Keywords: DS1307, RTC, real-time clock

Sep 29, 2006

APPLICATION NOTE 3921

# Using a DS1307 with a PIC Microcontroller

*Abstract: This application note is intended to demonstrate an application using the DS1307 real-time clock (RTC) with a Microchip PIC microcontroller. The software example includes basic operating routines. A schematic of the application circuit is included.*

## Discussion

This application note demonstrates how to use the DS1307 real-time clock (RTC) with a Microchip PIC16F628 microcontroller.

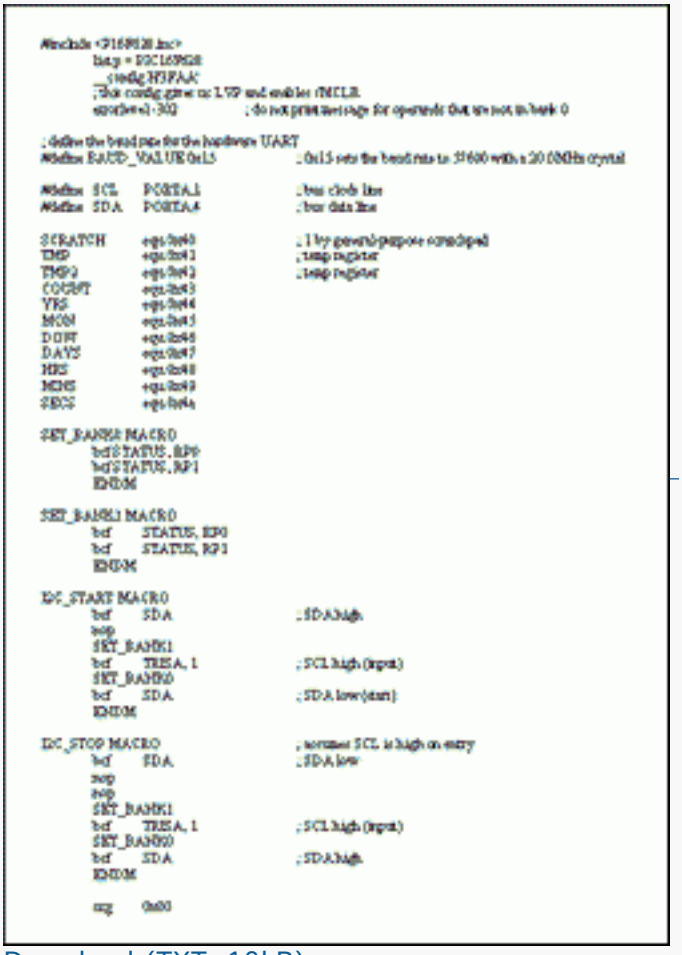
The example code, written in assembly code, includes a routine for reading the time and date from the RTC and a routine to write time and date data to the RTC from user entries.

## Operation

The program uses two general-purpose port pins on the microcontroller to communicate with the DS1307 using the I²C serial interface. The microcontroller's internal UART drives two port pins, which are connected to a DS232 line driver/receiver. User inputs and data outputs from the program are passed through the RS-232 interface from a terminal emulator program on a PC to the microcontroller. The RS-232 DTR input line controls the microcontroller's reset input.

The microcontroller in this example is a PIC16F628. For information on the microcontroller used in this application note, including available programming tools, visit the Microchip web site.

The software is shown in **Figure 1**. A schematic of the circuit is shown in **Figure 2**.



```
#include <P16F628.inc>
        list p = 16C628
        __config _CP_OFF & _WDT_OFF & _PWRTE_ON & _INTRC_OSC_NOCLKOUT & _MCLRE_OFF & _LVP_OFF & _BOREN_OFF
        ;Disable comparator to I/O and enable /MCLR
        errorlevel -302         ;do not print warnings for operands that are not in bank 0

; Define the baud rate for the hardware UART
#define BAUD_VALUE 0x15         ; 0x15 sets the baud rate to 57600 with a 20.000MHz crystal

#define SCL     PORTA,1         ;bus clock line
#define SDA     PORTA,4         ;bus data line

SCRATCH         equ 0x40        ;1 byt general-purpose scratchpad
TMP1            equ 0x41        ;temp register
TMP2            equ 0x42        ;temp register
COUNT           equ 0x43
YRS             equ 0x44
MON             equ 0x45
DOW             equ 0x46
DAYS            equ 0x47
HRS             equ 0x48
MINS            equ 0x49
SECS            equ 0x4A

SET_BANK0 MACRO
        bcf STATUS,RP0
        bcf STATUS,RP1
        ENDM

SET_BANK1 MACRO
        bsf     STATUS,RP0
        bcf     STATUS,RP1
        ENDM

I2C_START MACRO
        bsf     SDA             ;SDA high
        nop
        SET_BANK1
        bsf     TRISA,1         ;SCL high (input)
        SET_BANK0
        bcf     SDA             ;SDA low (start)
        ENDM

I2C_STOP MACRO                  ;assumes SCL is high on entry
        bcf     SDA             ;SDA low
        nop
        nop
        SET_BANK1
        bsf     TRISA,1         ;SCL high (input)
        SET_BANK0
        bsf     SDA             ;SDA high
        ENDM

        org     0x00
```

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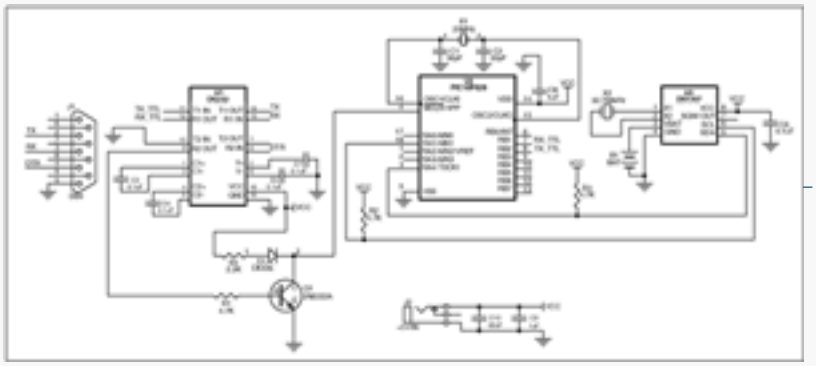
*Figure 1. Program Listing*



More detailed image (PDF, 126kB)

*Figure 2. Schematic drawing of the DS1307 circuit used with a PIC microcontroller.*

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Application note 3921: www.maxim-ic.com/an3921

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