

# MODBUS

## USER'S MANUAL

### FUSION SCR POWER CONTROLLERS



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## PROPRIETARY DATA

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# 1. OVERVIEW

## 1.1 Modbus Protocol

Most FUSION parameters are 16 bit integer values. However, there are some parameters such as MP 245 Load Power Zone 1 which use two 16-bit registers for the value. MP 245 is the HI word, MP 246 is the LO word, forming a 32-bit value.

Some values may have digits to the right of the decimal point. The decimal point, or resolution, will not be part of the message. Rather a parameter with one decimal place will be scaled x10, two decimal places scaled x100.

Example: 5.00 must be scaled and sent as 500 and will also need to be scaled when read using a “scale-factor” of 100.

Static IP addressing is recommended for industrial control systems when using Modbus TCP. Use of DHCP may prevent reliable connection to the controller and/or other connected devices.



Block reads of up to a maximum of 24 parameters are permissible with a recommended max polling rate of 4 Hz.

## FUSION Parameter List

A complete FUSION parameter list is available for download at the Control Concepts website under any of the Fusion digital product pages.

The list includes setup parameters 1 to 199 and monitor parameters 200 to 389.

## 1.2 Parameter Read

- Modbus function 0x03 “Read Holding Registers”
- Allows reading of multiple parameters
- Maximum parameter limit of 24 registers per message
- “Long Word” (32 bit) parameter values are returned using two (2) consecutive integer slots

## 1.3 Parameter Write

- Modbus function 0x06 “Preset Single Register”
- Limited to one parameter that is integer-only (no larger values)

## 1.4 Parameter Write, Multiple

- Modbus function 0x10 [16] “Preset Multiple Registers”
- Allows setting multiple parameters
- Maximum parameter limit of 24 registers per message
- Use two consecutive integer slots in the message to send “Long Word” (32 bit) values to the parameters that require a 32-bit value (MSW first)



FUSION controllers contain nonvolatile EEPROMs, and writing too frequently to an individual parameter may wear out the EEPROM and cause the controller to fail.

Control Concepts recommends allowing an average of five minutes between consecutive writes to an individual parameter within the range of 1-199, with the exception of digital setpoint commands 100-107 and the digital system command 129. Digital setpoints and digital system command may be written continually.

## 1.5 Read Alarm Status, or Read System Status

- Modbus Function 0x07 “Read Exception Status”
- Response contains a single byte field that may be used to return 8 status flags to indicate the status of the FUSION controller.

## 2. FUSION MODBUS RTU WIRING (-S Digital Communication Option)

FUSION power controllers implement the 2W-Modbus standard. **NOTE: Each FUSION RS-485 module already contains a 10k Ohm pull-up and pull-down resistor.**

If a RJ45 ( or a mini-DIN or a D-Shell) connector is used on an equipment for a MODBUS mechanical interface, a shielded female connector must be chosen. Then the cable-end must have a shielded male connector.

Connectors pin-out for 2W-MODBUS

Source: Modbus.org

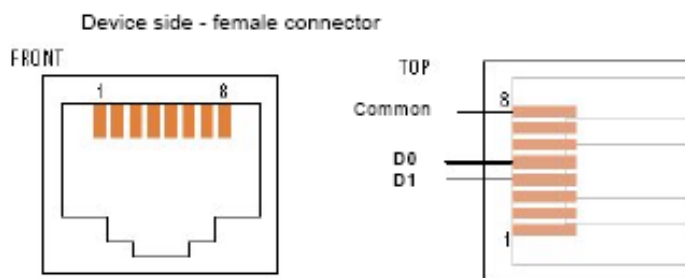


Figure 24: 2W- MODBUS on RJ45 connector ( required pin-out )

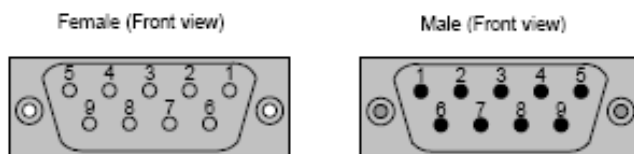


Figure 25: D-shell 9-pin connector

Screw type connectors can also be used.

If an RJ45 or a 9-pin D-shell connector is used for a standard MODBUS device, the pinouts hereafter must be respected for every implemented circuit.

### 2W-MODBUS RJ45 and 9-pin D-shell Pinouts

| Pin on RJ45 | Pin on D9-shell | Level of requirement | IDv Circuit | ITr Circuit | EIA/TIA-485 name | Description for IDv                                                     |
|-------------|-----------------|----------------------|-------------|-------------|------------------|-------------------------------------------------------------------------|
| 3           | 3               | optional             | PMC         | --          | --               | Port Mode Control                                                       |
| 4           | 5               | required             | D1          | D1          | B/B'             | Transceiver terminal 1, V1 Voltage ( V1 > V0 for binary 1 [OFF] state ) |
| 5           | 9               | required             | D0          | D0          | A/A'             | Transceiver terminal 0, V0 Voltage ( V0 > V1 for binary 0 [ON] state )  |
| 7           | 2               | recommended          | VP          | --          | --               | Positive 5...24 V D.C. Power Supply                                     |
| 8           | 1               | required             | Common      | Common      | C/C'             | Signal and Power Supply Common                                          |

MODBUS over serial line specification and implementation guide V1.0

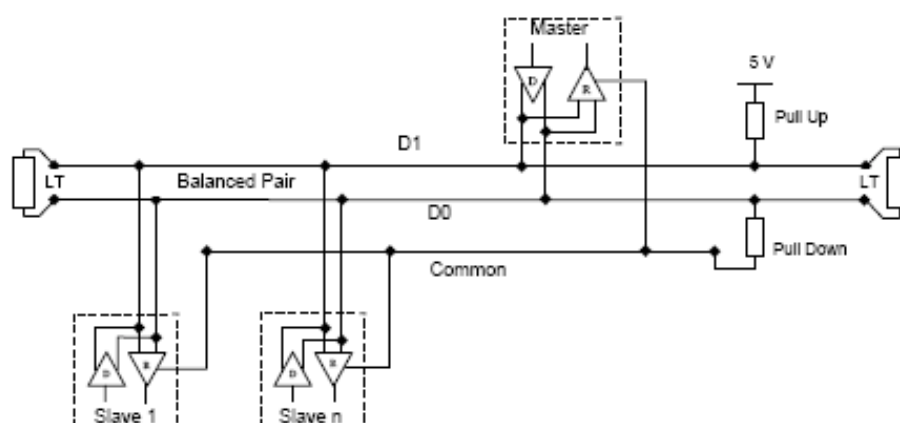
Source: Modbus.org

### Two-Wire MODBUS Definition

A MODBUS solution over serial line should implement a "Two-Wire" electrical interface in accordance with EIA/TIA-485 standard.

On such a 2W-bus, at any time one driver only has the right for transmitting.

In fact a third conductor must also interconnect all the devices of the bus : the common.



### 2W-MODBUS Circuits Definition

| Required Circuits |        | For device | Required on device | EIA/TIA-485 name | Description                                                             |
|-------------------|--------|------------|--------------------|------------------|-------------------------------------------------------------------------|
| on ITr            | on IDv |            |                    |                  |                                                                         |
| D1                | D1     | I/O        | X                  | B/B'             | Transceiver terminal 1, V1 Voltage ( V1 > V0 for binary 1 [OFF] state ) |
| D0                | D0     | I/O        | X                  | A/A'             | Transceiver terminal 0, V0 Voltage ( V0 > V1 for binary 0 [ON] state )  |
| Common            | Common | --         | X                  | C/C'             | Signal and optional Power Supply Common                                 |

#### Notes :

- For Line Termination (LT), Pull Up and Pull Down resistors, please refer to section "Multipoint System requirements".
- D0, D1, and Common circuit names must be used in the documentation related to the device and the Tap ( User Guide, Cabling Guide, ... ) to facilitate interoperability.
- Optional electrical interfaces may be added, for example :
  - Power Supply : 5...24 V D.C.
  - Port mode control : PMC circuit ( TTL compatible ). When needed, port mode may be controlled either by this external circuit and/or by another way ( a switch on the device for example ). In the first case while an open circuit PMC will ask for the 2W-MODBUS mode, a Low level on PMC will switch the port into 4W-MODBUS or RS232-MODBUS Mode, depending on the implementation.

### 3. FUSION MODBUS TCP WIRING (-E Digital Communication Option)



| Ethernet 10BaseT (Twisted Pair) |             |               |
|---------------------------------|-------------|---------------|
| Pin #                           | Signal Name | Function      |
| 1                               | TD+         | Transmit Data |
| 2                               | TD-         | Transmit Data |
| 3                               | RD+         | Receive Data  |
| 4                               | NC          | No Connection |
| 5                               | NC          | No Connection |
| 6                               | RD-         | Receive Data  |
| 7                               | NC          | No Connection |
| 8                               | NC          | No Connection |

FUSION with Modbus TCP uses a standard Ethernet pin-out shown above. We recommend using at least Cat 5e shielded cable between the controller and other Ethernet-enabled devices.

### 4. FUSION CONNECTION SETTINGS

Use the Control Panel software and USB connection to setup the Modbus TCP settings for the power controller. After connecting the power controller to Control Panel, select the device and open the “Communication” category as shown in Figure 4.00.

**COMMUNICATION**  
 Fieldbus module, CCI Link, and display setup

**TCP/IP**

IP Address

IP Address (Comm. Module)

REFRESH IP ADDRESS

**Modbus TCP**

Communications Watchdog  s

Communications Timer  s

**Network Timeout**

Network Timeout Action
 

Communications Heartbeat Timeout
 

Continue ☐ Stop ☐

Comm. Heartbeat Timer

**CCI Link**

Tag

**Display**

Display Auto Scroll ☒ Enabled

DEFAULT SCREEN LIST
 CUSTOM SCREEN LIST

**Figure 4.00: Use Control Panel to adjust the Modbus RTU / TCP settings for the power controller (settings for Modbus TCP are pictured)**

## 4.1 RS-485 Settings

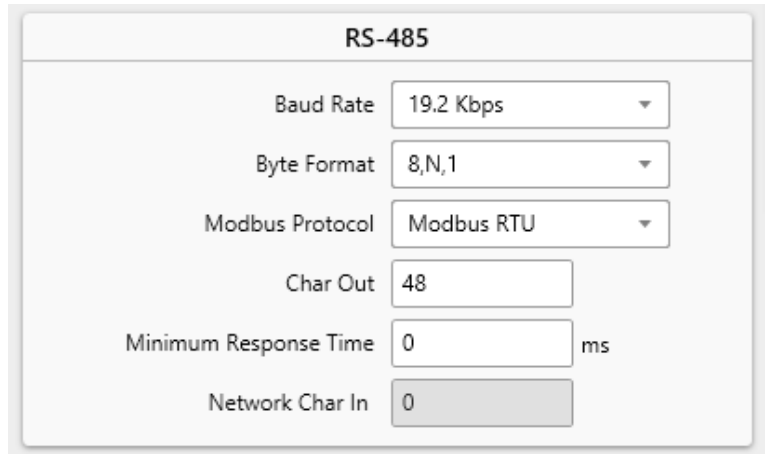
### Comm Address [SP 120]

Default Value: 1

The address of the Modbus device on the network.

### RS-485 Baud Rate [SP 121]

| Setting                       | Description           |
|-------------------------------|-----------------------|
| <b>9600 bps</b>               | 9600 bits per second  |
| <b>19200 bps</b><br>[Default] | 19200 bits per second |



**Figure 4.01: Set the Modbus RTU address using Control Panel**

### RS-485 Byte Format [SP 122]

| Setting                     | Description                          |
|-----------------------------|--------------------------------------|
| <b>N, 8, 1</b><br>[Default] | No parity, 8 data bits, 1 stop bit   |
| <b>E, 8, 1</b>              | Even parity, 8 data bits, 1 stop bit |

### Modbus Protocol [SP 123]

| Setting                        | Description              |
|--------------------------------|--------------------------|
| <b>Modbus RTU</b><br>[Default] | 8 bit binary protocol    |
| <b>Modbus ASCII</b>            | ASCII character protocol |

Modbus ASCII protocol is included from troubleshooting only, and therefore has limited capabilities.

### RS-485 Char Out

This parameter is used for diagnostic purposes to verify the output communications from the RS-485 module are correct. When updating this parameter, the device will send the inputted byte out the RS-485 module. Use an external system to verify the value received is correct.

### RS-485 Minimum Response Time [SP 130]

Used to delay the response of the RS-485 module, so that it does not respond too quickly. The communications module will not respond faster than the value set, but it may take longer to respond.

### RS-485 Network Char In [MP 324]

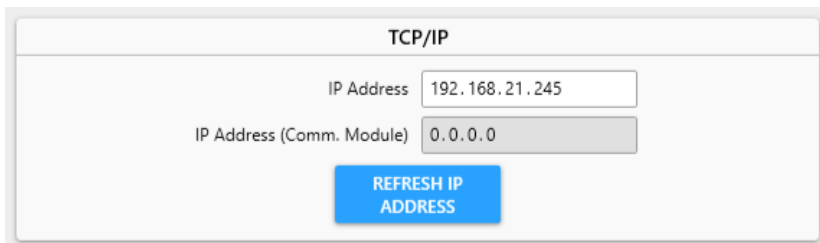
This parameter is used for diagnostic purposes to verify the input communications into the RS-485 module are correct. Send a single RS-485 byte to the device and verify that the correct byte was received using this monitor parameter.

## 4.2 TCP/IP Settings

The “IP Address” field [SP 126] displays the IP Address stored in the power controller. Enter the desired IP Address into this field, and press the “Enter” key to write the IP Address to the device.

The “IP Address (Comm. Module)” field [MP 1915] displays the IP Address as read from the Fieldbus communications card.

Click “REFRESH IP ADDRESS” to read the IP Address from the communications module and update the “IP Address (Comm. Module)” field. The “IP Address (Comm. Module)” value should match the “IP Address (Comm. Module)” value. If these values do not match, try changing the “IP Address” value and see if the “IP Address (Comm. Module)” values updates, or contact CCI technical support.



**Figure 4.02: Update and view the IP Address in the “TCP/IP” category in Control Panel**



FUSION may take up to two minutes to set the IP address. You can verify the IP address has been set by scrolling the display to the IP Address screen.

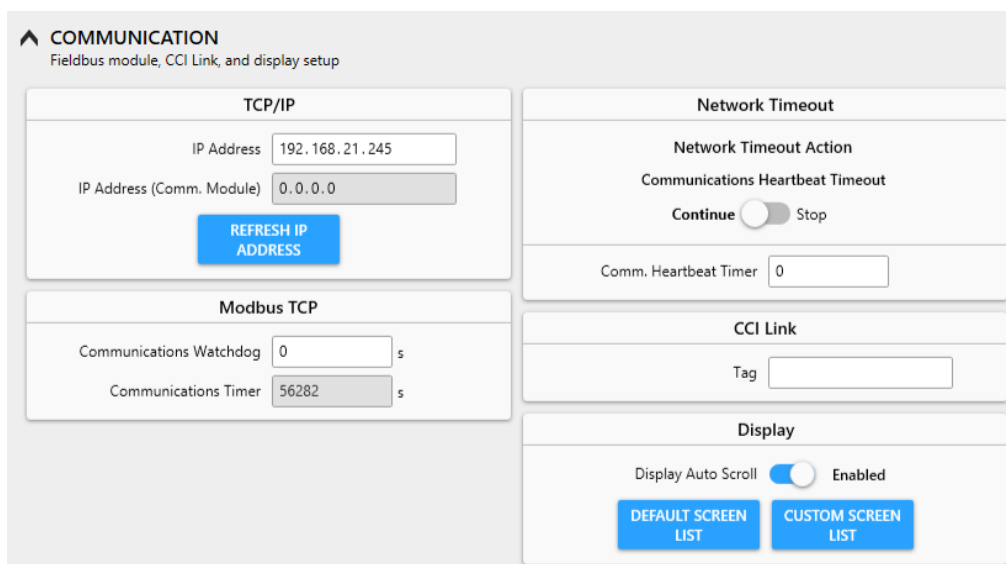
## 4.3 Modbus TCP Settings

### **Communications Watchdog [SP 135]**

When the first message to the controller’s address is received, the communications watchdog timer starts. Subsequent messages reset the timer. The minimum setting is 15 seconds and a maximum of 65535 seconds. When this timer expires, the communication module’s configuration is interrogated by the controller to verify proper operation. If the module IP address does not match the address kept locally in the controller, the module is reprogrammed with the correct address.

### **Communications Timer [MP 370]**

Displays the current value of the Communications Watchdog parameter [SP 135].



**Figure 4.03: Adjust the Modbus TCP settings using Control Panel**

## 4.4 Network Timeout

### **Communications Heartbeat Timer [SP 125]**

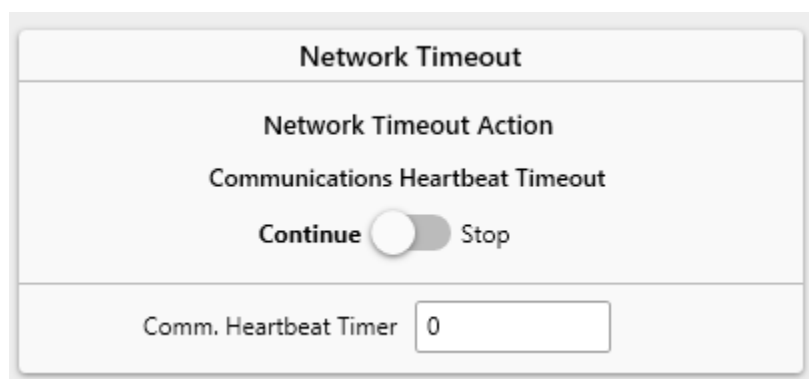
When the first message to the controller's address is received, the heartbeat timer starts. Subsequent messages reset the timer. If the heartbeat timer expires, the Network Timeout Action [SP 128] is executed. A notification of the communication timeout will be indicated on the display of the controller. When the timer is timed out, the next valid message will reset the timer. When the heartbeat time is set to 0 seconds, the timer is disabled. See Network Timeout Action below for more information on how the controller behaves when the network timeouts.

### **Network Timeout Action [SP 128]**

The network timeout action specifies the behavior that should occur when the device loses communication with the PLC. If "Communications Heartbeat Time" is set to "Stop", the device will enter an inhibit state and stop outputting during a timeout event. If "Comm. Heartbeat Time" is set to "Continue", the device will continue operating normally, and a warning alarm will activate.

An additional option is to have the controller notify an external signaling device, such as a light tower or alarm system, when a network timeout occurs. To do so, locate Relay 1 and Relay 2 alarms in the "Alarm Relays" category in Control Panel. Check "Communications Error" in the "System Relay Mask" section to receive notifications in the event of a digital communication failure.

To restore communication when a network timeout occurs and the controller enters the warning or inhibit state (based on the Network Timeout Action setting), address the problem and confirm communication between the PLC and the controller. After communication has been reestablished, cycle run/reset on P1 to clear the fault. These two steps must occur in sequence.



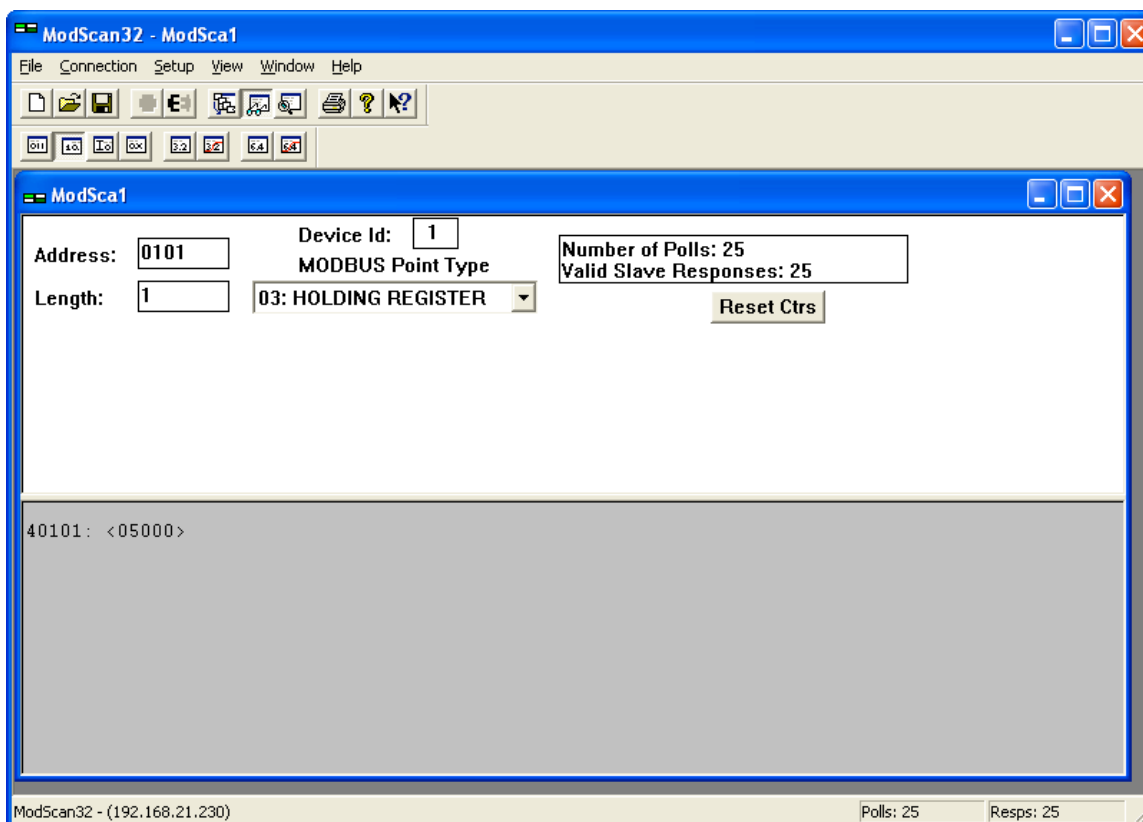
**Figure 4.04: Select "Stop" for the "Communications Heartbeat Timeout" to have the device stop outputting when a network timeout occurs.**

## 5. TESTING FUSION MODBUS-TCP WITH MODSCAN32

Located at <http://www.win-tech.com/html/modscan32.htm>

Unzip modscan23.zip

1. Run modscan32.exe
2. Enter in product registration
3. Click Connection->connect
4. Enter in Remote Modbus TCP server, IP address shown on fusion display, server port 502
5. Enter in Address=101 (equals parameter 100 Digital Setpoint 1), length=1, 03:Holding register
6. Click Setup->Extended->Preset registers
7. Click 5000 for 50 Volt setpoint and click update
8. Should read 5000 from register and see 50V on display for "Dig Setpoint 1"

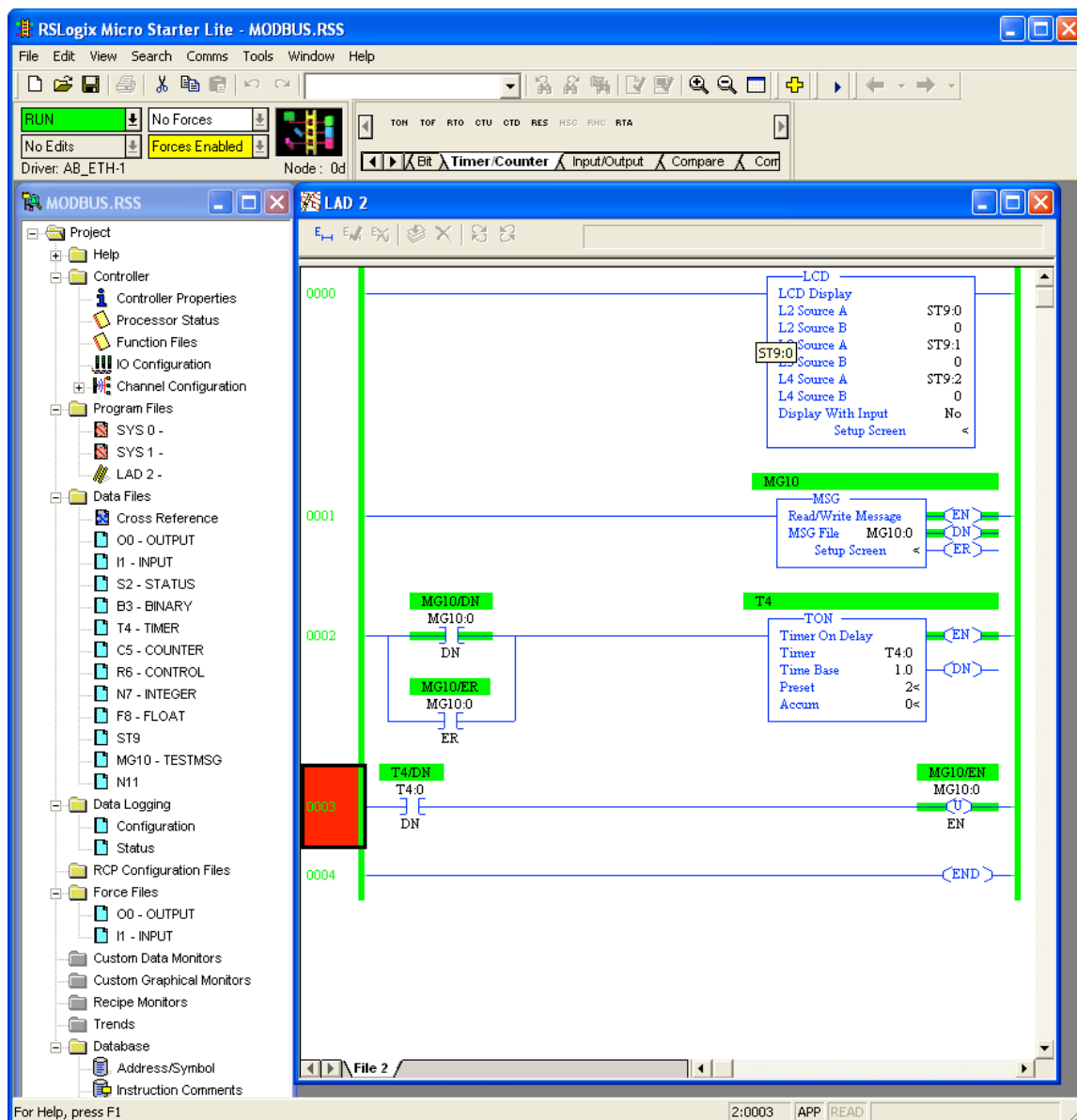


## 6. FUSION MODBUS WITH MICROLOGIX 1100 PLC

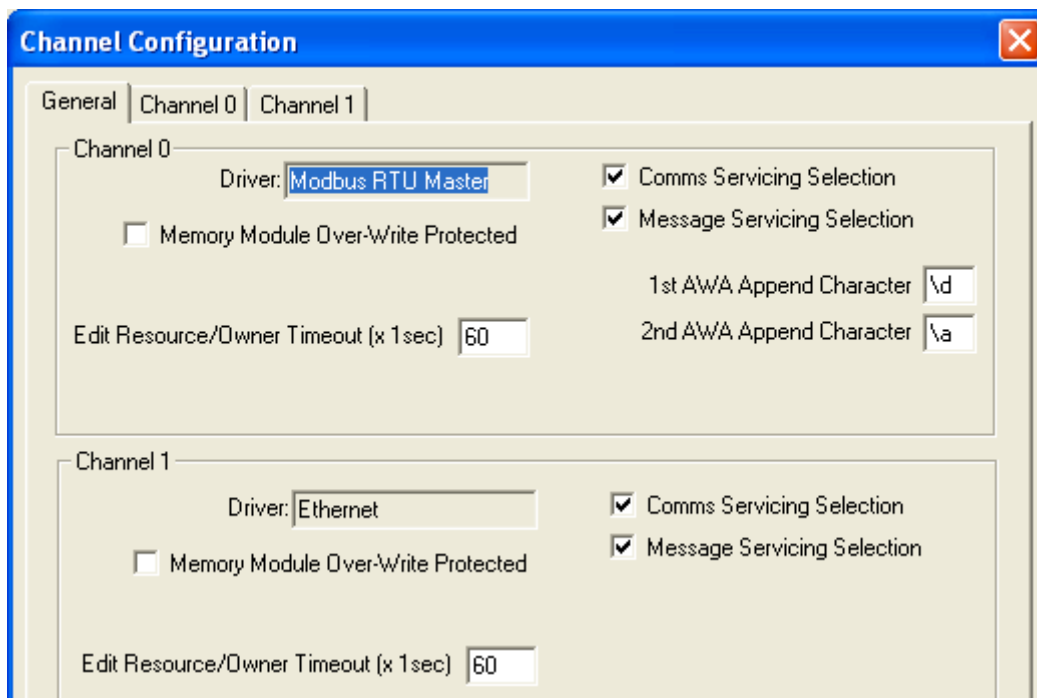
PLC: MicroLogix 1100 with Modbus cable 1763-NC01

PLC software: RSLogix Micro Starter Lite (free)

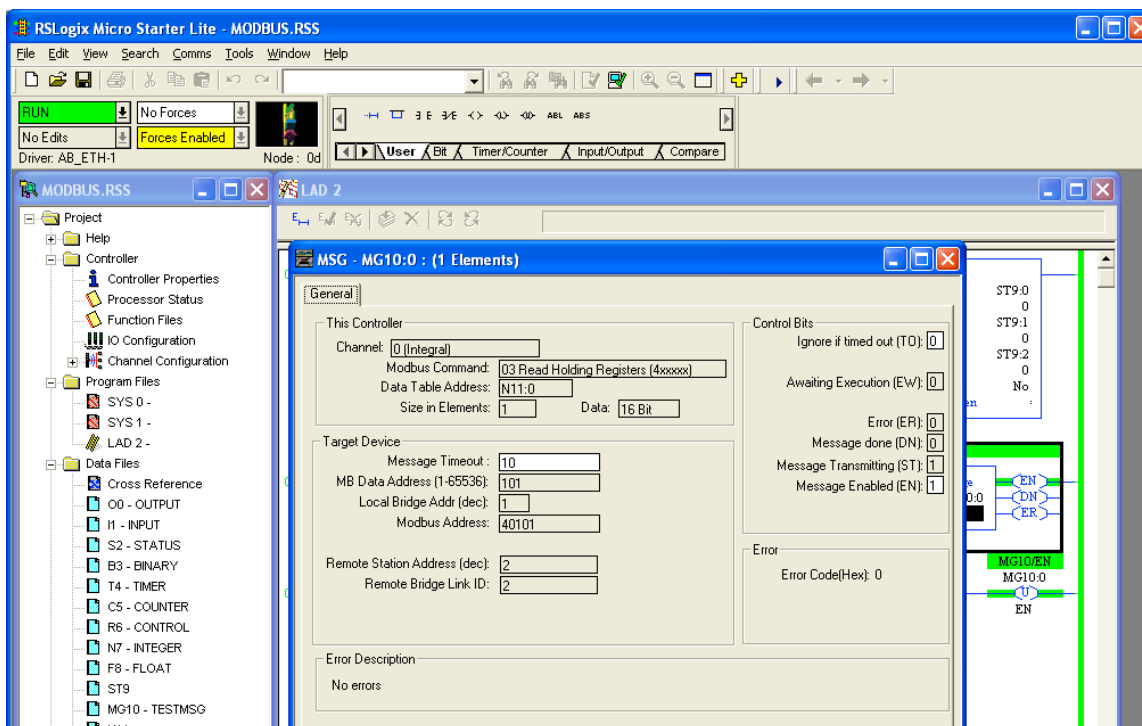
1) Enter the PLC commands listed below. The timer is set to poll the Fusion device once every two seconds.



2) Set the channel to be Modbus RTU Master and then set the proper Baud rate.



3) Set the Modbus message to be 101 (read digital setpoint 1)



4) Program PLC and set it to run. Check that the proper data appears in the Data Table Address and that it matches FUSION display for “Dig Setpoint 1.” The Modbus register will read 100 times the value shown on display.

## 6. FUSION MODBUS TCP WITH SIEMENS CPU-315-2 PN/DP PLC

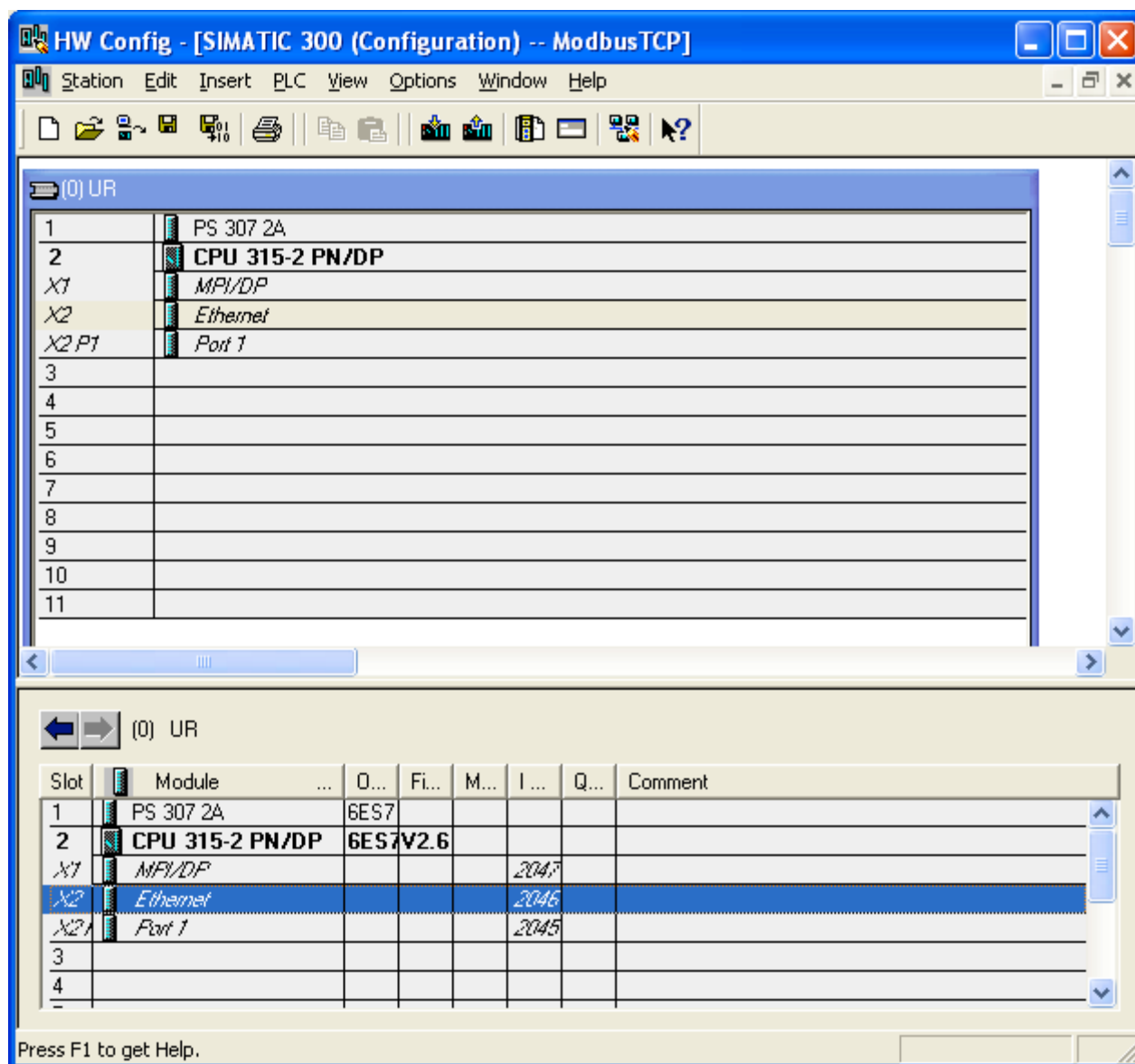
PLC: Siemens CPU-315 PN/DP PLC (6ES7 315-2EH13-0AB0)

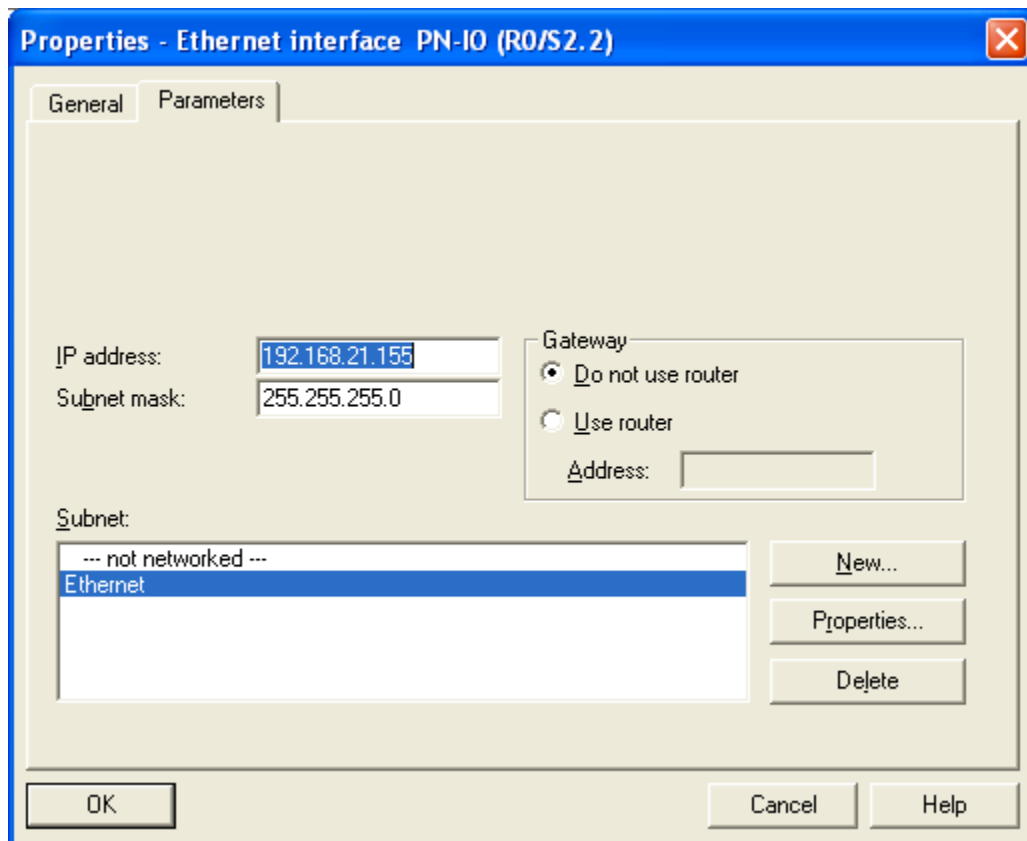
PLC software: Simatic Manager - Step 7

S7-OpenModbusTCP: PN-CPU V2.x (2XV9450-1MB02)

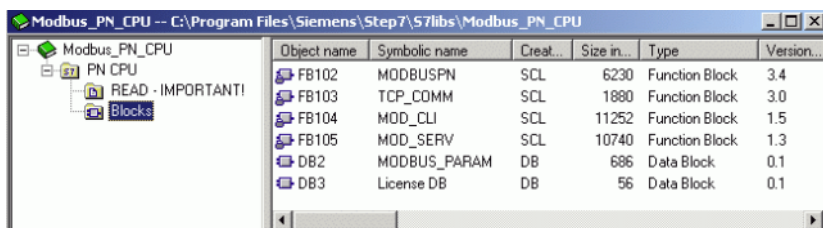
S7 Modbus TCP Wizard: <http://support.automation.siemens.com/WW/view/en/31535566>

- 1) Install Simatic Manager and S7 OpenModbusTCP per instruction manual.
- 2) Create S7 project and set IP address of PLC in HW Config.





3) Copy Modbus library blocks FB102-FB105, DB2, DB3, into project.



4) Install and run Modbus TCP Wizard, configuring the following Modbus registers.



**Modbus TCP Wizard**

**STEP 7 project**  
Select STEP 7 project and block folder.

STEP 7 project: C:\Program Files\Siemens\Step7\s7proj\Modbus~1 ...

Block folder: ModbusTCP\SIMATIC 300\CPU 315-2 PN/DP\S7 Program(2)\Blocks ...

IP Address of station found  
192.168.21.155 -> integrated: 1

Info Help < Previous Next > Finish

**Modbus TCP Wizard**

**Upload connections**  
List of connections

| ID (16#...) | DB/UDT | Connection type | Connection name | Remote IP    |
|-------------|--------|-----------------|-----------------|--------------|
| 1           | DB2    | Modbus TCP      | Fusion_IP_233   | 192.168.21.2 |
|             |        |                 |                 |              |
|             |        |                 |                 |              |
|             |        |                 |                 |              |
|             |        |                 |                 |              |
|             |        |                 |                 |              |
|             |        |                 |                 |              |
|             |        |                 |                 |              |
|             |        |                 |                 |              |
|             |        |                 |                 |              |

< [Progress Bar] >

☐ New ☒ Change ☐ Copy Export

Info Help < Previous Next > Finish

### Modbus TCP Wizard

**Modbus general parameter**  
General parameter



☐ SIMATIC S7 acts as server

☐ single write (function code 05/06)

☐ connect at startup

Info Help < Previous Next > Finish

### Modbus TCP Wizard

**Communication Partners**  
Enter the properties of the communications partners.

|                           | Simatic S7                                                            | Modbus device                                                         |
|---------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------|
| Connection ID:            | W#16# 1                                                               | W#16# 0001                                                            |
| Connection name:          | Fusion_IP_233                                                         |                                                                       |
| Connection establishment: | <input checked="" type="radio"/> Active <input type="radio"/> Passive | <input type="radio"/> Active <input checked="" type="radio"/> Passive |
| Connection                | <input type="checkbox"/> Unspecified connection partner               | <input type="checkbox"/> Unspecified connection partner               |
| IP address:               | 001 . 000 . 000 . 001                                                 | 192 . 168 . 21 . 233                                                  |
| Used interface:           | CPU 315/317 (Firmw) ▼                                                 | ▼                                                                     |

Info Help < Previous Next > Finish

### Modbus TCP Wizard

**Connection parameters**  
Enter the parameters for the connection.

| Simatic S7                             |                                       | Modbus device                                    |
|----------------------------------------|---------------------------------------|--------------------------------------------------|
| Local port no:                         | <input type="checkbox"/> Specify port | <input checked="" type="checkbox"/> Specify port |
| <input checked="" type="radio"/> ASCII | <input type="text"/>                  | <input type="text" value="502"/>                 |
| <input type="radio"/> HEX              | <input type="text"/>                  | <input type="text" value="1F6"/>                 |

Info Help < Previous Next > Finish

### Modbus TCP Wizard

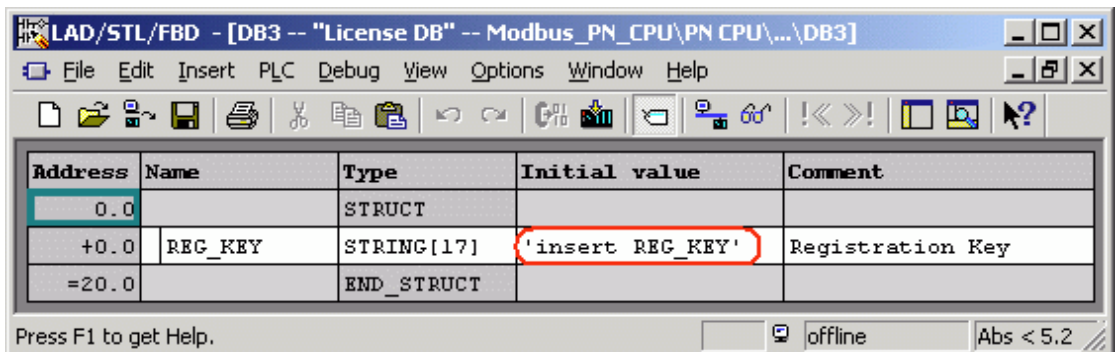
**Modbus TCP address reference**  
List of data areas

| Data area | Data type         | Start address | End address | DB number |
|-----------|-------------------|---------------|-------------|-----------|
| 1         | Holding Registers | 100           | 116         | 11        |
| 2         | Holding Registers | 220           | 239         | 10        |
| 3         | Holding Registers | 245           | 256         | 12        |
| 4         | Holding Registers | 260           | 271         | 13        |
| 5         | Holding Registers | 275           | 286         | 14        |
| 6         | Holding Registers | 290           | 301         | 15        |
| 7         | not used          | 0             | 0           | 0         |
| 8         | not used          | 0             | 0           | 0         |

Info Help < Previous Next > Finish

5) Create the variable tables DH10-DB15.

6) Open the license DB and copy the 17-digit registration key received from IT4industry to the column "Initial Value."



Copy OB100 source code into project:

```

L      100
T      "CONTROL_DAT".START_ADDRESS
L      16
T      "CONTROL_DAT".LENGTH
L      3
T      "CONTROL_DAT".DATA_TYPE
L      1
T      "CONTROL_DAT".UNIT

CALL   "MODBUSPN" , "IDB_MODBUS"
ID     := "CONTROL_DAT".ID
DB_PARAM := "MODBUS_PARAM"
RCV_TIME :=
CONN_TIME :=
KEEP_ALIVE :=
ENQ_ENR :=
DISCONNECT :=
REG_KEY := "LICENSE_DB".REG_KEY
LICENSED := "CONTROL_DAT".LICENSED
BUSY := "CONTROL_DAT".BUSY
CONN_ESTABLISHED := "CONTROL_DAT".CONN_ESTABLISHED
DONE_NDR := "CONTROL_DAT".DONE_NDR
ERROR := "CONTROL_DAT".ERROR
STATUS_MODBUS := "CONTROL_DAT".STATUS_MODBUS
STATUS_CONN := "CONTROL_DAT".STATUS_CONN
STATUS_FUNC := "CONTROL_DAT".STATUS_FUNC
IDENT_CODE :=
UNIT :=
DATA_TYPE :=
START_ADDRESS :=
LENGTH :=
TI :=
WRITE_READ :=

L      500
T      "CONTROL_DAT".RCV_TIME

L      T#5S
T      "CONTROL_DAT".CONN_TIME

AN     "CONTROL_DAT".ERROR
S      "CONTROL_DAT".ENQ_ENR      //INIT completed without error, enable data transfer
BEC

L      "CONTROL_DAT".STATUS_CONN
T      "CONTROL_DAT".Save_STATUS_CONN      //for static display in VAT

L      "CONTROL_DAT".STATUS_MODBUS
T      "CONTROL_DAT".Save_STATUS_MODBUS      //for static display in VAT

// STATUS_FUNC => Save STATUS_FUNC
L      DB1.DBD 38
T      DB1.DBD 92
L      DB1.DBD 42
T      DB1.DBD 96
L      DB1.DBD 46
T      DB1.DBD 100

```

Copy OB1 source code into project.

```

L      3
T      "CONTROL_DAT".DATA_TYPE
L      1
T      "CONTROL_DAT".UNIT

CALL   "MODBUSFN" , "IDB_MODBUS"
ID     := "CONTROL_DAT".ID
DB_PARAM := "MODBUS_PARAM"
RECV_TIME := "CONTROL_DAT".RECV_TIME
CONN_TIME := "CONTROL_DAT".CONN_TIME
KEEP_ALIVE :=
ENQ_ENR := "CONTROL_DAT".ENQ_ENR
DISCONNECT := "CONTROL_DAT".DISCONNECT
REG_KEY := "LICENSE_DB".REG_KEY
LICENSED := "CONTROL_DAT".LICENSED
BUSY := "CONTROL_DAT".BUSY
CONN_ESTABLISHED := "CONTROL_DAT".CONN_ESTABLISHED
DONE_NDR := "CONTROL_DAT".DONE_NDR
ERROR := "CONTROL_DAT".ERROR
STATUS_MODBUS := "CONTROL_DAT".STATUS_MODBUS
STATUS_CONN := "CONTROL_DAT".STATUS_CONN
STATUS_FUNC := "CONTROL_DAT".STATUS_FUNC
IDENT_CODE := "CONTROL_DAT".IDENT_CODE
UNIT := "CONTROL_DAT".UNIT
DATA_TYPE := "CONTROL_DAT".DATA_TYPE
START_ADDRESS := "CONTROL_DAT".START_ADDRESS
LENGTH := "CONTROL_DAT".LENGTH
TI := "CONTROL_DAT".TI
WRITE_READ := "CONTROL_DAT".WRITE_READ

L      "CONTROL_DAT".TI           //TI should be incremented with each job
INC    1
T      "CONTROL_DAT".TI

A      "CONTROL_DAT".ENQ_ENR
R      "CONTROL_DAT".ENQ_ENR      //INIT completed without error, enable data transfer

O      "CONTROL_DAT".DONE_NDR
O      "CONTROL_DAT".ERROR
S      "CONTROL_DAT".ENQ_ENR      //INIT completed without error, enable data transfer

A      "CONTROL_DAT".ERROR
JC     ERR1

CALL   "WAIT"
WT:=20000                          // 20 ms seconds
CALL   "WAIT"
WT:=20000                          // 20 ms seconds
CALL   "WAIT"
WT:=20000                          // 20 ms seconds
CALL   "WAIT"
WT:=20000                          // 20 ms seconds
CALL   "WAIT"
WT:=20000                          // 20 ms seconds

A      "CONTROL_DAT".DONE_NDR
JCN    M002

//job finished without error
=      "CONTROL_DAT".Save_DONE_NDR

L      "CONTROL_DAT".Count_Done   //for test purposes
INC    1
T      "CONTROL_DAT".Count_Done

L      "CONTROL_DAT".UNIT         //save request information
T      "CONTROL_DAT".Save_UNIT    //for static display in VAT

```

```

L      "CONTROL_DAT".DATA_TYPE
T      "CONTROL_DAT".Save_DATA_TYPE

L      "CONTROL_DAT".START_ADDRESS
T      "CONTROL_DAT".Save_START_ADDRESS

L      "CONTROL_DAT".LENGTH
T      "CONTROL_DAT".Save_LENGTH

L      "CONTROL_DAT".TI
T      "CONTROL_DAT".Save_TI

A      "CONTROL_DAT".WRITE_READ
=      "CONTROL_DAT".Save_WRITE_READ

//Rotate ModbusTCP register reads from 100, 220, 245, 260, 275
L      "CONTROL_DAT".START_ADDRESS
L      100
==D
JC      C2

L      "CONTROL_DAT".START_ADDRESS
L      220
==D
JC      C3

L      "CONTROL_DAT".START_ADDRESS
L      245
==D
JC      C4

L      "CONTROL_DAT".START_ADDRESS
L      260
==D
JC      C5

L      "CONTROL_DAT".START_ADDRESS
L      275
==D
JC      C6

//Digital Setpoint 1 - 8
C1:  L      100
      T      "CONTROL_DAT".START_ADDRESS
      L      16
      T      "CONTROL_DAT".LENGTH
//UNCOMMENT TO WRITE DIGITAL SETPOINT
//SET
// =      "CONTROL_DAT".WRITE_READ

      BEU

// Zone 1,2,3,4 - Line Voltage, Load Voltage, Temperature
C2:  L      220
      T      "CONTROL_DAT".START_ADDRESS
      L      19
      T      "CONTROL_DAT".LENGTH
      BEU

// Zone 1 Load Power, Alarms
C3:  L      245
      T      "CONTROL_DAT".START_ADDRESS
      L      11
      T      "CONTROL_DAT".LENGTH
      BEU

// Zone 2 Load Power, Alarms
C4:  L      260
      T      "CONTROL_DAT".START_ADDRESS
      L      11

```

```

T      "CONTROL_DAT".LENGTH
BEU

// Zone 3 Load Power, Alarms
C5:   L      275
      T      "CONTROL_DAT".START_ADDRESS
      L      11
      T      "CONTROL_DAT".LENGTH
      BEU

// Zone 4 Load Power, Alarms
C6:   L      290
      T      "CONTROL_DAT".START_ADDRESS
      L      11
      T      "CONTROL_DAT".LENGTH
      BEU

M002: A      "CONTROL_DAT".ERROR
      JCN    M001

//job finished with error

ERR1: L      "CONTROL_DAT".Count_Error  //for test purposes
      INC    1
      T      "CONTROL_DAT".Count_Error

      L      "CONTROL_DAT".STATUS_CONN
      T      "CONTROL_DAT".Save_STATUS_CONN  //for static display in VAT

      L      "CONTROL_DAT".STATUS_MODBUS
      T      "CONTROL_DAT".Save_STATUS_MODBUS  //for static display in VAT

// STATUS_FUNC => Save_STATUS_FUNC
L      DB1.DBD  38
T      DB1.DBD  92
L      DB1.DBD  42
T      DB1.DBD  96
L      DB1.DBW  46
T      DB1.DBW  100

M001: NOP    0

```

9) OB1 monitors Zone 1-4 voltage, temperature, power, and digital setpoints. Edit the FUSION display screen “Dig Setpoint 1” and make sure it matches the first data byte of DB11. The modbus register will read 100 times the value shown on display.