

EE2361 - Lecture 31  
11/21/16

## Scanning A/D channels

Scan multiple inputs to  
the A/D.

Reference: PIC24F Family Reference Manual  
Section 17: A/D Converter  
(DS39705B, 2009)

You set up a sequence of "channels" to be scanned.

For example, suppose you have  $M$  devices with analog signals to convert

$\Rightarrow$  How to do this?

Example: ANO - AN3

1. Need to make the corresponding  
pins analog

ADIPCFG = 0xFFFO ;

ANO - AN3   
are analog

2. Need to select the channels we are going to scan

ADICSSL = 0x000F;

└ Scan AN0-AN3

Note: For our device (24FJ64GA002) there are 10 possibilities.

For our device, there is no ADICSSH since only 10 inputs

3. For this example we will trigger the conversion using the internal counter, SSRC = 111

$\Rightarrow$  ADICON1 = 0x00E0;

ADICON1

## 4. Configure ADICON2

let's generate an interrupt after every 4 samples.

SMPI = 0011 (interrupt after 4 samples)

and enable scanning, use ADICSSL for determining input channels

CSCNA = 1 (scan selected inputs in ADICSSL)

ADICON2 = 0x040C;

5. Everything else

sample time of  $31 T_{ad}$ , with  $T_{ad} = 2 T_{cy}$

$ADCON3 = 0x1F01;$

Finally turn on the A/D

$ADCON1$  bits.  $ADON = 1;$

# Code Example

Example in lecture

Example 17-8 in ~~24F~~ 24F FRM

Figure 17-12      "



Conversion Triggers can be selected

⇒ this is what stops sampling  
and initiates conversion

⇒ for our device there are 4  
possibilities

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look at using Timer 3 (or Timer 2/3)

Conversion is initiated when the  
TMR matches the PR

Might want to do this if the analog signal changes slowly, or conserve battery.

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Look at sampling every 10 s

10 s will allow lower power consumption

⇒ power consumption is proportional to switching frequency

If we use a ~~16-bit~~<sup>1:256</sup> premultiplier ~~on~~ with  
Timer 3 will it work? Assume 16 MHz

$$\frac{2^{16} \times 256 \times 62.5 \text{ ns}}{1:256} = 1.048576 \text{ seconds}$$

16-bit  
register (2<sup>16</sup>) Tcy

If we combine Timer 2/3 to get a 32-bit

timer register  $2^{16} \times 1.048576 = 65536 \times 1.048576 = 68719.47674 \text{ seconds}$

or 19.08814 354 hours

Do 2 - things with the Timers

32-bits for Timer 2/3 the control  
register/controls both the timers for 32-bit  
operation with both  
registers

T2CON

Select the 32-bit operation

Set PR3:PR2 to a value for 10s

upper  
16-bits

lower  
16-bits

for 32-bit 2/3 operation

As a 32-bit timer  
Timer 2/3

TMR3:TMR2  
PR3:PR2

For The A/D conversion event with  
Timer 3 or Timer 2/3 we only need  
a match       $TMR3:TMR2 = PR3:PR2$

Code : Check & Post