

Pre-Lab

1. In computing there are traditionally two ways for a microprocessor to listen to other devices and communicate. These two methods are commonly called polling and interrupts. A large amount of information about these two methods exists. Please describe what each of them is and a few examples where you would choose one over the other.

Polling is used when you are handling events that are synchronous, happening frequently, and not a high priority. This is likely used for reading data off of a network card. Interrupts are used when you need to handle events that are asynchronous, happening relatively infrequently, and are of high priority. Interrupts are good for real time applications like sensors.
2. What is the function for each bit in the following registers in the ATmega128? EICRA, EICRB, and EIMSK. You can find this information from either the AVR Instruction Set guide, or the ATmega128 Reference Manual both located on the lab web site.
HINT: These registers are related to external interrupts.

Configuration behavior for EICRA and EICRB:

00 - Low Level triggers an interrupt

01 - Any logical change

10 - Falling edge

11 - Rising edge

EICRA: (Located at \$6A)

bit 0 => Configuring behavior for interrupt 0

bit 1 => Configuring behavior for interrupt 0

bit 2 => Configuring behavior for interrupt 1

bit 3 => Configuring behavior for interrupt 1

bit 4 => Configuring behavior for interrupt 2

bit 5 => Configuring behavior for interrupt 2

bit 6 => Configuring behavior for interrupt 3

bit 7 => Configuring behavior for interrupt 3

EICRB: (Located at \$6A)

bit 0 => Configuring behavior for interrupt 4

bit 1 => Configuring behavior for interrupt 4

bit 2 => Configuring behavior for interrupt 5

bit 3 => Configuring behavior for interrupt 5

bit 4 => Configuring behavior for interrupt 6

bit 5 => Configuring behavior for interrupt 6

bit 6 => Configuring behavior for interrupt 7

bit 7 => Configuring behavior for interrupt 7

Configuration behavior for EIMSL:

0 - Interrupt is disabled

1 - Interrupt is enabled

EIMSK: (Located at \$39)

bit 0 => Configuring behavior for interrupt 0

bit 1 => Configuring behavior for interrupt 1

bit 2 => Configuring behavior for interrupt 2

bit 3 => Configuring behavior for interrupt 3

bit 4 => Configuring behavior for interrupt 4

bit 5 => Configuring behavior for interrupt 5

bit 6 => Configuring behavior for interrupt 6

bit 7 => Configuring behavior for interrupt 7

3. The AVR microcontroller uses interrupt vectors to run code when an interrupt is triggered. What is an interrupt vector? List the memory locations for the following vectors in the AVR microcontroller: Timer/Counter2 Comparison Match, External Interrupt 2, and USART1-Rx Complete.

An interrupt vector is a member of the interrupt vector table. The table holds the addresses that will be called when a specific interrupt is called.

The memory location of Timer/Counter2 Comparison Match vector is: \$0012 The memory location of External Interrupt 2 vector is: \$0006 The memory location of the USART1-Rx Complete Interrupt vector is: \$003C

4. In the AVR microcontroller, like many others, there are several different ways of triggering interrupts. Below is a sample signal being input onto one of the external interrupt pins. List where the interrupt would trigger on this waveform if the interrupt was set up as: a.) rising edge, b.) Falling Edge, c.) Level High, and d.) Level Low.

- time 8 and 23
- time 3 and 20
- time 9 and 24
- time 4 and 21