PLM 14000

PLM 14000 Powered Loudspeaker Management system
The PLM 14000 is a two-input, two-output amplifier platform optimized for high-power requirements, including the most demanding sub-bass applications with loading down to 2 ohms. A software-controlled bridge mode allows coupling the two channels for a single prodigious 14,000 W output. Beyond sheer power, the PLM 14000 seamlessly integrates networked audio distribution, drive proces-sing, and load verification with real-time performance monitoring into a single hardware unit plus unified software controller. As a cohesive system, the PLM 14000 affords significant advantages when compared to conventional approaches utilizing separate components.

Lab.gruppen Technology

- 7000 W per channel @ 2 ohms**
- 4350 W per channel @ 4 ohms**
- 14,000 W @ 4 ohms in bridge mode
- 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
- Compatible with Lake LM 26, Dolby® Lake Processor and other legacy Dolby Lake devices
- Primary and secondary network connections
- 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
- Dual Binding post (4) or Neutrik® speakON® (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 193 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

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 14000 Powered Loudspeaker Management system incorporates further enhancements for even greater sustained output power. The basic output topology remains Lab.gruppen's patented Class TD – combining exceptional efficiency of Class D with the sonic purity of Class B designs – but with new circuitry for greater current-carrying capabilities. The Regulated Switch Mode Power Supply (R.SMPS) delivers full power during long low-frequency bursts and maintains stable rail voltages despite fluctuating line voltage. Additional PLM 14000 power platform features include extreme power density, a software-controlled bridge mode, 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 14000 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 14000 contains two 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, 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, 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.

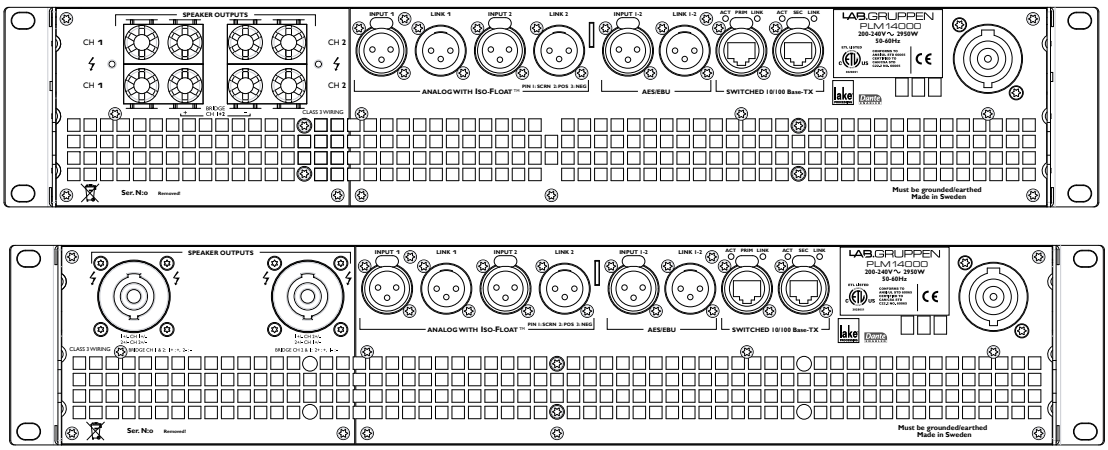
The Lake Controller software is optimized for a wireless Tablet PC. Operation is easy and intuitive, with the "feel" of real-time analog faders and controls. The same Lake Controller interface can be used to operate Dolby Lake Processors, Lake Contour, and Lake Mesa Quad EQ processors as part of a unified 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.

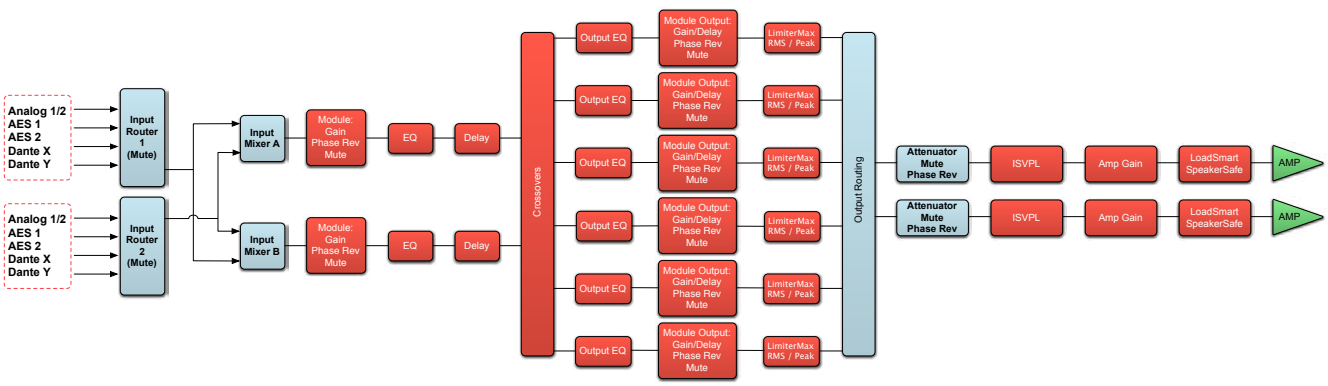
Dante Digital Audio Network
The PLM Series Powered Loudspeaker Management systems are equipped as standard with Dante, a self-configuring digital audio networking solution from Audinate® of Australia. Based on the newest developments in networking technology, Dante provides reliable, sample-accurate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

PLM 14000 Neutrik speakON connector version shown.

The front panel is the “local control center” for the PLM 14000. 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 14000 is available with either binding posts or an “embedded patch panel” with Neutrik speakON connectors (2 x NLT4). 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, as well as the possibillity to bridge the two channels together. 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 14000

General				
Number of input channels	2			
Number of output channels	2			
Peak total output all channels driven	14000 W			
Max. Peak output voltage per channel	193 V			
Max. output current per channel	90 A peak			
Max. Output Power	**2 ohms**	**4 ohms**	**8 ohms**	**16 ohms**
All channels driven	7000 W [1]	4300 W [1]	2300 W	1150 W
All channels driven into optimal impedance interval	> 7000 W into 1.8 – 2.1 ohms			
Bridged per ch. (all channels driven)	n.r. [2]	14000 W [1]	8600 W [1]	4600 W
Bridged into optimal impedance interval	>14000 W into 3.6 – 4.2 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)	> 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 - 193 V, step size 0.1 V			
Current Peak Limiter < 300 ms	90 A peak			
Current Average Limiter (CAL) > 300 ms	44 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 (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	Two 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 140 - 265 V / 70-135 V [3]			
Soft start / Inrush Current Draw	Yes / max. 5 A			
Power Average Limiter (PAL)	Yes			
Power Factor Correction (PFC)	No			
Breaker Emulation Limiter (BEL), software controlled 5 - 32 A	No			
Under-Voltage Limiter (UVL)	No			
Dimensions				
Rack rail to rear panel	W: 483 mm (19”), H:88 mm (2 U), D: 386 mm (15.2”)			
Overall depth including handles and rear support	460 mm (18.1”)			
Weight	13.5 kg (30 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).

Note 2): Regarding n.r. (not recommended) notes: The amplifier will be fully operational in bridge-mode into 2 ohm and high impedance (Hi-Z) loads, but due to physical constraints in the construction, the max. output power will not be significantly higher than running individual channels and therefore this mode of operation is not recommended.

Note 3): Separate 230 V or 115 V versions available. Not selectable on the product.

All specifications are subject to change without notice.