Rapid LED Mean Well LDD-H-4 Board

Contents

Overview

This document details the setup of a Rapid LED LDD-H-4 board with Mean Well LDD LED drivers. The LDD-H-4 allows you to quickly and easily connect a 9-56VDC power supply to 1 to 4 LDD-H drivers and their corresponding LED strings. Each LDD driver inserted into the LDD-H-4 board is individually controllable/dimmable via a 0-5V 100Hz-1KHz PWM square wave. Most Arduino's and the Coralux Storm controllers provide this capability. In addition, you can daisy chain, or connect multiple boards together to add more dimmable channels and/or power more LEDs.

Do not use any switches, connectors or quick connects on any LED output from the LDD-H-4.

DO NOT APPLY POWER TO ANY COMPONENTS BEFORE ALL CONNECTIONS AND WIRING ARE COMPLETE OR YOU RISK BURNING OUT YOUR LEDs AND/OR DRIVERS

How the LDD Driver Works

The LDD-H driver takes DC voltage from a power supply and turns it into constant current by varying its output voltage. It does this in a step-down fashion, meaning it takes an input voltage and drops it down to the voltage required by your LED string to maintain a constant current.

LDD Driver Electrical Specifications

The input to an LDD driver and thus the LDD-H-4 board must be between 9-56VDC.

The LDD driver has a minimum voltage drop of 3V to function properly. This means if the input is 45VDC, the maximum voltage output is 45VDC-3VDC = 42VDC. The output voltage going to an LED string connected to an LDD must be greater than 2V and less than 52V.

Dimming can be accomplished with a controller that supplies a 0-5V PWM signal with a frequency of 100Hz to 1 KHz.

How Many LEDs Can the LDD Driver Power?

To determine the maximum number of LEDs that can be powered in a series string connected to a LDD driver we must follow three steps (V and VDC are used interchangeably):

1. Ensure voltage in to the LDD-H-4 is between 9-56VDC (Volts DC, not AC!)
2. Compute maximum voltage output, which is Vin – 3VDC.
3. Divide maximum output by voltage drop across one LED. The voltage drop across a high brightness LED is ~3.0-3.3V, but can vary. If you are unsure of what value to use, test, review the datasheet, or contact RapidLED with questions. If you have a decimal after dividing, always round down, i.e. 14.776 = 14. The result of 14 is the maximum number of LEDs the LDD can power.

Maximum LEDs Example 1 - 56VDC in

1. Voltage in is between 9-56VDC, we can continue
2. Maximum voltage output is Vin – 3V = 56VDC – 3V = 53V
3. Maximum voltage output divided by voltage drop across one led = 53V / 3.2V = 16.5625. Round down to 16. 16 is the maximum number of LEDs the LDD can power.

Maximum LEDs Example 2 - 10VDC in

1. Voltage in is between 9-56VDC, we can continue
2. Maximum voltage output is Vin-3V = 10V – 3V = 7V
3. Maximum voltage output divided by voltage drop across one LED = 7V / 3.2V = 2.1875V. Round down to two. Two is the maximum number of LEDs the LDD can power.

How many LDD Drivers Can My Power Supply Power?

To calculate how many LEDs your power supply can power, use the power formula P = VI. The restrictions for LEDs per LDD from the above section must be met before continuing. As long as the total power draw from your LEDs is within the wattage and amperage output specifications of your power supply, you should be able to power your setup.

P = power in Watts
V = voltage in Volts
I = current in Amps (not mA, 1000mA = 1A)

Steps to calculate approximate total power requirement:

1. Calculate voltage drop for all LED strings
    a. Use a multimeter to measure voltage drop across entire string (contact Rapid LED if you are unclear on how to measure voltage drop)
    b. Use ~3.2V per LED as an estimate – this may not be accurate, so you should test this with a multimeter or consult the datasheet for your specific LED if you require precise results.
2. Multiply the voltage drop for that string by the amount of current (in Amps) going through it (V * I). The results are in Watts for that string.
3. Repeat for each string to get Watts per string
4. Add the results to get total wattage requirement

Example 1 – 4 LED strings, 8 LEDs per string, 700mA (.7A) per string

1. Calculate the voltage drop for the LED string. 8 LEDs * 3.2V/LED = 25.6V
2. P = VI = Voltage Drop * Current = 25.6V * .7A = ~17.92 Watts/string
3. All strings are equal so they are all ~17.92 Watts
4. ~17.92W * 4 Strings = ~71.68 Watts total

Example 2 – 6 LED strings with 12 LEDs per string @ 700mA and 2 LED strings with 12 LEDs @ 350mA (this would require two LDD-H-4 boards to be connected together).

1. 12 LEDs/string * ~3.2V = ~38.4V/string
2. Two types of Strings
    a. ~38.4V * .7A = ~26.88 Watts/string
    b. ~38.4V * .35A = ~13.44 Watts/string
3. 6 strings will draw ~27 watts and 2 strings will draw ~13 watts.
4. (26.88W * 6 strings) + (13.44W * 2 strings) = ~188.16 Watts

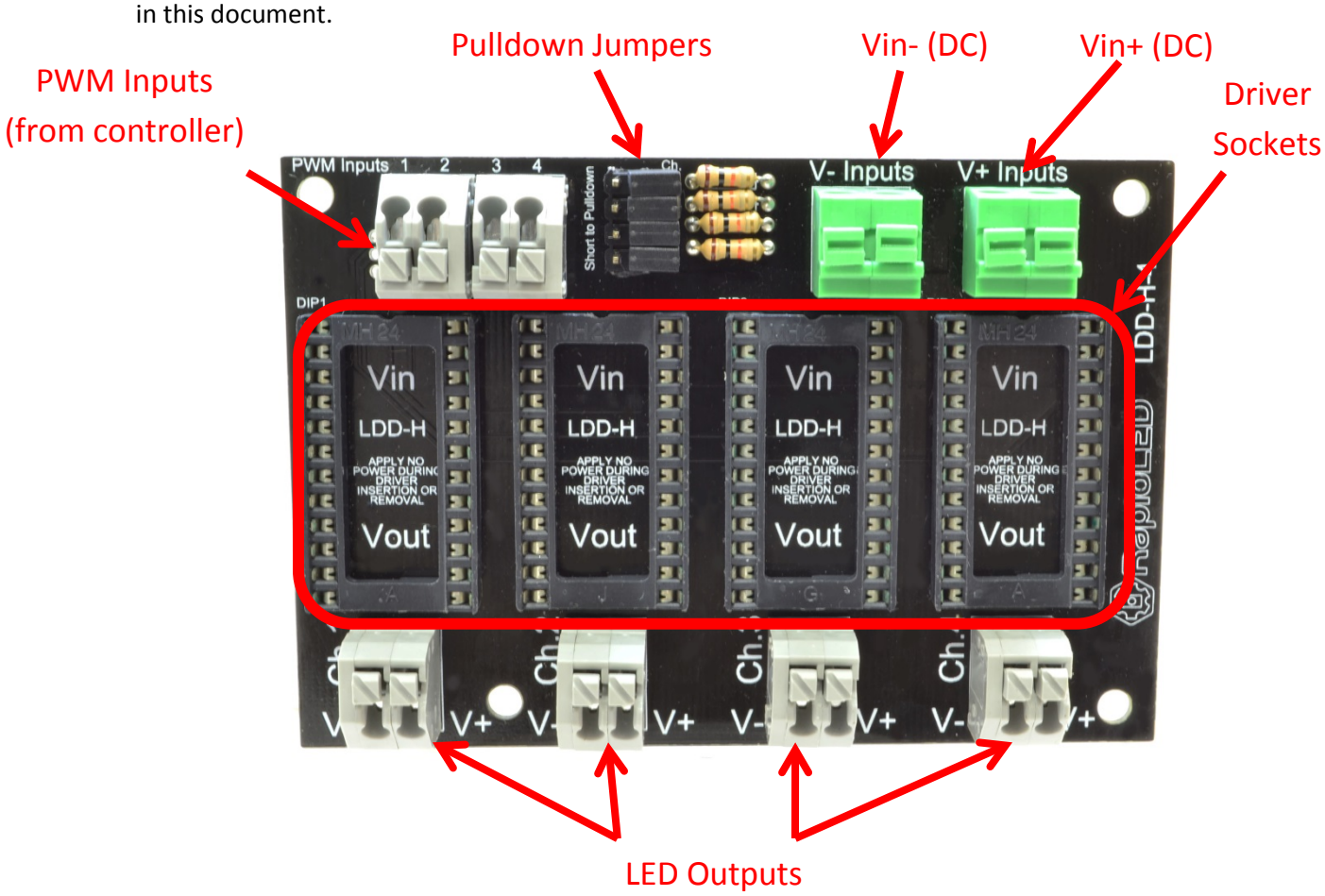
Usage Disclaimer

Doing any of the following will damage the board, drivers, power supply and/or LEDs and will void the warranty:

- Touching the board to a metal surface while the board is under power.
- Placing the board, drivers or power supply in a condensing environment.
- Connecting or disconnecting any wires while the board is under power.
- All components must have proper ventilation to prevent overheating.

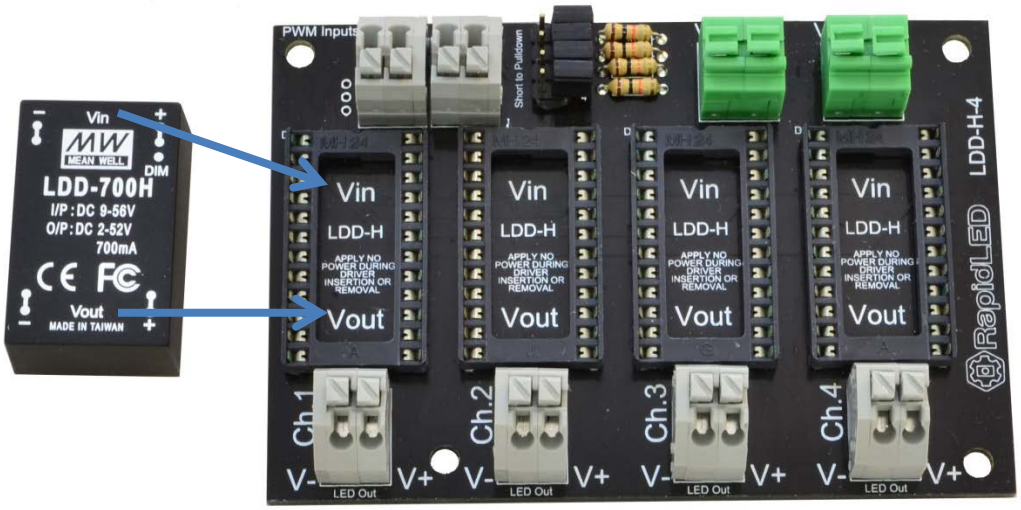
LDD-H-4 Board Layout

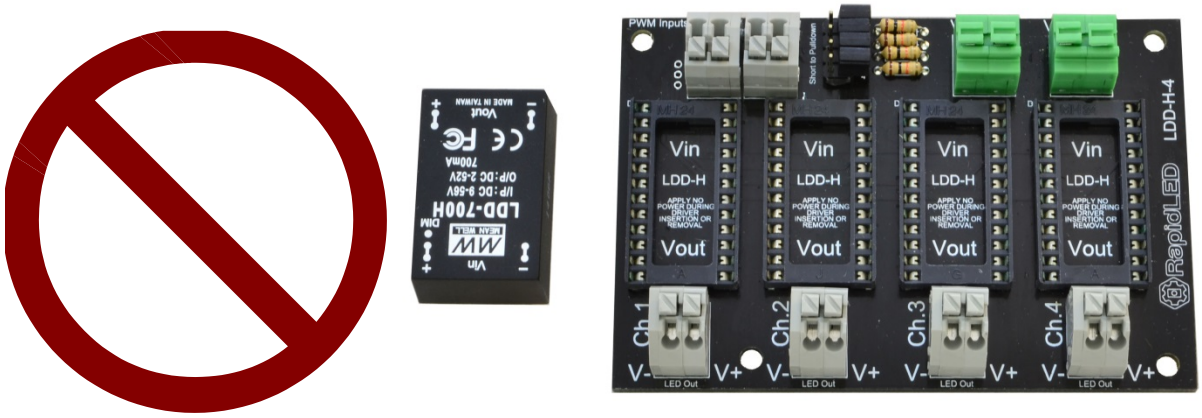
Below is a labelled picture of all of the board components. Each of these will be discussed in detail later in this document.



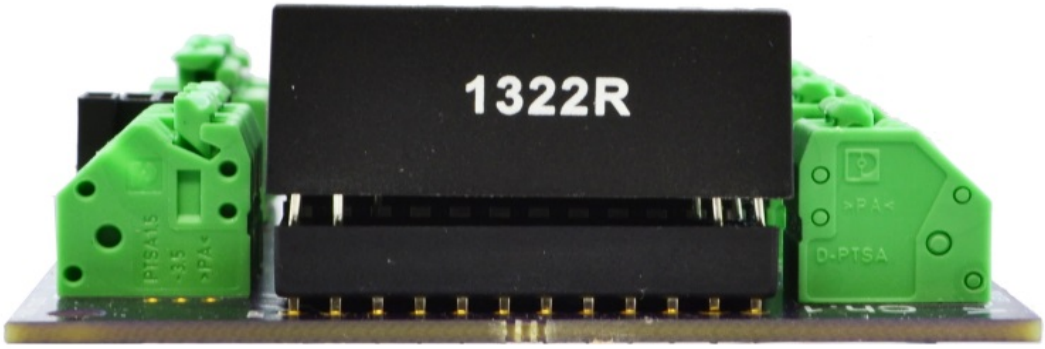
Installing the LDD-H Driver

Orient your LDD-H driver with a driver socket so Vin on the driver and Vin in the socket are on the same side. The same goes for Vout. The text will be oriented the same direction on both if the driver is rotated properly. If the driver is upside down, text in the middle of the driver socket and the text on the LDD will be upside down in relation to each other. Be careful to install the driver in the correct orientation such that "Vin" and "Vout" on the driver are aligned with the Vin and Vout of the driver socket. NOTE: If the driver is installed upside down, you WILL damage the driver.





Align the pins on the driver with the driver sockets and press the driver down firmly until it is fully seated in the socket. It's best to do this with your thumb in the middle of the driver. Make sure that the pins are aligned before pressing down so that the pins don't get bent. This is what the driver will look like on the board before and after installation:



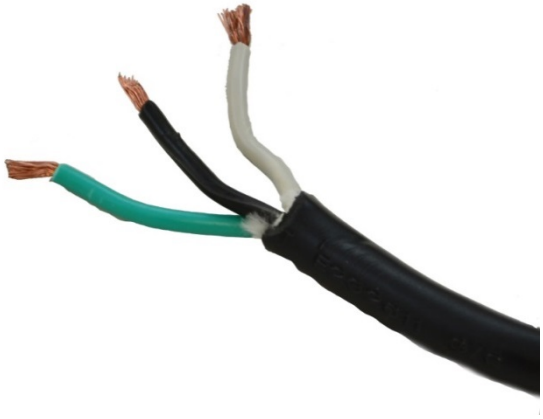
The final result will be that the driver will sit flush with the driver socket. Repeat this process with all remaining drivers that you want to use on that board. In this case, all 4 channels on the board are being used, but the board can be used without all driver sockets being filled:

The LDD-H-4 board is designed to hold the LDD drivers firmly and the drivers are not meant to be removed once they are installed. We do not recommend removing the LDD drivers from the LDD-H-4 board. Removal can result in damage to the driver and will void any warranty.

If you need to remove a driver from the LDD-H-4, ensure no power is applied to it, remove all wiring and place it on a clean workspace. Starting with the leftmost or rightmost LDD, grasp it firmly on the sides and pull straight out to avoid bending the pins. A flat head screw driver can also be used by putting the blade in between an LDD driver and its driver socket and gently prying up the driver, working your way back and forth between sides to “rock” the driver out.

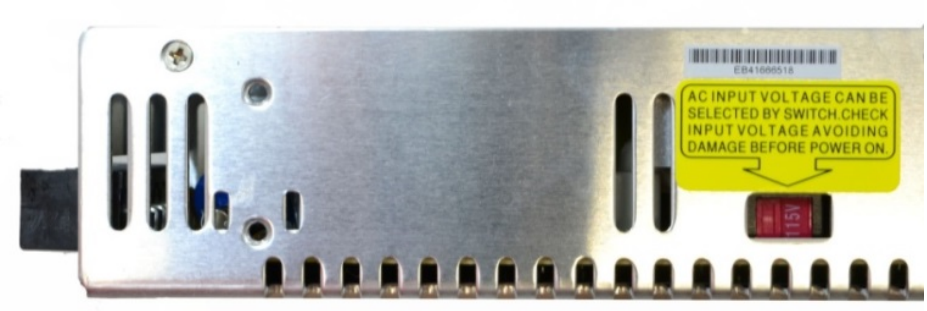
Wiring a Power Cord to the Power Supply (if using a SE-350-48 power supply)

Make sure all 3 wires from the power cord are stripped.



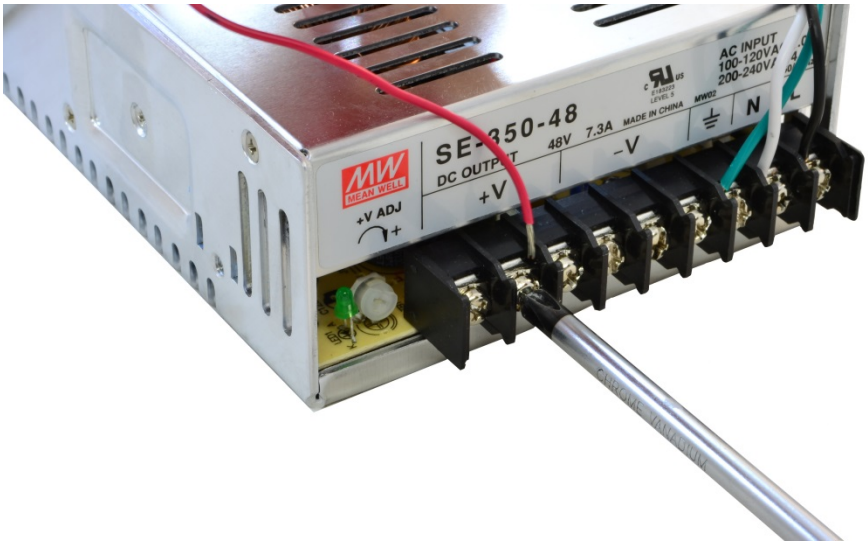
Loosen the screw terminals on the right side of the SE-350-48 power supply; insert the green wire into the ground terminal, the white wire into the N terminal and the black wire into the L terminal, tightening the screws onto the stripped wire to ensure a good connection is made.

NOTE: If you are using AC power 100-120VAC, the switch on the side of the power supply must be flipped to 115V. If you are using 200-240VAC flip the switch to 220V.

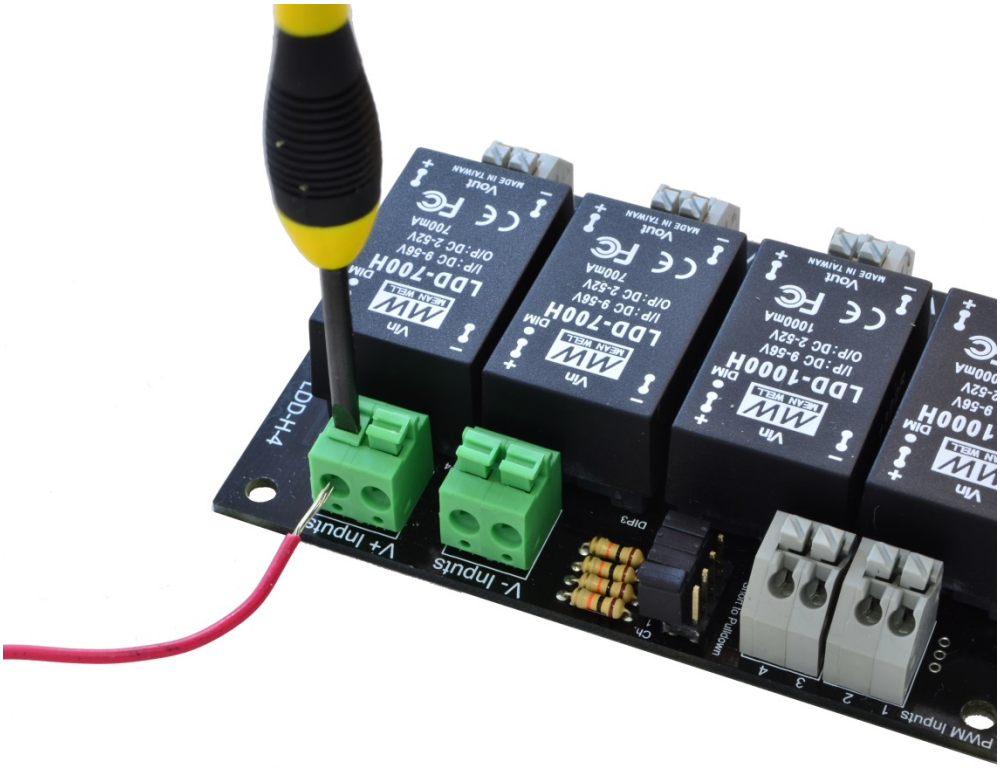


Connecting the LDD-H-4 to a DC Power Supply

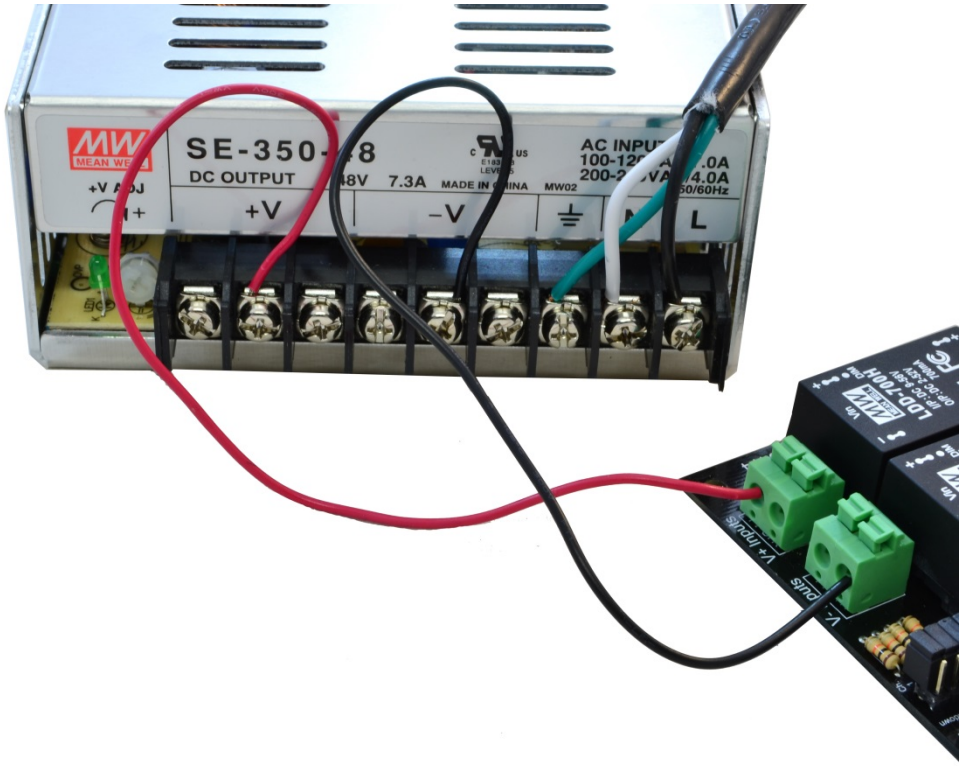
If using a SE-350-48, loosen a screw on +V and –V. You will need to strip 0.3” (8mm) of protective jacketing from each end of the two wires that will go from the SE-350-48 to the LDD-H-4. After doing this, attach the +V wire to a +V screw terminal on the SE-350-48 and the –V wire to a –V screw terminal.



Next, insert the other end of the +V wire into one of the “V+ Inputs” spring terminals on the LDD-H-4 by pushing down the tab down either with your finger or a flat blade screwdriver. After releasing the tab, give a slight tug on the wire; it should not come out if inserted properly. If you need to remove the wire, press down on tab on top of the terminal and pull out the wire.

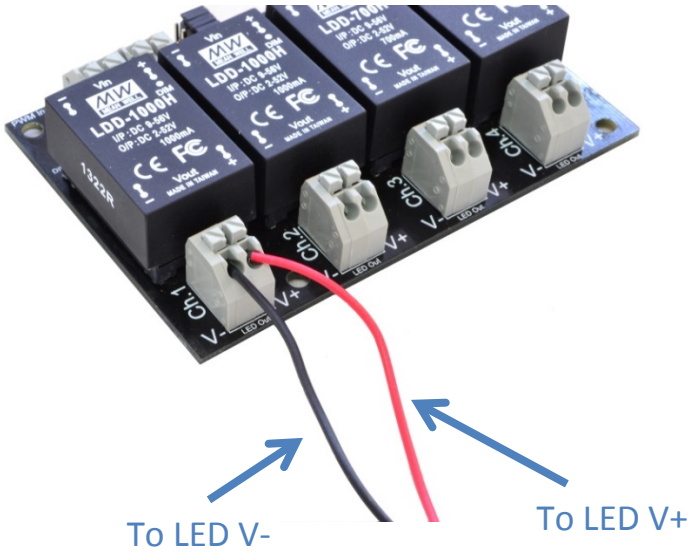


Repeat this process with the wire attached to the –V screw terminal on the SE-350-48, but insert it into the spring terminal labeled “V- Inputs.”

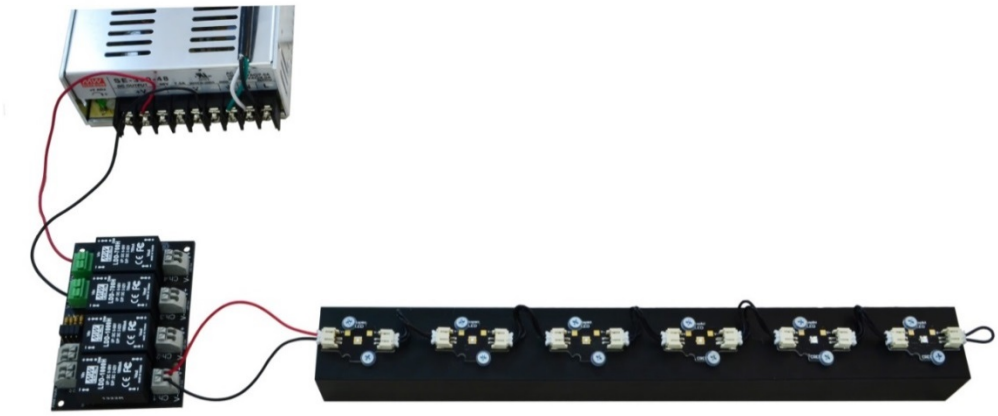


Connecting an LED string to the Board

The LED outputs are labeled on the LDD-H-4. Each output is marked with a Channel number (Ch.), a V- side and a V+ side. To connect an LED string to the LDD-H-4, press down on the left spring terminal for that channel and insert the V- wire from your LED string and release the spring terminal. Give the V- wire a little tug to ensure it is securely inserted into the spring terminal. Repeat the process for the V+ wire from your LED string, but insert it into V+ for the same string. Repeat this for all remaining LDD drivers and LED strings. NOTE: The LDD-1000H and LDD-700H drivers output 1000mA and 700mA respectively. Ensure the maximum current handling capacity of your LEDs is not exceeded by the output of the LDD driver. For example most UV LEDs can handle a maximum of 700mA, hooking them up to a LDD-1000H which outputs 1A, will cause irreparable damage to those LEDs. Consult the LED datasheet or contact Rapid LED for the maximum current handling capacity of your LEDs.



Repeat this process for all remaining channels being used on the board. From left to right with the board facing up, the channels are 1 through 4 respectively. In this picture, we are using Ch.1 on the board with a string of Solderless LEDs:

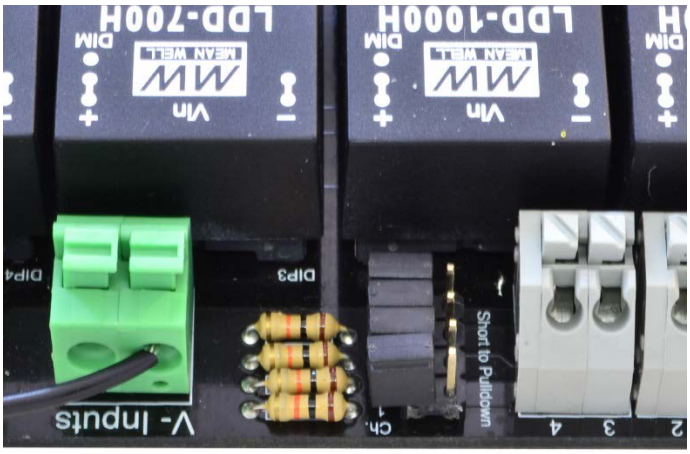


Modifying Default Dimming Behavior (Default 100% or Default 0%)

By default, LDD drivers installed onto the LDD-H-4 will run at maximum output current without a dimming signal. The default behavior can be modified, on a channel by channel basis, by closing an associated jumper for that channel so that the default is 0%. You will want to do this if using a LED controller to prevent any output from occurring while the controller starts up,shuts down or is turned off. To modify the default behavior, short/jump the pins for the associated channel with the included jumpers. When shorted without a dimming signal, output current is 0%.

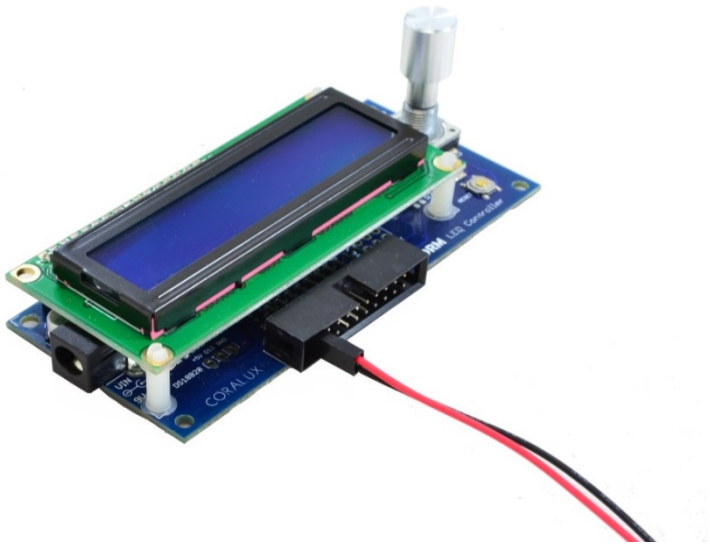
If you are using Channels 2 and 3 on the Storm (not the Storm X) to control your lights and you want your lights to be off when those channels are at 0%, short the jumpers on the board as shown below, where all channels are shorted/jumped.

If the jumper is only plugged into one pin or there is no jumper at all on that channel, then the channel is “Always On.” This means that if there is no PWM dimming signal to that channel, the LED string on that channel will be at 100% intensity. If you aren’t using a controller, this is the mode you will select because all of the LED strings will run at 100% with no dimming signal in this mode. This is the default setup of the LDD-H-4. All channels are set to the Always On position in this picture:

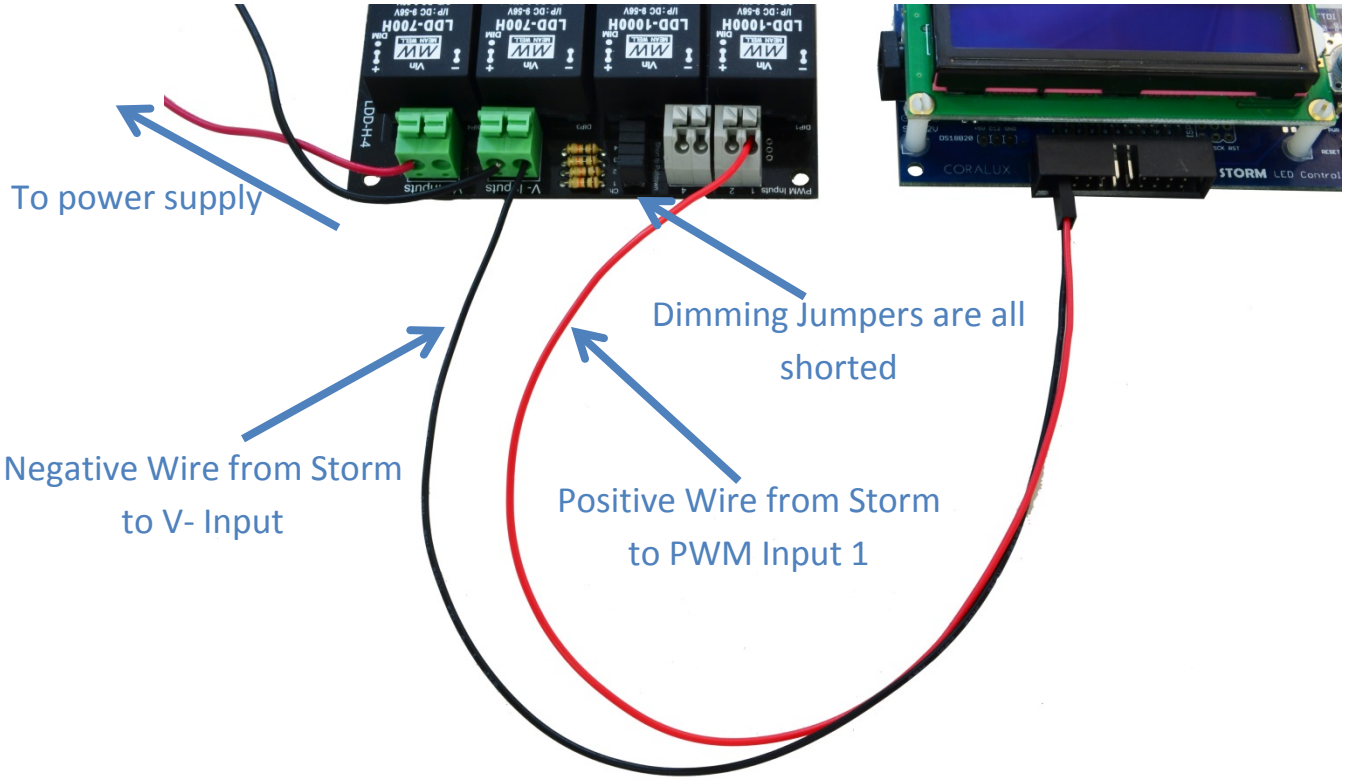


Connecting an LDD-H Driver Board to the Storm or Storm X Controller

First, plug the Storm jumper cable into the Storm controller with the red wire up and the black wire down relative to the Storm screen. The channels start from left to right, and the jumper in this picture is plugged into Channel 1 on the Storm. You can plug the additional jumpers into additional spots on the controller. Channels 1 through 6 are dimming channels on the Storm. Please note on the Storm X, Channel 1 is the 6th set of pins starting from the left side with the channels going from left to right, and Channels 1 through 16 are dimming channels on the Storm X.

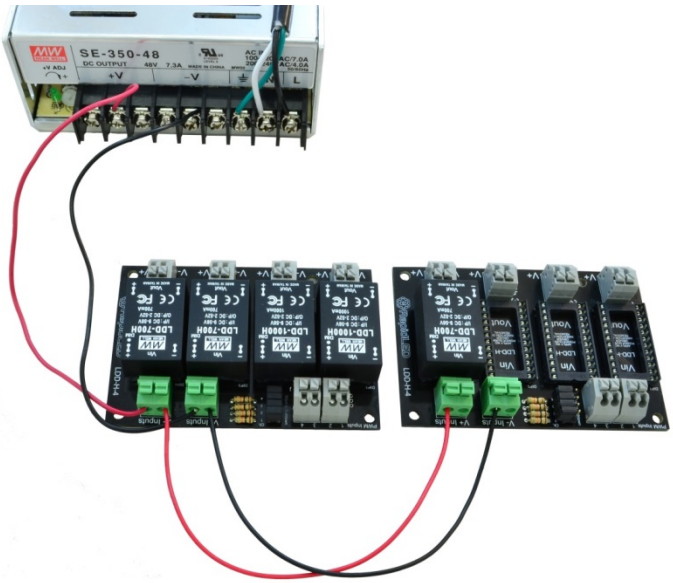


Next, cut off the opposite end of the jumper and strip both wires to 8 mm (~0.31”). You will connect the red wire from the jumper to one of the PWM Inputs labelled 1 through 4 on the LDD-H-4 board. The PWM Inputs are numbered exactly like the driver channels; meaning PWM Input 1 corresponds to LED Out Ch. 1. The black wire from the jumper shares a common ground with the LDD driver. Connect it to one of the V- Inputs on the LDD-H-4 board or to one of the –V screw terminals if using the SE-350-48 power supply. Repeat these steps for any other channels being used on the Storm or Storm X controller.



Connecting Multiple Driver Boards Together

You can connect multiple driver boards together using one power supply if you have more than 4 LDD-H drivers. Connect your first board to the power supply as instructed above, and then connect a wire between a V+ input on the first board and a V+ input on the second board. Repeat the process with a wire between a V- input on each board:



Proceed with wiring up the LED strings and Storm Controller per the instructions above.

Mounting the Driver Board

The LDD-H-4 must be mounted to a non-metal surface. There are 4 holes on the board that can be used to mount the board to another surface. Based on your choice, you will either receive 4 plastic standoffs or 4 plastic bushings with your board. We recommend having the board and power supply in a well-ventilated area for cooling purposes. NOTE: DO NOT let the board come in contact with a metal surface while the board is plugged in. This can damage the board and/or the drivers.

To use the standoffs, poke them through the back of the board in each of the 4 holes. Then, peel off the paper to expose the tape and stick to your mounting surface. Make sure that the mounting surface is clean to ensure proper adhesion.

The bushings must be used in conjunction with #4 wood screws. Place the bushings between the back of the board and the mounting surface and then screw into the mounting surface. Don't over-tighten the screws to ensure the board doesn't get cracked.

Finishing Up

After all of your wiring is complete, plug in the power cord from the power supply and the adapter from the Storm Controller and enjoy!