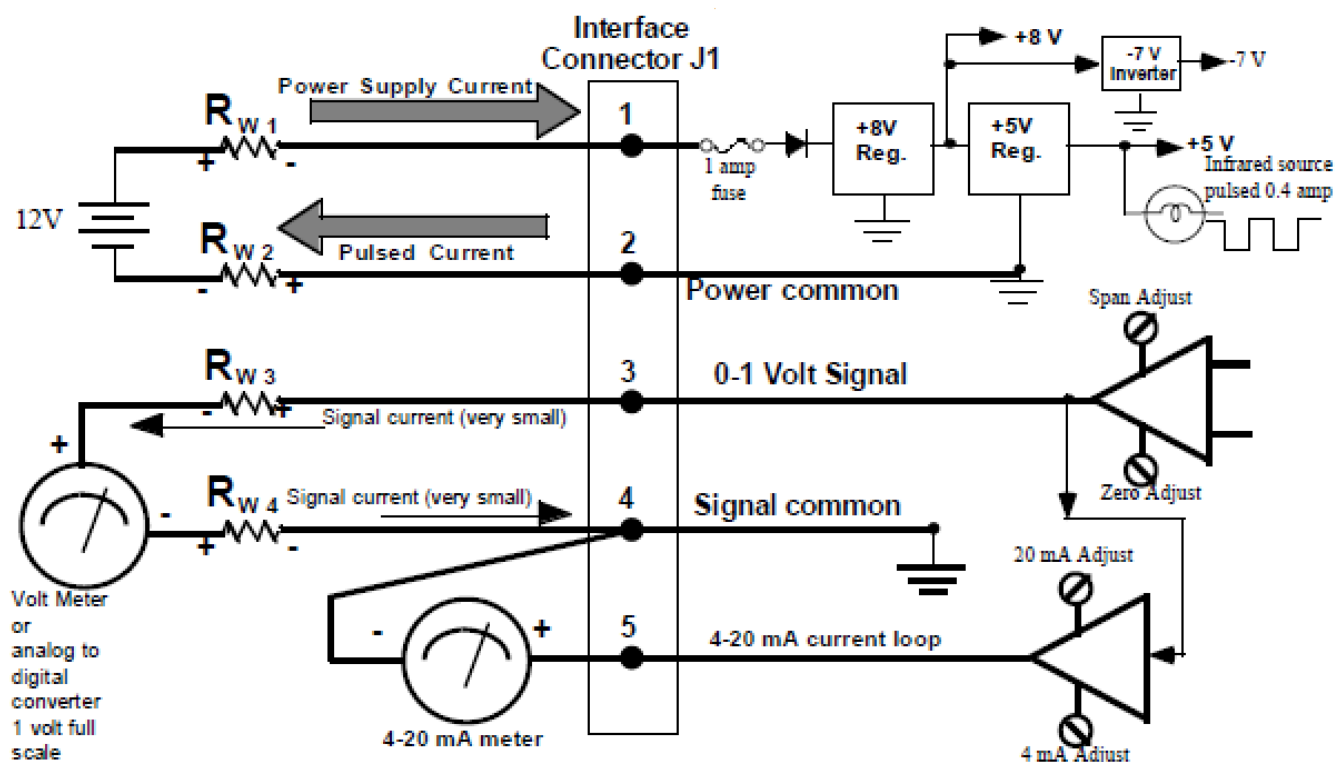


### How to avoid Ground Loops and Electro-Magnetic Interference (EMI)

As can be seen below, the two circuits (two loops – the power supply circuit and the signal circuit) should be kept separate. Even though the Power Common and the Signal Common are tied together on our printed circuit board, separate wires must be run for each one, and the Power Common wire should be of a large wire gauge and as short as possible. The object is to prevent the pulsed power supply current from getting into the signal path. The power supply current pulses, created by the infrared source turning on and off every 1.0085 seconds, and will follow the path of least resistance (represented by  $R_{W1}$  and  $R_{W2}$ , the resistance of the wires). The current flowing through the wire resistance creates a voltage drop (current times resistance) that would appear to be noise if the two loops were connected together. This is classically called a **ground loop** problem. It should be called **ground loops**.



The pulsating power supply return current will take the path of least resistance. If the wire from pin #2 is large and short, the current will travel through it and not in the signal path which would introduce an offset and noise. The **SIGNAL COMMON** must have a separate wire for the signal current to flow through. There must be a minimum of 4 wires. A 3-wire connection where one wire is used for both power supply and signal common will **not work** even with the current loop.

The other application note concerns electro-magnetic interference (EMI). The infrared sensor and its amplifiers are sensitive to strong magnetic fields that are building and collapsing at 50 or 60 Hz rates. Examples of this would be devices like fan motors, florescent light fixtures, or AC solenoids that are within a few centimeters of the 2008RT 12V (remote diffusion head). The magnetic field induces a signal that beats with the pulse rate of the infrared source. The symptom of this type of EMI is an output signal (0 to 1 volt) that slowly goes up and down at a period of about 8 to 15 seconds. This can be easily avoided by keep the unit away from sources of the strong fields. If you cannot avoid being close to an EMI source, then place an earth-grounded shield between the EMI source and the 2008RT 12V.