

UNIT IV

INTERFACING WITH PIC MICROCONTROLLER

ADC INTERFACING WITH PIC16F877A

Microcontrollers are very useful especially when it comes to communicating with other devices, such as sensors, motors, switches, memory, and even another microcontroller. As we all know many interface methods have been developed over years to solve the complex problems of balancing needs of features, cost, size, power consumption, reliability, etc. but the ADC Analog-to-Digital converter remains famous among all. Using this ADC we can connect any type of Analog sensor.

The Analog-to-Digital (A/D) Converter module has eight for the 40/44-pin devices.

The conversion of an analog input signal results in a corresponding 10-bit digital number. The A/D module has high and low-voltage reference input that is software selectable to some combination of VDD, VSS, RA2, or RA3.

The A/D converter has the unique feature of being able to operate while the device is in Sleep mode. To operate in Sleep, the A/D clock must be derived from the A/D's internal RC oscillator.

Registers used for ADC

- A/D Control Register 0 (ADCON0)
- A/D Control Register 1 (ADCON1)
- A/D Result High Register (ADRESH)
- A/D Result Low Register (ADRESL)

A/D Control Register 0 (ADCON0)

The ADCON0 register, shown in the below image, controls the operation of the A/D module

ADCON0 REGISTER

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	U-0	R/W-0
ADCS1	ADCS0	CHS2	CHS1	CHS0	GO/DONE	—	ADON
bit 7							bit 0

A/D Control Register 1 (ADCON1)

The ADCON1 register, shown below, configures the functions of the port pins i.e Used to configure the GPIO pins for ADC. The port pins can be configured as analog inputs (RA3 can also be the voltage reference) or as digital I/O.

ADCON1 REGISTER

R/W-0	R/W-0	U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0
ADFM	ADCS2	—	—	PCFG3	PCFG2	PCFG1	PCFG0
bit 7							bit 0

A/D Result High Register (ADRESH) & A/D Result Low Register (ADRESL)

The ADRESH: ADRESL registers contain the 10-bit result of the A/D conversion. When the A/D conversion is complete, the result is loaded into this A/D Result register pair, the GO/DONE bit (ADCON0<2>) is cleared and the A/D interrupt flag bit ADIF is set

Steps to follow

To do an A/D Conversion, the following steps are followed:

1. Configure the A/D module:

- Configure analog pins/voltage reference and digital I/O (ADCON1)
- Select A/D input channel (ADCON0)
- Select A/D conversion clock (ADCON0)
- Turn on A/D module (ADCON0)

2. Configure A/D interrupt (if desired):

- Clear ADIF bit
- Set ADIE bit
- Set PEIE bit
- Set GIE bit

3. Wait the required acquisition time.

4. Start conversion:

- Set GO/DONE bit (ADCON0)

5. Wait for A/D conversion to complete by either:

- Polling for the GO/DONE bit to be cleared (interrupts disabled); OR
- Waiting for the A/D interrupt

6. Read A/D Result register pair (ADRESH: ADRESL), clear bit ADIF if required.

