HOW TO USE: Internal Analog to Digital Converter

Files: ADC_internal.c/h
Variable Prefix: ADC_internal_
Macro Prefix: ADC_INT_

Overview:
ADC_internal.c/h has been developed specifically for the LPC2194/01. It was developed and tested by Nicolas Champagne-Williamson on Ranger's motor board in March 2009.

Features:
- Supports 4 channels of conversion
- Exponential averaging filter

Setup:
- Within the ADC_internal.h file...
    + copy the 'Hardware Setup' section into the 'setup_hardware()' function of the 'hardware_setup.c' file.
        - This will correctly setup up the AD control register (ADCR) and setup the correct pin configurations (PINSEL1).
    + copy the 'Software Setup' portion into the 'software_setup.h' file.
        - Set these values according to your code
        - *_READ: if you need to read from a channel, set its READ to 1
        - *_GAIN: the gain for the output of each channel's filter; float value
        - *_OFFSET: the offset for the output of each channel's filter; float value
        - *_FILTER: the filter coefficient for the exponential averaging filter (see: **Filter**)
            + Should be a value between 0 (no filter) and 14, inclusive. The filter is only employed on data once a non-zero value has been added. This limits the effect of beginning zeros on later data, especially with larger coefficients.
        - **struct Filter{...}:** you only need one of these defined in the software_setup.h file, so check to make sure it is not doubly defined if some other module also uses this struct.

Conversions:
- To convert a channel, call the function **ADC_internal_convert(short channel)**
- This will update the value stored in the filter with a new value

Filter:

- The exponential averaging filter uses the **filter struct** to store the values of each channel. This module uses four filters - one for each channel. The struct stores the current value of the filter, the data count, and the coefficient. When a new value is added to the filter, 1/2^coefficient of the new value is added to (1 - 1/2^coefficient) of the old data. The coefficient has to be between 0 and 14, inclusive. A coefficient of 0 means no filtering, the filter simply stores the latest value.