EE3704 Embedded System

Chapter 3

Presented by
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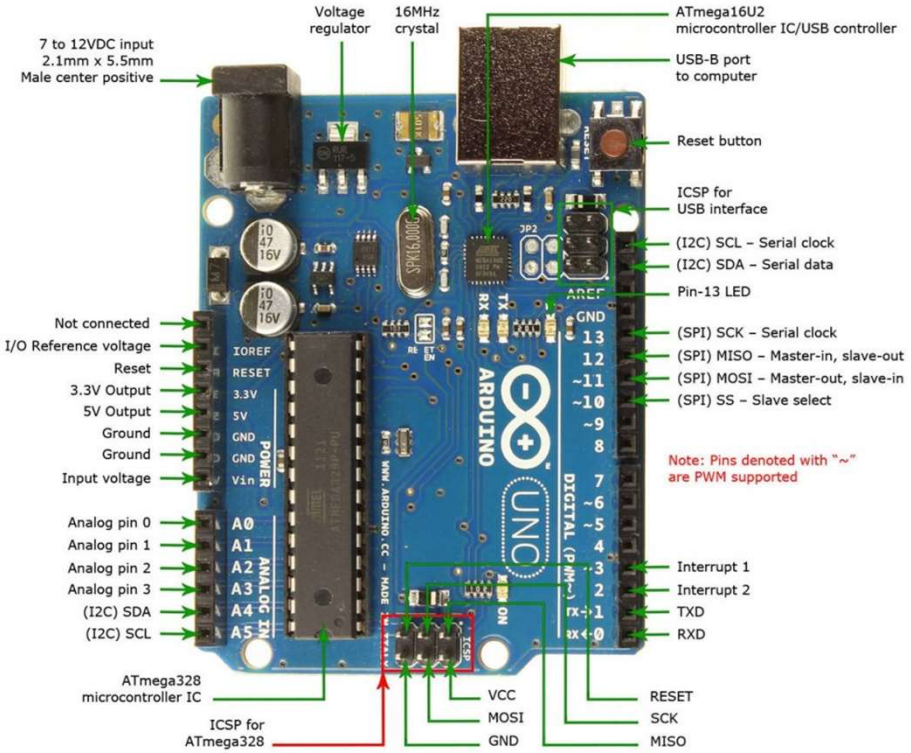
Chapter 3: Digital Input



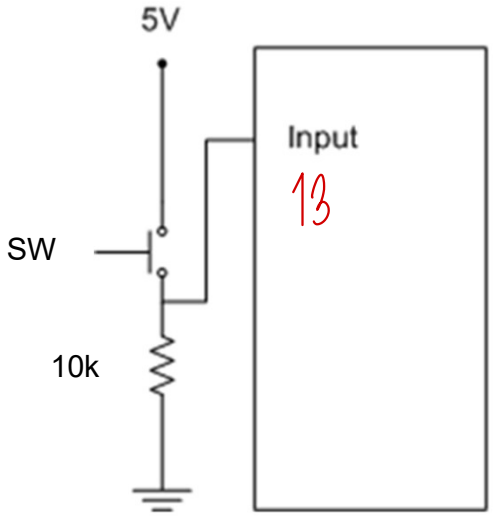
Function:

pinMode(PINnumber, INPUT);

digitalRead();

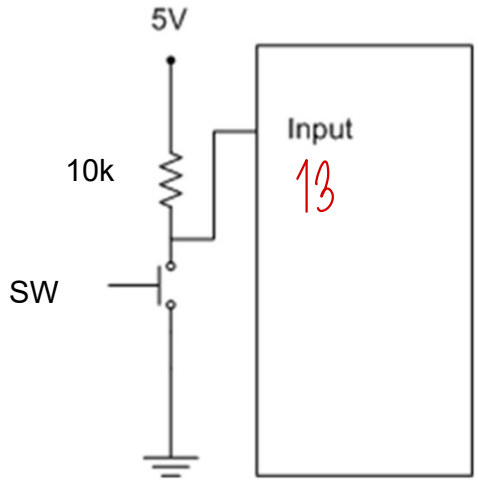
Chapter 3: Digital Input

- Active High connection



SW	Input read
OFF	0 V = logic 0
ON	5 V = logic 1

- Active Low connection



SW	Input read
OFF	5 V = logic 1
ON	0 V = logic 0

If-else

```
if (testExpression)
{
    // statement(s)
}
```

```
if (testExpression) {
     // statement(s) inside the body of if
}
else {
     // statement(s) inside the body of else
}
```

```
if (testExpression1)
{
    // statement(s)
}
else if(testExpression2)
{
    // statement(s)
}
else if (testExpression 3)
{
    // statement(s)
}
.
.
else
{
    // statement(s)
}
```

Math's operation

Operator	Description	Example
==	Checks if the values of two operands are equal or not. If yes, then the condition becomes true.	(A == B) is not true.
!=	Checks if the values of two operands are equal or not. If the values are not equal, then the condition becomes true.	(A != B) is true.
>	Checks if the value of left operand is greater than the value of right operand. If yes, then the condition becomes true.	(A > B) is not true.
<	Checks if the value of left operand is less than the value of right operand. If yes, then the condition becomes true.	(A < B) is true.
>=	Checks if the value of left operand is greater than or equal to the value of right operand. If yes, then the condition becomes true.	(A >= B) is not true.
<=	Checks if the value of left operand is less than or equal to the value of right operand. If yes, then the condition becomes true.	(A <= B) is true.

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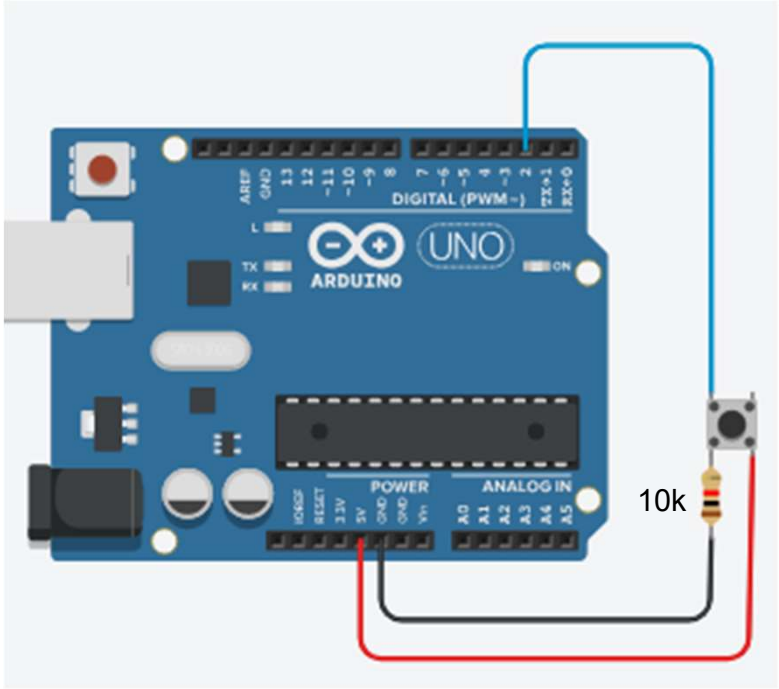
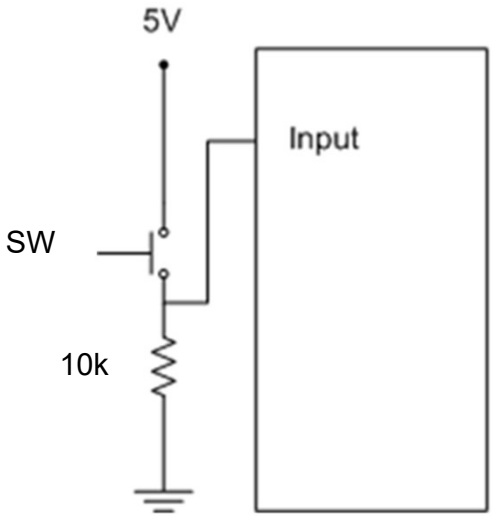


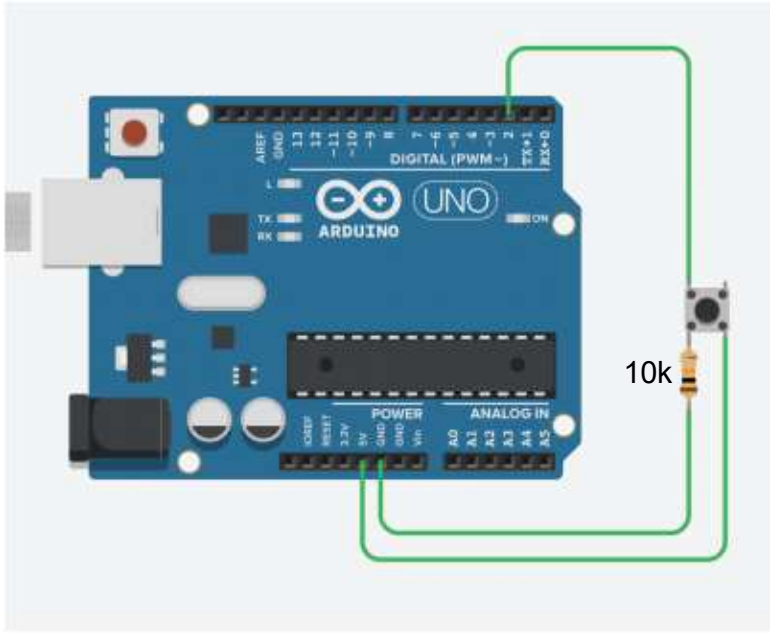
- Active High connection



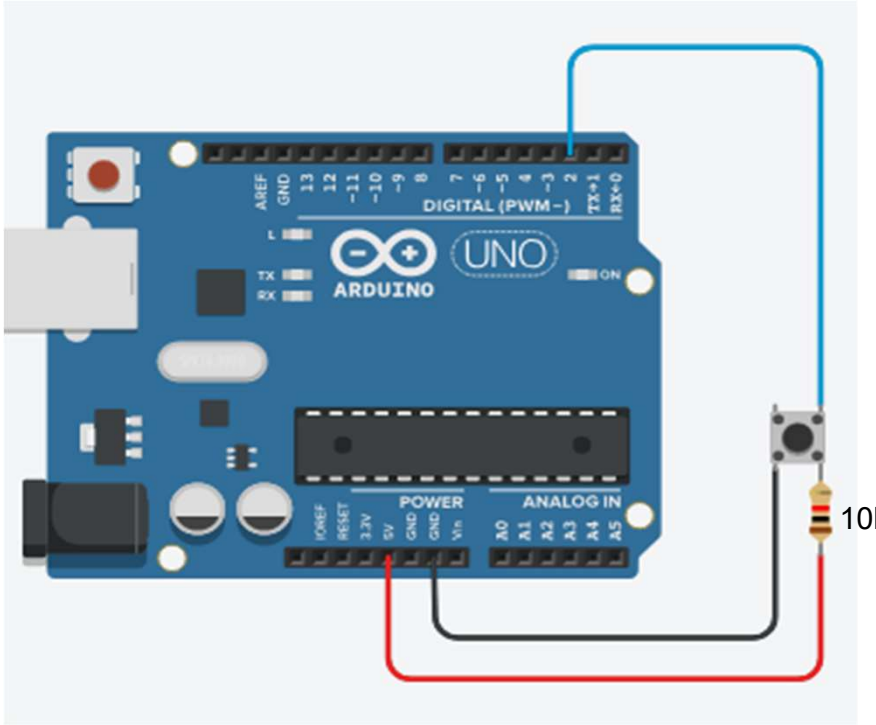
Chapter 3: Digital Input

Example 3.1: Active high connection switch

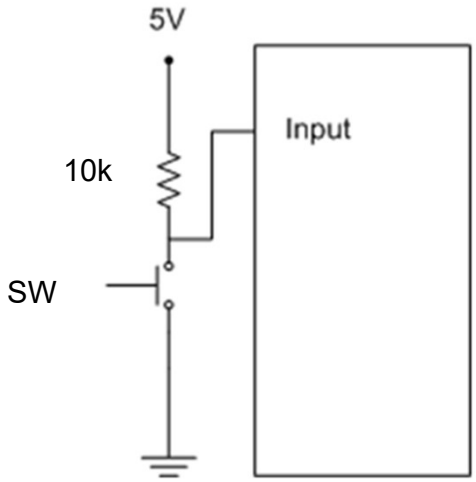
- When Press Switch at Input (Pin 2)
  - Active high LED (Pin 13) turn On
- When Press is not ~~Switch~~ Press at Input (Pin 2)
  - Active high LED (Pin 13) turn Off



Chapter 3: Digital Input



- Active Low connection

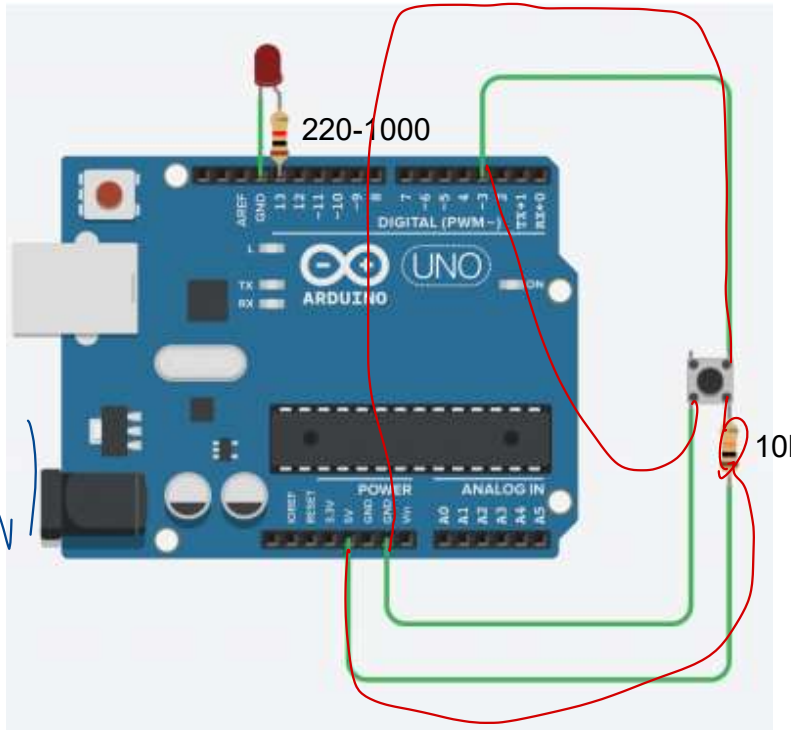


Chapter 3: Digital Input

Example 3.2: Active low connection switch

- When Press Switch at Input (Pin 3)
  - Active high LED (Pin 13) turn On
- When Press is not Switch at Input (Pin 3)
  - Active high LED (Pin 13) turn Off

!= not equal



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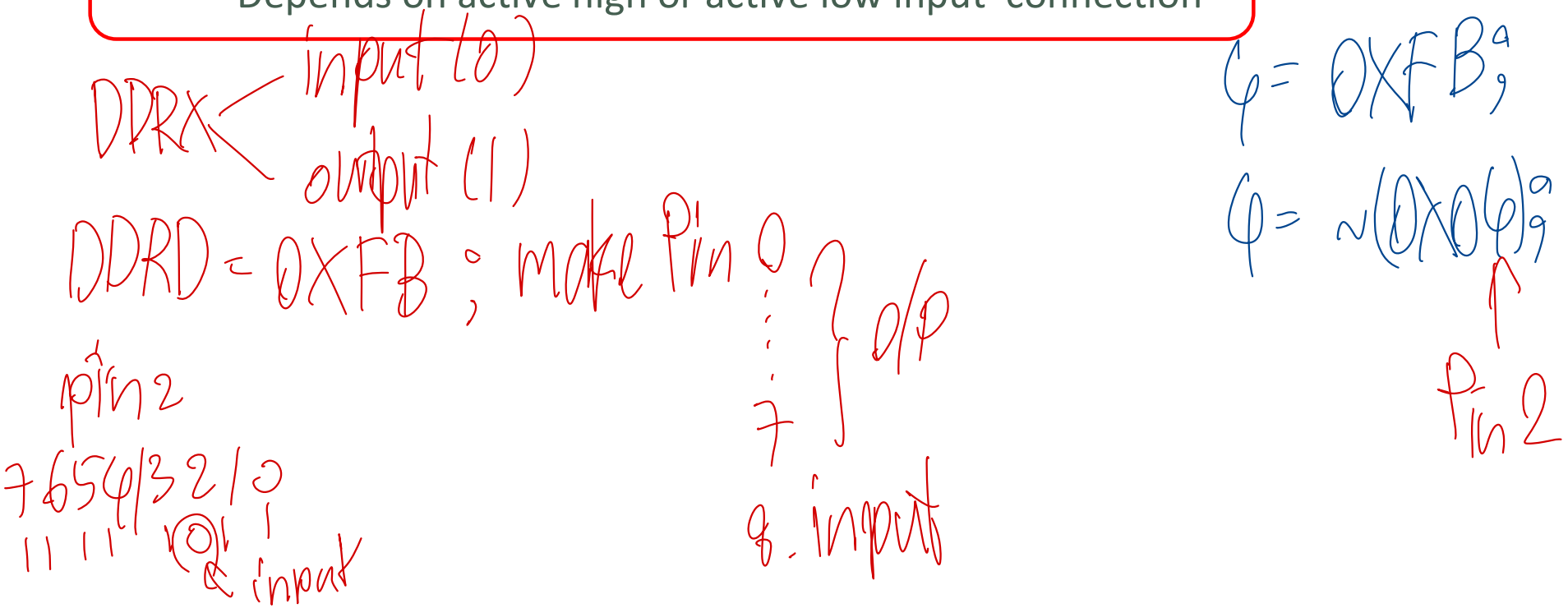
Example 3.3: Active High connection switch

- Press SW1 (pin 2) : Active high LED1(Pin8) On
  - Un-Press SW1 : Active high LED1(Pin8) Off
- Press SW2 (pin 3) : Active high LED2(Pin9) On
  - Un-Press SW2 : Active high LED2(Pin9) Off
- Press SW3 (pin 4) : Active high LED3(Pin10) On
  - Un-Press SW3 : Active high LED3(Pin10) Off
- Press SW4 (pin 5) : Active high LED4(Pin11) On
  - Un-Press SW4 : Active high LED4(Pin8) Off

Chapter 3: Digital Input Register

- PINx map to Arduino digital pins (example x=D)
  - PIND – The Port D Input Pins Register – read only
    - Depends on active high or active low input connection



Chapter 3: Digital Input

```
DDRD 4 = ~(0X0C)
DDRD 4 = ~(0X04);
DDRD 4 = ~(0X08);
```

Example 3.3Extra : Active High connection switch

***Use DDRx, PORTx, and PINx**

- Press SW1 (pin 2) : Active high LED1(Pin8) On
  - Un Press SW1 : Active high LED1(Pin8) Off
- Press SW2 (pin 3) : Active high LED2(Pin9) On
  - Un Press SW2 : Active high LED2(Pin9) Off
- Press SW3 (pin 4) : Active high LED3(Pin10) On
  - Un Press SW3 : Active high LED3(Pin10) Off
- Press SW4 (pin 5) : Active high LED4(Pin11) On
  - Un Press SW4 : Active high LED4(Pin8) Off

PinD

7 6 5 4

AIM SW

3 2 1 0

0 0

normal

not press

press

X X X X

X X X X

X

1

1

X X X

SW1= PinD & 0x80;

SW2= PinD & 0x04;

PORT B Pin 9 Pin 8

7 6 5 4 | 3 2 1 0

X X X X | X X X 1 PORTB = 0X01;

X X X X | X X 1 X PORTB = 0X02;

DIPSW ⇒ Toggle SW → stay on when press

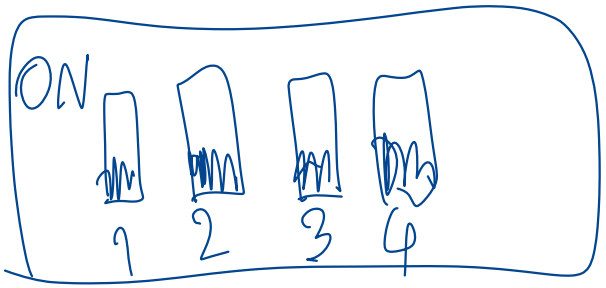
Chapter 3: Digital Input

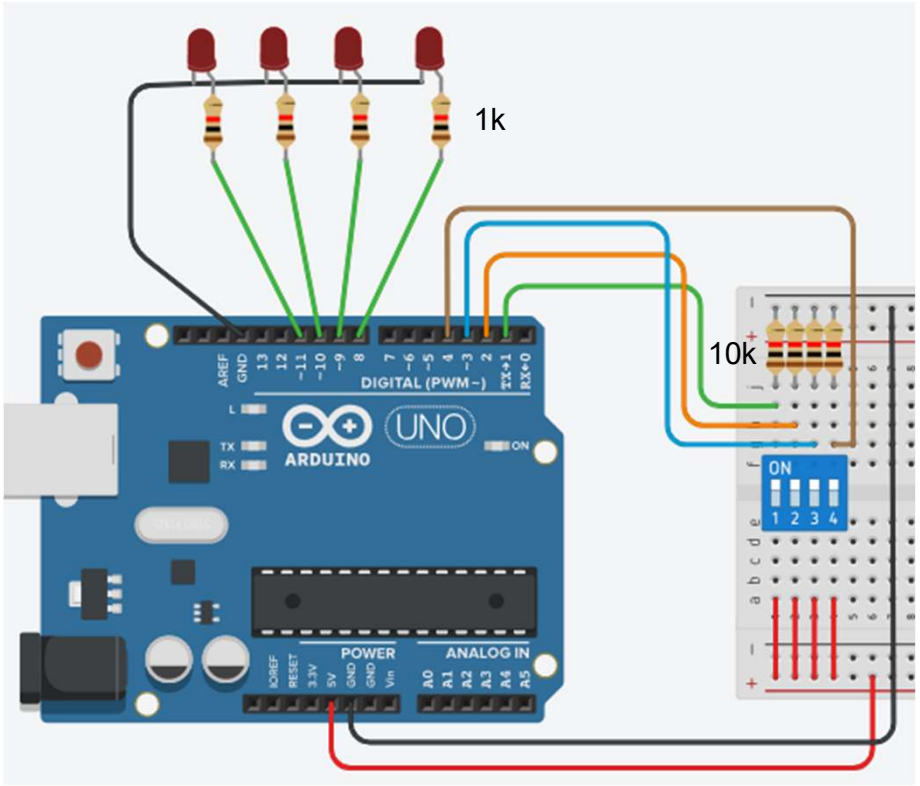
Example 3.4: Active High connection DIP SW

***Use DDRx, PORTx, and PINx**

SW1 = PIN2, SW2 = PIN3, SW3 = PIN4, SW4 = PIN5

- Toggle SW1 : AH-LED1 (Pin8 only) On
- Toggle SW12 : AH-LED2 (Pin9 only) On
- Toggle SW123 : AH-LED3 (Pin10 only) On
- Toggle SW1234 : AH-LED4 (Pin11 only) On
- Other conditions : AH-ALL LEDs Off





Chapter 3: Summary for Digital Input Output Registers

- DDRx, PORTx and PINx map to Arduino digital pins (example x=D)

  - DDRD – The Port D Data Direction Register – read/write
    - Input : 0, Output : 1
  - PORTD – The Port D Data Register – read/write
    - Low : 0, High : 1 (Depends on active high or low connection)
  - PIND – The Port D Input Pins Register – read only
    - Low : 0, High : 1 (Depends on active high or low connection)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