



Integrated Systems Engineering & Products

PROTOCOL CONVERTER
MODBUS TCP to MODBUS RTU

Technical Manual

DOCUMENTED BY

ISEP

Updated: 14 Dec 2001

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1 Introduction

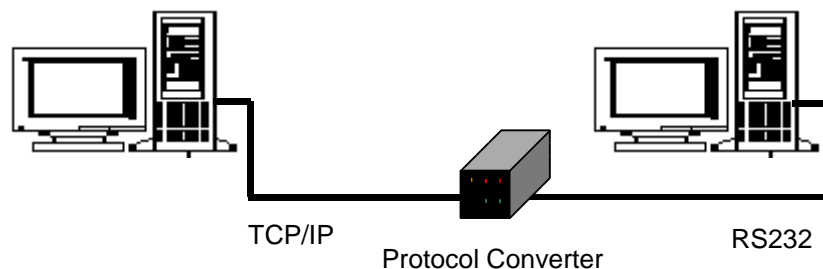
The MODBUS TCP to MODBUS RTU Protocol Converter by ISEP facilitates data communications between MODBUS TCP and MODBUS RTU. It does this by sending MODBUS TCP queries to MODBUS RTU and vice-versa. The MODBUS RTU datas are transmitted through RS-232 port and MODBUS TCP through ethernet port provided on the converter.

2 System Configuration

Converter is user configurable. The HyperTerminal of a PC connected to port 1 can be used to enter the configuration for IP address (IP address of the Converter itself), Remote IP address (IP Address of the MODBUS TCP Slave, to which the Converter wants to establish a connection), Gateway address, Net-mask address, for the Ethernet port and Baud rate, Data bits, Parity and Mode(Client/Server) for the serial port 2 through which the data communications takes place.

In the monitoring system, MODBUS RTU or MODBUS TCP could be monitored. The converter can be configured to act as Client or Server based on which device (MODBUS RTU or MODBUS TCP) is acting as Master or Slave. If the MODBUS TCP is acting as Master then configure the converter to act as server and if MODBUS RTU is acting as Master then configure the converter to act as client. (See the Configuration Setup for details) .

The converter is connected to MODBUS RTU via the Port 2 (RS232 port). The converter is connected to MODBUS TCP via the LAN port.. The system configuration is shown below.



3 Configuration Set-Up

The Converter is designed to sit on a 35 mm DIN Rail. There are two serial ports and one ethernet port on the Converter.

PORT 1 : Configuration port .

PORT 2: Communication port.

LAN : Ethernet port.

To enter the configuration values or to see the existing configuration, connect a PC to the Configuration port (port 1) of the Converter and open the HyperTerminal. Hyper Terminal should be connected at 19,200 baud, 8 data bits, 1 stop bit and parity None. On power up, the HyperTerminal displays the factory settings of the following parameters:

IP address = 090.000.000.190
(IP address of the Converter)

Remote IP address =000.000.000.000
If the MODBUS RTU is acting as Master then Remote IP address is the IP address of the MODBUS TCP Slave with which the Converter wishes to establish a connection . If the MODBUS TCP is acting as Master then leave the Remote IP address at its factory setting (0.0.0.0).

Net-mask = 255.255.255.000
Gateway = 0.0.0.0
baud-rate = 019200
data-bit = 8
parity = N (None)
Mode = S(Server).

Converter requests if the user wants to change any configuration or use the existing one.

Do you wish to continue configuration ?

Press "Y" or "y" and wait for few seconds until the Converter enters into configuration mode. DO not enter "Enter Key" after pressing "Y" or "y" on the keyboard.

If the user doesn't wish to change any configuration simply enter "any key" other than "Y" or "y" to exit out of configuration mode.

Once in the configuration mode, Converter requests for the following values :
User can enter the corresponding new values followed by "Enter Key" or simply enter the "Enter Key " to use the existing values

Enter the IP address.(xxx.xxx.xxx.xxx followed by Enter Key)
(e.g :- "090.000.000.180" followed by "Enter Key").

Enter the Remote IP address.(xxx.xxx.xxx.xxx followed by Enter Key)
If the MODBUS RTU is acting as Master then please enter the IP address of the MODBUS TCP Slave followed by "Enter Key". If the MODBUS TCP is acting as Master then leave the Remote IP address at its factory setting 000.000.000.000.

Enter the Gateway address.(xxx.xxx.xxx.xxx followed by Enter Key)
Please leave it at factory setting if there is no gateway

Enter the Netmask address.(xxx.xxx.xxx.xxx followed by Enter Key)
(e.g :- "255.255.255.000" followed by "Enter Key").

Enter the baud rate.

Please use 6 digits to enter baud rate followed by "Enter Key".

(e.g :- "019200" followed by "Enter Key")

(Valid baud rates are 300,1200,2400, 9600,19200,38400,57600,115200).

Enter the Databit.

Please enter "8" or "7" followed by "Enter Key".

Enter the Parity.

Please use 1 Capital letter to enter Parity.

(e.g :- "E" for Even, "O" for Odd & "N" for None followed by "Enter Key".)

Enter the Mode.(C=Client or S=Server).

Please enter "C" or "S" followed by "Enter Key".

If the MODBUS TCP is acting as Master then configure the converter to act as server and if MODBUS RTU is acting as Master then configure the converter to act as client.

Once the user finishes the configuration, the Converter will prompt again if the user wishes to continue the configuration to correct any of the values.

Do you wish to continue the configuration ?

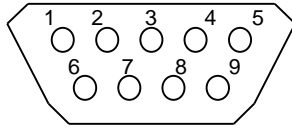
Enter "any key" other than "Y" or "y" to exit out of configuration mode.

Converter then displays the last entered values

All MODBUS TCP requests are sent via TCP on registered port 502

Once the Converter exits out of configuration mode it enters into communication mode. It transmits data received from the Ethernet port to the serial port and vice versa. During the communication mode, for any reason if the user wishes to change any configuration of the ports, power off the Converter and power up again. The Converter will start the communication process described above automatically.

The pin description for the 9 pin D connector is shown below.



3 Pin Male Connector	
Pin #	Description
2	Tx
3	Rx
5	Ground
rest	No connection

(Once the converter is configured the same connector can be used for the Communication Port).

Configuration Port(Port 1) = 3 Pin Male Connector

Communication Port(Port 2) = 3 Pin Male Connector

4 Overview of Communication Process

This section provides an overview of the communication processes that takes place within the MODBUS TCP device , the MODBUS RTU device and the protocol converter.

The protocol converter begins a series of events upon receiving a valid query from the Master device(MODBUS TCP or MODBUS RTU based on the configuration of the the converter). Currently, the valid queries are for following function codes:

Function Code	Description
1	Read Output Table
2	Read Input Table
3	Read Registers
4	Read Analog Input
5	Force Single Output
6	Preset Single Register
7	Read Exception Status
16	Preset Multiple Registers

The converter will ignore any function codes other than those stated above.

On power up, the converter monitors the Master device continuously for queries. The converter will only respond to queries with the function codes mentioned above.

Upon receipt of a valid query, the converter will send this query to the slave device. After which, it waits for a response from the slave. The maximum amount of time, that is allowed between the time the last byte of the command is sent from the converter to the time the slave responds, is 400 milliseconds. That is around 500 milliseconds, that is the maximum amount of time that a master can wait for the response from the converter after a query has been sent. If no response is received from the slave, the converter will abort the communication process of the current query and monitor the master for a new query. The whole communication process of the current query could be finished before the master sends the next query.

For the MODBUS RTU, the converter will do the error check first after a packet is received. The CRC-16 code of the MODBUS RTU query and the CRC-16 code of the MODBUS RTU response are used for error check. If a packet from MODBUS RTU with errors in its CRC-16 code, the converter will ignore this packet. If a query with errors is received, the converter will ignore this query and wait for the next query.

If no response is received from the converter after the master sends the query, check the converter first. If the Tx LED of the port still flashes after a query is received, that means the converter works well and the devices should be checked. Otherwise, power off the converter and power up again. The converter will start the communication process described above automatically.

