Notes on Analog-to-Digital Converter (ADC)

"What do those big numbers ADS1115().read_adc(0) return mean?"

Resolution

An N-bit ADC can divide the input signal into 2^N intervals. So a 1-bit ADC can give a one-bit number: if the input is higher than half its input range, the output is 1; otherwise it's 0. The ADS1115 is a 16-bit converter. That means it can divide the input signal into $2^{16} = 65536$ intervals. This is called the **resolution** of the ADC.

Input Range

There a handful of input voltage ranges the ADS1115 can operate in (Google "ADS1115 data sheet"). If for example the $\pm 4.096V$ range is chosen, then the ADS1115 maps a -4.096V input signal to -32768, and a +4.096V signal to +32767 (so a total of 65536 intervals, including "0").

So if sensor.read_adc(0) returns a number N, it means the voltage of the input signal is:

$$\frac{N}{32767} * 4.096V \tag{1}$$

For example, if sensor.read_adc(0) returns 19207, then the voltage of the input signal is

$$\frac{19207}{32767} * 4.096V = 2.4V \tag{2}$$

You can verify this with a voltmeter.

ADS1115 Data Sheet

The set of input ranges for the ADS1115 is near the top of P.19:
http://www.ti.com/lit/ds/symlink/ads1115.pdf