PLM 10000Q Powered Loudspeaker Management system

The two-input, four-output PLM 10000Q seamlessly integrates networked digital signal distribution, drive processing, power amplification, and load verification plus performance monitoring in a single hardware unit and unified software controller. This new approach, designated Powered Loudspeaker Management (PLM), is a cohesive blend of Lake® Processing and Lab.gruppen power. As a complete system, the PLM 10000Q affords significant benefits when compared to conventional approaches utilizing separate components.

Lab.gruppen Technology

- 2350 W per channel @ 2 ohms**
- 2300 W per channel @ 4 ohms**
- 2U chassis weighing only 13.5 kg (30 lbs)
- Class TD® output stage
- Regulated Switch Mode Power Supply (R.SMPS™)
- Copper-finned Intercooler® with transverse-mounted output devices
- Full suite of protection and fault monitoring features
- Comprehensive loudspeaker preset database
- LoadLibrary™ load “Fingerprint” (identity and characteristics) data
- Comprehensive LoadSmart™ load verification and SpeakerSafe™ continuous loudspeaker performance monitoring
- Dante™ low-latency digital network included as standard
- Fully compatible with Dolby Lake Processor, Lake Contour™, and Lake Mesa Quad EQ™ and Mesa Parametric EQ™ devices
- Primary and secondary network connections (for daisy chaining or system redundancy)
- Digitally controlled “amplifier gain” adjustable in 0.1 dB steps from 22 to 44 dB
- Digital output attenuation in 0.25 dB steps from -inf to 0 dB
- Binding post or Neutrik® Speakon® (1 x NLT8, 2 x NLT4) power output connectors
- Digitally implemented, zero-overshoot Inter-Sample Voltage Peak Limiting (ISVPL™) adjustable in 0.1 V steps from 17.8 to 153 V
- Power Average Limiter (PAL)
- High-brightness front-panel LCD display
- Moisture resistant silicone touchpad for front-panel display mode selection and menu navigation

** More power available when driven asymmetrically.

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

PLM 10000Q Technical Data
Powered Loudspeaker Management: Technology Overview

Power Amplifier
Although based on technology in Lab.gruppen’s road-proven FP+ Series, the amplifier platform in the PLM 10000Q Powered Loudspeaker Management system incorporates further enhancements for even greater sustained output power. The basic output topology remains Lab.gruppen’s patented Class TD (offering Class D efficiency with the sonic purity of Class B designs), but with new circuitry for substantially greater current-carrying capabilities. The Regulated Switch Mode Power Supply (R.SMPS) is optimized to deliver full power during long low-frequency bursts, as well as maintain stable rail voltages despite fluctuating line voltage. The PLM Series also offers extreme power density, patented Intercooler cooling, a full suite of protection features, and a Power Average Limiter (PAL) to prevent tripping of mains breakers.

Load Verification and Continuous Performance Monitoring
The PLM 10000Q includes a revolutionary set of tools for fast, accurate load verification and real-time performance monitoring. The key to both features is the 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 ongoing detailed critical information about system-wide driver integrity.

Lake Processing
The PLM 10000Q contains four full-featured 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, the two revolutionary EQ interfaces used by the Dolby Lake Processor. 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 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 Powered Loudspeaker Management system. In addition to controlling all parameters of standard Lake Processing (therefore appropriate for use with Dolby Lake Processors), all new versions 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, sub). 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, the 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. Operation is easy and intuitive, with the “feel” of real-time analog faders and controls. 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 Lake Controller software feature is seamless integration with third party real-time sound system measurement, optimization, and control software packages via the Lake Analyzer Bridge. Users can measure spectrum and transferfunction and adjust system EQ at the same time, using the same user interface.

Dante Digital Audio Network
The PLM Series Powered Loudspeaker Management systems are equipped as standard 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 products with Dante (like Dolby Lake Processors) to find each other on the network and configure themselves.

PLM 10000Q Neutrik Speakon connector version shown.
The front panel is the “local control center” for the PLM 10000Q. 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 10000Q 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 10000Q

General
Number of input channels 2
Number of output channels 4
Peak total output all channels driven 10800 W
Max. Peak output voltage per channel 153 V
Max. output current per channel 50 A peak

Max. Output Power
All channels driven 2350 W 2400 W 1300 W 660 W
Channels 1 and 2, while channels 3 and 4 are driven at -3 dB 
All channels driven into optimal impedance interval > 2700 W into 2.4 – 3.2 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) >116 dB
Dynamic range with analog inputs >114 dB
Frequency response (1 W into 8 ohms, 20 Hz - 20 kHz) < +/-0.05 dB
Input Common Mode Rejection (CMR) 20 Hz to 1 kHz > 78 dB
Internal sample rate 96 kHz
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
THD + Noise 0.00022 %, typical at 1 kHz unweighted at +26 dBu headroom setting

AES / EBU inputs
Supported resolutions ≤ 24 bit
Supported sample rates 44.1, 48, 88.2, 96, 176.4, 192 kHz

Dante Audio Network
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 - 153 V, step size 0.1 V
Current Peak Limiter < 300 ms 49 A peak
Current Average Limiter (CAL) > 300 ms 25 Arms
Limiters (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

Back 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 NL8M, 2 x NL4M) or 4 Binding Posts (pairs) (must be specified upon order)
Auto 10/100, Auto Uplink 2 x RJ45 EtherCon
Control and monitoring interface Via Ethernet for Lake Controller software
Detachable mains cord Neutrik PowerCon 32 A
Cooling Two fans, front-to-rear airflow, temperature controlled speed

Front-panel user interface:
Display, daylight readable LCD 2.5 inch
Fault/Warning/Limit/Clip indicators RGB LEDs
Mute and soft function buttons 8 provided
Standby Power button On/Off
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, 230 V / 115 V nominal 1)
140-265 V / 70-135 V (45 - 66 Hz)
Soft start / Inrush Current Draw Yes / max. 5 A
Main’s Power Average Limiter (PAL) Yes

Dimensions (W/H/D)
W: 483 mm (19"), H: 88 mm (2 U), Overall D: 470 mm (18.5") deep including handles and rear support.
Weight 13.5 kg (30 lbs.)
Finish Black painted steel chassis with black painted steel / aluminum front

Approvals
CE, ANSI(UL 60065 6TL), CSA C22.2 NO. 60065, FCC

Note 2): Assymetrically loading the output channels (as shown, for example): If one channel has reduced output power requirements, the voltage drop from the power supply will be reduced, resulting in a higher voltage and power output for the other channel.

All specifications are subject to change without notice.

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