as a patch point for the signal from the correspondingly numbered group mixing bus. Nominal output and input level is +4 dBu (1.23 V).

The OUT jacks may be used as auxiliary group outputs to another console or as a group output to a multitrack tape machine, although the direct output connectors are provided for this purpose [83]. They are most often likely to be used for sending the input channel signal to an auxiliary signal processors (compressors, graphic EQs, noise gates, etc). INSERT OUT is always "live" whether or not the group output is on.

The IN jacks apply signal to the group busses and are "normalled" so that inserting a plug interrupts the internal signal flow through the bus, instead bringing in the return from an auxiliary signal processor. However, there is an INSERT on/off switch in each bus [31] which can bypass the INSERT IN jack, regardless of whether an external source is plugged in or not.

91. ST1 INSERT L (IN, OUT)

These phone jacks serve as a patch point for the signal from the left side of the stereo mixing bus. Nominal output and input level is +4 dBu (1.23 V). They function just like the Group Insert jacks [90], except they affect the main stereo output instead of the group output.

92. ST1 INSERT R (IN, OUT)

These phone jacks are just like the ST1 INSERT L jacks [91], except they affect the right side of the stereo mixing bus.

93. ST2 INSERT L & R (IN, OUT)

These phone jacks are identical to the adjacent ST1 INSERT jacks, but are used for the Stereo 2 left and right busses.

94. VCA: SLAVE/OFF/MASTER (1-4, 5-8)

This pair of rotary, screwdriver-operated switches determine whether this console's or a remote console's VCA Master Faders control this console's voltage-controlled amplifiers (VCAs). The function may be switched separately for Masters 1 through 4 and Masters 5 through 8.

When set to the MASTER, this console's VCA MASTER Faders [39] are in control of any other PM4000M (or PM4000) connected to the VCA/MUTE CONTROL connector [99].

SLAVE position disables this console's VCA MASTER Faders and, instead, allows a second PM4000M, a PM4000, a PM3000, or a specially designed remote automation system to control this console's VCAs via the VCA/MUTE CONTROL connector [99].

When set to OFF, the remote VCA function is disabled altogether, and the VCA master faders are effective and affected by only this console.

Splitting control of Masters 1-4 and 5-8 between two consoles facilitates control of complex mixing systems by multiple console operators.

95. MUTE: SLAVE/OFF/MASTER (1-4, 5-8)

The pair of rotary, screwdriver-operated switches labeled MUTE determine whether this console or a remote console's MUTE MASTER switches control this console's channel on/off mute groups. The function may be switched separately for Master

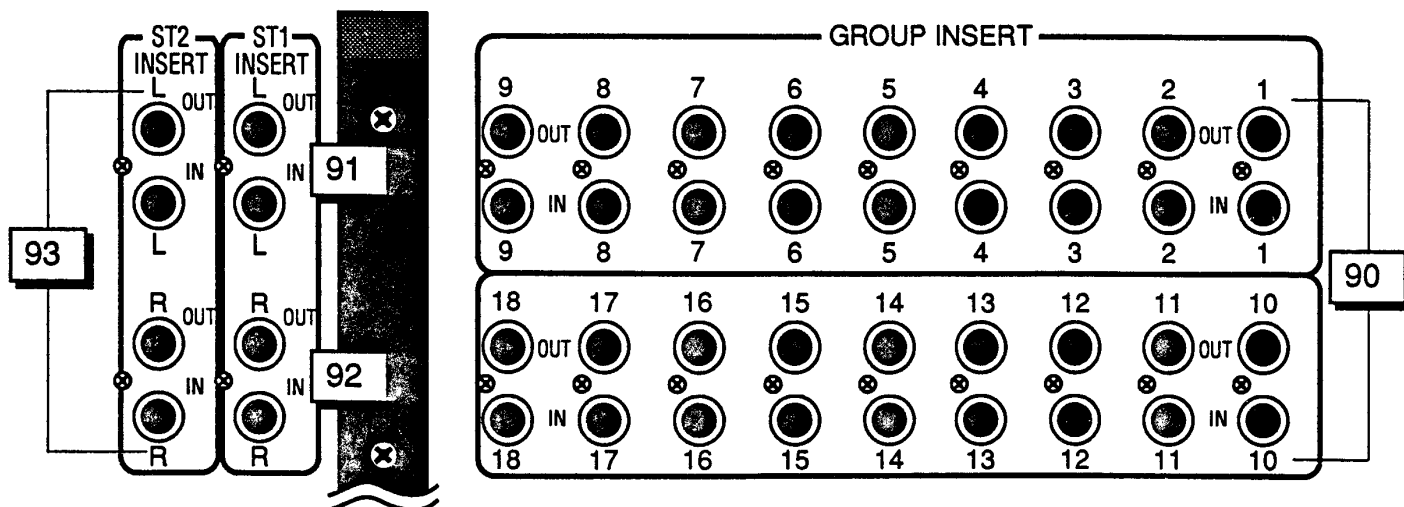


Figure 2-10. PM4000M Rear Panel: Group and Stereo Insert In/Out Connectors

Mute groups 1 through 4 and 5 through 8.

The rationale for splitting MUTE control between groups 1 through 4 and 5 through 8 is the same as that for the VCAs [94]. Control is applied via the same multipin remote connector as the VCAs [99].

96. CUE Connect/Off MASTER

This CUE switch determines whether a remote console's cue logic links to this console ("Connect") or not ("Off"). The connection is via the VCA/MUTE connector [99].

97. PHANTOM MASTER (+48V)

This recessed slide switch turns the console's 48-volt phantom power supply on and off. When this is OFF, no power will be supplied to any mic, regardless of the channel's +48 V on/off switch setting [1].

98. FAN (speed switch)

This switch sets the operating speed of the rear-panel mounted cooling fans [84]. LOW position is adequate for most operation. However, in high

ambient temperatures or where the console is being used out-of-doors in direct sunlight, be sure to use the HIGH position. Any time you feel the front panel of the console becoming hotter than usual, switch to HIGH position.

99. VCA/MUTE CONTROL

This multi-pin locking connector is an input/output point for control voltages in the PM400M. It enables two PM400Ms to be interlinked so that the muting logic and VCA MASTERS from one console also affect the other. The adjacent VCA and MUTE SLAVE/MASTER switches [94] [95] affect the function of this connector. This connector also may be used for interface to a remote control system which may be developed for "automation" of master muting and group levels. Refer to Figure 2-12 for details on wiring.

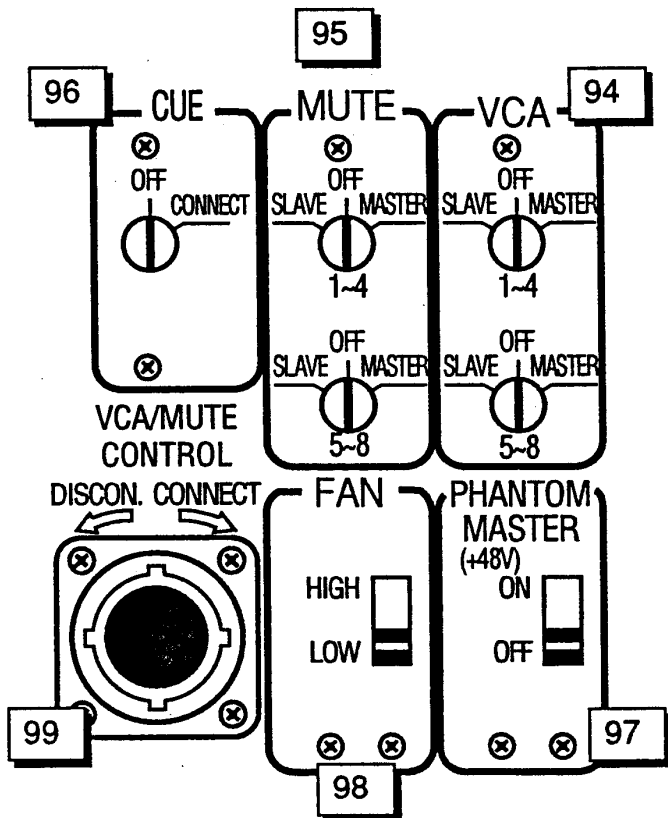
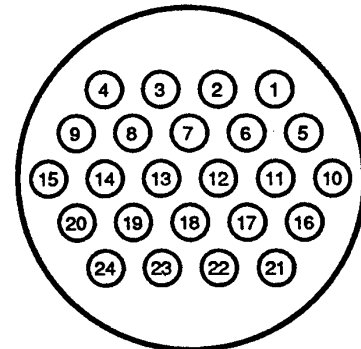


Figure 2-11. PM400M Rear Panel: VCA/Mute Control Connector and Master Mode Switches



CONNECTOR PINS. (FEMALE)

PIN N°	FUNCTION	PIN N°	FUNCTION
1	VCA EXT 1	13	MUTE EXT 3
2	VCA EXT 2	14	MUTE EXT 4
3	VCA EXT 3	15	MUTE EXT 5
4	VCA EXT 4	16	MUTE EXT 6
5	VCA EXT 5	17	MUTE EXT 7
6	VCA EXT 6	18	MUTE EXT 8
7	VCA EXT 7	19	GND
8	VCA EXT 8	20	GND
9	GND	21	GND
10	NC	22	INPUT CUE EXT
11	MUTE EXT 1	23	NC
12	MUTE EXT 2	24	NC

Figure 2-12. VCA/MUTE Connector Pin Assignments

100. GROUP OUT (1 - 18)

These 18 male XLR connectors output signal from the 18 group mixing busses, just after the Group Master Faders. They may be used for 18 discrete mono feeds to various stage monitor amps and speakers, for up to 9 stereo pairs for the same purpose (and for wireless monitors), and for a variety of other purposes including: house console submixes, multitrack tape recorder(s), TV production and/or remote feeds, or for feeds to a multi-zone theatrical sound system, depending upon the application.

101. STEREO 1 OUT (L, R)

This pair of XLR connectors output the stereo 1 mix after the ST1 MASTER fader. They may be used to feed a stereo stage monitor or other speaker system, master tape recorder, remote source, etc.

102. STEREO 2 OUT (L, R)

This pair of XLR connectors output the stereo 2 mix after the ST2 MASTER fader.

103. CUE A OUT (L, R)

This pair of XLR connectors output the Cue bus signal, which may be mono or stereo depending on the source of the signal (mono for Input channel cues, stereo or mono for Group or Stereo Bus cues depending upon how they are set on the front panel). The CUE A OUT level is affected by the front-panel CUE A LEVEL control. There is no output unless at least one front-panel CUE switch is activated. These connectors are useful for driving the amps and speakers for the console operator's monitors, or a headphone distribution system (with external power amp), or to another console's Cue sub input.

104. CUE B OUT (L, R)

This pair of XLR connectors output the same Cue bus signal as the adjacent pair of connectors, but with the level s affected by the front-panel CUE B LEVEL control. They may be used for the same purpose as CUE A OUT. For example, one cue out might feed local monitor speakers, while the other feeds a transmitter for driving a wireless monitor system for the console operator. This approach provides alternate reference levels so the operator can best evaluate the sound heard by various performers, whether they are listening via conventional monitor speakers or via a wireless monitor system.

105. TB OUT

This male XLR connector outputs signal from the talkback circuit when the TB OUT switch [57] is on. If that switch is OFF, this output is muted. Assuming the TB OUT switch is on, this output is derived from the talkback input XLR when the TALKBACK switch [67] is engaged. Otherwise the TB OUT is derived from the console's oscillator/ noise generator.

The TB OUT may be fed to the IFB (Interruptible Foldback) program input of an intercom system in order that the console operator can talk into the intercom system. In some cases, it can be applied to an auxiliary program audio input or some other input on a standard intercom system.

NOTE: PM400M Talkback signals do not slate to the CUE outputs as they do in PM4000 consoles.

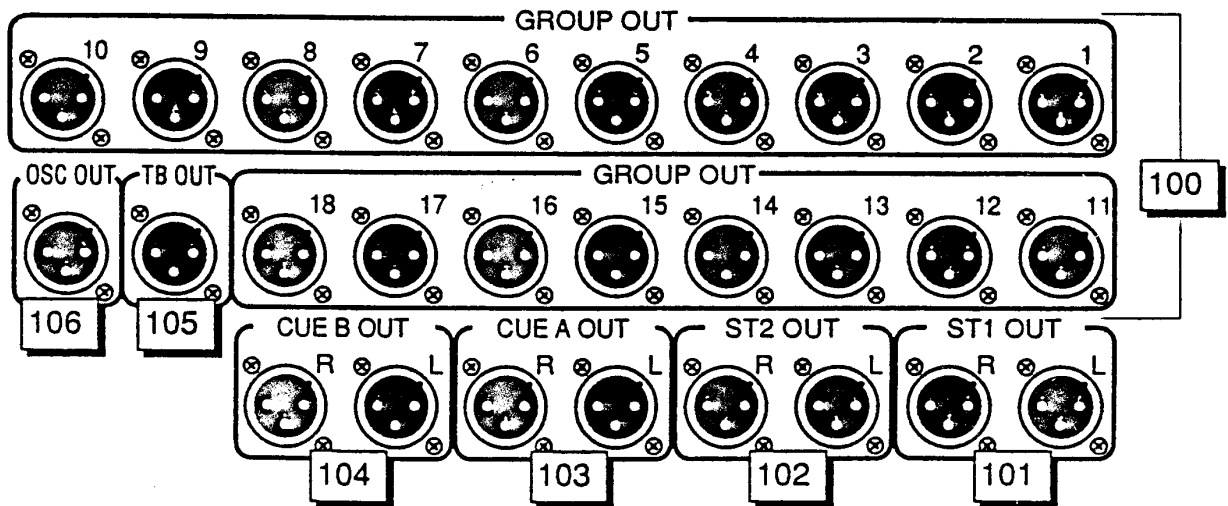


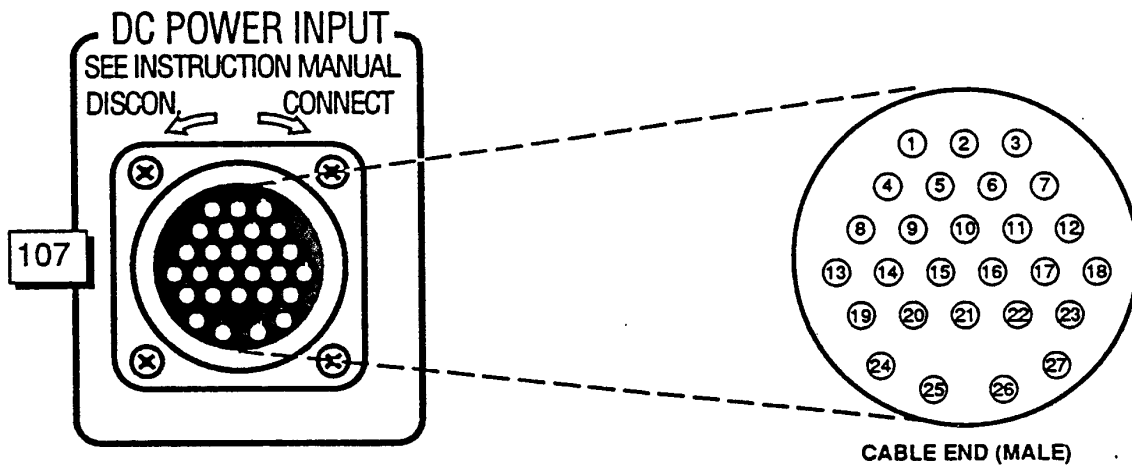
Figure 2-13. PM4000M Rear Panel: Bus Output Connectors

106. OSC OUT

This male XLR connector outputs signal from the console's oscillator/noise generator when the OSC OUT switch [58] is on. In order to actually obtain any output signal, however, the oscillator must be switched on [60], and the OSC LEVEL control [62] must be turned up.

107. DC POWER INPUT

This multi-pin, locking connector accepts a special umbilical cable from the console's external power supply (Model PW4000). The cable should be carefully mated, making sure the locking ring is securely hand tightened to avoid inadvertent disconnection.



PIN N°	FUNCTION	PIN N°	FUNCTION
1	-19V	15	±19V GND
2	-19V	16	±19V GND
3	FRAME GND	17	+12V GND
4	-19V	18	+12V GND
5	-19V	19	PM CAUTION (+)
6	FRAME GND	20	+48V
7	FRAME GND	21	+48V GND
8	+19V	22	+12V
9	+19V	23	+12V
10	±19V GND	24	PW CAUTION (-)
11	±19V GND	25	REMOTE CTRL*
12	+12V GND	26	REMOTE CTRL*
13	+19V	27	+12V
14	+19V		

*REMOTE CONTROL FOR POWER SUPPLY

Figure 2-14. PM4000M Rear Panel: DC Power Input Connector and its Pin Assignments

2.4 The PW4000 Power Supply

108. POWER

This alternate-action switch turns on the AC input to the supply, and thereby provides the necessary output voltages to the console via the umbilical power cable. Pressing the switch a second time turns off the power.

109. Operation Monitor

This panel of LEDs indicates when power is present at the various power supply outputs, as well as other aspects of the power supply's

operation. A row of NORMAL LEDs is illuminated when +48V, +12V, +19V, and -19V outputs are operating. Below that is a corresponding row of UNUSUAL LEDs, one or more of which illuminates if the output is not within normal tolerance. There is also a green POWER indicator that is illuminated when power is turned on, a red THERMAL indicator that is illuminated when the power supply has overheated (and automatically shut down), and a digital indicator that displays the AC line voltage input to the power supply.

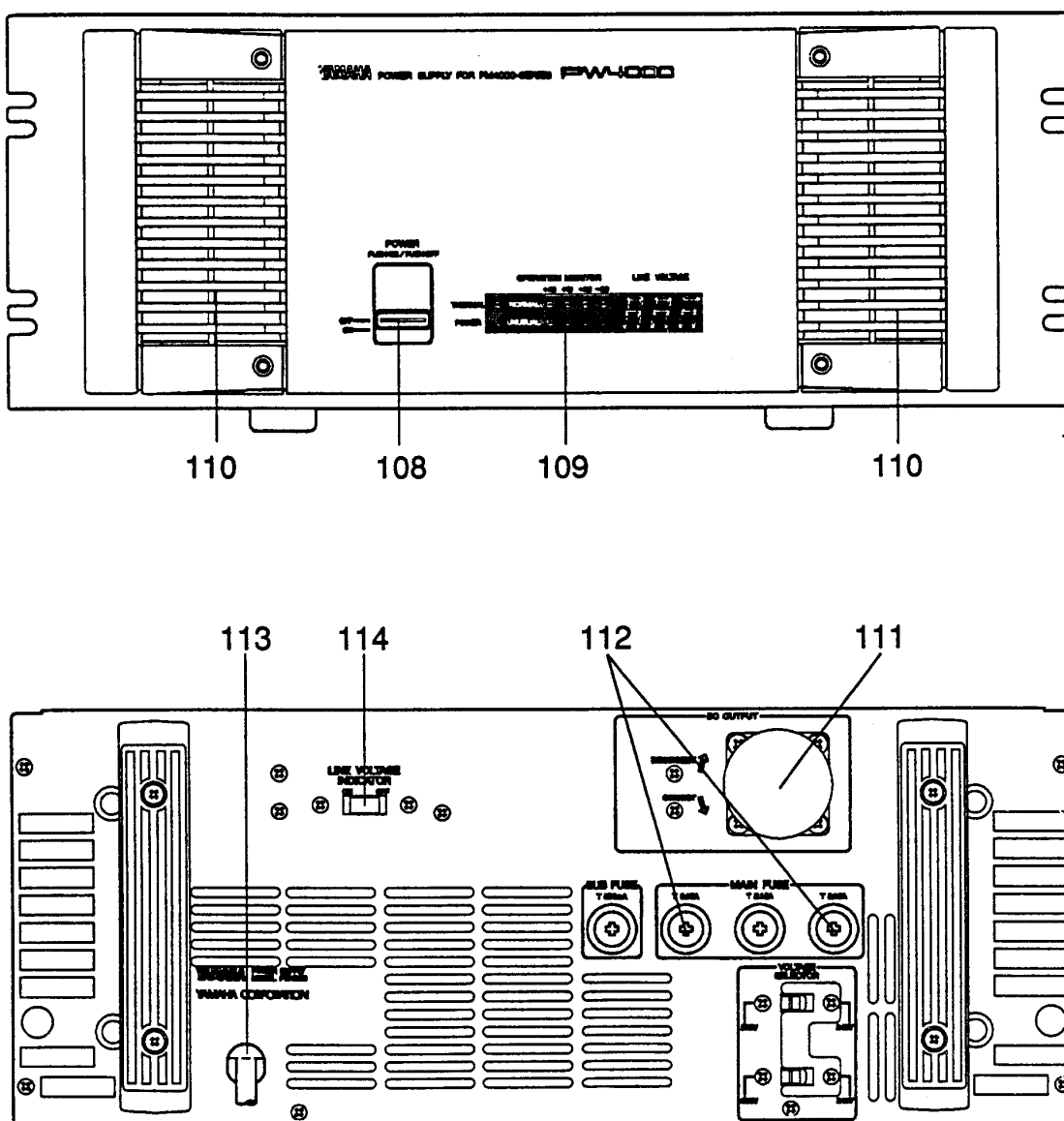


Figure 2-16. PW4000 Power Supply (Front and Rear Panels)

110. (Grille)

The power supply is cooled by a pair of quiet running fans that pull air through front-panel grilles and exhaust it through vents at the back. A reticulated foam element behind each grille filters the air entering the power supply.

NOTE: Filter elements are cleanable. Refer to Section 9.

111. DC OUTPUT (Umbilical Connector)

This locking, multi-pin connector provides the necessary DC voltages from the PW4000 power supply to the PM4000M console. The cable must be connected correctly before attempting to operate the console. See Figure 2-14 for the pin assignments.

CAUTION: Always make certain that the PW4000 power is turned OFF prior to connecting or disconnecting the umbilical cable at the console or at the power supply.

112. FUSES

Three main fuses and one sub fuse protect the primary and secondary portions of the PW4000 power supply. They should be replaced only with fuses of the same current rating and type (250 V Slo-Blow): see power supply specifications in Section 3 of this manual.

NOTE: Internal fuses in the PW4000 are also present, but should not normally blow. These are for service by qualified service personnel only.

113. (Power Cord)

This power cable connects the PW4000 to the AC power mains. A grounded (3-wire) outlet of at least 15 amperes capacity should be used.

114. LINE VOLTAGE INDICATOR (Switch)

When this slide switch is in the ON position, the front-panel digital indicator [109] will display the line voltage regardless of the position of the power switch [110].

About Power Supply Switching Unit SU4000

The optional Power Supply Switching Unit SU4000 lets you connect a second Power Supply Unit PW4000 to your Yamaha Mixing Console PM4000M. Should your primary PW4000 experience failure during a live performance, the SU4000 automatically switches to the second (backup) power unit to ensure uninterrupted excitement to the audience. The applicable units may be connected as shown below.

