Using Siemens S7-300 PLC to Perform Acyclic Read and Write on MGate 5102

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Using Siemens S7-300 PLC to Perform Acyclic Read and Write on MGate 5102

1. Application Description

A. Objective

This document describes how to use Siemens PLC to perform Acyclic Read and Write on MGate 5102-PBM-PN to get PROFIBUS Status Word and Communication List or to set PROFIBUS Control Word.

In this application, the administrator wants to manage MGate 5102-PBM-PN diagnostic information. For example, to get and set PROFIBUS operation mode and to get PROFIBUS Communication List via Siemens PLC.

B. Goals

This document shows you how to:

- Use Siemens PLC to do Acyclic Read and Write.
- Get ROFIBUS Status Word and ROFIBUS Communication List from MGate 5102-PBM-PN.
- Set ROFIBUS Control Word from MGate 5102-PBM-PN.

2. System Topology

The following figure shows a system architecture in which **MGate 5102-PBM-PN**, **PC1** (running SIMATIC Step 7), **Siemens S7-300 PLC**, and **Pro-face GP-4501 TW** (a HMI device to control and monitor PLC) are connected to the Ethernet network. MGate 5102-PBM-PN connects to MGate 4101-MB-PBS via a PROFIBUS cable. Pro-face GP-4501TW controls and monitors Siemens S7-300 via Ethernet.



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3. Hardware and Software Requirements

3.1. Hardware Requirement

A. Siemens SIMATIC S7-300 PLC:

Processor: CPU 315-2 PN/DP Article Number: 6ES7315-2EH14-0AB0 Version:3.2.7

B. MGate 5102-PBM-PN:

Firmware Version: V1.2_Build_13083010 GSDML File: GSDML-V2.3-Moxa-MGate-20130708.xml

C. MGate 4101-MB-PBS:

Firmware Version: Ver1.3_Build_14031018 GSD File: MPBS0D80.gsd.

3.2. Software Requirement

A. SIMATIC Step7:

Siemens PLC Engineering Software by Siemens AG. Version: **V5.5+SP3**

B. MGate Manager:

Software utility to configure Moxa MGate devices. Version: **1.10**

C. GP-Pro EX:

Screen editor Utility from Pro-face. Rev.: **V3.5**

4. Configuration

4.1. Hardware Installation

A. Ethernet Connection

Use Ethernet cables to connect Siemens PLC, MGate 5102-PBM-PN, and Pro-face GP-4501TW to an Ethernet switch.

B. PROFIBUS Connection

Use a PROFIBUS cable to connect MGate 5102-PBM-PN to MGate 4101-MB-PBS.

4.2. Configuring MGate 5102-PBM-PN

Use MGate Manager to configure the following MGate 5102-PBM-PN settings.

A. PROFINET Setting

Set [Device Name] to "mgate-dev".

B. PROBUS Setting

- Add MGate 4101 to the Slave List with the address 3.
- Set the IO modules as [Slot 1]: "Input 1 Word" and [Slot 2]: "Output 1 Word".

4.3. Configuring MGate 4101-MB-PBS

- On the switch, set the PROFIBUS address as 3.
- In MGate Manager, set the PROFIBUS IO on MGate 4101-MB-PBS to [Slot 1]: "Input 1 Word" and [Slot 2]: "Output 1 Word".

4.4. Configuring Siemens PLC

4.4.1. Creating a STEP 7 Project

Start SIMATIC Manager and create a new project. Click **File** \rightarrow **New**. Then, set the project name in the **Name** field and click **OK**.

SIMATIC Manager					
File PLC View Options	Window	Help			
🗅 🍃 🔡 🛲 🧉	8 1				
New Preiest	_	_	-	_	X
New Project					
User projec	ts Libraries .	Multiprojects	1		
Name		Storage	e path		
24slotb	umin	D:\PLC	NDemo\\$7-24\$	lot\24slotbu	
4101B	umin200	D:\PLC	Demo'S7Bun	nin8W41011	Bu_:
4101B	umin200	D:\PLC	\Demo\\$7Bun	nin200\4101)	Bun
4101B	umin8W	D:\PLC	\Demo\\$7Bun	nin8W41011	Bun:
E9 5102		C:\Prog	gram Files\Siem	iens'Step7\s7	proj
E9 5102_1	.024	C:\Prog	gram Files'Siem	iens'Step7\s7	proj 🖛
					•
🗖 <u>A</u> dd to cu	urent multiproje	ect			
Na <u>m</u> e:			<u>T</u>	уре:	
5102Acyclic	:		P	roiect	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				I F Librari	
<u>S</u> torage locat	ion (path):		I.	<u>r</u> Libiary	
D:\PLC\Den	io\5102Acyclic			Browse	
ОК			Cancel	I	Help
	_	_	_		

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4.4.2. Inserting a Station

In SIMATIC Manager, click **Insert** → **Station** and select to insert **SIMATIC 300 Station** into the project.



4.4.3. Configuring Hardware

A. Adding a Rack

1. In SIMATIC Manager, double-click **Hardware**.



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The HW Config screen appears. Click Insert → SIMATIC 300 → RACK
 → Rail to insert the rack object.



The following figure shows the HW Config screen after adding the rack object.



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B. Adding a CPU

You must add the appropriate CPU module to the STEP7 project based on the actual hardware model. In this example, **CPU 315-2 PN/DP** is the hardware model.

1. In the HW Config screen, drag the selected CPU module to the slot table.

🛱 HW Config - [SIMATIC 300(1) (Configuration) 5102Acyclic]											
Un Station Ed	mand Station Four liver Fire Abino Abino Abino Helb										
🗋 🗁 🚔 📓] D 😂 🍄 📓 🚳 🚳 💼 🏟 🎰 🎒 🗖 명 🐘 /										
() UR 1 2 3 4 6 7 () UR 1 2 3 4 5 6 7 () UR								En	d: offile: 	Standard PROFIBUS-PA PROFINET IO SIMATIC 300 C7 C7.300 C70.302 C70.312 C70.312 C70.312 C70.312 C70.312 C70.312 C70.312 C70.313 C70.313 C70.313-C2 C70.312-C2 C70.312-C2 C70.312	<u>nt</u> ni <u> </u>
(0) UF Slot Mod 1 2 3 4 4 5 6 7 7 8 9 9 9 9	ale Order numbe	r 	Firmware	MPI address	I address	Q address	Com			⊕ CPU 314 IPM ⊕ CPU 314C2 PR ⊕ CPU 314C2 PR/DP ⊕ CPU 315C2 PR/DP	
Press F1 to get He	lp.							(di	stribu	UUS-DF SHAVES FOR SIMILATIC S7, M7, and C7 fed rack)	Er

The **Properties-Ethernet interface PN-IO** screen appears.

 Configure the IP address and Subnet mask fields for Siemens PLC. Click New to add a new subnet as "Ethernet(1)". Then, click OK.

Properties - Ethernet interface PN-IO (R0/S2	2.2)
General Parameters	
	If a subnet is selected, the next available addresses are suggested.
IP address: Subnet mask: Use different method to obtain IP address Subnet:	Gateway © Do not use router © Use router <u>A</u> ddress:
not networked Ethemet(1)	New Properties Delete
OK	Cancel Help

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2

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The HW Config screen indicates that the PN-IO interface extends the **"Ethernet(1)"** network in the topology.



4.4.4. Installing the GSD file

For engineering and configuration purposes, you must the device's GSDML file through SIMATIC Manager.

A. In the HW Config screen, click **Options** → **Install GSD File**.

₩ HW Config - [SIMATIC 300(1) (Configuration) 5102Acyclic] ₩ <u>S</u> tation <u>E</u> dit Insert <u>P</u> LC <u>V</u> iew <u>Options</u> <u>W</u> indow <u>H</u> elp						
D 🗲 🖫 🔍 🖏 🎒 🛍 🛍 🖬	Customize Ct	rl+Alt+E				
	Specify Module Configure Network Symbol Table Ct Report System Error Edit Catalog Profile Update Catalog Install HW Updates Install GSD File	rl+Alt+T <u>a (100)</u>				
<	Find in Service & Support Create GSD file for I-Device					

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B. In the Instll GSD Files screen, click **Browse** to navigate to the folder and select the GSDML file for the Moxa PROFINET device. Then, click **Install** and **Close**

Install GSD Files				×
Install GSD Files:	om the directory	•		
D:\5102\Rom\GSDML				<u>B</u> rowse
	Release	Version	Inguages	
GSDML-V2.3-Moxa-MGate-20130708.xml GSDML-V2.2-Moxa-MGate-20130708.xml	07/08/2013 12:00:00 AM	V2.3 V2.2	English	
Install Show Log	Select <u>A</u> ll D	eselect All		
Close				Help

If the GSD file is installed successfully, the system displays **Moxa PROFINET Device** in the the hardware catalog list.

<u>F</u> ind:		m‡ mi
<u>P</u> rofile:	Standard	•
⊡ ₩ F	ROFIBUS DP	
	ROFIBUS-PA	
🗎 🗄 🐺 F	ROFINET IO	
0	📄 Additional Field Devices	
	≒… 🧰 Gateway	
	吏 🧰 MGate Fixed	
	🖻 🛄 MGate Generic	
	🖻 🚡 Moxa PROFINET Device	
	🗄 🧰 Input modules	
	🗄 💼 Output modules	
	庄 💼 MGate Series	
	±… 🧰 netTAP 100	
[🗄 💼 General	
[🗄 💼 Network Components	
📔 🗄 📲	📄 Gateway	
11	а ны	

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4.4.5. Configuring the PROFINET IO Device

In the HW Config screen, select and drag **Moxa PROFINET Device** from the hardware catalog list to **PROFINET IO** \rightarrow **Additional Field Devices** as shown in the following figure.



The following figure shows the topology with the Moxa PROFINET Device object graphic.



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Jeneral			
Short description:	mgate-dev		
	(Moxa Gateway) PROFINET IO/PROFIBUS-DP Gateway D)evice	*
			~
Order no./ firmware:	MGate-PNIO / V1.2		
Family:	MGate Generic		
<u>D</u> evice name:	mgate-dev		
GSD file:	GSDML-V2.3-Moxa-MGate-20130518.xml		
	Change Release Number		
$\begin{bmatrix} \underline{N} \text{ ode in PROFINET} \end{bmatrix}$	O system		
D <u>e</u> vice number:	1 PROFINET-IO-System (100))	
IP address:	192.168.32.230 Ethemet		
🔽 <u>A</u> ssign IP address	via IO controller		
Comment:			
			*
			-

You can double-click **"(1)maget-dev**" of Moxa PROFINET Device object to configure its properties.

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4.4.6. Configuring I/O Modules

You can configure the selected I/O modules for data exchange with Siemens PLC. You can select the I/O module combinations based on your application. This example uses the **Input 2 Byte** and **Output 2 Byte** IO combination.

- A. Drag the **Input 002 Byte** module from the module list for Moxa PROFINET Device to slot **1**.
- B. Drag the **Output 002 Byte** module to slot **2**.
- C. Save the changes.



4.5. Configuring Siemens PLC Acyclic Read/Write Operation

4.5.1. Inserting Data Block

You must first add data blocks to configure request and response parameters.

A. In the SIMATIC Manager screen, click **Insert → S7 Block → Data Block** to add data blocks.



B. In the Properties screen, configure the fields and click **OK** to create two data blocks. Enter the field values as listed in the following table.

Name	DB1	DB2
Symbolic Nam	DB_Request	DB_Response
Properties - Data Block		×
General - Part 1 General	- Part 2 Calls Attributes	
<u>N</u> ame and type:	DB1 Shared DB	▼
Symbolic Name:	DB_Request	
Symbol <u>C</u> omment:		
Created in <u>L</u> anguage:	DB 💌	
Project path:		
Storage location of project:	D:\PLC\Demo\5102Acyclic\5102A	сус
	Code	Interface
Late created:	08/01/2014 02:15:17 PM 08/01/2014 02:15:17 PM	08/01/2014 02:15:17 PM
Comment:		
-		
		~
ОК		Cancel Help
Properties - Data Block		
General - Part 1 Genera	1 - Part 2 Calls Attributes	1
<u>N</u> ame and type:	DB2 Shared DB	▼
Symbolic Name:	DB_Response	
Symbol <u>C</u> omment:		
Created in <u>L</u> anguage:	DB	
Project path:		

D:\PLC\Demo\5102Acyclic\5102Acyc

08/01/2014 02:16:20 PM

08/01/2014 02:16:20 PM

Interface

08/01/2014 02:16:20 PM

Cancel

Help

Code

Storage location of project:

Date created: Last modified:

Comment:

OK

4.5.2. Copying SFB52 and SFB53

SFB52 and **SFB53** function blocks are used for read and write requests on Siemens PLC.

Complete the following steps to copy these function blocks to your project:

- A. In the SIMATIC Manager screen, click **File** \rightarrow **Open** and click the **Library** tab.
- B. Select Standard Library and click OK to open the pre-defined library.

Name	Storage nath
Additional Modbus Blocks	D.VPLC\\$7\MB'
Redundant IO CGP V40	C.\Pmgram File
Redundant IO CGP V52	C:\Program File ≡
Redundant IO MGP V32	C:\Program File
SIMATIC NET CP	C:\Program File
Standard Library	C:\Program File
🗪 stillihs (V2)	C:\Pmgram File 🔻
< III	*
Selected	
ser projects:	
braries: 1	
unple projects:	
ultiprojects:	<u>B</u> rowse

- C. From the Standard Library tree view, click **System Function Blocks** → **Blocks**.
- D. On the right panel, select **SFB52** and **SFB53** and click **Copy** to copy them to your projects.

SIMATIC Manager - [Standar	d Library C:\F	Program Files\Siemens\Step7\S7I	ibs\stdlib3	0]						
📀 <u>F</u> ile <u>E</u> dit Insert PLC <u>V</u> i	iew <u>O</u> ptions	<u>W</u> indow <u>H</u> elp								
D 🚅 🔐 🛲 🐰 🛍 🙉	• • •	🖭 📴 🔠 🖬 🔹 🛛 < No Film	er >	• Y	🐮 🛞 🐂 🖻	1 II N?				
🖃 🔶 Standard Library	Object name	Symbolic name	Created i	in language	Size in the work me	Туре		Version (Header)	Name (Header)	Un
🗄 💼 Communication Blocks	SFB43	PULSEGEN	STL			System function blo	ock	1.0	PULSEGEN	
E GT IEC Function Blocks	SFB44	ANALOG	STL			System function blo	ock	1.0	ANALOG	
🗈 🛐 Miscellaneous Blocks	SFB46	DIGITAL	STL			System function blo	ock	1.0	DIGITAL	
Organization Blocks	SFB47	COUNT	STL			System function blo	ock	1.0	COUNT	
Im PID Control Blocks	SFB48	FREQUENC	STL			System function blo	ock	1.0	FREQUENC	
FROFIenergy Blocks	SFB49	PULSE	STL			System function blo	ock	1.0	PULSE	
So-S/ Converting Blocks	SFE52	RDREC	STL			Sustem function blo	ock	1.0	RDREC	
- sri System Punction Blocks	SFB53	WRREC	STL	Open (Object	Ctrl+Alt+O	ck			
Bucks	SFB54	RALRM	STL				ck	1.0	RALRM	
E ST 11-57 Converting Diocks	SFB60	SEND_PTP	STL	Cut	_	Ctrl+X	ck	1.0	SEND_PTP	
	SFB61	RCV_PTP	STL	Сору		Ctrl+C	ck	1.0	RCV_PTP	
	SFB62	RES_RCVB	STL	Dacta	-	Ctrl+V	ck	1.0	RES_RCVB	
	SFB63	SEND_RK	STL	T date		Curry	ck	1.0	SEND_RK	
	SFB64	FETCH_RK	STL	Delete		Del	ck	1.0	FETCH_RK	
	SFB65	SERVE_RK	STL				ck	1.0	SERVE_RK	
	SFB73	RCVREC	STL	Insert I	lew Object	•	ck	1.0	RCVREC	
	SFB74	PRVREC	STL				ck	1.0	PRVREC	
	SFB75	SALRM	STL	Compa	ire Blocks		ck	1.0	SALRM	
	SFB81	RD_DPAR	STL	Duint			ck	1.0	RD_DPAR	
	SFB104	IP_CONF	STL	Print			ck	1.0	IP_CONF	
	SFC0	SET_CLK	STL	Specia	Object Properties	•		1.0	SET_CLK	
1	CTR SRC1	RFAD CLK	STI.				1	10	RFAD CLK	

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4.5.3. Adding SFB52 and SFB53 Instance DB

Add two data blocks for **SFB52** and **SFB53**. To create the data blocks, configure the fields in the **Properties – Data Block** screen as shown in the following table.

Name and type	DB52	DB53
	Instance DB	Instance DB
	SFB52	SFB53
Symbolic Name	SFB52_Instance	SFB53_Instance

For more information on accessing the Properties – Data Block screen, see the **Inserting Data Block** section.

The following figures show the Properties – Data Block screen.

Properties - Data Block	- Interiorie in it	x			
General - Part 1 General	- Part 2 Calls Attributes				
<u>N</u> ame and type:	DB52 Instance DB 💽 SFB52 💌] [
Symbolic Name:	SFB52_Instance	-			
Symbol <u>C</u> omment:					
Created in <u>L</u> anguage:	DB				
Project path:					
Storage location of project:	D:\PLC\Demo\5102Acyclic\5102Acyc				
Data amatad	Code Interface				
Last modified:	08/01/2014 02:25:03 PM 08/01/2014 02:25:03 PM				
C <u>o</u> mment:	A				
ОК	Cancel Help				

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Properties - Data Block	×
General - Part 1 General	Part 2 Calls Attributes
<u>N</u> ame and type:	DB53 Instance DB 💌 SFB53 💌
Symbolic Name:	SFB53_Instance
Symbol <u>C</u> omment:	
Created in <u>L</u> anguage:	DB
Project path:	
Storage location of project:	D:\PLC\Demo\5102Acyclic\5102Acyc
Data created :	Code Interface
Last modified:	08/01/2014 02:26:54 PM 08/01/2014 02:26:54 PM
C <u>o</u> mment:	
	v
OK	Cancel Help

After adding the two data blocks, the SIMATIC Manager displays the entries as shown in the following figure.

SIMATIC	SIMATIC Manager - [5102Acyclic D:\PLC\Demo\5102Acyclic\5102Acyc]								
🖹 <u>F</u> ile <u>E</u> o	dit <u>I</u> nsert P <u>L</u> C <u>V</u> ie	ew <u>O</u> ptions <u>W</u> i	ndow <u>H</u> elp						
🗋 🗅 😅 🛛 🖁	🗅 😰 📰 🥽 🕹 🐁 🛍 💿 🐾 💺 🏗 🛍 💼 (< No Filies> 💽 🍞 🞇 🕮 🖼 🖿 🕅								
🖃 🎒 5102A	Acyclic	Object name	Symbolic name	Created in language	Size in the work me	Туре	Version (Header)	Name (Header)	Un
🖻 🔝 SI	IMATIC 300(1)	🚵 System data				SDB			
Ė- 🛽	CPU 315-2 PN/DP	🖽 OB1			38	Organization Block	0.1		
Ē	S7 Program(1)	🗇 DB1	DB_Request	DB	38	Data Block	0.1		
1	Sources	🗇 DB2	DB_Response	DB	38	Data Block	0.1		
	Blocks	🗇 DB52	SFB52_Instance	DB	64	Instance data block f	0.1		
		DB53	SFB53_Instance	DB	62	Instance data block f	0.1		
1		SFB52	RDREC	STL		System function block	1.0	RDREC	
		🚛 SFB53	WRREC	STL		System function block	1.0	WRREC	

4.5.4. Configuring DB1

Click the **DB1** data block to configure the structure variable as shown in the following figure.

[Address	Name	Туре	Initial value	Comment
	0.0		STRUCT		
	+0.0	ControlWordByte1	BYTE	B#16#0	
	+1.0	ControlWordByte2	BYTE	B#16#0	
	=2.0		END_STRUCT		

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4.5.5. Configuring DB2

Click the **DB2** data block to configure the structure variable as shown in the following figure.

Address	Name	Туре	Initial value	Comment
0.0		STRUCT		
+0.0	StatusWordByte1	BYTE	B#16#0	
+1.0	StatusWordByte2	BYTE	B#16#0	1:Stop, 2: Clear, 3: Operate
+2.0	Slave000007	BYTE	B#16#0	Slave 0~7
+3.0	Slave008015	BYTE	B#16#0	Slave 8~15
+4.0	Slave016023	BYTE	B#16#0	Slave 16~23
+5.0	Slave024031	BYTE	B#16#0	Slave 24~31
+6.0	Slave032039	BYTE	B#16#0	Slave 32~39
+7.0	Slave040047	BYTE	B#16#0	Slave 40~47
+8.0	Slave048055	BYTE	B#16#0	Slave 48~55
+9.0	Slave056063	BYTE	B#16#0	Slave 56~63
+10.0	Slave064071	BYTE	B#16#0	Slave 64~71
+11.0	Slave072079	BYTE	B#16#0	Slave 72~79
+12.0	Slave080087	BYTE	B#16#0	Slave 80~87
+13.0	Slave088095	BYTE	B#16#0	Slave 88~95
+14.0	Slave096103	BYTE	B#16#0	Slave 96~103
+15.0	Slave104111	BYTE	B#16#0	Slave 104~111
+16.0	Slave112119	BYTE	B#16#0	Slave 112~119
+17.0	Slave120125	BYTE	B#16#0	Slave 120~125
=18.0		END_STRUCT		

4.5.6. Programing Acyclic Read to MGate to set getting Status Word

- A. Insert **Network 2** to program Read Status Word.
- B. Under **SFB blocks**, drag **SFB52** to **Network 2** and configure the input and output parameters as shown in the following figure.



The following describes the parameters.

- REQ: The Read request is sent to MGate 5102-PBM-PN using bit memory M1.0. Enter 1 (true) to start the read request. The request should then be ended. Enter 0 (false) to end the request. A Reset Bit logic is used to reset M1.0.
- VALID: Bit memory M1.1 indicates whether a new data record was received and valid.
- BUSY: Bit memory M1.2 indicates whether the read process is terminated or not.
- ERROR: Bit memory M1.3 indicates whether an error has occurred while processing the function.
- STATUS: The double-word bit memory MD10 contains an error code. For error descriptions, see "Help on system functions / function blocks".
- ID: The PN-IO diagnostic address (for example, "2041"). This address is used for PROFINET acyclic read/write to MGate5102-PBM-PN to perform pre-defined diagnoses.
- INDEX: Data record number. For MGate5102-PBM-PN Status Word, the starting address is 1024.
- MLEN: Maximum length in bytes of the data record information to be fetched. For MGate5102-PBM-PN Status Word, the length is 2 bytes.
- RECORD: Destination area for the read data record. For DB 2 in this example, the starting address is 0 and the address length is 2 bytes.

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4.5.7. Programing Acyclic Read to MGate to Get the Communication List



The following describes the parameters.

- REQ: The Read request is sent to MGate 5102-PBM-PN using bit memory M2.0. Enter 1 (true) to start the read request. The request should then be ended. Send a value of 0 (false) to end the request. A Reset Bit logic is used to reset M2.0.
- VALID: Bit memory M2.1 indicates whether a new data record has been received and valid.
- BUSY: Bit memory M2.2 indicates whether the read process is terminated or not.
- ERROR: Bit memory M2.3 indicates whether an error has occurred while processing the function.
- STATUS: The double-word bit memory MD10 contains an error code. For error descriptions, see "Help on system functions / function blocks".
- ID: The PN-IO diagnostic address (for example, "2041"). This address is used for PROFINET acyclic read/write to MGate5102-PBM-PN to perform pre-defined diagnoses.
- INDEX: Data record number. For MGate5102-PBM-PN Status Word, the starting address is 1024.
- MLEN: Maximum length in bytes of the data record information to be fetched. For MGate5102-PBM-PN Communication List, the length is 16 bytes.
- RECORD: Destination area for the read data record. For DB 2 in this example, the starting address is 2 and the address length is 16 bytes.

- 4.5.8. Programing Acyclic Write to MGate 5102-PBM-PN to Set Control Word In SIMATIC Manager, double-click OB1 under S7 Program → Blocks. The OB1 block is a Program Cycle Organization Block. The operating system of the S7 CPU executes OB1 periodically. When OB1 has been executed, the operating system starts it again. Cyclic execution of OB1 is started after the startup has been completed.
 - A. Click **OB1** to edit the program.
 - B. Insert **Network 1** to program Write Control Word.
 - C. Under **SFB blocks**, drag **SFB53** to **Network 1** and configure the input and output parameters as shown in the following figure.



The following describes the parameters.

- REQ: The write request ("Write parameter") is sent to MGate 5102-PBM-PN using bit memory M0.0. Enter 1 (true) to start the write request. The request should then be ended. Send a value of 0 (false) to end the request. A Reset Bit logic is used to reset M0.0.
- DONE: Bit memory M0.1 indicates whether a data record has been transferred.
- BUSY: Bit memory M0.2 indicates whether the write process is terminated or not.
- ERROR: Bit memory M0.3 indicates whether an error has occurred while processing the function.
- STATUS: The double-word bit memory MD10 contains an error code. For error descriptions, see "Help on system functions / function blocks".

Using Siemens S7-300 PLC to Perform Acyclic Read and Write on MGate 5102

- ID: The PN-IO diagnostic address (for example, "2041" as shown in the following figure). This address is used for PROFINET acyclic read/write on MGate5102-PBM-PN to perform pre-defined diagnoses.
- INDEX: Data record number. For MGate5102-PBM-PN Control Word, the starting address is 1024.
- LEN: Length of the fetched data record information. For MGate5102-PBM-PN Control Word in this example, the length is 2 bytes.
- RECORD: Write Out Data Record. For DB 1, the starting address is 0 and the address length is 2 bytes.

Image: Constraint of the second sec	PU 315-2 PN/DP		Ethemet(1): I	PROFINET-IO-	System (100)	(1) mgato-d
•					_ /	
(1) mgate-d	lev					
Slot	🚺 Module	Order number	I address	Q address	Diagnostic address:	Comment
Ø	mgate-dev	MGate-PNIO			2042*	
XI	I PN-10				2041*	
XI PI	Porti				2040*	
XI P2	🚺 Port2				2039*	
1	Input 002 Byte		256257			
2	Output 002 Byte			256257		
3						
4						
5						

Using Siemens S7-300 PLC to Perform Acyclic Read and Write on MGate 5102

4.6. Creating the Variable Table

In the variable table, you can modify and monitor the connected PLC variables and memory content.

To insert a variable table in the SIMATIC Manager screen, click **Insert** \rightarrow **S7 Block** \rightarrow **Variable Table**.

Add the variables as shown in the following figure and save the changes.

	Var - [VAT_1 5102Acyclic\SIMATIC 300(1)\CPU 315-2 PN/DP\S7 Program(1)]									
	👪 Table Edit Insert PLC Variable View Options Window Help									
₽	1	0 🖻 🖬		B 👗 🖻	a 🛍 🗠	CH 🗙	9 1	≗ №	Sø &r ≥≥	₩1 Ka
	1	Address		Symbol				Display format	Status value	Modify value
1		//Write "Con	trol	Word" Requ	lest Trigger					
2		M 0.0						BOOL		
3		//Read "Statu	ıs W	'ord" Reque	st Trigger					
4		M 1.0						BOOL		
5		//Read "Com	mu	nication List	" Request Ti	rigger				
6		M 2.0						BOOL		
7		//Status Wor	d							
8		DB2.DBW	0					HEX		
9		//Control Wo	nd							
10		DB1.DBW	0					HEX		
11		//Communic	atio	n List						
12		DB2.DBB	2	"DB_Resp	onse".Slave	000007		HEX		
13		DB2.DBB	3	"DB_Resp	onse".Slave	008015		HEX		
14		DB2.DBB	4	"DB_Resp	onse".Slave	01 <i>6</i> 023		HEX		
15		DB2.DBB	5	"DB_Resp	onse".Slave	024031		HEX		
16		DB2.DBB	6	"DB_Resp	onse".Slave	032039		HEX		
17		DB2.DBB	7	"DB_Resp	onse".Slave	040047		HEX		
18		DB2.DBB	8	"DB_Resp	onse".Slave	048055		HEX		
19		DB2.DBB	9	"DB_Resp	onse".Slave	056063		HEX		
20		DB2.DBB	10	"DB_Resp	onse".Slave	064071		HEX		
21		DB2.DBB	11	"DB_Resp	onse".Slave	072079		HEX		
22		DB2.DBB	12	"DB_Resp	onse".Slave	080087		HEX		
23		DB2.DBB	13	"DB_Resp	onse".Slave	088095		HEX		
24		DB2.DBB	14	"DB_Resp	onse".Slavø	096103		HEX		
25		DB2.DBB	15	"DB_Resp	onse".Slave	104111		HEX		
26		DB2.DBB	16	"DB_Resp	onse".Slave	112119		HEX		
27		DB2.DBB	17	"DB_Resp	onse".Slave	120125		HEX		
28										

Using Siemens S7-300 PLC to Perform Acyclic Read and Write on MGate 5102

4.7. Downloading a Project to PLC

In the SIMATIC Manager screen, click the **Download to Module** icon to download the configuration to **CPU 315-2 PN/DP**.



Select Node Address				X
Over which station add	ress is the programming de	evice connected to	the module CPU 3	315-2 PN/DP?
Rack:	0 -			
<u>S</u> lot:	2			
Target Station:	 Local Can be reached by me 	eans of gateway		
Enter connection to ta	rget station:			
IP address	MAC address	Module type	Station name	Module name
192.168.32.229	00-1B-1B-57-C8	CPU 315-2	SIMATIC 30	CPU 315-2
•	111			4
, Accessible Nodes				
192.168.32.229	00-1B-1B-57-C8-30	CPU 315-2P	SIMATIC 30	CPU 315-2 P
•				4
		<u>U</u> pdate		
ок			Cancel	Help

PLC starting communicating with MGate 5102-PBM-PN. The **PN Status** (PROFINET) LED on MGate 5102-PBM-PN turns **steady green** which indicates that the PROFINET status of the device is in **RUN** mode.

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Using Siemens S7-300 PLC to Perform Acyclic Read and Write on MGate 5102

4.8. Configuring GP- Pro EX

4.8.1. Creating a New project

- A. Start the GP-Pro EX application.
- B. The Welcome to GP-Pro EX window appears. Select **New** and click **OK**.

67-7ro EX	New Create Project From Sample Active_Alarm_Detail_Block.prx Alarm_History_Display.prx EZ_Tower_Light_QVGA.prx EZ_Tower_Light_VGA.prx	•
	 Open Existing Project Open Recent Project Native Test.prx ControlLogix.prx S7Demo.prx 4501test.prx 	•
		OK (0) Cancel

- C. Configure the following **Display Unit** settings and click **Next**.
 - Series: Select GP 4000 Series and GP-45** Series from the drop-down lists.
 - Model: Select GP-4501TW from the drop-down list.

Welcome to GP-Pro EX					_
	Display Unit				
62-2co DX	Series	GP4000 Series			•
		GP-45** Series			•
	Model	GP-4501TW			•
	Orientation	Landscape 🔻			
	Specifications				
	Screen Size	10.4 inch			
	Resolution	640 x 480 pixels (VGA)			
	Display Unit	TFT Color LCD			
	Display Colors	65,536 Colors			
	Touch Panel	Analog			
	Internal Memory	16 MB			
	Backup Memory	128 KB			
	COM1	RS-232C			
	COM2	RS-422(RS-485)			
	USB(A)	1 Ports			
	USB(mini-B)	1 Ports			
	LAN	1 Ports			
	SD	On			
	Video Input	None			
	Internal Board	None			
			Back (B)	Next (N)	Cancel

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- D. In the Device/PLC screen, configure the following fields and click **New Screen**:
 - Manufacture: Select Siemens AG from the drop-down list.
 - Series: Select SIMATIC S7 Ethernet from the drop-down list.
 - Port: Select Ethernet (TCP) from the drop down list.

Welcome to GP-Pro EX		
67-7ro E X	Device/PLC Number of Devi	ices/PLCs
		Device/PLC 1
	Manufacturer	Siemens AG
	Series	SIMATIC S7 Ethernet
	Port	Ethemet (TCP)
		Refer to the manual of this Device/PLC
		Recent Device/PLC
	4	4
	Use System	Area Device Information
	Back (B) Communication Settings New Logic New Screen Cancel

The system closes the Welcome screen and creates a Base Screen as shown in the following figure.



4.8.2. PLC Connection Setup

- A. Click the **Project** tab and select **Device/PLC**.
- B. In the **Device/PLC 1** configuration area, click the icon next to **PLC1** as indicated in the following figure.

Using Siemens S7-300 PLC to Perform Acyclic Read and Write on MGate 5102



- C. In the PCI settings screen, configure the following fields and click New:
 - Destination IP Address: Enter the IP address.
 - Connection Type: Select OP Communication from the drop-down list.
 - CPU Rack Number: Enter "0".
 - CPU Slot Number: Enter "2".
 - Use Tag Data: Select this check box.

🚰 Individual Device Settings 🛛 💌					
PLC1					
PLC Type	S7-300/400 Series -				
Device Names	English				
(If you change "PLC Type please reconfirm all addr	e" or "Device Names", ess settings.)				
Destination IP Address	192. 168. 32. 229				
Connection Type	OP Communication 🔹				
CPU Rack Number	0				
CPU Slot Number	2				
Tag Data					
🔽 Use Tag Data					
Ne	W Edit				
	Default				
0	(O) Cancel				

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D. The Add Tag screen appears. Click Import.

ata type <all></all>			▼ Usage	<al></al>	▼ Update
Name	Data type	Address		Comment	

E. In the **Tag Import** screen, select **DB_Request** and **DB_Response**; then, click **OK**.

Tag Data type Address Comment							
Name DB_Request DB_Response SFB52_Instance SFB53_Instance	Data type DB_Request DB_Response SFB52_Instance SFB53_Instance	Address DB00001.DBB00000 DB00002.DBB00000 DB00052.DBX00000.0 DB00053.DBX00000.0					
] Log File C:\Users\gen	eral_chiang\Documents\20148	1-下午 030931.html	Select Unselect <u>Select All Unselect A</u> Browse Filter Clear Filter OK Cancel				

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F. In the **Tag List** screen, click **Add** to add the BOOL tags as shown in the following figure.

g Data Name TagData01 lata type <all></all>		✓ Usage	CAI> Update
Tag Data type			
Name	Data type	Address	Comment
CommunicationListTrigger	BOOL	M00002.0	
ControlWordTigger	BOOL	M00000.0	
DB_Request	DB_Request	DB00001.DBB00000	
DB_Response	DB_Response	DB00002.DBB00000	
StatusWordTrigger	BOOL	M00001.0	
Import Export	Expand All Colla	pse All	dd Edit Delete

Create a new Screen and insert the parts as shown in the following figure.

MGate 5102 Acyc	lic Read/Write Test
Trigger	Control/Status Vord
Control Word	Input Control Word
	Output Status Word
Status Word	Note:
Communication List Read	1: Stop, 2: Clear, 3: Operate
	tion.List
Slave 0~7 1 Slave 32~39 1	Slave 64~71 1 Slave 96~103 1
Slave 8~15 1 Slave 40~47 1	Slave 72~79 1 Slave 104~111 1
Slave 16~23 1 Slave 48~55	Slave 80~87 1 Slave 112~119 1
Slave 24~31 1 Slave 56~63 1	Slave 88~95 1 Slave 120~125 1

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23 🚔 Switch/Lamp Parts ID Switch Feature Switch Common Lamp Feature Color Label SL 0000 ÷ Comment V Switch Feature Multi-function List Bit Switch Special Switch Word Screen Selector Bit Switch Switch Change Switch >>Extended Bit Address [PLC1]ControlWordTiggei 🔻 🧰 Normal Copy from Lamp Copy to Lamp Cir_0005M_17G Bit Action Bit Set • Select Shape No Shape Add Delete Include in Operation Log ÷ Copy and Add OK (O) Cancel Help (H)

The following figure shows a Control Word/Status Word input box example.

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Using Siemens S7-300 PLC to Perform Acyclic Read and Write on MGate 5102

The following figure shows a Control Word/Status Word input box example.

Parts ID Basic Display Color/Alam Operation Process Data Entry Display Data Display Data Display Data Display Data Display Displa
ABC Numeric Text Date/Time Statistical Show Limit Input Display Display Display Display Display Display Display Display Monitor Word Address >>Extended [PLC1]DB_Request.ControlV Image: ControlV Image: ControlV >>Extended Select Shape Data Type 8 Bit Dec Sign +/- Round Off
Select Shape Data Type B Bit Dec Sign +/- Round Off
Help (H)

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The following figure shows a Communication List input box example.

🖆 Data Display	and a standard and a	×
Parts ID DD_0002	Basic Display Color/Alam Operation Process Display Data Image: Additional system of the	Input Display
DataDisp_0003M Select Shape No Shape	DB Response.Slave000007 Image: Comparison of the second secon	
Help (H)	Include in Operation Log	Cancel

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Using Siemens S7-300 PLC to Perform Acyclic Read and Write on MGate 5102

5. Communication Test

5.1. Performing HMI Test

5.1.1. Write Control Word Test

- A. Log in to the MGate 5102-PBM-PN web console. Click System Management
 → Maintenance → PROFIBUS Control and change the switch operation mode to Stop.
- B. In the HMI panel, select the Input Control Word input box and enter **3** on pop-up keypad.



- C. In the HMI panel, click **Control Word Trigger** to set Siemens PLC to send Acyclic Write Command to MGate 5102-PBM-PN.
- D. Log in to the MGate 5102-PBM-PN web console. Click System Management
 → Maintenance → PROFIBUS Control, the status for the operation mode is Operate.

5.1.2. Read Status Word Test

After Test A (**Write Control Word Test**), click **Status Word Trigger** to set Siemens PLC to send Acyclic Read Command to MGate 5102-PBM-PN. The value for the Status Word input box value is updated to **3**.

5.1.3. Read Communication List Test

After Test B (**Read Status Word Test**), click **Communication List Trigger** to set Siemens PLC to send Acyclic Read Command to MGate 5102-PBM-PN. The values for Slave 0~7 input boxes should be updated to **8** to indicate that MGate 5102-PBM-PN is exchanging datat ("Data_Exchange") with PROFIBUS Slave (at address "3").

	orer never	ic Read/write lest
Trigger	~	Control/Status Word
Control Word	Write	Input Control Word
		Output Status Word
Status Word	Read	Note:
		1: Stop, 2: Clear, 3: Operate
Communication List		
	Communicat	ion List
51ave Ø~7 <mark>8</mark>	51ave 32~39 🚺	Slave 64~71 0 Slave 96~103 0
Slave 8~15 🚺	51ave 40~47 🚺	Slave 72~79 0 Slave 104~111 0

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5.2. Using the Variable Table

Open the **VAT_1** variable table and click the **Monitor** icon to connect PLC to the monitor variables.

	Va	ar - [VAT_1 @	5102Acyclic\SIMATIC 300(1)\CPU 31	5-2 PN/DP\S7 P	rogram(1) ON	ILINE]
K	Ī	able <u>E</u> dit <u>I</u> n	isert P <u>L</u> C V <u>a</u> riable <u>V</u> iew <u>O</u> ption	ns <u>W</u> indow <u>H</u>	<u>H</u> elp	
÷	1			1 💦 💁	<u>କ କା</u> <u>କା</u>	47 <i>Iller</i>
	1	Address	Symbol	Display format St	atus value 🛛	Modify value
1		//Write "Control	Word" Request Trigger			
2		M 0.0		BOOL	false	
3		//Read "Status W	/ord" Request Trigger			
4		M 1.0		BOOL	false	
5		//Read "Commu	nication List" Request Trigger			
6		M 2.0		BOOL	false	
7		//Status Word				
8		DB2.DBW 0		HEX	W#16#0000	
9		//Control Word				
10		DB1.DBW 0		HEX	W#16#0000	
11		//Communication	n List			
12		DB2.DBB 2	"DB_Response".Slave000007	HEX	B#16#00	
13		DB2.DBB 3	"DB_Response".Slave008015	HEX	B#16#00	
14		DB2.DBB 4	"DB_Response"Slave016023	HEX	B#16#00	
15		DB2.DBB 5	"DB_Response".Slave024031	HEX	B#16#00	
16		DB2.DBB 6	"DB_Response".Slave032039	HEX	B#16#00	
17		DB2.DBB 7	"DB_Response".Slave040047	HEX	B#16#00	
18		DB2.DBB 8	"DB_Response"Slave048055	HEX	B#16#00	
19		DB2.DBB 9	"DB_Response".Slave056063	HEX	B#16#00	······
20		DB2.DBB 10	"DB_Response"Slave064071	HEX	B#16#00	
21		DB2.DBB 11	"DB_Response".Slave072079	HEX	B#16#00	
22		DB2.DBB 12	"DB_Response"Slave080087	HEX	B#16#00	
23		DB2.DBB 13	"DB_Response".Slave088095	HEX	B#16#00	
24		DB2.DBB 14	"DB_Response"Slave096103	HEX	B#16#00	
25		DB2.DBB 15	"DB_Response".Slave104111	HEX	B#16#00	
26		DB2.DBB 16	"DB_Response".Slave112119	HEX	B#16#00	
27		DB2.DBB 17	"DB_Response"Slave120125	HEX	B#16#00	
28						

5.2.1. Write Control Word Test

A. Log in to the MGate 5102-PBM-PN web console. Click System Management
 → Maintenance → PROFIBUS Control and change the operation mode to Stop.

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B. In the VAT_1 variable table, set DB1.DBW 0 to W#16#0003 and click the Active Modify Value icon. The value for the DB1.DBW 0 status value should be updated to W#16#0003.

s se	Va	ar - [VAT_1 @	5102Acyclic\SIMATIC 300(1)\CPU 31	.5-2 PN/DP\S	7 Program(1) O	NLINE]
	Ī	able <u>E</u> dit <u>I</u> n	isert P <u>L</u> C V <u>a</u> riable <u>V</u> iew <u>O</u> ptio	ns <u>W</u> indow	<u>H</u> elp	
÷	1		5 <u>x B</u> B M M X P	≗ № §	% 🛯 🖉	No llas
	1	Adduess	Symbol	Display format	Status value	Maify value
1		//Write "Control	Word" Request Trigger			
2		M 0.0		BOOL	false	
3		//Read "Status W	Vord" Request Trigger	•		
4		M 1.0		BOOL	false	
5		//Read "Commu	nication List" Request Trigger			
6		M 2.0		BOOL	false	
7		//Status Word	å			
8		DB2.DBW 0		HEX	W#16#0000	
9		//Control Word	۵			
10		DB1.DBW 0		HEX	W#16#0000	W#16#0003
11		//Communicatio	n List	:		······
12		DB2.DBB 2	"DB_Response".Slave000007	HEX	B#16#00	

C. Set **M 0.0** to **true** and click the **Active Modify Value** icon. This sets Siemens PLC to send Acyclic Write Command to MGate 5102-PBM-PN.

	ΪI	able <u>E</u> dit <u>I</u> r	nsert P <u>L</u> C V <u>a</u> riable <u>V</u> iew <u>O</u> ptic	ons <u>W</u> indow	<u>H</u> elp	
÷	I)		5 1 B B 🗠 🖂 🗙 🗣	₽ № §	<u>) 66 az 66</u>	⁴² 1 //w
	1	Adduess	Symbol	Display format	Status value	Modify value
1		//Write "Control	Word" Request Trigger			
2		M 0,0		BOOL	false	true
3		//Read "Status V	Vord" Request Trigger			
4		M 1.0		BOOL	false	
5		//Read "Commu	inication List" Request Trigger	.'		
6		M 2.0		BOOL	false	
7		//Status Word	•••••••••••••••••••••••••••••••••••••••	.'		
8		DB2.DBW 0		HEX	W#16#0000	
9		//Control Word	•••••••••••••••••••••••••••••••••••••••	.'		
10		DB1.DBW 0		HEX	W#16#0003	W#16#0003
11		Communicatio				

D. Log in to the MGate 5102-PBM-PN web console. Click System Management
 → Maintenance → PROFIBUS Control and the status for the operation mode becomes Operate.

5.2.2. Read Status Word Test

After Test A (**Write Control Word Test**), set **M 1.0** to **true**; then, click the **Active Modify Value** icon. This sets Siemens PLC to send Acyclic Read Command to MGate 5102-PBM-PN. The status value of **DB2.DBW 0** should be updated to **W#16#0003**.

	👪 Iable Edit Insert PLC Variable View Options Window Help							
-12	1		3 X B 🖻 🗠 🗙 🗣	≗ № §) 66° 47° 66°	^{KI} ² 1 ////		
	1	Adduess	Symbol	Display format	Status value	Mulify value		
1		//Write "Control	Word" Request Trigger					
2		M 0.0		BOOL	💼 false 🛛	rue		
3		//Read "Status W	'ord" Request Trigger	•				
4		M 1.0		BOOL	false	true		
5		//Read "Commu	nication List" Request Trigger		/ [_]			
6		M 2.0		BOOL	false			
7		//Status Word		•	+			
8		DB2.DBW 0		HEX	W#16#0003			
9		//Control Word		•••••••••••••••••••••••••••••••••••••••				
10		DB1.DBW 0		HEX	W#16#0003	W#16#0003		
11		//Communication	n List	•••••••••••••••••••••••••••••••••••••••	λ.			

5.2.3. Read Communication List Test

After Test B, set **M 2.0** to **true**; then, click the **Active Modify Value** icon. This sets Siemens PLC to send Acyclic Read Command to MGate 5102-PBM-PN. The status value of **DB2.DBB 2** should be updated to **B#16#08** to indicate that MGate 5102-PBM-PN is exchanging data ("Data_Exchange") with PROFIBUS Slave at address **3**.

	I	able <u>E</u> dit <u>I</u> n	sert P <u>L</u> C V <u>a</u> riable <u>V</u> iew <u>O</u> ptio	ns <u>W</u> indow	<u>H</u> elp				
÷	◍▯▰◼◓▯▯ॿॿॎॎॎ▫▫◣◾◾ਃਲ਼। ◷▰▰๛๙๚๛๛								
	1	Address	Symbol	Display format	Status value	M a lify value			
1		//Write "Control	Word" Request Trigger		/				
2		M 0.0		BOOL	🗖 false 🛛	true			
3		//Read "Status W	ord" Request Trigger	**	1				
4		M 1.0		BOOL	💼 false 🖌	rwe			
5		//Read "Commu	nication List" Request Trigger	•••••••••••••••••••••••••••••••••••••••	1.				
6		M 2.0		BOOL	false	true			
7		//Status Word			- / ·				
8		DB2.DBW 0		HEX	₩#1 <mark>5#000</mark> 3				
9		//Control Word		**	1				
10		DB1.DBW 0		HEX	W * 1 <i>6</i> #0003	W#16#0003			
11		//Communication	n List						
12		DB2.DBB 2	"DB_Response".Slave000007	HEX	B#1 <i>6</i> #08				
13		DB2.DBB 3	"DB_Response".Slave008015	HEX	B#16#00				
14		DDADDD 4		TTT-57	DIRCIPS				

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