

PROFIBUS Application for MGate 4101-MB-PBS

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Apply to	MGate 4101-MB-PBS
OS	Windows XP 32 bits

This application note will cover the following topics:

1. Application Summary
2. Introduction to PROFIBUS
3. System Architecture
4. System Requirements
5. Installing the PROFIBUS Master Board
 - A. Install NetTool
 - B. NetTool Configuration
6. Configuring the MGate 4101-MB-PBS
7. Communication Status Verification
8. Troubleshooting
 - A. Troubleshooting the MGate 4101-MB-PBS
 - B. Troubleshooting Communication Failures
 - i. Communication Failure (PROFIBUS Side)
 - ii. Communication Failure (Modbus Side)
9. Reference

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Moxa manufactures one of the world's leading brands of device networking solutions. Products include serial boards, USB-to-serial hubs, media converters, device servers, embedded computers, Ethernet I/O servers, terminal servers, Modbus gateways, industrial switches, and Ethernet-to-fiber converters. Our products are key components of many networking applications, including industrial automation, manufacturing, POS, and medical treatment facilities.

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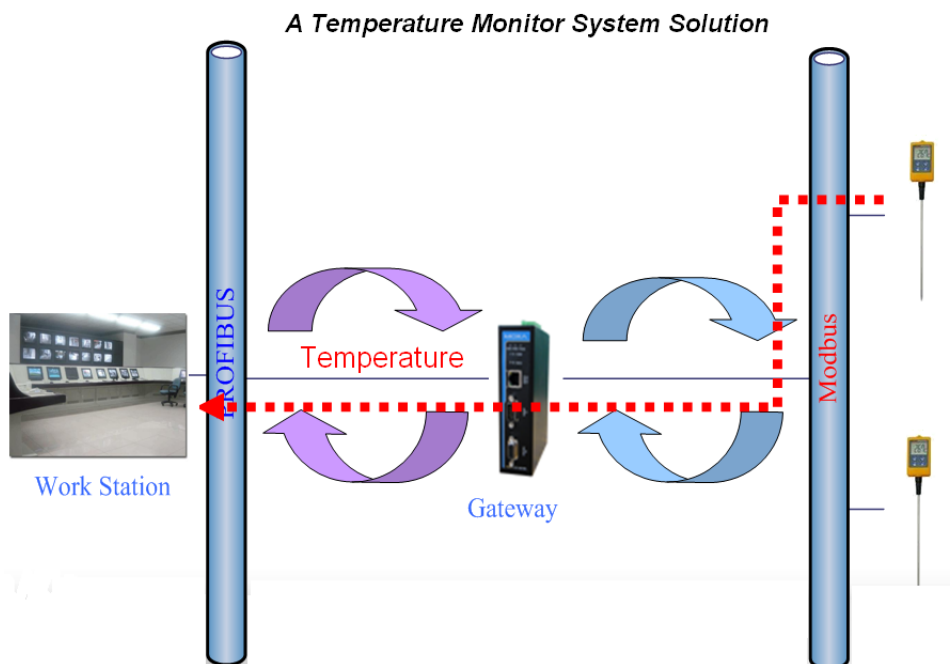
1. Application Summary

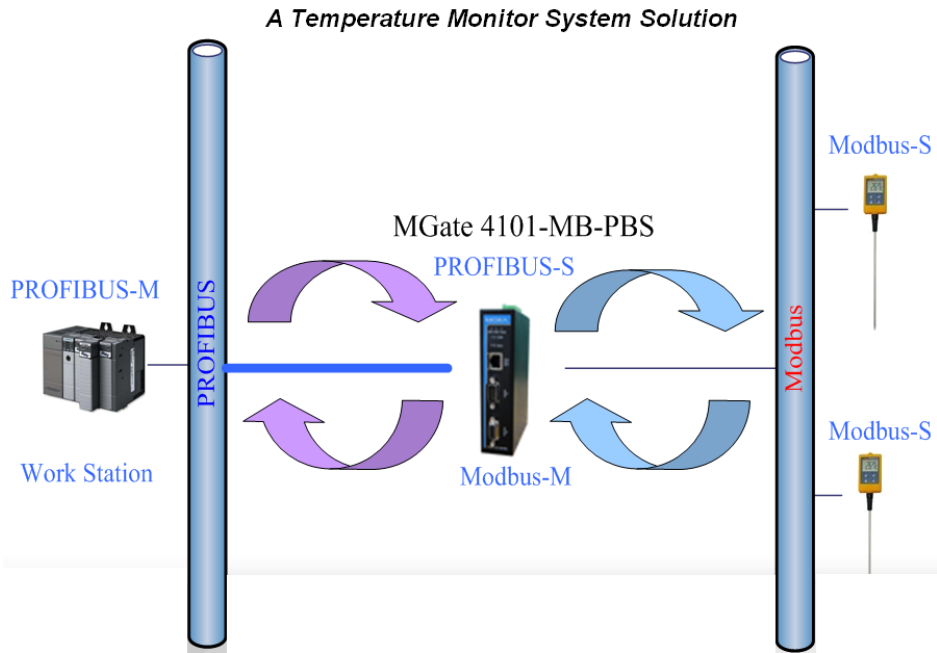
This application note describes how to establish communication between PROFIBUS and Modbus devices via the MGate 4101-MB-PBS. The MGate is both a PROFIBUS slave and a Modbus master when used for this type of application.

2. Introduction to PROFIBUS

PROFIBUS is a fieldbus communication standard for use in automation systems. PROFIBUS, or Process Field Bus, was proposed by BMBF (German department of education and research) in 1989. PROFIBUS is an entirely different protocol from PROFINET, which is an Ethernet-based protocol.

The diagram below shows a PROFIBUS gateway application for factory automation. The workstation needs to gather temperature readings from Modbus devices at different locations. In order for the workstation to poll the Modbus devices for temperature data, a PROFIBUS-to-Modbus gateway will need to be installed for the transfer of data between these two protocols.

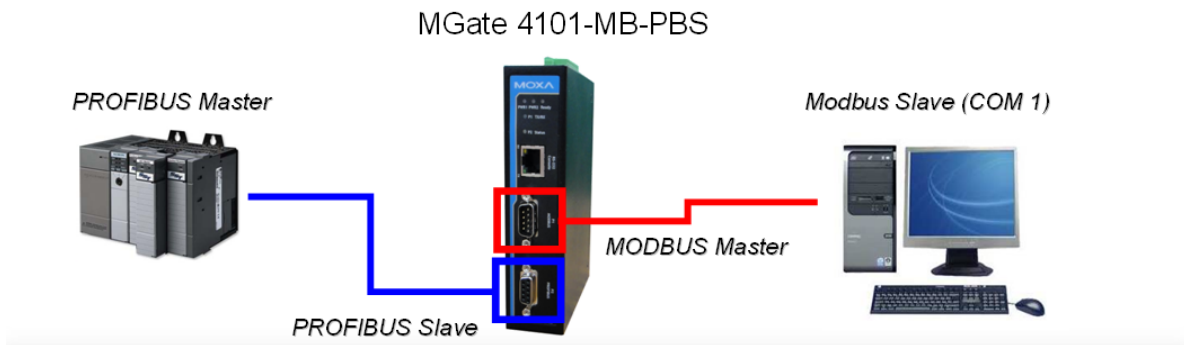




3. System Architecture

To simulate the environment specified above, the Mgate 4101 will perform gateway functions between a PROFIBUS master and a Modbus slave. Please refer to the illustration below.

Application	Description	Hardware / Software
Work Station	PROFIBUS Master	HMS Anybus-S Fieldbus Board
	PROFIBUS Master Tool	NetTool
Gateway	PROFIBUS Slave	MGate 4101-MB-PBS
	MODBUS Master	
Meter	MODBUS Slave (COM 1)	Modbus Slave (Software runs on PC)



We will define the parameters of the IO module and the Modbus data request for the MGate device.

Modbus request:

Modbus Request

Enable	Cyclic	Length	8
Slave ID	1	Internal Address	0
Function Code	01:Read coils	Poll Interval (ms)	1020
Address	0	Swap	None

OK Cancel

IO module:

PROFIBUS IO Module

I/O Type	Input
Data Type	Byte
Data Length	1

OK Cancel

4. System Requirements

We need to verify that we have all the necessary components to simulate the PROFIBUS/Modbus environment. The following are the system requirements for this exercise:

Hardware Requirements

1. MGate 4101-MB-PBS (PROFIBUS to Modbus gateway)
2. HMS Anybus-S Fieldbus board (PROFIBUS master board)
3. PROFIBUS cable
4. RS232 null modem cable (RJ45 to DB9 female, for MGate 4101-MB-PBS configuration)

Software Requirements

1. Windows XP (32-bit)
2. MGate Manager utility
3. Modbus slave utility
4. Modbus poll utility
5. NetTool
6. HMS driver for HMS Anybus-s Fieldbus board\

5. Installing the PROFIBUS Master Board

After installing the master board on your PC, we have to configure HMS-Anybus-M PROFIBUS DV-V1 to enable this card to work. In the next section, you can follow the step-by-step instructions for setup. If you are an expert with configuring the master board, please jump to the next section.

A. Install NetTool:

1. First, double-click the icon to install NetTool.



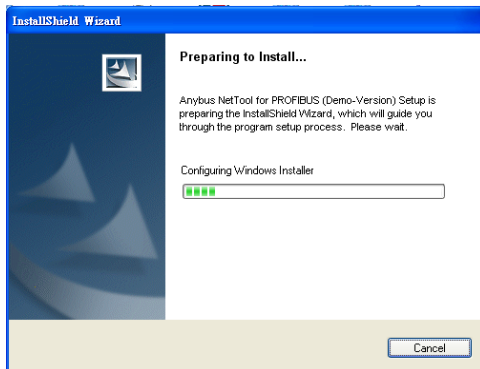
2. Click 'Config. Tools' on this menu.



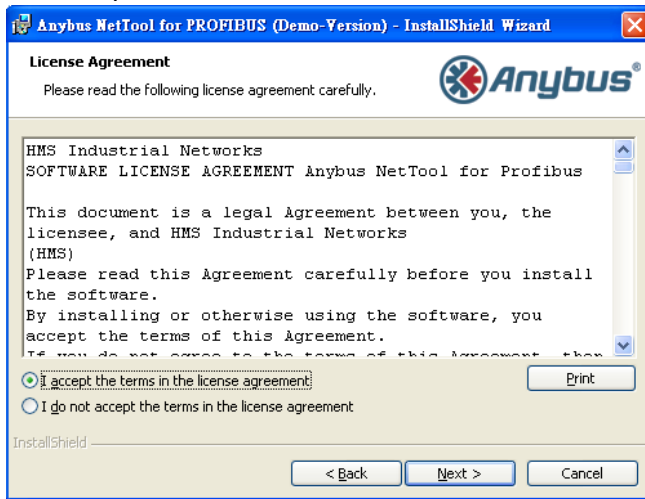
3. Navigate to 'Config.Tools\NetTool-PB (Profibus)' and then click the icon to install NetTool



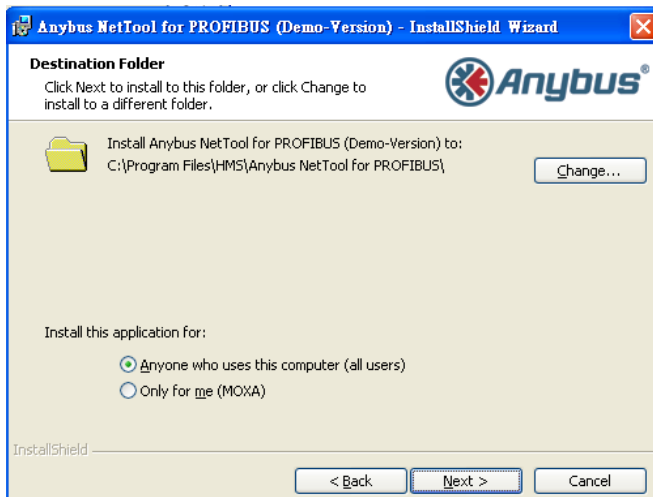
4. Please follow the installation steps to install utility



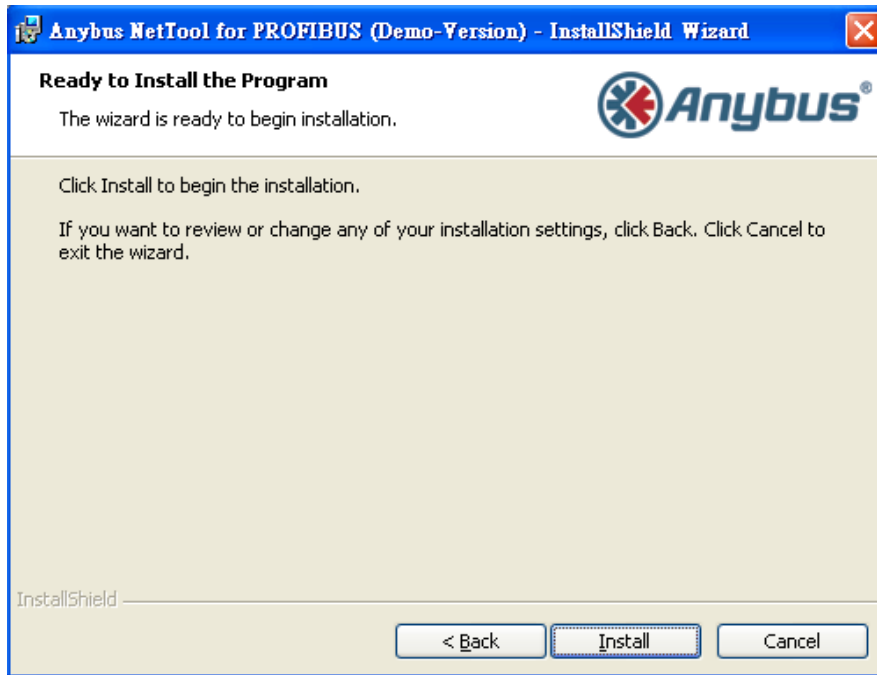
5. Accept the license and click 'Next'.



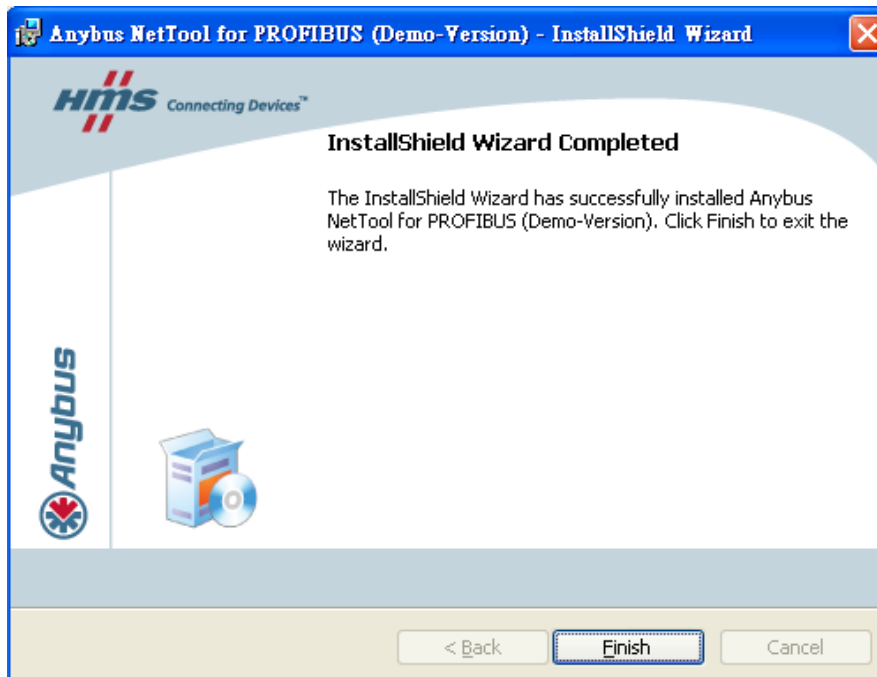
6. Select installation path and permissions.



7. Click 'Install' to start the installation process.

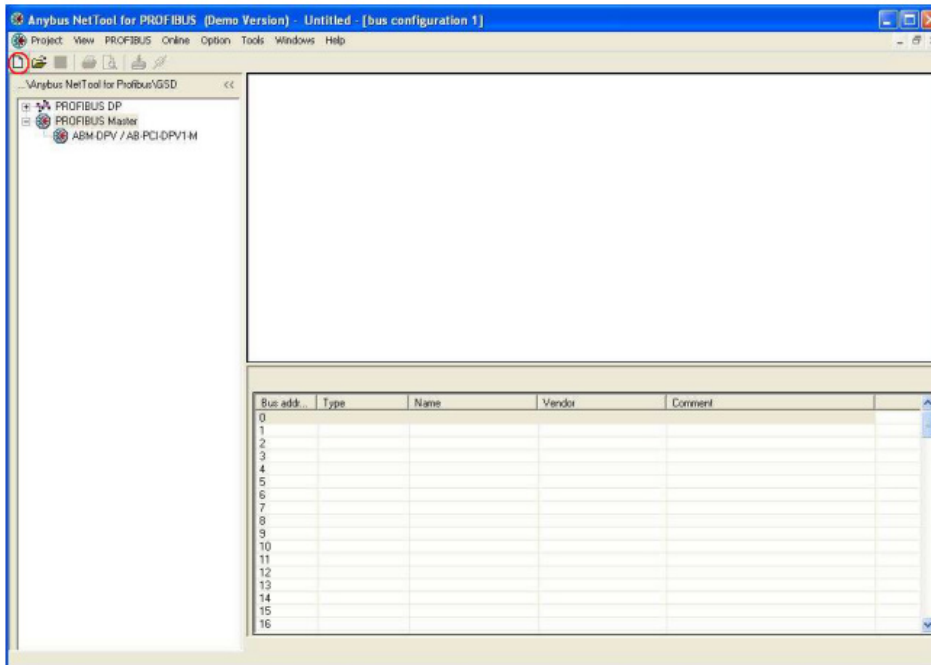


8. Click 'Finish' to exit the installation process.

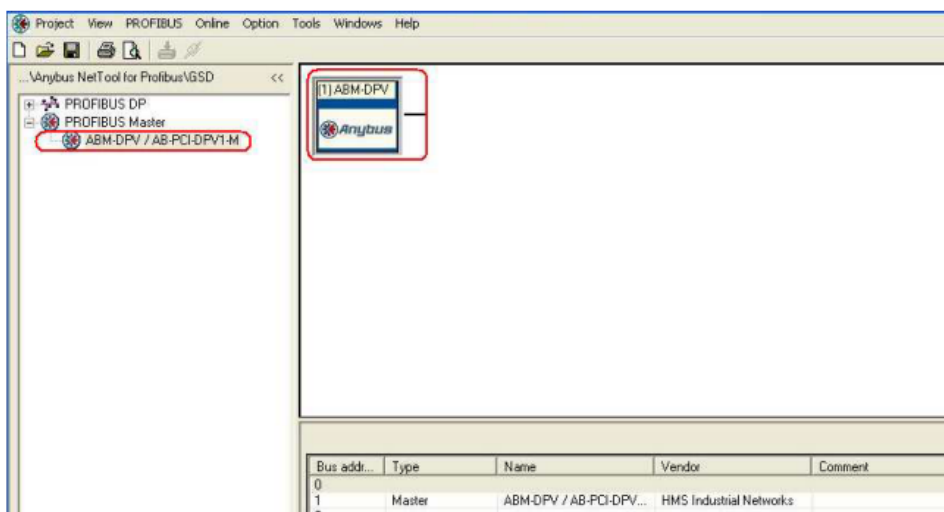


B. NetTool Configuration:

1. After installing NetTool, open the program and click the icon shown below to begin a new configuration.

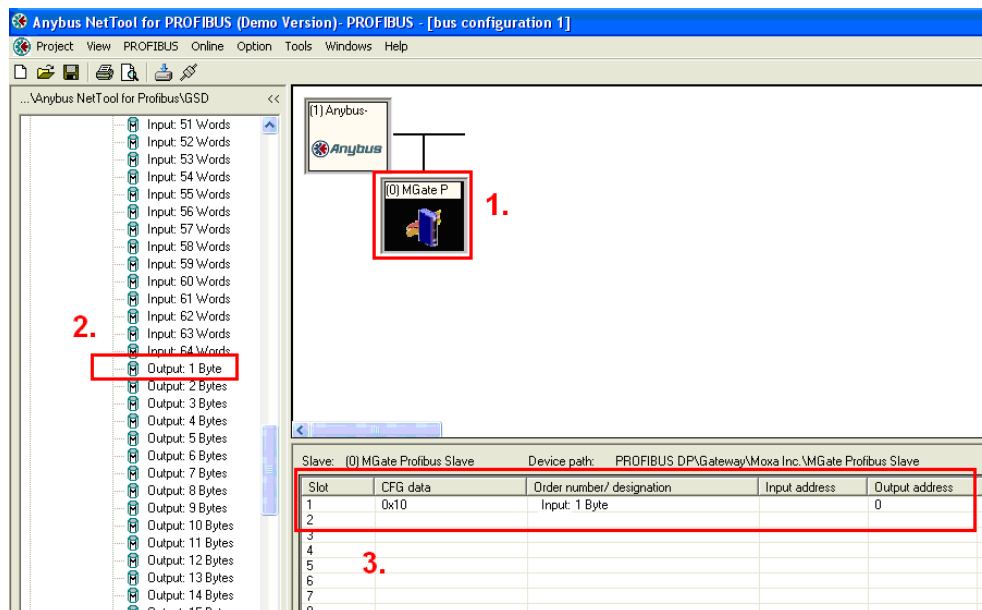


2. Import the GSD files of the PROFIBUS master and slaves, which are provided by the manufacturers. The GSD file for the MGate 4101-MB-PBS is included with the device.
3. Select 'ABM-DPV' and drag it to the right window. An icon will be generated to represent the PROFIBUS Master board.

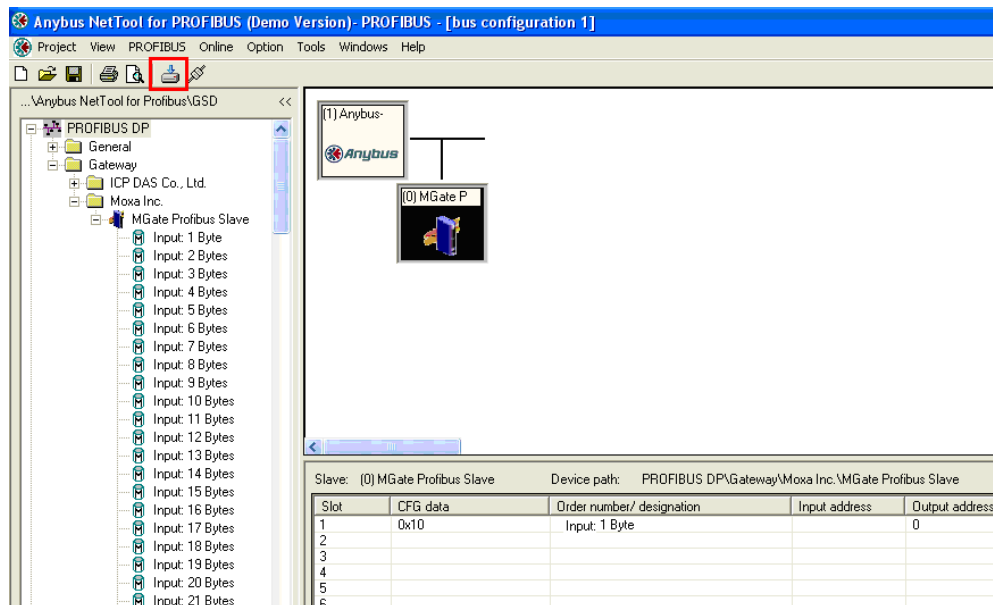


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4. Select 'MGate PROFIBUS Slave' and drag it to the right window. An icon will be generated to represent the MGate slave gateway. We will assume that the bus address for the PROFIBUS master is 1 and the bus address for the MGate device is 0.
5. Click the MGate device icon first, then drag the 'output 1 Byte' module into the right table.

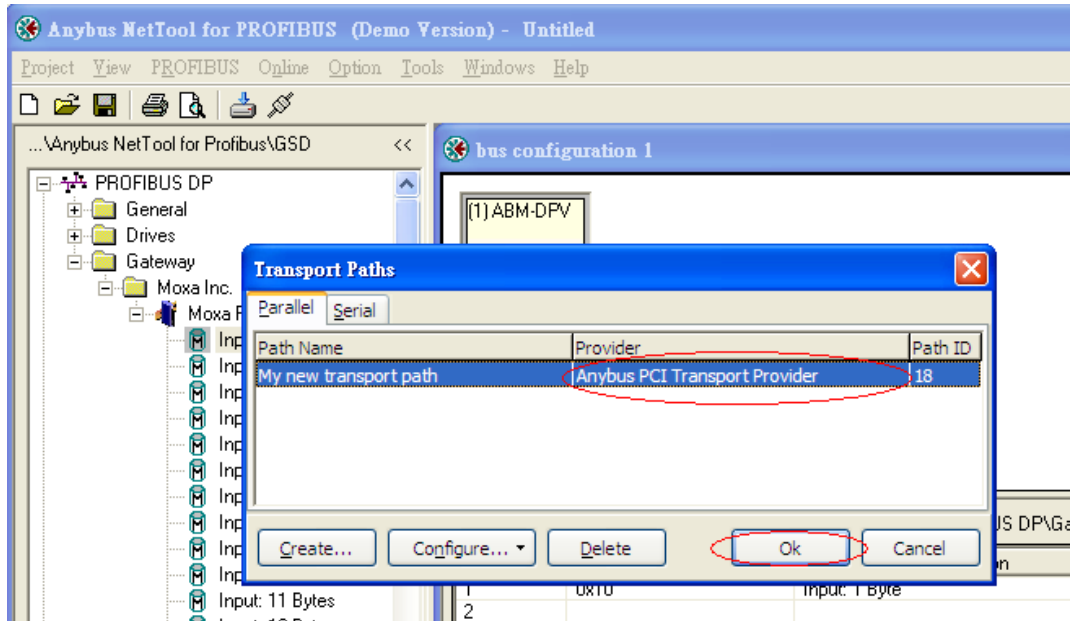


6. Click the 'download' icon to download configurations to the Master board.

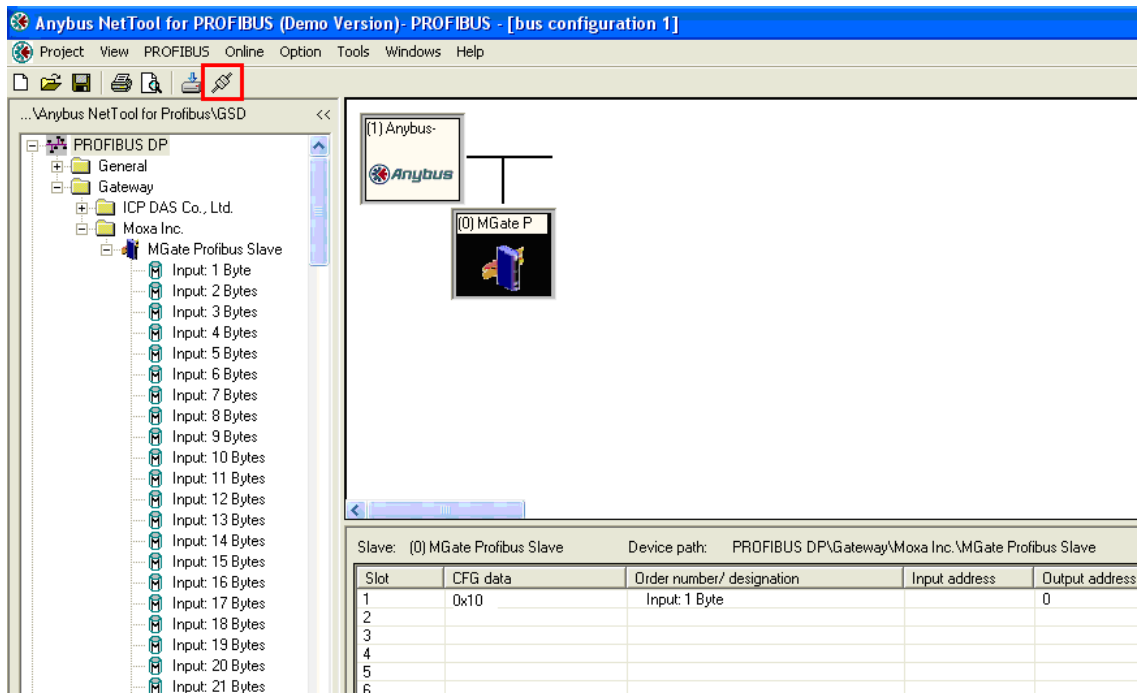


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Note: on the “Parallel” tab, select “Anybus PCI Transport Provider”, then click OK



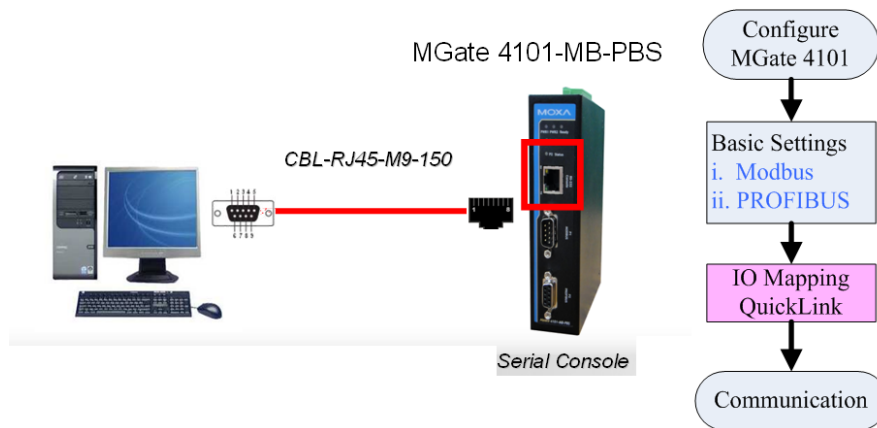
- Click the ‘monitor/modify connect’ icon to start communication on the PROFIBUS. However, before you start communicating on the PROFIBUS, You have to configure the MGate device first. In the following section, we will configure the MGate device.



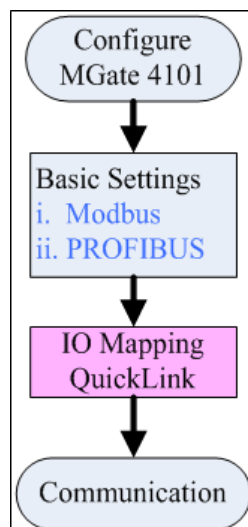
6. Configuring the MGate-4101-MB-PBS

First, you will need to connect the COM port of PC to the MGate 4101-MB-PBS for configuration through the MGate Manager utility(MGate Manager supports MGate 4101-MB-PBS from ver1.3). Now you can configure the MGate device from the PC, via the serial connection.

Item	Hardware / Software Description
Gateway	MGate-4101-MB-PBS
RJ45 Serial Cable	CBL-RJ45-M9-150 RJ45 to DB9 cable
Modbus	Modbus Poll (QuickLink)
PC + COM1	MGate Manager (Software runs on PC)

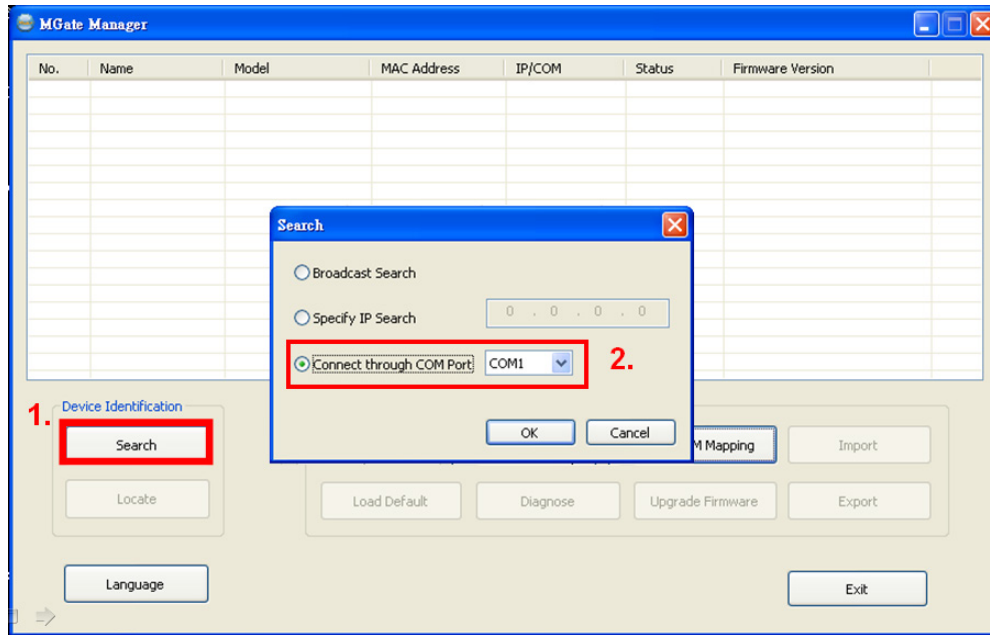


In the diagram below, the flow chart shows the software installation steps to configure the MGate, which consists of 4 steps. QuickLink is used to map Modbus request and create IO modules

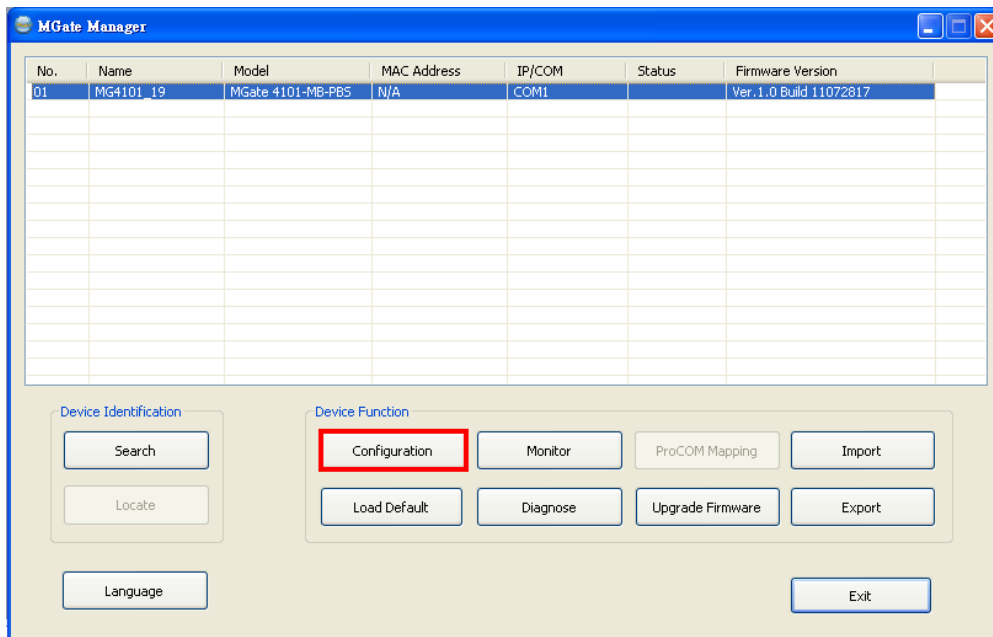


Configuration:

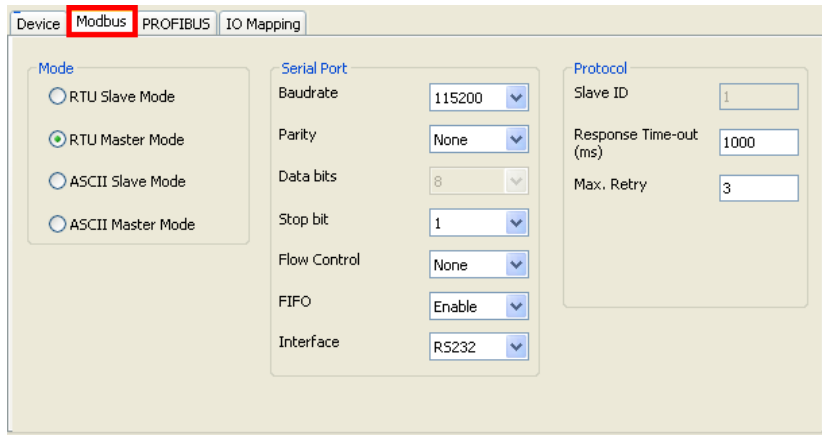
1. Start MGate Manager and detect the target device with the search function. It will search for device(s) on the serial connection.



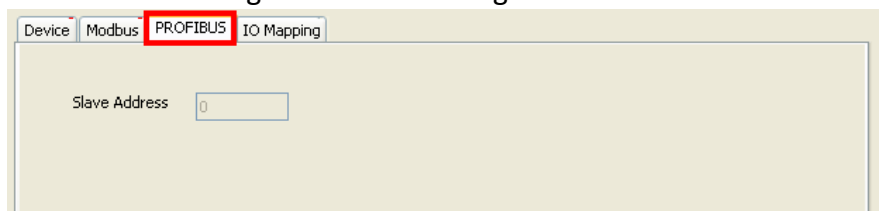
2. Select the target device and click the configuration button to configure the MGate device.



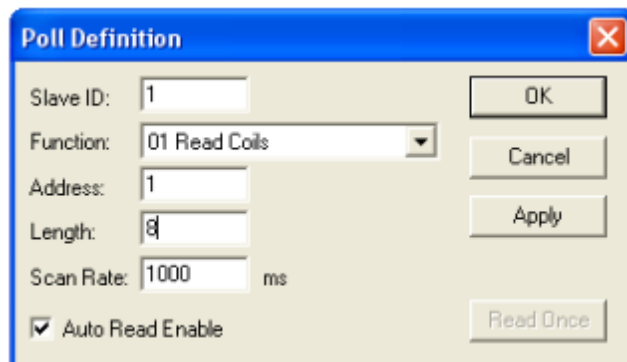
3. Select the Modbus tab. For this instance, we will set the Modbus mode to RTU Master Mode.



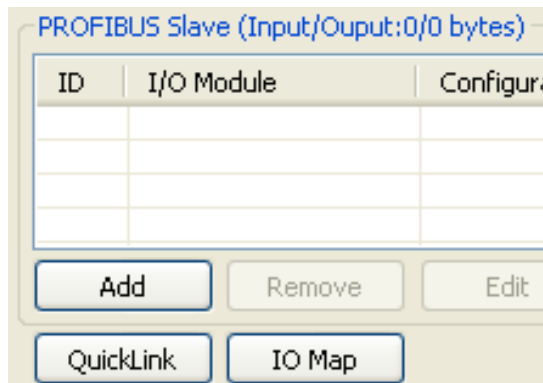
4. Then select the PROFIBUS tab. By default, the PROFIBUS slave address is set to 0, and since the rotary on the MGate is already set to 00, we don't need to change the PROFIBUS settings on MGate Manager.



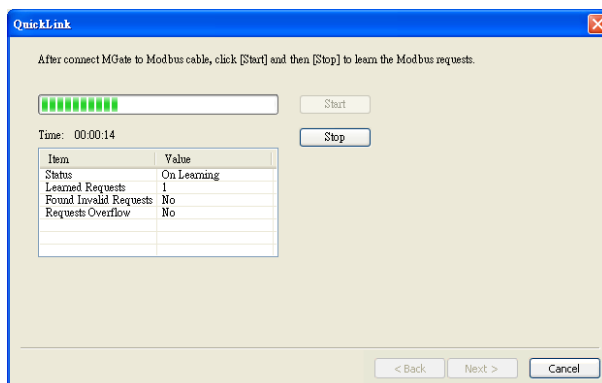
5. To establish communications between the PROFIBUS and Modbus devices, we need to perform IO mapping on the MGate device. There are two ways to perform IO mapping: manually and QuickLink. This application will only demonstrate IO mapping through QuickLink. If you wish to proceed with IO mapping manually, please refer to the MGate user manual.
 - a) The first step is to configure the Modbus poll utility to function as a Modbus master. Since we need to poll data from the Modbus slave regularly, we will assign a request for the Modbus master as shown in the following picture. Set the data packet length to 8, click Apply first, and then click OK.



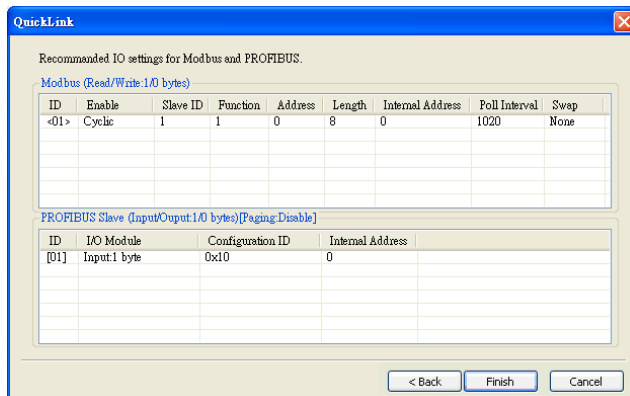
b) Then click the QuickLink button to begin.



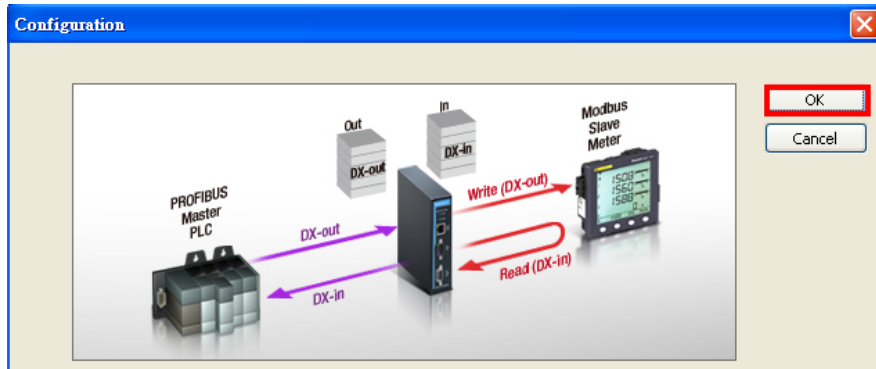
c) Now click the Start button to initiate QuickLink. The QuickLink process will take a moment to learn the request parameters sent from the Modbus Master (Modbus Polling). After we see that the MGate 4101 has learned the request (for this demonstration, there is only one poll request), you can stop the QuickLink procedure and click Next.



d) The final step is to check the learned request(s) of the MGate-4101. If everything looks fine, click the Finish button. (you can still modify requests manually, if needed.)

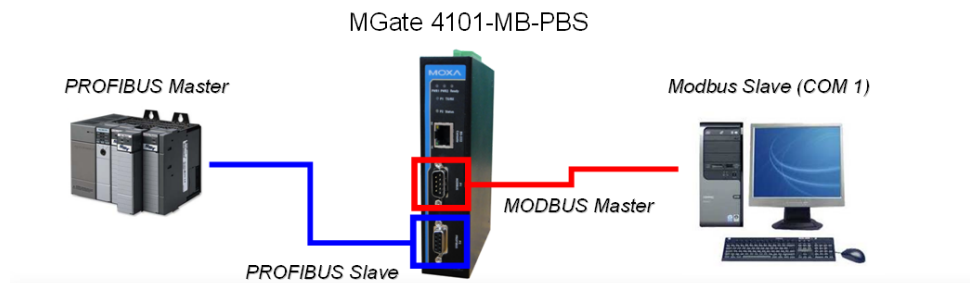


- e) Click the OK button to save and apply your new configuration settings to the MGate.



- f) Connect your devices according to the topology below.

Application	Description	Hardware / Software
Work Station	PROFIBUS Master	HMS Anybus-S Fieldbus Board
	PROFIBUS Master Tool	NetTool
Gateway	PROFIBUS Slave	MGate 4101-MB-PBS
	MODBUS Master	
Meter	MODBUS Slave (COM 1)	Modbus Slave (Software runs on PC)



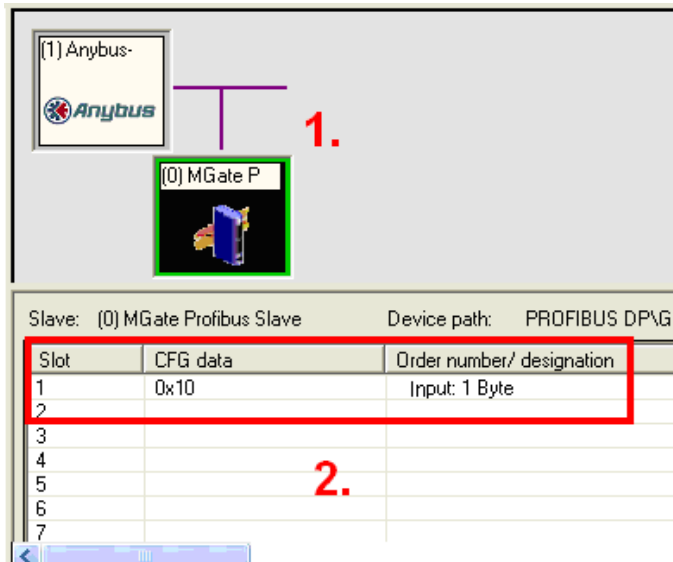
- g) Now the PROFIBUS and Modbus segments are ready to communicate. Communications verification will be demonstrated in the following section.

7. Communication Status Verification

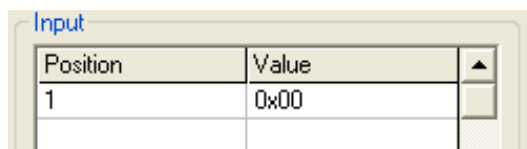
Up to this point, if configuration steps have been done correctly, the MGate device should work properly as a PROFIBUS/Modbus gateway. However, it is a good idea to check to make sure that the MGate device is work properly. Please refer to the following steps to verify communication.

Moxa Tech Note PROFIBUS Application for MGate 4101-MB-PBS

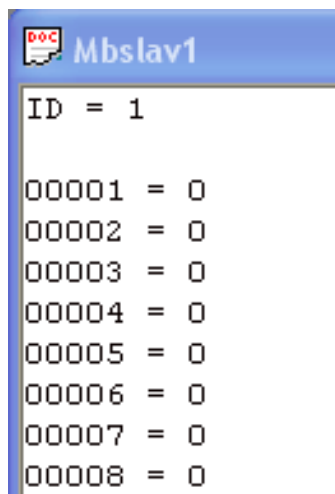
1. On the Anybus NetTool for PROFIBUS utility, make sure the icon of the MGate device is outlined in green. That's indicates that data transmission on the PROFIBUS side is working properly (please refer the following figure).
2. In order to confirm communication, we can change the data value from the PROFIBUS master to the Modbus slave. Double click the output module (outlined in red).



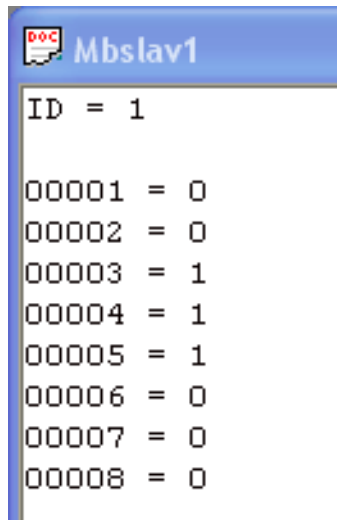
3. Note that the value is 0x00 before the change.



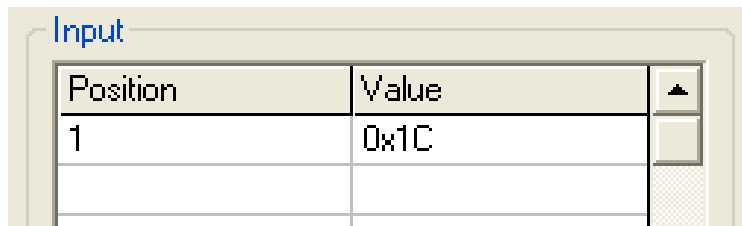
4. Before we change the value, note that in the Modbus slave utility, the initial value is 0 as well.



5. Change the value to 0x1C.



6. Now we see that the value has changed to 0x1C on NetTool.



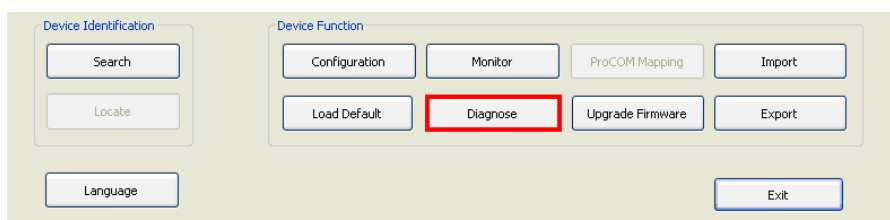
7. The MGate-4101 will poll Modbus slave regularly.

8. Troubleshooting

A. Troubleshooting for MGate 4101-MB-PBS device

"Anybus NetTool for PROFIBUS" (developed by HMS) and "Modbus Slave" can be used to diagnose communication status. If you encounter a problem, here are some suggestions for troubleshooting.

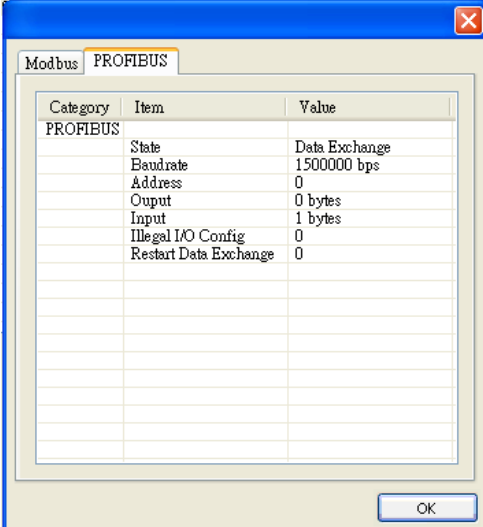
The diagnose function on the MGate Manager can help you determine whether the problem is on the PROFIBUS side or on the Modbus side. For details, please refer to the user manual.



Moxa Tech Note PROFIBUS Application for MGate 4101-MB-PBS

If PROFIBUS side is OK, you will see the following information:

- State = Data Exchange
- Illegal I/O Config = 0
- Restart Data Exchange = 0



The screenshot shows a window titled 'Modbus PROFIBUS' with a table of parameters. The table has three columns: 'Category', 'Item', and 'Value'. The 'Category' column is labeled 'PROFIBUS'. The 'Item' column lists various parameters, and the 'Value' column shows their current values.

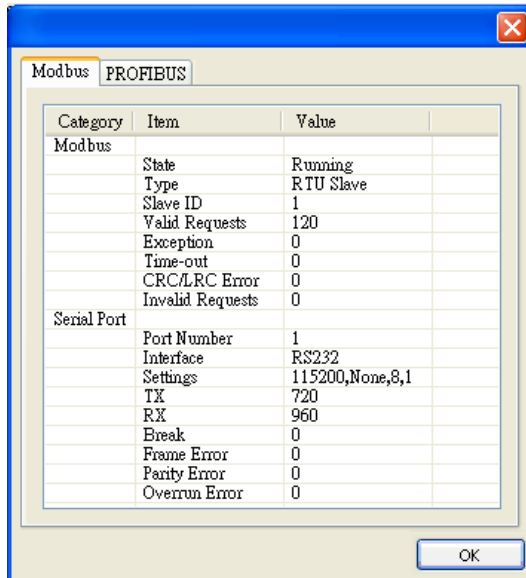
Category	Item	Value
PROFIBUS	State	Data Exchange
	Baudrate	1500000 bps
	Address	0
	Output	0 bytes
	Input	1 bytes
	Illegal I/O Config	0
	Restart Data Exchange	0

On the Modbus segment, there are two sections being displayed; Modbus settings and serial parameters. Under normal operating conditions, you will see the following:

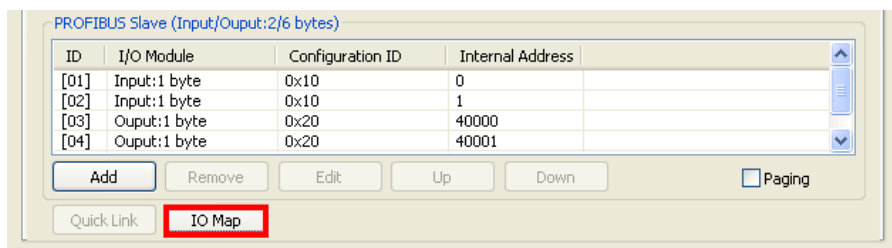
- State = Running
- Valid requests is increasing
- Exception = 0
- Time-out = 0
- CRC/LRC Error = 0
- Invalid Requests = 0

For serial port parameters, you can expect to see the following when everything is working properly:

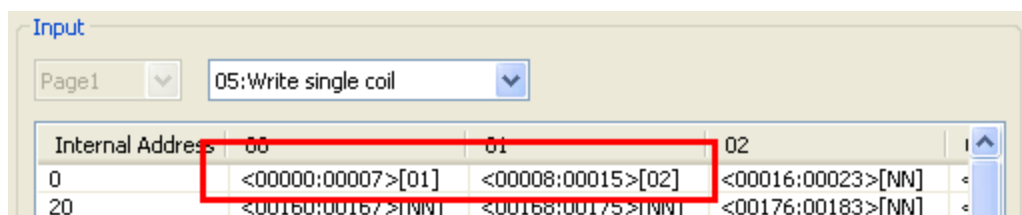
- Break = 0
- Frame Error = 0
- Parity Error = 0
- Overrun Error = 0



When the problem is on the PROFIBUS segment, the IO map function on the MGate Manager can help you check if the IO modules match the Modbus requests. For details, please refer to the user manual. The key point is that you need to make sure the IO module corresponds with the settings of PROFIBUS master.



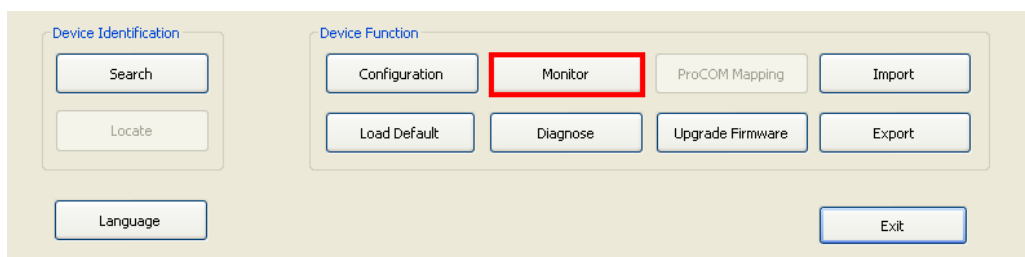
Input internal memory:



Output internal memory:

Internal Address	00	01	02
40000	<00000:00007>[03]	<00008:00015>[04]	<00016:00023>[05]
40020	<00160:00167>[16]	<00168:00175>[17]	<00176:00183>[18]
40040	<00320:00327>[32]	<00328:00335>[33]	<00336:00343>[34]

If the problem is on the Modbus segment, the Monitor function on the MGate Manager can help you to check the communication flow. For details, please refer to user manual.



B. Troubleshooting Communication Failures

[Overview]

The most common issue encountered by users is communication failure. However, the cause of the problem is usually unknown. In the following section, we will learn how to locate the source of the problem.

Here are two troubleshooting examples of communication failure. One for PROFIBUS side, the other is for Modbus side.

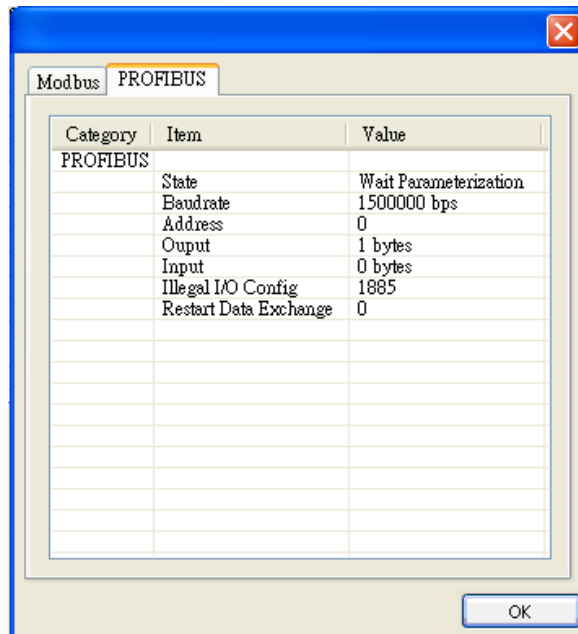
i. Communication Failure (PROFIBUS side)

The IO module of the master card is bigger than the IO module of the MGate 4101. In this case, the MGate 4101 will go into diagnose mode and communications are not normal.

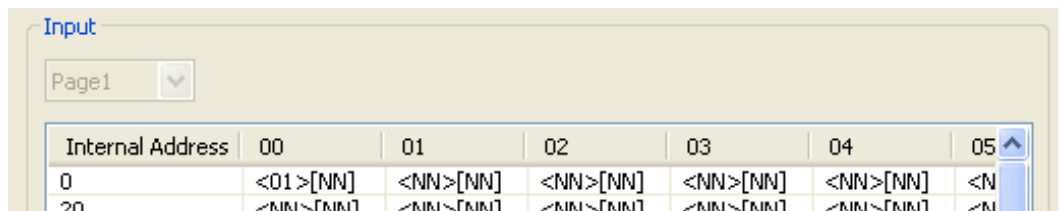
[Solution]

First, we used diagnose function to check which side the issue happened. We found some incorrect information on diagnose:

- Illegal I/O Config != 0
- State = Wait Parameterization



We can assume that the problem is on the PROFIBUS side, so we check the IO map. On the IO map, we see that only one IO module was mapped, but two should have been mapped.



After correction, the communication is ok

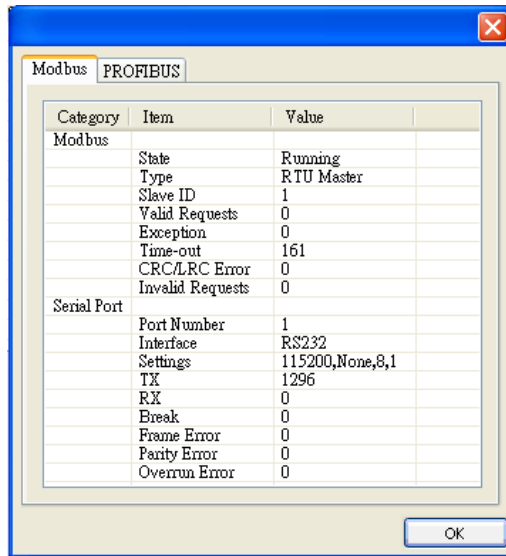
ii. Communication failure (Modbus side)

The baud rate of the Modbus master utility is 9600, but the baudrate is at 115200 for the MGate 4101.

[Solution]

We use the diagnose function to determine the location of the problem. We can immediately see a problem with these fields:

- Valid Requests = 0
- Time-out != 0



We can assume that the problem is on the Modbus side. We can use the Monitor feature. On monitor traffic, we found MGate doesn't get response from Modbus Master.

No.	Time	Src. & Dst.	Type	Slave ID	Function Code	Data
1	0.000	Port1->	RTU Request	1	1	01 01 00 00 00 01 FD CA
2	1.010	Port1->	RTU Request	1	1	01 01 00 00 00 01 FD CA
3	2.030	Port1->	RTU Request	1	1	01 01 00 00 00 01 FD CA
4	3.040	Port1->	RTU Request	1	1	01 01 00 00 00 01 FD CA
5	4.050	Port1->	RTU Request	1	1	01 01 00 00 00 01 FD CA

So first we check the Modbus master connection and realize that the baudrate of the master does not correspond with the baudrate of the slave. Adjust the baudrate settings and communications should be back to normal.

9. Reference

1. MGate 4101-MB-PBS user manual
2. MOXA MTSC material for MGate 4101-MB-PBS
3. MOXA MTSC material for MGate 3000
4. HMS Anybus-S Fieldbus Board user manual
5. <http://en.wikipedia.org/wiki/Profibus>