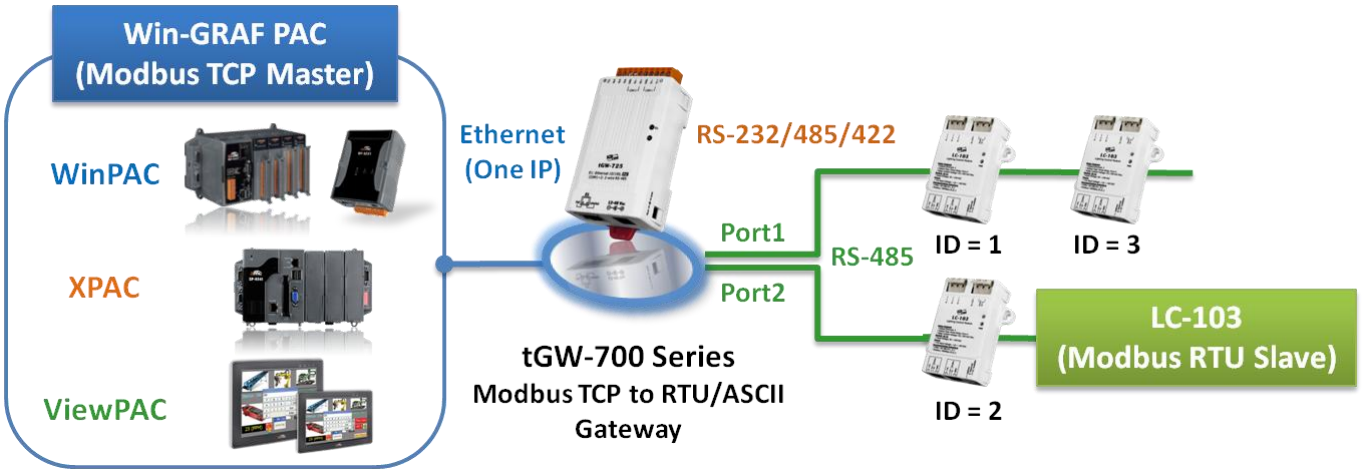
How to Use the Win-GRAF PAC to Connect the tGW-700 to Expand Modbus RTU Master Ports?

If using the Modbus RTU (RS-232/485/422) device to transmit data in a long-distance application area, the user will normally choose a lower baud rate for better signal quality. But, using this way will cause low transmission efficiencies. In order to improve this problem, ICP DAS releases the tGW-700 series products (tiny Modbus TCP to RTU/ASCII gateway) for converting Ethernet/RS-485 signals so that the user can reduce the RS-485 cable lengths and solve the issue with inefficient communications.

This paper will provide a demo program (demo_tgw725.zip) to describe how the Win-GRAF PAC communicates with LC-103 modules via the tGW-700 gateway (as the figure below).



1.1. Using the tGW-700 Series (Modbus TCP to Modbus RTU/ASCII Gateway)

The tGW-700 module is a Modbus TCP to RTU/ASCII gateway that enables a Modbus TCP host (e.g., WP-8xx8) to communicate with serial Modbus RTU/ASCII devices through an Ethernet network, and eliminates the cable length limitation of legacy serial communication devices. Visit the tGW-700 series webpage for more information on
http://www.icpdas.com/root/product/solutions/industrial_communication/pds/tgw-700.html

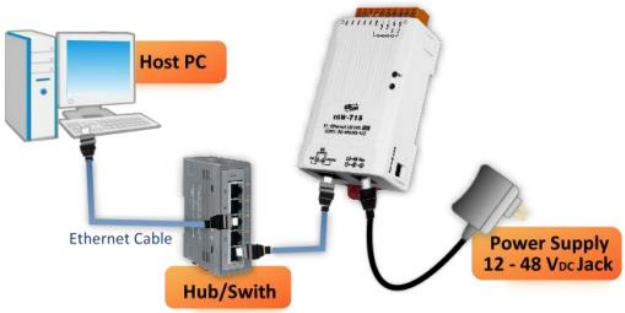
tGW-700 series User Manual
http://ftp.icpdas.com/pub/cd/tinymodules/napdos/tgw-700/document/
(See the chapter 3 & chapter 4 of this manual to know the way of network setting, testing and web function configuration for the tGW-700 module.)

Before using the tGW-700, the user must configure its network and COM Port setting:

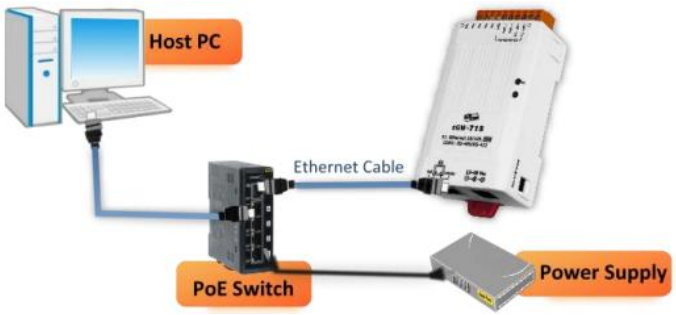
- **Connect the Power Supply and the Host PC**

1. Check that the Init/Run switch is in the "Run" position.

2. Connect both the tGW-700 and the Host computer to the same sub-network or the same Ethernet Switch, and then power on the tGW-700.



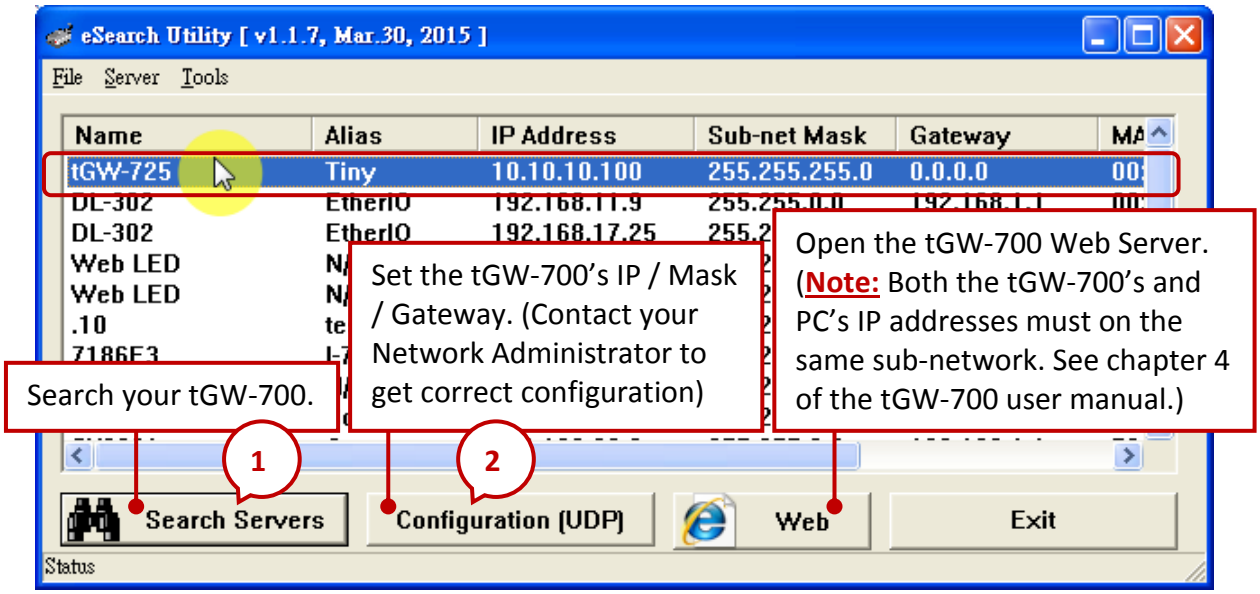
+12 to +48 V_{DC} jack Power Supply (Non-PoE)



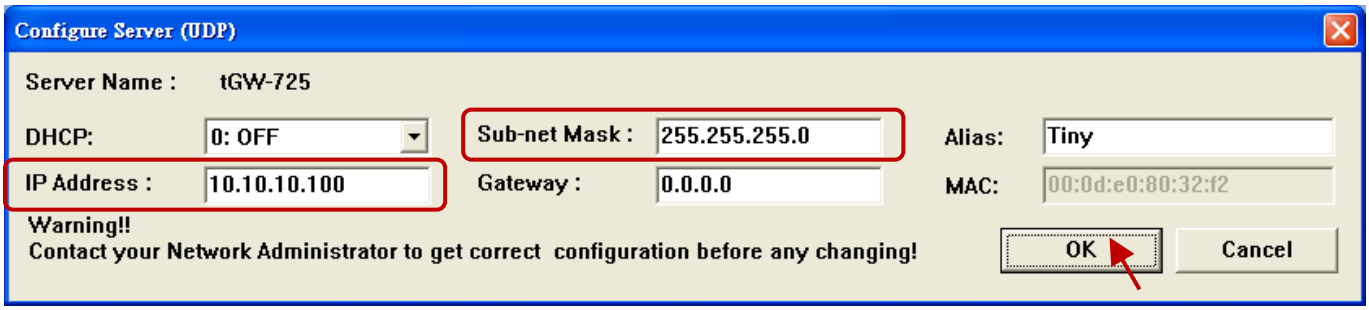
PoE Power Supply

- **Install the "eSearch Utility", and then Search and Configure the Network Setting for the tGW-700**

http://ftp.icpdas.com/pub/cd/tinymodules/napdos/software/modbus_utility/



Please contact your Network Administrator to get the correct IP, Mask and Gateway addresses.
After completing these settings, click the "OK" button and they will take effect within 2 seconds.



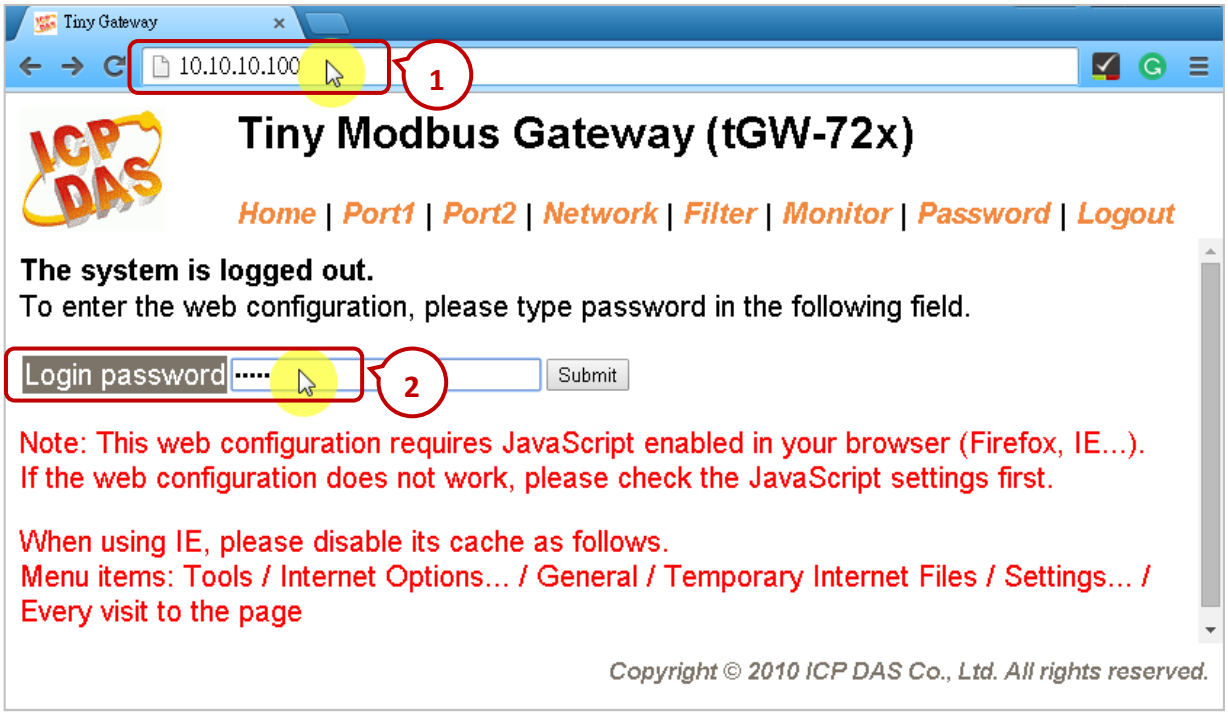
- **Web Configuration**

You can refer the tGW-700 user manual (chapter 4) to view the configuration way for all features.
The following will describe the COM Port setting.

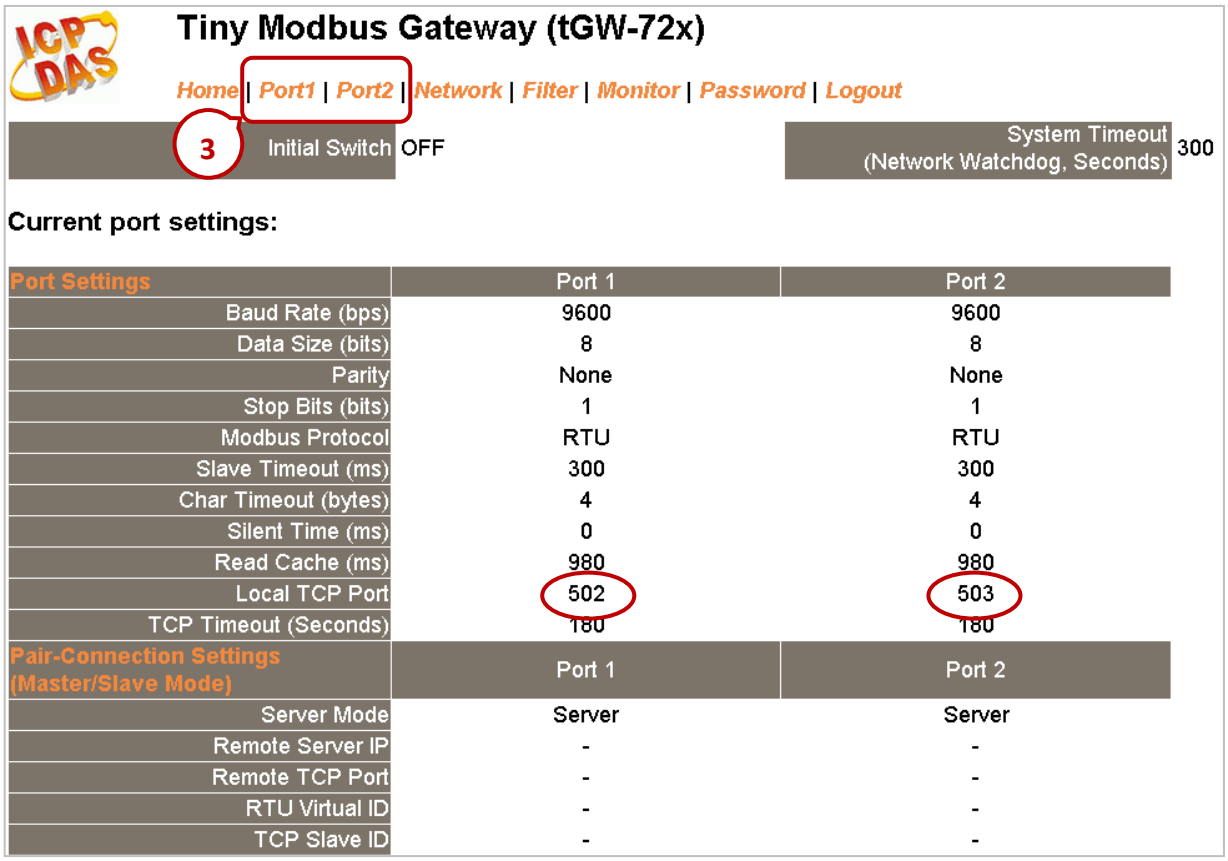
1. Enter the tGW-700's IP address on the web browser.
   Note: Both the tGW-700's and PC's IP addresses must on the same sub-network, for example,

	IP	Mask
tGW-700	**10.10.10**.100	**255.255.255**.0
PC	**10.10.10**.xxx	**255.255.255**.0

2. Enter the password (the factory default password is "admin").



3. After logging in, the main page (Home) will display the current port setting. The user can also click “Port1” or “Port2” tab to modify the settings.



Tiny Modbus Gateway (tGW-72x)

Home | Port1 | Port2 | Network | Filter | Monitor | Password | Logout

3 Initial Switch OFF

System Timeout (Network Watchdog, Seconds) 300

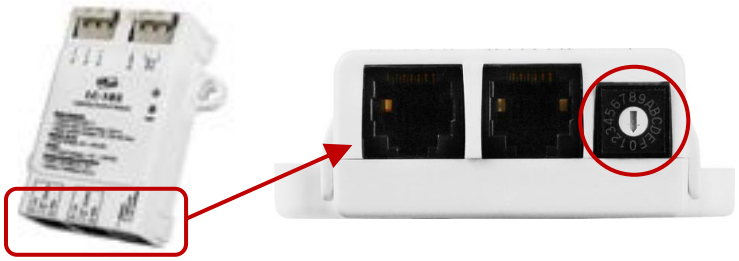
Current port settings:

Port Settings	Port 1	Port 2
Baud Rate (bps)	9600	9600
Data Size (bits)	8	8
Parity	None	None
Stop Bits (bits)	1	1
Modbus Protocol	RTU	RTU
Slave Timeout (ms)	300	300
Char Timeout (bytes)	4	4
Silent Time (ms)	0	0
Read Cache (ms)	980	980
Local TCP Port	502	503
TCP Timeout (Seconds)	180	180
Pair-Connection Settings (Master/Slave Mode)	**Port 1**	**Port 2**
Server Mode	Server	Server
Remote Server IP	-	-
Remote TCP Port	-	-
RTU Virtual ID	-	-
TCP Slave ID	-	-

1.2. Connecting the tGW-700 Series and the LC-103 module (1 DI, 3 Relay)

In this paper, we provide a demo project (demo_tgw725.zip) to describe how the Win-GRAF PAC communicates with LC-103 modules via the tGW-725 (the Modbus TCP to Modbus RTU/ASCII gateway with two RS-285 ports). You can run the Win-GRAF Workbench and click "File → Add Existing Project → From Zip..." to open this project.

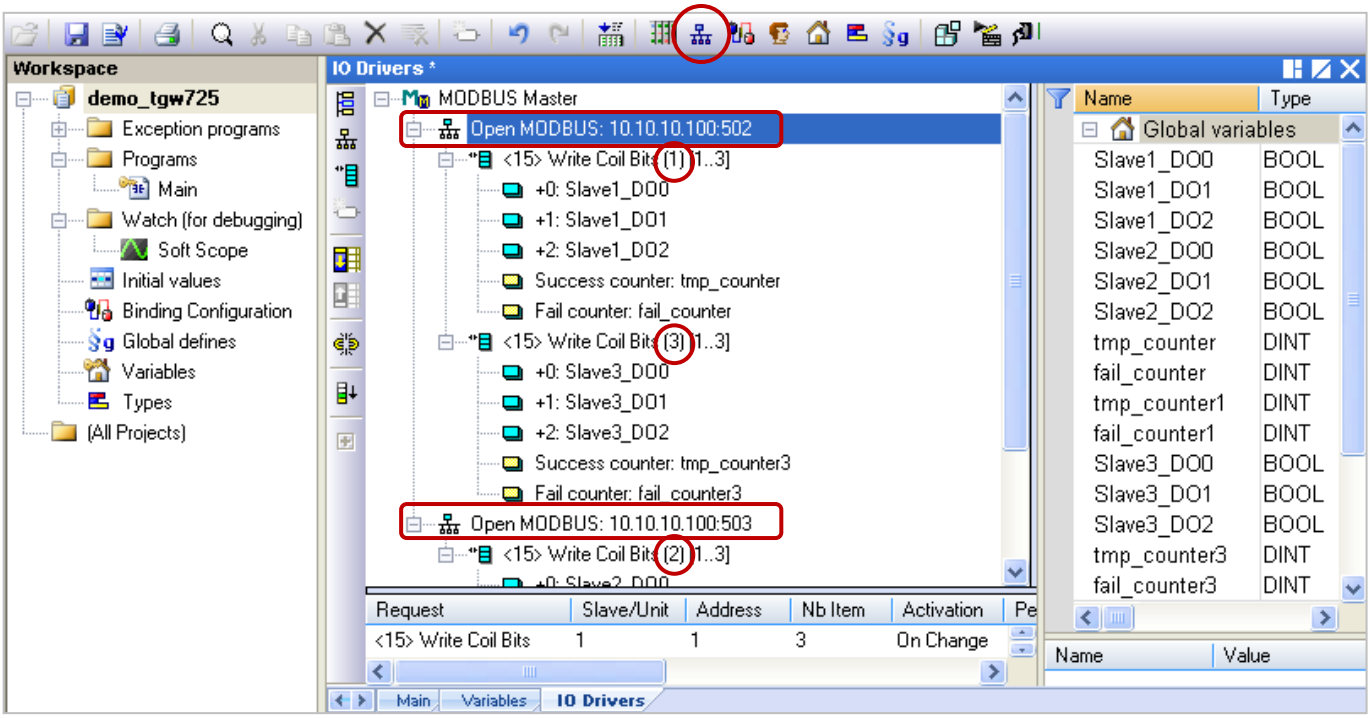
The LC-103 is an easy-to-use lighting control module that supports the Modbus RTU protocol and provides 1 channel for digital input and 3 channels for relay output. Before using this module, set its ID No. depends on your application needs, for example, if the required ID is "1", simply adjust the rotary switch to “1" at the bottom of the module. Visit the LC-103 webpage for more detailed information: http://www.icpdas.com/root/product/solutions/remote_io/rs-485/lighting_control/lc-103.html



The LC series module user manual:
ftp://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/lc/

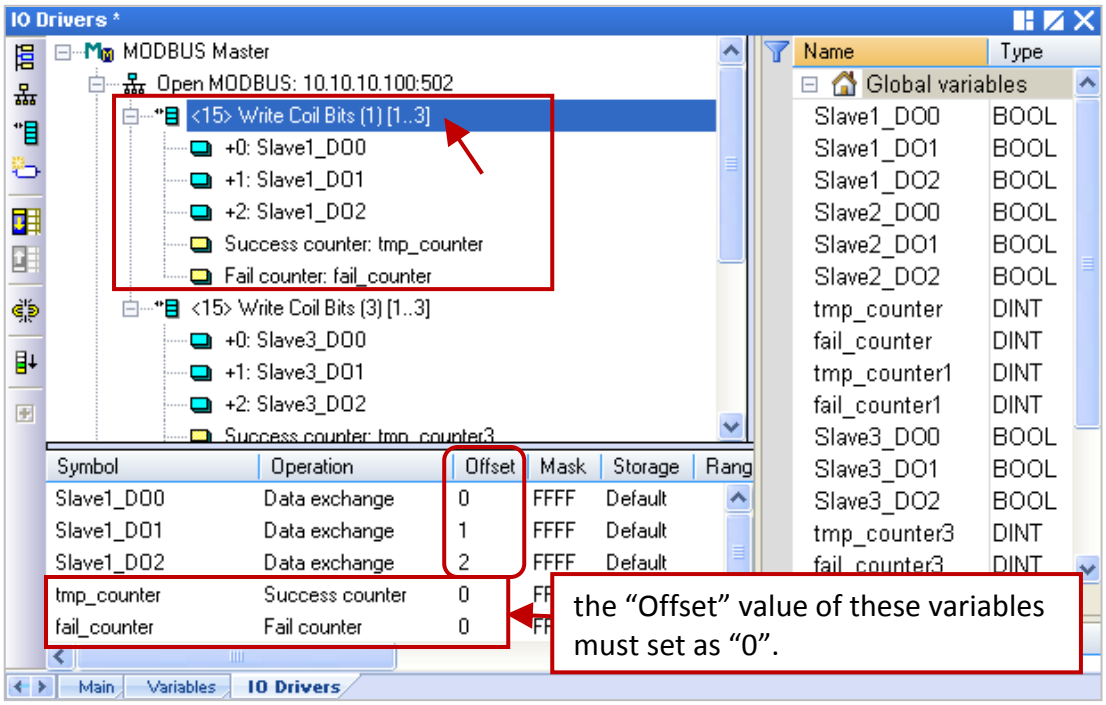
Demo Project Description: (Refer the FAQ-011 to know how to create this project.)

1. Click the “Open Fieldbus Configuration” tool button to open the “IO Drivers” window.

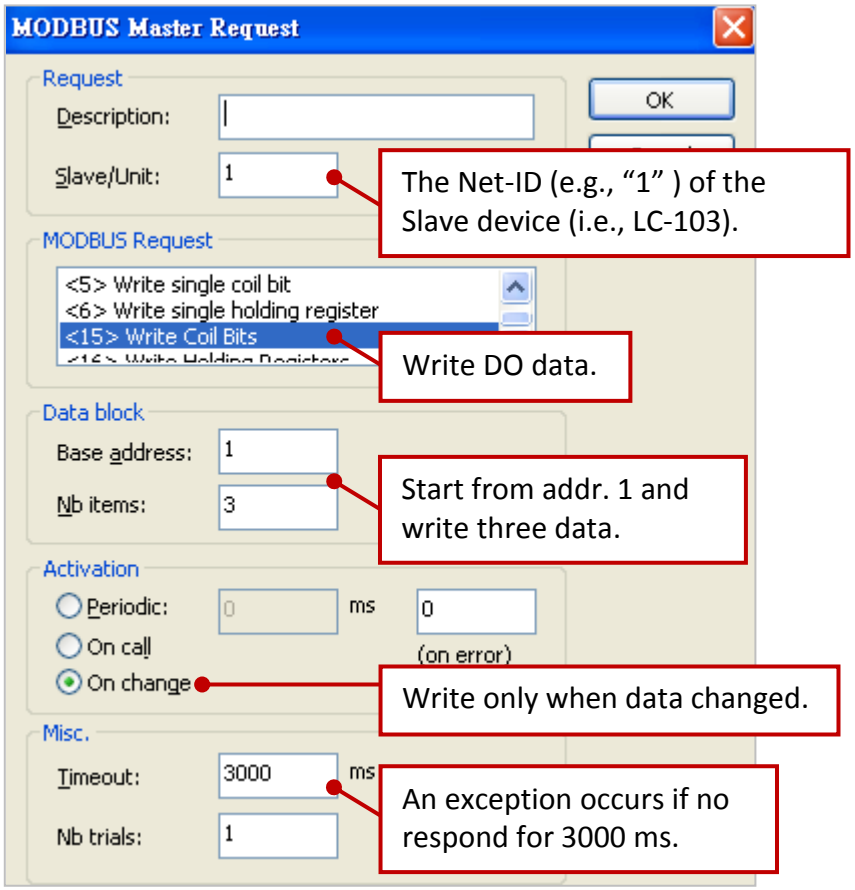


On the screen, the "Open MODBUS: 10.10.10.100:**502** / Open MODBUS: 10.10.10.100:**503**" means that the tGW-725’s IP address is "10.10.10.100" and using two COM ports (RS-485) No. - "502“ and "503". And, there are two LC-103 modules (Slave ID = "1" and "3") connected to its COM1 and one LC-103 connected to the COM2 (Slave ID = 2). The following will describe the configuration way of each Modbus Master Request one-by-one.

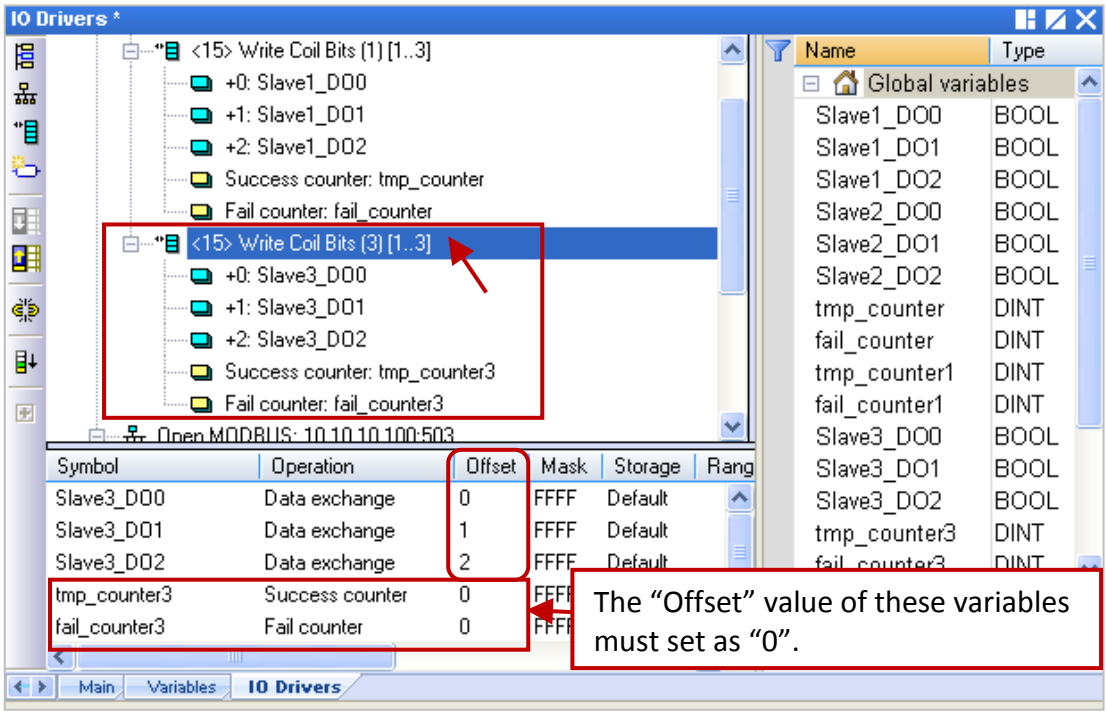
2. Mouse double-click the first data block under the COM1 (Port = 502) to view this Modbus Master request. In this example, the Win-GRAF PAC (Modbus TCP Master) send three DO commands to the **LC-103 (Slave ID = 1)** via the tGW-725‘s **COM1 (Port = 502)**. As the figure below, the "Operation" is set to "Success counter" (or "Fail counter") that means this variable value will add 1 if the command was successfully sent (or failed). Moreover, the “Offset” value of these variables must set as “0”.



Note: The “Offset” value starts at “0” and the Modbus address of variable is equal to the “Offset” value plus 1 (Base address).

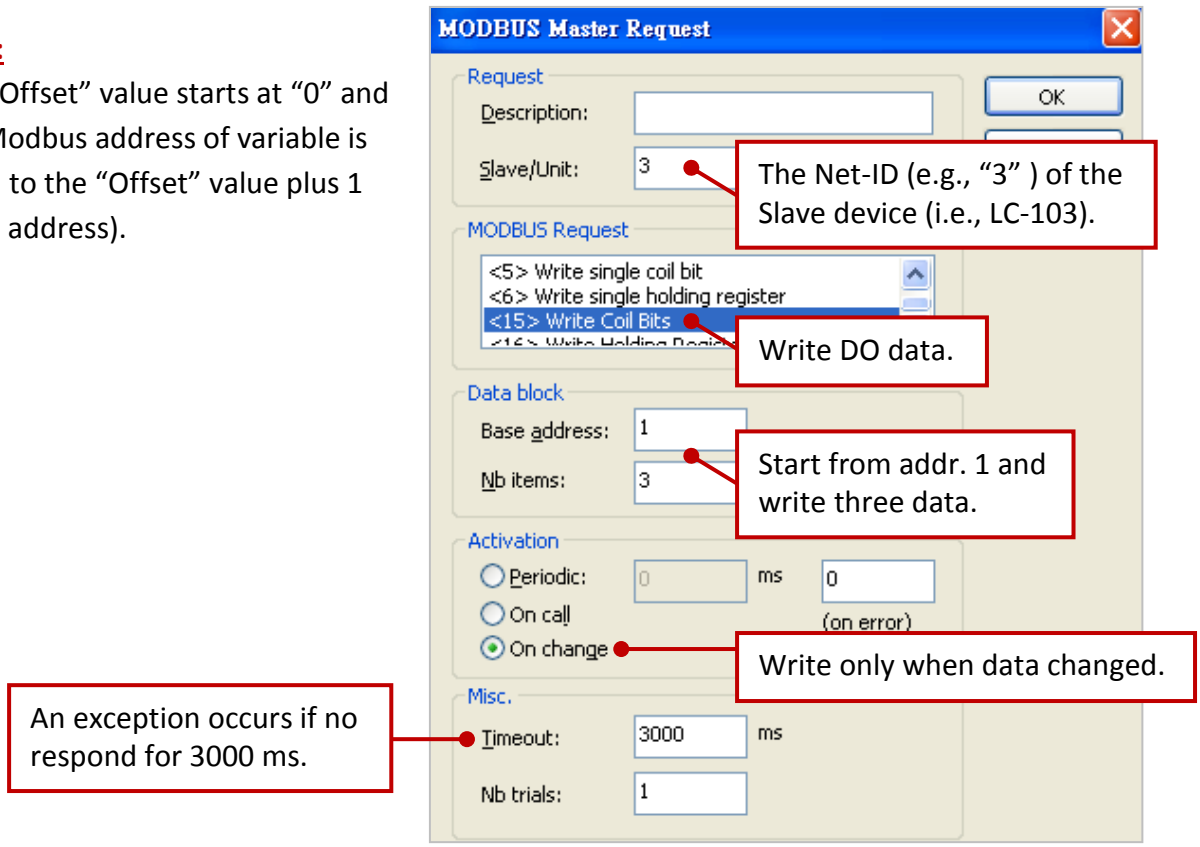


3. Mouse double-click the 2nd data block under the COM1 (Port = 502) to view this Modbus Master request. In this example, the Win-GRAF PAC (Modbus TCP Master) send three DO commands to the **LC-103 (Slave ID = 3)** via the tGW-725's **COM1 (Port = 502)**. As the figure below, the "Operation" is set to "Success counter" (or "Fail counter") that means this variable value will add 1 if the command was successfully sent (or failed). Moreover, the "Offset" value of these variables must set as "0".

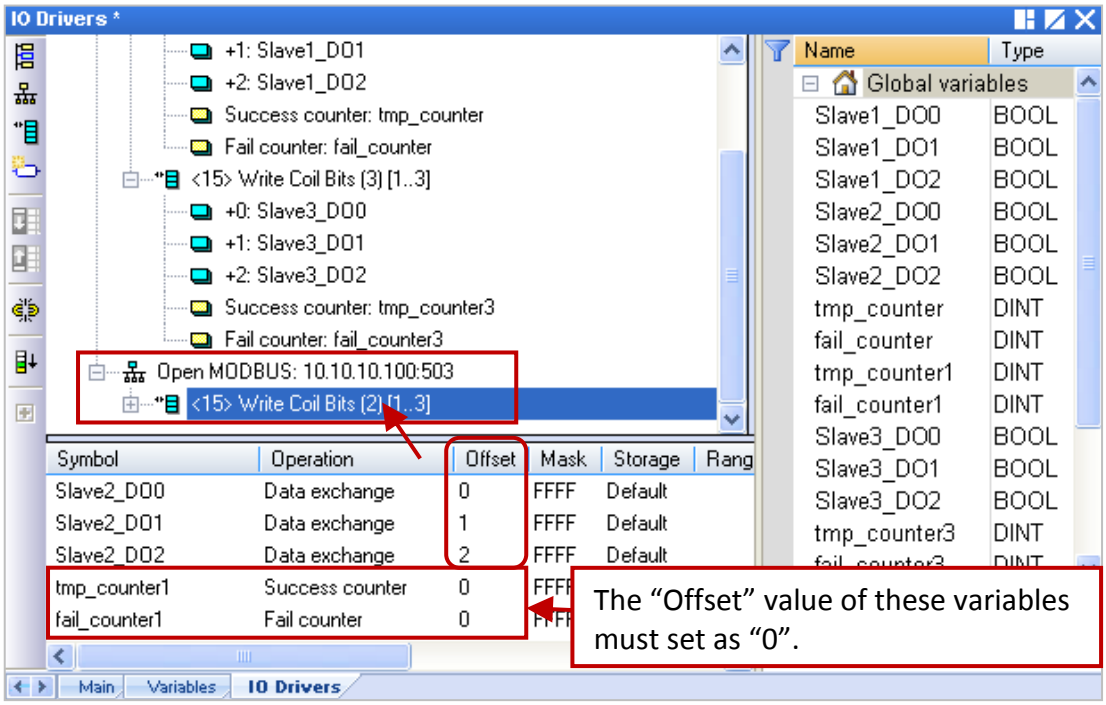


Note:

The "Offset" value starts at "0" and the Modbus address of variable is equal to the "Offset" value plus 1 (Base address).

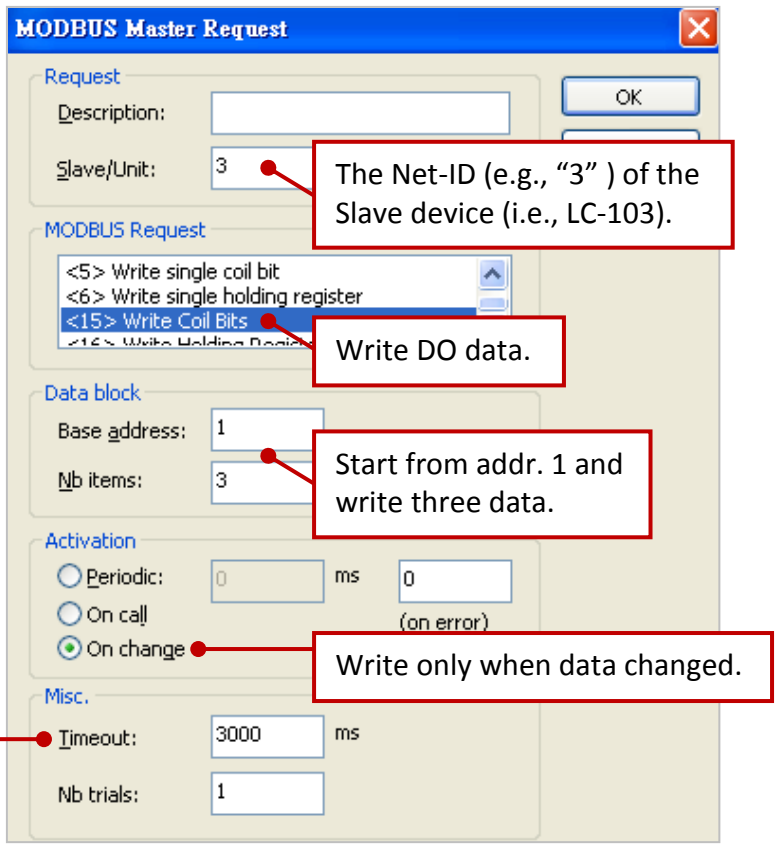


4. Mouse double-click the data block under the COM2 (Port = 503) to view this Modbus Master request. In this example, the Win-GRAF PAC (Modbus TCP Master) send three DO commands to the **LC-103 (Slave ID = 2)** via the tGW-725's **COM2 (Port = 503)**. As the figure below, the "Operation" is set to "Success counter" (or "Fail counter") that means this variable value will add 1 if the command was successfully sent (or failed). Moreover, the "Offset" value of these variables must set as "0".



Note:

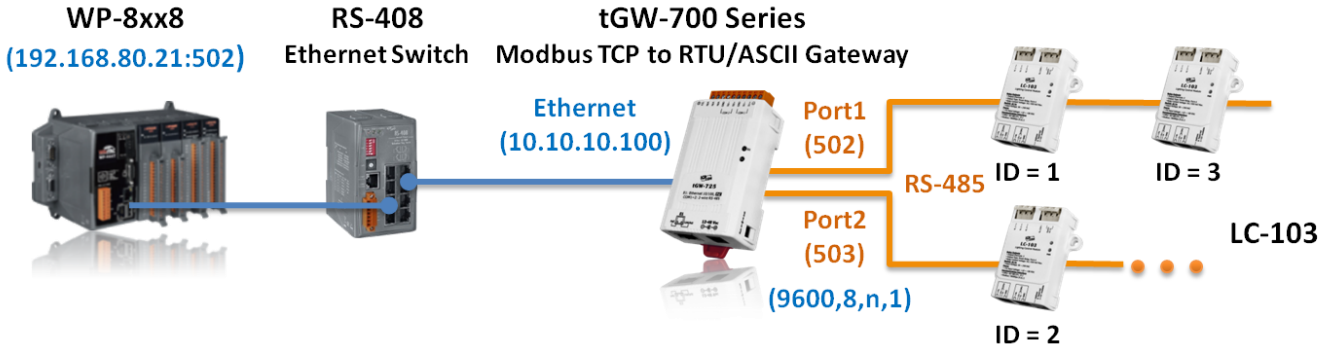
The "Offset" value starts at "0" and the Modbus address of variable is equal to the "Offset" value plus 1 (Base address).



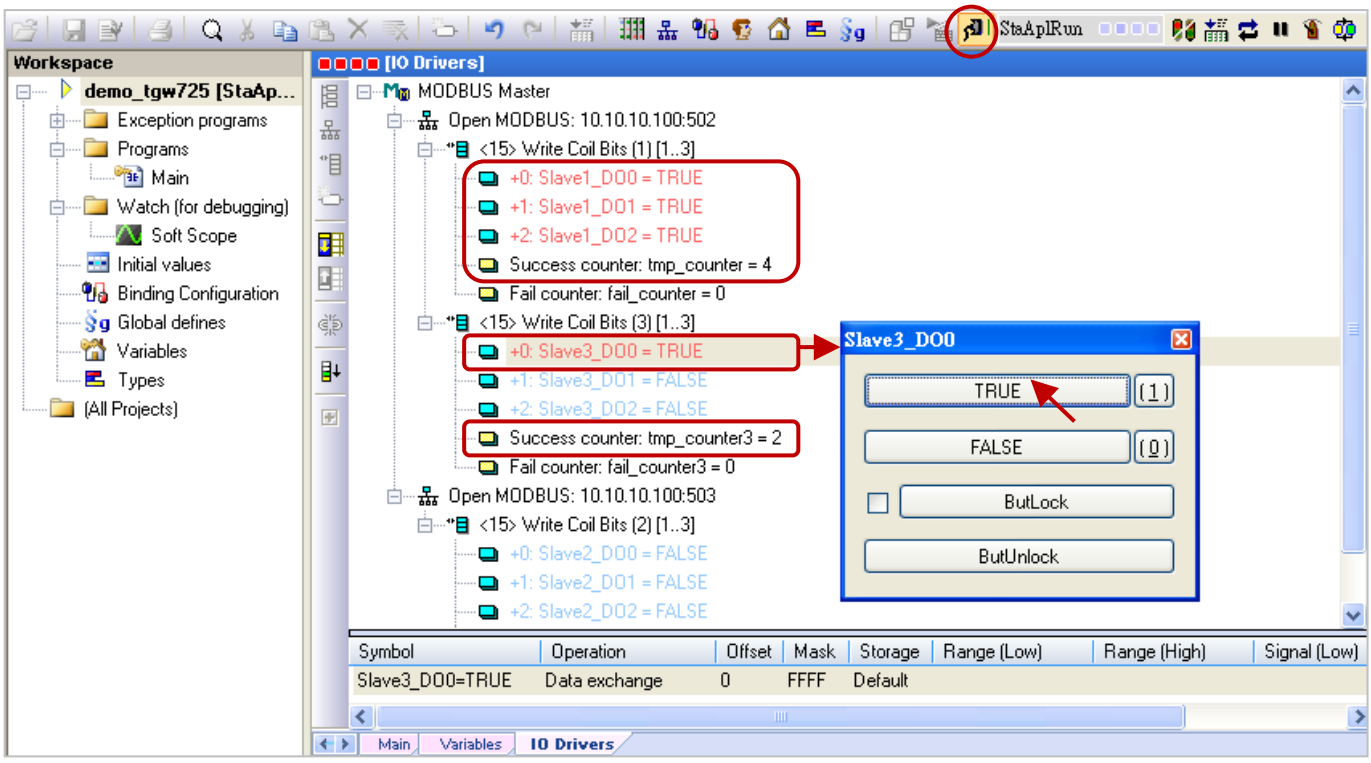
1.3. Test the Demo Project (demo_tgw725.zip)

Before testing this demo project, download it to your Win-GRAF PAC.
(If you're not familiar with it, refer the Win-GRAF Getting Started Manual - Section 2.3.4 and 2.3.5.)

The Hardware Wiring:



After connecting with the Win-GRAF PAC, double-click on any DO variable and set it as "TRUE" in the “I/O Drivers” window. If the write operation is successful, then the "tmp_counter" value will add "1".



Note: When the Win-GRAF PAC boots up, it will send the Modbus request to the Modbus Slave device. So, you can see the "tmp_counter" value starts at "1" which means this data write is successful.