

RTS USB Controller User Guide

Real Time Solutions

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1 General description

The RTS USB Controller is a device designed to control up to 6 relays via USB. On the host PC the device is recognized as a Virtual COM port. The onboard USB-to-serial chip is Microchip MCP-2200 [2]. Therefore, any of the common applications which support serial interface can be used.

Two product variants are available:

- Powered over external +12 VDC supply (Figure 1)
- Powered over USB cable (Figure 2)

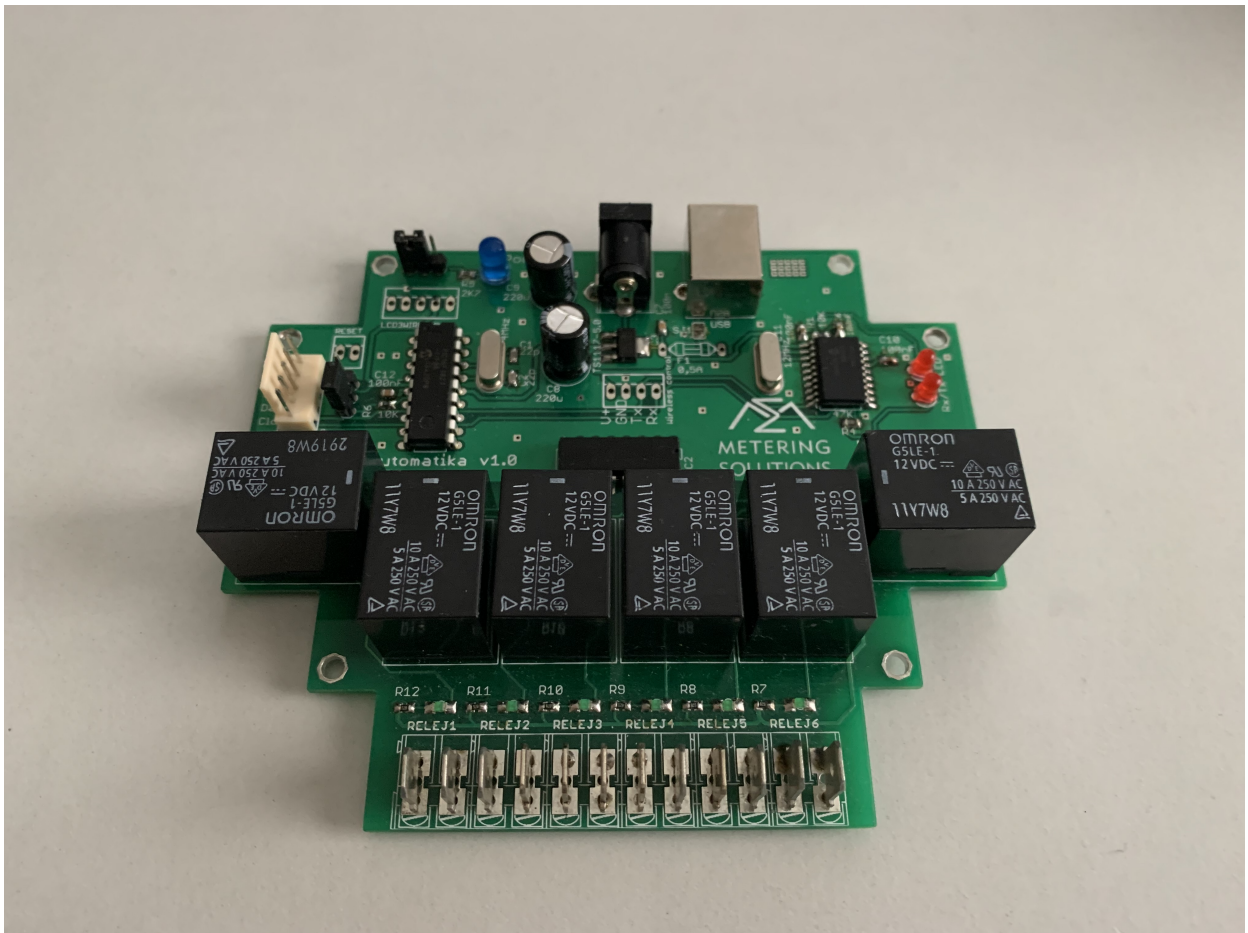


Figure 1: +12 VDC externally powered RTS USB Controller.

The relays (in both product variants) are rated to sustain 10 A 250 VAC/30 VDC load. For each relay there is a dedicated on-board LED to show the current state - ON or OFF. The NO (Normally Open) and COM (Common) contacts are accessible via terminal block or faston connectors.

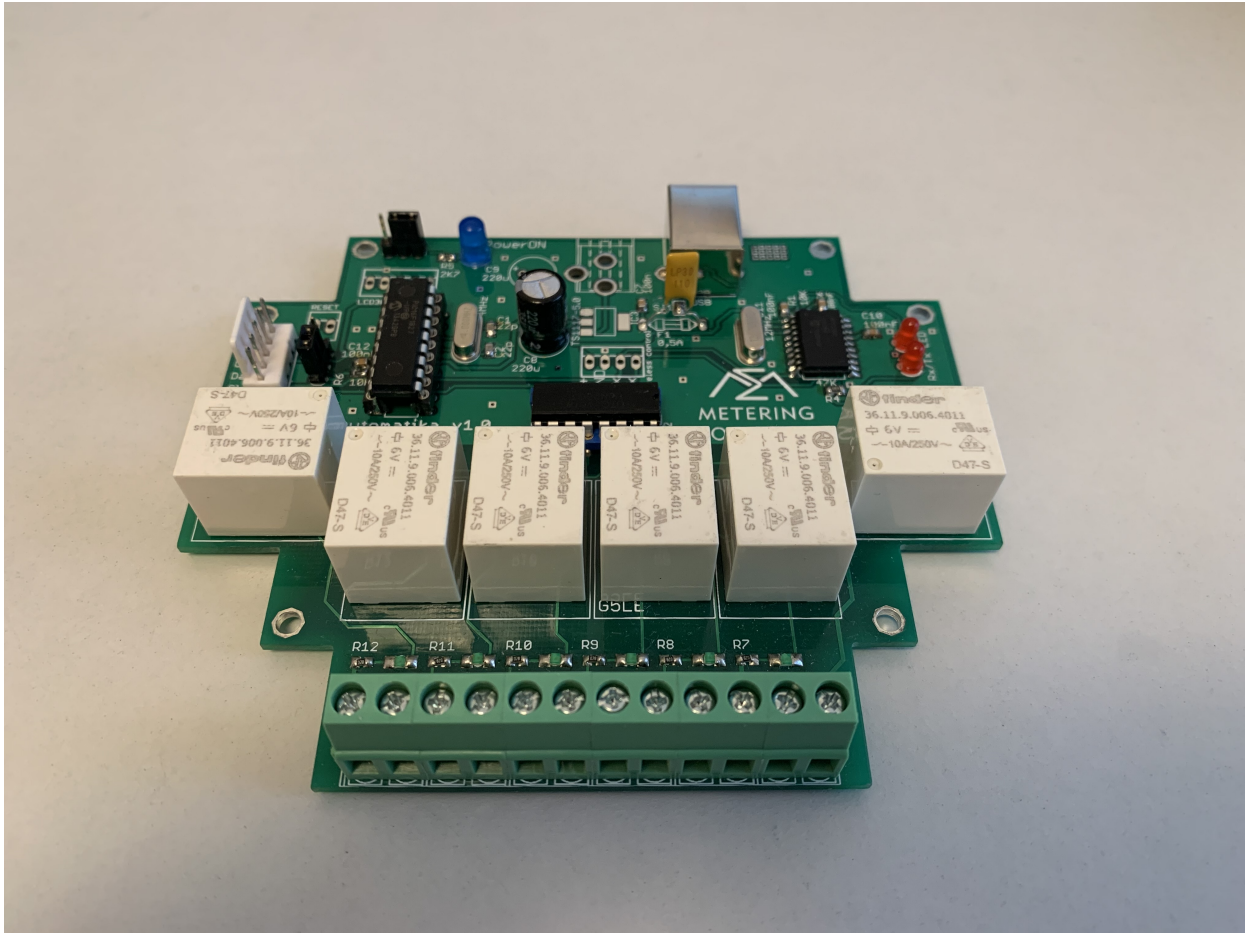


Figure 2: USB powered RTS USB Controller.

The board is equipped with three LEDs:

- Power LED
- Tx LED
- Rx LED

The Tx and Rx LEDs blink when there is an ongoing traffic. The LEDs are enabled per default and can be disabled or their behavior reconfigured via Microchip MCP2200 Configuration Utility [1]. The figure 3 shows an overview of the MCP2200 Configuration Utility and the default settings.

Product dimensions: 118x98x27 mm. Mounting on a DIN rail is possible (see Figure 4).

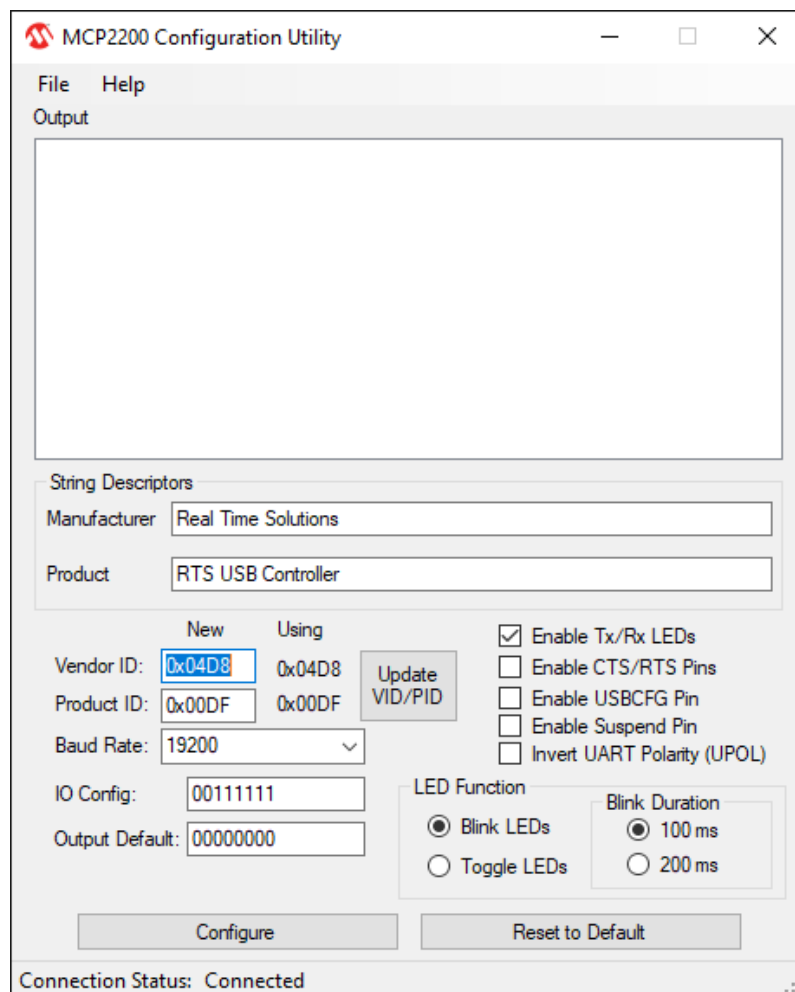


Figure 3: MCP 2200 Configuration Utility Overview.

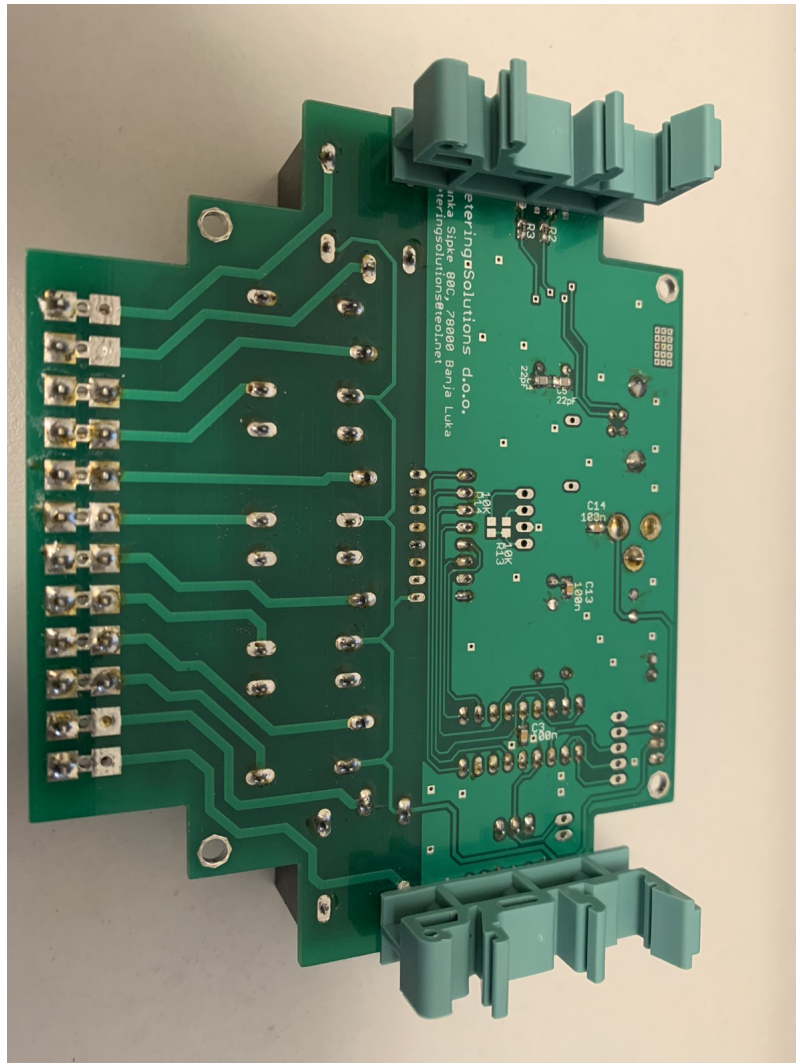
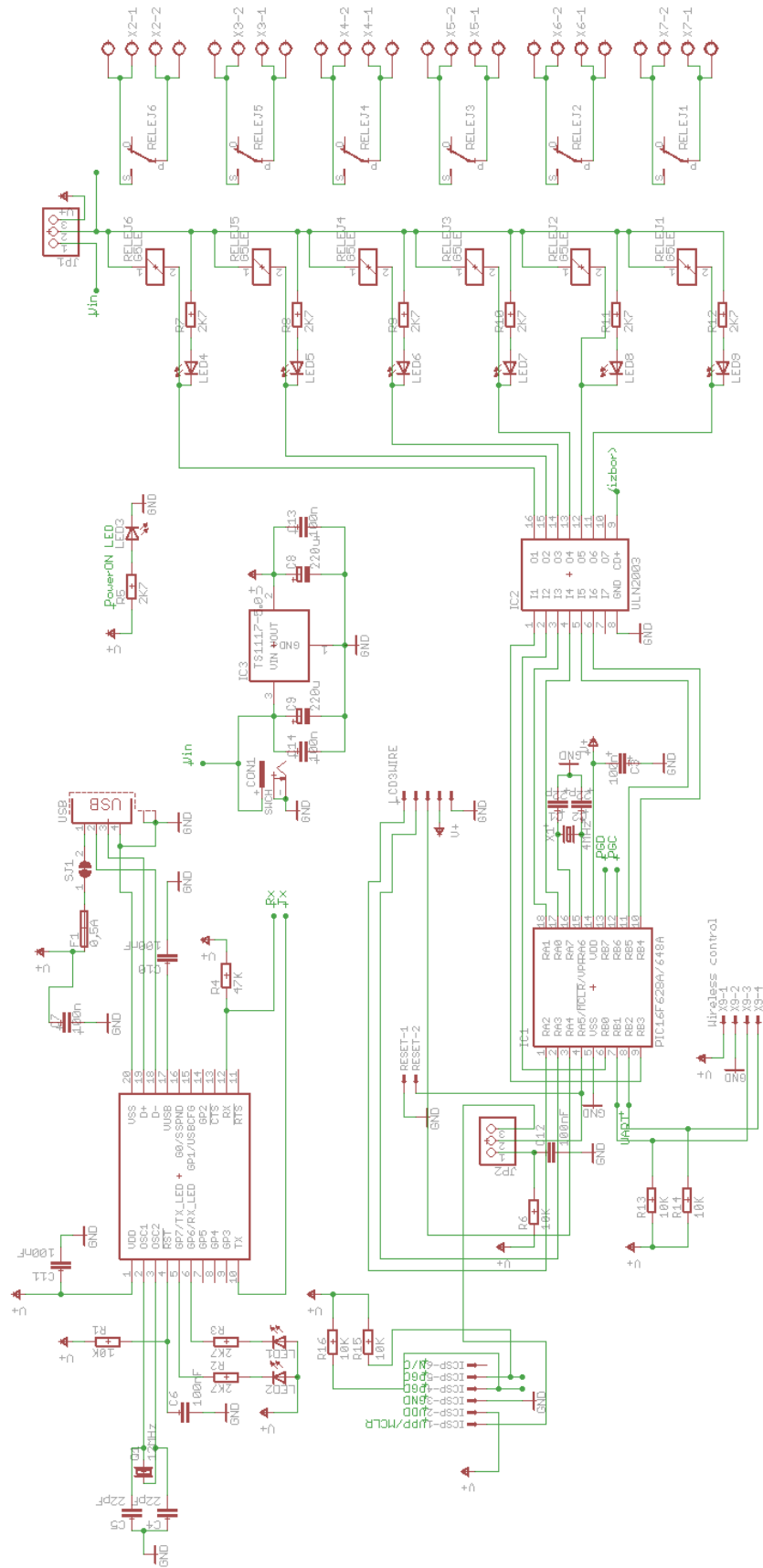


Figure 4: DIN rail mounting adapter.

2 Schematics



The JP1 jumper is used to select the power source of the relays. The jumper position 1-2 connects the relay power supply to the external power source. The position 2-3 connects the power source of the relays to +5 VDC from USB.

Note: The JP1 jumper is already put in the proper position depending on the board variant. Changing the position may seriously damage the device or its components!

The JP2 jumper is used to enable/disable the ICSP (In Circuit Serial Programming) of the microcontroller. The default position of the JP2 is 1-2.

3 Communication protocol

The RTS USB controller communication protocol consists of the predefined messages that are exchanged with the host PC. In general, the host PC initiates the communication by sending a message while the RTS USB controller is in listening mode.

Depending on the particular message, the RTS USB controller replies with an acknowledge message or with a data message.

Each message from host PC contains a *Header* - "RTSRC", followed by *Command* and *Data* field. The message terminates with a line feed character "\n". All messages from the host PC which are not terminated will be discarded.

The response messages to the host PC do not contain *Command* field and they are terminated with a carriage return "\r" and a line feed character "\n".

The following message types are supported:

- Set output state
- Get output state
- Set supervision state
- Output state
- Acknowledge

3.1 Set output state

The Set output state message is used to turn on/off a relay.

The value of the *Command* field is *SO* (Set Output).

The first digit in the *Data* field represents the relay and can be set in range of 1...6.

The second digit in the *Data* field represent the state and can be set to 0 (Off) or 1 (On).

The figure 5 shows an example of how to turn on relay 1.

Header	Command	Data	Termination
RTSRC	SO	11	\n

Figure 5: Set output state example message

The answer to this message is Acknowledge message (see 3.5).

3.2 Get output state

The Get output state message is used to read the state of a relay.

The value of the *Command* field is *GO* (Get Output).

The value in the *Data* field represents the relay and can be set in range of *1...6*.

The figure 6 shows an example of how to read the state of relay 1.

Header	Command	Data	Termination
<i>RTSRC</i>	<i>GO</i>	<i>1</i>	<i>ln</i>

Figure 6: Set output state example message

The answer to this message is Output state message (see 3.4).

3.3 Set supervision state

The RTS USB controller can operate in two modes:

- Normal mode (default)
- Supervised mode

In the Normal mode, action on the outputs (relays) are taken only after a valid (corresponding) message is received and remain unchanged until requested by host PC.

In the Supervised mode, host PC must continuously send the messages so that RTS USB controller does not enter the safe state. In safe state all relay outputs are turned off. This is a safety measure which reduces the risk of incidents in case of a connection loss. The maximum allowed time between two consecutive messages in the Supervise mode is 6 seconds. The type of message which host PC sends is not relevant, as long as it contains a valid header and a termination character.

The Set supervision state message is used to enable or disable the supervision state.

The value of the *Command* field is *SSV* (Set Supervision State).

The value in the *Data* field represent the state and can be set to *0* (Off) or *1* (On).

The figure 7 shows an example of how to enable the supervision.

The answer to this message is Acknowledge message (see 3.5).

Header	Command	Data	Termination
<i>RTSRC</i>	<i>SSV</i>	<i>1</i>	<i>\n</i>

Figure 7: Set supervision state example message

3.4 Output state

The Output state message is a response to Get output state message.

The value in the *Data* field represent the relay and it's current state - *0* (Off) or *1* (On).

The figure 8 shows an example of current state of relay 1.

Header	Data	Termination
<i>RTSRC</i>	<i>OUT1:1</i>	<i>\r\n</i>

Figure 8: Output state example message

3.5 Acknowledge

The Acknowledge message is a response to Set output state and Set supervision state messages.

The value in the *Data* field is *ACK*.

The figure 9 shows Acknowledge message structure.

Header	Data	Termination
<i>RTSRC</i>	<i>ACK</i>	<i>\r\n</i>

Figure 9: Acknowledge message structure

References

- [1] Microchip Technology Inc. *MCP2200 Configuration Utility 1.3*. URL: <https://mcp2200-configuration-utility.software.informer.com/>. (accessed: 06.02.2021).
- [2] Microchip Technology Inc. *MCP2200 USB 2.0 to UART Protocol Converter with GPIO Device Overview*. URL: <https://www.microchip.com/wwwproducts/en/en546923>. (accessed: 06.02.2021).