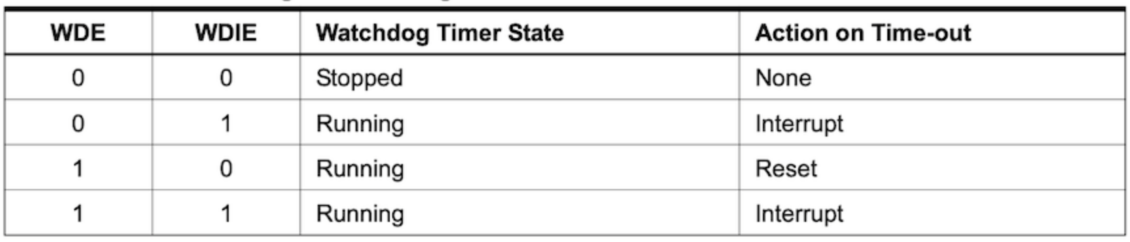
ATtiny85 Watchdog

Sources

- ATtiny85 Datasheet, Chapter 8.4
- wolles-elektronikkiste.de/en/sleep-modes-and-power-management#Anker4 — seems to be the only working example for interrupts …
- avr/wdt.h

Description

- The watchdog has its own, independent 128 kHz oscillator (timer) to monitor the MCU operation
- Watchdog modes
- 

WDE	WDIE	Watchdog Timer State	Action on Time-out
0	0	Stopped	None
0	1	Running	Interrupt
1	0	Running	Reset
1	1	Running	Interrupt

  - **Stopped** — default, not active, no power consumption
  - **Interrupt mode** (WDE = 0)— generates an **interrupt** at time-out
  - **Watchdog / Reset mode** (WDE = 1) — generates an MCU **reset** at time-out unless the counter is reset to zero before time-out via **`wdt_reset`**`()`
    - WDIE = 1
      - **one "last-chance" interupt** is raised, WDIE is set to 0 by hardware
      - **next time-out causes MCU reset** unless WDIE is set to 1 by interrupt handler
    - WDIE = 0
      - directly resets the MCU — this is the behaviour configured by **`wdt_enable`**`(timeout)`
- Disabling the watchdog requires a two-step sequence involving WDCE (Watchdog Change Enable) flag
  - **Taken care of by `wdt_disable`**`()`

Using the Watchdog

- avr/wdt.h (Doxygen comments)

```
// Timeout bit-mask values
#define WDTO_15MS   0
#define WDTO_30MS   1
#define WDTO_60MS   2
#define WDTO_120MS  3
#define WDTO_250MS  4
#define WDTO_500MS  5
#define WDTO_1S     6
#define WDTO_2S     7
#define WDTO_4S     8
#define WDTO_8S     9

#define wdt_enable(timeout)  // Will perform a device reset at timeout, e.g. if code entered infinite loop.
                             // User valus like this: wdt_enable(WDTO_500MS)

#define wdt_reset()          // Reset the watchdog timer. When the watchdog timer is enabled,
                             // a call to this instruction is required before the timer expires,
                             // otherwise a watchdog-initiated device reset will occur.
#define wdt_disable()
```

- **`wdt_enable(timeout)`**

  - Sets up a **true watchdog** that **will** perform an **MCU reset** after the given timeout unless **`wdr_reset()`** is called before timeout.

```
#include <avr/wdt.h>       // Include the avr-libc Watchdog timer handling library

void setup() {
  wdt_enable(WDTO_8S);     // Set watchdog timeout to 8 seconds
}

void loop() {
  wdt_reset();             // Reset the watchdog timer to zero before timeout --> call frequently :-)
}
```

- Set WDE = 1 and WDIE = 1, to generate **an interrupt in place** of an **MCU reset**:
    - **Reset WDIE = 1 after each "last-chance" interrupt**
    - This option is independent of the WDT control-register name which varies across AVR processors
    - PREFERRED!

```
void setup_watchdog(uint8_t timeoutBitmask){
  cli();
  wdt_enable(timeoutBitmask);
  WDTCR |= _BV(WDIE);
  sei();
}

ISR(WDT_vect) {
  WDTCR |= _BV(WDIE);
}

// Invoke like this
setup_watchdog(WDTO_1S);
```

- Alternatively: set WDE = 0 and WDIE = 1:
    - This option **depends on the WDT control-register name** (varies across AVR processors)

```
void setup_watchdog(uint8_t timeoutBitmask){
  cli();
  wdt_reset();                                               // Reset counter to zero
  WDTCR  = (1<<WDIE) | (0<<WDE) | timeoutBitmask;            // Enable interrupt, no system reset
  // WDTCR  = (1<<WDIE) | (0<<WDE) | (1<<WDP2) | (1<<WDP1);   // Alternative, 1 second
  sei();
}

// Invoke like this
setup_watchdog(WDTO_1S);
```

- **`wdt_disable`**`()`

  suggested usage (see also: ATtiny85 Datasheet, p.46, Note under "Bit 3 – WDE: Watchdog Enable")

```
MCUSR &= ~_BV(WDRF);
wdt_disable();
```