Grounded Low Voltage Breakout Board

User and Maintenance Manual

ECE 492 - Spring 2021

Introduction

The GLV breakout board takes in 24V from the GLV battery before distributing it into 3 circuit breakers, allowing GLV circuitry to operate at a smaller gauge of wire. GLV is then routed to the GLV portion of TSI, where it is then distributed to various subsystems throughout the car. The GLV board also provides power to Logic, and an I2C line for the GLV current and voltage sensor. Questions can be directed to Zachary Martin, at martinz@lafayette.edu.

Major GLV Components

1. GLV Battery
2. Rules Compliance
3. Breakering 24V
4. I2C Commmunications
5. Status Lights

APPENDIX

A. GLV Header Connections

GLV Battery

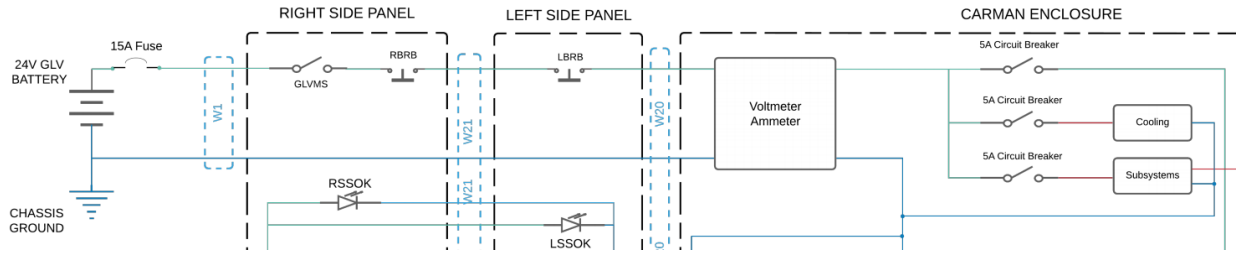
The GLV Battery must be charged for proper operation of the GLV system. The GLV battery can be charged using a PST-G100-24F8 charger. This charger charges the 24V battery at 1.5A, and it includes a plug and forget algorithm which allows it to be plugged in without the possibility of overcharging the battery. The charger has lights which indicate when the battery has finished charging. The actual battery is a 24V, 15Ah LiFePo4 battery that is currently in the dyno room.

Rules Compliance

The GLV System Voltage is established at 24V, less than 30V as dictated by EV4.1.1. Per EV4.1.2, the GLV battery will be securely mounted to the frame. In accordance with EV4.1.3-4.1.5, the hot terminal shall be insulated and the grounded terminal shall be secured to the nearest chassis ground using (at minimum) 12 AWG wire. The GLV battery is not wet-cell and therefore EV4.1.6 does not apply. Per EV4.1.7, the Li-Ion batteries are commercially assembled. No orange cables will be used in GLV per EV4.1.8.

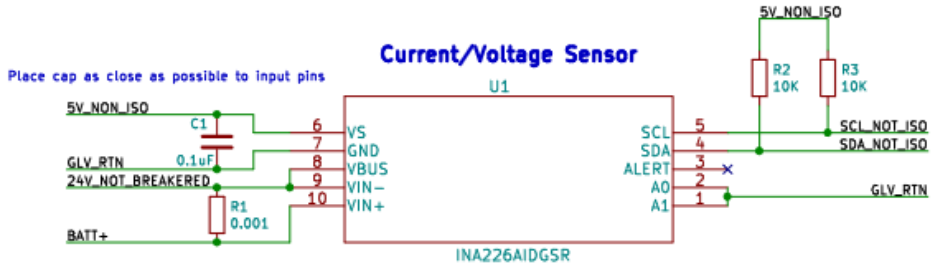
Breakering 24V

There are 3 5A circuit breakers (W28-XQ1A-5) that 24V runs through. One for the safety loop, cooling, and all other subsystems. Measured data in the past has shown that each AIR draws 1.3A-1.6A for about 300ms as they close and settle down to about 200mA nominal (each). Current measurements in the dyno room need to be taken for cooling and all other subsystems to check if 5A is appropriate in reality for cooling and general. Also note the 15A fuse that is right after the battery.



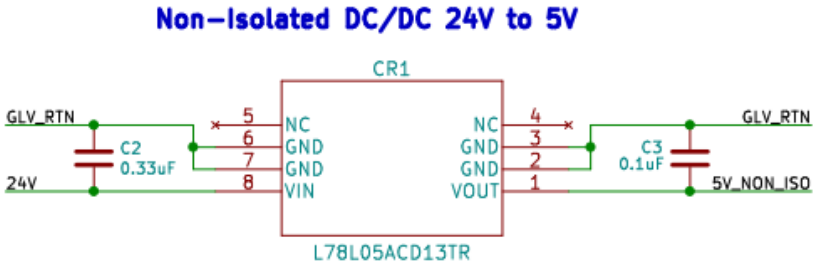
I2C Communications

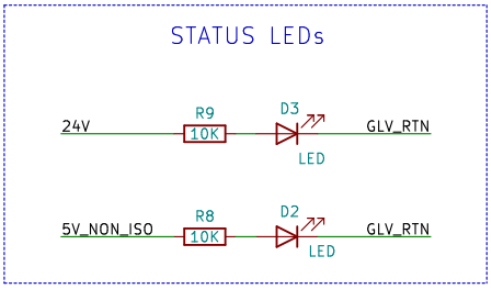
The INA226 sensor on the GLV board reports current, power, and bus voltage measurements of the GLV system to SCADA. For calibration, please see its datasheet that is listed on the GLV BOM. R2 and R3 are used as pull-ups for the non-isolated portion of the I2C line.



Status Lights

There are two status lights located on the GLV BOB. A 24V and 5V status LED are lit up when 24V is supplied to the board over the J1 connection and 5V when 5V_NON_ISO is generated from a DC/DC converter.





APPENDIX A: GLV Header Connections

J1: Header interfaces the GLV board with the Left Side Panel's ammeter and voltmeter, connecting the board straight to the battery's terminals. The BATT+ signal received over the connector is shorted and sources the signals BREKAER_IN_SL, BREAKER_IN_GENERAL and BREAKER_IN_COOL before they are breakered.

J2: Extra supplies another option for an extra 24V hookup. Is sourced from the 24V subsystem voltage i.e. BREAKER_OUT_GENERAL.

J3: The connector supplies 24V to power the Can Isolator for the Motor Controller.

J4: The header connects to Logic's I2C line and communicates the GLV's current, voltage and power from the on-board voltage/current sensor.

J5: This header provides TSI with the beginning portion of the safety loop (after the safety loop circuit breaker) and 24V for the cooling system.

J6: This header provides connections to the 3 circuit breakers on the side of the carman enclosure.