# How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

Moxa Technical Support Team <u>support@moxa.com</u>

## Contents

1	Application Description	2
2	System Topology	3
3	Required Equipment and Components	4
Α.	TIA Portal	4
В.	Modbus Slave	4
C.	MGate 5111 Firmware	4
D.	MGate 5111's GSD File	4
4	MGate 5111 Setting	5
Α.	Protocol Conversion	5
В.	Configure Modbus Commands	5
C.	Configure PROFIBUS Module	7
D.	I/O Data Mapping	8
5	Siemens PLC Setting	9
6	Communication Test2	21
Α.	Status Monitoring	21
В.	Fault Protection	27

Copyright © 2017 Moxa Inc.

Released on December 28, 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 <u>www.moxa.com</u>. You may also contact Moxa by email at <u>info@moxa.com</u>.

#### How to Contact Moxa

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



#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

## **1** Application Description

The **TIA Portal** is **Siemens's** new software platform to configure and program **S7-300/400/1200/1500** PLCs. This technical note demonstrates how to configure the **Siemens S7-300** to connect with the **MGate 5111** in **TIA Portal** V14.

The **MGate 5111** supports a variety of maintenance functions, such as **Protocol Diagnostics**, **Traffic Monitoring**, **Status Monitoring**, and **Fault Protection**. The **Status Monitoring** function notifies a PLC/DCS/SCADA system when a Modbus device gets disconnected or does not respond. If a command has run successfully, the status bit's value will be 1. If a command has failed, the status bit's value will be 0. In this case, the master device will be aware of the failure status of the slave device. When a PROFIBUS cable gets disconnected, the **Fault Protection** function executes actions on end devices identified by a pre-defined value set by the user.

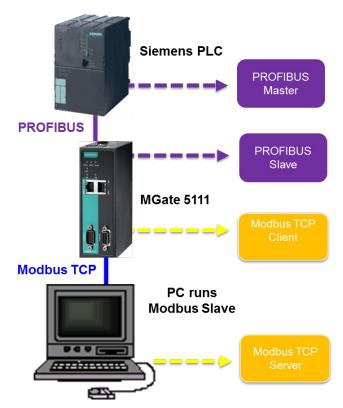
This technical note demonstrates how PROFIBUS Master (**Siemens** PLC) get these Modbus command statuses by receiving **Input Status module** values, as well as how the **Fault Protection** function works. We also demonstrate how **Protocol Diagnostics** and **Traffic Monitoring** make troubleshooting easy.

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

## 2 System Topology

This technical note demonstrates how to exchange data between a PROFIBUS master and six Modbus TCP slaves. The Modbus TCP slave IDs 1-3 use Modbus Read command and show the **Status Monitoring** function. The Modbus TCP slave IDs 4-6 use Modbus Write command and show the **Fault Protection** function.

We use the **Siemens S7-300** as the PROFIBUS Master to connect the **MGate 5111**'s PROFIBUS port. On a PC, we run a **Modbus Slave** tool to simulate Modbus TCP slaves that the **MGate 5111** will connect to the PC's TCP 502 to poll slaves.



Copyright  $\ensuremath{\mathbb{C}}$  2017 Moxa Inc.

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

## **3** Required Equipment and Components

#### A. TIA Portal

As a registered **Siemens**'s customer you can download the trial software for **TIA Portal** V14 and test it for 21 days.

Version: V14

#### Download Website:

https://support.industry.siemens.com/cs/document/109740158/simatic-step-7-(tia-port al)-v14-trial-download?dti=0&lc=en-WW

#### **B. Modbus Slave**

<u>Modbus Slave</u> is a popular Modbus slave simulator to test and debug your modbus devices. Supports Modbus RTU/ASCII and Modbus TCP/IP.

Version: V6+

Download Website: http://www.modbustools.com/download.html

#### C. MGate 5111 Firmware

Version: V.1.0

Download Website: <u>http://www.moxa.com</u>

#### D. MGate 5111's GSD File

The **GSD** (General Station Description) file is an electronic device datasheet or device data base file that identifies the PROFIBUS IO device. This file can be installed into a PROFIBUS Engineering tool, e.g., TIA Portal so that the PROFIBUS Engineering tool can configure this PROFIBUS IO Device.

Version: V.1.0 or higher

Download Website: <u>http://www.moxa.com</u>

Note: For wiring, please refer to the MGate 5111 User's Manual

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

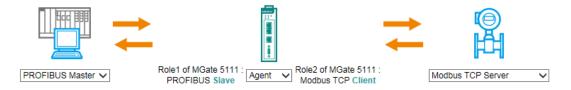
## 4 MGate 5111 Setting

For details, please refer to the MGate 5111 user's manual that you can download from <u>www.moxa.com</u>

#### A. Protocol Conversion

Login to the **MGate 5111**'s Web Console. Set **Protocol Conversion**: Role 1 as PROFIBUS Slave and Role 2 as TCP Client.

#### **\*Protocol Conversion**



#### **B.** Configure Modbus Commands

Under **Modbus TCP settings**, set **Max. retry** as 0. The default value is 3. Changing this value to 0 is in order to quickly demonstrate the detection that the TCP command has failed.

Then add below Function Code 03 commands to poll Slave ID1- ID3's register 0, and add Function Code 06 commands to write Slave ID4-ID6's register 0.

 Role
 Client

 Client Settings
 0
 (0 - 30000 ms)

 Initial delay
 0
 (0 - 5)

 Response timeout
 1000
 (10 - 120000 ms)

Modbus Commands

					🔂 Add 🛛 🔗 Ed	it 🖺 Clor	ne 🏛 Delete	1 Move
Index	Name	Slave IP Address	Slave ID	Function	Address / Quantity	Trigger	Poll Interval	Endian Swap
1	ID1	192.168.32.143 : 502	1	3	Read address 0, Quantity 1	Cyclic	1000	None
2	ID2	192.168.32.143 : 502	2	3	Read address 0, Quantity 1	Cyclic	1000	None
3	ID3	192.168.32.143 : 502	3	3	Read address 0, Quantity 1	Cyclic	1000	None
4	ID4	192.168.32.143 : 502	4	6	Write address 0, Quantity 1	Data Change	N/A	None
5	ID5	192.168.32.143 : 502	5	6	Write address 0, Quantity 1	Data Change	N/A	None
6	ID6	192.168.32.143 : 502	6	6	Write address 0, Quantity 1	Data Change	N/A	None

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

Name	ID4	]
Slave IP address	192.168.32.143	Port 502
Slave ID	4	]
Function	06 - Write Single Registe	r 🗸
Trigger	Data Change	~
Endian swap	None	~
Write starting address	0	(0 - 65535)
Write quantity	1	]
Fault protection	Keep latest data	$\sim$
Fault timeout	60000	(100 - 65535 ms)

Keep ID4's Fault Protection command as Keep latest data.

For ID5 Fault Protection command, choose Clear all data bit to 0 and set Fault timeout as 10000 ms.

Name	ID5	
Slave IP address	192.168.32.143	Port 502
Slave ID	5	
Function	06 - Write Single Register	r 🗸
Trigger	Data Change	~
Endian swap	None	~
Write starting address	0	(0 - 65535)
Write quantity	1	
Fault protection	Clear all data bit to 0	$\checkmark$
Fault timeout	10000	(100 - 65535 ms)

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

For ID6 Fault Protection command, choose Set to user defined value and set Fault value as 0xFF 0xFF. Fault timeout is set as 10000 ms.

Name	ID6	
Slave IP address	192.168.32.143 Port 502	
Slave ID	6	
Function	06 - Write Single Register	
Trigger	Data Change 🗸	
Endian swap	None 🗸	
Write starting address	0 (0 - 65535)	
Write quantity	1	
Fault protection	Set to user defined value 🗸	
Fault timeout	10000 (100 - 65535 ms)	
Fault value(Hex)	0 1 2 3 4 5 6 7 8 0 FF FF	9

#### C. Configure PROFIBUS Module

Add **Input Module 1 words** to Slot 1-3 to map the register values of Modbus Slave ID 1-3. Add **Input Status Module** to store the Modbus TCP command status on Slot 4. Add **Output: 1 word** modules to slots 5-7 to write the value on the registers of Modbus Slave IDs 4~6.

Slave Settings		
Slave address	3	(Slave addres

#### PROFIBUS I/O Table

	🔂 Add 🛛 🖁	🖻 Edit 🛛 🖶 Clone 🏦 Delet	te 🇘 Move
Index	Name	I/O Module	CID
1	Module1	Input:1 word	0x50
2	Module2	Input:1 word	0x50
3	Module3	Input:1 word	0x50
4	Module4	Input:1 byte(status)	0x10
5	Module5	Output:1 word	0x60
6	Module6	Output:1 word	0x60
7	Module7	Output:1 word	0x60

Copyright  $\ensuremath{\mathbb{C}}$  2017 Moxa Inc.

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

#### D. I/O Data Mapping

Let the MGate auto map the data on both sides of the MGate's IO Internal Memory. Modbus read commands fit PROFIBUS Module 1-3 as below. Take note that the **input status module** is not included in MGate's IO Internal Memory.

## • I/O Data Mapping

	Data flow direction	PROFIE	BUS Master <	Modbus TCP Serv	er 🗸
Mapping address arrangeme	ent	Automatic 🗸			
	Pread			Pread	© ⊨H
Your device : PROFIBUS Master	Role 1 of MGate 51 PROFIBUS Slave	11 :	Role 2 of MGa Modbus TCP (		Your device : Modbus TCP Server
Name I/O Module C	ID Internal Address	Data Size	Name Function	Internal Address	Quantity
Module1 Input 0x	.50 0 1	2 bytes	ID1 3	0 1	2 bytes
Module2 Input 0x	:50 2 3	2 bytes	ID2 3	2 3	2 bytes
Module3 Input 0x	.50 4 5	2 bytes	ID3 3	4 5	2 bytes

On the other data flow, we can see PROFIBUS Modules 5-7 fit ID4 and ID5's Modbus write commands as follows:

## :• I/O Data Mapping

	Data flow direction	PROFIL	BUS Master> N	Modbus TCP Serv	er 🗸
Mapping address arrange	ment	Automatic 🗸			
	write			write	() 日 日
Your device : PROFIBUS Master	Role 1 of MGate 5 PROFIBUS Slave		Role 2 of MGat Modbus TCP (		Your device : Modbus TCP Server
Name I/O Module	CID Internal Address	Data Size	Name Function	Internal Address	Quantity
Module5 Output	0x60 0 1	2 bytes	ID4 6	0 1	2 bytes
Module6 Output	0x60 2 3	2 bytes	ID5 6	2 3	2 bytes
Module7 Output	0x60 4 5	2 bytes	ID6 6	4 5	2 bytes

Copyright  $\ensuremath{\mathbb{C}}$  2017 Moxa Inc.

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

## **5** Siemens PLC Setting

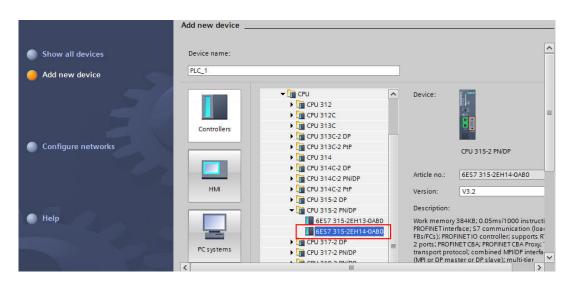
(1) Create a new project.

VA Siemens			_ <b>-</b> ×
		Totally Inte	grated Automation PORTAL
Start 🏻		Create new project	
Devices &	Open existing project	Project name:	MGate 5111 C:lUsers\PVC\Documents
networks	🥚 Create new project	Path: Author:	PVC
PLC programming	Migrate project	Comment:	~
Motion & technology	Close project		
Visualization 👔	Welcome Tour First steps		Create
Online & Jagnostics	Installed software		
	Help		
	🕢 User interface language		
Project view			

(2) Once the new project has been created successfully, click **Configure a device** to add the PLC.

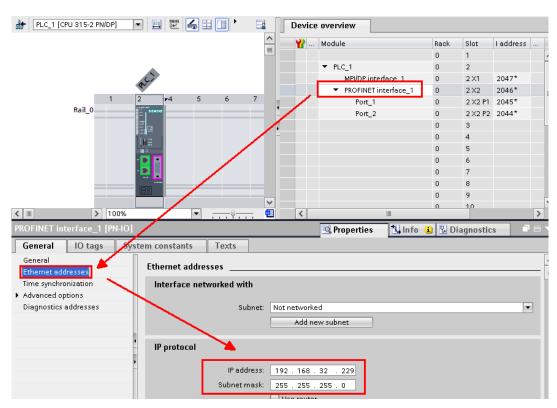
	First steps	
Open existing project	Project: "MGate5111" was opened successful	y. Please select the next step:
Create new project	Start	
Migrate project		
Close project		
Welcome Tour	Devices & of	Configure a device
🥚 First steps	PLC programming	Write PLC program
<ul> <li>Installed software</li> <li>Help</li> </ul>	Motion & 🔅	Configure technology objects
🛞 User interface language	Visualization	Configure an HMI screen

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111



To add the actual PLC's CPU model, select it from **Controllers**  $\rightarrow$  **CPU** as below:

#### (3) Click PLC's PROFINET interface to set its IP Address.



#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

HC_1 [CPU 315-2 PN/DP]	) 🖽 🖭 🖌 🖽		Device overview				
			🔪 🕂 🍟 Module	Rac	k Slot	I address	
		1		0	1		
12			▼ PLC_1	0	2		
A.C.			MPI/DP int	erface_1 0	2 ×1	2047*	
1 2 •4	5 6 7	8 9	PROFINET	interface_1 0	2 X 2	2046*	
Rail_0			Port_1	0	2 X2 P1	2045*	
			Port_2	0	2 X2 P2	2044*	
				0	3		
				0	4		
				0	5		
	/			0	6		
				0	7		
				0	8		
			-	0	9		-
< III > 100%	-				10		>
		<u></u>		1111			
		<u></u> . (			Diagnostic		
MPVDP interface_1 [Modul_]			Properties		Diagnostic	s	
MPVDP interface_1 [Modul_] General IO tags Syste		Texts			Diagnostic	s	
MPVDP interface_1 [Modul_]					Diagnostic	s I	
MPVDP interface_1 [Modul] General IO tars Syste	em constants	Texts			Diagnostic	\$	
MPVDP interface_1 [Modul_ General IO tags Syste General MPI address	em constants	Texts			Diagnostic	s T	
MPVDP interface_1 [Modul_ General IO tags Syste General MPI address Time synchronization	em constants	Texts			Diagnostic	\$	
MPVDP interface_1 [Modul_ General IO tags Syste General MPI address Time synchronization	em constants	Texts orked with	Properties		Diagnostic		
MPVDP interface_1 [Modul_ General IO tags Syste General MPI address Time synchronization	em constants	Texts orked with	Properties		Diagnostic		
MPVDP interface_1 [Modul_ General IO tags Syste General MPI address Time synchronization	em constants	Texts orked with	Properties		Diagnostic		
MPVDP interface_1 [Modul_ General IO tags Syste General MPI address Time synchronization	em constants MPI address Interface netwo Parameters	Texts orked with	Properties		Diagnostic		
MPVDP interface_1 [Modul_ General IO tags Syste General MPI address Time synchronization	em constants MPI address Interface netwo Parameters	Texts orked with Subnet:	Not networked Add new subnet		Diagnostic		

#### (4) Click PLC's **MPI/DP interface** to set **Interface Type** as PROFIBUS.

Click **Add new subne**t to add a PROFIBUS subnet.

MPVDP interface_1 [Module]		🔍 Properties	🗓 Info 🔒 🎚 Diagnostics	78
General IO tags Sys	stem constants Texts			
General PROFIBUS address	PROFIBUS address			
Operating mode	Interface networked with			
Time synchronization				
SYNC/FREEZE	Subnet:	Not networked		-
Diagnostics addresses	[	Add new subnet		
	Parameters			
	· Interface type:	PROFIBUS		-
	Address:	2		•

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

Then a **PROFIBUS\_1** subnet is created. You can modify the PROFIBUS baudrate by modifying **Transmission Speed** 

PLC_1 CPU 315-2 PN/DP		Network data
< .	> 1	00%
PROFIBUS_1 [Profibus]	Roperties	🗓 Info 追 🗓 Diagnostics 👘 🗖 🖃 🔻
General IO tags Sys	stem constants Texts	
General Network settings	Network settings	
Cable configuration		
Additional network devices	Highest PROFIBUS address:	126
Bus parameters	Transmission speed:	1.5 Mbps
Constant bus cycle time	Profile:	DP V

(5) Click Options → Manage general station description to install the MGate
 5111's GSD file.

끊 Siemens - C:ሠsers만VCDocument	sWautomationWGate51111WGate5111
Project Edit View Insert Online	Options Tools Window Help
📑 📑 🔚 Save project ا 🐰 🗐 🕻	🍸 Settings
Project tree	Support packages
Devices	Manage general station description files (GSD) Start Automation License Manager
	🍓 Show reference text
5 > ▼ 1 MGate5111	🛄 Global libraries 🔹 🕨

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

Manage genera	al station descrip	tion files			×
Source path:	C:\PROFIBUS_S_G	SD			
Content of in	nported path				
File		Version	Language	Status	Info
Mpbs1025.	gsd		Default	Not yet installed	
<					>
				Delete	II Cancel

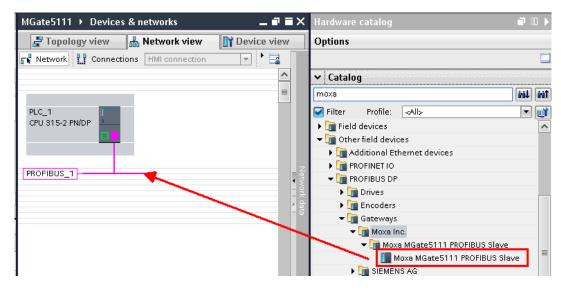
Select the **MGate 5111**'s GSD file then click **Install**.

Make sure the installation is a success.

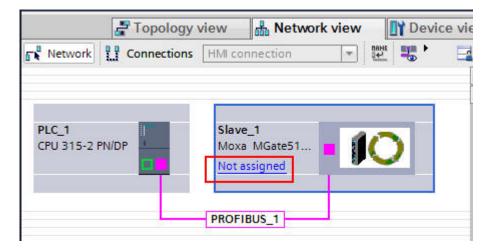
Manage general stat	ion descript	ion files			×
Installation result					
1 Message					
<ul> <li>Installation was</li> </ul>	s completed s	uccessfully.			
Save log		Install addition	il files	Close	

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

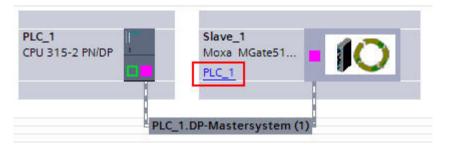
(6) In the Hardware catalog window, we can filter "moxa" to search the MGate 5111. Choose the MGate 5111 device icon, then drag and drop to PROFIBUS\_1 subnet.



(7) Click **Not assigned** to assign the **MGate 5111** to **PLC\_1**.



Then the **MGate 5111** is set into **PLC\_1**'s DP Master System.



Copyright  $\ensuremath{\mathbb C}$  2017 Moxa Inc.

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

(8) In the MGate 5111's Device view, drag and drop Input 1 Word to Slot 1-3 and Input 1 Byte to Slot 4. Assign their I address to 0-6.

ngrouped devices	▶ Slave_1						_ •		K Hardware catalog
			10 10	Topology view 🛛 🛔 N	letwork viev	/ <b>I</b> 1	Device vie	ew	Options
a MGate5111 PR 🔻 📱	. 🕅 🍯 💷 🕨		Device	overview					
		^	<b>**</b>	Module	Rack	Slot	l address		✓ Catalog
				Slave_1	0	0	2043*		Search>
_	4.5			Input: 1 Word_1	0	1	01	1	🛛 🔽 Filter Profile: 🤜
		-		Input: 1 Word_2	0	2	23		Head module
		×		Input: 1 Word_3	0	з	45		Universal module
		-		Input: 1 Byte_1	0	4	6 ┥	-	I Input: 1 Byte
					0	5			Input: 2 Bytes
		~			0	6		-	Input: 3 Bytes
> 100%	▼		<					>	Input: 4 Bytes

Drag and drop **Output 1 Word** to Slot 5-7. Assign their **Q address** to 0-5.

🚽 Topology view 👔	🖁 Network vi	ew	Device	view	Options
Device overview					Catalog
YY Module	Rack	Slot	I address	Q add	✓ Catalog
Slave_1	0	0	2043*		
Input: 1 Word_1	0	1	01		Filter Profile: <ali> III III III IIII IIII IIII IIII IIII</ali>
Input: 1 Word_2	0	2	23		Output: 60 Bytes
Input: 1 Word_3	0	3	45		
Input: 1 Byte_1	0	4	6		Output: 61 Bytes
Output: 1 Word_1	0	5		01	Output: 62 Bytes
Output: 1 Word_2	0	6		23	Output: 63 Bytes Output: 64 Bytes Output: 1 Word
Output: 1 Word_3	0	7		45	Output: 64 Bytes
	0	8			
					Output: 2 Words

(9) Under the **MGate 5111**'s **Properties**, set its PROFIBUS address as its actual address, which is set by hardware's rotary switch.

Slave_1 [Module]		🖻 Properties 🚺 Info 🔋 🛽 Diagnostics	
General IO tags Sys	stem constants Texts		
✓ General Catalog information	PROFIBUS address		
PROFIBUS address General DP parameters	Interface networked with		
Watchdog SYNC/FREEZE	Subnet	: PROFIBUS_1 Add new subnet	•
Diagnostics addresses	Parameters		
	Address		-
	Highest address Transmission speed		

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

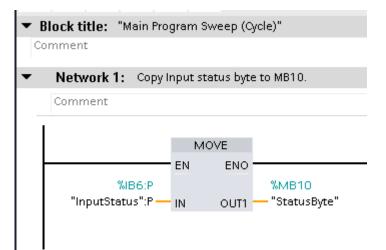
(10) We want to get Modbus ID1-ID3's register value and make sure the Modbus commands' responses are valid. If a Modbus command's response is invalid or times out, the register value will show a specific value. In this demonstration, we will use a program to set this value as 0xFFFF. We will show details later.

We created the following tags:

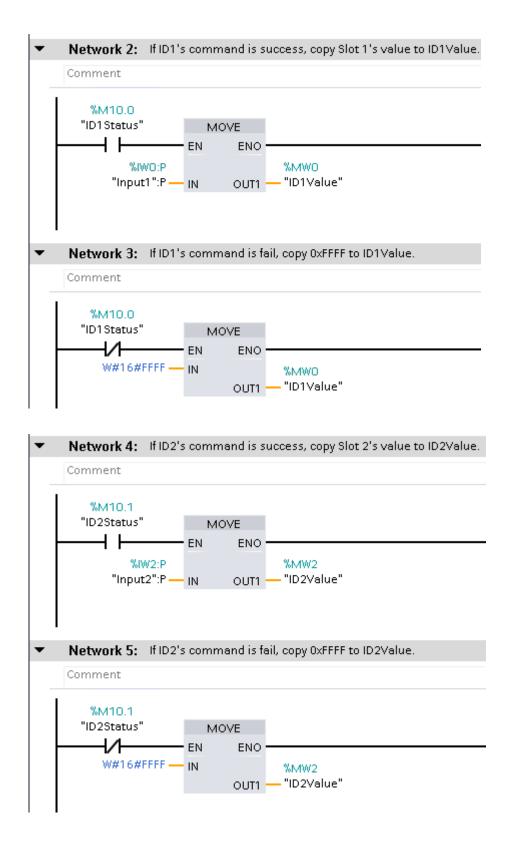
MGa	te511	1 → PLC_1 [	CPU 315-2	PN/DP] → PLC ta	ags 🕨 Def	ault tag table [14]			
					🕣 Tags	🗉 User constants 🖌			
🥩 :	e 🗄	h 🎝 🕹							
D	Default tag table								
	N	ame	Data type	Address	Comment				
1	-	ID1Value	Word	%MW0	Show ID1 r	unning value			
2		ID2Value	Word	%MW2	Show ID2 r	unning value			
з	-00	ID3Value	Word	%MW4	Show ID3ru	inning value			
4		InputStatus	Byte	%IB6	Slot 4's val	ue			
5	-	StatusByte	Byte	%MB10	Status Byte	which copied from Slot 4			
6	-	ID1Status	Bool	%M10.0	ID1 comma	and status			
7	-00	ID2Status	Bool	%M10.1	ID2 comma	and status			
8		ID3Status	Bool	%M10.2	ID3 comma	and status			
9	-00	Input1	Word	%IWO	Slot 1's val	ue			
10	-	Input2	Word	%IW2	Slot 2's val	ue			
11	-00	Input3	Word	%IW4	Slot 3's val	ue			
12	-	Output4	Word	%QW0	Write ID4				
13	-00	Output5	Word	%QW2	Write ID5				
14	-	Output6	Word	%QW4	Write ID6				

Click Main [OB1] to edit program.

Each Network program shows as follows:



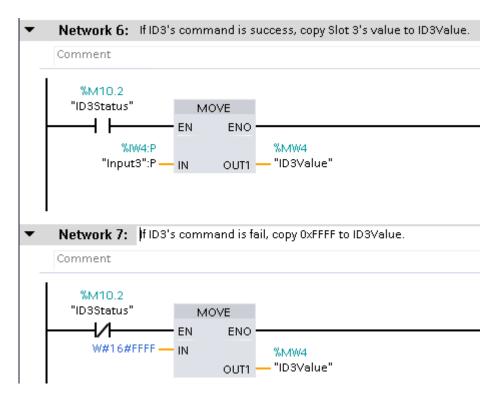
#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111



Copyright  $\ensuremath{\mathbb C}$  2017 Moxa Inc.

Page 17 of 29

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111



(11) Execute **Compile** and make sure there are no errors.

IA Siemens - C:WsersPVCDocumer	nts\Auto	mation\MGate5111\MGate5111
Project Edit View Insert Online	Optior	ns Tools Window Help
📑 📑 🔚 Save project ا 🐰 📋	î ×	ふ 🗙 🍊 🙀 🗓 🌆 😫 📓 💋 Go online
Project tree		MGate5111 Compile
Devices		
2		ыйый 学 👻 🐛 🖿 🚍 💬 溜 ± 🚇
Ê		
📜 🔻 🛅 MGate5111	^	
✓ MGate5111     ✓ MGate5111     ✓ Add new device		
🗧 🚠 Devices & networks		
		%M10.1
Device configuration		"ID2Status" MOVE
📃 🖳 Online & diagnostics		
🔻 🔙 Program blocks		W#16#FFFF IN %MW:
Add new block		

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

#### (12) Execute Download

🚻 Siemens - C:Wsers@VCDocumentsWutomationMGate5111MGate5111 Project Edit View Insert Online Options Tools Window Help 📑 🎦 🔚 Save project ا 🐰 🗓 👔 🗙 🏷 🛨 (🖛 🛨 🔚 🖳 🚹 🖉 Go online 🖉 Go Project tree /DP] <sup>21</sup> Download to device Devices 36 🔲 🔂 ਮੁੱਖ 🖉 🛫 💺 🗮 🚍 🚍 💬 🚝 ± 🚝 😑 🔻 🛅 MGate5111 ~ \_\_\_\_\_ -⊢ -/⊢ -<u>()</u> → 💣 Add new device 📥 Devices & networks ▼ 🛅 PLC\_1 [CPU 315-2 PN/DP] %M10.1 T Device configuration "ID2Status" MOVE н 😨 Online & diagnostics ╢ EN ENO  $\equiv$ 🔻 🔜 Program blocks W#16#FFFF -IN %MW2 "in hyalua" 💣 Add new block 0.1.TA M. LODAL

Click **Start Search** to search for an accessible PLC.

	Device	Device type	Slot	Туре	Address	Subnet
	PLC_1	CPU 315-2 PN/DP	2 X 2	PN/IE	192.168.32.229	
		CPU 315-2 PN/DP	2 ×1	PROFIBUS	2	PROFIBUS_
		Type of the PG/PC int		PN/IE		•
		PG/PC int	erface:	💹 Realtek RTI	L8168D/8111D Family P(	
		Connection to interface/s	ubnet:	Direct at slot	'2 X2'	(
		1 st ga	iteway:			
	Select target de	1 st ga	Interfe		Show all compatible	
	-	1st ga				e devices
	-	1st ga	Interfe		Address	e devices
	-	1st ga	Interfe		Address	e devices
Each LED	-	1st ga	Interfe		Address	e devices
Flash LED	-	1st ga	Interfe		Address	e devices
Flash LED	-	1st ga	Interfe		Address	e devices



#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

Select target device: Show all compatible devices -Device Device type Interface type Address Target device PLC\_1 CPU 315-2 PN/DP PN/IE 192.168.32.229 8 PLC 1 PN/IE Access address 📄 Flash LED Start search Display only error messages Online status information: 🦺 Found accessible device general-chiang [192.168.32.143] ^ Scan completed. 1 compatible devices of 2 accessible devices found. Petrieving device information... 🗹 Scan and information retrieval completed. ~ <u>L</u>oad <u>C</u>ancel

After locating an accessible PLC, execute Load.

The **TIA Portal** will check hardware and software consistency. After checking for errors, click **Load** to download.

tatus	1	Target	Message	Action
<b>∔</b> ∐	<u> </u>	▼ PLC_1	Ready for loading.	
	▲	<ul> <li>Protection</li> </ul>	Protection from unauthorized access	
	4		Devices connected to an enterprise network or directly to the internet must be appropriately protected against unauthorized access, e.g. by use of firewalls and network segmentation. For more information about industrial security, please visit http://www.siemens.com/industrialsecurity	
	•	Device configurat	. Delete and replace system data in target	Download to device
	×	P Device conligarate.	. Delete and replace system data in target	Download to device
	0	▶ Software	Download software to device	Consistent download

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

After loading, enable **Start all** to start modules and then click **Finish**.

tatus	!	Target	Message	Action
ή.	<b>%</b>	▼ PLC_1	Downloading to device completed without error.	
	4	<ul> <li>Start modules</li> </ul>	Start modules after downloading to device.	🗹 Start all
1				
			111	

## 6 Communication Test

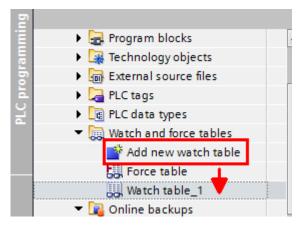
## A. Status Monitoring

(1) The PC runs a **Modbus Slave** tool and listens on TCP port 502. Add slave IDs 1-3 and set their register 0's value as 1, 2, 3, respectively.

📓 Modbus Slave - Mbslave3 👘 📼 📼							
File Edit Connection Setup Display View Window Help							
0 🖻 🖬 🚳 🗂 🗏	1 🗴 💡 💦						
Mbslave1 ID = 1: F = 03 00000 0 1 1	Mbslave2 ID = 2: F = 03 00000 0 2 1	Mbslave3           ID = 3: F = 03           00000           0           3           1					

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

(2) Click Add new watch table to create the Watch table\_1.



Add the following tags to be monitored:

	PLC_	_1 [CPU 315-2 PN/	DP] 🕨 Watch an	d force tables 🔸	Watch table_1
<b>*</b>	🥐 🛛	1 10 1 10 17	oon oon ≻ 1		
	i	Name	Address	Display format	Monitor value
1		"Input1"	%IWO	Hex	
2		"Input2"	%IW2	Hex	
3		"Input3"	%IW4	Hex	
4		"InputStatus"	%IB6	Hex	
5		"ID1Value"	%MW0	Hex	
6		"ID2Value"	%MW2	Hex	
7		"ID3Value"	%MW4	Hex	
8		"StatusByte"	%MB10	Hex	

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

(3) Click **Go online** and then click **Monitor all**.

)±(	al± [₽	1 II II 🛛 🛤	🚿 Go online 🔊	Go offline  🎄 📗	<b>□</b> × '					
1	1 [CPU 315-2 PN/DP] > Watch and force tables > Watch table_1 📃 🖬									
			<u> </u>							
<b>*</b>	🥐 🛛	🤊 🌆 🌮 🕯 🎝	©on ▶ 1							
	i	Name	Address	Display format	Monitor value					
1		"ReqBit"	%M11.0	Bool	TRUE					
2		"ID1Value"	%MW0	Hex	16#0001					
з		"ID2Value"	%MW2	Hex	16#0002					
4		"ID3Value"	%MW4	Hex	16#0003					
5		"RecordByte"	%MB10	Hex	16#07					
6		"Output4"	%QW0	Hex	16#0000					
7		"Output5"	%QW2	Hex	16#0000					
8		"Output6"	%QW4	Hex	16#0000					

When **Input Status module** shows a value of 7, then commands 1-3 are successful. **ID1Value**- **ID3Value** are running as 1, 2, 3, respectively.

ì I	x ら	± (* ± 🖥 🗓 🛛	🖬 🖳 🗛 🚿 Go	online 📝 Go offline	· 🎝 🖪 🖪 🗴	2 🗄
MG	iate511	1 → PLC_1 [CPU	315-2 PN/DP] 🕨	Watch and force	tables 🔸 Force (	table
ý	🥐 🛙	🔉 F.I F., F. 😭	h 00h 1			
	i	Name	Address	Display format	Monitor value	Force
1		"Input1":P 🛛 🔳	%IW0:P	Hex 💽	16#0001	
2		"Input2":P	%IW2:P	Hex	16#0002	
3		"Input3":P	%IW4:P	Hex	16#0003	
4		"InputStatus":P	%IB6:P	Hex	16#07	
5		"ID1Value"	%MW0	Hex	16#0001	
6		"ID2Value"	%MW2	Hex	16#0002	
7		"ID3Value"	%MW4	Hex	16#0003	
8		"StatusByte"	%MB10	Hex	16#07	
9			<add new=""></add>			

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

(4) We can use the MGate's Protocol Diagnostics tool on the Web Console to check Modbus and PROFIBUS communication status:

Via System Monitoring → Protocol Status → Modbus TCP Diagnose, we can see its connection status is **OK** with no invalid responses.

_	• Modb	us TCP Diagnose	
Main Menu	Auto refres	h	
Quick Setup			
Overview	Category	Item	Value
Basic Settings	Modbus		
Network Settings		Mode	Master
Serial Settings		Number of connection	1
-		Sent request	503
- Protocol Settings		Received valid response	503
- System Management		Received invalid response	0
- System Monitoring		Received exception	0
- System Status		Timeout	0
	Connections		
- Protocol Status	Client 1	Status	OK
I/O Data View		Remote IP:Port	192.168.32.143 :502
Modbus TCP Diagnose		Sent request	503
PROFIBUS Slave Diagnose		Received valid response	503
		Received invalid response	0
Modbus TCP Traffic		Received exception	0
Restart		Timeout	0

Via System Monitoring -> Protocol Status -> Modbus TCP Traffic, we can log Modbus TCP communication traffic:

ain Menu	Auto	scroll					
Quick Setup	9	tart	Stop	Export Ready t	o capture.		
Overview			Chop	Lapon Incody (	o ouptoro.		
Basic Settings	No.	Time	Send/Receive	Remote IP : port	Slave ID	Function Code	Data
Network Settings	-	0.097	Senu	192.100.32.143.002	2	3	TA 01 00 00 00 00 02 03 00 00 00 01
Serial Settings	2	0.108	Receive	192.168.32.143:502	2	3	1A 61 00 00 00 05 02 03 02 00 02
Protocol Settings	3	0.116	Send	192.168.32.143:502	3	3	1A 62 00 00 00 06 03 03 00 00 00 01
System Management	4	0.127	Receive	192.168.32.143:502	3	3	1A 62 00 00 00 05 03 03 02 00 03
	5	0.897	Send	192.168.32.143:502	1	3	1A 63 00 00 00 06 01 03 00 00 00 01
System Monitoring	6	0.907	Receive	192.168.32.143:502	1	3	1A 63 00 00 00 05 01 03 02 <mark>00 01</mark>
- System Status	7	1.097	Send	192.168.32.143:502	2	3	1A 64 00 00 00 06 02 03 00 00 00 01
- Protocol Status	8	1.107	Receive	192.168.32.143:502	2	3	1A 64 00 00 00 05 02 03 02 00 02
I/O Data View	9	1.116	Send	192.168.32.143:502	3	3	1A 65 00 00 00 06 03 03 00 00 00 01
Modbus TCP Diagnose	10	1.127	Receive	192.168.32.143:502	3	3	1A 65 00 00 00 05 03 03 02 <mark>00 03</mark>
PROFIBUS Slave Diagnose	11	1.897	Send	192.168.32.143:502	1	3	1A 66 00 00 00 06 01 03 00 00 00 01
	12	1.908	Receive	192.168.32.143:502	1	3	1A 66 00 00 00 05 01 03 02 00 01
Modbus TCP Traffic	13	2.096	Send	192.168.32.143:502	2	3	1A 67 00 00 00 06 02 03 00 00 00 01
Restart	14	2.108	Receive	192.168.32.143:502	2	3	1A 67 00 00 00 05 02 03 02 00 02
Logout	15	2.116	Send	192.168.32.143:502	3	3	1A 68 00 00 00 06 03 03 00 00 00 01
	16	2.128	Receive	192.168.32.143:502	3	3	1A 68 00 00 00 05 03 03 02 00 03

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

Via System Monitoring → Protocol Status → PROFIBUS Slave Diagnose, we can see State's value is note as Data Exchange:

	°∙ PI	ROFIBUS SI	ave Diagnose
- Main Menu	Auto refr	esh	
Quick Setup	I	I	1
Overview	Category	Item	Value
Basic Settings	PROFIBUS		
Network Settings		State	Data Exchange
Serial Settings		Baudrate	1500000
		Address	3
- Protocol Settings		Output	6 bytes
- System Management		Input	7 bytes
- System Monitoring		Illegal I/O Config	0
- System Status		Restart Data Exchange	U
- Protocol Status			
I/O Data View			
Modbus TCP Diagnose			
PROFIBUS Slave Diagnose			
Modbus TCP Traffic			

Via System Monitoring  $\rightarrow$  Protocol Status  $\rightarrow$  I/O Data View, we can choose **PROFIBUS Master**  $\leftarrow$  Modbus TCP Server data flow side to see Modbus slave input data:

	••1/U Da		e vv							
lain Menu	Auto refresh									
Quick Setup										
Overview	Data flow direction F	PROFIBUS I	Vaster < N	lodbus TCP	Server 🗸		Start add	dress(He	•x) 0	
Basic Settings		D		$\square$		$\mathbb{D}$	-			
Network Settings	Internal Address	00	01	02	03	04	05	06	07	08
	0000h	00	01	00	02	00	03	00	00	00
Serial Settings	0010h	00	00	00	00	00	00	00	00	00
Protocol Settings	0020h	00	00	00	00	00	00	00	00	00
System Management	0030h	00	00	00	00	00	00	00	00	00
	0040h	00	00	00	00	00	00	00	00	00
System Monitoring	0050h	00	00	00	00	00	00	00	00	00
- System Status	0060h	00	00	00	00	00	00	00	00	00
- Protocol Status	0070h	00	00	00	00	00	00	00	00	00
I/O Data View										
Modbus TCP Diagnose										
PROFIBUS Slave Diagnose										

#### • I/O Data View

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

(5) Disable Modbus Slave ID 2 on the Modbus Slave tool, so Modbus Command 2 can't receive any responses. Check Watch table; Input Status module shows a value of 5 and ID2Value a value of 0xFFFF.

<b>#</b>	🖆 🔮 🌆 🖉 7. % 🜮 🖤								
	i	Name	Address	Display format	Monitor value	Ν			
1		"Input1"	%IWO	Hex	16#0001				
2		"Input2"	%IW2	Hex	16#0002				
3		"Input3"	%IW4	Hex	16#0003				
4		"InputStatus"	%IB6	Hex	16#05				
5		"ID1Value"	%MW0	Hex	16#0001				
6		"ID2Value"	%MW2	Hex	16#FFFF				
7		"ID3Value"	%MW4	Hex	16#0003				
8		"StatusByte"	%MB10	Hex	16#05				

Disable Modbus Slave ID 1 and 3 on the **Modbus Slave** tool. Check Modbus TCP Diagnose; **Status** shows that the **Request\_timeout** and **Timeout** counters are increasing:

## **Modbus TCP Diagnose**

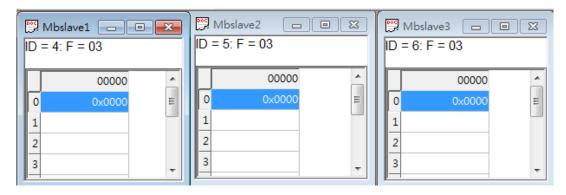
Auto refresh

Category	Item	Value
Modbus		
	Mode	Master
	Number of connection	1
	Sent request	1705
	Received valid response	1600
	Received invalid response	0
	Received exception	0
	Timeout	104
Connections		
Client 1	Status	Request_timeout
	Remote IP:Port	192.168.32.143 :502
	Sent request	1705
	Received valid response	1600
	Received invalid response	0
	Received exception	0
	Timeout	104

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

#### **B. Fault Protection**

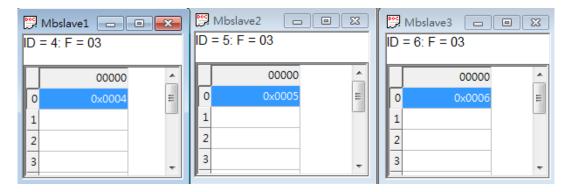
(1) Add slave ID4-ID6 on the Modbus Slave tool as below:



(2) On the Watch table, set **Modify value** on QW0 as 0x0004, QW2 as 0x0005, QW4 as 0x0006. Then click the **Modify** button.

Ŷ	🥑 🧤 🗓 🌮 1	R 🖓 🍄 📬				
	i Name	ddress	Display format	Monitor value	Modify value	4
1	"Input1"	%IWO	Hex	16#0001		
2	"Input2"	%IW2	Hex	16#0002		
3	"Input3"	%IW4	Nex	16#0003		
4	"InputStatus"	%IB6	Hex	16#05		
5	"ID1Value"	%MW0	Hex	16#0001		
6	"ID2Value"	%MW2	Hex	16#FFFF		
7	"ID3Value"	%MW4	Hex	16#0005		
8	"StatusByte"	%MB10	Hex	16#05	•	
9	"Output4"	%QW0	Hex	16#0004	16#0004	
10	"Output5"	%QW2	Hex	16#0005	16#0005	
11	"Output6"	%QW4	Hex	16#0006	16#0006	

(3) Check Modbus Slave IDs 4-6; they are updated as 0x0004, 0x0005, 0x0006, respectively.



Copyright  $\ensuremath{\mathbb{C}}$  2017 Moxa Inc.

#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

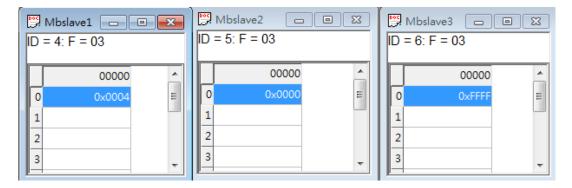
Via System Monitoring  $\rightarrow$  Protocol Status  $\rightarrow$  I/O Data View, we can choose **PROFIUS Master**  $\rightarrow$  Modbus/TCP Server data flow side to see the PROFIBUS output data:

## • I/O Data View

#### Auto refresh

Data flow direction PROFIBUS Master> Modbus TCP Server 🗸						Start addre	
	ID4		ID5		ID6		
Internal Address	00	01	02	03	04	05	
0000h	00	04	00	05	00	06	
0010h	00	00	00	00	00	00	
0020h	00	00	00	00	00	00	
0030h	00	00	00	00	00	00	
0040h	00	00	00	00	00	00	
0050h	00	00	00	00	00	00	
0060h	00	00	00	00	00	00	
0070h	00	00	00	00	00	00	

(4) Remove the PROFIBUS cable. After 10000 ms, the Fault Timeout is on. Check whether Modbus Slave ID 4's register 0 value is still 0x0004. Slave ID 5's register 0 value is updated to 0x0000 and Slave ID 6's register 0 to 0xFFFF.



#### How to Use the TIA Portal to Set a Siemens PLC and the MGate 5111

Check **PROFIBUS Master** → **Modbus/TCP Server** data flow side. We can see they all updated as its **Fault Value**:

## •I/O Data View

#### Auto refresh

Auto refresh

Data flow direction PROFIBUS Master> Modbus TCP Server 🗸						Start addre	
	Π	)4	ID5		ID6		
Internal Address	00	01	02	03	04	05	
0000h	00	04	00	00	FF	FF	
0010h	00	00	00	00	00	00	
0020h	00	00	00	00	00	00	
0030h	00	00	00	00	00	00	
0040h	00	00	00	00	00	00	
0050h	00	00	00	00	00	00	
0060h	00	00	00	00	00	00	
0070h	00	00	00	00	00	00	

Check **PROFIBUS Slave**. Its Baudrate shows **Not Found** and State shows **Wait Parameterization**:

## **PROFIBUS Slave Diagnose**

Category	Item	Value
PROFIBUS		
	State	Wait Parameterization
	Baudrate	Not Found
	Address	3
	Output	6 bytes
	Input	7 bytes
	Illegal I/O Config	0
	Restart Data Exchange	1