UM10789

USB-I²C-bus interface OM13518 with a GUI for the RTCs PCF85263 and PCF85363

Rev. 1 — 19 May 2014 User manual

Document information

Info	Content
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Abstract	User manual for the universal USB-I²C-bus interface dongle OM13518

Revision history

Rev	Date	Description
v.1	20140519	first revision

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1. Introduction

The OM13518 dongle is an easy to use interface handler between the USB of a PC and the I^2C-bus. The software control via a Graphical User Interface (GUI) allows a fast start to communicate with different circuits.

- USB-2 is used for data and the 5 V power supply.
- Three I^2C-bus ports are wired in parallel.
- Cables to connect up the I^2C-bus are enclosed.

2. Key features

2.1 USB-I^2C interface module

The OM13518 dongle is a ready to run module. It creates a virtual COM-port via an USB connection. It provides three I^2C-bus connections with 5 V option to power the application (max 450 mA).

Power consumption: module/total: <50 mA/max 500 mA

I^2C-bus clock frequency: 245 Hz – 400 kHz

USB driver for Windows: Windows XP, Windows 7, Windows 8

Size: 50 mm × 40 mm × 15 mm

2.2 Software

The software control via a GUI allows a fast start to communicate to the different circuits.

Aside from the detailed GUI pages for the Real-Time Clocks, a UNIVERSAL INTERFACE allows to communicate with any I^2C-bus device by entering directly the hex codes. Example: `s A2 28 p`

Where s stands for the I^2C START and p for the I^2C STOP condition.

3. Dongle

3.1 Circuit diagram

The dongle establishes the connection between the PC (USB port) and the I²C-bus interface.

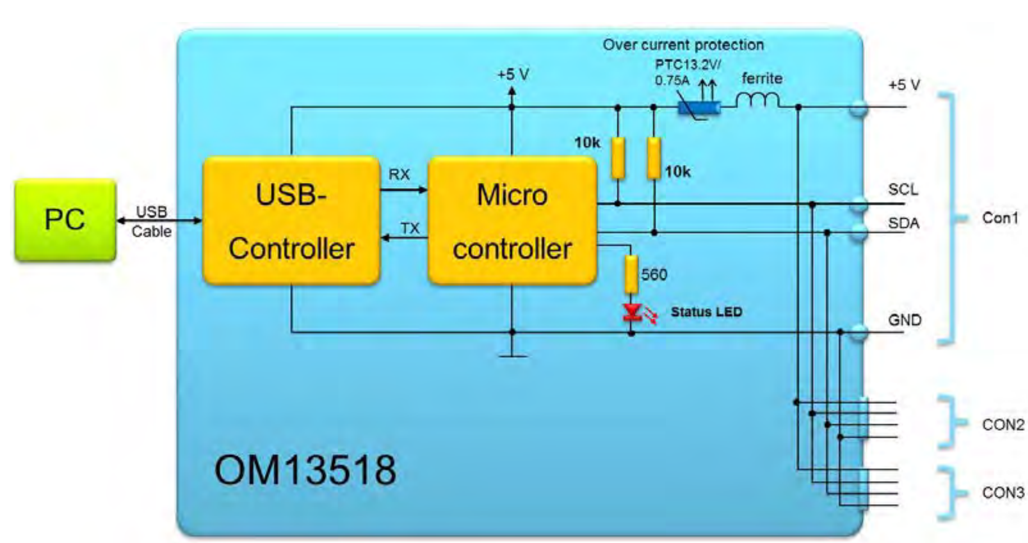


Fig 1. Simplified Block diagram of the OM13518

3.2 Interfacing I²C-bus peripherals

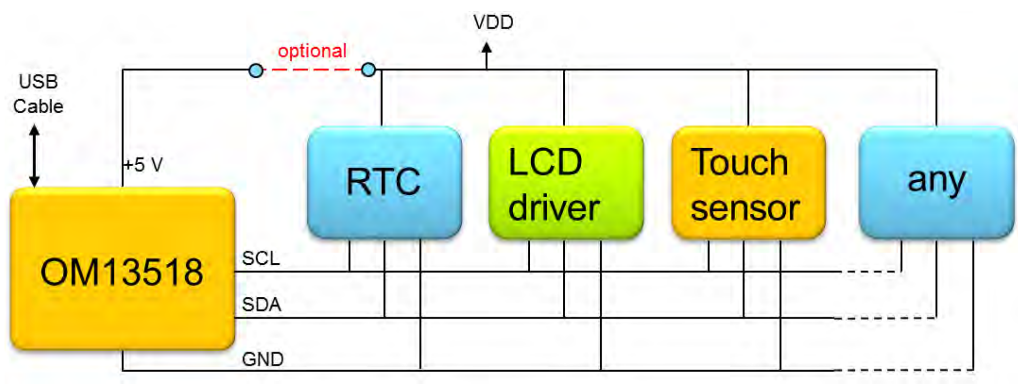
The I²C-bus peripherals are connected directly with the I²C-bus. The 3 connectors Con1, Con2, and Con3 are connected in parallel and carry the four signals as also imprinted on the package:

+5 V: Optional 5 V supply can be used. Total consumption of all 3 outputs must be kept below 450 mA.

SCL: Serial CLock line

SDA: Serial DAta line

GND: Ground



In case that the periphery is connected to the +5V from the OM13518 no V_{DD} connection must be used.

Fig 2. Interfacing to the I²C-bus

There is no need for external pull-up resistors, since 10 kΩ pull-ups are already built in the OM13518 dongle.

4. Installation

4.1 Hardware and driver installation

4.1.1 The box contains:

- One dongle
- One USB cable
- Three I²C-bus cables:
  - One with female connector dedicated for NXP-RTC evaluation boards
  - Two cables for custom use via solder connection
  - The signal assignment is imprinted on the interface module

Fig 3. A) Dongle OM13518, B) connected to an evaluation board

4.1.2 Driver

First install the USB software driver before connecting the interface module.

- Unpack the file : `cp210x_vcp_win_xp_s2k3_vista_7_8_v6_6_1.zip`
- Install the driver in administrator mode

4.1.3 Hardware

1. Connect the USB cable with the dongle and with the PC and let the device to install. Connect the I²C-bus cable to your application; turn on the power in case an external one is needed.
2. The red LED will light up to indicate that the OM13518 successfully started up.
3. Now the system is ready for starting the GUI software

4.2 GUI Installation

1. Unpack the file `NXP_USB-I2C-RTC_GUI_V02.zip`.The latest version can be downloaded from the OM13518 home page.
2. Run the exe file: `NXP_USB-I2C-RTC_GUI_V02.exe`
3. A start window will pop op
4. Choose the right com port in the drop down list
5. Press Connect: Status changes to *Connected* and turns green

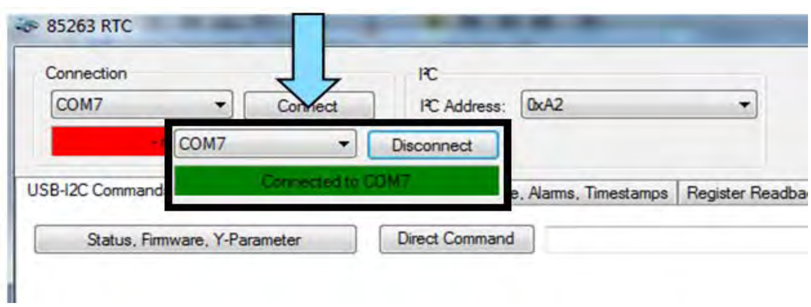


Fig 4. Start window of the GUI

5. Features of the Graphical User Interface (GUI)

The GUI can be used as a universal I²C-bus interface for controlling any peripheral circuit. Alternatively some specific windows are available e.g. for the Real-Time Clocks PCF85263 and PCF85363.

5.1 Universal I²C-bus interface

The Universal I²C interface allows controlling any circuit by entering directly the I²C-bus instructions. It is part of the Tab *USB-I2C Commands*.

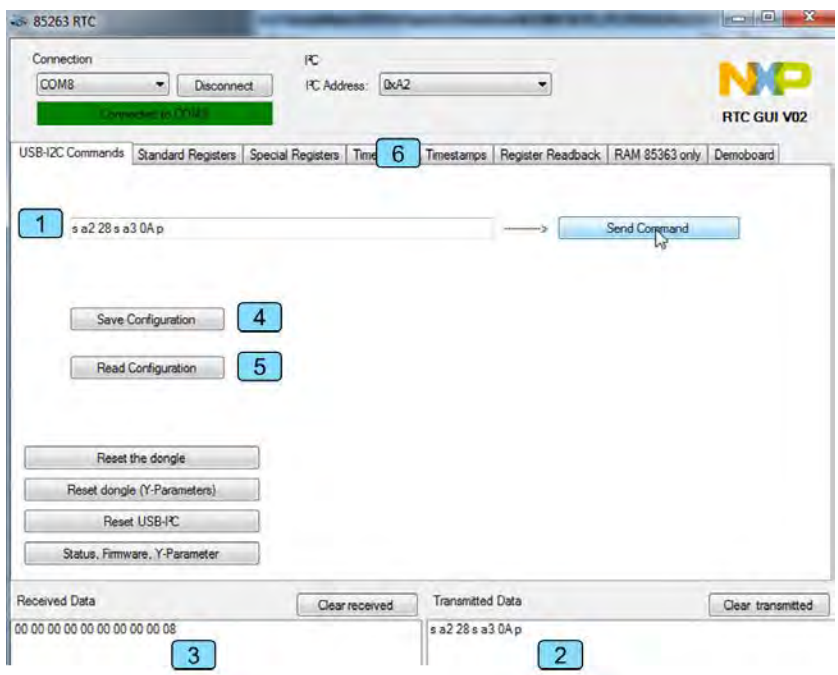


Fig 5. First Tab: *USB-I2C commands*

Procedure and details:

1. Universal I²C-bus interface control, type in the following format:

- Writing data, e.g.: `s A2 28 04 p` press *Send Command*
  (`s` = START, `A2` = slave address, `28 04` = data, `p` = STOP)
- Reading data, e.g.: `s A2 28 s A3 0A p`: press *Send Command* setting address pointer, then reading 10 bytes (0Ah)

2. The sent data will be reflected in the field *Transmitted Data.*
3. The read data bytes are listed in the field *Received Data*.
4. Configuration can be saved on the PC (see section 5.2.1).
5. Configuration can be reloaded to continue with the used presetting for further tasks (see section 5.2.1.2).

6. Tabs on the GUI of the RTCs: PCF85263, PCF85363, to follow
7. Hovering the mouse-pointer over a function button, tool tips will pop up for explanations.
8. Pressing ▼ will open the list of possible options to select from.

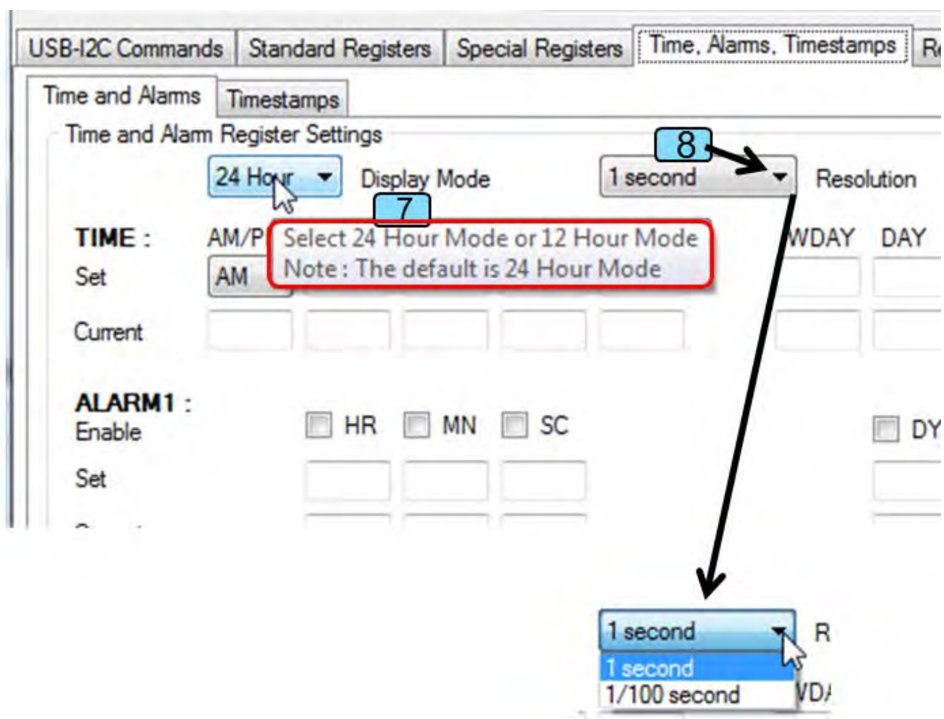


Fig 6. Hovering the mouse-pointer and drop-down menus

5.2 GUI pages for the RTC PCF85263 and PCF85363

The objective is to have a fast and straight forward control of all the functions of the RTC.

The principle for controlling is explained on the window *Time, Alarms, Timestamps* in Fig 7.

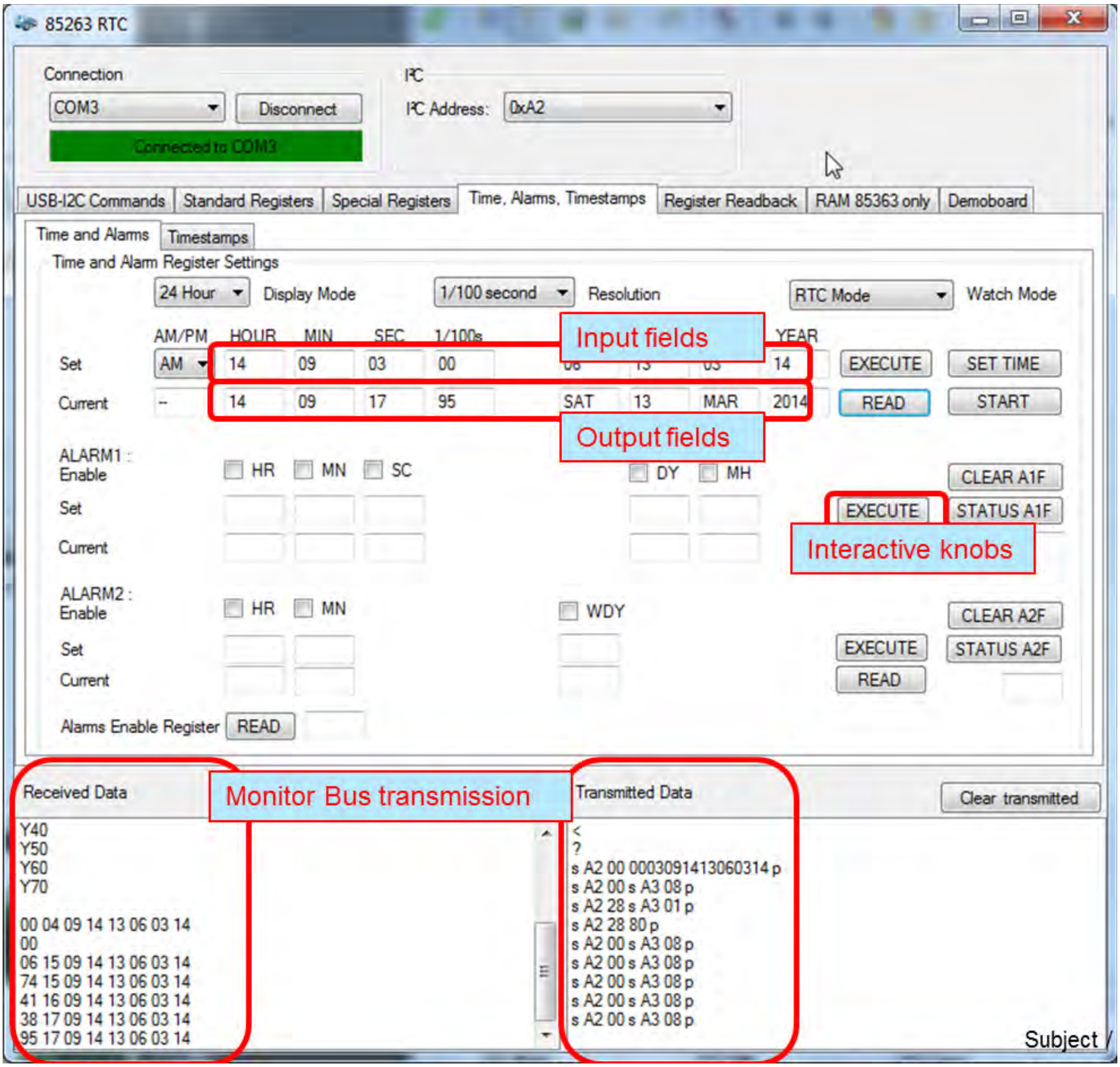


Fig 7. Window structure; *Time, Alarms, Timestamps*

5.2.1 Save and read back the configuration

5.2.1.1 All the setting can be saved

1. Work with the GUI until you have the IC configured as desired.
2. Save the desired configuration to a file as follows: *USB-I2C-Commands* tab, *Save Configuration*, select a directory and name (see Fig 8).

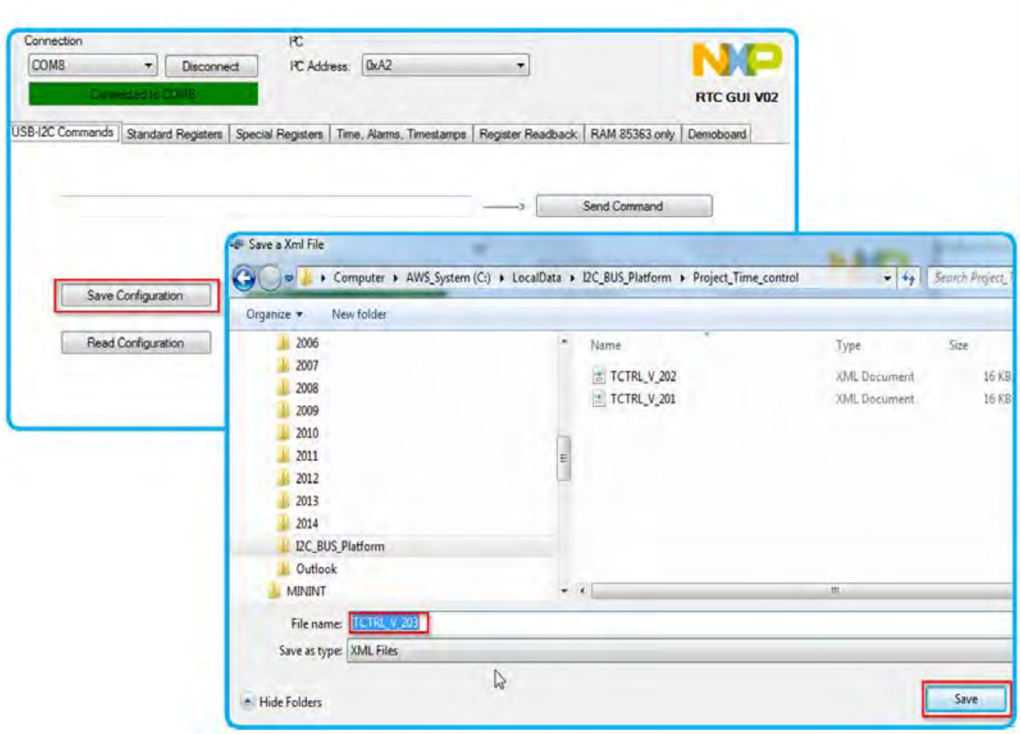


Fig 8. Selecting the directory

3. If the GUI succeeds in writing the file, it will produce a pop-up window and then just press OK (see Fig 9).

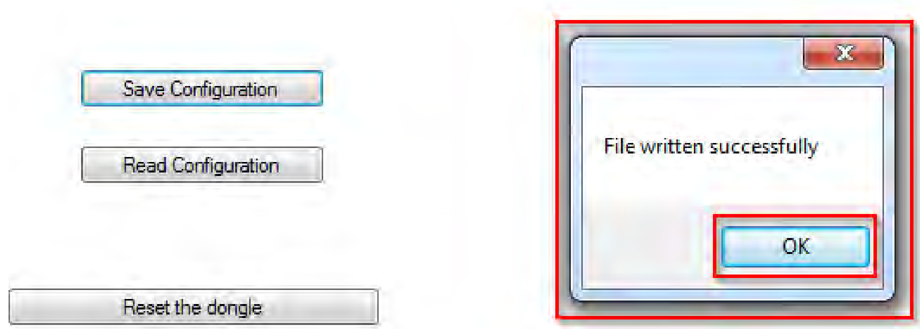
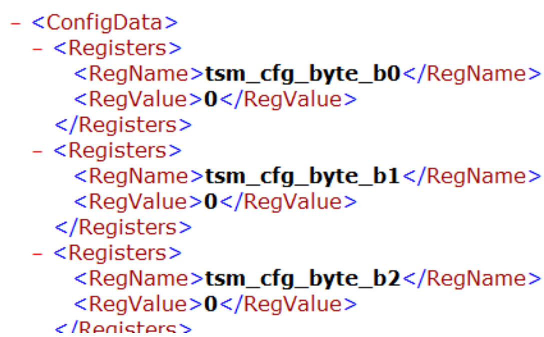


Fig 9. Confirmation window

File Format:

The file is written in standard XML format, which almost all Operating Systems can read (see Fig 10).



```xml
- <ConfigData>
  - <Registers>
      <RegName>tsm_cfg_byte_b0</RegName>
      <RegValue>0</RegValue>
    </Registers>
  - <Registers>
      <RegName>tsm_cfg_byte_b1</RegName>
      <RegValue>0</RegValue>
    </Registers>
  - <Registers>
      <RegName>tsm_cfg_byte_b2</RegName>
      <RegValue>0</RegValue>
    </Registers>
```

Fig 10. XML format example

5.2.1.2 Reload the settings

1. Read back a saved configuration file with *Read Configuration* (see Fig 11):

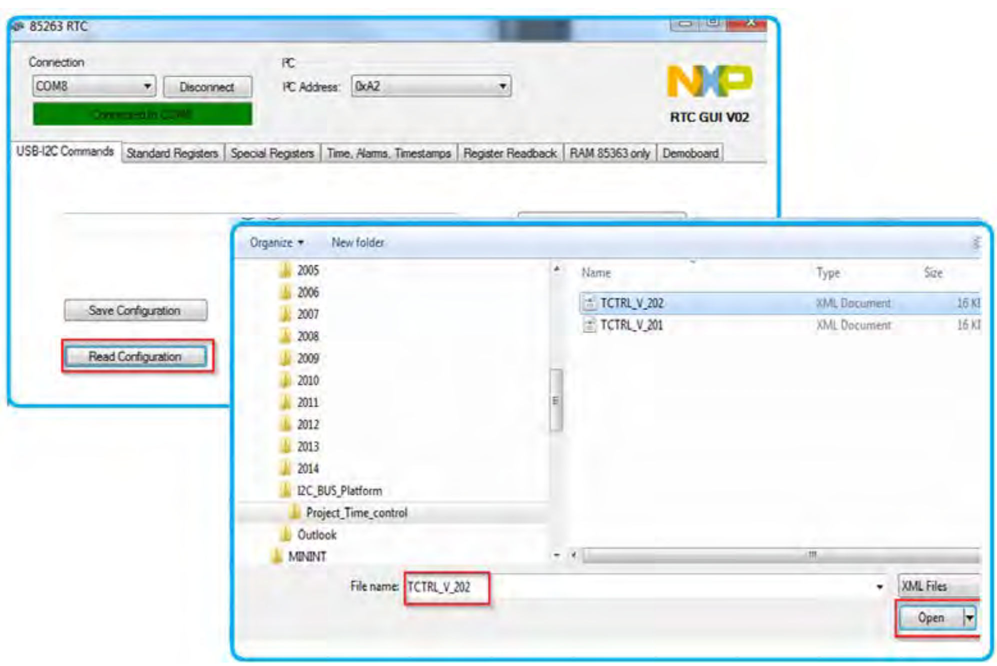


Fig 11. Selecting the directory and file

2. If the GUI manages to read in the files successfully, it will produce a pop-up window and then just press OK (see Fig 12).

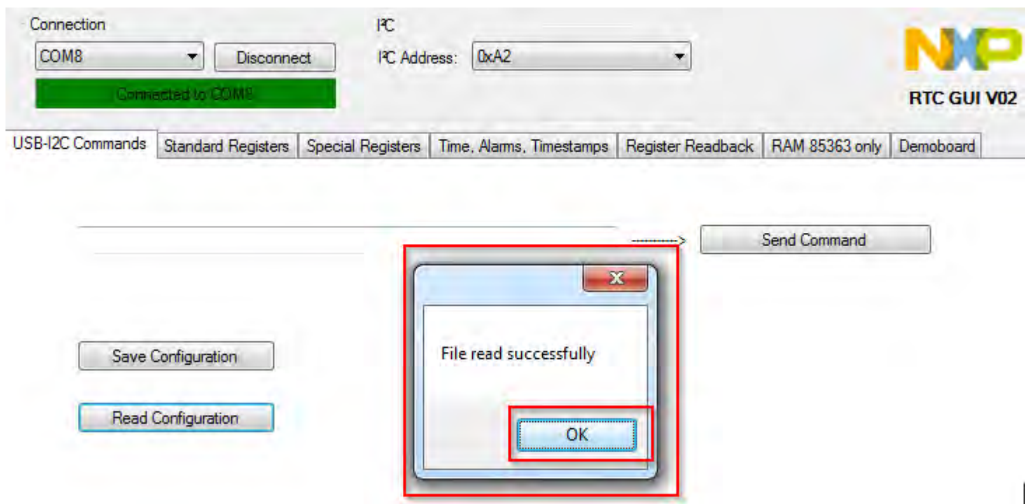


Fig 12. Confirmation window

5.3 Examples

5.3.1 Setting the clock and reading it

1. Perform a Software reset: *Reset* tab, function *SWR* (see Fig 13).

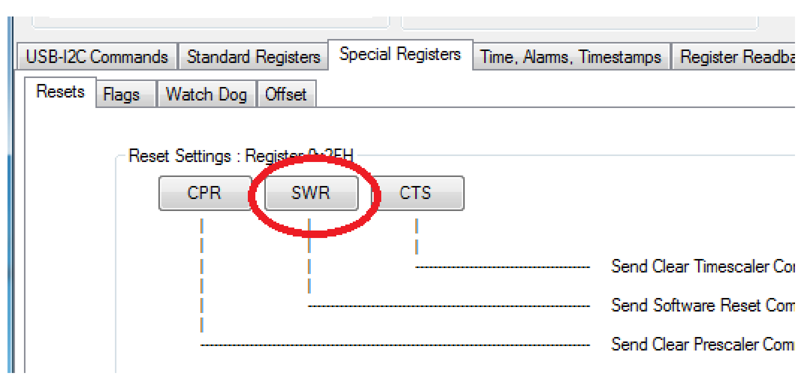


Fig 13. Reset of the software

2. Select menu *Special Registers* and press *SWR*.
3. Set the time and read back to verify that the clock is running (see Fig 7).

- A valid time and date can be entered in the *Set* row, then press *EXECUTE*
- The *SET TIME* programs the actual time based on your PC (see Fig 7 and Fig 14).
- *READ* reads the current time and date of the RTC (see Fig 7 and Fig 14).

- *START* will continuously read the time at about once every second (see Fig 7 and Fig 14).

There are options to change from *24 hour* to *12 hour* mode, activate the *1/100s* resolution and change the RTC from *RTC mode* (clock mode) to *stop watch mode* (see Fig 7 and Fig 14).

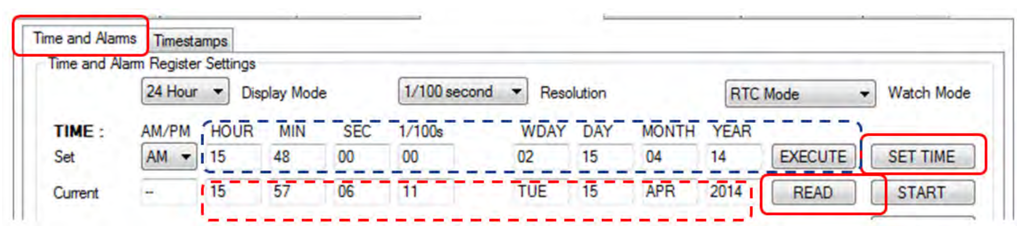


Fig 14. Time control

5.3.2 Blinking the LED at the interrupt output with the help of the watchdog

Procedure and details:

1. Perform a Software reset: *Reset* tab, function *SWR* (see Fig 15).

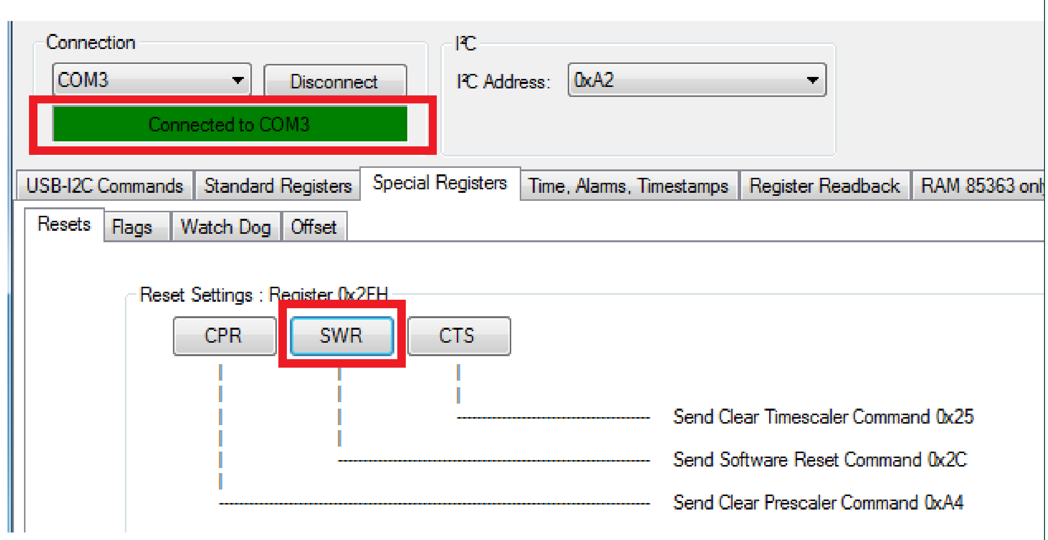


Fig 15. Software reset

2. Enable *INTA* for interrupt mode (see Fig 16).

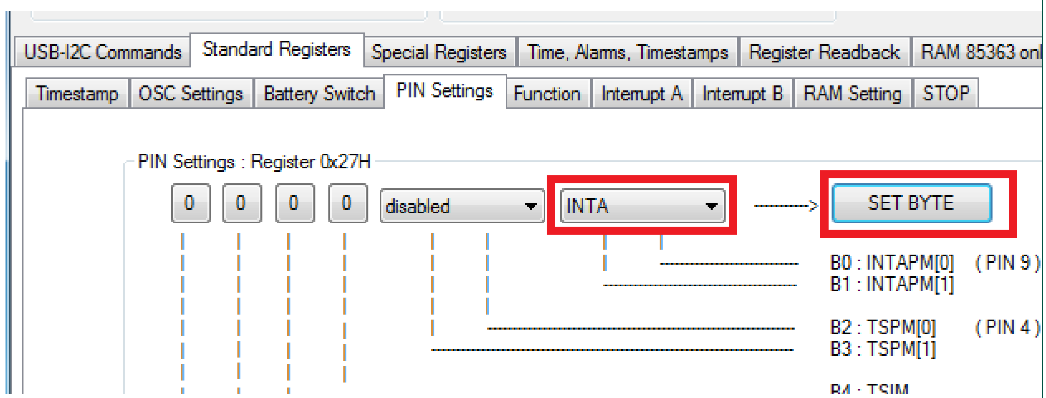


Fig 16. Enable the INTA for interrupt mode

3. Enable *INTA* for Watchdog (pulse at each time countdown occurs) (see Fig 17).

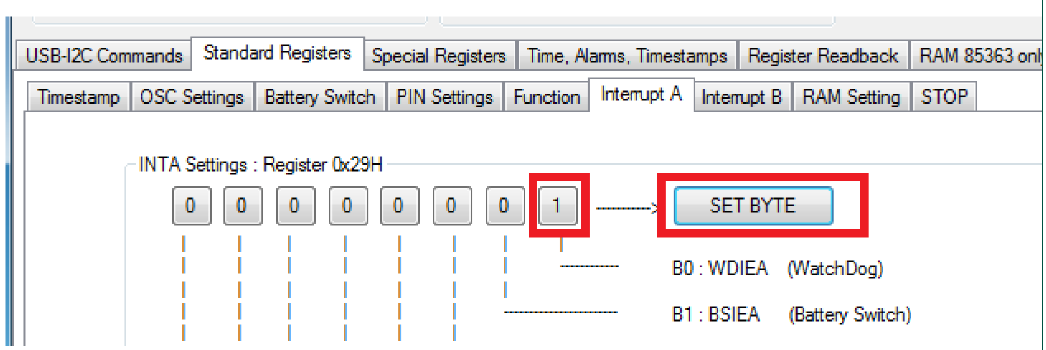


Fig 17. Enable the INTA for Watchdog

4. Enable the watchdog for a repeat every 2 seconds for example (see Fig 18).

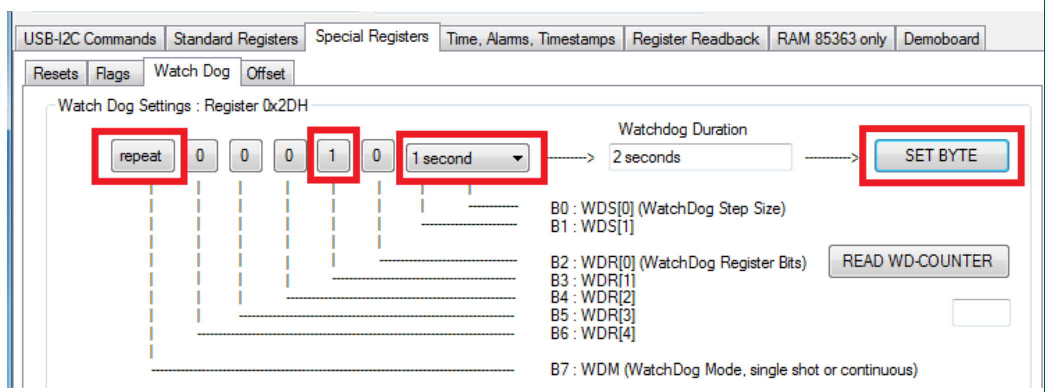


Fig 18. Enable the watchdog for a repeat every 2 seconds

5. Observe the LED flashing every 2 seconds!!!

5.3.3 Interactive quartz frequency offset correction:

The quartz crystals come with a tolerance of typical ± 20 ppm. To correct the actual offset of the quartz in use, take the following steps:

1. Measure the frequency at CLKout pin, e.g. 32 768.51 Hz
2. Write the measured frequency in the entry field, it automatically calculates the offset and the needed correction value. 15.19 ppm or 7 correction pulses.
3. By activating *SET BYTE* the offset value is programmed in to the RTCs offset register.

Note: The offset calibration operates at the time counter level and will not result in any observable change in frequency.

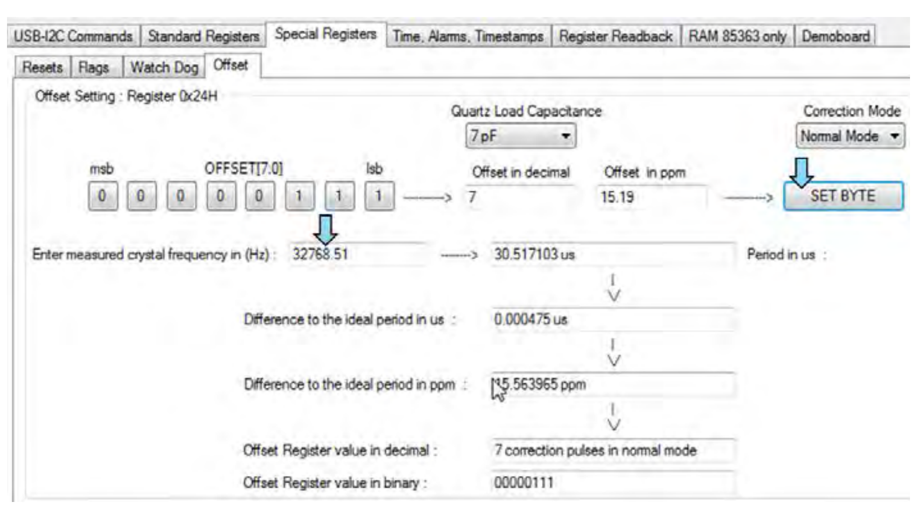


Fig 19. Offset correction

5.3.4 Dedicated drop down menus are integrated for e.g.:

- Register overview: reading all the values at once
- Back-up battery control
- Timestamp
- Watch dog
- RAM

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