



APPLICATION NOTE

« AC15/20 Series» (MODBUS TCP
ONBOARD COMMUNICATION WITH
SIEMENS S7 PLC-Configuration and
Programming with Tia Portal)

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1. Abstract

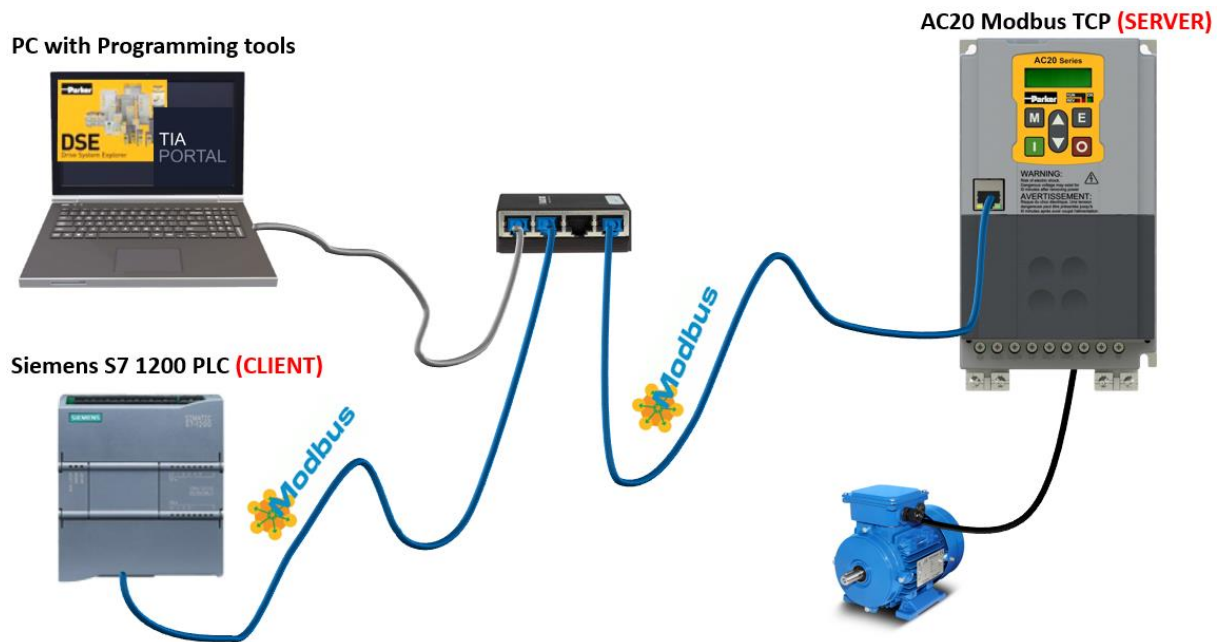
This application note describes how to set up communication between AC15/20 driver and Siemens S7-1200 Controllers through the Modbus TCP Onboard communication.

2. Introduction

The parker AC15/20 drive can be easily integrated into a Siemens Tia portal architecture via the Modbus TCP communication. The communication requires the configuration of **network parameters**, **data exchange** for the AC15/20 and the setting of **Modbus Request** using the available function block in Tia portal Library.

3. Tools

	Name	Firmware Version
Hardware	AC20 Drive	1.2.1
	Siemens PLC S7-CPU 1212C DC/DC/DC	V4.2
Software	Parker DSE Lite	3.13
	Siemens Tia Portal	17



Basically, the AC15 / AC20 Drive is designed to act as a **SERVER**, in which case the siemens PLC must act as a **CLIENT** over Modbus TCP. The server is always waiting for client request.

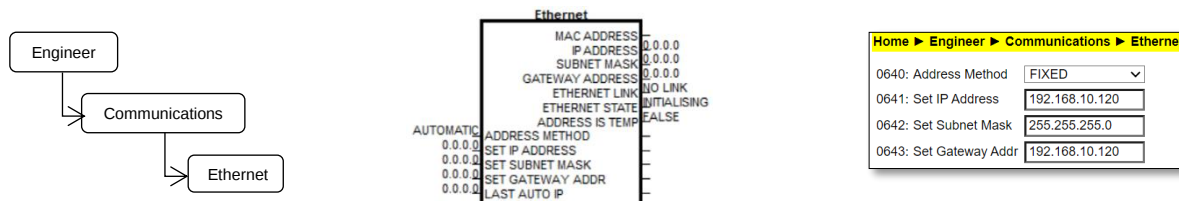
4. Set up the AC15/20 Communication parameters

The configuration of the AC15/20 drive communication can be performed with AC15/20 keypad or Parker DSE Lite application or the AC15/20 Webserver.

Parameters listed in the tables below must be set to establish communication with master.

➤ Ethernet Parameters

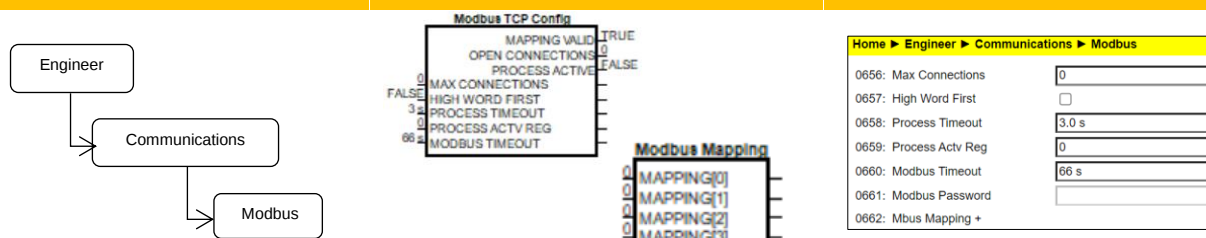
Keypad Menu Path	DSE-Lite Function Block	Webserver
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NO°	Name	Default Value	Description
0640	ADDRESS METHOD (<i>Method for assigning the IP address</i>)	AUTOMATIC	Address assigned by DHCP server
		LINK LOCAL	Address assigned link-local by the inverter
		FIXED	IP address must be set manually via parameters “0641”, “0642”, “0643”
0641	SET IP ADDRESS	0.0.0.0	IP address of the inverter
0642	SET SUBNET MASK	0.0.0.0	Subnet Mask of the inverter
0643	SET GATEWAY ADDR	0.0.0.0	Gateway address of the inverter

➤ Modbus TCP Parameters

Keypad Menu Path	DSE-Lite Function Block	Webserver
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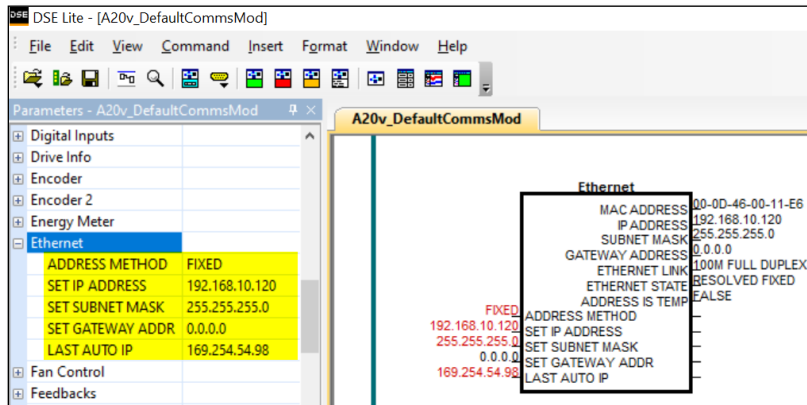


NO°	Name	Default Value	Description
0656	MAX CONNECTIONS	0	Max number of Modbus TCP connection allowed
0657	HIGH WORD FIRST	FALSE	Modbus TCP “WORD” order of 32-bit network data
0658	PROCESS TIMEOUT	3	Process Active Timeout in seconds
0659	PROCESS ACTV REG	0	Register to read/write to maintain process active
0660	MODBUS TIMEOUT	66	Modbus connection timeout
0661	MODBUS PASSWORD		Manage the register data access
0662	MODBUS MAPPING	TAG ID of the parameter	Defined the process data exchange between the Modbus PLC and the AC15/20. Data are defined into the parameter range [0663 ... 0678]

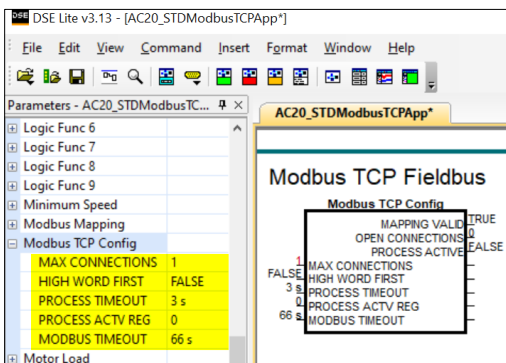
4.1 Config the drive using Parker DSE Lite Application

Display your configuration page in DSE Lite, click the plus sign [+] at the left of function block “Ethernet” and “Fieldbus Config” to set the appropriate communication parameters or double click the function Blocks to open parameters tab in the configuration interface. (The sample config code “AC20_STDMoibusTCPApp.AC20 can be downloaded from Parker website).

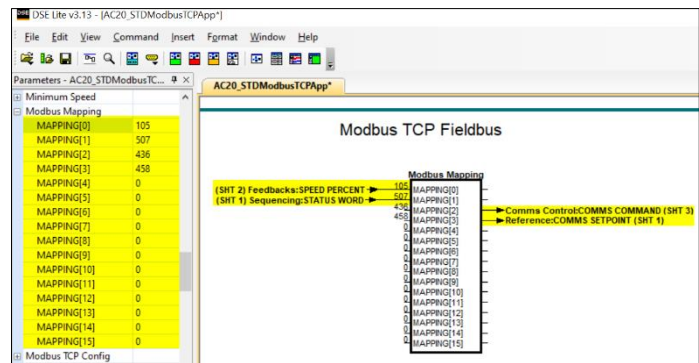
➤ Ethernet Config



➤ Fieldbus Modbus TCP Config



Modbus Comms Config



Modbus Mapping Config

the function block “**Modbus Mapping**” array is used to map the process data, the array allows parameters to be grouped together and packs the registers, the 1-byte and 2-byte parameters use only 1 register.

the mapping is done by adding parameters TAG ID into the table or by using link connection from parameter to the table array. If an invalid parameter (including a password parameter) is entered in the table, then the diagnostic parameter Mapping Valid will show the mapping as being invalid. However, all the valid entries in the table will be mapped. Invalid entries will be ignored, and no register allocated.

- An array parameter number will be considered as invalid mapping, rather the parameter numbers of individual elements within the array should be used.
- A string parameter must be modified from the first register in the string.

4.2 Config the drive using AC15/20 Webserver

Access the AC15/20 webserver by typing the IP-Address of the drive into a web browser. Switch the driver state from “Operational” to “Configuration” by clicking on stop button, then set the parameters.

➤ Ethernet Config

Parker

Summary | Parameters | Passwords

ENGINEER ▾ Home ► Engineer ► Communications ► Ethernet

⏮ ⏪ ⏩ ⏭

Monitor

State: **Configuration**
Drive: **OK**

0640: Address Method	FIXED ▾
0641: Set IP Address	192.168.10.120
0642: Set Subnet Mask	255.255.255.0
0643: Set Gateway Addr	192.168.10.120
0645: Address Is Temp	☐

➤ Fieldbus Modbus TCP Config

Set the Modbus communication and use the “Mbus Mapping” Table to set the process data mapping. Add the parameters TAG ID into the table.

Parker Parameters AC20G

Summary | Parameters | Passwords

ENGINEER ▾ Home ► Engineer ► Communications ► Modbus

⏮ ⏪ ⏩ ⏭

Monitor

State: **Configuration**
Drive: **OK**

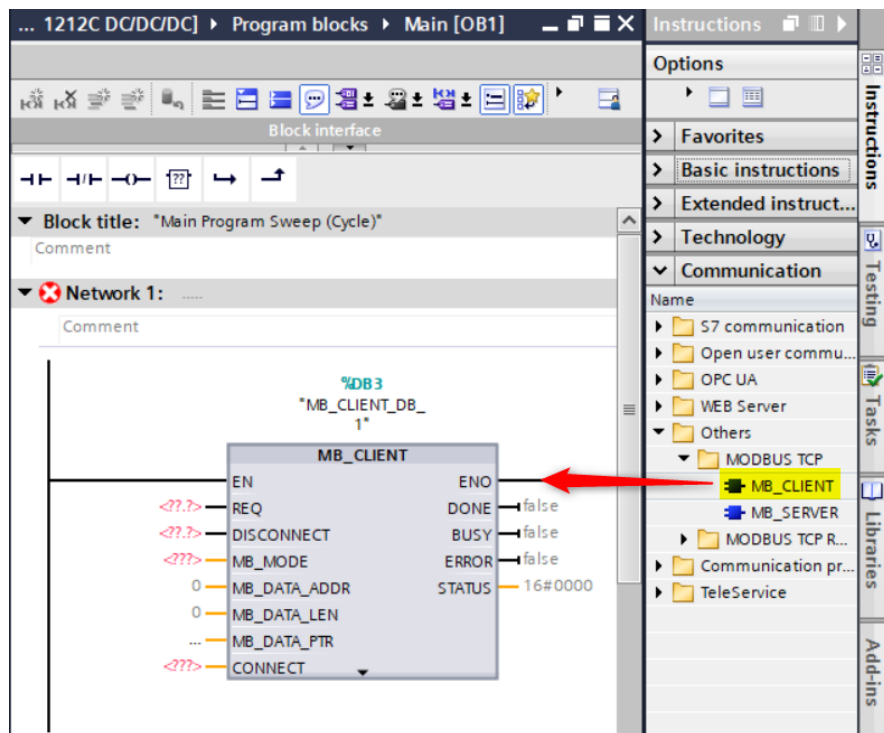
0656: Max Connections	1
0657: High Word First	☐
0658: Process Timeout	3.0 s
0659: Process Actv Reg	0
0660: Modbus Timeout	66 s
0661: Modbus Password	
0662: Mbus Mapping -	
000:	0105 Speed Percent
001:	0507 Status Word
002:	0436 Comms Command
003:	0458 Comms Setpoint
004:	0000

5. Communication Set between PLC and AC15/20 Drive

5.1 Modbus request configuration on Tia Portal.

The “**MB_CLIENT**” function block is used to turn S7 PLC to Modbus client device, the “**MB_CLIENT**” is used to build the Modbus Request. The function block can be found in the Tia Portal communication library.

Open a program block or a function, then drag and drop the “**MB_CLIENT**” instruction under the communication category to the block interface.



Parameters of “**MB_CLIENT**” description

- **REQ:** When set to TRUE, the block continuously send request to the AC Drive.
- **DISCONNECT:** Allows the program to control connection with the AC Drive
- **MB_MODE:** Type of request is defined according to data address (**MB_DATA_ADDR**) and data length (**MB_DATA_LEN**); *See the table below for AC drive function code and mapping.*

Note: Supported function code and register address

Function Code	Register Address	MB_DATA_ADDR	MB_MODE
Read Holding Registers (#3)	00001 - 00256	40001 - 40256	0
Read Input Registers (#4)	00001 - 00256	30001 - 30256	0
Write Single Registers (#6)	00001 - 00256	40001 - 40256	1
Write Multiple Registers (#16)	00001 - 00256	40001 - 40256	2

Read/Write multiple registers function code is not supported by AC15/20 Device.

- **MB_DATA_PTR:** register buffers data going to or coming from AC Drive
- **CONNECT:** connection parameters

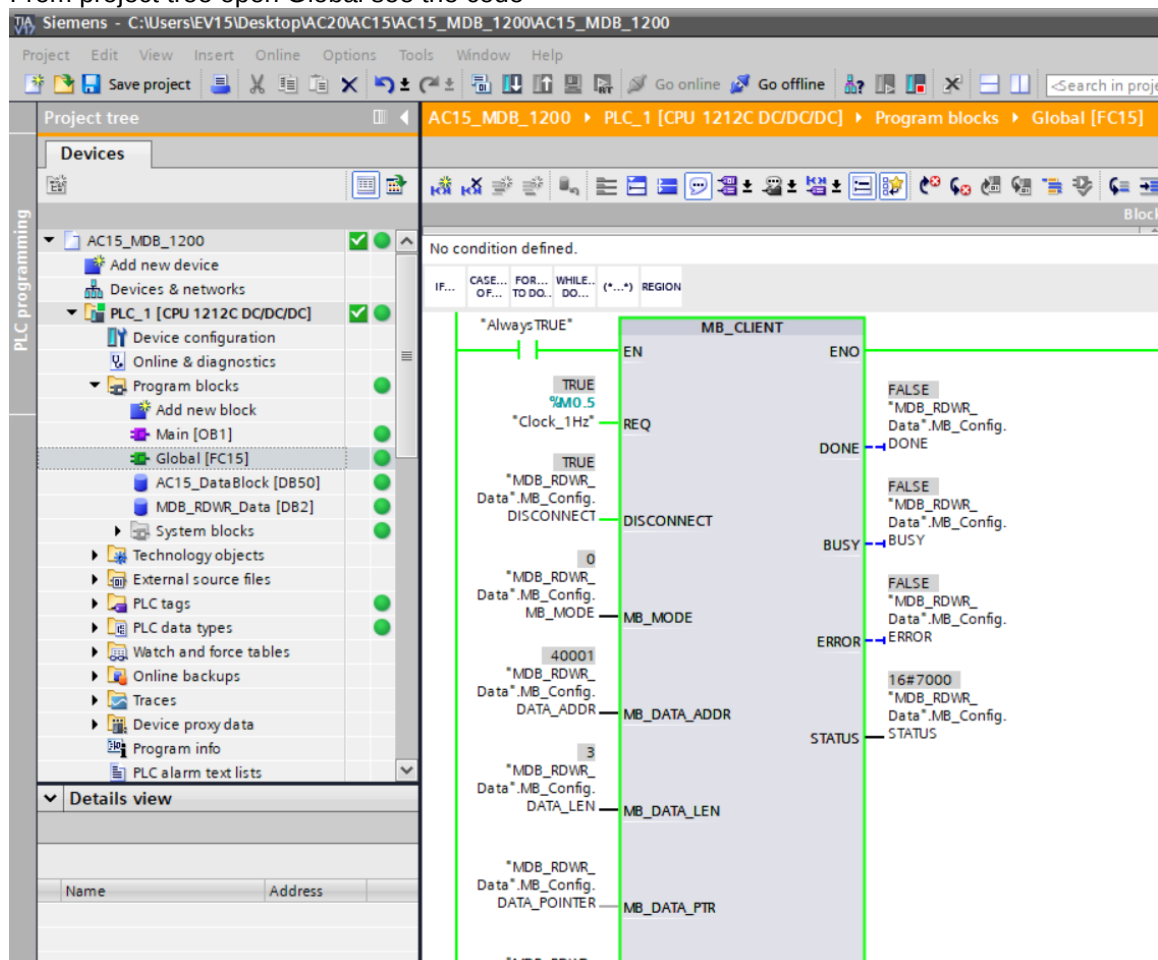
Name	Data type	Start value	Comment
Static			
CONNECT	TCON_IP_v4		
Interfaceld	HW_ANY	64	HWIdentifier of IE-interface submodule
ID	CONN_OUC	16#1	connection reference / identifier
ConnectionType	Byte	16#0B	type of connection: 11=TCP/IP, 19=UDP (17=TCP/IP)
ActiveEstablished	Bool	True	active/passive connection establishment
RemoteAddress	IP_V4		remote IP address (IPv4) of AC Drive
ADDR	Array[1..4] of Byte		IPv4 address
ADDR[1]	Byte	192	IPv4 address
ADDR[2]	Byte	168	IPv4 address
ADDR[3]	Byte	10	IPv4 address
ADDR[4]	Byte	120	IPv4 address
RemotePort	UInt	502	remote UDP/TCP port number
LocalPort	UInt	0	local UDP/TCP port number

5.2 Sample program.

Download the sample code from website: Open with Tia Portal, make sure the PC, PLC and AC15/20 drive are physically connected.

Compile and download project into the PLC then go online with PLC.

From project tree open Global see the code



Network 1: In this network the case condition is used to manage the operation read or write, the two operations must not be performed in the same cycle.

AC15_MDB_1200 ▸ PLC_1 [CPU 1212C DC/DC/DC] ▸ Program blocks ▸ Global [FC15]

Block interface

No condition defined.

IF... CASE... OF... FOR... TO DO... WHILE... DO... (*...*) REGION

▼ Block title:

Comment

▼ Network 1:

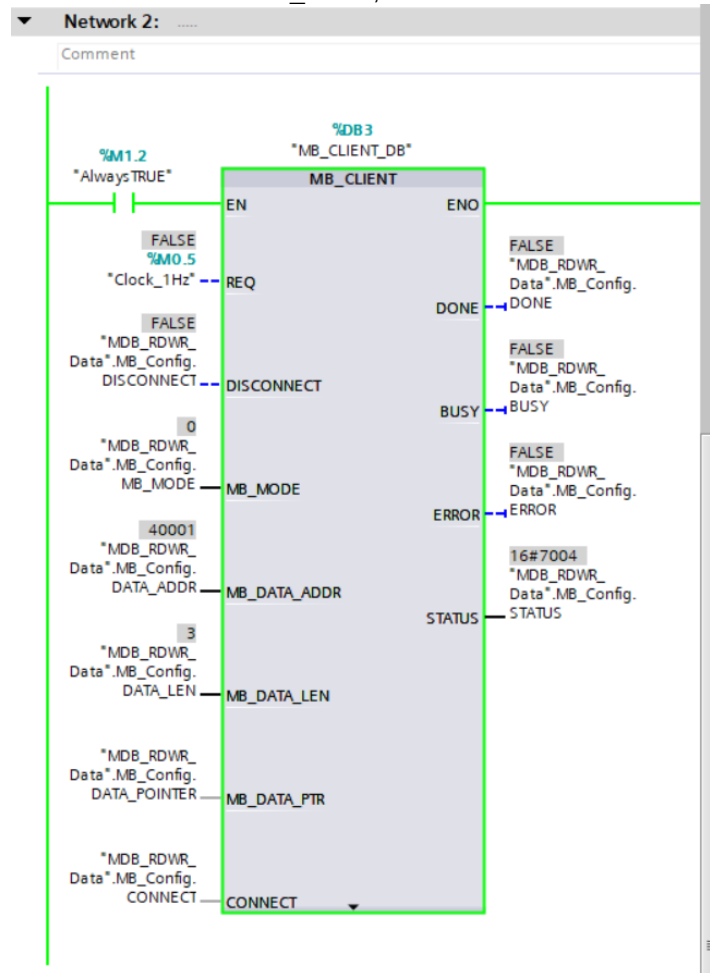
handle read/write cycle

```

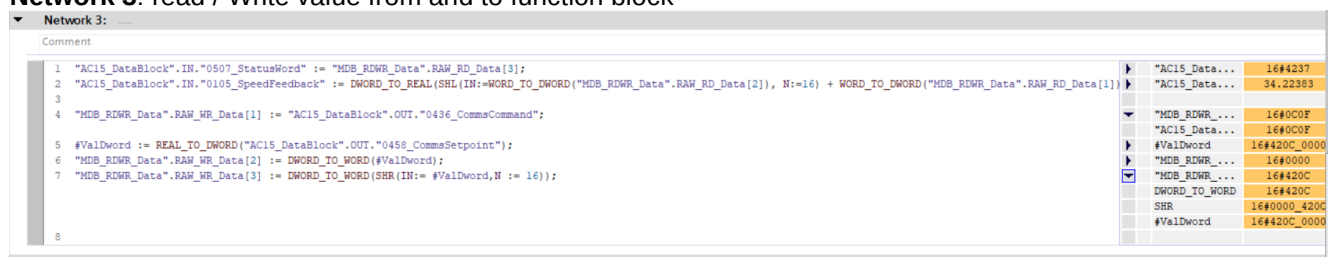
1 CASE "MDB_RDWR_Data".iStateMB OF
2   0:
3     "MDB_RDWR_Data".MB_Config.DISCONNECT := TRUE;
4     "MDB_RDWR_Data".iStateMB := 1;
5   1: //Read operation
6     IF "MDB_RDWR_Data".MB_Config.STATUS = 16#7000 THEN
7       "MDB_RDWR_Data".MB_Config.MB_MODE := 0;
8       "MDB_RDWR_Data".MB_Config.DATA_LEN := 3;
9       "MDB_RDWR_Data".MB_Config.DATA_ADDR := 40001;
10      "MDB_RDWR_Data".MB_Config.REQUEST := TRUE;
11      "MDB_RDWR_Data".MB_Config.DISCONNECT := FALSE;
12      ;
13    END_IF;
14    IF "MDB_RDWR_Data".MB_Config.DONE THEN
15      "MDB_RDWR_Data".RAW_RD_Data := "MDB_RDWR_Data".MB_Config.DATA_POINTER;
16      "MDB_RDWR_Data".MB_Config.DISCONNECT := TRUE;
17      "MDB_RDWR_Data".iStateMB := 10;
18    END_IF;
19
20   10: //write operation
21    IF "MDB_RDWR_Data".MB_Config.STATUS = 16#7000 THEN
22      "MDB_RDWR_Data".MB_Config.DATA_POINTER := "MDB_RDWR_Data".RAW_WR_Data;
23      "MDB_RDWR_Data".MB_Config.MB_MODE := 2;
24      "MDB_RDWR_Data".MB_Config.DATA_LEN := 3;
25      "MDB_RDWR_Data".MB_Config.DATA_ADDR := 40004;
26      "MDB_RDWR_Data".MB_Config.DISCONNECT := FALSE;
27    END_IF;
28    IF "MDB_RDWR_Data".MB_Config.DONE THEN
29      "MDB_RDWR_Data".MB_Config.REQUEST := FALSE;
30      "MDB_RDWR_Data".iStateMB := 0;
31    END_IF;
32  ELSE // Statement section ELSE
33    ;
34  END_CASE;
35

```

Network 2: implement the function block MB_Client, which is used to build the Modbus Request



Network 3: read / Write value from and to function block



✓ DSE Lite Online Monitor

DSE Monitor List	
Parameter	Value
Comms Control::COMMS COMMAND	0x0C0F
Feedbacks::SPEED PERCENT	34.59 %
Reference::COMMS SETPOINT	35 %
Sequencing::STATUS WORD	0x4237

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