ZERO EMISSION
VEHICLES AUSTRALIA

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Fuel Gauge Driver v1.3

Intuitive instrumentation for your EV

Please read these instructions carefully
for proper installation and use of this product.

1. INTRODUCTION

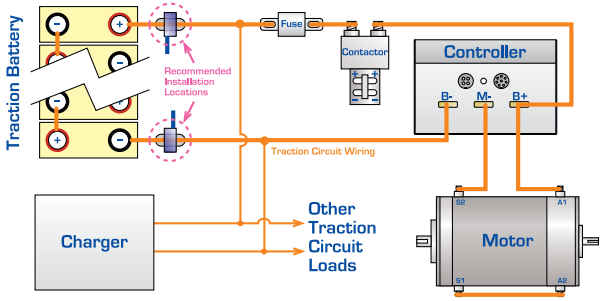
The single most important piece of information every EV driver needs to know is the State of Charge (SoC) of their battery. This device offers an elegantly simple solution, using the vehicle's original fuel gauge to display SoC. As well as simplifying installation, the original fuel gauge offers drivers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

2. INSTALLATION

The device should be securely fastened to the vehicle using the integrated mounting bracket. It should be installed where it is protected from the elements - inside sealed battery enclosures is ideal. It is usually most convenient to mount it close to the positive or negative battery terminal, along the path of the power cables.

Route the power cable from the battery through the hole in the FGD's toroidal current sensor. Ensure that there are no loads between the battery and fuel gauge (such as charger, DC/DC conveter, etc), or current flowing to/from them will not be monitored and state of charge will be inaccurate.

The diagram below shows recommended installation locations in a typical EV circuit:

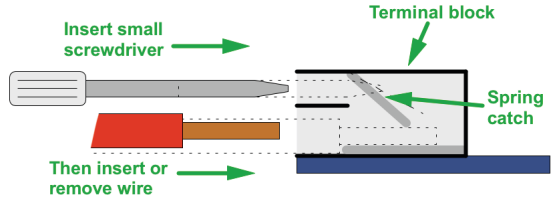


Recommended install location(s)

The flow of conventional current (+ve to -ve) should go from the back to the front of the current sensor – that is, the side with the mounting bracket should be oriented towards the positive terminal.

3. WIRING

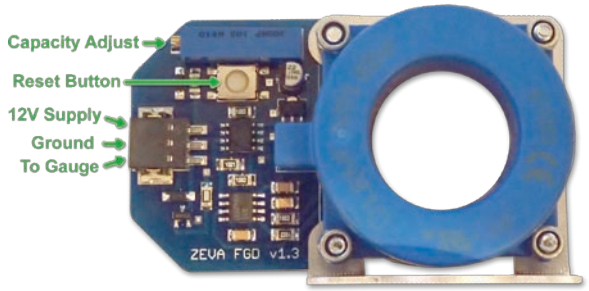
The FGD uses a spring-lock terminal block for quick, secure connection of wires. Simply insert a small screwdriver (or paperclip) in the upper hole to lift the internal spring, then insert (or remove) wire, and remove screwdriver to lower the spring and lock the wire in place. Wires should have about 8mm conductor exposed for optimum penetration. A light tug on the wire once inserted should ensure that the spring lock has engaged.



Using spring-lock terminal blocks

The pin functions are as follows:

- **Pin 1 (top / furthest from bracket):** Permanent 12V supply: The device must be powered at all times (not ignition switched) to ensure current flow is monitored even when the key is off.
- **Pin 2:** Ground, or vehicle chassis.
- **Pin 3 (bottom):** To fuel gauge, substituting the wire originally going back to the sensor in your fuel tank.



Wiring pins, reset button and capacity adjustment

4. IMPORTANT NOTE WHEN POWERING UP

The FGD calibrates the zero point of its current sensor during the first 2 seconds of first powering up. It is important to ensure that there is zero current flow through the traction circuit during this time to ensure correct calibration. (If you

have a master switch in your traction circuit, turn it off before powering up the FGD.)

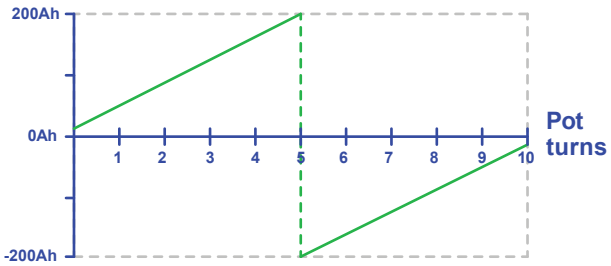
If the FGD loses power, it will reset to 100% SoC when next powering up. The rationale for this is that the battery may have been charged or discharged while the FGD was off, and hence it cannot know the correct SoC.

If you experience any SoC drift, the FGD can be reset back to 100% after a full charge by either pressing the onboard reset button, or by temporarily interrupting power to the FGD with a remote switch on its power supply. As above, ensure there is zero current flow in the traction circuit when resetting to ensure accurate zero point calibration on startup.

5. CALIBRATION

The FGD is calibrated using a single 10-turn pot, which is adjusted using a small flat-blade screwdriver. The pot has no end-of-travel indication, so to begin calibration it is best to complete 10 full turns in either direction to ensure you start at one end or the other as a reference point.

The adjustment pot changes the scaling of battery capacity with respect to your fuel gauge. Fully clockwise represents minimum capacity for conventional gauge polarity, and fully anticlockwise represents minimum capacity for reversed gauges. Moving towards the centre will increase effective capacity, with a polarity swap at the midpoint. Each turn typically represents approximately 40Ah change in battery capacity, however it can vary depending on the scaling of your vehicle's OEM fuel gauge.



Effective battery capacity vs pot turns

Capacity calibration is best performed after one full-depth discharge cycle. After a full charge, simply drive the vehicle to its maximum range (approx 3.2V/cell for LiFePO4 or 12V/batt for PbA is a good reference point) then adjust this tuning pot until the fuel gauge needle sits on Empty.

The FGD will come factory set for normal gauge polarity and minimum capacity setting. This is a good place to start testing, both to confirm your gauge polarity and to verify gauge movement during a short drive.

6. TECH NOTE ON SoC SYNCHRONISATION

The FGD uses 100% SoC as its synchronisation point. Once it reaches 100% SoC, it will ignore any further charge current. Lithium batteries have approximately 1% charge inefficiency – that is, your charger will put 1% more power into the cells than you will 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 synchronisation with the pack's SoC automatically.

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

7. 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 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 to allow it to resynchronise.

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

8. SPECIFICATIONS

- Power supply input voltage: 6-28VDC (12V nominal)
- Reverse voltage and fuse protected
- Power consumption: 20mA approx
- Current measurement range: ±1200A
- Capacity range: 10-200Ah approx, depending on gauge
- Traction circuit voltage range: Limited by power cable insulation only
- Dimensions: 71x42x20mm, plus bracket

9. TECHNICAL SUPPORT

If you have any queries not covered by this manual, feel free to contact us via our website: **www.zeva.com.au**

Products are covered against manufacturing faults for a period of 12 months from date of purchase. If you believe your module may be faulty, please contact us for RMA information.

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