Basic procedures for attaching strain gauges:

Installing a strain gauge is much easier than it looks. There are just a few easy steps:

1. **Clean the surface of the object where you want to attach it.** Some suggestions for cleaning are to sand the surface off with a fine grit sandpaper, rinsing it with a degreasing agent, rinsing it with a neutralizer, and wiping it clean with gauze (gauze is a lint-free fabric).

2. **Glue on the strain gauge.** This can be done by the following steps:
   a. Put the strain gauge face down on a piece of tape
   b. If your bonding agent requires a catalyst, brush it on the exposed side of the strain gauge
   c. Apply a single drop of superglue/bonding agent to the clean surface of the object
   d. Tape the gauge to the object so that the superglue touches the gauge
   e. Apply pressure with your finger for at least one minute
   f. Peal the tape off

3. **Solder the wires to the terminals on the strain gauge.** This is probably the most difficult step because the soda in the can keeps the strain gauge cold. This causes the solder to cool too quickly and form a bead shape on the strain gauge leads rather than coating the surface. The result is a fragile bond. Just do the best you can. Some suggestions for a good solder are:
   a. Use a solid wire
   b. Scratch off any superglue that may have dried on the terminals of the strain gauge.
   c. Put a drop of solder on the gauge terminal first so that it forms a solid bead, then press the wire against the bead, then press the soldering iron against the wire. The wire should easily sink in the solder bead.
   d. Don’t overdo it. It is very easy for the soldering iron to char the silicon on the gauge and ruin it.

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**Helpful Tips**

- Don’t put on too much superglue. It makes the strain gauge much stiffer, which keeps the gauge from straining as much. This can significantly affect your measurement.
- Make sure the gauge is pointing in the correct direction. The gauge will measure the strain parallel to the consecutive wires.
- Be careful not to bend the strain gauge too much. The gauges are very fragile and will break easily.
- Don’t touch the gauge with your fingers. Don’t touch the surface of the can with your fingers after you have cleaned it. The oil from your fingers will prevent the gauge from bonding correctly.
Basic procedures for setting up LabView

There are many ways to set up the block diagram for this lab. The example above demonstrates a very simple setup. This will send the voltage acquired by the DAQ directly to the measurement file, which means that you will have to interpret the results later.
I think that it would be fun if someone did all of their calculations before performing the experiment and programmed their block diagram so that it displayed the gauge pressure directly to their Labview front panel. It wouldn’t be that much harder and it would make the pictures and graphs look much better.

Calculating the Pressure

Below is an example of the data that I collected when I did the lab.

![Graph showing voltage over time for Soda Can Lab](image.png)

The difference between steady state voltage at the beginning and the steady state voltage at the end is $\delta E_o$. Use that number that you collected and the following equations to calculate $P$ (pressure).

$$\frac{\delta E_o}{E_i} \approx \frac{GF\varepsilon}{4}$$

...(for a quarter bridge)

$$P = \left(\frac{4Et}{D}\right)\left(\frac{\varepsilon_{hoop}}{2 - v}\right)$$

I calculated the internal gauge pressure in the can to be 7.95 psi, but it should have been about 30 psi. I think that my inaccuracies came from using too much superglue. Good luck!