Tech-note

Modbus RTU Server Driver for JMobile

This document describes the implementation of the Modbus RTU Server protocol. Using this communication driver, multiple HMI panels can be connected to a Modbus master. A subset of the standard Modbus function codes has been implemented to allow for an easy and efficient information flow between the master and the slaves

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Modbus RTU Server Driver

The Modbus RTU Server communication driver lets you connect the panel as a slave in a Modbus RTU network. It is possible to connect multiple HMI panels to one Modbus master controller. The information exchange will use standard Modbus messages.
This approach will also offer an interesting way to connect the HMI panels to SCADA systems through the universally supported Modbus RTU communication protocol.

Principle of Operation

This communication driver will implement a Modbus RTU slave unit in the HMI device. A subset of the complete range of Modbus Function Codes will be supported. The available Function Codes will allow the transfer of data between the master and the slave.
The diagram in figure shows the system architecture. Note that the HMI is actually simulating the communication interface of a PLC: it has two data types (Coils and Registers) that are respectively Boolean and 16 bit integers.
The panel will always access data in its internal memory. Data can be transferred to and from the Modbus master only on initiative of the master itself.

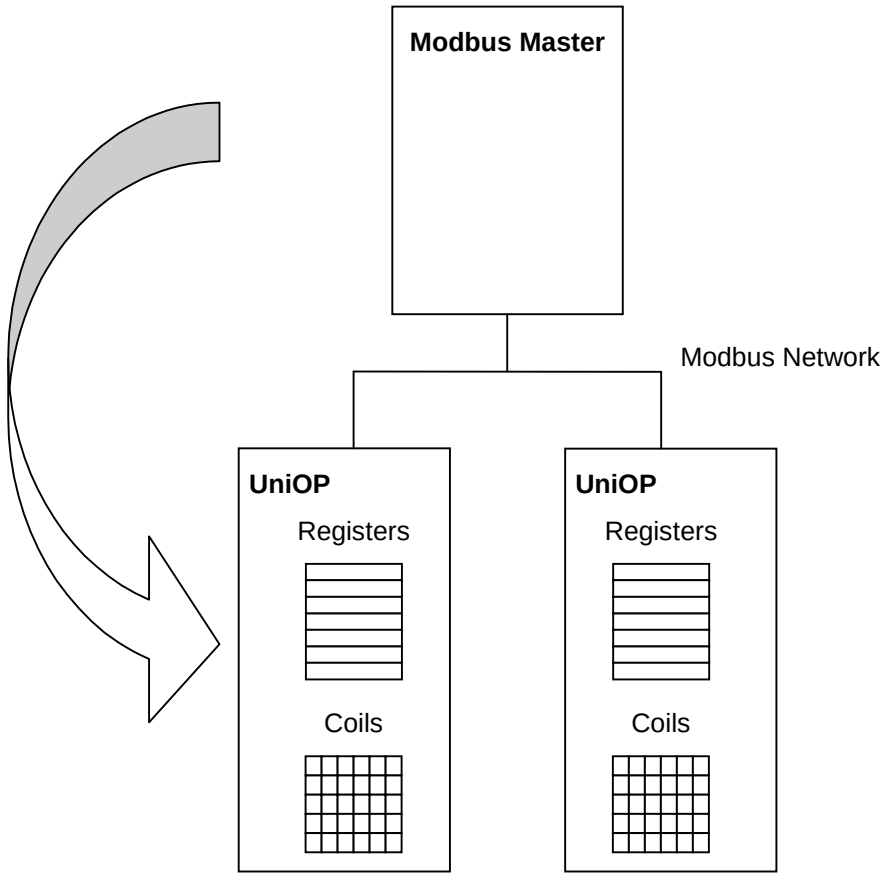

Figure 1

Settings

Protocol Editor Settings

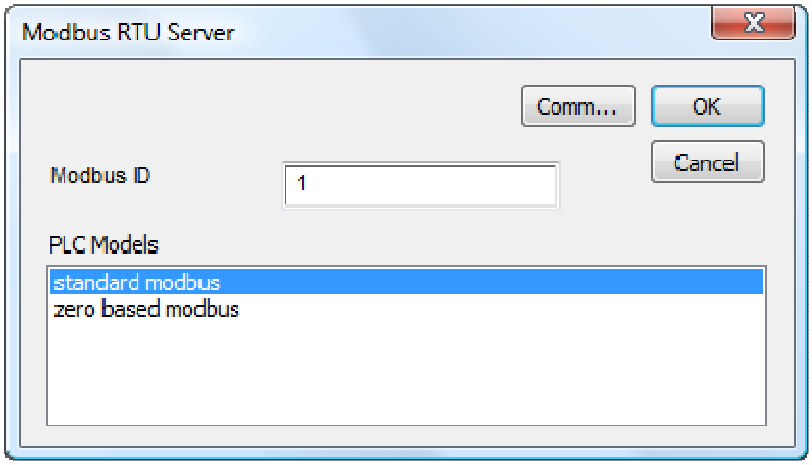

Figure 2

Modbus ID The HMI device is a slave in the network and will exchange data with a single master controller. Every panel in the network must be assigned its own Slave ID. PLC Communication parameters must be set according to the values programmed in the master controller

PLC Models The Controller Setup dialog box allows you to select between two different flavours of Modbus addressing. You can select the flavour most appropriate for your needs. The ‘Standard Modbus" model type implements a Holding Register range of between 400001 and 402048 and an Output Coils range of between 1 and 2048. The "Zero based Modbus" model type, on the other hand, implements a Holding Register range of between 400000 and 402047 and an Output Coils range of between 0 and 2047. Please note that the address range used in the Modbus frames will always be respectively between 0 and 1097 for the Holding Registers and between 0 an 9997 for Coils.

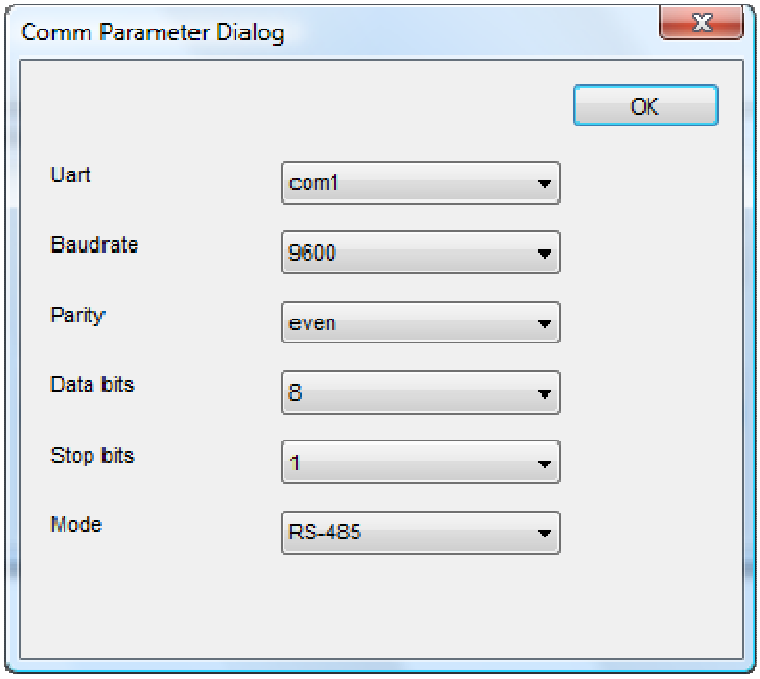

Figure 3

Uart	Serial port selection. COM1 is the HMI PLC port, COM2 is the PC/Printer port
Baudrate, Parity, Data bits, Stop bits	Communication parameters for the serial line
Mode	Serial port mode; can be selected between: RS-232, RS-485 (2 wires) RS-422 (4 wires)

Communication Status

The actual communication status can be displayed using the dedicated system variables. Please refer to the manual for further information about available system variables and their use.

This communication protocol acts as server and does not return any specific Protocol Error Message.

Implementation details

This Modbus RTU slave implementation supports only a subset of the standard Modbus Function Codes. Only the Function Codes necessary for the data exchange between the panel and the Modbus master have been implemented.
The supported Function Codes are listed in the table below.

Code	Function	Description
01	Read Coil Status	Reads multiple bits in the panel Coil area
03	Read Holding Registers	Read multiple panel Registers
05	Force Single Coil	Forces a single panel Coil to either ON or OFF
06	Preset Single Register	Presets a value in a panel Register
08	Loopback Diagnostic Test	Only sub function 00 (Return Query Data) is supported
15	Force Multiple Coils	Forces multiple panel Coils to either ON or OFF
16	Preset Multiple Registers	Presets value in multiple panel Registers
17	Report Slave ID	Returns some diagnostic information of the controller present at the slave address

The HMI protocol will return the Exception Code 01 (Illegal Function) if the Function Code received in the query is not supported.

The HMI protocol will return the Exception Code 03 (Illegal Data Value) if a sub function other than 00 is specified for Function 08.

The amount of memory available in the HMI device is as follows:

Data Type	Type	Range
Coils	Bit	0 – 2047
Registers	Word	0 – 2047

The HMI protocol will return the Exception Code 02 (Illegal Data Address) if the Data Address received in the query exceeds the predefined data ranges.