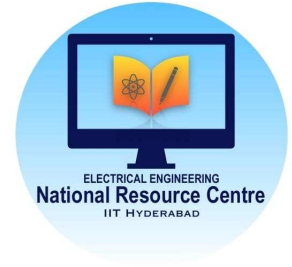




AVR-Assembly Setup



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Abstract—This manual shows how to setup the assembly programming environment for the arduino.

1 COMPONENTS

The components required for this manual are listed in Table 1.0.

Component	Value	Quantity
Arduino	UNO	1

TABLE 1.0

2 SOFTWARE INSTALLATION

1. `sudo apt-get install avra avrdude geany`
2. Find the USB port to which arduino is connected.

%Finding the port

```
sudo dmesg | grep tty
%The output will be something like
[ 6.153362] cdc_acm 1-1.2:1.0: ttyACM0:
USB ACM device
%and your port number is ttyACM0
```

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```
cd ~
wget https://raw.githubusercontent.com/gadepall/arduino/master/assembly/setup/m328Pdef/m328Pdef.inc
```

3. `wget https://raw.githubusercontent.com/gadepall/arduino/master/assembly/setup/codes/hello.asm`

5. Open **hello.asm** in **geany**. Go to Build→Set Build Commands→Compile and type

```
avra "%f"
```

6. Then go to Build→Set Build Commands→Execute and type

```
avrdude -p atmega328p -c arduino -P /dev/ttyACM0 -b 115200 -U flash:w:%e.hex
```

7. In **hello.asm** replace **gadepall** in

```
.include "/home/gadepall/m328Pdef.inc"
```

with your username.

8. Connect the arduino to the computer.
9. Compile by pressing **F8**. Execute by pressing **F5**. You should see the led beside pin 13 light up.
10. Now edit **hello.asm** by modifying the line to

```
ldi r17,0b00000000
```

Save and execute. The led should turn off.

11. What do the following instructions do?

```
ldi r16,0b00100000
out DDRB,r16
```

Solution: The Atmega328p microcontroller for the arduino board has 32 internal 8-bit registers, R0-R31. R16-R31 can be used directly for i/o.

The first instruction loads an 8-bit binary number into R16. The second instruction loads the value in R16 to the DDRB register. Each bit of the DDRB register corresponds to a pin on the arduino. The second instruction declares pin 13 to be an output port. Both the instructions are equivalent to `pinMode(13, OUTPUT)`.

12. What do the following instructions do?

<pre>ldi r17,0b00100000 out PortB,r17</pre>

Solution: The instructions are equivalent to `digitalWrite(13)`.