Docklight Application Note: RS422/485 communication

Docklight can access any COM communication port available in Windows. Physically, these ports will be RS232 SUB D9 interfaces in many cases. However, it is also possible to use Docklight for other communication standards such as RS485 and RS422, which have a different electrical design to RS232 but follow the RS232 communication mechanism.

Unlike RS232, a RS422/485 communication link allows bus topologies that connect e.g. one master with several slave devices. The following sections describe additional settings and options available in Docklight that facilitate analyzing and debugging such data links.

TIP: For high-speed and time-critical RS485 and RS422 bus monitoring, see also our **Docklight Tap 485** hardware accessory and the related Application Note “Docklight Tap Pro and Docklight Tap 485” [3] http://docklight.de/pdf/Docklight_Application_Note_TapPro_Tap485.pdf

1 Communicating over a 2-wire RS485 link

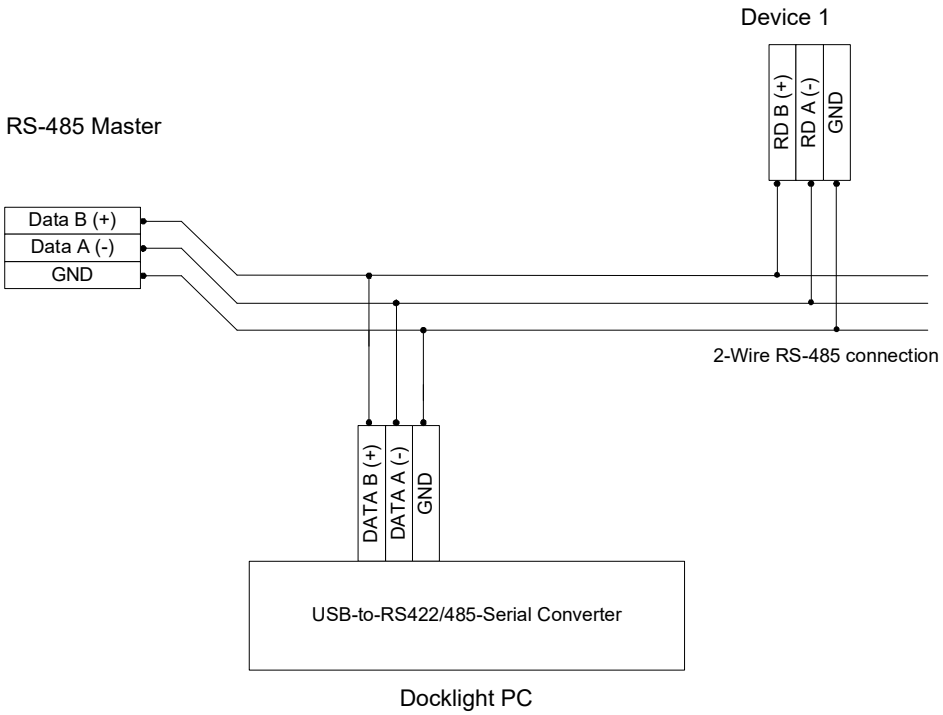

Figure 1: Communicating over a 2-wire RS485 link

For communicating over a two-wire RS485 bus, a RS422/485 interface is required on the Docklight PC, e.g. a USB-to-RS485/422 adapter as listed in section 5, “RS422/RS485 Reference Hardware”.

NOTE: Please pay special attention to signal ground connections in RS485/422, because of possible problems with ground loop currents (when signal GND is connected between remote bus nodes) or high ground potential differences GPD (when no common signal GND is used). See also “Grounding and Insulation” in Texas Instruments Application Report: The RS-485 Design Guide SLLA272C [4].

Use the following setup:

- Open the **Project Settings** dialog and choose **Send/Receive Mode**
- At **Send/Receive on comm.. channel**, select the COM port assigned to your RS422/RS485 interface.

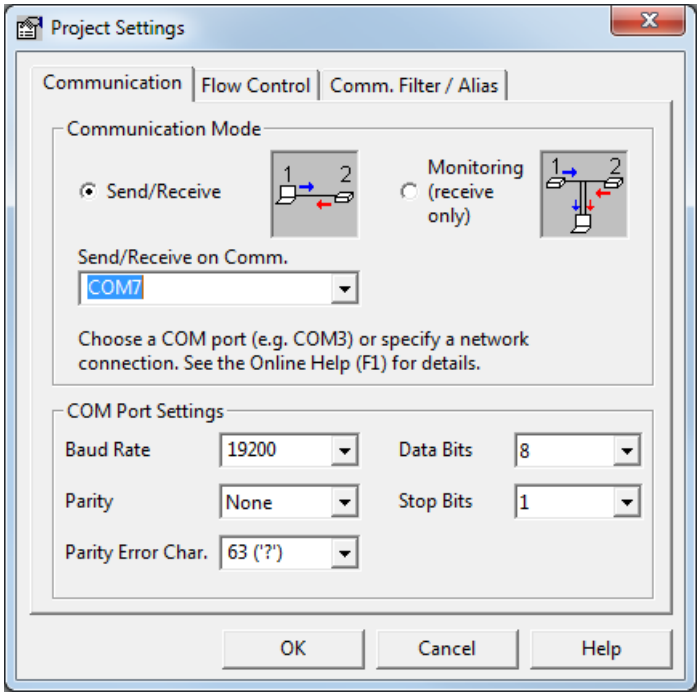

Figure 2: Docklight Project Settings for 2-wire RS485 communication

2 Monitoring a 2-wire link (RS485 / half duplex)

- Use the same settings as in the previous section 1: “Communicating over a 2-wire RS485 link”.

When monitoring a two-wire bus, Docklight cannot distinguish between two different data directions and use two different colors (blue / red) to distinguish between master and slave device telegrams. You will only see one data direction (red) inside the communication window. But Docklight provides a number of functions to process such data streams and separate the master and slave telegrams:

1. In most applications there is a significant pause time between the master requests and the slave answers. In this case use the menu **Tools-->Options...-->Date/Time Stamps**, then activating **Pause detection....** and choosing a time small enough to safely detect this silence between the master and slave telegrams. "0.1 seconds" can be a good default value to start with.

2. If there is no significant pause between the master telegrams and the slave responses, you need to teach Docklight something about your data stream and the application protocol used: Using so-called **Receive Sequence** definitions (see http://docklight.de/manual/receivesequence.htm), you can make Docklight trigger on certain data that defines the telegram end. For example, if your protocol uses an ETX (ASCII code 03) character to mark the telegram end, you could define a "Receive Sequence" that triggers on this character, and inserts an additional line break / time stamp after receiving such a character.

3 Monitoring a 4-wire link (RS422 or RS485 full duplex)

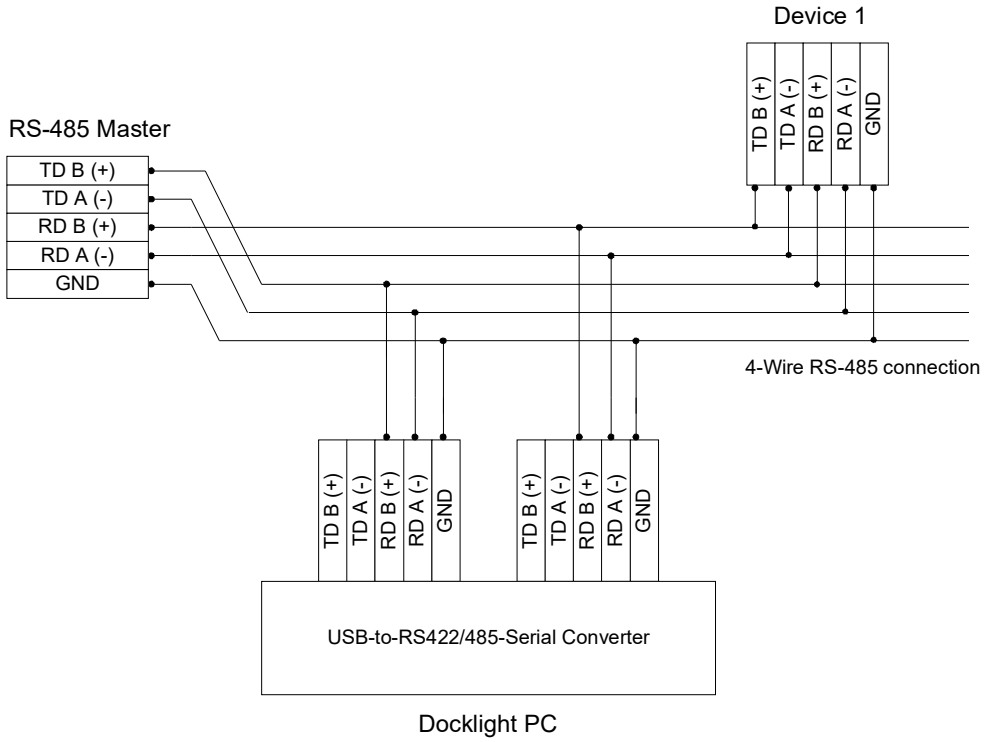

Figure 3: Monitoring a 4-wire RS422/485 link

Monitoring a 4-wire RS422/RS485 network is similar to RS232 monitoring applications (see http://docklight.de/manual/monitortheserialcommunicationb.htm). Two free RS422/485 interfaces, resp. two COM ports are required for monitoring, and Docklight can distinguish between two data directions, e.g. master telegrams (blue) and slave responses (red).

Use the following setup:

- Open the **Project Settings** dialog and choose **Monitoring Mode**
- At **Receive Channel 1** and **Receive Channel 2**, choose the two COM ports assigned to the RS422/RS485 interfaces.

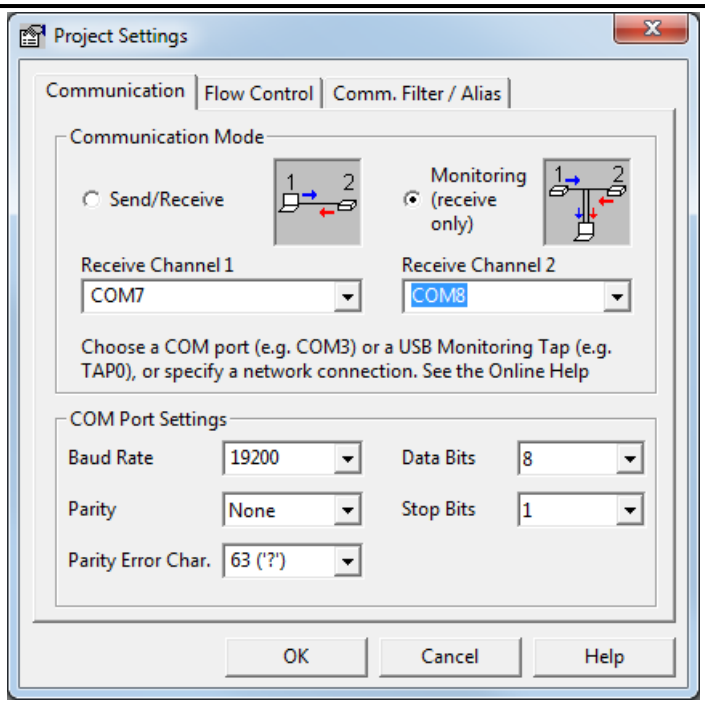

Figure 4: Docklight Project Settings for 4-wire RS422 monitoring

4 RS422/485-Specific Project Settings in Docklight

RS485 Transceiver Control (menu 'Project Settings…', tab 'Flow Control')

Some RS232-to-RS485 or USB-to-RS485 converters require manual RTS control. I.e. the DTE (your PC) needs to tell the converter when it should enable its RS485 driver for transmission.

This is usually done using the RTS status line of the COM port. If you choose **RS485 Transceiver Control** in Docklight, the serial port driver sets **RTS=High** before transmitting the first character, and **RTS=Low** after the last character has been transmitted.

Please refer to the operating manual of your RS485 interface/converter and check if the RS485 Transceiver Control setting is required or not. Most RS485 products offer an "automatic mode" where the RTS signal is not required and **Flow Control Support = Off** (default setting) can be used in Docklight.

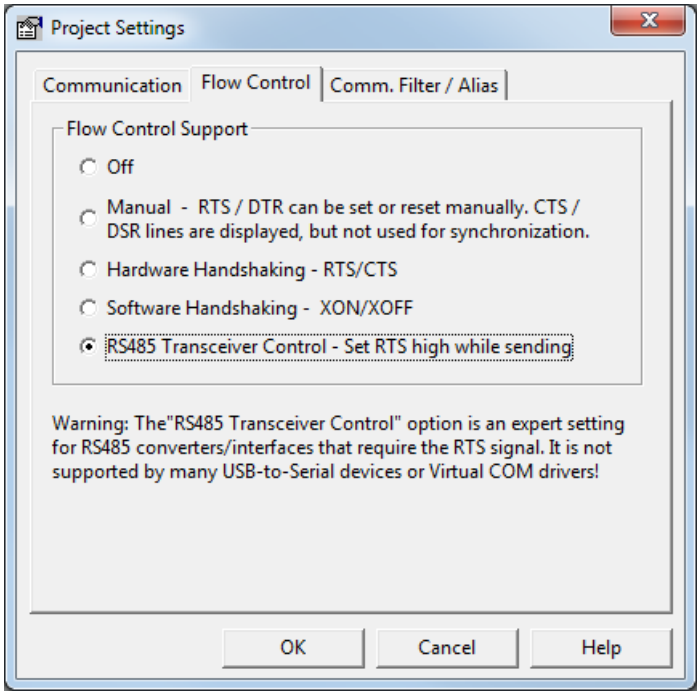

Figure 5: Flow Control Setting for RS485 Transceiver Control

5 RS422/RS485 Reference Hardware

- MOXA TCC-100/100I (www.moxa.com)
  Isolated RS232 to RS-422/485 converter
- MOXA UPort 1150/UPort 1150I (www.moxa.com)
  1-port RS-232/422/485 USB-to-serial converters
- USB Edgeport/2i (www.digi.com)
  2 RS-422/485 serial DB-9 interfaces
- VScom USB-COM-PRO (www.vscom.de)
  1 Port RS232/422/485, software configurable
- FTDIChip Ltd reference converter cables for RS422 and RS485 (www.ftdichip.com) , e.g.
  USB-RS485-WE-1800-BT

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7 References

[1] Docklight Scripting V2.1 User Manual,from edition 08/2015
http://docklight.de/pdf/docklight_scripting_manual.pdf

[2] Docklight Application Note: Docklight Tap Pro and Docklight Tap 485
http://docklight.de/pdf/Docklight_Application_Note_TapPro_Tap485.pdf

[3] Docklight Tap 485 Product Sheet
http://www.docklight.de/pdf/Docklight_Tap_485.pdf

[4] Texas Instruments Application Report: The RS-485 Design Guide (SLLA272C)
http://www.ti.com/lit/an/slla272c/slla272c.pdf