Errata and Suggestions for Future GLV Teams

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The following is a list of errata that the 2019-2020 GLV team encountered, compiled to the best of our ability. We have also included some suggestions/advice based on our experience.

Safety Loop

- The 2018-2019 team had a large voltage drop (over 2V) present in the low voltage systems that they were unable to fix. While the 2020 team was able to make some small improvements, the voltage drop is still present.
    - After testing the current draw of the GLV BOB, we are fairly certain the drop is not caused by the BOB. Prof. Nadovich will most likely tell you this also, but you'll have to check the entire low voltage system. It's likely that there are many smaller issues that make up the drop.
    - We saw some small improvements replacing old cables in the dyno room. Getting the CarMan working in the Dyno room will likely require you to make new cables anyway

GLV Breakout Board (BOB) rev. 4.4

- R1 should be removed. Send the CTRL signal directly to Pin 1 of U3.
- R11 should be a 10k resistor
- Pin 6 of Connector J5 should carry MReset_B. This has been corrected on the board with a fly wire, and has been adjusted in the KiCAD files of later revisions.
- Several of the chips on the board should have decoupling capacitors. GLV BOB rev. 5.0 and above have corrected this issue.
- Chips that communicate via I2C with SCADA are not working. We were unable to fix it before the school closed.
- There are 3 connectors on the GLV board to SCADA's Raspberry Pi. GLV BOB rev 5.1 was designed to house the Pi directly on the BOB and route all signals through one connector. It also provides additional components that allow the GLV to convert CAN signals to SPI, which can be sent directly to the Pi without need for a Pi HAT.
- The AMS Fault logic present on the board may not be sufficient. The 2020 team decided to have the new Dashboard PCB handle the AMS Fault detection by monitoring an AMS heartbeat signal supplied by SCADA, but progress was halted after Lafayette closed due to COVID-19.
- The 4.4 board has a spot for a CAN terminating resistor which it should not have, on the current board this has been corrected with solder. The terminating resistor is present on GLV BOB rev 5.1 after reorganizing the CAN layout with the SCADA team.

- Pins 7&8 of this chip (U2) are switched, on the board this has been corrected with fly wires and has been adjusted in the KiCAD files of later revisions.
- The Molex Megafit connectors the GLV board uses do not have a removal tool. This makes it very difficult to adjust/make cables. Changing the type of connector used is highly recommended.

General Suggestions for the Project

Make sure you know how to use KiCAD or an equivalent. If you need to make a custom library for parts, make sure it's used by the entire team to keep things organized. Know how to use GitHub (I hadn't used it since Digital Circuits and that really came back to bite me).

Understanding How the BOB Works

Make sure you understand what each part on the BOB does. Prof. Nadovich is going to ask you questions about everything on it. Rev.5.1's schematics were revised to be easier to follow, and I added notes for parts that confused me while I was working on it. Claiming that, "last year's team did it this way" is not a valid design choice. Believe me, we tried that. You're going to have to read some datasheets.

BOB rev.4.4 and BOB rev.5.1

While the current BOB version in the CarMan is rev.4.4, we highly suggest using rev.5.1. After building 4.4, we realized there were a lot of errors we didn't catch (see above list). We made rev.5.1 to fix these problems, and to improve on current designs.

The biggest change with 5.1 is the addition of SCADA's Raspberry Pi mounted directly on the BOB. Our previous designs had too many connectors to the Pi, so we worked with the SCADA team to redesign our connection. This new design added parts to translate CANline to SPI, which can be sent directly to the Pi without the need for a Pi HAT.

This design can (and should) be further improved upon. For example, we learned that Raspberry Pi Compute Modules exist, which are a more compact version of a regular Pi, designed for industrial applications. Talk to your SCADA team and see if you can use one of these instead of a regular Pi. It'd be a lot easier to house this on the BOB than a full-sized Pi.