

MGate 5103 Tech Note

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Swapping the Byte Order in a Siemens PLC or Allen-Bradley PLC With the MGate 5103

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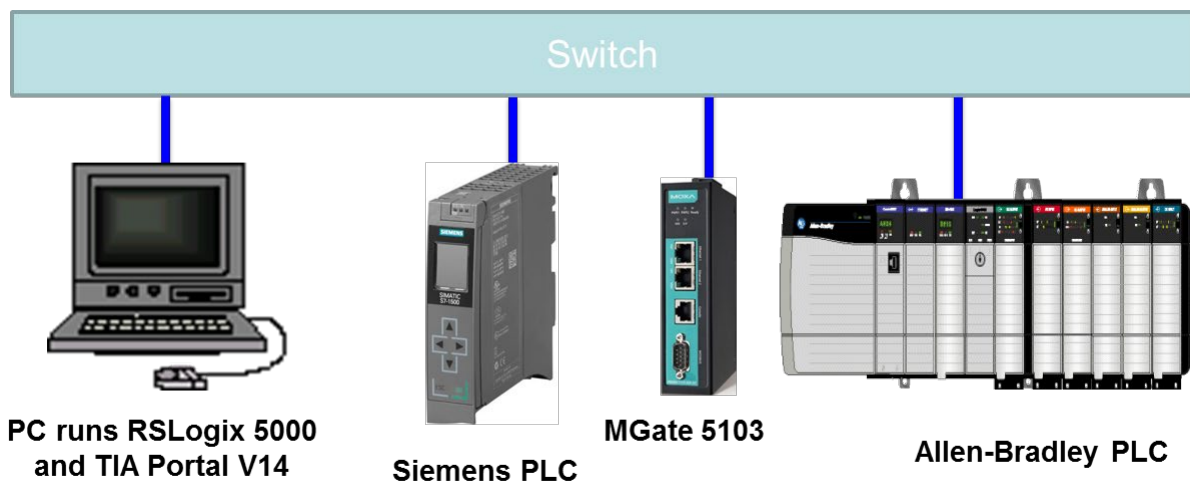
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1. Introduction

The data byte order usually differ from one PLC to the next one. Siemens PLC uses Big Endian byte order, while Allen-Bradley PLC uses Little Endian byte order. The byte order must be swapped in order to obtain the correct value in the different types of PLCs. This tech note demonstrates how to swap the byte order in a Siemens PLC or Allen-Bradley PLC.

2. System Topology

The figure below demonstrates the topology when using the MGate 5103 to convert data between PROFINET and Ethernet/IP protocols. The PC runs RSLogix 5000 to configure and monitor the Allen-Bradley PLC and runs TIA Portal V14 to configure and monitor Siemens PLC.



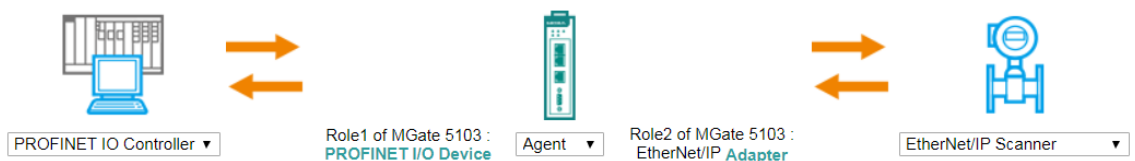
3. MGate 5103 Settings

Log in to the MGate 5103’s web console, and then configure the following settings.

3.1. Protocol Conversion

Under the **Protocol Conversion** settings, select **PROFINET IO Device** as Role1 and **EtherNet/IP Adapter** as Role2.

Protocol Conversion



3.2. PROFINET Settings

Under **PROFINET Settings**, set **Device Name** to **mgate-dev**.

PROFINET Settings



Configuration

Device Name	mgate-dev
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3.3. EtherNet/IP Settings

Under **EtherNet/IP Settings**, set **I/O data size configuration** under **Connection1 Adapter Settings** to **User defined**. Also, set **O → T data (Output) size** and **T → O (Input) data size** at 4 bytes.

Connection1 Adapter Settings

O → T instance	100
T → O instance	110
I/O data size configuration	User defined ▼
O → T (Output) data size	4 (0 - 496 bytes)
T → O (Input) data size	4 (0 - 496 bytes)

4. Siemens PLC Settings

In this demonstration, Siemens PLC S7-1513 is connected to the MGate 5103. Use TIA Portal V14 to configure the Siemens PLC as follows:

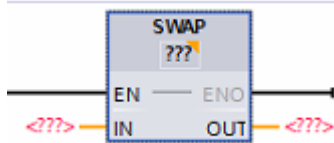
(1) MGate device setting:

Insert **Input 4 Bytes** into Slot 1 and **Output 4 Bytes** into Slot 2.

Module	Rack	Slot	I address	Q address	Type
mgate-dev	0	0			Moxa PROFINET De...
PN-IO	0	0 X1			mgate-dev
Input 004 Byte_1	0	1	0...3		Input 004 Byte
Output 004 Byte_1	0	2		0...3	Output 004 Byte
	0	3			

(2) OB1 Program:

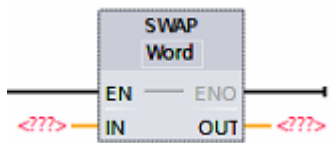
Use the **SWAP** function block to change the order of the bytes.



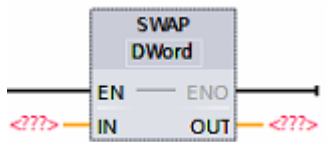
Select the data type of the function block from the **???** dropdown list.

The conversion scenario will be as below:

- A. **Word** data type will convert **IN 0x0A 0x0B** to **OUT 0x0B 0x0A**, which is **Byte Swap**.

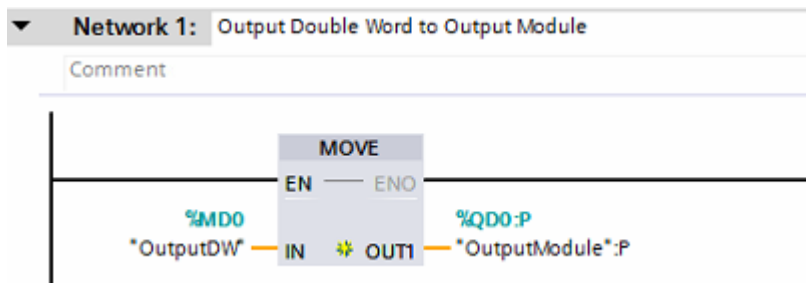


- B. **DWord** data type will convert **IN 0x0A 0x0B 0x0C 0x0D** to **OUT 0x0D 0x0C 0x0B 0x0A**, which is **Byte and Word Swap**.



An example of the Ladder program is shown below:

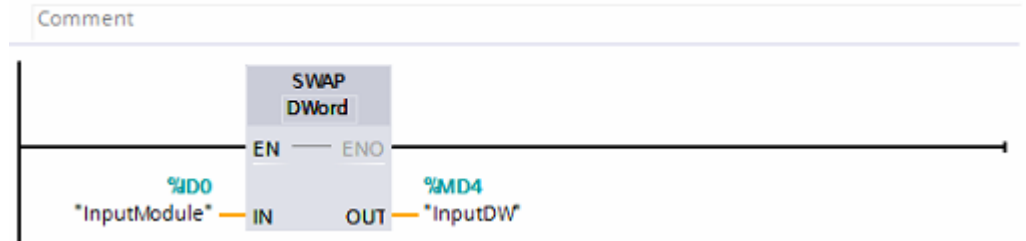
(1) Output Double Word to Output Module.



- (2) Use DWord data type SWAP, which is **Byte and Word Swap**, to swap the

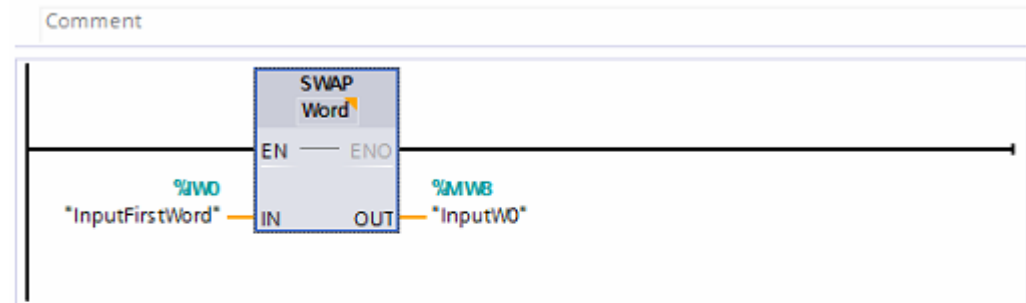
Input Module value.

Network 2: Using DWord data type SWAP to convert Input Module as "Byte and Word Swap" value.

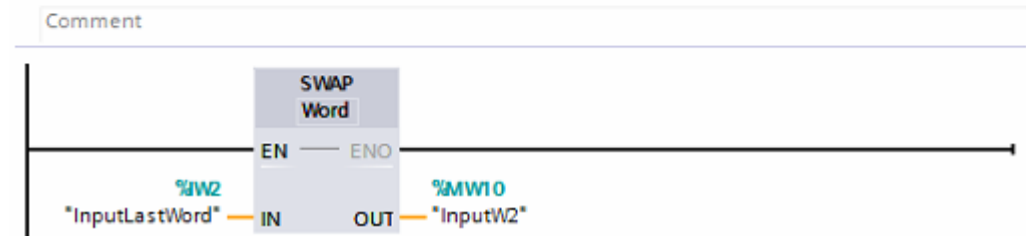


(3) Use Word data type SWAP, which is **Byte Swap**, to swap the **Input Module** value.

Network 3: Using Word data type SWAP to convert First Word of Input Module as "Byte Swap" value.



Network 4: Using Word data type SWAP to convert Last Word of Input Module as "Byte Swap" value.

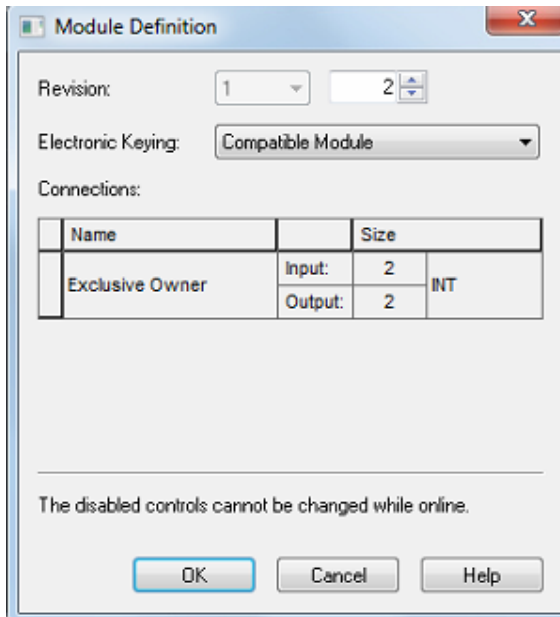


5. Allen-Bradley PLC Settings

In this demonstration, Allen-Bradley ControlLogix PLC is connected to the MGate 5103. Use RSLogix 5000 to configure the Allen-Bradley PLC as follows:

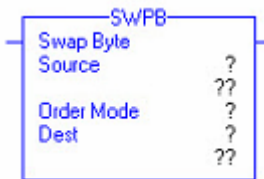
(1) MGate device setting:

Set MGate's **Exclusive Owner Connections Input** size to 2 INT and **Output Size** to 2 INT.



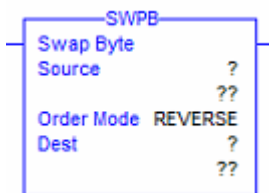
(2) MainRoutine Program setting:

Use the **SWPB** function block to swap the bytes order of a value.

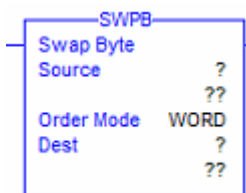


The explanation of **Order Mode** when **Source** and **Dest** data types are **DINT**:

- a. **REVERSE** Order Mode, which is **Byte and Word Swap**, will swap from **Source 0x0A 0x0B 0x0C 0x0D** to **Dest 0x0D 0x0C 0x0B 0x0A**.



- b. **WORD** Order Mode, which is **Word Swap**, will swap from **Source 0x0A 0x0B 0x0C 0x0D** to **Dest 0x0C 0x0D 0x0A 0x0B**.



- c. **HIGH/LOW** Order Mode, which is **Byte Swap**, will swap from **Source 0x0A 0x0B 0x0C 0x0D** to **Dest 0x0B 0x0A 0x0D 0x0C**.

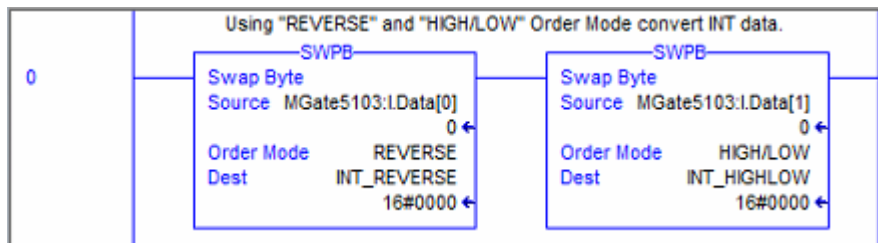


The explanation of **Order Mode** when **Source** and **Dest** data types are **INT**:

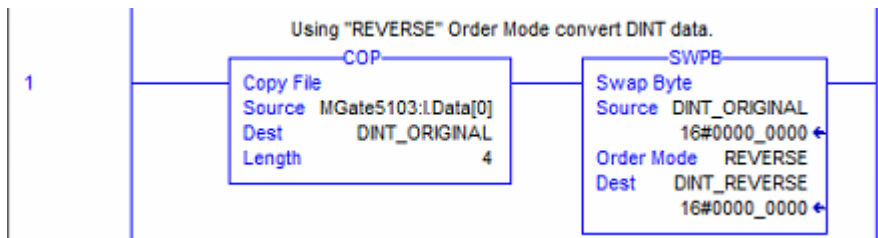
HIGH/LOW or **REVERSE** Order Mode is Byte Swap, will swap from Source 0x0A 0x0B to Dest 0x0B 0x0A.

An example of the Ladder program is shown below:

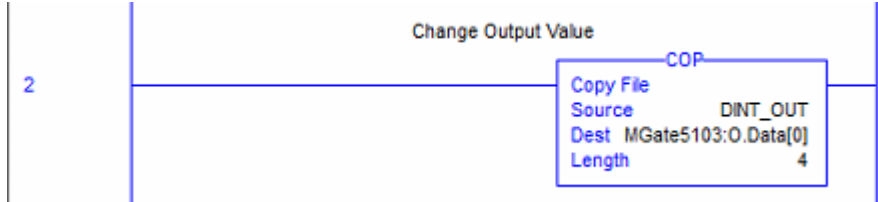
- (1) Rung 0: Use **REVERSE** and **HIGH/LOW** Order Mode to swap **INT** data.



- (2) Rung 1: Use **REVERSE** Order Mode to swap **DINT** data.



- (3) Rung 2: Change **DINT tag's** output value.



6. Communication Test

6.1. PROFINET IO Controller --> EtherNet/IP Scanner

Under the **TIA Portal Watch** table, change the value of **OutputDW** to 0x1234_5678.

SWAP1500 > PLC_1 [CPU 1513-1 PN] > Watch and force tables > Watch table_1						
	Name	Address	Display format	Monitor value	Modify value	
1	*OutputDW	%MDO	Hex	16#1234_5678	16#1234_5678	

Under the MGate's **I/O Data View**, select **PROFINET IO Controller --> EtherNet/IP Scanner** data flow. The first four bytes are shown as 0x12, 0x34, 0x56, and 0x78.

⌚ I/O Data View

Auto refresh

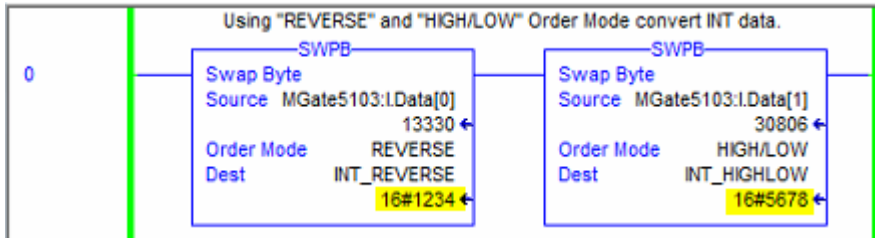
Data flow direction PROFINET IO Controller --> EtherNet/IP Scanner ▾

Internal Address	00	01	02	03	04	05
0000h	12	34	56	78	00	00
0010h	00	00	00	00	00	00
0020h	00	00	00	00	00	00
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Under the RSLogix 5000 monitor tags, the MGate's input data [0] obtains the value of 0x3412 and input data [1] obtains the value of 0x7856.

Controller Tags - Swap5103(controller)						
Scope: Swap5103		Show: All Tags				
Name	Value	Force Mask	Style	Data Type		
+ DINT_ORIGINAL	16#7856_3412		Hex	DINT		
+ DINT_REVERSE	16#1234_5678		Hex	DINT		
+ INT_HIGHLOW	16#5678		Hex	INT		
+ INT_REVERSE	16#1234		Hex	INT		
- MGate5103:I	{...}	{...}		_03DF:MGate_7...		
- MGate5103:I.ConnectionFa...	0		Decimal	BOOL		
- MGate5103:I.Data	{...}	{...}	Decimal	INT[2]		
+ MGate5103:I.Data[0]	16#3412		Hex	INT		
+ MGate5103:I.Data[1]	16#7856		Hex	INT		
+ MGate5103:O	{...}	{...}		_03DF:MGate_7...		
+ DINT_OUT	16#0000_0000		Hex	DINT		

When using **REVERSE** or **HIGH/LOW** Order Mode, input data [0] is swapped to 0x1234 and input data [1] swapped to 0x5678.



6.2. PROFINET IO Controller <-- EtherNet/IP Scanner

Under the RSLogix 5000 monitor tags, change the value of the DINT_OUT tag to 0x1234_5678.

Name	Value	Force Mask	Style	Data Type
DINT_ORIGINAL	16#7856_3412		Hex	DINT
DINT_REVERSE	16#1234_5678		Hex	DINT
INT_HIGHLOW	16#5678		Hex	INT
INT_REVERSE	16#1234		Hex	INT
MGate5103:I	{...}	{...}		_03DF:MGate_7...
MGate5103:O	{...}	{...}		_03DF:MGate_7...
DINT_OUT	16#1234_5678		Hex	DINT

Under the MGate's **I/O Data View**, select **PROFINET IO Controller <-- EtherNet/IP Scanner** data flow. The first four bytes are shown as 0x78, 0x56, 0x34, and 0x12.

I/O Data View

Auto refresh

Data flow direction PROFINET IO Controller <-- EtherNet/IP Scanner

Internal Address	00	01	02	03	04
0000h	78	56	34	12	00
0010h	00	00	00	00	00

Under the **TIA Portal Watch** table, the **InputModule** tag obtains the value 0x78563412. When using DWord Swap, the **InputDW** tag obtains the value of 0x12345678. When using Word Swap, the **InputWO** tag obtains the value of 0x5678

and the **InputW2** tag obtains the value of 0x1234.

	i	Name	Address	Display format	Monitor value
1		*OutputDW	%MD0	Hex	16#1234_5678
2		*InputModule*	%ID0	Hex	16#7856_3412
3		*InputDW	%MD4	Hex	16#1234_5678
4		*InputW0*	%MW8	Hex	16#5678
5		*InputW2*	%MW10	Hex	16#1234
6					