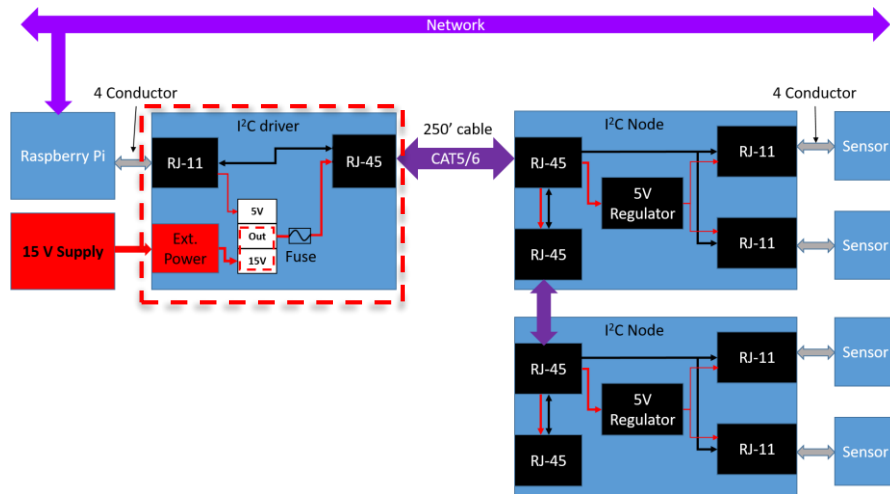# I²C extender in Altium

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I²C extender in Altium

The Hall A GEM gas distribution system is monitored by Python code I developed to run on a Raspberry Pi. The Distribution system is in the hall, while the Raspberry Pis are 250 feet away in the alcove. This distance protects the Raspberry Pis from radiation. The code uses I²C protocol and the Raspberry Pi does not source enough current to push a 3.3 V signal that far. The signal has to be extended. One of the issues with the extender system currently installed is the lack of a protection circuit. So a bad cable or something happening to a good cable can cause issues. One of which is a capacitor burning up in the end station, unattended.

- Develop a schematic to extend an I2C protocol signal over hundreds of feet
- Add protections in the design to make the system more robust

I2C extender diagram, with emphasis on the driver board which is configured for external power

As a solution, I started working on developing new circuits, in Altium Designer, with fusing on the input power and a coil to help isolate the I²C signal from common mode noise. There will be two circuits, a driver, and a node. The driver will accept an external power input which will be able to output a higher voltage (12 V to 15 V) to counter any line voltage drop, while the node will regulate that voltage in the 3.3 V to 5 V range, which are the standard voltages needed for I²C. The nodes should also be able to extend the I²C bus from one board to another, which expands the connectivity to a single bus.

Altium designer schematic of the I²C driver circuit
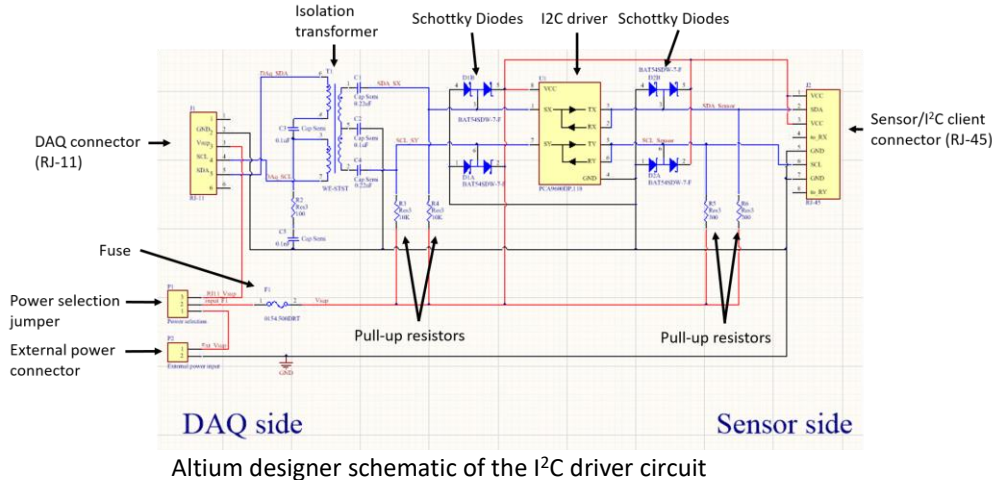
So far, I have developed a schematic for the driver board which I will review with DSG engineering before producing a board design. After the review of the driver circuit, I plan to produce the schematic for the node boards. These boards will replace the extenders currently used on the GEM gas distribution monitoring system.