Fuel Gauge Driver v1.1

Mini Manual

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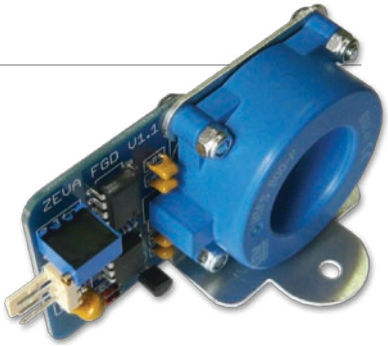
ZEVA Fuel Gauge Driver v1.1

Mini-manual

1. Introduction

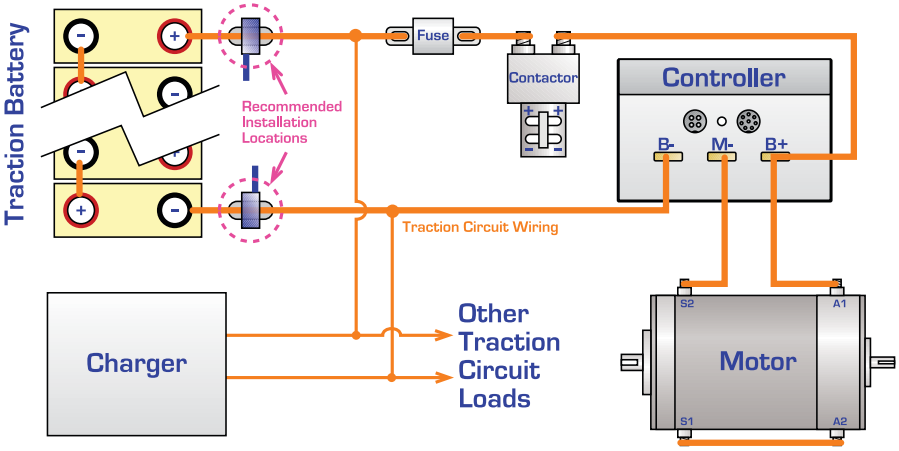


The single most important piece of information every EV driver needs to know is the State of Charge (SoC) of their battery. This device offers an elegantly simple solution, using the vehicle's original fuel gauge to display SoC. As well as simplifying installation, the original fuel gauge offers drivers the most intuitive feedback, particularly those unfamiliar with EV technology.

2. Installation

The device should be rigidly fastened to the vehicle using the integrated mounting bracket. The device should be installed where it is protected from the elements, such as inside your battery enclosures. It is usually most convenient to mount close to either the positive or negative battery terminal.

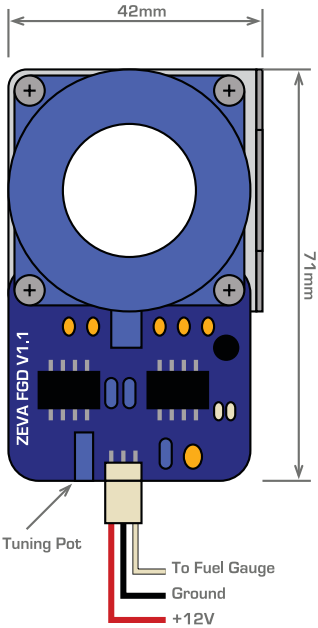
Route the power cable from the battery through the blue toroidal current sensor. Ensure that all loads in your traction circuit (including charger, DC/DC converter) are connected to the traction circuit *after* the Fuel Gauge Driver (FGD) or they will not be monitored. The diagram below shows recommended install locations in an EV circuit example:



The flow of conventional current should go from the back to the front through the blue toroidal current sensor – that is, the side with the mounting bracket attached should be oriented towards the positive terminal.

3. Wiring

The FGD has just three wires to connect, as shown on the diagram right. All wiring should be referenced to the vehicle's 12V electrical system, not the traction circuit.



The middle pin goes to ground (vehicle chassis). The +12V wire must be connected to a *permanent* supply (not switched by ignition) so that the device is able to monitor current flow at all times, e.g during charging and quiescent current while the car is idle.

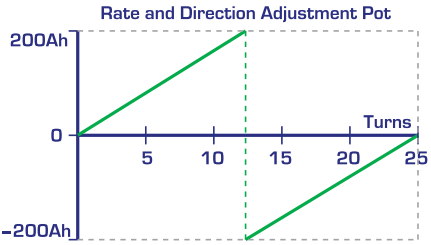
The FGD calibrates the zero point of its current sensor during the first 2 seconds after being powered up. It is important to ensure that there is zero current flow through the traction circuit during this period to ensure accurate calibration. (If you have a master switch in your traction circuit, turn it off before powering up the FGD.)

If the device loses power, it will reset to 100% SoC. The rationale behind this is to offer a simple method for re-synchronizing the state of charge at the end of a charge cycle if you experience any SoC drift.

The third wire goes to your fuel gauge, replacing the input originally coming from the level sensor in your fuel tank.

4. Calibration

Adjustment of the device is achieved via the single blue 25-turn tuning pot on the circuit board. Some vehicles use fuel tank sensors with minimum resistance when full, and some have minimum resistance when empty. This device can simulate both sensor types, with the lower half of the tuning pot's range used for conventional gauges and the upper half used for reversed gauges.



When first powered up, wind the pot fully clockwise or anti-clockwise – until the gauge needle is on Full – to determine gauge polarity in your vehicle. (Note: you may need your ignition key on for the factory gauge itself to activate.) The tuning pot has 25 full turns from end to end, and will click gently when you reach the limit of travel.

Capacity calibration is best performed during one full-depth discharge cycle. After a full charge simply drive the vehicle to its maximum range (3.2V/cell for LiFePO4 or 12V/batt for PbA is a good reference point) then adjust the tuning pot until the needle sits on empty. Some older vehicles have very slow-moving fuel gauge needles so some patience may be required!

5. Tech note on SoC synchronization

The FGD uses 100% SoC as it's synchronization point. Once it hits 100% SoC, it will ignore any further charge current. Lithium batteries have approx 1% charge inefficiency, which means your charger will usually put 1% more energy in to the cells than you can get back out. This 1% is useful to give the FGD a brief synchronisation window at the top-of-charge, to compensate for any SoC drift from measurement inaccuracy. In most cases, it will allow the FGD to maintain synchronization with your pack's SoC transparently.

The device does *not* stop counting current flow when it hits 0% SoC, so you can recalibrate your low point anytime without truncating the SoC counter.

6. Accuracy and SoC drift

This device uses a Hall Effect sensor to measure current flow. Whilst offering good accuracy and linearity, they can suffer from a small amount of zero-point drift and inaccuracy when measuring very low levels of current. If a vehicle is not driven or charged for a period of weeks or longer, the FGD may have accumulated SoC error due to quiescent current flow. In such cases simply recharge your pack, then reset the FGD (via power cycle) to allow it to resynchronize.

This device should only be used to give an indication of the battery's SoC, and can not replace a battery management system (BMS) for protecting your cells from overcharging or over-discharging.

7. Advice for use with modern vehicles and digital gauges

Some digital and aftermarket fuel gauges are more particular about the input signal they receive, and some modern vehicles perform error checking on the input. If the FGD doesn't seem to be working with your gauge, you can try putting a resistor between the FGD and gauge, usually in the order of 20 ohms but it will be gauge-dependent.

If using a programmable aftermarket gauge, select an input resistance range with a small value for Full and a large value for Empty, then add a resistor equal to the Full resistance.

8. Specifications in brief

- Power supply input voltage: 9-30VDC
- Power consumption: Approx 20mA @ 12VDC.
- Measured current range: ±1200A
- Capacity range: Approx 10-200Ah (some variation depending on OEM gauge behaviour)
- Traction circuit voltage range: Limited by power cable insulation rating
- Reverse voltage protected and fuse protected

The ZEVA Fuel Gauge Driver is proudly designed and manufactured in Australia.