ISEP

Integrated Systems Engineering & Products

PROTOCOL CONVERTER

MODBUS TCP TO SAMSUNG PROTOCOL

Technical Manual

DOCUMENTED BY

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Table of Content

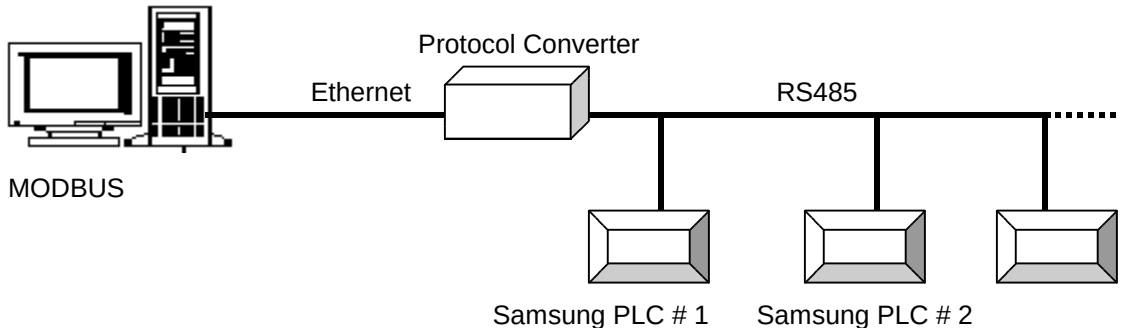
1 Introduction

The MODBUS TCP to SAMSUNG Protocol Converter by ISEP facilitates data communications between a MODBUS TCP master and one or more SAMSUNG PLC slave. It does this by converting MODBUS TCP queries to equivalent SAMSUNG Protocol commands. The SAMSUNG Protocol commands are transmitted on a RS-232 bus and only the SAMSUNG Protocol monitor whose address matches responds. Upon receipt of the SAMSUNG Protocol response, the converter will translate it to MODBUS TCP messages recognizable by the MODBUS TCP master device.

2 System Configuration

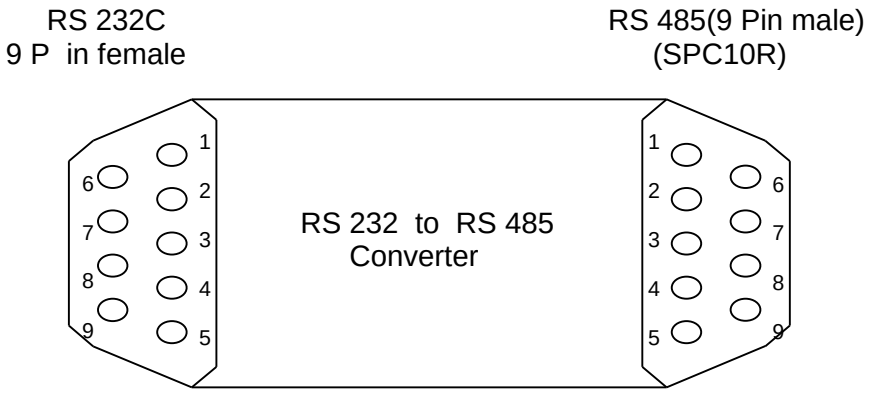
Converter is user configurable. The Hyper Terminal of a PC connected to port 2 can be used to enter the configuration for IP address (IP address of the Converter itself), Remote IP address (IP Address of the SAMSUNG Protocol Slave, to which the Converter wants to establish a connection), Gateway address,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

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



3 Converter Description

The converter is designed to sit on a Din rail.
The pin description for the 9 pin D connector is shown below.



RS 232C 9 Pin Female Connector	
Pin #	Description
2	Tx
3	Rx
5	Ground
rest	No connection

RS 485 Male Connector	
Pin #	Description
6	TR -
7	TR +
5	Ground
9	Vcc(+5V)
rest	No connection

4 Overview of Communication Process

This section provides an overview of the communication processes that takes place within the SAMSUNG PLC slave, the MODBUS TCP master and the Protocol converter.

The Protocol converter begins a series of events upon receiving a valid MODBUS TCP query from the MODBUS TCPmaster. Currently, the valid query is Read Registers. The converter will ignore any queries other than those stated above.

On power up, the converter monitors the MODBUS TCP port continuously for queries. The converter will only respond to queries with the function codes 3 which correspond to the query mentioned above.

Upon receipt of a valid query, the converter will convert the MODBUS TCP query to a SAMSUNG Protocol command. After which, it will send out the command and waits for a response from the SAMSUNG PLC 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 SAMSUNG PLC monitor responds, is 1000 milliseconds If no response is

received from the SAMSUNG PLC slave, the converter will abort the communication process of the current query and wait for a new MODBUS TCP query. The whole communication process of the current query could be finished before the MODBUS TCP master send next query.

If an error- free response is received from the SAMSUNG PLC slave, the converter will convert it to a MODBUS response. The converter then sends this response back to the MODBUS TCP master.

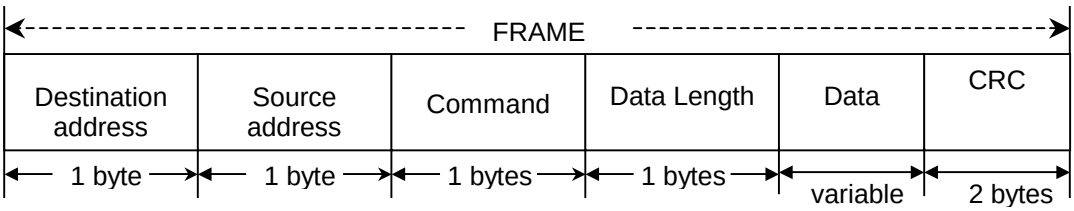
For the communication ports of the converter, the converter will do the error check first after a packet is received from SAMSUNG PLC. The checksum byte of SAMSUNG Protocol response are used for error check. If a response from SAMSUNG PLC slave has errors in its checksum, the converter will ignore this response and wait for next query from the MODBUS TCP master. The converter will not re-transmitt the SAMSUNG Protocol commands to the SAMSUNG PLC slave and send response to the MODBUS TCP master if no error-free response is received from the SAMSUNG Protocol monitors. If a query with errors is received, the converter will ignore this query and wait for next query.

If no response is received from the converter after the MODBUS TCP master sent the query, check the converter first. If the Tx LED of the SAMSUNG PLC port still flash after a query is received on the MODBUS port, that means the converter work well and the SAMSUNG PLC monitor should be checked. Otherwise, power off the converter and power up again. The converter will start the communication process described above automatically.

5 Description of SAMSUNG PROTOCOL

The PLC is the slave device and the converter issues commands as a master. Upon receipt of a valid frame (with no errors), the PLC responds with corresponding data.

This section describes the various message formats and definition of the Samsung PLC protocol used in protocol converter. The message fields for a typical message are shown below:



Destination address: The address sending to. Range over 0 to 255. 0xE1 means sent to the master. 1-255 other than 0xE1 means send to slave. No broadcast message can be sent to all the devices because the address in the frame must be defined for a unique device.

Source address: The address sending from. Range over 0 to 255. 0xE1 means sent to the master. 1-255 other than 0xE1 means send to slave.

Command: this command instructs the receiver what action must be performed.

Data Length: Range over 0 to 255. This lists the data's total number of bytes from the Comm. From after Data Length to before CRC. A maximum of 250 data bytes are allowed.

Data: For polling number of data, it is increasing from 1 to number of register with 0x40 after every number. For example to poll for 4 register would be 0x01, 0x40, 0x02, 0x40, 0x03, 0x40, 0x04, 0x40. If no data, just 1 byte 0x00 will do.

CRC: Cyclic Redundancy Check (CRC-16) Calculation

The pseudo code for calculation of the CRC-16 is given below.

Preset byte count for data to be sent.
Initialize the 16-bit remainder (CRC) register to all ones.
XOR the first 8-bit data byte with the high order byte of the 16-bit CRC register. The result is the current CRC.

INIT SHIFT: Initialize the shift counter to 0.

SHIFT: Shift the current CRC register 1 bit to the right.
Increment shift count.
Is the bit shifted out to the right (flag) a 1 or a 0?
If it is a 1, XOR the generating polynomial with the current CRC.
If it is a 0, continue.
Is shift counter equal to 8?
If NO, return to SHIFT.
If YES, increment byte count.
Is byte count greater that the data length?
If NO, XOR the next 8-bit data byte with the current CRC and go to INIT SHIFT.
If YES, add current CRC to end of data message for transmission and exit.

6 Serial ports configuration in the Protocol converter

The converter is designed to sit on a 35 mm DIN Rail. There are two serial ports on the converter .

Port 1: SAMSUNG PROTOCOL port.
Port 2 : Configuration port
LAN : Ethernet port.

On power up, Converter enters into Configuration mode and requests for the set up configuration of the SAMSUNG PLC port through the port 2. These requests can be viewed through the Hyper-terminal of the PC connected to port 2 of the Converter. Hyper-terminal should be connected at 19200 baud, 8 databit ,1 stop bit and parity None. HyperTerminal displays the existing configuration

IP address = 090.000.000.190
(IP address of the Converter)

Remote IP address =000.000.000.000
Leave the Remote IP address at its factory setting (0.0.0.0).

Net-mask = 255.255.255.000
Gateway = 0.0.0.0

Port 1
Baud-rate = 9600 baud
data-bit = 8
parity = None

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)
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")

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".)

Once the user finishes the configuration, the Converter will prompt again 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.

Converter will take the last entered values for setting up the SAMSUNG PLC port and enters into communication mode.

During the communication mode, for any reason if the user wants to change any configuration of the Ethernet port or SAMSUNG Protocol port, A power off and Power up of the Converter is required. The Converter will start the communication process automatically. During normal operation, If there is a power failure and recovery, the Converter will automatically start-up and will use the last set communication parameters to establish communication automatically.