How to Program Siemens Step 7 to Get MGate 4101-MB-PBS' Diagnostic Information

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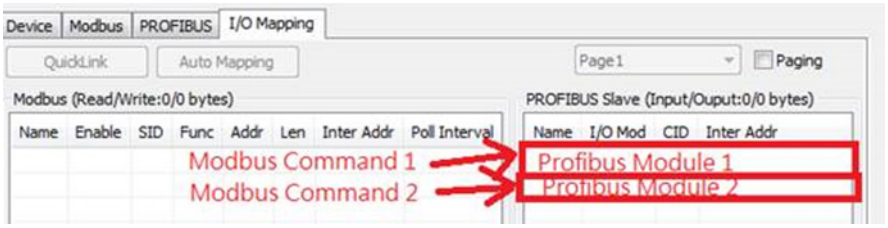
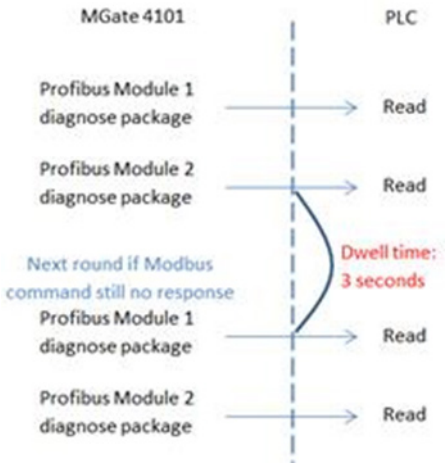
1 Description of Application

When an error, such as a disconnection or no response, occurs in the Modbus connection while the MGate 4101-MB-PBS is in Modbus Master mode, the MGate, however, will continue sending polling requests. After three requests have been sent without a response, the MGate will then enter diagnostic mode. In this mode, the MGate sends diagnostic packets periodically to PROFIBUS master. Upon receiving the correct response, the MGate will go back to normal operations.

For example, let's assume two Modbus commands are mapped to two PROFIBUS modules that will be used in the PLC program. If the two Modbus commands don't get a response, then the MGate 4101-MB-PBS will send a PROFIBUS diagnostic package to the master. If the Modbus command is still failing after a dwell time of three seconds, then the MGate 4101-MB-PBS will trigger the next diagnostic package transmission.





The diagnostic packet format is shown in the table below:

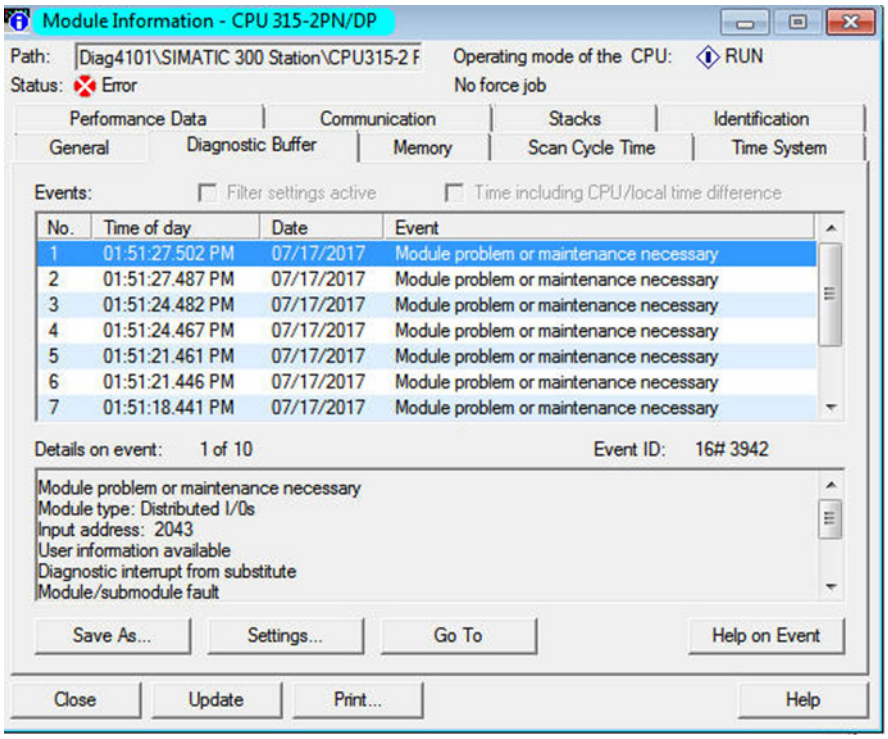
Byte	Parameter	Notes
1	Length	The length of diagnostic packet
2	Page number	The paging number where the problematic data is located
3	Module	The PROFIBUS IO module number where the problematic data is located

For instance, if the diagnose packet is 03 01 02, then it means the problematic data is located on page one of the second PROFIBUS IO module.

If you use Siemens PLC Step 7 PLC program develop environment, the values of the diagnostic packets will be displayed on the hardware's diagnostic screen. Though this is useful during the programming phase, it is not efficient for operators or maintenance engineers, since they need to have the PLC source file and have to log in to the PLC again to check the value on the hardware's diagnose screen. Instead, those diagnostic package can rather be read via a PLC program and displayed directly on SCADA or HMI systems.

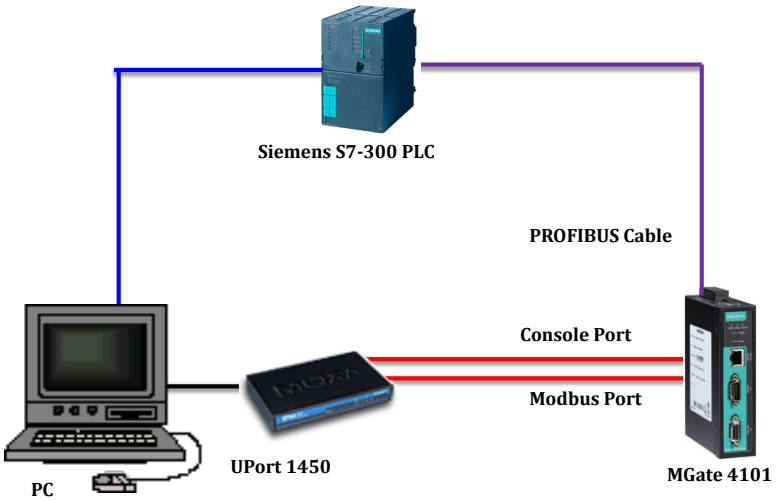
How to Program Siemens Step 7 to Get MGate 4101-MB-PBS' Diagnostic Information

This a more intuitive way to know diagnose messages. This tech note demonstrates how to program in Siemens Simatic Step 7 to retrieve the MGate's diagnostic information.



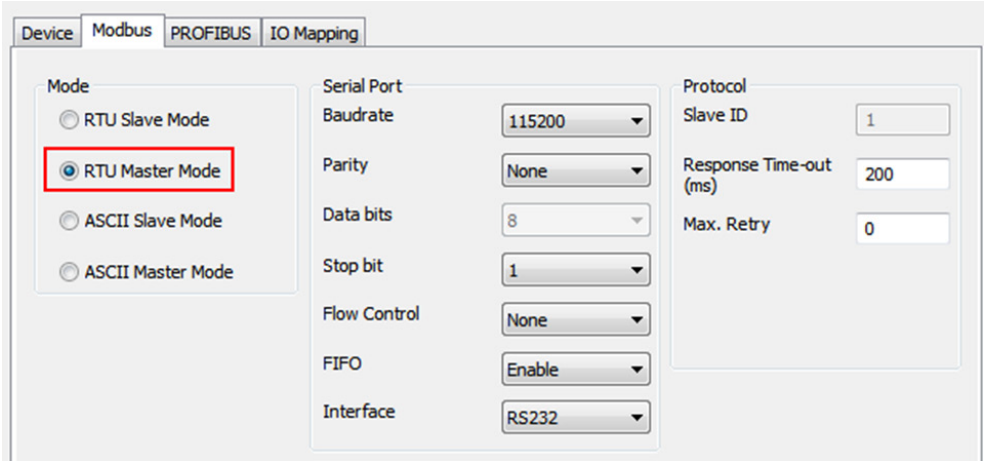
2 System Topology

In the topology below, we use Siemens S7-300 PLC to communicate with the MGate 4101-MB-PBS. The MGate 4101-MB-PBS acts as a Modbus RTU Master to communicate with the Modbus Slave simulator running on the PC.

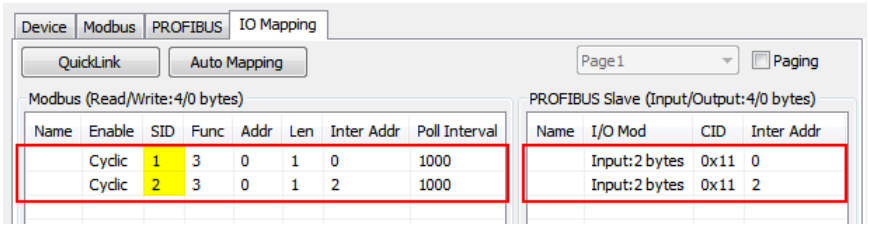


3 Modbus Setting

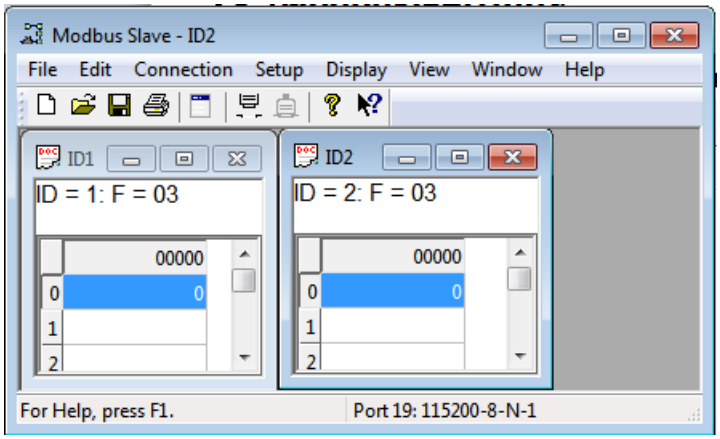
The PC runs MGate Manager to configure the MGate 4101-MB-PBS. Under the **Modbus** setting, check RTU Master Mode.



Under the **IO Mapping** setting, add two **Modbus Read** commands that poll Slave ID1 and ID2. Mapping these two commands to two "Input:2 bytes" PROFIBUS modules.

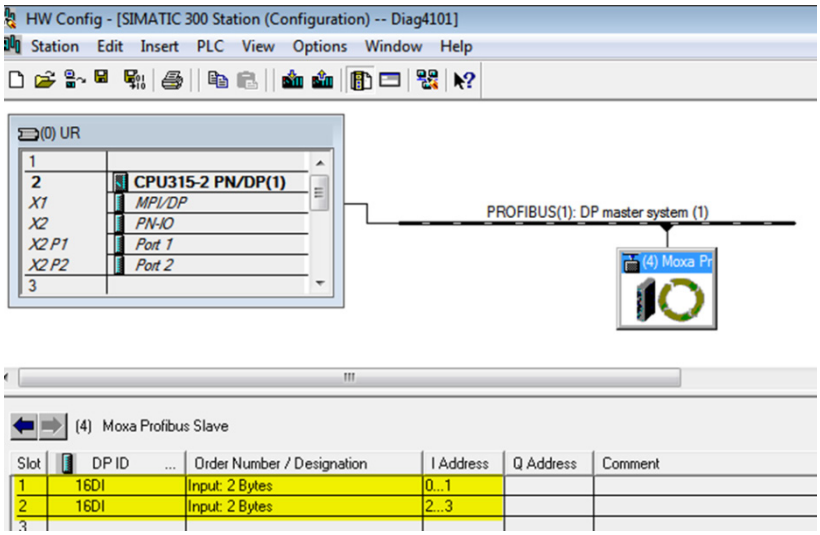


The PC runs the **Modbus Slave** simulator. Create Slave ID1 and Slave ID2 to respond to the MGate 4101-MB-PBS's polling. In this situation, the MGate is in **Normal** mode.

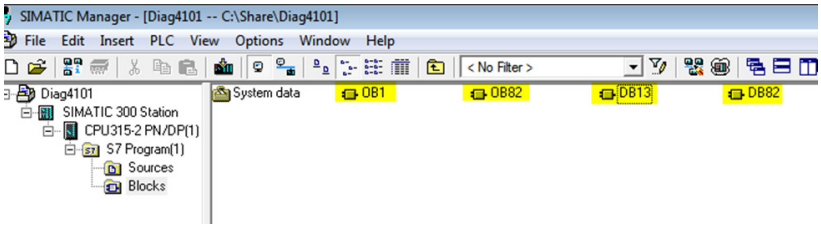


4 Siemens PLC Setting

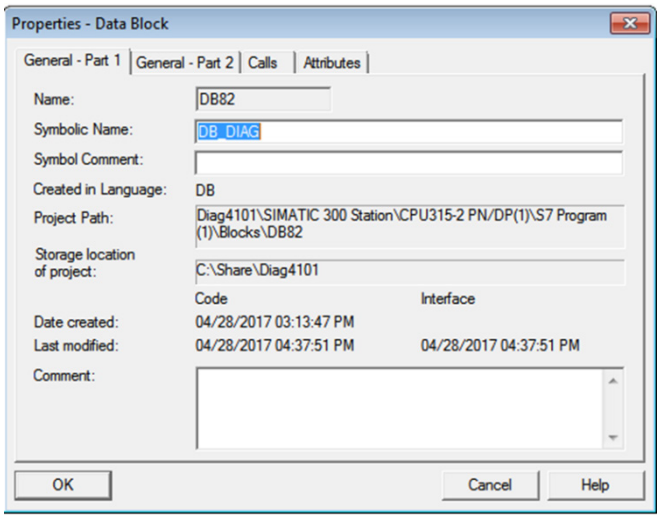
1. Under **HW Config**, add the MGate PROFIBUS Slave to the PROFIBUS topology. Add two "Input: 2 Bytes" modules.



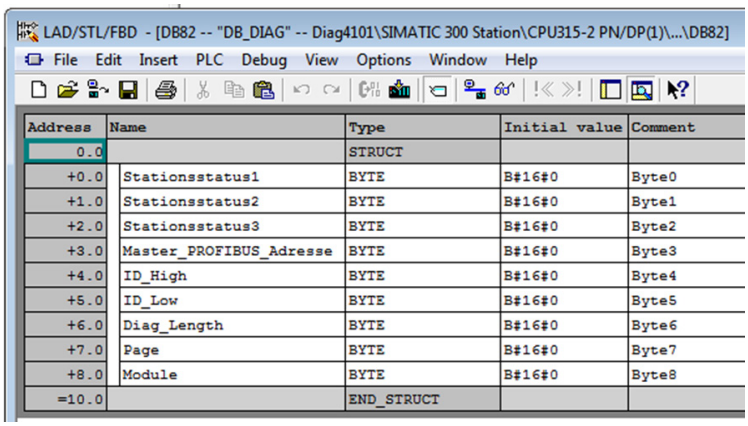
2. Under **S7 Program->Blocks**, add OB1 and OB82 organization block objects. Also, add DB13 and DB82 data-block objects.



3. Set DB82's **Symbolic Name** as "DB_DIAG".



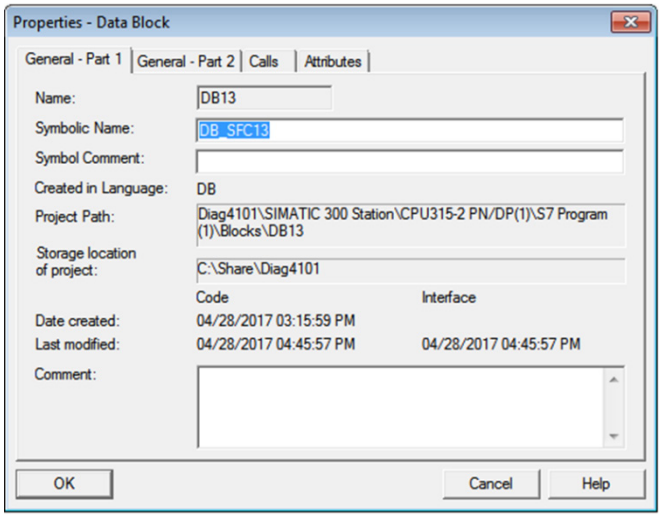
Edit DB82 object as below:



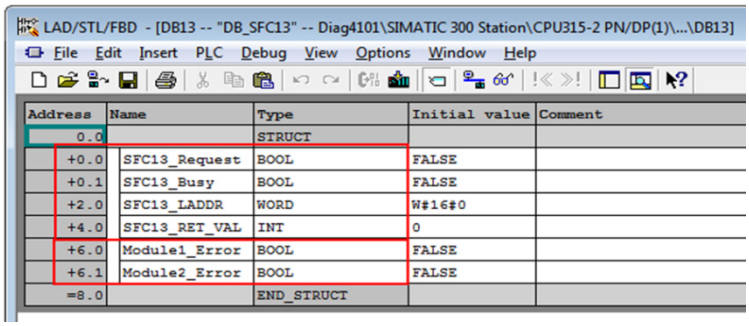
Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	Stationsstatus1	BYTE	B#16#0	Byte0
+1.0	Stationsstatus2	BYTE	B#16#0	Byte1
+2.0	Stationsstatus3	BYTE	B#16#0	Byte2
+3.0	Master_PROFIBUS_Adresse	BYTE	B#16#0	Byte3
+4.0	ID_High	BYTE	B#16#0	Byte4
+5.0	ID_Low	BYTE	B#16#0	Byte5
+6.0	Diag_Length	BYTE	B#16#0	Byte6
+7.0	Page	BYTE	B#16#0	Byte7
+8.0	Module	BYTE	B#16#0	Byte8
=10.0		END_STRUCT		

This object that is 9 bytes will store the MGate Diagnose Packet response.

4. Set DB13's **Symbolic Name** as "DB_SFC13"



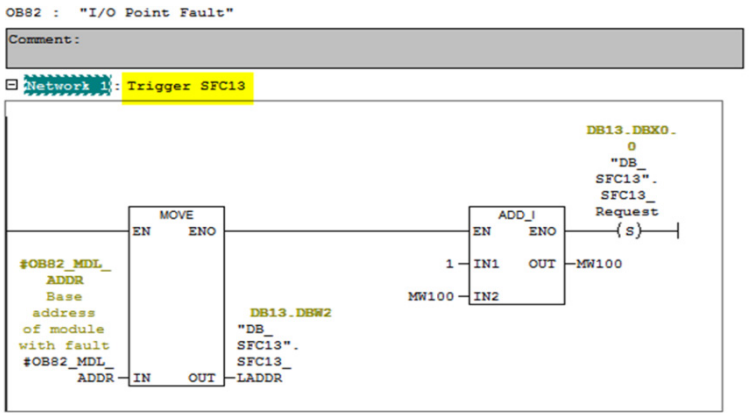
Edit DB13 object as below:



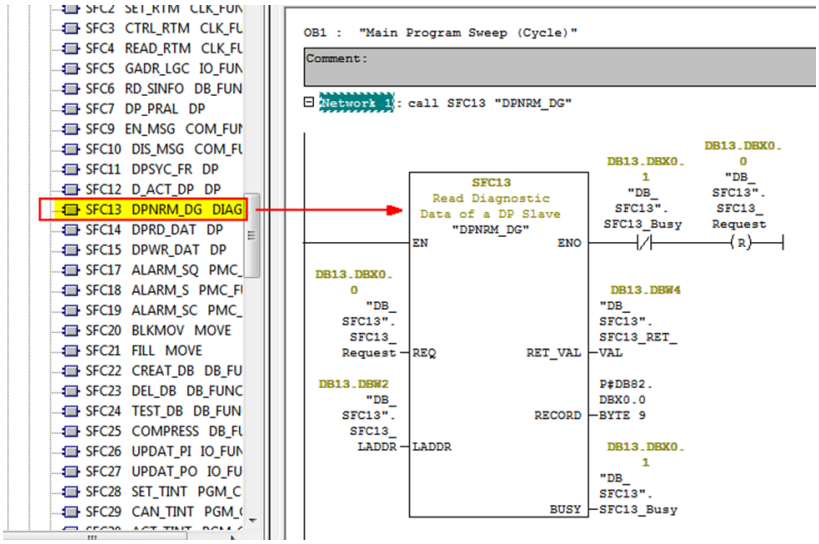
Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	SFC13_Request	BOOL	FALSE	
+0.1	SFC13_Busy	BOOL	FALSE	
+2.0	SFC13_LADDR	WORD	W#16#0	
+4.0	SFC13_RET_VAL	INT	0	
+6.0	Module1_Error	BOOL	FALSE	
+6.1	Module2_Error	BOOL	FALSE	
=8.0		END_STRUCT		

Addresses 0~5 will store SFC 13 response. We will store PROFIBUS module status in Address 6.0 and 6.1 after receiving the diagnostic packet.

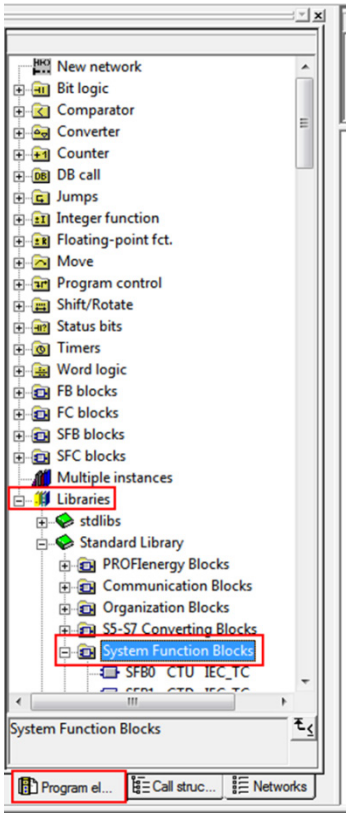
5. **OB82 setting:** OB82 handles the **I/O Point Fault** interruption. When the MGate 4101-MB-PBS diagnosis is received, the Siemens PLC will trigger this interruption. In this state, we set **"DB_SFC13." SFC13_Request** bit to **Trigger SFC 13** to read PROFIBUS diagnosis.



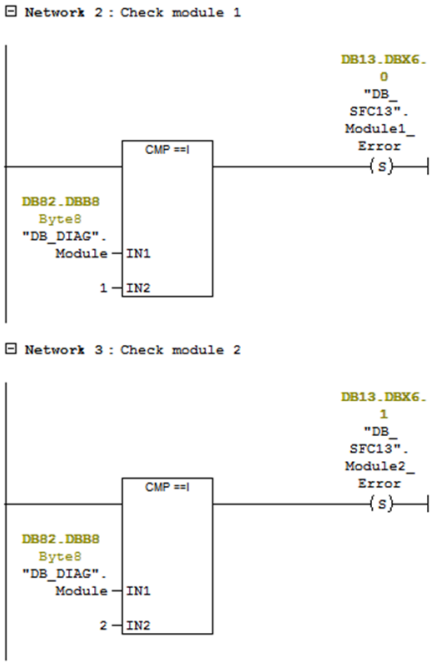
6. **OB1 setting:** In Network 1, when **"DB_SFC13".SFC13_Request** is enabled, we call SFC13 to read diagnosis.



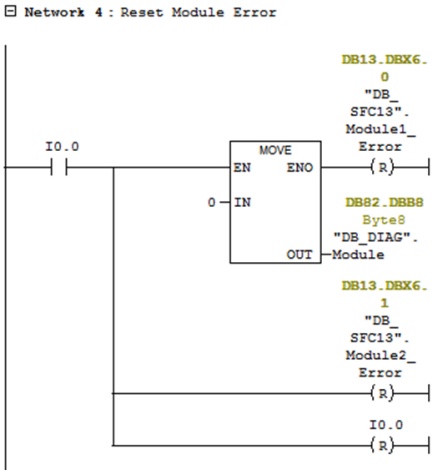
The SFC 13 function block is under **Libraries->Standard Library->System Function Blocks.**



In Network 2 and Network 3, we check **"DB_DIAG".Module** byte to indicate the status of module 1 and module 2 should the MGate 4101-MB-PBS detect a Modbus command error.



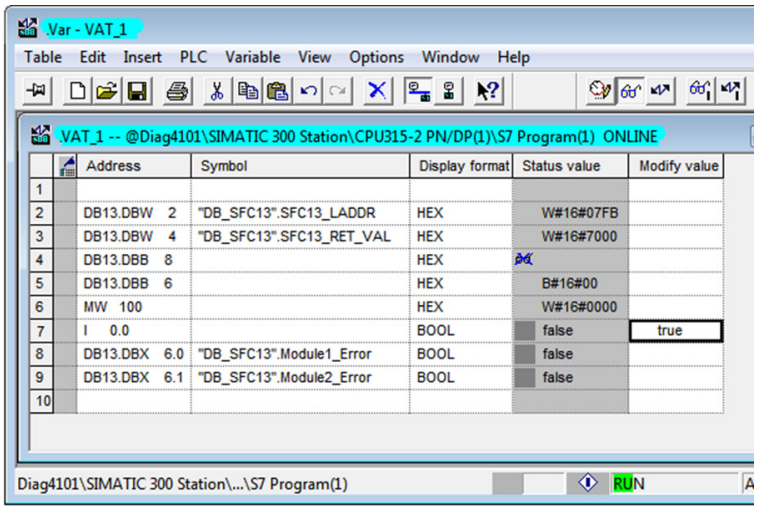
In Network 4, we reset "**DB_SFC13".Module1_Error**, and **"DB_SFC13".Module2_Error** when I0.0 bit is triggered.



5 Communication Test

1) Create Variable Table

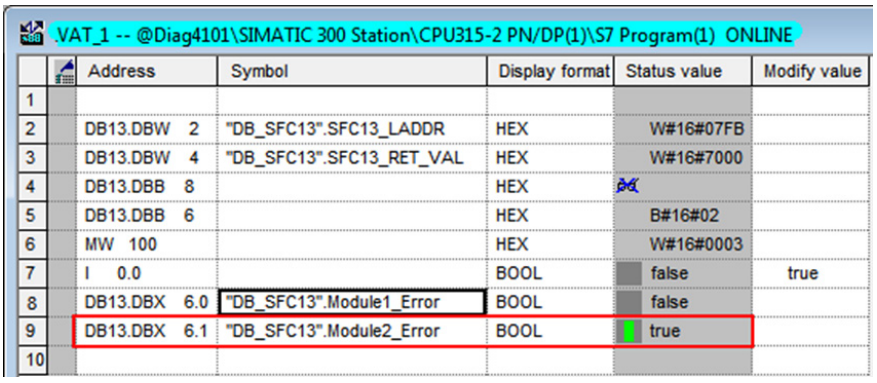
Create the Variation Table below and go online:



When the MGate 4101-MB-PBS is in normal mode, then the statuses of **"DB_SFC13".Module1_Error** and **"DB_SFC13".Module2_Error** are shown as false.

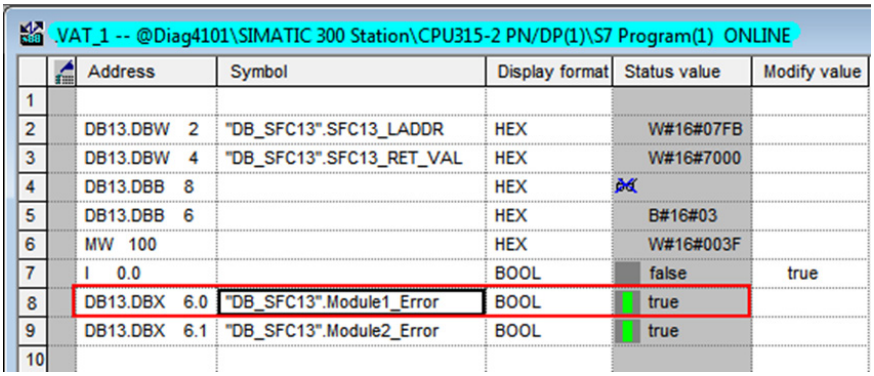
2) Close Modbus Slave ID 2 Test:

We close Modbus Slave ID 2 simulator to let the MGate 4101-MB-PBS enter diagnostic mode. We can see the status of **"DB_SFC13".Module2_Error** is true.



3) Close Modbus Slave ID 1 Test:

We close Modbus Slave ID 1 simulator. We can see the status of **"DB_SFC13".Module1_Error** is true.


VAT_1 -- @Diag4101\SIMATIC 300 Station\CPU315-2 PN/DP(1)\S7 Program(1) ONLINE

	Address	Symbol	Display format	Status value	Modify value
1					
2	DB13.DBW 2	"DB_SFC13".SFC13_LADDR	HEX	W#16#07FB	
3	DB13.DBW 4	"DB_SFC13".SFC13_RET_VAL	HEX	W#16#7000	
4	DB13.DBB 8		HEX	B#16#04	
5	DB13.DBB 6		HEX	B#16#03	
6	MW 100		HEX	W#16#003F	
7	I 0.0		BOOL	false	true
8	DB13.DBX 6.0	"DB_SFC13".Module1_Error	BOOL	true	
9	DB13.DBX 6.1	"DB_SFC13".Module2_Error	BOOL	true	
10					

4) Back to Normal Mode Test:

We open Modbus Slave ID 1 and ID2 simulator to respond the MGate 4101-MB-PBS's polling. The MGate 4101-MB-PBS will go back to **n**ormal mode. But the statuses of **"DB_SFC13".Module1_Error** and **"DB_SFC13".Module2_Error** are still true.

We can set I0.0 bit to reset the status of **Module1_Error** and **"DB_SFC13".Module2_Error**.