

# MGate 5109 with DNP3 SCADA Application

Moxa Technical Support Team  
[support@moxa.com](mailto:support@moxa.com)

## Contents

- 1. System Topology..... 2**
- 2. Required Equipment and Components ..... 4**
  - 2.1. PcVue SCADA ..... 4
  - 2.2. Modbus Slave ..... 4
- 3. MGate 5109 Setting ..... 4**
  - 3.1. Serial Settings ..... 4
  - 3.2. Protocol Conversion ..... 5
  - 3.3. DNP3 Settings..... 5
  - 3.4. Modbus Settings ..... 8
  - 3.5. I/O Data Mapping Settings .....10
- 4. Modbus Slave Setting..... 12**
- 5. PcVue Setting ..... 14**
- 6. Communication Test ..... 19**
  - 6.1. MGate Protocol Diagnose Introduction.....19
  - 6.2. DNP3 Connection Status .....20
  - 6.3. Read BI Test .....21
  - 6.4. Read Counter Test .....23
  - 6.5. Read AI Test .....24
  - 6.6. Write BO and AO Test .....25

---

Copyright © 2017 Moxa Inc.

Released on July 19, 2017

### About Moxa

Moxa is a leading manufacturer of industrial networking, computing, and automation solutions. With over 25 years of industry experience, Moxa has connected more than 30 million devices worldwide and has a distribution and service network that reaches customers in more than 70 countries. Moxa delivers lasting business value by empowering industry with reliable networks and sincere service for automation systems. Information about Moxa’s solutions is available at [www.moxa.com](http://www.moxa.com). You may also contact Moxa by email at [info@moxa.com](mailto:info@moxa.com).

### How to Contact Moxa

Tel: +886-2-8919-1230  
Fax: +886-2-8919-1231

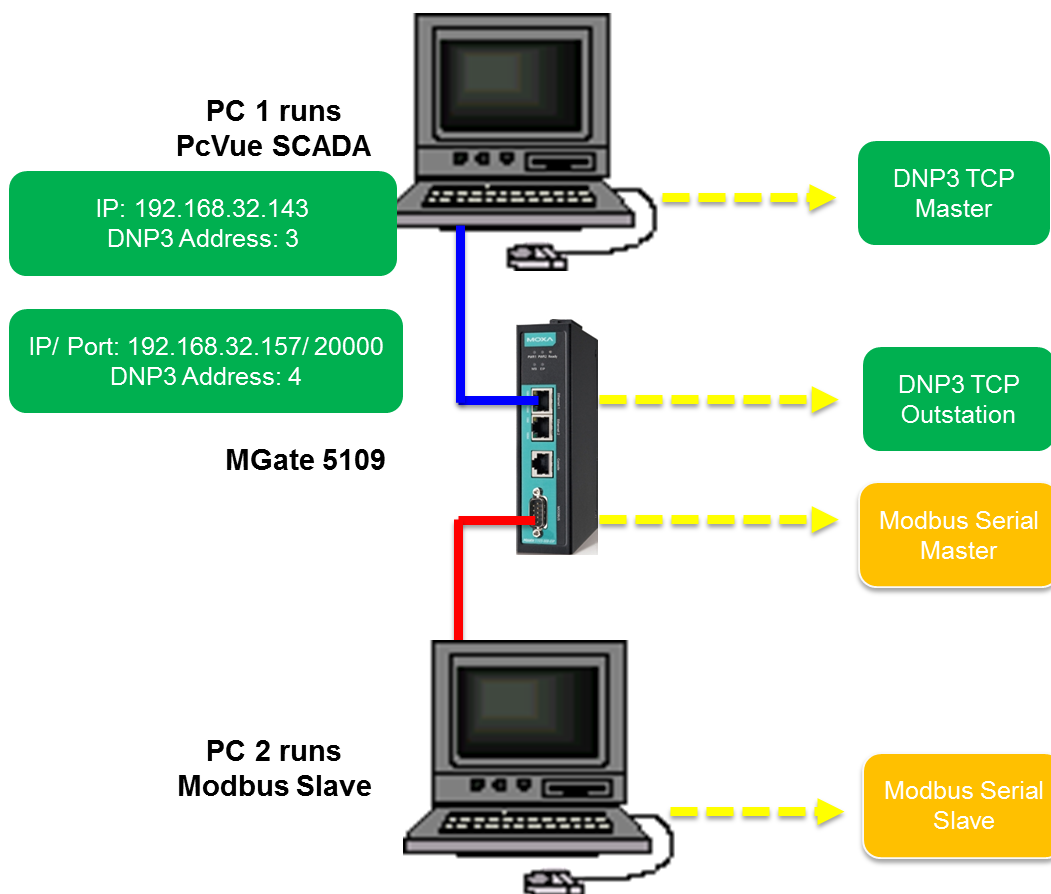


# Moxa Tech Note MGate 5109 with DNP3 SCADA Application

## 1. System Topology

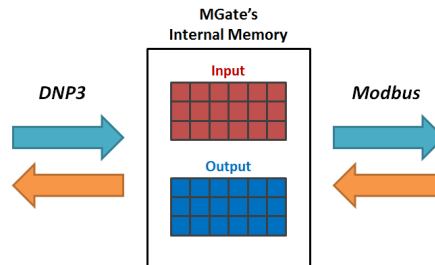
This application note demonstrates how to use the **MGate 5109** to communicate with a **DNP3-based SCADA**. **PcVue SCADA** is used as a DNP3 TCP Master to remotely control and monitor Modbus RTU via the MGate 5109.

The MGate 5109's protocol conversion is **DNP3 TCP/UDP Outstation <-> Modbus RTU/ASCII Slave**.



# Moxa Tech Note MGate 5109 with DNP3 SCADA Application

MGate 5109 is the agent to convert Modbus to DNP3, and vice versa. In agent mode, the MGate 5109 uses an internal memory to exchange data between Modbus and DNP3 protocols. The MGate's internal memory is divided into two parts: one for input and the other for output, as shown in the figure below:



In order to simplify the configuration for internal memory mapping, the MGate 5109 shows the corresponding protocol addresses for both Modbus and DNP3, which you will find in the I/O Data Mapping. Let's take DNP3 Binary Output as an example. Because DNP3 Binary Output can be read and written, you will find the following information in the I/O Data Mapping page. The details of the configuration will be explained in this technical note.

## I/O Data Mapping

Select your scenario DNP3 TCP/UDP Master -> Modbus RTU/ASCII Slave

---

Modbus Mapping address arrangement Automatic

write

write

Your device : DNP3 TCP/UDP Master      Role 1 of MGate5109 : DNP3 TCP/UDP Outstation      Role 2 of MGate5109 : Modbus RTU/ASCII Master      Your device : Modbus RTU/ASCII Slave

Full mapping    Un-full mapping    None mapping

Type	Index	Name	Function	Internal Address	Quantity
Binary Output	0 ... 15	WriteBO	15	0 ... 1	2 bytes
Analog Output	0 ... 1	WriteAO	16	2 ... 5	4 bytes

## I/O Data Mapping

Select your scenario DNP3 TCP/UDP Master <- Modbus RTU/ASCII Slave

---

Modbus Mapping address arrangement Automatic

read

read

Your device : DNP3 TCP/UDP Master      Role 1 of MGate5109 : DNP3 TCP/UDP Outstation      Role 2 of MGate5109 : Modbus RTU/ASCII Master      Your device : Modbus RTU/ASCII Slave

Full mapping    Un-full mapping    None mapping

Type	Index	Name	Function	Internal Address	Quantity
Binary Input	0 ... 15	ReadBI	1	0 ... 1	2 bytes
Binary Output	0 ... 15	ReadBO	1	2 ... 3	2 bytes
Counter	0 ... 1	ReadCounter	3	4 ... 11	8 bytes
Analog Input	0 ... 1	ReadAI	3	12 ... 19	8 bytes
Analog Output	0 ... 1	ReadAO	3	20 ... 23	4 bytes

# Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Here is a brief checklist to help you review the steps needed for a successful conversion.

	Equipment	Check items
1	Modbus TCP Server	Hardware connections. Modbus registers to be read or written.
2	MGate 5109	Hardware connections. MGate basic settings. Modbus master commands. DNP3 outstation settings
1	DNP3 TCP Master	Hardware connections DNP3 outstation configurations DNP3 master address setting DNP3 outstation objects configuration: BI/BO/AI/AO/Counter

## 2. Required Equipment and Components

### 2.1. PcVue SCADA

**PcVue SCADA** system is published by **ARC Informatique**. Version **11.1** is used in this demonstration. It has a DNP3 built-in driver for DNP3 communication.

### 2.2. Modbus Slave

[Modbus Slave](#) is the very popular Modbus slave simulator to test and debug your Modbus devices. It supports Modbus RTU/ASCII and Modbus TCP/IP.

**Download Website:** <http://www.modbustools.com/download.html>

## 3. MGate 5109 Setting

Log in to the MGate 5109's web console, and then complete the following settings:

### 3.1. Serial Settings

Set as below:

#### Serial Settings

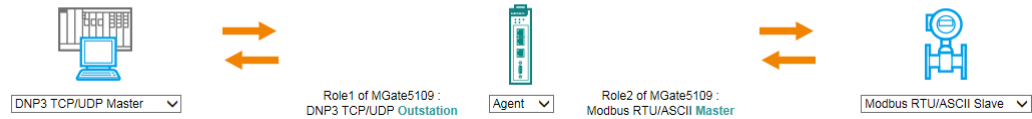
Port	Baud rate	Parity	Data bit	Stop bit	Flow control	FIFO	Interface
1	115200	None	8	1	None	Enable	RS-485 2-wire

# Moxa Tech Note MGate 5109 with DNP3 SCADA Application

## 3.2. Protocol Conversion

Set as below:

### Protocol Conversion

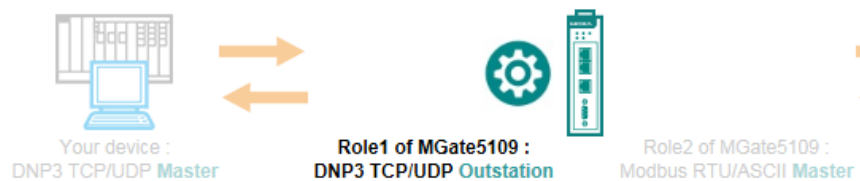


## 3.3. DNP3 Settings

In **DNP3 TCP/UDP Outstation Settings**, complete the following settings below:

- Set the **DNP3 address** as **4**
- Set **Enable unsolicited response** to **Enable**.
- Set the **Unsolicited response master DNP3 address** as **3**
- Set the **Unsolicited response master IP/Port** as PC1's **20000** port.

### DNP3 TCP/UDP Outstation Settings



Mode selection	Outstation
Basic Settings	
DNP3 address	<input type="text" value="4"/> (0 - 65519)
Local port	<input type="text" value="20000"/> (1 - 65535)
Network Type	<input checked="" type="radio"/> TCP <input type="radio"/> UDP
Enable unsolicited response	<input type="text" value="Enable"/>
Unsolicited response master DNP3 address	<input type="text" value="3"/> (1 - 65519)
Unsolicited response master IP/Port	<input type="text" value="192.168.32.143"/> : <input type="text" value="20000"/> (1 - 65535)

## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Set the **Object Point Numbers** as below:

DNP Object Settings	
Object Type	Number of Points
Binary Input	16
Binary Output	16
Counter	2
Analog Input	2
Analog Output	2

Click **Binary Input** to set **Default static variation** as **2: With Flags**, set **Default event variation** as **2: With Absolute Time**.

Binary Input	
Number of points	16
Default static variation	2: With Flags
Default event variation	2: With Absolute Time

Click the **Event Settings** button to set all of **BI Event Class** as **1**.

The screenshot shows the 'Binary Input Settings' dialog box. On the left, there is a sidebar with options: 'Number of points', 'Default static variation', 'Default event variation', and 'Event Settings'. The 'Event Settings' option is highlighted with a red box and a red arrow points to it. The main area of the dialog is titled 'Quick Events Setting' and contains the following fields:

- Points Index**: A text box containing '0-15'.
- Class of Event**: Radio buttons for 0, 1, 2, and 3. The radio button for '1' is selected.
- Buttons**: 'Set' and 'Cancel' buttons.

## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Click **Counter** to set **Counter Length** as **1: 32 Bit**.

### Counter Settings

Counter

Number of points 2

Counter length **1: 32 Bit**

Set all **Class of Event** as **2**.

The image shows two overlapping screenshots from a configuration interface. The background screenshot is titled "Counter Settings" and shows a table for "Event Settings" with "Point Index" values 0 and 1. A red box highlights the value "1" in the "Point Index" column. The foreground screenshot is titled "Quick Events Setting" and shows a "Points Index" field with "0-1" and a "Class of Event" section with radio buttons for 0, 1, 2, and 3. The radio button for "2" is selected. There are "Set" and "Cancel" buttons at the bottom.

Click **Analog Input** to set **Analog Input Length** as **1: 32 Bit**.

### Analog Input Settings

Analog Input

Number of points 2

Analog input length **1: 32 Bit**

Set **AI Class of Event** as **3**.

Set AI 0 **Event Trigger Method** as **Change of state**. When this value gets changed, it sends an unsolicited message with a notification about the event.

## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

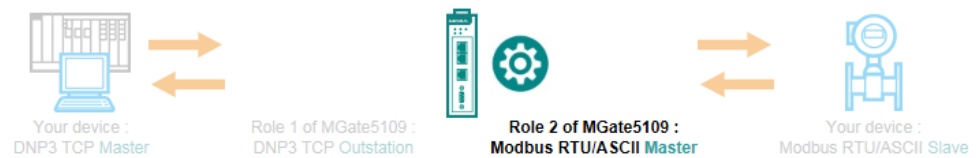
Set AI 1 **Event Trigger Method** as **Deadband** and the value as **10**. If the AI's value is updated to under 10, it does not generate an event. If the AI 1's value is updated to over 10, it sends an unsolicited message with a notification about this event.

Event Settings		
Point Index	Class of Event	Event Trigger Method
0	<input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input checked="" type="radio"/> 3	Change of state ▼
1	<input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input checked="" type="radio"/> 3	Deadband ▼ 10 (0 - 65535)

### 3.4. Modbus Settings

In Modbus RTU/ASCII Settings, keep the settings as the default value:

#### ⚙️ Modbus RTU/ASCII Settings



Role	Master
Mode	RTU ▼
Master Settings	
Initial delay	0 (0 - 30000 ms)
Max. retry	3 (0 - 5)
Response timeout	1000 (10 - 120000 ms)
Inter-frame delay	0 (10 - 500 ms, 0: default)
Inter-character timeout	0 (10 - 500 ms, 0: default)



## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Set out the mapping of Modbus RTU to a DNP3 data object as below:

Modbus Slave ID	Mapping DNP3 Data Object	Modbus Data Type	Points Mapping	Swap
1	BI	Coil	BI 0 → Coil 1, BI 1 → Coil 2..., BI 15 → Coil 16	None
2	BO	Coil	BO 0 → Coil 1, BO 1 → Coil 2..., BO 15 → Coil 16	None
3	Counter	Register	Counter 0 → Register 1 and 2, Counter 1 → Register 3 and 4	Word
4	AI	Register	AI 0 → Register 1 and 2, AI 1 → Register 3 and 4	Word
5	AO	Register	AO 0 → Register 1, AO 1 → Register 2	None

Add Modbus Command to read/write Modbus RTU Slave as below:

Modbus Commands

[+ Add](#)
[Edit](#)
[Clone](#)
[Delete](#)
[Move](#)

Index	Name	Slave ID	Function	Address / Quantity	Trigger	Poll Interval	Endian Swap
1	ReadBI	1	1	Read address 0, Quantity 16	Cyclic	1000	None
2	ReadBO	2	1	Read address 0, Quantity 16	Cyclic	1000	None
3	WriteBO	2	15	Write address 0, Quantity 16	Data Change	N/A	None
4	ReadCounter	3	3	Read address 0, Quantity 4	Cyclic	1000	Word
5	ReadAI	4	3	Read address 0, Quantity 4	Cyclic	1000	Word
6	ReadAO	5	3	Read address 0, Quantity 2	Cyclic	1000	None
7	WriteAO	5	16	Write address 0, Quantity 2	Data Change	N/A	None

# Moxa Tech Note MGate 5109 with DNP3 SCADA Application

## 3.5. I/O Data Mapping Settings


In the I/O Data Mapping web page, choose the scenario **DNP3 TCP/UDP Master → Modbus RTU/ASCII Slave**. Map **BO 0-15** and **AO 0-1** to **WriteBO** and **WriteAO** commands as below and then submit:


### ⚙️ I/O Data Mapping


Select your scenario DNP3 TCP/UDP Master --> Modbus RTU/ASCII Slave


---


**Modbus Mapping address arrangement** Automatic

  
Your device :  
DNP3 TCP/UDP Master

  
**write**

  
Role 1 of MGate5109 :  
**DNP3 TCP/UDP Outstation**

  
**write**

  
Your device :  
Modbus RTU/ASCII Slave

: Full mapping    : Un-full mapping    : None mapping

Type	Index	Name	Function	Internal Address	Quantity
Binary Output	0 ... 15	WriteBO	15	0 ... 1	2 bytes
Analog Output	0 ... 1	WriteAO	16	2 ... 5	4 bytes

# Moxa Tech Note MGate 5109 with DNP3 SCADA Application


Choose another scenario: **Modbus RTU/ASCII Slave → DNP3 TCP/UDP Master**. Map **BI 0-15, BO 0-15, Counter 0-1, AI 0-1** and **AO 0-1** to **ReadBI, ReadBO, ReadCounter, ReadAI** and **ReadAO** as below and then submit:

## I/O Data Mapping


Select your scenario: DNP3 TCP/UDP Master <-- Modbus RTU/ASCII Slave

---


Modbus Mapping address arrangement: Automatic




Your device :  
DNP3 TCP/UDP Master



**Role 1 of MGate5109 :**  
DNP3 TCP/UDP Outstation



**Role 2 of MGate5109 :**  
Modbus RTU/ASCII Master



Your device :  
Modbus RTU/ASCII Slave

Full mapping    Un-full mapping    None mapping

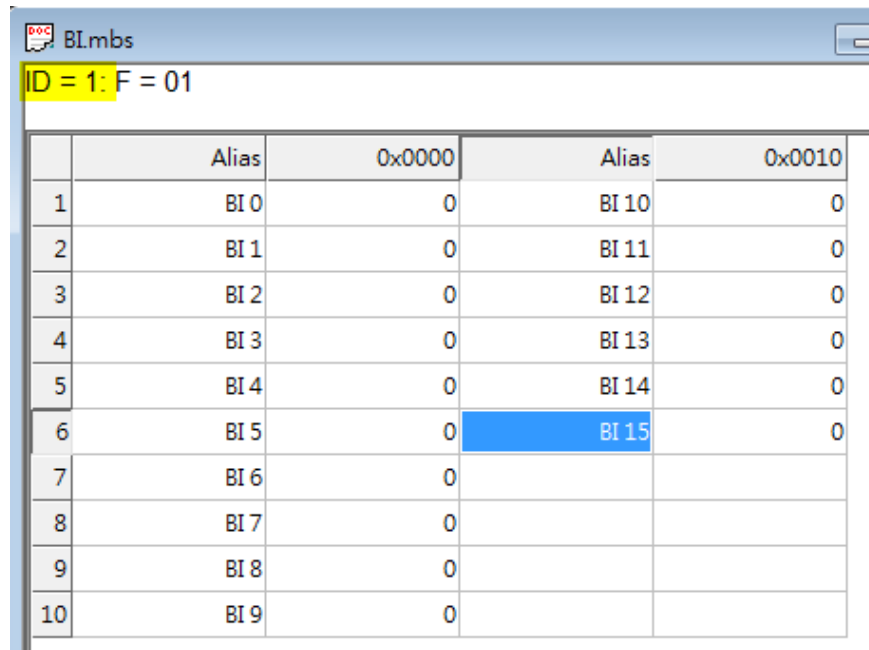
Type	Index	Name	Function	Internal Address	Quantity
Binary Input	0 ... 15	ReadBI	1	0 ... 1	2 bytes
Binary Output	0 ... 15	ReadBO	1	2 ... 3	2 bytes
Counter	0 ... 1	ReadCounter	3	4 ... 11	8 bytes
Analog Input	0 ... 1	ReadAI	3	12 ... 19	8 bytes
Analog Output	0 ... 1	ReadAO	3	20 ... 23	4 bytes

Make sure all of the DNP3 object points are mapping to Modbus-command quantities equally.

## 4. Modbus Slave Setting

PC2 runs **Modbus Slave** and connects to the MGate 5109's serial port. Add the Modbus definition as below:

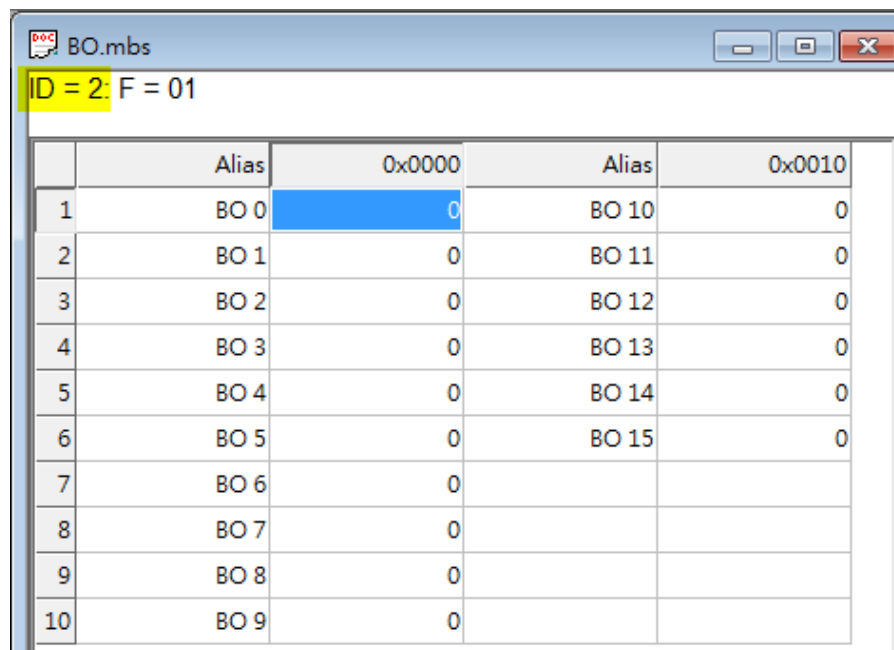
### BI Definition, Slave ID 1:



The screenshot shows a window titled "BI.mbs" with a yellow highlight on "ID = 1: F = 01". Below the title bar is a table with 10 rows and 5 columns. The columns are labeled "Alias", "0x0000", "Alias", and "0x0010". The rows contain binary input (BI) definitions from BI 0 to BI 15. The value "0" is present in the "0x0000" column for all rows, and "0" is present in the "0x0010" column for all rows. The row for BI 15 is highlighted in blue.

	Alias	0x0000	Alias	0x0010
1	BI 0	0	BI 10	0
2	BI 1	0	BI 11	0
3	BI 2	0	BI 12	0
4	BI 3	0	BI 13	0
5	BI 4	0	BI 14	0
6	BI 5	0	BI 15	0
7	BI 6	0		
8	BI 7	0		
9	BI 8	0		
10	BI 9	0		

### BO Definition, Slave ID 2:

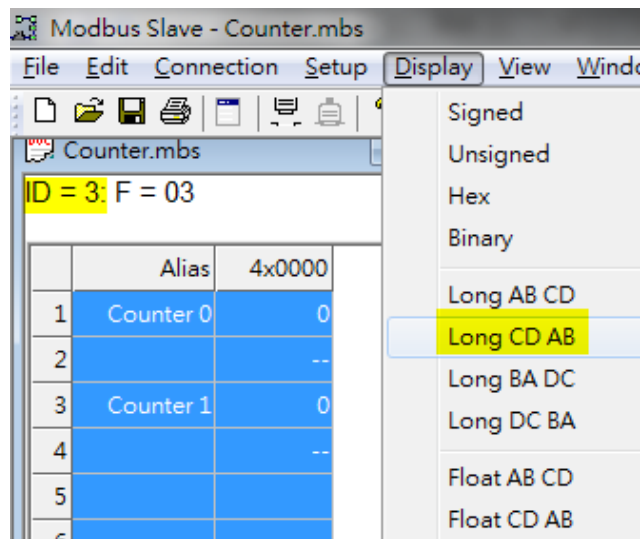


The screenshot shows a window titled "BO.mbs" with a yellow highlight on "ID = 2: F = 01". Below the title bar is a table with 10 rows and 5 columns. The columns are labeled "Alias", "0x0000", "Alias", and "0x0010". The rows contain binary output (BO) definitions from BO 0 to BO 15. The value "0" is present in the "0x0000" column for all rows, and "0" is present in the "0x0010" column for all rows. The row for BO 0 is highlighted in blue.

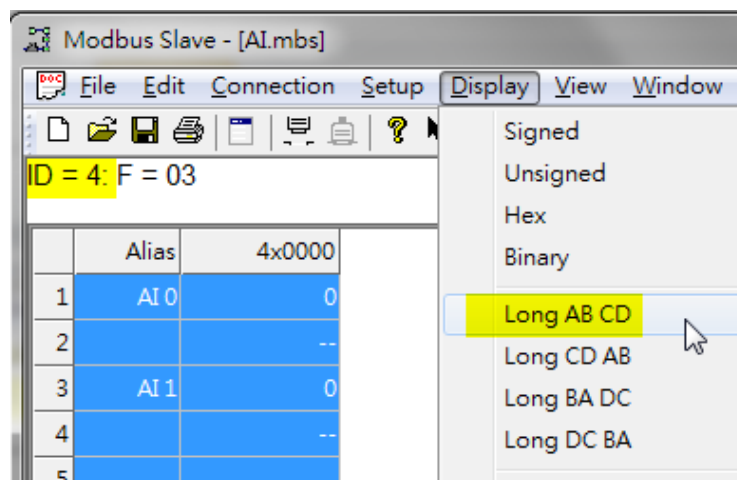
	Alias	0x0000	Alias	0x0010
1	BO 0	0	BO 10	0
2	BO 1	0	BO 11	0
3	BO 2	0	BO 12	0
4	BO 3	0	BO 13	0
5	BO 4	0	BO 14	0
6	BO 5	0	BO 15	0
7	BO 6	0		
8	BO 7	0		
9	BO 8	0		
10	BO 9	0		

# Moxa Tech Note MGate 5109 with DNP3 SCADA Application

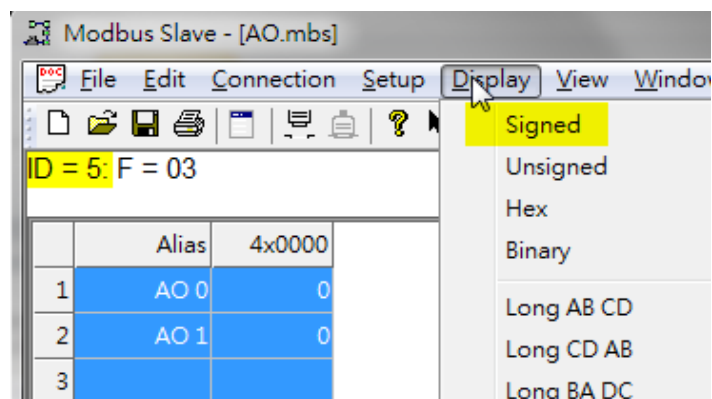
## Counter Definition , Slave ID 3:



## AI Definition , Slave ID 4:

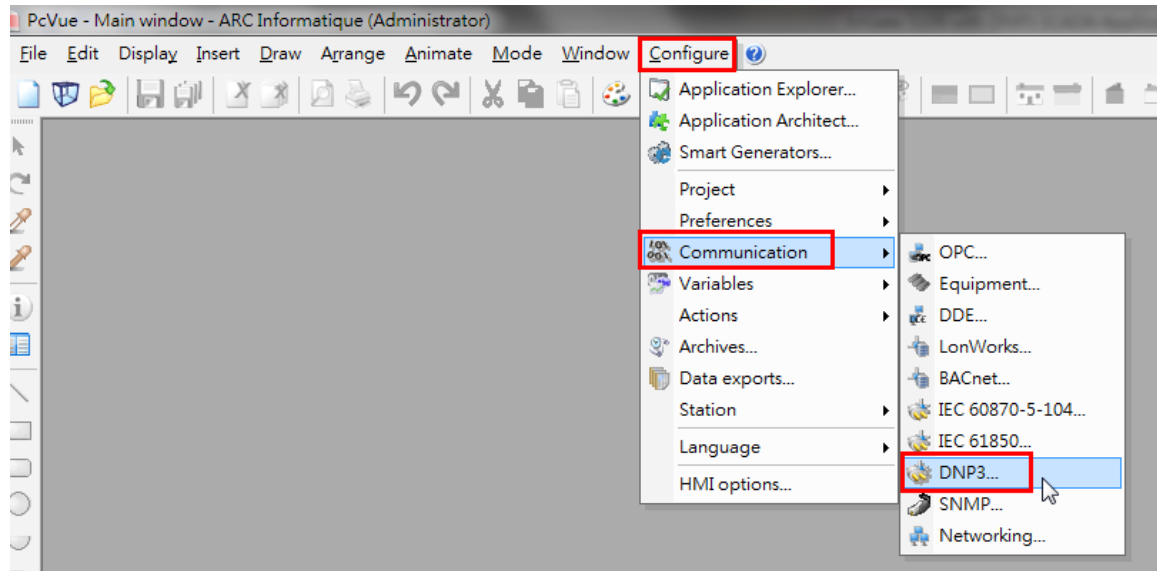


## AO Definition , Slave ID 5:

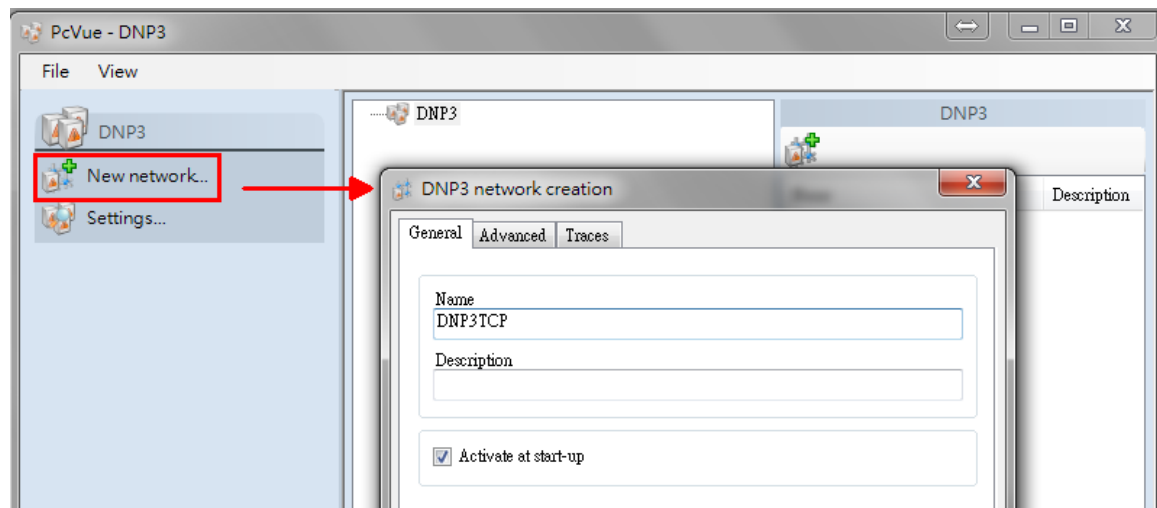


## 5. PcVue Setting

PC1 runs PcVue. Click **Configure->Communication->DNP3** to set DNP3 communications.

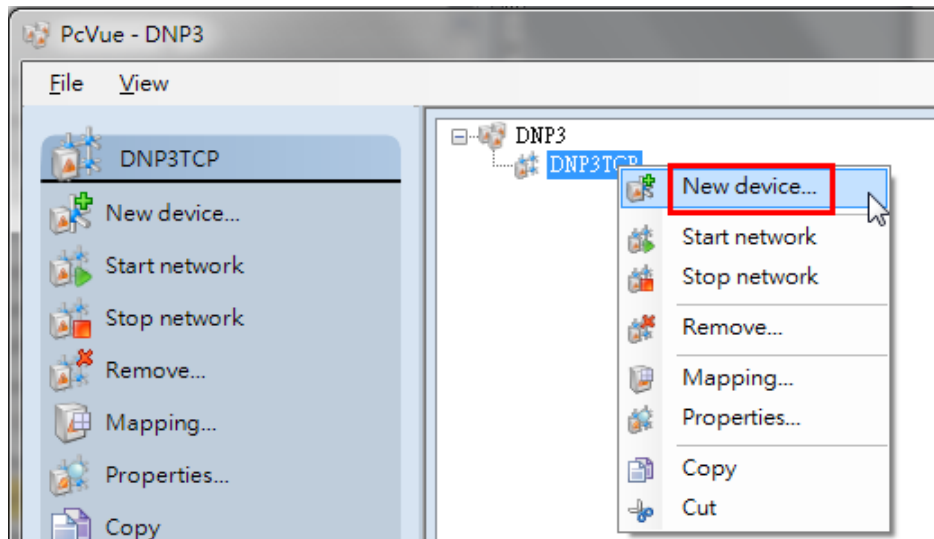


Click **New network** to add a DNP3 TCP network.

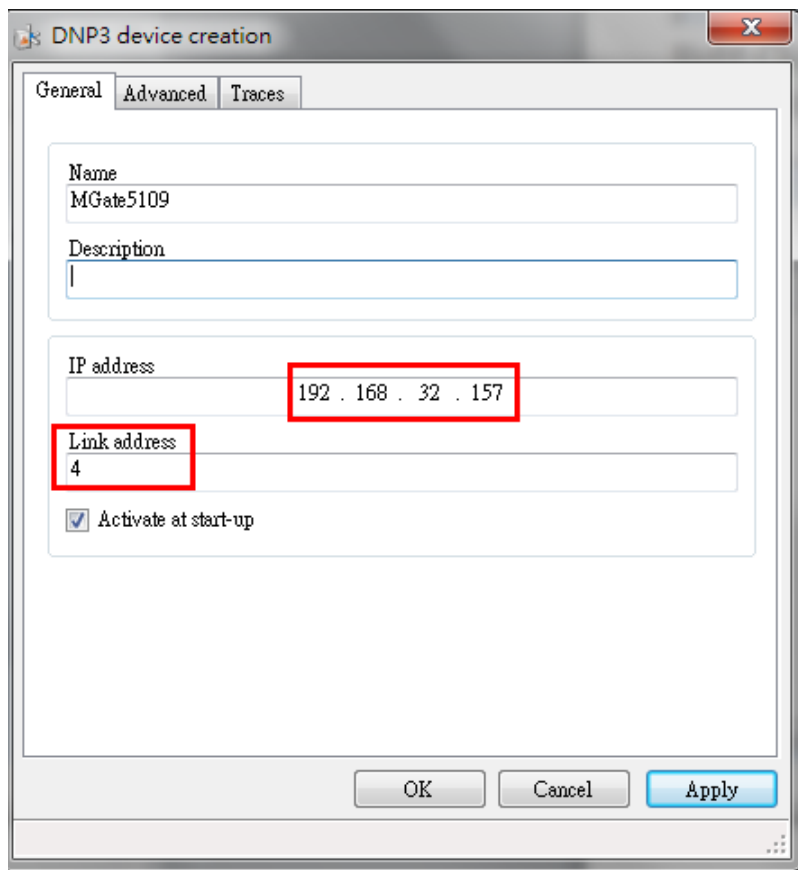


## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Right-click this network to add **New device**.

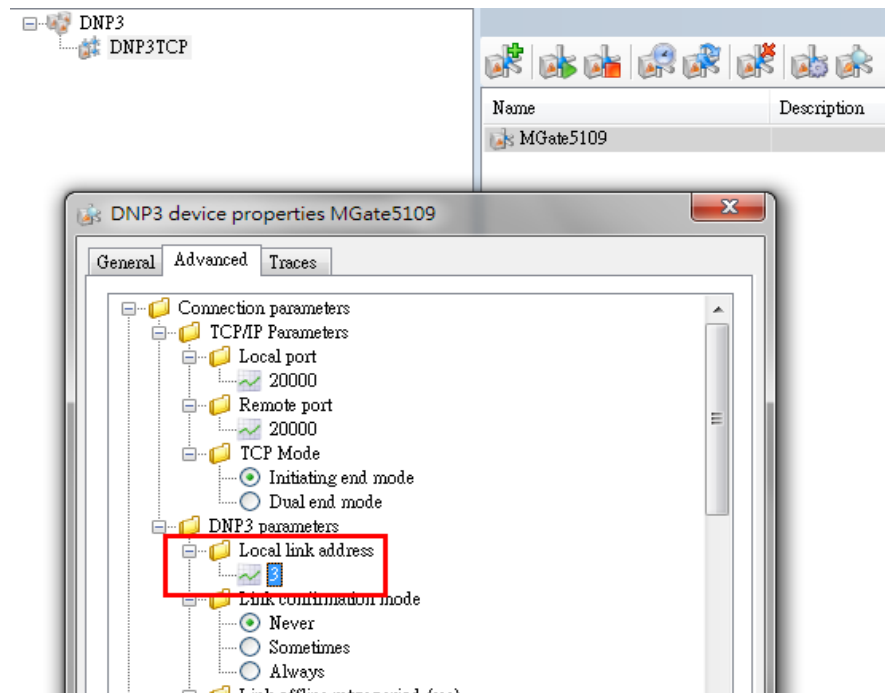


Input MGate 5109's IP in **IP address** field. Set **Link address** as **4**.

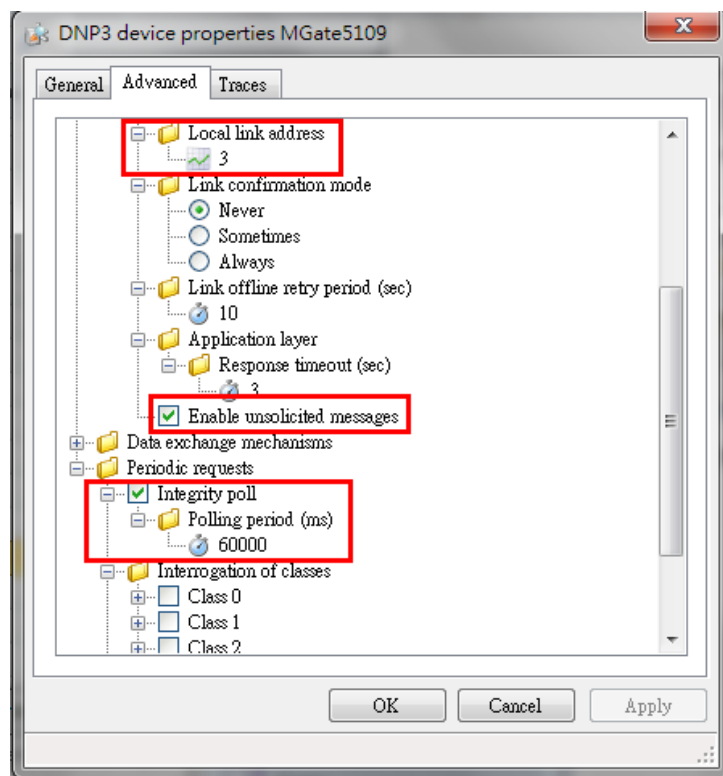


## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Change **Local link address** to **3** in the **Advanced** tab.



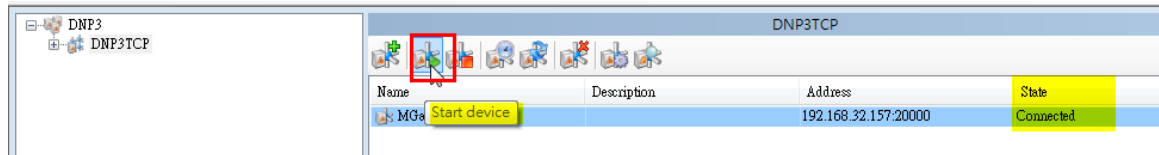
Click **Enable Unsolicited Message** and set the **Polling period** under **Integrity Poll** at **60000ms**.



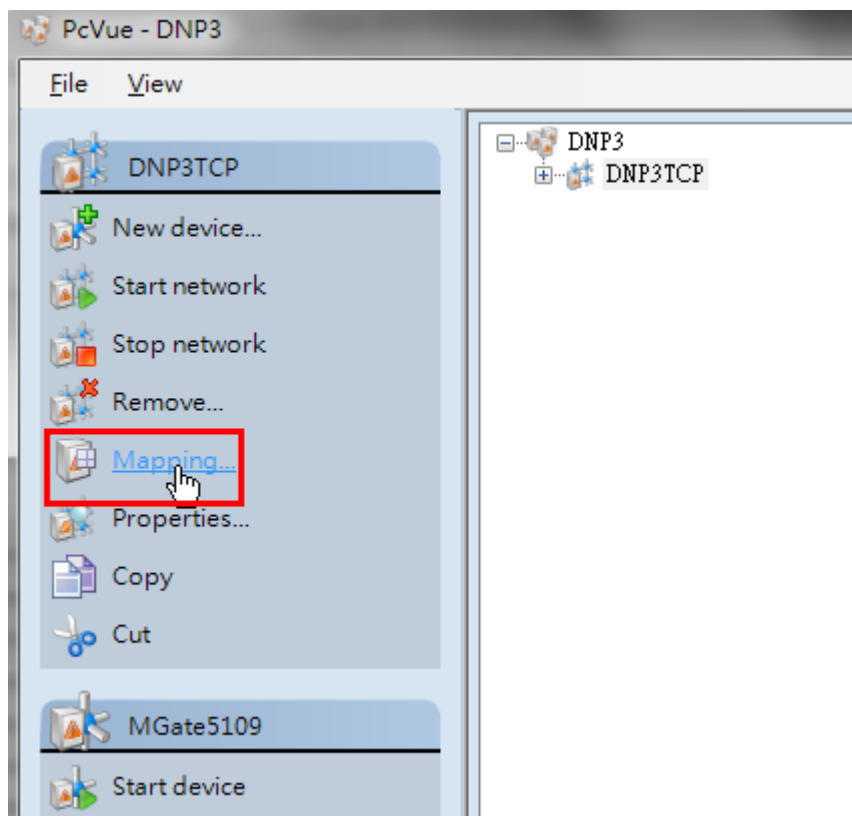


## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Click **Start device**. SCADA will then try to connect to the MGate 5109. If the MGate 5109 is connected, the **State** would show **Connected**.



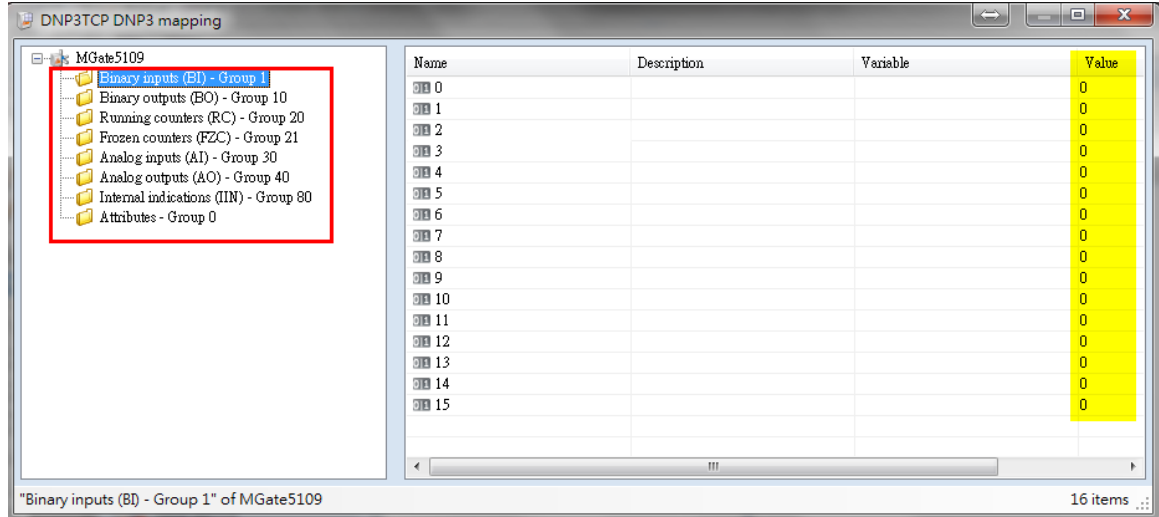
Click **Mapping** for a DNP3 Object Status window to pop up.



## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

See SCADA poll back the MGate 5109's objects, including BI, BO, AI, and AO.

Also see these object points' value.



The screenshot shows the 'DNP3TCP DNP3 mapping' window. On the left, a tree view shows the 'MGate5109' object with several sub-groups. The 'Binary inputs (BI) - Group 1' is highlighted with a red box. On the right, a table displays the mapping for these 16 binary input points. The table has four columns: Name, Description, Variable, and Value. The 'Value' column is highlighted in yellow and shows a value of 0 for all 16 points.

Name	Description	Variable	Value
0			0
1			0
2			0
3			0
4			0
5			0
6			0
7			0
8			0
9			0
10			0
11			0
12			0
13			0
14			0
15			0

"Binary inputs (BI) - Group 1" of MGate5109 16 items

## 6. Communication Test

### 6.1. MGate Protocol Diagnose Introduction

In the MGate 5109 web console, **Protocol Status** diagnoses the protocol status. It includes **I/O Data View** and **DNP3 TCP/UDP Diagnose** as below:

**Main Menu**

- Quick Setup
- Overview
- Basic Settings
- Network Settings
- Serial Settings
- Protocol Settings
  - Protocol Conversion
  - DNP3 TCP/UDP Outstation
  - Modbus RTU/ASCII Master
  - I/O Data Mapping
- System Management
- System Monitoring
  - System Status
  - Protocol Status
  - I/O Data View**
  - DNP3 TCP/UDP Diagnose**
  - Modbus RTU/ASCII Diagnose
  - Modbus RTU/ASCII Traffic

**DNP3 TCP/UDP Outstation Diagnose**

Auto refresh

Outstation Statistics

Received Requests	23
Sent Responses	23
Sent Unsolicited Message	0
Binary Input Event buffer	0
Counter Event buffer	0
Analog Input Event buffer	0
Connected Master IP	192.168.32.143

Point Information

Binary Input

Point Index	Value	Flags
0	OFF	OFFLINI
1	OFF	OFFLINI
2	OFF	OFFLINI
3	OFF	OFFLINI
4	OFF	OFFLINI
5	OFF	OFFLINI
6	OFF	OFFLINI

In the **I/O Data View** web page, select **Data flow direction** to see the IO raw data in **DNP3 TCP/UDP Master-> Modbus RTU/ASCII Slave** or **Modbus RTU/ASCII Slave -> DNP3 TCP/UDP Master**.

### **I/O Data View**

Auto refresh

Data flow direction  DNP3 TCP/UDP Master -> Modbus RTU/ASCII Slave  Start address(Hex)

Internal Address	00	01	02	03	04	05	06	07	08	09
000h	00	00	00	00	00	00	00	00	00	00
0010h	00	00	00	00	00	00	00	00	00	00
0020h	00	00	00	00	00	00	00	00	00	00
0030h	00	00	00	00	00	00	00	00	00	00
0040h	00	00	00	00	00	00	00	00	00	00
0050h	00	00	00	00	00	00	00	00	00	00
0060h	00	00	00	00	00	00	00	00	00	00
0070h	00	00	00	00	00	00	00	00	00	00

In the **DNP3 TCP/UDP Outstation Diagnose** web page, users can monitor the DNP3 Outstation status, including its Data Object Points status.

# Moxa Tech Note MGate 5109 with DNP3 SCADA Application

## ⚙️ DNP3 TCP/UDP Outstation Diagnose

Auto refresh

### Outstation Statistics

Received Requests	27
Sent Responses	27
Sent Unsolicited Message	0
Binary Input Event buffer	0
Counter Event buffer	0
Analog Input Event buffer	0
Connected Master IP	192.168.32.143

### Point Information

Binary Input

Point Index	Value	Flags	Time Updated
0	OFF	OFFLINE	N/A
1	OFF	OFFLINE	N/A
2	OFF	OFFLINE	N/A
3	OFF	OFFLINE	N/A
4	OFF	OFFLINE	N/A
5	OFF	OFFLINE	N/A
6	OFF	OFFLINE	N/A

## 6.2. DNP3 Connection Status

Check **System Monitoring** → **Protocol Status** → **DNP3 TCP/UDP Diagnose**, and make sure **Connected Master IP** is PC1.

## ⚙️ DNP3 TCP/UDP Outstation Diagnose

Auto refresh

### Outstation Statistics

Received Requests	27
Sent Responses	27
Sent Unsolicited Message	0
Binary Input Event buffer	0
Counter Event buffer	0
Analog Input Event buffer	0
Connected Master IP	192.168.32.143

### Point Information

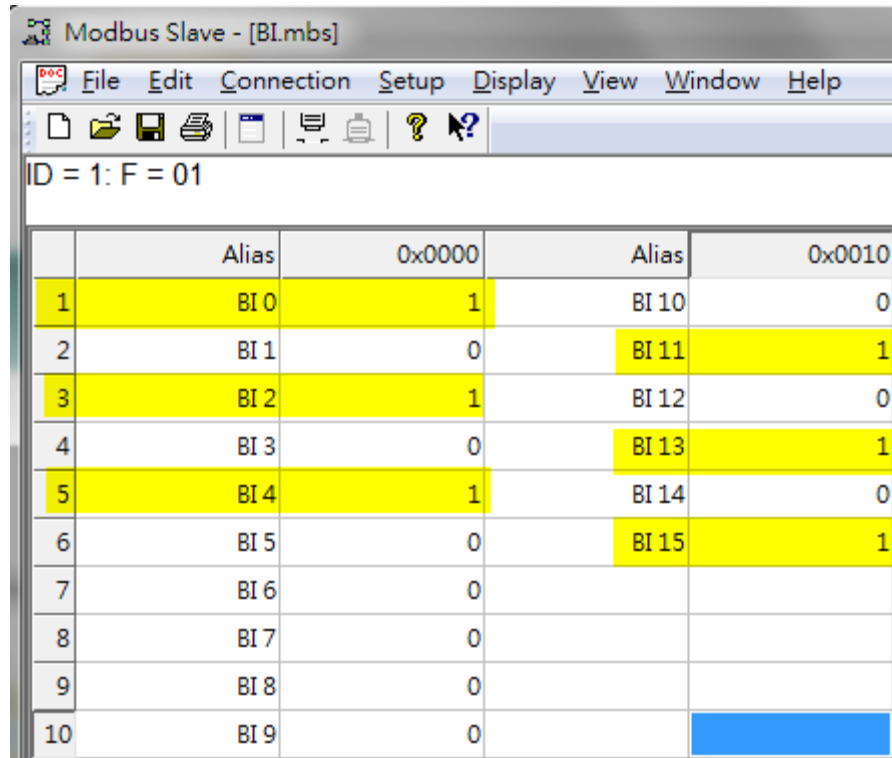
Binary Input

Point Index	Value	Flags	Time Updated
0	OFF	OFFLINE	N/A
1	OFF	OFFLINE	N/A
2	OFF	OFFLINE	N/A
3	OFF	OFFLINE	N/A
4	OFF	OFFLINE	N/A
5	OFF	OFFLINE	N/A
6	OFF	OFFLINE	N/A

# Moxa Tech Note MGate 5109 with DNP3 SCADA Application

## 6.3. Read BI Test

Change Modbus Slave ID 1's Alias BI 0, 2, 4, 11, 13, 15 status to **On** as below:



The screenshot shows a window titled "Modbus Slave - [BI.mbs]". Below the menu bar (File, Edit, Connection, Setup, Display, View, Window, Help) and a toolbar, the text "ID = 1: F = 01" is displayed. A table lists binary inputs with columns for Index, Alias, and Value (0x0000 and 0x0010).

	Alias	0x0000	Alias	0x0010
1	BI 0	1	BI 10	0
2	BI 1	0	BI 11	1
3	BI 2	1	BI 12	0
4	BI 3	0	BI 13	1
5	BI 4	1	BI 14	0
6	BI 5	0	BI 15	1
7	BI 6	0		
8	BI 7	0		
9	BI 8	0		
10	BI 9	0		

Check the following's status in MGate DNP3 TCP/UDP Diagnose page:

Point Information

Binary Input

Point Index	Value	Flags	Time Updated
0	ON	ONLINE	2017-01-05 17:50:55
1	OFF	ONLINE	2017-01-05 17:50:55
2	ON	ONLINE	2017-01-05 17:50:55
3	OFF	ONLINE	2017-01-05 17:50:55
4	ON	ONLINE	2017-01-05 17:50:55
5	OFF	ONLINE	2017-01-05 17:50:55
6	OFF	ONLINE	2017-01-05 17:50:55
7	OFF	ONLINE	2017-01-05 17:50:55
8	OFF	ONLINE	2017-01-05 17:50:55
9	OFF	ONLINE	2017-01-05 17:50:55
10	OFF	ONLINE	2017-01-05 17:50:55
11	ON	ONLINE	2017-01-05 17:50:55
12	OFF	ONLINE	2017-01-05 17:50:55
13	ON	ONLINE	2017-01-05 17:50:55
14	OFF	ONLINE	2017-01-05 17:50:55
15	ON	ONLINE	2017-01-05 17:50:55

# Moxa Tech Note MGate 5109 with DNP3 SCADA Application

## MGate IO Dataview:

### I/O Data View

Auto refresh

BI 7 6 5 4 3 2 1 0    BI 15 14 13 12 11 10 9 8  
 00010101            1 0 1 0 1 0 0 0

Data flow direction: DNP3 TCP/DNP Master <-- Modbus RTU/ASCII Slave
Start address(Hex)

Internal Address	00	01	02	03	04	05	06	07	08
0000h	15	A8	00	00	00	00	00	00	00
0010h	00	00	00	00	00	00	00	00	00
0020h	00	00	00	00	00	00	00	00	00

## PcVue SCADA BI Status

DNP3TCP DNP3 mapping

MGate5109

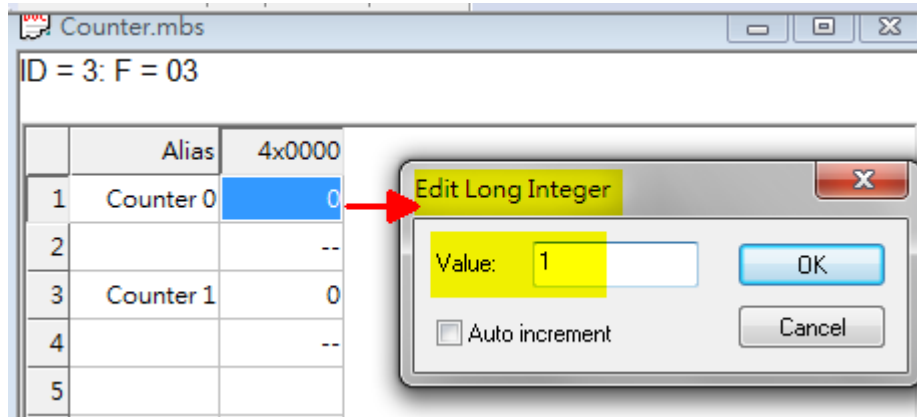
- Binary inputs (BI) - Group 1
- Binary outputs (BO) - Group 10
- Running counters (RC) - Group 20
- Frozen counters (FZC) - Group 21
- Analog inputs (AI) - Group 30
- Analog outputs (AO) - Group 40
- Internal indications (IIN) - Group 80
- Attributes - Group 0

Name	Description	Value
01 0		1
01 1		0
01 2		1
01 3		0
01 4		1
01 5		0
01 6		0
01 7		0
01 8		0
01 9		0
01 10		0
01 11		1
01 12		0
01 13		1
01 14		0
01 15		1

# Moxa Tech Note MGate 5109 with DNP3 SCADA Application

## 6.4. Read Counter Test

Change Modbus Slave ID 3's Alias Counter 0's status to 1 and Counter 1's status to 2 as below:



Check the following's status:

Point Information

Counter ▼

Point Index	Value	Flags	Time Updated
0	1	ONLINE	2017-01-05 18:48:23
1	2	ONLINE	2017-01-05 18:48:23

### MGate IO Dataview:

Data flow direction: DNP3 TCP/UDP Master <-- Modbus RTU/ASCII Slave

Counter 0 Start address(Hex)  Counter 1 Length 128

Internal Address	00	01	02	03	04	05	06	07	08	09	0A	0B
0000h	15	A8	00	00	00	01	00	00	00	02	00	00
0010h	61	4E	00	BC	00	00	00	00	00	00	00	00

### PcVue SCADA Counter Status:

DNP3TCP DNP3 mapping

MGate5109

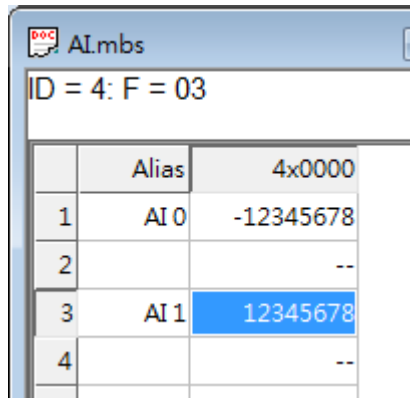
- Binary inputs (BI) - Group 1
- Binary outputs (BO) - Group 10
- Running counters (RC) - Group 20
- Frozen counters (FZC) - Group 21
- Analogue inputs (AI) - Group 30

Name	Description	Variable	Value
0			1
1			2

# Moxa Tech Note MGate 5109 with DNP3 SCADA Application

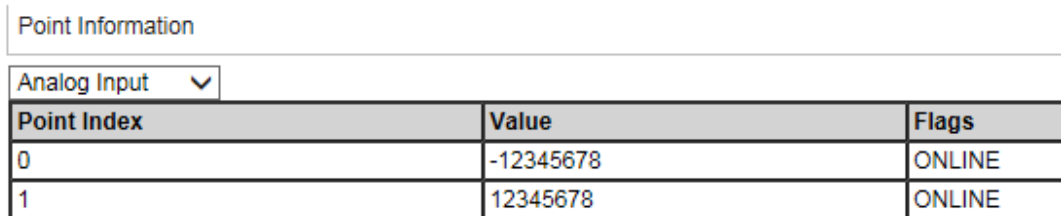
## 6.5. Read AI Test

Modify Modbus Slave ID 3's Alias AI 0 status to **-12345678** and AI 1 status to **12345678** as below:



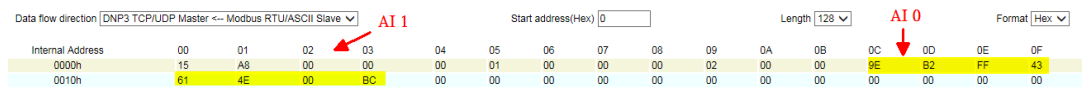
	Alias	4x0000
1	AI 0	-12345678
2		--
3	AI 1	12345678
4		--

Check the following's status:



Point Index	Value	Flags
0	-12345678	ONLINE
1	12345678	ONLINE

### MGate IO Dataview:



Data flow direction: DNP3 TCP/UDP Master ← Modbus RTU/ASCII Slave

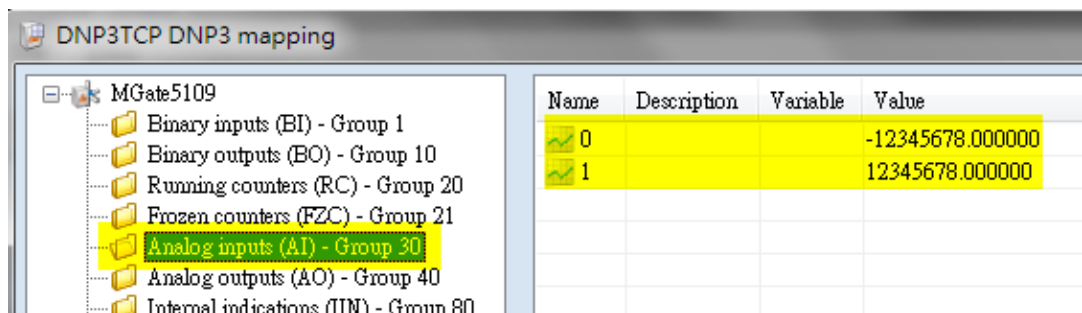
Start address (Hex): 0

Length: 128

Format: Hex

Internal Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
0000h	15	A8	00	00	00	01	00	00	00	00	02	00	9E	B2	FF	43
0010h	61	4E	00	BC	00	00	00	00	00	00	00	00	00	00	00	00

### PcVue SCADA AI Status:



Name	Description	Variable	Value
0			-12345678.000000
1			12345678.000000

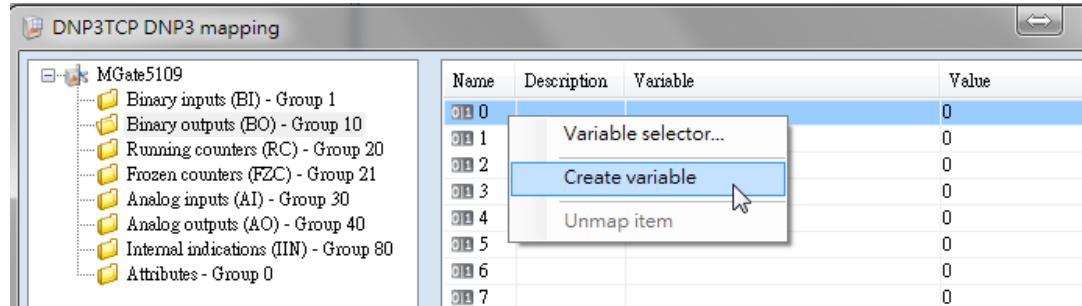
If we change the status of Modbus Slave ID 3's Register 3 and 4 (AI 1) to 1, it wouldn't generate an event because its deadband is 10. SCADA's AI 1 must wait for the next Integrated Poll (interval is 60000ms) to update its value.



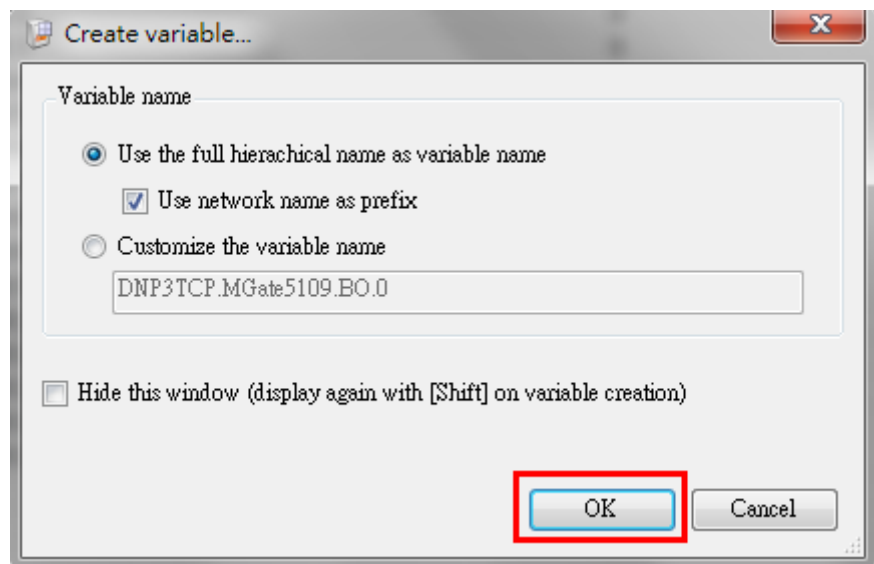
# Moxa Tech Note MGate 5109 with DNP3 SCADA Application

## 6.6. Write BO and AO Test

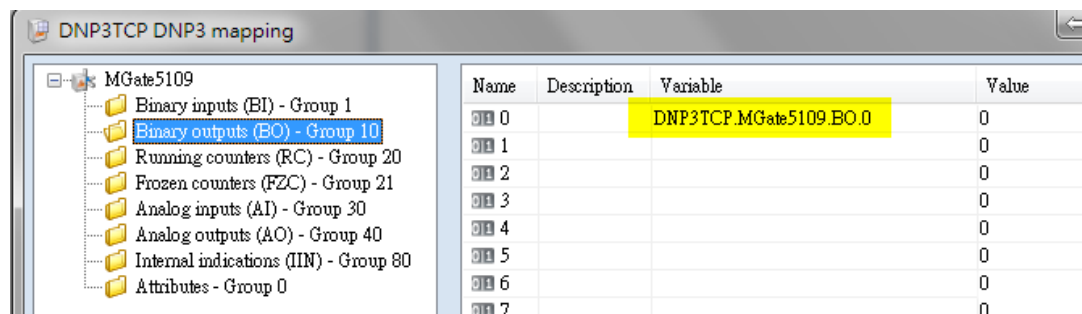
In **DNP3TCP DNP3 mapping**, right-click on BO 0 to set **Create variable**.



Use the default setting and click **OK**.

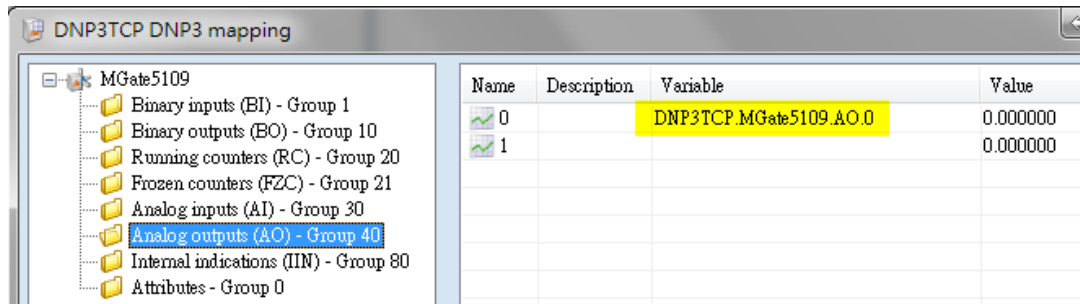


BO 0 will map to this variable.



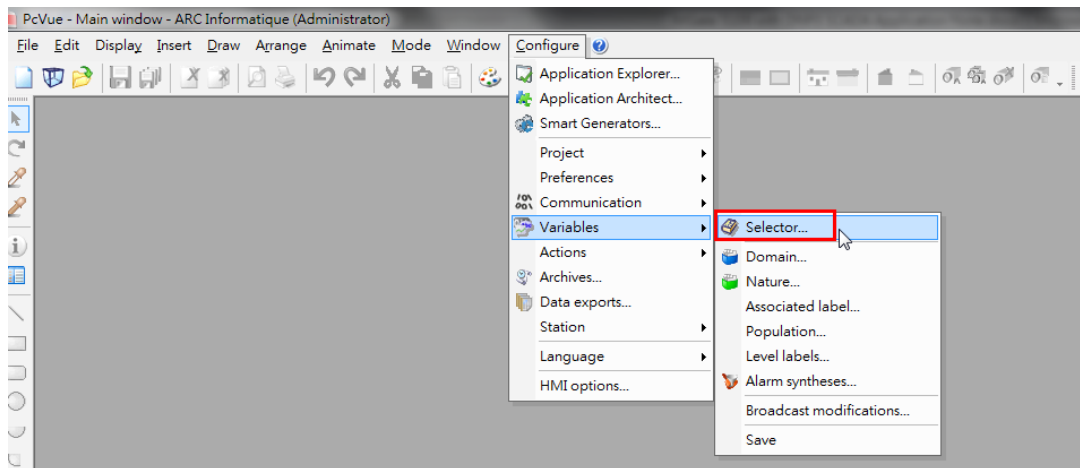
## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Use the same method to create the AO 0 variable as below:

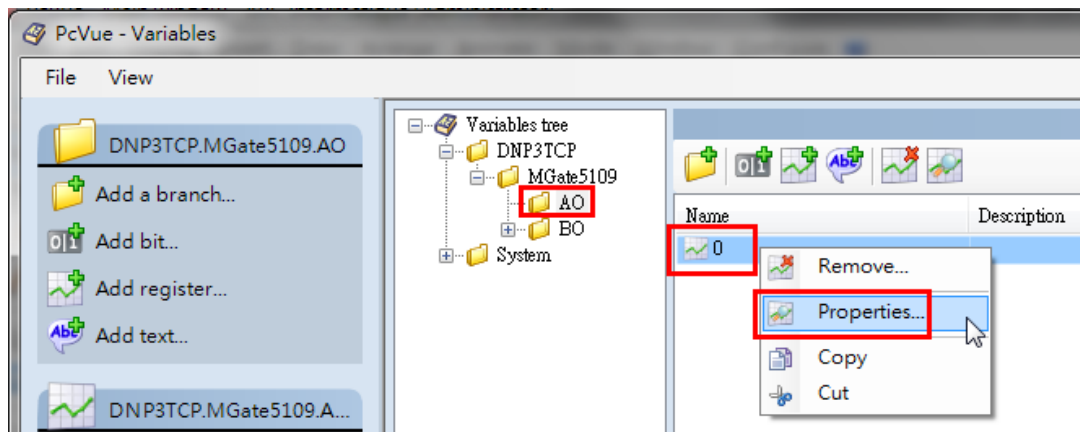


Name	Description	Variable	Value
0		DNP3TCP.MGate5109.AO.0	0.000000
1			0.000000

In PcVue **Main window**, click **Configure** → **Variables** → **Selector**.

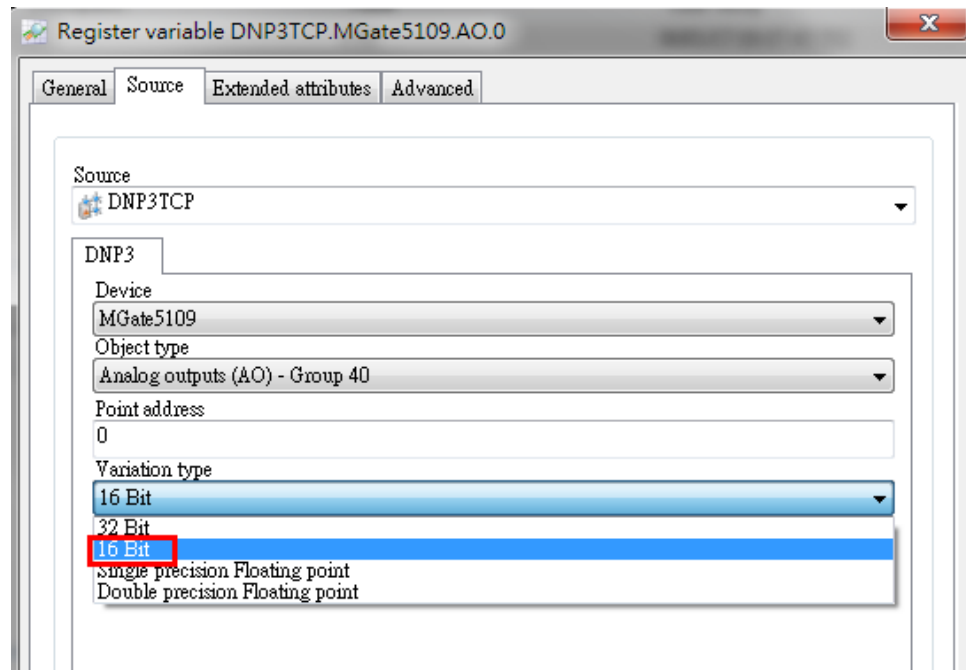


Click the AO 0 variable **Properties** to edit:



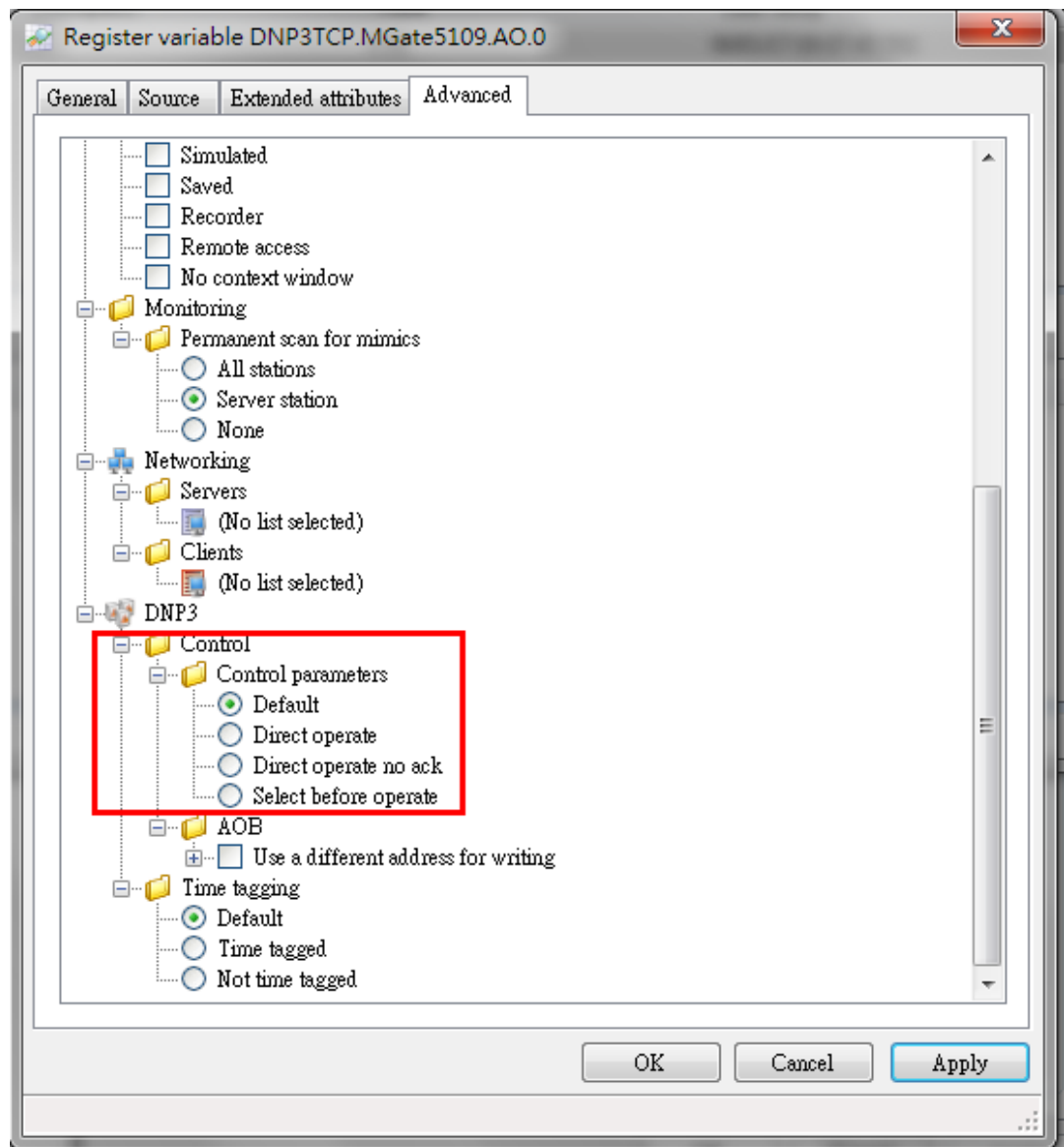
## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Because the MGate 5109 only supports **DNP3 Level2**, the AO **variation type** should select **16 Bit** under the **Source** tab.



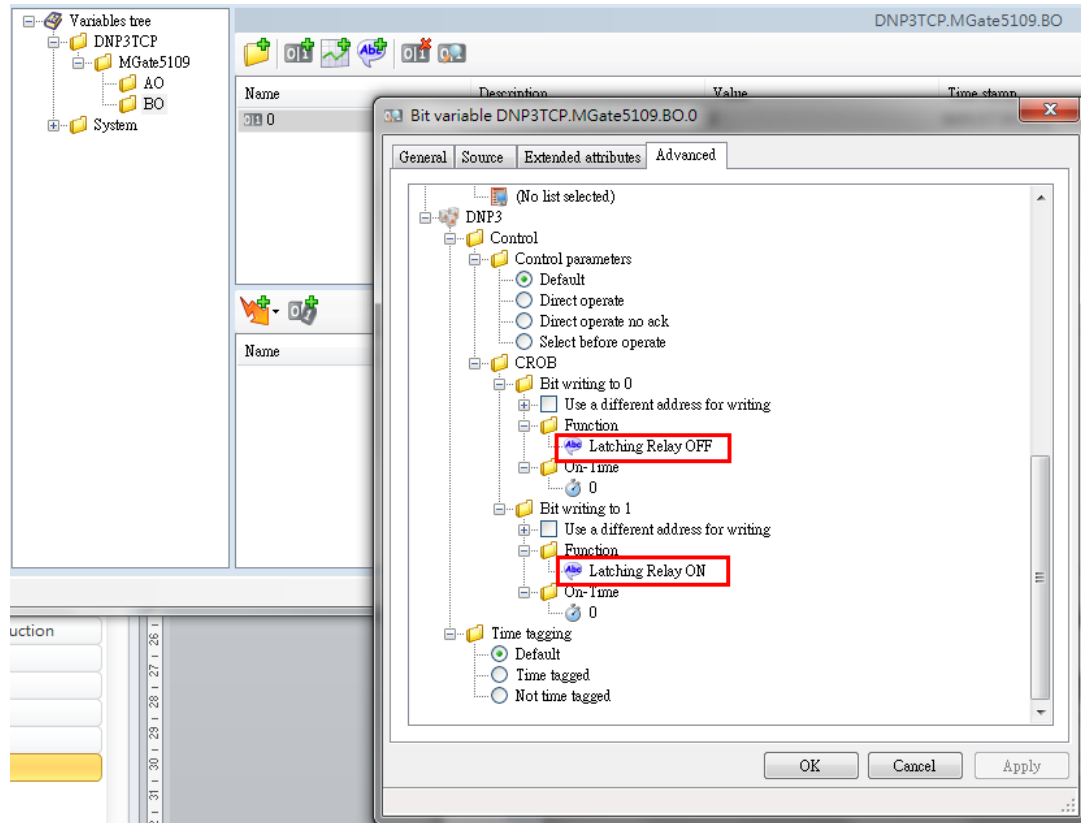
## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Under the **Advanced** tab, configure the **Control** parameters as below:

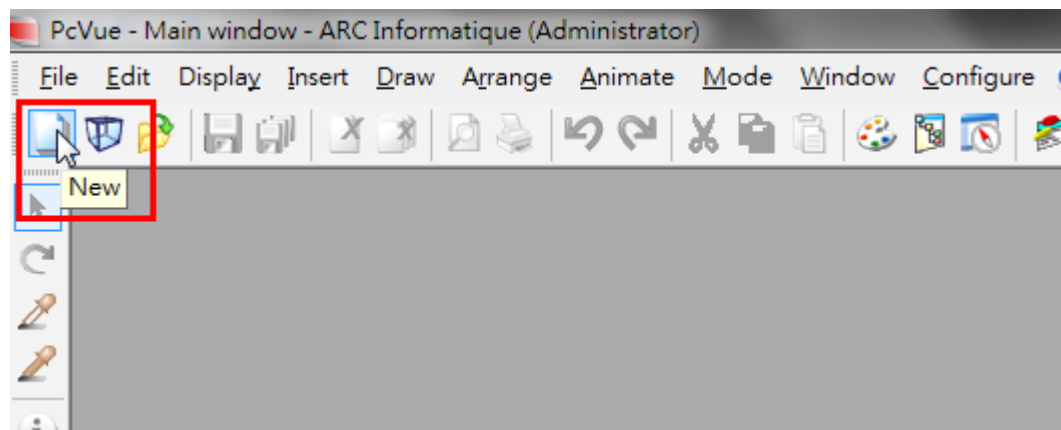


## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Under BO 0 variable's advanced setting, select the **CROB** parameter. Use **Latching Relay ON** and **Latching Relay OFF**.

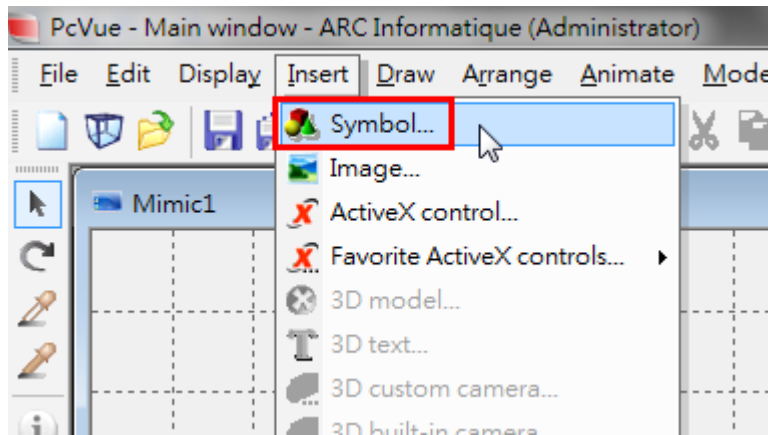


Under the **PcVue Main window**, click **New** to create a new **Mimic**. Mimic is PcVue's HMI graphic object.

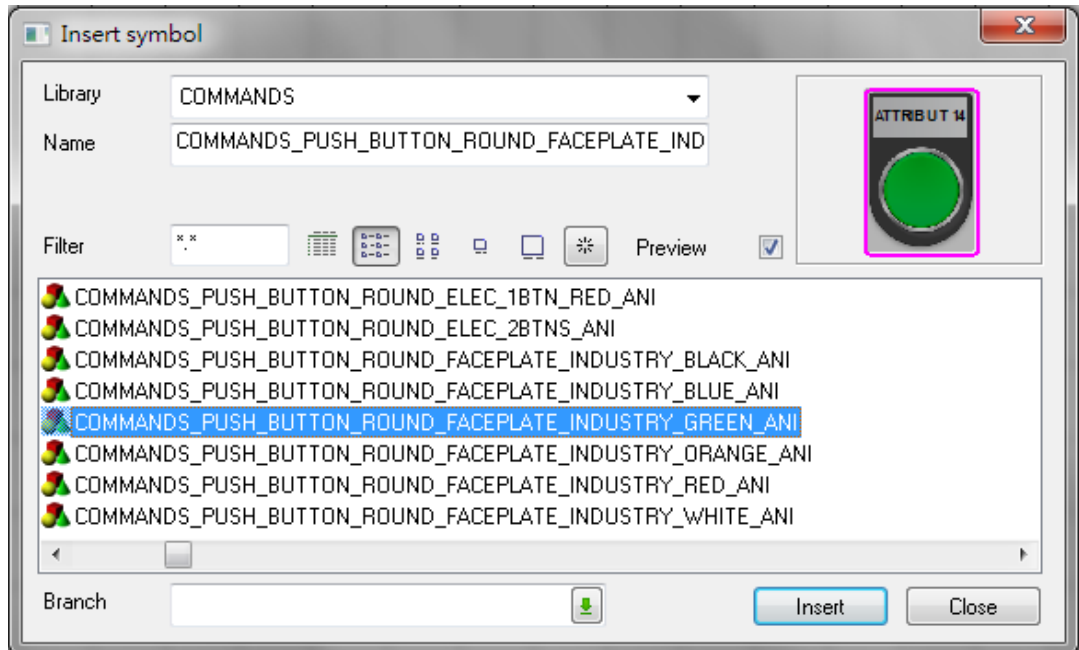


## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Click **Insert** → **Symbol**.

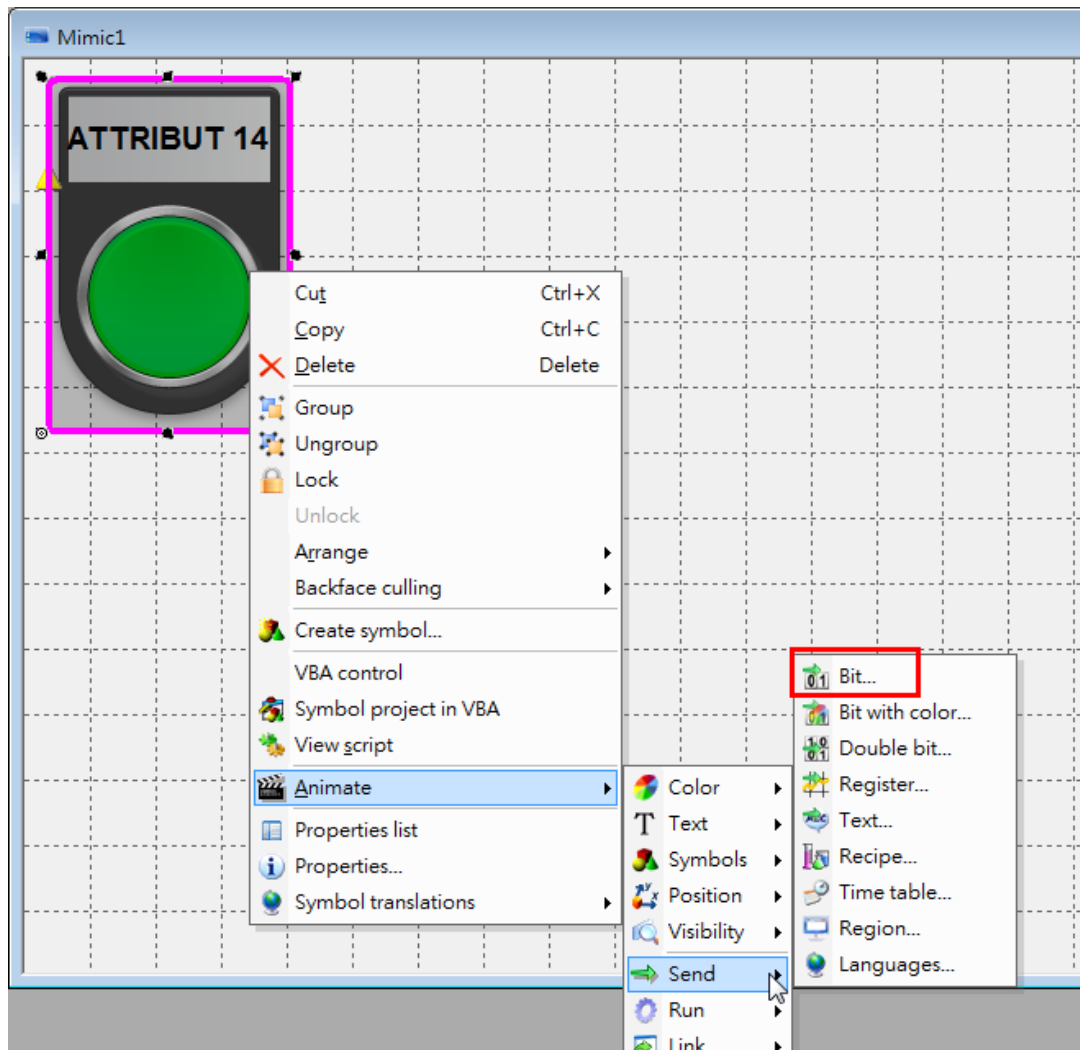


Choose a button symbol.



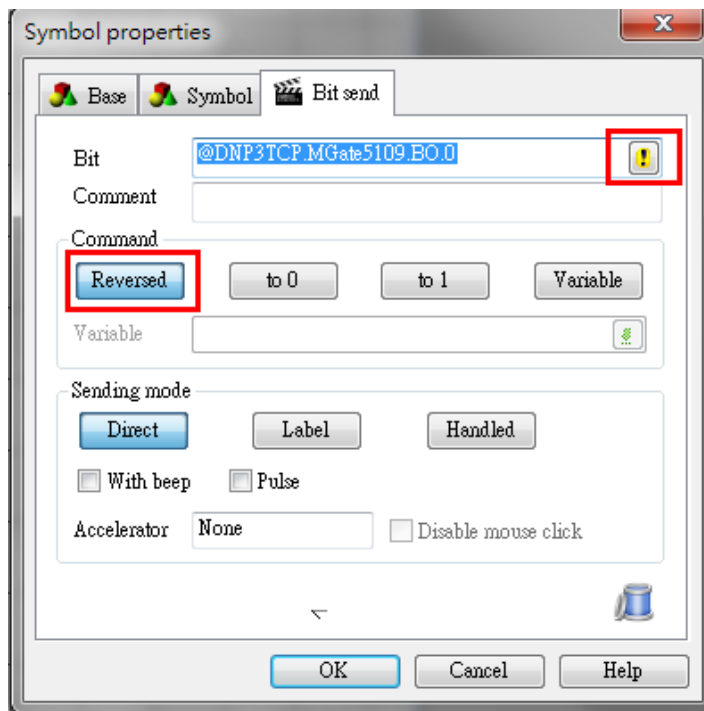
## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Right-click this symbol, then click **Animate** → **Send** → **Bit**

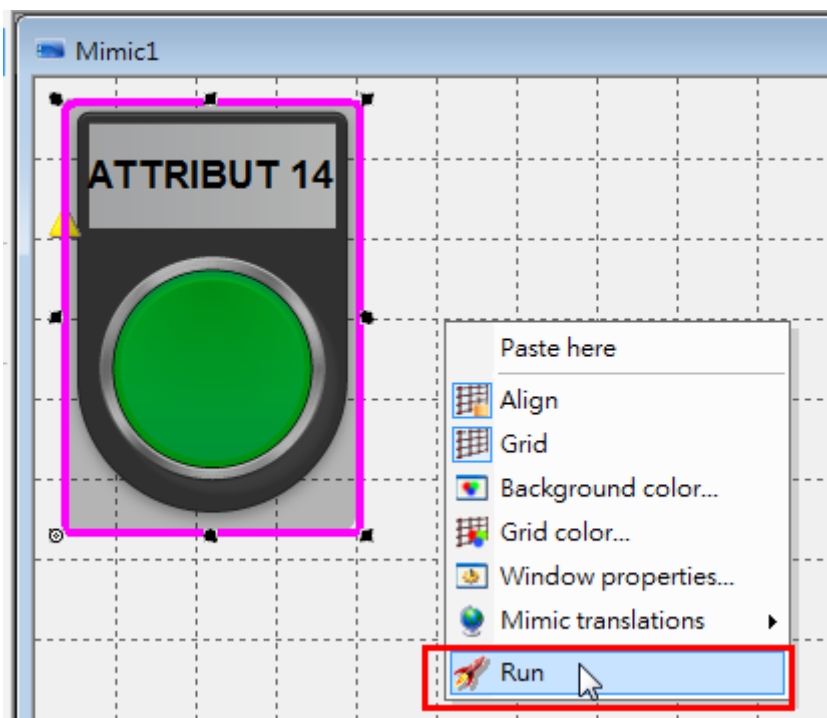


## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Set BO 0's variable in the **Bit** field. Under **Command type**, select **Reversed**.



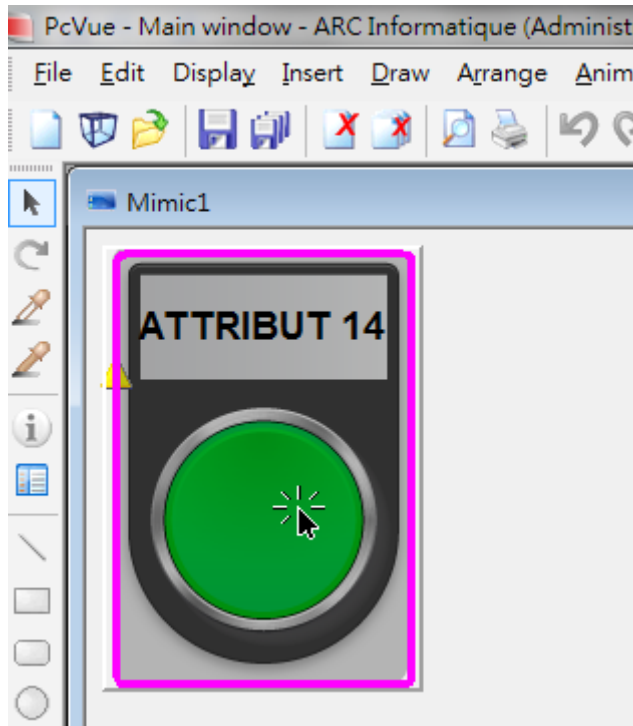
Right-click on **Mimic** to execute **Run** mode.





## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

If you click this BO 0 button; it would write BO 0 **On**. Because this object command type is **Reversed**, click it again so that it would write BO 0 **Off**.



### MGate DNP3 Diagnose:

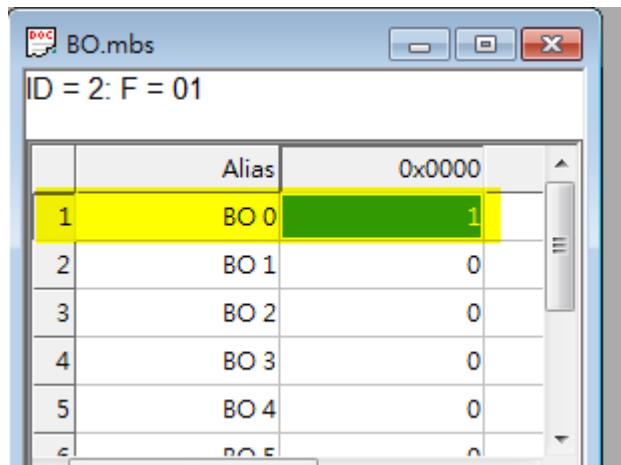
Point Information

Binary Output ▾

Point Index	Value	Flags	Time Updated
0	ON	ONLINE	2017-01-06 13:32:43
1	OFF	ONLINE	2017-01-06 13:32:43
2	OFF	ONLINE	2017-01-06 13:32:43
3	OFF	ONLINE	2017-01-06 13:32:43

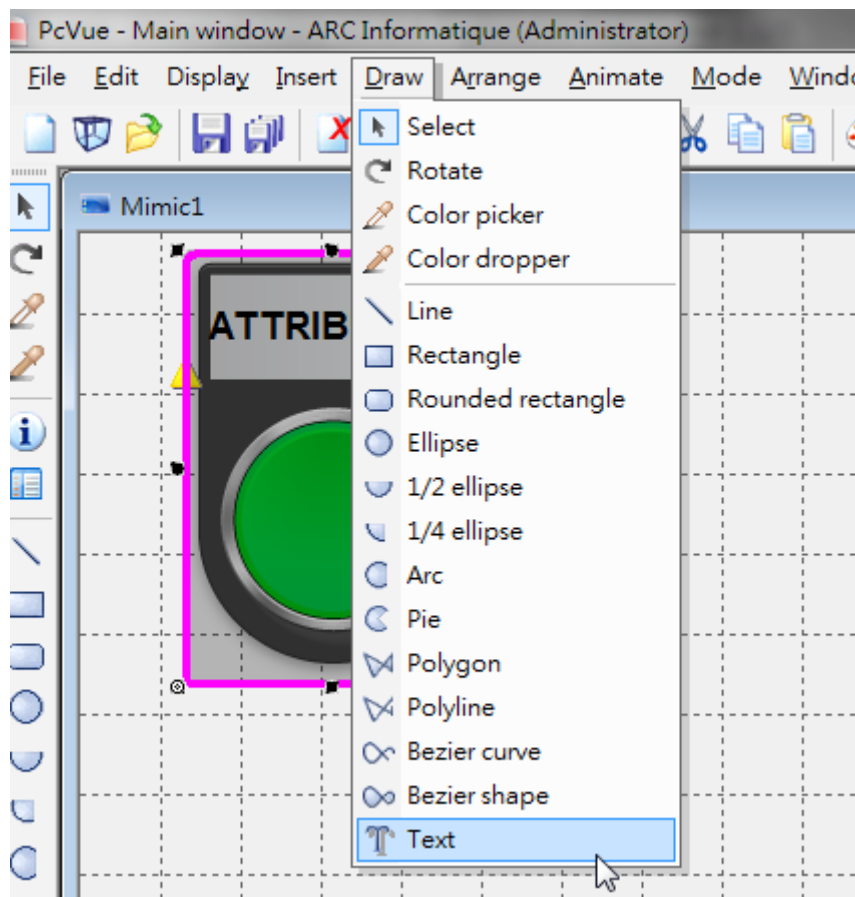
## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

### Modbus Slave-BO:



	Alias	0x0000
1	BO 0	1
2	BO 1	0
3	BO 2	0
4	BO 3	0
5	BO 4	0
6	BO 5	0

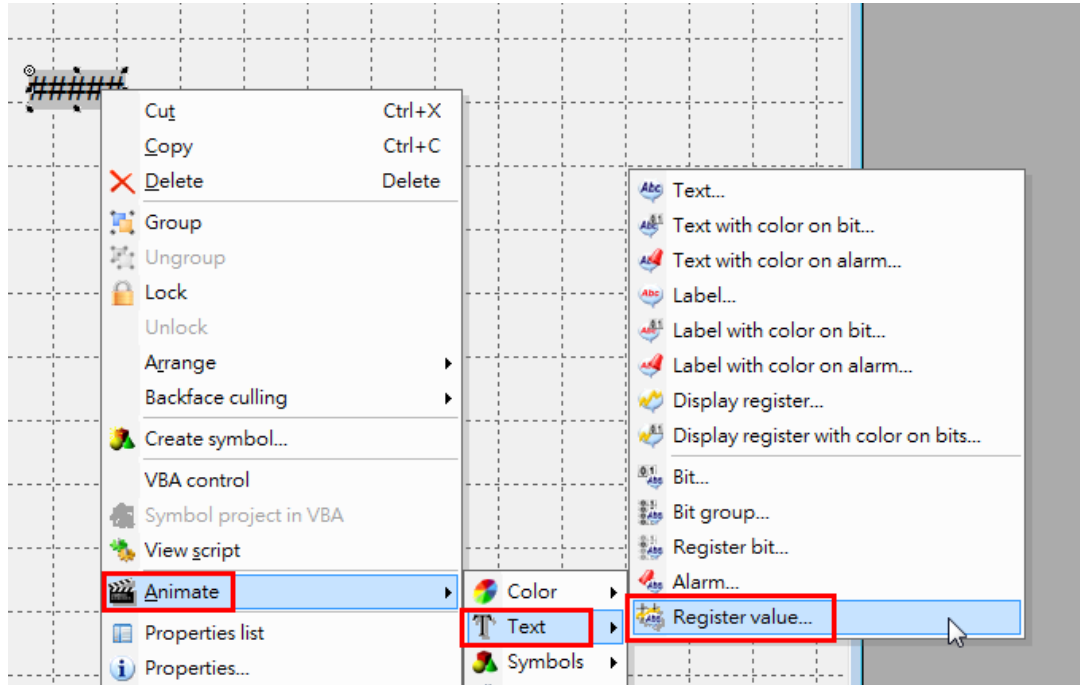
Return to **Edit** mode. Click **Draw** → **Text**.



## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

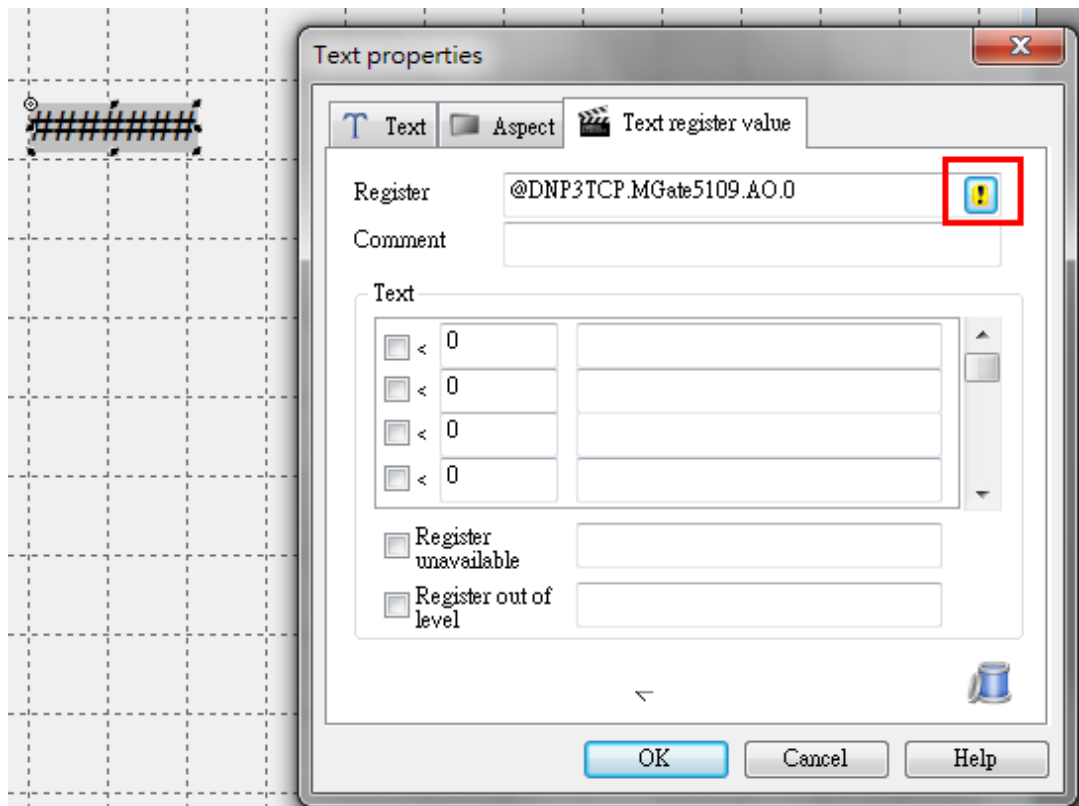
Input text as "#####".

Right-click this text object, click **Animate** → **Text** → **Register Value**.



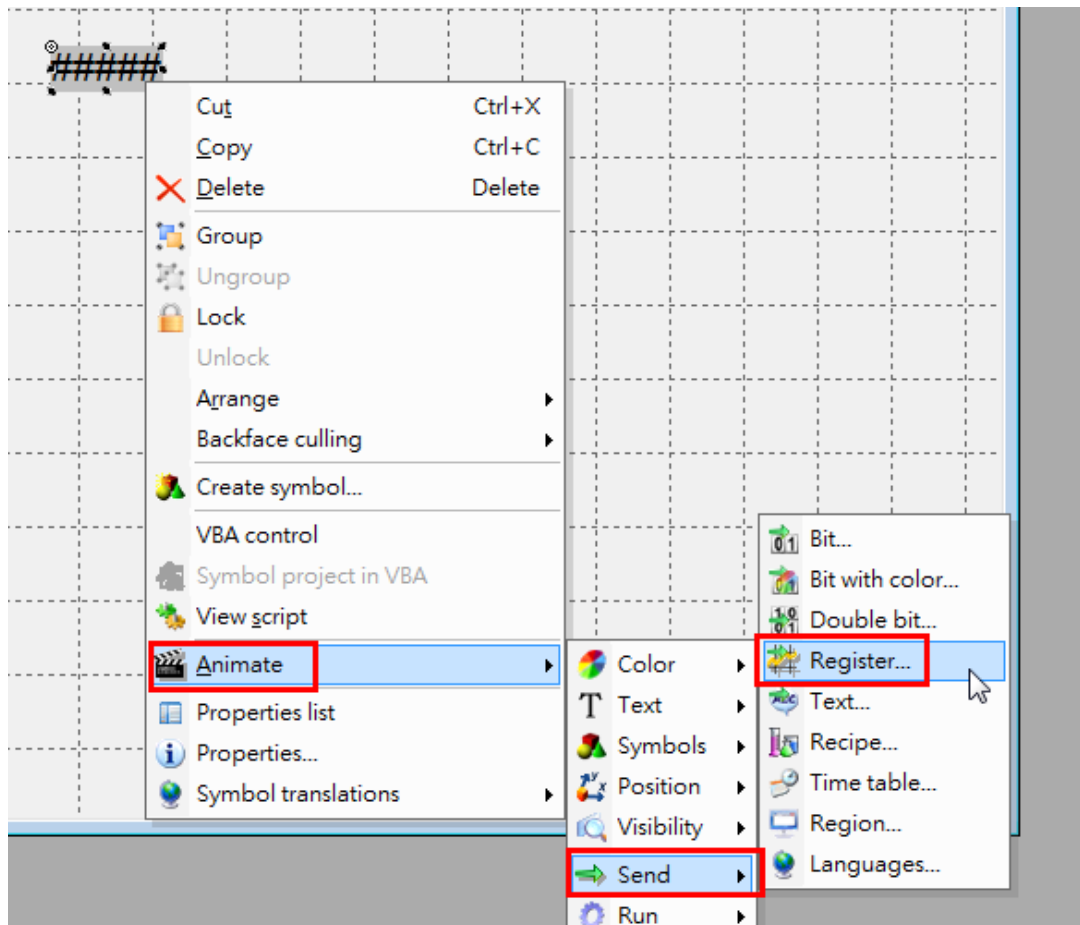
## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Select the AO 0 variable in the **Register** field.



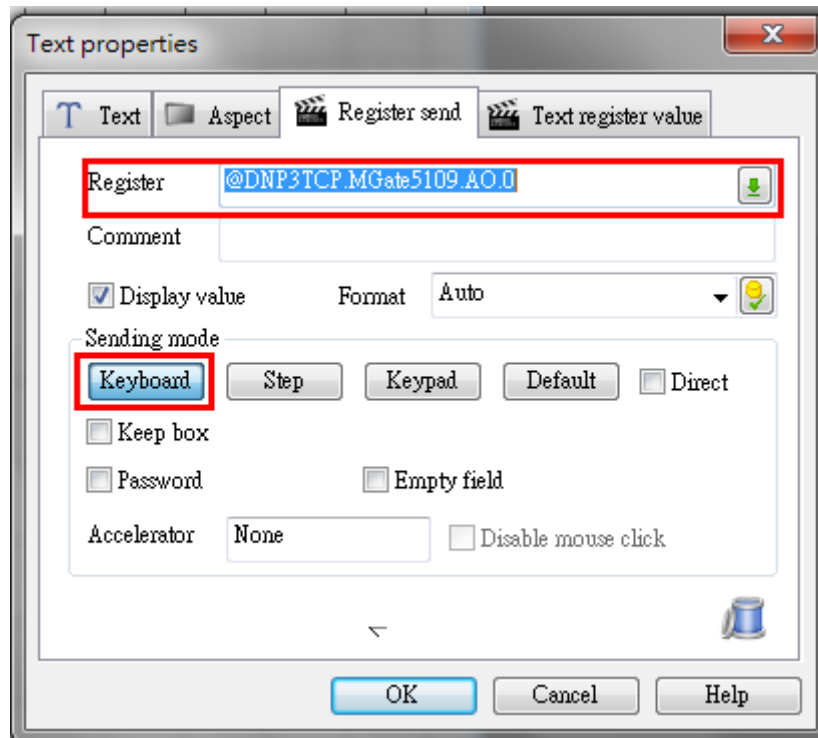
## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Right-click this text object and click **Animate** → **Send** → **Register**.



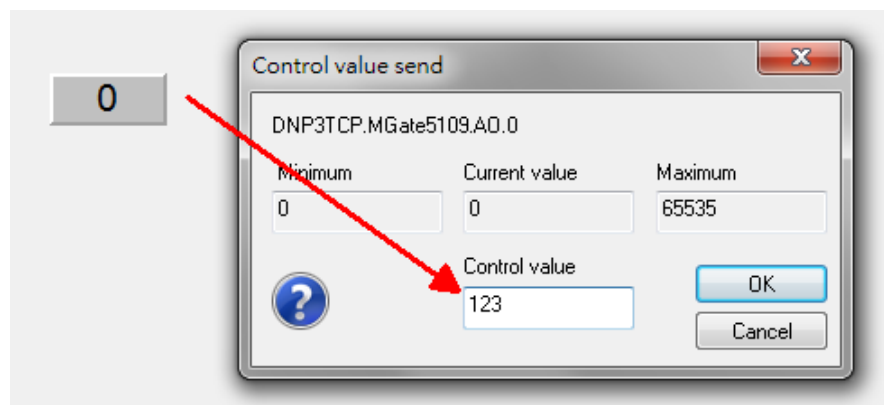
## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

Select the AO 0 variable in the **Register** field. Select **Keyboard** as the **Sending mode**.



Right-click on **Mimic** to execute **Run mode**.

This text object will show the current status as **0**. When you right-click on it, a keyboard to input **Control value** will pop up. Input **123** and click **OK**.

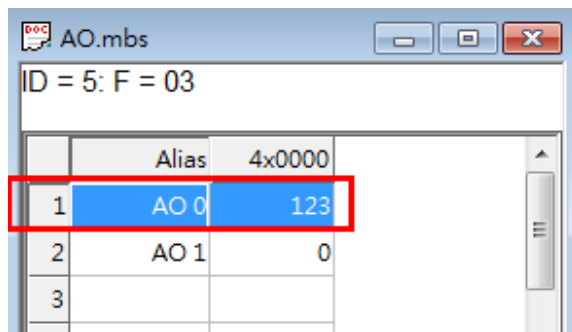


## Moxa Tech Note MGate 5109 with DNP3 SCADA Application

### MGate DNP3 Diagnose:

Point Information			
Analog Output ▾			
Point Index	Value	Flags	Time Updated
0	123	ONLINE	2017-01-06 11:39:11
1	0	ONLINE	2017-01-06 11:39:11

### Modbus Slave-AO:



	Alias	4x0000
1	AO 0	123
2	AO 1	0
3		

After **Integrated Poll** (interval as 60000 ms), this text object's value will be updated as **123**.

