

Making an electronic pressure transducer

Buying sensors for interfacing to computers for data-logging and electronic control purposes can be rather expensive for many budgets. Fortunately it is relatively easy to build these for yourself. Pressure is a parameter that is frequently needed for a great many experiments. For example, work with gas laws is made easier if a simple pressure sensor is available. This article describes the building and testing of a robust pressure sensor suitable for use in schools and which produces an output that can be fed into a standard computer interfacing set.

The major component of this sensor is the pressure gauge itself. These are available from RS Components at a very reasonable price. There is a range

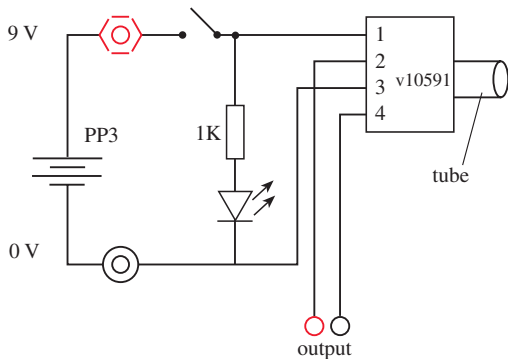
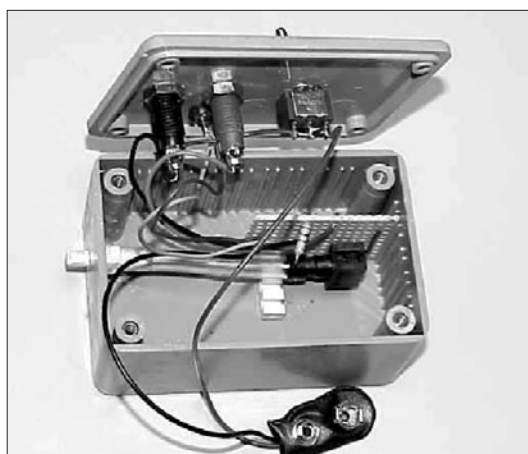


Figure 1. *Circuit diagram.*

Table 1. *Component list.*

| Component | Supplier | Stock number |
|---------------------------------|-------------------|--------------|
| PP3 battery clip | RS Components | 489-021 |
| Round insulated socket , 4 mm | RS Components | |
| red | | 444-646 |
| black | | 444-646 |
| ABS boxes 85 × 56 × 25 mm | RS Components | 502-348 |
| Single-pole switches | RS Components | 330-963 |
| LED (green) 3 mm | RS Components | 180-8451 |
| LED holder 3 mm | RS Components | 262-2983 |
| Resistor 10k $\frac{1}{4}$ watt | RS Components | 131-378 |
| Pressure sensor | RS Components | 235-5762 |
| Tubing PVC 4 mm | Fisher Scientific | TWT 200 051J |
| Straight connector | TTS | TCON20 |

**Figure 2.** *The inside of the pressure sensor box.***Figure 3.** *The completed box.*

of gauges with different pressure ranges and sensitivities stated in psi by the manufacturer. The device chosen here is a 0.5 psi (3.5 kPa) device, which is the lowest range available. They go up to 250 psi (1.7 MPa). The gauge sensors use atmospheric pressure as a reference. The 0.5 psi (3.5 kPa) device was selected because it is in the range which makes it suitable for replacing simple water manometer pressure-measuring tools in some of our experiments.

The circuit

Figure 1 shows the simple circuit diagram for this sensor.

The manufacturer recommends that these devices should be given 10 V ‘excitation’. However, they work perfectly well when connected to a 9 V PP3

type battery. The power supply is switched to conserve the battery when not in use. The LED indicates when the unit is switched on. The output voltage for the sensor used is in the range 0–35 mV. This is adequate for connecting to a great many computer interfacing boards. We use the PCL818HG boards from Advantech.

Figure 2 shows the circuit board laid out in the box and indicates how the pipeline connectors are adapted to provide access to the outside world.

Figure 3 shows the box with the lid secured. This is now a self-contained switchable pressure transducer.

A number of these boxes was made up and the outputs were compared. This was done by connecting the terminals of a ‘T’ connector to a water manometer, the pressure transducer and a small

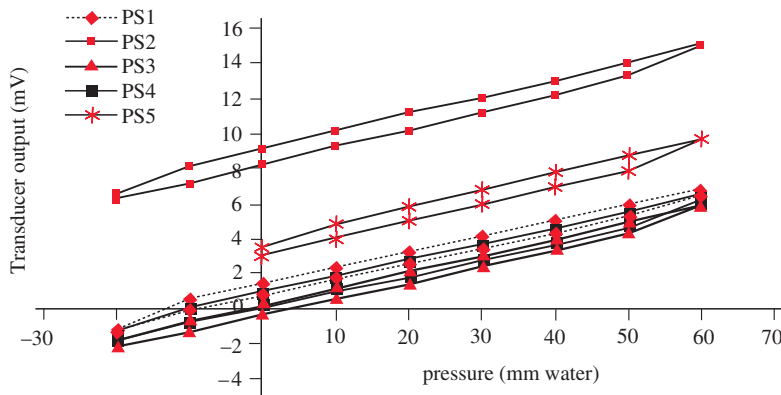


Figure 4. Calibration graph.

syringe. Figure 4 shows a plot of the transducer output against manometer readings for each of five units.

It should be noted that each sensor is different in output level for the same pressure. However, although the intercepts on the output axis vary, the gradients of the output characteristics are very similar. Also notice that the loop nature of the result indicates that there is a certain degree of hysteresis present.

These transducers have been used many times in

the laboratory in a variety of experiments and have been shown to be reliable and robust.

The list of components needed to build this device is shown in table 1.

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