PLM 20000Q

PLM 20000Q Powered Loudspeaker Management System

The PLM 20000Q Powered Loudspeaker Management system seamlessly integrates an extraordinarily powerful four-channel amplifier platform with Lake® Processing, Dante networked signal distribution, accurate load verification and real-time performance monitoring. Engineered as a unified system, the PLM 20000Q affords significant advantages - in sonic performance, user functionality, inventory utilization, and long-term cost savings - when compared to conventional approaches using separate components. The two-input, four-output PLM 20000Q features a software-controlled bridge mode, allowing one or both adjacent channel pairs to be coupled for two or three output channels with a power rating of 9600 W (@ 4 ohms) on the bridged outputs.

Lab.gruppen Technology

- >5000 W per channel @ 2.2 – 3.3 ohms

- 4400 W per channel @ 4 ohms

- 2U chassis weighing only 17 kg (37 lbs)

- Class TD® output stage

- Universal (70 - 265 V) Regulated Switch Mode Power Supply (R.SMPS™) works anywhere in the world

- Power factor correction (PFC) helps maintain full output during extended power bursts

- Copper-finned Intercooler® with transverse-mounted output devices

- Comprehensive loudspeaker preset database

- LoadSmart™ load verification and SpeakerSafe™ continuous loudspeaker performance monitoring

- Dante™ low-latency digital network included as standard

- Compatible with Lake LM 26, Dolby® Lake Processor and other legacy Lake devices

- Primary and secondary network connections

- Digitally controlled "amplifier gain" adjustable in 0.1 dB steps

- Digital output attenuation in 0.25 dB steps from -inf to 0 dB

- Binding post or Neutrik® speakON® output connectors

- Digitally implemented, zero-overshoot Inter-Sample Voltage Peak Limiting (ISVPL™) adjustable in 0.1 V steps from 17.8 to 194 V

- Power Average Limiter (PAL) with software-controlled Breaker Emulation Limiter (BEL™) prevents mains fuse tripping

- Under-Voltage Limiting (UVL™) enables continued operation with mains voltage sags as low as 65 V

- High-brightness front-panel LCD display

- Moisture resistant silicone touchpad for front-panel display mode selection and menu navigation

Lake Processing Technology

- Raised Cosine Equalization™

- Linear phase and classical crossovers

- LimiterMax™ – peak and RMS limiters

- Iso-Float™ ground isolation

- Super Module capability

- Integration of third party frequency measurement and analysis system via the Lake Analyzer Bridge

- Analog and AES digital inputs with loop-thru outputs

- Auto-select input router for all inputs with user definable priorities

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Powered Loudspeaker Management: Technology Overview

Power Amplifier

The power amplifier platform of the PLM 20000Q integrates several new developments to maintain reliable, sustained output at unprecedented power levels. The redesigned Regulated Switch Mode Power Supply (R.SMPS) connects to any mains supply in the world: operating range is 100 V - 265 V, but Under Voltage Limiting enables operation at 70 V with reduced output. Power factor correction (PFC) reduces peak current draw from the mains, while precise rail regulation maintains stable rail voltages during extended bursts. (Extreme low-frequency beats will not affect mid- and high-frequency headroom.) The patented Class TD output stage - renowned for sonic purity - has been refined for higher current capacity (up to 194 V maximum peak voltage output) while peak limiting circuits hold output devices inside tolerances and below the thermal protection threshold. Despite high efficiency, the extreme power output of the PLM 20000Q places extraordinary demands on the mains supply; therefore, to ensure uninterrupted operation, a Power Average Limiter works with software-controlled Breaker Emulation Limiter (BEL™) to avoid tripping mains breakers during prolonged peak demands. Additional amplifier section features include a software-controlled bridge mode, patented Intercooler heat dissipation, and a full suite of circuit protection features.

Load Verification and Continuous Performance Monitoring

The PLM 20000Q includes a revolutionary set of tools for accurate load verification and real-time performance monitoring. The key to both features is LoadLibrary, a comprehensive database that provides unique "Fingerprints" (load characteristics) for each loudspeaker model in the system. Using this data and on-board DSP, LoadSmart compares predicted response (using a brief test signal) to the actual response, instantly identifying potential problems. When activated, SpeakerSafe real-time performance monitoring helps the operator avoid power compression and provides detailed information about system-wide driver integrity.

Lake Processing

The PLM 20000Q contains two Lake Processing modules, each offering precise settings for gain, delay, crossover slope, equalization, and limiting. Exclusive Lake Processing algorithms are included for Raised Cosine Equalization, linear phase crossovers, LimiterMax loudspeaker protection, and Iso-Float ground isolation. Raised Cosine Equalization is the foundation for the Lake Mesa EQ and the Ideal Graphic EQ. Mesa EQ offers asymmetric filtering to match the asymmetric responses of many loudspeaker systems; the Ideal Graphic EQ offers true sum-to-flat response, so the adjustments provide uniform boost and cut along with greater selectivity. Lake Processing also offers classical crossovers (selectable up to 48 dB per octave) as well as linear-phase crossovers capable of slopes exceeding 180 dB per octave for greater control to limit lobing and off-axis cancellation.Lake Processing also offers both classical crossovers (selectable up to 48 dB per octave) and linear phase crossovers. Capable of slopes exceeding 180 dB per octave, linear phase crossovers offer greater control to limit lobing and off-axis cancellation.

Lake Controller Software

Lake Controller software provides a unified interface for control and monitoring of all functions of the PLM 20000Q. In addition to controlling all parameters of standard Lake Processing, new versions also provide control and monitoring of exclusive PLM features: digital input gain and attenuation, and load verification and performance monitoring via LoadSmart and SpeakerSafe.

The flexible Lake Controller software environment can control extensive networks of powered loudspeaker management systems from a single computer. The user interface is based on discrete processing modules, with each module assigned to power outputs normally defined for sets of band-limited drivers (e.g. low, mid, high, subs). Adjustments can be made in real time to any parameter of any module on the network. Modules may be assigned to groups representing subsystems in larger systems, such as main arrays, delays, and fills in an arena system. Because each module can be assigned to more than one group, Lake Controller can simultaneously address multiple groups for global adjustments as needed while maintaining independent control of separate subsystems and individual components.

The Super Module functionality allows a single on-screen module interface to control output channels in different PLM units. For example, a three-way Super Module could be configured using a high-power LF channel in one PLM unit along with lower-powered MF and HF channels in a different unit.

The Lake Controller software is optimized for a wireless Tablet PC. The same Lake Controller interface can be used to operate Dolby Lake Processors, Lake Contour, and Lake Mesa Quad EQ processors as part of a unified system. Another feature is seamless integration with third party real-time sound system measurement and optimization software packages via the Lake Analyzer Bridge. Users can measure spectrum and transfer function while simultaneously adjusting system EQ on the same user interface.

Dante Digital Audio Network

PLM Series Powered Loudspeaker Management systems are equipped with Dante, a self-configuring digital audio networking solution from Audinate® of Australia. Based on the newest developments in networking technology, Dante provides reliable, sample-accurate audio distribution over Ethernet with extremely low latency. Dante incorporates Zen™, an automatic device discovery and system configuration protocol which enables PLM Series products and other Dante-enabled products to find each other on the network and configure themselves.


PLM 20000Q Neutrik speakON connector version shown.

The front panel is the "local control center" for the PLM 20000Q. An intuitive, menu driven interface allows quick access to key functions using the moisture resistant silicone touchpad. Information is clearly displayed on the daylight-readable, 2.5-inch LCD panel. The soft-button keypad and precision rotary encoder provide control of processing and amplification functions, with key lock available.
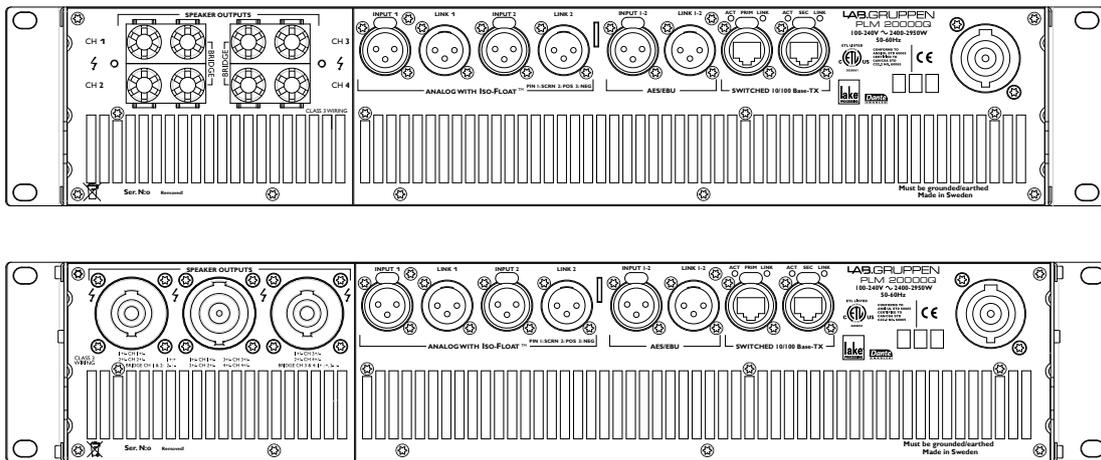
The PLM 20000Q is available with either binding posts or an "embedded patch panel" with Neutrik speakON connectors (2 x NLT4 and 1 x NLT8). Common connectors include; 2 x analog input XLR with switchable Iso-Float, 2 channels of AES/EBU with link-through capability for daisy chaining, 2 x etherCON® for linking or redundancy. A 32 amp powerCON® connector is used for mains supply.
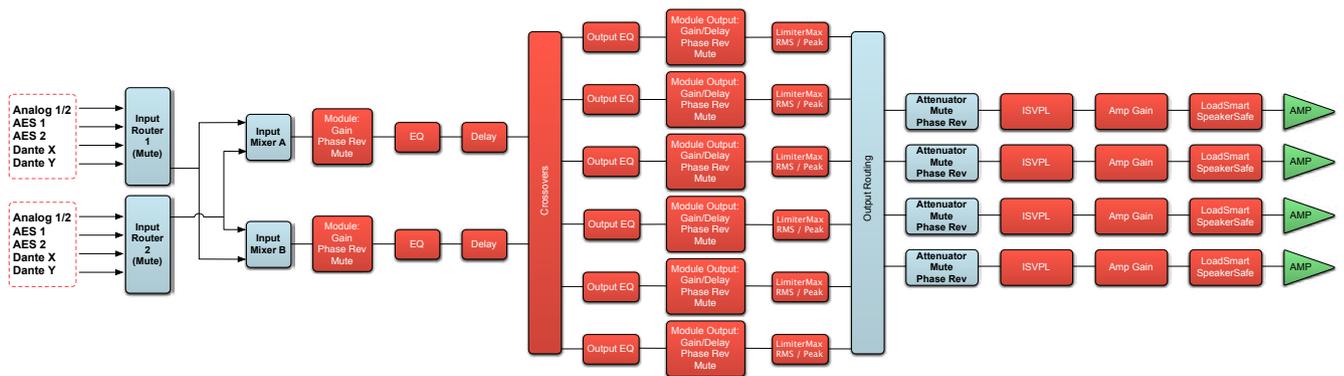
This signal flow block diagram illustrates the flexible mixing and routing, as well as the powerful signal processing capabilities, offered by the PLM Series. The input routers allow for redundant and prioritized inputs, with automatic switch over in case of signal failure. The input mixers provide mixing capabilities between the outputs of the two input routers. The two Lake Processing modules (covering all red blocks) provide user EQ, crossover and output filters along with gain adjustments, mute, phase reverse, delay, and limiters. Module outputs can be routed to either power output channel. Each power output channel provides individual channel attenuation, mute and phase reversal. Each power output channel also implements configurable amplifier gain and an advanced peak limiter in the ISVPL.

The flexible architecture of the PLM Series allows the settings for each unit to be stored in different hierarchies. The Lake Processing modules can be instantly configured with module files that are cross compatible with Dolby Lake products. Settings can also be stored and recalled on a system and subsystem level (system/subsystem files) as well as on a device level (frame presets).

Specifications PLM 20000Q

General

Number of input channels	2
Number of output channels	4
Peak total output all channels driven	20000 W
Max. Peak output voltage per channel	194 V
Max. output current per channel	67 A peak

Max. Output Power

	2 ohms	4 ohms	8 ohms	16 ohms
All channels driven	4800 W [1]	4400 W [1]	2300 W	1150 W
All channels driven into optimal impedance interval	> 5000 W into 2.2 – 3.3 ohms			
8 ohms bridged per ch.	8800 W			
4 ohms bridged per ch.	9600 W			
Bridged into optimal impedance interval	>10000 W in 4.4 – 6.6 ohms			

Audio Performance

THD + N 20 Hz - 20 kHz for 1 W	< 0.05%
THD + N at 1 kHz and 1 dB below clipping	< 0.04%
Dynamic range with digital inputs (for all supported sample rates)	> 114 dB
Dynamic range with analog inputs	> 110 dB
Frequency response (1 W into 8 ohms, 20 Hz - 20 kHz)	+ /-0.05 dB
Common Mode Rejection (CMR)	> 74 dB, 20 Hz to 20 kHz
Internal sample rate	96 k
Internal data path	32 bit floating point
Product propagation delay, best case (96 kHz AES)	1.61 ms
Product propagation delay, analog input	1.68 ms

Sample Rate Converters

THD + Noise	0.00003 %, 20 Hz - 20 kHz, unweighted

Analog to Digital inputs

Inputs	2 inputs x 2 link
Input sensitivity range	+12 or +26 dBu
THD + Noise	0.00022 %, typical at 1 kHz unweighted at +26 dBu headroom setting
	0.00033 %, typical at 20 Hz and 20 kHz unweighted at +26 dBu headroom setting

AES / EBU inputs

Inputs	2 inputs x 2 link
Supported resolutions	≤ 24 bit
Supported sample rates	44.1, 48, 88.2, 96, 176.4, 192 kHz

Dante Audio Network

Inputs and outputs	2 inputs, 2 outputs
Supported sample rates	48, 96 kHz
Supports redundant paths	Yes
Flexible topology	Yes
Network latency	0.8, 1.3 and 4 ms

Device presets

Local memory locations for the settings of the product	100

Limiters

Adjustable Inter-Sample Voltage Peak Limiter (ISVPL)	17.8 - 194 V, step size 0.1 V
Current Peak Limiter < 300 ms	67 A peak
Current Average Limiter (CAL) > 300 ms	33 Arms
LimiterMax (rms and peak limiters)	
– MaxRMS (rms voltage limiter)	Yes
– MaxPeak (peak voltage limiter)	Yes

Gain

Amplifier gain	22 - 44 dB, step size 0.1 dB
Analog attenuator	-Inf to 0 dB, step size 0.25 dB

Rear-panel interface

AES / EBU / I/O (input + link)	2 x 3-pin XLR
Analog, 2-channel I/O (input + link)	4 x 3-pin XLR, electronically balanced
Output connectors	Neutrik speakON (1 x NLT8, 2 x NLT4) or 4 Binding Posts (pairs)
Auto 10/100, Auto Uplink	2 x RJ45 etherCON
Control and monitoring interface	Via Ethernet for Lake Controller software, or DLM (the 3rd Party Protocol)
Detachable mains cord	Neutrik powerCON 32 A
Cooling	Three fans front-to-rear airflow, temperature controlled speed

Front-panel user interface:

Display	2.5 inch, daylight readable LCD
Fault/Warning/Limit/Clip indicators	RGB LEDs and detailed fault description on display
Mute and soft function buttons	8 provided
Standby Power button	On/Standby
Mute Enable button	Enables muting of outputs and inputs via soft-button keypad
Meter button	Toggles through meter views
Menu button	Provides a menu driven interface for full function front panel control
Rotary Encoder	Yes
Exit button	Provides a "back" function

Power

Operating voltage (45 - 66 Hz)	Universal power supply 70 - 265 V
Soft start / Inrush Current Draw	Yes / max. 8 A
Power Average Limiter (PAL)	Yes
Power Factor Correction (PFC)	Yes
Breaker Emulation Limiter (BEL), software controlled 5 - 32 A	Yes, selectable breaker profile
Under-Voltage Limiter (UVL)	Yes

Dimensions

Rack rail to rear panel	W: 483 mm (19"), H:88 mm (2 U), D: 424 mm (16.7")
Overall depth including handles and rear support	498 mm (19.6")

Weight

	17 kg (37 lbs)

Finish

	Black painted steel chassis with black painted steel / aluminum front

Approvals

	CE, ANSI/UL 60065 (ETL), CSA C22.2 NO. 60065, FCC

Note 1): Asymmetrical loading of the outputs will yield even higher ratings. If one (or two) channel(s) has reduced power requirements, then the voltage drop from the power supply will be reduced, resulting in higher power availability for the other channel(s).

All specifications are subject to change without notice.