

SIMPLE ANALOGUE-TO-DIGITAL CONVERTER

Normally analogue-to-digital converter (ADC) needs interfacing through a microprocessor to convert analogue data into digital format. This requires additional hardware and necessary software, resulting in increased complexity and hence the total cost.

The circuit of A-to-D converter shown

here is configured around ADC 0808, avoiding the use of a microprocessor. The ADC 0808 is an 8-bit A-to-D converter, having data output lines D0-D7. It works on the principle of successive approximation. It has a total of eight analogue input channels, out of which any one can be selected using address lines A, B and C. Here, in

this case, input channel IN0 is selected by grounding A, B and C address lines.

Usually the control signals EOC (end of conversion), SC (start conversion), ALE (address latch enable) and OE (output enable) are interfaced by means of a microprocessor. However, the circuit shown here is built to operate in its continuous mode without using any microprocessor. Therefore the input control signals ALE and OE, being active-high, are tied to Vcc (+5 volts). The input control signal SC, being active-low, initiates start of conversion at falling edge of the pulse, whereas the output signal EOC becomes high after completion of conversion (digiti-

sation). This EOC output is coupled to SC input, where falling edge of EOC output acts as SC input to direct the ADC to start the next conversion.

As the conversion starts, EOC signal goes high. At next clock pulse EOC output again goes low, and hence SC is enabled to start the next conversion. Thus, it provides continuous 8-bit digital output corresponding to instantaneous value of analogue input. The maximum level of analogue input voltage should be appropriately scaled down below positive reference (+5V) level.

The ADC 0808 IC requires clock signal of typically 550 kHz, which can be easily derived from an astable multivibrator constructed using 7404 inverter gates. In order to visualise the digital output, the row of eight LEDs (LED1 through LED8) have been used, wherein each LED is connected to respective data output lines D0 through D7. Since ADC works in the continuous mode, it displays digital output as soon as analogue input is applied. The decimal equivalent digital output value D for a given analogue input voltage Vin can be calculated from the relationship

$$D = \frac{V_{IN}}{V_{REF}} \times 255$$

