LINEA RESEARCH

LIMPET *dsp'*
## OEM Installation
& Operation Guide

Thank you

Thank you for choosing this product for your application. Please spare a little time to study the contents of this guide so that the best possible performance can be obtained from the unit. Linea Research are always happy to answer any questions and can be contacted via www.linea-research.co.uk.

Primarily targeted at active loudspeakers, Limpet is an ideal companion for Linea Research analog pod amplifiers, adding Digital Signal Processing and BvNET networked monitoring and control.

The PC application that is used to control BvNET devices is called 'PodWare'. PodWare is an integral part of the system, being used in 'OEM' mode to factory configure the Limpet for its intended application and in 'User' mode for either one-to-one or networked 'live' control and monitoring.

Mechanical Installation

Limpet should be mounted securely, away from extreme sources of heat. Linea Research are pleased to offer advice on optimal mounting positions and methods.
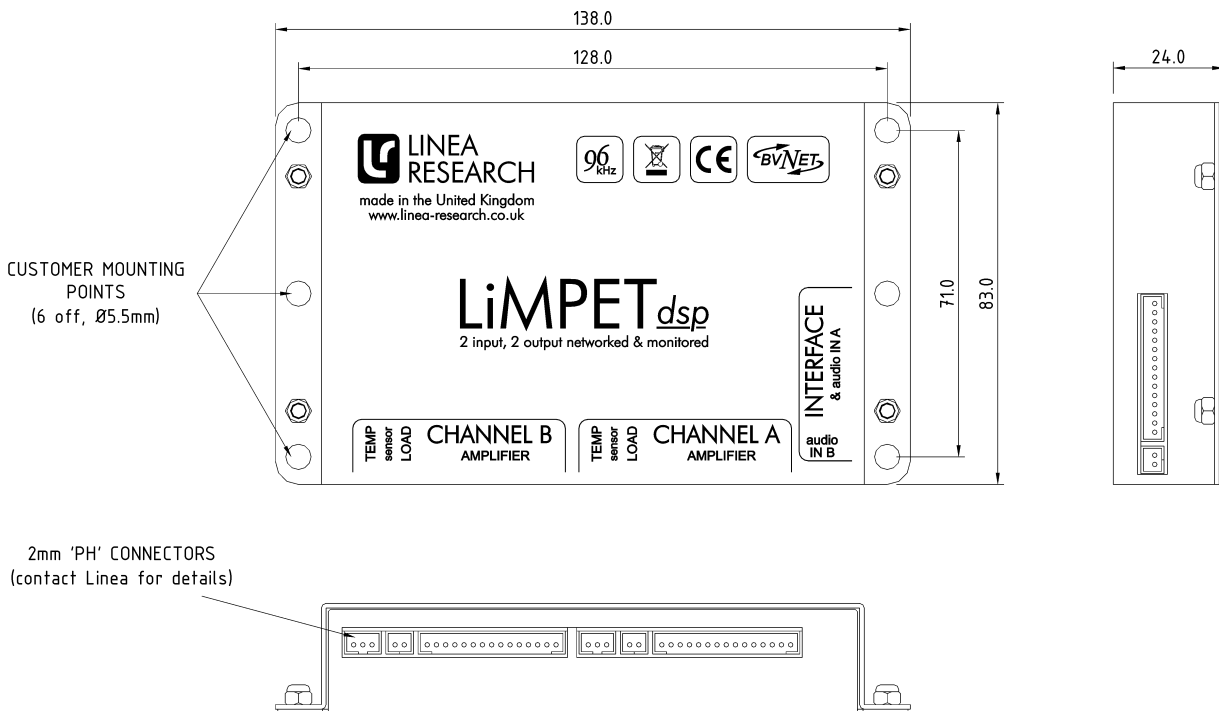
Connectors

There are eight multi-way connectors on Limpet. These connect the device to up to two amplifiers, up to two audio inputs, temperature sensors, load current monitors and a user interface circuit board. All the connectors are of the readily available, multi-sourced 2mm pitch 'PH' type.

Amplifiers

The amplifier ports are designed to allow direct interfacing to Linea Research's analog 'pod' products. It may also be possible to use Limpet with other non-Linea amplifier products. Please contact Linea with any such enquiries.

Channel B Audio Input

This is available on a 2 way connector situated next to the 'interface' connector. It is wired as follows :

Pin	Function
1	Audio in A+
2	Audio in A-

Audio

To ensure the highest audio quality, 96kHz sampling rate and 24 bit audio converters are used, together with a powerful 3rd generation Sharc Digital signal Processor (DSP) running audio processing algorithms borne from years of experience in high quality professional digital audio. System levels have been configured to provide the lowest possible noise floor commensurate with good input signal handling capability.

Limpet has two balanced analog inputs and two analog outputs. The DSP provides considerable processing possibilities, and in addition it is possible to freely route either input chain to either or both output chains. This makes a number of configurations possible especially if two amplifiers are employed. The number of input channels shown in PodWare is determined by the firmware model issued by Linea Research which in turn follows the requirements of the OEM customer.

Gain & headroom

Limpet's maximum output signal level of about +5.5dBu has been set to provide a good match to the clip point of Linea's MiniPod amplifier products. The maximum input level that can be applied to Limpet is higher than this at about +10dBu to allow easy system integration and the lowest overall noise performance to be achieved.

The input gain control(s) in PodWare would normally be set to 0dB, and should be considered a user control for reducing the sensitivity of the loudspeaker in a given installation situation.

The output gain control(s) would normally be used to adjust the relative drive levels between drivers in a two amplifier system. The nominal output gain(s) would normally be set to 0dB since this will achieve equal headroom between inputs and outputs. However, the Output gain(s) may be used to compensate for OEM equalisation or crossover filtering which causes the overall gain to be altered.

The Limiter(s) are calibrated with reference to the maximum output of Limpet. A limiter threshold of 0dB is thus the clip point of the amplifier. The limiter(s) should be set so that they start to operate below a level which the driver(s) are known to survive. The Limiter meters show the signal level on the input to the limiter referenced to the limiter threshold. A reading above 0dB (the red section on the meter) thus indicates the amount of limiting.

Monitoring

Temperatures

Limpet contains a temperature sensor internally which is always shown on the PodWare panel. In addition, up to two further external temperature sensors may be attached, which could, for example, be used to monitor the temperature of an amplifier and speaker driver. If temperatures are being monitored then it is possible for the DSP to apply audio limiters to try and keep the temperature within an OEM configured limit.

The OEM settings determine whether either or both of these sensors are enabled, if so a temperature bar graph and a temperature log will be displayed for that sensor in PodWare. To change the setting, with PodWare in OEM mode, two tick-boxes will be found in the Crossover/Gain tab. Ticking one of the boxes will hide (exclude) the relevant temperature gauge.

Limpet is designed to be used with National Semiconductor LM35 temperature sensors. Linea can supply these parts ready fitted to a Limpet compatible wire loom. If the OEM wishes to manufacture their own cables, the connections are as follows:

Pin	LM35 Function
1	+V
2	Vout
3	GND

Driver Impedances

Like the external temperature sensors, up to two external current transformers may be attached to a Limpet which will then be able to monitor the impedance of the connected driver(s). PodWare is then able to check that the driver impedance is within the limits set by the 'Min. Imp' and Max Imp' controls on the Crossover / Gain tab in PodWare (when in OEM mode). If any of these controls are set to 'off' (the lowest parameter value) then impedance checking is disabled and the impedance indicators removed from the panel in PodWare for that sensor. If currents are being monitored then it is possible for the DSP to apply audio limiters to try and keep the driver currents within OEM configured limits.

The current sensing transformers are available from Linea already fitted to a small circuit board with all the appropriate connectors ready to be screwed inside an OEM speaker. The individual components are also available should the OEM wish to incorporate the current monitoring as part of a passive crossover board.

Indicators

Limpet can drive up to three LEDs. What these LEDs indicate can be configured by the OEM to be either 'Limit channel A & 'Limit channel B' or 'Signal' & 'Limit' (with the limiter on either channel causing it to light).

The third 'Wink' LED (and the other LEDs except 'power') flash for five seconds when the 'wink' button on the device's PodWare panel is pressed. If this LED is positioned on the front of a speaker it provides a useful way to easily locate a particular unit on a network. As this LED shares a control line with 'VOICE switch B' it is not possible to have both the wink LED and also use voices 2 & 4. The OEM settings determine the function of this line.

DSP & PodWare

As mentioned before, PodWare is the PC application which is used to control Linea Research's products, either one-to-one or networked using BvNET. The abbreviated information here is intended to impart some basic information to allow customers to quickly start using their Limpets. For a detailed description and operating guide for PodWare please contact Linea.

Branding

It is possible for OEM customers to apply 'branding' to both their versions of the PodWare PC control application and also the control panels that PodWare displays when connected to an OEM's product. Amongst other things it is possible to have a customised 'splash' screen, customise fonts and to choose the colours of control panels and controls etc. This choice of appearance will always be used when an OEM's product is discovered on a BvNET network, even if it was discovered from a differently branded version of PodWare (should the OEM have allowed this).

Monitoring

PodWare allows the following Limpet parameters to be continuously monitored and displayed :

- Input level meter
- Limiter meters
- Amplifier protect indicator
- Internal Limpet temperature meter
- External temperature sensor meter(s)
- Driver impedance indicator(s)
- Amplifier clip indicator
- Temperature logging (all three sensors)
- Amplifier protection logging
- Power cycle count

Driver impedance is displayed as a 'good / bad' indication in user mode and a numerical measurement of impedance (in Ohms) in OEM mode.

OEM & User Settings

The Crossover / Gain tab in the PodWare control panel allows the crossover and driver equalisation parameters to be adjusted. Delay offsets between drivers can also be set here. This tab also allows Limpet to be given a name to correspond with the model of speaker that it is fitted inside. This name will be reported by PodWare when it discovers the device.

DSP Processing

This is a block diagram of the DSP audio processing provided by Limpet:
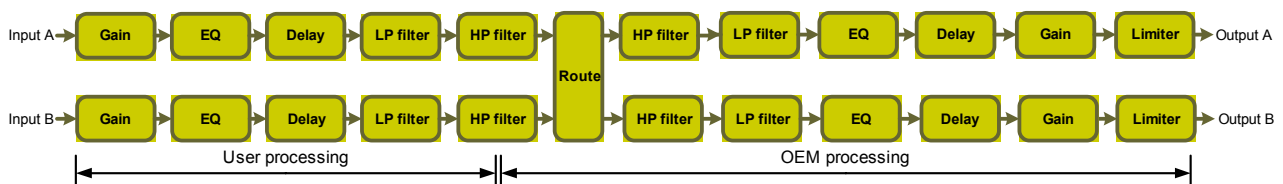
By having a clean split between OEM and user processing, security is very simple because the user cannot access any of the parameters which are considered to be the responsibility of the OEM. Only with the OEM password, agreed with Linea, can PodWare be unlocked to gain access to the OEM parameters.

Voices

Limpet allows four complete sets of parameters to be stored. Each set is called a VOICE. Voices may be used, for example, to select an alternative tuning as may be required if a speaker is used with or without a separate sub-bass unit. Voice settings are stored permanently inside Limpet and so will always be available even if Limpet is not being used with PodWare.

The voice selected depends on the condition of two 'switch' lines. Normally two latching switches would be used to determine which voice is selected. If no connections are made to either of the two voice select terminals, voice 1 will always be activated at power-on.

The following table shows which voices are selected for given voice switch positions:

Voice Number	Switch A	Switch B
1	Open	Open
2	Ground	Open
3	Open	Ground
4	Ground	Ground

Please remember that the control line for 'switch B' has to be configured by the OEM to be either a voice change switch input or the 'wink' LED. If the wink LED is needed then it will only be possible for the user to select between two voices.

Currently Linea divides the four possible voices into two pairs. One pair, voices 1 & 3 being referred to as 'Factory', the other pair, voices 2 & 4 being 'User'. This means that the OEM can program Limpet with two sets of settings that will always be available and that the user cannot change. With reference to the DSP processing block diagram above, the parameters that can be set by the OEM for the factory modes are :

- Input gain
- Input High-Pass filter
- Input Low-Pass filter
- Output Gain
- Output High-Pass Filter
- Output Low-Pass Filter
- 6 band Output Parametric EQ
- 2 band Output Shelving EQ
- Output Delay
- Output Limiter

It is usual that the OEM will program these same default factory values in to the two 'user' voices. Users will then be able to use PodWare to modify these voices by adjustment of the following parameters :

- Input gain
- Input High-Pass filter
- Input Low-Pass filter
- Input Delay
- 8 band Input Parametric EQ
- 2-band Input shelving EQ

Please note that in order to protect drivers, the user will only be able to adjust the high pass filter if the OEM allows this in the OEM settings. With PodWare in user mode, adjustments are made simultaneously to voices 3 & 4.

Authoring Voices

The OEM password must be entered for it to be possible to edit the settings for the factory voices (1& 3).

Since normally most of the parameters will be similar in every voice because they pertain to the drivers and cabinet etc, it is possible to save time by entering the parameters with the voice selector in the PodWare panel set to 'all', this will simultaneously apply any changes made to all four voices.

Once satisfied with the general settings, the required differences between the voices can then be made by selecting that particular voice and making the changes.

When working online, either in OEM or user mode, be aware that the setting of the voice switches on the device itself will still affect the voice which is 'heard'. PodWare can be editing an entirely different voice. Make sure that the same voice is selected on both the product and PodWare if it is desired to hear the results of the changes to avoid confusion. The voice group-box in PodWare has an 'active' voice indicator which shows the voice the product has been set to i.e. which voice is currently being listened to.

Once settings editing is finished, they will have been automatically stored in the Limpet if that Limpet was 'online' when the changes were made. The settings may also be saved into a 'factory file' (*.dfa). This file can be used later in a number of ways:

- loaded into an offline panel in OEM mode for further editing
- loaded into an online device in OEM mode for auditioning / editing
- loaded into an online device in User mode, for factory configuration or field updates
  (by means of File>Open Factory Settings)

Should an OEM wish to change the settings of units in the field, modified factory files can be distributed and loaded by the user without disturbing their user-settings, and without the user being able to access the OEM settings.

Bridging
In OEM mode, on a Limpet that has been configured for 2-way operation, PodWare shows a bridge button in the Crossover / Gain tab. This may be activated to allow Limpet to drive two amplifiers in anti-phase for bridge driving loudspeakers. As there are generally some electrical details that need to be addressed when using amplifiers in bridge, please contact Linea Research for further details.

User Connections
The Limpet 'interface' connector is intended to be used with a circuit board that provides the user interface. This board would normally provide audio and BvNET connections as well as providing for LEDs, voice switches and support circuitry.

Below are some details of the standard single audio input interface circuit board offered by Linea Research. Linea are always happy to advise OEMs on different arrangements.

Notes
As standard the POWER, SIGNAL & LIMIT LEDs can be any combination of 5mm red, green or blue types on 100mm leads. The MODE switch(s) can be on either 100mm or 250mm leads. Other colours, switch types & lead lengths are possible subject to a minimum order quantity.

The WINK LED would normally be supplied by the customer as it is generally fitted to the front of the cabinet. A type that can give the desired brightness with about 15mA of drive should be selected. It is not possible to have both the WINK LED & the second DSP VOICE switch.

The audio & BvNET connectors use standard Neutrik 'A' series cutouts & should be secured with 2.9x8 pan-head 'plastite' screws. The Limpet is connected with either a 150mm, 300mm or 450mm long wire loom supplied by Linea.
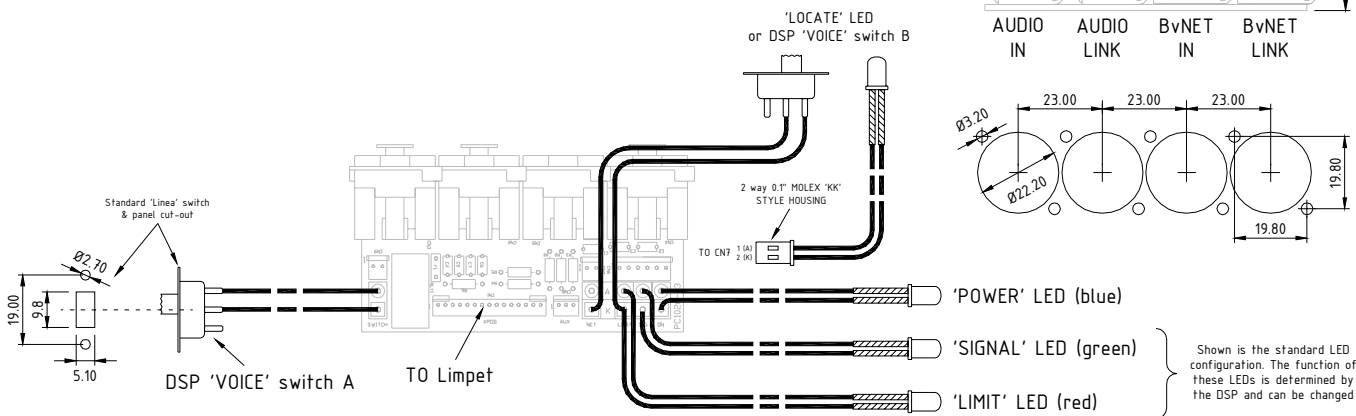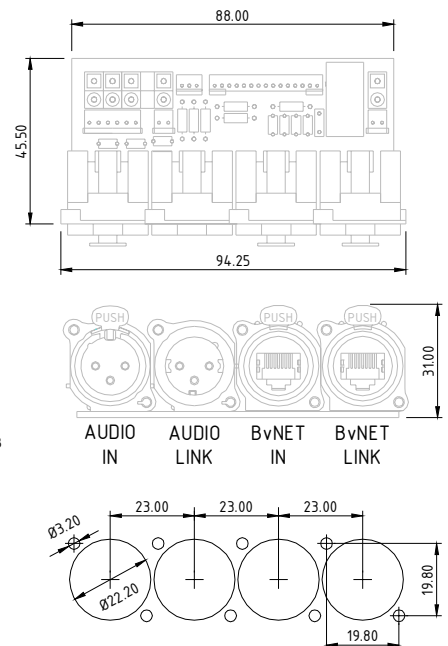
Technical Specifications

Audio

Input impedance	11k Ohms balanced, 5.5k Ohms unbalanced
Output Impedance	<50 Ohms impedance balanced
Maximum Input level	+10dBu
Maximum Output level	+5.5dBu
Converters	24 Bit
Sample rate	96kHz
Frequency Response	10Hz - 40kHz +/- 1dB / 20Hz - 20kHz +/- 0.5dB
Dynamic range	110dBA
THD (20Hz – 20kHz)	better than 0.01%

Environmental

Temperature	0 to +55°C
Humidity	0 to 80% RH (non-condensing)
Power consumption	4W max.

Dimensions

Height	24mm
Width	83mm
Depth	138mm
Weight	300g

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 imply conformity with the following European standards:

- EN55103-1   Electromagnetic Interference (Emission)
- EN55103-2   Electromagnetic Susceptibility (Immunity)

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