

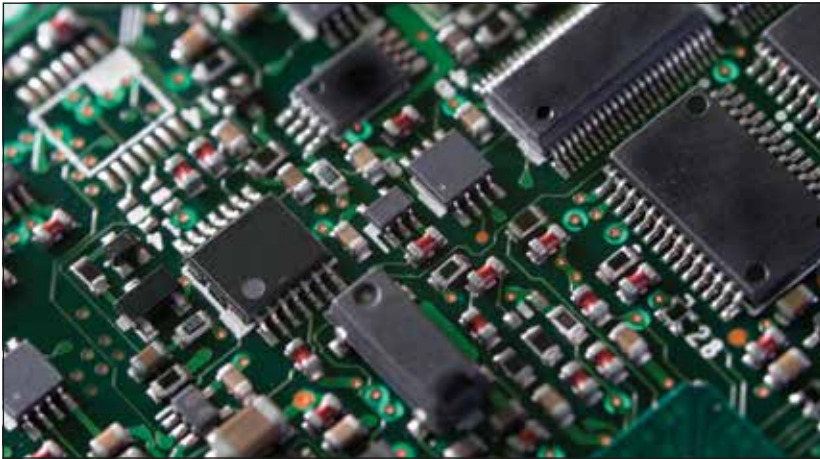
# PowerMatch® Configurable Professional Power Amplifiers

Class-D installation amplifiers that deliver performance with efficiency, reliability and versatility.



## The challenge of designing Class-D power amplifiers today

Over the years, professional Class-D power amplifier designs have matured greatly from early models that sacrificed low noise and transient performance for greater efficiency. Today's Class-D amplifiers bring great improvements in sound quality and reliability over linear amplifier architectures and offer significant benefits to both system integrators and end users. For the industry, newer Class-D amplifier designs bring real savings as they can now pack more channels and more power into installations – requiring less rack space, less hardware, less specialised AC power and reduced cooling requirements. For venue owners and managers, Class-D products reduce the overall cost of ownership due to their inherent efficiency.



As promising as Class-D amplification technology appears, considerable variations in audio performance, efficiency and reliability remain. In fact, many audio professionals still notice a difference in how linear amplifier designs, such as Class-AB, sound in comparison to these newer Class-D models. The reality is, while the underlying architecture is proven, Class-D amplifier evolution is far from over.

## The Bose® design approach to Class-D amplifiers

Concerns from industry professionals around Class-D transparency, performance and reliability piqued the interest of Bose engineers and prompted a research endeavour into the audio quality of Class-D professional power amplifiers. After studying and listening to many established amplifiers, Bose research engineers agreed that many Class-D models hit their operational limits and underperformed in a number of real-life use cases. This led Bose engineers to rethink power amplifier design and apply decades of past Bose research in power supplies, amplifiers and control systems to a new amplifier architecture. The objective was to create the best-sounding Class-D amplifier possible for professional audio applications.

As part of this pursuit, Bose engineers collaborated with system integrators that led to another key insight: many touring amplifiers were assumed and placed into fixed sound installations. Aside from the cost implications in specifying these products for installed jobs, additional drawbacks surfaced in the areas of installation ease, configurability and maintenance.

It became evident from evaluating both Class-D audio performance and installation-specific requirements that the design goal must include an end-to-end systems approach with technology innovations across these four elements: audio quality, configurability, efficiency and reliability.

[audio quality] + [configurability] + [efficiency] + [reliability]

After five years of research and development work, prototype evaluation and beta-site testing with leading system integrators, Bose engineers introduced a cutting-edge power amplifier with differentiated features for the installed market.

## Bose® research applied – the PowerMatch® configurable professional power amplifier

PowerMatch is a line of versatile multichannel power amplifiers – featuring outstanding performance in the dimensions of audio quality, configurability, efficiency and reliability.



PowerMatch amplifier, internal view

### The PowerMatch design formula

#### 1 Audio quality

Proprietary technologies are applied to deliver outstanding linearity, transient response, low noise and dynamic range. [| page 4 |](#)

#### 2 Configurability

Throughout each stage of the job, from initial specification to final installation, advanced configurability features give integrators confidence that PowerMatch amplifiers can conform to and complement nearly any installation project. [| pages 5-10 |](#)

#### 3 Efficiency

Combined together as a system, the PeakBank™ power supply and Class-D amplifier enables high efficiency. [| page 11 |](#)

#### 4 Reliability

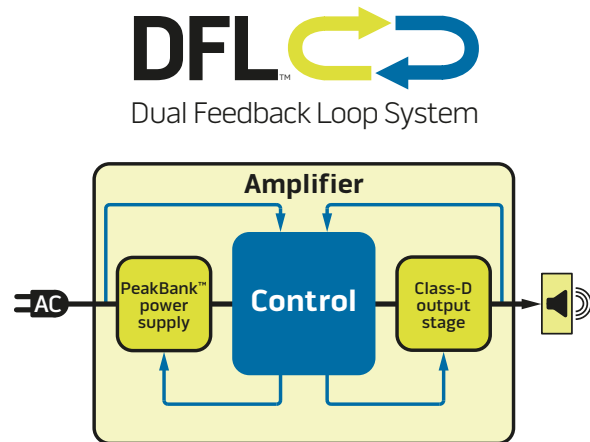
Reliability was built into each PowerMatch amplifier model, thanks to careful component selection, thermodynamic modelling, and 20 years of experience in the design and manufacture of rugged, reliable Class-D amplifiers. [| page 12 |](#)

## Audio quality

### 1 The Dual Feedback Loop (DFL™) system ensures the highest possible audio quality

Bose engineers discovered the key to optimal audio amplifier performance was to design a control system that could precisely monitor all elements of the amplifier – the complete chain from AC outlet to loudspeaker – and make adjustments instantaneously to ensure the best possible audio experience at the loudspeaker.

Based on decades of amplifier research and products for audio and non-audio applications, the Power Electronics Research Team at Bose created a sophisticated combination of hardware and software to overcome the shortcomings of Class-D amplifiers. The proprietary system, called Dual Feedback Loop, enables Bose PowerMatch amplifiers to deliver unparalleled sonic performance.



The proprietary DFL system provides precision control required for optimal power supply and Class-D amplifier performance.

### Ensure sonic transparency in all conditions – the true mission of an amplifier

Previous Class-D amplifier topologies have been challenged in accomplishing this mission in the following areas:

**Linearity** – The ability of an amplifier to produce audio output that is accurately proportional to the input signal to the amplifier is called linearity. Poor linearity affects tonal balance and transparency at all SPL levels. Linearity is especially critical and difficult to maintain with varying load impedance and AC power fluctuations.

**Transient Response** – Natural-sounding amplifiers react quickly to transfer power on-demand from the AC power outlet to the loudspeaker. Efficient as they may be, some Class-D designs have difficulty maintaining consistent response, as demonstrated in repeated signals such as kick drums or low-frequency bass notes.

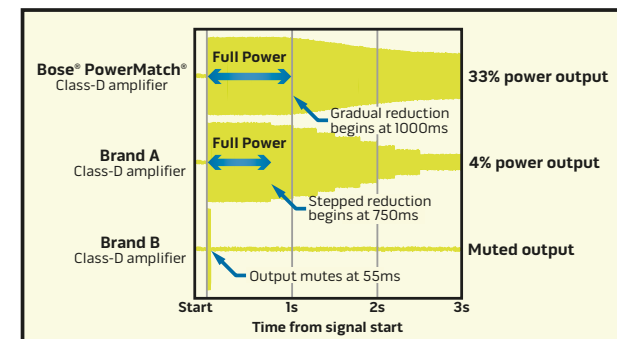
**Dynamic Range** – The ability for an amplifier to be accurate and noise-free when playing both soft and loud programme material is a key indicator of the overall sound quality of the amplifier.

### Maintain output with demanding programme material

Under demanding conditions, many conventional Class-D power amplifiers fail to maintain accurate output and therefore expose audible artifacts. The PowerMatch DFL system extends the operational limits and minimises artifacts.

Most notable improvements of the DFL are:

- › Smooth current clipping vs. “hard clipping” or a highly distorted waveform
- › Smooth power limiting vs. rapid and/or stepped output reduction
- › Graduated thermal limiting vs. thermal shutdown or reset.



Comparison of amplifier output duration at rated power.

## Configurability

### 2a The PowerMatch® amplifier line offers a distinct set of configurable models to suit more installation projects

PowerMatch amplifiers are available in 4- or 8-channel models at power levels of 250 W or 500 W per channel. All amplifiers are configurable to combine channel pairs to achieve higher power levels. For example, a 4-channel amplifier can easily be configured to serve as a dual-channel amplifier with twice the power per channel.

#### 8-channel models

##### PowerMatch PM8500/PM8500N



8 channels ■ 500 watts per channel ■ 4,000 watts total

##### PowerMatch PM8250/PM8250N



8 channels ■ 250 watts per channel ■ 2,000 watts total

#### 4-channel models

##### PowerMatch PM4500/PM4500N



4 channels ■ 500 watts per channel ■ 2,000 watts total

##### PowerMatch PM4250/PM4250N



4 channels ■ 250 watts per channel ■ 1,000 watts total

## Configurability

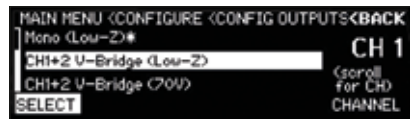
### 2b QuadBridge™ channel pairing technology brings power output options

QuadBridge configurability allows the amplifier to be arranged to run output channels individually or combined (2 or 4 channels), leveraging the total available power of the amplifier to meet the power and loudspeaker requirements of most installations. Mixed modes are also possible.

<p><b>Mono</b> Individual output channels</p> <p><b>V-Bridge</b> Two output channels bridged for twice the voltage</p> <p><b>I-Share</b> Two output channels paralleled for twice the current</p> <p><b>Quad</b> Four output channels combined for twice the voltage and twice the current</p>	<p><b>Mixed</b> Differing output modes can be used together to create flexible power options</p> <div style="text-align: center;"> <table border="1" style="margin: 0 auto;"> <tr><td>Mono</td><td>Mono</td><td>Mono</td><td>Mono</td></tr> <tr><td colspan="2">V-Bridge</td><td colspan="2">V-Bridge</td></tr> </table> <p>Example 1</p> <table border="1" style="margin: 0 auto;"> <tr><td colspan="2">I-Share</td><td>Mono</td><td>Mono</td></tr> <tr><td colspan="4">Quad</td></tr> </table> <p>Example 2</p> </div>	Mono	Mono	Mono	Mono	V-Bridge		V-Bridge		I-Share		Mono	Mono	Quad			
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V-Bridge		V-Bridge															
I-Share		Mono	Mono														
Quad																	

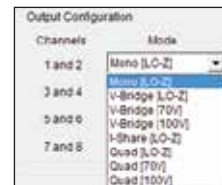
### Configure loudspeaker outputs easily through software

Configuration of the loudspeaker outputs is easy. Wire-in your loudspeakers then use the front panel of the amplifier or ControlSpace® Designer™ software to set your desired output mode.



Amplifier front-panel menu selection

OR



Mode selection via PC software

	Mono	V-Bridge	I-Share	Quad																		
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<b>PM4250</b>	<table border="1" style="margin: 0 auto;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td></tr> </table> <p>2 Ω/4 Ω, 250 W 8 Ω, 250 W 50 V, 250 W</p>	1	2	3	4	<table border="1" style="margin: 0 auto;"> <tr><td>1</td><td>2</td></tr> </table> <p>4 Ω/8 Ω, 500 W 70 V, 400 W 100 V, 500 W</p>	1	2	<table border="1" style="margin: 0 auto;"> <tr><td>1</td><td>2</td></tr> </table> <p>2 Ω, 500 W</p>	1	2	<table border="1" style="margin: 0 auto;"> <tr><td>1</td></tr> </table> <p>4 Ω, 1000 W 70 V, 800 W 100 V, 1000 W</p>	1									
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QuadBridge configuration modes across models

### Directly drive 70/100 V loads without transformers

PowerMatch® amplifiers can power any loudspeaker load directly without the use of transformers. Built-in software selection of loudspeaker type (Hi-Z or Lo-Z) and QuadBridge mode allow the amplifier to optimally drive loudspeaker loads as low as 2 Ω, 70/100 V loudspeaker lines, or a mix of both.

## Configurability

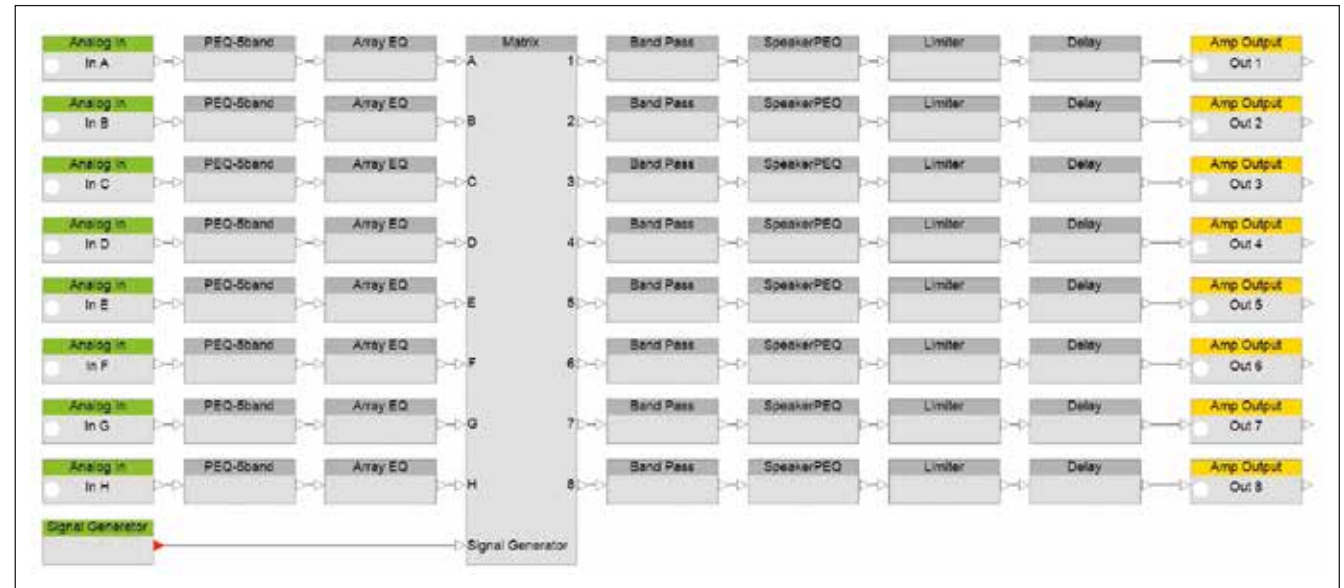
### 2c Built-in DSP saves on equipment cost, installation time and optimises the sound of each installation

By integrating loudspeaker processing into all PowerMatch® amplifiers, system integrators get to “good sound” quickly while saving on equipment costs and installation time.

The DSP can be accessed via the front-panel display or using ControlSpace® Designer™ software where extensive configurability and control is available.

PowerMatch amplifiers include signal processing blocks for the following operations:

- › Input selection, sensitivity and gain
- › Input channel 5-band parametric EQ
- › Array EQ for RoomMatch® array module loudspeakers
- › Programmable channel matrix
- › Band pass
- › 9-band parametric speaker EQ
- › Bose® loudspeaker presets
- › Driver alignment delay
- › Peak and RMS protection limiter
- › Output gain



PowerMatch integrated DSP processing blocks (8-channel amplifier shown)

### Install Bose Professional loudspeakers more quickly

While designed for use with any loudspeaker, PowerMatch amplifiers make installations even easier when paired with Bose loudspeakers. With just a few clicks, a loudspeaker preset can be recalled where limiter and EQ settings are auto-populated into the DSP chain – allowing an optimal starting reference for system integrators.



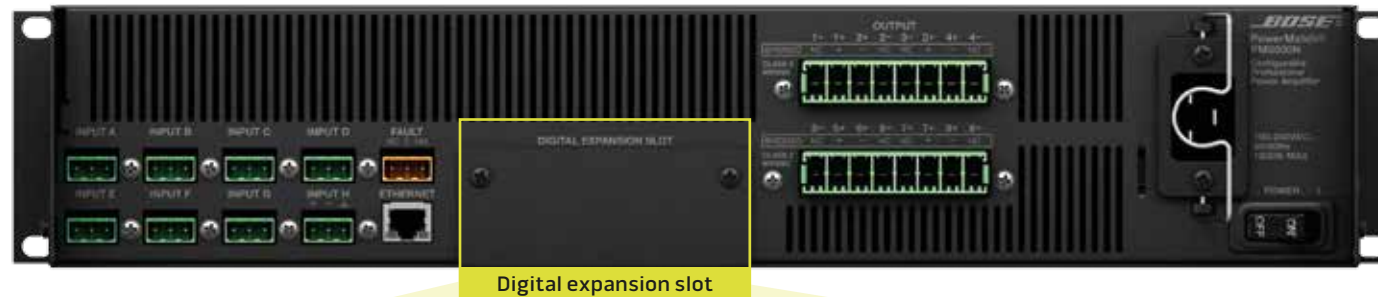
Front-panel selection for Bose loudspeakers

## Configurability

### 2d Digital input cards enable sharing of audio between devices and networks

All PowerMatch® amplifier models feature balanced analog line inputs (+24 dBu maximum).

A digital expansion slot further enables input capability, allowing the amplifier to connect with digital sources.



#### Dante™ network card



- **Input channels:** 8
- **Output channels:** 8, post-DSP
- **Interface:** RJ-45, 1 Gbps Ethernet
- **Secondary Port:** Switched, redundant, legacy HW
- **Format:** Uncompressed 24-bit, 48 kHz

#### CobraNet™ card



- **Input channels:** 8
- **Output channels:** 8, post-DSP
- **Interface:** RJ-45, 100 Mb Ethernet
- **Secondary Port:** Redundant
- **Format:** Uncompressed 24-bit, 48 kHz

#### ESPLink card



- **Input channels:** 8
- **Thur channels:** 8, unprocessed
- **Interface:** Optical/TOSLINK
- **Format:** Uncompressed 24-bit, 48 kHz

#### AES3 card



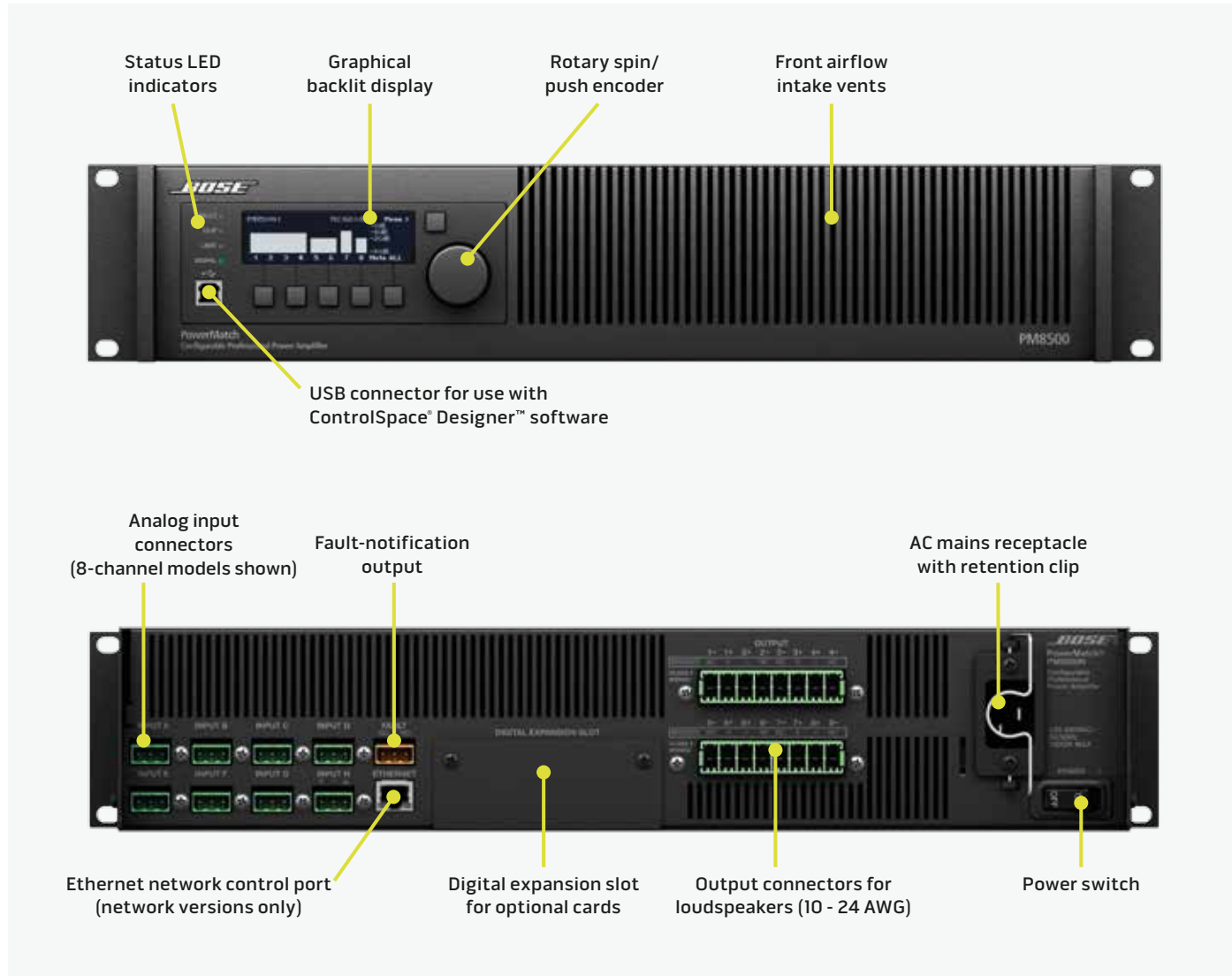
- **Input channels:** 8
- **Thur channels:** 8, unprocessed
- **Interface:** AES/EBU, 8 channel
- **Format:** Uncompressed 24-bit, 48 kHz



## Configurability

### 2e Controls and connection interfaces designed for fixed installations

PowerMatch® amplifiers offer a set of useful, yet simple controls and interface features to minimise setup time on the job.



### Control PowerMatch amplifiers remotely

When used on a standard Ethernet network, the ControlSpace® CC-64 control centre can be quickly configured to control one or more PowerMatch network-version amplifiers.



ControlSpace CC-64 control centre

Custom labelling and parameter controls allow system integrators the ability to offer either full access for qualified site personnel or limited access for less technical end users.

For single amplifier installations requiring remote CC-64 control, a direct RJ-45 cable connection can be used without additional network hardware.



## Configurability

**2f** All PowerMatch® amplifiers feature three methods of configuration and monitoring:

**[1]** Access amplifier settings and status from the front-panel interface

The front-panel user interface on all PowerMatch models allows for quick and simple access to most configuration parameters.

Whether checking for signal status, or using it for basic system configuration, the front panel is a convenient access point into any PowerMatch amplifier model.



Front-panel display and user interface



A 5-digit combination lock prevents unauthorised access to the front-panel interface.

**[2]** Connect to the PowerMatch amplifier using USB or Ethernet

Each PowerMatch model comes with a front-panel USB port for programmability using ControlSpace® Designer™ software.



Front-panel USB

**[3]** Network versions available for each PowerMatch model feature a rear-panel RJ-45 Ethernet connection for additional functionality over standard IP-based networks. This added functionality includes monitoring and control via ControlSpace Designer software, Serial-over-Ethernet and ControlSpace CC-64 control.



Rear-panel Ethernet

**2g** Configure, control and monitor using ControlSpace Designer software

With ControlSpace Designer software, users gain access to all PowerMatch amplifier features and functions, including detailed signal processing, amplifier status and control programming.

System troubleshooting is built into PowerMatch amplifiers via a set of remote monitoring and faults reporting utilities. Issues logged by the amplifier, such as power line and loudspeaker wiring faults, are reported on the amplifier front panel.

Fault reporting also can be viewed via an Ethernet connection with ControlSpace Designer software or using Serial-over-Ethernet with third-party control and monitoring systems (network version only).



Real-time network monitoring of multiple amplifiers

When using network-version amplifiers, system-wide control, configuration and monitoring of all connected Bose networked devices is available through Designer software, allowing users real-time access to both PowerMatch amplifiers and ControlSpace processors.

## Efficiency

### 3 Bose® PeakBank™ power supply provides high efficiency

The proprietary PeakBank power supply features a combination of technologies, enabling efficiency, high power density and reliability.

#### It starts at the AC outlet

The design goal was to bring efficiency and performance together. Bose engineers knew that in order to accomplish this, they had to start at the source of power – the wall outlet. They focused on building a power amplifier that was optimised to draw power from nearly any worldwide power source and deliver it efficiently to the loudspeaker. From 100 to 240 V, PowerMatch amplifiers have been designed to safely pull the maximum available power on-demand, up to 4,000 instantaneous watts, from a standard AC wall outlet.

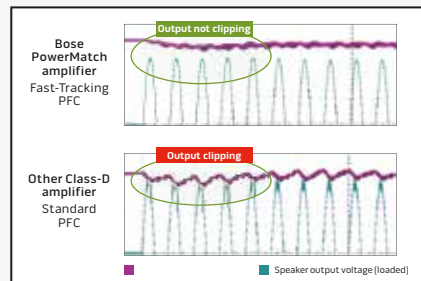


PeakBank power supply

### Fast-tracking Power Factor Correction (PFC)

The fast-tracking PFC circuit operates beyond conventional approaches. Bose Engineers designed a unique control circuit that allows the PeakBank power supply to predict, and quickly react to, demanding bass transients.

This results in stable power to the amplifier circuits unlike conventional approaches that sometimes exhibit a condition known as “rail sag,” where the +/- voltage supply drops and recovers too late to respond to amplifier output stage demands.

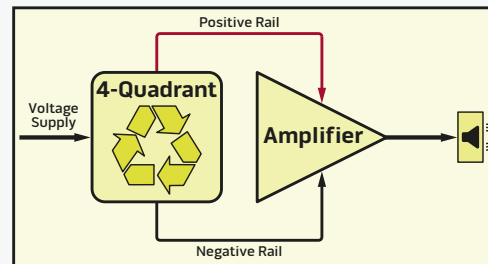


Comparison of Power Factor Correction (PFC) performance at rated power with 100 Hz Sine Transient

### 4-Quadrant operation

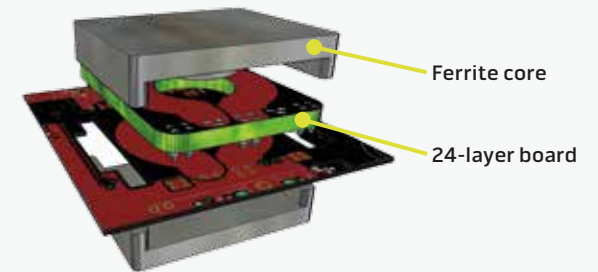
With programme material using demanding content (bass, live music), the power rails of many conventional amplifiers cannot fully deliver consistent output. With Bose 4-Quadrant operation, the power supply is able to instantaneously source and sink energy from either supply rail. This approach returns normally wasted energy from the loudspeaker and amplifier back into the power supply.

The result: Better efficiency and more stable power to the amplifier during peak power demands.



Recycled and balanced power with Bose 4-Quadrant operation

### Planar magnetics transformer



The high-powered, yet lightweight planar magnetic transformer offers increased precision and significantly higher reliability. Unlike bulky conventional transformers with wire windings, the Bose transformer uses a ferrite core mounted to a dense 24-layer circuit board where each layer holds an exact winding pattern of copper.

## Reliability

### 4 Reliability is designed in from the beginning

Leveraging over 20 years experience in the development and production of Class-D amplifiers, Bose applied design techniques and a rigorous test suite to ensure long-term reliability of PowerMatch® amplifiers in the field.

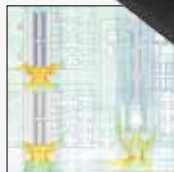
PowerMatch amplifiers are covered by the Bose® Limited Warranty, which lasts five years from the date of purchase.



### Advanced thermal design

Providing adequate cooling for a high-power multichannel amplifier is key to providing a highly reliable product.

PowerMatch amplifiers are designed with filterless cooling pathways and processor-controlled fans that prevent damage to critical amplifier circuits – even in the unlikely event that one fan fails.



Thermal simulation



IR imaging

The use of thermodynamic modelling and infrared imaging tools in the design phase allowed Bose engineers to fine-tune this effective cooling design.

### Life testing

During the product-testing cycle, PowerMatch amplifiers are subjected to extremes of temperature, humidity, air quality and vibration.



Air quality/dust testing



Thermal/humidity testing



Shock and vibration testing

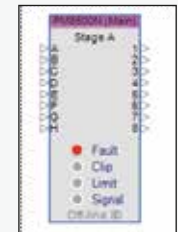
### Fault detection and alert system

The PowerMatch amplifier continuously monitors for external events (AC mains or loudspeaker issues) as well as internal operating temperature, power supply status and amplifier status for potential adverse issues.

Critical faults are detected, stored, then broadcast as alarms to users:



Front-panel fault LED and LCD notification



Designer™ software online notification



Rear-panel contact closure

Serial-over-Ethernet broadcast (network version only)

## PowerMatch® amplifier specification summary

	PM8500/PM8500N	PM8250/PM8250N	PM4500/PM4500N	PM4250/PM4250N
<b>Output channels, total power<sup>1</sup></b>	8 channels, 4000 W configurable Supports 2/4/8 Ω, 70/100V loads	8 channels, 2000 W, configurable Supports 2/4/8 Ω and 70/100 V loads	4 channels 2000 W, configurable Supports 2/4/8 Ω and 70/100 V loads	4 channels 1000 W, configurable Supports 2/4/8 Ω and 70/100 V loads
<b>Mono Mode output power</b>	500 W (4 Ω), 300 W (8 Ω)	250 W (4 Ω and 8 Ω)	500 W (4 Ω), 300 W (8 Ω)	250 W (4 Ω and 8 Ω)
<b>V-Bridge Mode output power</b>	1000 W (4 Ω, 8 Ω, 100 V), 800 W (70 V)	500 W (4 Ω, 8 Ω, 100 V), 400 W (70 V)	1000 W (4 Ω, 8 Ω, 100 V), 800 W (70 V)	500 W (4 Ω, 8 Ω, 100 V), 400 W (70 V)
<b>I-Share Mode output power</b>	1000 W (2 Ω)	500 W (2 Ω)	1000 W (2 Ω)	500 W (2 Ω)
<b>Quad Mode output power</b>	2000 W (4 Ω, 100 V), 1600 W (70 V)	1000 W (4 Ω, 100 V), 800 W (70 V)	2000 W (4 Ω, 100 V), 1600 W (70 V)	1000 W (4 Ω, 100 V), 800 W (70 V)
<b>Frequency response</b>	20 Hz - 20 kHz (+/-0.5 db)	20 Hz - 20 kHz (+/-0.5 db)	20 Hz - 20 kHz (+/-0.5 db)	20 Hz - 20 kHz (+/-0.5 db)
<b>Signal-to-noise ratio, analog input</b>	>102 dBA (below rated power)	>99 dBA (below rated power)	>102 dBA (below rated power)	>99 dBA (below rated power)
<b>THD for power rating, typical</b>	<0.4% (at 1 W, 20 Hz to 20 kHz)	<0.4% (at 1 W, 20 Hz to 20 kHz)	<0.4% (at 1 W, 20 Hz to 20 kHz)	<0.4% (at 1 W, 20 Hz to 20 kHz)
<b>Input channels</b>	(8) Balanced line-level, Euroblock, Digital expansion card slot	(8) Balanced line-level, Euroblock, Digital expansion card slot	(4) Balanced line-level, Euroblock, Digital expansion card slot	(4) Balanced line-level, Euroblock, Digital expansion card slot
<b>Control</b>	Fault-Notification Output, Ethernet control <sup>2</sup> , and Serial-over-Ethernet <sup>2</sup>	Fault-Notification Output, Ethernet control <sup>2</sup> , and Serial-over-Ethernet <sup>2</sup>	Fault-Notification Output, Ethernet control <sup>2</sup> , and Serial-over-Ethernet <sup>2</sup>	Fault-Notification Output, Ethernet control <sup>2</sup> , and Serial-over-Ethernet <sup>2</sup>
<b>Dimensions</b>	20.7" D x 19" W x 3.5" H (525 mm x 483 mm x 88 mm)	20.7" D x 19" W x 3.5" H (525 mm x 483 mm x 88 mm)	20.7" D x 19" W x 3.5" H (525 mm x 483 mm x 88 mm)	20.7" D x 19" W x 3.5" H (525 mm x 483 mm x 88 mm)
<b>Net weight</b>	28.4 lb (12.9 kg)	28.3 lb (12.8 kg)	24.4 lb (11.1 kg)	24.4 lb (11.1 kg)
<b>AC mains requirement</b>	100 to 240 VAC (50/60 Hz), 20A (120 V) or 16A (230 V)	100 to 240 VAC (50/60 Hz), 15A (120 V) or 10A (230 V)	100 to 240 VAC (50/60 Hz), 15A (120 V) or 10A (230 V)	100 to 240 VAC (50/60 Hz), 15A (120 V) or 10A (230 V)
<b>Efficiency, 1/3 Rated Power</b>	> 75 % (pink noise input signal)	> 68 % (pink noise input signal)	> 73 % (pink noise input signal)	> 66 % (pink noise input signal)
<b>Accessories</b>	PowerMatch Dante™ network card (PC 359844-0020) PowerMatch CobraNet® card (PC 345975-0110) PowerMatch ESPLink digital input card (PC 349898-0110) PowerMatch AES3 input card (PC 638301-0010) ControlSpace® CC-64 control centre <sup>2</sup> (PC 041760)			

**Notes:**

- Output power is measured per channel, all channels driven, using test signals at 1 kHz.
- Capability only available in network (N) amplifier versions.

All information subject to change without notice.

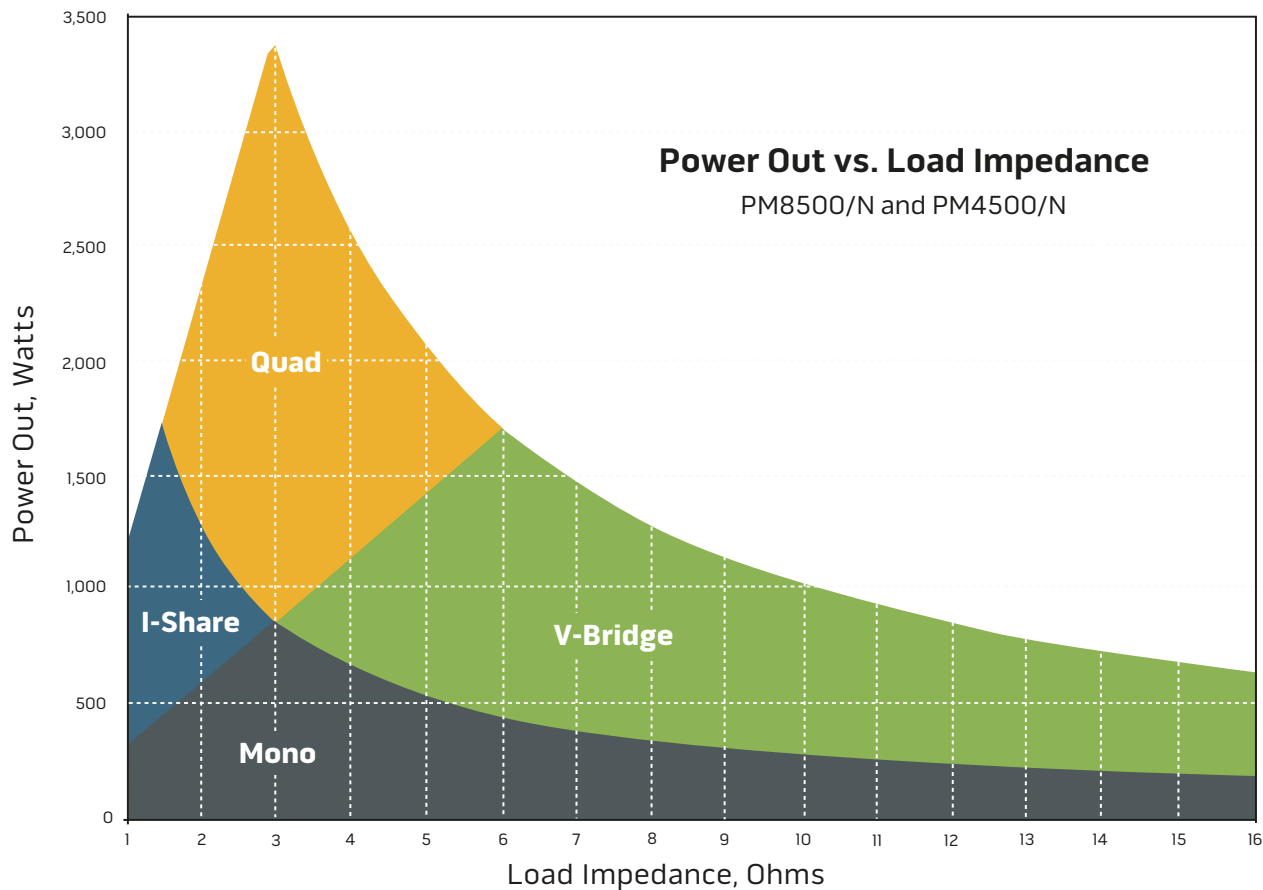
Dante™ is a trademark of Audinate Pty Ltd., CobraNet® is a trademark of Cirrus Logic, Inc.

## Power Out vs. Load Impedance

PowerMatch® amplifiers offer QuadBridge™ channel pairing technology, allowing system installers to easily configure the amplifier to match target loudspeaker requirements.

The Power Out vs. Load Impedance graph shown on this page, for models PM8500/N and PM4500/N, can serve as a tool to help identify the best amplifier mode for nearly any loudspeaker impedance and power level. Models PM8250/N and PM4250/N share similar guidelines (at 1/2 the power shown).

To use this chart, first locate the loudspeaker's nominal impedance on the x-axis. Follow the vertical line up on the chart to the desired power level for the loudspeaker (y-axis). The shaded area represents the amplifier configuration mode required. The desired mode can be set through the front-panel interface on the amplifier or using ControlSpace® Designer™ software. Refer to the PowerMatch Installation and Operating Guide (pages 17-18, 29) for more information.



## The Common Amplifier Format

Visit [www.cafgroup.org](http://www.cafgroup.org) where additional measurement data is available for the PM8500 using the Common Amplifier Format (CAF). CAF is a test methodology developed specifically to present a common set of measurements and documentation for the selection, deployment and comparison of professional power amplifiers.



## About Bose Professional Systems Division

Professional sound systems demand an uncommon expertise and specialised products. Bose Professional Systems Division is a dedicated group of engineers, product managers, technical support specialists and customer service teams that are focused on the professional audio markets. For more than three decades, the Professional Division has developed innovative loudspeakers, electronics and software to meet the needs of demanding professional applications.

Bose Professional products are sold only through authorised pro-audio dealers, AV-system integrators and distributors. We provide substantial support for our distribution network, including product technical information, system design support and after-sale support. Bose® sound is found throughout the world in performing arts centres, theatres, houses of worship, stadiums, restaurants, retail stores, corporate buildings and hospitality establishments.

| [pro.bose.com](http://pro.bose.com) |

## About Bose Corporation

Bose Corporation was founded in 1964 by Dr. Amar G. Bose, professor at the Massachusetts Institute of Technology. Today, the company is primarily known for its research in acoustics, which has produced inventions that have improved the performance of:

- Loudspeakers
- Home entertainment systems
- Automotive music systems designed for the interior acoustics of each car model (first introduced by Bose)
- Noise reducing headsets for pilots and the public (first introduced by Bose)
- Sound in public spaces
- The production of sound for musicians requiring electronic amplification of their instruments
- Materials testing and durability simulation instruments for biomedical applications
- Driver suspension systems for heavy-duty trucks



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*Better sound through research*

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