NL512 - Biphasic Pulse Buffer

Introduction

The NL512 BIPHASIC PULSE BUFFER is the interface between any bipolar signal and two of the NeuroLog NL800 ISOLATORS so that bipolar, isolated, constant current signals can be used for stimulation. This is "current out for voltage in".

The NL512 can also control two independent NL800's - one with the positive phase and the other with the negative phase of a DAC output.

The NL512 features a high input impedance and four input ranges to allow a number of different modules, or an external signal (such as from the DAC in a PC), to be used for the input signal. A GATE input allows multiple units to be connected to a single analogue source with each channel being digitally enabled separately. The switch, in the OFF position, disables the module.

> The NL800 ISOLATOR features no battery usage except for when a stimulus is being presented which is achieved by using an input opto-coupler. This does suffer from having a low impedance and a DC offset which is different for each unit but the NL512 removes these problems.

The NL512 provides easily adjustable internal finger controls for the DC offset of each of the NL800's.

An on-board jumper allows the unit to be driven by one of four different ranges for Full Scale current output from the NL800's. These are ±10V, ±5 V, ±2.5 V and ±1 V.

The 1 mm jumper system on the board allows the unit to be driven from the unit on its immediate left, if required, via the Motherboard in the NL900 Rack and Power Supply.

Specification Summary

IN

Input voltage range:	±15 V max.
for Full Scale Output	±10 V; ±5 V; ±2.5 V or ±1 V by on-board jumper selection.
Input impedance	1 MΩ
Frequency response	>1 MHz. This will usually be limited to less than this by the NL800.

GATE

Logic levels	TTL compatible
Function	ON (unit working) - TTL high (>2.8 V or no connection) OFF (unit disabled) - TTL low (<0.8 V)
Input voltage range:	±15 V max.
Input impedance	~85 kΩ
Response time	<5 µs

ON/OFF Switch

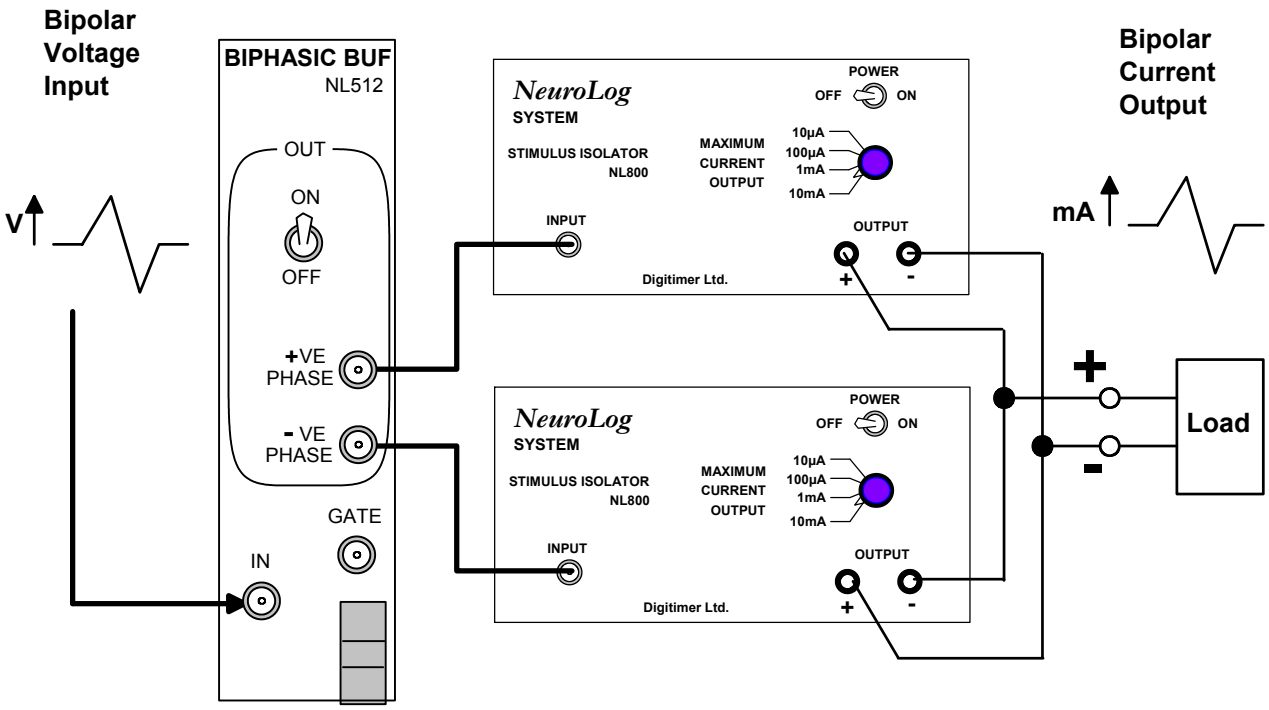
This overrides the GATE input to disable the module when set to OFF.

OUT

Output DC offset for NL800	<0.7 to >2.3 V - Separately set for each phase.
Output voltage range	0 to +10 V
Output current for NL800	up to 20 mA
Output impedance	<10 Ω

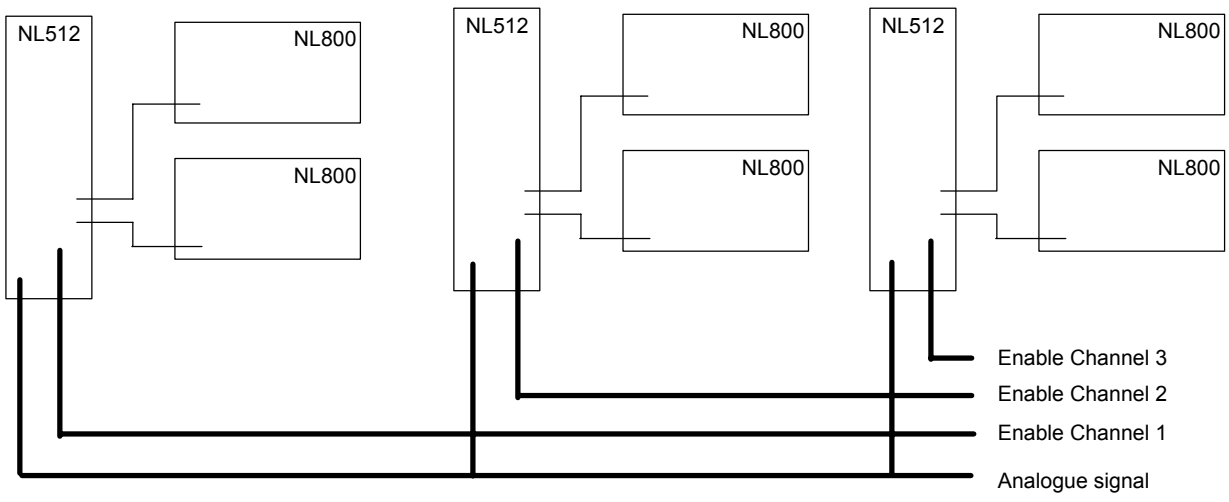
Rear connections to the NL900 motherboard allow an input interconnection for IN or GATE and the module to the immediate left without the need of a front panel cable.

Connection of NL512 to 2 x NL800's



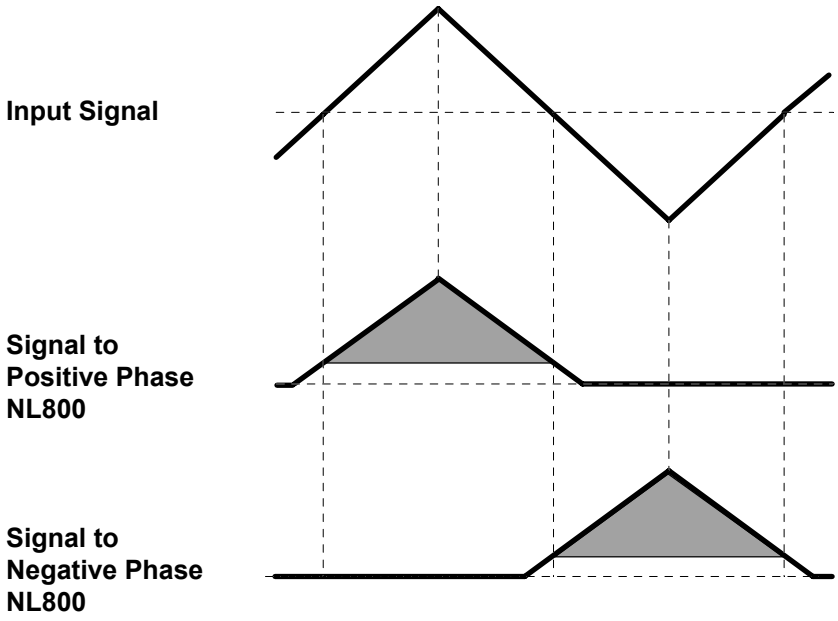
With this connection, a bipolar voltage input signal will produce an isolated bipolar current output through the load (preparation).

Controlling 3 channels from 1 DAC and 3 digital lines



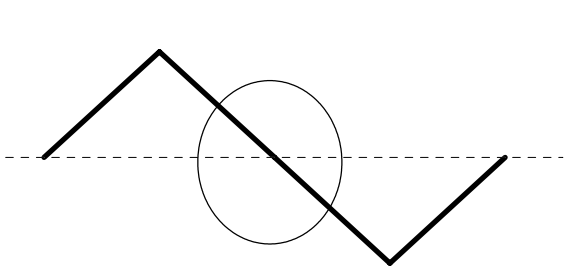
With this arrangement, you can control multiple bipolar channels one at a time from a PC card with a single analogue output and multiple digital control lines being used to enable the required channel.

Each NL800 is factory set for a 10 V input giving the selected Full Scale current output but they will each have different DC Offsets. The NL512 needs to be adjusted to match the NL800's used.

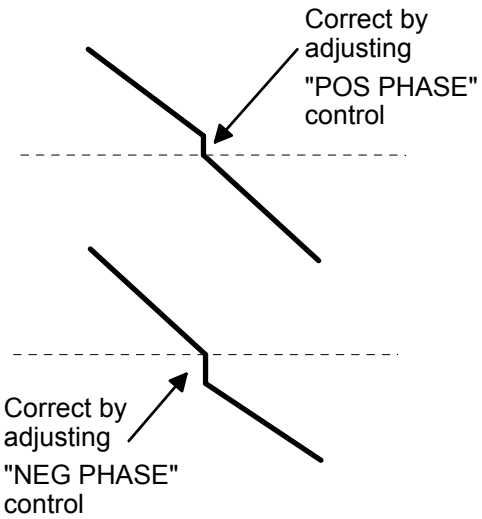


This diagram shows a bipolar input signal and the signals to the two NL800's. The solid areas indicate where each NL800 operates. Note that the DC offset of each NL800 is automatically added to the input signal before being applied to the NL800.

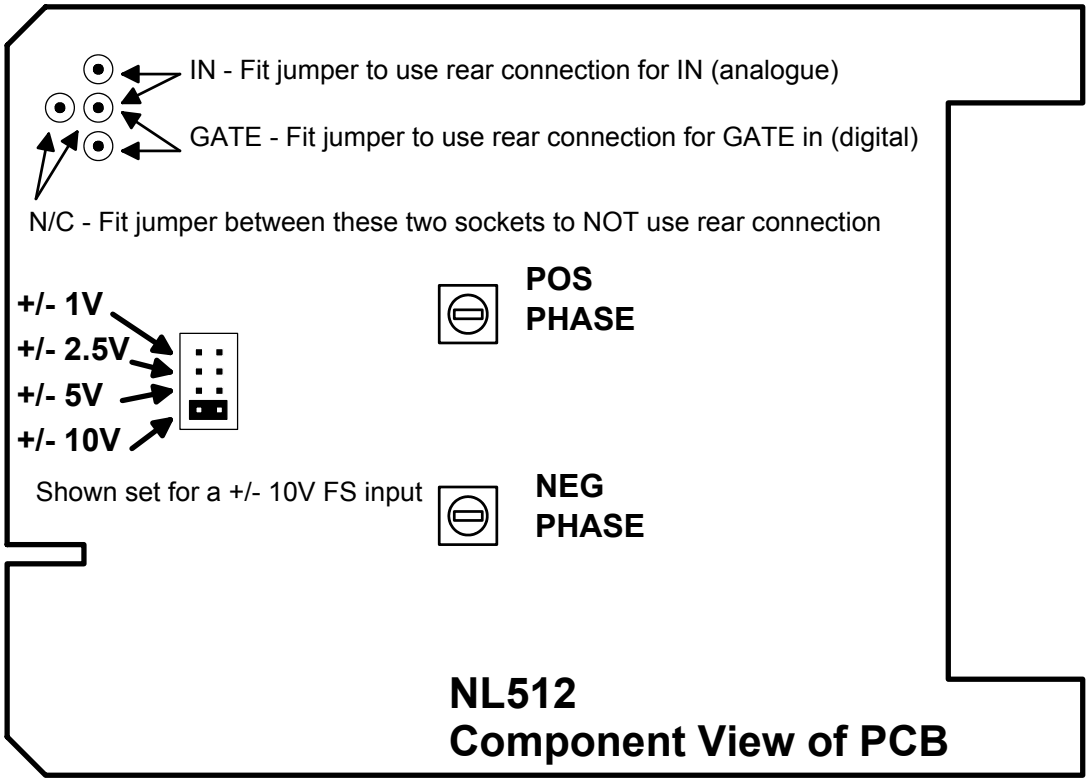
Setting the Output DC Offset (linearity) for NL800's - (refer to diagram of controls on next page)
This is adjusted independently for each NL800 and performed by applying a bipolar ramp (or sine wave) signal to the input of the NL512 and monitoring the voltage across a resistor fitted as a dummy load to a pair of NL800's connected in reverse parallel (as shown in the figure on the previous page). The presets should be set for the best linearity of the output waveform at around the zero volt level using the correct preset for the required phase. Once set for a specific NL800, that unit should be left connected or readjustment may be necessary for best linearity around zero output of the NL800.



Input signal
and what Output should be
indicating area expanded to right



Enlarged sections around 0 V
showing "cross-over" distortion



Rear Connections

The rear edge connector in the NL900 rack allows the output of the module to the immediate left to be connected to the input of this module without the need of a front panel lead.
This is enabled and disabled by setting the black jumper in the upper rear corner (upper LH, above) on the board. The jumper has to be pulled from the board, rotated to the required position and pushed back into the board sockets.

Rear Input
IN - Set the jumper in the upper hole and the one immediately below it.
GATE - Set the jumper in the lower hole and the one immediately above it.
N/C - No Connection (to the output of the module to the left) is set by placing the jumper in the rear hole and the one immediately to the right of it.

Rear Output
This module does not have any.

On-board Jumpers

Input Signal Range - The Input Signal range is set by placing the one, and only, jumper on the correct horizontal pair of pins. The jumper is in the rear centre (LH centre, above) of the board. This is altered by pulling the jumper from the board and placing it on the two appropriate pins.

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