

MIXING CONSOLE

PM3500

OPERATING MANUAL

Bescheinigung des Importeurs

Hiermit wird bescheinigt, daß der/die/das

MIXING CONSOLE Typ : PM3500

(Gerät, Typ, Bezeichnung)

in Übereinstimmung mit den Bestimmungen der

VERFÜGUNG 1046/84

(Amtsblattverfügung)

funkentstört 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



FCC INFORMATION (U.S.A.)

1. IMPORTANT NOTICE: DO NOT MODIFY THIS UNIT!

This product, when installed as indicated in the instructions contained in this manual, meets FCC requirements. Modifications not expressly approved by Yamaha may void your authority, granted by the FCC, to use the product.

2. IMPORTANT: When connecting this product to accessories and/or another product use only high quality shielded cables. Cable/s supplied with this product **MUST** be used. Follow all installation instructions. Failure to follow instructions could void your FCC authorization to use this product in the USA.

3. NOTE: This product has been tested and found to comply with the requirements listed in FCC Regulations, Part 15 for Class "B" digital devices. Compliance with these requirements provides a reasonable level of assurance that your use of this product in a residential environment will not result in harmful interference with other electronic devices. This equipment generates/uses radio frequencies and, if not installed and used according to the instructions found in the users manual, may cause interference harmful to the operation of other electronic devices. Compliance with FCC regulations does not guarantee that interference will not occur in all installations. If this product is found to be the source of interference, which can be determined by turning the unit "OFF" and "ON", please try to eliminate the problem by using one of the following measures:

Relocate either this product or the device that is being affected by the interference.

Utilize power outlets that are on different branch (circuit breaker or fuse) circuits or install AC line filter/s.

In the case of radio or TV interference, relocate/reorient the antenna. If the antenna lead-in is 300 ohm ribbon lead, change the lead-in to co-axial type cable.

If these corrective measures do not produce satisfactory results, please contact the local retailer authorized to distribute this type of product. If you can not locate the appropriate retailer, please contact Yamaha Corporation of America, Electronic Service Division, 6600 Orangethorpe Ave, Buena Park, CA 90620

The above statements apply **ONLY** to those products distributed by Yamaha Corporation of America or its subsidiaries.

ADVARSEL!

Lithiumbatteri—Eksplussionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af sammefabrikat og type. Levér det brugte batteri tilbage til leverandoren.

VARNING

Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

VAROITUS

Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemiin tyyppeihin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

CANADA

THIS DIGITAL APPARATUS DOES NOT EXCEED THE "CLASS B" LIMITS FOR RADIO NOISE EMISSIONS FROM DIGITAL APPARATUS SET OUT IN THE RADIO INTERFERENCE REGULATION OF THE CANADIAN DEPARTMENT OF COMMUNICATIONS.

LE PRESENT APPAREIL NUMERIQUE N'EMET PAS DE BRUITS RADIOELECTRIQUES DEPASSANT LES LIMITES APPLICABLES AUX APPAREILS NUMERIQUES DE LA "CLASSE B" PRESCRITES DANS LE REGLEMENT SUR LE BROUILLAGE RADIOELECTRIQUE EDICTE PAR LE MINISTERE DES COMMUNICATIONS DU CANADA.

Introduction

Thank you for purchasing the Yamaha PM3500 MIXING CONSOLE. In order to take full advantage of the PM3500 and enjoy long, trouble-free performance, please read this owner's manual carefully, and keep it in a safe place for future reference.

Precautions

■ Warnings

- Do not place a container with liquid or small metal objects on top of this unit. Liquid or metal objects inside this unit are a fire and electrical shock hazard.
- Do not allow water to enter this unit or allow the unit to become wet. Fire or electrical shock may result.
- Connect this unit's power cord only to an AC outlet of the type stated in this Owner's Manual or as marked on the unit. Failure to do so is a fire and electrical shock hazard.
- Do not scratch, bend, twist, pull, or heat the power cord. A damaged power cord is a fire and electrical shock hazard.
- Do not place heavy objects, including this unit, on top of the power cord. A damaged power cord is a fire and electrical shock hazard. In particular, be careful not to place heavy objects on a power cord covered by a carpet.
- If you notice any abnormality, such as smoke, odor, or noise, or if a foreign object or liquid gets inside the unit, turn it off immediately. Remove the power cord from the AC outlet. Consult your dealer for repair. Using the unit in this condition is a fire and electrical shock hazard.
- Should this unit be dropped or the cabinet be damaged, turn the power switch off, remove the power plug from the AC outlet, and contact your dealer. If you continue using the unit without heeding this instruction, fire or electrical shock may result.
- If the power cord is damaged (i.e., cut or a bare wire is exposed), ask your dealer for a replacement. Using the unit with a damaged power cord is a fire and electrical shock hazard.
- Do not remove the unit's cover. You could receive an electrical shock. If you think internal inspection, maintenance, or repair is necessary, contact your dealer.
- Do not modify the unit. Doing so is a fire and electrical shock hazard.
- If lightning begins to occur, turn off the power switch of the unit as soon as possible, and unplug the power cable plug from the electrical outlet.
- If there is a possibility of lightning, do not touch the power cable plug if it is still connected. Doing so may be an electrical shock hazard.

■ Cautions

- Keep this unit away from the following locations:
 - Locations exposed to oil splashes or steam, such as near cooking stoves, humidifiers, etc.
 - Unstable surfaces, such as a wobbly table or slope.
 - Locations exposed to excessive heat, such as inside a car with all the windows closed, or places that receive direct sunlight.
 - Locations subject to excessive humidity or dust accumulation.
- This unit has ventilation holes at the rear, and the bottom to prevent the internal temperature rising too high. Do not block them. Blocked ventilation holes are a fire hazard.
- To relocate the unit, turn the power switch off, remove the power plug from the AC outlet, and remove all connecting cables. Damaged cables may cause fire or electrical shock.
- Turn off all musical instruments, audio equipment, and speakers when connecting to this unit. Use the correct connecting cables and connect as specified.
- Always lower the volume control to minimum before turning on the power to this unit. A sudden blast of sound may damage your hearing.
- Clean the contacts of the phone plug before connecting it to the SPEAKERS jack of this unit. Dirty contacts may generate heat.
- Use only speaker cables when connecting speakers to amplifier outputs. Using other types of cables is a fire hazard.
- Hold the power cord plug when disconnecting it from an AC outlet. Never pull the cord. A damaged power cord is a potential fire and electrical shock hazard.
- Do not touch the power plug with wet hands. Doing so is a potential electrical shock hazard.
- The inside of the unit should be cleaned periodically. Dust accumulation inside the unit may cause malfunction and is a potential fire hazard. Consult your dealer for information about cleaning.
- To prevent electrical shock when cleaning the unit, remove the power plug from the AC outlet.
- If you know you will not use this unit for a long period of time, such as when going on vacation, remove the power plug from the AC outlet. Leaving it connected is a potential fire hazard.

How to use this manual

1.1 Terminology and typographic conventions7
 1.2 Features7

Features

2.1 Front panel features11

2.1.1 Monaural input module11

- [1] 1 2 3 4 5 6 7 8 (ASSIGN switches)
- [2] PAN (switch and rotary control)
- [3] ST (Stereo)
- [4] +48V (phantom power)
- [5] GAIN
- [6] 30dB (pad switch)
- [7] Ø (Phase)

Equalizer

- [8] HI (peak/shelf)
- [9] HI-MID
- [10] LO-MID
- [11] LO (peak/shelf)
- [12] EQ
- [13] INSERT
- [14] HPF (switch and control)
- [15] AUX 1-8 (AUX ON/OFF and PRE/POST switches, and level controls)
- [16] PEAK, NOMINAL and SIGNAL indicators
- [17] ON/EDIT switch and CHECK indicator
- [18] VCA GROUP (1 through 8)
- [19] Fader
- [20] SOLO SAFE switch
- [21] CUE

Cue groups and cue priority

2.1.2 Stereo input module16

- [22] PAN (switch and rotary controls)
- [23] GAIN control and L-MONO switch
- [24] AUX send controls
- [25] PEAK, NOMINAL and SIGNAL indicators

2.1.3 Control module18

Solo section

- [26] SOLO switch
- [27] SOLO SEL – MTRX, AUX, GROUP, ST (solo select switches)
- [28] CUE MODE SEL– MASTER CUE PFL, VCA CUE PRE PAN, (cue mode selector switches)
- [29] LAST CUE

Scene memory controls

- [30] UTILITY key
- [31] RECALL key
- [32] MEMORY display
- [33] STORE key
- [34] CHECK key
- [35] Number keys and ENTER
- [36] UP/DOWN keys
- [37] DIRECT RECALL

2.1.4 Group master modules21

Matrix section (modules 1 through 4)

- [38] SUB IN L and R
- [39] ST L and R
- [40] 1 through 8 LVL (level) and PAN controls
- [41] MASTER control
- [42] ON/EDIT key and CHECK indicator
- [43] CUE (matrix cue)

Table of Contents

<i>AUX sends</i>	
[44] INSERT (AUX send insert switches)	
[45] AUX send faders	
[46] Σ PEAK indicators	
[47] ON/EDIT keys and CHECK indicators	
[48] CUE (AUX send cue)	
<i>VCA group section</i>	
[49] VCA MUTE	
[50] VCA MASTER fader	
[51] NOMINAL Indicator	
[52] VCA CUE switch	
<i>Some additional VCA details</i>	
2.1.5 Group master modules 2	24
[53] Matrix level controls	
[54] Main channel group STEREO panpots	
[55] TO ST (to STereo) switches	
[56] TO MATRIX switches	
[57] INSERT (group insert switches)	
[58] GROUP faders	
[59] Σ PEAK indicators	
[60] ON/EDIT keys and CHECK indicators	
[61] CUE (group cue)	
2.1.6 Stereo master module	25
<i>Talkback and oscillator section</i>	
[62] GROUP and ST (talkback to group and stereo routing switches)	
[63] AUX (talkback to AUX routing switches)	
[64] OSC OUT (oscillator output)	
[65] TB OUT (talkback output)	
[66] PINK, 10k, 1k, 100, OFF and OSC ON (oscillator switches and indicator)	
[67] SWEEP (oscillator sweep control and switch)	
[68] LEVEL OSC (oscillator level)	
[69] INPUT -50dB (talkback input)	
[70] $\sqrt{80}$ (80Hz bass roll-off talkback filter)	
[71] LEVEL (TB Input)	
[72] ON (Talkback ON switch)	
<i>Stereo section</i>	
[73] ST TO MATRIX (stereo to matrix switch)	
[74] INSERT (stereo insert)	
[75] Σ PEAK L and R indicators	
[76] ON/EDIT key and CHECK indicator	
[77] CUE (stereo cue)	
[78] Faders (stereo faders)	
2.1.7 Monitor module	28
[79] PFL TRIM	
[80] VCA CUE TRIM	
<i>MONITOR B</i>	
[81] TB, 2TR IN 1, 2 TR IN 2, MONI A (monitor B selector switches)	
[82] LEVEL (MONITOR B level control)	
[83] ON (MONITOR B switch)	
<i>MONITOR A</i>	
[84] 2TR IN 1, 2 TR IN 2, L MONO, R MONO (monitor A selector switches)	
[85] LEVEL (MONITOR A level control)	
[86] ON (MONITOR A switch)	
[87] INPUT, VCA, MASTER (cue source indicators)	
[88] MATRIX, AUX, GROUP (meter selection switches)	
[89] PHONES (headphone level control)	
[90] PHONES connectors	
2.1.8 Meter bridge	30
[91] PW CAUTION, +48, +12, +19, -19 (power supply indicators)	
[92] Lamp dimmer	

2.2 PM3500 rear panel features	30
<i>Some points to note:</i>	
2.2.1 Standard (monaural) input module	31
[93] INPUT	
[94] INSERT OUT and INSERT IN	
[95] DIRECT OUT	
2.2.2 Stereo input modules	32
[96] INPUT L and INPUT R	
[97] INSERT (L) and (R) INSERT IN and OUT jacks	
2.2.3 SUB IN connectors	32
[98] GROUP SUB IN (1 through 8)	
[99] AUX SUB IN (1 through 8)	
[100] ST SUB IN (stereo sub inputs)	
[101] CUE SUB IN (L and R)	
[102] MATRIX SUB IN (L and R)	
[103] 2 TR IN 1 and 2 TR 2 (L and R)	
2.2.4 INSERT points	33
[104] ST INSERT L and R (OUT/IN) (stereo insert points)	
[105] GROUP INSERT 1 through 8 (OUT/IN)	
[106] AUX INSERT 1 through 8 (OUT/IN)	
2.2.5 OUTPUTs	34
[107] MONITOR A and MONITOR B (L and R)	
[108] ST OUT (L and R)	
[109] MATRIX OUT (5 through 8)	
[110] GROUP OUT (1 through 8)	
[111] ST MATRIX OUT (1 through 4, L and R)	
[112] AUX OUT (1 through 8)	
[113] TALKBACK OUT	
[114] OSC OUT	
2.2.6 Control functions	35
[115] VCA CONTROL connector and MASTER/SLAVE switch	
[116] INPUT CUE/SOLO	
[117] CUE CONTROL IN/OUT	
[118] MIDI IN, MIDI OUT, MIDI THRU	
[119] DC POWER input	
[120] PHANTOM MASTER	
[121] FAN LOW/HIGH	
2.3 The PW4000 power supply	36
[122] POWER	
[123] Operation monitor	
[124] Grille	
[125] Power cord	
[126] LINE VOLTAGE INDICATOR (Switch)	
[127] FUSES	
[128] DC OUTPUT (umbilical connector)	
 Specifications	
3.1 PM3500 mixing console general specifications	39
3.2 Input characteristics	41
3.3 Output characteristics	42
3.4 Dimensional drawings	43
3.5 Optional equipment and parts for the PM3500 console	45

Table of Contents

3.6 Block diagrams	46
3.6.1 Input module (mono)	
3.6.2 Input module (stereo)	
3.6.3 SOLO and scene recall module	
3.6.4 Group master module 1	
3.6.5 Group master module 2	
3.6.6 Stereo master module	
3.6.7 Monitor module	
3.6.8 Meter bridge	
3.7 PW4000 power supply specifications	54
MIDI scenes	
4.1 Normal mode	55
4.1.1 Using the DIRECT RECALL keys to recall scenes	
4.1.2 Using the UP and DOWN keys to recall scenes	
4.1.3 Using the number keys to recall scenes	
4.1.4 Using MIDI to recall scenes	
4.1.5 Storing scenes	
4.1.6 Controlling individual channels through MIDI	
4.2 CHECK mode	56
4.2.1 Recalling scenes in CHECK mode	
4.2.2 Pre-setting scenes in CHECK mode	
4.3 UTILITY mode	57
4.3.1 Program Change messages	
4.3.2 Control Change messages	
4.3.3 System Exclusive messages	
4.3.4 Running status	
4.3.5 Echo back	
4.3.6 UTILITY mode functions	
4.3.7 Control Change messages and bus ON/EDIT switches	
4.4 Error messages on the display	60
4.5 MIDI bulk dump formats	60
4.6 MIDI implementation chart	62
4.7 Midi flowcharts (transmission and reception)	63
Installation notes	
5.1 Planning an installation	65
5.2 Power mains	65
5.2.1 Verify the correct mains voltage	
5.2.2 Ensure there is a good earth ground	
5.2.3 How to obtain a safety ground when using a 2-wire outlet	
5.2.4 Improperly wired AC outlets: lifted grounds	
5.2.5 Improperly wired AC outlets: lifted neutral	
5.2.6 AC safety tips	
5.2.7 Power source integrity	
5.2.8 Turn-on sequencing	
5.3 Theory of grounding	68
5.3.1 Why is proper grounding important?	
5.3.2 Ground loops	
5.3.3 Basic grounding techniques	
5.3.4 Balanced lines and ground lift switches	

5.4 Audio connectors and cables	71
5.4.1 Types of cable to use	
5.4.2 Cable layout	
5.4.3 Balanced versus unbalanced wiring	
5.4.4 The pros and cons of input transformers	
5.4.5 Noise and losses in low and high impedance lines	
5.5 Direct boxes (DI boxes)	75
5.5.1 Passive guitar direct box	
5.5.2 Active guitar direct box	
5.6 Configuring equipment racks	76
5.7 Direct box schematics	78
5.7.1 Passive box	
5.7.2 Active box	
Gain structure and levels	
6.1 Standard operating levels	79
6.1.1 Mic level or low level	
6.1.2 Line level or medium level	
6.1.3 Speaker level and high level	
6.2 Dynamic range and headroom	80
6.2.1 What is dynamic range?	
6.2.2 The relationship between sound levels and signal levels	
6.2.3 A discussion of headroom	
6.2.4 What happens when the program source has wider dynamics than the sound equipment?	
6.2.5 A general approach to setting levels in a sound system	
6.2.6 How to select a headroom value and adjust levels accordingly	
6.3 Gain overlap and headroom	84
Optional functions	
7.1 Removing and installing a module	85
7.2 Monaural input modules	86
7.2.1 Monaural input module insert I/O pre- or post-EQ (switch)	
7.2.2 Monaural input module direct out: pre-EQ or post-fader (switch) pre-ON and post-ON switch (jumper)	
7.2.3 Monaural input module: AUX 1 through 8 pre-EQ or post-EQ (switch)	
7.2.4 Monaural input module: group 1 through 8 pre-EQ or post-EQ (switch)	
7.3 Stereo input modules	87
7.3.1 Stereo input module: phase reversal (switch)	
7.3.2 Stereo input module: L and R insert I/O insert I/O pre- or post-EQ (switch)	
7.3.3 Stereo input module: AUX 1 through 8 pre-EQ or post-EQ (switch)	
7.4 Group master modules 1	88
7.4.1 Group master module 1: AUX CUE AFL pre- /post-ON jumpers	
7.4.2 Group master module 1: matrix CUE AFL pre- /post-ON jumpers	
7.5 Group master modules 2	89
7.5.1 Group master module 2: group sum gain (0, -6dB) switch	
7.5.2 Group master module 2: group-to-stereo jumpers	
7.5.3 Group master module 2: group-to-matrix pre- /post-fader jumpers	
7.5.4 Group master module 2: matrix CUE AFL pre- /post-ON jumpers	
7.5.5 Group master module 2: group CUE AFL pre- /post-ON jumpers	
7.5.6 Group master module 2: group-to-stereo pre- / post ON jumpers	

Table of Contents

7.6 Stereo master module	90
7.6.1 Stereo master module: stereo-to-matrix pre- /post-fader jumpers	
7.6.2 Stereo master module: stereo-to-matrix pre- / post ON jumpers	
7.6.3 Stereo master module: stereo CUE AFL pre- /post-ON jumpers	
7.6.4 Stereo master module: talkback-to-group gain (0, -6dB) switch	
7.7 Hints on circuitry for remote control of the VCA masters	91
Operating notes and hints	
8.1 Console gain structure	95
8.1.1 What is the proper gain structure?	
8.1.2 What affects gain structure?	
8.1.3 Establishing the correct input channel settings	
8.1.4 Establishing the correct group master settings	
8.1.5 How VCA control affects gain structure	
8.1.6 Channel muting and gain structure	
8.2 Further hints & conceptual notes	97
8.2.1 What is a VCA, and why is it used?	
8.2.2 The distinction between the group busses and the VCA master “groups”	
8.2.3 Using the channel INSERT IN jack as a line input	
Applications	
9.1 General applications	101
9.1.1 Theater	
9.1.2 Production	
9.1.3 Post-production	
9.1.4 Video work	
9.1.5 Sound reinforcement	
9.2 Setup concepts	103
9.2.1 Deriving a stereo mix from groups 1 through 8	
9.2.2 Using the mix matrix with the subgroups and stereo bus to function as 10 subgroups	
9.2.3 Creating 7 independent stereo mixes (or 14 independent mono mixes) with the mix matrix	
9.2.4 Using the VCA masters and the group masters to obtain the functional equivalent of 16 subgroups	
9.2.5 Using the VCA masters to control the same input channels in order to handle different scenes	
Maintenance	
10.1 Cleaning the console	107
10.1.1 The console and power supply exterior	
10.1.2 Power supply air filters	
10.1.3 Pots and faders	
10.1.4 The console interior	
10.1.5 Meter lamp replacement	
10.2 Where to check if there is no output	108
10.3 What to do in case of trouble	108
Block and level diagram	

1 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 "FEATURES" section. Check this and the "SPECIFICATIONS" section, and you will see most of what you need to know. The rest of this manual provides background information to help you make the most of this console and auxiliary equipment.

If you want to know more about AC power distribution and safety, grounding, balanced versus unbalanced cables, direct boxes, and so forth, this information is also present in this manual. 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.

1.1 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 uppercase type. That is, if when referring 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 may capitalize only the first letter; for example, "observe there is no identification of the input Fader".

There are 8 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 8 "Group Mixing Busses".

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 "FEATURES" 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 with the page number on which the description is to be found.

This is a real warning that Underwriters Laboratories says we must print:

WARNING

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

1.2 Features

The PM3500 is a professional mixing console with the kind of flexibility, performance and reliability for which Yamaha has earned a worldwide reputation. It picks up where the famous PM3000 console leaves off, with more functions, a higher level of performance, and a greater degree of versatility than ever before. The console comes with stereo and mono input modules, and you can specify the configuration of your console at the time of ordering, or field-swap modules later if required (even between shows).

The PM3500 is available in 24, 32, 40 or 48 input module versions (in the U.S.A., a special order is needed for the 24-module version). The 40 and 48-channel versions come equipped with center master positions, to facilitate 2-operator working. When fitted with stereo modules, the actual number of input channels is higher than the number of modules—up to 52 input channels can be fitted per console, the limit being imposed by the power supply. No compromises are present in the equalization stages of the stereo module—all input modules feature full 4-band fully parametric equalization. There are 8 VCA (Voltage Controlled Amplifier) master faders used for control of any combination of input channels (see page 22 for a discussion of VCAs). There are also eight conventional mixing busses and a stereo bus, to which any channel can be assigned. There are eight monaural auxiliary busses on every input module, four of which can be switched in pairs

1—How to use this manual

to become stereo auxiliary busses on the stereo input modules. Auxiliary sends are all switched pre- or post-fader. These busses may be used to augment the eight groups and stereo groups, or they can be used for a variety of purposes: foldback send, effects sends and remote mixes.

Input channels can be assigned directly to the stereo bus, or through the eight group masters. The console can therefore be used in a sub-grouped mode with a “grand master” pair of stereo faders, or can be used with independent stereo and multi-channel mixes.

The PM3500 is fitted with Yamaha’s pioneering Mix Matrix function. On the PM3500, this is a 12 x 12 configuration. Each matrix channel can accept any or all of the following: the stereo master busses, the eight group busses, two dedicated matrix sub inputs and a (stereo) sub input. These signals can be mixed into any or all of four stereo busses or four additional mono busses. The matrix feature allows you to create stage monitor mixes from subgroups, create different speaker mixes for different parts of the house, feed local and remote programs simultaneously, make mono and stereo mixes from the same subgroups, etc. If the matrix is set to pick up the subgroups ahead of the group master faders, the subgroups can be mixed onto the stereo bus with one mix, and a variety of completely independent mono or stereo mixes can be created from the subgroups using the matrix.

The PM3500 can handle literally any line or mic level source, thanks to differentially balanced inputs, a 30dB attenuation pad, and a continuously variable gain control with a 50dB range. When extra grounding isolation is required, optional input transformers can be fitted on a per-channel basis. Although the PM3500 has ample headroom throughout the chain, level indicators are fitted on input modules to show signal, nominal and peak levels. Summed peak LED warn of potential clip situations on each group and aux bus, as well as on the stereo bus.

In addition to the audio grouping, the PM3500 incorporates a VCA grouping system. Next to each channel fader, there are eight VCA group switches which control that channel’s assignment to be controlled by one or more of the VCA master faders. When more than one channel is assigned to a particular VCA bus, the output levels of these channels can be raised or lowered with one VCA fader. The significant difference between this system and conventional busses is that if signal processing of multiple inputs is required, it is necessary to run the combined signal through a signal bus (which is why the PM3500 incorporates full-length master faders). However, when VCA master faders are used, a channel’s level can be altered by more than one

group fader. Since the VCA group directly alters the level of a channel, it can alter the post-fader output of that channel to any of the eight conventional group busses, something unattainable with the conventional group master faders. A rear-panel multi-pin connector [115] (page 35) is provided for the purpose of controlling these voltage levels, helping automate the group levels. The VCAs are sonically improved, and all bus, VCA group, etc. assignments are made using latching switches; avoiding CMOS switching and “glue-logic”.

Master muting and ON switching for input channels, VCA groups, master groups, matrix channels, and the stereo masters are memorizable and MIDI-controllable, following the lead of Yamaha’s successful M2000 series. Scenes can be stored in any of 128 memories. The first eight of these memories can be recalled with a single button-press. The others can be recalled through simple front-panel operations, or from a MIDI master controller or sequencer. This gives enormous flexibility when producing live shows, allowing, for instance, groups of backing vocal or backing instrument microphones to be selectively muted at different points in the performance. Check LEDs together with the ON buttons allow visual previewing of scenes prior to recall, eliminating potentially embarrassing errors in scene recall.

Since the modern trend is towards fully-featured auxiliary returns, the PM3500 uses the full capabilities of the input modules for this purpose. Hence, the PM3500 can be fitted with up to 48 input modules—the stereo input modules being particularly effective for today’s effects. In addition, the INSERT IN jacks on the rear panel can be used for aux return purposes, and the insert switch on each module can be used to make the signal at this input into the module’s input, rather than the main channel input. This allows great flexibility without repatching.

An outstanding feature of the PM3500 is its extensive cue capability. There is a CUE switch on every input channel, 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 signals the operator when the phones/cue outputs are

in cue mode.

The PM3500 has an excellent talkback system plus a useful test oscillator. An XLR input can be set to accept a microphone input, and is activated with the TALKBACK switch. That signal can be slated to any of the group or aux 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 to pink noise, and can be swept from 0.2 to twice the set frequency, and its output level is adjustable. 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 14 illuminated VU meters, each with a peak LED to warn of potential clipping. 12 of these meters can be switched to monitor alternate busses (group, aux and matrix busses, as well as CUE and TALKBACK busses, so the metering gives you a comprehensive view of signal levels in your system.

PM3500 electronic performance is everything you'd expect from the manufacturers who developed the PM3000 and PM4000 consoles. 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 PM3500 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 PM3500's hundreds of illuminated switches and indicators. Multiple rear-mounted cooling fans reduce internal temperatures to prolong component life.¹

The highly advanced PM3500, 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 PM3500 is a straightforward console to use. Anyone who has used the PM4000, or a PM3000 should immediately feel comfortable with the PM3500. 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.

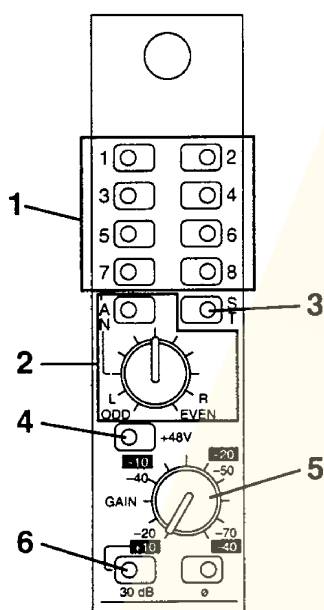
1. Heat is generated by electronic components, and is the enemy of them. In some segments of the industry (such as Las Vegas showrooms), it has been customary to leave equipment switched on all the time. This tradition grew out of the days when vacuum tube equipment was prevalent, and vacuum tubes did 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 PM3500 remains cooler than its predecessors, thanks to cooling fans, it remains a prudent practice to shut it off when it is not being used.

1-How to use this manual

2 Features

2.1 Front panel features

2.1.1 Monaural input module



1 1 2 3 4 5 6 7 8 (ASSIGN switches)

These locking switches assign the channel output to group mixing busses 1 through 8. An LED indicator in each switch illuminates when the signal is assigned to the buss.

2 PAN (switch and rotary control)

The locking PAN (integral LED illuminates when engaged) switch activates the PAN pot so that the signal can be positioned between any assigned even-numbered and odd-numbered group mixing busses or between the L and R stereo busses if the channel has been assigned to the stereo bus. This allows you to create up to four additional stereo mixes. At the center position, 3dB less signal is applied to each buss than the level obtained at hard right or left positioning, so that the combined stereo signal across a pair of busses adds up to constant power, regardless of the position of the PAN control.

3 ST (Stereo)

This locking (integral LED illuminates when engaged) switch assigns the channel output directly to the stereo bus. Assigning a channel directly

to the stereo bus will create a cleaner, quieter mix than assigning then signal to group busses and mixing the groups down to a stereo mix.

4 +48V (phantom power)

This (integral LED illuminates when engaged) switch turns the phantom power (+48V) on and off at the channel's XLR input connector. The power will only be turned on, however, if the MASTER PHANTOM POWER switch [120] (page 35) is on. When the MASTER PHANTOM POWER switch and this module switch are on, +48V is applied to both pins 2 and 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.

5 GAIN

This rotary knob provides 50dB 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 30dB less overall gain when the 30dB pad [6] (page 11) is engaged.

6 30dB (pad switch)

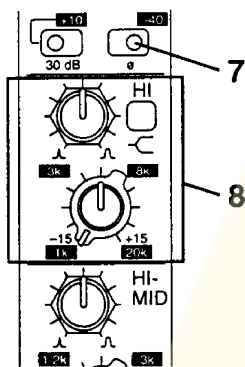
When this switch is engaged, (integral LED illuminates when engaged), the input signal is attenuated by 30dB. This pad should be used in conjunction with the GAIN control [5] (page 11) to obtain the precise channel sensitivity of a given source. If you are not sure whether an input is high line level or mic level, start with the PAD engaged and the GAIN control at the -20 (+10)

2-Features

position (fully counter-clockwise). Rotate the GAIN control clockwise, slowly. If you still don't get enough level, or the signal is still noisy with a lot of gain, turn the gain down again, disengage the pad, and reset the GAIN control as necessary.

NOTE

By adjusting the GAIN control, you may be able to get the same level, whether on or not the pad is engaged. Listen for noise and distortion—if the signal is noisy, you should not use the pad, and if there is a lot of distortion, the pad should be engaged.



8 HI (peak/shelf)

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

Q

This rotary control adjusts the Q (bandwidth) of this section of the equalizer from a very narrow (fully counterclockwise) to a very broad (fully clockwise) band, with a center detent at a Q of 1.2.

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

7 Ø (Phase)

This switch (integral LED illuminates when engaged), reverses the polarity of pins 2 and 3 on the channel's XLR connector. In normal mode (up, not illuminated), pin 2 is the signal high connector, and when engaged (down, illuminated), pin 3 is high.

This switch eliminates the need for you to rewire connectors or use adapters for out-of-phase sources. This switch can be used to reverse polarity intentionally to cancel leakage from adjacent microphones, for example, or to create electro-acoustical effects by mixing together out-of-phase signals from microphones picking up the same source.

Equalizer

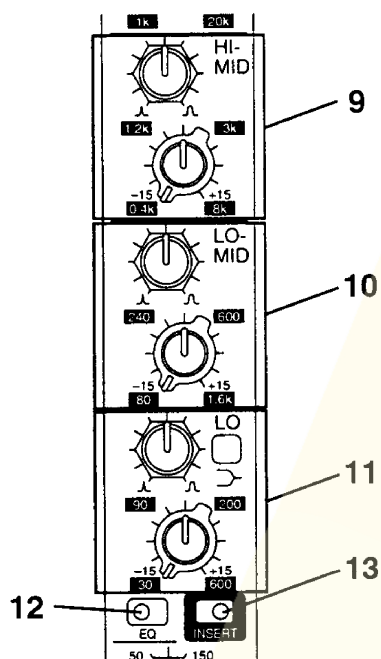
The input channel equalizer is divided into four bands, each with sweepable filter frequencies. The high and low bands may be switched between peaking and shelving types, and the high-mid and low-mid bands are peaking. All bands have adjustable Q, providing fully parametric type equalization. The level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

1k ~ 20k

The outer concentric knob sweeps the equalization frequency for this band between 1kHz and 20kHz.

-15 ~ +15dB

The inner concentric knob adjusts the gain of the set frequency band by ± 15 dB. The center detent position indicates unary gain.

**9 HI-MID****Q**

This rotary control adjusts the Q (bandwidth) of this section of the equalizer from a very narrow (fully counterclockwise) to a very broad (fully clockwise) band, with a center detent at a Q of 1.2.

0.4k ~ 8k

The outer concentric knob sweeps the equalization frequency for this band between 800Hz and 8kHz.

-15 ~ +15dB

The inner concentric knob adjusts the gain of the set frequency band by ± 15 dB. The center detent position indicates unity gain.

10 LO-MID**Q**

This rotary control adjusts the Q (bandwidth) of this section of the equalizer from a very narrow (fully counterclockwise) to a very broad (fully clockwise) band, with a center detent at a Q of 1.2.

80 ~ 1.6k

The outer concentric knob sweeps the equalization frequency for this band between 80Hz and 1.6kHz.

-15 ~ +15dB

The inner concentric knob adjusts the gain of the set frequency band by ± 15 dB. The center detent position indicates unity gain.

11 LO (peak/shelf)

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

Q

This rotary control adjusts the Q (bandwidth) of this section of the equalizer from a very narrow (fully counterclockwise) to a very broad (fully clockwise) band, with a center detent at a Q of 1.2. 1k ~ 20k

30 ~ 600

The outer concentric knob sweeps the equalization frequency for this band between 30Hz and 600Hz.

-15 ~ +15dB

The inner concentric knob adjusts the gain of the set frequency band by ± 15 dB. The center detent position indicates unity gain.

NOTE

There is no EQ clip indicator to show clipping induced by gain levels added in the equalization section. The CLIP indicator [25] (page 17) near the channel fader is used to show post-EQ clipping.

12 EQ

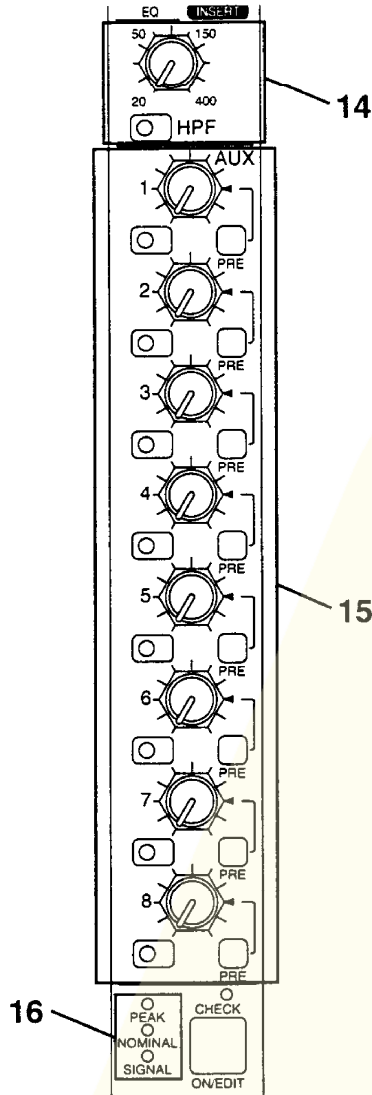
This locking switch (integral LED illuminates when engaged) activates (LED on, switch engaged) or bypasses (LED off, switch disengaged) the channel equalization section. This is useful for A-B comparison of the equalized vs. unequalized signal, or, if the EQ is bypassed, maximum signal quality on pre-equalized signals.

13 INSERT

When this switch is engaged (integral LED illuminates when engaged), any signal present at the channel's INSERT IN jack [94] (page 31) will replace the channel signal. The INSERT OUT jack is always "live" and is unaffected by this switch. The main use of this switch is to select or deselect any processing equipment connected to the INSERT IN jack. Note that the INSERT loop's pick-off point is post-GAIN, PHASE and HPF, and EQ. The loop's signal is re-inserted post-EQ, and pre-VCA. These points can be changed using in-

2-Features

ternal switches (see the section on "Optional Functions" on page 85 for details).



14 HPF (switch and control)

The HPF switch (integral LED illuminates when engaged) engages the channel's high-pass (low cut) filter with a slope of 12dB/octave.

The HPF control sets the cutoff frequency of the filter from 20Hz (fully counter-clockwise) to 400Hz (fully clockwise).

The HPF can be used to cut wind noise, vocal popping, stage rumble and low-frequency leakage and overspill. Use higher-frequency settings

on the HPF to reduce leakage into mics which are handling high-frequency sources. The filter can also be used to protect woofers from damage caused by unneeded low-frequency components; for instance, if a microphone is dropped or kicked. Bypass the filter only if you really need the bass frequencies from a particular instrument (bass guitar, organ, bass drum, etc.).

15 AUX 1-8 (AUX ON/OFF and PRE/POST switches, and level controls)

Each monaural input channel is fitted with eight auxiliary busses. These can be assigned pre-EQ and fader (switch engaged) or post-EQ and fader (switch disengaged) with the PRE switches.

The signal can be routed to the auxiliary busses when the ON switch is engaged (integral LED illuminates when engaged) or can be muted when the switch is disengaged.

The level of the signal sent to the auxiliary busses is adjustable with the level controls.

When in the PRE switch is set to the pre-position, the signal will be sent pre-fader and post-EQ. This can be reset to pre-fader and pre-EQ by means of an internal switch. See the section on "Optional Functions" on page 85 for details.

CAUTION

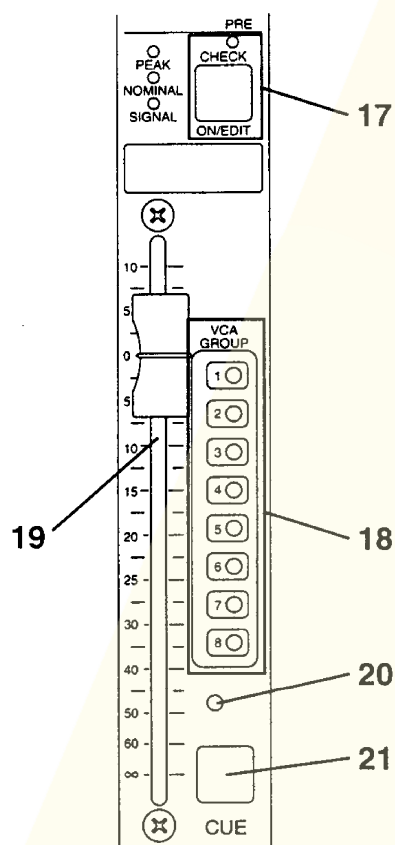
Since the PM3500 does not use dedicated auxiliary returns, an input module (stereo or monaural) should be used for this purpose. It is important that any module used for this purpose does not feed the auxiliary bus whose output is feeding this module. If this is done, feedback will occur, which can damage speakers and circuits in your system. If, for instance, a reverb unit is attached to Aux bus 1, and the return is fed back into channel 24, the AUX 1 ON switch of channel 24 should be left off to avoid feeding the reverb output back into the signal processor.

16 PEAK, NOMINAL and SIGNAL indicators

These indicators are used to give an instant reference on the signal levels entering the input channel. The pick-off point is post-phase and pre-HPF. In effect, they can be regarded as a three-el-

ement bargraph meter, and they turn on at the following levels:

PEAK	3dB below clip
NOMINAL	nominal level
SIGNAL	20dB below nominal



17 ON/EDIT switch and CHECK indicator

The ON/EDIT switch illuminates when active. When on, the channel's input is routed to the appropriate master group busses as determined by the Assign switches [1] (page 11), the stereo buss (if selected) and any auxiliary busses.

The switch can also be used to edit the configuration of "scenes" prior to storing them into one of the 128 memories available (see "Pre-setting scenes in CHECK mode" on page 56).

The green CHECK LED becomes operational when the PM3500 is in CHECK mode (see "Pre-

setting scenes in CHECK mode" on page 56) to verify the status of a channel prior to recalling a scene.

18 VCA GROUP (1 through 8)

When any of these switches (integral LEDs illuminate when engaged), the corresponding VCA group master fader(s) will also control the output level of the channel. A channel may be assigned to more than one VCA master group.

CAUTION

If you assign (or deassign) an input channel to a VCA group during a performance, the channel level will jump up or down, unless the VCA fader is set precisely to the nominal level.

19 Fader

The long-throw fader sets the level applied from the channel to the eight group mixing busses and the stereo bus. If any auxiliary sends [15] (page 14) are set to post-fader, it will control these levels as well. Unlike most other consoles, the fader does not pass audio signals, but controls a VCA through which the audio is passed. Accordingly, the channel level may be controlled from the eight VCA master faders or the VCA control connector [115] (page 35), if any of the VCA GROUP switches have been engaged.

20 SOLO SAFE switch

This switch (unmarked) beside the fader and immediately below the VCA group assignment switches prevents the channel from being soloed when this switch is engaged. It has no effect when the console is not in SOLO mode.

21 CUE

The exact function of this (electronically-latching) switch on each input channel depends on the setting of the Master SOLO MODE switch [26] (page 18).

If the console is set to SOLO mode, pressing this switch mutes all other input channels, and only those channels whose CUE switch is engaged will feed the console outputs ("solo in place").

If the console is set to CUE mode (SOLO off), the console then has a triple-priority cue system, designed to give the engineer maximum control and speed when it is most important. Pressing any channel CUE switch causes the channel signal to replace any master or VCA cue signal in the MONITOR A outputs and MONITOR B (if

2-Features

MONI A is selected) outputs and the phones outputs.

Cue groups and cue priority

In addition to the channel CUE, the VCA groups can also be cued by pressing their CUE switches. The engineer can also easily select any of the 25 output mixes (Groups 1 through 8, Stereo, Matrix 1 through 8, and AUX sends 1 through 8) by pressing the corresponding CUE switches. These three groups of cue signals form the three *cue groups*: INPUT, VCA and MASTER. These three groups are exclusive, i.e. cue sources from only one group at a time can be selected. The currently-monitored cue group is shown on the CUE GROUP indicators [87] (page 29).

Once a cue source from another cue group has been selected, the current cue group will be changed to the group containing the last-selected cue source. For example, if the engineer is cueing the stereo outputs, the MASTER indicator will be lit. Pressing any input channel's CUE switch will change the indicator to INPUT and will stop the CUE signal from the stereo bus. If other channels' CUE switches are pressed, their signals will be added to the cue bus. If all INPUT CUE switches are released, the cue buss will once again be fed by the stereo (MASTER) bus.

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 main house feed or the vocal subgroups. However, should feedback occur, or should any other condition require attention, the PM3500 enables the engineer to check any input channel(s) or VCA group(s) instantly by pressing the CUE switch(es). The input (or VCA group) whose CUE switch is engaged then automatically replaces the selected output mix in the headphone and cue outputs. The engineer can make the necessary adjustments, and then return to monitoring the original output mix simply by unlatching the input channel or VCA group CUE switch.

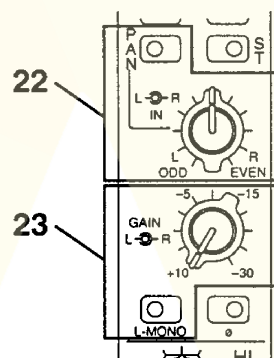
Pressing the channel CUE switch will lock it down (electronically – this is not a mechanically locking switch). The LED in the switch is illuminated when the channel is cued. Although the cue signal is not affected by the fader or ON/OFF switch, it is affected by the Input PAD, GAIN control, Filter, channel EQ, and anything connected between the channel's INSERT IN and OUT jacks (if the INSERT switch is engaged).

NOTE

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 PM3550 cue signal(s) will automatically change to the input cue group as soon as the CUE switch of one or more channels is engaged. The cue signals will revert to their previous state (MASTER or VCA) as soon as all channel CUE switches are released.

2.1.2 Stereo input module

The stereo input module is very similar to the monaural input module—for this reason, only the features which differ from the monaural module will be described here.



22 PAN (switch and rotary controls)

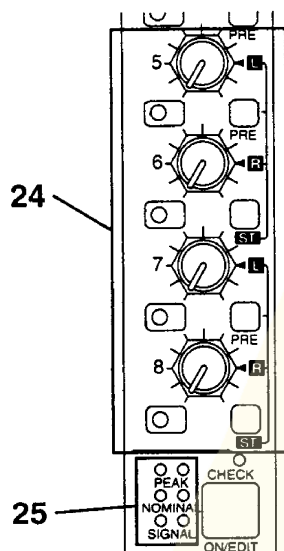
These controls are similar to those on the monaural modules, except that the "pan pot" is, in fact, two concentric pan pots. The inner pot moves the position of the signal applied at the left channel input within the stereo image, and the outer does the same for the right input signal.

23 GAIN control and L-MONO switch

The GAIN control on a stereo input module is, once again, two pots, clutched together so that adjustment can be made easily to both input signals simultaneously or individually. The inner pot controls the gain of the signal applied at the left channel input within the stereo image, and the outer does the same for the right input signal. The gain control provides 40dB of adjustment; from +10dB (fully counter-clockwise) to -30dB (fully clockwise).

Stereo input modules do not include a PAD switch. The position that such a switch would occupy is used by a L-MONO switch (integral LED

illuminates when engaged). When engaged, only the signal at the left channel input is processed by the channel.



24 AUX send controls

These differ from the monaural channels' AUX send controls in the following way: controls 5, 6, 7 and 8 cannot be individually switched between pre- and post-fader operation. Instead, there are two PRE switches: one controlling 5 and 6, and the other controlling 7 and 8.

There are also two ST switches (integral LEDs illuminate when engaged), marked ST, which, when engaged, allow the routing of the stereo input signals in a flexible way. These switches apply to two pairs of AUX busses: 5+6, and 7+8. When engaged, the left signal of the stereo input channel is routed to the odd-numbered AUX bus (5 or 7) and the right channel to the even-numbered bus (6 or 8). The levels are individually controllable with the appropriate controls.

NOTE

When using the AUX busses on the stereo input modules in this way, make sure that the AUX sends from mono channels correspond to what you expect. The most obvious use of this facility is to use effect processors which accept stereo inputs. If such a device (say a delay line) was connected to AUX 7 and 8, and a mono signal was sent to 7, but not to 8, the return might well possess strange stereo imaging. Likewise, if two different monaural input effect units are connected to 7 and 8, and the ST

switches are engaged on a stereo input module, the left and right signals would be sent to different processors—probably not the desired effect.

25 PEAK, NOMINAL and SIGNAL indicators

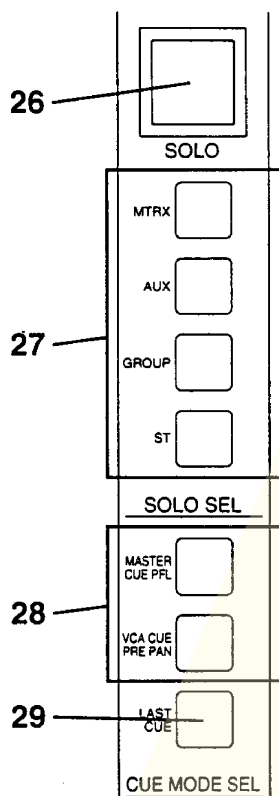
These indicators work in the same way as the monaural indicators [16] (page 14), but there are two sets of them in each module (one set for the left and one set for the right input signals).

The stereo input modules may be regarded as identical to the monaural input modules in all other respects.

2-Features

2.1.3 Control module

This module contains the soloing and master cue controls as well as the controls necessary for scene storage and recall. For a full discussion of the use of these controls, consult "MIDI scenes" on page 55.



Solo section

This section allows the master control of soloing functions.

26 SOLO switch

This switch changes the function of the console's CUE switches between CUE and SOLO. When in CUE mode, CUE switches are added to the signal appearing in the phones jacks. When in SOLO mode, pressing a CUE switch will mute all other channels (similar to the SOLO function on a recording console) and this red switch flashes, to remind you that SOLO rather than CUE mode has been selected. This, while invaluable in a pre-performance setup session, is obviously highly undesirable in a live performance. For this reason, this switch is located under a hinged, lift-up cover to prevent accidental operation during a

performance. Software protection is also provided to prevent accidental activation of this switch (page 58).

CAUTION

Before the beginning of a performance, always make sure that this switch is OFF (CUE mode selected). Otherwise, pressing any CUE switch will mute all other channels.

27 SOLO SEL – MTRX, AUX, GROUP, ST (solo select switches)

These switches (integral LEDs illuminate when engaged) allow the matrix, AUX sends, master groups or the stereo bus to be added to the currently soloed channels. These switches are only effective when the console is in SOLO mode.

If one of these switches is pressed (say the AUX switch) then the signal of any AUX send whose CUE switch is pressed will be added to the SOLO signal(s) from the input channel(s). The MTRX, GROUP and ST switches work similarly for matrix, master group and the stereo busses.

28 CUE MODE SEL– MASTER CUE PFL, VCA CUE PRE PAN, (cue mode selector switches)

These switches (illuminated when engaged) allow the selection of different cue modes when the console is in CUE or SOLO mode.

Pressing MASTER CUE PFL means that any master channels (i.e. busses which are not input groups or VCA master groups) which are cued will appear pre-fader. Usually, when this switch is not engaged, these will be cued post-fader.

If VCA CUE PRE PAN is selected, VCA master groups will be cued from a point which is post-VCA fader, but pre-pan (the cueing will not be in place). VCA groups are usually cued post-pan (in place) when this switch is not engaged.

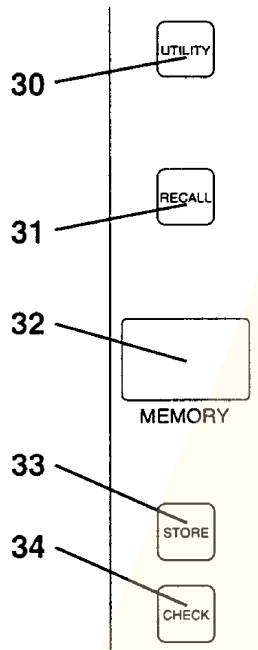
29 LAST CUE

This switch, when engaged, will turn off all CUE switches. If any CUE switches are subsequently engaged, this CUE signal will replace the current CUE signal. Any further CUE switches pressed will replace the current CUE signal with the CUE signal of the last channel or bus whose CUE switch has been pressed.

Turning this LAST CUE switch off will turn off all currently-engaged CUE switches.

Scene memory controls

A brief guide to the functions of these controls. For full details of how to use the scene memories, consult "MIDI scenes" on page 55.



30 UTILITY key

This key (illuminates when engaged), allows access to a number of scene and console utilities. Repeated pushes of this switch will cycle through the following utility modes (see "UTILITY mode" on page 57):

Display shows	Meaning
BATT	Battery level check
M-PR	Memory protect on or off
S-PR	Solo protect on or off
STCU	Stereo cueing for AUX and GROUP pairs
INIT	Memory initialization
M-CH	MIDI channel for reception and transmission
PGM	Enable/disable MIDI Program Change transmission and reception
CTRL	Enable/disable MIDI Control Change transmission and reception
OMNI	Disables OMNI mode for MIDI Program Change

Display shows	Meaning
ECHO	Enables/disables MIDI echo back
BULK	Initiates a MIDI Bulk Dump from the PM3500
RQST	Prepares the PM3500 for a MIDI Bulk Dump from a remote MIDI device
	OFF - the UTILITY switch goes off, and the PM3500 is no longer in UTILITY mode

If the console is in a utility mode, and the UTILITY key is pressed and held down for a second, then released, the console will exit utility mode.

31 RECALL key

This key is used to recall and activate the scene memory whose number is currently shown in the display.

32 MEMORY display

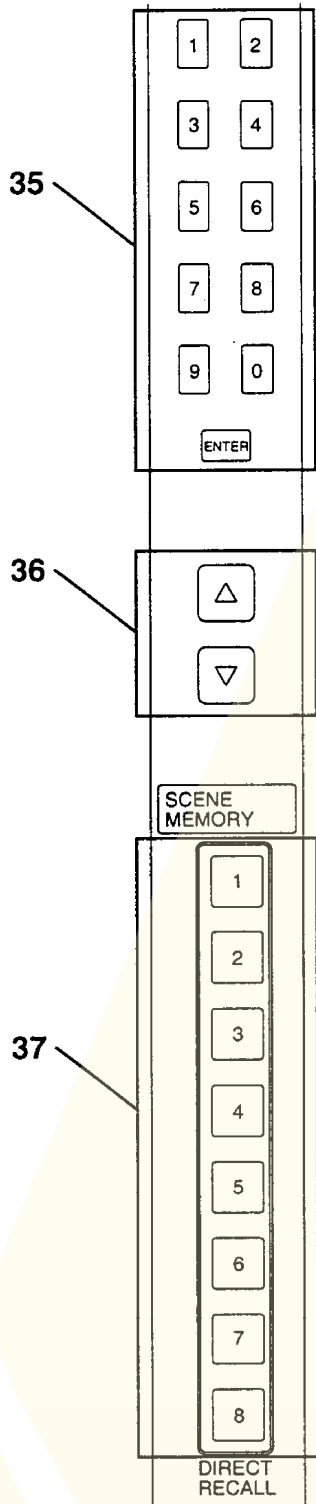
This 4-digit dot-matrix LED display usually shows the currently-selected scene memory. It is also used to display the current UTILITY [30] (page 19) mode, and if a utility is being accessed, shows the parameters for that utility.

33 STORE key

This key is used to store the current channel ON settings into the memory whose number is currently shown on the display. This key is also used to confirm some settings in UTILITY mode.

34 CHECK key

This puts the console into CHECK mode, which allows previewing of scene memories using the CHECK LEDs on each channel prior to recall.



35 Number keys and ENTER

These keys are used for direct input of scene memory numbers when this will be faster than using the up and down keys. The ENTER key is used for confirming entry of a number entered using the number keys.

36 UP/DOWN keys

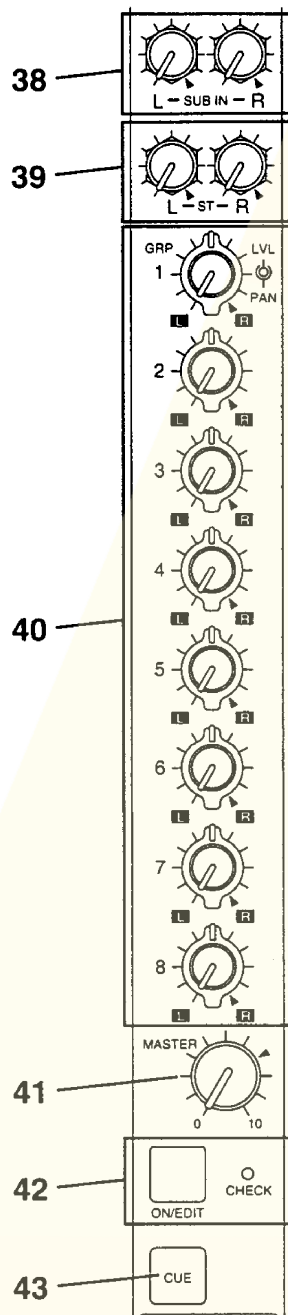
Used to step values up and down by one when entering data.

37 DIRECT RECALL

Scene memories 1 through 8 may be recalled directly without having to enter them through the number keypad or UP/DOWN keys and RECALL key. This allows the most commonly-used scene memories to be accessed with the minimum of trouble.

2.1.4 Group master modules

These modules are identical, except that the first four (group master modules 1) have stereo matrix grouping, and the other four (group master modules 2) have monaural matrix grouping. Additionally, the first four incorporate the master AUX send sections, and four include the Master Group sections.



Matrix section (modules 1 through 4)

38 SUB IN L and R

These adjust the level of the signal from the MATRIX SUB IN connectors fed to the matrix group.

39 ST L and R

These adjust the level of the L and R signals from the STEREO bus fed to the matrix group.

40 1 through 8 LVL (level) and PAN controls

These are concentric controls which adjust the level of the signal from the Master Groups fed to the stereo matrix group, and its placement within the matrix group's stereo image.

The outer center-detented control adjusts the master group's position in the matrix group's stereo image, and the inner adjusts the level. Nominal level is shown by a mark at the fully clockwise position.

As shipped, the group levels are routed post-fader to the matrix, but this can be changed by means of internal switches. Consult the OPTIONAL FUNCTIONS section for details.

41 MASTER control

This control regulates the level of the signal output by the matrix group to the appropriate connector on the rear panel. The control is labeled from 0 to 10, with a mark at approximately the "7" position to indicate the nominal level.

42 ON/EDIT key and CHECK indicator

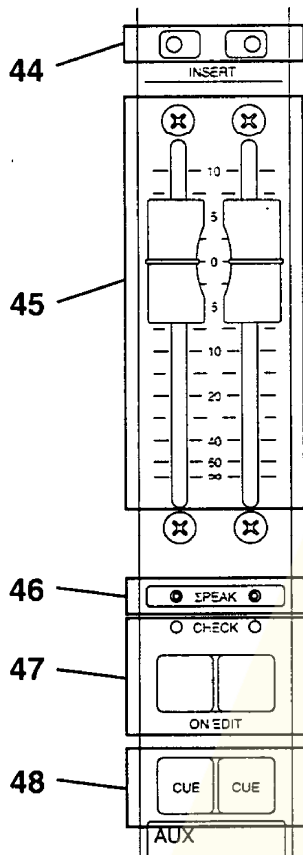
These work in the same way as the individual input module controls [17] (page 15). For a full explanation of how to use these, see "MIDI scenes" on page 55.

43 CUE (matrix cue)

When this switch is illuminated, the matrix mix signal (post-MASTER [41] (page 21)) from this matrix channel is added to any other master cue group signals, or replaces the existing cue signal if this belongs to a different group (VCA or INPUT). For these stereo matrix mix groups, cueing will be in place (the stereo image of the group will be preserved).

2-Features

AUX sends



44 INSERT (AUX send insert switches)

These switches (integral LED illuminates when engaged) replace the internal group signal with the signal present at the AUX INSERT IN jack. The AUX INSERT OUT jack is always "live" and is unaffected by this switch. The main use of this switch is to select or deselect any processing equipment connected to the appropriate INSERT IN jack. Note that the insert signal is inserted pre-fader. This point can be changed using internal switches (see "Optional functions" on page 85).

45 AUX send faders

The eight 60mm AUX send faders are grouped in pairs on four modules. This facilitates matching left and right AUX send levels when sending to an external stereo effects processor. Nominal level is at 0.

46 Σ PEAK indicators

These indicators will illuminate if the pre-fader level of an AUX send bus reaches 3dB below the clipping level.

47 ON/EDIT keys and CHECK indicators

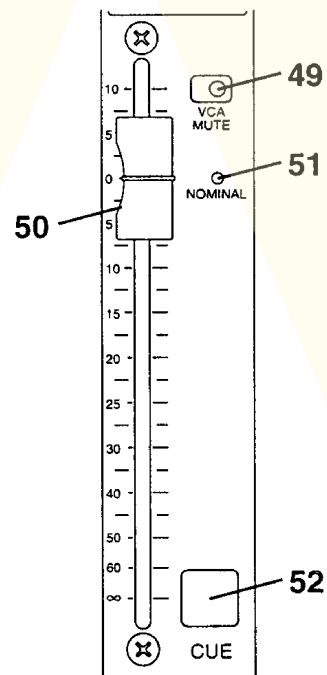
These work in the same way as the individual input module controls [17] (page 15). For a full explanation of how to use these, see page 55.

48 CUE (AUX send cue)

When this switch is illuminated, the AUX send signal (post-fader) from this channel is added to any other master cue group signals, or replaces the existing cue signal if this belongs to a different group (VCA or INPUT).

VCA group section

As mentioned earlier (page 8), the PM3500 incorporate VCA grouping. These groups are in addition to the normal groups provided on most consoles, and give yet another degree of flexibility in the way that you work.



49 VCA MUTE

Engaging this switch is the equivalent of setting the VCA master fader at maximum kill. The switch is illuminated when the master fader is muted. This affects all input channels assigned to

the correspondingly numbered VCA group. The switch enables you to preset a VCA group level, then mute that group until the appropriate cue.

NOTE

This is not the same as a MASTER MUTE 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. On the PM3500, the scene memories can be used to provide a MASTER MUTING function.

50 VCA MASTER fader

This fader applies a DC control voltage to any input channels whose correspondingly numbered VCA group assign switch [18] (page 15) 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 master 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 available post-fader Group bus sends and the stereo bus send. See the NOMINAL Indicator [51] (page 23) and the note below it.

51 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.

52 VCA CUE switch

When this switch is engaged (illuminated), the VCA group signal from this channel is added to any other VCA cue group signals, or replaces the existing cue signal if this belongs to a different group (MASTER or INPUT).

NOTE

VCA master faders apply DC voltage to one or 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.

Some additional VCA details

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

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

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

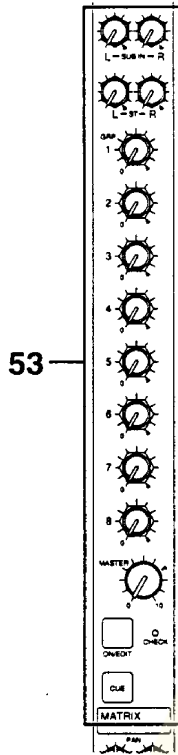
When an input fader or an assigned VCA master fader is pulled all the way down to "infinite" attenuation position, the voltage is sensed in the input module, and the channel on/off relay opens to completely kill the output from the VCA. The channel ON lamp will remain active, however, indicating that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

If the console is set to the "SLAVE" rather than the "MASTER" mode with the rear-panel VCA SLAVE/MASTER switch [115] (page 35), then the console's affected VCA MASTER faders (1 through 4 and/or 5 through 8) will have no effect. Instead, any DC control signals applied to the VCA/MUTE CONTROL connector [115] (page 35) will affect correspondingly assigned input channels.

2-Features

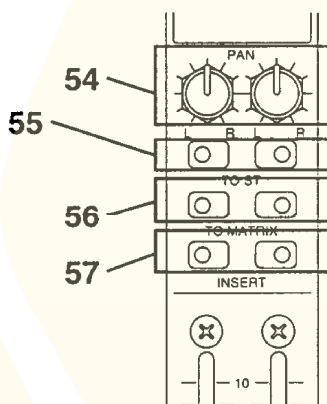
2.1.5 Group master modules 2

These group master modules differ from modules 1 through 4 in that the matrix groups are monaural and that the master groups, rather than the AUX sends, are contained in these groups. Controls for two master groups are provided on each module. The different controls and features are described below:



53 Matrix level controls

These matrix groups (5 through 8) differ from matrix group level controls 1 through 4 [40] (page 21) in that these are monaural. Accordingly, these are single controls. Nominal level is indicated by a mark at the fully clockwise position.



54 Main channel group STEREO panpots

When groups are assigned to the stereo bus using the TO ST switches [55] (page 24), these center-detented pots determine the group signal's position in the stereo image.

55 TO ST (to STereo) switches

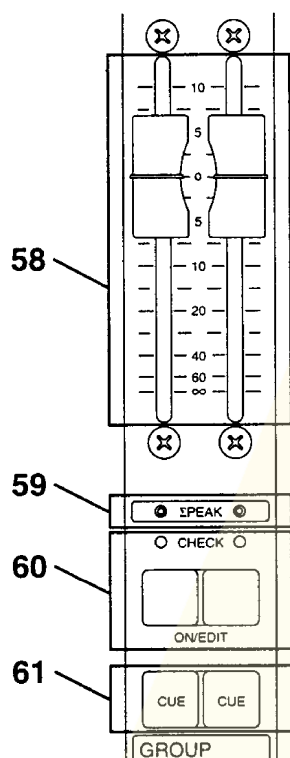
The locking TO ST (integral LED illuminates when engaged) switches route the group signal to the stereo bus when engaged.

56 TO MATRIX switches

The locking TO MATRIX (integral LED illuminates when engaged) switches route the group signal to the matrix busses when engaged. When these switches are disengaged, they act as "mute to matrix" switches.

57 INSERT (group insert switches)

These switches (integral LED illuminates when engaged) replace the internal group signal with the signal present at the GROUP INSERT IN jacks. The GROUP INSERT OUT jack is always "live" and is unaffected by this switch. The main use of this switch is to select or deselect any processing equipment connected to the appropriate INSERT IN jack. Note that the insert signal is inserted pre-fader. This point can be changed using internal switches (see the section on "Optional Functions" on page 79 for details).



58 GROUP faders

The eight 60mm GROUP faders are grouped in pairs on four modules. This facilitates matching left and right group levels when working in stereo pairs. Nominal level is at 0.

59 Σ PEAK indicators

These indicators will illuminate if the pre-fader level of an group bus reaches 3dB below the clipping level.

60 ON/EDIT keys and CHECK indicators

These work in the same way as the individual input module controls [17] (page 15). For a full explanation of how to use these, see the section on "MIDI scenes" on page 55.

61 CUE (group cue)

When this switch is illuminated, the group signal (post-fader) from this group is added to any other master cue group signals, or replaces the existing cue signal if this belongs to a different group (VCA or INPUT).

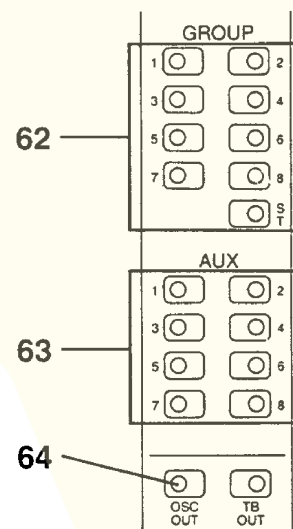
The VCA controls on these four modules are identical to those described above: [49] (page 22) through [51] (page 23).

2.1.6 Stereo master module

This module provides the controls and routing for talkback and the integral line-up oscillator as well as the stereo output controls.

Talkback and oscillator section

This section includes the oscillator and talkback routing and selection controls, as well as the talkback input connector and switch.



62 GROUP and ST (talkback to group and stereo routing switches)

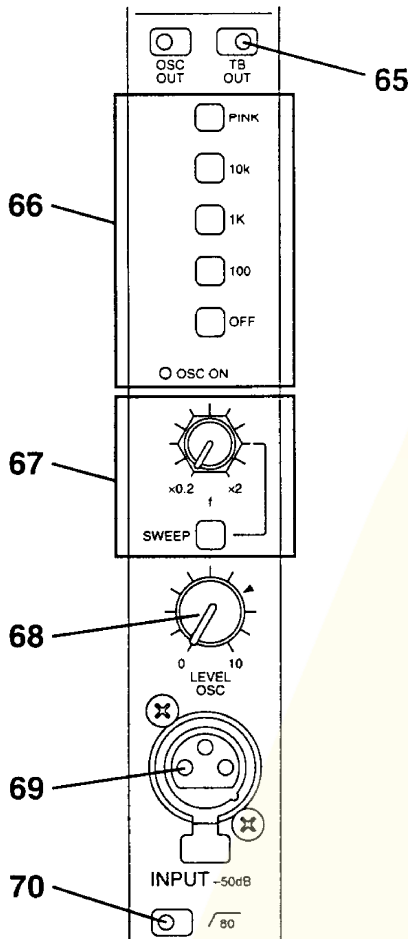
These nine switches (integral LEDs illuminate when engaged) route the talkback signal to the appropriate group bus(es) and/or to the Stereo bus.

63 AUX (talkback to AUX routing switches)

These eight switches (integral LEDs illuminate when engaged) route the talkback signal to the appropriate AUX sends.

64 OSC OUT (oscillator output)

The PM3500 incorporates a dedicated oscillator output [114] (page 34). This switch (integral LED illuminates when engaged) turns the signal from this connector on and off. It does not turn the oscillator on or off.



65 TB OUT (talkback output)

The PM3500 incorporates a dedicated talkback output [113] (page 34) which is used for direct output of the signal from the TALKBACK input and/or the internal oscillator. This switch (integral LED illuminates when engaged) turns the signal from this connector on and off when the talkback switch [72] (page 27) is engaged. It does not turn the oscillator or talkback signal on or off.

66 PINK, 10k, 1k, 100, OFF and OSC ON (oscillator switches and indicator)

These 5 interlocking switches set the sine-wave oscillator to 100Hz, 1kHz or 10kHz operation when the SWEEP switch [67] (page 26) is in fixed frequency position (disengaged). They also per-

mit selection of a pink noise source, or turn off the oscillator/noise source altogether.

The red OSC ON indicator shows the on/off status of the oscillator (illuminated in any switch setting other than OFF).

NOTE

Even though the oscillator may not be assigned to any busses, it is still possible that it could be inadvertently selected 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.

67 SWEEP (oscillator sweep control and switch)

Engaging the SWEEP switch removes the oscillator from its fixed frequency mode (i.e., generating exactly 100Hz, 1kHz or 10kHz). 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 10kHz, and sweep mode is engaged, you can adjust the actual oscillator frequency between 2kHz and 20kHz.

68 LEVEL OSC (oscillator level)

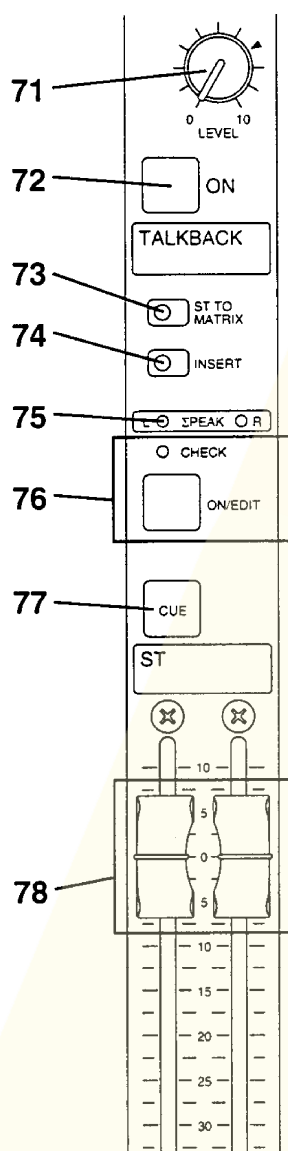
This rotary control adjusts the oscillator output level fed to the OSC OUT, TALKBACK OUT connector, and any mixing busses to which the signal may be assigned. This control does not affect the Talkback level. A nominal level is marked at approximately the "7" value (the scale is from "0" to "10").

69 INPUT -50dB (talkback input)

This XLR-3 connector accepts a low-Z microphone. A gooseneck or headset microphone can be used here. The 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 [62] (page 25), [63] (page 25) and [65] (page 26).

70 /80 (80Hz bass roll-off talkback filter)

This switch (integral LED illuminates when engaged) turns on a 80Hz high-pass filter which affects the signal input at the talkback input [69] (page 26). This can be used to eliminate microphone "pop" etc. when talking back to performers.

**71 LEVEL (TB Input)**

This rotary control adjusts the signal level after the talkback preamplifier, thereby affecting the sensitivity of the TB input. This control affects the TB level applied to any busses and to the TB OUT connector; it does not affect the oscillator level.

72 ON (Talkback ON switch)

This is a latching switch which illuminates when active. When active, signals from the oscillator [66] (page 26) and the talkback input [69] (page

26) are routed through any selected group busses and the TALKBACK OUT output if selected.

Also when this signal is active, the signal from the MONITOR B outputs is muted and the signal from the MONITOR A outputs is dimmed by 10dB.

Stereo section

This section contains the controls for the assignment and control of the stereo bus.

73 ST TO MATRIX (stereo to matrix switch)

This switch (integral LED illuminates when engaged) allows the L and R stereo signals to be routed through to the matrix groups. When disengaged, the ST L and R [39] (page 21) controls in the matrix section have no effect.

74 INSERT (stereo insert)

This switch (integral LED illuminates when engaged) replace the stereo signal with the signal present at the STEREO INSERT IN jacks. The STEREO INSERT OUT jack is always "live" and is unaffected by this switch. The main use of this switch is to select or deselect any processing equipment (equalizer, compressor, etc.) connected to the INSERT IN jack. Note that the insert signal is inserted pre-fader. This point can be changed using internal switches (see the section on "Optional Functions" on page 85 for details).

75 Σ PEAK L and R indicators

These indicators will illuminate if the pre-fader level of either the left or right stereo bus reaches 3dB below the clipping level.

76 ON/EDIT key and CHECK indicator

These work in the same way as the individual input module controls [17] (page 15). For a full explanation of how to use these, see the section on "MIDI scenes" on page 55.

77 CUE (stereo cue)

When this switch is illuminated, the stereo signal (post-fader) is added to any other master cue group signals, or replaces the existing cue signal if this belongs to a different group (VCA or INPUT).

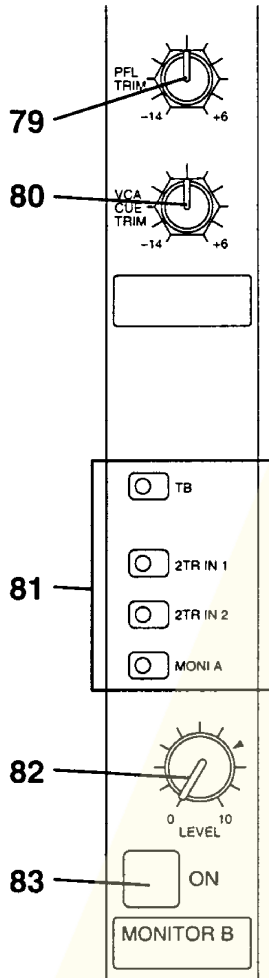
78 Faders (stereo faders)

These long-throw faders adjust the level of the signal from the stereo buss to the ST OUT jacks.

2-Features

2.1.7 Monitor module

This module contains the switches and controls necessary for monitoring. There are two separate stereo monitor busses (A and B).



79 PFL TRIM

This control allows the adjustment of the PFL bus signal over a 20dB range (from -14dB to +6dB) prior to being output from the MONITOR A connectors and the phones jacks.

80 VCA CUE TRIM

This control allows the adjustment of the VCA cue bus signal over a 20dB range (from -14dB to +6dB) prior to being output from the MONITOR A connectors and the phones jacks.

MONITOR B

This section drives a pair of connectors [107] (page 34) for feeding a power amplifier/speaker system, etc. There are four different sources which can be selected for monitoring through these connectors.

81 TB, 2TR IN 1, 2 TR IN 2, MONI A (monitor B selector switches)

These interlocking switches with integral LED indicators determine the signal which will be output from the MONITOR B connectors: talk-back (TB), one of two line level stereo sources attached to the TAPE IN jacks (2 TR IN 1 and 2 TR IN 2) and a copy of whatever is selected for monitoring through the MONITOR A connectors (MONI A).

82 LEVEL (MONITOR B level control)

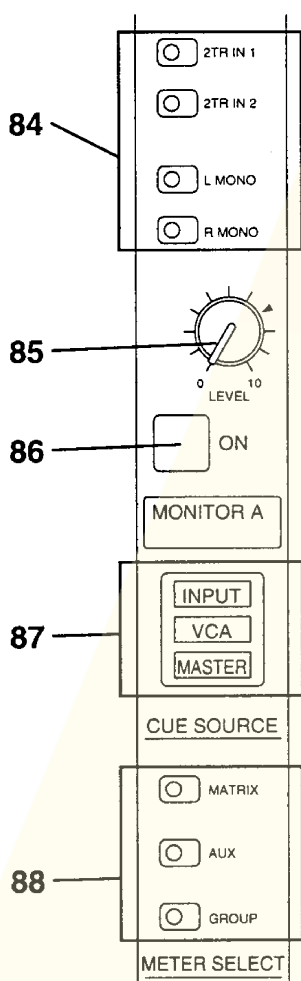
This rotary control marked from 0 (fully counter-clockwise) to 10 (fully clockwise) controls the level of the signal output from the MONITOR B connectors. A nominal level setting is marked at about the "7" position.

83 ON (MONITOR B switch)

This switch (illuminates when engaged) feeds (engaged) or mutes (disengaged) the signal output from the MONITOR B connectors.

MONITOR A

This section drives a pair of connectors [107] (page 34) for feeding a power amplifier/speaker system, etc. There are four different sources which can be selected for monitoring through these connectors.



84 2TR IN 1, 2 TR IN 2, L MONO, R MONO (monitor A selector switches)

These switches with integral LED indicators determine the signal which will be output from the MONITOR A connectors: one of two line level stereo sources attached to the TAPE IN jacks (2 TR IN 1 and 2 TR IN 2), the left channel of the stereo bus (L MONO) and the right channel of the stereo bus (R MONO).

85 LEVEL (MONITOR A level control)

This rotary control marked from 0 (fully counter-clockwise) to 10 (fully clockwise) controls the level of the signal output from the MONITOR A connectors. A nominal level setting is marked at about the "7" position.

86 ON (MONITOR A switch)

This switch (illuminates when engaged) feeds (engaged) or mutes (disengaged) the signal output from the MONITOR A connectors.

87 INPUT, VCA, MASTER (cue source indicators)

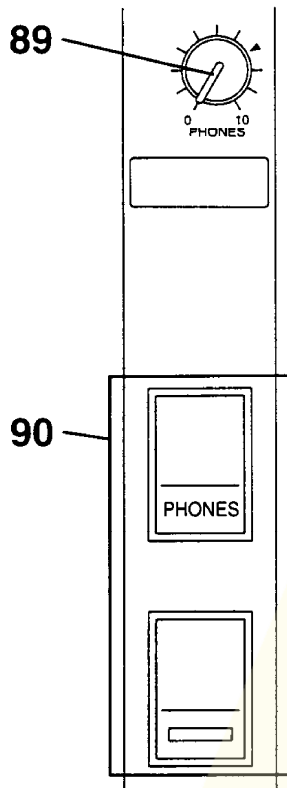
These indicators give a useful instant indication of the source currently being monitored through the phones and MONITOR A outputs. If a channel input source is being cued, the red INPUT indicator will light. If a VCA group has been selected for cueing, the yellow VCA indicator will light. If a master source has been selected, the green MASTER indicator will light.

88 MATRIX, AUX, GROUP (meter selection switches)

These three interlocking switches with integral LED indicators select the meter functions on the meter bridge. The two larger meters always show the levels of the stereo L and R busses, regardless of these switches. The assignment of the other meters in the three different modes is as follows:

Meter #	MATRIX	AUX	GROUP
1	MATRIX 1 L	AUX 1	GROUP 1
2	MATRIX 1 R	AUX 2	GROUP 2
3	MATRIX 2 L	AUX 3	GROUP 3
4	MATRIX 2 R	AUX 4	GROUP 4
5	MATRIX 3 L	AUX 5	GROUP 5
6	MATRIX 3 R	AUX 6	GROUP 6
7	MATRIX 4 L	AUX 7	GROUP 7
8	MATRIX 4 R	AUX 8	GROUP 8
9	MATRIX 5	CUE L	CUE L
10	MATRIX 6	CUE R	CUE R
11	MATRIX 7	TB OUT	TB OUT
12	MATRIX 8	OSC OUT	OSC OUT

2-Features



89 PHONES (headphone level control)

This rotary control, marked from "0" to "10", adjusts the level of the signal fed to the headphones connectors. Nominal level is indicated at about the "7" position.

90 PHONES connectors

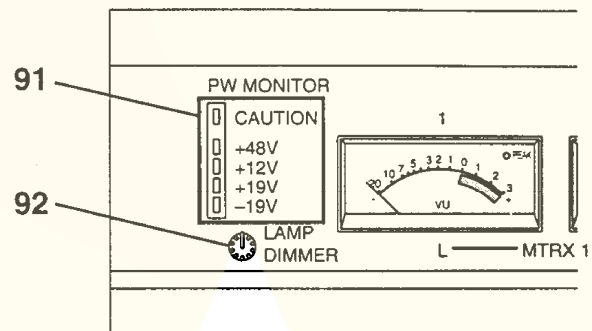
Two stereo phones connectors are provided, for use with almost any 8Ω or higher impedance stereo headphones. This enables two operators (or an engineer and producer) to work on the PM3500 simultaneously. The jacks are recessed behind spring-loaded covers to exclude dust, etc. when not in use. Both jacks are angled to minimize strain on cables and connectors.

2.1.8 Meter bridge

The PM3500 is equipped with 2 jumbo and 12 large illuminated VU meters, all with true VU ballistics to indicate approximate loudness. In addition, each meter is equipped with a peak LED to warn of impending clipping. These LEDs turn on 3dB below the clip point. Assuming the meter is monitoring a signal with a

+24dBm maximum output capability, the peak LED will turn on when the instantaneous level reaches +21dBm. Since the standard VU scale only goes to +3 VU (corresponding roughly to +7dBm with a steady-state signal), the peak LED will turn on when the level is about 14dB above the maximum meter scale. Bear in mind, however, that the meter needle may not respond to a brief transient which can cause the peak LED to flash. A percussive signal, for instance, can cause the peak level to be 20dB to 30dB above the average level.

Other than the two jumbo meters, which always indicate the stereo left and right channel signals, the meters can be switched to indicate a variety of signals using the METER SELECT switches [88] (page 29).



91 PW CAUTION, +48, +12, +19, -19 (power supply indicators)

These LEDs show the status of the remote power supply. The +48, +12, +19 and -19 LEDs should normally be on, showing that the corresponding voltages are being delivered to the console. If there is a fault and one of these voltages is low or dead, the PW CAUTION LED will flash to alert you of this situation.

92 Lamp dimmer

This rotary dimmer turns any lamps attached to the rear-panel lamp sockets from off (fully counter-clockwise, clicks off), to full intensity (fully clockwise). As supplied, the console Lit-Lites are fitted with standard incandescent bulbs, but the hoods and the power supply can accommodate higher intensity quartz bulbs.

2.2 PM3500 rear panel features

Some points to note:

All XLR and phone jacks on the PM3500 are balanced, unless otherwise explicitly stated.

All outputs and patch points are at the +4dBu level, unless explicitly stated otherwise.

Channel inputs, sub inputs, sub outputs and primary outputs use XLR-3 type connectors, wired as follows:

Pin no.	Connection
1	Ground
2	+ (hot)
3	- (cold)

Note the male and female polarities of these connectors on the PM3500; male connectors are generally used as outputs, and female as inputs. This can assist you in remembering the direction of signal flow.

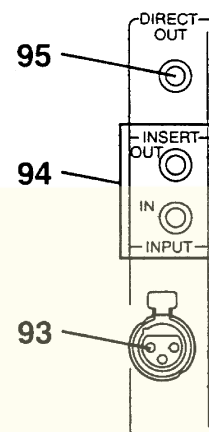
INSERT IN/OUT points are 1/4" tip-ring-sleeve connectors, wired as follows:

Pin	Connection
Sleeve	Ground
Ring	+ (hot)
Tip	- (cold)

Input channel XLR-type connectors are electronically balanced, but optional input isolation transformers can be installed on a per-module basis. All output XLRs are also electronically balanced.

If required, optional isolation transformers can be supplied in a 19-inch rack-mount unit, each unit accommodating eight transformers. In this way, inputs and outputs can be provided with extra grounding isolation and common mode rejection where required, without the price in direct costs, weight or signal quality where the transformers are not required.

2.2.1 Standard (monaural) input module



Phantom power warning

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

93 INPUT

This XLR-type connector supplies the signal to the channel module. The nominal input level may vary from -70dBu to $+10\text{dBu}$ according to the settings of the channel input gain control and the pad switch [5] (page 11) and [6] (page 11).

94 INSERT OUT and INSERT IN

These phone jacks serve as patch points for the channel. The nominal input and output is $+4\text{dBu}$ (1.23V).

The OUT jack may be used as an auxiliary output to another console or as a direct output to a multitrack tape recorder (however, a separate DIRECT OUT [95] (page 31) is provided for this purpose). Most often, it will be used for sending the input channel signal to an off-board signal processor (compressor/limiter, graphic equalizer, noise gate, etc.). The INSERT OUT jack is always live, regardless of the channel's ON status. The IN jack applies a signal to the input channel and is normalled so that inserting a plug interrupts the channel's internal signal flow, bringing in the signal here (usually the return from an off-board processor). This can be bypassed with the channel's INSERT switch [13] (page 13), which overrides this normalling.

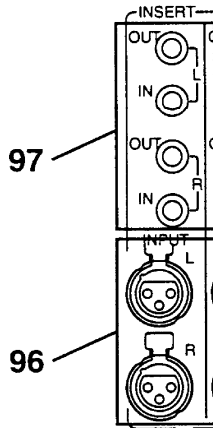
95 DIRECT OUT

The DIRECT OUT jack outputs the channel's output from a post-fader position. However, each module can be changed (jumper setting) to change this pick-off point to post-pad and gain, but pre-EQ and HPF. See the OPTIONAL FUNCTIONS section for details

2-Features

2.2.2 Stereo input modules

Note that the stereo input modules are not provided with direct out jacks.



96 INPUT L and INPUT R

These XLR-type connectors supply signals to the channel module. The nominal input level of each channel may vary from -30dBu to +10dBu according to the settings of the channel input gain control [23] (page 16). Since this gain control is a dual-ganged control, the gain of each channel may be set individually.

If the stereo module is being used as a mono input module, the input signal should be connected to the L input, and the L-MONO switch [23] (page 16) should be engaged.

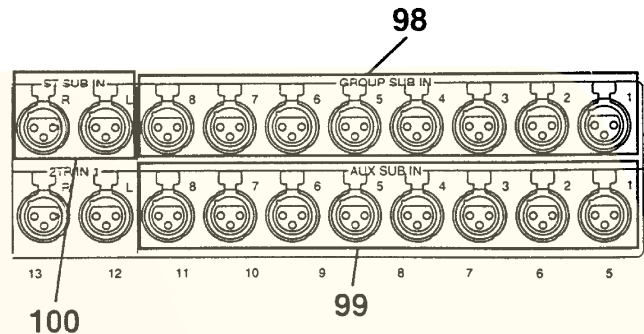
97 INSERT (L) and (R) INSERT IN and OUT jacks

These function in the same way as the monaural insert points [94] (page 31). The provision of two insert points enables, say, a noisy stereo analog synthesizer to be passed through a pair of linked noise gates.

Again, the insert can be defeated by using the INSERT switch [13] (page 13). This switch applies to both the L and R insert loops.

2.2.3 SUB IN connectors

These connectors allow the PM3500 to accept extra inputs from another console or sub-mixer, allowing the PM3500 to act as the master console for both consoles.



98 GROUP SUB IN (1 through 8)

These connectors apply a signal directly to the group mixing busses (ahead of the group insert and group faders). These signals may be used for adding signals from another console or sub-mixer directly to the mixing groups. Typically, these might be fed from the GROUP OUTs of another console, or might be fed on a paired basis from a keyboard or percussion stereo sub-mixer.

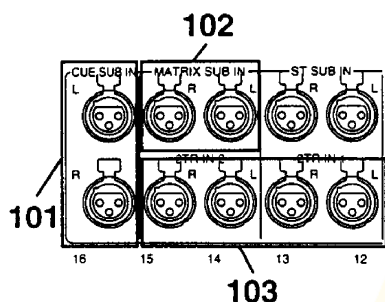
99 AUX SUB IN (1 through 8)

These connectors apply a signal directly to the AUX SEND busses (ahead of the AUX insert and AUX faders). These signals will generally be fed from another console or sub-mixer's AUX OUT connectors, allowing the same effect to be applied on all AUX sends throughout the console chain.

Remember that on the PM3500, AUX 5 and 6 and AUX 7 and 8 may be paired for stereo operation [24] (page 17). Care should therefore be taken when connecting sub-console AUX OUTs to these SUB IN connectors, so that signals are correctly routed through the effects chain.

100 ST SUB IN (stereo sub inputs)

This pair of connectors feeds signals into the stereo bus, ahead of the stereo insert and stereo faders. Another console or sub-mixer's stereo outputs can therefore be added to the PM3500 stereo bus.



101 CUE SUB IN (L and R)

This pair of connectors feeds signals into the CUE bus. This is useful when another console is being used in conjunction with the PM3500, and it is necessary to sum the CUE busses from the two consoles.

102 MATRIX SUB IN (L and R)

This pair of connectors feeds signals into the mix matrix. The level of these signals into each matrix group is individually controllable with the SUB IN controls in each matrix group [38] (page 21). These connectors can be used to feed the stereo signal from another source which is to be fed to the matrix, but is not destined for the front-of-house mix. One example of this where matrix busses are used for the performers' foldback mix, and a taped click track for count-in or timekeeping might be required in a piece. Using the MATRIX SUB IN connectors, this click track can be fed to the appropriate matrix groups, and the volume adjusted throughout the piece as required, without it being fed through the front-of-house system.

103 2 TR IN 1 and 2 TR 2 (L and R)

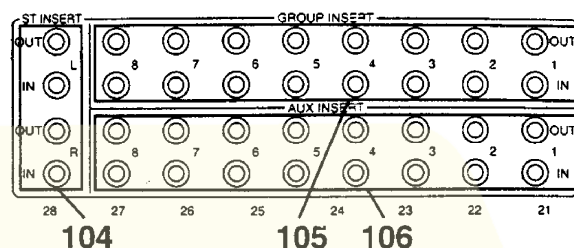
Although strictly speaking, these are not SUB inputs, they may be treated as such in this section. When performing, up to two stereo tape recorders can be used to record the performance. The tapes can be monitored from the A or B monitor outputs [107] (page 34) using the appropriate selector switches [81] (page 28) and [84] (page 29). Connect the TAPE OUT or PLAY outputs of the tape recorder(s) to the appropriate connectors.

NOTE

These inputs are rated at a nominal +4dBu. Many domestic and even semi-professional recorders are -10dBu. Take care when attaching a recorder to these inputs, and make sure that the levels match.

2.2.4 INSERT points

The PM3500 is provided with balanced group insert points, allowing group processing of these signals.



104 ST INSERT L and R (OUT/IN) (stereo insert points)

These phone jacks serve as patch point for the signal from the stereo left and right busses.

The OUT jacks may be used as SUB outputs to another console or to a stereo recorder, though the OUTs may also be used for this purpose. They are primarily intended for adding off-board signal processors, etc. to the stereo signal path. The INSERT OUT jacks are always live, regardless of the stereo bus ON status.

The IN jacks apply signals to the stereo bus and are normalled so that inserting a plug interrupts the bus internal signal flow, bringing in the signal here (usually the return from an off-board processor). This can be bypassed with the stereo INSERT switch [74] (page 27), which overrides this normaling.

105 GROUP INSERT 1 through 8 (OUT/IN)

These phone jacks serve as a patch point for the signal from the correspondingly numbered group mixing bus.

The OUT jacks may be used as auxiliary group outputs to another console or to a multi-track recorder, though the GROUP OUTs may also be used for this purpose. They are primarily intended for adding off-board signal processors, etc. to the group signal path. The INSERT OUT jack is always live, regardless of the group's ON status. The IN jack applies a signal to the group and is normalled so that inserting a plug interrupts the group's internal signal flow, bringing in the signal here (usually the return from an off-board processor). This can be bypassed with the group's INSERT switch [57] (page 24), which overrides this normaling.

106 AUX INSERT 1 through 8 (OUT/IN)

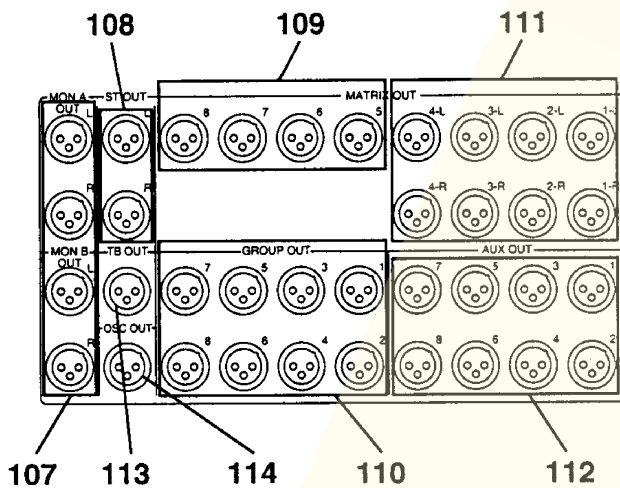
These phone jacks serve as a patch point for the signal from the correspondingly numbered AUX SEND bus.

2-Features

The OUT jacks may be used as auxiliary AUX SEND outputs to another console or to a multi-track recorder, though the AUX OUTs may also be used for this purpose. They are primarily intended for adding off-board signal processors, etc. to the signal path. The INSERT OUT jack is always live, regardless of the AUX SEND's ON status.

The IN jack applies a signal to the group and is normalled so that inserting a plug interrupts the internal signal flow of the bus, bringing in the signal here (usually the return from an off-board processor). This can be bypassed with the AUX bus INSERT switch [44] (page 22), which overrides this normalling.

2.2.5 OUTPUTS



107 MONITOR A and MONITOR B (L and R)

These pairs of connectors provide feeds to a control-room monitoring system, or headphone distribution system. The MONITOR A signal will be muted when the talkback ON switch [72] (page 27) is activated.

108 ST OUT (L and R)

This pair of outputs provides the main stereo output from the stereo bus. These outputs will typically be used to drive the main amplifier/speaker chain comprising the front-of-house system.

109 MATRIX OUT (5 through 8)

These four outputs provide additional feeds from the four mono matrix groups. These may be used for the same purposes as the stereo matrix

feeds, bearing in mind, of course, the fact that these are monaural sources.

110 GROUP OUT (1 through 8)

These eight outputs provide direct post-fader feeds from the eight mixing groups. They may be used to feed a master console's GROUP SUB INs, foldback mixes, to provide different amplifier feeds for different parts of the venue, or to drive a multi-track recorder.

111 ST MATRIX OUT (1 through 4, L and R)

These eight outputs provide stereo post-master outputs from the first four matrix groups. They may be used for a variety of purposes: alternative mixes for different parts of the venue, dressing-room cueing, lobby feeds, stereo foldback mixes, supplying feeds to stereo recorders or OB units, etc.

112 AUX OUT (1 through 8)

These eight outputs provide direct post-fader [45] (page 22) feeds from the eight aux sends. They may be used to feed effect processors whose outputs will be connected to input channels. Outputs 5+6 and 7+8 may be paired for stereo operation (see the stereo input channel [24] (page 17)).

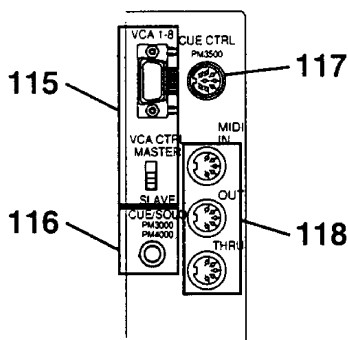
113 TALKBACK OUT

This provides a direct output from the talkback bus when the TB OUT switch [65] (page 26) is engaged. It may be used in situations where talkback is not being slated to a group, AUX send or the stereo bus, and may be used to drive a "squawk box" or headphones system for the on-stage monitoring or lighting crew, for example.

114 OSC OUT

When the OSC OUT switch [64] (page 25) is engaged, this connector will output the signal from the oscillator. A useful function for this connector would be to connect it to an input on a patchbay, where it can be readily patched through to any input in the system for rapid signal tracing.

2.2.6 Control functions



115 VCA CONTROL connector and MASTER/SLAVE switch

This allows control of another similarly-equipped console¹, or the PM3500 to be controlled by a similarly-equipped console, depending on the status of the MASTER/SLAVE switch. When in MASTER mode, the PM3500 can control another console's VCA levels, and when in SLAVE mode, the VCA levels of the PM3500 can be controlled by another unit. The pinouts for the 9-pin D-sub connector are:

Pin #	Assignment
1	VCA control 1
2	VCA control 2
3	VCA control 3
4	VCA control 4
5	VCA control 5
6	VCA control 6
7	VCA control 7
8	VCA control 8
9	Ground

116 INPUT CUE/SOLO

This allows the PM3500 to switch between CUE and SOLO modes depending on the signal received at this stereo 1/4" jack from a PM3000 or PM4000 series console. This will override the function of the local SOLO switch [26] (page 18).

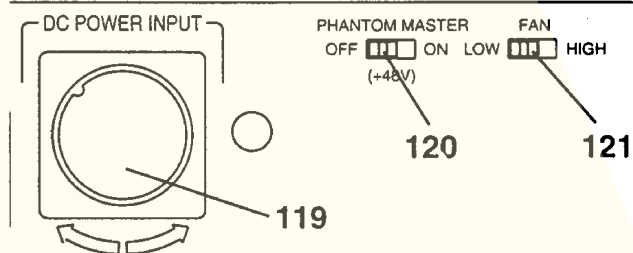
1. Such consoles are, in addition to the PM3500, the PM3000 and PM4000 series.

117 CUE CONTROL IN/OUT

This 8-pin DIN connector allows the PM3500 to transmit and receive CUE data from a similarly-equipped console.

118 MIDI IN, MIDI OUT, MIDI THRU

These connectors accept, output and pass on MIDI data respectively. The OUT terminal is also configurable as a merged OUT and THRU connector in UTILITY mode (see "MIDI Echoback" on page 58).



119 DC POWER input

This is a locking multi-pin connector which accepts power from the PW4000 power supply through the supplied 3m umbilical cable. When making the power connection to the console, mate the cable and this connector prior to hand-tightening the locking ring.

CAUTION

Never attempt to power the console from any power supply other than the PW4000, and do not use any cable other than the supplied cable for making power connections, otherwise damage to the console may result.

120 PHANTOM MASTER

This switch enables or disables the phantom powering switches on all the monaural channel modules [4] (page 11).

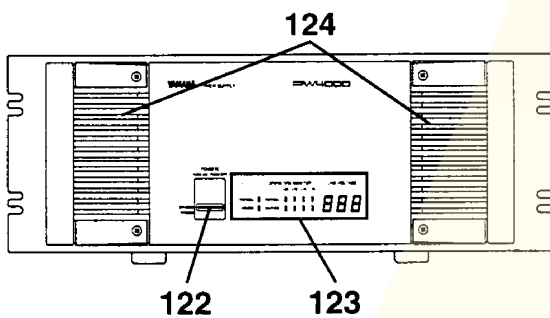
121 FAN LOW/HIGH

The PM3500 is equipped with cooling fans. In most circumstances, these may be used in the LOW position. However, if the console is being used in a warm ambient environment, or outdoors with direct sunlight falling on the front panel, it may be necessary to set this switch to HIGH. You should set this switch to the HIGH position if you feel the front panel of the console becoming hotter than usual.

NOTE

As mentioned earlier, we recommend that you turn the console OFF when it will not be in use for a prolonged period. One exception to this general rule is if the console is located in a high-humidity environment or in an environment subject to sudden temperature changes. In this case, leave the console switched on to avoid condensation, which may cause damage to internal circuitry.

2.3 The PW4000 power supply



122 POWER

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

123 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 the +48V, +12V, +19V, and -19V outputs are operating. Below that is a corresponding row of LEDs (UNUSUAL), 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 illuminates if the power supply has overheated (and has been automatically shut down), and a digital indicator displaying the AC line voltage input to the power supply.

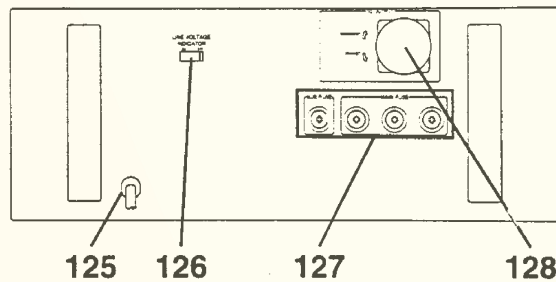
124 Grille

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 "Power supply air filters" on page 107.



125 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.

126 LINE VOLTAGE INDICATOR (Switch)

This slide switch turns the front-panel digital line voltage indicator display on or off, regardless of the position of the POWER switch.

127 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): 3 Main Fuses @ 6 A; Sub Fuse @ 3A.

NOTE

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

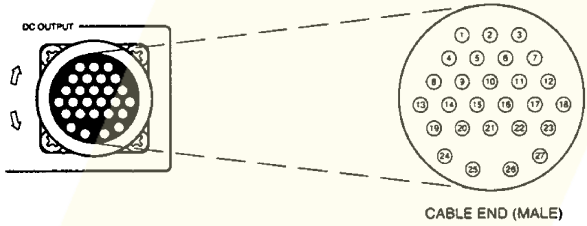
128 DC OUTPUT (umbilical connector)

This locking, multi-pin connector provides the necessary DC voltages from the PW4000 power supply to the PM3500 console. The cable must be connected correctly before attempting to operate the console. See the table below for the pin assignments to this NK-27P connector.

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.

Pin #	Function	Pin #	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	NC
12	+12V GND	26	NC
13	+19V	27	+12V
14	+ 19V		



3 Specifications

3.1 PM3500 mixing console general specifications

Total Harmonic Distortion (Master Output)	< 0.1% (THD+N)	20Hz – 20kHz @ +14dBu, 600Ω
	<0.01% (2nd to 10th harmonics)	20Hz – 20kHz @ +14dBu, 600Ω
Frequency response (Master Output)	0± ¹ / ₃ dB	20Hz – 20kHz @ +4dBu, 600Ω
Hum and Noise (20Hz – 20kHz) Rs=150Ω Input gain = Max Input PAD = OFF Input sensitivity = -70dB Hum and noise ^a (20Hz – 20kHz) 48ch	-128dB	Equivalent input noise
	-98dB	Residual output noise
	-54dB (58dB S/N)	GROUP OUT Master fader and one channel fader at nominal
	-84dB (88dB S/N)	STEREO OUT Master fader at nominal and all channel assign switches off and all group to stereo switches off
	-81dB (85dB S/N)	AUX OUT Master fader at nominal and all channel AUX mix switches off
	-92dB (96dB S/N)	MATRIX OUT Master level control at nominal and all Matrix mix controls at minimum
	-85dB (89dB S/N)	GROUP OUT Master fader at nominal and all channel assign switches off
Crosstalk	-80dB @ 1kHz, -70dB @ 10kHz	adjacent inputs
	-80dB @ 1kHz, -70dB @ 10kHz	input to output
Maximum voltage gain	74dB	CH IN to CH INSERT OUT
	90dB	CH IN to AUX OUT (pre-fader)
	100dB	CH IN to AUX OUT (post-fader)
	84dB	CH IN to MONITOR OUT (INPUT CUE)
	64dB	TALKBACK IN to TALKBACK OUT
	10dB	SUB IN to OUT
	10dB	2TR IN to MONITOR OUT
	84dB	CH IN to DIRECT OUT
	94dB	CH IN to GROUP OUT
	94dB	CH IN to STEREO OUT (CH to ST)
	104dB	CH IN to STEREO OUT (GROUP to ST)
	104dB	CH IN to MATRIX OUT (GROUP to MATRIX)
	51dB	ST CH (ST) to GROUP OUT/STEREO OUT (CH to ST)
	47dB	ST CH (ST) to AUX OUT (pre-fader)
	54dB	ST CH IN (L MONO) to GROUP OUT/STEREO OUT (CH to ST)
50dB	ST CH IN (L MONO) to AUX OUT (pre-fader)	
44dB	ST CH IN to MONITOR OUT (ST INPUT CUE)	

3–Specifications

Mono input PAD switch	30dB		
Mono input gain control	50dB variable		
Stereo input gain control	40dB variable		
VCA cue gain trim	20dB (–14dB to +6dB)		
PFL (Input cue) gain trim	20dB (–14dB to +6dB)		
Input high-pass filter	12dB/octave roll-off	below 20 – 400Hz at –3dB point	
Channel equalization ±15dB max	1kHz – 20kHz	HIGH (shelving/peaking, Q= 0.5 – 3)	
	400Hz – 8kHz	HIGH MID (peaking, Q= 0.5 – 3)	
	80Hz – 1.6kHz	LOW MID (peaking, Q= 0.5 – 3)	
	30Hz – 600Hz	LOW (shelving/peaking, Q= 0.5 – 3)	
Talkback high-pass filter	12dB/octave roll-off	80Hz at –3dB point	
Oscillator/noise	Sine wave @ 100Hz, 1kHz, 10kHz or pink noise	Sweepable from 0.2 to 2 times nominal frequency; less than 1% THD @ + 4dB output	
Phantom power	+48V DC applied to balanced inputs	via 6.8kΩ current-limiting isolation resistors. Rear-panel PHANTOM MASTER switch turns all on or off. When Master is ON, individual channels' phantom power may be switched with channels' PHANTOM switches	
Channel indicators	Built into each monaural and stereo input module (two each per stereo module)		
	PEAK	Red	Turns on when pre- or post-EQ level reaches 3dB below clip level
	NOMINAL	Orange	Turns on when post-EQ level reaches nominal level
	SIGNAL	Green	Turns on when post-EQ level reaches 20dB below nominal level
Σ Peak indicators	Red	In each GROUP, AUX and STEREO bus turns on when pre-fader level reaches 3dB below clip level	
Scene memories	Direct Recall	Memories 1 through 8	
	Switchable recall	Memories 1 through 128	
VU meters	2 large, 12 smaller	All switchable, all illuminated, with true VU ballistics	
VU meter peak indicators	In each meter (red LED)	Turns on when level reaches 3dB below clip level	

Dimensions				
Dimensions	Height		335mm (13.2in)	all models
	Depth		900mm (35.4 in)	all models
	Width		1322mm (52.0 in)	24-channel model
			1562mm (61.5in)	32-channel model
			1822mm (71.7 in)	40-channel, center master model
			2062mm (81.2 in)	48-channel, center master model
	Weight		90kg (198.4 lb)	24-channel model
			106kg (233.7 lb)	32-channel model
			124kg (273.4 lb)	40-channel, center master model
			140kg (308.6 lb)	48-channel, center master model
Supplied accessories			PW4000 power supply	
			Umbilical cable for power supply	
			Label (ST,CH)	

a. Hum and noise are measured with a 6dB/octave filter @ 12.7kHz; equivalent to a 20kHz filter with infinite dB/octave attenuation

3.2 Input characteristics

Connection	PAD	Gain Trim	Actual load impedance	For use with nominal	Input level ^a			Connector in Mixer ^b
					Sensitivity ^c	Nominal	Max. before clip	
CH IN (1 through ch#4)	0	-70	3kΩ	50Ω – 600Ω mics and 600Ω lines	-90dB (24.5μV)	-70dB (245μV)	-48dB (3.09mV)	XLR-3-31 type
	30				-60dB (775μV)	-40dB (7.75mV)	-18dB (97.6mV)	
	0	-20			-40dB (7.75mV)	-20dB (77.5mV)	+2dB (976mV)	
	30				-10dB (245mV)	+10dB (2.45V)	+32dB (30.9V)	
ST CH IN (1 – 4) [L, R]		-30	5kΩ	600Ω lines	-50dB (2.45mV)	-30dB (24.5mV)	-8dB (309mV)	XLR-3-31 type
		+10			-10dB (245mV)	+10dB (2.45V)	+32dB (30.9V)	
TALKBACK IN			3kΩ	50Ω – 600Ω mics	-70dB (245μV)	-50dB (2.45mV)	-28dB (30.9mV)	XLR-3-31 type
2TR IN (1, 2) [L,R]			10kΩ	600Ω lines	-6dB (388mV)	+4dB (1.23V)	+26dB (15.5V)	XLR-3-31 type
GROUP (1 through 8) SUB IN			10kΩ	600Ω lines	-6dB (388mV)	+4dB (1.23V)	+26dB (15.5V)	XLR-3-31 type
STEREO [L, R] SUB IN								
AUX (1 through 8) SUB IN								
MATRIX [L, R] SUB IN								
CUE [L, R] SUB IN								

3–Specifications

Connection	PAD	Gain Trim	Actual load impedance	For use with nominal	Input level ^a			Connector in Mixer ^b
					Sensitivity ^c	Nominal	Max. before clip	
CH (1 through ch#) INSERT IN			10k Ω	600 Ω lines	-16dB (123mV)	+4dB (1.23V)	+26dB (15.5V)	Phone jacks (TRS) ^e
ST CHN (1 through 4) [L, R] INSERT IN								
GROUP (1 through 8) INSERT IN								
STEREO [L, R] INSERT IN								
AUX (1 through 8) INSERT IN					-6dB (388mV)			

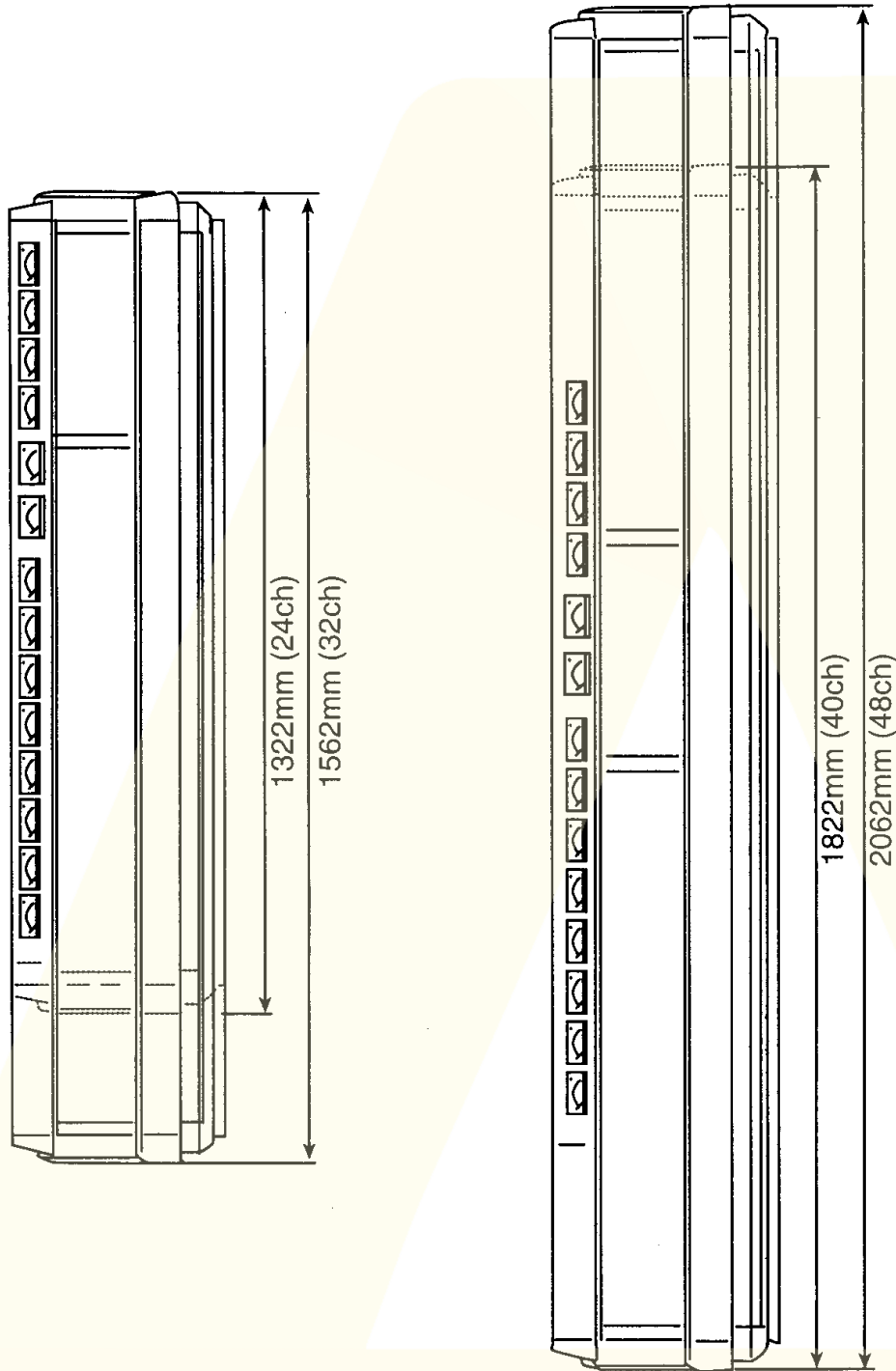
- In these specifications, when dB represents a specific voltage, 0dB is referenced to 0.775V_{rms}
- All XLR connectors are balanced
- Sensitivity is the lowest level that will produce an output of +4dB (1.23V) or the nominal output level when the unit is set to maximum level
- 24 channels, 32 channels, 40 channels or 48 channels
- All phone jacks are balanced (T=hot, R=cold, S=Gnd)

3.3 Output characteristics

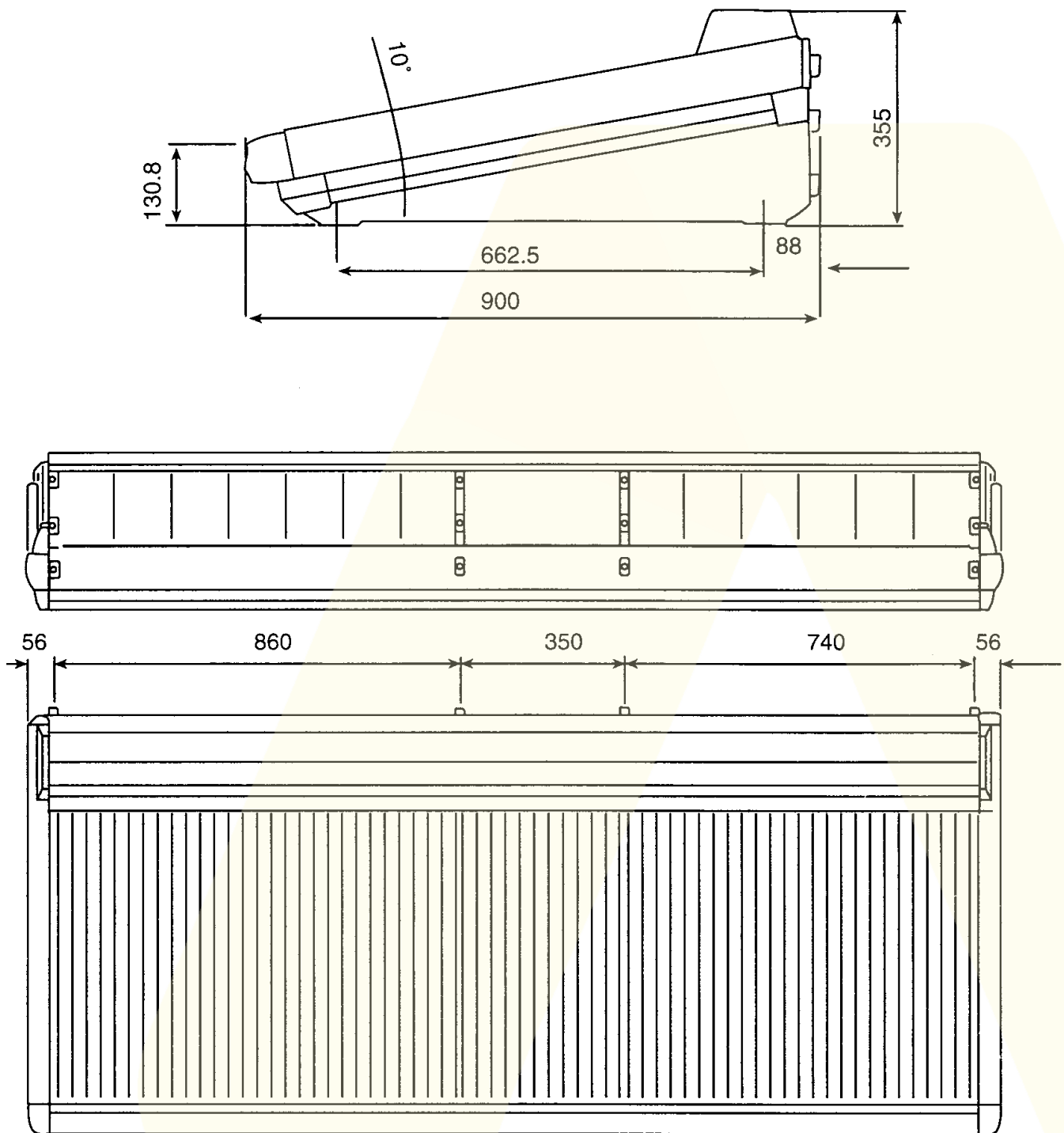
Connection	Actual Source Impedance	For use with nominal	Output level ^a		Connector in mixer
			Nominal	Max before clip	
GROUP (1 through 8) OUT STEREO [L,R] OUT AUX (1 through 8) OUT ST-MATRIX (1 through 4) [L, R] OUT MATRIX (1 through 4) OUT MONITOR (A, B) [L, R] OUT TALKBACK OUT OSC OUT	150 Ω	600 Ω lines	+4dB (1.23V)	+24dB (12.3V)	XLR-3-32 type ^b
CH DIRECT OUT (1 through ch# ^c)	150 Ω	600 Ω lines	+4dB (1.23V)	+24dB (12.3V)	Phone jack (TRS) ^d
CH (1 through ch#) INSERT OUT ST CH (1 through 4)[L, R] INSERT OUT GROUP (1 through 8) INSERT OUT STEREO [L, R] INSERT OUT AUX (1 through 8) INSERT OUT	150 Ω	10k Ω lines	+4dB (1.23V)	+24dB (12.3V)	Phone jack (TRS) ^d
PHONES (1, 2) [L, R] OUT	15 Ω	8 Ω phones	75mW	150mW	Stereo phone jack ^e
		40 Ω phones	65mW	150mW	

- In these specifications, when dB represents a specific voltage, 0dB is referenced to 0.775V_{rms}
- All XLR connectors are balanced
- 24 channels, 32 channels, 40 channels or 48 channels
- Phone jacks are balanced (T=hot, R=cold, S=Gnd)
- Stereo phone jacks are unbalanced

3.4 Dimensional drawings



3-Specifications



All dimensions in millimeters (mm)
Dimensions shown are for 48-channel center console model

3.5 Optional equipment and parts for the PM3500 console

Part description	Part number
Monaural input module	MN3500
Stereo input module	ST3500
Monaural input rear panel	MNRP3500
Stereo input rear panel	STRP3500
Group master module 1	GRM3500-1
Group master module 2	GRM3500-2
Stereo master module	STM3500
Monitor module	MON3500
Control module	CNT3500
Input transformer	IT3500
Blank module	BL3500

Contact your PM3500 supplier for details of availability of these parts.

For European Model

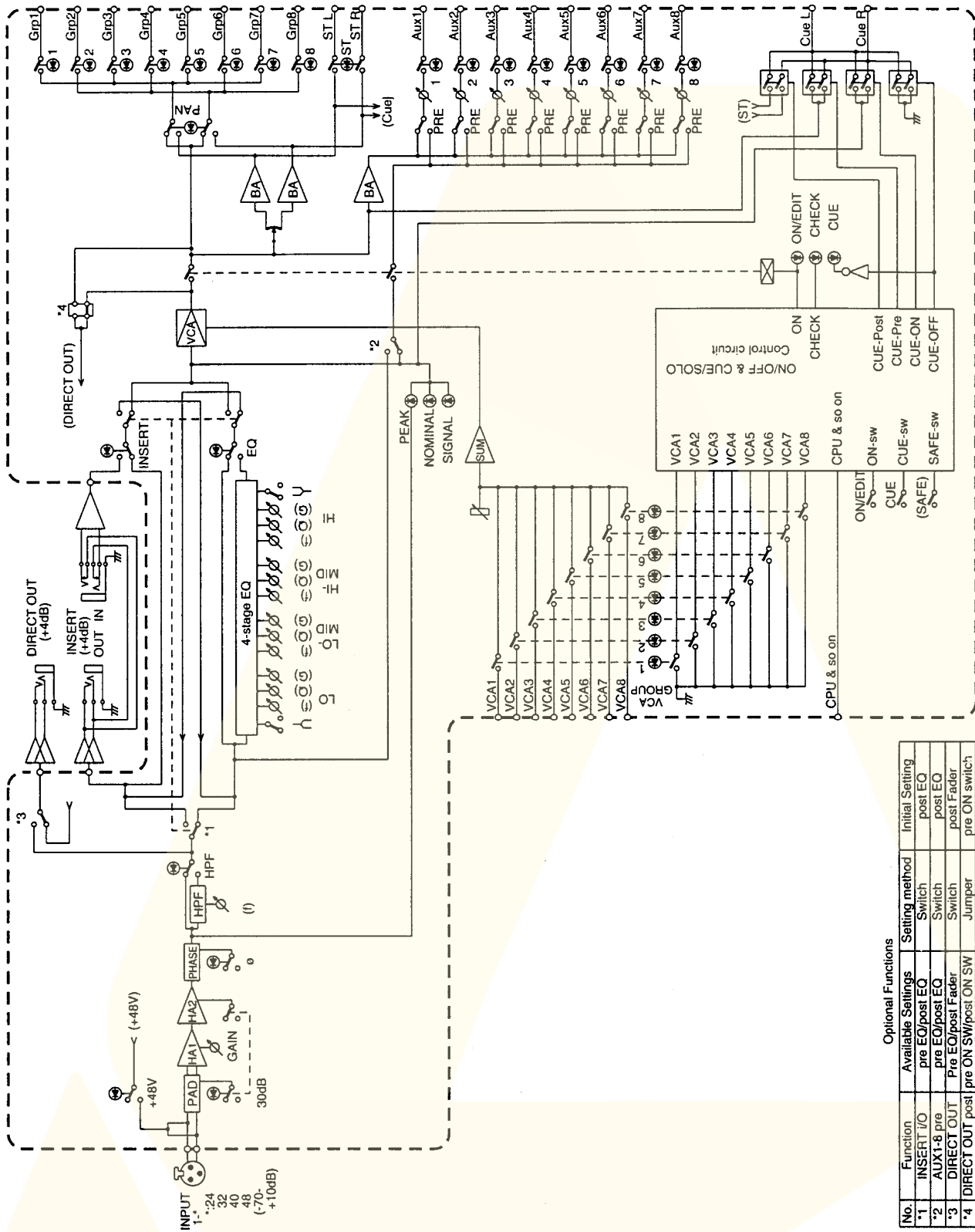
Purchaser/User Information specified in EN55103-1 and EN55103-2.

Conformed Environment: E1, E2, E3 and E4.

3-Specifications

3.6 Block diagrams

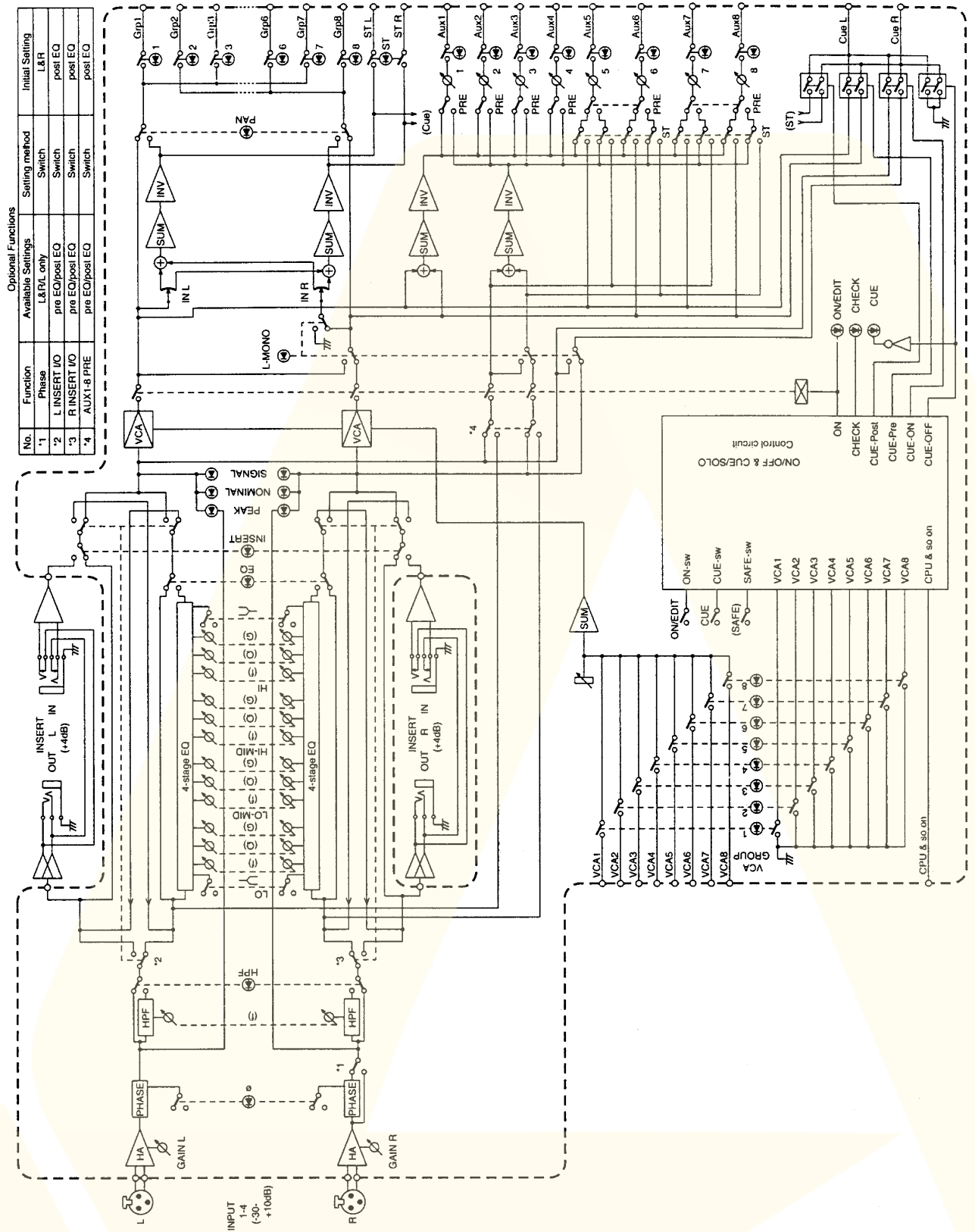
3.6.1 Input module (mono)



Optional Functions

No.	Function	Available Settings	Setting method	Initial Setting
*1	INSERT I/O	pre EQ/post EQ	Switch	post EQ
*2	AUX1-8 pre	pre EQ/post EQ	Switch	post EQ
*3	DIRECT OUT	Pre EQ/post Fader	Switch	post Fader
*4	DIRECT OUT	pre ON SW/post ON SW	Jumper	pre ON switch

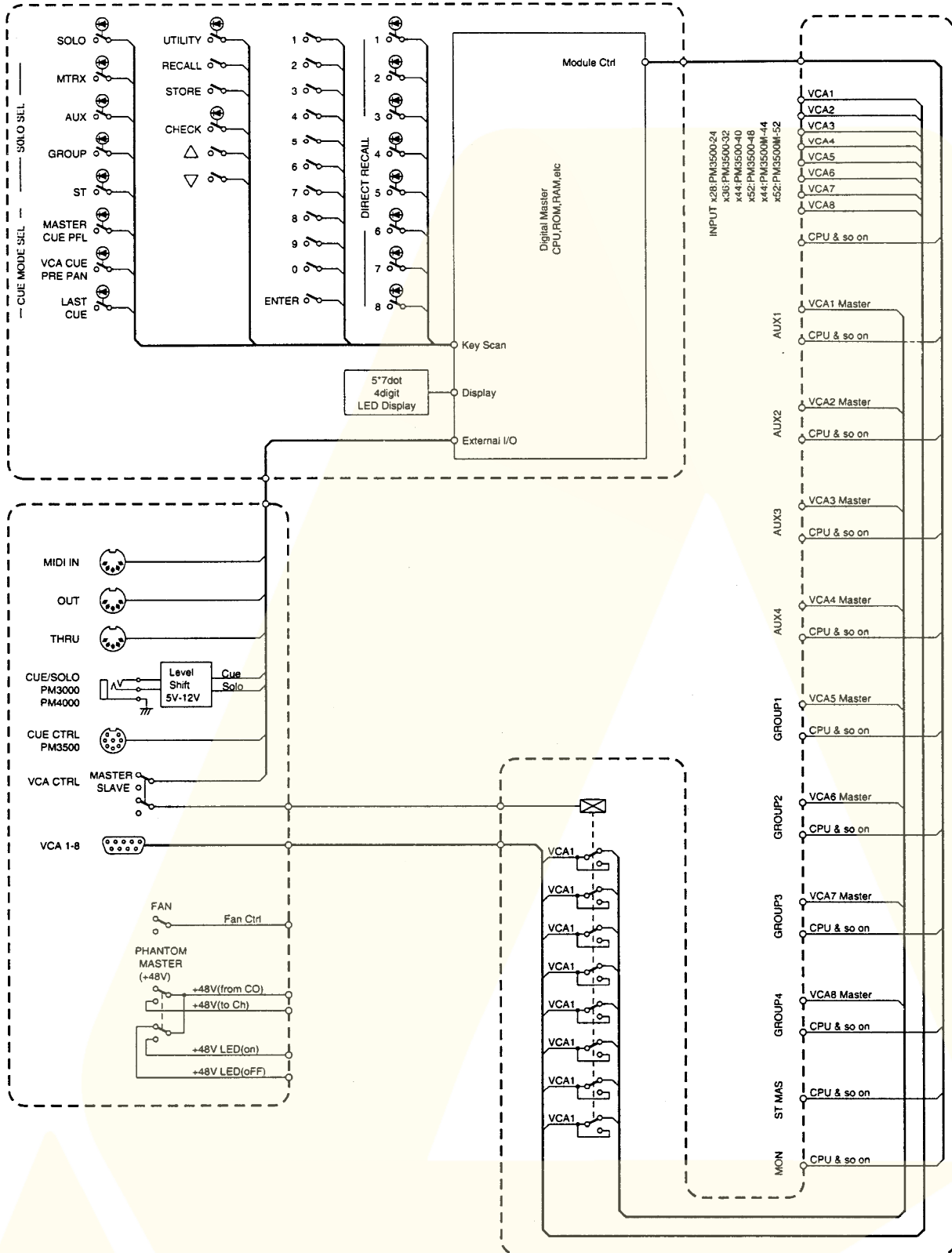
3.6.2 Input module (stereo)



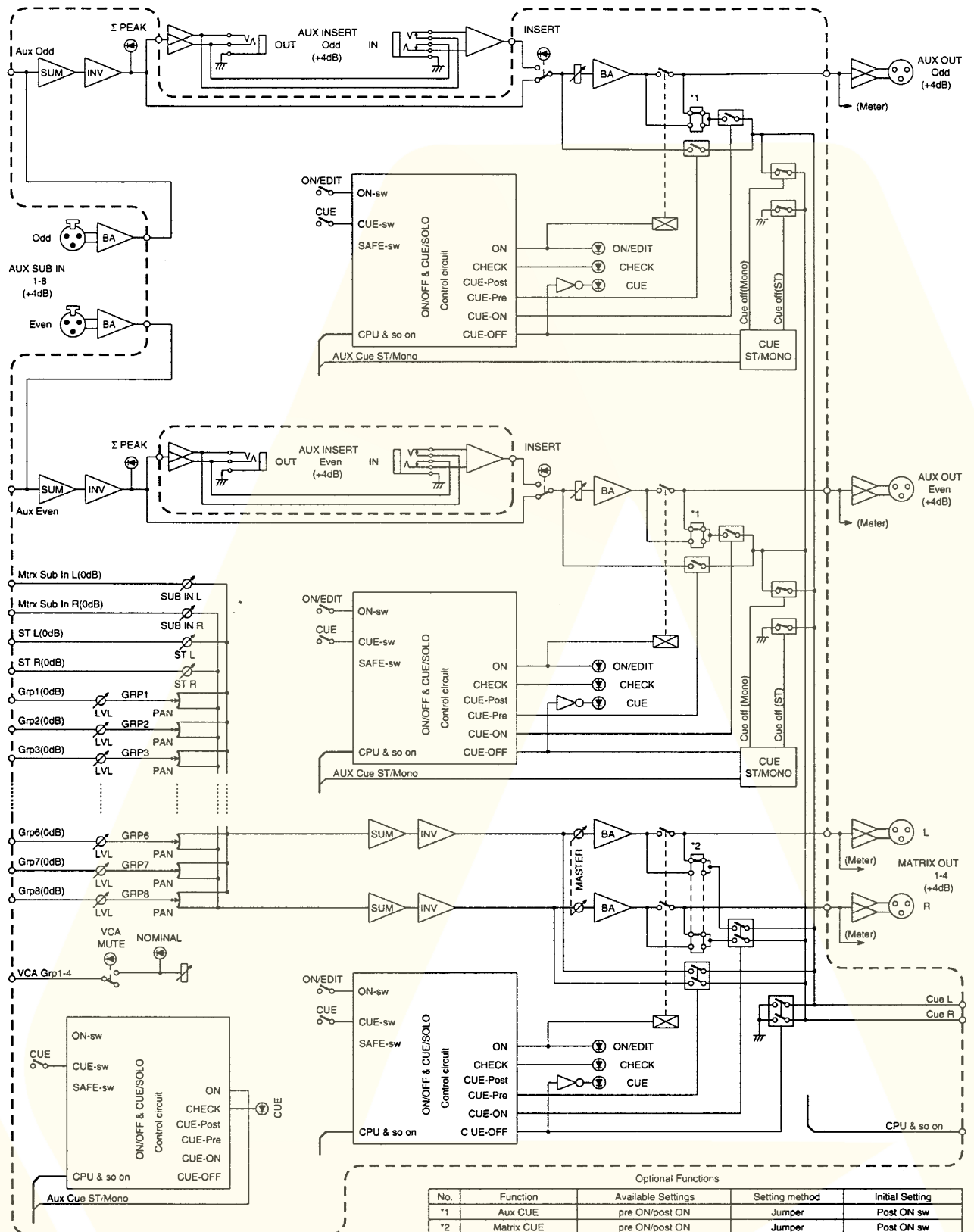
Optional Functions				
No.	Function	Available Settings	Setting method	Initial Setting
1	Phase	L&R only	Switch	L&R
2	L INSERT I/O	pre EQ/post EQ	Switch	post EQ
3	R INSERT I/O	pre EQ/post EQ	Switch	post EQ
4	AUX1-8 PRE	pre EQ/post EQ	Switch	post EQ

3-Specifications

3.6.3 SOLO and scene recall module

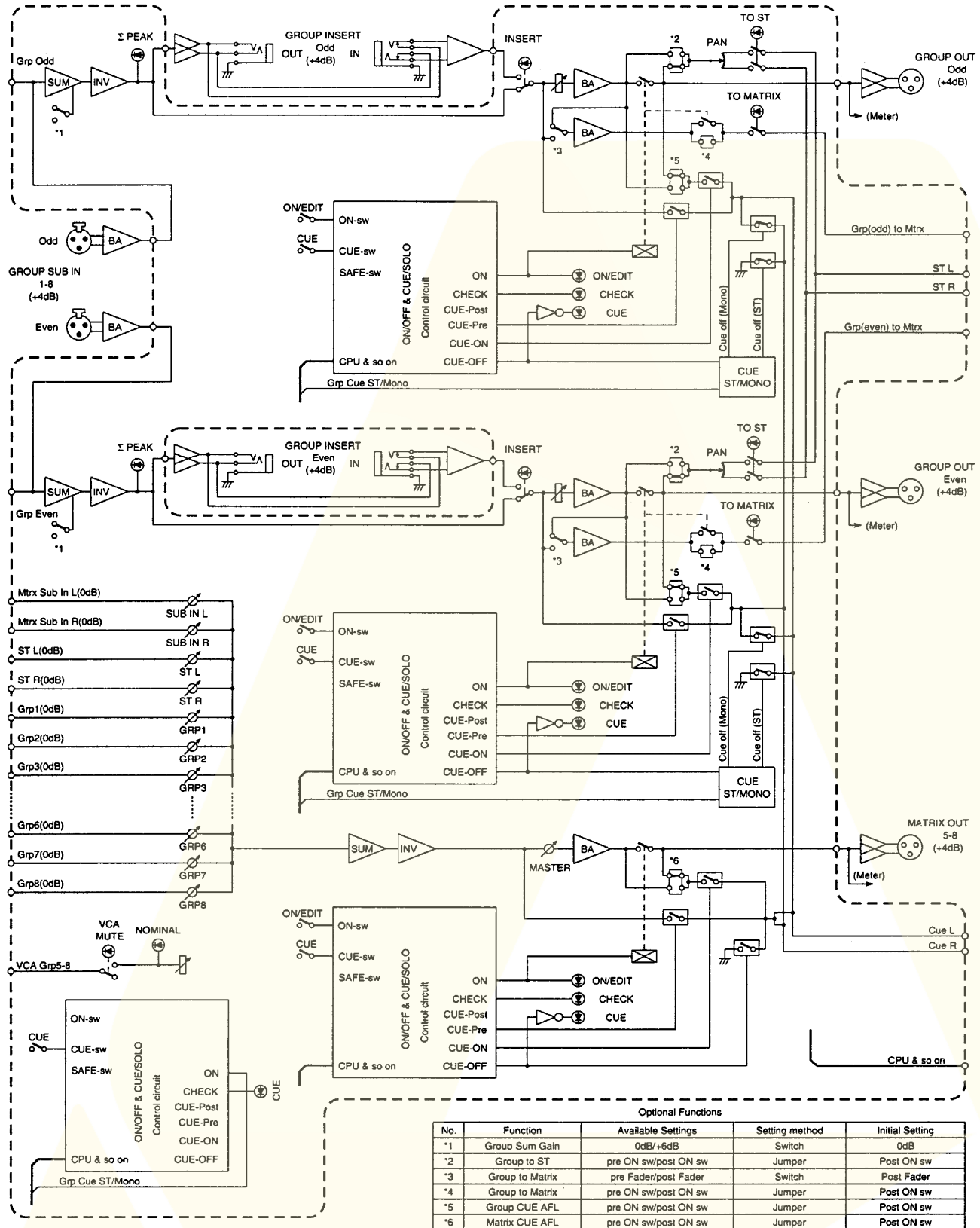


3.6.4 Group master module 1

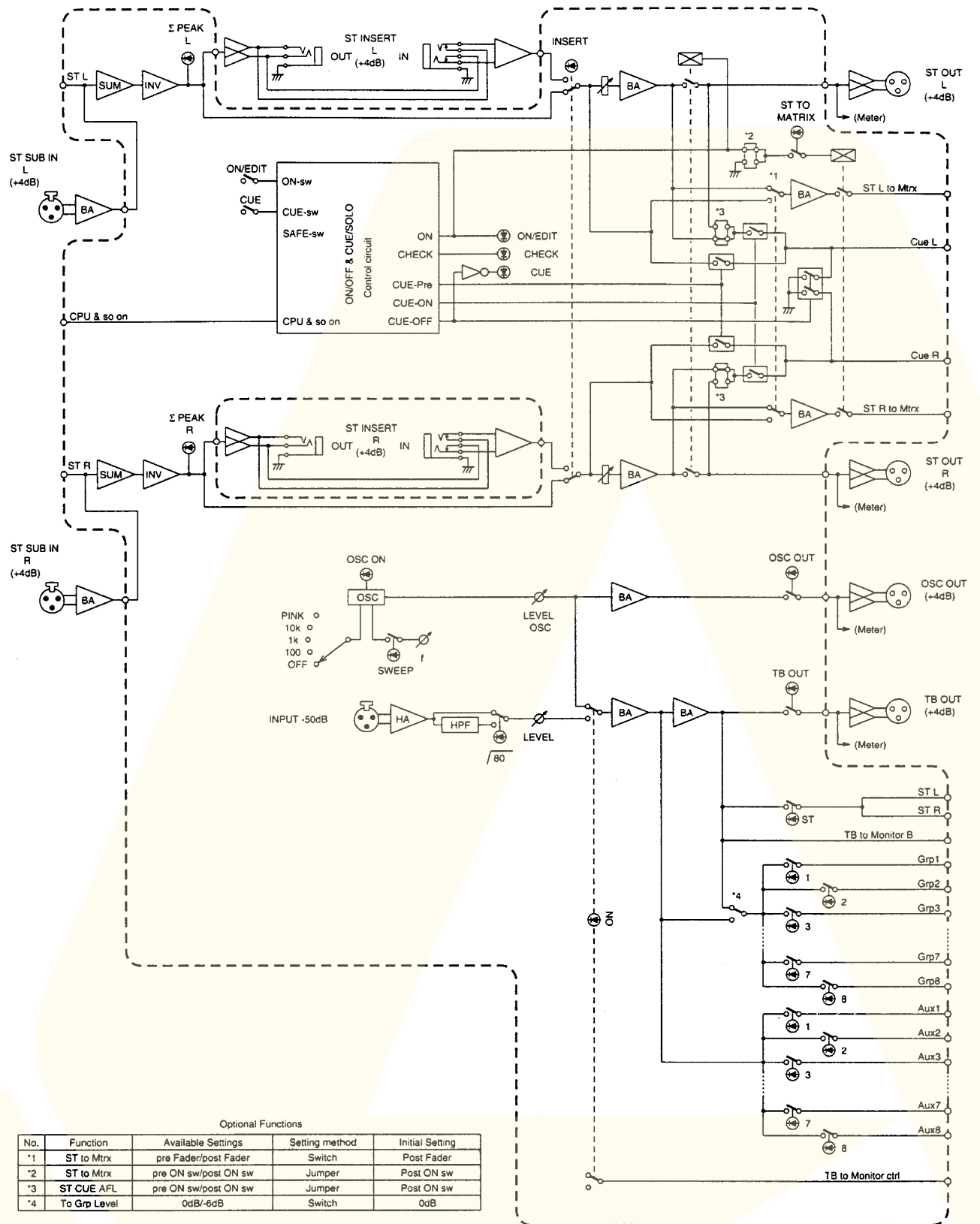


3-Specifications

3.6.5 Group master module 2



3.6.6 Stereo master module

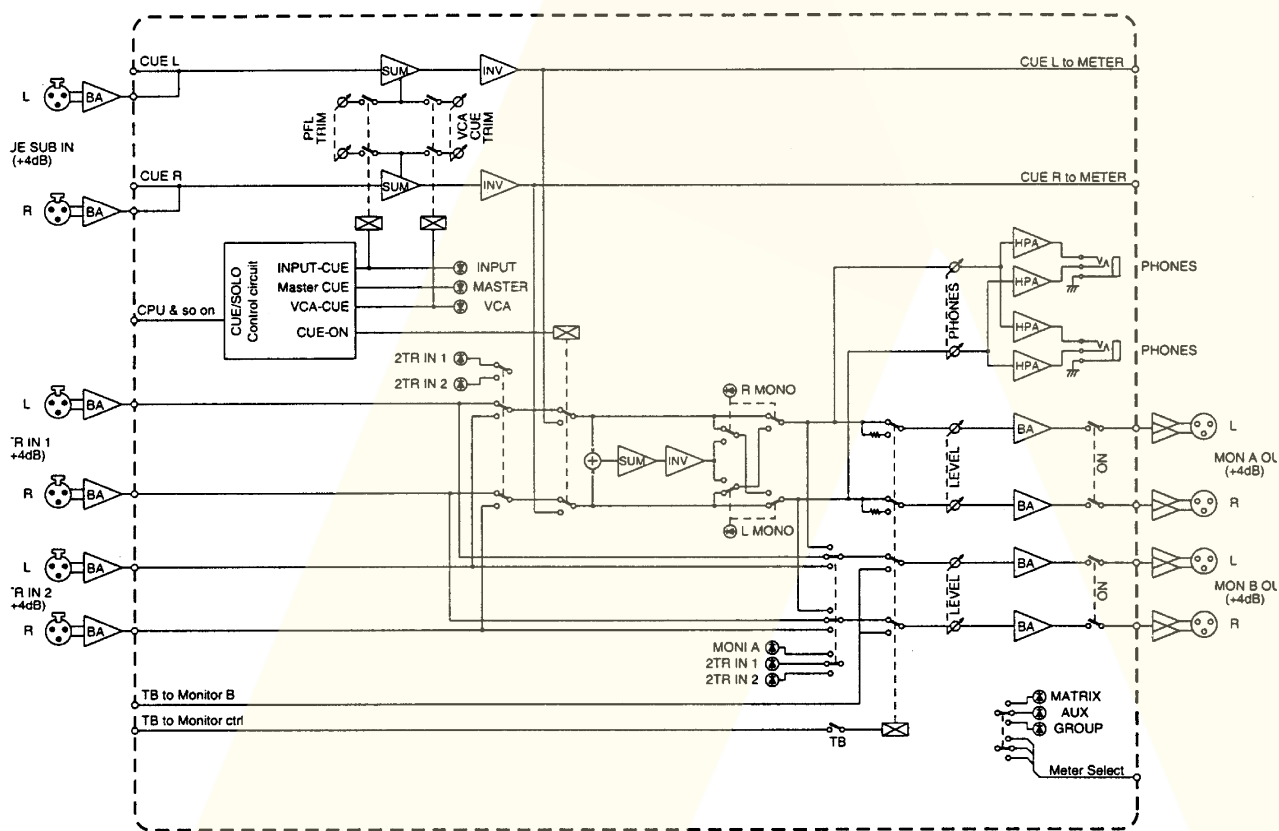


Optional Functions

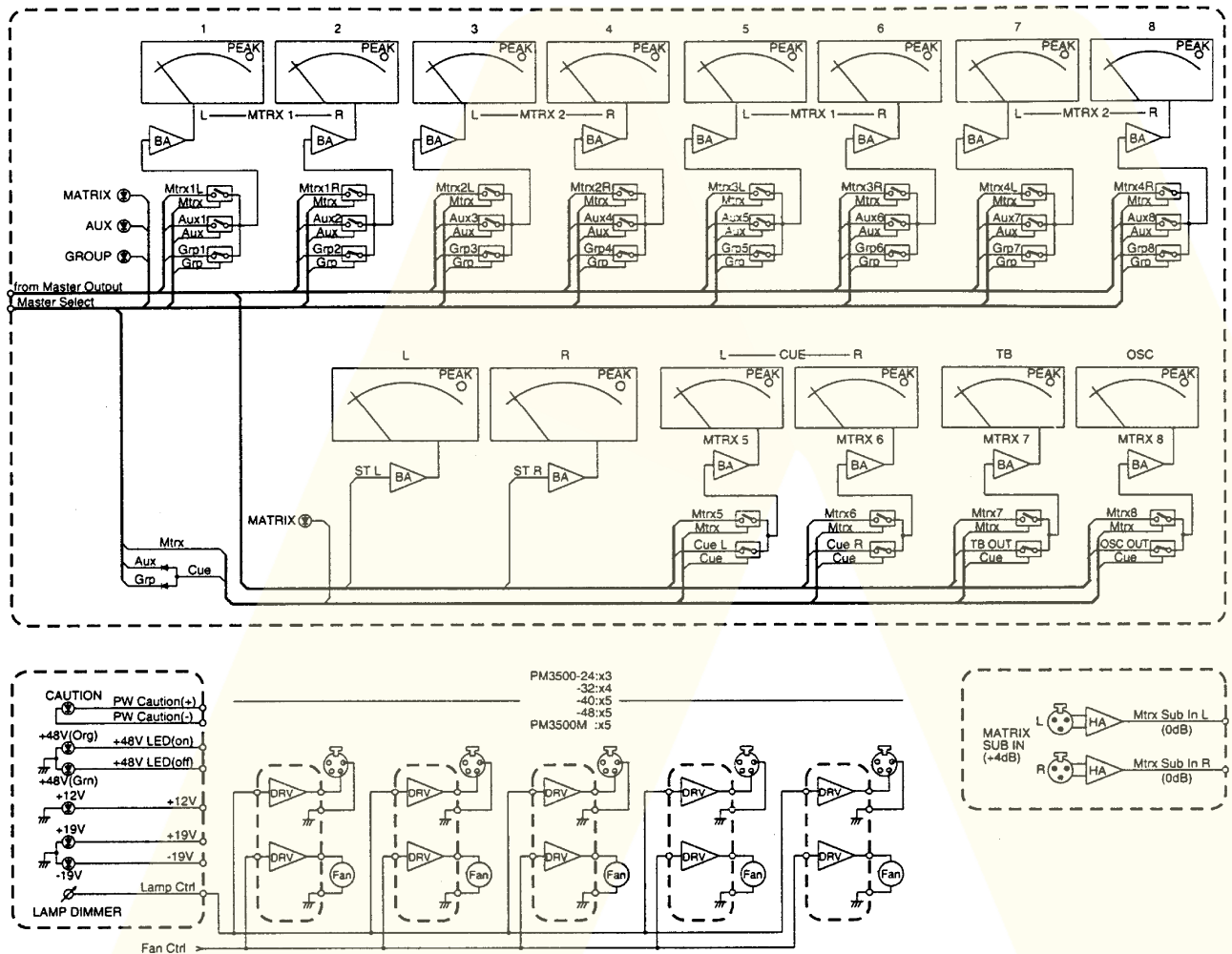
No.	Function	Available Settings	Setting method	Initial Setting
*1	ST to Mtrix	pre Fader/post Fader	Switch	Post Fader
*2	ST to Mtrix	pre ON sw/post ON sw	Jumper	Post ON sw
*3	ST CUE AFL	pre ON sw/post ON sw	Jumper	Post ON sw
*4	To Grp Level	0dB/-6dB	Switch	0dB

3-Specifications

3.6.7 Monitor module



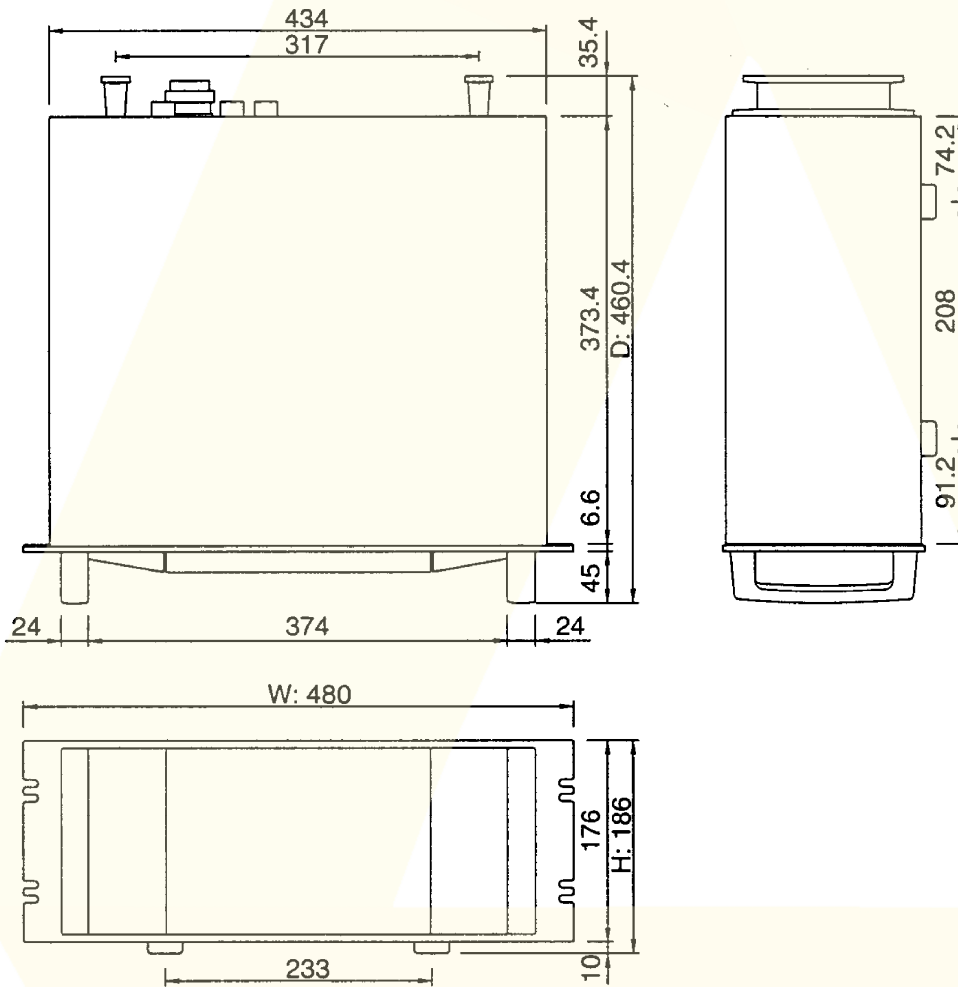
3.6.8 Meter bridge



3-Specifications

3.7 PW4000 power supply specifications

Power requirements	120V 60Hz 1500VA 1250W	CSA/UL model
	240V 50Hz 1250W	BS model
	230V 50Hz 1250W	General model
Dimensions		
Height	186mm (7.3 in)	
Depth	461mm (18.1 in)	
Width	480mm (18.9 in)	
Weight	36kg (79.4lb)	
Secondary outputs	±19V	13A
	+12V	8A
	+48V	0.7A



All dimensions in millimeters (mm)