# How to Use the TIA Portal to Set a Siemens PLC and the MGate 5103

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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>.

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# How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

### **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 5103** in **TIA Portal** V14.

The **MGate 5103** 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 then be 0. In this case, the master device will be aware of the failure status of the slave device. When a PROFINET connection is disconnected, the **Fault Protection** function executes actions on end devices identified by a pre-defined value set by the user.

This technical note also demonstrates how the PROFINET IO controller (**Siemens** PLC) receive these Modbus command statuses by sending **PROFINET Acyclic Read** commands, as well as how the **Fault Protection** function works. We also demonstrated how to use the **Protocol Diagnostics** and **Traffic Monitoring** functions for troubleshooting.

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## How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

### 2 System Topology

This technical note demonstrates how to exchange data between a PROFINET IO controller and six Modbus RTU slaves. The Modbus RTU slave IDs 1-3 use Modbus Read command, and shows the **Status Monitoring** function. The Modbus RTU slave IDs 4-6 use Modbus Write command, and shows the **Fault Protection** function.

We use **Siemens S7-300** as the **PROFINET IO controller** to connect the **MGate 5103**. On a PC, we run **Modbus Slave** tools to simulate Modbus RTU slaves and connect to the **MGate 5103**'s serial port.



### **3** Required Equipment and Components

### A. TIA Portal V14

As a registered **Siemens**'s customer, you can download the trial software for the **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 very popular Modbus slave simulator to test and debug of your Modbus devices. It supports Modbus RTU/ASCII and Modbus TCP/IP.

Version: V6+

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

#### C. MGate 5103 Firmware

Version: V.1.0 or higher

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

#### D. MGate 5103's GSDML File

The **GSDML** (General Station Description Mark-Up Language) file is an electronic device datasheet or device database file that identifies the PROFINET IO device. This file can be installed into the PROFINET Engineering Tool, e.g., the TIA Portal, so that this PROFINET Engineering Tool can configure the PROFINET IO Device.

#### Version:

GSDML-V2.2-Moxa-Device0202-20170502.xml/GSDML-V2.3-Moxa-Device0202-2017050 2.xml

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

Note: For wiring, please refer to the MGate 5103's User's Manual.

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### 4 MGate 5103 Settings

For details, please refer to the MGate 5103 user's manual. You can download it from <u>www.moxa.com</u>

#### A. Protocol Conversion

Log in to the MGate 5103's Web Console. Set Protocol Conversion: Role 1 as PROFINET IO Device, Role 2 as Modbus RTU/ASCII Master.

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



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

Under **Modbus RTU/ASCII setting**, set Modbus as **RTU**, **Max. retry** as 0. The default of this value is 3. Change this value to 0 in order to quickly detect when a Modbus command failed.

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

Role	Master	
Mode	RTU 🗸	
Master Settings		
Initial delay	0	(0 - 30000 ms)
Max. retry	0	(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)

				🔂 Add 🥔	Edit 🖺 Cl	one 🏛 Delei	te 🗘 Move
Index	Name	Slave ID	Function	Address / Quantity	Trigger	Poll Interval	Endian Swap
1	ID1	1	3	Read address 0, Quantity 1	Cyclic	1000	None
2	ID2	2	3	Read address 0, Quantity 1	Cyclic	1000	None
3	ID3	3	3	Read address 0, Quantity 1	Cyclic	1000	None
4	ID4	4	6	Write address 0, Quantity 1	Data Change	N/A	None
5	ID5	5	6	Write address 0, Quantity 1	Data Change	N/A	None
6	ID6	6	6	Write address 0, Quantity 1	Data Change	N/A	None

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For ID4 command's **Fault Protection**, keep it as **Keep latest data**.

Name	ID4	
Slave ID	4	
Function	06 - Write Single Register	r 🗸
Trigger	Data Change	~
Endian swap	None	~
Write starting address	0	(0 - 65535)
Write quantity	1	
Fault protection	Keep latest data	~
Fault timeout	60000	(100 - 65535 ms)

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

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

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

Name	ID6
Slave ID	6
Function	06 - Write Single Register
Trigger	Data Change 🗸
Endian swap	None V
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 9 0 FF FF

# How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

### C. Configure PROFINET Setting

Only the Device Name needs to be set. Set it as mgate-dev.

### D. I/O Data Mapping

Allow the MGate to automap the data on both sides of the MGate's IO Internal Memory. Check I/O Data Mapping with Data flow direction: PROFINET IO Controller → Modbus RTU/ASCII Slave or PROFINET IO Controller ← Modbus RTU/ASCII Slave. Make sure the PROFINET Output or Input Slot Size is fully and correctly mapped to Modbus Internal Address.

	Data flow direction	PROFI	NET IO Co	ntrolle	er> Moo	ibus RTU	I/ASCII SI	ave 🗸	
Mapping address arrang	gement Auto	omatic 🗸							-
	write				W	➡ rite		© ₩	
Your device : PROFINET IO Controller	Role 1 of MGate 5103 : PROFINET IO Device		Role 2 of Modbus I	MGat RTU/A	te 5103 : ASCII <mark>M</mark> a	ister	Yo Mo	our device : odbus RTU/ASCII Slave	
	PROFINET Output Slot Siz Required minimum 6 t	ze bytes	Name Fur ID4 ID5 ID6	nction 6 6 6	Internal 0 2 4	Address 1 3 5	Quantity 2 bytes 2 bytes 2 bytes		
	Data flow direction	PROFIN	NET IO Cor	ntrolle	r < Mod	lbus RTU	I/ASCII SIa	ave 🗸	_
Mapping address arrang	Auto	matic 🗸							
	Pread				<b>r</b> e	<b>D</b> ad			
Your device : PROFINET IO Controller	Role 1 of MGate 5103 : PROFINET IO Device		Role 2 of Modbus F	MGat RTU/A	e 5103 : \SCII <mark>Ma</mark>	ster	Yo Mo	our device : odbus RTU/ASCII <mark>Slave</mark>	
	PROFINET Input Slot Size Required minimum 6 b	e oytes	Name Fur ID1	nction 3	Internal 0	Address	Quantity 2 bytes		
		-	ID2	3	2.	. 3	2 bytes		
			ID3	3	4.	. 5	2 bytes		

### How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

### **5** Siemens PLC Setting

(1) Create a new project.

VA Siemens				_ <b>_</b> ×
				Totally Integrated Automation PORTAL
Start	I		Create new project	
Devices &		Open existing project	Project name:	MGate5103
networks		Create new preject	Path:	C:\Users\PVC\Documents\Automation
PLC		Create new project	Author:	
programming		Migrate project	connicit	
Motion & technology	-	🕥 Close project		
Visualization		Welcome Tour First stans		Create
Online & Diagnostics	10	Installed software		
		💮 Help 🚯 User interface language		
Project view				

(2) After the project is successfully created, click **Configure a device** to add the PLC.



### How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

According to the actual PLC's CPU model, select it from **"Controllers \rightarrow S7-300 \rightarrow CPU" as below:** 



#### (3) Click PLC's **PROFINET interface\_1** to set its **IP Address**.



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(4) Click Add new subnet to create subnet as PN/IE\_1.

PROFINET interface_1 [PN-IO]		🗟 Properties	🗓 Info	🗓 Diagnostics	
General IO tags Sys	tem constants Texts				
General Ethernet addresses	Ethernet addresses				
Time synchronization	Interface networked with				
<ul> <li>Advanced options</li> </ul>					
Diagnostics addresses	Subnet:	PN/IE_1			-
		Add new subnet			

(5) Click Options → Manage general station description to install the MGate 5103's GSD file.

Siemens - C:Wsers/PVC/Documents/Automation/MGate5111/MGate5111

Project Edit View Insert Online
Options Tools Window Help

Image: Solution Stress
Image: Support packages

Project tree
Support packages

Image: Solution Stress
Manage general station description files (GSD)

Start Automation License Manager
Show reference text

Image: Solution Start Automation License Manager

Select the latest version of the MGate 5103, V2.3, and then click Install.

n files			() (
Version	Language	Status	Info
V2.2	English	Not yet installed	PROFINET I
. V2.3	English	Not yet installed	PROFINET I
	1111		>
		Delete	all Cancel
	<ul> <li>Version</li> <li>V2.2</li> <li>V2.3</li> </ul>	n files Version Language V2.2 English V2.3 English V2.3 I English	r files          Version       Language       Status         V2.2       English       Not yet installed         V2.3       English       Not yet installed

## How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

lanage general	station descript	tion files	_		>
lasse liet an an					
Installation res	suit				
S Installatio	on was completed s	uccessfully.			
	14				
Save	log	Install additional f	files	Close	
				-1975	

Make sure the installation is successful.

(6) In the Hardware catalog window, filter "moxa" to search the MGate 5103. Choose the Moxa PROFINET Device 0202 device icon, and drag and drop to PN/IE\_1 subnet.



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(7) Under Network view, it shows that the MGate 5103 is in the PN/IE\_1 subnet. Click Not assigned to assign the MGate 5103 to PN/IE\_1.



Then **MGate 5103** is set into the **PLC\_1**'s PROFINET IO System.

🛃 Тор	ology view	📥 Network view	Device view
💦 Networ	k 🚹 Conne	ections HMI connection	
	<b>Ӆ</b> 10 s	ystem: PLC_1.PROFINET I	0-System (100) 📃 🔼
			=
15-2 PN/DP		mgate-dev	
		PLC_1	
	PLC_1.PR	OFINET IO-Syste	

If your **MGate 5103** Device Name is not **mgate-dev**, you can modify it via **Properties** → **General** → **Name**".

-		
•		
	> 100%	<b>-</b>
	* 100%	I I I Y I I I
mgate-dev [Moxa PROFINET Dev	vice 0202] 📴 Properties 🚺 Info	追 🗓 Diagnostics
mgate-dev [Moxa PROFINET Dev General IO tags Syst	vice 0202] 💽 Properties 🚺 Info sem constants Texts	i Diagnostics
mgate-dev [Moxa PROFINET Dev General IO tags Syst	vice 0202] 💽 Properties 🚺 Info rem constants Texts General	i 🛛 Diagnostics
mgate-dev [Moxa PROFINET Dev General IO tags Syst General Catalog information	vice 0202] 💽 Properties 🚺 Info rem constants Texts General	i 🛛 Diagnostics
mgate-dev [Moxa PROFINET Dev General IO tags Syst General Catalog information PROFINET interface [X1]	vice 0202] 💽 Properties 🚺 Info eem constants Texts General	i Diagnostics
mgate-dev [Moxa PROFINET Dev General IO tags Syst General Catalog information PROFINET interface [X1] General	vice 0202] Roperties Linfo em constants Texts General Name: mgate-d	Diagnostics
mgate-dev [Moxa PROFINET Dev General IO tags Syst General Catalog information PROFINET interface [X1] General Ethernet addresses	vice 0202]  Properties  Info mem constants Texts General Name: mgate-o Author: PVC	i Diagnostics

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(8) Under the MGate 5103's Device view, drag and drop Input 006 Byte to Slot 1. Assign the I address to 0-5.

	📲 Topology view	📥 Network	view	📑 Devic	e view		Options
	Device overview						
	🔐 Module	Rack	Slot	l address	Q ad		✓ Catalog
	<ul> <li>mgate-dev</li> </ul>	0	0	2042*		^	<search></search>
	PN-IO	0	0 ×1	2041*			Filter Profile: Alls
	Input 006 Byte_1	0	1	05		≡	The Input modules
		0	2				Input 001 Pite
		0	3				input oor byte
		0					📗 Input 002 Byte
		0	4			$\mathbf{N}$	📗 Input 003 Byte
1		0	5				Input 004 Byte
		0	6				
•		0	7				Input ous Byte
		0	8				Input 006 Byte

Drag and drop **Output 006 Byte** to Slot 2. Assign the **Q address** to 0-5.



(9) We want to get the register values of Modbus ID1- ID3 and make sure these Modbus commands' responses are valid. If a Modbus command's response is invalid or times out, the register value will show 0xFFFF. We will show the details later. We created these tags below:

D	Default tag table							
	-	Name	Data type	Address 🔺	Comment			
1	-	Input1	Word	%IW0	PIWO			
2	-0	Input2	Word	%IW2	PIW2			
з	-	Input3	Word	%IW4	PIW4			
4	-	Output4	Word	%QW0	Write ID4			
5	-	Output5	Word	%QW2	Write ID5			
6	-00	Output6	Word	%QW4	Write ID6			
7	-	ID1Value	Word	%MWO	Show ID1 running value			
8	-	ID2Value	Word	%MW2	Show ID1 running value			
9	-	ID3Value	Word	%MW4	Show ID1 running value			
10	-00	RecordByte	Byte	%MB10	Modbus Command Status			
11	-	ID1Status	Bool	%M10.0	ID1 command status			
12	-	ID2Status	Bool	%M10.1	ID2 command status			
13	-0	<b>ID3Status</b>	Bool	%M10.2	ID3 command status			
14	-	ReqBit	Bool	%M11.0	REQ = 1: Send request			
15	-	ValidBit	Bool	%M11.1	New data record was received and is valid			
16	-	BusyBit	Bool	%M11.2	BUSY = 1: The reading process is not yet complete.			
17	-	ErrorBit	Bool	%M11.3	ERROR = 1: An error occurred during the reading process.			
18	-	StatusCode	DWord	%MD12	Block status or error information			

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### How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

Click Main [OB1] to edit program.

Drag and Drop the **RDREC** function block to Network 1. DB setting pops up to add **RDREC Instance**. Click **OK** to apply it.

Call ontions		1	🖌 🔜 word rogic operations	
can options	<u>^</u>	- 1	🕨 🛱 Shift and rotate	
	Data block	- 1	Etc Additional instructions	
	Name RDREC_DB	- 1		
DB	Number 1	- 1		
Single		-		
instance		-	<ul> <li>Extended instructions</li> </ul>	
	<ul> <li>Automatic</li> </ul>		Name	Description
	If you call the function block as a single instance, the function	- 1	Nome Nome	Description
	block saves its data in its own instance data block.		Cher	
		- 1	String + Char	
			Process image	
			🔻 🛄 Distributed I/O	
		$\overline{}$	DP & PROFINET	
		1	- RDREC	Read data record
			- WRREC	Write data record
		_	🚘 GETIO	Read process image
			📥 SETIO	Transfer process image
			= GETIO PART	Read process image a
	more		ETIO_PART	Transfer process imag
			N Taskaslana	
	OK Cancel		recnnology	
			> Communication	

Fill in the input/output parameters as below:



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Parameter descriptions:

- ①. REQ: If this bit is true, the request will be sent to the **MGate 5103**.
- ②. VALID: Bit memory M11.1 indicates whether a new data record was received and valid.
- ③. BUSY: Bit memory M11.2 indicates whether the read process has been terminated.
- ④. ERROR: Bit memory M11.3 indicates whether an error occurred while processing the function.
- (5). STATUS: The bit memory double word MD12 contains block status or error information.
- (6). ID: It is the PN-IO diagnostic address, which is 2041, as below. This address is used for PROFINET acyclic read/write for the MGate 5103 to do some pre-define diagnoses.

MGate5103 → Ungrouped devices → mgate-dev [Moxa PROFINET Device 0202] _ ■ ■ ×									
🖉 Topology view 🛛 🚠 Network view 🛛 😭 Device view									
mgate-dev (Moxa PROF	🔠 mgate-dev [Moxa PROFINET D 💌 🔛 🚰 🛛 Device overview								
		^	<b>**</b>	Module	Rack	Slot	I address		
				<ul> <li>mgate-dev</li> </ul>	0	0	2042*	^	
dev				PN-IO	0	0 X1	2041*		
A31E		=		Input 006 Byte_1	0	1	05		
<b>U</b>					0	2			
					0	3			
					0	4		_	
					0	5		=	
					0	6			
					0	7			
	*				0	8			
					0	9			
					0	10			
					0	11			

- ⑦. INDEX: Data record number. For the MGate 5103, the command status starting address is 30000.
- ⑧. MLEN: The maximum length of bytes of the data record information to be fetched. In this demo, we only need one byte to get command 1-3 status (Bit 0-2).
- (b) . RECORD: The destination area for the read data record. We use MB10 to store it.

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Other Networks' programs are illustrated as below:

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(10) Execute **Compile** and make sure there is no error.



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### How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

#### (11) Execute **Download.**



Click Start Search to search an accessible PLC.

	o device				***************	
	Configured acce	ess nodes of "PLC_1"				
	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 X1	PROFIBUS	2	PROFIBUS_1
		Type of the PG/PC inte PG/PC inte Connection to interface/s 1st ga	erface: erface: ubnet: teway:	PN/IE	L8168D/8111D Family P '2 X2'	CI-E Gigabi V 🕅
	Select target de	vice:			Show all compatible	e devices
	Select target de Device	vice: Device type	Interf	ace type	Show all compatible	e devices
	Select target de Device —	vice: Device type —	Interf	ace type	Show all compatible Address Access address	e devices Target device —
Flash LED	Select target de Device —	vice: Device type —	Interf	ace type	Show all compatible Address Access address	e devices Target device —



### How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

Select target device: Show all compatible devices -Device Device type Interface type Address Target device 192.168.32.229 PLC\_1 CPU 315-2 PN/DP PN/IE 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

When an accessible PLC has been found, execute **Load**.

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

Load pre	eview			×
<b>?</b>	heck l	before loading		
Status	1	Target	Message	Action
ŧ	<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	
	0	<ul> <li>Device configurat</li> </ul>	Delete and replace system data in target	Download to device
	0	▶ Software	Download software to device	Consistent download
<			III	>
				Refresh
			Finish	Load Cancel

## How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

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

atus	!	Target	Message	Action	
ų.	<u> </u>	▼ PLC_1	Downloading to device completed without error.		
	<u>^</u>	<ul> <li>Start modules</li> </ul>	Start modules after downloading to device.	Start all	

### 6 Communication Test

### A. Status Monitoring

(1) PC runs the **Modbus Slave** tool to connect to the **MGate 5103**'s Serial port. Add slave ID1-ID3 and set each one's register 0's value as 1, 2, 3, respectively.

📓 Modbus Slave - Mbslave3 📃 💷 🖃						
File Edit Connection	Setup Display View W	indow 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 the Siemens PLC and the MGate 5103

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



Add the tags below to be monitored:

1	<u>1 [CPU 315-2 PN/DP]</u> Watch and force tables Watch table_1								
<b>*</b>	🛫 😻 🗞 🌮 🖧 🖤 🖤								
-	i	Name	Address	Display format	Monitor v				
1		"ReqBit"	%M11.0	Bool					
2		"ID1Value"	%MW0	Hex					
з		"ID2Value"	%MW2	Hex					
4		"ID3Value"	%MW4	Hex					
5		"RecordByte"	%MB10	Hex					
6		"Output4"	%QW0	Hex					
7		"Output5"	%QW2	Hex					
8		"Output6"	%QW4	Hex					

## How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

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

)±(	pal± [₹	1 II II II II A	🚿 Go online 🔊	Go offline   🏭 🕕					
1	[CPU	315-2 PN/DP] 🕨 \	Watch and force t	ables 🕨 Watch t	able_1 🛛 🗕 🗖				
<b>1</b>	# # b 1, 2 2 m m								
	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				

If **ReqBit** status is not **True**, you can input **True** under the **Modify value** column, click the **Modify** button to enable send request.

>	PLC_1 [CPU 315-	2 PN/DP] 🕨 Watcl	h and force tables	s 🔸 Watch table	_1 💶 🖬 🖷
<b>*</b>	🔮 😼 占 🖋	1 🕫 🖓 🕅			
	Name	Address	Display format	Monitor value	Modify value
1	"ReqBit"	%M11.0	Bool 💌	TRUE	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	

We can see **RecordByte** shows a value of 7, pointing out that the commands 1-3 are successful. The **ID1Value-ID3Value** are running as 1, 2, 3, respectively.

#### How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

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

Via System Monitoring → Protocol Status → Modbus RTU/ASCII Diagnose, we can see its Received Valid response counter is equal to the Sent request counter.

	Modbus RTU/ASCII Diagnose								
Main Menu	🗹 Auto refr	Auto refresh							
Quick Setup		1	1						
Overview	Category	Item	Value						
Basic Settings	Modbus								
Network Settings		Mode	RTU Master						
		Sent request	264						
Senai Settings		Received valid response	264						
- Protocol Settings		Received invalid response	0						
- System Management		Received CRC/LRC Error	0						
- System Monitoring		Received exception	0						
- System Status		Timeout	0						
- Protocol Status									
	Serial Port								
I/O Data View		Port number	1						
Modbus RTU/ASCII Diagnose		Break	0						
PROFINET Diagnose		Frame error	0						
Modbus RTU/ASCII Traffic		Parity error	0						
		Overrun error	0						

Via System Monitoring → Protocol Status → Modbus RTU/ASCII Traffic, we can log Modbus RTU communication traffic:

Main Menu	Auto	o scroll				
Quick Setup	Start Stop Export Ready to capture					
Overview			- or operation of the second s			
Basic Settings	No.	Time	Send/Receive	Slave ID	Function Code	Data
Network Settings	1	0.048	Send	1	3	01 03 00 00 00 01 84 04
Serial Settings	2	0.090	Receive	1	3	01 03 02 <mark>00 01 7</mark> 9 84
- Protocol Settings	3	0.108	Send	2	3	02 03 00 <mark>00 00</mark> 01 84 39
- System Management	4	0.150	Receive	2	3	02 03 02 <mark>00 02</mark> 7D 85
- System Monitoring	5	0.209	Send	3	3	03 03 00 00 00 01 85 E8
- System Status	6	0.250	Receive	3	3	03 03 02 <mark>00 03</mark> 81 85
- Protocol Status	7	1.048	Send	1	3	01 03 00 00 00 01 84 0A
	8	1.087	Receive	1	3	01 03 02 00 01 79 84
I/O Data View	9	1.108	Send	2	3	02 03 00 00 00 01 84 39
Modbus RTU/ASCII Diagnose	10	1.147	Receive	2	3	02 03 02 00 02 7D 85
PROFINET Diagnose	11	1.208	Send	3	3	03 03 00 00 00 01 85 E8
Modbus RTU/ASCII Traffic	12	1.247	Receive	3	3	03 03 02 00 03 81 85
	40	0.040	0		<b>•</b>	04 00 00 00 00 04 04 04

#### **Modbus RTU/ASCII Traffic**

## How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

Via System Monitoring → Protocol Status → PROFINET Diagnose, we can see its Connected PLC MAC Address:

Auto refresh			
	1		
Category	Item	Value	
PLC Status			
	Connected PLC MAC Address	00:1B:1B:57:C8:30	
	PLC Operation Mode	RUN	
Parameters			
	Sender clock (packet interval)	8 ms	
	Device name	mgate-dev	
I/O Slot			
	Slot 1 Input 6 Byte	00 01 00 02 00 03	
	Slot 2 Output 6 Byte	00 00 00 00 00 00	
	Category PLC Status Parameters I/O Slot	Category         Item           PLC Status         Connected PLC MAC Address           PLC Operation Mode         Planameters           Sender clock (packet interval)         Device name           I/O Slot         Slot 1 Input 6 Byte           Slot 2 Output 6 Byte         Slot 2 Output 6 Byte	Category         Item         Value           PLC Status

### **PROFINET Diagnose**

Via System Monitoring  $\rightarrow$  Protocol Status  $\rightarrow$  I/O Data View, we can choose **PROFINET IO Controller**  $\leftarrow$  Modbus RTU/ASCII Slave data flow side to see the Modbus slave input data:

• I/O Data View

Main Menu	Auto refresh						
Quick Setup							
Overview	Data flow direction PROFINET IO Cont	roller <	Modb	us RTU	J/ASCII	Slave N	~
Basic Settings		Π	51	П	72	П	53
Network Settings	Internal Address	00	01	02	03	04	05
Serial Settings	0000h	00	01	00	02	00	03
- Protocol Settings	0010h	00	00	00	00	00	00
	0020h	00	00	00	00	00	00
- System Management	0030h	00	00	00	00	00	00
- System Monitoring	0040h	00	00	00	00	00	00
- System Status	0050h	00	00	00	00	00	00
- Protocol Status	0060h	00	00	00	00	00	00
	0070h	00	00	00	00	00	00
I/O Data View							

Modbus RTU/ASCII Diagnose

## How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

**Modbus RTU/ASCII Diagn** 

(5) Disable Modbus Slave ID 2 on Modbus Slave tool, so Modbus Command 2 can't receive any responses. Check Watch table, RecordByte shows a value of 5 and ID2value is updated as 0xFFF.

<b>*</b>	学 🔮 🌆 🕫 🏞 🤁 🌄 🚏 🖤										
-	Name	Address	Display format	Monitor value							
1	"ReqBit"	%M11.0	Bool	TRUE							
2	"ID1Value"	%MW0	Hex	16#0001							
З	"ID2Value"	%MW2	Hex	16#FFFF							
4	"ID3Value"	%MW4	Hex	16#0003							
5	"RecordByte"	%MB10	Hex	16#05							

Check Modbus RTU/ASCII Diagnose, the Timeout counter is increasing:

			0
Main Menu	Auto refre	esh	
Quick Setup	1	I	1
Overview	Category	Item	Value
Basic Settings	Modbus		
Network Settings		Mode	RTU Master
Sorial Sottings		Sent request	2929
Senar Settings		Received valid response	2875
- Protocol Settings		Received invalid response	0
- System Management		Received CRC/LRC Error	0
- System Monitoring		Received exception	0
Oustern Otetur		Timeout	53
- System Status			
- Protocol Status	Serial Port		
I/O Data View		Port number	1
Modbus RTU/ASCII Diagnose		Break	0
PROFINET Diagnose		Frame error	0
Modbus RTI I/ASCII Traffic		Parity error	0
modulus intro/Aboil franc		Overrun error	0

### **B. Fault Protection**

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



## How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

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

)	PLC_1 [CPU 31!	5-2 PN/DP] 🕨 Wat	ch and force tabl	es 🔸 Watch tabl	e_1 🗕 🗖	≡×						
<b>*</b>	# # b 1/2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1											
	Name	Address	Display format	Monitor value	Modify value	9						
1	"ReqBit"	%M11.0	Bool	TRUE	TRUE							
2	"ID1Value"	%MW0	Hex	16#0001								
З	"ID2Value"	%MW2	Hex	16#FFFF								
4	"ID3Value"	%MW4	Hex	16#0003								
5	"RecordByte"	%MB10	Hex	16#05								
6	"Output4"	%QW0	Hex	16#0004	16#0004							
7	"Output5"	%QW2	Hex	16#0005	16#0005							
8	"Output6"	%QW4	Hex	16#0006	16#0006							

(3) Check Modbus Slave ID 4-ID6; they are updated as 0x0004, 0x0005, 0x0006.



Via System Monitoring  $\rightarrow$  Protocol Status  $\rightarrow$  I/O Data View, we can choose **PROFINET IO Controller**  $\rightarrow$  Modbus RTU/ASCII Slave data flow side to see the PROFINET output data:

### • I/O Data View

Auto refresh

Data flow direction PROFINET IO Controller> Modbus RTU/ASCII Slave									
	Ι	D4	5	П	06				
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			

## How to Use the TIA Portal to Set the Siemens PLC and the MGate 5103

(4) Shut down the PLC. After 10000 ms, the **Fault Timeout** is on. Check whether Modbus Slave ID 4's register 0 value still is 0x0004. Slave ID 5's register 0 value is updated as 0x0000, and Slave ID 6's register 0 value is updated as 0xFFFF.

	<b>POC</b>	Mbslave4		<b>P</b>	Mbslave5 🗖			Mbslave6		
	ID :	= 4: F = 03		ID	= 5: F = 03		ID	= 6: F = 0	3	
		00000	<u>^</u>	F	00000	<u>^</u>			00000	*
I	0	0x0004		0	0×0000		0		0xFFFF	
	1			1			1			

Check **PROFINET IO Controller** → **Modbus RTU/ASCII Slave** data flow side; they all updated as its **Fault Value**:

### • I/O Data View

Auto refresh

Data flow direction	
PROFINET IO Controller> Modbus RTU/ASCII Slave N	~

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 **PROFINET Diagnose**. Its **Connected PLC MAC Address** shows **Not Connected**:

### **PROFINET Diagnose**

Auto refresh

Category	Item	Value
PLC Status		
	Connected PLC MAC Address	Not Connected
	PLC Operation Mode	N/A
Parameters		
	Sender clock (packet interval)	0 ms
	Device name	mgate-dev
I/O Slot		

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