# GW-7553-B / GW-7553-M PROFIBUS/Modbus TCP Gateway

# User's Manual







**High Quality, Industrial Data Acquisition, and Control Products**

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## List of Revision

| Date | Author | Version | Revision |
|---|---|---|---|
| 2012/05/10 | Ryan | 1.33 | Release |
| 2013/05/30 | Elliot | 1.34 | Release |
| 2017/05/15 | Eric | 1.35 | Add GW-7553-M information. |



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# 1. Introduction

PROFIBUS and Modbus are two kinds of famous protocols and are wildly used in the fields of factory and process automation. The GW-7553-B / GW-7553-M is a PROFIBUS to Modbus TCP gateway. By using this module, users can easily put the Modbus TCP devices into PROFIBUS network.

***Figure 1*** shows an application example for the GW-7553-B / GW-7553-M module.

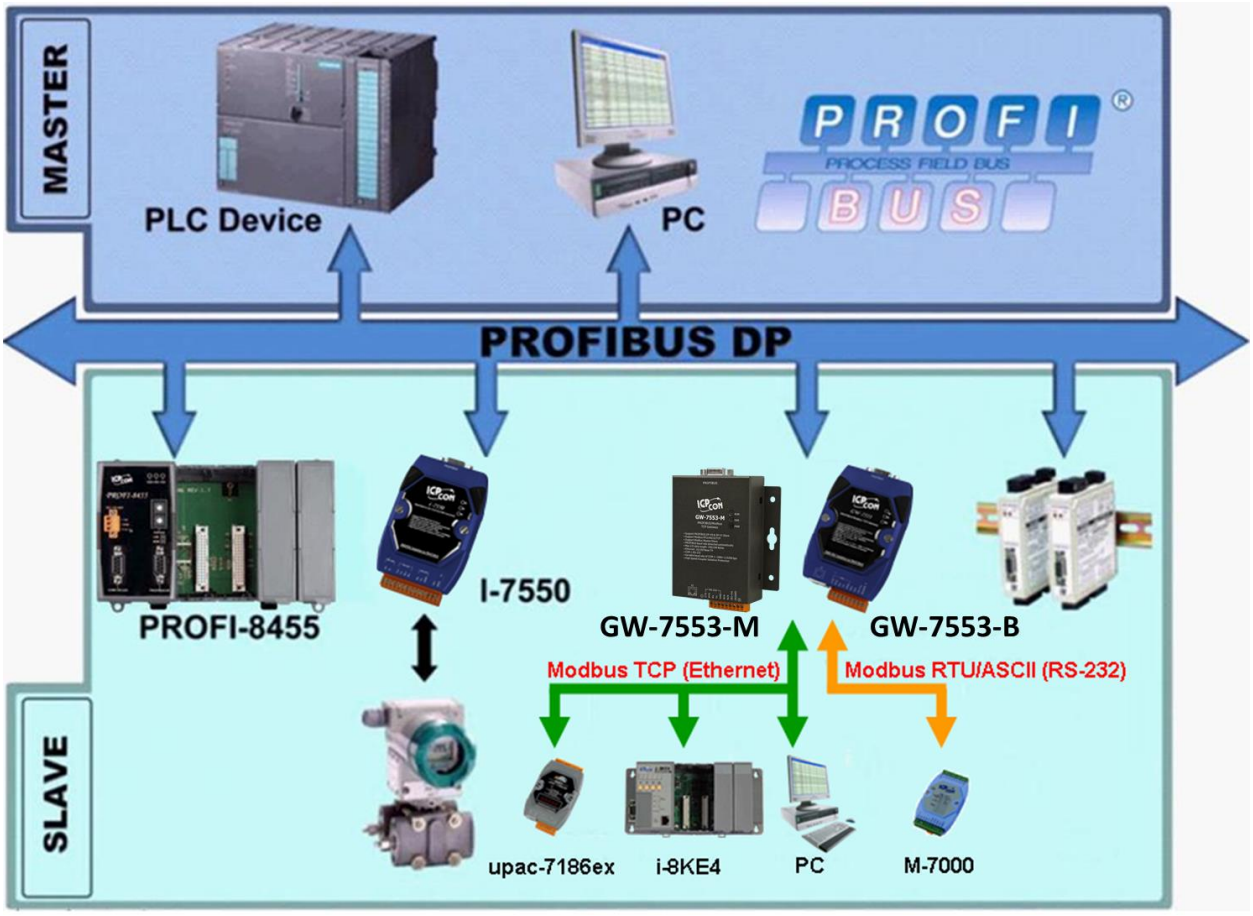



*Figure 1 Application architecture of the GW-7553-B / GW-7553-M module*

The GW-7553-B / GW-7553-M Gateway is specially designed for the slave device of PROFIBUS DP protocol. In the Modbus protocol application, the GW-7553-B / GW-7553-M can be a Modbus Master device or Slave device. The Modbus devices can exchange data with the PROFIBUS Master device via the GW-7553-B / GW-7553-M module.



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The main features and specification of GW-7553-B / GW-7553-M are described as below:

## 1.1 Features

- 16-bit Microprocessor inside with 80MHz
- Profichip VPC3+C PROFIBUS controller
- Support PROFIBUS DP-V0 & DP-V1 slave
- PROFIBUS transmission rate detect automatically
- Max transmission speed up to 12 Mbps for PROFIBUS and 115.2 kbps for COM Port
- Support Modbus RTU, ASCII and TCP format
- Support Modbus Master/Slave mode
- Support safe value setting
- COM Port driver has 1K bytes QUEUE input buffer & 512 bytes QUEUE output buffer
- Max length of output/input data is 240/240 Bytes
- Ethernet Port: 10/100 Base-TX
- 2500Vrms High Speed iCoupler Isolation Protection for PROFIBUS network
- 3000$V_{DC}$ Isolation Protection on the PROFIBUS side
- Provide LED indicators
- Built-in Watchdog
- Mountable on DIN Rail

## 1.2 Modules Support

Only the following Modbus commands are supported by the gateway.

*Table 1 Modbus function codes*

| Code | Name | Description |
|---|---|---|
| 01 | Read Coil Status | Read the ON/OFF status of discrete outputs in the slave |
| 02 | Read Input Status | Read the ON/OFF status of discrete inputs in the slave |
| 03 | Read Holding Registers | Read the binary contents of holding registers in the slave |
| 04 | Read Input Registers | Read the binary contents of input registers in the slave |
| 05 | Force Single Coil | Write a single output to either ON or OFF in the slave |
| 06 | Preset Single Register | Write an integer value into a single register in the slave |
| 15 | Force Multi. Coils | Write each coil in the sequence of coils to either ON or OFF in the slave |
| 16 | Preset Multi. Registers | Write a block of contiguous registers in the slave |

## 1.3 Specification



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COM Port specs:

- Serial port - RS-232
- Serial port interface: screw terminal block
- Baud Rate：2400/4800/9600/19200/38400/57600/115200 bps
- Data Format: 7/8 data bits, None/Odd/Even parity bit, 1/2 stop bit

PROFIBUS specs:

- PROFIBUS interface connector: D-Sub 9-pin female
- Baud Rate: 9.6k/19.2k/45.45k/93.75k/187.5k/500k/1.5M/3M/6M/12Mbps
- Address Setting: 0~126 (set by DIP switch or EEPROM)

Ethernet specs:

- 10/100Base-TX (Auto-negotiating, Auto_MDIX, LED indicator)

Power requirement:

- Unregulated +10 ~ +30 $V_{DC}$
- Power reverse protection, Over-Voltage brown-out protection
- Power consumption 2.5W

Module specs:

- Dimensions:
  GW-7553-B : 119mm X 72mm X 33 mm
  GW-7553-M :118mm X 102mm X 27 mm
- Operating temperature: -25 ~ 75 ℃
- Storage temperature: -30 ~ 85 ℃
- Humidity：5 ~ 95% RH, non-condensing
- LED Status Indicators(***Table 2***)

*Table 2 LED status indicator*

| | |
|---|---|
| PWR LED | – Show the power state<br>– Show data state |
| ERR LED | – Show error state |
| RUN LED | – Show communication state of PROFIBUS |



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# 2. Hardware

## 2.1 Block Diagram of GW-7553-B / GW-7553-M

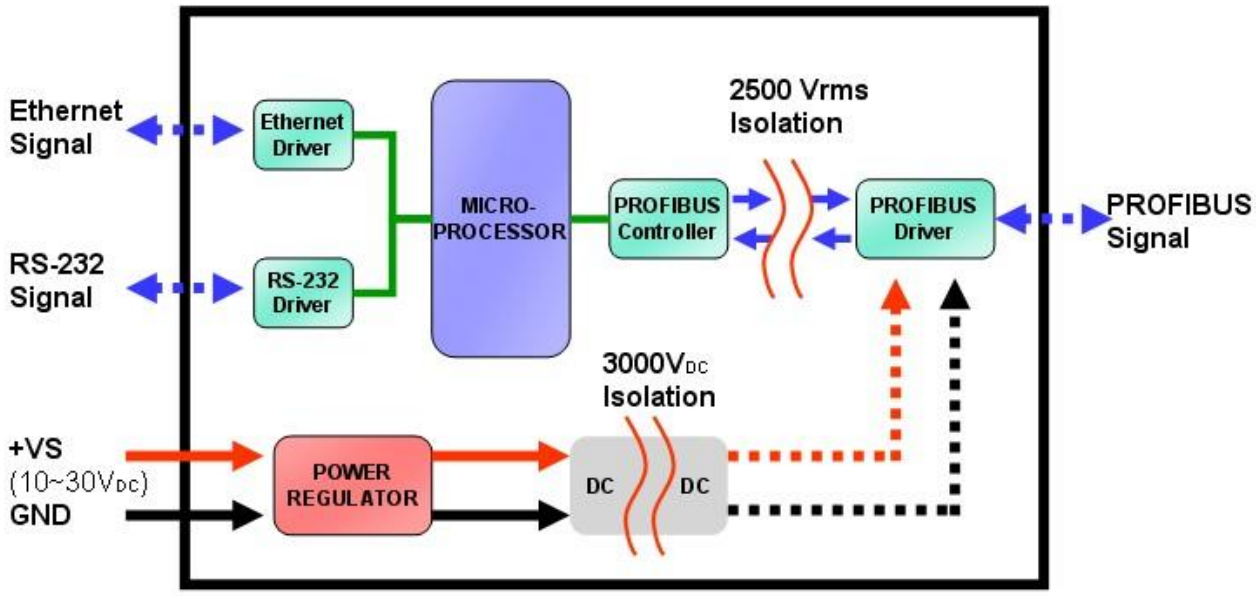



*Figure 2 Block diagram of GW-7553-B / GW-7553-M*

## 2.2 Pin Assignment






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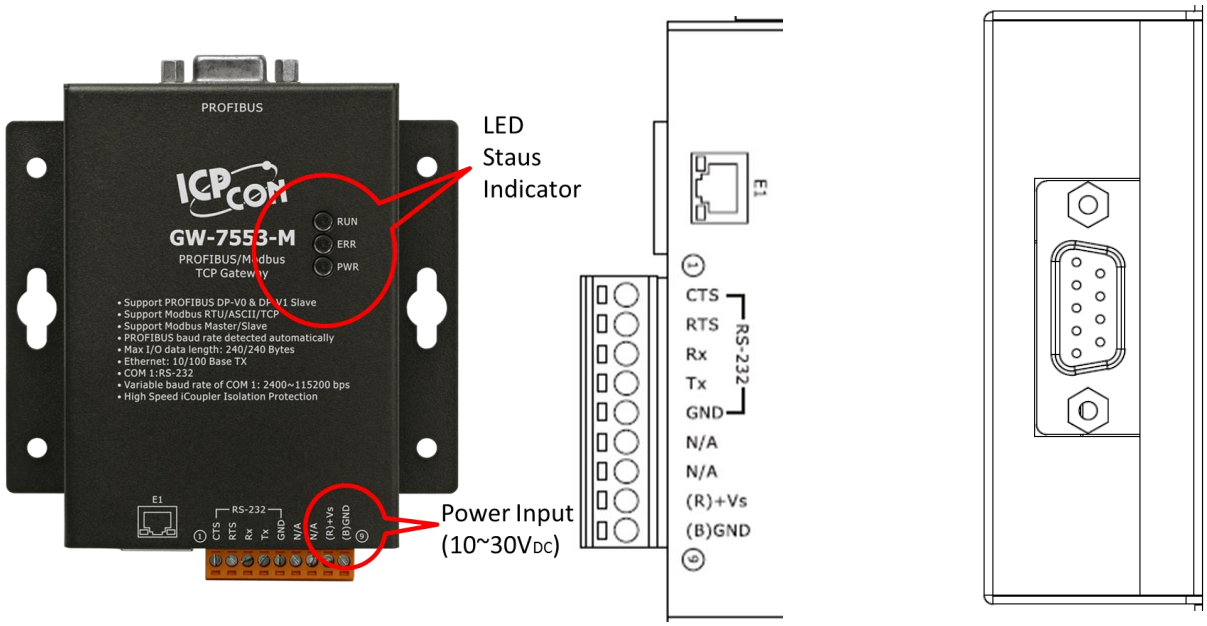
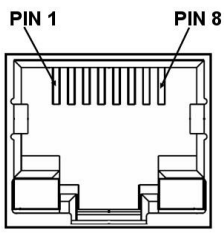



*Figure 3 Pin assignment of GW-7553-B / GW-7553-M*

*Table 3 9-pin screw terminal block*

| Pin | Name | Description |
|---|---|---|
| 1 | CTS | Clear to Send of RS-232 |
| 2 | RTS | Request to Send of RS-232 |
| 3 | RX | Receive Data of RS-232 |
| 4 | TX | Transmit Data of RS-232 |
| 5 | GND | GND of RS-232 |
| 6 | - | N/A |
| 7 | - | N/A |
| 8 | +VS | V+ of Power Supply(+10 ~ +30 VDC) |
| 9 | GND | GND of Power Supply |

*Table 4 RJ-45 socket*



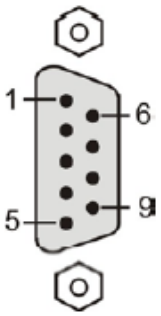



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| Pin | Name | Description |
|---|---|---|
| 1 | TX+ | TX+ output |
| 2 | TX- | TX- output |
| 3 | RX+ | RX+ input |
| 4 | - | N/A |
| 5 | - | N/A |
| 6 | RX- | RX- input |
| 7 | - | N/A |
| 8 | - | N/A |

*Table 5 PROFIBUS DB9 Female Connector*

| Pin | Name | Description |
|---|---|---|
| 1 | - | N/A |
| 2 | - | N/A |
| 3 | B | Non-inverting Bus Line |
| 4 | ISODE | Isolated DE output for use in PROFIBUS applications where the state of the isolated drive enable node needs to be monitored. |
| 5 | GND | Power supply ground for the first node and the last node |
| 6 | VP | +5V Power Supply for the first node and the last node |
| 7 | - | N/A |
| 8 | A | Inverting Bus Line |
| 9 | - | N/A |




## 2.3 Wiring

GW-7553-B / GW-7553-M supports PROFIBUS to Serial or Ethernet communication. It is recommended to use only one communication interface (RS-232 or Ethernet) of the Gateway at the same time. The following section describes the connection interface of GW-7553-B / GW-7553-M.

### 2.3.1 RS-232 connection



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The RS-232 port of the GW-7553-B / GW-7553-M has got three pins. The wiring of the RS-232 device with the RS-232 port of the GW-7553-B / GW-7553-M is shown in ***Figure 4***.

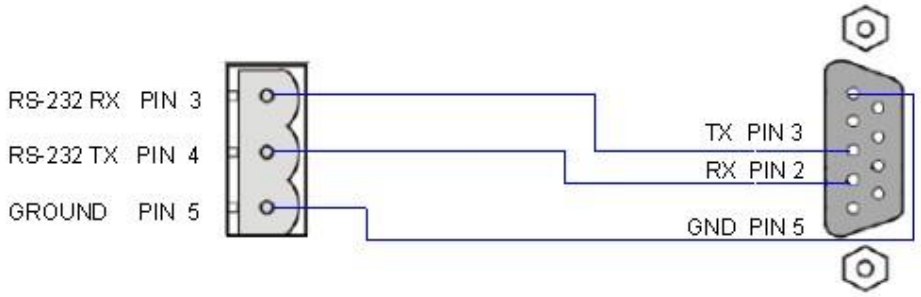



*Figure 4 RS-232 wiring diagram*

### 2.3.2 Ethernet connection

The user can connect GW-7553-B / GW-7553-M with the other device to the same sub network or same Ethernet Switch, as shown in ***Figure 5***.

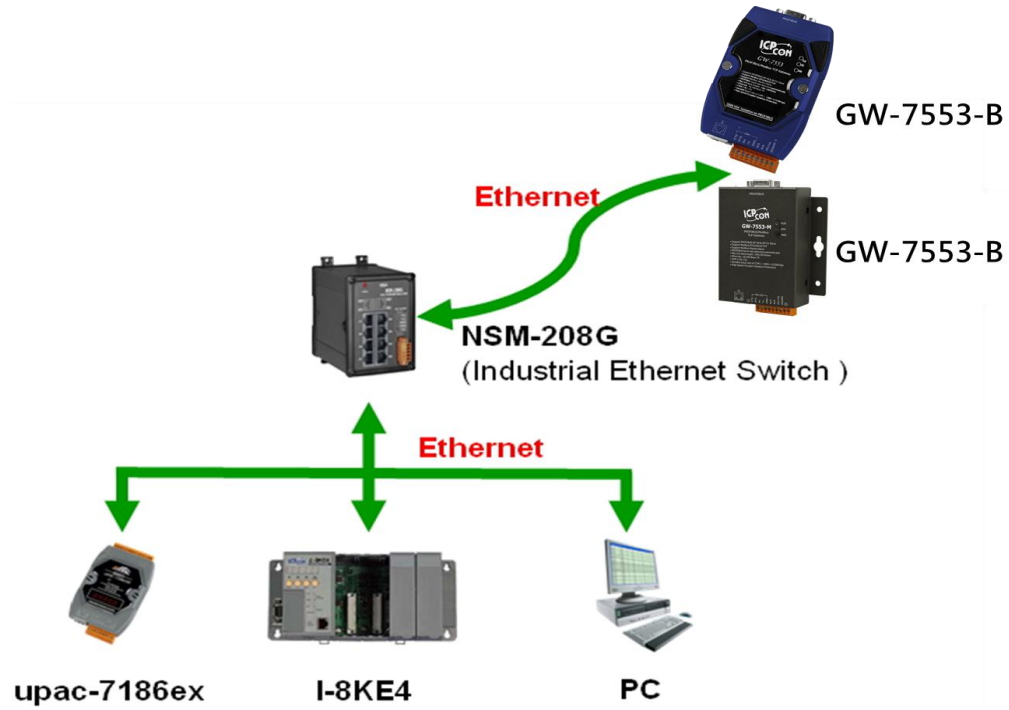



*Figure 5 Ethernet connection*



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### 2.3.3 PROFIBUS Connection

The PROFIBUS interface of the GW-7553-B / GW-7553-M is a DB9 female connector. The connector uses the standard PROFIBUS 9 pin assignment. It is recommended to use a standard PROFIBUS cable and connector (DB9 male). As with every serial bus the rate of safe data transmission in a PROFIBUS network decreases with increasing distance between Master and Slave. ***Table 6*** shows the transmission rate and range for a cable with the following properties:

1. Impedance :135~165 Ω
2. Capacity : lower than 30 pF/m
3. Loop resistance : lower than 110 Ω/km
4. Wire diameter : greater than 0.65 mm
5. Core cross-section : greater than 0.34 $mm^2$

*Table 6 Transmission rate decreasing with increasing transmission distance*

| Transmission Rate(kbps) | Transmission Distance per Segment (meter) |
|---|---|
| 9.6, 19.2, 45.45,93.75 | 1200 |
| 187.5 | 1000 |
| 500 | 400 |
| 1500 | 200 |
| 3000, 6000, 12000 | 100 |

In order to minimize the reflection effect of signal transmission, both ends (first node and last node) of a PROFIBUS segment needs to be equipped with an active terminal resistor as shown in ***Figure 6***. A standard PROFIBUS connector is usually already equipped with a terminal resistor. The user therefore only has to switch on the resistor of the devices stationed at the ends of a segment as shown in ***Figure 7***.



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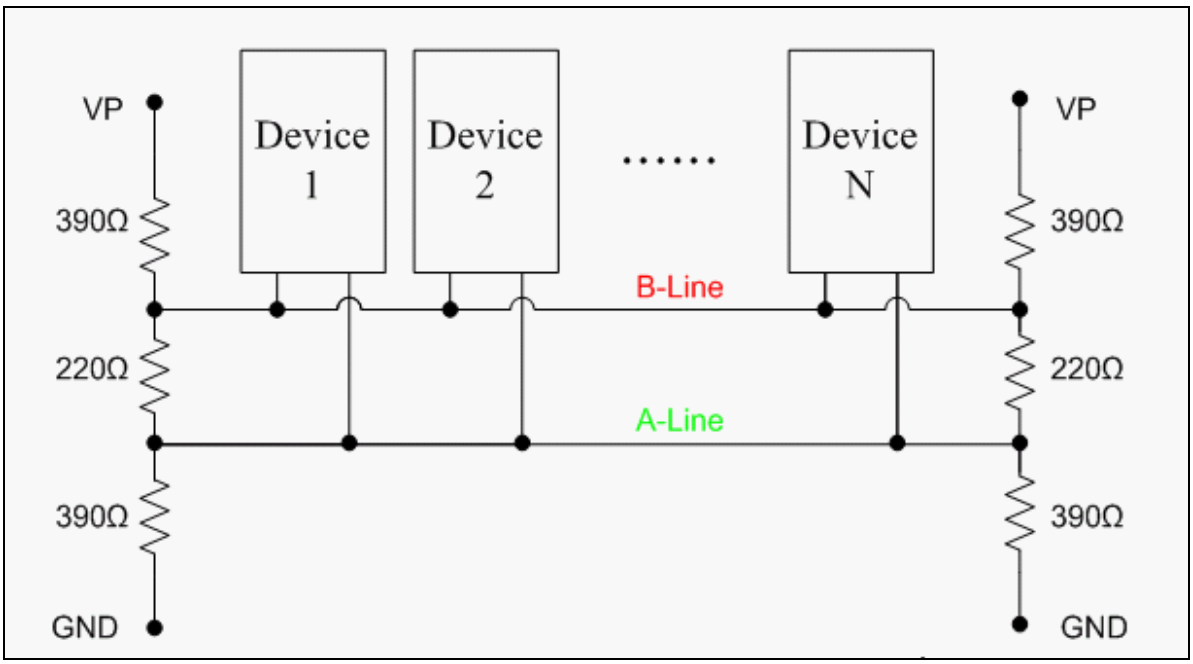



*Figure 6 PROFIBUS connection*

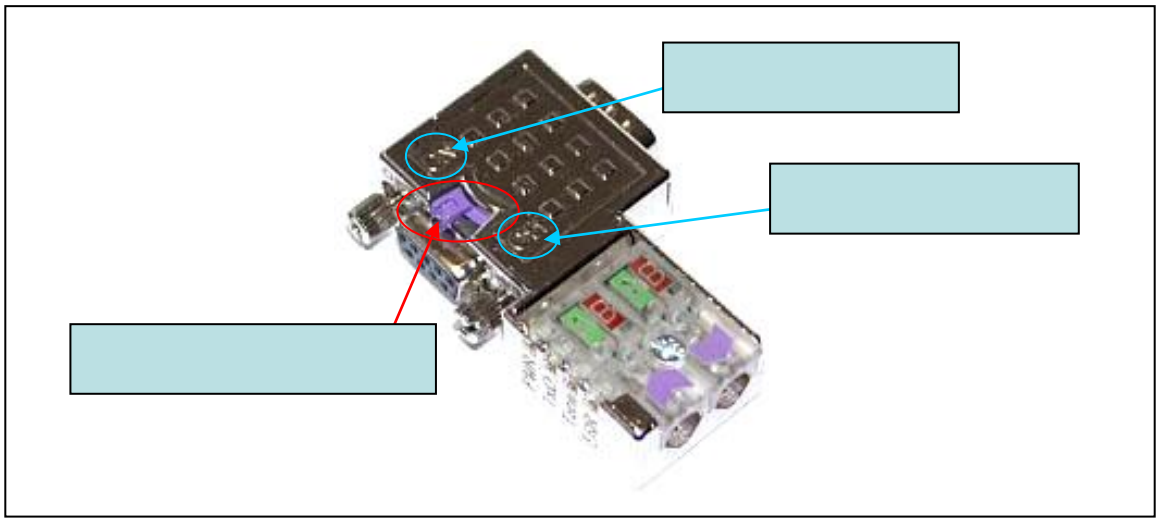


*Figure 7 PROFIBUS connector*

The number of stations in a PROFIBUS network is restricted to 126. According to the PROFIBUS specification up to 32 stations are allowed per segment. A repeater has to be used to link the bus segments.

## 2.4 Setting the PROFIBUS Address

The station address of GW-7553-B / GW-7553-M can be set by using either the



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DIP switch or by writing it directly to the EEPROM. The DIP switch covers a range from 0 to 255. The valid address range of a PROFIBUS station spans from 0 to 126. ***Table 7*** shows three examples of setting the station address by using the DIP switch. The DIP switches are accessed by opening the modules housing (***Figure 8)***. ***Table 8*** explains which address will be used by the module after power on, if the DIP switch address setting differs from the address stored in the EEPROM.

*Table 7 DIP switch setting example*

| **Station address** | **DIP switch (SW1)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 126 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |

*Note: 1=>ON, 0=>OFF*

*Table 8 The Address setting of the GW-7553-B / GW-7553-M*

| DIP switch Setting | Description |
|---|---|
| 0~125 | 1. The address setting of the EEPROM is ignored.<br>2. The address can not be set by the PROFIBUS configuration tool. |
| 126-254 | 1. The address setting of the DIP switch is ignored.<br>2. If the address in the EEPROM is 126, the PROFIBUS configuration tool can set a new address and save it to the EEPROM. |
| 255 | 1. Slave address in the EEPROM is set to 126. |



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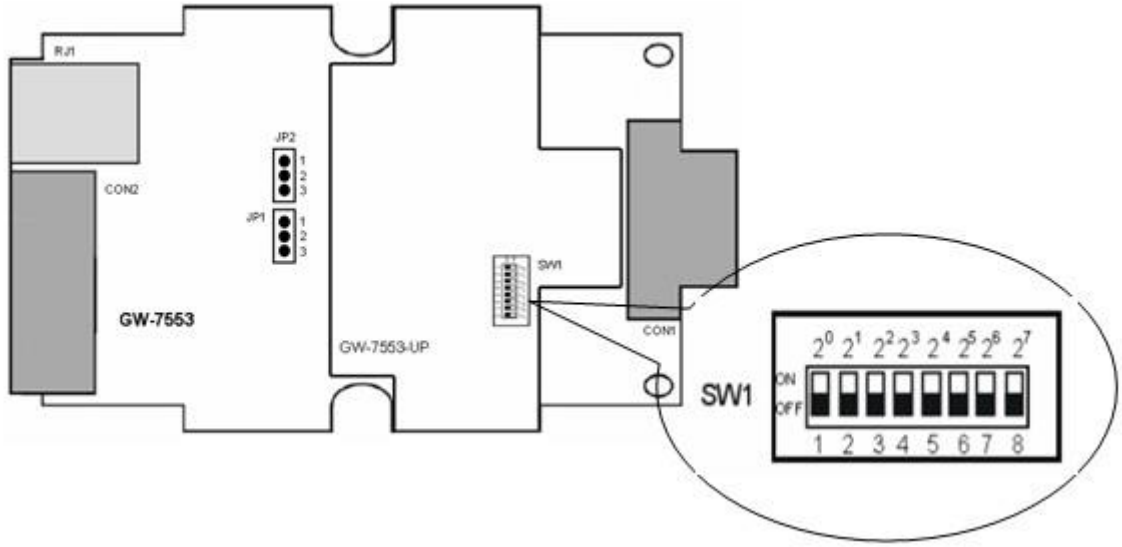



*Figure 8 DIP switch*

Each Slave must have a unique valid address (1 to 125) in order to be able to communicate with the Master. To change the address by using the configuration tool it is necessary to first set the address stored in the EEPROM to 126. This is done by setting the DIP switch to 255 in the power off state. Switching the module on is forcing the module to change its address in the EEROM to 126. In the next step switch the module off and change the DIP switch setting to any value from 126 to 254. This step is necessary in order to prevent the module to change its address in the EEPROM to 126 every time it is powered on. The configuration tool can now assign the Slave a new address.

## 2.5 LED status indicator

The GW-7553-B / GW-7553-M provides three LEDs to indicate the statuses of the GW-7553-B / GW-7553-M module. The position of LEDs and descriptions are shown in ***Table 9*** and ***Figure 9***.

*Table 9 LED status description*

| LED Name | Status | Description |
|---|---|---|
| PWR | flash | When the GW-7553-B / GW-7553-M acts as a Modbus Slave device and receiving query message form Modbus Master device, PWR led will flash. |
| | on | Power supply is ok.<br>The firmware has loaded. |



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| LED Name | Status | Description |
|---|---|---|
| | off | Power supply has failed. |
| ERR | flash | When the GW-7553-B / GW-7553-M connects with the utility tool, it will flash fast (flash once about 55ms).<br>When the GW-7553-B / GW-7553-M has diagnostic message, it will flash slowly (flash once about 220ms). |
| | on | – Connection error between PROFIBUS Master and Slave or<br>– PROFIBUS system has not been configured correctly. |
| | off | Normal operation<br>PROFIBUS system has been configured correctly |
| RUN | on | Data exchange mode<br>Normal operation. |
| | off | GW-7553-B / GW-7553-M module is not in a data exchange mode. |




*Figure 9 LED position*

## 2.6 Normal/Setting DIP switch

There is a DIP switch on the back of the GW-7553-B module, as shown in ***Figure 10***.



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The DIP switch is used to set the GW-7553-B module works in operation mode or setting mode. In the normal situation, it needs to set the DIP switch to the “Normal” position. In this case, the GW-7553-B module can communicate with Modbus devices. When the user sets the DIP switch to the “Setting” position, the GW-7553-B module can communicate with the utility to set the safe value and network configuration.

GW-7553-M module only can connect to Utility via setting the control bit (please refer section 4.6.2 Output data area and communication command) to enable the setting mode of the GW-7553-M.

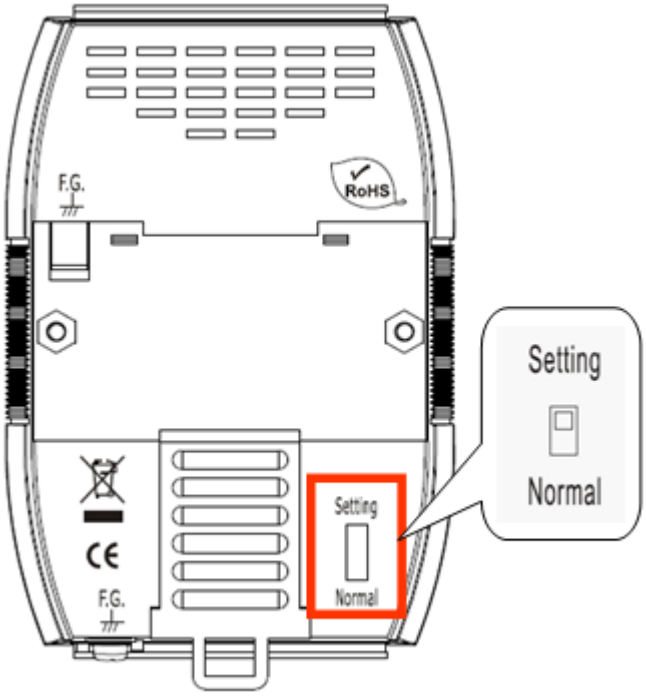



*Figure 10 DIP switch of the GW-7553-B*

PS:

There are two kinds of methods to enable the setting mode of the GW-7553-B.

The user can change the position of the DIP switch or set the control bit (please refer section 4.6.2 Output data area and communication command) to enable the setting mode of the GW-7553-B, as shown in ***Table 10*** .

*Table 10 Mode of GW-7553-B*

| Mode | SM(control bit)=0 | SM(control bit)=1 |
|---|---|---|
| DIP switch=Normal | operation mode | setting mode |
| DIP switch =Setting | setting mode | setting mode |



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# 3. Communication protocol transfer theorem

## 3.1 PROFIBUS data exchange

The GW-7553-B / GW-7553-M is a PROFIBUS DP Slave device. The GW-7553-B / GW-7553-M is first parameterized then configured and finally it goes into the data exchange mode (***Figure 11***).

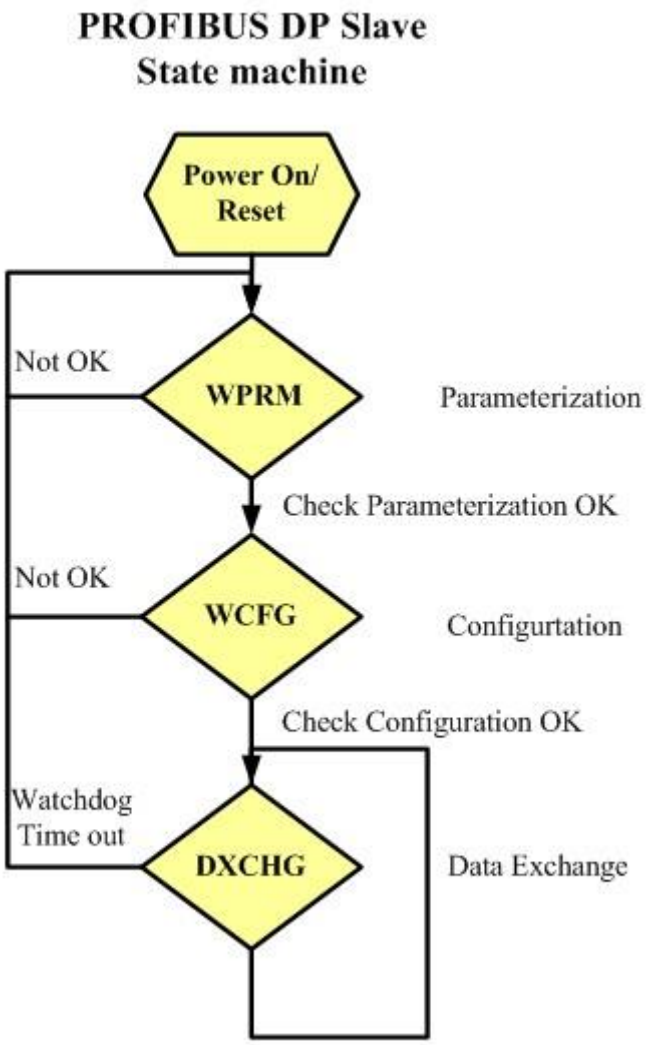



*Figure 11 State machine of PROFIBUS DP Slave device*

The GW-7553-B / GW-7553-M exchanges data cyclically between internal DI、DO、AI、AO data and PROFIBUS Master device in data exchange mode, as shown in ***Figure 12***.



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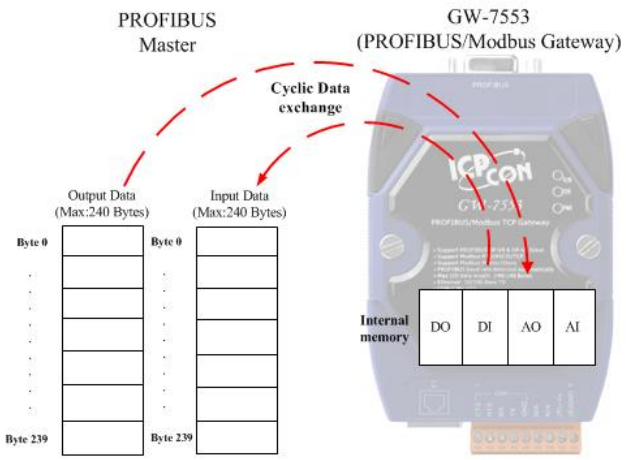



*Figure 12　Data exchange between PROFIBUS Master device and GW-7553-B / GW-7553-M*

The GW-7553-B / GW-7553-M downloads the parameter and configuration from PROFIBUS Master device to be the module parameters. The GW-7553-B / GW-7553-M and PROFIBUS Master device have different data type and data address, the GW-7553-B / GW-7553-M can transfer different data format to PROFIBUS Master device through module parameters. When the GW-7553-B / GW-7553-M acts as a Modbus Master device, it will send DI、AI data to input data area of PROFIBUS Master device and it will save data that receives from PROFIBUS Master device to internal DO、AO memory space，as shown in ***Figure 13***、***Figure 14***.



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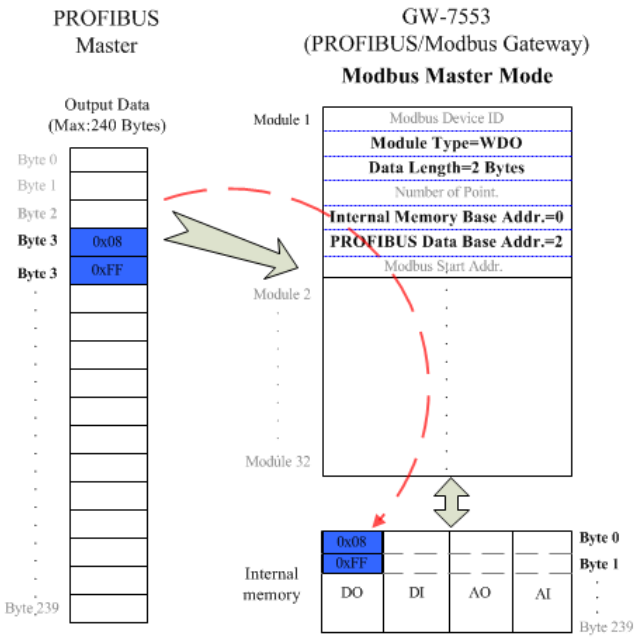



*Figure 13 The output data of PROFIBUS Master device send to the GW-7553-B / GW-7553-M*

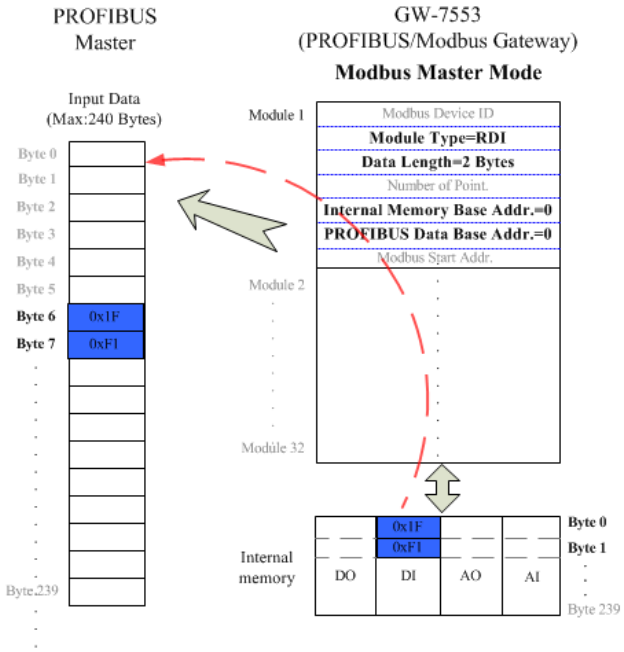



*Figure 14 The input data of PROFIBUS Master device receive from the GW-7553-B / GW-7553-M*

When the GW-7553-B / GW-7553-M acts as a Modbus Slave device, it will send DO、AO data to input data area of PROFIBUS Master device and it will save data that receives from PROFIBUS Master device to internal DI、AI memory space**,** as shown in ***Figure 15*** **、*Figure 16***.



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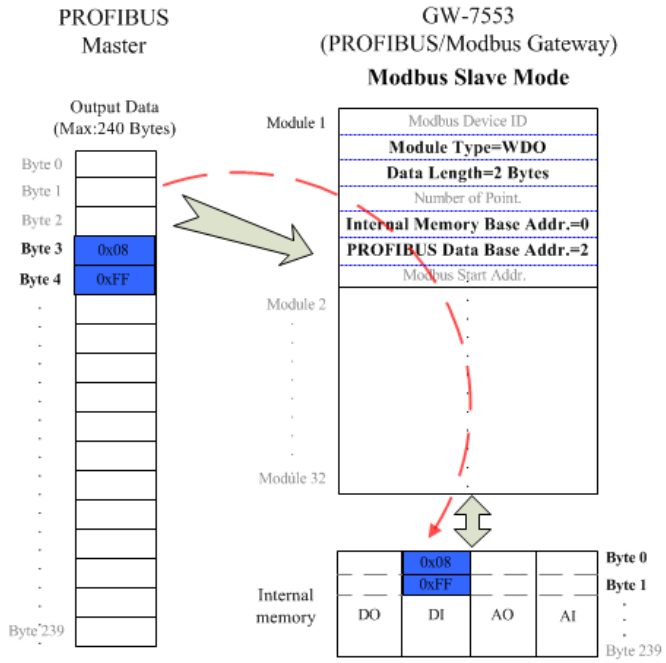



*Figure 15 The output data of PROFIBUS Master device send to the GW-7553-B / GW-7553-M*

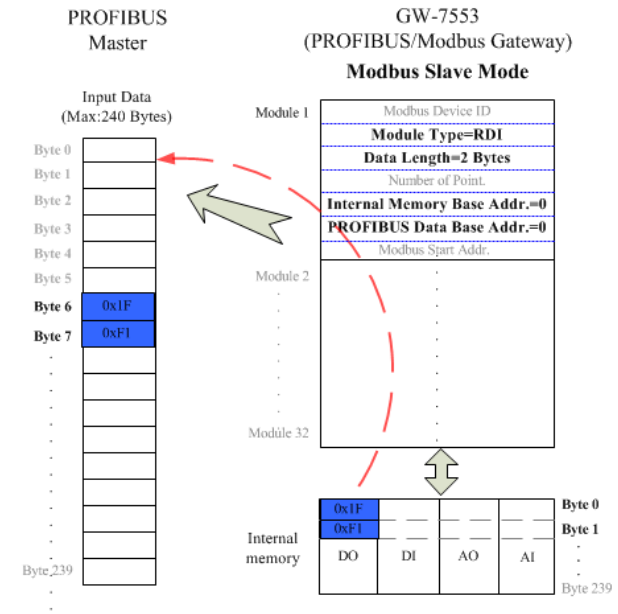



*Figure 16 The input data of PROFIBUS Master device receive from the GW-7553-B / GW-7553-M*

## 3.2 Modbus data exchange

Modbus protocol belongs to Master-Slave communication and it uses query and response message to arrive at data exchange and device control, as shown in



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***Figure 17*** Data exchange between the Modbus devices and the GW-7553-B / GW-7553-M.

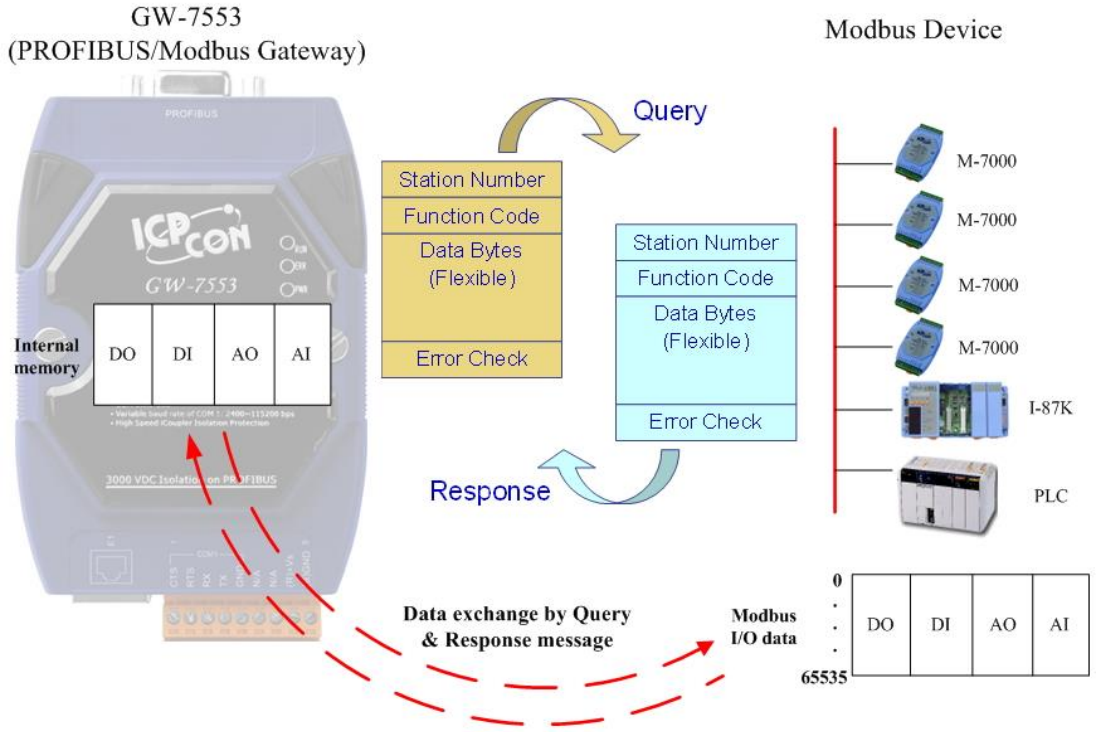



*Figure 17 Data exchange between the Modbus devices and the GW-7553-B / GW-7553-M*

When the GW-7553-B / GW-7553-M acts as a Modbus Master device, it can get query message through module parameter and DO、AO data and send query message to Modbus Slave device. It can also receive response message form Modbus Slave device and then saving to internal DI、AI memory space, as shown in ***Figure 18*** 、**Figure 19**.



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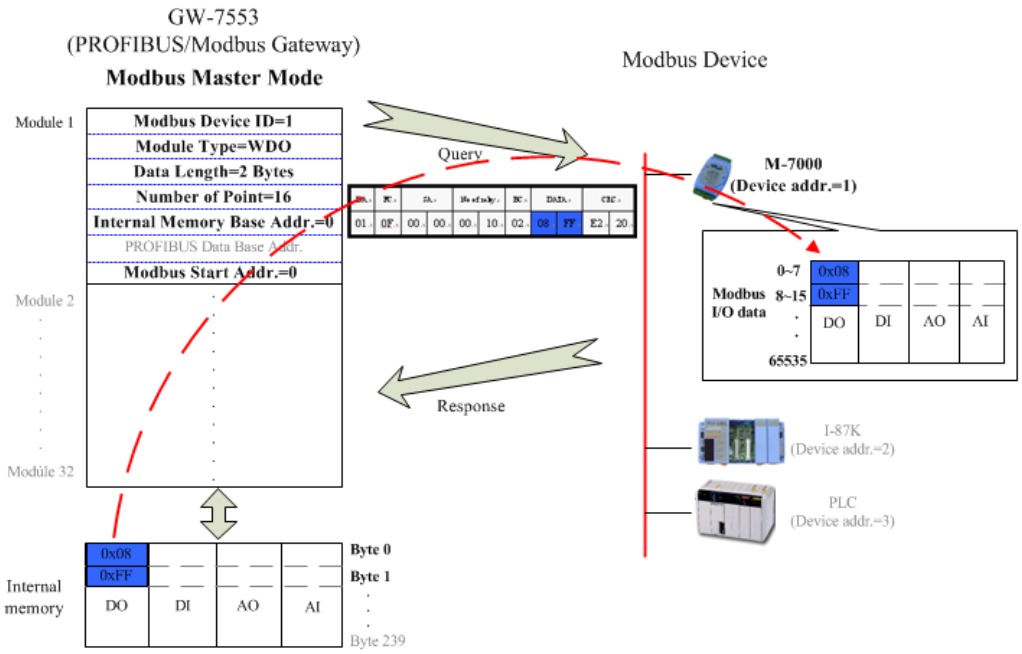



*Figure 18 GW-7553-B / GW-7553-M output data to Modbus Slave devices*

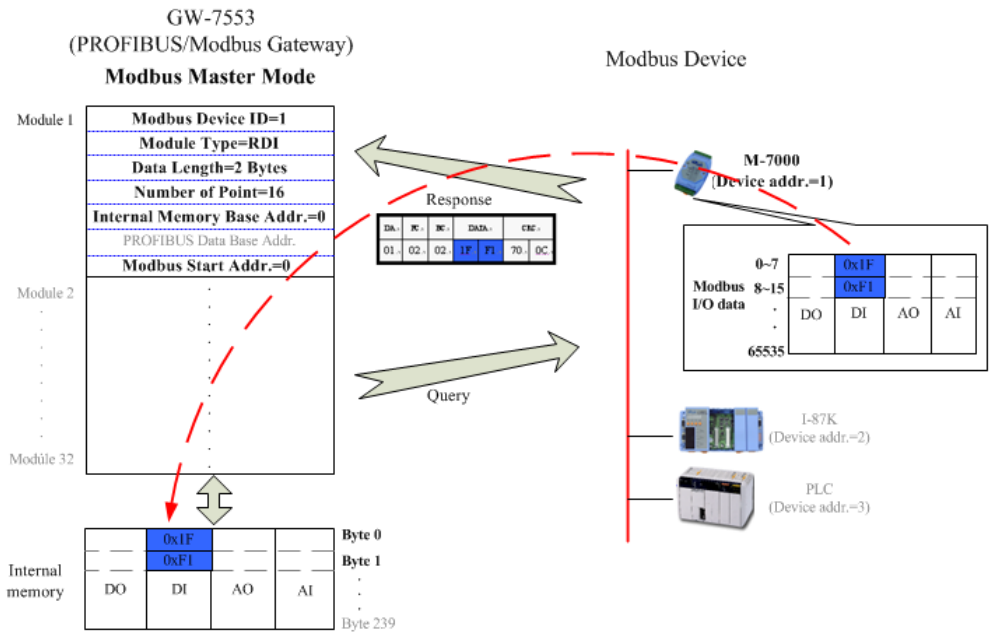



*Figure 19 GW-7553-B / GW-7553-M receive data from Modbus Slave devices*

When the GW-7553-B / GW-7553-M acts as a Modbus Slave device, it can receive query message from Modbus Master device and then saving to internal DO、AO memory space. It can also send response message to Modbus Master device through internal DI、AI data， as shown in ***Figure 20*** 、***Figure 21***.



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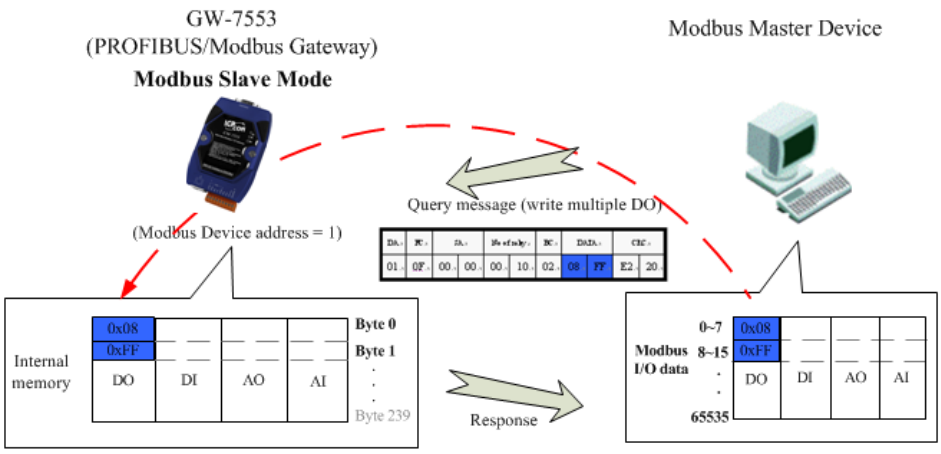



*Figure 20 The GW-7553-B / GW-7553-M receive data from Modbus Master device*

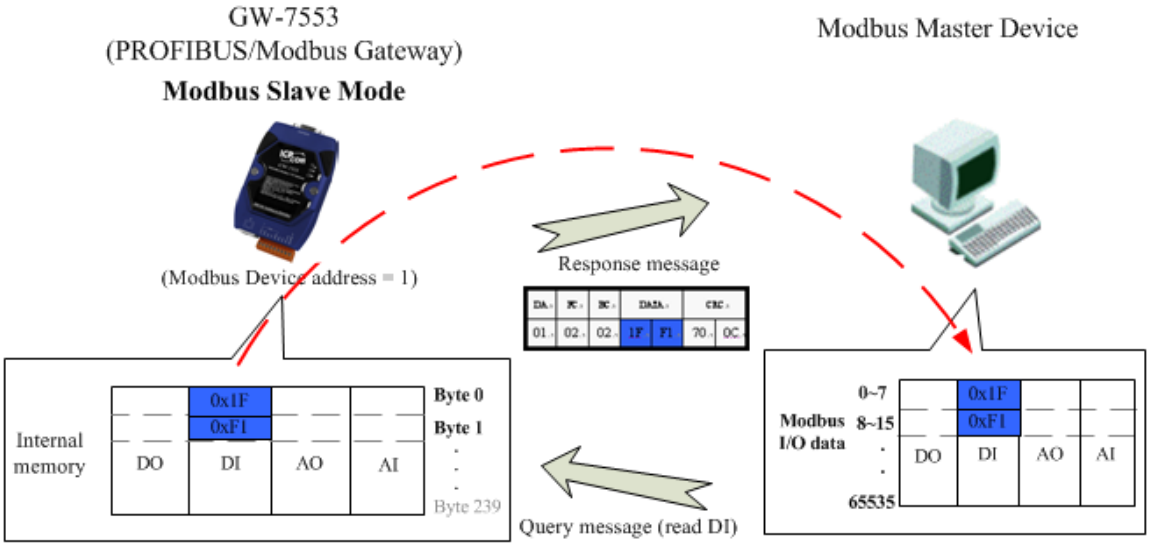



*Figure 21 The GW-7553-B / GW-7553-M output data to Modbus Master device*

## 3.3 Communication protocol transfer

In section 3.1 and 3.2, we can understand that data exchange is through DI、DO、AI、AO memory space of the GW-7553-B / GW-7553-M between



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PROFIBUS Master、Modbus and the GW-7553-B / GW-7553-M. When the GW-7553-B / GW-7553-M acts as a Modbus Master device, the data exchange runs continuously between PROFIBUS Master、Modbus and the GW-7553-B / GW-7553-M, as shown in ***Figure 22*** 、***Figure 23***.

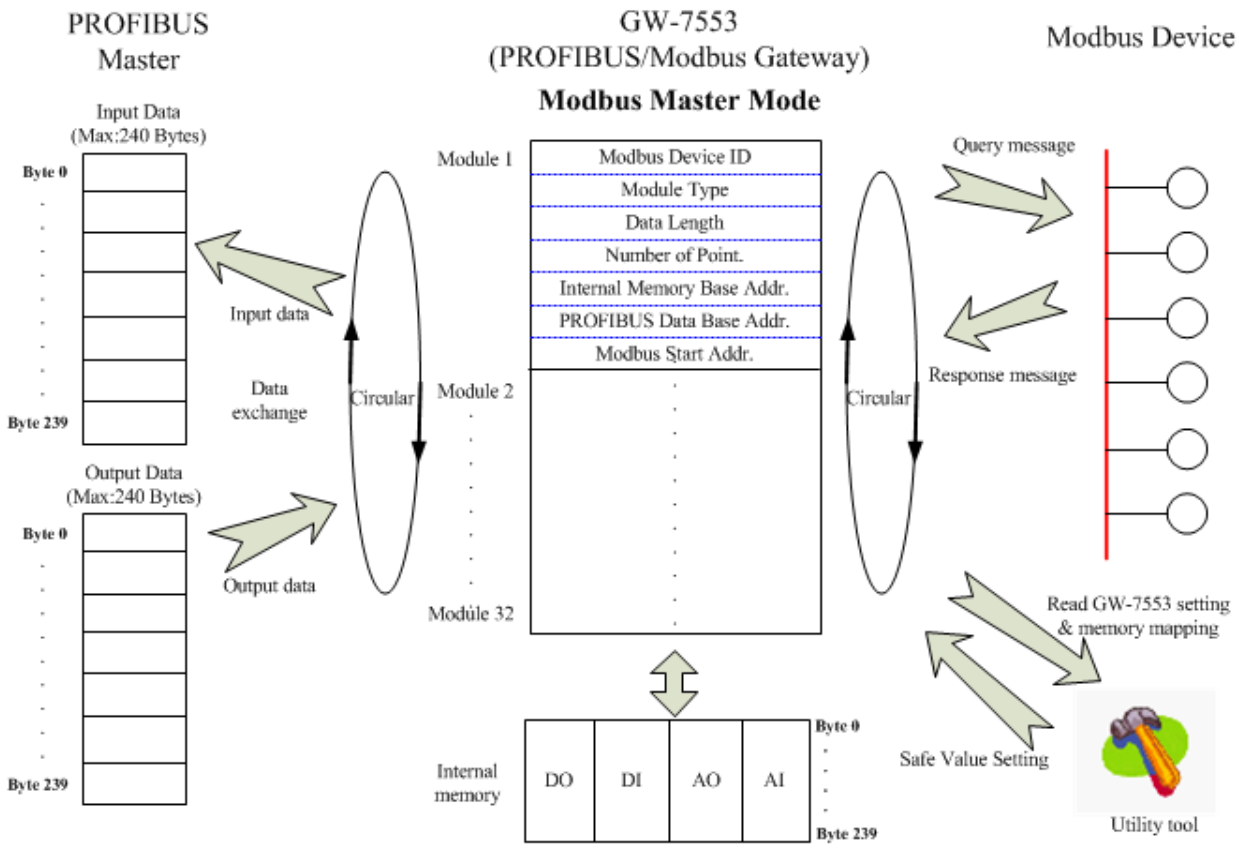



*Figure 22 GW-7553-B / GW-7553-M (master mode) communication protocol transfers*



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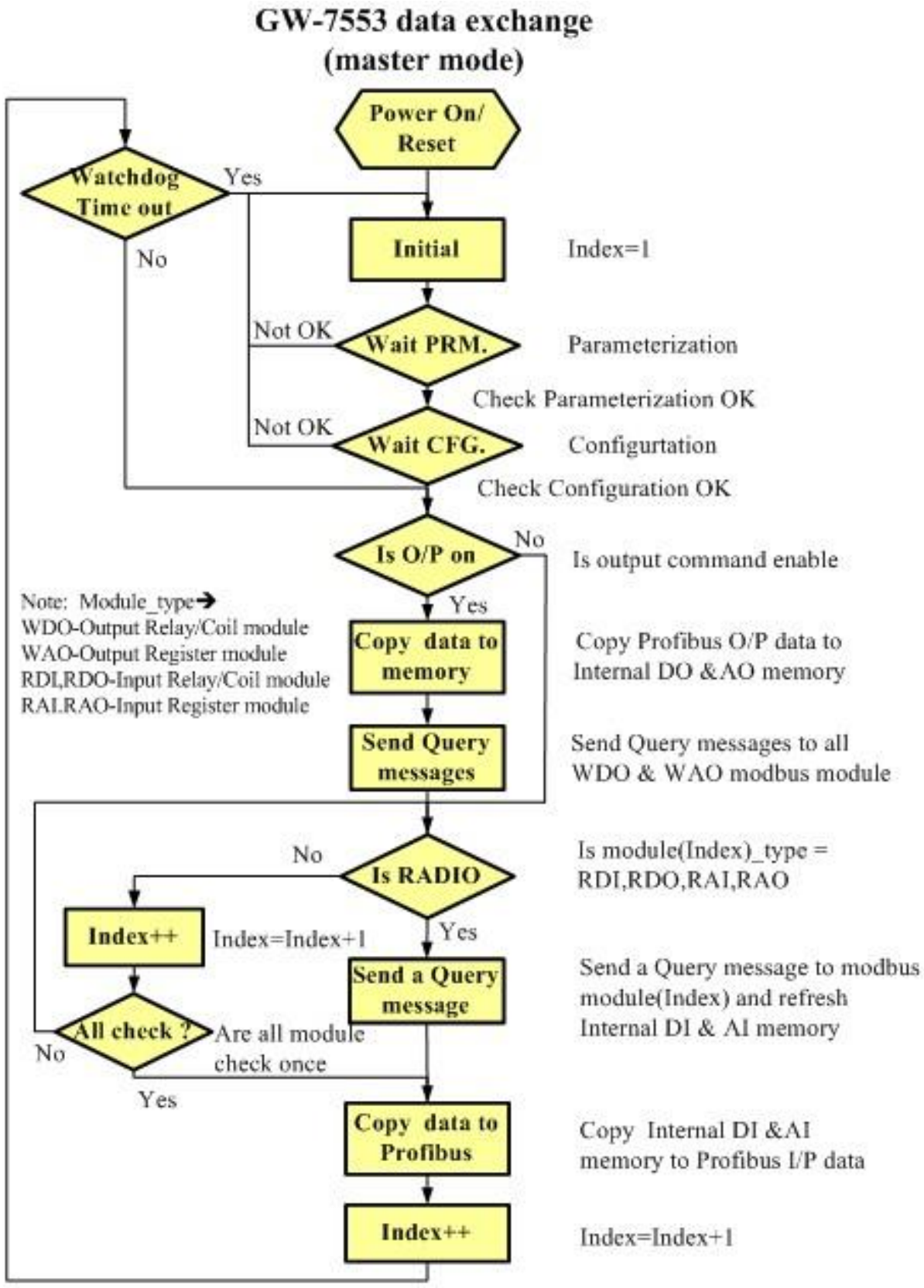



*Figure 23 GW-7553-B / GW-7553-M (master mode) flowchart*



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When the GW-7553-B / GW-7553-M acts as a Modbus Slave device, the data exchange runs continuously between PROFIBUS Master and the GW-7553-B / GW-7553-M and the data exchange runs between Modbus Master device and the GW-7553-B / GW-7553-M, when GW-7553-B / GW-7553-M receive query message from Modbus Master device, as shown in ***Figure 24*** 、***Figure 25***.

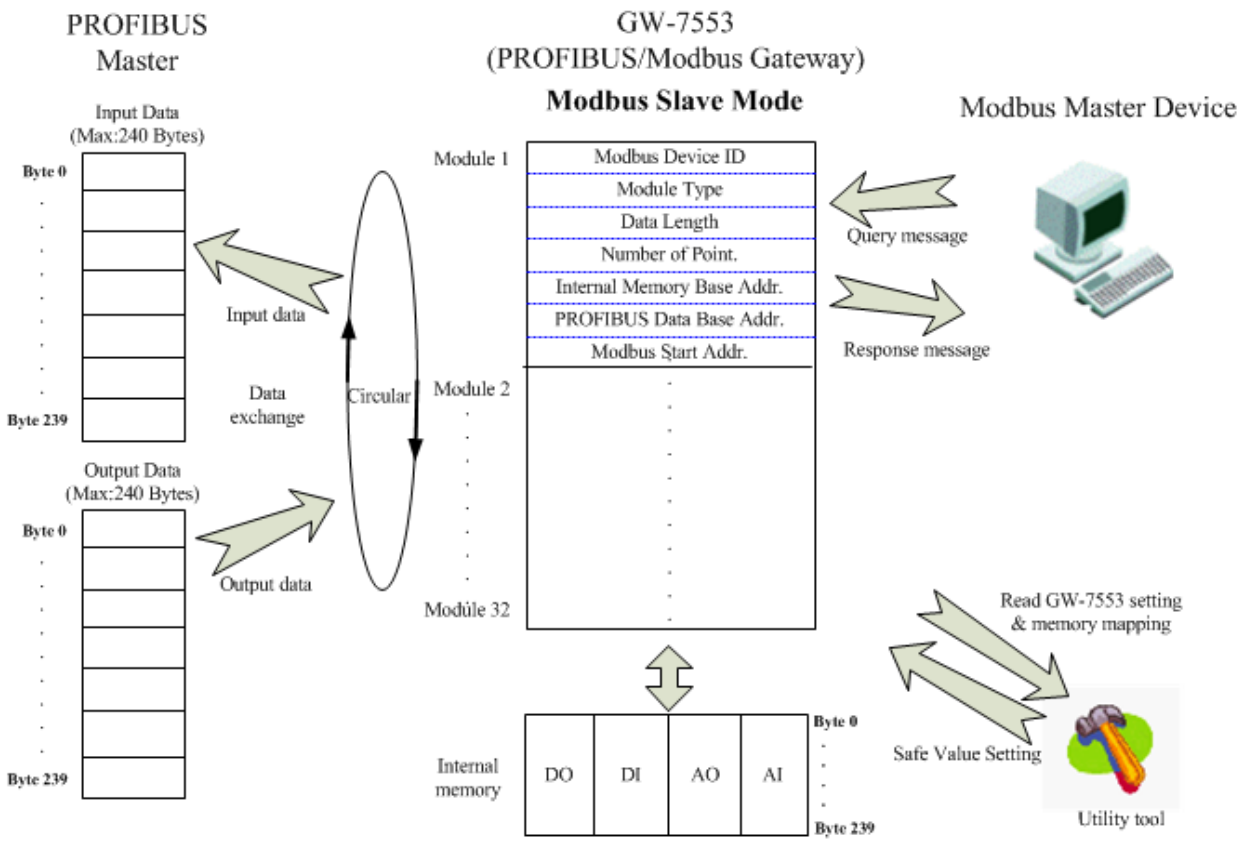



*Figure 24 GW-7553-B / GW-7553-M (slave mode) communication protocol transfer*



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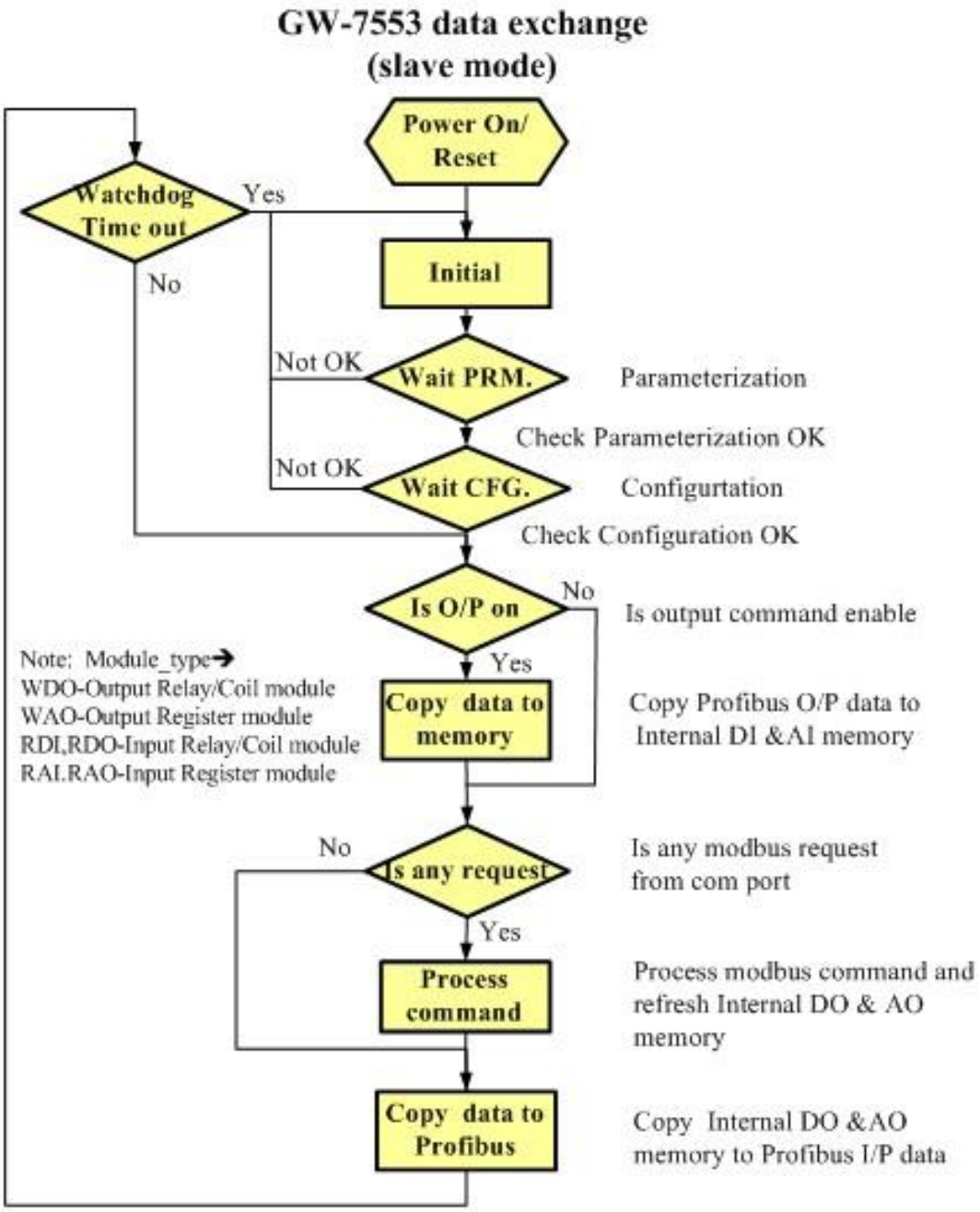



*Figure 25 GW-7553-B / GW-7553-M (slave mode) flowchart*



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## 3.4 PROFIBUS DP-V1 Acyclic Service

DP-V1 is the extension of DP-V0, it extend the original cyclic data exchange to acyclic one. Traditional data-exchange exploits default SAP for cyclic data-exchange. In DP-V1, Additional SAPs(49, 50, 51) for acyclic service, The SAP 49 is Resource Manager for manage each class 2 connection; The SAPs 50 and 51 are Read/Write/Alarm_Ack access point for class 1 connection.

DPV1 extension consists of 2 main parts : 1. MSAC_C1 2. MSAC_C2. For details, as shown in ***Table 11***.

*Table 11 Service for DPV1 acyclic comminication*

| | service |
|---|---|
| MSAC_C1 | Class 1 master reads a data block from the slave (**Read**) |
| | Class 1 master writes a data block to the slave (**Write**) |
| | An alarm is transmitted from the slave to the master, which explicitly acknowledge receipt (**Alarm**、**Alarm_Ack**) |
| MSAC_C2 | Setup of a connection for acyclic communication between the calss 2 master and the slave (**Initiate**) |
| | Class 2 master reads a data block from the slave (**Read**) |
| | Class 2 master writes a data block to the slave (**Write**) |
| | Class 2 master can write application-specific data acyclically to the slave and, if required, read data from the slave in the same cycle (**Data Transport**) |
| | Termination of a connection for acyclic communication between the calss 2 master and the slave (**Abort**) |

DP-V1 slave provide a unique acyclic service entry SAP 49, this SAP called Resource Manager. Resource Manager play the role of coordinator, it coordinate multiple remote connection at one time. Before acyclic data-exchange, class 2 master send an initiate request to SAP 49, then resource manager search for an available SAP(48~0) to response these information to Class 2 Master. After Class 2 Master receives initiate response, it applies the new SAP to request information you want. In contrast to C1 Master, C2-Master supports Data-Transport service for read & write at one cycle. If DP-V1 services were no more need, Class 2 Master sent the Abort request to terminate the connection. During the connection, DP-Slave start watchdog timer to monitor the C2 DP-V1 telegram (C2-Init, C2-Abort, C2-Write, C2-Read, C2-DataTransport, C2-IDLE). If watchdog timer didn’t clear by C2-IDLE, DP-slave will terminate this connection automatically.

The Information in DP-V1 is addressing by Slot and Index. The slot(0~255) addresses the module and the index(0~255) addresses the data blocks assigned to



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a module. Each data block can be up to 244 bytes. Length is used to indicate the read/write length. If the information addressing use non-exist slot、index or length, the corresponding error code will be signaled(see ***Table 12***、***Figure 26*** Error code/Error class), the reply is sent to the master.

*Table 12 Error code/Error class*

| Error_Class | Meaning | Error_Code |
|---|---|---|
| 10 | application | 0 = read error<br>1 = write error<br>2 = module failure<br>3 to 7 = reserved<br>8 = version conflict<br>9 = feature not supported<br>10 to 15 = user specific |
| 11 | access | 0 = invalid index<br>1 = write length error<br>2 = invalid slot<br>3 = type conflict<br>4 = invalid area<br>5 = state conflict<br>6 = access denied<br>7 = invalid range<br>8 = invalid parameter<br>9 = invalid type<br>10 to 15 = user specific |
| 12 | resource | 0 = read constrain conflict<br>1 = write constrain conflict<br>2 = resource busy<br>3 = resource unavailable<br>4 to 7 = reserved<br>8 to 15 = user specific |

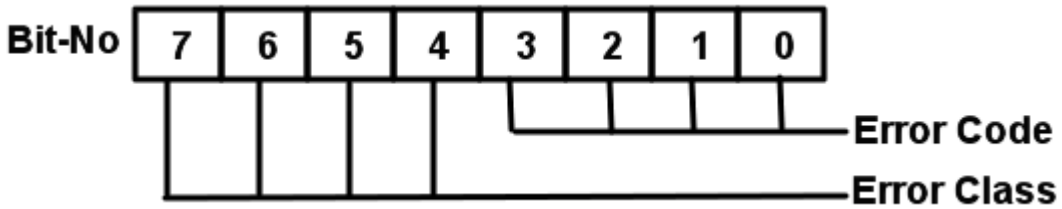



*Figure 26 Error code/Error class*



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DP-V1 services supported by GW-7553-B / GW-7553-M are Read、Write and Data Transport service, Alarm_Ack didn't supported. List shown below is the Slot-Index mapping table.

*Table 13 Slot-Index mapping table*

<table>
<tr><th>Slot</th><th>Modbus Type</th><th>Index</th><th>Length</th></tr>
<tr><td>1</td><td>N/A</td><td>0</td><td>1</td></tr>
<tr><td rowspan="6">2~32</td><td>RDI</td><td rowspan="3">NO. of relay/Coil</td><td rowspan="3">1</td></tr>
<tr><td>RDO</td></tr>
<tr><td>WDO</td></tr>
<tr><td>RAI</td><td rowspan="3">NO. of Words</td><td rowspan="3">2</td></tr>
<tr><td>RAO</td></tr>
<tr><td>WAO</td></tr>
<tr><td>33~255</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
</table>

**Slot 1** is used for the system setting module. Because the user must add "System setting module" at the first module before the other modules, else the GW-7553-B / GW-7553-M will send the diagnostic messages to PROFIBUS Master and the system will be abnormal.

**Slot 2~32** is used for Modbus modules. Index mapped input/output channel from corresponding module. If a digital module(DI/DO module), one index is only one bit. If an analog module(AI/AO module), one index is one word.

**Slot 33~255** is not supported by GW-7553-B / GW-7553-M. Because the maximum number of I/O modules is 32.

Note：
The data block fixed by DPV1 write acyclic service will be overwritten by DPV0 cyclic service. We provide an option in "slot 1、index 0、length 1" to change the priority of DPV1 write acyclic service . The Default value is 0. To achieve the higher priority of DPV1 write acyclic service , the value has to be set to "1".

Example 1:
If user setup 3 modules in GW-7553-B / GW-7553-M, system setting module、2



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bytes digital output module(DO) and 4 words analog input module(AI).

In this case, the range of slot、index and length of each modules is shown in below.
system setting module : slot -> 1, index -> 0 , length -> 1
2 bytes digital output module : slot -> 2, index -> 0~15 , length -> 1
4 words analog input module : slot -> 3, index -> 0~3 , length -> 2



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# 4. Communication

## 4.1 Field of application

A master station can be a PLC, PC or any other smart device. The system can be a mono-master system (***Figure 27***) or a multi-master system (***Figure 28***). The GW-7553-B / GW-7553-M enables the integration of the Modbus devices into a PROFIBUS DP network.

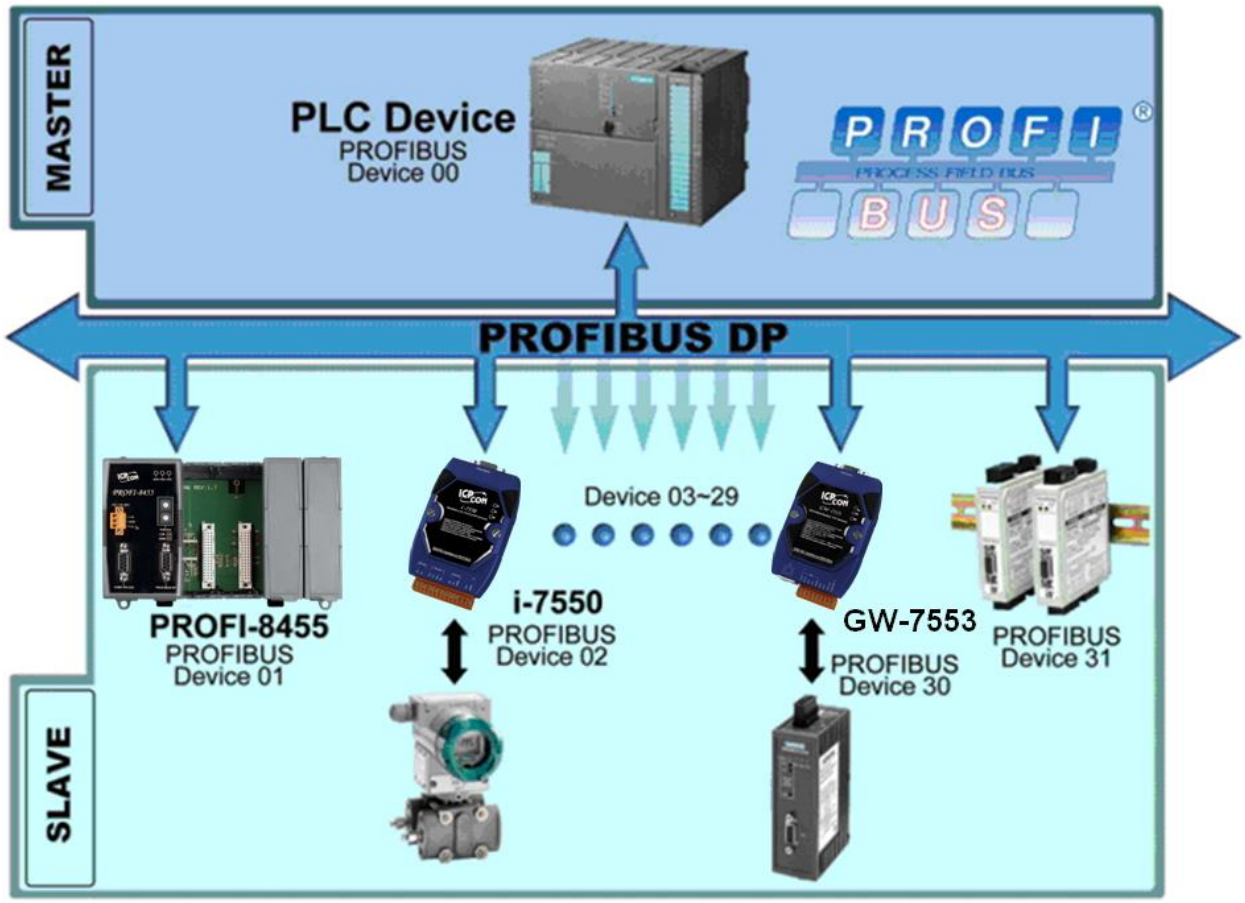



*Figure 27 Mono-master system*



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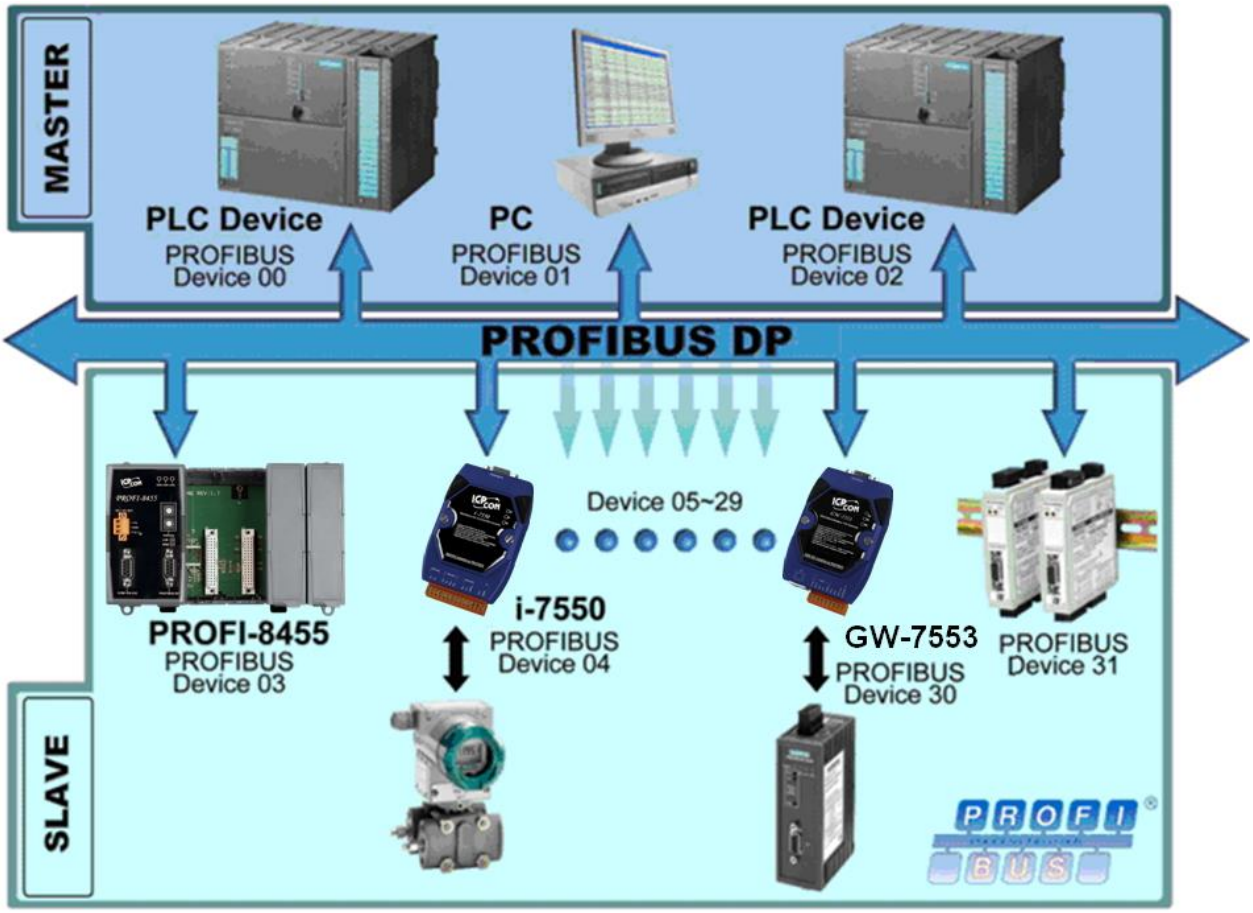



*Figure 28 Multi-master system*

## 4.2 GSD file

The parameters(ex: baud rate, message length, number of input / output data and etc. ) of each PROFIBUS DP device are described in a GSD file. The GSD file of the GW-7553-B / GW-7553-M can be form the ICP DAS companion CD-ROM (PATH --> CD: \PROFIBUS\GATEWAY\GW-7553 \GSD\).
Users can copy the GSD file ( IPDS0C0D.gsd ) and the Bitmap file(ICP_7553.bmp , i_7553.bmp ) into any local destination folder.

### 4.2.1 Example of loading GSD file

In the following example, the SIEMATIC S7-300 CPU313C-2 DP is used. The configuration and communication is done by the program “Step 7 Manager” provided by SIEMENS.

Step 1: Copy the GSD file (IPDS0C0D.gsd) from CD of the GW-7552-B module into the destination folder.



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**File->CopyGSD**
(Directory: --> CD: \PROFIBUS\GATEWAY\GW-7553 \GSD\)

Step 2: Choose “Install GSD file” by clicking the “Options” button in the Step 7 Manager.

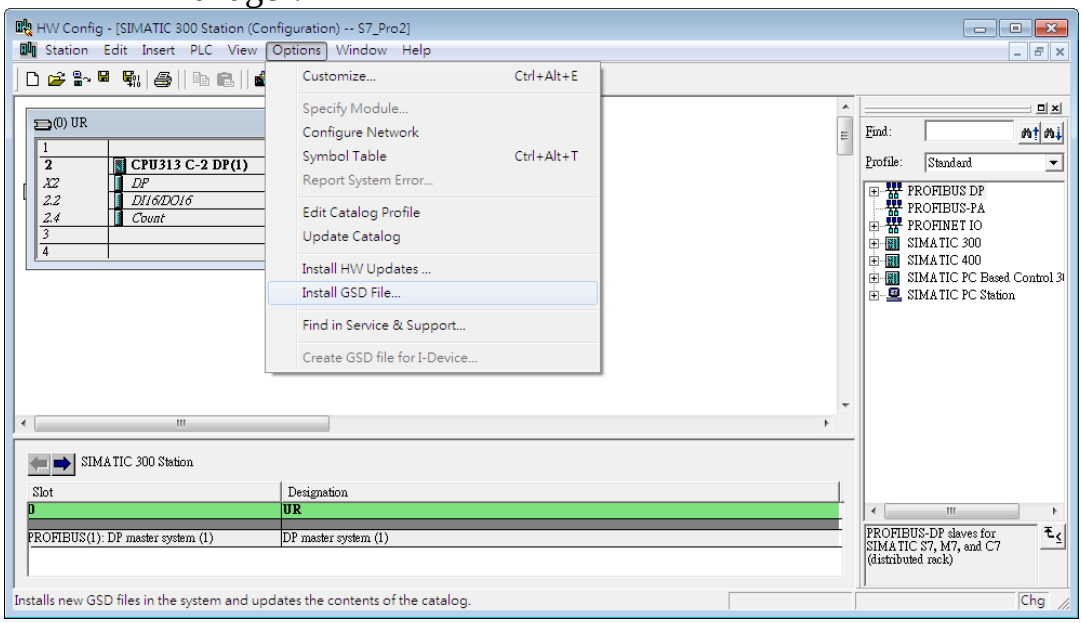



*Figure 29* install GSD file

Step 3: Click “Browse” button to choose where the GSD file located

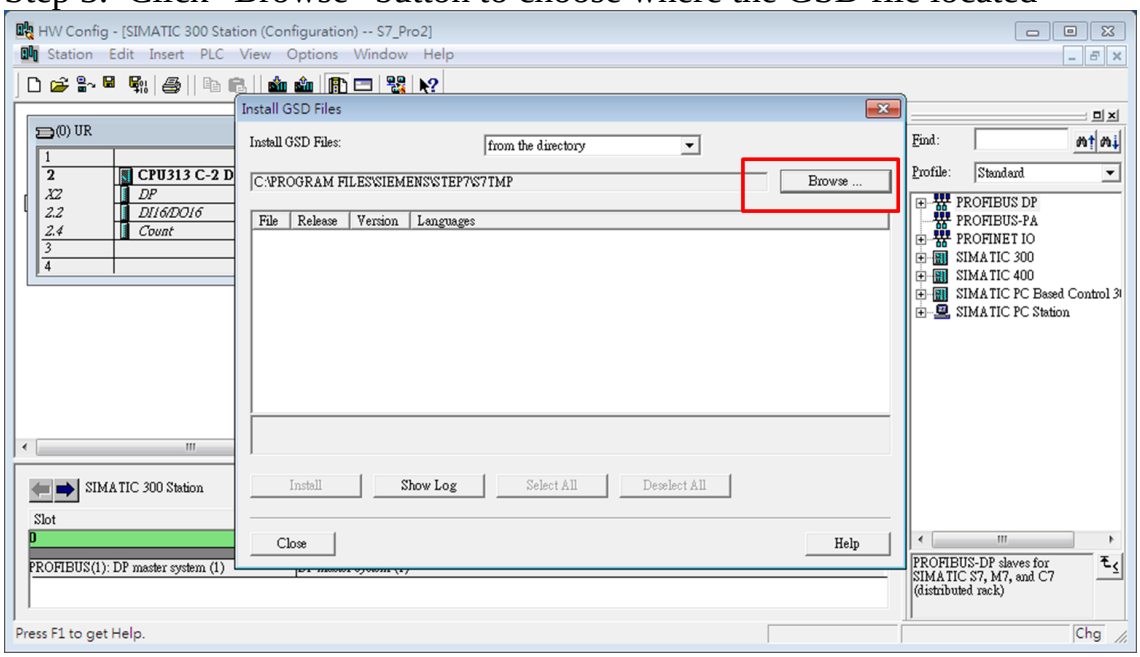



*Figure 30* choose the path where GSD file located.



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Step 4: Select the GSD file and click “Install” button.

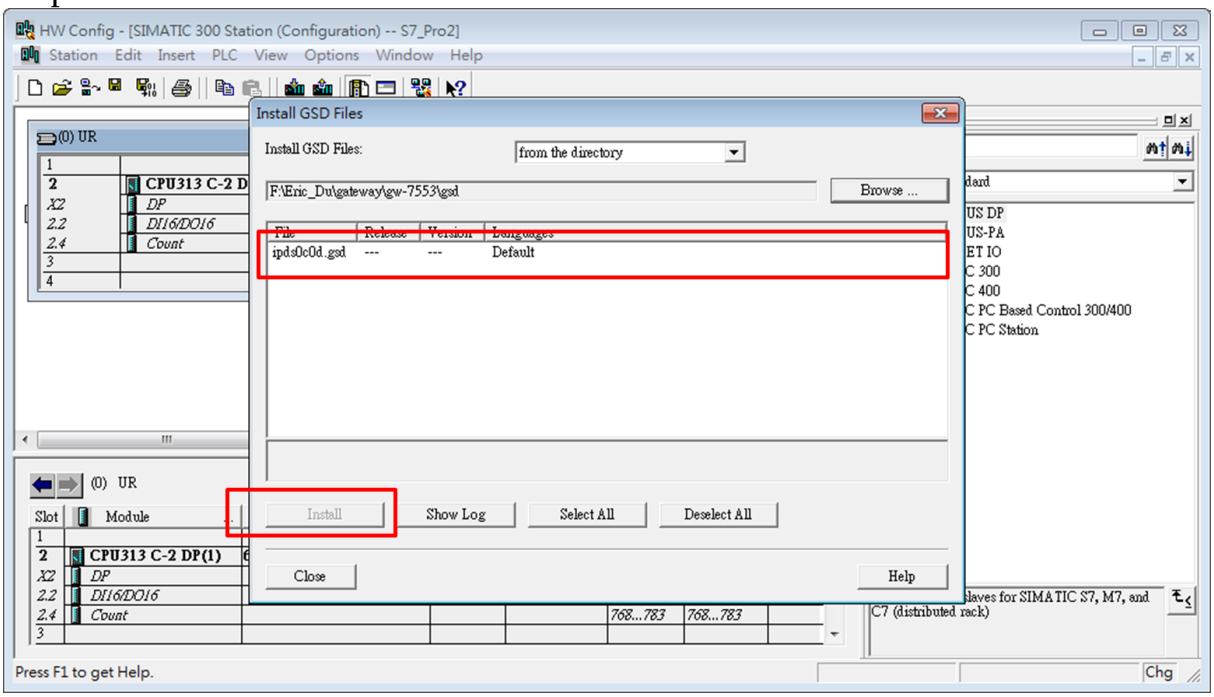



*Figure 31* select the GSD file of the GW-7552-B to install

Step 5: Check the window if the GW-7552-B and its details can be found, if yes then GW-7552-B is successfully added.

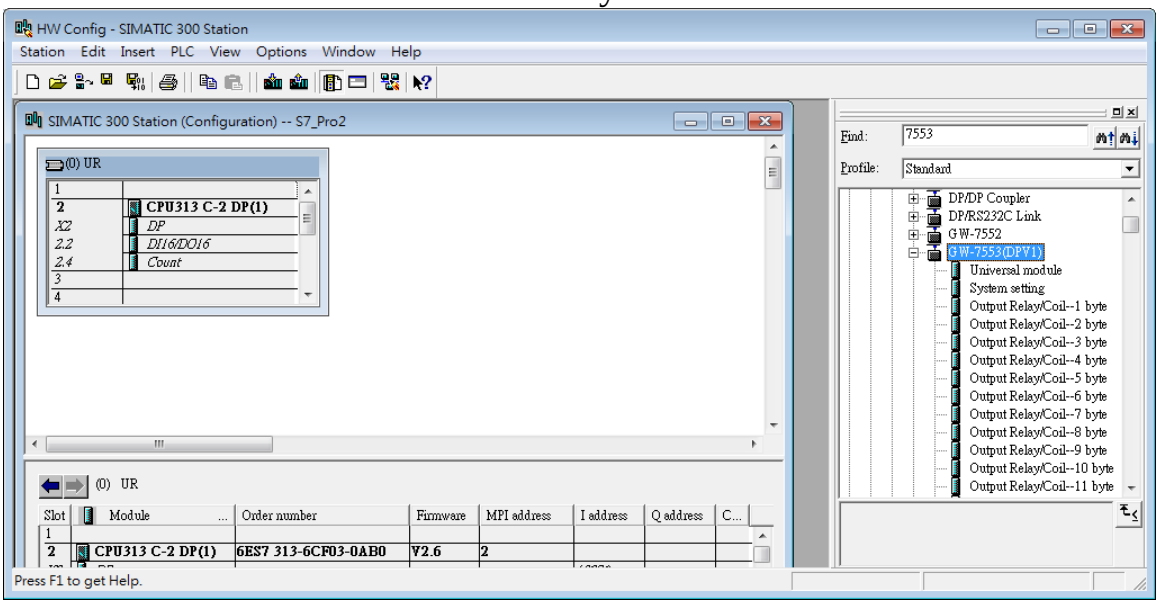



*Figure 32* Finish adding the GW-7552-B

## 4.3 The Configuration of the common parameters

GW-7553-B / GW-7553-M has twelve common parameters. The user can



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configure the common parameters to set the communication mode and data format by the PROFIBUS configuration tool. The common parameters are described below.

- COM Port baud rate：2400/4800/9600/19200/38400/57600/115200
- COM Port parity：None/Even/Odd
- COM Port data length：7/8 data bit
- COM Port stop bit：1/2 stop bit
- Modbus Type：Master/Slave
- Modbus Format：RTU/ASCII/TCP
- I/O Safe Mode：Retain last value/Switch safe value
- Byte Order : Little-Endian/Big-Endian
- Output Data Mode : Manual/Auto
- Modbus Device ID(S)：1~247
- Polling Modbus Device Interval(ms) (M)：1~65535ms
- Query Message Timeout Value(ms)(M)：1~65535ms
- TCP_Connect_Num(T)(M)：1~8

PS：

a. When stop bit of COM Port is 2, data bit of COM Port must be 7 or else stop bit of COM Port will be set to 1.
b. I/O Safe Mode

**When GW-7553-B / GW-7553-M acts as a Modbus Master (Modbus Type=Master):**

*i. Data exchange between PROFIBUS Master and GW-7553-B / GW-7553-M is interrupted*

"I/O Safe Mode" will be activated when the data exchange between PROFIBUS Master and GW-7553-B / GW-7553-M is interrupted (e.g. no physical connection, PROFIBUS Master leaves the data exchange mode, etc.).

- I/O safe mode = "Switch Safe Value"
  The GW-7553-B / GW-7553-M will set internal DIO and AIO data to safe value and send the safe values to the Modbus Slave device.
- I/O safe mode = "Retain Last Value"
  Internal DIO and AIO data retain last value

*ii. Connection between Modbus Slave and the GW-7553-B / GW-7553-M is interrupted*

- I/O safe mode = "Switch Safe Value"



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The GW-7553-B / GW-7553-M will set the internal DI and AI data to safe value and send safe values to PROFIBUS Master device.

- I/O safe mode = “Retain Last Value”
  Internal DIO and AIO data retain last value

**When GW-7553-B / GW-7553-M acts as a Modbus Slave (Modbus Type=Slave):**

*i. Data exchange between PROFIBUS Master and GW-7553-B / GW-7553-M is interrupted*

“I/O Safe Mode” will be activated when the data exchange between PROFIBUS Master and GW-7553-B / GW-7553-M is interrupted.

- I/O safe mode = “Switch Safe Value”
  The GW-7553-B / GW-7553-M will set internal DIO and AIO data to safe value.
- I/O safe mode = “Retain Last Value”
  Internal DIO and AIO data retain last value

*ii. Connection between Modbus Master and the GW-7553-B / GW-7553-M is interrupted*

Internal DIO and AIO data retain last value received

Please refer to section 5.4 about the safe value settings

c. Byte order is an important factor related to the memory allocation. Big-endian byte order (Motorola format) allocates more significant byte in lower memory address. On the other hand, little-endian byte order (Intel format) allocates more significant byte in higher memory address.
d. When Output Data Mode is “Auto”, the GW-7553-B / GW-7553-M will update the value of the output and input module automatically. When Output Data Mode is “Manual”, the GW-7553-B / GW-7553-M will update the value of the input module automatically and the user must update manually the value of the output module (please refer to section 4.6.2 Data Output Command).
e. Modbus device ID is a Modbus address of the GW-7553-B / GW-7553-M, when the GW-7553-B / GW-7553-M acts as a Modbus Slave device.
f. We recommend the user to set the “query message timeout value” bigger than 3ms in order to identify the response message.
g. The user can set the maximum number of Modbus TCP Slave device by “TCP_Connect_Num”. These Modbus TCP Slave devices can have different IP Address for connection.
h. (M) means the parameter is effective, when Modbus Type of GW-7553-B / GW-7553-M is Master.



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(S) means the parameter is effective, when Modbus Type of GW-7553-B / GW-7553-M is Slave.
(T) means the parameter is effective, when Modbus Format of GW-7553-B / GW-7553-M is TCP.

## 4.4 The Configuration of the modules

The user can set the number and size of the I/O modules in the PROFIBUS configuration tool. The settings of the modules are described below.

- Max. I/O modules：32 modules
- System setting module：3 byte output , 6byte input
- Output module：Output Relay/Coil => 1~32 Bytes
  Output Register => 1~64 Words
- Input module：Input Relay/Coil => 1~32 Bytes
  Input Register => 1~64 Words
- Max. length of I/O data：480 Bytes
- Output length：0~240 Bytes
- Input length：0~240 Bytes

Note:
The user must add “System setting module” at the first module before the other modules, else the GW-7553-B / GW-7553-M will send the diagnostic messages to PROFIBUS Master and the system will be abnormal.

The modules have module parameters about the communication settings. The module parameters are shown in the below：

A. Output Relay/Coil module parameters：

- Modbus Slave Device ID(M)：0~247
- Start Address(M)：0~65535
- NO. of Relay/Coil(M)：8*(n-1)+1 ~ 8*n Bits
  n=Module size/Byte
- TCP_Connect_Index(T)(M)：1~8

B. Output Register module parameters：

- Modbus Slave Device ID (M)：0~247
- Start Address(M)：0~65535
- Change Word Order：Enable/Disable (Even module only)
- TCP_Connect_Index(T)(M)：1~8



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C. Input Relay/Coil module parameters：

- Modbus Slave Device ID (M)：0~247
- Start Address(M)：0~65535
- NO. of Relay/Coil(M)：8*(n-1)+1 ~ 8*n Bits
  n=Module size/Byte
- Module Type(M)：Read DI/DO
- TCP_Connect_Index(T)(M)：1~8

D. Input Register module parameters：

- Modbus Slave Device ID (M)：0~247
- Start Address(M)：0~65535
- Module Type(M)：Read AI/AO
- Change Word Order：Enable/Disable (Even module only)
- TCP_Connect_Index(T)(M)：1~8

**Example 1:**
If the user wants to read a Modbus digital input module (DI module), Device ID is 1, data address is 10010~10019, and data count is 10 via the first TCP connection.

In this case, the user can select an "Input Relay/Coil=> 2 Bytes module", module parameters are shown in the below:

Input Relay/Coil module parameters：

- Modbus Slave Device ID(M)：1
- Start Address(M)：9
- NO. Of Relay/Coil(M)：10
- Module Type(M)：Read DI
- TCP_Connect_Index(T)(M)：1

**Example 2:**
If the user wants to write a Modbus analog output module (AO module), Device ID is 2, data address is 40001~ 40004 and data count is 4 via the second TCP connection.

In this case, the user can select an "Output Register => 4 Words module", module parameters are shown in the below:



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Output Register module parameters：

- Modbus Slave Device ID(M)：2
- Start Address(M)：0
- Change Word Order：Disable
- TCP_Connect_Index(T)(M)：2

PS：

a. Relay/Coil module is digital module (DI/DO module), the unit is Byte; Register module is analog module (AI/AO module), the unit is Word.
b. Modbus Slave Device ID：It is a Modbus Slave device address.
c. Start Address：The GW-7553-B / GW-7553-M and Modbus Slave device exchange data from this starting address.
d. NO. of Relay/Coil：It is data size that the GW-7553-B / GW-7553-M and Modbus Slave device exchange.
e. Module type：The user can select data type for data exchange by this setting.
   - Write DO(WDO)-- Write Digital Output
   - Write AO(WAO)-- Write Analog Output
   - Read DI(RDI)- Read Digital Input
   - Read DO(RDO)- Read Digital Output
   - Read AI(RAI)-Read Analog Input
   - Read AO(RAO)-Read Analog Output
f. Change Word Order：When this setting is “Enable”, the GW-7553-B / GW-7553-M will change the data between the high word and low word for reading easily.
g. TCP_Connect_Index：The user can select TCP connection of the module. The module will transmit and receive data from this connection.

## 4.5 Diagnostic messages

The GW-7553-B / GW-7553-M can record maximally 10 diagnostic messages at the same time. If the number of the diagnostic messages is bigger than 10, the GW-7553-B / GW-7553-M will not process other diagnostic message. The diagnostic messages have four types. They are “Module Error”, “System Setting Module Error”, “EEPROM Error” and “Input Data Error”. The diagnostic messages are shown in ***Table 14***.

*Table 14 Diagnostic messages*

| Messages | Description | Note |
|---|---|---|



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| | | |
|---|---|---|
| Module 1~32 Error * (0x01-0x32) | ILLEGAL FUNCTION!(0x01) | Please refer Modbus Exception Code definition for detail. |
| | ILLEGAL DATA ADDRESS!(0x02) | |
| | ILLEGAL DATA VALUE!(0x03) | |
| | SLAVE DEVICE FAILURE!(0x04) | |
| | ACKNOWLEDGE!(0x05) | |
| | SLAVE DEVICE BUSY!(0x06) | |
| | NEGATIVE ACKNOWLEDGE!(0x07) | |
| | MEMORY PARITY ERROR!(0x08) | |
| | Modbus NOT DEFINED ERROR!(0x09) | |
| | GATEWAY PATH UNAVAILABLE!(0x0A) | |
| | DEVICE FAILED TO RESPOND!(0x0B) | |
| | CRC (LRC) Error!(0xFD) | |
| | Response Message Timeout!(0xFE) | |
| | Response Message error!(0xF8) | |
| | Connection error!(0xF7) | |
| System setting module Error | Not find System setting module.(0x3D) | |
| | Position is not correct!(0x3E) | |
| EEPROM Error | Read safe value error.(0xFB) | |
| | Read IP error!(0xFA) | |
| | Write IP error!(0xF9) | |
| Data Error | PROFIBUS lose input data.(0x3C) | |
| | Lose PROFIBUS output data.(0x3F) | |

“*” These error messages are not supported when the GW-7553-B / GW-7553-M act as a Modbus Slave.

PS:

Diagnostic message will shown in input data area of System setting module (Please refer to section 4.6.1)

Data Error：

a. GW-7553-B / GW-7553-M acts as a Modbus Master



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If the polling speed between the GW-7553-B / GW-7553-M device and the Modbus Slave is faster than the data exchange rate between PROFIBUS Master and the GW-7553-B / GW-7553-M then the PROFIBUS Master will not get all the data from the Modbus Slave and therefore a diagnostic message ("PROFIBUS lose input data") will be send by the GW-7553-B / GW-7553-M to the PROFIBUS Master

b. GW-7553-B / GW-7553-M acts as a Modbus Slave
If the GW-7553-B / GW-7553-M receives more telegram from the Modbus Master than it transmits to the PROFIBUS Master then a diagnostic message ("PROFIBUS lose input data") will be send by the GW-7553-B / GW-7553-M to the PROFIBUS Master.

c. When the GW-7553-B / GW-7553-M receives a "data output command" (output byte 0) from system setting module, and this command didn't increase in order (ex: 0->1, 1->2,…, 255->0), the GW-7553-B / GW-7553-M will think that it lose some output data of the PROFIBUS Master and a diagnostic message ("Lose PROFIBUS output data") will be sent by the GW-7553-B / GW-7553-M to the PROFIBUS Master.

## 4.6 I/O data exchange

The I/O data exchange is decided by Modbus type of the GW-7553-B / GW-7553-M (please refer section 4.3 The Configuration of the common parameters) between PROFIBUS Master device and the GW-7553-B / GW-7553-M. Output data area of PROFIBUS Master device is mapped into DO/AO memory of the GW-7553-B / GW-7553-M and input data area of PROFIBUS Master device is mapped into DI/AI memory of the GW-7553-B / GW-7553-M, when Modbus type is Master. In the other way, Output data area of PROFIBUS Master device is mapped into DI/AI memory of GW-7553-B / GW-7553-M and input data area of PROFIBUS Master device is mapped into DO/AO memory of GW-7553-B / GW-7553-M, when Modbus type is Slave (please refer section 3.1 PROFIBUS data exchange ).

### 4.6.1 Input data area

The maximum length of input data is 240 bytes. Before arrange the input module, the user must arrange and configure the system setting module. The first six bytes belong to diagnostic message, as shown in *table 15.* The user can get data and control I/O of Modbus Slave device or get DI/DO/AI/AO of the GW-7553-B / GW-7553-M by read input module.



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*Table 15 Input data area*

| Module | Byte | Data | Description |
|---|---|---|---|
| System setting module (diagnostic message) | 0 | | The number of Diagnostic messages |
| | 1 | 00or05 | Fixed value(The value is00 when byte 0 is 0, The value is 05 when byte 0 is not 0) |
| | 2 | 00orA0 | Fixed value(The value is00 when byte 0 is 0, The value isA0 when byte 0 is not 0) |
| | 3 | | Message(refer to Table 14) |
| | 4 | 00 | Fixed value |
| | 5 | | Description(refer to Table 14) |
| Input module | 6~239 | Data | Receive data |

EX. Input data area in byte 0 ~ byte5 information is “04 05 A0 02 00 FE”,
”04” means there are 4 diagnostic messages
“02” means “Module 2 error!”
“FE” means “Response Message Timeout!”

### 4.6.2 Output data area and communication command

The maximum length of output data is 240 bytes. Before arrange the output module, the user must arrange and configure the system setting module. The first three bytes belong to communication commands, as shown in ***Table 16***. The user can change data and I/O state of Modbus Slave device or DI/DO/AI/AO data of GW-7553-B / GW-7553-M by modify data of output module.

*Table 16 Output data area*

| **Module** | **Byte** | **Bit Position** | | | | | | | | **Description** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| System setting module | 0 | | | | | | | | | Data output command |
| | 1 | - | - | - | - | - | - | SM | DC | Control bit |



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| Module | Byte | Bit Position | | | | | | | | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | | | | | | | | | Output module select |
| Output module | 3~239 | | | | | | | | | Output data |

- Data output command(byte 0)
  a. When Modbus type is Master
     When this byte is changed, PROFIBUS Master device will send data of output module to DO/AO data of GW-7553-B / GW-7553-M and then GW-7553-B / GW-7553-M will send query message to Modbus Slave device for change data or output state of Modbus Slave device.

  b. When Modbus type is Slave
     When this byte is changed, PROFIBUS Master device will send data of output module to DO/AO data of GW-7553-B / GW-7553-M.

  PS: When the user use this byte to trigger “data output command”, the user must increase this byte in order (ex: 0->1, 1->2,…, 255->0) or else the GW-7553-B / GW-7553-M will send a diagnostic message to the PROFIBUS Master (please refer section 4.5 Diagnostic messages).

- Control bit(byte 1)
  DC(bit 0)：When this bit is set (DC=1), diagnostic messages sent by the GW-7553-B / GW-7553-M module will all be cleared.

  SM(bit 1)：When this bit is set (SM=1), the GW-7553-B / GW-7553-M will enter setup mode. The utility can communicate with the GW-7553-B / GW-7553-M in this mode.

  When this bit is "0" (SM=0), the GW-7553-B / GW-7553-M will enter normal operation mode. The GW-7553-B / GW-7553-M can communicate with Modbus device in this mode.

  Bit 2~7：The remaining bits have to be set to zero.
- Output module select(byte 2)
  When this byte is ‘0’ and the user change data output command(byte 0), it will trigger all data output command of output modules.



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When this byte isn't '0' and the user change data output command(byte 0), it will trigger single data output command of the output module and this byte represent module address of the output module (ex: "byte 2"=3, it represent that the user want to trigger data output command of the third module )

## 4.7 Establish connection with GW-7553-B / GW-7553-M

Before establishing a connection between the DP-Master and the GW-7553-B / GW-7553-M, user should execute the following steps first.

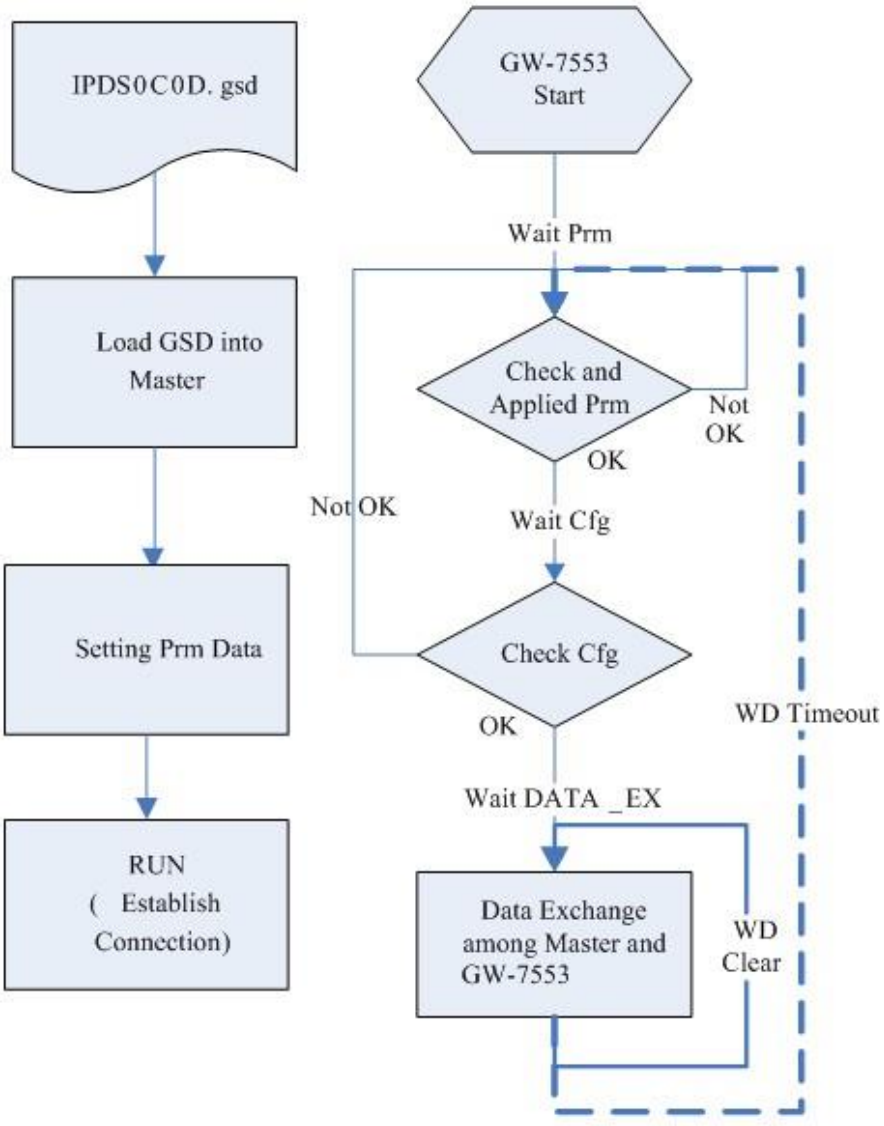



*Figure 33 Establish connection with GW-7553-B / GW-7553-M*

First, users must load the electronic device description file (GSD file) of the GW-



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7553-B / GW-7553-M into the DP-Master, and then set the parameters. Finally change your DP-Master from Offline state to Operate state. While DP-Master changes to operate mode, GW-7553-B / GW-7553-M will initial the modules. Then GW-7553-B / GW-7553-M allocates the memory space and waits for Set_Prm telegram. The next step is waiting for Check_Cfg telegram in order. If there is no error occurs, GW-7553-B / GW-7553-M proceeds into data exchange state. Users can observe the status indicator LED to know the state of GW-7553-B / GW-7553-M. At the meantime, if there is any error occurs, GW-7553-B / GW-7553-M will return to wait parameterization.

## 4.8 Data exchange example—Modbus RTU

In this example a Modbus master device simulated by a PC program sends query message and receives response message from a Profibus master via the GW-7553-B gateway.

In the following example the SIEMATIC S7-300 CPU313C-2 DP is used. The configuration and communication is done by the program "Step 7 Manager" provided by SIEMENS.

Step 1: Copy the GSD file and assign the GW-7553-B a valid station address (Please refer to the section 4.2 GSD file).

Step 2: Connect the RS-232 port of the GW-7553-B module to a COM port of the PC and the PROFIBUS port to a PROFIBUS Master (***Figure 34***).

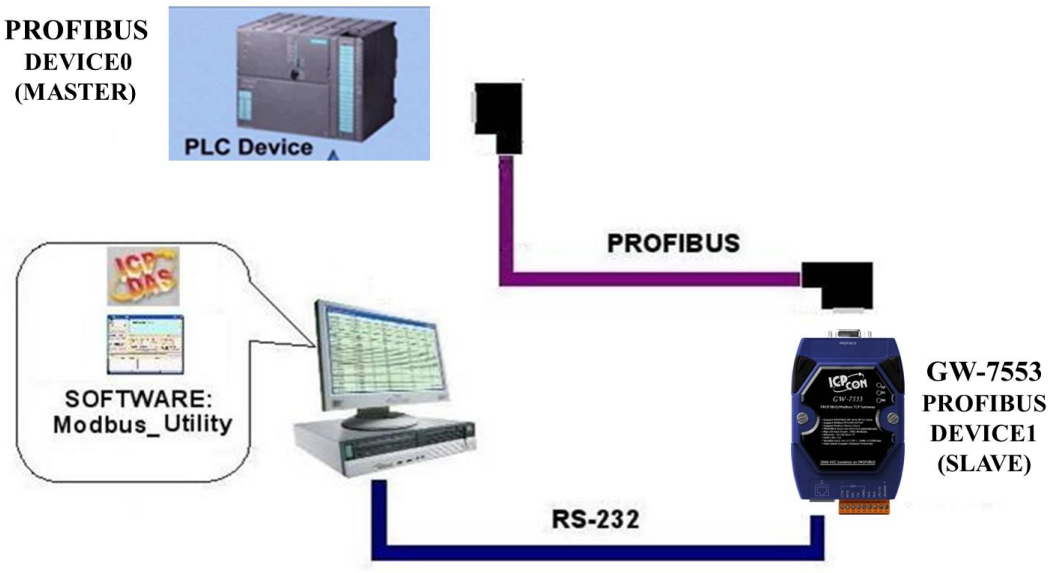



*Figure 34 Wiring diagram between PC and GW-7553-B*

Step 3: Set GW-7553-B parameter "Modbus type" to slave and "Modbus



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Format ” to Modbus RTU ,as to other parameters please remain as default. Please refer to section 4.3 the Configuration of the common parameters for setting instructions. Shown as the diagram below.

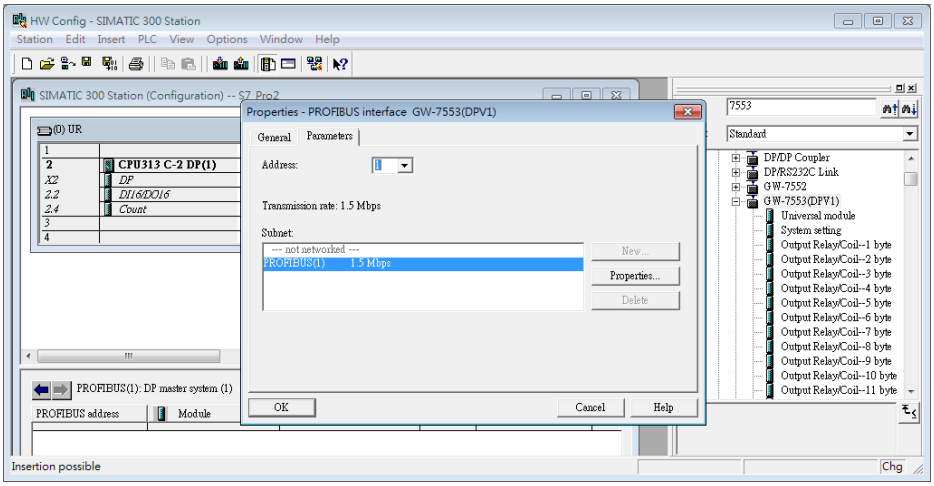



*Figure 35 Add GW-7553-B , double click the GW-7553-B icon to choose “Profibus” and check the Profibus address is “1” then click “OK”*

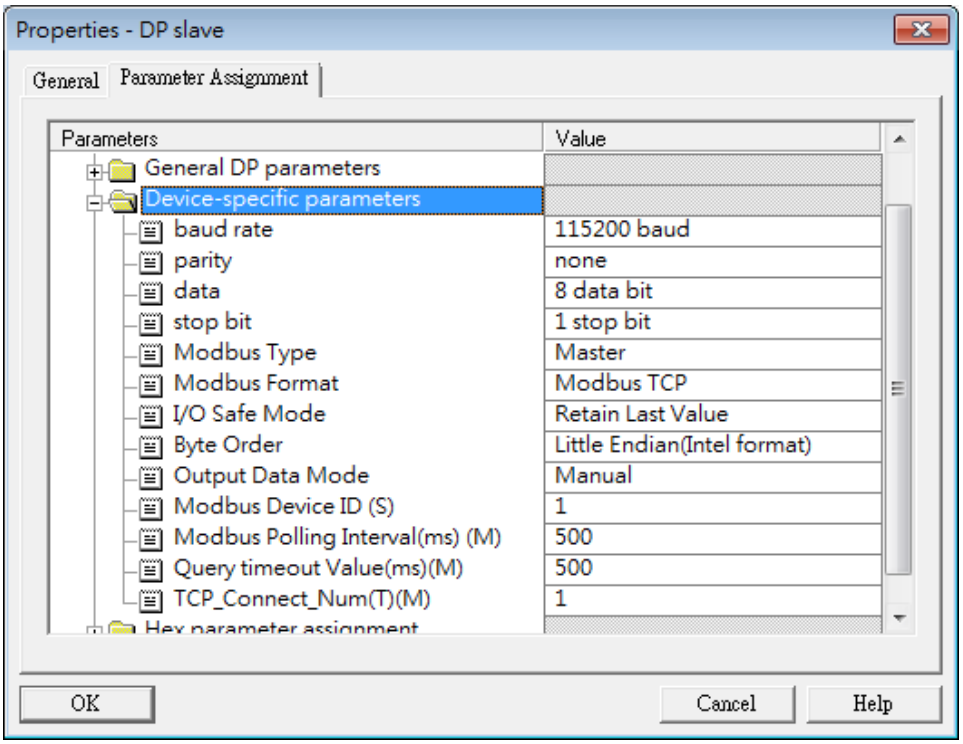



*Figure 36 Click “Parameter Data…” button to open the “Parameter Data” window*



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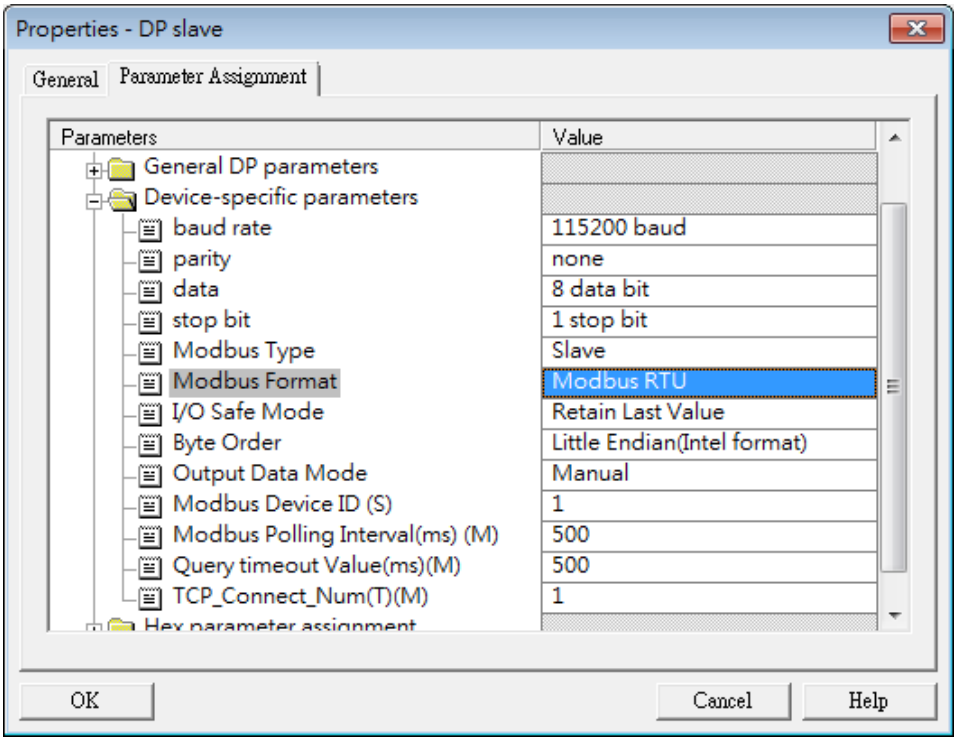



*Figure 37 The user needs to change "Modbus Type" to Slave and "Modbus Format" to Modbus RTU for this example and click "OK" button*

Step 4: Set the GW-7553-B modules, as shown in ***Figure 38*** *and* ***Figure 39***.

- Select "System setting" module: "System setting" module always has to be selected otherwise no communication can be established between the gateway and the Modbus network.
- Select "Output Relay/Coil" module: In this example an "Output Relay/Coil--2 Byte" module is selected.
- Select "Input Relay/Coil" module: In this example an "Input Relay/Coil--2 Byte" module is selected.

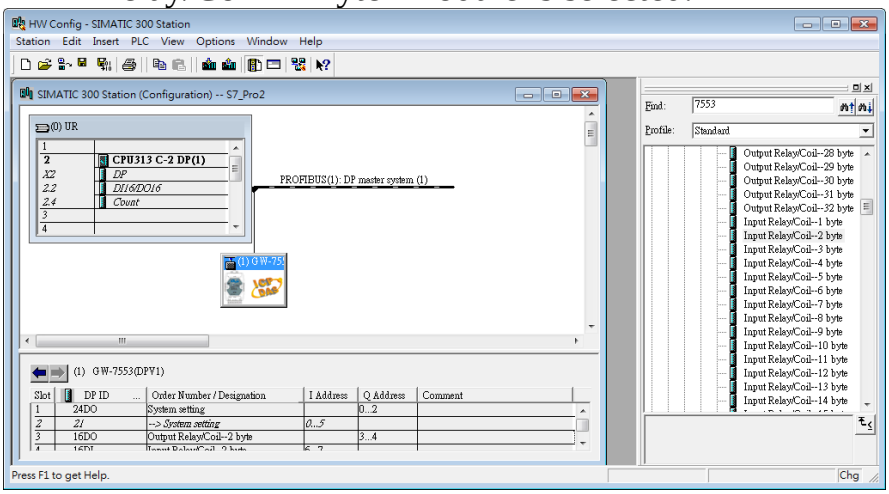



*Figure 38* Add modules



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Step 5: Save and compile. Now the setting done by the Step 7 has been saved and compiled.

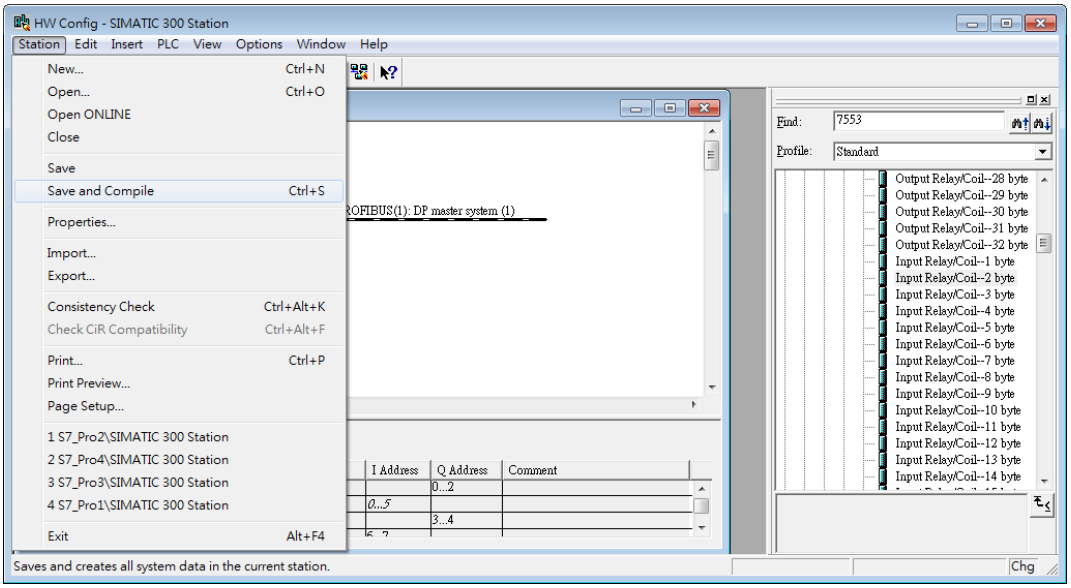



*Figure 39* Save and compile

Step 6: Click "PLC -> Download ", to download program to PLC.

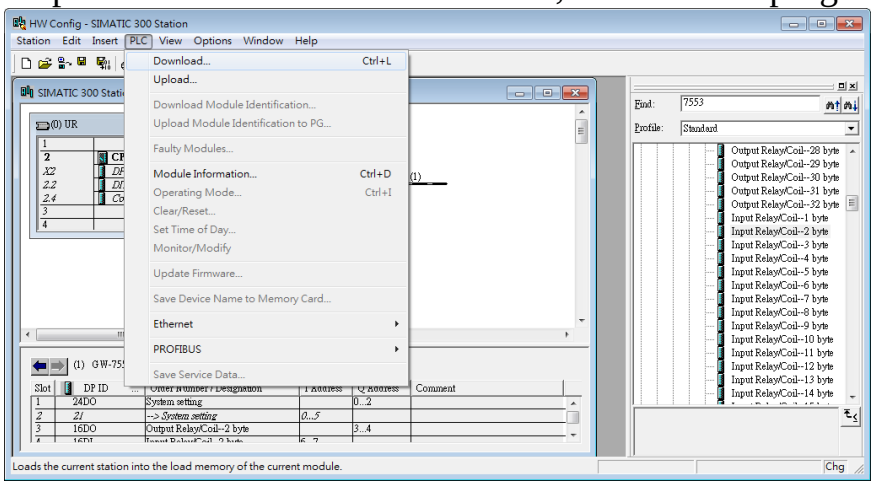



*Figure 40 Click "Download" to download the setting into PROFIBUS master*

### 4.8.1 Sending data from a Modbus Master device

-- Start the test utility "MBRTU" (***Figure 41***) on the PC.
This utility simulates a Modbus Master device and is on the web site in the following directory:



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http://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/modbus/modbus_utility/

(1) Set the COM Port number of the PC
(2) Set the Baud rate to 115200
(3) Set the Line control to N,8,1
(4)Open the connection

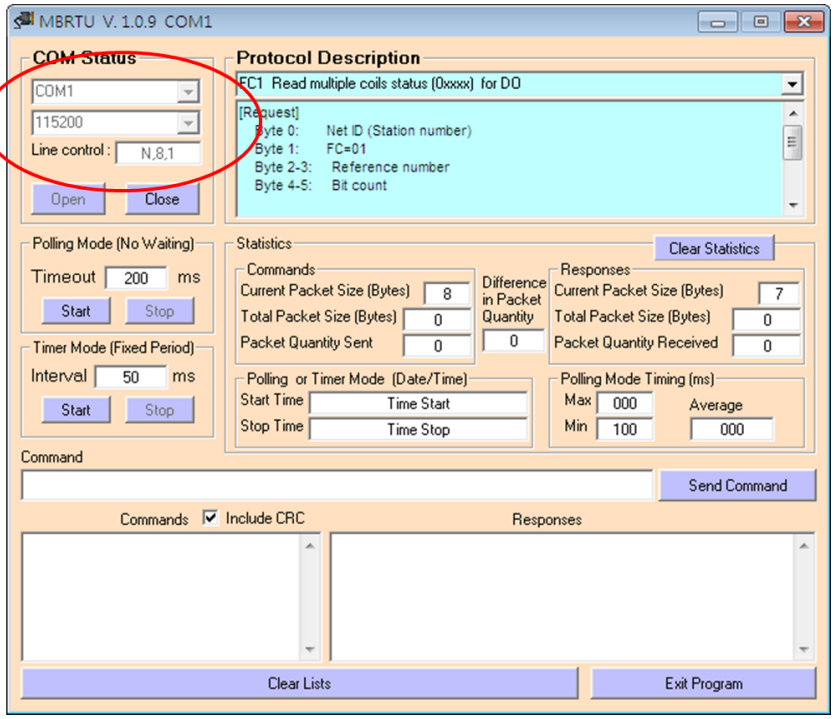



*Figure 41 MBRTU Utility*

--Send Command to write DO of the GW-7553-B

The user needs to input command (" 01 0F 00 00 00 10 02 FF FF") here and click <Send Command> button to send Modbus command: "01 0F 00 00 00 10 02 FF FF E3 90" and then MBRTU can receive response message (" 01 0F 00 00 00 10 54 07"). The user can find byte 6, 7 of the input data area in the configuration program "Step 7" have changed into "0xFF" at this time, as shown in the below.



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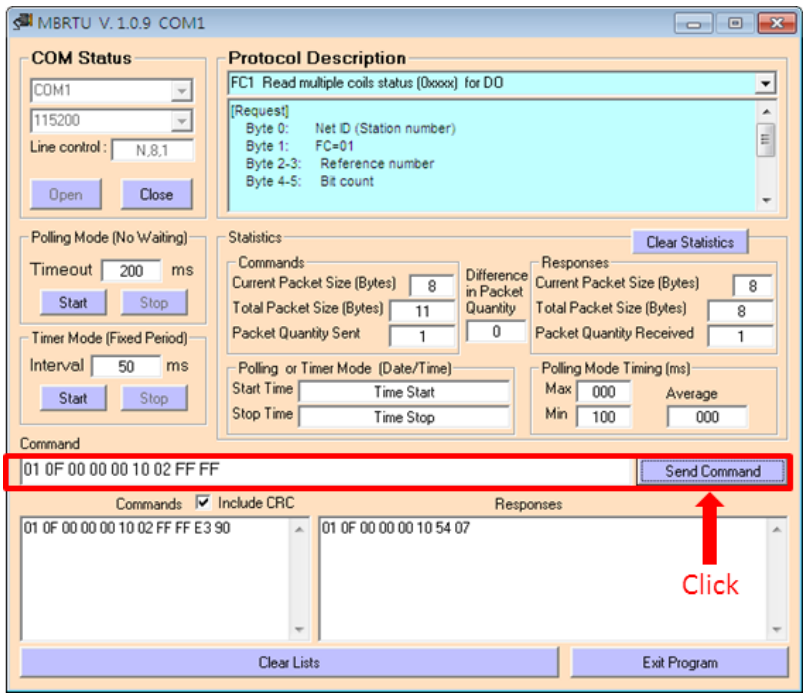



*Figure 42 Send Modbus command (output data: 0xFF, 0xFF)*

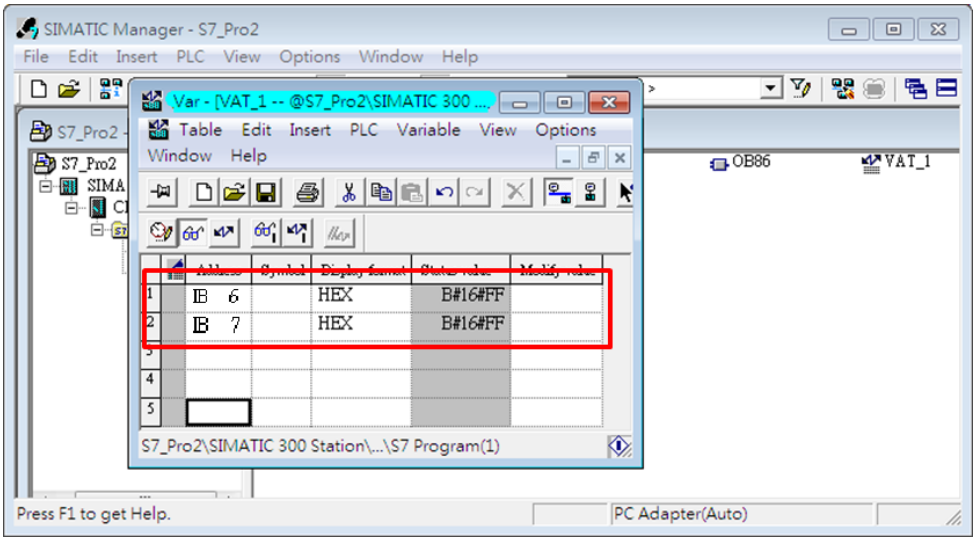



*Figure 43 Receive "0xFF" in the input data area*

*Table 17 Receive "0xFF" in the input data area*

| ***Module*** | ***Byte*** | ***Data type*** | ***Representation*** | ***Value*** |
|---|---|---|---|---|
| Input module | Input 6 | Byte | Hex | 0xFF |
| | Input 7 | Byte | Hex | 0xFF |



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PS:

Modbus command:

Query message

| DA | FC | SA (Hi) | SA (Lo) | NO (Hi) | NO (Lo) | BC | DATA | | CRC check | |
|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 0F | 00 | 00 | 00 | 10 | 02 | FF | FF | E3 | 90 |

Response message

| DA | FC | SA (Hi) | SA (Lo) | NO (Hi) | NO (Lo) | CRC check | |
|---|---|---|---|---|---|---|---|
| 01 | 0F | 00 | 00 | 00 | 10 | 54 | 07 |

- DA: Device Address-0x01
- FC: Function Code-0x0F=>Write multi-DO
- SA(Hi): Start Address(Hi byte)-0x00
- SA(Lo): Start Address(Lo byte)-0x00
- NO(Hi): No. Of points (Hi byte)-0x00
- NO(Lo): No. Of points (Lo byte)-0x10
- BC: Byte Count-0x02

### 4.8.2 Receiving data from the PROFIBUS Master device

--Send Command to read DI of the GW-7553-B

The user needs to input command (" 01 02 00 00 00 10") in MBRTU and click <Send Command> button to send Modbus command: "01 02 00 00 00 10 79 C6" and then MBRTU can receive response message (" 01 02 02 00 00 B9 B8"). In this message, the user can know the value of DI0 & DI1 is "0" in the GW-7553-B

--Send output data to write DI of the GW-7553-B by the PROFIBUS Master

The user needs to set "0xFE" & "0xDC" in byte 3 & byte 4 of output data area in the configuration program "Step 7" and then set the value of the first



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byte from 0 to 1 to trigger the data output command.

--Send Command to read DI of the GW-7553-B again

Now the user can input command (" 01 02 00 00 00 10") in MBRTU and click <Send Command> button to send Modbus command: "01 02 00 00 00 10 79 C6" again. Then MBRTU can receive response message (" 01 02 02 FE DC F8 41"). In this message, the user can know the value of DI0 & DI1 have changed into "0xFE" & "0xDC" in the GW-7553-B, as shown in ***Figure 44***, ***Figure 45*** , ***Figure 46*** & ***Table 18*** Set output data and trigger output data command.

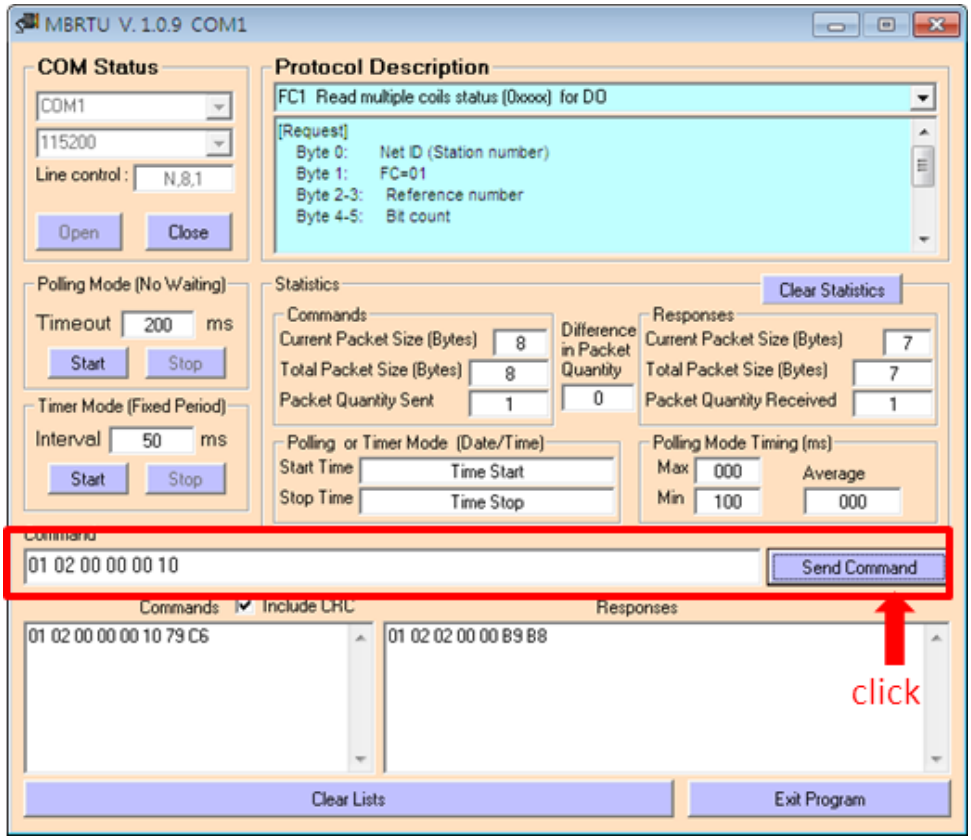



*Figure 44 Send Modbus command to read DI of the GW-7553-B*



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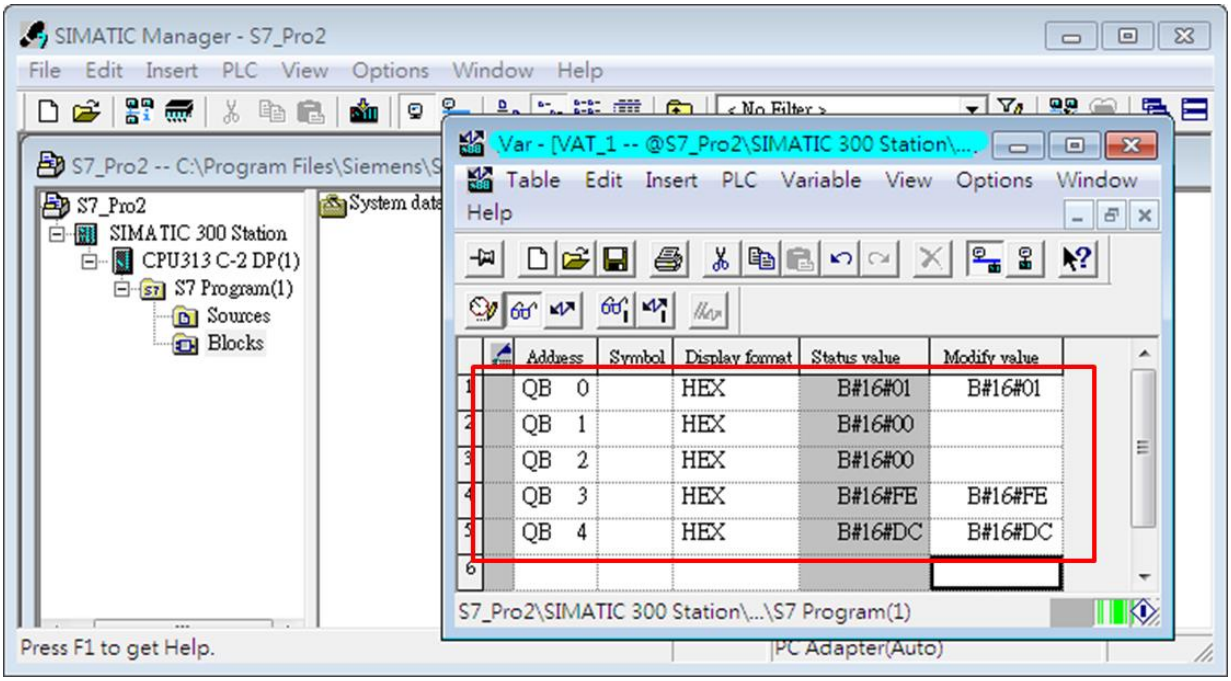



*Figure 45 Set output data and trigger output data command in the output data area*

*Table 18 Set output data and trigger output data command*

| ***Module*** | ***Byte*** | ***Data type*** | ***Representation*** | ***Value*** |
|---|---|---|---|---|
| System module | Output 0 | Byte | Hex | 0x00 ⟶ 0x01 |
| | Output 1 | Byte | Hex | 0x00 |
| | Output 2 | Byte | Hex | 0x00 |
| Output module | Output 3 | Byte | Hex | 0x00⟶ 0xFE |
| | Output 4 | Byte | Hex | 0x00⟶ 0xDC |



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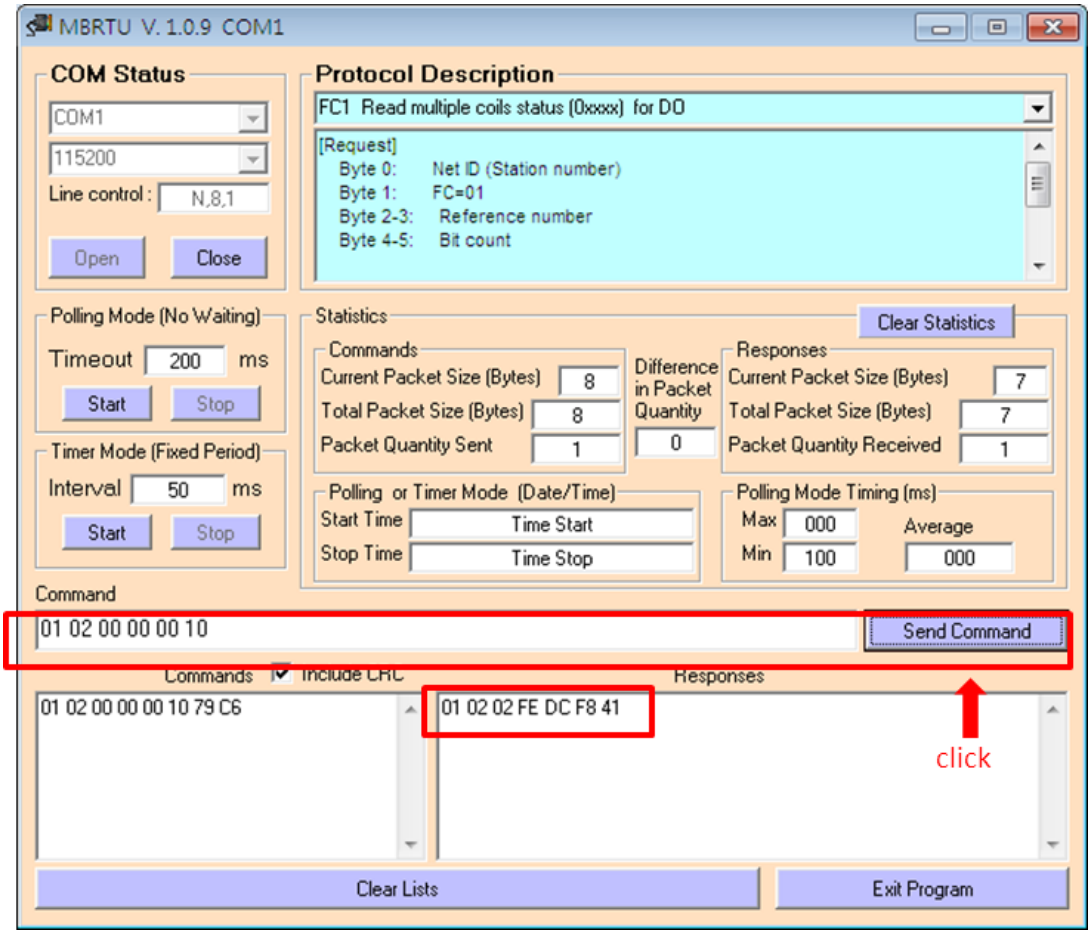



*Figure 46 Send Modbus command to read DI of the GW-7553-B and receive data (0xFE, 0xDC)*

PS:

Modbus command:

Query message

| DA | FC | SA (Hi) | SA (Lo) | NO (Hi) | NO (Lo) | CRC check | |
|---|---|---|---|---|---|---|---|
| 01 | 02 | 00 | 00 | 00 | 10 | 79 | C6 |

Response message

| DA | FC | BC | DATA | | CRC check | |
|---|---|---|---|---|---|---|
| 01 | 02 | 02 | FE | DC | F8 | 41 |



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- DA: Device Address-0x01
- FC: Function Code-0x02:read DI
- SA(Hi): Start Address(Hi byte)-0x00
- SA(Lo): Start Address(Lo byte)-0x00
- NO(Hi): No. Of points(Hi byte)-0x00
- NO(Lo): No. Of points (Lo byte)-0x10
- BC: Byte Count-0x02

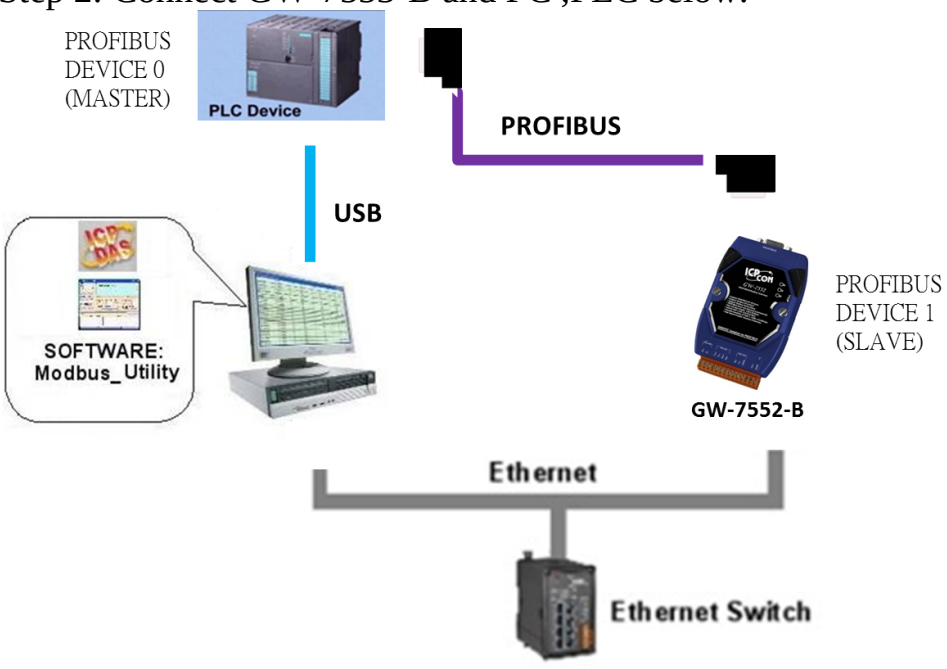
## 4.9 Data exchange example—Modbus TCP

In this example a Modbus master device simulated by a PC program sends query message and receives response message from a Profibus master via the GW-7553-B gateway.

In the following example the SIEMATIC S7-300 CPU313C-2 DP and GW-7553-B are used. The configuration and communication is done by the program "Step 7 Manager" provided by SIEMENS.

Step 1: Copy the GSD file and assign the GW-7553-B a valid station address (Please refer to the section 4.2 GSD file).

Step 2: Connect GW-7553-B and PC ,PLC below.






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*Figure 47 Wiring diagram between PC and GW-7553-B*

Step 3: Set the parameters of the GW-7553-B . We need to change “Modbus Type” to Slave and “Modbus Format” to Modbus TCP. The default setting is being used in the other parameters for this example. Please refer to section 4.3 the Configuration of the common parameters. The users can set parameters as shown below.

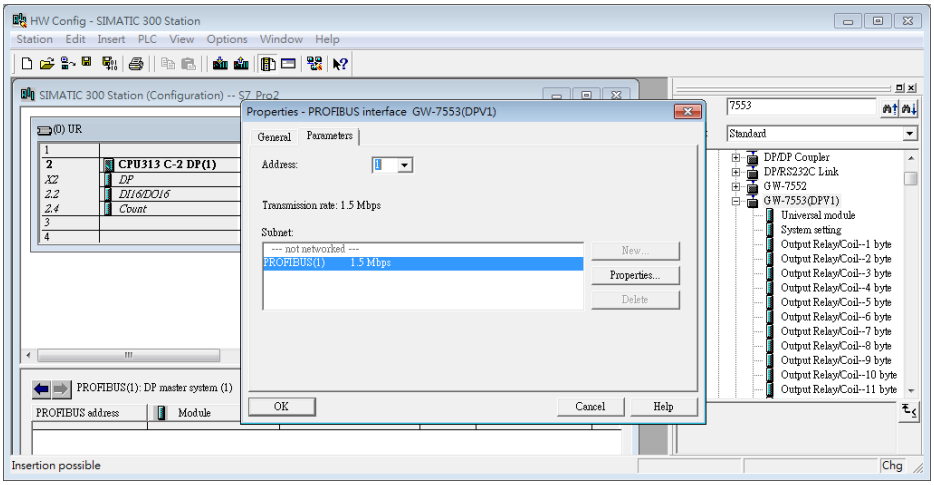



*Figure 48 Double click the GW-7553-B icon to setup the PROFIBUS address as “1”.*

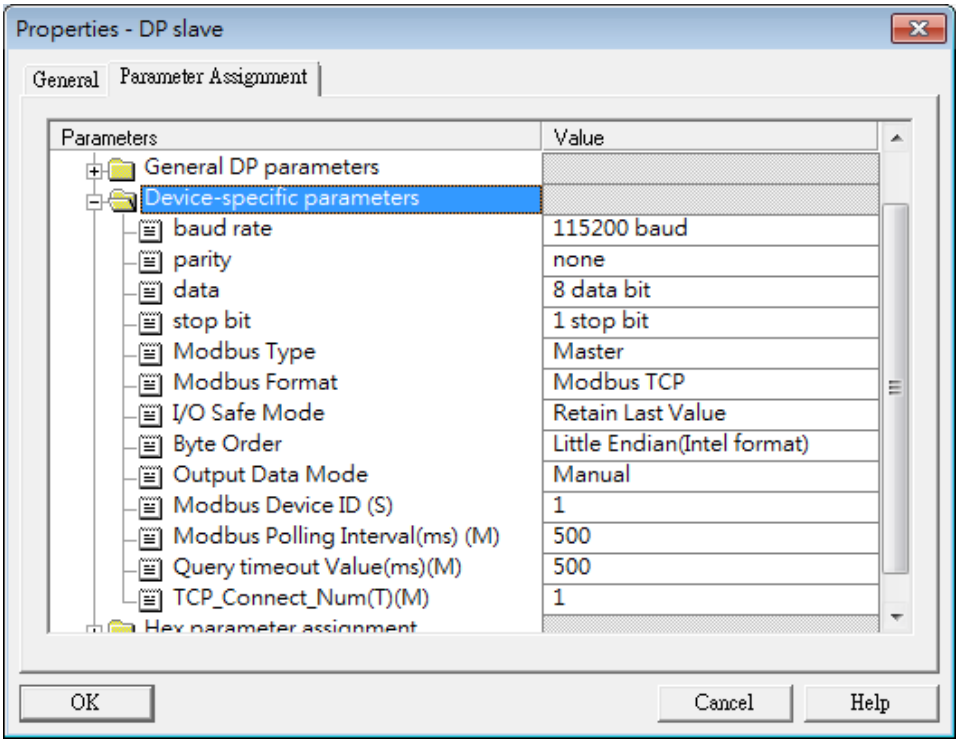



*Figure 49 Click “Parameter Data…” to setup parameters*



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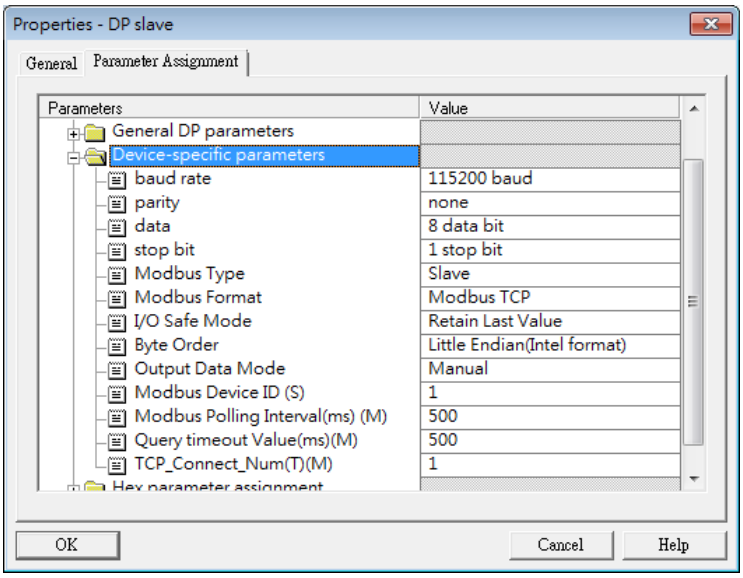



*Figure 50 The user needs to change "Modbus Type" to Slave and "Modbus Format" to Modbus TCP for this example and click "OK" button*

Step 4: Set the GW-7553-B modules, as shown in ***Figure 81*** *and* ***Figure 82***.

- Select "System setting" module: "System setting" module always has to be selected otherwise no communication can be established between the gateway and the Modbus network.
- Select "Output Relay/Coil" module: In this example a "Output Relay/Coil--2 Byte" module is selected.
- Select "Input Relay/Coil" module: In this example a "Input Relay/Coil--2 Byte" module is selected.

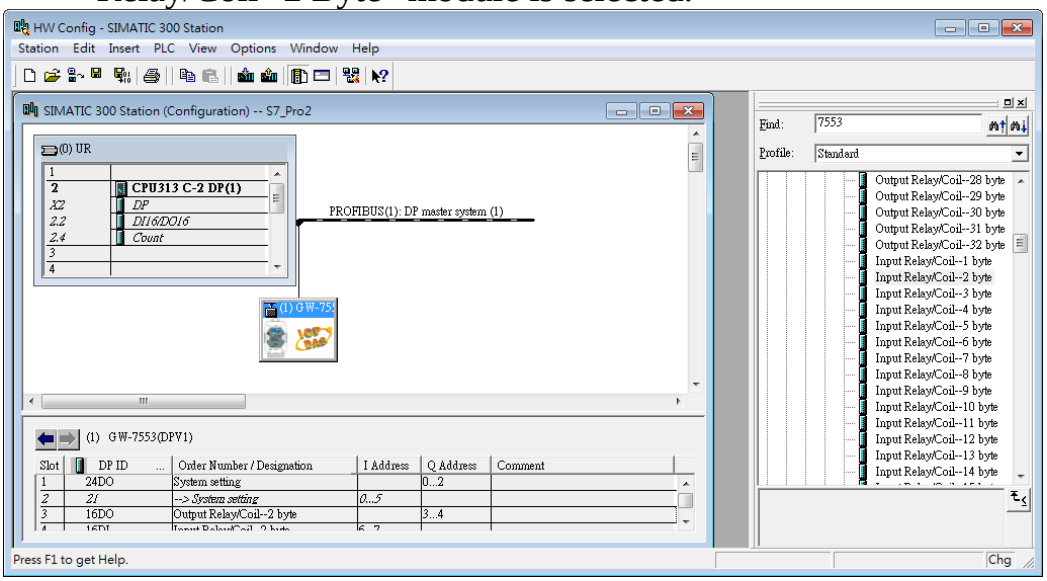



*Figure 51 Add modules*



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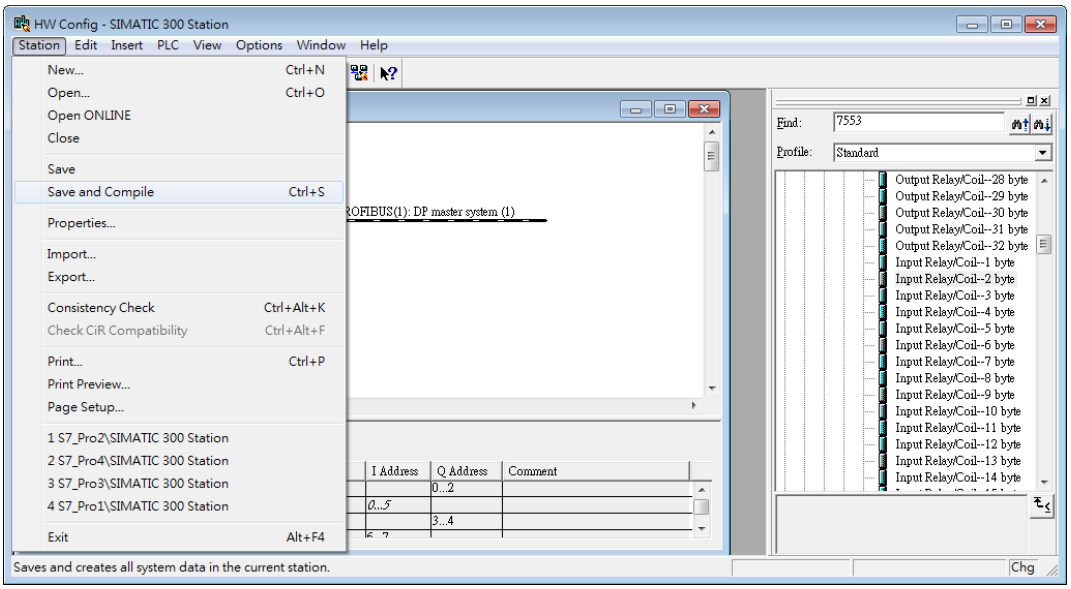



*Figure 52 Save and compile*

Step 5: Save and complie

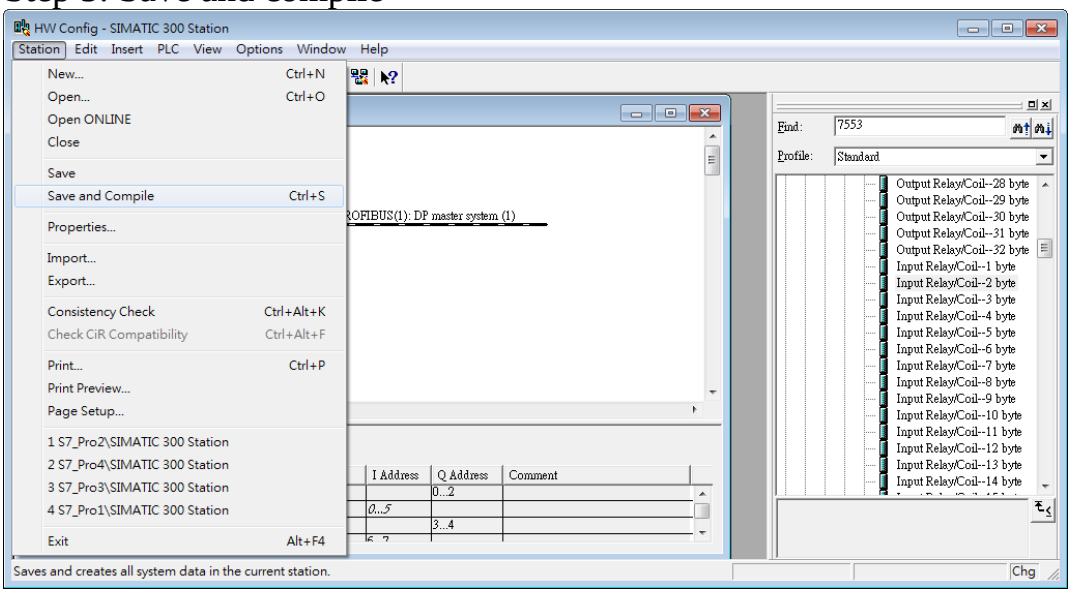



Figure 53 Download to PLC

Step 6: Now the setting done by the Step 7 has to be downloaded to the PROFIBUS Master.



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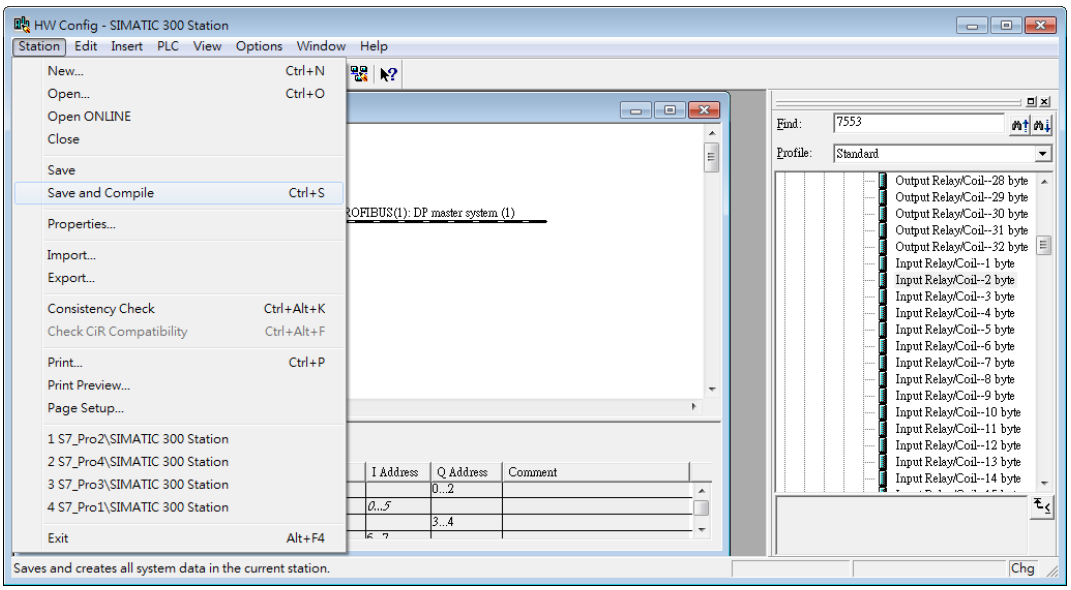



*Figure 53 Click "Download" to download the setting into PROFIBUS Master*

Step 7: Set the network settings of the GW-7553-B by PROFIBUS/Modbus gateway utility (please refer section 5.5 & 5.6). The settings of the GW-7553-B must have the same domain and different IP with the PC (ex: PC's IP=192.168.0.106, MASK=255.255.0.0; GW-7553-B's IP=192.168.0.107, MASK=255.255.0.0).

Step 8: Reset the power of the GW-7553-B for an active setting.

### 4.9.1 Receiving data from a Modbus Master device

-- Start the test utility "MBTCP" (***Figure 84***) on the PC.
This utility simulates a Modbus Master device and is on the web site in the following directory:
*http://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/modbus/modbus_utility/*

(1) Set the IP address of the GW-7553-B (2) Click the connect button



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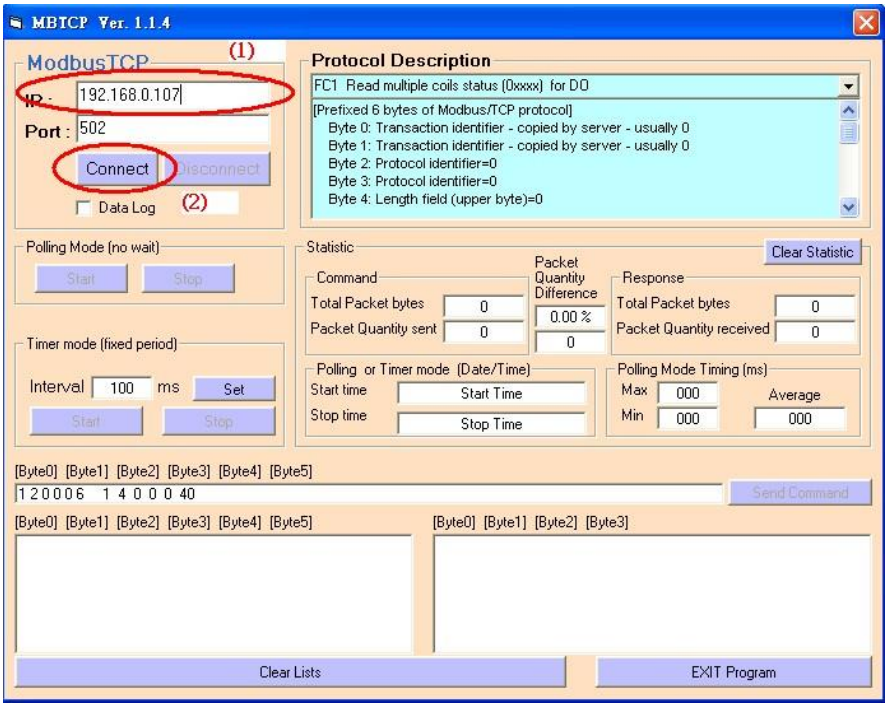
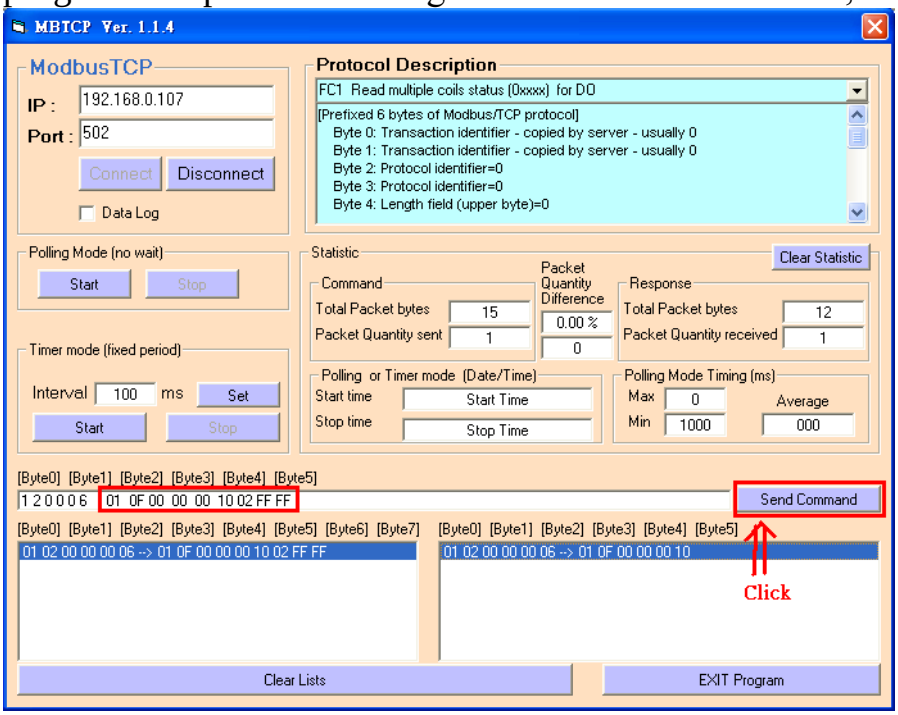



*Figure 54 MBTCP Utility*

--Send Command to write DO of the GW-7553-B

The user needs to input command (" 01 0F 00 00 00 10 02 FF FF") here and click <Send Command> button to send Modbus command: "01 0F 00 00 00 10 02 FF FF" and then MBTCP can receive response message (" 01 0F 00 00 00 10"). The user can find byte 6, 7 of the input data area in the configuration program "Step 7" have changed into "0xFF" at this time, as shown below.






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*Figure 55 Send Modbus command (output data: 0xFF, 0xFF)*

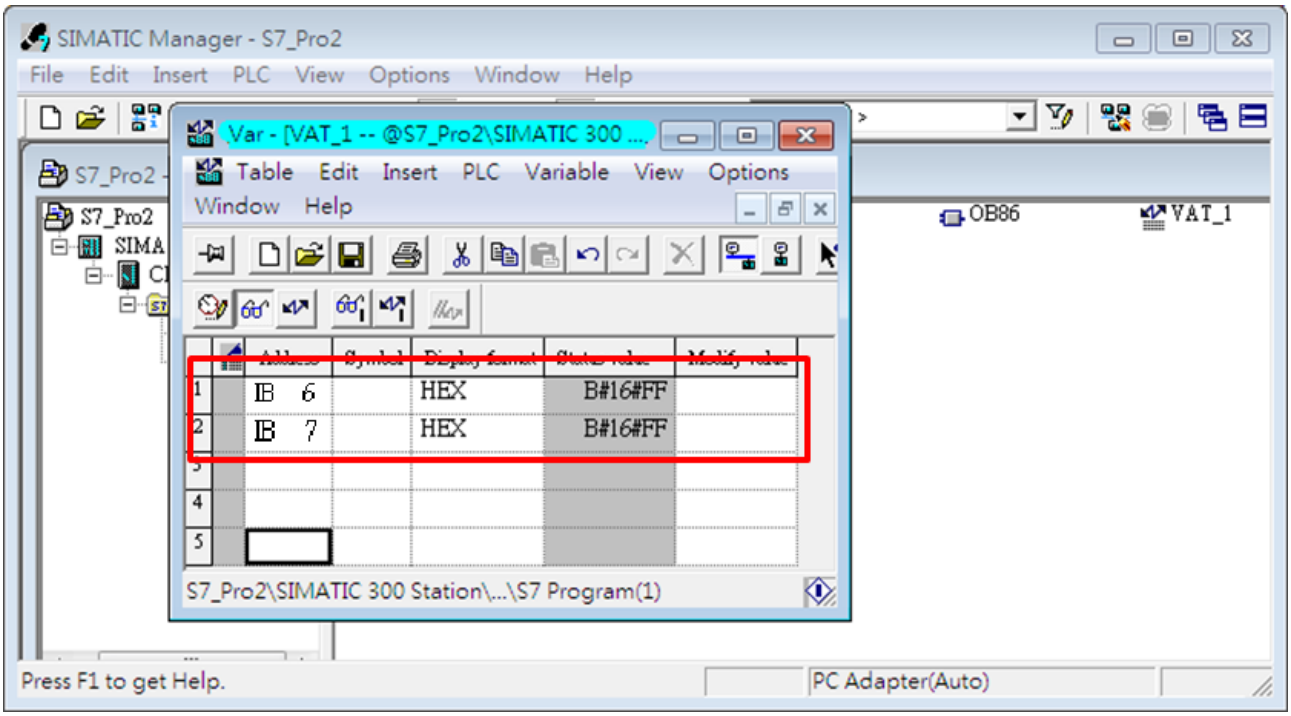



*Figure 57 Receive "0xFF" in the input data area*

*Table 19 Receive "0xFF" in the input data area*

| ***Module*** | ***Byte*** | ***Data type*** | ***Representation*** | ***Value*** |
|---|---|---|---|---|
| Input module | Input 6 | Byte | Hex | 0xFF |
| | Input 7 | Byte | Hex | 0xFF |

PS:

Modbus command:

Query message

| DA | FC | SA (Hi) | SA (Lo) | NO (Hi) | NO (Lo) | BC | DATA | |
|---|---|---|---|---|---|---|---|---|
| 01 | 0F | 00 | 00 | 00 | 10 | 02 | FF | FF |



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Response message

| DA | FC | SA (Hi) | SA (Lo) | NO (Hi) | NO (Lo) |
|---|---|---|---|---|---|
| 01 | 0F | 00 | 00 | 00 | 10 |

- DA: Device Address-0x01
- FC: Function Code-0x0F=>Write multi-DO
- SA(Hi): Start Address(Hi byte)-0x00
- SA(Lo): Start Address(Lo byte)-0x00
- NO(Hi): No. Of points (Hi byte)-0x00
- NO(Lo): No. Of points (Lo byte)-0x10
- BC: Byte Count-0x02

### 4.9.2 Receiving data from the PROFIBUS Master device

--Send Command to read DI of the GW-7553-B

The user needs to input command (" 01 02 00 00 00 10") in MBTCP and click <Send Command> button to send Modbus command: "01 02 00 00 00 10" and then MBTCP can receive response message (" 01 02 02 00 00"). In this message, the user can know the value of DI0 & DI1 is "0" in the GW-7553-B.

--Send output data to write DI of the GW-7553-B by the PROFIBUS Master

The user needs to set "0xFE" & "0xDC" in byte 3 & byte 4 of output data area in the configuration program "Step 7" and then set the value of the first byte from 0 to 1 to trigger the data output command.

--Send Command to read DI of the GW-7553-B again

Now the user can input command (" 01 02 00 00 00 10") in MBTCP and click <Send Command> button to send Modbus command: "01 02 00 00 00 10" again. Then MBTCP can receive response message (" 01 02 02 FE DC"). In this message, the user can know the value of DI0 & DI1 have changed into "0xFE" & "0xDC" in the GW-7553-B, as shown in ***Figure 87***, ***Figure 88, Figure 89***, & ***Table 26*** Set output data and trigger output data command.



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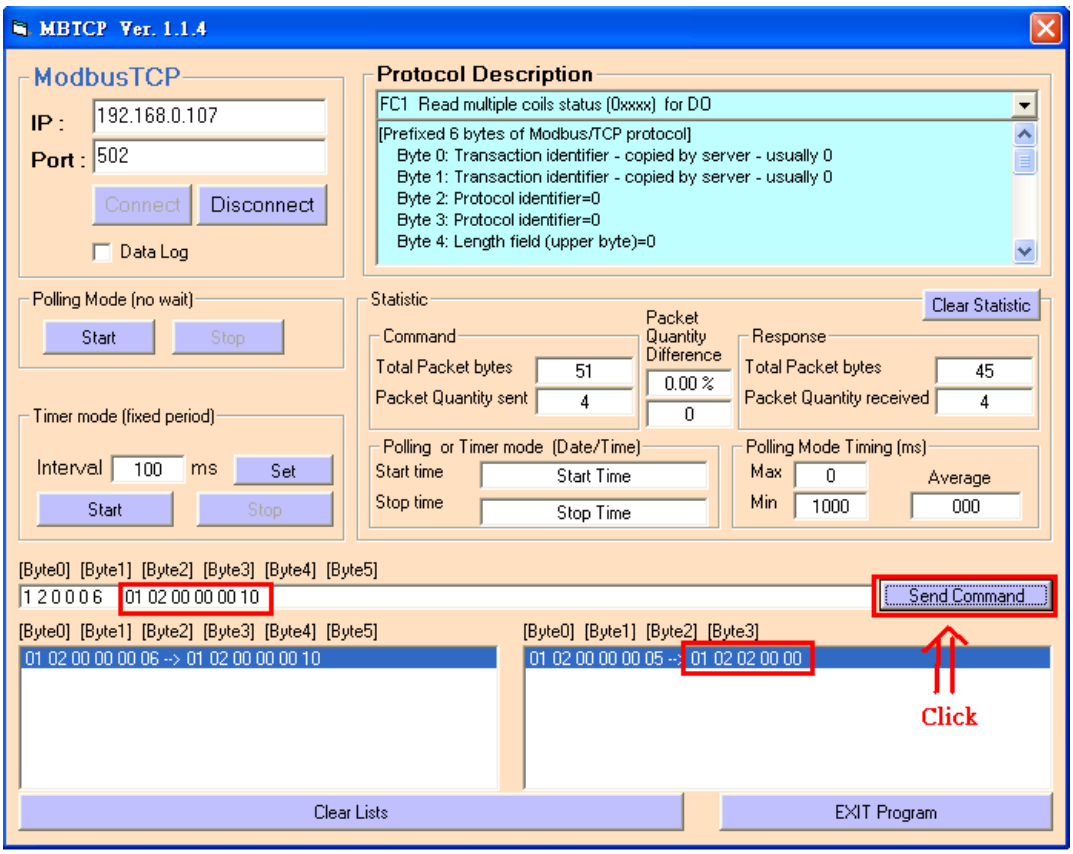



*Figure 56 Send Modbus command to read DI of the GW-7553-B*

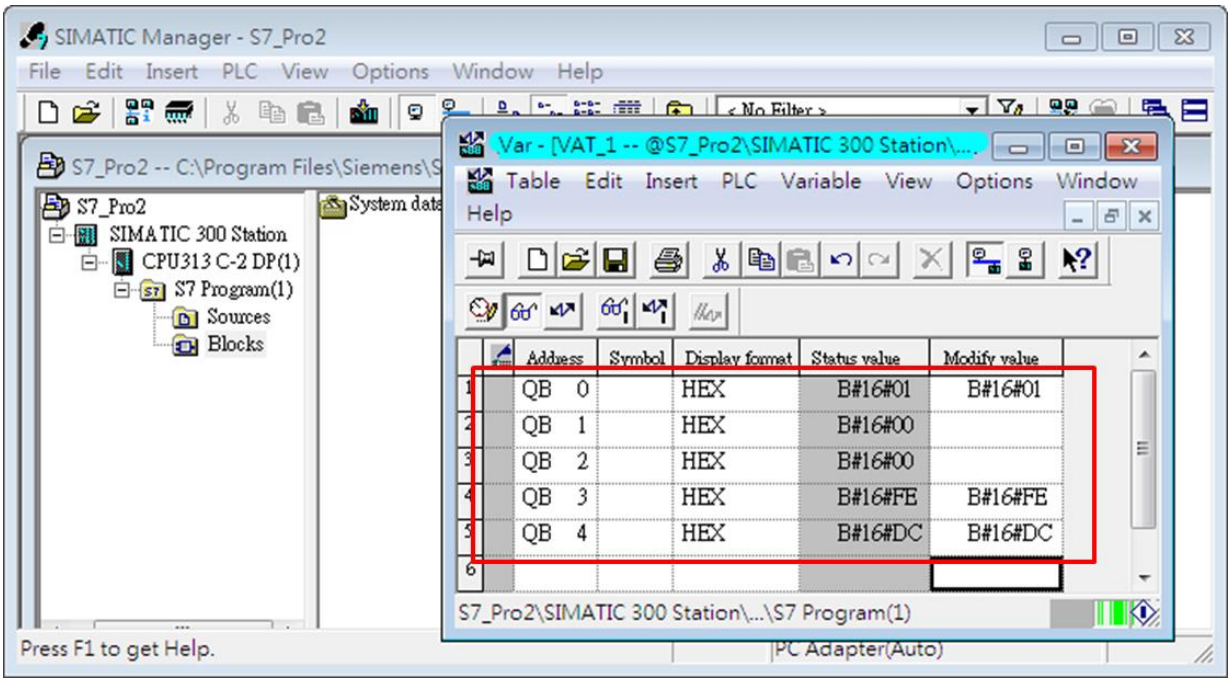



*Figure 57 Set output data and trigger output data command in the output data area*



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*Table 20 Set output data and trigger output data command*

| *Module* | *Byte* | *Data type* | *Representation* | *Value* |
|---|---|---|---|---|
| System module | Output 0 | Byte | Hex | 0x00 ⟶ 0x01 |
| | Output 1 | Byte | Hex | 0x00 |
| | Output 2 | Byte | Hex | 0x00 |
| Output module | Output 3 | Byte | Hex | 0x00⟶ 0xFE |
| | Output 4 | Byte | Hex | 0x00⟶ 0xDC |

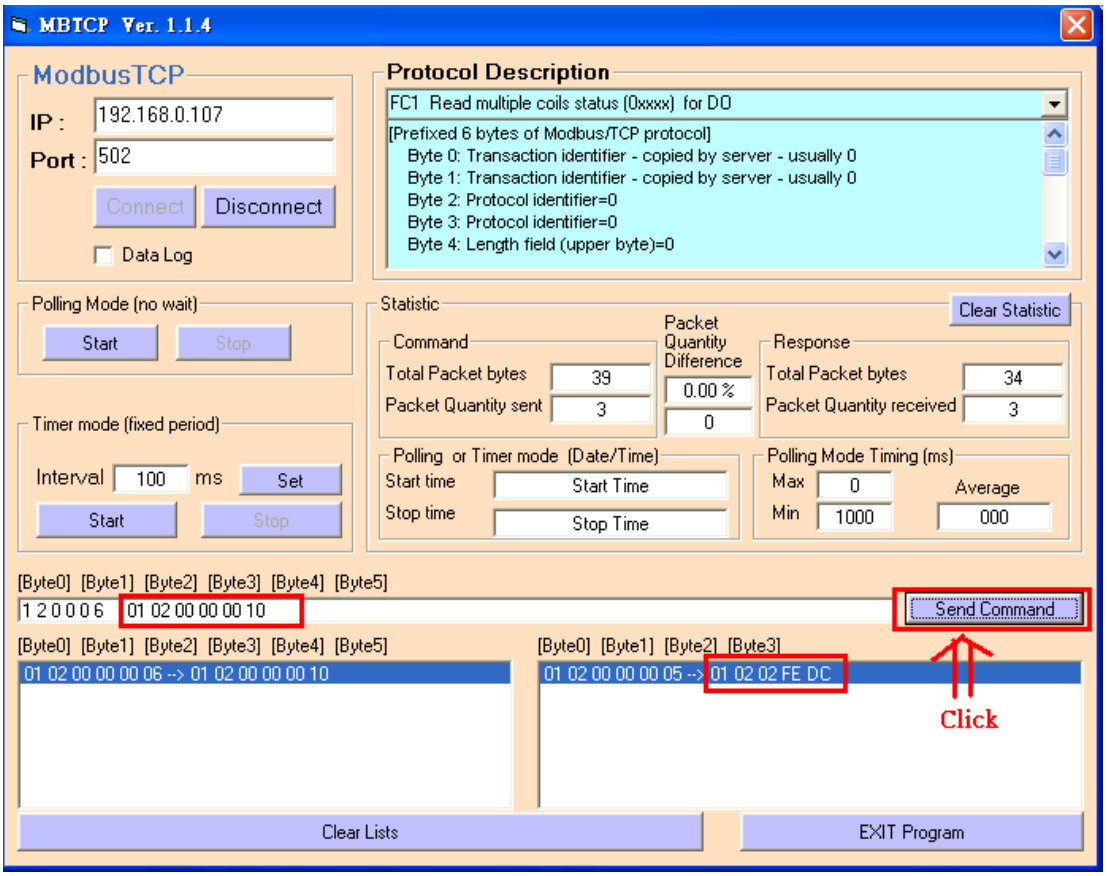



*Figure 58 Send Modbus command to read DI of the GW-7553-B and receive data (0xFE, 0xDC)*



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PS:

Modbus command:

Query message

| DA | FC | SA (Hi) | SA (Lo) | NO (Hi) | NO (Lo) |
|---|---|---|---|---|---|
| 01 | 02 | 00 | 00 | 00 | 10 |

Response message

| DA | FC | BC | DATA | |
|---|---|---|---|---|
| 01 | 02 | 02 | FE | DC |

- DA: Device Address-0x01
- FC: Function Code-0x02:read DI
- SA(Hi): Start Address(Hi byte)-0x00
- SA(Lo): Start Address(Lo byte)-0x00
- NO(Hi): No. Of points(Hi byte)-0x00
- NO(Lo): No. Of points (Lo byte)-0x10
- BC: Byte Count-0x02

## 4.10 PROFIBUS DP-V1 Data exchange example—Modbus RTU

In this example a Modbus Master device simulated by a PC program sends query message and receives response message from a PROFIBUS Master via the GW-7553 gateway.

In the following examples the CIF50-PB PROFIBUS Master card from Hilscher is used. The configuration and communication is done by the program "SyCon" provided by Hilscher.

Step 1: Copy the GSD file and assign the GW-7553 a valid station address (Please refer to the section 4.2 GSD file).



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Step 2: Connect the RS-232 port of the GW-7553 module to a COM port of the PC and the PROFIBUS port to a PROFIBUS Master (***Figure 34***).

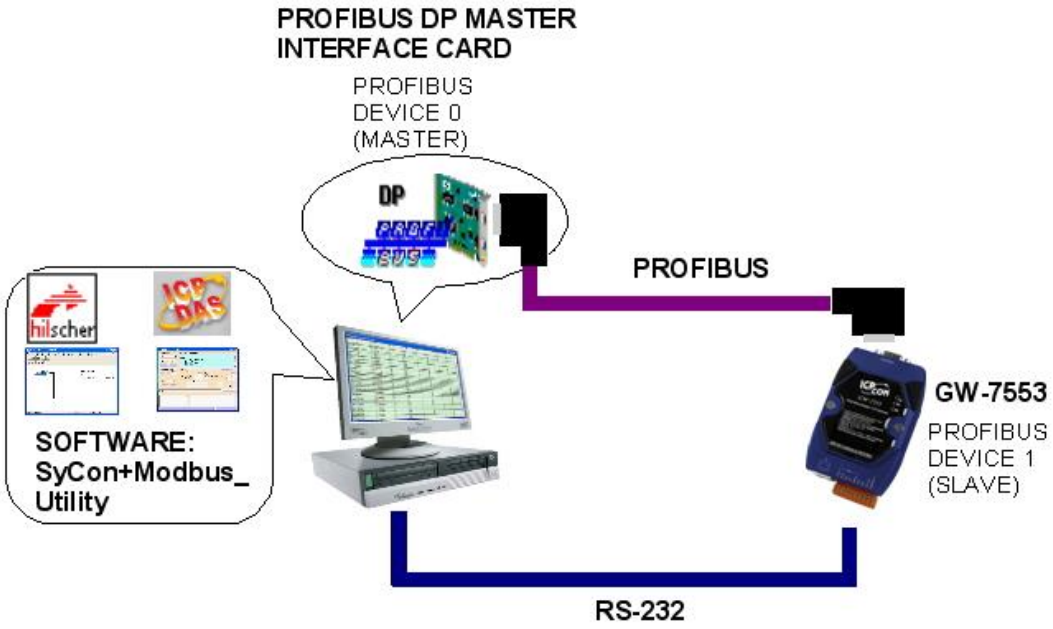



*Figure 59 Wiring diagram between PC and GW-7553*

Step 3: Set the parameters of the GW-7553. We just need to change "Modbus Type" to Slave and the default setting is being used in the other parameters for this example. Please refer to section 4.3 the Configuration of the common parameters. The users can set parameters as shown in the below.

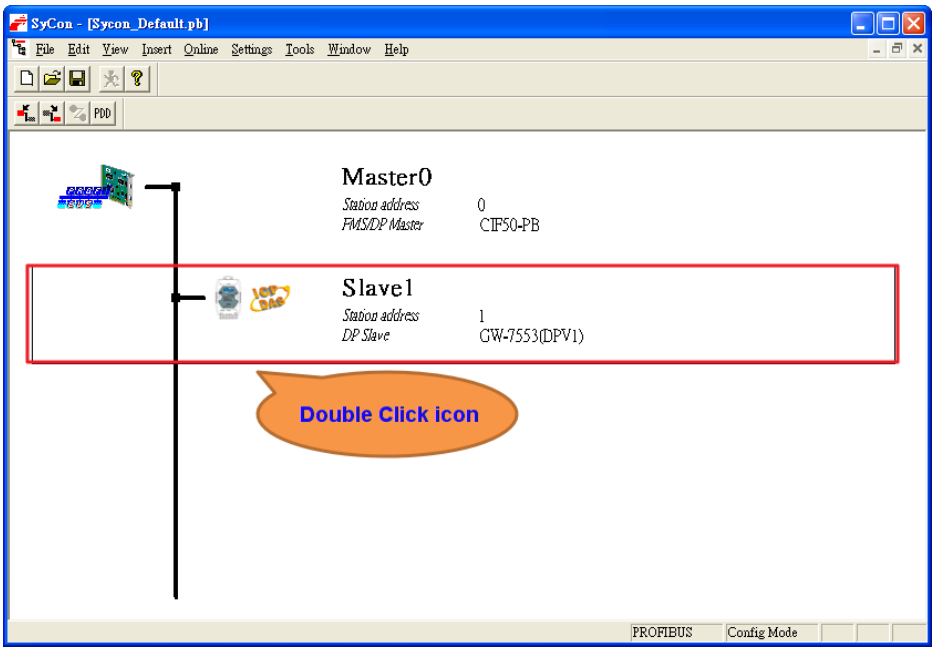



*Figure 60 Double click the GW-7553 icon to open the "Slave configuration"*



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*window*

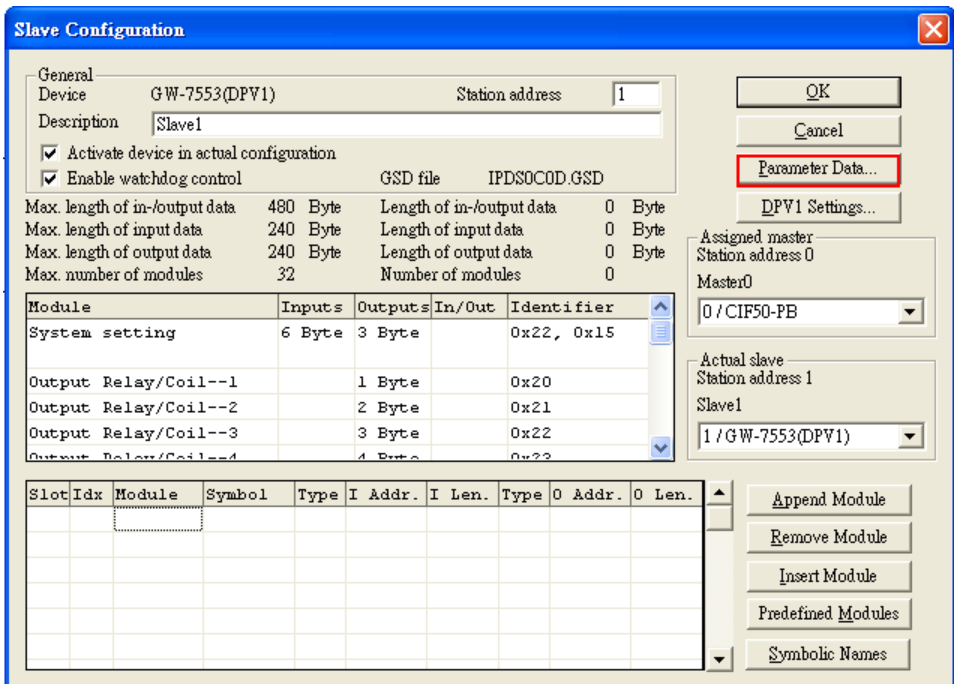



*Figure 61 Click "Parameter Data…" button to open the "Parameter Data" window*

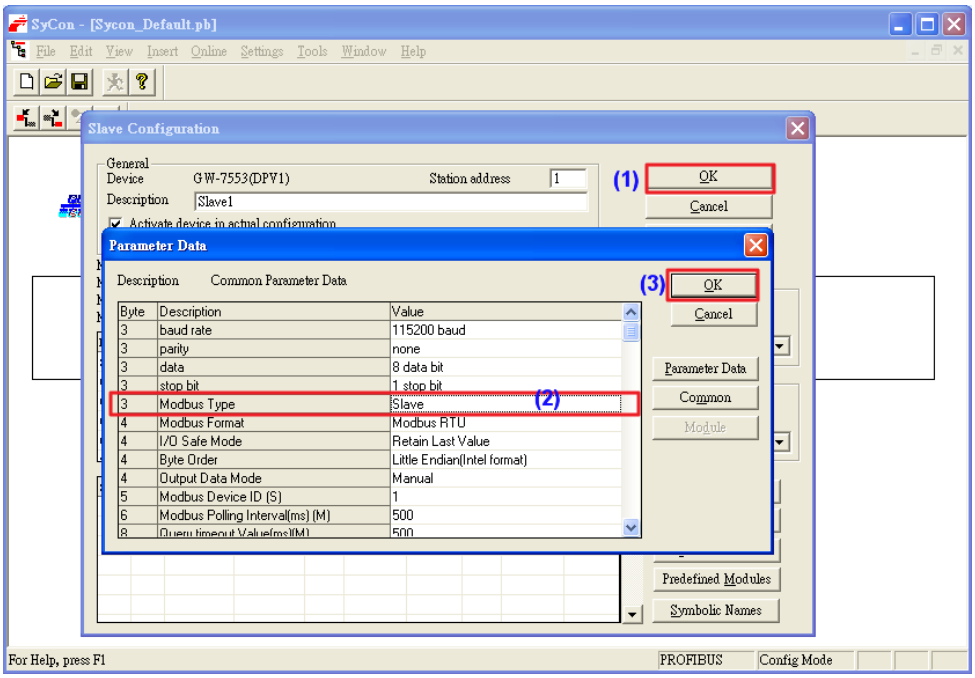



*Figure 62 The user needs to change "Modbus Type" to Slave for this example and click "OK" button*

Step 4: Set the GW-7553 modules, as shown in ***Figure 38*** *and* ***Figure 39***.

– Select "System setting" module: "System setting" module always has



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to be selected otherwise no communication can be established between the gateway and the Modbus network.

- Select “Output Relay/Coil” module: In this example a “Output Relay/Coil--2 Byte” module is selected.
- Select “Input Relay/Coil” module: In this example a “Input Relay/Coil--2 Byte” module is selected.
- Select “Output Relay/Coil” module: In this example a “Output Register--1 word” module is selected.

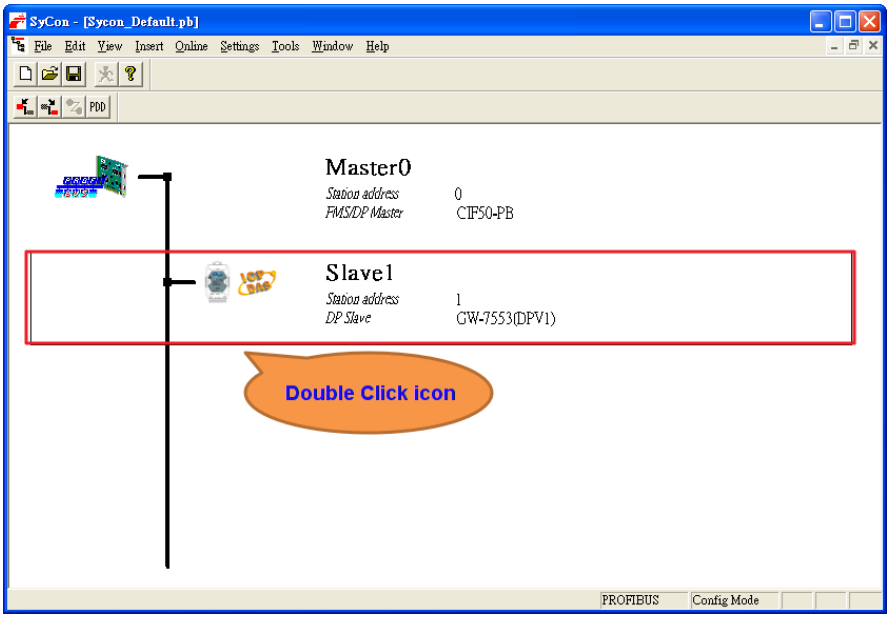



*Figure 63 Double click the GW-7553 icon to open the “Slave configuration” window*



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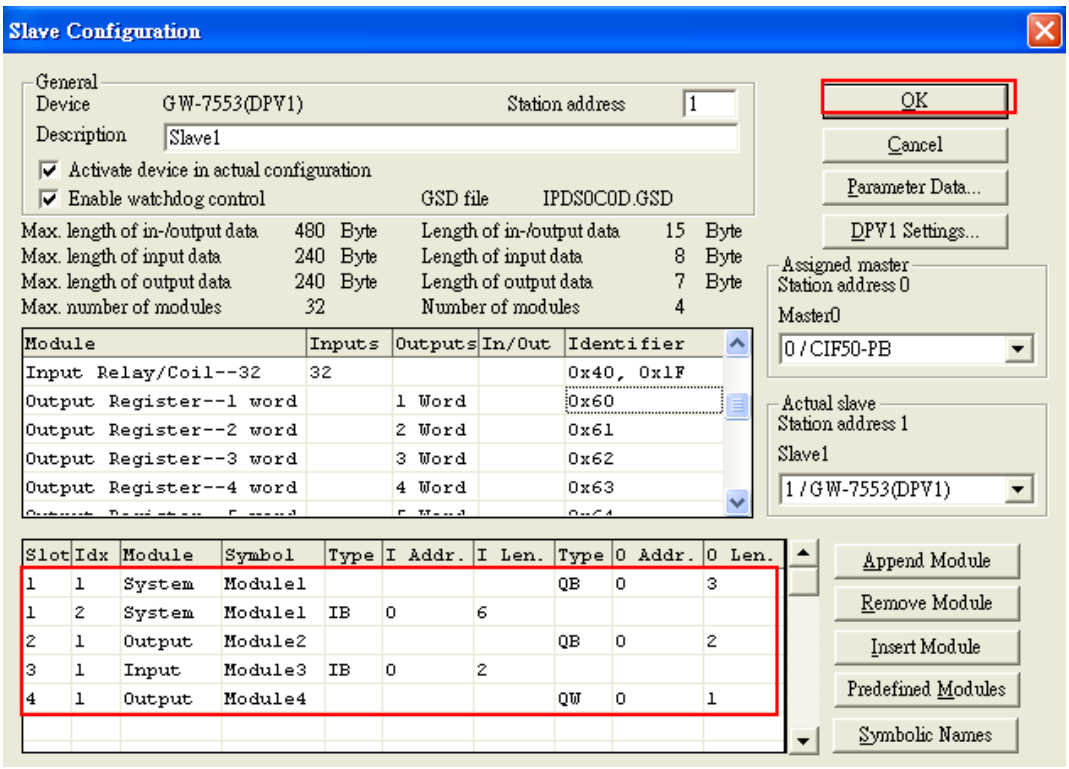



*Figure 64 Select modules*

Step 5: Close the “Slave Configuration” window by clicking the “OK” button.

Step 6: Now the setting done by the configuration tool has to be downloaded to the PROFIBUS Master.

Click on the Master area in the graphic window then

**Online** -> **Download…**



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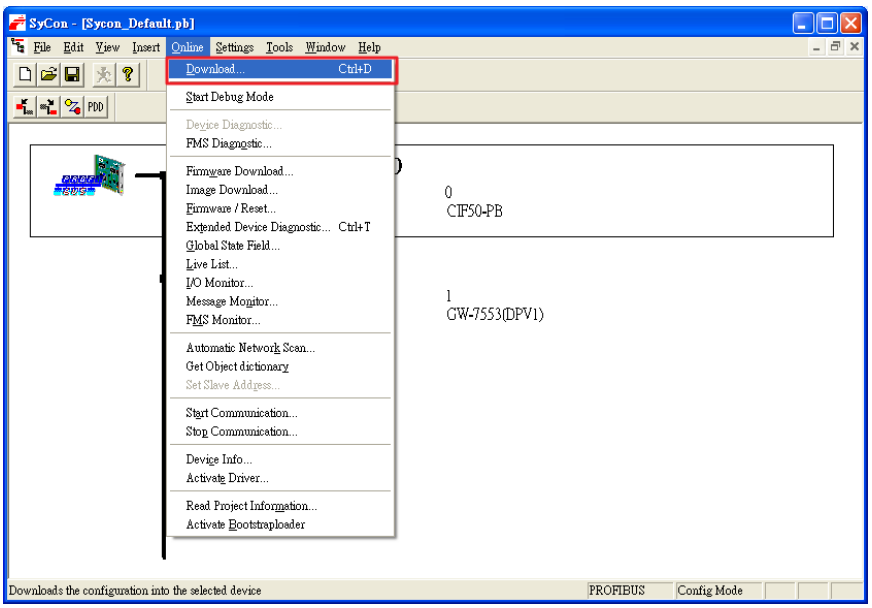



*Figure 65 Click "Online->Download" to download the setting into PROFIBUS Master*

### 4.10.1 Sending data from a Modbus Master device

-- Start the test utility "MBRTU" (***Figure 41***) on the PC.
This utility simulates a Modbus Master device and is on the web site in the following directory:
*http://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/modbus/modbus_utility/*

(1) Set the COM Port number of the PC
(2) Set the Baud rate to 115200
(3) Set the Line control to N,8,1
(4)Open the connection



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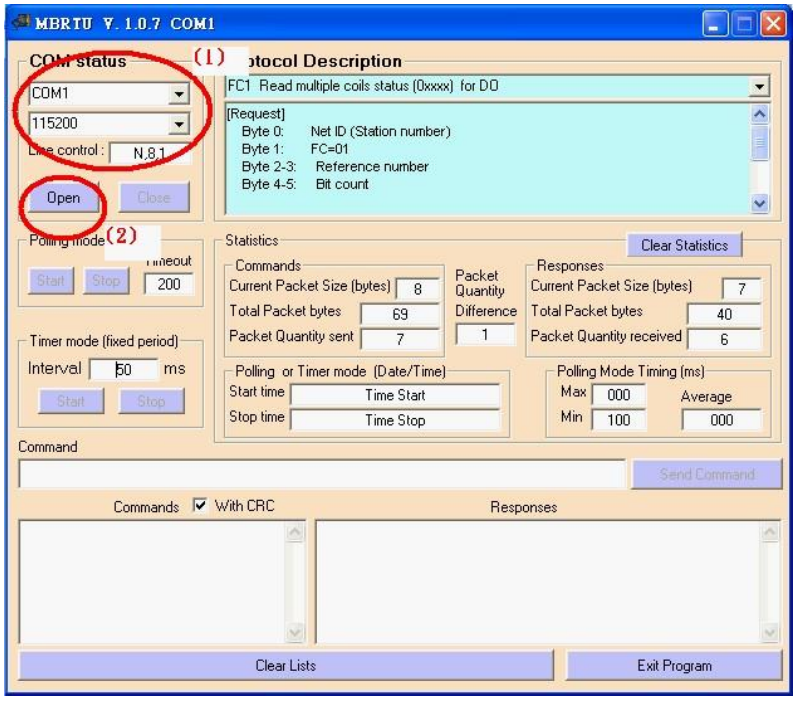
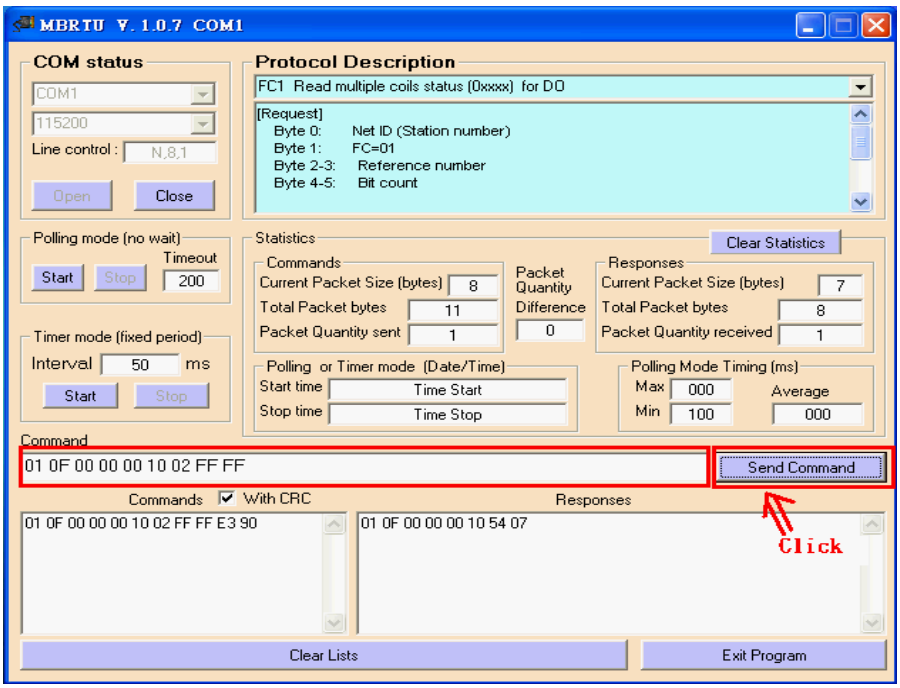



*Figure 66 MBRTU Utility*

--Send Command to write DO of the GW-7553

The user needs to input command (" 01 0F 00 00 00 10 02 FF FF") here and click <Send Command> button to send Modbus command: "01 0F 00 00 00 10 02 FF FF E3 90" and then MBRTU can receive response message (" 01 0F 00 00 00 10 54 07"). The user can find byte 6, 7 of the input data area in the configuration program "SyCon" have changed into "0xFF" at this time, as shown in the below.






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*Figure 67　Send Modbus command (output data: 0xFF, 0xFF)*

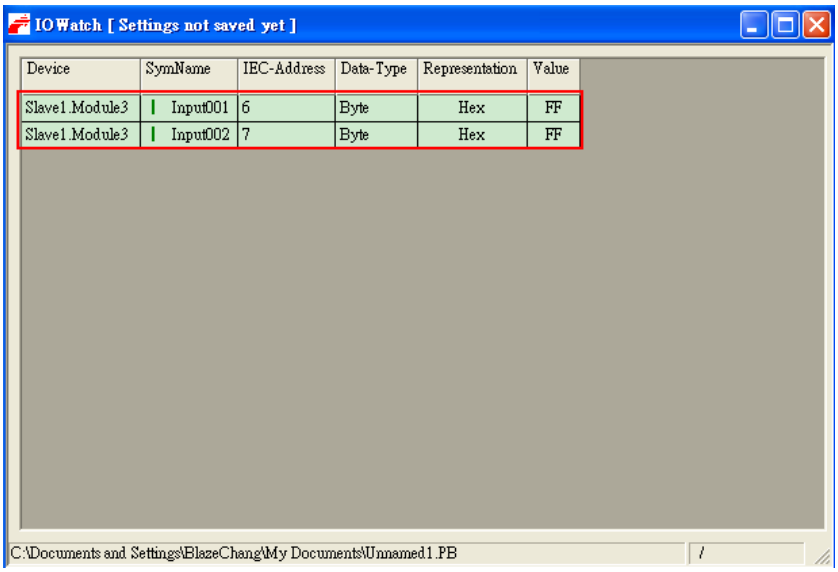



*Figure 68　Receive "0xFF" in the input data area*

*Table 21　Receive "0xFF" in the input data area*

| ***Module*** | ***Byte*** | ***Data type*** | ***Representation*** | ***Value*** |
|---|---|---|---|---|
| Input module | Input 6 | Byte | Hex | 0xFF |
| | Input 7 | Byte | Hex | 0xFF |

PS:

Modbus command:

Query message

| DA | FC | SA (Hi) | SA (Lo) | NO (Hi) | NO (Lo) | BC | DATA | | CRC check | |
|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 0F | 00 | 00 | 00 | 10 | 02 | FF | FF | E3 | 90 |

Response message

| DA | FC | SA (Hi) | SA (Lo) | NO (Hi) | NO (Lo) | CRC check |
|---|---|---|---|---|---|---|



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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 01 | 0F | 00 | 00 | 00 | 10 | 54 | 07 |

- DA: Device Address-0x01
- FC: Function Code-0x0F=>Write multi-DO
- SA(Hi): Start Address(Hi byte)-0x00
- SA(Lo): Start Address(Lo byte)-0x00
- NO(Hi): No. Of points (Hi byte)-0x00
- NO(Lo): No. Of points (Lo byte)-0x10
- BC: Byte Count-0x02

### 4.10.2 Using PROFIBUS DP-V1 to read data from a PROFIBUS Master Device

--Send Command to write DO of the GW-7553

In section 4.8.1. The user can find byte 6, 7 of the input data area in the configuration program "SyCon" have changed into "0xFF".

--"Message Monitor"

Message Monitor is provided by Sycon, user can click **Online->Message Monitor** menu. User must enter parameters relative to DPV1 in the message monitor in order to read/write data via DPV1 from a profibus slave.

The message monitor is shown in ***Figure 69***.



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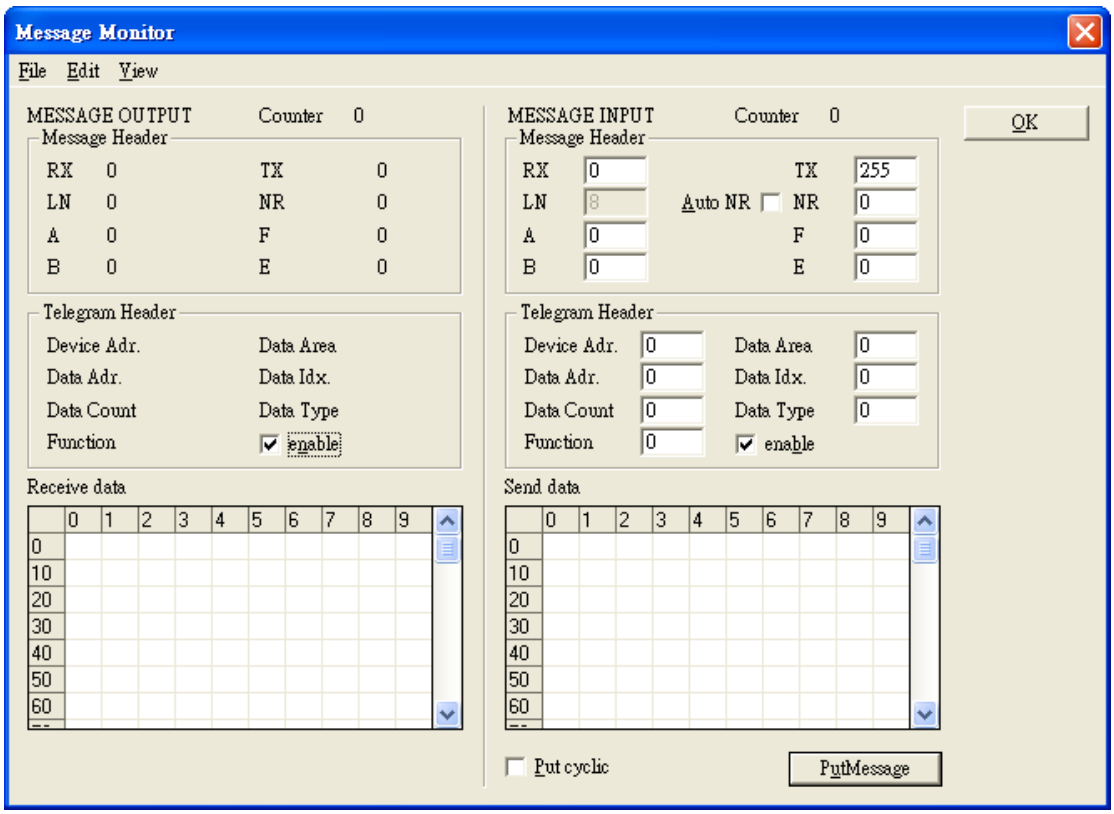



*Figure 69 "Message Monitor"*

--Sending Initiate request telegram to establish connection between Profibus Master and GW-7553

If configure CIF50-PB as a class 1 master, user do not establish connection.

If configure CIF50-PB as a class 2 master, user must establish connection.

Please click **Online->Message Monitor**, then fill in parameters relative to Initiate request telegram, as shown in ***Figure 70*** and ***Table 22***.



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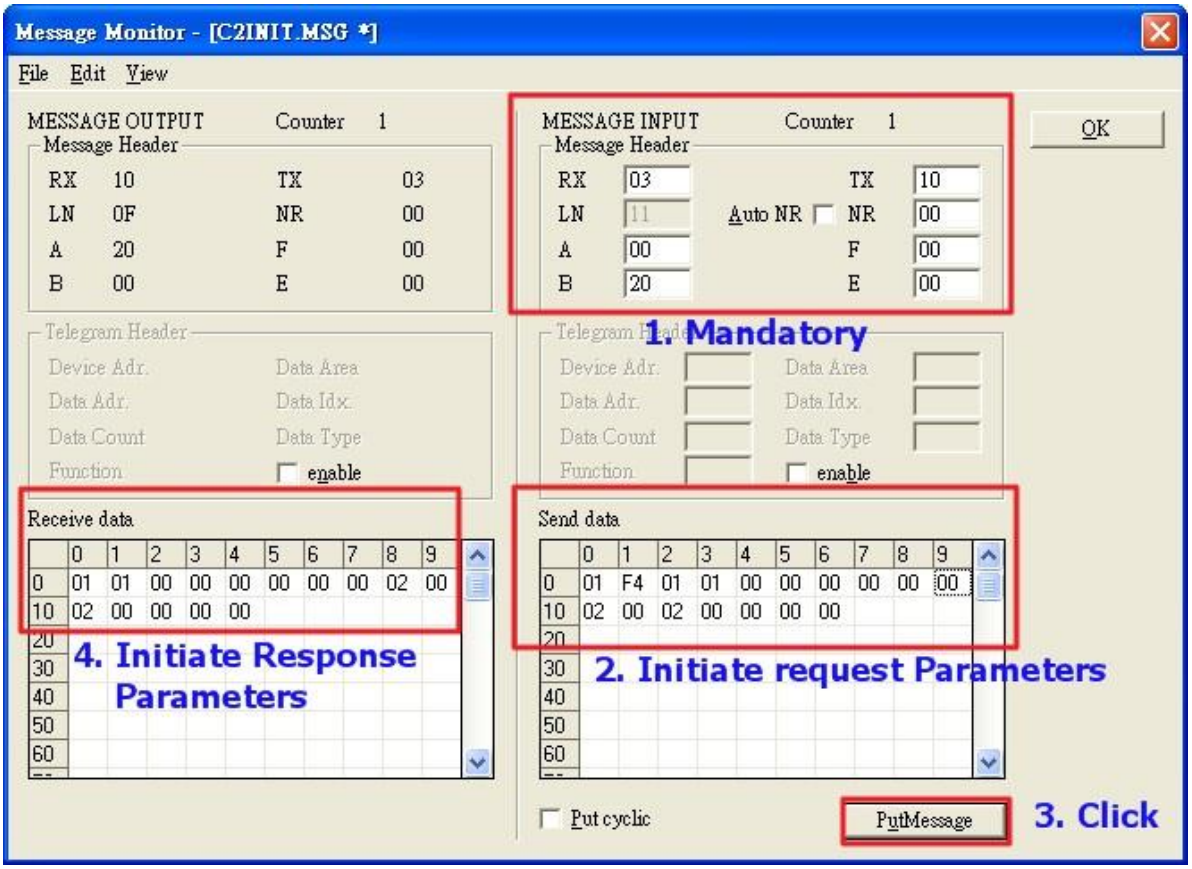



*Figure 70 Initiate request Parameters*

*Table 22 Send data Parameters*

| Parameters | Value | Parameters | Value |
|---|---|---|---|
| PROFIBUS station address of GW-7553 | 0x01 | S-Type | 0x00 |
| Send Timeout (Lo) | 0xF4 | S-Len | 0x02 |
| Send Timeout (Hi) | 0x01 | D-Type | 0x00 |
| Features Supported 1 | 0x01 | D-Len | 0x02 |
| Features Supported 2 | 0x00 | S_Addr API | 0x00 |
| Profile Features Supported 1 | 0x00 | S_Addr SCL | 0x00 |
| Profile Features Supported 2 | 0x00 | D_Addr API | 0x00 |
| Profile Ident Number (Lo) | 0x00 | S_Addr SCL | 0x00 |
| Profile Ident Number (Hi) | 0x00 | | |

--Sending Read request telegram to read data of the GW-7553
If configure CIF50-PB as a class 1 master,《Message Header->B》is 0x11
If configure CIF50-PB as a class 2 master,《Message Header->B》is 0x21
Please click **Online->Message Monitor**, then fill in parameters relative to Read request telegram, as shown in ***Figure 71***、***Figure 72*** and ***Table 23*** Telegram



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Header Parameters .

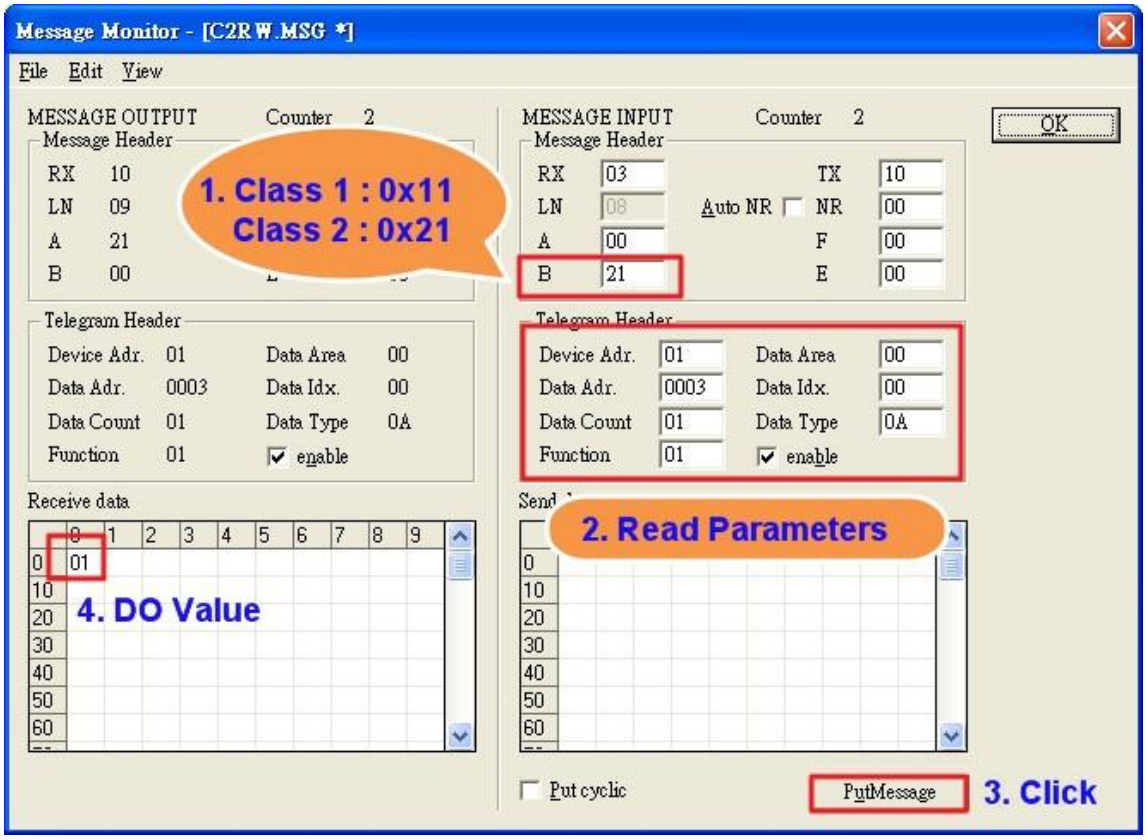



*Figure 71 Read request Parameters*

*Table 23 Telegram Header Parameters*

| Parameters | Value | Meaning for DPV1 |
|---|---|---|
| Device Adr. | 0x01 | PROFIBUS station address of GW-7553 |
| Data Area | 0x00 | Unused |
| Data Adr. | 0x03 | Slot number |
| Data Idx. | 0x00 | Index |
| Data Count | 0x01 | Length |
| Data Type | 0x0A | Unused |
| Function | 0x01 | Read |

In this case, slot 3 is used for “Input Relay/Coil--2 Byte” (see ***Figure 39*** ),the DO value of index 0 is “0x01”.



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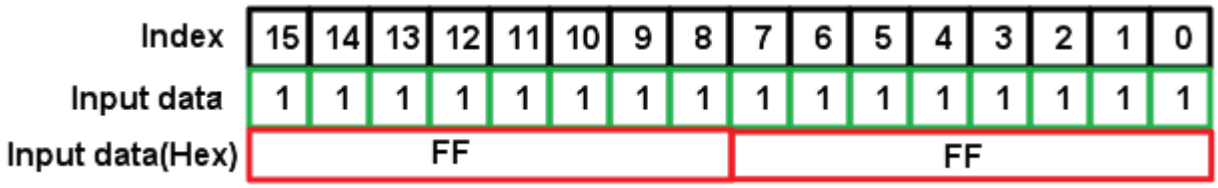



*Figure 72 Index range*

-- Sending Abort request telegram to terminate connection between Profibus Master and GW-7553
If configure CIF50-PB as a class 1 master, user do not terminate connection.
If configure CIF50-PB as a class 2 master, user must terminate connection.
Please click **Online->Message Monitor**, then fill in parameters relative to Abort request telegram, as shown in ***Figure 73***.

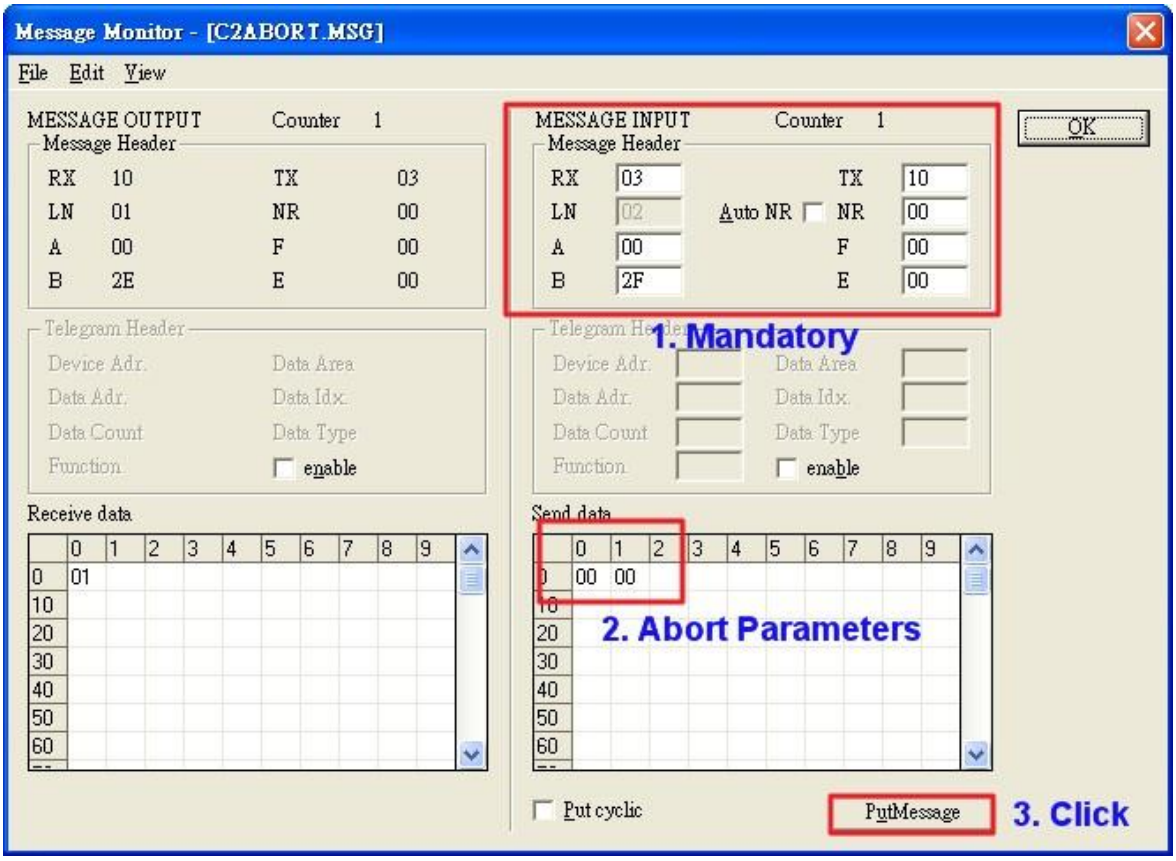



*Figure 73 Abort request Parameters*

### 4.10.3 Receiving data from the PROFIBUS Master device

--Send Command to read DI of the GW-7553
The user needs to input command (" 01 02 00 00 00 10") in MBRTU and click <Send Command> button to send Modbus command: "01 02 00 00 00



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10 79 C6" and then MBRTU can receive response message (" 01 02 02 00 00 B9 B8"). In this message, the user can know the value of DI0 & DI1 is "0" in the GW-7553.

--Send output data to write DI of the GW-7553 by the PROFIBUS Master

The user needs to set "0xFE" & "0xDC" in byte 3 & byte 4 of output data area in the configuration program "SyCon" and then set the value of the first byte from 0 to 1 to trigger the data output command.

--Send Command to read DI of the GW-7553 again

Now the user can input command (" 01 02 00 00 00 10") in MBRTU and click <Send Command> button to send Modbus command: "01 02 00 00 00 10 79 C6" again. Then MBRTU can receive response message (" 01 02 02 FE DC F8 41"). In this message, the user can know the value of DI0 & DI1 have changed into "0xFE" & "0xDC" in the GW-7553, as shown in ***Figure 44***, ***Figure 45*** , ***Figure 46*** & ***Table 18*** Set output data and trigger output data command.

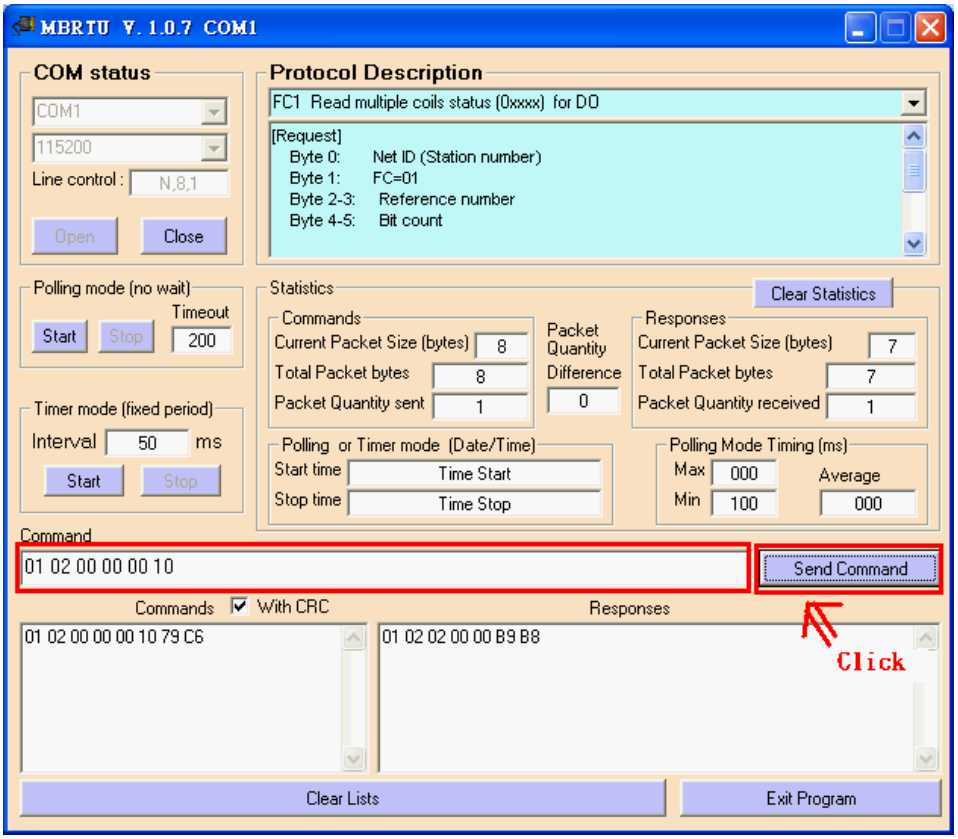



*Figure 74 Send Modbus command to read DI of the GW-7553*



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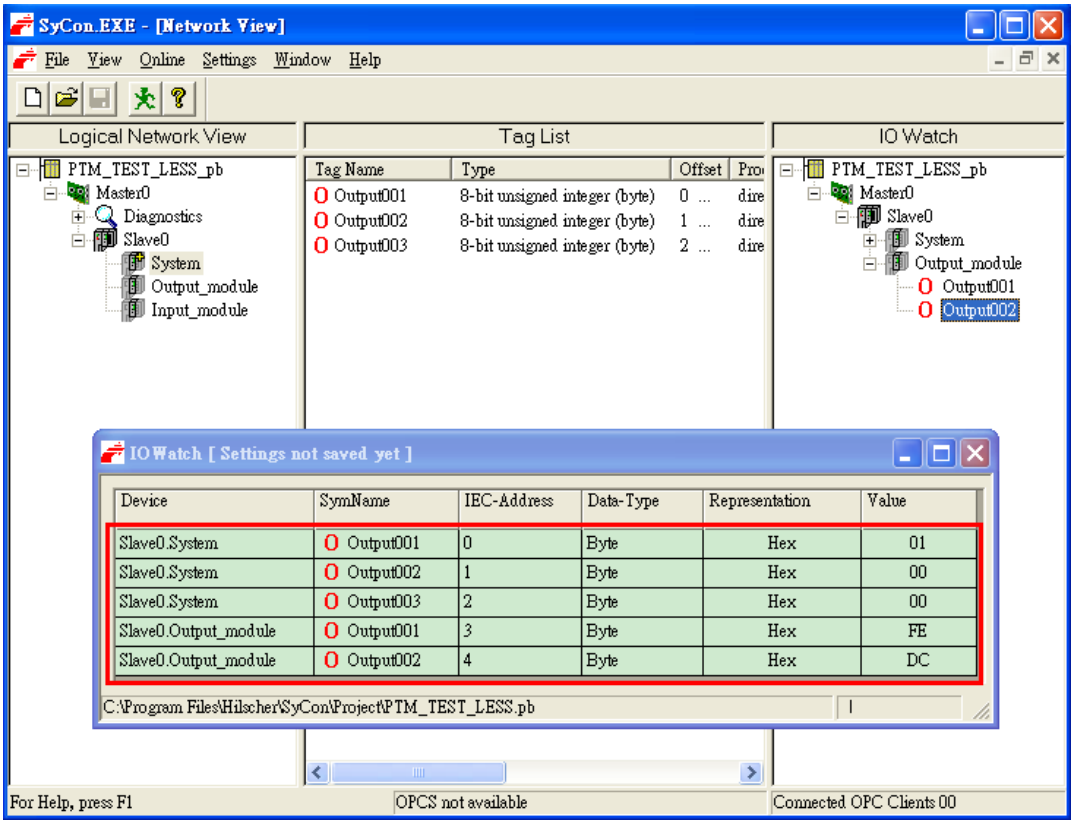



*Figure 75 Set output data and trigger output data command in the output data area*

*Table 24 Set output data and trigger output data command*

| ***Module*** | ***Byte*** | ***Data type*** | ***Representation*** | ***Value*** |
|---|---|---|---|---|
| System module | Output 0 | Byte | Hex | 0x00 ⟶ 0x01 |
| | Output 1 | Byte | Hex | 0x00 |
| | Output 2 | Byte | Hex | 0x00 |
| Output module | Output 3 | Byte | Hex | 0x00⟶ 0xFE |
| | Output 4 | Byte | Hex | 0x00⟶ 0xDC |



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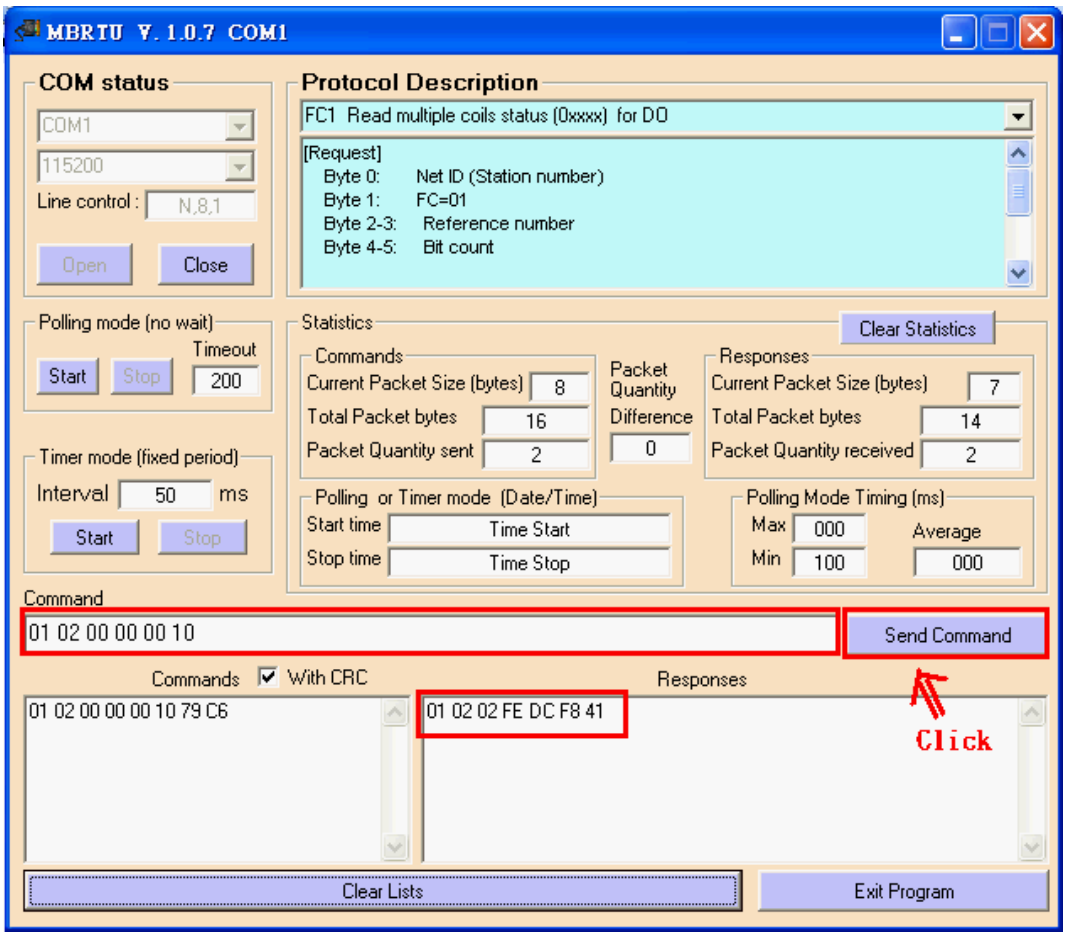



*Figure 76 Send Modbus command to read DI of the GW-7553 and receive data (0xFE, 0xDC)*

PS:

Modbus command:

Query message

| DA | FC | SA (Hi) | SA (Lo) | NO (Hi) | NO (Lo) | CRC check | |
|---|---|---|---|---|---|---|---|
| 01 | 02 | 00 | 00 | 00 | 10 | 79 | C6 |

Response message

| DA | FC | BC | DATA | | CRC check | |
|---|---|---|---|---|---|---|
| 01 | 02 | 02 | FE | DC | F8 | 41 |



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- DA: Device Address-0x01
- FC: Function Code-0x02:read DI
- SA(Hi): Start Address(Hi byte)-0x00
- SA(Lo): Start Address(Lo byte)-0x00
- NO(Hi): No. Of points(Hi byte)-0x00
- NO(Lo): No. Of points (Lo byte)-0x10
- BC: Byte Count-0x02

### 4.10.4 Using PROFIBUS DP-V1 to write data from a PROFIBUS Master Device

--Send Command to read AI of the GW-7553

The user needs to input command (" 01 04 00 00 00 01") in MBRTU and click <Send Command> button to send Modbus command: "01 04 00 00 00 01 31 CA" and then MBRTU can receive response message (" 01 04 02 00 00 B9 30"). In this message, the user can know the value of AI0 is "0x00,0x00" in the GW-7553.

### 4.10.5 Data Exchange example – Modbus TCP

## 4.11 Data exchange example—Modbus TCP

In this example a Modbus Master device simulated by a PC program sends query message and receives response message from a PROFIBUS Master via the GW-7553 gateway.

In the following examples the CIF50-PB PROFIBUS Master card from Hilscher is used. The configuration and communication is done by the program "SyCon" provided by Hilscher.

Step 1: Copy the GSD file and assign the GW-7553 a valid station address (Please refer to the section 4.2 GSD file).

Step 2: Connect GW-7553 and PC by ***Figure 77***.



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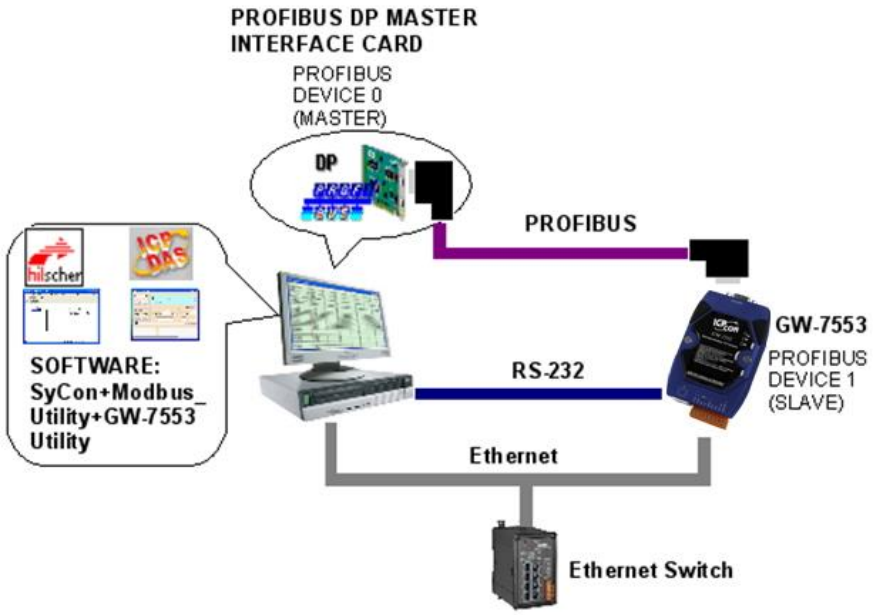



*Figure 77 Wiring diagram between PC and GW-7553*

Step 3: Set the parameters of the GW-7553. We need to change "Modbus Type" to Slave and "Modbus Format" to Modbus TCP. The default setting is being used in the other parameters for this example. Please refer to section 4.3 the Configuration of the common parameters. The users can set parameters as shown below.

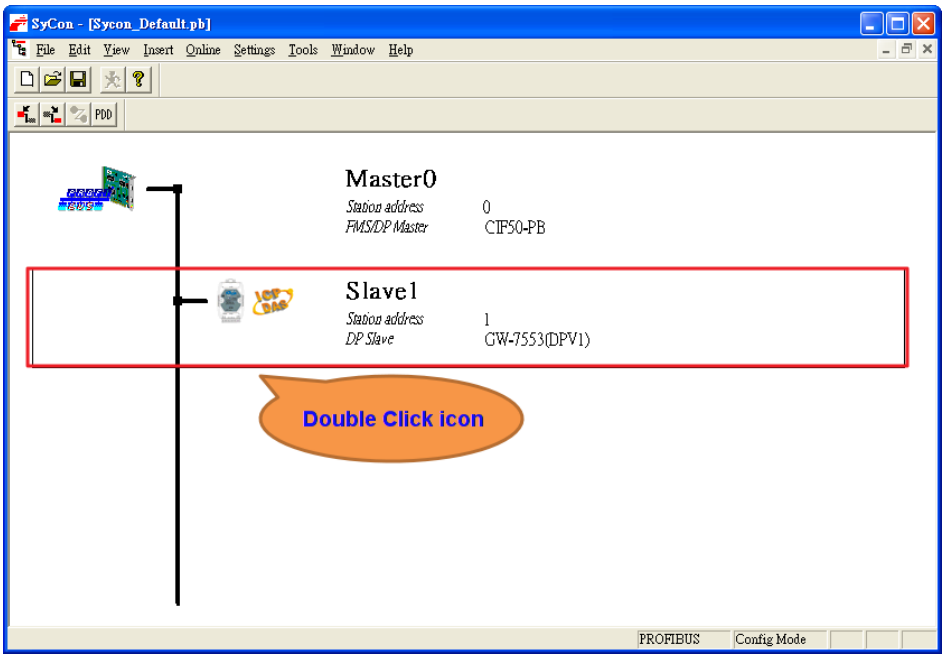



*Figure 78 Double click the GW-7553 icon to open the "Slave configuration" window*



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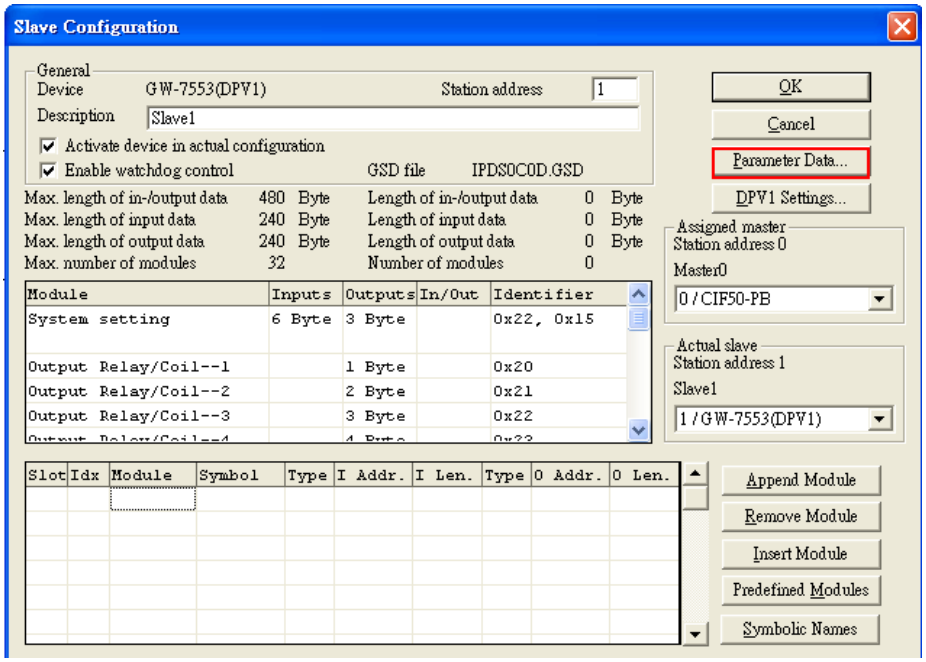



*Figure 79 Click "Parameter Data…" button to open the "Parameter Data" window*

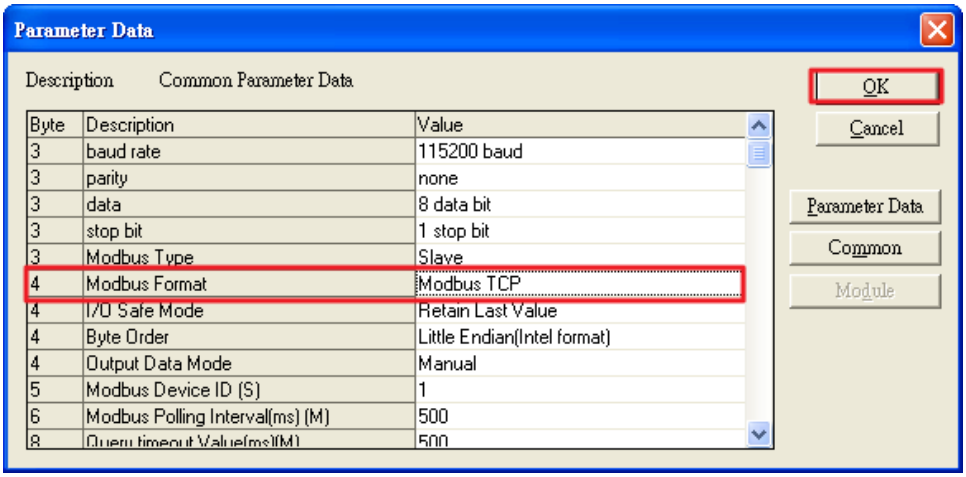



*Figure 80 The user needs to change "Modbus Type" to Slave and "Modbus Format" to Modbus TCP for this example and click "OK" button*

Step 4: Set the GW-7553 modules, as shown in ***Figure 81*** *and* ***Figure 82***.

- Select "System setting" module: "System setting" module always has to be selected otherwise no communication can be established between the gateway and the Modbus network.
- Select "Output Relay/Coil" module: In this example an "Output Relay/Coil--2 Byte" module is selected.



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– Select “Input Relay/Coil” module: In this example a “Input Relay/Coil--2 Byte” module is selected.

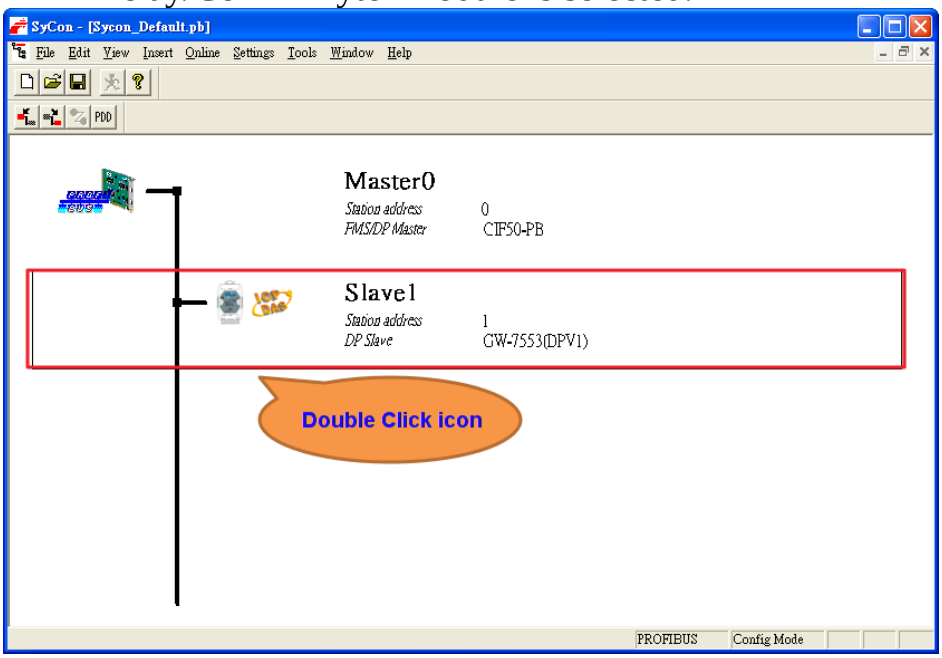



*Figure 81 Double click the GW-7553 icon to open the “Slave configuration” window*

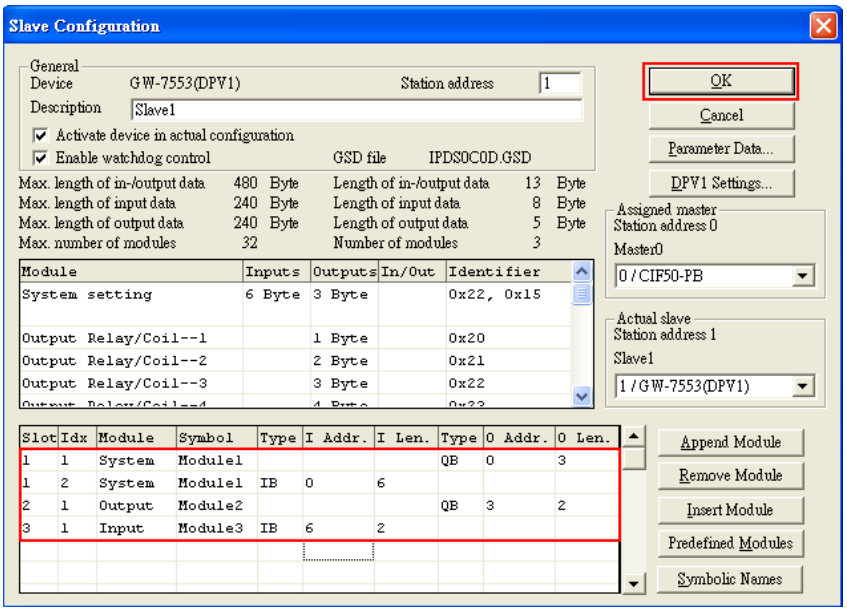



*Figure 82 Select modules*

Step 5: Close the “Slave Configuration” window by clicking the “OK” button.

Step 6: Now the setting done by the configuration tool has to be



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downloaded to the PROFIBUS Master.

Click on the Master area in the graphic window then **Online -> Download…**

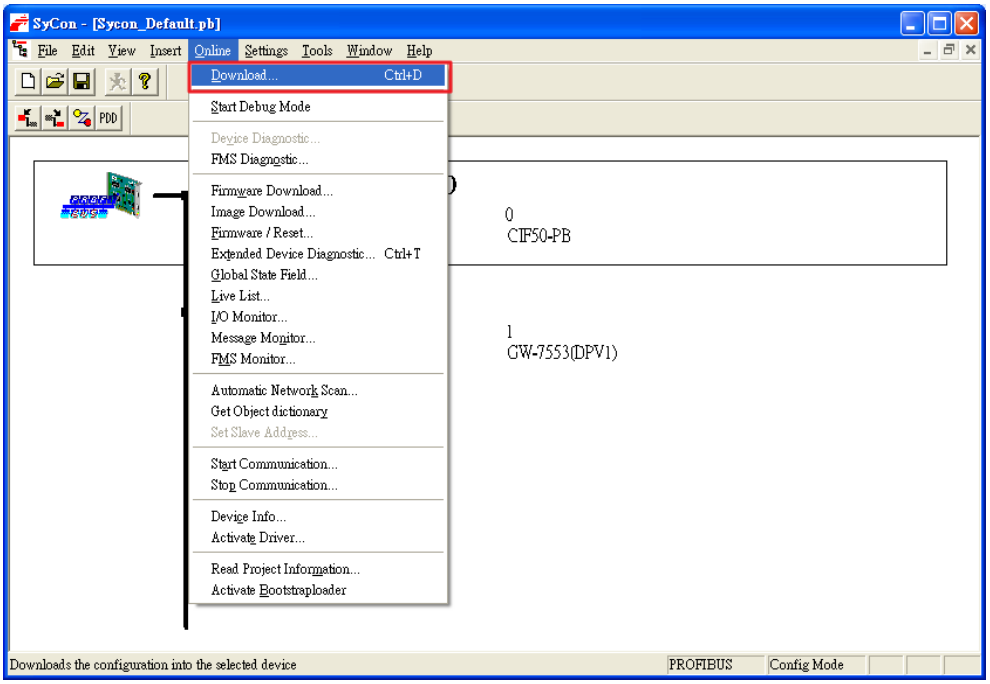



*Figure 83 Click "Online->Download" to download the setting into PROFIBUS Master*

Step 7: Set the network settings of the GW-7553 by PROFIBUS/Modbus gateway utility (please refer section 5.5 & 5.6). The settings of the GW-7553 must have the same domain and different IP with the PC (ex: PC's IP=192.168.0.106, MASK=255.255.0.0; GW-7553's IP=192.168.0.107, MASK=255.255.0.0).

Step 8: Reset the power of the GW-7553 for an active setting.

### 4.9.1 Receiving data from a Modbus Master device

-- Start the test utility "MBTCP" (***Figure 84***) on the PC.
This utility simulates a Modbus Master device and is on the web site in the following directory:
*http://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/modbus/modbus_utility/*

(1) Set the IP address of the GW-7553
(2) Click the connect button



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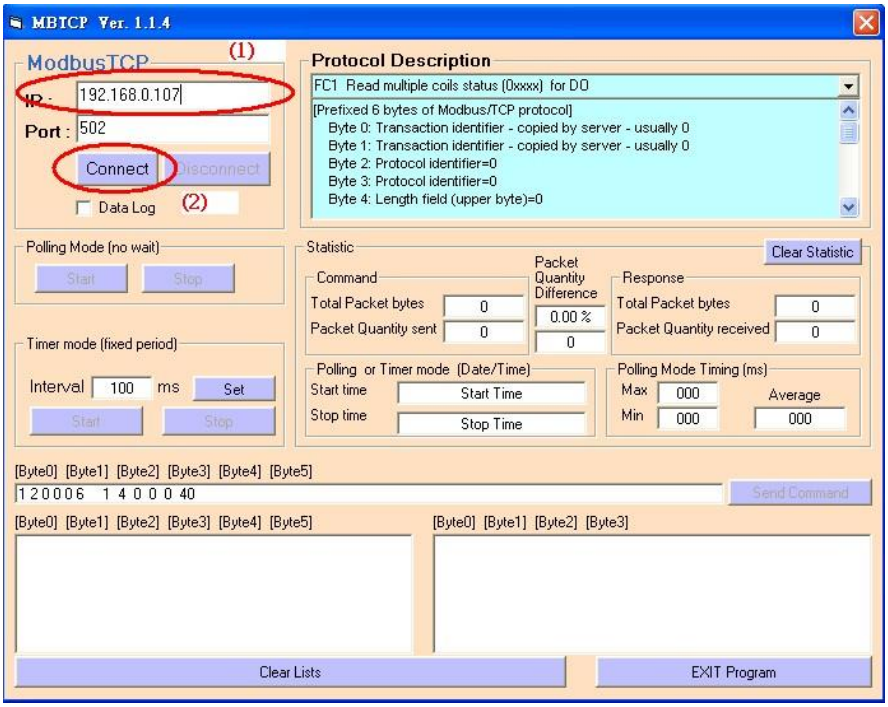
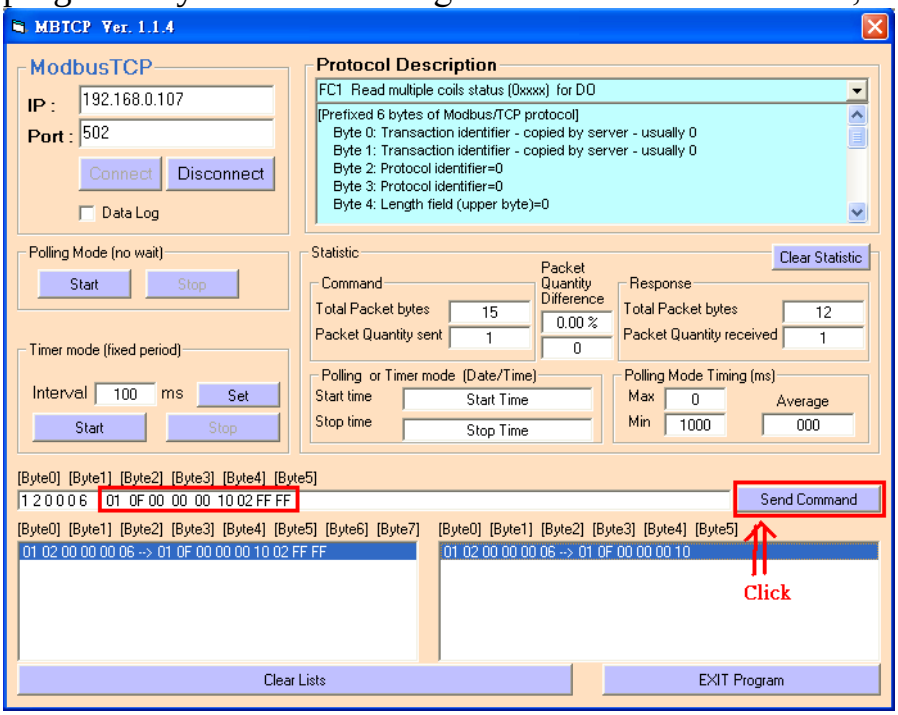



*Figure 84 MBTCP Utility*

--Send Command to write DO of the GW-7553

The user needs to input command (" 01 0F 00 00 00 10 02 FF FF") here and click <Send Command> button to send Modbus command: "01 0F 00 00 00 10 02 FF FF" and then MBTCP can receive response message (" 01 0F 00 00 00 10"). The user can find byte 6, 7 of the input data area in the configuration program "SyCon" have changed into "0xFF" at this time, as shown below.






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*Figure 85 Send Modbus command (output data: 0xFF, 0xFF)*

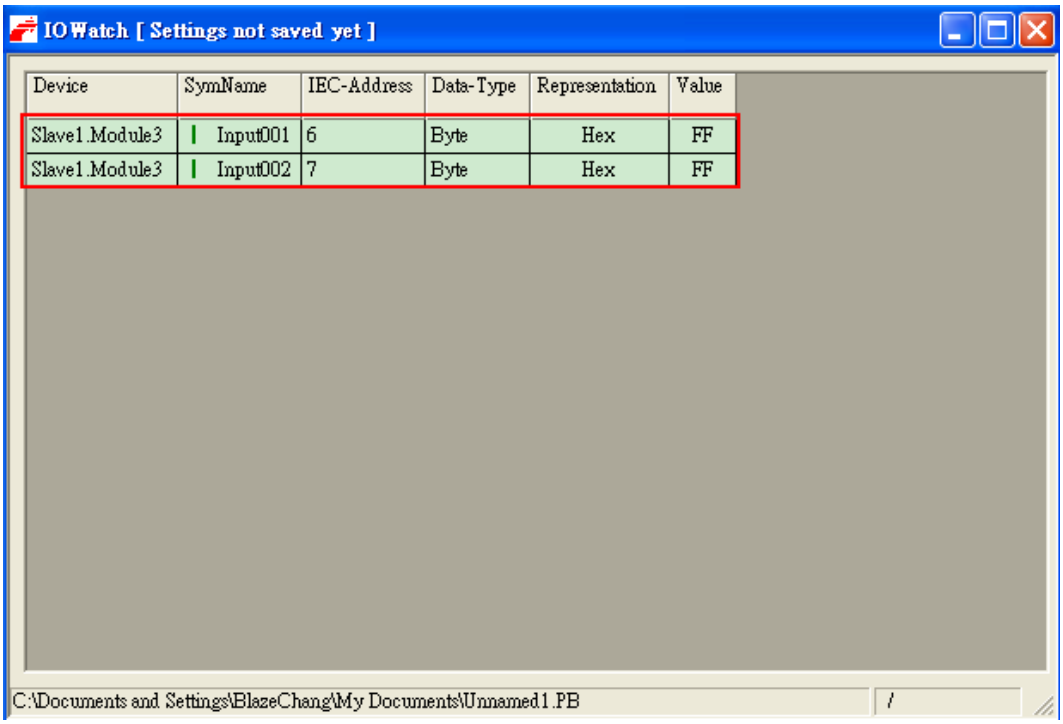



*Figure 86 Receive "0xFF" in the input data area*

*Table 25 Receive "0xFF" in the input data area*

| ***Module*** | ***Byte*** | ***Data type*** | ***Representation*** | ***Value*** |
|---|---|---|---|---|
| Input module | Input 6 | Byte | Hex | 0xFF |
| | Input 7 | Byte | Hex | 0xFF |

PS:

Modbus command:

Query message

| DA | FC | SA (Hi) | SA (Lo) | NO (Hi) | NO (Lo) | BC | DATA | |
|---|---|---|---|---|---|---|---|---|
| 01 | 0F | 00 | 00 | 00 | 10 | 02 | FF | FF |



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Response message

| DA | FC | SA (Hi) | SA (Lo) | NO (Hi) | NO (Lo) |
|---|---|---|---|---|---|
| 01 | 0F | 00 | 00 | 00 | 10 |

- DA: Device Address-0x01
- FC: Function Code-0x0F=>Write multi-DO
- SA(Hi): Start Address(Hi byte)-0x00
- SA(Lo): Start Address(Lo byte)-0x00
- NO(Hi): No. Of points (Hi byte)-0x00
- NO(Lo): No. Of points (Lo byte)-0x10
- BC: Byte Count-0x02

### 4.9.2 Receiving data from the PROFIBUS Master device

--Send Command to read DI of the GW-7553

The user needs to input command (" 01 02 00 00 00 10") in MBTCP and click <Send Command> button to send Modbus command: "01 02 00 00 00 10" and then MBTCP can receive response message (" 01 02 02 00 00"). In this message, the user can know the value of DI0 & DI1 is "0" in the GW-7553.

--Send output data to write DI of the GW-7553 by the PROFIBUS Master

The user needs to set "0xFE" & "0xDC" in byte 3 & byte 4 of output data area in the configuration program "SyCon" and then set the value of the first byte from 0 to 1 to trigger the data output command.

--Send Command to read DI of the GW-7553 again

Now the user can input command (" 01 02 00 00 00 10") in MBTCP and click <Send Command> button to send Modbus command: "01 02 00 00 00 10" again. Then MBTCP can receive response message (" 01 02 02 FE DC"). In this message, the user can know the value of DI0 & DI1 have changed into "0xFE" & "0xDC" in the GW-7553, as shown in ***Figure 87***, ***Figure 88, Figure 89***, & ***Table 26*** Set output data and trigger output data command.



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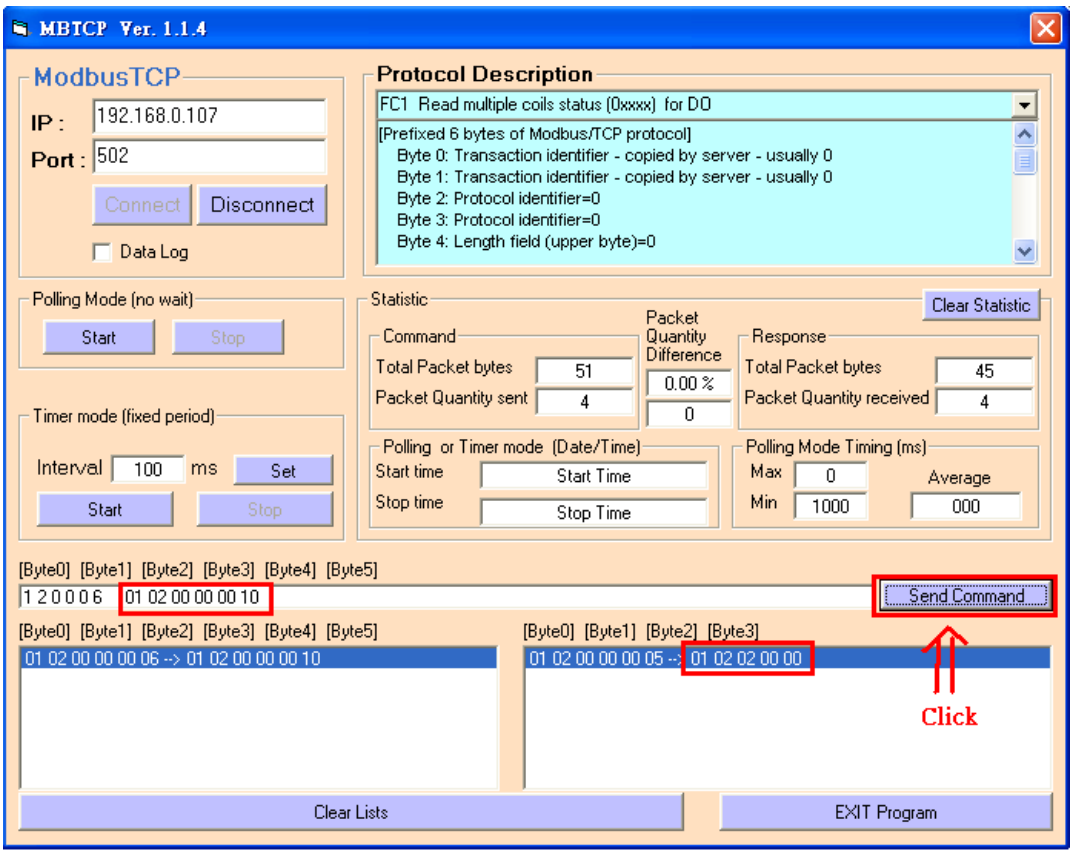
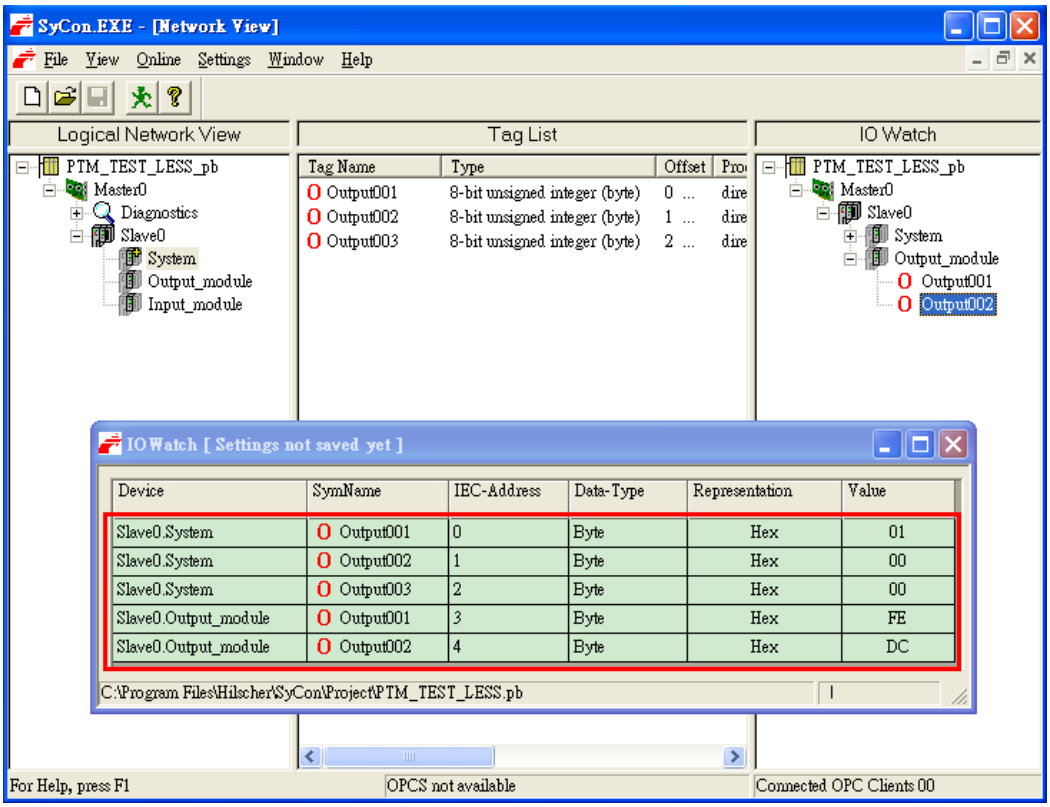



*Figure 87 Send Modbus command to read DI of the GW-7553*






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*Figure 88 Set output data and trigger output data command in the output data area*

*Table 26 Set output data and trigger output data command*

| *Module* | *Byte* | *Data type* | *Representation* | *Value* |
|---|---|---|---|---|
| System module | Output 0 | Byte | Hex | 0x00 ⟶ 0x01 |
| | Output 1 | Byte | Hex | 0x00 |
| | Output 2 | Byte | Hex | 0x00 |
| Output module | Output 3 | Byte | Hex | 0x00⟶ 0xFE |
| | Output 4 | Byte | Hex | 0x00⟶ 0xDC |

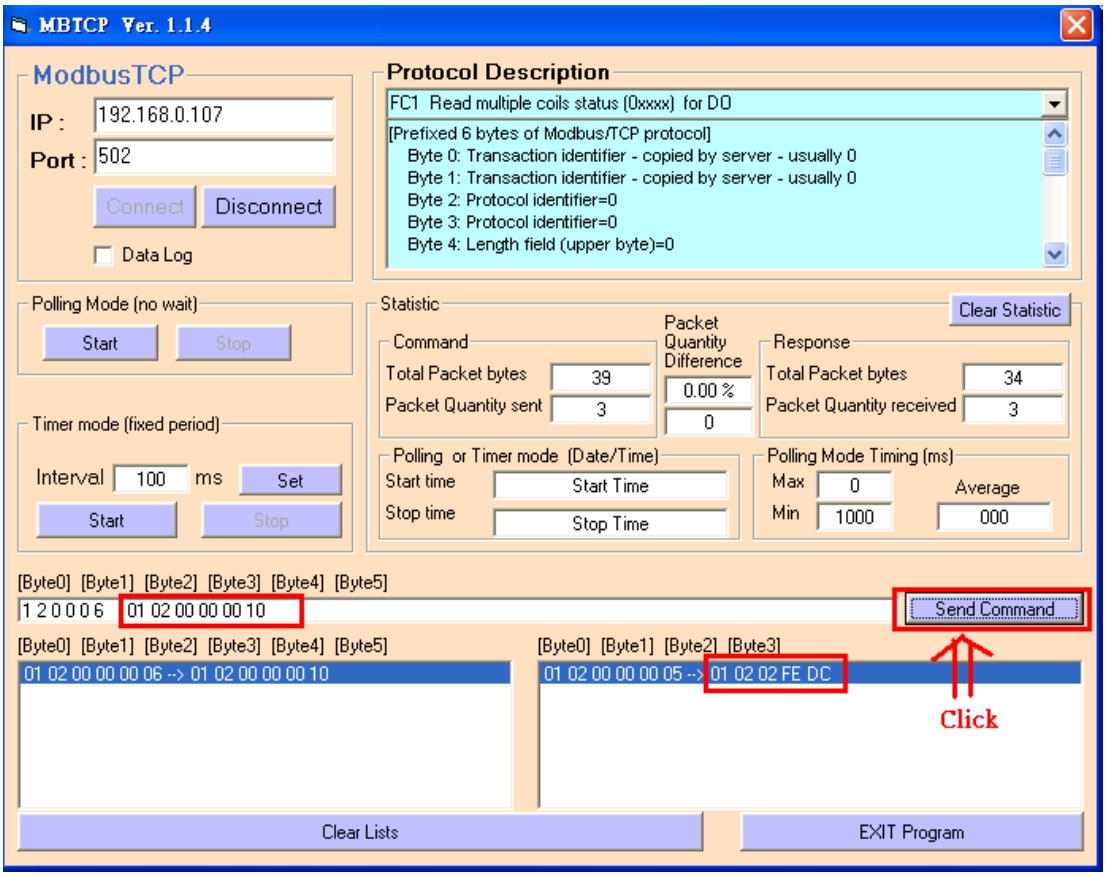



*Figure 89 Send Modbus command to read DI of the GW-7553 and receive data (0xFE, 0xDC)*



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PS:

Modbus command:

Query message

| DA | FC | SA (Hi) | SA (Lo) | NO (Hi) | NO (Lo) |
|---|---|---|---|---|---|
| 01 | 02 | 00 | 00 | 00 | 10 |

Response message

| DA | FC | BC | DATA | |
|---|---|---|---|---|
| 01 | 02 | 02 | FE | DC |

- DA: Device Address-0x01
- FC: Function Code-0x02:read DI
- SA(Hi): Start Address(Hi byte)-0x00
- SA(Lo): Start Address(Lo byte)-0x00
- NO(Hi): No. Of points(Hi byte)-0x00
- NO(Lo): No. Of points (Lo byte)-0x10
- BC: Byte Count-0x02



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# 5. Application of Utility

## 5.1 Install Utility

Step 1：

Download the PROFIBUS/Modbus gateway utility setup file from the CD-ROM disk following the path of “CD:\profibus\gateway\GW-7553 \utilities\” or the web site “ftp://ftp.icpdas.com.tw/pub/cd/fieldbus_cd/profibus/gateway/GW-7553 /utilities/”

Step 2：

Execute the Setup.exe file to install the PROFIBUS/Modbus Gateway Utility.

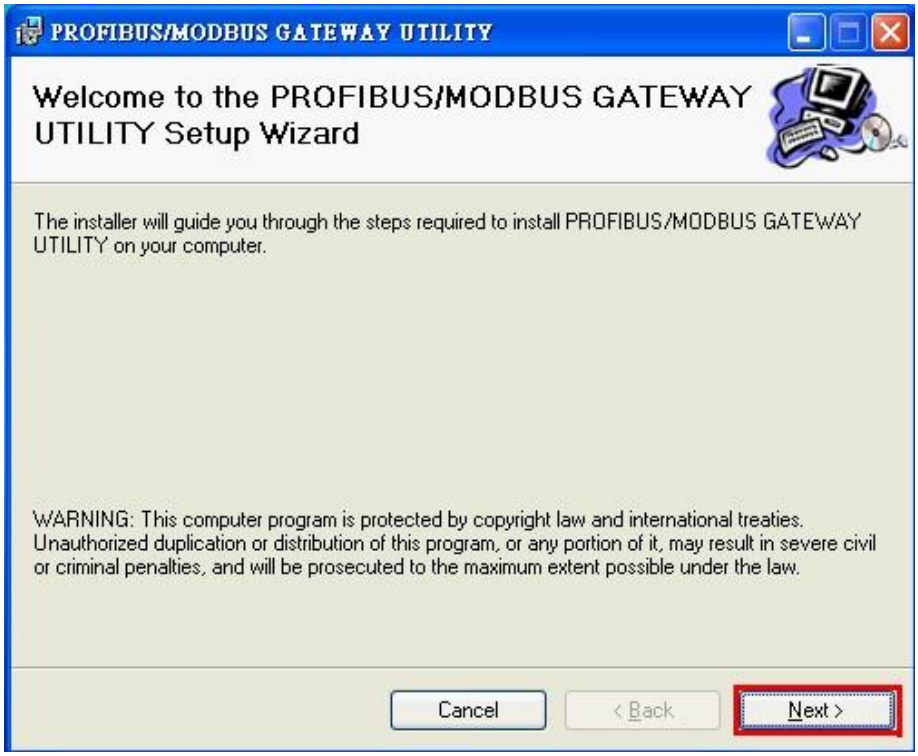



*Figure 90 Install the utility*

Step 3：

Click the “Next” button to continue. If you want to change the installation destination, click “Browse” button to set the installation path.



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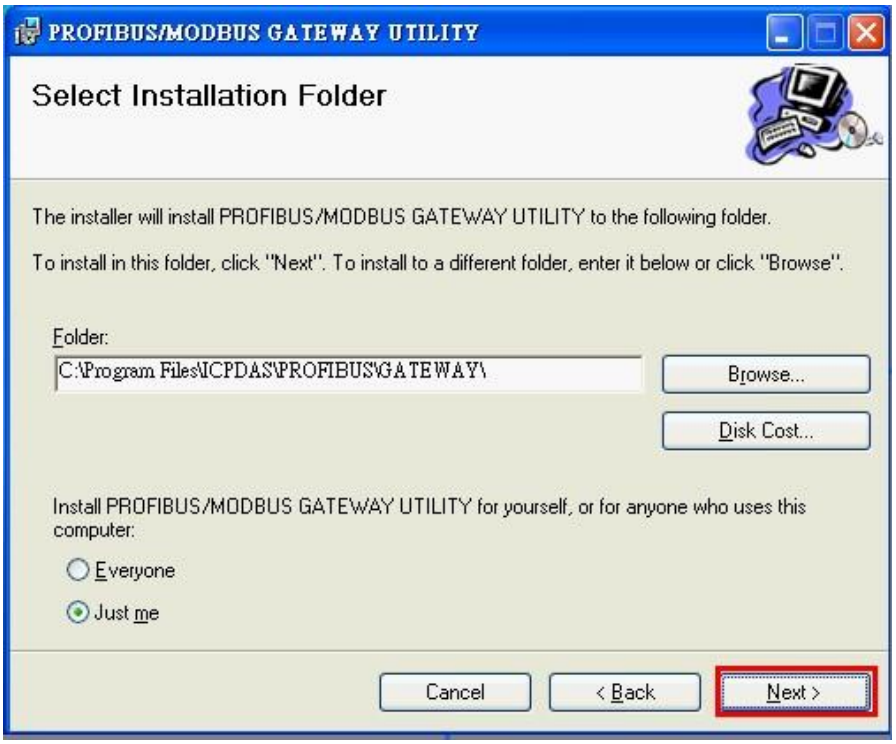



*Figure 91　Set the installation path*

Step 4：

Click the “Next” button to confirm installation

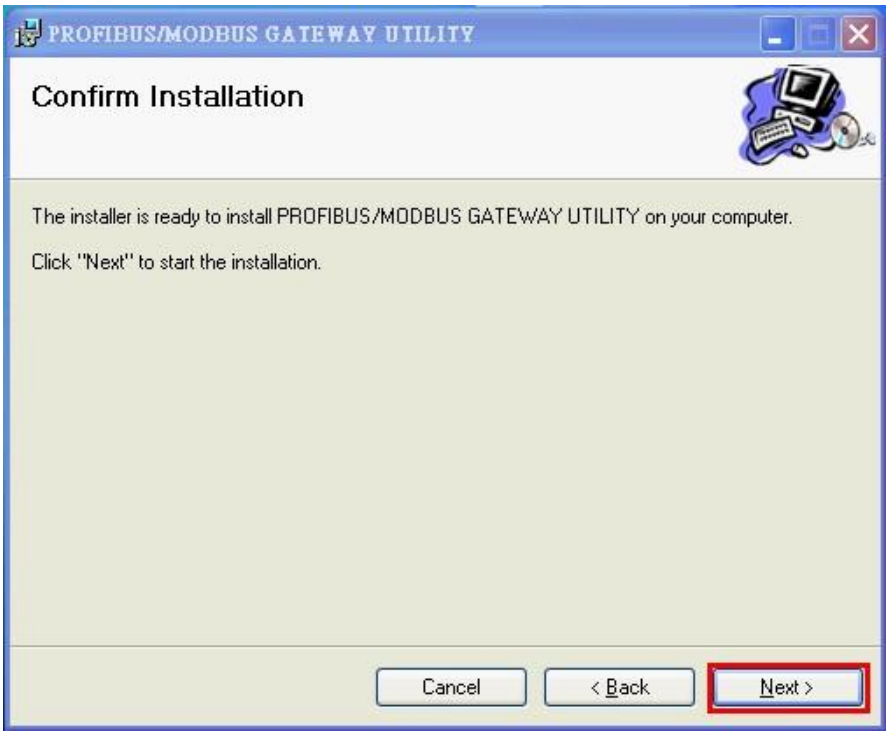



*Figure 92　Confirm installation*



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Step 5：

Click the “Close” button to finish and exit the installation program

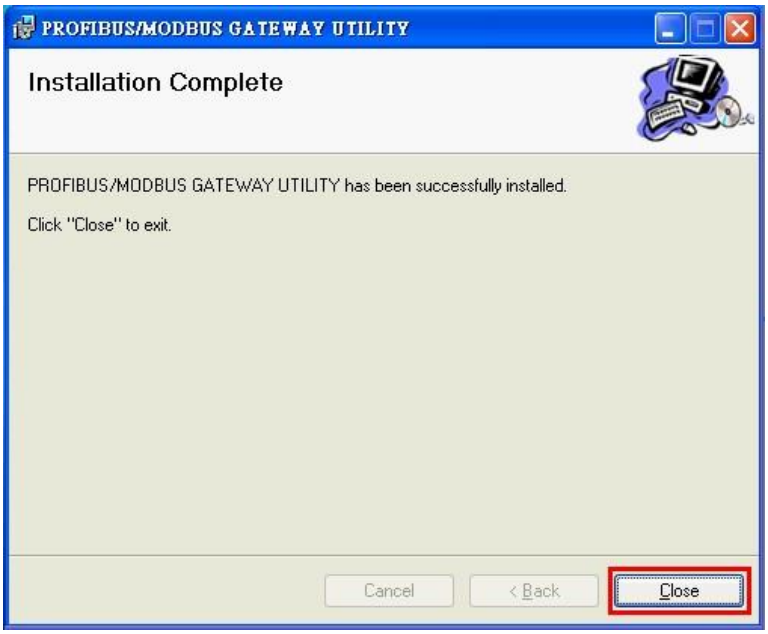



*Figure 93 Installation complete*

Step 6：

After finishing the installation of the PROFIBUS/Modbus Gateway Utility, users can find the Utility as shown in the following screen shot.

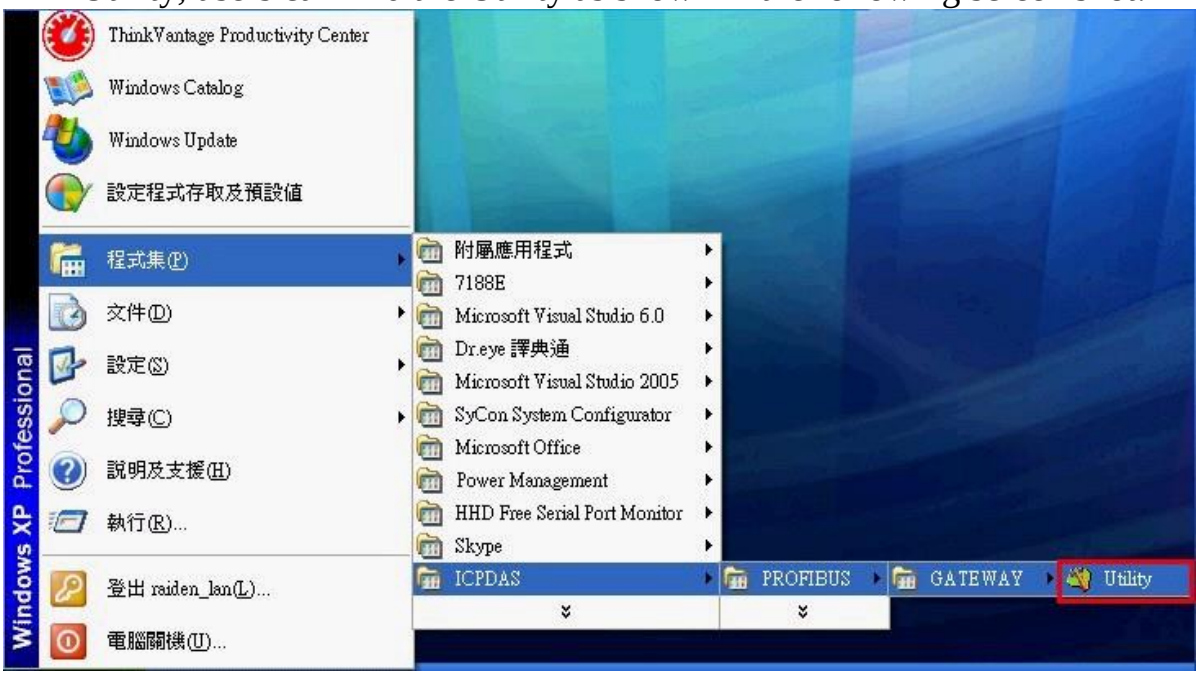



*Figure 94 The path of Utility*



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## 5.2 Utility introduction

By this utility, the user can understand the module address of PROFIBUS、Modbus and the GW-7553-B / GW-7553-M. The utility also support users set safe value and network setting easily. It introduces main window of the utility first as shown in ***Figure 95***.

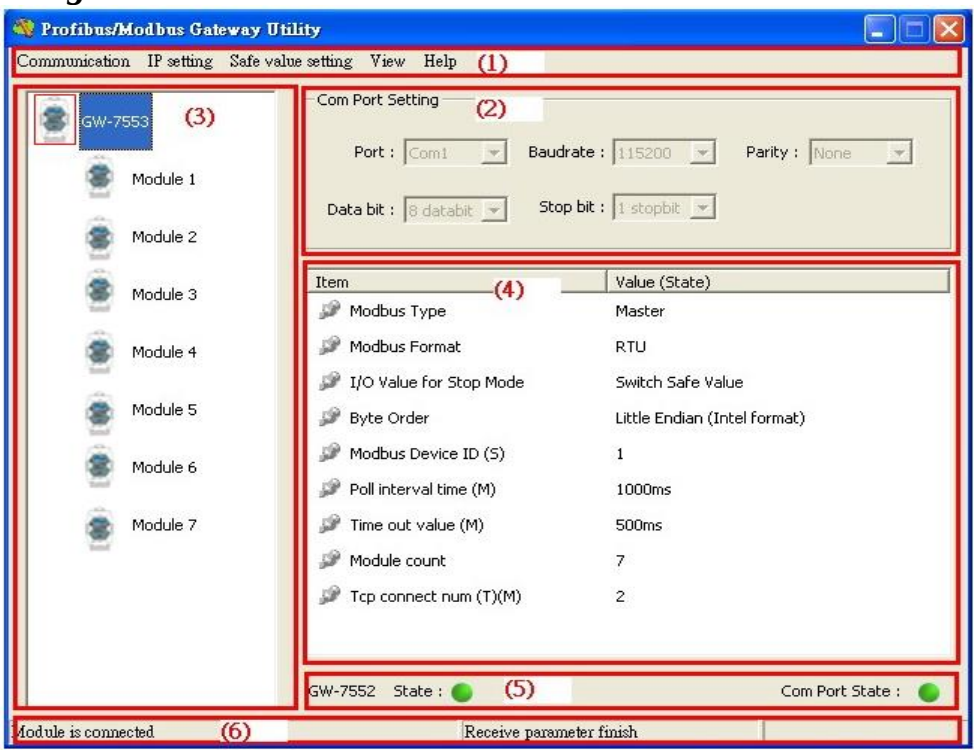



*Figure 95 Main window of the utility*

Main window of the utility has 6 parts, they are (1)Menu、(2)COM Port settings、(3)Module state、(4)Module parameters、(5)Connection status of GW-7553-B / GW-7553-M and COM Port、(6) Status bar, as shown in the below.

### 5.2.1 Menu：

1. Communication =>
   a. Connect：Open COM Port and connect with the GW-7553-B / GW-7553-M
   b. Disconnect：Close COM Port and disconnect with the GW-7553-B / GW-7553-M
   c. Exit：Exit from the utility

2. IP Setting =>



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a. New Setting：Open a new IP setting.
b. Load from file：Load a IP setting from the file.
c. Load from device：Load a IP setting from the GW-7553-B / GW-7553-M.

3. Safe Value Setting =>
   a. New Setting：Open a new safe value setting.
   b. Load from file：Load a safe value setting from the file.
   c. Load from device：Load a safe value setting from the GW-7553-B / GW-7553-M.

4. View =>
   a. Space configuration in device：Display memory address configuration of select module in the GW-7553-B / GW-7553-M.
   b. Space configuration in PROFIBUS：Display memory address configuration of select module in PROFIBUS Master station.
   c. Space configuration in Modbus：Display memory address configuration of select module in the Modbus.

5. Help =>
   a. Get Firmware Version From Module：Show firmware version of the GW-7553-B / GW-7553-M.
   b. About Utility：Show about version of the utility.

### 5.2.2 COM Port settings：

1. Port: COM1~COM8
2. Baud rate: 2400/4800/9600/19200/38400/57600/115200
3. Parity: None/Odd/Even
4. Data bit: 8 data bit
5. Stop bit: 1 stop bit

### 5.2.3 Module state：

It can display the number of modules in the GW-7553-B / GW-7553-M and display module parameters in the window of the module parameter by click the module's icon.

### 5.2.4 Module parameters：

Display module parameters of the GW-7553-B / GW-7553-M.



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### 5.2.5 Connection status of device and COM Port：

Module state：Display connection status between the utility and the GW-7553-B / GW-7553-M. The green color means connected and the red color means disconnected.

COM Port state：Display state of the PC's COM Port. The green color means COM Port is open and the red color means COM Port is close.

### 5.2.6 Status bar：

Display messages about COM Port connection、the GW-7553-B / GW-7553-M connection and the progress of data transmission.

## 5.3 Memory address configuration of the module

There are 3 kinds of memory address configuration. They are (1)Space configuration in device、(2) Space configuration in PROFIBUS、(3)Space configuration in Modbus, as shown in ***Figure 96***.

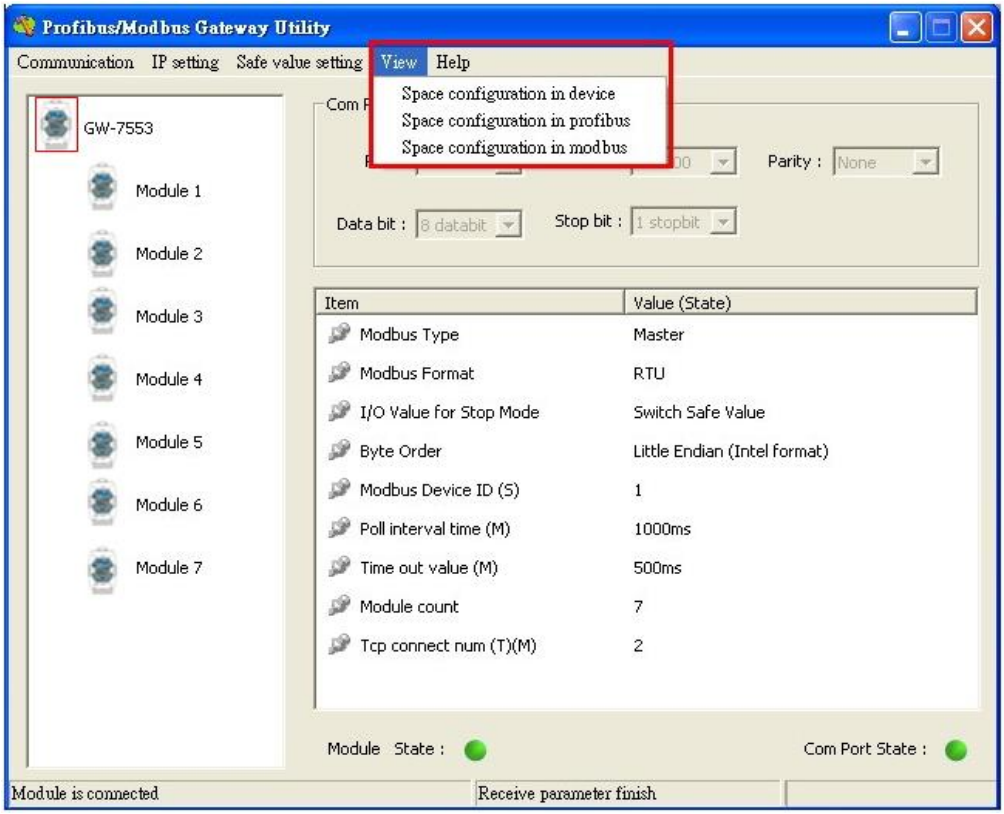



*Figure 96 The menu of space configuration*



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### 5.3.1 Space configuration in device：

The user can select check box of the module to show memory address configuration of DI/DO/AI/AO in the GW-7553-B / GW-7553-M, as shown in ***Figure 97***.

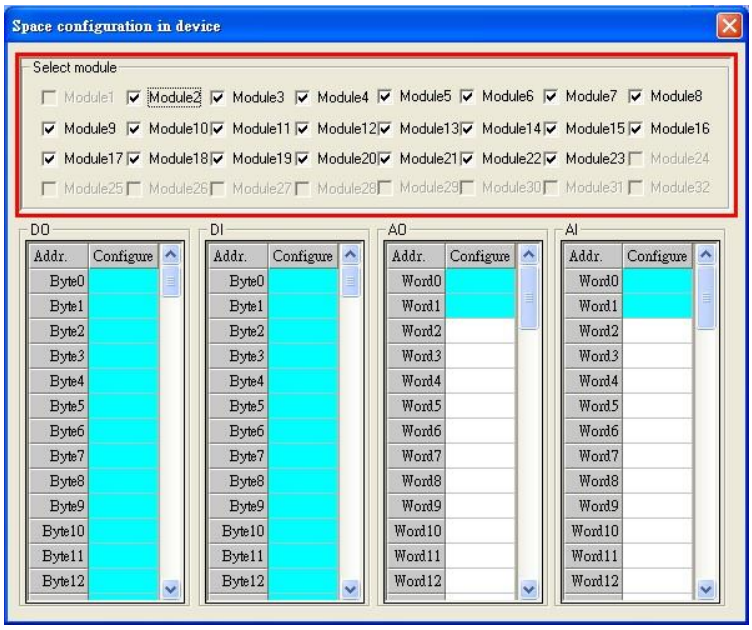



*Figure 97 Space configuration in device*

### 5.3.2 Space configuration in PROFIBUS：

The user can select check box of the module to show memory address configuration of I/O data area in the PROFIBUS Master station, as shown in ***Figure 98***.

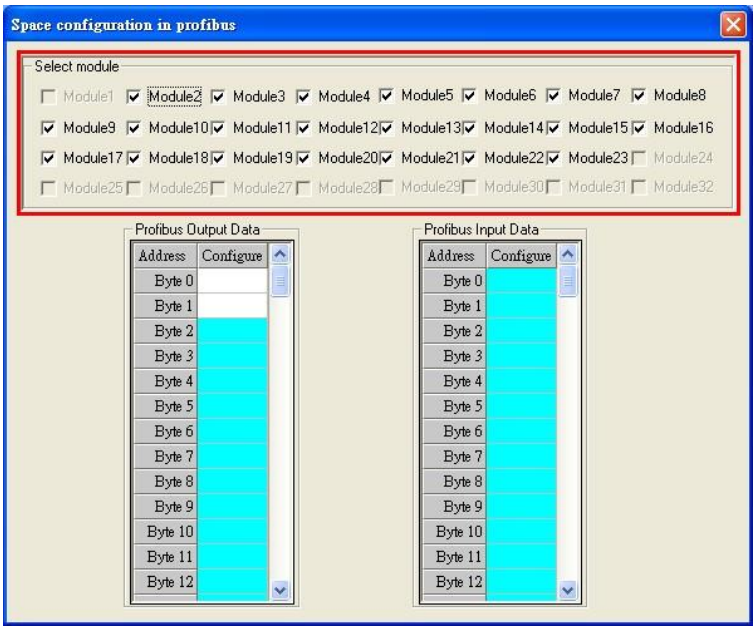



*Figure 98 Space configuration in PROFIBUS*



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### 5.3.3 Space configuration in Modbus：

The window of "Space Configuration in Modbus" divided into 3 parts to explain, as shown in ***Figure 99*** .

(1) Select module:
The user can select check box of the module to show memory address configuration of DI/DO/AI/AO in Modbus network.

(2) Display interface:
The user can click "Write Output" button to show DO/AO memory address configuration of output modules in Modbus network, click "Read Input" button to show DI/AI memory address configuration of input modules in Modbus network, click "Read Output" button to show DO/AO memory address configuration of input modules in Modbus network.

(3) Color display:
The user can discriminate states of Modbus address configuration by different color. White means the address is not used. Light blue means the address was configured by a module. Mazarine means the address was configured by many modules, but Modbus ID is not repeat in these modules. Red means the address was configured by many modules and Modbus ID is repeat in these modules. The data may be read and written by different modules at this time, it may make the data transmit and device control error easy because address configuration and Modbus ID overlap.



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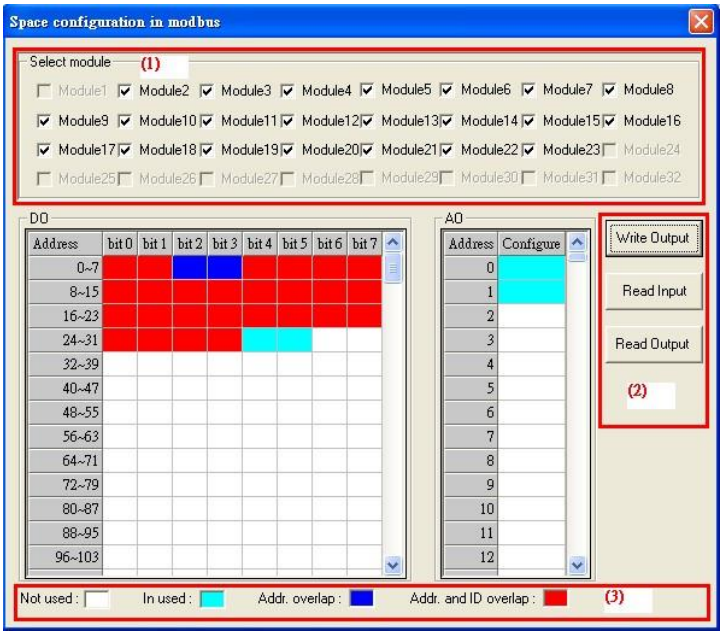



*Figure 99 Space configuration in Modbus*

## 5.4 Safe value setting

There are 3 kinds of safe value setting. They are (1) Open a new setting、(2)Load from file、(3)Load from device, as shown in ***Figure 100***.

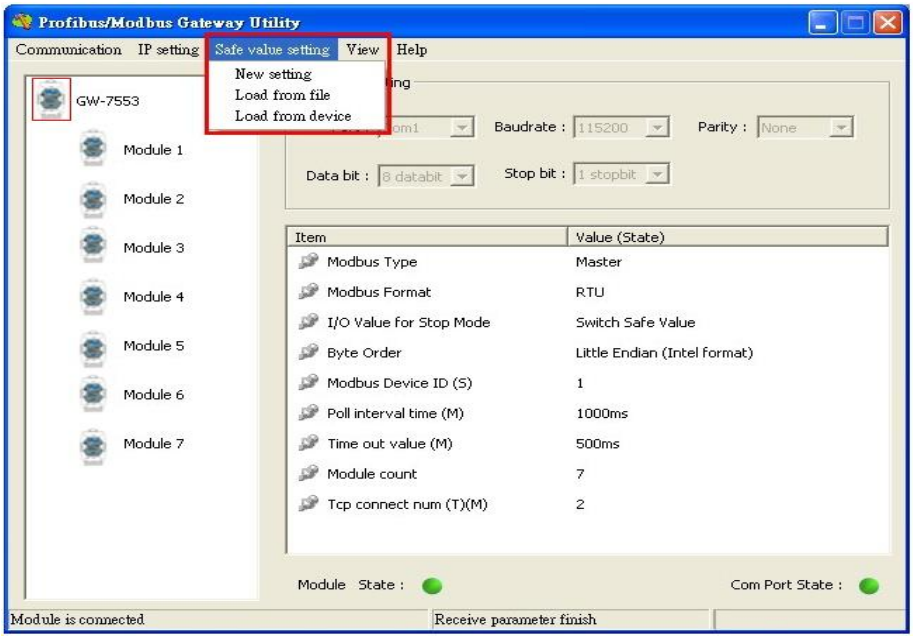



*Figure 100 The menu of safe value setting*

The window of "Safe Value Setting" divided into 6 parts to explain, as shown in ***Figure 101***.



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(1) Select module:
The user can select check box of the module to know memory address configuration of the module for set safe value of the module.

(2) DI/O table:
The user can double click left button of mouse at the value of DI/DO to change the value from “H” to “L” or “L” to “H”.

(3) All DI/O setting:
The user can click “All set to H” button to set all of DI/DO to “H” and click “All set to L” button to set all of DI/DO to “L”.

(4)AI/O table:
The user can double click left button of mouse at the value of AI/AO to change the value into 0x0000~0xFFFF.

(5) All AI/O setting:
The user can click “All set to F” button to set all of AI/AO to “0xFFFF” and click “All set to 0” button to set all of AI/AO to “0x0000”.

(6) Display and Save interface
The user can click “Output” button to show safe value setting of DO/AO, click “Input” button to show safe value setting of DI/AI, click “Save to File” button to open “save file dialog” to save safe value setting for backup, click “Save to Device” button to save safe value setting to EEPROM of the GW-7553-B / GW-7553-M.



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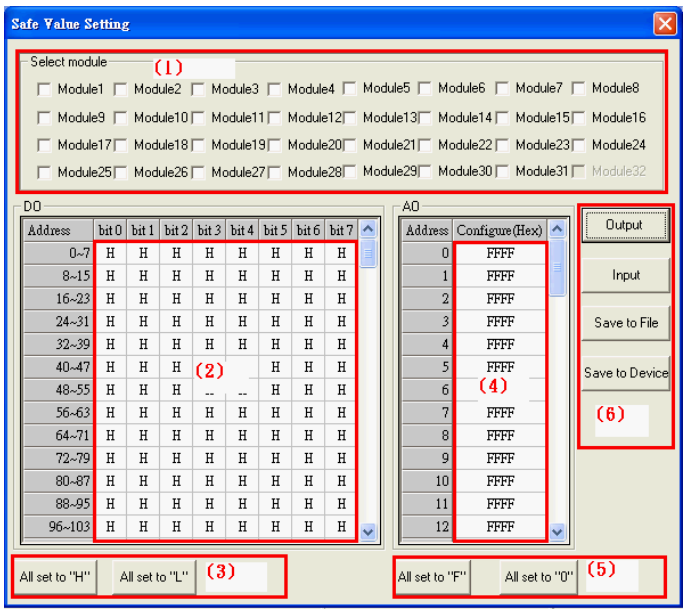



*Figure 101 Safe value setting*

## 5.5 IP setting

There are 3 kinds of IP setting. They are (1) Open a new setting、(2)Load from file、(3)Load from device, as shown in ***Figure 102***.

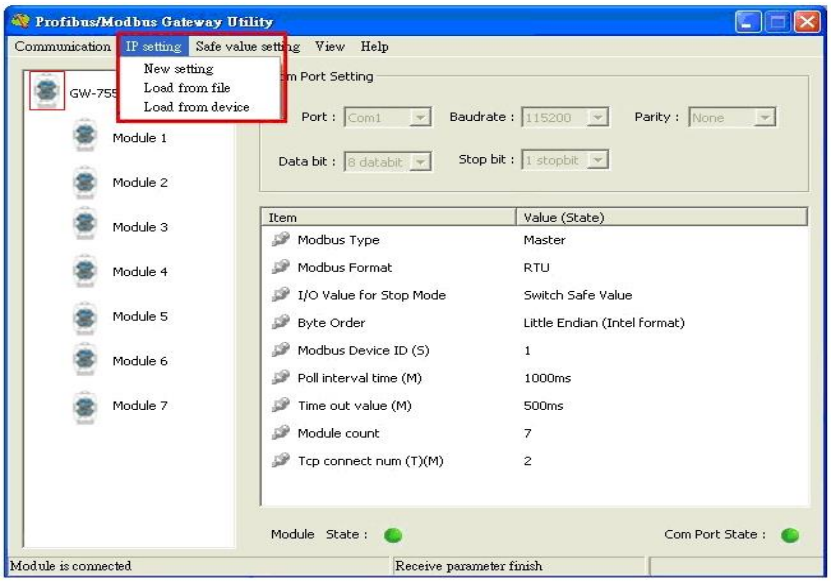



*Figure 102 The menu of IP setting*

The window of “IP Setting” divided into 3 parts to explain, as shown in ***Figure 103***.

(1) Local IP Setting:



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The user can set local IP setting of GW-7553-B / GW-7553-M in this part.

(2) Remote IP Setting:
The user can set IP address, time out value and reconnecting time of the Modbus TCP Slave in this part. When GW-7553-B / GW-7553-M acts as a Modbus TCP Master, these settings are effective. GW-7553-B / GW-7553-M can connect Modbus TCP Slave devices by these IP settings and the maximum of Modbus TCP Slave device is 8.

(3) Save interface
The user can click “Save to File” button to open “save file dialog” to save IP setting for backup, click “Save to Device” button to save IP setting to EEPROM of the GW-7553-B / GW-7553-M.

Note:
If IP setting is ok, user needs to restart GW-7553-B / GW-7553-M to read new IP setting value.

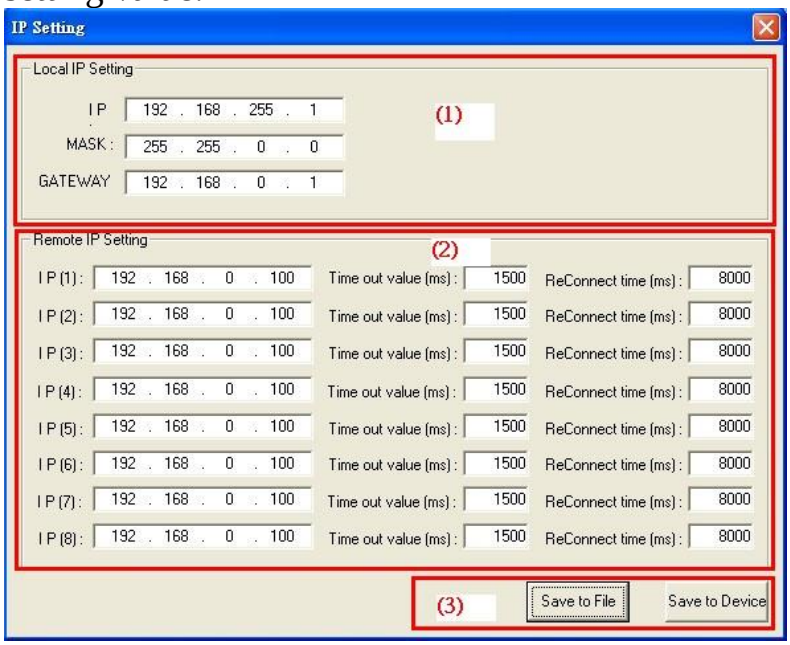


*Figure 103 IP setting*

## 5.6 Establish connection with GW-7553-B / GW-7553-M

The connection of Utility and GW-7553-B / GW-7553-M is shown in ***Figure 104***. Please follow the steps to establish connection.

Step 1:
Wire COM Port of PC to RS-232 port of GW-7553-B / GW-7553-M.



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Step 2:

Connect PROFIBUS cable between PROFIBUS Master station and GW-7553-B / GW-7553-M and enter data exchange mode (please refer step 1~6 of section 4.8 PROFIBUS and Modbus data exchange demo for detail). The RUN LED of GW-7553-B / GW-7553-M is going to light at this time.

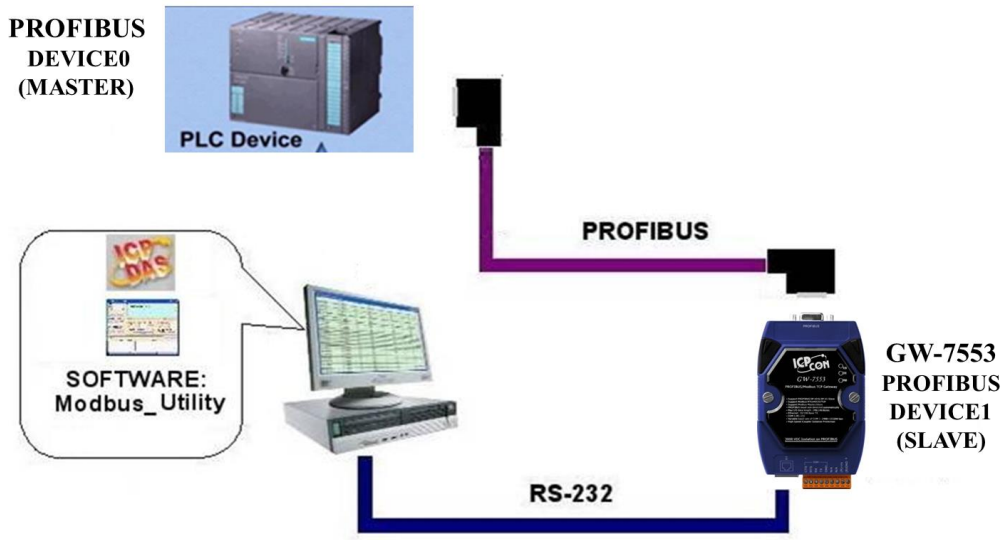



*Figure 104 The connection of Utility and GW-7553-B / GW-7553-M*

Step 3:

Set bit 2 of byte 1 to High in output data area of the PROFIBUS Master station (set the GW-7553-B / GW-7553-M to setting mode; please refer section 4.6.2 Output data area and communication command) or turn the switch on the back of the GW-7553-B / GW-7553-M to setting mode (please refer section 2.6 Normal/Setting DIP switch).

Step 4:

Open Utility.exe on PC.



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*Figure 105 Open Utility*

Step 5:

Set COM Port communication setting of Utility (please refer section 5.2.2 COM Port settings) the same as COM Port setting of GW-7553-B / GW-7553-M(please refer section 4.3 The Configuration of the common parameters)

Step 6:

Click “Communication=>Connect” button in menu.

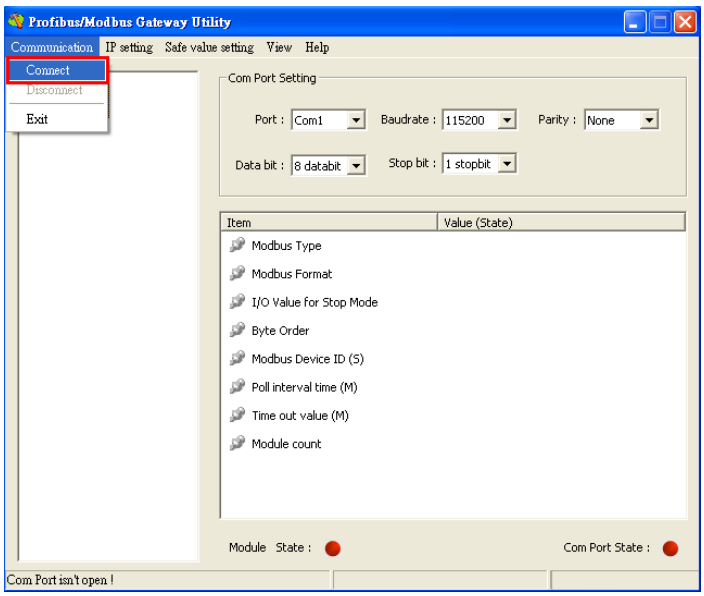



*Figure 106 Communication menu*

Step 7:

Module state shows green in the Utility now, it means the connection is



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complete.

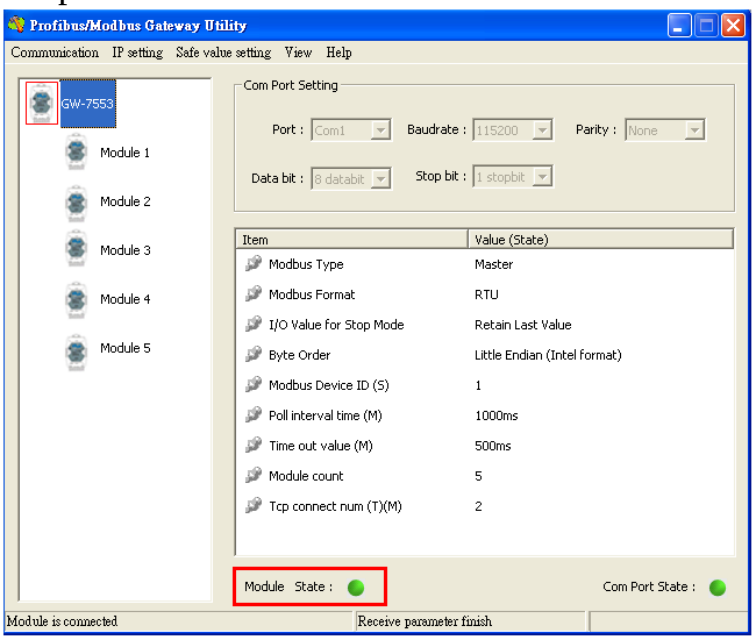



*Figure 107 Display connection state*



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# 6. Configuration with Web Browser

## 6.1 Connecting to Web Server

Open web browser (ex. IE) and enter the IP address of the GW-7553-B / GW-7553-M module in the Address field and press "**Enter**" to connect to GW-7553-B / GW-7553-M module, as shown in ***Figure 108***

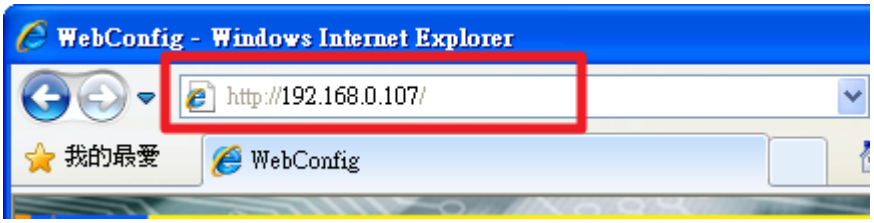



*Figure 108 Connecting to Web Server*

User can do the following steps to find the IP address of GW-7553-B / GW-7553-M:

Step 1: Open MiniOS7 Utility

1. The utility is on the web site in the following directory: http://ftp.icpdas.com/pub/cd/8000cd/napdos/minios7/utility/minios7_utility/
2. Choose "Connection→Search" or "F12", as shown in ***Figure 109***.

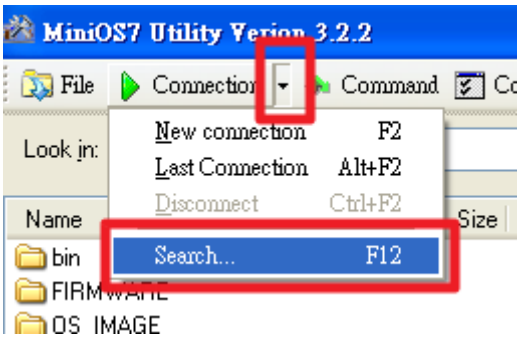



*Figure 109 Search IP*

Step 2: User can find the IP address of GW-7553-B / GW-7553-M, as shown in ***Figure 110***



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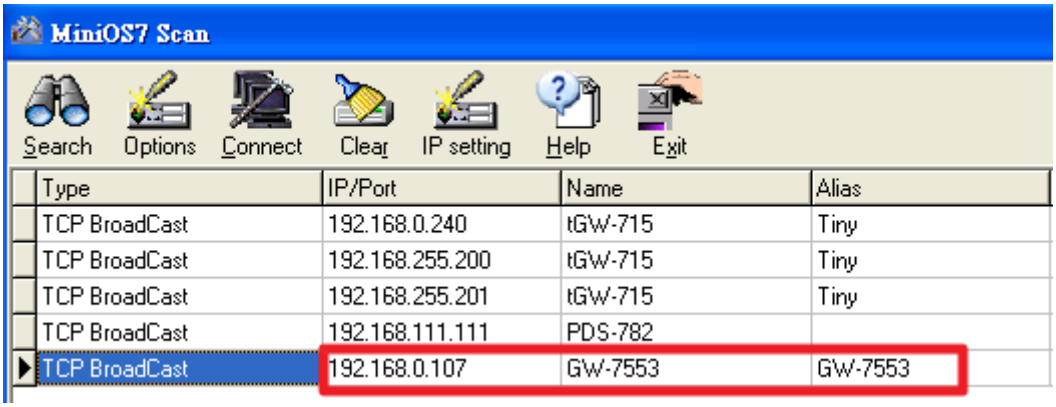



*Figure 110 IP address*

## 6.2 Web Configuration—Function menu




The left side is the function menu and the other is the setup page in the first page.



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Function menu:

- Login
- User Account
- IP Setting
- Safe Value Setting
- Communication Log
- Information

  Reboot

The “Reboot” button can provide the user to restart the GW-7553-B / GW-7553-M, when user login successfully.

## 6.3 Web Configuration—Setup page

### A. Login

The user login and logout interface, as shown in ***Figure 111***

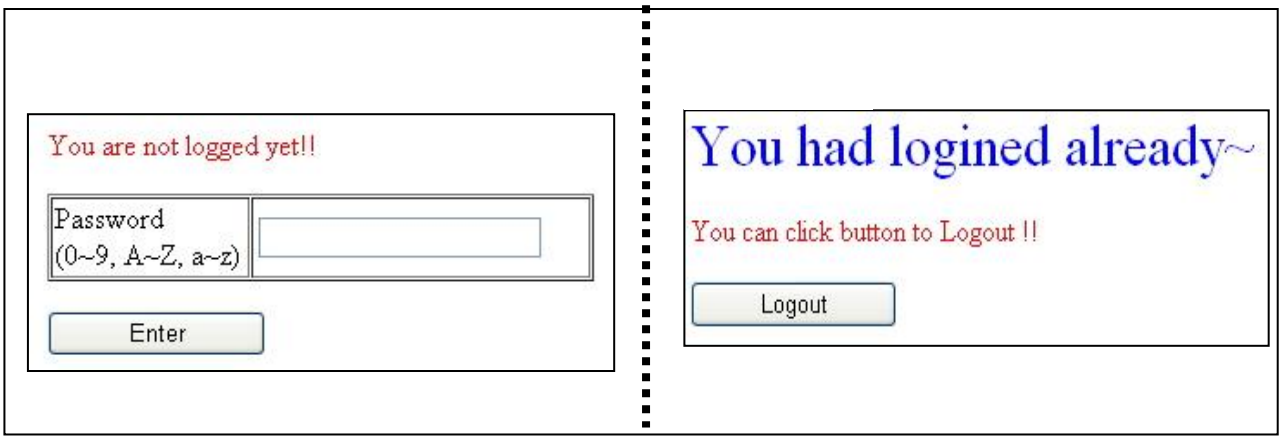



*Figure 111 Login*

**Note:**

- The user can turn the switch on the back of the GW-7553-B / GW-7553-M to setting mode (Please refer to section 2.6) , and then user can login by using the default password of GW-7553-B / GW-7553-M.
- The default password of GW-7553-B / GW-7553-M is “icpdas”
- The idle time of web server is 5 minutes. If web server is idle more than 5 minutes, web server will logout automatically.



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## B. User Account

The user can change password in this page, as shown in ***Figure 112***.

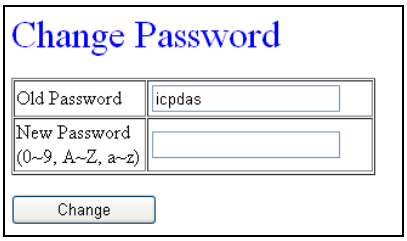



*Figure 112 User Account*

## C. IP Setting

The user can set IP setting in this page, as shown in ***Figure 113***, if IP setting is ok, user needs to restart GW-7553-B / GW-7553-M to read new IP setting value

(1) New Setting：Open a new IP setting
(2) Load From Device：Load the IP setting from GW-7553-B / GW-7553-M
(3) Local IP Setting：The user can set local IP setting of GW-7553-B / GW-7553-M in this part.
(4) Remote IP Setting：The user can set IP address, time out value and reconnecting time of the Modbus TCP Slave in this part. When GW-7553-B / GW-7553-M acts as a Modbus TCP Master, these settings are effective. GW-7553-B / GW-7553-M can connect Modbus TCP Slave devices by these IP settings and the maximum of Modbus TCP Slave device is 8.
(5) Save to Device：Save the IP setting to EEPROM of GW-7553-B / GW-7553-M



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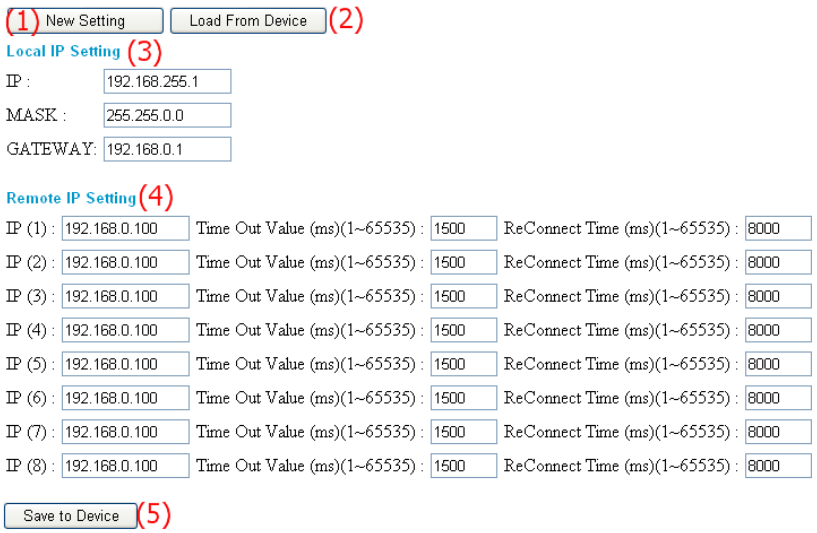



*Figure 113 IP Setting*

## D. Safe Value Setting

The user can set safe value setting in this page, as shown in ***Figure 114***. User select the module and press “Enter” to show the safe value setting of this module and it will save the safe value setting to EEPROM of GW-7553-B / GW-7553-M when user press “Save to Device”.



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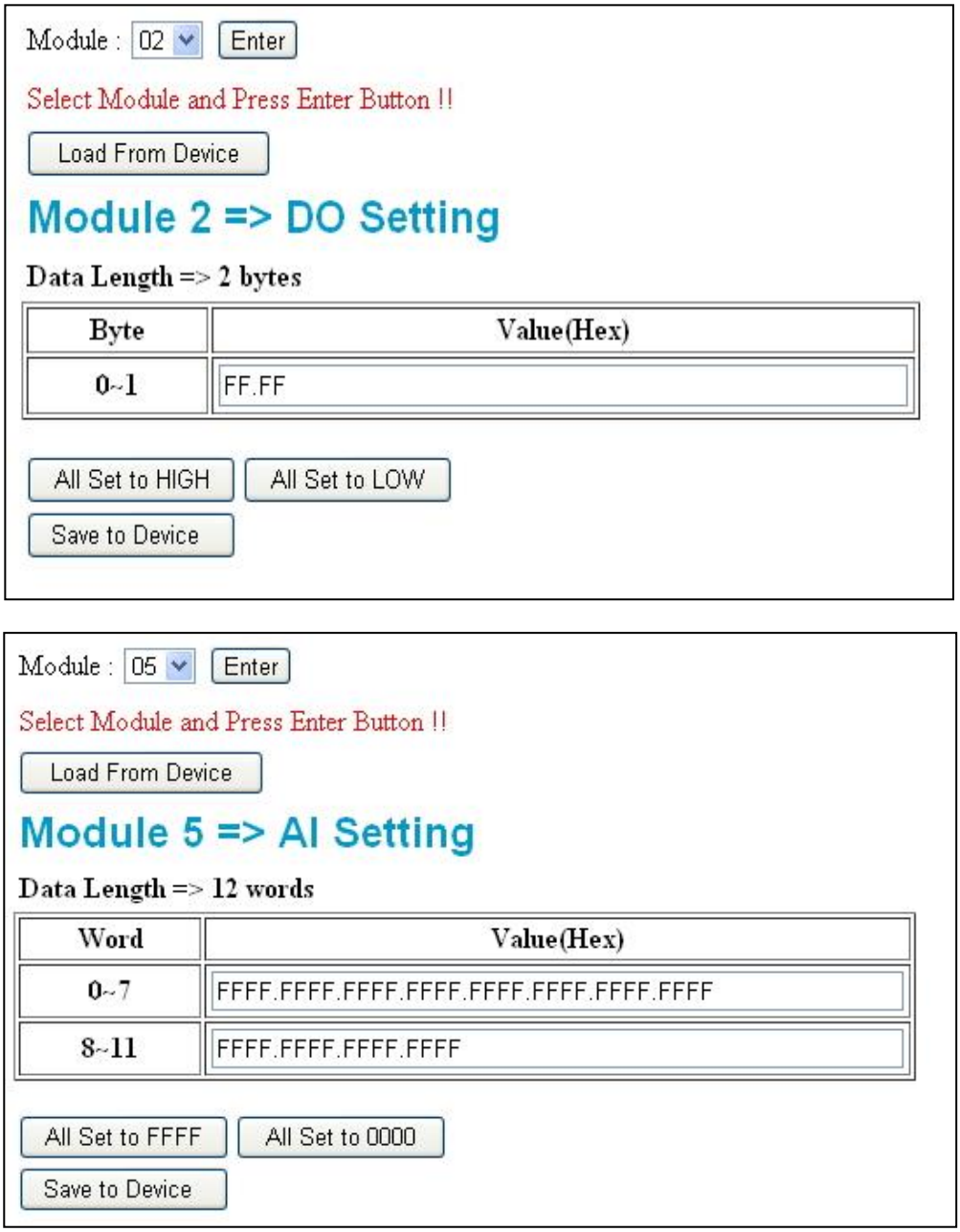



*Figure 114 Safe Value Setting*

## E. Communication Log

The user can monitor communication between GW-7553-B / GW-7553-M and Modbus devices in this page, as shown in ***Figure 115***.



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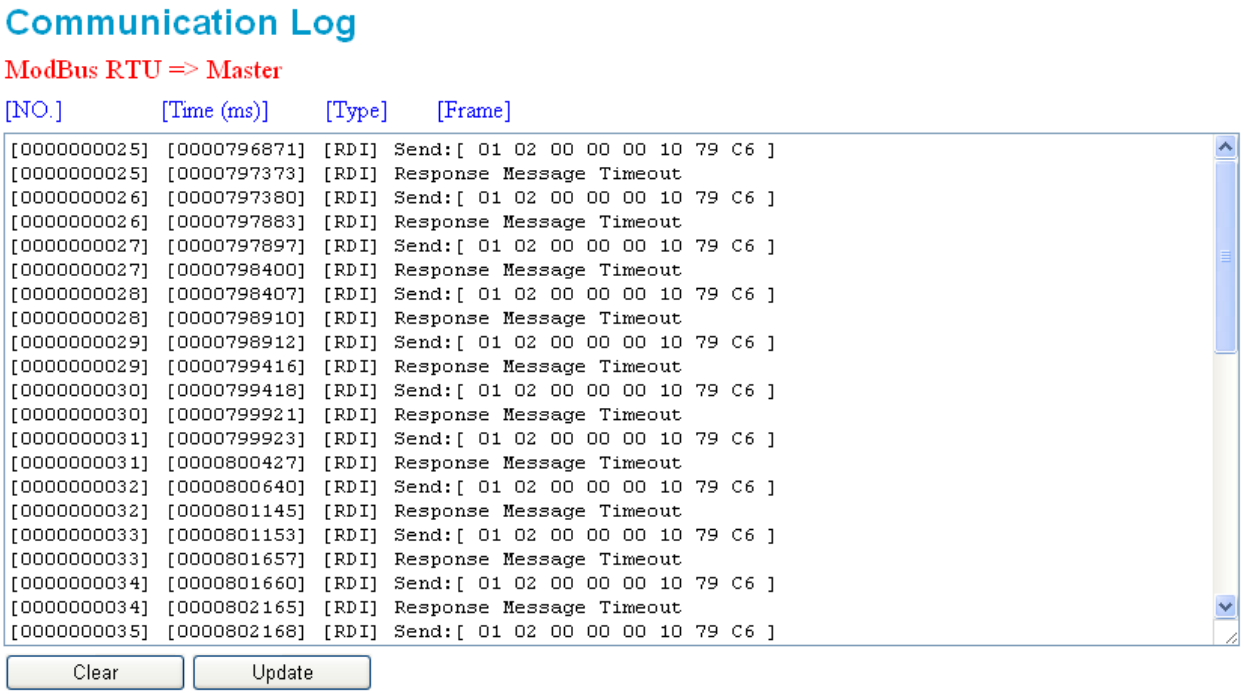



*Figure 115 Communication Log*

## F. Information

Information is shown in ***Figure 116***. This page has 4 parts, they are (1)PROFIBUS INFO、(2)MODULE LIST、(3)DIAGNOSTIC INFO、(4)DEVICE INFO, as shown in the below.

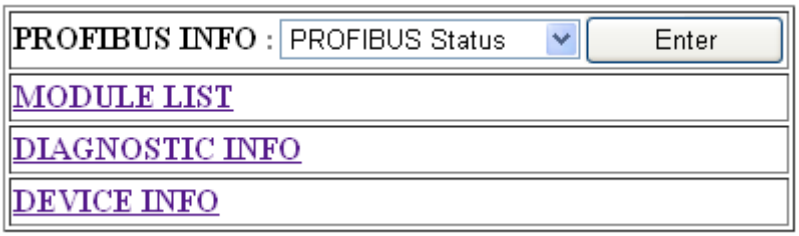


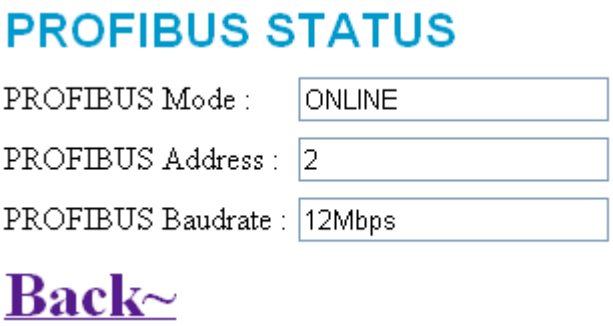

*Figure 116 Information*

(1) PROFIBUS INFO：

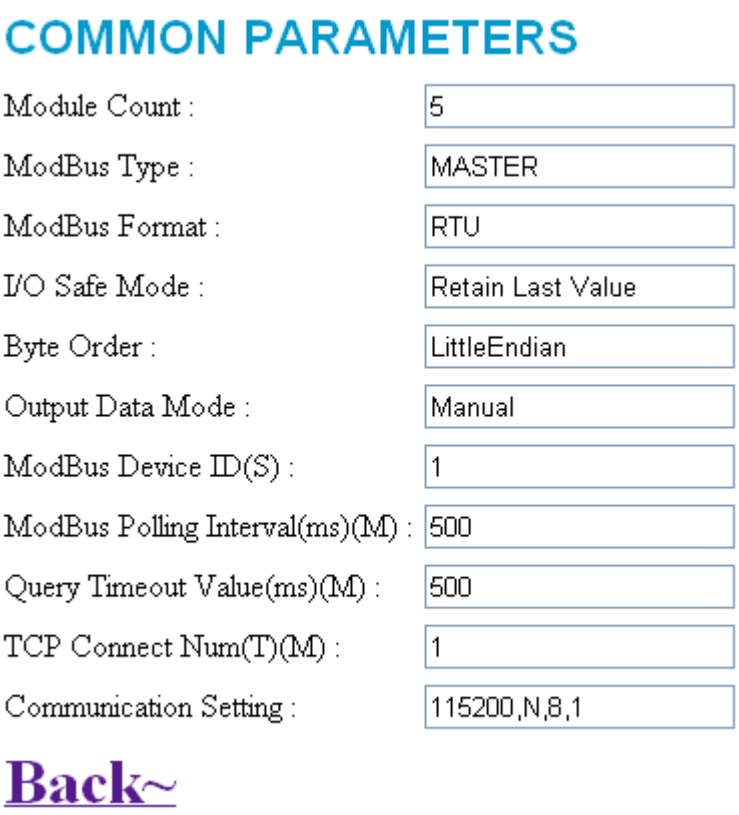
a. PROFIBUS Status：This page shows PROFIBUS mode、PROFIBUS address and PROFIBUS baudrate.



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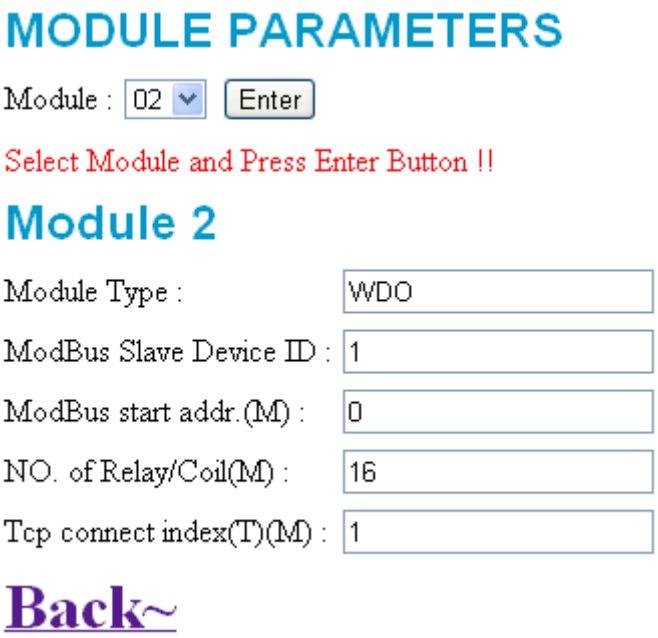

b. Common Parameters：This page shows common parameters of PROFIBUS.




c. Module Parameters：This page shows the module parameters of each module.



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(2) MODULE LIST：

When PROFIBUS state is online, this page will shows all selected module of GW-7553-B / GW-7553-M, as shown in ***Figure 117***.

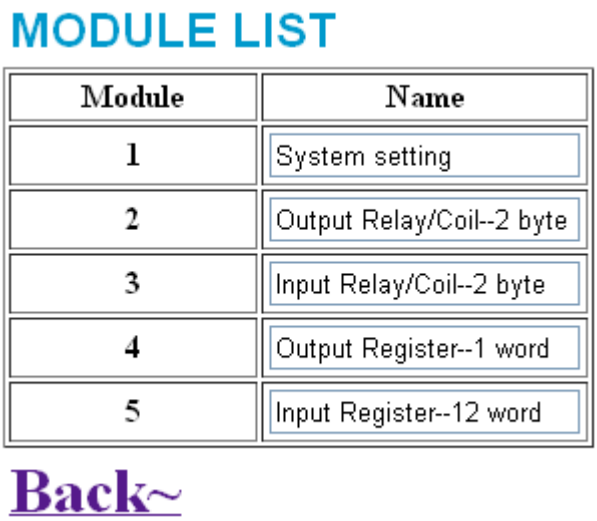



*Figure 117　Module List*

(3) DIAGNOSTIC INFO：

When PROFIBUS state is online, this page will shows the diagnostic messages of GW-7553-B / GW-7553-M, as shown in ***Figure 118***.



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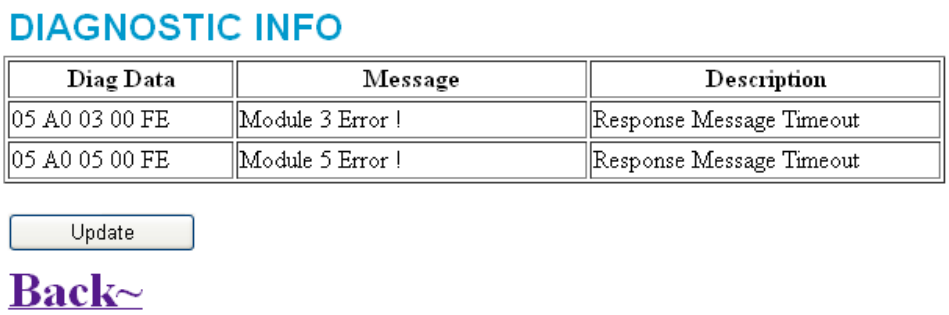



*Figure 118 Diagnostic info*

(4) DEVICE INFO：

This page shows the device information of GW-7553-B / GW-7553-M, as shown in ***Figure 119***.

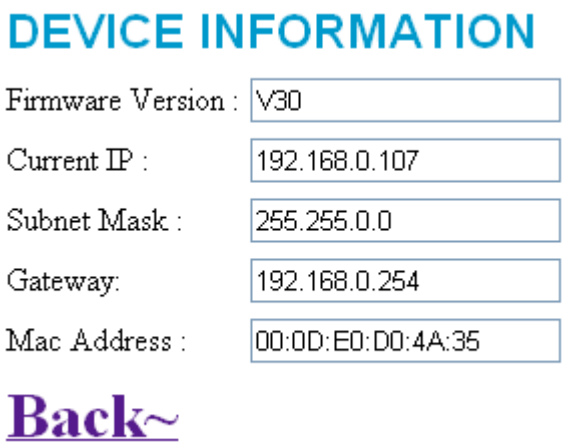



*Figure 119　Device info*



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# 7. Troubleshooting

The troubleshooting list can help users to resolve the problems when using the GW-7553-B / GW-7553-M. If the problem still can't be solved, please contact with technical staff of ICP DAS.

*Table 27 Errors and solutions*

| Item | Trouble state | Solution |
|---|---|---|
| 1 | 'PWR' LED indication of the GW-7553-B / GW-7553-M is always turned off | The power supply of GW-7553-B / GW-7553-M has some problems. Please check the wire connection of the power and the voltage is between 10~30V$_{DC}$. |
| 2 | 'ERR' LED indication of the GW-7553-B / GW-7553-M is always turned on | That means the GW-7553-B / GW-7553-M isn't connecting to the PROFIBUS Master station. Please check the wire connection and the PROFIBUS Master station. The configuration and address of GW-7553-B / GW-7553-M in the PROFIBUS Master station are not correct. |
| 3 | 'ERR' LED indication of the GW-7553-B / GW-7553-M is flashing fast | It means the GW-7553-B / GW-7553-M is in setting mode and connects with Utility. Please close Utility and set the GW-7553-B / GW-7553-M to operation mode (please refer section 2.6 Normal/Setting DIP switch and section 4.6.2 Output data area and communication command). |
| 4 | 'ERR' LED indication of the GW-7553-B / GW-7553-M is flashing slow | It means the GW-7553-B / GW-7553-M has diagnostic messages. Please check diagnostic messages in the PROFIBUS Master station. |
| 5 | PROFIBUS Master station can not communicate with the Modbus device, when “RUN LED” of the GW-7553-B / GW-7553-M is light and “ERR LED” of the GW-7553-B / GW-7553-M is dark. | a. Please confirm the GW-7553-B / GW-7553-M is working in operation mode and avoid clearing diagnostic message by communication command (please refer section 2.6 Normal/Setting DIP switch and section 4.6.2 Output data area and communication command).<br>b. Please confirm the connection between the GW-7553-B / GW-7553-M and Modbus device.<br>c. Please confirm COM Port setting (please refer section 4.3 The Configuration of the common parameters) or IP setting (please refer section 5.5 IP setting) of the GW-7553-B / GW-7553-M the same as the Modbus device.<br>d. Please confirm module ID of the GW-7553-B / GW-7553-M (please refer section 4.3 The Configuration of the common parameters and section 4.4 The Configuration of the modules) the same as Modbus address of Modbus device.<br>e. Please confirm Setting of Start Address and NO. of Relay/Coil is correct (please refer section 4.4 The Configuration of the modules). |



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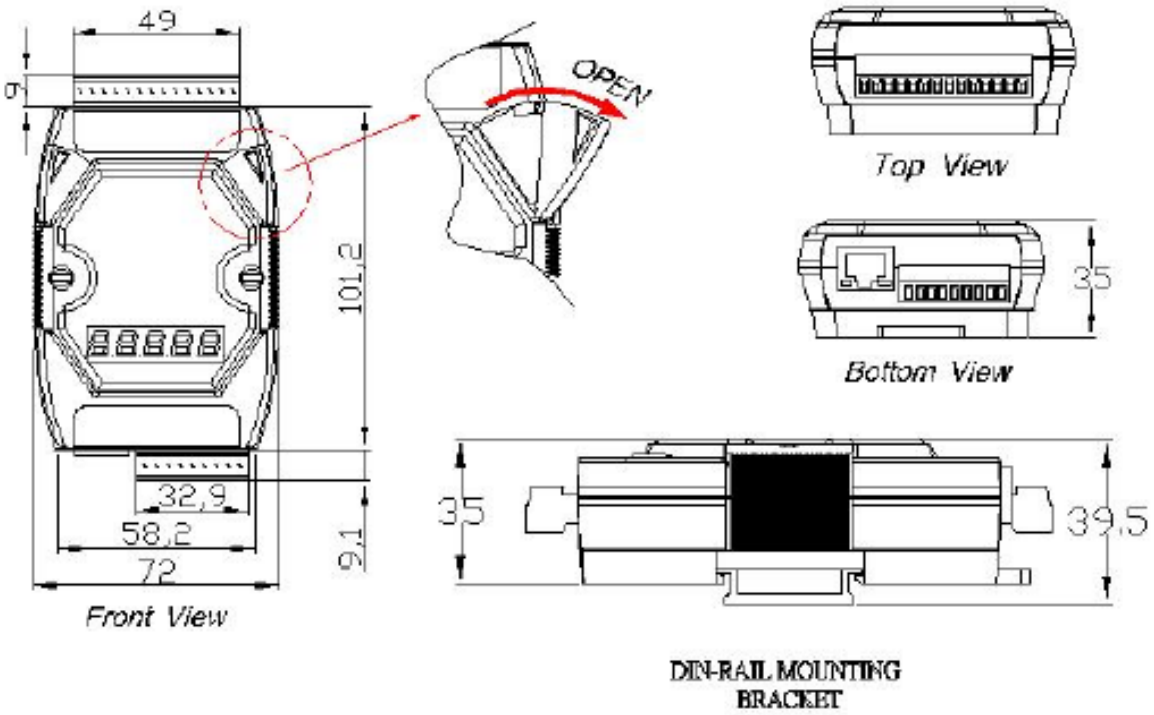
| Item | Trouble state | Solution |
|---|---|---|
| | | f. Please confirm the output data put in correct address and have changed value of byte 0 to trigger the output command, when output data can not send to Modbus device in output data area of PROFIBUS Master (please refer section 4.6.2 Output data area and communication command). |

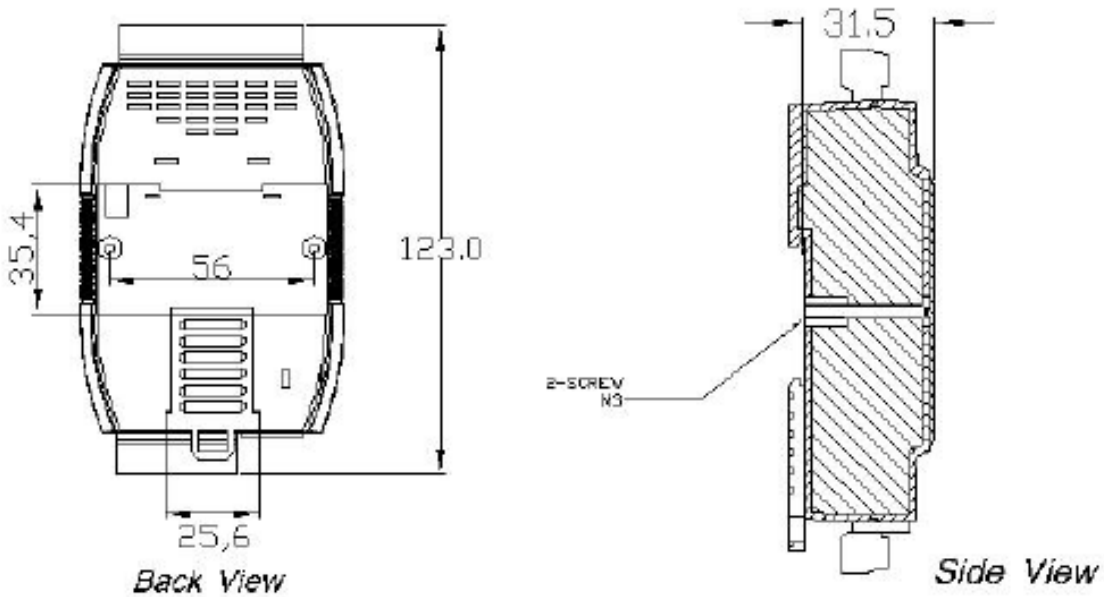


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# 8. Dimensions

GW-7553-B

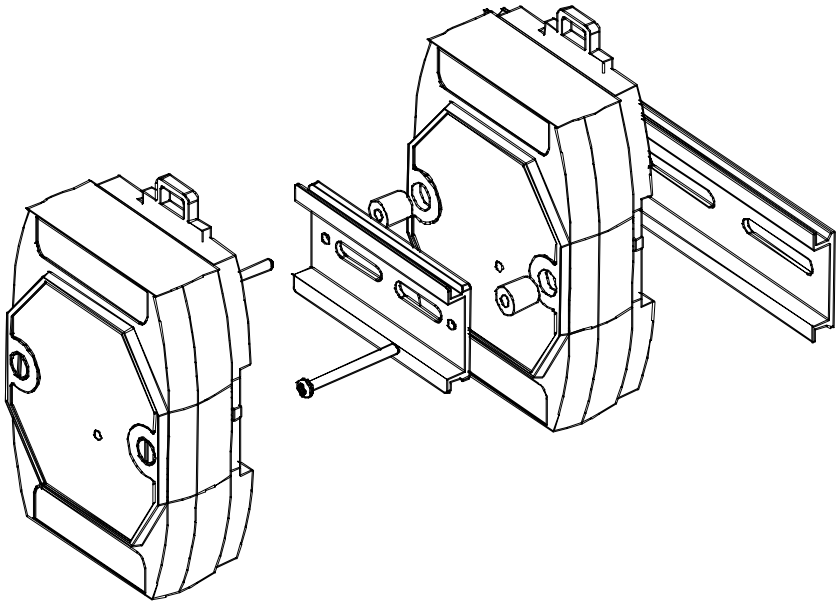


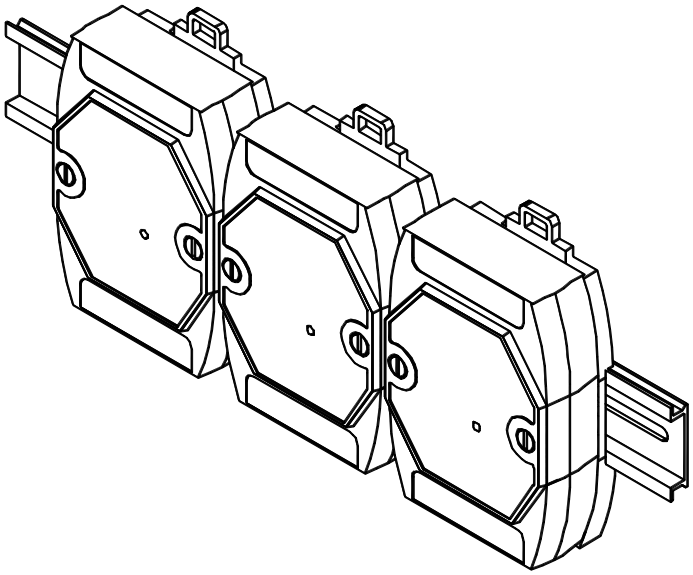




*Unit : mm*



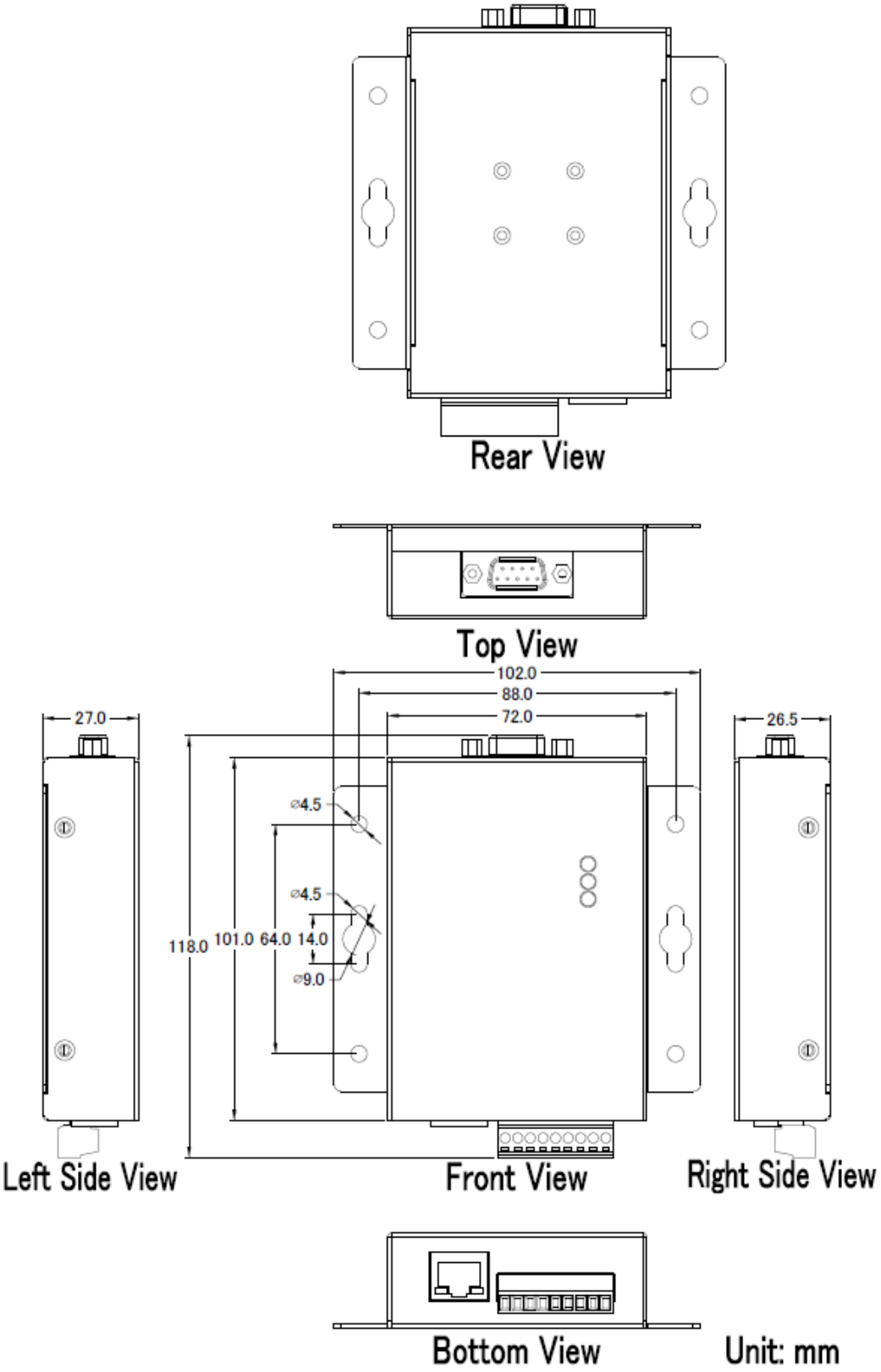
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