Introduction

The Eigenharp Alpha has a built-in high quality microphone pre-amplifier, which supports several different microphone types.

This white paper provides information to assist customers in connecting and using different types of microphones with the Alpha microphone interface.

Please also refer to the user documentation for the Alpha for information on how to configure the software operating modes necessary to use the microphone interface.

There are a wide range of microphones available on the market today, many of which have very different interface requirements. The Eigenharp Alpha microphone pre-amplifier has been designed to allow a wide variety of microphone types to be used, but this means that the user may need to configure the interface into a specific (non-default) operational mode, and to wire the microphone cable connector in a specific way.

This document is intended to provide the information necessary to help customers connect their own microphones to the Alpha. Eigenlabs regrets, however, that it is not able to offer microphone wiring advice to customers for any specific manufacturer make and model.

Eigenlabs supply a small range of high quality microphones that are suitable for use with the Alpha, and are supplied with the correct connector already wired onto the cable. If you do not feel comfortable with the process of identifying the correct interface method and wiring the microphone connector appropriately, then these microphones are available to buy from our web site.

Pre-amplifier Interface Specification

The microphone pre-amplifier has the following specifications:

- External interface via high quality locking 4 pin LEMO 00 series connector.
- Balanced and Un-balanced microphone types supported.
- 24 bit at 96khz A/D converter.
- Programmable gain from 10 to 45db in 1db steps.
- -26dB software selectable input PAD.
- Software selectable 48V phantom power.
- 10V Electret bias/polarisation power.
- High quality input stage with the following noise performance characteristics : EIN A-weighted = -110dBu with 150 Ohm source 20Hz to 20kHz, 40 dB gain. EIN Un-weighted = -115dBu with same conditions as A-weighted.

Microphone Types

The pre-amplifier has been designed to support the following types of microphone :

Condenser Microphones

This type of microphone is based on a capacitive diaphragm which requires a bias voltage, and typically has a small amplifier built into the microphone capsule. Power must therefore be supplied to a Condenser microphone for it to operate, and this can either be in the form of a voltage available from the pre-amplifier interface, or by a battery contained within the body of the microphone.

Condenser microphones are often of a very high quality.

Electret Microphones

This is a sub-type of Condenser microphone that uses a capacitive diaphragm that is permanently biased by a static charge inherent within the construction of the diaphragm. Electret microphones still typically require a power source, as they also include a small amplifier within the capsule.

Electret microphones are the most common type of microphone available today, but are typically of a lower quality than a 'standard' Condenser microphone.

To avoid confusion within this document we will use the term 'Condenser' exclusively to mean Condenser microphones that are specifically not of the Electret sub-type.

Dynamic Microphones

This type of microphone uses a coil attached to a diaphragm, moving with the field of a permanent magnet. Dynamic microphones do not require a bias voltage and do not typically include an internal amplifier, and therefore do not require power to be supplied from the preamplifier interface (or from a battery).

Powering Microphones

As previously discussed, Condenser and Electret microphone types require a power source in order to operate. Sometimes this is provided by a battery, but often the power must be supplied from the microphone pre-amplifier interface. The Eigenharp Alpha microphone pre-amplifier can supply microphone power in two forms, as described below.

Phantom Power

The term Phantom Power refers to an industry standard (DIN 45596) method of powering a microphone using a bias voltage placed on the microphone signal interface lines by the preamplifier. This voltage is typically 48V DC, although the standard also allows for other voltages.

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The Eigenharp Alpha mic pre-amplifier includes a 48V DC Phantom Power source that can be switched onto the mic interface under software control.

The user should take care to ensure that the correct type of microphone has been connected to the pre-amplifier interface before enabling the Phantom Power mode of the interface. Although the voltage is supplied through high value resistors, it is still possible that it could damage a delicate microphone of an in-compatible type.

Bias Voltage

The Eigenharp Alpha Microphone Pre-amplifier interface provides a 10V DC power supply intended for use a the 'bias' power source for Electret microphones.

For flexibility this supply voltage is provided on a separate pin of the microphone interface connector, and can therefore be left un-connected if not required.

It is fairly typical that Condenser type microphones will be designed to operate with a pre-amplifier interface that supplies Phantom Power. However some types of Condenser microphone are supplied with a converter that uses 48V Phantom Power and converts it to a lower voltage that is then used to power the microphone itself. It is often possible to 'bypass' this converter and wire a connector directly to the cable coming out of the microphone capsule. In this case the microphone would be powered using the Bias voltage supply rather than Phantom Power.

For this reason it is not unusual that a Condenser microphone would be operated using the Bias_Power operating mode of the Alpha microphone interface, which is also the standard operating mode for Electret type microphones.

Microphone Interface

The microphone interface socket is located at the top of the Alpha instrument, next to the breath pipe socket.



Figure 1 : Location of the Microphone Interface socket, and socket pin numbers

The associated connector plug is a 4 pin LEMO 00 series connector, which is a high quality type in common usage within the audio industry. Manufacturers part number is FGG.00.304.CLAD35.





The Microphone interface has the following pin functions.

Pin 1 : +10Vdc bias/polarisation voltage output

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Pin 2 : Hot / Positive input to pre-amp [with software selectable phantom power]

Pin 3 : Cold / Negative input to pre-amp [with software selectable phantom power]

Pin 4 : Status LED output [LED power is on when Mic interface is active]

Shell : Audio Ground

Note that the connector shell is connected to Audio Ground. This is a quiet Ground and is not directly connected to the case ('chassis') of the Alpha. Connecting the connector shell (or microphone shell) directly to the Alpha instrument body metalwork may result in a reduction of audio quality, and should be avoided.

The LED output is intended to allow an optional status LED to be wired with the microphone. This LED will be lit when the microphone interface is enabled in the software. To use this interface connect the Anode of the LED to Pin 4 and the Cathode to the connector Shell. The interface includes a 220R resistor in series with the 3.3V supply, which will provide aprox 6mA of drive current for a typical LED with a 2V forward voltage drop.

A functional block diagram of the microphone pre-amplifier is given in Figure 3.





Figure 3 : Block diagram of the Alpha Microphone interface

The interface is configured from the application software using the following parameters :

Microphone Type : Selects the base operational mode of the interface. Modes are :-

Bias Power Mode

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This is the default operational mode. Phantom Power is disabled (Switch SW 2 is open), and the interface is configured for a Pseudo Balanced input with the COLD (negative) input connected to audio Ground via a 1.5k resistor (switch SW3 closed). If power is required for a Condenser or Electret microphone it is available on the BEP output (Pin 1).

Phantom_Power Mode

Phantom Power is enabled on both the HOT and COLD input lines (SW 2 closed). The interface is configured for Balanced input (SW3 open).

Digital Converter

Amplifier



Dynamic Mode

Phantom Power is disabled (SW2 open). The interface is configured for Balanced operation (SW3 open). Intended primarily for use with Dynamic microphones.

Microphone Gain : Selects the gain of the Differential Amplifier. 10 to 45db in 1db steps.

Microphone PAD Enable : Enables the PAD attenuation function (-26dB).

The PAD is typically used with a 'hot' microphone that includes an integrated preamplifier. It prevents clipping from a higher amplitude source.

Microphone Enable : Master interface enable.

By default the Mic interface is disabled. Note that LED output is active when the interface is enabled, and can be used as an indication that the mic is 'live'.

Interfacing Examples

The following sections show how to connect examples of different types of microphone to the interface.

Note that the GND connection to the microphone shown within these diagrams will typically be the outer shield/screen of the microphone cable, and should be connected to the shell of the LEMO.

Electret Microphone, single ended



This would be a typical configuration for a low cost Electret microphone. If the microphone includes an internal battery then pin 1 (Bias power) should be left un-connected.

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Electret/Condenser Microphone, Pseudo Differential

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This configuration is applicable to a higher quality microphone with a differential output, that requires power, but is not designed for use with 48V Phantom Power.

Condenser Microphone, Differential



This configuration is applicable to higher quality microphone with a differential output, that is designed to operate from an interface with 48V Phantom Power. This would be typical of a high quality Condenser microphone.

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Dynamic Microphone, Differential



This configuration is applicable to a microphone with a differential output, that does not require external power. This would be typical for a Dynamic microphone, but could also be applicable for a Condenser microphone that is powered by a battery. Note that Bias power is still available in this mode, although it would generally not be used.

Specific Example : DPA4022 (manufacturer : DPA)

This is a high quality Condenser microphone.

We use the DPA4022 as an example here because it is possible to interface it to the microphone pre-amplifier in two different ways. The microphone is supplied by the manufacturer with an XLR connector that includes electronics within the connector (separate from the bias and amplifier circuitry within the microphone capsule itself).

Method 1 : Connection to the XLR interface (Phantom Power)

The microphone XLR connector includes electronics to power the microphone capsule from 48V Phantom Power. A cable converter (XLR socket to Lemo Plug) is required, with the wiring shown below. The microphone interface should be configured for *Phantom_Power* mode.



Method 2 : Direct connection to the microphone capsule

It is possible to remove the XLR connector fitted to the microphone and wire the LEMO plug directly to the cable from the microphone capsule. In this configuration the microphone is no-longer compatible with Phantom Power, and must be powered by the lower voltage Bias power supply. The microphone interface should be configured for *Bias_Power* mode in this case. The wiring for this configuration is shown below. This is how the microphone is supplied by Eigenlabs if bought from our web store.

