LINEA RESEARCH

OEM Loudspeaker System Controller

The **Loudspeaker System Controller** provides a complete speaker processing solution for OEM's. Our development team is unrivalled in this field having brought more than a dozen designs to market over the past fifteen years. This detailed experience coupled with a fresh start at Linea Research has enabled them to create the LSC range with a meticulous blend of performance, ease of use, reliability and commercial viability. Extensive branding options support the OEM's look and feel. LSC is now successfully established in the market place with thousands of units in daily use. Our OEM customers have enjoyed commercial success, exceptionally low field failure rates, almost non-existent technical support calls and above all sonic qualities that match those of the boutique offerings.

- Two input channels
- Four or Six output channels
- High quality 96kHz audio processing
- Easy to use
- Proven reliability
- Flexible hiding of OEM settings
- Finished in your livery
- PC control from PodWare
- BvNET networking option

Introduction / Key Features

The Linea Research Loudspeaker System Controller (LSC) is a high performance, easy to use signal processor for loudspeaker systems, providing processing for up to stereo 3-way or mono 6-way configurations. The LSC provides generous amounts of signal processing capability and a wide variety of crossover shapes. The package is complemented by a highly flexible parameter hiding arrangement, and presets for both the OEM and the user.

The LSC may be controlled just as comprehensively from its front panel, or by using the PodWare software application. PodWare can operate a single LSC, or can optionally control a multi-km network of products using the BvNET networking standard.

Sonic Purity

Independent listening tests have confirmed that the Linea Research LSC performs as well as the very top brands often costing many times more than the LSC. This is testament to our 'Minimum Signal Path' philosophy, our careful choice of converters, and our many years of expertise in DSP algorithm design for professional audio.

The LSC uses 96kHz sampling rate, Burr-Brown analogue-to-digital converter, the renowned Wolfson multi-bit digital-to-analogue converter, and a powerful 3rd generation Sharc Digital signal Processor (DSP). All this adds up to deliver the ultimate in sonic transparency and a stunning open natural sound quality.

Crossover shapes

The LSC is capable of crossovers up to 8th order (48dB/Octave). In addition to the usual Butterworth, Linkwitz-Riley and Bessel filter shapes, the LSC provides access to Hardman crossover filtering, a technique we are proud to have introduced to the industry. Hardman filters produce much steeper cut-off slopes for a given order than conventional crossover alignments, without any additional group delay. This allows a lower order filter to be used without sacrificing cut-off characteristics, but with smoother group delay and less severe phase penalties, giving a more natural sound. Hardman filters also provide identical phase characteristics between adjacent bands (like Linkwitz-Riley), so the polar performance is rock steady

As we also employ phase matching on our Bessel filters, adjacent bands are in-phase throughout the crossover region.

Our white-paper "Crossover Filter Shape Comparisons" provides more detail on this subject.

High-Pass Filtering

To avoid unnecessary inter-band phase shifts common in many competing products, we provide high-pass filtering on the inputs rather than forcing you to apply 'system' high-pass filtering on the low crossover bands.

Our white-paper "High-Pass Filtering in Two-Way Systems" explains why this is important.

Presets

The LSC allows forty-five complete sets of parameters to be stored. Each set is called a *Preset*. Presets may be used, for example, to select a loudspeaker system from a library, or to apply one of a number of venue tunings specialised for different types of event. Presets are stored permanently inside the LSC and so will always be available even if The LSC is not being used with PodWare. The OEM can easily create a library of locked 'factory' presets from which the user can create their own variants.

Ease of Use

Many users have commented on how quick and easy this product is to use. This did not happen accidentally; it was a primary design aim based on user testimony. There are no multiple nested menus, just simple X-Y navigation among the channels and their parameters. The parameters for a given processing element appear on the clear backlit display three at a time, allowing adjustment of these using the three velocity-sensitive rotary controls. The LSC always does what you would expect. When adjusting parameters in Stereo mode, the values are automatically adjusted in both channels together.

It makes the difficult decisions for you. The limiter will always automatically select the attack and release speeds to suit the current settings. It is our long experience that this assures the best performance of your system.

Branding

Subject to minimum batch quantities, you can choose to have the unit finished in your choice of paint colour, your silk-screen layout and colours and your logo.

Each device is branded for the OEM customer so that PodWare reports the model name of your choice, with your PodWare panel colour scheme etc.
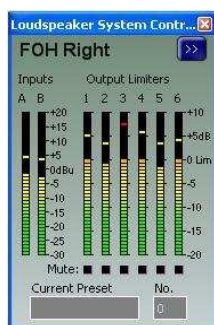
Obcom

An all-new, clean messaging system developed by Linea Research, called Obcom is at the heart of our software. Obcom is used throughout our application software, and across all communications media (such as BvNET). It is a thoroughly uniform standard that allows easy communication between different applications and different devices that support the Obcom standard. Obcom now has a large user base and is supported by many Pro Audio manufacturers.

PodWare Application

Thanks to the power of Obcom, PodWare becomes much more than just a remote control panel for a LSC. PodWare and any connected device(s) become intimately intertwined, faithfully duplicating any control adjustments whether they are made in PodWare or on the front panel of the device itself. Adjust a gain control on the device, and watch the gain fader in PodWare smoothly slide in sympathy. They simply cannot get out of 'sync'. You can also update the firmware in the unit via PodWare – even via the network.

The PodWare PC Windows application uses a small panel called a *MonIcon* to display all the important status information about the LSC at a glance. From this small panel it is possible to see input signal activity, limiter activity, preset selection and mute status. The full control panel is only one click away from the MonIcon.

Each output can be named in PodWare. These names not only appear for the User on the PodWare control panels, but also show briefly when scrolling through outputs on the device itself.

Security

As the OEM, you have complete freedom to edit any parameters you wish, then optionally lock any individual parameters away from the user so that they cannot be edited or even viewed in PodWare or on the device. You can also apply a model name for the device.

Once a complete tuning has been prepared, you can save the settings into a Preset. PodWare allows you to lock any given presets so that they become permanent factory presets which the end user cannot erase or overwrite. When you save a file in PodWare as an OEM, a Factory file is created which contains all these parameters and all the factory presets. This file can then be used to load settings in production.

Should you wish to change the factory presets in the field, modified Factory files can be distributed and loaded by the user without disturbing the user presets, and without the user being able to access the OEM settings in the factory presets.

The full The LSC control panels in PodWare look like this:
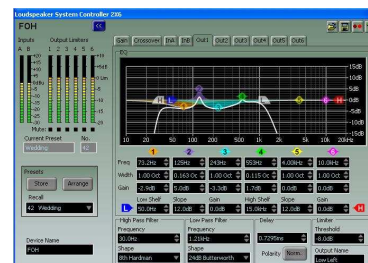
Hiding

You can hide the parameters of each individual processing element from the user by selecting it to be hidden in the special hiding tab in PodWare.

The user cannot access any of the hidden parameters which are considered to be the responsibility of the OEM. Only with your OEM password (agreed with Linea Research) can PodWare be unlocked to gain access to the OEM parameters and to the hiding tab.

User settings

The user cannot access your hidden settings or overwrite your factory presets since these are only accessible in OEM mode, which is password protected.

The user can however freely use any unhidden processing elements, even spare equalisation not utilised in an OEM factory preset, which will effectively overlay your OEM settings. The user can then save modified versions of your factory presets.
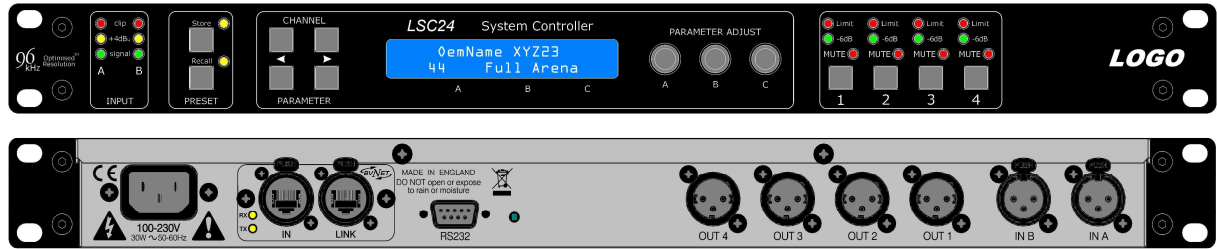
User Security

In addition to the OEM security features, the LSC also has a hidden Secure button on the rear panel, which causes the front panel controls to become inoperative and thus tamper-proof.
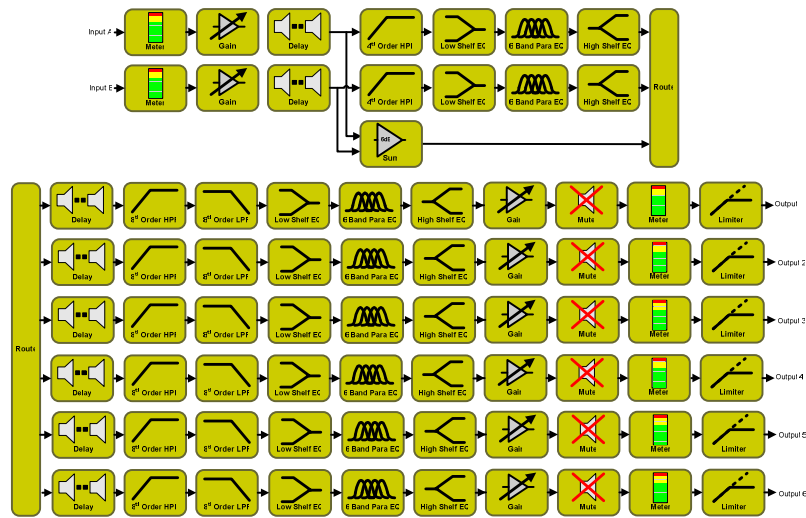
Panel Views

Six output version:

Four output version:

Signal Processing Block Diagram

Parameter ranges

Input Gain	-80 to +20dB
Input Delay	0 to 405ms
Input HPF Freq.	20Hz to 25kHz
Input HPF shapes	1st order, Bes12, But12, LR12, Bes18,But18<Bes24, But24, LR24, Hardman4th
Output Gain	-80 to +20dB
Output Polarity	Norm, Invert
Output Delay	0 to 80ms
Output HPF Freq.	20Hz to 25kHz
Output HPF shapes	1st order, Bes12, But12, LR12, Bes18,But18<Bes24, But24, LR24, Hardman4th , But48, LR48, Hardman8th
Output LPF Freq.	20Hz to 25kHz
Output LPF shapes	1st order, Bes12, But12, LR12, Bes18,But18<Bes24, But24, LR24, Hardman4th , But48, LR48, Hardman8th
Output Lim Thresh	-40 to +20dBu
Para EQ Freq	10Hz to 25kHz
Para EQ Width	0.1 to 5.2 Oct Q 0.2 to 14.2
Para EQ Gain	-15 to +15dB
Para EQ Slope	6 to 12dB
Shelf EQ Freq	10Hz to 25kHz
Shelf EQ Gain	-15 to +15dB

Technical Specifications

Input impedance:	>10k Ohm balanced
Output Imp:	<100R Gnd balanced
Max Input level:	+20dBu
Max Output level:	+20dBu into 600R
Sample rate:	96kHz
Frequency Resp:	20Hz - 20kHz +/-0.5dB 10Hz - 40kHz +/- 3dB
Dynamic range :	>110dBA Typ. (20Hz - 20kHz)
THD (20Hz–20kHz):	<0.008% Typ.
Power consumption:	25W max.

Connectors

Audio Inputs:	3 pin female XLR
Audio Outputs:	3 pin male XLR
Comms:	9 pin female D
Mains:	3 pin IEC

Environmental

Temperature:	0 to +55°C
Humidity:	0 to 80% RH (non-condensing)

Dimensions

Height:	44mm
Width:	482mm
Depth:	254mm
Weight:	2.7kg net

Options

- BvNET Network card

Regulatory compliance

This product complies with the EMC Directive (89/336/EEC) as issued by the Commission of the European Community. Compliance with these directives implies conformity with the following European standards:

- EN55103-1   Electromagnetic Interference (Emission)
- EN55103-2   Electromagnetic Susceptibility (Immunity)
- EN60065   Electrical Safety

It also meets the requirements of UL6500 (Electrical Safety) and FCC part 15B (EMC).

This product is intended for operation in the E2 (commercial & light industrial) and E3 (urban outdoors) Electromagnetic Environments.
E&OE