Memorial University of Newfoundland
Faculty of Engineering and Applied Science

Engineering 4862 Microprocessors

Lecture 25

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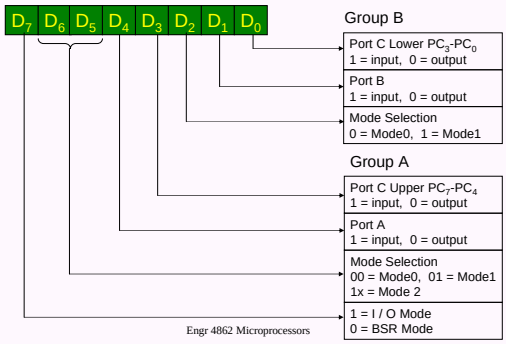
Interface DAC to a PC

- DAC (Digital-to-Analog Converter)
  - Device used to convert digital pulses to analog signals
  - Two methods of making the DAC
    - Binary weighted
    - R / 2R ladder
    - The vast majority of IC use R / 2R since it can achieve a much high degree of precision

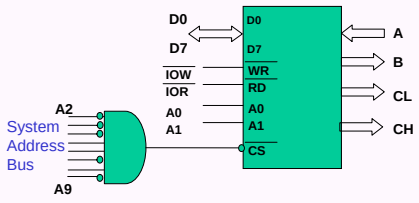
Control Word of 8255



Criterion for Judging a DAC: Resolution

- Resolution is a function of the number of binary inputs. ➔ common ones are 8, 10, 12 pins
- The number of analog output levels is equal to 2^n, where n is the number of data inputs
  - ➔ 8-input DAC (MC1408)
    gives 256 discrete voltage/current levels of output
  - ➔ 12-input DAC → 4096 voltage/current levels
  - ➔ 16-input DAC → 65,536 voltage/current levels

8255 Design Example



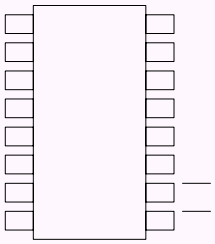
MC1480 DAC (or DAC 808)

- In MC1480, the digital inputs are converted to current (I_{out}) and by connecting a resister to the I_{out} pin, we convert the result to voltage.
- The current provided by I_{out} is a function of binary numbers at D0-D7 and the reference current.
- I_{ref} is generally set to 2.0 mA.
- $I_{out} = I_{ref} . (D_7/2 + D_6/4 + D_5/8 + D_4/16 + D_3/32 + D_2/64 + D_1/128 + D_0/256)$.

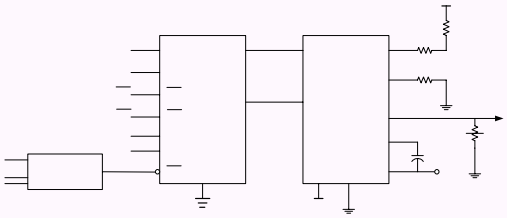
Interface DAC to PC

- Example1
  - Interface MC1480 to Microprocessor through PPI 8255
- Example2
  - Interface AD558 directly to Microprocessor

Interface AD558 to 8088 8-bit DAC Voltage Output



Interface MC1480 to Microprocessor through PPI 8255

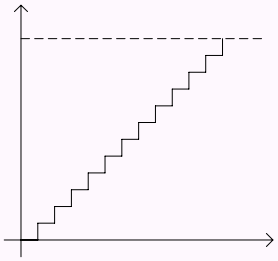


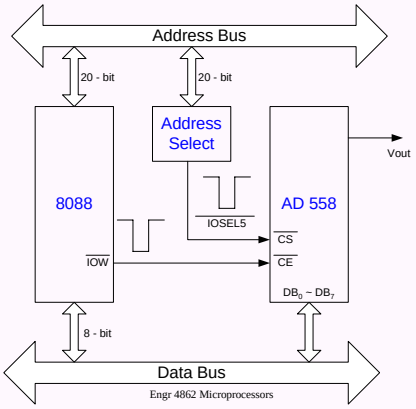
Interface ADC and Sensors to a PC

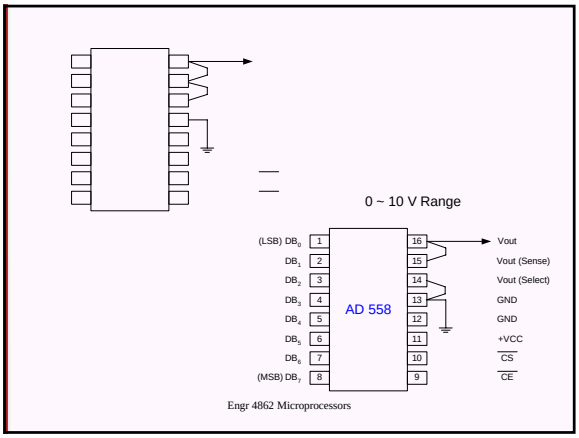
- AD558 is configured as “write only”
- VCC range +4.5V ~ + 16.5 V, normally +5V
- Vout Range: 0 ~ 2.56 V, or 0 ~ 10 V
- Digital Input Code Output Voltage

Binary	Hex	Decimal	2.56V	10V
00000000	00	0	0	0
00000001	01	1	0.010V	0.039V
00001111	0F	15	0.150V	0.586V
11111111	FF	255	2.55V	9.961V


```
   MOV AL, 80H
   OUT PCtrl, AL
   MOV AL, 0
Cont: OUT PA, AL
   INC AL
   CMP AL, 0
   JZ Stop
   MOV CX, 0FFFFH
Here: LOOP Here
   JMP Cont
Stop: INT 6
```







0 ~ 2.56 V Range

(LSB) DB_0	1		16	Vout
DB_1	2		15	Vout (Sense)
DB_2	3		14	Vout (Select)
DB_3	4	AD 558	13	GND
DB_4	5		12	GND
DB_5	6		11	+VCC
DB_6	7		10	CS
(MSB) DB_7	8		9	CE