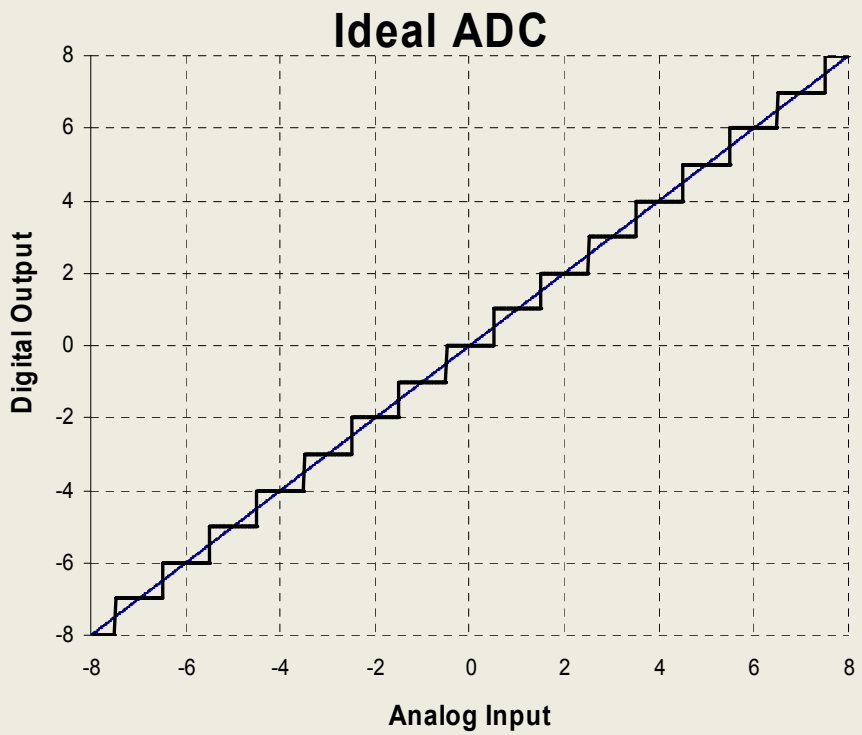
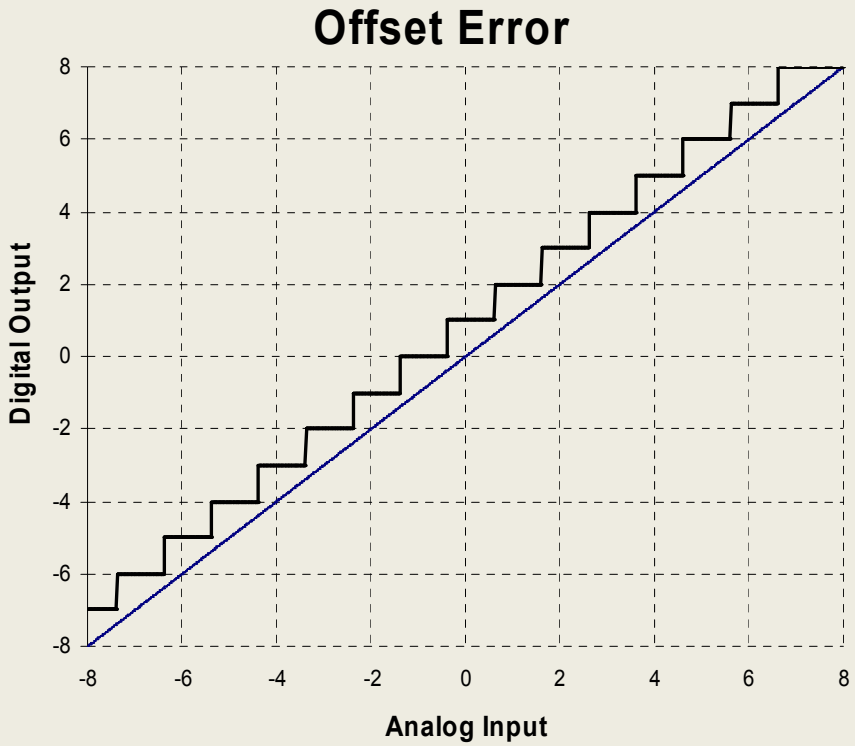
ADC Errors

- Ideal ADC
  - Input is quantized into uniform steps.
  - Transitions at +/- 50% of Δ



ADC Errors

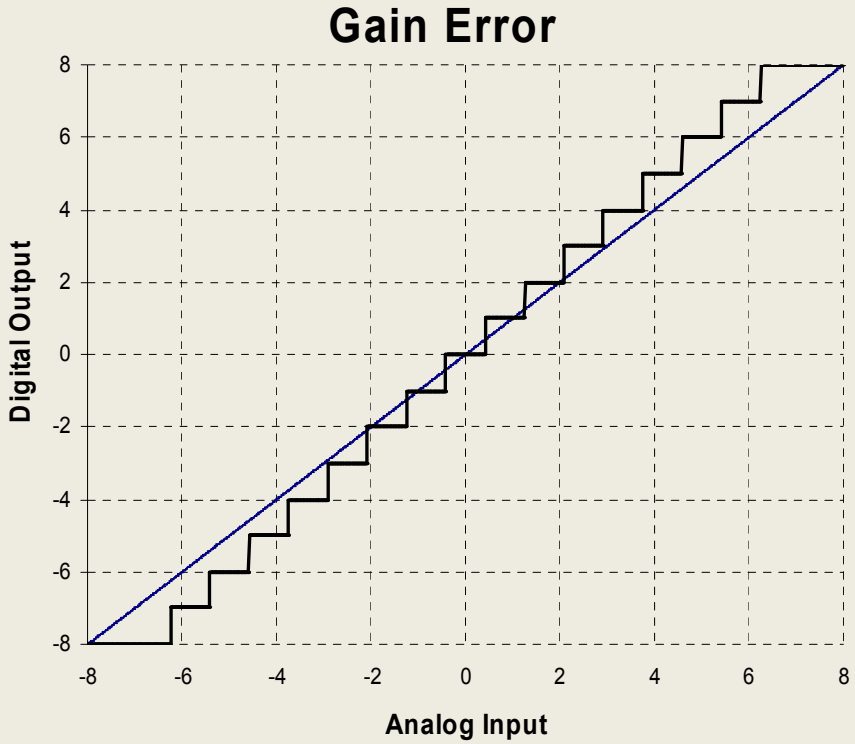
- Offset Error
  - Defined as a constant difference, over the whole range of the ADC, between the actual output value and the ideal output value.
  - Expressed as number of LSBs (counts)
  - Total system offset error includes offset error from preamplifiers or signal transducers.



Offset error can be removed be measuring a reference point and subtracting that value from future samples.

ADC Errors

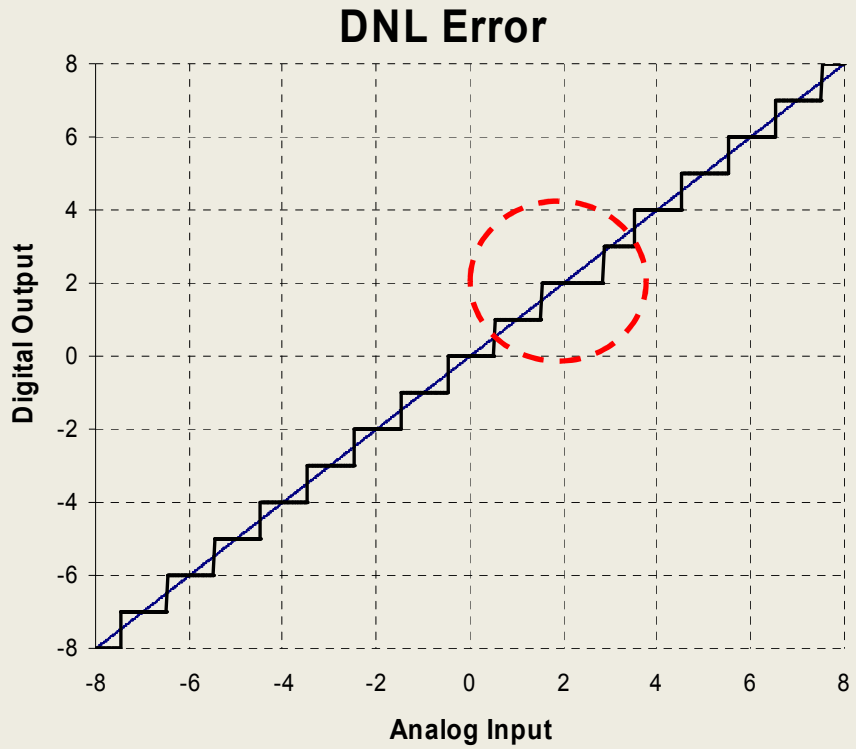
- Gain Error
  - Defines as the difference of the slope of the actual output values and the ideal output values.
  - Expressed as a percentage.
  - Total system gain error includes any gain errors from preamplifiers, attenuators, or signal transducers.



Gain error can be removed be measuring a second reference point to determine the actual gain.

ADC Errors

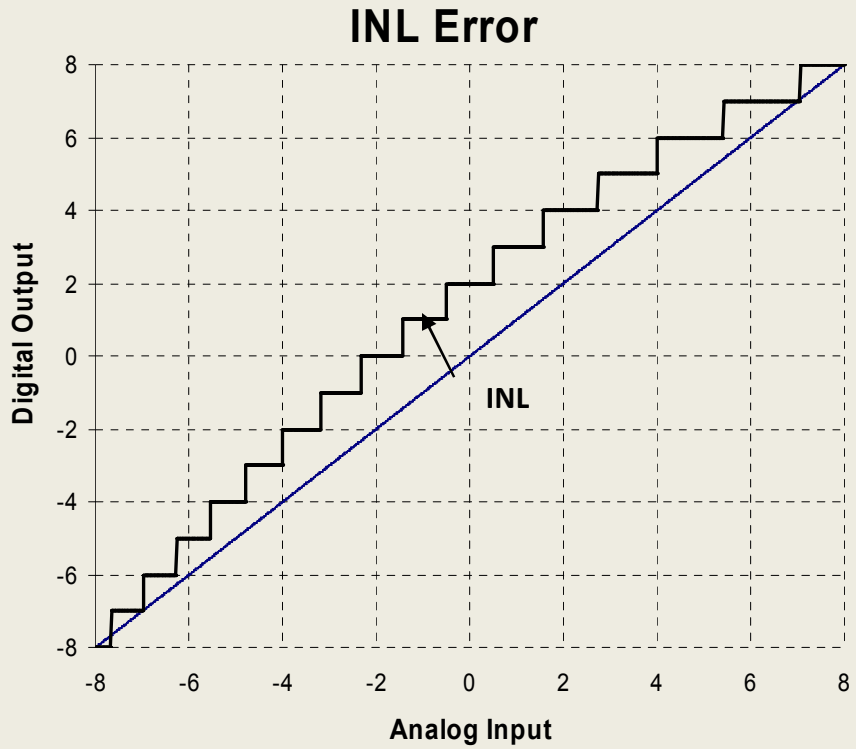
- Differential Non-Linearity
- For an ideal ADC the output is
- divided into 2^n uniform steps
- each with the width Δ.
  - Any deviation from the ideal step width is the Differential Non-Linearity. (DNL)
  - Expressed as counts.



DNL is a function of each ADC's particular architecture. It is not possible to remove its effects with calibration.

ADC Errors

- Integral Non-Linearity
- DNL errors accumulate to produce a total Integral Non-Linearity (INL).
  - Defined as the maximum deviation from the ideal line.
  - Measured from the center of the step.
  - Expressed as counts.



INL is a function of each ADC's particular architecture. It is not possible to remove its effects with calibration.