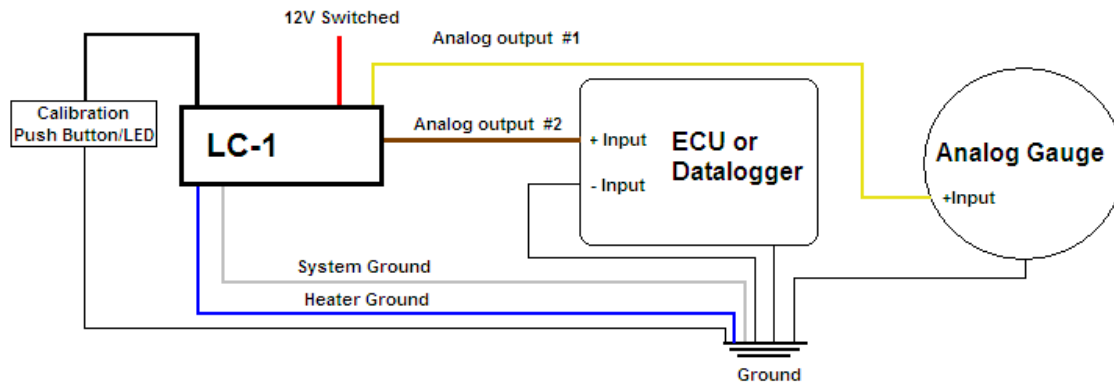


## 2.2 Connecting the LC-1 to an ECU or data logger

All Innovate MTS devices like the LC-1 with dual serial ports should have their system grounds connected together to a common ground point. If an external data logger or ECU is to be fed by an MTS device, the MTS ground should be located at or near the ECU or data logger's input signal ground. Some ECU's or data loggers have differential inputs. A differential input has a separate ground INPUT for each sensor input. This ground input MUST be connected also to ground as shown in these diagrams. If one analog output of the LC-1 is used to drive an AFR display and the other output is used to connect to an ECU, the AFR display ground should be connected to the ECU ground. **The schematics below can also adapted for 7-wire LC-1s. Simply wire the Green analog ground wire with the System ground.**



## 2.3 Electrical Grounding Concerns

The electrical environment inside a car provides unique challenges, combining high voltages and currents, low-voltage signals, convoluted signal paths, and variable conditions (i.e., fans turning on and off, or starter cranking).

When using precision electronics, it is important for ALL electronics to share a common ground. Remember that "Ground" is more than just the return path for any circuit- it is also the reference against which any voltage is measured.

Since it is not always practical to ground every device to the exact same location, here are some tips on grounding:

1. The BEST grounding scheme is all grounds (i.e., ECU, Gauges, LC1 heater, LC1 system, etc.) SOLDERED into a single lug and bolted to the engine block.
2. The next best is all grounds attached to the same source, as close as possible, but on separate lugs. This is because even the corrosion between lugs can create ground offset and noise. Incidentally, this is why many ECUs have separate ground wires for injectors vs. ECU system ground- separating high voltages and low voltages reduces noise.
3. Grounding to the engine block is usually better than grounding to the frame.
4. Grounding a gauge to the radio is usually bad- ground offset can vary with volume.
5. Grounding to an ECU housing is generally not optimal- housings are strapped to the frame for shielding, but not necessarily grounded.
6. One of the WORST things to do is to ground most of your electronics to one place (i.e. the engine block), but ground one device somewhere else (i.e., the frame). Not only can this result in ground offsets, it can also create a "path of least resistance" for high currents THROUGH a low-current device. This can result in melted wires and vaporized diodes, when, for example, starter currents flow through gauges.

## 2.4 Mounting the sensor using a Bung.