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:

<table>
<thead>
<tr>
<th>Byte</th>
<th>Parameter</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Length</td>
<td>The length of diagnostic packet</td>
</tr>
<tr>
<td>2</td>
<td>Page number</td>
<td>The paging number where the problematic data is located</td>
</tr>
<tr>
<td>3</td>
<td>Module</td>
<td>The PROFIBUS IO module number where the problematic data is located</td>
</tr>
</tbody>
</table>

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.

![Modbus Configuration Screenshot]

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.

![IO Mapping Screenshot]

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.

![Modbus Slave Screenshot]
4 Siemens PLC Setting

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

![HW Config Diagram](image1)

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

![OB1 and OB82 Blocks](image2)

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

![DB Block Properties](image3)
Edit DB82 object as below:

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:

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.

![Image of OB82 setting diagram]

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

![Image of OB1 setting diagram]
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:

![Variation Table](image)

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.

![Status Table](image)
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.

![Image showing Modbus SFC values]

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 normal 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.