AVRFreaks

DESIGN NOTE

#013

KEYWORDS:

STK500, ATMEGA8, ASYNCHRONOUS TIMER/COUNTER, 32 KHZ CRYSTAL

Using ATmega8 Asynchronous Timer/Counter Oscillator with a 32 kHz X-tal on STK500

Introduction

This document describes how to connect a 32.768 kHz X-tal to the Asynchronous Timer/Counter of the ATmega8 when using the STK500 development board. A test program that verifies that the 32.768 kHz Oscillator is running and the Asynchronous Timer is clocked is also provided.

When using the Asynchronous Timer/Counter of ATmega8 the system clock of the device have to be the internal calibrated RC Oscillator. This is due to the fact that the pins requried for the 32 kHz Oscillator are the same as those requried to run the device on external clock, external RC, or X-tal.

Step by Step – How to Connect the X-tal

1. Insert Atmega8 in SCKT3200A2 socket on STK500.
2. Set the fuses so that the internal RC is used as System Clock.
3. Connect PB3 from PORTB header to LED0 on LEDs header.
4. Remove XTAL1 jumper so no STK500 clock source will interfere with the 32.768 kHz X-tal.
5. Connect 6-pin programming cable between ISP6PIN and SPROG2.
6. Connect the 32.768 kHz X-tal to XT1 and XT2 pins on PORTE/AUX header.

Note that the STK500's 28-pin analog socket (SCKT3200A2) is originally designed for AT90S4433. This device has only a 6-pin PORTB and only PB0 to PB5 are connected to the PORTB header. ATmega8 has a 8-pin PORTB and the last two pins are the same as XTAL1 and XTAL2 but they are not connected to PORTB header. Therefore, you cannot connect the 32.768 X-tal to PB6 and PB7 on the PORTB header.

The Test Code

The code initializes the Timer to use the Asynchronous Timer/Counter Oscillator. By commenting in the "sync_setup" function, you can choose to run from the System Clock instead of the external X-tal. If you cannot get the Timer running on the external X-tal – try to run it on the System Clock to make sure that the rest of you program works.

The OC2 pin is set to toggle on compare match and the Compare Register (OCCR2) is set to give a compare match every 10 mS.

To use the test code the ATmega8 have to use the internal calibrated RC Oscillator as system clock (since an external clock source would require the pins that are in use by the 32.768 kHz Oscillator).

```
.include "m8def.inc"     ;ATmega8 bit and register definition file

.def    temp    =r16     ;Temporary register

RESET:
  ldi   temp,high(RAMEND);Set-up Stack Pointer
  out   SPH,temp
  ldi   temp,low(RAMEND)
  out   SPL,temp

  sbiDDRB,3              ;Set OC2 pin as output

  rcall   async_setup  ;Select one clock source by commenting out the other
; rcall   sync_setup

loop:     rjmp  loop     ;Eternal loop


async_setup:             ;Enable async operation on external X-tal
  ldi   temp,25          ;Gives a 5Hz pulse on OC2
  out   OCR2,temp

  ldi   temp,((1<<WGM21)|(1<<COM20)|(1<<CS22)|(1<<CS20));Toggle OC2 on
  out   TCCR2,temp       ;compare match,  prescaler set to 128,
                         ;Clear the timer on compare match

  ldi   temp,(1<<AS2)    ;Enable async timer
  out   ASSR,temp

  ret

sync_setup:              ;Enable sync operation on internal clock
  ldi   temp,97          ;Gives a 5Hz pulse on OC2
  out   OCR2,temp

  ldi   temp,((1<<WGM21)|(1<<COM20)|(1<<CS22)|(1<<CS21)|(1<<CS20));Toggle OC2
  out   TCCR2,temp       ;on compare match, prescaler set to 1024,
                         ;Clear the timer on compare match
  ret
```