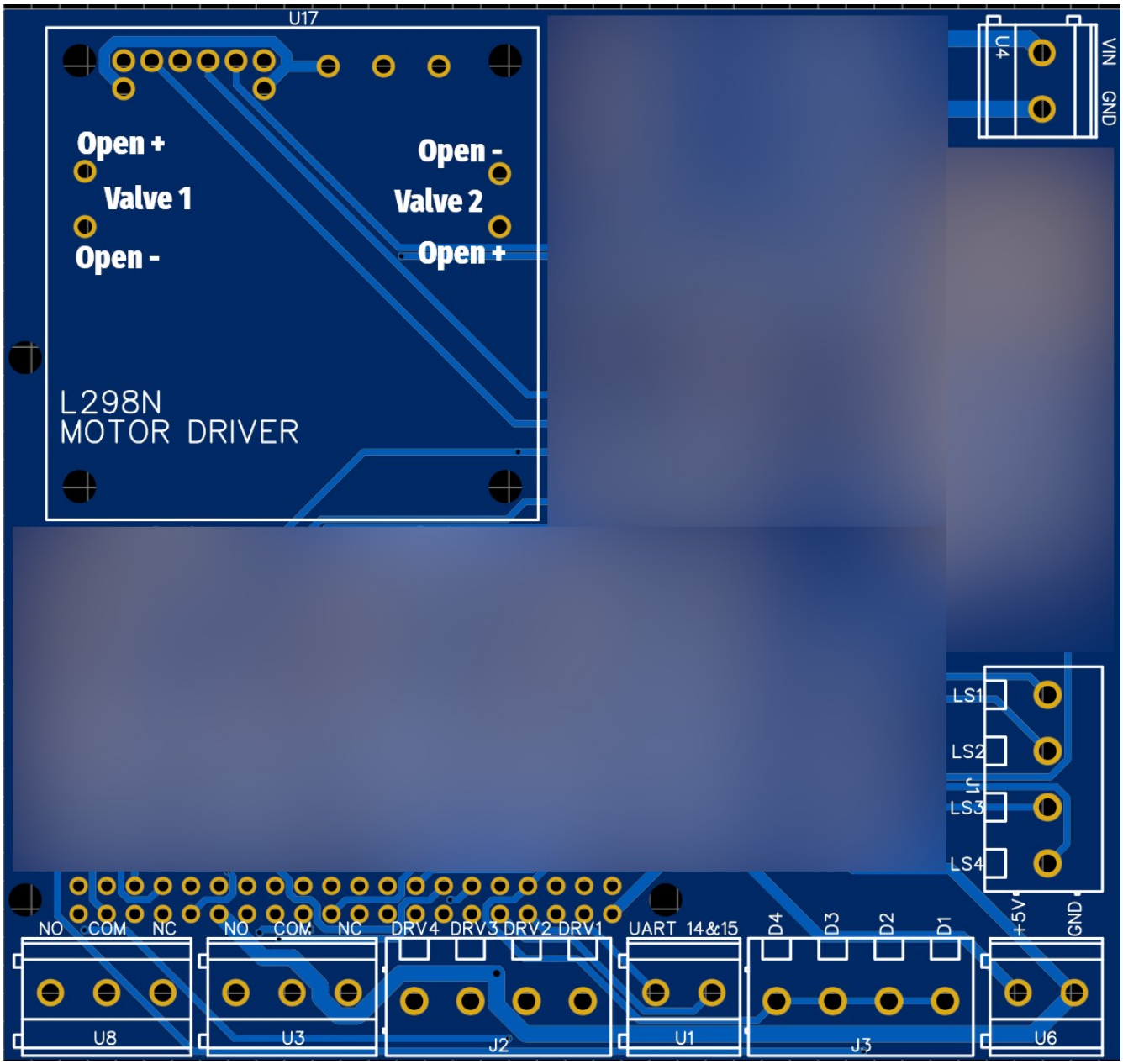
Raspberry Pi Hat Usage

Thanks to Mathias at Firefly3D in Sweden, the RPi Smart Still controller system is nowhere near as complicated to build as the original prototype system. Whether you build the Raspberry Pi Hat boards yourself, or order them already assembled, there are still quite a few wires connected to them. But, this is still easier to build because all you need is a screwdriver to assemble a system.

Below is an image of the Raspberry Pi Hat printed circuit board with everything blurred out except for the screw terminal locations. This is so I can explain what all of the screw terminals are for and what connects to each one. This applies to both versions *(1.1 and 1.2)* of the Raspberry Pi Hat printed circuit bards.



U4: In the upper right corner, this is where the power supply connects. Unlike the prototype system, the Raspberry Pi Hat based system only runs on 12 volts. After some testing with the prototype system, I was able to determine that running one on 19 to 24 volts really isn't best. The cooling valves actually move a little too fast and this affects the ability to automatically dial in dephlegmator settings. A simple 12 volt, 5 amp power brick is all that's needed. These are available on Amazon all day long, every day, from numerous sellers.

L298N MOTOR DRIVER: This is the footprint where the motor driver board for the cooling valves is situated. If you look at the assembled hats that I sell on my website *(https://panhandleponics.com)* you will notice that I modify these motor driver boards so they simply plug into a socket on the hat. So all we need to be concerned with here are the 2-conductor screw terminals on the board that I've labeled as Valve 1 *(condenser)* and Valve 2 *(dephlegmator)*. If you are using the same US Solid brand valves that I use *(covered in the Still-Monitor-and-Controller document)* the yellow wires are the Open + and the blue wires are the Open -.

U8 and U3: These are the switching terminals for auxiliary relays 1 *(U3)* and 2 *(U8)*. These should only be used for switching low voltage, low current loads. DO NOT use these for switching AC powered loads. If you need to switch AC loads, you should use these relays to switch remote solid state relays mounted as close to the AC load as possible. Every solid state relay that I've ever seen, uses a 3 to 32 volt DC signal, so you could just as easily use the 12 volts from your existing power brick here. The terminals from left to right are normally closed, common, and normally open. The contacts on these relays are only rated at 10 amps, so you should really avoid anything over 5 amps to avoid contact burn/sparking.

J2: This is the connector for the stepper motor that runs your heating dial. Hats that I sell on my website are pre-adjusted to work with a Nema 17 motor *(.540 volts on the current limiter)* which I use to run the potentiometer on an SCR based power controller. If you are using any kind of a gas burner, you will want a gear drive stepper motor due to the added torque required to turn a gas valve. The terminals here are for the pair of coils of the stepper motor *(1a, 1b, 2a, 2b)*. If the motor appears to run in reverse, you can either switch the coils here, or invert the stepper rotation in the user interface under the Configure Heating section.

U1: This is the serial data connection for the digital hydrometer. Keep in mind that in serial communications, the TX line from one device always connects to the RX line of the other device. The left terminal is the Raspberry Pi TX line, and the right terminal is the RX line. In the LIDAR hydrometer readers that I sell on my website, the tip of the 3.5mm audio cable is its TX line, the ring is the RX line. Obviously, the ground of the plug connects to the hat's ground.

J3: This is the bus for the DS18B20 temperature sensor data lines. Yes, there are only 3 used by the system at this time, but an extra terminal was added here to fill in the empty space. It doesn't matter which sensor is connected to which terminal here. These are 1-Wire Network devices and all share the same GPIO pin on the Raspberry Pi.

U6: This is the 5 volt power supply output used for powering various other parts of the system. Such as the DS18B20 temperature sensors, the power supply for the digital hydrometer, and anything else you need to power. Keep in mind that this has a 5 amp current limit. I generally suggest connecting these two terminals to screw terminal strips to make it easier to connect these extra devices. You will have 3 grounds for the temperature sensors, 2 for the valve limit switches, and 2 for the digital hydrometer *(one for power and one for serial data)*.

J1: These are the terminals for the valve limit switches. If you are using the same US Solid brand valves that I use, the limit switches are on the red and green wires, red is the closed limit, green is the open limit. LS1 is the Valve 2 closed limit, LS2 is the Valve 2 open limit, LS3 is the Valve 1 closed limit, and LS4 is the Valve 1 open limit. The way the limit switches work is that when either of those terminals are grounded, the valve is at its limit in that direction. If neither are grounded, the valve is somewhere in between. The position is tracked by knowing how many milliseconds has been applied to the motor in either direction. This isn't dead on accurate, but it doesn't need to be and things are always reset whenever either of the limit switches shorts to ground.

That covers all of the connections to the Raspberry Pi Hat. Please refer to the Still-Monitor-and-Controller document for further information. Understanding things in the original prototype design will help you understand what the hat is doing. This document also contains Amazon links to various parts and accessories you might need for your system build.

All future videos that I upload on the RPi Smart Still controller system will be on my new system based on the Raspberry Pi Hat. I have cannibalized my prototype system for parts, so it officially no longer exists and I really don't see any point in providing support for builds based on that system any further.