

Graphical User Interface GUI for Micro Crystal's Real-Time-Clocks

using USB - 12C-Bus Dongle

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1. Summary

The growing number of features of Real-time Clocks can be optimally evaluated through an intuitive Graphical User Interface (GUI). To simplify the hardware setup Micro Crystal offers a kit with the USB port to I²C-Bus dongle and a type specific RTC demo board. The GUI it is the straight forward approach for communicating with the RTC and monitoring all functions including register and flag settings. The string of applied I²C-Bus commands is reflected in real time as reference for the firmware development. A dedicated mask for communication with other I²C-Bus circuits is provided in addition.

Features:

- Ready to run dongle establishing bidirectional USB to I²C-Bus translation.
- Three parallel wired I²C-Bus ports include also +5 V for supplying power to the demo board.
- USB and customized cables for the I²C-Bus are included

2. Key Functions

2.1. Hardware: USB-I²C interface dongle

The dongle is a ready to run module. It creates a virtual COM-port via the USB connection. It provides three I^2C -Bus connections with optional output of 5 V for powering up the application (max 450 mA).

Power consumption:Module / total: <50 mA / max 500 mA</th>I²C-Bus clock frequency:245 Hz - 400 kHzUSB driver for Windows:Windows XP, Windows 7, Windows 8Size:50 mm × 40 mm × 15 mm

2.2. Software

The software control via a GUI allows a fast setup for communicating with the Real-Time-Clock module. Aside from the detailed GUI pages for the specific Real-Time Clocks, allows communicating with any I^2 C-Bus device by entering directly the data hex codes.

Example: s 64 2A p

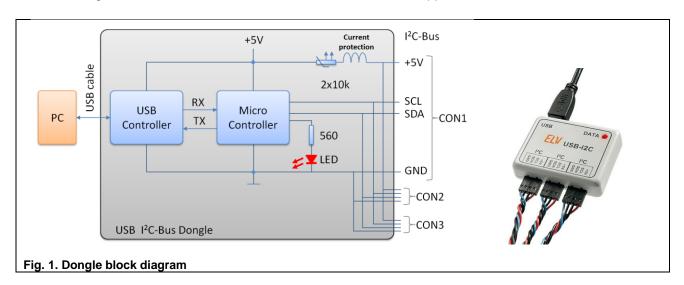
Nomenclature: All terms are in hexadecimal format!

- s stands for the I²C START condition
- 64 for the slave address
- 2A for the first data byte to be sent
- p for the I²C STOP condition

3. Bridge circuit USB to I²C-Bus

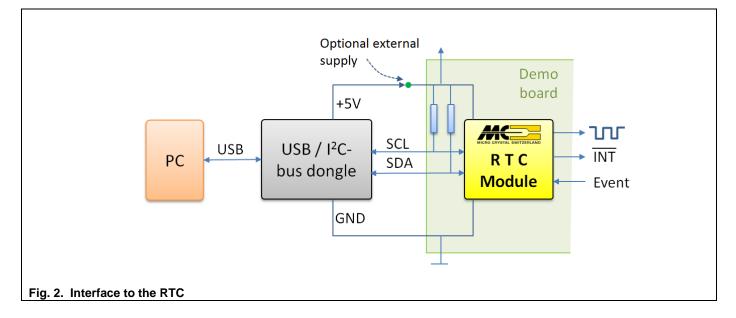
3.1. Circuit diagram of the dongle

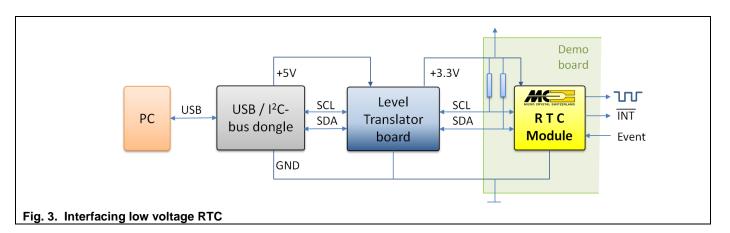
The block diagram illustrates both connections: to the PC and to the application under evaluation.



The three connectors CON1, CON2, and CON3 are wired in parallel and carry the four required signals; their order is 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
 - *) : The pull-up resistors are located on the demo board





4. Installation

Use the following sequence:

4.1. Software Driver

- Install the USB software driver before connecting the interface module!
- Download the CP210x USB to UART Bridge VCP Drivers from Silicon Labs website: <u>https://www.silabs.com/</u>
- Unpack the CP210x Drivers zip file
- Install the driver in administrator mode, by double click.

4.2. Hardware

Connect the USB cable between the Dongle and your PC as well the as the l²C-Bus cable to your target RTC board. In case an external supply voltage is used make sure it is now turned on.

The red LED will light up indicating the dongle successfully started up. The system is now ready for starting the GUI software.

4.3. Software GUI

Installation of the GUI

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- a) Run the exe file: USB-I2C-RV8803.exe (program name 8803 is RTC specific)
- b) The start window will pop up (Fig. 4)
- c) Choose the appropriate com-port from the drop-down list (usually the last one on the list)
- d) Press Connect: Status changes to Connected to COMn and turns green

'erbindung	6	PC			
СОМЗ	Connect	PC Address:	0x64	•	771
- not co	innected -			N	ICRO CRYST
			3803 RTC		
uction General USB-I2C	0			the second se	
General 030-120	Commands Registers Time	e, Alarm Stam			
General 03D-120	Commands Registers Time	e, Alarm	A CONTRACTOR OF A CONTRACTOR O		
General 03D-120	Commands Registers Time	e, Alarm	Verbindung		
General 03D-120	Commands Registers Time	e, Alarm	A CONTRACTOR OF A CONTRACTOR O		Disconnect
	Commands Registers Time	e, Alarm	Verbindung		Disconnect
General 030-120	Commands Registers Time		Verbindung	Connected to COM6	Disconnect
General 035-120	Commands Registers Time	e, Alarm	Verbindung COM6		bisconnect

User Manual

Fig. 4. Start window of the GUI

5. Operation

The Graphical User Interface is organized by a number of drop-down menus. Specific windows visualize the actual status and allow controlling the specific Micro Crystal RTC-module. In a separate menu the GUI can be used as a universal I²C-Bus interface for controlling any peripheral circuit. Details under 5.2

5.1. Procedure

The drop-down windows follow a general structure (Fig. 5 below)

- 1. Input fields to set e.g. the current time, to start transmission to the RTC press EXECUTE.
- 2. Output fields are updated after the READ button is pressed
- 3. Interactive knobs allow activating different functions or selecting specific parameters
- 4. Monitoring bus transmission: After every executed bus transmission the bus protocol is listed in the field *Transmitted Data*. Any data received by the controller is listed in the field *Received Data*. This is ideal for verifying the code needed for proper execution.

Verbindung COM6 duction G	Conne	cted to COM CComman		ct	PC Pr ddress:	0x64	Readback [)emoboard	•	MICRO CRY RV-8803-	STAL SWITZERLAN C7 RTC GUI V01	
me and Alaı Time and A	m Jarm Register	Settings										
					input fi	elds	'1'					
TIME : Set	HOUR 09	MIN 15	SEC 18	1/100s 00	01	06	03	YEAR 16]>	EXECUTE	SET TIME	ר
Current	09	15	27	50	SUN	06	MAR	2016	آ	READ	stop repeat 🗸	
ALARM : Enable	✓ HR	MN			OU V WD	_	ields '2' eekday		_	interac	tive knobs '3'	
Set	00	00			00				>	EXECUTE	CLEAR AF	
Current	00	00			00				۲	READ	STATUS AF	
eived Data 7 15 09 01 0					Clear recei	ved	Transmitted s 64 10 0018 s 64 10 s 65	15090106031	16 p		Clear transmitted	_
					onitoring	ا ماد			N			

5.2. General USB I²C-Bus Commands

The Universal I²C interface allows controlling any circuit by entering directly the I²C-Bus instructions.

Verbindung	PC				
COM6	I ² C Address: 0x64		MICRO		STAL SWITZE
Introduction General USB-I2C Commands Registers Tim	e, Alarm Timestamp Regi	ster Readback Demoboard		8803-0	C7 RTC GUI
A s64 00 p		>	Send Command	<	stop repeat
B s 64 00 s 65 0a p		>	Send Command	<	stop repeat
c		>	Send Command	<	stop repeat
D		>	Send Command	<	stop repeat
String ABBBAB b		>	Send Command	<	stop repeat
Reset the dongle		d	Save Configuration		
C Reset dongle (Y-Parameters) Reset USB-PC		e	Read Configuration		
Status, Firmware, Y-Parameter					
Received Data	Clear received	Transmitted Data			Clear tr
39 18 09 01 06 03 16 00 00 00		s 64 00 p s 64 00 s 65 0a p			

a) There are 4 command lines A to D for preparing communication. The data format is straight forward I²C-Bus protocol:

e.g.: for sending data: s 64 02 04 p press Send Command

e.g.: for reading data: s 64 02 s 65 0A p: press Send Command setting address pointer, then reading 10 bytes (0Ah)

(s = START, 64 = slave address, 02 04 = data, p = STOP)

The command lines can be fired off once per click or repeatedly every 100ms, 1s, 2s, 10s.

- b) The string allows to sequentially firing the above command lines: e.g. A B B D C. When using fast repetition rate it is of good practice to increase the l²C-Bus speed. (Use the T400000 instruction for setting the bus speed to 400kHz, details are shown below under 'Additional instructions')
- c) Reset functions can be executed
- d) Saving the actual configuration on the PC, including all settings on the RTC. Assign a specific name and select a directory.
- e) Reloading of stored settings to continue former tasks.

Additional instructions:

- A Space is ignored, letters can be in capital or small.
- Sequences like s6400p or s 64 00 p are interpreted identically
- s I²C-Bus Start condition, also for repetitive start condition
- P I²C-Bus-Bus STOP condition
- L n Inserts a delay of n ms: 1 to 65535ms (n= 0001...FFFF)
- T m Setting the I²C-Bus frequency: minimum 226Hz m= 000226, maximum 409.6kHz m= 409600
- ? System status and settings are read from the dongle

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