YAMAHA CORPORATION
P.O.BOX 1, Hamamatsu Japan
www.yamahaproaudio.com

1972 PM200
1974 PM1CCC
1978 PM2000
1985 PM3000
1987 DMP7
1988 DMP7D DMP11
1987 PM1800
1990 DMR8 DMC1000
1988 PM2800
1993 DMP9-8 DMP9-16
1989 PM1200
1994 ProgrammableMix 01
1995 02R
1992 PM4000
1997 03D
1995 PM3500
1998 01V
2000 PM1D
2002 DM2000 02R96
2003 PM5000
2003 DM1000 01V96

30th Anniversary
PM consoles since 1972

15th Anniversary
Digital consoles since 1987

30th Anniversary
Mix With the Best
PM Consoles since 1972
Digital Consoles since 1987

YAMAHA
CREATING 'KANDO' TOGETHER
'Kando'... inspiring the heat and soul

LPA475 Printed in Japan

30th 15th Anniversary
Mix With the Best
PM Consoles since 1972
Digital Consoles since 1987

MIXING CONSOLE

PM 5000

YAMAHA
CREATING 'KANDO' TOGETHER
'Kando'... inspiring the heat and soul

The Best Gets Even Better

In the 30 years or so that have elapsed since the field of "sound reinforcement" began to emerge from the simple PA systems that were the norm throughout the 60's and early 70's, Yamaha has made significant strides forward perfection. When the very first PM console was introduced way back in '72, it was a front-line contender in the field, with superior performance and features.

The same could be said of the PM1000, then the PM2000 … right up to the PM4000 which has become the de-facto industry standard.

Each new model in the PM series has traditionally built upon and augmented the strengths of its predecessor, adding new features and functionality that became the templates that others would follow – the matrix mix system introduced on the PM1000 and the PM3000's VCAs are perfect examples.

In a sense Yamaha has led the field of modern console design and production all the way.

The same can be said of the incredible PM1D all-digital console, which has essentially defined the role of digital technology in sound reinforcement for the foreseeable future.

The evolution continues to this day.

The PM5000 is simply the most advanced analog sound reinforcement console in its class. It is a "pure analog" console in the audio sense, and it borrows freely from the world of digital technology to give you unprecedented control flexibility and efficiency.

The PM5000 is the culmination of Yamaha's extensive experience and expertise in many areas – professional console design and production, control interface design, and of course sound itself. There's really only one choice if you need the best in terms of capacity, versatility, reliability and, most importantly, unmatched sound quality: the Yamaha PM5000.

PM5000-52C (Center master)
PM5000-36 (Right master)
PM5000-28 (Right master)

The Basics …

Advanced Features That Set the PM5000 Apart

If you're familiar with the industry-standard PM4000 console, you'll feel right at home with the PM5000.

All the features that you want and need are still there, but with some significant improvements.

The basic control layout has been retained, with a few modifications to accommodate the PM5000's new features.

Great emphasis has been placed on the tactile aspects of the PM5000 interface to ensure the smoothest, most efficient possible operation.

This section covers some of the innovations that can take your mixes to the next level.

Analog Evolution Continues – Advanced Circuitry and Sound

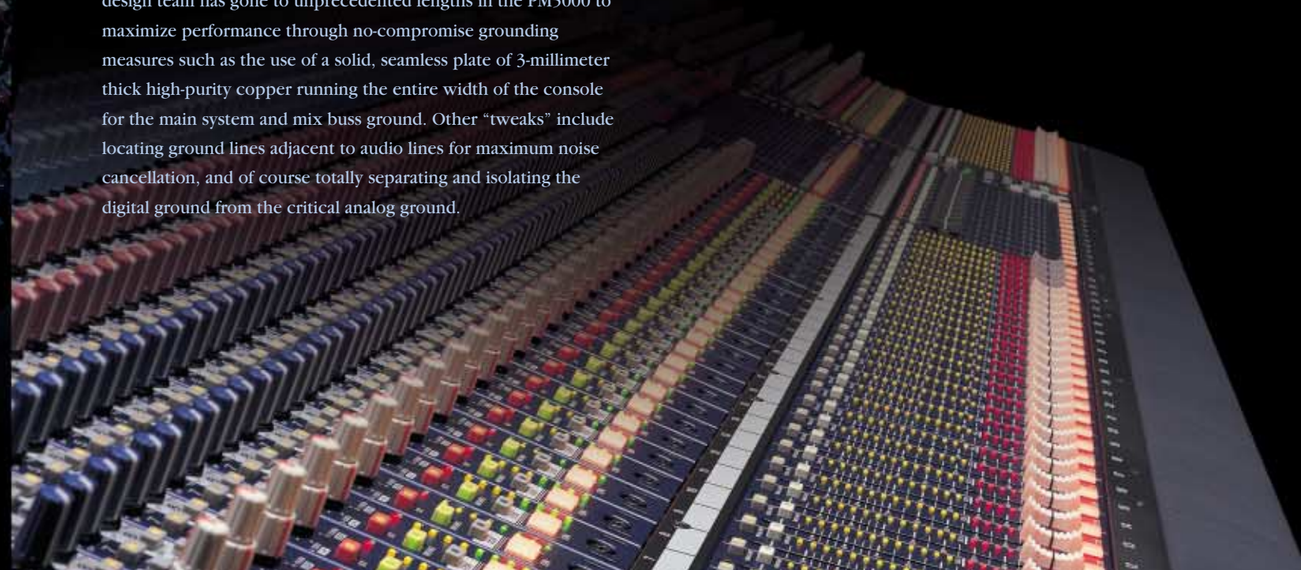
The PM5000 takes full advantage of the latest analog technology – both in terms of the devices and components used and the way in which they are used in refined new circuitry – to deliver unprecedented sonic quality. But achieving such performance is not easy, because there are no simple equations that describe the way a circuit will sound once it is built. It's a process of trial and error – build, test, listen, and repeat until the sound is right. This is both technology and art.

Thorough Grounding Measures for Maximum Performance

In a console the size of the PM5000 grounding is critical – and not only to minimize hum and noise. Proper grounding can mean the difference between merely "good" and "great" sound. The PM design team has gone to unprecedented lengths in the PM5000 to maximize performance through no-compromise grounding measures such as the use of a solid, seamless plate of 3-millimeter thick high-purity copper running the entire width of the console for the main system and mix buss ground. Other "tweaks" include locating ground lines adjacent to audio lines for maximum noise cancellation, and of course totally separating and isolating the digital ground from the critical analog ground.

Top-performance Head Amplifiers

It's safe to say that an overwhelming portion of the sound quality of any console is determined by its head amplifiers. It is here that the greatest amount of gain is applied, and it is therefore this stage that has the greatest potential to degrade the delicate audio signals it must handle. Special care and attention was given to head amp design in the PM5000. The approach was to simplify the circuitry as much as possible in order to minimize signal deterioration, and use the finest parts available throughout. The results are audible – you won't hear anything but the input signal, with every delicate nuance fully intact.



35-bus Configuration for FOH and Monitor Applications

The 35 buses that make up this extraordinarily versatile configuration include 12 STEREO Auxiliary buses, 8 GROUP/Auxiliary buses, a stereo buss, and mono (center) bus. The 8 GROUP/Auxiliary buses can be switched for group or auxiliary operation in pairs. Whether configured as 12 STEREO and 8 GROUP buses for FOH operation, or as 32 (12 STEREO + 8 MONO) Auxiliary buses for monitor applications, you get total convenience, quality, and control. When set up as group buses you can select either the input-channel pre- or post-pan signal as the source. And since the STEREO Auxiliary master sections feature L+R switches, they can be used as mono sends, as required.

12 VCA GROUPS and 12 (4 STEREO + 8 MONO) Mix Matrix

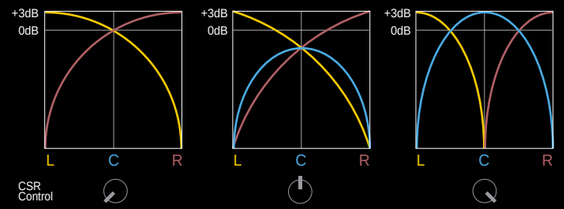
Another Yamaha innovation that has been expanded in the PM5000 is VCA grouping. 12 VCA Group switches next to each channel fader enable that channel to be assigned to and controlled by one or more of the console's full-length VCA Master Faders. The VCA Master Faders control the assigned input channels directly as well as the related post-fader auxiliary send levels. And, of course, the PM5000 employs the finest VCAs available for utterly transparent control with no degradation in signal-to-noise performance. There is also a 4 STEREO + 8 MONO matrix mix section for all 35 buses. In mono terms you have a total of 16 possible matrix sub-mixes for large system applications.

Variable Sum Gain Controls

Previously, when overload or clipping occurred at a console's summing amplifiers – prior to the master faders on all buses – it was necessary to adjust the input channel fader and/or head amplifier levels of all related channels. Yamaha's new SUM GAIN control provides variable 0 through 20dB attenuation immediately prior to the corresponding summing amplifiers, eliminating the need to readjust numerous channel level settings. Another advantage of this feature is that optimum input levels can be maintained for peak sonic performance.

Standard L-R or L-C-R Panning with Center-Side Ratio Control

Even the PM5000's main STEREO and MONO buses can be used in more than one way. All mono input channels can be assigned to the STEREO master bus with normal L-R panning and/or the MONO master bus. They can also be assigned for L-C-R panning using the MONO bus as the "C" bus. When L-C-R panning is engaged the CSR (Center-Side Ratio) control can be used to adjust the L-C-R panning curve for optimum positioning of sound in any venue.



Refined EQ Response

The PM5000's 4-band fully-parametric channel equalizers have been refined and updated to provide the kind of warm, natural response today's engineers prefer. The eminently "musical" response of these equalizers means you achieve the sound you want easily without harshness or "edginess".

Advanced Control Capabilities …

Digital Technology Where It Really Shines

Although the PM5000 is a fully analog console in all audio-related areas, digital technology provides some profound advantages for control. So in a sense the PM5000 is a hybrid, giving you the finest analog audio performance and features combined with state-of-the-art digital control – much of which was created for and proven in the PM1D digital console – for a truly refined mixing experience.

Digital Scene Storage & Recall

While handling all audio signals in the analog domain, the PM5000 offers advanced digital scene recall capability to handle today's varied and often complex entertainment requirements. Recallable parameters include channel ON/OFF switching, assignments, and fader positions (see chart below). Up to 990 complete scenes – with user-assigned titles – can be stored in the PM5000's on-board memory. And because motor faders, illuminated switches and LED indicators immediately respond to the recalled parameters, console status can be visually confirmed in an instant. The RECALL SAFE function that has proven to be a valuable feature on the all-digital PM1D has also been included in the PM5000 scene recall system.

Scene Storage / Recall Parameter

section	category	parameter	safe key
Channel	Input	LEVEL (fader) ON TO ST (STEREO bus assign) TO MONO (MONO bus assign) LCR assign (MONO ch only) STEREO AUX bus assign GROUP AUX bus assign VCA GROUP assign MUTE GROUP assign FADE TIME assign	FADER SAFE RECALL SAFE No Recall / Fader Safe Applicable
Master	STEREO AUX	ON	RECALL SAFE
	GROUP/AUX	ON STEREO bus assign MONO bus assign	
	STEREO	ON	
	MONO (C)	ON	
	STEREO MATRIX	ON	
	MATRIX	ON	
VCA		MASTER (fader) MUTE	FADER SAFE
		FADE TIME assign	No Recall / Fader Safe Applicable
Others		Title FADE TIME	No Recall / Fader Safe Applicable

External Memory for Extra Capacity & Data Portability

In addition to the 990-scene on-board memory, PM5000 scenes can be saved to plug-in compact flash memory modules. In addition to providing unlimited storage capacity, this also means that scene data can be easily transferred from console to console.

Motor Faders

The PM5000 features high-performance motor faders on all input channels and VCA masters for instant scene level recall – recall a scene from the PM5000's scene memory and the faders are right where they're supposed to be. A single engineer can now make full-board level changes by simply pressing a button – and get the levels right every time.

MIDI Automation Control

MIDI program change messages can be used for scene recall. If you need more than basic scene automation, MIDI control change messages can be used to control fader settings and all other scene parameters in real time.

GPI Control

A D-Sub25 Pin connector provides 8 control outputs for fader start/stop control of external playback or recording devices, as well as scene recall. Three control inputs are provided for scene memory increment and decrement, plus talkback switching.

Comprehensive Software Implementation

The PM5000's digital features go way beyond simple scene storage and recall, Utility functions let you specify how individual channels and the overall console will function in quite fine detail. There are also plenty of "safety" features to prevent accidents during a performance – recall safe, fader safe, mute safe, solo safe, memory protection, lock, and more.

There's even a preview function that lets you check and edit scenes before actually recalling a scene. Monitor time alignment is made easy by a built in DSP delay stage that can be programmed in time, feet, or meter units

Overall Hardware Configuration

The PM5000 modules are housed in a specially-designed hardened-aluminum chassis that provides optimum strength and durability that will handle even the toughest touring conditions. A unique and very useful feature of the PM5000 design is that MONO and STEREO modules are freely interchangeable. You can place your MONO and STEREO modules wherever you want them for optimum operating convenience in your application. You can also add STEREO modules to increase the number of inputs available: in the 52-channel frame, for example, it is possible to install 32 MONO and 20 STEREO modules for a total of 72 inputs. MONO module pairs can be replaced with STEREO module pairs at the time of order.

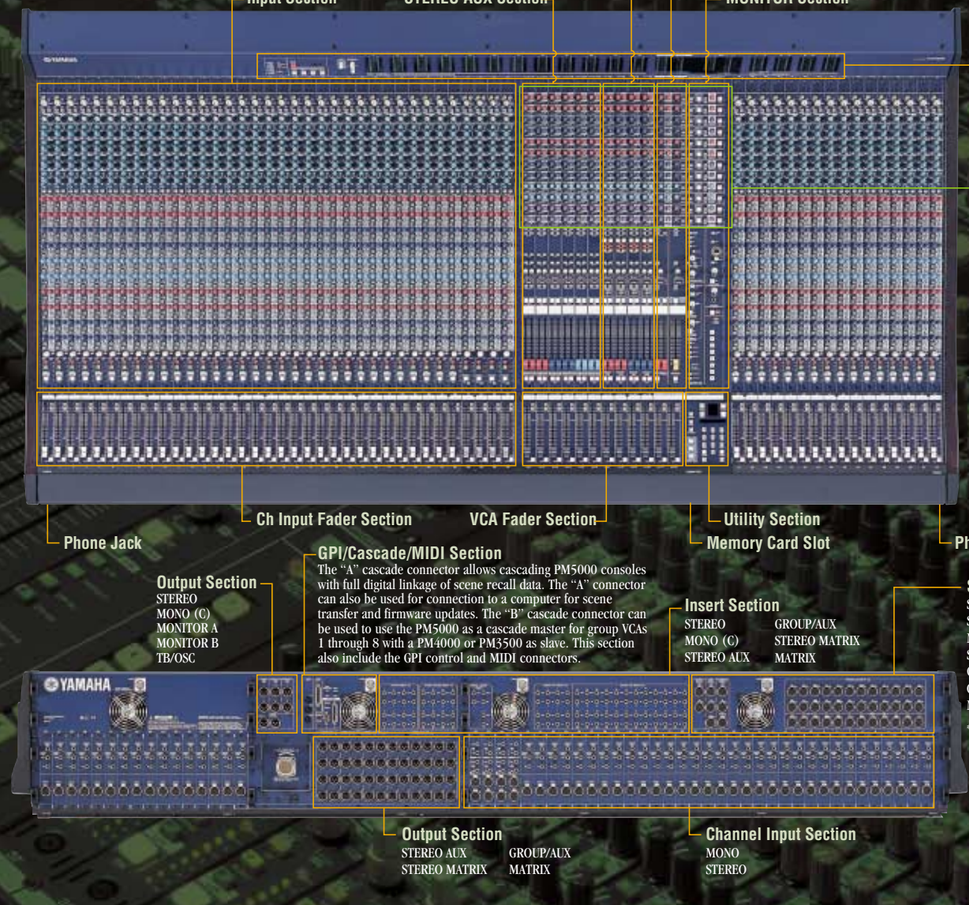
MODEL	Standard Configuration		Possible max. number of Inputs when additional ST modules installed.
	MONO INPUT	ST INPUT	
PM5000-52C	48 modules	4 modules	72ch (32MONO+20ST)
PM5000-36	32 modules	4 modules	72ch (36ST)
PM5000-28	24 modules	4 modules	56ch (28ST)

All operational "details" such as knob size, spacing, and feel, have been refined to maximize control smoothness and efficiency.

The control layout is color-coded and arranged according to signal flow for efficient operation, as well as positive visual confirmation of overall console status. Exhaustive evaluation tests were carried out in actual in-use conditions to determine the optimum color schemes and control positioning. Comprehensive use of illuminated switches and LED indicators also enhances the interface design and functionality. And thanks to a number of control interface refinements the PM5000's numerous controls are comfortably organized in a surprisingly compact design. The are also a few extra control interface enhancements that make this console pure joy to operate – such as a dimmer control that can be used to adjust the brightness of all console indicators for optimum visibility under any lighting conditions.

As always, Yamaha has gone to great lengths to deliver maximum reliability under any conditions. One example is the use of gold-clad contacts in all audio switches, achieving three to five times greater operational reliability compared to conventional switches.

PM5000-52C



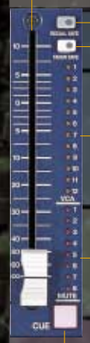
High-reliability Power Supply

The dedicated PW5000 power supply unit delivers clean, plentiful power to the PM5000's analog circuitry via a high-performance transformer-based system. The digital control and switching relay circuitry is powered by a high-efficiency switching power supply system. Operating efficiency has been significantly increased, operating temperature range has been dramatically enhanced, and overall weight has been reduced. A low-speed fan achieves superior cooling efficiency for stable, reliable operation even under normally difficult conditions. Furthermore, two power supply units can be coupled for failsafe switchover operation without the need for an external switching unit.

PW5000

Motorized Channel Fader

These full-length motor faders are of the finest quality for exceptionally smooth operation and reliability.
12 VCA assignment indicators and 8 MUTE indicators are located next to the corresponding faders.



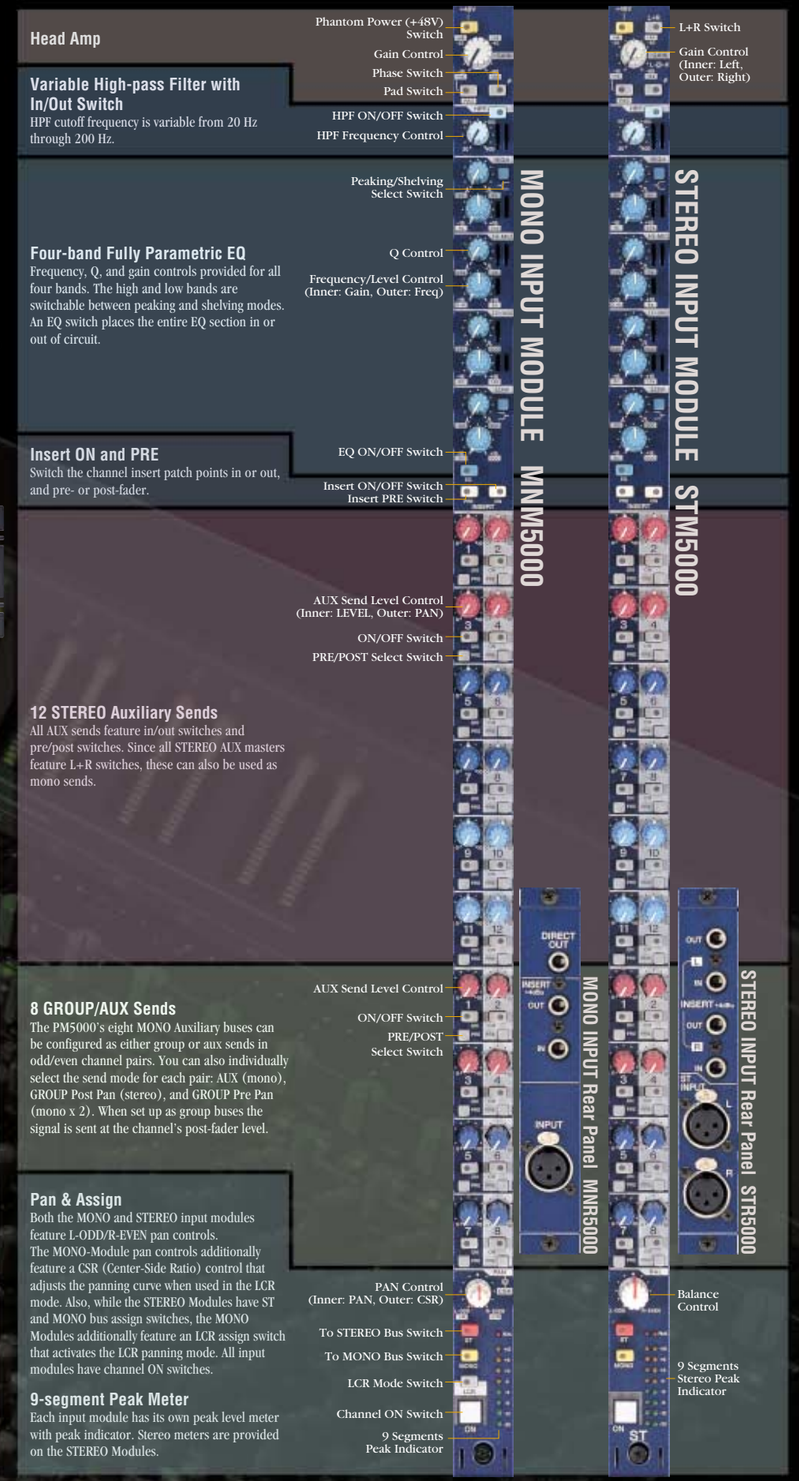
Recall Safe & Fader Safe

The channel faders have RECALL SAFE and FADER SAFE switches for extra scene-recall control and security. The RECALL SAFE switches disengage total scene recall for the corresponding channel, while the FADER SAFE switches disengage recall of only the fader position data. A utility function allows the user to specify whether "mute safe" is included in the RECALL SAFE function.

Multi-function Cue Switch

All channel and VCA faders feature CUE switches that have three auxiliary functions that can be selected via the utility section Assign Mode parameter: VCA on/off, mute, and auto-fade assign. Of course, they function as CUE during normal live operation.

CUE switches on channel faders also engage solo monitoring when the console's solo mode is on.



4 STEREO + 8 MONO Matrix

Yamaha's mix matrix system is one of the features that have made PM-series consoles the first choice for sophisticated sound-reinforcement applications. Wherever you might need submixes – to create stage monitor mixes, to feed different speaker zones, to create separate local and remote feeds, or to make separate mono and stereo mixes from a single subgroup – the mix matrix will prove invaluable. The PM5000 matrix allows any of the console's Auxiliary and/or Group bus signals to be mixed to up to 12 different sub-mixes – eight mono and four stereo. STEREO Matrix mixes 1 through 4 can be switched for mono or stereo operation. Matrix channels also accept direct stereo sub-input from a rear panel connector.

STEREO Matrix

Matrix 1 – 8

STEREO Matrix Send Level Control

Matrix Send Level Control

STEREO AUX MASTER MODULE SAM5000

GA (GROUP/AUX) MASTER MODULE GAM5000

Stereo Matrix Send Level Control (Inner: Level, Outer: Pan)

STEREO Matrix Send Level Control

SUB IN Send Level Control

Σ - Peak Indicator

Talkback/ Oscillator Switch

STEREO/MONO MASTER MODULE SMM5000

MONO Matrix Send Level Control

MONO Mode Indicator

Insert Switch

ON Switch

Cue Switch

STEREO Matrix Master Level Control

Recall Safe Switch

MONO Matrix Master Level Control

MONITOR MODULE MON5000

TO MATRIX Switch

All AUX channels have TO MATRIX switches that assign the corresponding aux bus signal to the mix matrix.

TO MATRIX Switch

TB/OSC Switch

Engages or defeats the talkback/oscillator signal for the corresponding aux bus.

TB/OSC Switch

TB/OSC Switch

L+R Switch

Sums the L and R channel signals to mono.

L + R Switch

INSERT Switch

Engages or bypasses the bus insert patch points.

Insert Switch

Insert Switch

SUM GAIN Control

Can be used to compensate for excessive signals levels at the summing amplifiers of each bus without having to readjust all channel faders assigned to the group. Sum-peak indicators provided a clear visual indication of sum overload, which can then be easily compensated for by using the corresponding SUM GAIN controls.

SUM GAIN Control

SUM GAIN Control

Σ - Peak Indicator

Recall Safe Switch

Recall Safe Switch

RECALL SAFE Switch

Disengages scene recall for the corresponding module. A utility function allows mute safe to be included or excluded from the recall safe function.

ON/OFF Switch

ON/OFF Switch

ON/OFF Switch

Master Faders

The 12 STEREO send master faders and 8 MONO GROUP/AUX master faders are full-length types. The stereo faders control both channels of the corresponding stereo signal.

STEREO AUX Master Fader

GROUP/AUX Master Fader

STEREO Master Fader

MONO Master Fader

ST AUX

GROUP/ AUX

STEREO

MONO

CUE Switch

CUE Switch

PAN Control

TO STEREO Switch

TO MONO Switch

GROUP/AUX Bus Mode Indicators

This group of indicators indicates the current mode of the corresponding group/auxiliary bus: GROUP POST PAN, GROUP PRE PAN, or AUX. The mode can be set individually for each odd/even-channel pair. This function can be set via the utility mode.

TO MATRIX Switch

Oscillator

The PM5000's versatile oscillator offers many of the features of expensive outboard oscillator units: pink noise in addition to 10k, 1k, and 100 Hz sine waves. When the sine wave SWEEP function is ON the frequency can be continuously varied from x0.2 to x2. When the pink noise BURST function is ON, 200-millisecond pink noise bursts are generated with variable spacing.

FRQ./PINK Switch (PINK: Pink Noise, 10k: 10kHz, 1k: 1kHz, 100: 100Hz)

Oscillator ON Switch

SWEEP/INTERVAL Control

SWEEP/BURST Switch

Oscillator LEVEL Control

INPUT CUE TRIM Control

VCA CUE TRIM Control

Monitor

Comprehensive controls for easy, efficient monitoring of all console signals. Two monitor outs – A and B – are provided. There's even a monitor time alignment function that allows application of a delay to the monitor signal via an internal DSP.

MONITOR B Section (LEVEL Control & ON Switch)

MONITOR A Section (LEVEL Control & ON Switch)

Monitor Select Switch (LCR, L+R, +MON(C), 2TR IN1, 2TR IN2)

Monitor Cue Indicators (INPUT, VCA, MASTER)

MASTER PFL Switch

When PFL is off (i.e. AFL is on), the "PRE ON" or "POST ON" mode can be specified via a utility function.

LAST CUE Mode Switch

Talkback/ Oscillator OUT Switch

Phantom (+48V) Switch

Talkback INPUT (XLR Connector)

High Pass (80Hz) Filter Switch

Talkback LEVEL Control

Talkback ON switch

Talkback

Includes a phantom power switch for the talkback mic, as well as a switchable 80 Hz HPF.

PHONES (Level Control & Jack)

In addition to the panel jack, phones jacks are provided at two locations on either side of the panel below the front pad.

METER Mode SELECT Switch

MUTE MASTER Mode Indicator

DIRECT RECALL Mode Indicator

Mute Group Master/ Direct Scene Recall

METER BRIDGE

PW5000 Monitoring Indicator

SOLO MODE On/Off Switch

PREVIEW On/Off Indicator

DIMMER Controls

SOLO SELECT Switches

Solo Monitoring

When the console's solo mode is engaged, the input channel CUE switches can be used for solo monitoring. Independent solo mode buttons allow solo monitoring to be engaged or disengaged for the MATRIX, STEREO AUX, GROUP/AUX, and STEREO/MONO Master buses.

Mortorized VCA Fader

Utility Section

These controls provide a fast, easy way to store and recall scenes, and enter scene names for easy identification. This section also includes a FADE TIME function which allows the scene-recall fade time to be independently set for each scene. Fade time can be set from 0.1 to 10 seconds in 0.1-second increments, 10 seconds to 20 seconds in 0.2 second increments, or from 20 to 60 seconds in 0.5 seconds increments. The utility section provides access to a number of other functions that contribute to versatile, efficient operation and easy console setup.

NOMINAL Indicator

FADER SAFE Switch

VCA MUTE Switch

ALPHABET Switch

TITLE Switch

UTILITY Switch

RECALL Switch

RECALL UNDO Switch

3 Digits 7 segment LED & 4 Digits Dot Matrix LED

PREVIEW Mode Switch

STORE Switch

Title Display (12 Digits dot Matrix LED)

Numeric Key Pad (0 - 9)

ENTER Switch

Motorized VCA Fader

Multi-Function CUE Switch

FADE TIME Assign Switch

DEC Switch (-1)

INC Switch (+1)

CLEAR switch

MUTE Group Assign Switch

VCA Group Assign Switch

Options

MNM5000	MONAURAL INPUT MODULE
MNR5000	MONAURAL INPUT REAR PANEL
STM5000	STEREO INPUT MODULE
STR5000	STEREO INPUT REAR PANEL
SAM5000*	STEREO AUX MASTER MODULE
GAM5000*	GA (GROUP/AUX) MASTER MODULE
SMM5000	STEREO MONO MASTER MODULE
MON5000	MONITOR MODULE
ITR5000	INPUT TRANSFORMER
BLM5000	BLANK MODULE
LA5000	GOOSENECK LIGHT
PSL5000	POWER SUPPLY LINK CABLE

*All modules are available as options, and a full set of colored fader knobs is provided with each STEREO AUX or GA (GROUP/AUX) MASTER MODULE.

An Interview with the PM Series Development Team

The year 2003 marks the 30th anniversary of the birth of Yamaha PM-series consoles. Since the release of the PM200, the first mass-produced professional console, the PM-series has virtually led the field of sound reinforcement. It is fair to say that Yamaha PM consoles have defined the evolution of sound reinforcement consoles.

Tetsuo "Ted" Wakamatsu

Joined Yamaha in 1967 and immediately began working on sound reinforcement products. A chief engineer who produced many legendary mixers, and has been part of PM history since the PM200.

Kenji Ikeya

Joined Yamaha in 1981. Mostly involved in large console development. Also took part in the development of the DMR8 digital mixer/recorder. A future-looking engineer putting his deep digital knowledge into PM5000.

Koji Aoyama

Joined Yamaha in 1975. An electronics engineer who took part in development of the PM180 and PM170, as well as the P2002 and other power amplifiers. A "craftsman" engineer who has mostly been involved with analog mixer development.

When was the first PM-series console released?

Wakamatsu: The first console was the PM200. I think it was released in November, 1972, more than 30 years ago.

Tell us what led to the development of the PM200.

Wakamatsu: Yamaha was organizing a large number of music events here in Japan at the time.

There was the NEMU - Jazz Inn, the Popular Music Contest, the World Popular Song Festival, and others. The history of Yamaha PA production began with the development of original equipment for those events. As the events grew in scale, new equipment had to be designed to handle the changing requirements.

Before the PM consoles there were the EM-series (EM = Ensemble Mixer) powered mixers.

These were designed to allow a wide range of instruments to be easily mixed, and featured guitar inputs and built-in rhythm machines for this purpose. We sold systems complete with speakers – the Yamaha Ensemble Systems – that were popular for their ease of use. But as the needs of our users changed the output power and feature complement had to be increased.

Returning to the PM200, it was at this stage that we separated the mixer and power amplifier for PA applications, and concentrated on boosting performance.

The PM200 had unbalanced inputs and outputs and a mono output bus, but balanced inputs and outputs and a stereo bus were provided on its successor, the PM400. That was a time when PAs were evolving from small, simple systems to much larger systems.

What consoles were the big-name artists from overseas using in the early 70's?

Wakamatsu: Most were using name-brand recording consoles modified for sound-reinforcement use. When domestic gear was used it was mostly high-priced custom consoles of the type that were used in broadcast studios. Whenever artists came from overseas we would always go to the concerts to see what gear was being used, and how it was being used.

The PM1000 was released in 1974. How was it possible to provide such high performance and advanced features at such a groundbreaking price?

Wakamatsu: We designed all parts and circuitry ourselves to achieve the highest possible reliability, while mass production allowed us to reduce the overall cost.

For example, we were using faders made by another manufacturer during the prototyping process, but eventually designed and produced our own. Unlike modern linear designs, we used a unique friction-driven rotary control system in the early faders. To ensure that high performance and reliability we used a volume pod that employed carbon chips for the contacts and duralumin for the control shaft. By creating our own high-performance parts, we were able to reduce production cost.

The same can be said about transformers. High-performance audio circuitry was advancing rapidly in the early 70's, as was the design of audio transformers, and we applied these advances to our PA equipment. We had custom transformers wound to our precise specifications in order to achieve the desired performance.

Why was the PM1000 so widely accepted?

Wakamatsu: Because it answered the needs of the times. It was, for example, the first model to incorporate our matrix mix system. The matrix system was developed to solve a channel-capacity situation we encountered at our own music events. We had to use one PM200 just for drums, a second for guitar, bass and other instruments, and a third to combine the outputs of those two mixers with vocals. It was clear that what we really needed was a mixer that somehow provided several mixers in one. Apparently many of our users felt the same way.

We have continued to implement new ideas and features in every new model in the PM series: the matrix system in the PM1000, hard chassis construction in the PM2000, VCA faders and mute groups in the PM3000, and so on.

How was the response from overseas?

Wakamatsu: In overseas markets, especially the U.S.A, the reputation of Yamaha consoles grew rapidly. One of the biggest west-coast bands of the era used the PM2000 on their national tour.

Why do you think leading professional around the world adopted the PM2000?

Wakamatsu: I think reliability is the biggest factor. Expensive cusI think reliability is the biggest factor. Expensive custom consoles and other equipment are one-of-a-kind products that cannot easily be subjected to rigorous reliability testing.

Mass production, however, allows the implementation of drop testing, extreme temperature testing, and other procedures that guarantee the durability of the final product. And since mass produced products may be used in a wide range of conditions all around the globe, we receive plenty of feedback that can be used to improve quality. Yamaha's worldwide service network is another very important factor.

At the time of the PM2000 consoles were becoming quite large and chassis rigidity was becoming an issue. One of the tests we are still using is our "flight case test". During prototyping we order a custom flight case – not even a very sturdy one – and place the console in it. The flight case is stood on end, and then tipped over in both directions and allowed to fall to the floor. If the console powers up immediately and works flawless after that ordeal, then it passes the test. This type of durability is essential to withstand the rigors of a tour that might span more than 6 months and several tens of cities.

One very popular rock group at the time sent us a message of thanks because they had actually dropped one of our consoles down a flight of stairs and it had still worked perfectly.

The PM3000 was the first to introduce VCAs in a sound reinforcement console. How was the response?

Wakamatsu: At the time VCAs were being used in a number of recording consoles, but the general attitude was that VCAs simply didn't sound good.

Aoyama: Our sales staff even asked us not use VCAs.

And so why were VCAs eventually used?

Wakamatsu: We created original Yamaha VCAs using discreet hybrid ICs. We were absolutely confident that we could deliver the quality, and wanted to implement some new ideas.

Aoyama: In addition to sound, usability was an important determining factor. In the PM3000 all 8 VCA groups could be assigned in any combination.

Wakamatsu: However, for about a year after the console was released I didn't see anyone using the VCA faders. It took a while before they were accepted, but it was clear to us that in the future other makers would be using VCAs in their consoles as a matter of course. We were confident that we were doing the right thing.

What was new in the PM4000?

Wakamatsu: Stereo auxiliary buses, and fully-parametric EQ.

Aoyama: For the first time we marketed three versions: hall (for the domestic market only), monitor, and FOH. And it was possible to replace mono input modules with stereo modules (for a maximum of 64 input channels). People were beginning to use more stereo sources at the time, and there was a huge demand for stereo modules.

Why do you think the PM4000 became the de-facto standard sound-reinforcement console?

Aoyama: The PM4000 completely solved all of the deficiencies of the PM3000. We are exceptionally lucky to have so much feedback from leading artists and engineers that gets incorporated into our knowledge base. That's another advantage of mass production: we can reach a large number of users worldwide who contribute to the development of succeeding models through their feedback. That's why we opted not to take the custom-shop route from the PM200 onward.

As a result, the PM4000 took sound quality, operation, and reliability to an unprecedented new level.

And now the PM5000. Tell us about the development concept.

Wakamatsu: We aimed for the best sound ever in the PM series. The term "sound quality" alone does suffice to define truly great sonic performance. Signal-to-noise ratio and separation are also extremely important elements. In the digital domain S/N and separation are not an issue, but in an analog mixers all three elements must be given careful attention. The hurdle is much higher in the analog domain, and in a sense it was a challenge.

Ikeya: In terms of sound quality we achieved the desired results through circuit design, parts selection, and repeated evaluation by professional engineers. Optimum S/N and separation were achieved through circuit design, a grounding scheme that eliminates the effects of noise from the power supply and external sources, and careful redesign of the printed circuit board patterns.

What does the PM5000 offer in terms of usability?

Wakamatsu: Scene recall is an important feature. Not just a simple scene memory, but a comprehensive implementation of the digital control system that has proven to be of great value in the PM1D all-digital console, including the recall safe and fader safe functions. There are a number of other innovations, such as the new summing gain controls.

And finally, why an analog console?

Wakamatsu: To us there is really no difference between analog and digital mixers. Our goal is simply to give discriminating professional engineers the tools they want and need to do the best possible job at any time.

Aoyama: The PM series has been at the top of the field for 30 years, and it's going to stay there.

Ikeya: We are fortunate to have extensive know-how and resources in both analog and digital sound. We haven taken the best of both worlds and created the best-sounding PM console to date: the PM5000.