# Sensors Board C & Assembly Strategy

## Introduction

This document will suggest basic strategies for creating 'C' and Assembly code for the Sensors E-Block.  Because this E-Block can be used with a variety of upstream boards (e.g. PICmicro multi-programmer board), this document will not provide all of the information required.  See the "further reading" section for more complete reference information.

This E-Block has 3 analogue sensors -  an LDR, a potentiometer and an external sensor input.  These are connected to pins 1, 2 and 4 of the E-Block connector (which would correspond to A0, A1 and A3 if this E-Block was connected to Port A of the PICmicro multi-programmer board).  Each of these inputs can typically vary between 0V and Vcc (Vcc would generally be 5V).

It also has a digital sensor input connected to pins 3 and 5 (A2 and A4 in the PICmicro example above).  Pin 3 is an output to the sensor and pin 5 is used to read the sensor's input.

## Implementing a strategy

The following strategy is specific for a PICmicro microcontroller, but should be adaptable to any upstream device.

### Analogue sensors

The basic steps required to read an analogue value using a PICmicro are as follows:
1)  Initialise the i/o pins so that the required input is an analogue input
2)  Set up any other ADC configuration (e.g. voltage references, result justification)
3)  Select the appropriate ADC channel
4)  Initiate the ADC conversion
5)  Wait for the conversion to be completed
6)  Read the conversion result

Step 5 can be performed by waiting for a set time, or by polling the GO/DONE bit in the ADC module.  Alternatively, the PICmicro can be configured to interrupt when the conversion has completed.

### Digital sensor

There are currently 2 digital sensors available: a "light gate" and a "motion sensor".  The light gate is easiest to use - basically, pin 5 on the E-Block connector can be monitored to indicate when the light gate's beam had been broken.

The motion sensor is used to measure distance using ultrasound.  Basically, a pulse must be send into the sensor (pin 3 on the E-Block connector), which will cause a level change on pin 5 a small time later.  The time for the pulse to be "echoed" directly relates to the amount of time taken for an ultrasound click to be echoed from the sensor.

## Further reading

Specific information on how to initialise and perform an analogue-to-digital conversion can be found in the relevant microcontroller / ADC datasheet.

The datasheet for the specific external sensor will also need to be consulted.