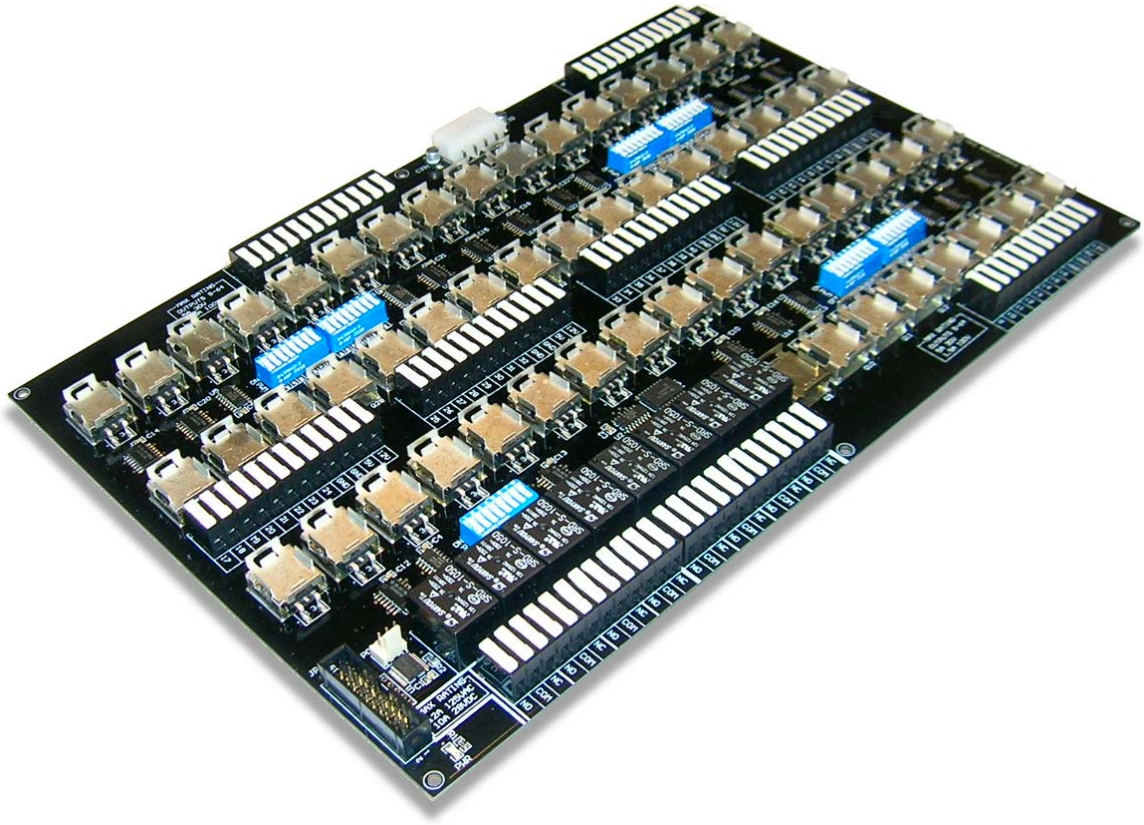
LO-HV64N
Latched Output Power Card



Product ID. : LO-HV64NN
Rev. : 1.1
Date : May 14, 2010
Firmware Rev. : N/A

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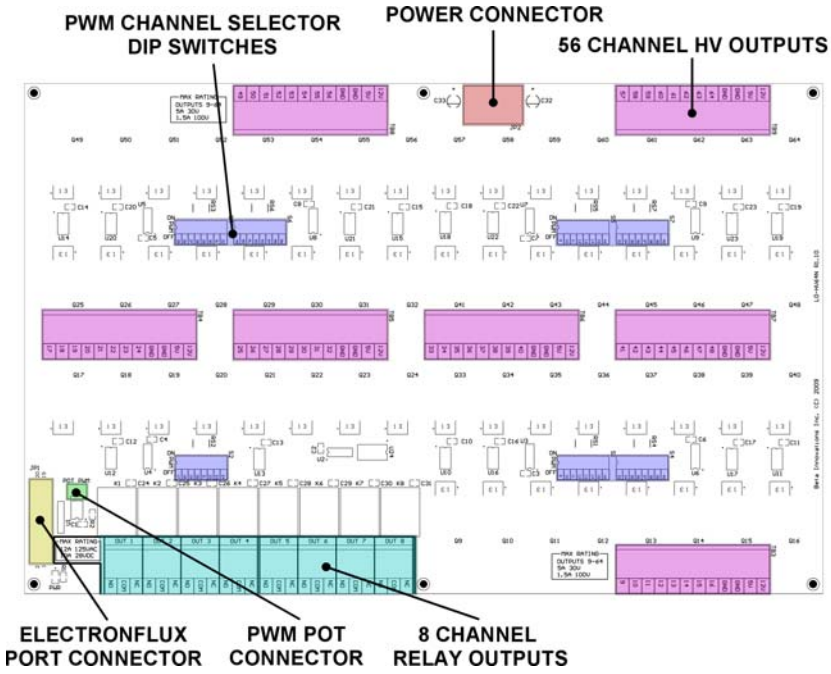
Connecting the LO-HV64N Card

IMPORTANT: DO NOT PLUG the LO-HV64N module into any port while the USB module is powered. Turn off power to the module before installing the LO-HV64N card.

With the module's power turned off, connect the LO-HV64N card to any of the ports using a keyed ribbon cable if supplied with your card. If using your own cable, care must be taken to ensure that the orientations of pin 1 on the cable connectors are matched to pin 1 of the IO port and the LO-HV64N port.



Plug in a HDD power connector from a suitable ATX PSU into the power connector *JP2*.

The LO-HV64N card is a passive device and will not be automatically detected by your USB module. You will need to activate the port of your module and set it to *Latched Output* mode in the Device Manager utility in order to use the LO-HV64N outputs.

Refer to the Device Manager utility help file for details on activating port features on your USB module.

Relay Output Channels 1 - 8

The LO-HV64N card provides up to 8 SPDT Relay outputs capable of driving AC sources up to 7A @ 250 VAC or DC sources up to 10A @ 28VDC.

Absolute Max Rating

Resistive Load	7A 250 VAC 12A 125 VAC 10A 28 VDC
Inductive Load	3A 125 VAC

IMPORTANT: Exceeding maximum ratings will void the product warranty.

Equivalent SPDT Relay Circuit

CAUTION: Do not connect any AC sources to any other terminals except to output channels 1 to 8. Startup conditions of the ElectronFlux module may cause the outputs to toggle momentarily until power is stabilized and the IO port pins are properly initialized.

Output Channels 9 - 64

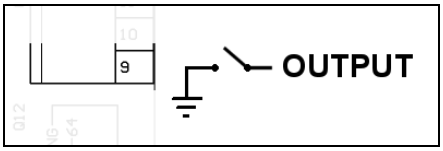
The LO-HV64N power output card can control up to 5A and 100VDC max on each channel. When activated, the channel output will ground the terminal. As such, different voltages can be used on each channel output using external sources or the onboard 5 VDC and 12 VDC.

Absolute Max Rating

Resistive or Inductive Load	5A @ 30 VDC 1.5A @ 100VDC

IMPORTANT: Exceeding max ratings will void the product warranty.

Equivalent Output Circuit



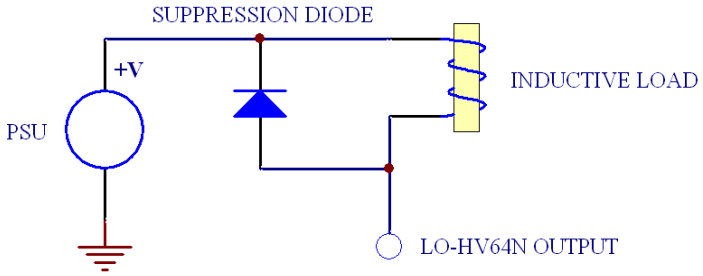
CAUTION: Do not connect any AC sources to any other terminals except to output channels 1 to 8. Startup conditions of the ElectronFlux module may cause the outputs to toggle momentarily until power is stabilized and the IO port pins are properly initialized.

The high voltage and high current loads are isolated from the ElectronFlux IO port, however clamping diodes are required for protection when connecting inductive loads.

Suppression Diodes

Suppression diodes must be used on any outputs connected inductive loads (relays, magnetic switches, motors, etc.) in order to eliminate "kick-back". These are used to clamp any voltage spikes and provide a low impedance path for the current in the inductor to decay gradually once power is turned off.

Use a fast switching diode such as the UF4007 or equivalent. Connect suppression diodes as illustrated below across the inductive load terminals.



WARNING: Failure to use suppression diodes will cause erratic or unpredictable behavior from any devices sharing the common GND.

Connecting Output Channels

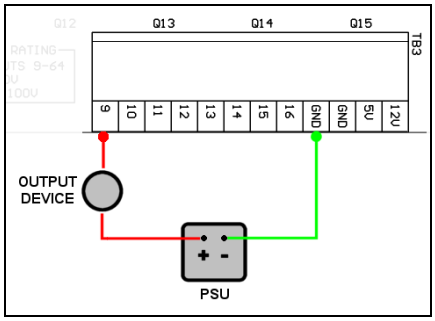
The LO-HV64N power output card provides 64 channels individually controlled by the IO port on the ElectronFlux module. Each output channel is internally connected to a common ground, as such careful observation of polarity requirements of output devices must be considered when connected to any of the output terminals.

Multiple electronic devices such as lamps can be connected to the same channel provided the total current draw does not exceed max rating for each channel of 5A.

CAUTION: Startup conditions of the ElectronFlux module may cause the channel outputs to toggle momentarily until power is stabilized and the IO port pins are properly initialized.

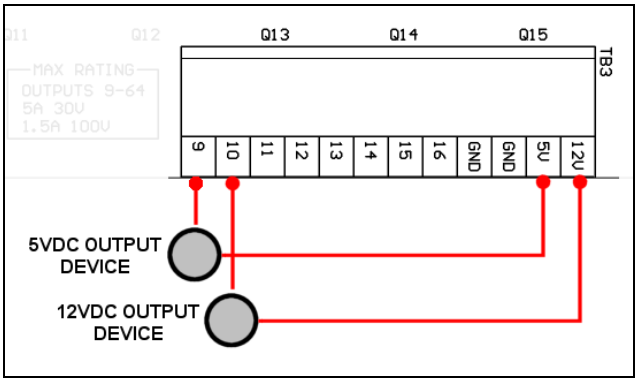
External Voltage Sources

Any external voltage sources used to power devices connected to the LO-HV64N outputs must be grounded to any of the GND terminals on the card.



Onboard 5VDC & 12VDC

If using the LO-HV64N card with 5V or 12V rated electronic devices, connect the onboard 5VDC or 12VDC terminals to the output device as illustrated below. Note that GND is internally connected. Current is limited by the PSU connected to power connector *JP2*.



WARNING: DO NOT CONNECT ANY EXTERNAL POWER SUPPLY to the 5V or 12V terminals. Doing so may cause irreparable damage to the card and/or ElectronFlux module and will void the product warranty.

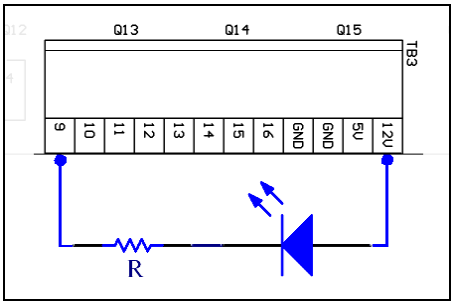
Overcurrent Output Protection

Although the LO-HV64N is capable of handling large current loads and voltages, it is not immune to damage resulting from overcurrent conditions due to shoddy wiring, short circuits or high current draw devices. There is no onboard current load monitoring circuitry on the LO-HV64N card. All protection must be provided through external means and can be as simple as a current limiting resistor up to resettable circuit breakers.

IMPORTANT: Failure to use any output protection will void the product warranty.

Current Limiting Resistor

Current limiting resistors are typically used on low current devices such as LEDs. Connect any suitable LED through a current limiting resistor *R* to an output channel as illustrated below.



Use the following formula to calculate the required current limiting resistor *R*. Refer to LED manufacturer's specifications for the values of $\mathbf{V_{led}}$ and $\mathbf{I_{led}}$.

$$\mathbf{R = (Vcc - V_{led})/ I_{led}}$$

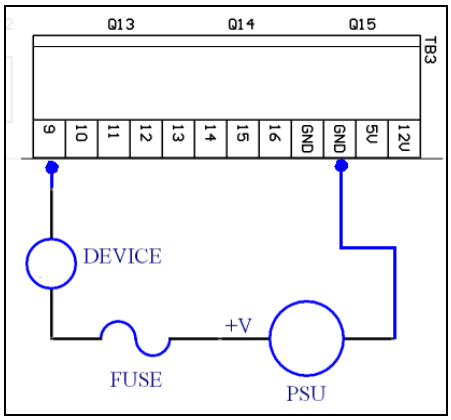
R : current limiting resistor (Ohms)
Vcc : supply voltage, in this example 12V.
$\mathbf{V_{led}}$: Max rated LED voltage (2 - 3.4V typ.)
$\mathbf{I_{led}}$: Max rated LED current (15 - 25mA typ.)

WARNING: Failure to use a current limiting resistor or one with too low an R value may result in permanent damage to the LED and possibly the output channel.

Fuses

Since current limiting resistors are inadequate when used with high current loads, fuses are a suitable alternative. The fuse must carry the normal load current of the circuit without nuisance openings. However, when an overcurrent occurs the fuse must interrupt the overcurrent, limit the energy let-through, and withstand the voltage across the fuse during arcing.

The diagram below illustrates the proper method of using a fuse to protect a device connected to an output channel.



Fuse Selection Guide

To properly select a fuse the following must be considered:

- Normal operating current (The current rating of a fuse is typically derated 25% for operation to avoid nuisance blowing. For example, a fuse with a current rating of 10A is not usually recommended for operation at more than 7.5A.)
- Overload current and time interval in which the fuse must open.
- Application voltage (DC Voltage) onboard or external.
- Considerations: Reduce installation cost, ease of removal, mounting type/form factor, etc.

Fuse current rating can be determined using the following calculations. First we must determine the maximum current limit on the output channel for the given Voltage used.

$$\mathbf{I_{max} = P_{max} / Vcc}$$

I_{max} : Maximum current rating of channel (Amps). This will also be the fuse current rating.
Vcc : supply voltage (Volts). This can be external source or the onboard 5V or 12V source.
P_{max} : Max power rating of output channel (Watts). Use 150W for the LO-HV64N.

Next we determine the fuse type, fast-acting or slow-blow.

$$\mathbf{I_{per} = (I_{fuse} / I_{max}) * 100}$$

I_{per}: The percentage of fuse current rating wrt channel maximum current limit (%)
I_{fuse}: Fuse current rating (Amps). Maximum expected current draw of the output device + 25%.
I_{max}: Output channel current limit (Amps) as determined from pervious equation.

If $\mathbf{I_{per}}$ is 75% or less use a slow-blow fuse, if higher use a fast-acting fuse. $\mathbf{I_{fuse}}$ must never exceed $\mathbf{I_{max}}$.

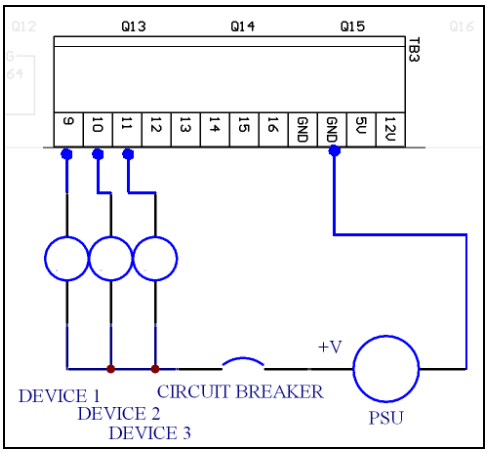
WARNING: Failure to use a fuse on a low current output can result in an overcurrent condition damaging the LO-HV64N card as a result of a catastrophic failure of the output device. This will void the product warranty.

Circuit Breakers

Circuit breakers are a more costly resettable version of fuses and follow the same selection guidelines as described above. Unlike fuses which operate once and then have to be replaced, a circuit breaker can be reset (either manually or automatically) to resume normal operation.

Connecting Multiple Output Channels to a Circuit Breaker

Multiple output channels can be safely connected to a single circuit breaker as illustrated below if the combined current draw the output devices does not exceed the current limit of a single output channel at a given source voltage.



Example 1:

The combined current draw is 3.5 Amps for the three output devices illustrated above. The PSU is 28V. The maximum current limit for each channel is 5.36A as determined by the formula for $\mathbf{I_{max}}$ = 150W / 28V**.**

A circuit breaker with a rating of 4A is selected as determined by derating 5.36A by 25% for slow-blow type. Since the combined current draw of 3.5A does not exceed 4A, the circuit breaker will operate within normal parameters.

Example 2:

The combined current draw is 11.5 Amps for the three output devices illustrated above. The PSU is 15V. The maximum current limit for each channel is thus 10A as determined by the formula for $\mathbf{I_{max}}$ = 150W / 15V**.**

A circuit breaker with a rating of 7.5A is selected as determined by derating 10A by 25% for slow-blow type. Since the combined current draw of 11.5A exceeds the 10A channel limit, the circuit breaker will blow when multiple channels are activated simultaneously. The combined channels

must be separated and additional breakers used in order to avoid the circuit breaker from nuisance blowing.

Recommended Circuit Breaker

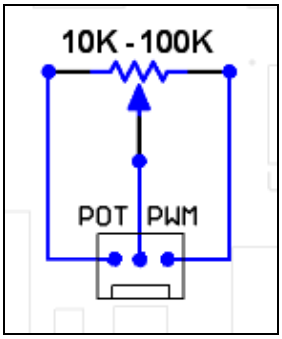
The W58-XC4C12A-? (where "?" Is the current rating of the circuit breaker in Amps) is a thermal resettable circuit breaker.

These are slow-blow type with very low ON resistance useful when using low voltage sources such as the onboard 5VDC. These must be derated 25% for proper operation in order to avoid exceeding the channel current limit.

WARNING: Failure to use a circuit breaker on a low current output can result in an overcurrent condition damaging the LO-HV64N card as a result of a catastrophic failure of the output device. This will void the product warranty.

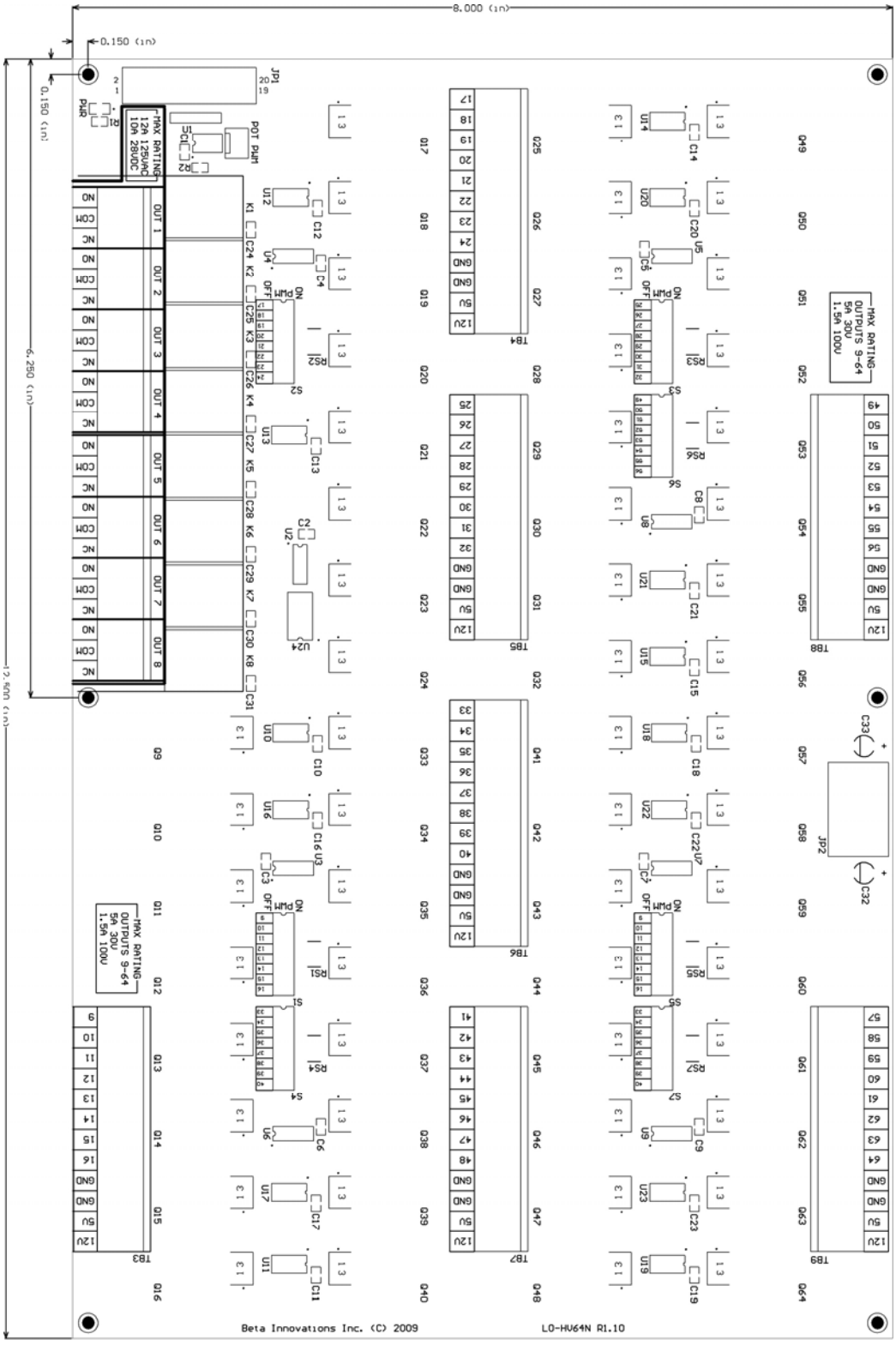
PWM Dimming Output Channels

The onboard PWM circuit can be used to dim individually selected output channels through dipswitches *S1-S7*. Dimming is controlled by a potentiometer connected to the connector labeled *POT PWM* as illustrated below.



WARNING: Do not activate PWM dimming on channels connected to inductive loads.

Mechanical Specifications



Visit www.betainnovations.ca for the availability of expansion modules and accessories.