**LowSpec Control Board Specification**

**V01**

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**Overview:**

This is a board that is located in or on the spectrometer. It is designed to operate with the LowSpec and follow-on spectrometer. It’s intent is to work in conjunction with the High Voltage Supply module for the relco lamp and an ODroid architecture described in my earlier Functional Block Diagram – V2.

This is only a first prototype and will have to be modified depending on the end requirement to control the follow on spectrometer.

The Calibration Lamp (Relco lamp) and Flat lamp are controlled from the High Voltage Supply module.

This module controls:

\*A high intensity LED is used to illuminate the slit to assist in aligning the target on the slit

\* Heating pads for temperature control (if temperature control is used or could be used for other purposes)

\* Temperature sensors for feedback on the temperature control

\* Two stepper motors for grating rotation and calibration lamp inserter ( as defined but could be used of other purposes)

**Power supply requirements:**

+5 volts – used for Arduino Nano 33 BLE sense and stepper motors

+12 volts – used for PWM control of the heating pad, slit illumination LED

**Function:**

* I wanted to implement some sort of feedback so when a command is sent by the ODroid the unit can respond with a signal saying that the command was received and the device is working.
* I use the light sensing capability of the Nano 33 BLE sense module as some of the feedback.
* The slit illuminator is a high intensity LED that could be mounted inside of a spectrometer somewhere or in the bottom of the LowSpec II housing. It could be populated on the board in a location so the control module could be mounted on the bottom of the LowSpec, or it could be hooked up to J6 and wired to where ever is desired. As a feedback mechanism I have a standard LED hooked in series with the high intensity LED. This will put out a small amount of light that can be detected by the light sensor in the Nano 33 BLE sense module. This will light if there is current going through the high intensity LED. This can also be used to monitor if the LED is changing over time.
* The slit illuminating LED is hooked up to one of the IO pins that can be uses as a PWM so it could be used to control the intensity of the illumination if desired.
* The heater output, J7, supplies PWM current to the heating pads if temperature control is implemented. There is a voltage divider driven by the heater output that supplies about 1.5 volts to the analog input A2 when the heater is turned on. This gives feedback that the command to turn on the heating pads functioned properly and that current is flowing through the heating pads.
* The temperature of the heat control can be set by sending a command from the ODroid through the serial communication.
* As part of the temperature control feedback system one wire temperature sensors (DS10B20) are hooked up to J3.
* There are LEDs hooked to each of the stepper motor drive signals. This is designed to work in conjunction with stepper motors 28BYJ-48 5VDC. This will allow the Nano 33 BLE sense to detect their light showing that the command to move the stepper motors has been received and the motors are getting the signal to move.
* The Nano 33 BLE sense module can be read by the ODroid, through serial communications, to supply feedback that its commands have been received by this control module.
* All of the functions of the Nano 33 BLE sense, such as barometric pressure, relative humidity, spectrometer orientation, etc. can be read by the ODroid through the serial communications protocal.