

C-programming for beginners: Fuse settings for the Atmega devices

Fuse settings enable users to configure certain elements of the Atmega hardware (HW) at programming time. Once these choices have been made they stand until the device is reprogrammed. The following configuration choices have been made for the project and programmer devices:

The System Clock:

The internal 8MHz RC oscillator is selected

No clock prescaling is implemented

No clock output is implemented.

The start up timer (SUT) is either set to 65mS or is disabled.

Note

The SUT holds the device in reset to give the dc supply and clock frequency time to stabilize.

The SUT can be disabled if the brown out detector (BOD) selected. The BOD holds the device in reset until the dc supply reaches a preset level.

BOD detector

This is implemented for the project pcb so that it can safely be used with batteries.

The brown out voltage level is set to $2.7V \pm 0.2V$.

Note:

The BOD uses an internal 1.1V reference which it shares with the Analogue to digital converter (ADC).

The ADC which is disabled is set to use AVCC as its voltage reference.

The BOD protects memory that can become corrupted if the dc supply momentarily dips by putting the chip into reset.

The boot partition (implemented on the project pcb Atmega 328).

This is implemented by:

Setting the size of the boot partition to 2048 words (4096 (0x1000) bytes)

Setting the reset vector to location 0x7000 (the start of the boot partition).

Note: Where no bootloader code is required the reset vector is set to location 0x0.

In this case the size specified for the boot partition is not important and the application code can use the entire 0x8000 byte memory space.

Other settings

External reset	Enabled
Debug wire	Not used
Serial programming	Enabled
Watch dog timer (WDT)	Under programmer control
EEPROM memory	Survives chip erase

Memory lock bytes

No memory lock features are enabled.
This byte is always set to 0xEB

Note: Users should never need to change the Configuration bytes

C-programming for beginners: Fuse settings for the Atmega devices

Project PCB fuse settings for the Atmega 328

Extended fuse byte 0xFD

bit 7-3 These bits are not used, and are each set to 1 (their default value)

bit 2-0 These bits (101) set the brown out voltage to 2.7V.

Fuse byte high 0xD0

bit 7 1 External reset enabled

bit 6 1 Debug facility disabled

bit 5 0 Serial programming enabled

bit 4 1 Watch dog timer under programmer control

bit 3 0 EEPROM memory preserved during chip erase.

Bit 2 0 Bits 1 and 2 set the size of the boot partition

bit 1 0 A setting of 00 gives 2048 words the maximum possible size

bit 0 0 Sets the reset vector to location 0x7000 (the start of the boot partition)

Fuse byte 0xC2

bit 7 1 Divide clock by 8 disabled

bit 6 1 No external clock output

bit 5 0 Bits 5 & 4 define the Start up time (SUT)

bit 4,3 0 SUT is disabled since brown-out detector is set

bit 2 0 Bits 3-0 select clock

bit 1 1 These settings select

bit 0 0 the 8MHz internal oscillator

Note: When only running a single application or when loaded onto a programming pcb the following changes are made to the Atmega 328 fuse bytes:

The extended fuse byte becomes 0xFF The DOB is disabled

The fuse byte high becomes 0xD7 The reset vector is location 0x0. Bits 1&2 are non-critical

The fuse byte becomes 0xE2 SUT is set to 65mS

Fuse settings for the Atmega 168 when running projects

Extended fuse byte 0xFF

bit 7-3 These bits are not used, and are each set to 1 (their default value)

bit 2-1 These bits are used to set the size of the boot partition. Here their settings are not critical.

Bit 0 This bit sets the reset vector to location 0x0.

Fuse byte high 0xD5 Use D7 when running Programmer V2.29A (no BOD)

bit 7 1 External reset enabled

bit 6 1 Debug facility disabled

bit 5 0 Serial programming enabled

bit 4 1 Watch dog timer under programmer control

bit 3 0 EEPROM memory preserved during chip erase.

Bit 2 1

Bit 1 0 Bits 0 – 2 set the brown-out level to 2.7V.

Bit 0 1

Fuse byte C2 (The settings are identical to those of the Atmega 328)

Use E2 when running Programmer V2.29A (65mS SUT)