
MICROPROCESSOR SYSTEMS AND INTERFACING

CPE 342

WEEK 6- LECTURE 2

■ Outline

- ❑ Digital to Analog Converter (DAC)
- ❑ Analog to Digital Converter (ADC)
- ❑ Interfacing of DAC and ADC with microprocessor

Why we need DAC and ADC?

- ***Many events monitored and controlled by the microprocessor are analog events.***

These range from monitoring all forms of events, even speech, to controlling motors and like devices.

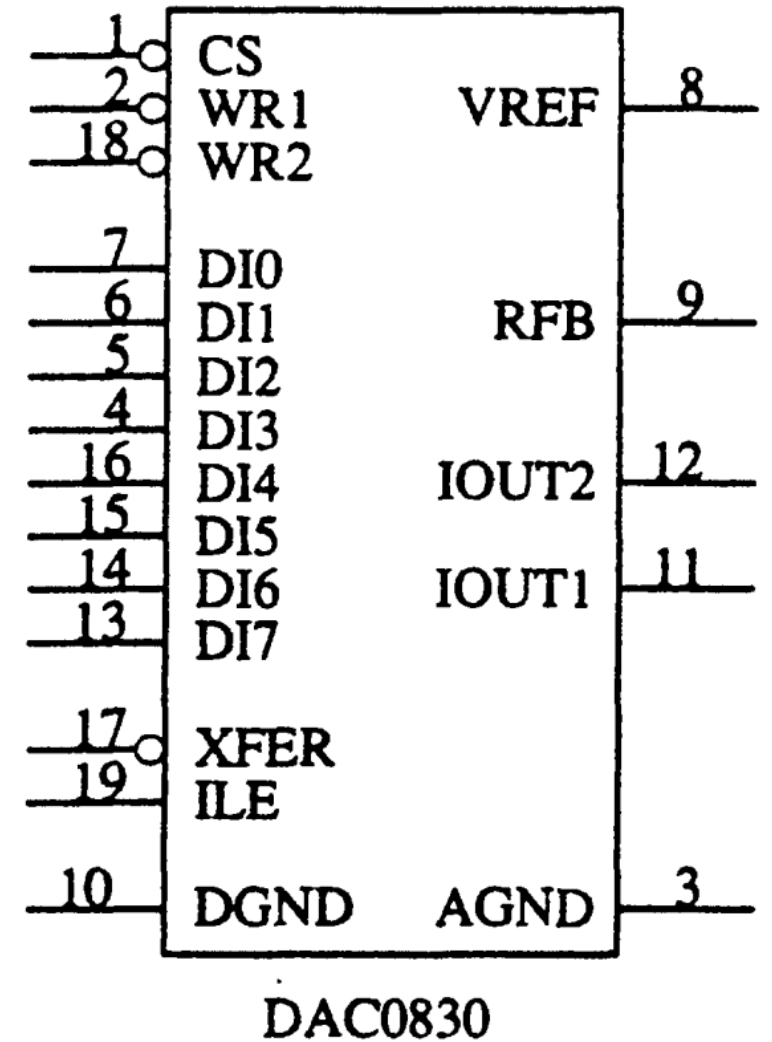
- ***These devices are used to interface the microprocessor to the analog world.***

DAC0830 Digital to Analog Converter

- A fairly common and low-cost digital-to-analog converter is the DAC0830. (National Semiconductor Corp.)
- An 8-bit converter that transforms an 8-bit binary number into an analog voltage.
- Other converters are available that convert from 10-, 12-, or 16-bit binary numbers into analog voltages

DAC0830 Digital to Analog Converter

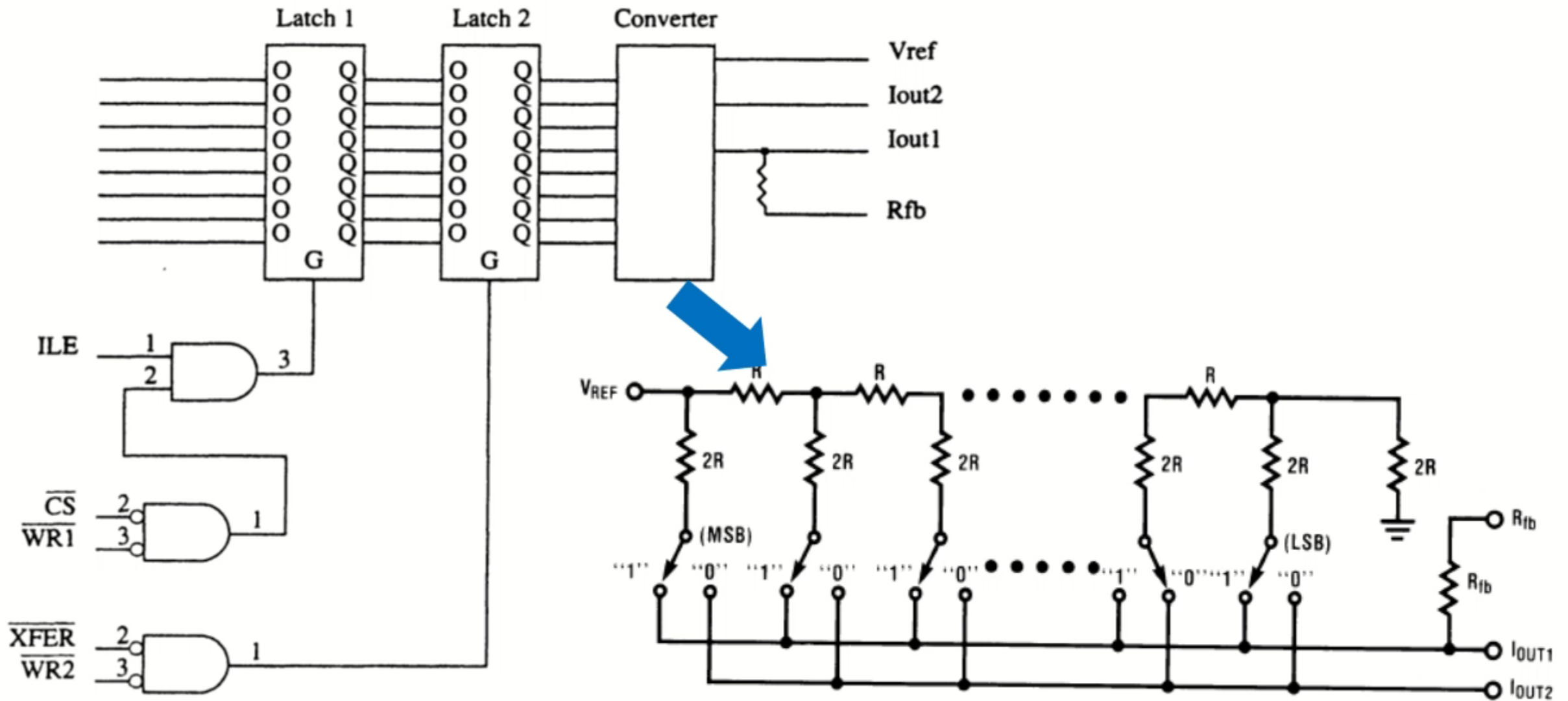
- The number of voltage steps generated by the converter is equal to the number of binary input combinations.
- 8-bit converter generates 256 voltage levels
- 10-bit converter generates 1024 levels



DAC0830 Digital to Analog Converter

- The DAC0830 is a medium-speed converter that transforms a digital input to an analog output in approximately $1.0\ \mu\text{s}$.
- The device has eight data bus connections for the application of the digital input code.
- Analog outputs labeled IOOUT1 & IOOUT2 are inputs to an external operational amplifier.
- Because this is an 8-bit converter, its output step voltage is defined as $-V_{\text{REF}}$ (reference voltage), divided by 255.
- the step voltage is often called the resolution of the converter. For $V_{\text{REF}} = -5.1\text{V}$, find the output for 10010010

Internal Structure of DAC0830

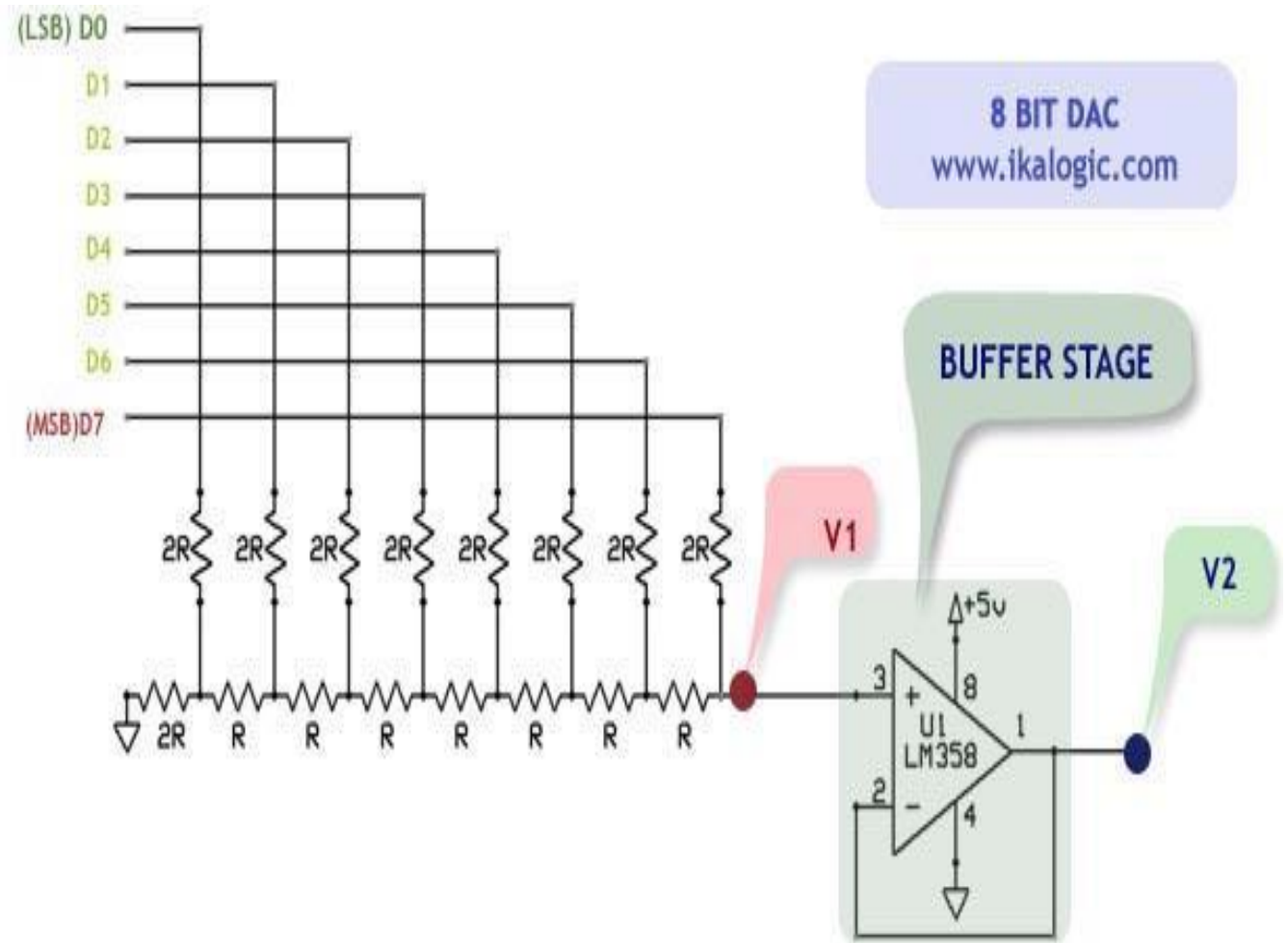


DAC0830 Digital to Analog Converter

- This device contains two internal registers.
 - the first is a holding register
 - the second connects to the R–2R internal ladder converter
- The two latches allow one byte to be held while another is converted.
- The first latch is often disabled and the second for entering data into the converter.
- Both latches within the DAC0830 are transparent latches.
 - when G input is logic 1, data pass through
 - when G input becomes logic 0, data are latched

DAC0830 Digital to Analog Converter

- The output of the R–2R ladder within the converter appears at IOUT1 and IOUT2.
- These outputs are designed to be applied to an operational amplifier such as a 741 or similar device.



Example: Connecting the DAC0830 to the Microprocessor.

- The DAC0830 is decoded at I/O port address 20H.
- When an OUT 20H,AL instruction is executed, contents of data bus connections AD0–AD7 are passed to the converter in the DAC0830.

