

Author: Mark Palmer, Microchip Technology Inc.

## INTRODUCTION

Usually a sensor requires its output signal to be amplified before being converted to a digital representation. Many times an operational amplifier (opamp) is used to implement a signal gain circuit. The programmability of this type of circuit allows the following issues to be solved:

- Optimization of the sensor output voltage range
- Calibration of the amplifier circuit's gain
- Adapting gain to input signal variations
  - sensor characteristics change over temperature/voltage
  - multiple input sources into a single gain circuit
- Field calibration updates
- Increased reliability vs mechanical potentiometer
- BOM consolidation – one op amp and one digital potentiometer supporting the various sensor options

This Application Note will discuss implementations of programmable gain circuits using an op amp and a digital potentiometer. This discussion will include implementation details for the digital potentiometer's resistor network. It is important to understand these details to understand the effects on the application.

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