FUJITSU

Application Note

Software Real Time Clock

for MB89630R and similar Microcontrollers

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Vers. 5.0 by F. Toumani

1) Overview

This Application Note features a Real Time Clock from a Watch Timer Interrupt (thus usable with a 32kHz Sub-Clock). It has been developped for the MB89630R series (and tested on the corresponding Starter-kit) but can be easily adapted for the other 8-bit series (MB89120/A, MB89130, ..., MB89990).

It also shows how it is possible to build a project composed of different modules, some written in Assembler and others in C, and to handle variables defined in independent sections.

2) Components of the project

The project is named "Calendar.Prj" and is composed of the following modules:

- **Init.Asm**   processes global initialization (Stack definition, RAZ memory) and a jump to the main module (Calendar.C).
- **Mode_Ext.Asm**   defines the Reset Vector.
- **Calendar.C**   contains the Clock speed definition, and the initialization of the RTC variables (CALLing RazClock.Asm). Manages the Watch Timer interrupt (CALLing WTIT.Asm), toggling LED0 each second occurs, and can check the date calculated (CALLing CHECK_DATE within WTIT.Asm).
- **RazClock.Asm**   initializes the Date parameters.
- **WTIT.Asm**   manages the Watch Timer interrupt and updates the RTC variables.
- **Int89630.Asm**   defines the interrupt used by the Processor (! ! to change for the appropriate Fujitsu's module if another Microcontroller is used ! !).
- **MB89630.Asm**   defines the I/O registers of the Processor (! ! to change for the appropriate Fujitsu's module if another Microcontroller is used ! !).

The variables which can be found within the project are :

CLF : Contains number of Watch Timer interrupts (32 ones make 1 sec)
SEC : Contains current second (00 to 59)
MIN : Contains currents minute (00 to 59)
HOUR : Contains current hour (00 to 23)
DAY : Contains current day (1 to 7)
MONTH : Contains current month (01 to 12)
DATE : Contains current date (01 to 31)
YEAR : Contains current year (00 to 99)

DAY2 : Shadow current day (1 to 7) ! ! not used ! !
MONTH2 : Shadow current month (01 to 12)
DATE2 : Shadow current date (01 to 31)
YEAR2 : Shadow current year (00 to 99)

LEAP : Boolean variable : leap year or not?
 LEAP:0 is used for current year YEAR

_switch : Debug switch to toggle LED1 ! ! not used ! !
Check : Switch to decide whether running Date checking or not

3) Possible improvements of the project

In this current version, the program only calculates the date (toggling the LED0 after each second), updating the internal variables, from the second to the year (taking into account the leap ones). One restriction however is that only the years between 1996 and 2100 are considered.

The project has been written with the purpose of showing a practical handling of the Fujitsu's Software environment. Many parts can then be optimized: the C-module, for instance, is not necessary, and the algorithms used in the project can certainly be re-written in a more efficient way.

It belongs thus to the user to adapt this example to the demands of his own application in terms of accuracy, size of code, speed of execution, and consumption. Regarding this latter consideration, one possible improvement of this example could be to use the WATCH mode, waking up the Microcontroller only to update the date (!! This, of course, is only possible for Microcontrollers equipped with a Sub-Clock !!).