Software for Waterkotte heating controllers

Documentation and implementation information

2019/20

https://github.com/mwllgr

Table of Contents

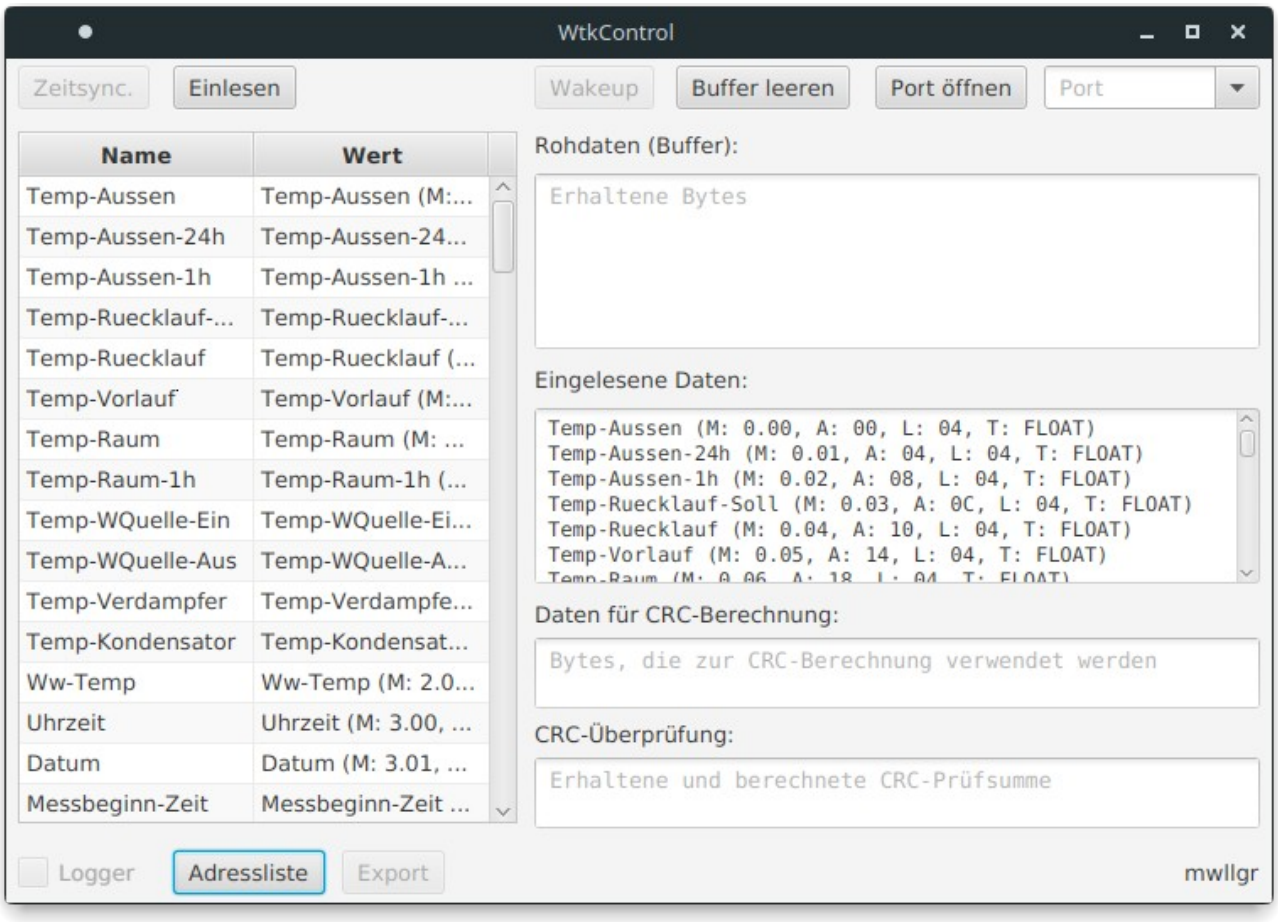
GUI flows

After launching the program, the user is greeted with a pretty empty GUI.

Reading an address list

By clicking on **Adressliste**, a *FileChooser* dialog opens and allows the user to select an address list CSV file. If the file is accessible and correctly formatted, the fields will be displayed in the *TableView* . At this point, the value of each field is the name of the field itself with some information, such as:

- Menu location `(M: X.XX)`
- Address/Offset `(A: XXX)`
- Length `(L: 0X)`
- Type (`T: XXXXXX`, specified in the protocol description)



Opening the port

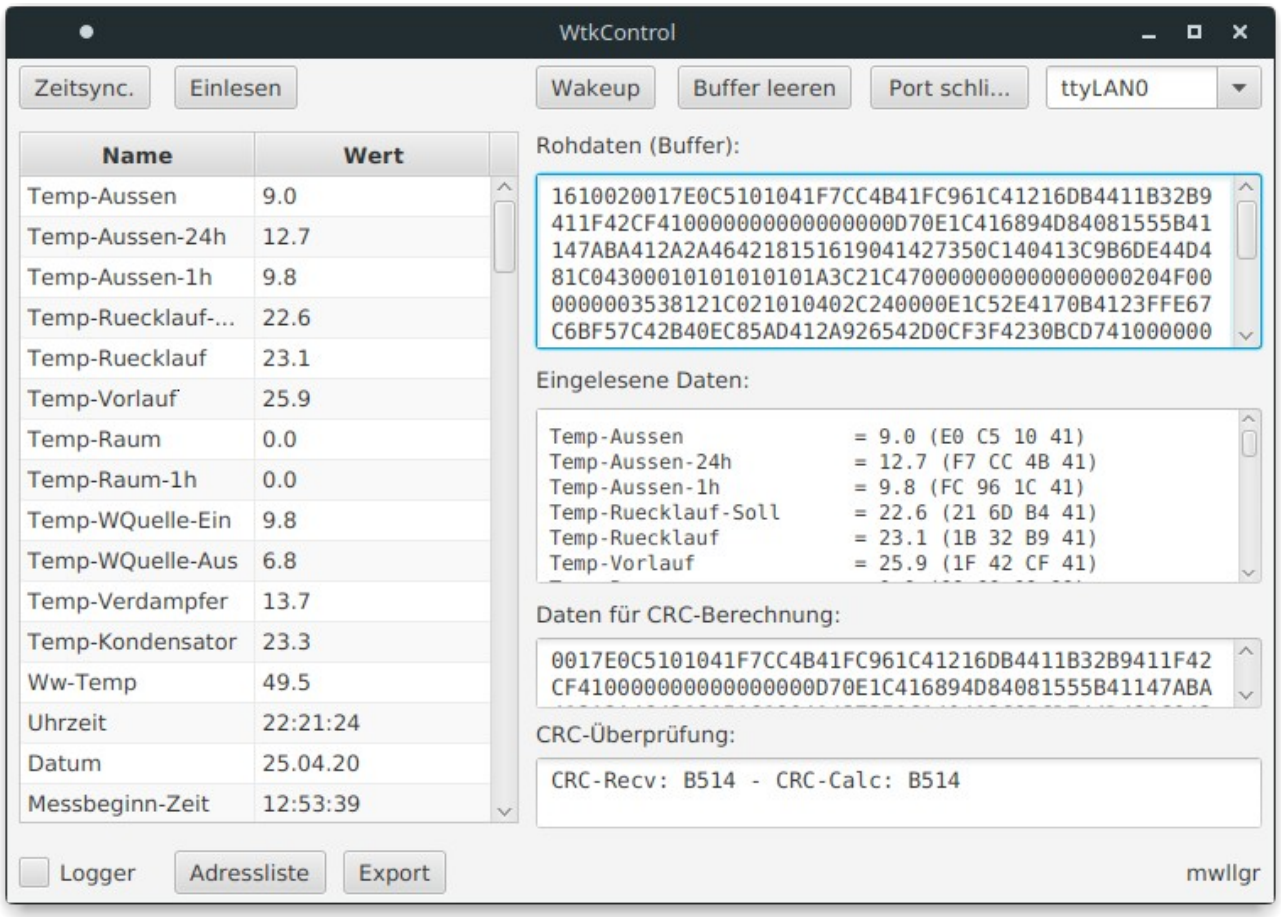
Depending on the current hardware configuration, you can select one of the detected serial ports in the *ComboBox* (e.g. *ttyUSB0* on Linux or *COM1* on Windows) or specify your own port – this is needed on Linux if you are using a virtual serial port for communication over TCP.

Reading the serial data

After selecting the address list and opening the port, everything is ready for reading the data for the first time. It's simple: Clicking on the **Einlesen** button initiates a request for all the known bytes in the address list. A serial communication listener checks for incoming bytes in the background and tries to parse them if a full frame is received.

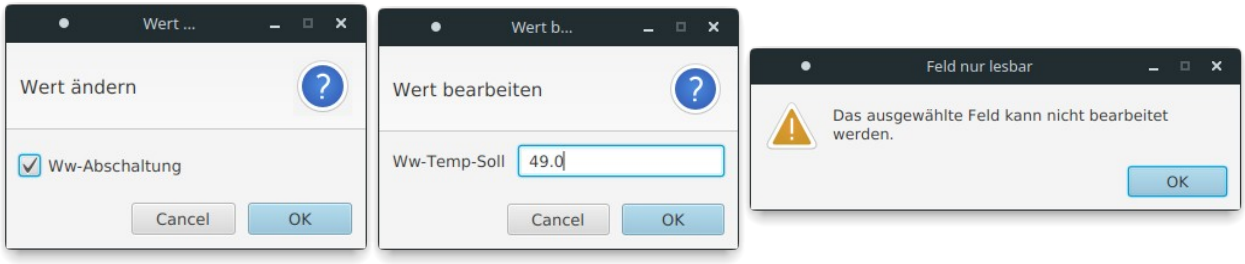
Full frame received

When a full frame has been received (detected using a Regex matcher), the parser "walks" through the bytes using the address offsets, lengths and data types. The now human-readable data is then being displayed in the *TableView* using the field names and values.



Editing a writable value

By clicking a writable value (some values are read-only, e.g. the current outside temperature etc.), depending on the data type, an edit dialog opens.



After clicking **OK** in a write dialog, a request to change the value will be sent to the serial interface. The software then waits for an acknowledge response and re-reads the values to make sure that the value has been changed.

Exporting the current values

By clicking on **Export**, a *FileSaverDialog* (FileChooser) opens – all current values will be exported to a selected file in the following CSV format after clicking on **Save**:

```
Timestamp,Name,Value
```

Example: `25-04-2020 16:07:06,Temp-Aussen,17.5`

Logger function

The software supports the function of requesting and logging the current values every minute into CSV files. Enabling/Disabling this function works by toggling the corresponding **Logger** *CheckBox.*

Naming convention for Logger CSV files (in program directory):

```
wtklogger-dd-MM-yyyy_hh-mm-ss.csv
```

Example: `wtklogger-25-04-2020_22-49-32.csv`

Time/date synchronization

If the real-time clock of the heating controller is incorrect or not in DST even though it's summer, syncing it with the PC's local clock is possible by clicking the **Zeitsync.** button. The clock fields in the table itself may not be modified directly.

Wake-Up

If the heating controller does not respond, a wake-up command might be necessary. Clicking the **Wake-Up** button sends a corresponding request to the serial interface.

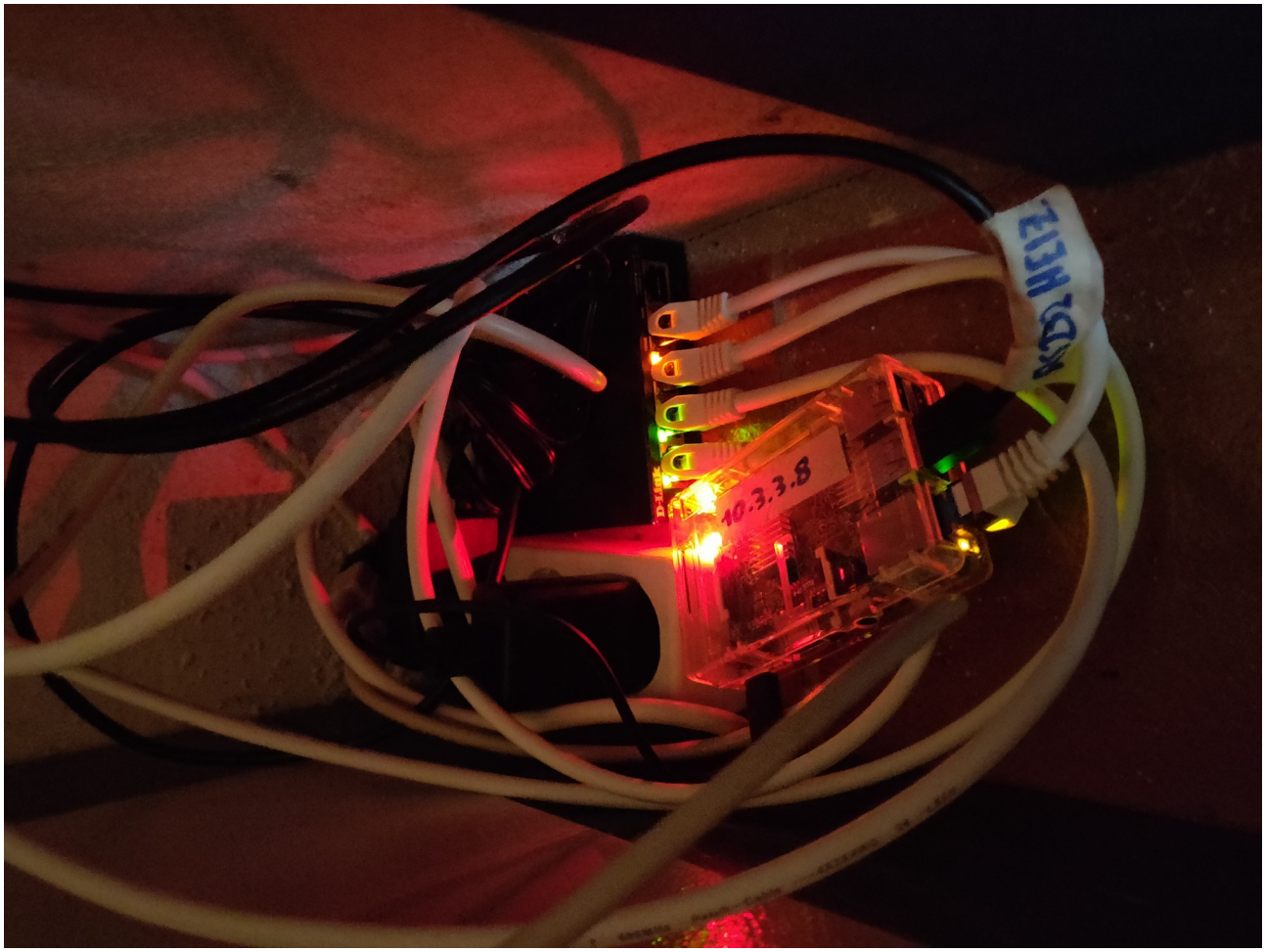
Clearing the buffer

When communicating via RS232 interfaces, it might happen that the PC or device transmits faulty bytes or receives random bytes because of the cable acting as an antenna (check the shielding!). Use the **Buffer leeren** button to clear the current hexadecimal buffer.

Technical description

Serial communication over the local network

In my example, I used a *Raspberry Pi* running the latest Raspbian OS with the software *ser2net* installed. By doing that I'm able to control the heating system from anywhere in the world (VPN required).



For ser2net, I used the following configuration (as mentioned in https://wiki.fhem.de/wiki/CUL_ueber_Netz – because I primarily use the FHEM server for home automation):

9165:raw:0:/dev/serial/by-id/usb-FTDI_FT232R_USB_UART_A105Z9XM-if00-port0:9600 NONE 1STOPBIT 8DATABITS

Under Linux, I'm then able to use the network serial port with *socat*:

```
sudo socat -x pty,link=/dev/ttyLAN0 tcp:10.3.3.8:9165
```

For Windows, HW VSP3 is a nice client:
https://www.hw-group.com/software/hw-vsp3-virtual-serial-port

CSV address list format

Name,Menue,Addresse,Laenge,Typ,Min,Max,ReadOnly
BYTES,-.--,00,11B,0,0,0,1
Temp-Aussen,0.00,00,4,f,0,0,1
Temp-Aussen-24h,0.01,04,4,f,0,0,1
Temp-Aussen-1h,0.02,08,4,f,0,0,1
[...]

Available types:

- f (Float)
- b (Binary)
- d (Date)
- t (Time)
- c (Unsigned char)
- n (Unsigned short)

ReadOnly values:

- 0 (no = writable)
- 1 (yes = not writable)

Protocol description

To communicate with the heating controller, the software makes use of the existing RS232 port on the controller itself.

The used protocol (often called DLE/ETX-protocol or "MOS") used is pretty simple. It consists of several modes, however, the scheme is always the same:

- DLE (h`10`)
- STX (h`02`)
- Slave addr. (h`01`)
- Mode
- Start addr. (2 bytes)
- Length (2 bytes) / Bytes to write after start addr.
- DLE (h`10`)
- ETX (h`03`)
- CRC (2 bytes)

Example command to write data for slave `01` at address `BC`:

```
10 02 01 13 00BC 0000C841 10 03 851C
```

Available modes

- h13 (Write memory)
- h14 (Write RTC)
- h15 (Read memory)

Response modes

Depending on the previous operation, the heating system responds with one of the following modes:

- h17 (Read response)
- h11 (Write response/ACK)

Data types

The protocol supports the following data types:

- Integers (1 or 2 bytes)
- Floats (IEEE-754 notation, 4 bytes, little endian)
- Binary (1 byte)
- Date (3 bytes, DD MM YY)
- Time (3 bytes, SS MM HH)

CRC calculation

Here are the needed parameters for the `CRC16_BUYPASS`:

CRC-Order	`16`
Input type	`Hex`
Polynomial	`0x8005`
Initial value	`0x0`
LSB/Final Xor Value	`0x0`
Input/data reflected/reversed	`No`
Result reflected/reversed	`No`

`crccalc.com` works well for testing.

Credits

Useful information

Information about the protocol
https://www.symcon.de/forum/threads/2092-ComPort-und-Waterkotte-abfragen

Libraries

The jSerialComm library
https://fazecast.github.io/jSerialComm/

(Open)JavaFX
https://openjfx.io/