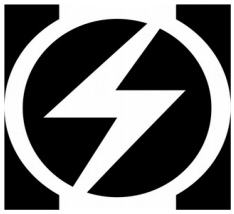
OSHMI



Open Substation HMI

Modbus TCP Driver

Configuration Manual

Version 1.09

Introduction

This driver is based on **libmodbus** protocol stack from:

http://libmodbus.org/

Using this driver it is possible to connect OSHMI to “n” PLC’s, meters, RTU’s or other generic IED’s that can support Modbus/ TCP protocol.

This driver is not a gateway, it only directs data to OSHMI.

Configuration

The driver *modbus.exe* file is installed in *c:\oshmi\bin*. This executable must be configured to run in *mon_proc.ini* or be executed manually.

The driver config file is *c:\oshmi\conf\modbus_queue.ini*. This file has the following format:

```
;[I104M]
; UDP Port to listen I104M transport messages (commands)
; Default=8098 (use 0 to disable commands)
;UDP_PORT_LISTEN=8098

; Define a Modbus slave IED
[RTU_1]
; IP ADDRESS
IP=127.0.0.1
; TCP PORT
PORT=502
; Slave selector (can be commented if a gateway is not used)
; SLAVE_ID=1
; Response timeout in ms
TIMEOUT=1000
; delay after each interrogation (in milliseconds)
DELAY=1000
; read holding registers (FC=0x03): mb_address, number of registers, OSHMI_address of 1st
; Analog 16bit values are converted to float and divided by 32767.0 (1FFFh -> 1.0),
;   so use kconv1=32767.0 in point_list.txt to restore the value as decimal from modbus
;   or scale the values as needed using kconv1(multiplier) and kconv2(offset).
READHR_1=40001 5 1000
READHR_2=40010 10 2000
; read each pair of consecutive holding registers (FC=0x03) as floats: mb_address, number of floats,
OSHMI_address of 1st
READHR_FLOAT_1=60001 5 11000
READHR_FLOAT_2=60010 10 12000
; read each pair of consecutive holding registers (FC=0x03) as longs: mb_address, number of floats,
OSHMI_address of 1st
READHR_LONG_1=60050 1 13000
READHR_LONG_2=60052 10 14000
; read input registers (FC=0x04): mb_address, number of registers, OSHMI_address of 1st
; Analog 16bit values are converted to float and divided by 32767.0 (1FFFh -> 1.0),
;   so use kconv1=32767.0 in point_list.txt to restore the value as decimal from modbus
;   or scale the values as needed using kconv1(multiplier) and kconv2(offset).
READIR_1=30001 5 3000
READIR_2=30006 1 3006
; read input status (FC=0x02): mb_address, number of bits, OSHMI_address of 1st
READIS_1=10001 32 5000
; read coils status (FC=0x01): mb_address, number of bits, OSHMI_address of 1st
READCS_1=1 32 8000

; read holding registers (FC=0x03) as bistring: mb_address, number of registers, OSHMI_address of 1st
; Each register (16bit) translates to 16 consecutive digital points of OSHMI
; If read more than one register it must be created blocks of 16 digital points in point_list.txt
; All digital points must be consecutive
READHR_BITSTR_1=0 1 9000

; Define a second Modbus slave IED
[RTU_2]
IP=127.0.0.1
PORT=503
SLAVE_ID=2
TIMEOUT=500
; delay after each interrogation (in milliseconds)
DELAY=100
; read holding registers (FC=0x03): mb_address, number of registers, OSHMI_address of 1st
READHR_1=40001 5 11000
READHR_2=40010 10 12000
; read input registers (FC=0x04): mb_address, number of registers, OSHMI_address of 1st
READIR_1=30001 5 13000
READIR_2=30006 1 13006
; read input status (FC=0x02): mb_address, number of input bits, OSHMI_address of 1st
READIS_1=10001 32 15000
; read coils status (FC=0x01): mb_address, number of input bits, OSHMI_address of 1st
READCS_1=1 32 18000
…
; when there are just 2 parameters per line, OSHMI address will be the same as mb_address
```

In the *point_list.txt* file must be configured point numbers, addresses as OSHMI_address (or mb_address when OSHMI_address omitted), RTU column as the RTU number from modbus_queue and conversion factors (*kconv's*) as needed.

Analog values from Modbus are sent to OSHMI emulating an IEC104 type 9 format (normalized value). Integer 16 bit values are divided by 32767 and converted to float (the value 32767=7FFFh represents the float value 1.0). So to restore the value as Modbus 16 bit integer you must use *kconv1*=32767 and *kconv2*=0 in point_list.txt. Use *kconv1*(multiplier) and *kconv2*(offset) to adjust

the scale to your measurement as needed.

Commands are only programmed in the *c:\oshmi\conf\point_list.txt* as follows:

ADDR column = Modbus object address.

RTU column = sequential number (1...N) of RTU from *modbus_queue.ini.*

KCONV1 column = bit number (0-15) for holding register command as bitstring

ASDU column must be configured according to the command type:

Command type	***Modbus***	***ASDU***
Binary command	Single Coil, FC=0x05	45
Binary double command	Multiple Coils, FC=0x0F	46
Analog output, normalized 16 bits	Preset Single Register, FC=0x06	48
Analog output, scaled 16 bits	Preset Single Register, FC=0x06	49
Binary command as bitstring	Holding Register as bitstring, FC=0X06	64

The “Binary command as bitstring” (ASDU 64) will translate in Modbus to a holding register read (16bit register) in specified address, next only the bit numbered by KCONV1 will be masked and set/reset by the command value, then the result will be written to the same holding register. So the other 15 bits will preserve the current values.

For Modbus commands, to write to address 0 (zero) it is necessary to put in the column ADDR of point_list.txt the value “-1” (minus one). This is necessary because the value 0 (zero) in this column means that the address is the same as point number.

Sample *point_list.txt* file configuration:

```
VERSION 3
POINT_NUMB ADDR         ID      TYP MESSAGE ALM  EQ INF OR UN RTU ASDU KCONV1     KCONV2   SUPCMD DC PR INIVAL "SUBST~BAY~DESCRIPTION"
  1000   0 MODBUS_RTU1_HR40001   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40001"
  1001   0 MODBUS_RTU1_HR40002   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40002"
  1002   0 MODBUS_RTU1_HR40003   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40003"
  1003   0 MODBUS_RTU1_HR40004   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40004"
  1004   0 MODBUS_RTU1_HR40005   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40005"
  2000   0 MODBUS_RTU1_HR40010   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40010"
  2001   0 MODBUS_RTU1_HR40011   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40011"
  2002   0 MODBUS_RTU1_HR40012   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40012"
  2003   0 MODBUS_RTU1_HR40013   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40013"
  2004   0 MODBUS_RTU1_HR40014   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40014"
  2005   0 MODBUS_RTU1_HR40015   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40015"
  2006   0 MODBUS_RTU1_HR40016   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40016"
  2007   0 MODBUS_RTU1_HR40017   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40017"
  2008   0 MODBUS_RTU1_HR40018   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40018"
  2009   0 MODBUS_RTU1_HR40019   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
40019"
  3000   0 MODBUS_RTU1_IR30001   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
30001"
  3001   0 MODBUS_RTU1_IR30002   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
30002"
  3002   0 MODBUS_RTU1_IR30003   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
30003"
  3003   0 MODBUS_RTU1_IR30004   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
30004"
  3004   0 MODBUS_RTU1_IR30005   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
30005"
  3006   0 MODBUS_RTU1_IR30006   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Holding Register
```

```
30006"
  5000   0 MODBUS_RTU1_IS10001   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10001"
  5001   0 MODBUS_RTU1_IS10002   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10002"
  5002   0 MODBUS_RTU1_IS10003   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10003"
  5003   0 MODBUS_RTU1_IS10004   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10004"
  5004   0 MODBUS_RTU1_IS10005   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10005"
  5005   0 MODBUS_RTU1_IS10006   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10006"
  5006   0 MODBUS_RTU1_IS10007   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10007"
  5007   0 MODBUS_RTU1_IS10008   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10008"
  5008   0 MODBUS_RTU1_IS10009   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10009"
  5009   0 MODBUS_RTU1_IS10010   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10010"
  5010   0 MODBUS_RTU1_IS10011   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10011"
  5011   0 MODBUS_RTU1_IS10012   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10012"
  5012   0 MODBUS_RTU1_IS10013   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10013"
  5013   0 MODBUS_RTU1_IS10014   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10014"
  5014   0 MODBUS_RTU1_IS10015   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10015"
  5015   0 MODBUS_RTU1_IS10016   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10016"
  5016   0 MODBUS_RTU1_IS10017   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10017"
  5017   0 MODBUS_RTU1_IS10018   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10018"
  5018   0 MODBUS_RTU1_IS10019   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10019"
  5019   0 MODBUS_RTU1_IS10020   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10020"
  5020   0 MODBUS_RTU1_IS10021   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10021"
  5021   0 MODBUS_RTU1_IS10022   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10022"
  5022   0 MODBUS_RTU1_IS10023   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10023"
  5023   0 MODBUS_RTU1_IS10024   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10024"
  5024   0 MODBUS_RTU1_IS10025   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10025"
  5025   0 MODBUS_RTU1_IS10026   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10026"
  5026   0 MODBUS_RTU1_IS10027   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10027"
  5027   0 MODBUS_RTU1_IS10028   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10028"
  5028   0 MODBUS_RTU1_IS10029   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10029"
  5029   0 MODBUS_RTU1_IS10030   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10030"
  5030   0 MODBUS_RTU1_IS10031   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10031"
  5031   0 MODBUS_RTU1_IS10032   D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Input Status
10032"
  8000   0 MODBUS_RTU1_CS01      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 01"
  8001   0 MODBUS_RTU1_CS02      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 02"
  8002   0 MODBUS_RTU1_CS03      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 03"
  8003   0 MODBUS_RTU1_CS04      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 04"
  8004   0 MODBUS_RTU1_CS05      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 05"
  8005   0 MODBUS_RTU1_CS06      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 06"
  8006   0 MODBUS_RTU1_CS07      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 07"
  8007   0 MODBUS_RTU1_CS08      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 08"
  8008   0 MODBUS_RTU1_CS09      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 09"
  8009   0 MODBUS_RTU1_CS10      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 10"
  8010   0 MODBUS_RTU1_CS11      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 11"
  8011   0 MODBUS_RTU1_CS12      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 12"
  8012   0 MODBUS_RTU1_CS13      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 13"
  8013   0 MODBUS_RTU1_CS14      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 14"
  8014   0 MODBUS_RTU1_CS15      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 15"
  8015   0 MODBUS_RTU1_CS16      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 16"
  8016   0 MODBUS_RTU1_CS17      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 17"
  8017   0 MODBUS_RTU1_CS18      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 18"
  8018   0 MODBUS_RTU1_CS19      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 19"
  8019   0 MODBUS_RTU1_CS20      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 20"
  8020   0 MODBUS_RTU1_CS21      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 21"
  8021   0 MODBUS_RTU1_CS22      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 22"
  8022   0 MODBUS_RTU1_CS23      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 23"
  8023   0 MODBUS_RTU1_CS24      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 24"
  8024   0 MODBUS_RTU1_CS25      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 25"
  8025   0 MODBUS_RTU1_CS26      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 26"
  8026   0 MODBUS_RTU1_CS27      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 27"
  8027   0 MODBUS_RTU1_CS28      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 28"
  8028   0 MODBUS_RTU1_CS29      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 29"
  8029   0 MODBUS_RTU1_CS30      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 30"
  8030   0 MODBUS_RTU1_CS31      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 31"
  8031   0 MODBUS_RTU1_CS32      D OFF/ON     0   0   0  0 E   1  0    1.000000   0.000000      0  1 0    1.00 "Modbus~RTU_1~Coil Status 32"
 11000   0 MODBUS_RTU2_HR40001   A Unit       0   0   0  0 E   1  0    1.000000   0.000000      0  1 1    1.00 "Modbus~RTU_1~Coil Status 32"
... other entries from RTU2 … (this is not a valid line, just a comment)
::::::::::::::Commands:::::::::::::: (this is not a valid line, just a comment)
 90000 7000 MODBUS_RTU1_FSC_7000 D Open/Close  0  0   0  7 E   1 45    1.000000   0.000000   5000  2 1    0.00 "Modbus~RTU_1~Output Single
Coil 7000"
 90001 7005 MODBUS_RTU1_PSR_7005 D Unit        0  0   0  7 E   1 48    1.000000   0.000000  40000  2 1    0.00 "Modbus~RTU_1~Output Single
Reg 7000"
 90002 7000 MODBUS_RTU2_FSC_7000 D Open/Close  0  0   0  7 E   2 45    1.000000   0.000000   5000  2 1    0.00 "Modbus~RTU_2~Output Single
Coil 7000"
 90003 7005 MODBUS_RTU2_PSR_7005 D Unit        0  0   0  7 E   2 48    1.000000   0.000000  40000  2 1    0.00 "Modbus~RTU_2~Output Single
Reg 7000"
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