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# **FnIO G - Series:**

## ***GL-9041***

***GL-9041 (RTEX with Ethernet Network Adapter)***

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History

Rev	Pages	Remarks	Date	Editor
1.00			June 26, 2024	Junho, Park
1.01	11	Delete 4PIN DIP Switch description	April 17, 2025	Junho, Park
	13,15, 19~24	Changed Non-cyclic Command / Response Data Byte Array		
	14,16	Changed Control Byte 3, Status byte 3 description		
1.02	11	Changed DipSW Description(6,7Pin ex)	May 13, 2025	Junho, Park
1.03	6, 11	Changed Max. Input / Output Data Size	July 30, 2025	Junho, Park
	6	Max. Expansion Module	August 08, 2025	Junho, Park
	5,6	TBD specifications confirmed	August 08, 2025	Junho, Park
	43~45	Changed MODBUS Special Register	Sep. 19, 2025	Junho, Park
	22	Description of changed firmware release date	Oct. 15, 2025	Junho, Park
1.04	45	Added Modbus Special Register 0x1116	Oct. 23, 2025	Junho, Park

## 1. Environment Specification

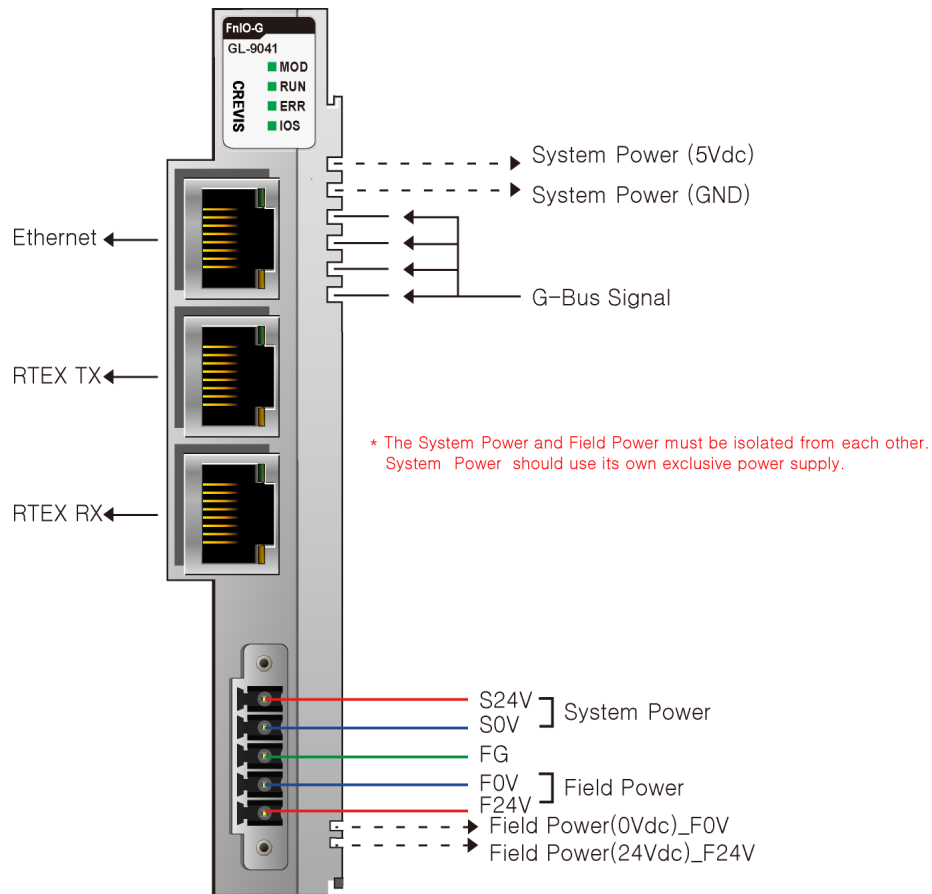
Environmental Specification	
Operating Temperature	-40°C ~ 60°C : 1A full load is allowed.
UL Temperature	-20°C~60°C
Storage Temperature	-40°C~85°C
Relative Humidity	5% ~ 90% non-condensing
Mounting	DIN rail
General specification	
Shock Operating	IEC 60068-2-27
Vibration Resistance	IEC 60068-2-6, 4g
Industrial Emissions	EN 61000-6-4/A11 : 2011
Industrial Immunity	EN 61000-6-2 : 2005
Installation Position	Vertical and horizontal installation is available.
Product Certifications	CE, UKCA, UL

## 2. GL-9041 (RTEX with Ethernet Network Adapter)

### 2.1. GL-9041 Specification

Items	Specification
<b>Communication Interface Specification</b>	
Adapter Type	Slave node (RTEX Generic Slave)
Protocol	RTEX
Sub-Protocol	Ethernet for MODBUS TCP / Webserver
Max. Expansion Module	16 slots
Max. Input / Output Data Size	Max. Input 60 bytes / Output 60 bytes (See specification "2.4.4. DIP Switch")
Max Length Bus Line	60m between nodes, total length 200m
Cable Recommendations	STP conforming to CAT5e or upper should be used
Node ID setting range	0 to 31
Baud Rate	100Mbps, 100BASE-TX, Full duplex
Interface Connector	RJ-45 socket * 3pcs
Ethernet Port	Ethernet port for MODBUS/TCP, Webserver or IAP Mode
Ethernet Default Setting	Default IP Address : 192.168.100.100 Default Subnet mask : 255.255.255.0 Default Gateway : 192.168.0.1 Default Domain name : gl9041.com (for Webserver)
IAP Mode	When DIP Switch 10 setting is On (Fixed IP Address : 192.168.100.100)
Indicator	4 LEDs 1 Green/Red, Module Status (MOD) 1 Green, Communication Status (RUN) 1 Red, Error Status (ERR) 1 Green/Red, Expansion Module Status (IOS)
Module Location	Starter module left side of G-Series system
<b>General specification</b>	
UL System Power	Supply voltage : 24Vdc nominal, Class2
System Power	Supply voltage : 24Vdc nominal Supply voltage range : 15~28.8Vdc Reverse polarity protection
Power Dissipation	60mA typical @ 24Vdc
Current for I/O Module	1.0A @ 5Vdc
Isolation	System power to internal logic : Non-isolation System power I/O driver : Isolation
UL Field Power	Supply voltage : 24Vdc nominal, Class2
Field Power	Supply voltage : 24Vdc typical (Max. 28.8Vdc) * Field Power Range is different depending on IO Module series. Refer to IO Module's Specification.
Max. Current Field Power Contact	DC 8A Max
Wiring	I/O Cable Max. 2.0mm <sup>2</sup> (AWG 14)
Weight	83g
Module size	22mm x 109mm x 70mm
Environment Condition	Refer to '1. Environment Specification'

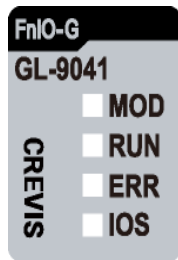
## 2.2. GL-9041 Wiring Diagram



Pin No.	Signal Description
1	System Power, 24V
2	System Power, Ground
3	F.G
4	Field Power, Ground
5	Field Power, 24V

## 2.3. GL-9041 LED Indicator

### 2.3.1. LED Indicator



LED No.	LED Function / Description	LED Color
MOD	Module Status	Green/Red
RUN	Communication Status	Green
ERR	Error Status	Red
IOS	Expansion Module Status	Green/Red

### 2.3.2. MOD (Module Status LED)

Status	LED	To indicate
Not Powered	OFF	Not power is supplied to the unit.
Device Operational	Green	The unit is operating in normal condition.
Device in Standby	Flashing Green	The device needs commissioning due to configuration missing, incomplete or incorrect.
MODBUS Error	Green/Red Toggle	MODBUS error such as watchdog error, etc.
Minor Fault	Flashing Red	Recoverable Fault. - EEPROM checksum fault.
Unrecoverable Fault	Red	The device has an unrecoverable fault. - Memory error or CPU watchdog error.

### 2.3.3. RUN (Communication Status LED)

Status	LED	To indicate
Not Powered or Init	OFF	Not power is supplied to the unit or State of the RTEX: INIT
Configuration	Flashing Green	State of the RTEX: CONFIG A or CONFIG B
Running	Green	State of the RTEX: RUNNING

### 2.3.4. ERR (Error Status LED)

Status	LED	To indicate
No Error	OFF	No Error.
Communication Error	Flashing Red	Timeout Error Continuous CRC Error Cyclic-data not receivable

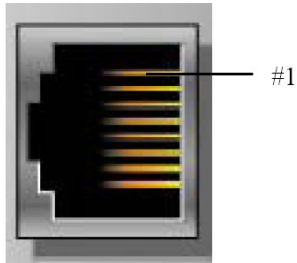


## 2.3.5. IOS (Extension Module Status LED)

Status	LED	To indicate
Not Powered	OFF	Device may not be powered.
No Expansion Module	Flashing Red	Adapter has no expansion module
Internal Bus Connection, Run Exchanging I/O	Green	Exchanging I/O data.
Expansion Configuration Failed	Red	One or more expansion module occurred in fault state. <ul style="list-style-type: none"><li>- Detected invalid expansion module ID.</li><li>- Overflowed Input/Output Size</li><li>- Too many expansion module</li><li>- Initialization failure</li><li>- Communication failure.</li><li>- Changed expansion module configuration.</li><li>- Mismatch vendor code between adapter and expansion module.</li></ul>

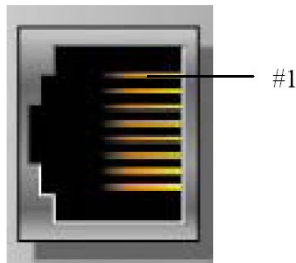
## 2.4. GL-9041 Electrical Interface

### 2.4.1. RJ-45 Socket(Ethernet)



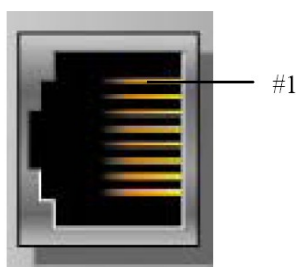
RJ-45	Signal Name	Description
1	TD+	Transmit +
2	TD-	Transmit -
3	RD+	Receive +
4	-	
5	-	
6	RD-	Receive -
7	-	
8	-	
Case	Shield	Shield RJ-45 Socket

### 2.4.2. RJ-45 Socket(RTEX TX)



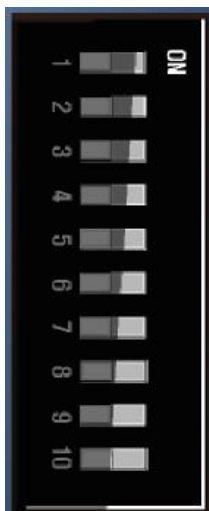
RJ-45	Signal Name	Description
1	-	
2	-	
3	TD+	Transmit +
4	-	
5	-	
6	TD-	Transmit -
7	-	
8	-	
Case	Shield	Shield RJ-45 Socket

### 2.4.3. RJ-45 Socket(RTEX RX)



RJ-45	Signal Name	Description
1	-	
2	-	
3	RD+	Receive +
4	-	
5	-	
6	RD-	Receive -
7	-	
8	-	
Case	Shield	Shield RJ-45 Socket

## 2.4.4. Dip Switch



DIP Pole#	Description	
1	DIP bit#0	Dip switch for setting Node ID. Max Node ID is 31(*)
2	DIP bit#1	
3	DIP bit#2	
4	DIP bit#3	
5	DIP bit#4	
6	DIP bit#0	Dip switch for setting Data Size. Max Data Size is 60byte(**)
7	DIP bit#1	
8	Reserved	
9	= ON : Enable DHCP/BOOTP (***)	
10	= ON : Enable IAP mode boot (Default IP Address : 192.168.100.100)	

### \* Node ID setting example

Item Description	DIP Switch Pole #									
	#1(1)	#2(2)	#3(4)	#4(8)	#5(16)	#6	#7	#8	#9	#10
Ex) ID = 0	OFF	OFF	OFF	OFF	OFF					
Ex) ID = 1	ON	OFF	OFF	OFF	OFF					
Ex) ID = 10	OFF	ON	OFF	ON	OFF					
Ex) ID = 16	OFF	OFF	OFF	OFF	ON					
Ex) ID = 20	OFF	OFF	ON	OFF	ON					
Ex) ID = 31	ON	ON	ON	ON	ON					

### \*\* Data Size setting example

Item Description	DIP Switch Pole #									
	#1(1)	#2(2)	#3(4)	#4(8)	#5(16)	#6	#7	#8	#9	#10
Ex) 12byte						OFF	OFF			
Ex) 28byte						ON	OFF			
Ex) 44byte						OFF	ON			
Ex) 60byte						ON	ON			

\*\*\* DHCP/BOOTP have to be set in special register(default : BOOTP).  
(0x1045, ref 3.3.3).

## 3. RTEX Communication Data Block

\* Area of all data block

	Command									Response							
Byte	b7	b6	b5	b4	b3	b2	b1	b0	Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	C (0)	Update Counter	MAC ID						0	R (1)	Update Counter Echo	Actual MAC ID					
1	-	Command Code							1	C Err	Command Code Echo						
2	Control Byte 0								2	Status Byte 0							
3	Control Byte 1								3	Status Byte 1							
4	Command Data Area								4	Response Data Area							
5									5								
6									6								
7									7								
8									8								
9									9								
10									10								
11									11								
12									12								
13									13								
14									14								
15									15								

Notes:

- When expanding the data size, the expanded data area is identical to the existing data area (bytes 4 to 15).

### 3.1. Command data block area

Command will be transmitted from the master (host controller) to slave (network adapter).

\* If the command code is in Cyclic Command Mode

Command								
Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	C(0)	Update Counter		MAC-ID (0 ~ 31)				
1	-	Command Code (0x70 : Cyclic Command Mode)						
2	Control Byte 0							
3	Control Byte 1							
4	Cyclic Output Data Byte 0							
5	Cyclic Output Data Byte 1							
6	Cyclic Output Data Byte 2							
7	Cyclic Output Data Byte 3							
8	Cyclic Output Data Byte 4							
9	Cyclic Output Data Byte 5							
10	Cyclic Output Data Byte 6							
11	Cyclic Output Data Byte 7							
12	Cyclic Output Data Byte 8							
13	Cyclic Output Data Byte 9							
14	Cyclic Output Data Byte 10							
15	Cyclic Output Data Byte 11							

**\* If the command code is in Non-cyclic Command Mode**

Command								
Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	C(0)	Update Counter		MAC-ID (0 ~ 31)				
1	-	Command Code (0x60 : Non-Cyclic Command Mode)						
2	Control Byte 0							
3	Control Byte 1							
4	Non-cyclic Command Data Byte 0							
5	Non-cyclic Command Data Byte 1							
6	Non-cyclic Command Data Byte 2							
7	Non-cyclic Command Data Byte 3							
8	Non-cyclic Command Data Byte 4							
9	Non-cyclic Command Data Byte 5							
10	Non-cyclic Command Data Byte 6							
11	Non-cyclic Command Data Byte 7							
12	Non-cyclic Command Data Byte 8							
13	Non-cyclic Command Data Byte 9							
14	Non-cyclic Command Data Byte 10							
15	Non-cyclic Command Data Byte 11							

**Notes:**

- Command code of byte 1 defines the contents from byte 4 to byte 15.
- Disposition of multiple byte data is little endian, which means that lower byte is first.
- Set the unused bit to 0.

### 3.1.1. Command header (Command byte 0)

Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	C(0)	Update Counter		MAC ID (0 ~ 31)				

Title	Description
C	<ul style="list-style-type: none"> <li>• Set this bit to 0 in command.</li> <li>• If this bit is set to level other than 0, Err. 86.0 “RTEX cyclic data error protection 1” alarm will be generated.</li> </ul>
Update Counter	<ul style="list-style-type: none"> <li>• Set the count up value at the command updating cycle.</li> <li>• The purpose is to detect the command updating timing at network adapter.</li> <li>• The network adapter echoes back this data in the response, the counter can also be used as the watchdog timer.</li> </ul>
MAC ID	<ul style="list-style-type: none"> <li>• Set up the node address of the network adapter.</li> <li>• If a node address different from actual setting value is used, Err. 86.0 “RTEX cyclic data error protection 1” alarm will be generated.</li> </ul>

## 3.1.2. Command Code And Command Data Area description (Command byte 1, 4 to 15)

Byte	b7	b6	b5	b4	b3	b2	b1	b0
1	-	Command Code						
4 ~ 15	Command Data Area							

Title	Description
Command Code	<ul style="list-style-type: none"> <li>Set up the command code.</li> <li>Command codes are classified into two types as cyclic command code for transmitting real-time data such as output data and non-cyclic command code for transmitting event-driven data such as parameter setup.</li> <li>Cyclic command code is assigned to bit 6 to 4 in byte 1 of command, and specifies the data for byte 4 to 15.</li> <li>Non-cyclic command code is assigned to bit 3 to 0 in byte 1 of command, and specifies the data for byte 4 to 15.</li> <li>Use of unsupported cyclic command causes Err. 86.1 "RTEX cyclic data error protection 2 alarm".</li> <li>See the figure below for details.</li> </ul>
Command Data Area	<ul style="list-style-type: none"> <li>Set up the command data specified by cyclic command code and non-cyclic command code.</li> </ul>

Byte	b7	b6	b5	b4	b3	b2	b1	b0
1	-	Cyclic command code			Non-cyclic command code			

Cyclic command		Non-cyclic command	
Bit 6 – 4	Application	Bit 3 – 0	Application
0	NOP	0	Normal command
1 ~ 5	Reserved	1	Reset command
6	Non-cyclic Data Mode	2	System ID command
7	Cyclic Data Mode	3 ~ 5	Reserved
		6	Parameter command
		5 ~ 15	Reserved

## 3.1.3. Control byte description (Command byte 2, 3)

Byte	b7	b6	b5	b4	b3	b2	b1	b0
2	STOP Action	0	0	0	0	0	0	RUN/STOP
3	0	0	0	0	0	0	0	ErrClear

Title	Description
STOP Action	<ul style="list-style-type: none"> <li>Used only in Cyclic Data Mode.</li> <li>Sets the output state of the output module when the "RUN/STOP" bit is '0'. 0 : Output all clear 1 : Last hold value</li> </ul>
RUN/STOP	<ul style="list-style-type: none"> <li>Used only in Cyclic Data Mode.</li> <li>Controls input/output data updates. 0 : input/output data update stop 1 : input/output data update run</li> <li>When the corresponding bit is "0", the output operation of the output module operates according to the setting of the "STOP Action bit".</li> </ul>
ErrClear	<ul style="list-style-type: none"> <li>Used to clear when there is a CRC error or timeout error after returning to normal state.</li> <li>Clear when a different value is entered than before. '0' -&gt; '1' / '1' -&gt; '0'</li> </ul>

## 3.2. Response data block area

Response will be transmitted from the slave (network adapter) to the master (host controller).

### \* If the command code is in Cyclic Command Mode

Response								
Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	R(1)	Update Counter Echo		Actual MAC-ID (0 ~ 31)				
1	CMD Err	Command Code Echo						
2	Status Byte 0							
3	Status Byte 1							
4	Cyclic Input Data Byte 0							
5	Cyclic Input Data Byte 1							
6	Cyclic Input Data Byte 2							
7	Cyclic Input Data Byte 3							
8	Cyclic Input Data Byte 4							
9	Cyclic Input Data Byte 5							
10	Cyclic Input Data Byte 6							
11	Cyclic Input Data Byte 7							
12	Cyclic Input Data Byte 8							
13	Cyclic Input Data Byte 9							
14	Cyclic Input Data Byte 10							
15	Cyclic Input Data Byte 11							

### \* If the command code is in Non-cyclic Command Mode

Response								
Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	R(1)	Update Counter Echo		Actual MAC-ID (0 ~ 31)				
1	CMD Err	Command Code Echo						
2	Status Byte 0							
3	Status Byte 1							
4	Non-cyclic Response Data Byte 0							
5	Non-cyclic Response Data Byte 1							
6	Non-cyclic Response Data Byte 2							
7	Non-cyclic Response Data Byte 3							
8	Non-cyclic Response Data Byte 4							
9	Non-cyclic Response Data Byte 5							
10	Non-cyclic Response Data Byte 6							
11	Non-cyclic Response Data Byte 7							
12	Non-cyclic Response Data Byte 8							
13	Non-cyclic Response Data Byte 9							
14	Non-cyclic Response Data Byte 10							
15	Non-cyclic Response Data Byte 11							

Notes:

- Command code at command data block defines the contents from byte 4 to byte 15.
- Disposition of multiple byte data is little endian, which means that lower byte is first.
- Replies 0 at unused bits.

## 3.2.1. Response header (Response byte 0)

Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	R(1)	Update Counter Echo		Actual MAC ID (0 ~ 31)				

Title	Description
R	<ul style="list-style-type: none"> <li>Return 1 as a response.</li> </ul>
Update Counter Echo	<ul style="list-style-type: none"> <li>Return the echo-back value of Update Counter.</li> <li>Use this to check whether the network adapter has received properly.</li> </ul>
Actual MAC ID	<ul style="list-style-type: none"> <li>Return the node address of the network adapter.</li> <li>This is not echo-back, but actual value that is the setup of the DIP-SW at power-up.</li> </ul>

## 3.2.2. Command Code Echo And Response Data Area description(Response byte 1, 4 to 15)

Byte	b7	b6	b5	b4	b3	b2	b1	b0
1	CMD Err	Command Code Echo						
4 ~ 15	Response Data Area							

Title	Description
CMD Err	<ul style="list-style-type: none"> <li>Return 1 at the command error occurred.</li> <li>Set to 1 when an error occurs upon receiving the command (before processing it).</li> </ul>
Command Code Echo	<ul style="list-style-type: none"> <li>Return the echo-back value of command code.</li> </ul>
Response Data Area	<ul style="list-style-type: none"> <li>Return the response data specified by cyclic command code and non-cyclic command code.</li> </ul>

## 3.2.3. Status byte description (Response byte 2, 3)

Byte	b7	b6	b5	b4	b3	b2	b1	b0
2	Data size state		0	0	Internal bus State(G-BUS)			
3	RTEX Protocol Error Status							

Title	Description																														
Data size state	<ul style="list-style-type: none"><li>• Returns the data size status of the network adapter.</li><li>• This is the actual value, which is the setting of the DIP-SW at power-on.</li><li>• The data size is as follows:</li></ul> <table><tr><th>DIP SW</th><th>Data Size</th><th>DIP SW</th><th>Data Size</th></tr><tr><td>0</td><td>16 byte</td><td>2</td><td>48 byte</td></tr><tr><td>1</td><td>32 byte</td><td>3</td><td>64 byte</td></tr></table>	DIP SW	Data Size	DIP SW	Data Size	0	16 byte	2	48 byte	1	32 byte	3	64 byte																		
DIP SW	Data Size	DIP SW	Data Size																												
0	16 byte	2	48 byte																												
1	32 byte	3	64 byte																												
Internal bus State (G-BUS)	<ul style="list-style-type: none"><li>• Returns the internal bus status of the network adapter.</li><li>• The internal bus status is as follows:</li></ul> <table><tr><th>Value</th><th>State</th><th>Value</th><th>State</th><th>Value</th><th>State</th></tr><tr><td>1</td><td>Init</td><td>4</td><td>Stop</td><td>7</td><td>CRC Err</td></tr><tr><td>2</td><td>Idle</td><td>5</td><td>Fault</td><td>8</td><td>Pause</td></tr><tr><td>3</td><td>Run</td><td>6</td><td>Reset</td><td>9</td><td>Master Fullat</td></tr></table>	Value	State	Value	State	Value	State	1	Init	4	Stop	7	CRC Err	2	Idle	5	Fault	8	Pause	3	Run	6	Reset	9	Master Fullat						
Value	State	Value	State	Value	State																										
1	Init	4	Stop	7	CRC Err																										
2	Idle	5	Fault	8	Pause																										
3	Run	6	Reset	9	Master Fullat																										
RTEX Protocol Error Status	<ul style="list-style-type: none"><li>• Returns the RTEX Protocol status of the network adapter.</li><li>• The RTEX Protocol status is as follows:</li></ul> <table><tr><th>Value</th><th>ERR State</th><th>Value</th><th>ERR State</th><th>Value</th><th>ERR State</th></tr><tr><td>0x00</td><td>No Err</td><td>0x04</td><td>Update CNT Err</td><td>0x22</td><td>Non-Cyclic CMD ERR</td></tr><tr><td>0x01</td><td>CRC Err</td><td>0x11</td><td>Invalid Node ID</td><td>0x31</td><td>Type Code Err</td></tr><tr><td>0x02</td><td>Timeout Err</td><td>0x12</td><td>Invalid CMD bit</td><td>0x32</td><td>Index Err</td></tr><tr><td>0x03</td><td>Config Err</td><td>0x21</td><td>Cyclic CMD Err</td><td></td><td></td></tr></table>	Value	ERR State	Value	ERR State	Value	ERR State	0x00	No Err	0x04	Update CNT Err	0x22	Non-Cyclic CMD ERR	0x01	CRC Err	0x11	Invalid Node ID	0x31	Type Code Err	0x02	Timeout Err	0x12	Invalid CMD bit	0x32	Index Err	0x03	Config Err	0x21	Cyclic CMD Err		
Value	ERR State	Value	ERR State	Value	ERR State																										
0x00	No Err	0x04	Update CNT Err	0x22	Non-Cyclic CMD ERR																										
0x01	CRC Err	0x11	Invalid Node ID	0x31	Type Code Err																										
0x02	Timeout Err	0x12	Invalid CMD bit	0x32	Index Err																										
0x03	Config Err	0x21	Cyclic CMD Err																												



## 3.2.4. Non-cyclic status byte description (Response byte 9)

Byte	b7	b6	b5	b4	b3	b2	b1	b0
9	ERR	WNG	0	Busy	0	0	0	0

Title	Description
ERR	Set to 1 when error occurs during process after reception of the command.
WNG	Set to 1 when the command is processed but with certain problem, e.g. written with restriction during parameter setting.
Busy	Kept at 1 while command is processed.

## 3.3. Cyclic Command description

### 3.3.1. Cyclic command list

Control mode	Command Code	Description
NOP	0xh	For temporary transmission of invalid data immediately after establishment of the network. Never use this command for any other purpose. Upon receiving this command, control is performed based on the previously received command.
Non-cyclic Data Mode	6xh	When using the command/response data in the area of byte 4 to 15 as non-cyclic command/response data. The input/output IO module cannot be controlled in this mode.
Cyclic Data Mode	70h	When using the command/response data in the area of byte 4 to 15 as cyclic command/response data. Non-cyclic commands cannot be controlled in this mode.

### 3.3.2. NOP command (Command code : 0xh)

This is for temporarily transmission of invalid data after the network has been established.

Never use this command for any other purpose.

The network adapter will execute according to the previous command.

Control bits (bytes 2-3) are also invalid (previous data is maintained).

Command									Response								
Byte	b7	b6	b5	b4	b3	b2	b1	b0	Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	C (0)	Update Counter	MAC ID						0	R (1)	Update Counter Echo	Actual MAC ID					
1	-	Command Code(00h)							1	C Err	Command Code Echo(00h)						
2	Control Byte 0 (Invalid data)								2	Status Byte 0 (Previous data)							
3	Control Byte 1 (Invalid data)								3	Status Byte 1 (Previous data)							
4	Command Data Area (Invalid data)								4	Response Data Area (Previous data)							
5									5								
6									6								
7									7								
8									8								
9									9								
10									10								
11									11								
12									12								
13									13								
14									14								
15									15								

### 3.3.3. Non-cyclic Data Mode command (Command code : 6xh)

This is for transmitting event-based data such as parameter settings.

The I/O module cannot be controlled while this command is in use.

	Command									Response							
Byte	b7	b6	b5	b4	b3	b2	b1	b0	Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	C (0)	Update Counter	MAC ID						0	R (1)	Update Counter Echo	Actual MAC ID					
1	-	Command Code(6xh)							1	C Err	Command Code Echo(6xh)						
2	Control Byte 0								2	Status Byte 0							
3	Control Byte 1								3	Status Byte 1							
4	Command Data Area								4	Response Data Area							
5									5								
6									6								
7									7								
8									8								
9									9								
10									10								
11									11								
12									12								
13									13								
14									14								
15									15								

### 3.3.4. Cyclic Data Mode command (Command code : 70h)

This is for transmitting data from the I/O module.

This command allows you to control the output module and obtain the values of the input module.

	Command									Response							
Byte	b7	b6	b5	b4	b3	b2	b1	b0	Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	C (0)	Update Counter	MAC ID						0	R (1)	Update Counter Echo	Actual MAC ID					
1	-	Command Code(70h)							1	C Err	Command Code Echo(70h)						
2	Control Byte 0								2	Status Byte 0							
3	Control Byte 1								3	Status Byte 1							
4	Command Data Area								4	Response Data Area							
5									5								
6									6								
7									7								
8									8								
9									9								
10									10								
11									11								
12									12								
13									13								
14									14								
15																	

## 3.4. Non-cyclic Command description

### 3.4.1. Non-cyclic command list

Title	Non-cyclic Command Code	Description
Normal	60h	Use this command for normal operation. This command is reference non-cyclic command.
Reset	61h	Use this command to reset the network adapter.
System ID	62h	Use this command to read the system ID of the network adapter. Information specified by Type_Code and Index will be returned in ASCII code.
Parameter	66h	Use this to read out or write parameter, to write to EEPROM etc.
Command error	-	Response is returned if the network adapter cannot receive an incomplete command, or Byte 1, bit 7 is 1.
Communication error	FFh (Response only)	The network adapter will send this response as it detects communication error (CRC error). Upon detecting the CRC error, network adapter will use the previously received command for controlling.

### 3.4.2. Normal command (Command code : 60h)

Command used for normal operation.

This command is also reference command of non-cyclic command.

	Command									Response							
Byte	b7	b6	b5	b4	b3	b2	b1	b0	Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	C (0)	Update Counter	MAC ID						0	R (1)	Update Counter Echo	Actual MAC ID					
1	-	Command Code(60h)							1	C Err	Command Code Echo(60h)						
2	Control Byte 0								2	Status Byte 0							
3	Control Byte 1								3	Status Byte 1							
4	Non-cyclic Command Data Byte 0								4	Non-cyclic Response Data Byte 0							
5	Non-cyclic Command Data Byte 1								5	Non-cyclic Response Data Byte 1							
6	Non-cyclic Command Data Byte 2								6	Non-cyclic Response Data Byte 2							
7	Non-cyclic Command Data Byte 3								7	Non-cyclic Response Data Byte 3							
8	Non-cyclic Command Data Byte 4								8	Non-cyclic Response Data Byte 4							
9	Non-cyclic Command Data Byte 5								9	Non-cyclic Response Data Byte 5							
10	Non-cyclic Command Data Byte 6								10	Non-cyclic Response Data Byte 6							
11	Non-cyclic Command Data Byte 7								11	Non-cyclic Response Data Byte 7							
12	Non-cyclic Command Data Byte 8								12	Non-cyclic Response Data Byte 8							
13	Non-cyclic Command Data Byte 9								13	Non-cyclic Response Data Byte 9							
14	Non-cyclic Command Data Byte 10								14	Non-cyclic Response Data Byte 10							
15	Non-cyclic Command Data Byte 11								15	Non-cyclic Response Data Byte 11							

Title	Command	Description
Non-cyclic Command Data Byte 0~11	Not used	Does not perform any action on the command.
Non-cyclic Response Data Byte 0~11	Not used	Not updated. The response value for the previous command is fixed.

### 3.4.3. Reset command (Command code : 61h)

Use this command to reset the network adapter.

<Precautions>

Before starting the reset command assure the safety.

Command									Response								
Byte	b7	b6	b5	b4	b3	b2	b1	b0	Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	C (0)	Update Counter	MAC ID						0	R (1)	Update Counter Echo	Actual MAC ID					
1	-	Command Code(61h)							1	C Err	Command Code Echo(61h)						
2	Control Byte 0								2	Status Byte 0							
3	Control Byte 1								3	Status Byte 1							
4	(0)								4	(0)							
5	(0)								5	(0)							
6	(0)								6	(0)							
7	(0)								7	(0)							
8	Type Code								8	Type Code Echo							
9	(0)								9	ERR	WNG	(0)	Busy	(0)	(0)	(0)	(0)
10	Index								10	Index Echo							
11	(0)								11	(0)							
12	(0)								12	(0)							
13	(0)								13	(0)							
14	(0)								14	(0)							
15	(0)								15	(0)							

Title	Command	Response
Type Code / Type Code Echo	Software reset mode setup* 00h : No software Reset Operation 01h : Software Reset Operation	Echo back value of Type_Code
Index / Index Echo	Set to 0	Return 0

\* Software reset mode (Type Code : 01h)

Use this mode when resetting (restarting) network adapter without turning off control power (software resetting).

Reset process has to be executed after confirming that the all of slaves have received reset command (x1h) normally, because it is necessary to reset surely all slaves even if the communication error occurs.

For this purpose, the network adapter resets itself at transition from the reset command (x1h) to normal command (x0h).

If the communication error occurs at transition from the reset command to normal command, there might be case that only some of the slaves can receive the normal command. In this case, the network adapter also resets itself if the communication time-out has occurred in the condition that the last command was Reset command (x1h).

The following shows the procedures to reset slaves.

- 1) Change command code of all slaves from normal command (x0h) to Reset command (x1h). Also, be sure to set Type\_Code to 01h and Index and Setting\_Data to 0.
- 2) Confirm that the value of Command Code Echo sent from all slaves is (x1h), and then return to normal command (x0h).
- 3) The network adapter will start executing a reset process when normal command (x0h) has been received normally, or when the communication time-out has occurred in the condition that the last received command was Reset command (x1h).
- 4) Since there is no response from slaves due to the reset state, the master will detect the communication time-out. When the time-out is detected, reset the RTEX communication IC and initialize the communication again.

## 3.4.4. System ID command (Command code : 62h)

Use this when you read out the system ID of the network adapter.

Return the information specified by Type\_Code and Index in ASCII code.

Command									Response								
Byte	b7	b6	b5	b4	b3	b2	b1	b0	Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	C (0)	Update Counter	MAC ID						0	R (1)	Update Counter Echo	Actual MAC ID					
1	-	Command Code(62h)							1	C Err	Command Code Echo(62h)						
2	Control Byte 0								2	Status Byte 0							
3	Control Byte 1								3	Status Byte 1							
4	(0)								4	(0)							
5	(0)								5	(0)							
6	(0)								6	(0)							
7	(0)								7	(0)							
8	Type Code								8	Type Code Echo							
9	(0)								9	ERR	WNG	(0)	Busy	(0)	(0)	(0)	(0)
10	Index								10	Index Echo							
11	(0)								11	(0)							
12	Non-cyclic Command Data Byte 8								12	Non-cyclic Response Data Byte 8							
13	Non-cyclic Command Data Byte 9								13	Non-cyclic Response Data Byte 9							
14	Non-cyclic Command Data Byte 10								14	Non-cyclic Response Data Byte 10							
15	Non-cyclic Command Data Byte 11								15	Non-cyclic Response Data Byte 11							

Title	Command	Response
Type Code / Type Code Echo	Specify the system ID to be read. ▪ For details, refer Section 3.4.4.1.	Echo back value of Type_Code
Index / Index Echo		Echo back value of Index
Non-cyclic Command Data Byte 8 ~ 11 / Non-cyclic Response Data Byte 8 ~ 11	Set to 0	Returns the Read value for the specified system ID. ▪ For details, refer Section 3.4.4.1.

## 3.4.4.1. System ID Command Type Code List

Type Code	Designation	Description
01h	Vendor name	ASCII code : "CREVIS" Hex : 43h, 52h, 45h, 56h, 49h, 53h
05h	Device type	Read out the device type. Example: 08h Remote IO
12h	Model No.	Read out the model number of the network adapter. ASCII code : "GL-9041" Hex : 47h, 4Ch, 2Dh, 39h, 30h, 34h, 31h
14h	Firmware Revision	Read out the firmware version of the network adapter. Example: '1.010', Read Data 0 : 01h, Read Data 1 : 0Ah
15h	Firmware Release Date	Read out the firmware Release Date of the network adapter. Example: '20251015', Read Data 0 : 20h, Read Data 1 : 25h, Read Data 2 : 10h, Read Data 3 : 15h
31h	External scale vendor ID	Returns 0h
32h	External scale model ID	Returns 0h
Other Value	Wrong Type Code	Returns command error(0031h)

## 3.4.4.2. Example of reading of vendor name("CREVIS")

Type Code Echo : 01h				
Byte 10	Intex Echo	00h	01h	02h
Byte 11	-	00h	00h	00h
Byte 12	Read Data 0	43h / 'C'	49h / 'I'	00h
Byte 13	Read Data 1	52h / 'R'	53h / 'S'	00h
Byte 14	Read Data 2	45h / 'E'	00h	00h
Byte 15	Read Data 3	56h / 'V'	00h	00h

## 3.4.4.3. Device type

Device type is identified as follows:

With this network adapter, 08h will be returned.

Device type	Description
00h	Reserved
01h	Servo driver
02h	stepping
03h	Pulse OUT
04h	Digital IN
05h	Digital OUT or IN & OUT
06h	Analog IN
07h	Analog OUT or IN & OUT
08h	Remote IO
09h	Gateway
0Ah ~ 0Fh	Reserved
10h	Reserved
11h	Reserved

## 3.4.5. Parameter command (Command code : 66h)

Use this to read out, to write the parameter and to write to EEPROM.

	Command									Response							
Byte	b7	b6	b5	b4	b3	b2	b1	b0	Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	C (0)	Update Counter	MAC ID						0	R (1)	Update Counter Echo	Actual MAC ID					
1	-	Command Code(66h)							1	C Err	Command Code Echo(66h)						
2	Control Byte 0								2	Status Byte 0							
3	Control Byte 1								3	Status Byte 1							
4	(0)								4	(0)							
5	(0)								5	(0)							
6	(0)								6	(0)							
7	(0)								7	(0)							
8	Type Code								8	Type Code Echo							
9	(0)								9	ERR	WNG	(0)	Busy	(0)	(0)	(0)	(0)
10	Index								10	Index Echo							
11	(0)								11	(0)							
12	Non-cyclic Command Data Byte 8								12	Non-cyclic Response Data Byte 8							
13	Non-cyclic Command Data Byte 9								13	Non-cyclic Response Data Byte 9							
14	Non-cyclic Command Data Byte 10								14	Non-cyclic Response Data Byte 10							
15	Non-cyclic Command Data Byte 11								15	Non-cyclic Response Data Byte 11							

Title	Command	Response
Type Code / Type Code Echo	Type of execution, e.g. reading and writing of parameter ▪ For details, refer to Section 3.4.5.1.	Echo back value of Type_Code
Index / Index Echo	Parameter number (Type, No.) ▪ For details, refer to Section 3.4.5.1.	Echo back value of Index
Non-cyclic Command Data Byte 8 ~ 11 / Non-cyclic Response Data Byte 8 ~ 11	Parameter write data	Parameter read data

### 3.4.5.1. Type code/Index list of parameter command

Title	Type Code
Parameter Reading	10h
Parameter Writing	20h

Title	Index	Range	Description
Update_Counter error protection setup	01h	0-17	Set the number of RTEX Update_Counter error protection detections.(default value is 0) If 0 or 1 is set for this parameter, update counter error checking is disabled.
Number of continuous communication error protection setup	02h	0-17	Set the number of RTEX continuous communication error protection detections.(default value is 2) If 0 or 1 is set for this parameter, 2 is internally set.
Timeout detection setup	03h	0-255	A value of 0 disables timeout detection.(default) If the value is not 0, the detection time is: Detection time = 81.92us x (setting value)
SYNC Output Delay setup	04h	0-127	Additional delay time for XSYNC output is set. This setting is applied to my node, and is not effective in the other nodes. Normally, set to 0 (no delay). Delay time = 0.64us x (setting value)

## 3.4.6. Command error (Command code : xxh)

If the network adapter cannot receive a command due to its incompleteness, it returns this response in which bit 7 of Byte 1 is 1.

Command									Response								
Byte	b7	b6	b5	b4	b3	b2	b1	b0	Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	C (0)	Update Counter	MAC ID						0	R (1)	Update Counter Echo	Actual MAC ID					
1	-	Command Code(xxh)							1	C Err (1)	Command Code Echo(xxh)						
2	Control Byte 0								2	Status Byte 0							
3	Control Byte 1								3	Status Byte 1							
4	(0)								4	(0)							
5	(0)								5	(0)							
6	(0)								6	(0)							
7	(0)								7	(0)							
8	Type Code								8	Type Code Echo							
9	(0)								9	ERR	WNG	(0)	Busy	(0)	(0)	(0)	(0)
10	Index								10	Index Echo							
11	(0)								11	(0)							
12	Non-cyclic Command Data Byte 8								12	Non-cyclic Response Data Byte 8							
13	Non-cyclic Command Data Byte 9								13	Non-cyclic Response Data Byte 9							
14	Non-cyclic Command Data Byte 10								14	Non-cyclic Response Data Byte 10							
15	Non-cyclic Command Data Byte 11								15	Non-cyclic Response Data Byte 11							

Title	Command	Response
C Err	-	Return 1.
Non-cyclic Command Data Byte 8 ~ 11 / Non-cyclic Response Data Byte 8 ~ 11	-	Command error code ▪ For details, refer to Sections 3.4.5.1

### 3.4.6.1. List of command error code

Category	Error code	Description
Command header related	0011h	• Mismatched node address (MAC-ID)
	0012h	• C bit is 1 despite of command
	0021h	• Cyclic command is not defined
	0022h	• Non-cyclic command is not defined (when cyclic command is Non-cyclic Data Mode) • Combination error of control mode and non-cyclic command.
Command code, control mode related	002Eh	• Control mode has been changed during execution of non-cyclic command (Busy = 1).
	0031h	• Type Code is not defined.
	0032h	• Index Code is not defined.



## 3.4.7. Communication error (Command code : xxh / Response code : Ffh)

This response will be returned when the communication error (CRC error) has been detected by the network adapter. Then the network adapter continues controlling based on the previously received command.

	Command									Response							
Byte	b7	b6	b5	b4	b3	b2	b1	b0	Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	C (0)	Update Counter	MAC ID						0	R (1)	Update Counter Echo	Actual MAC ID					
1	-	Command Code(xxh)							1	FFh							
2	Control Byte 0								2	Status Byte 0							
3	Control Byte 1								3	Status Byte 1							
4	(0)								4	(0)							
5	(0)								5	(0)							
6	(0)								6	(0)							
7	(0)								7	(0)							
8	(0)								8	(0)							
9	(0)								9	(0)							
10	(0)								10	(0)							
11	(0)								11	(0)							
12	(0)								12	(0)							
13	(0)								13	(0)							
14	(0)								14	(0)							
15	(0)								15	(0)							

Title	Command	Response
Byte 1	-	Return FFh

## 3.4.8. Operation

### 3.4.8.1. Cyclic Data Mode operation

If the cyclic command (byte 1, bits 6-4) is 7h and the RUN/STOP bit of the control byte is 1, the I/O Module update operation is performed.

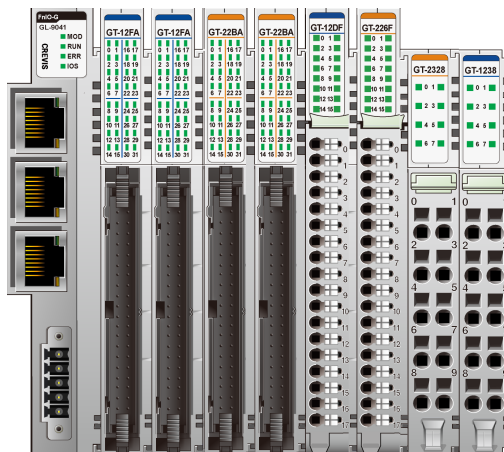
To stop the I/O module data update while maintaining RTEX communication, the RUN/STOP bit of the control byte must be changed to 0.

If the RUN/STOP bit of the control byte is 0, the output value of the output module is cleared or the previous data value is maintained depending on the setting of the STOP Action bit of the control byte.

Do not change to Non-cyclic Data Mode while operating in Cyclic Data Mode.

If you want to change to Non-cyclic Data Mode, you must first stop the I/O module update by setting the RUN/STOP bit of the control byte to 0.

In cyclic data mode, the data of the I/O module is mapped as follows:



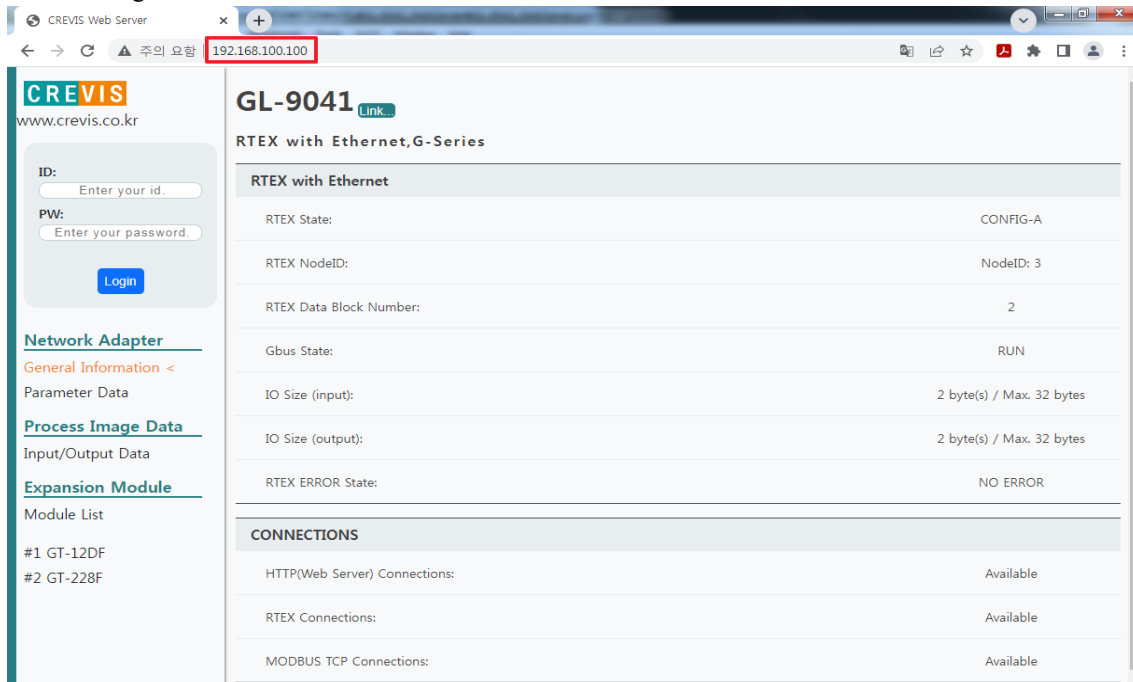
Slot No.	Module Description
#0	RTEX Adapter
#1	32-discrete input
#2	32-discrete input
#3	32-discrete output
#4	32-discrete output
#5	16-discrete input
#6	16-discrete output
#7	8-discrete input
#8	8-discrete output

	Command									Response							
Byte	b7	b6	b5	b4	b3	b2	b1	b0	Byte	b7	b6	b5	b4	b3	b2	b1	b0
0	C (0)	Update Counter	MAC ID						0	R (1)	Update Counter Echo	Actual MAC ID					
1	-	Command Code(70h)							1	C Err	Command Code Echo(70h)						
2	Control Byte 0(01h or 81h)								2	Status Byte 0							
3	Control Byte 1								3	Status Byte 1							
4	Discrete Output 32 pts (Slot #3 0~7bit)								4	Discrete Input 32 pts (Slot #1 0~7bit)							
5	Discrete Output 32 pts (Slot #3 8~15bit)								5	Discrete Input 32 pts (Slot #1 8~15bit)							
6	Discrete Output 32 pts (Slot #3 16~23bit)								6	Discrete Input 32 pts (Slot #1 16~23bit)							
7	Discrete Output 32 pts (Slot #3 24~31bit)								7	Discrete Input 32 pts (Slot #1 24~31bit)							
8	Discrete Output 32 pts (Slot #4 0~7bit)								8	Discrete Input 32 pts (Slot #2 0~7bit)							
9	Discrete Output 32 pts (Slot #4 8~15bit)								9	Discrete Input 32 pts (Slot #2 8~15bit)							
10	Discrete Output 32 pts (Slot #4 16~23bit)								10	Discrete Input 32 pts (Slot #2 16~23bit)							
11	Discrete Output 32 pts (Slot #4 24~31bit)								11	Discrete Input 32 pts (Slot #2 24~31bit)							
12	Discrete Output 16 pts (Slot #6 0~7bit)								12	Discrete Input 16 pts (Slot #5 0~7bit)							
13	Discrete Output 16 pts (Slot #6 8~15bit)								13	Discrete Input 16 pts (Slot #5 8~15bit)							
14	Discrete Output 8 pts (Slot #8 0~7bit)								14	Discrete Input 8 pts (Slot #7 0~7bit)							
15	-								15	-							

## 4. Webserver

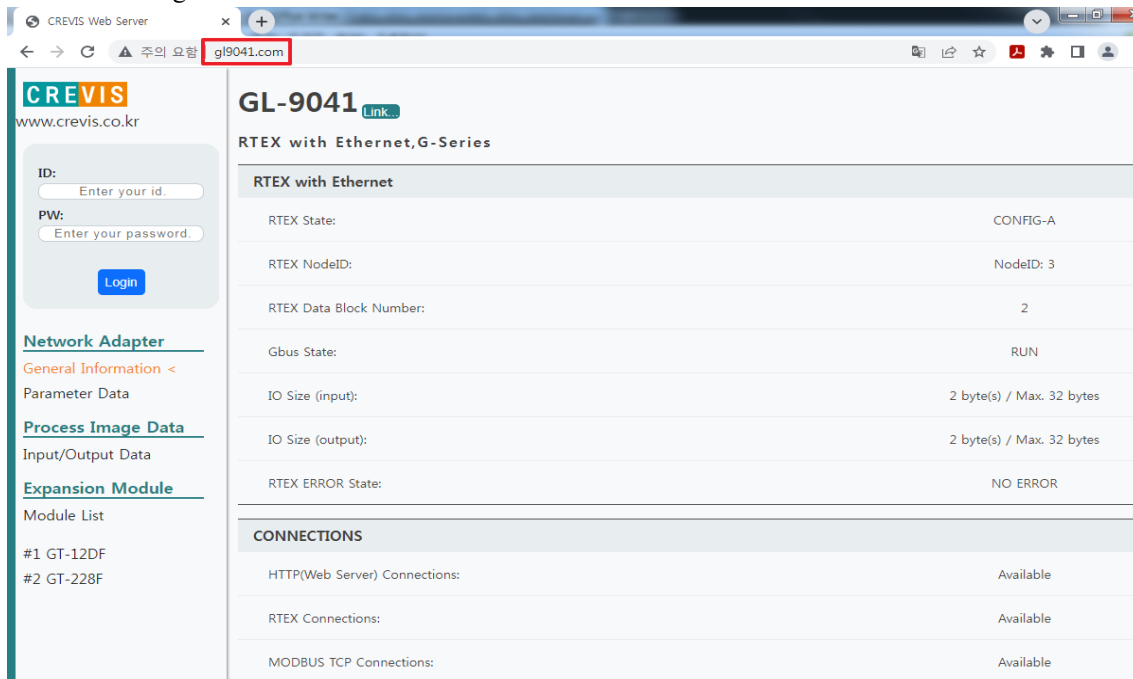
### 4.1. How to access the webserver

#### 1) IP Address usage



- Default IP Address is “192.168.100.100”
- IP address can be changeable by setting the parameter data of the network adapter (refer to Section 3.3.1).

#### 2) Domain Name usage



- Default Domain Name is “gl9041.com”
- Domain Name can be changeable by setting the parameter data of the network adapter (refer to Section 3.3.1).

## 4.2. Log-in information

### 4.2.1. Log-in



- Default ID is “crevis”
- Default Password is “crevis”
- Log-in should be done first in order to write the output data and parameter data.

### 4.2.2. How to change ID & Password



- ID and password can be changeable after the log-in.
- The ID characters' limitation is from 3 to 10 letters.
- The PW characters' limitation is from 8 to 16 letters ( alphabet & numbers ).
- The PW must consist of numbers and alphabets.
- ID and PW cannot contain special characters (ex - #@\$/? and etc ).

## 4.3. Other information

### 4.3.1. Network Adapter

#### 1) General Information

'General Information' contains the basic information of Network Adapter.

The screenshot shows the CREVIS Web Server interface for the GL-9041 Network Adapter. The left sidebar contains navigation links: Network Adapter, General Information (highlighted), Parameter Data, Process Image Data, Input/Output Data, Expansion Module, and Module List. The main content area displays the following information:

RTEX with Ethernet, G-Series	
<b>RTEX with Ethernet</b>	
RTEX State:	CONFIG-A
RTEX NodeID:	NodeID: 3
RTEX Data Block Number:	2
Gbus State:	RUN
IO Size (input):	2 byte(s) / Max. 32 bytes
IO Size (output):	2 byte(s) / Max. 32 bytes
RTEX ERROR State:	NO ERROR
<b>CONNECTIONS</b>	
HTTP(Web Server) Connections:	Available
RTEX Connections:	Available
MODBUS TCP Connections:	Available
<b>IP ADDRESS</b>	
IP Address:	192.168.100.100
Subnet Mask:	255.255.255.0
Gateway:	192.168.0.1
MAC Address:	00:14:F7:00:00:02
<b>General Information</b>	
Firmware Revision:	1.000(07/03/2024)
Expansion Modules:	2 module(s) / Max. 63 modules

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## 2) Parameter Data

Change the Domain name and IP address, subnet, gateway setting and RTEX Parameter Data in 'Parameter Data'.  
When you change the Parameter Data, you must turn the system power OFF and ON.

CREVIS Web Server x +

← → ↻ 주의 요함 | 192.168.100.100/#/nasetup/

**CREVIS**  
www.crevis.co.kr

Welcome,  
crevis

change ID change PW Logout

**Network Adapter**

General Information  
**Parameter Data <**  
Process Image Data  
Input/Output Data  
Expansion Module

Module List

#1 GT-12DF  
#2 GT-226F

### GL-9041 Link...

RTEX with Ethernet, G-Series

#### IP ADDRESS SETTING Write

IP Address:	192.168.100.100
Subnet Mask:	255.255.255.0
Gateway:	192.168.0.1
Domain Name:	gl9041.com

#### RTEX PARAMETER SETTING Write

Timeout Value:	0
SYNC Output Delay Time Value:	0
CRC Error Protection Value:	2
Update Counter Error Protection Value:	0

# After the system is reset, you can access the changed values.

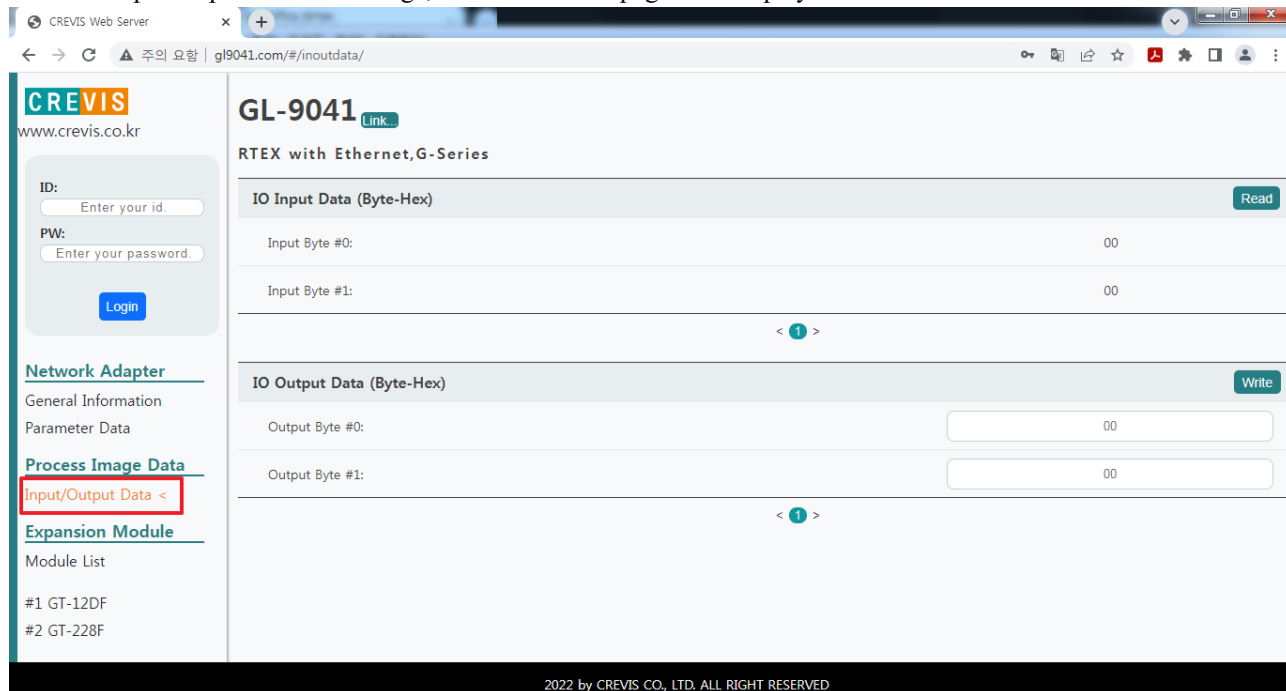
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## 4.3.2. Process Image Data

### 1) Input/Output Data

'Input/Output Data' shows the input/Output value connected to GL-9041.

If the input/output data size is large, it is divided into pages and displayed.

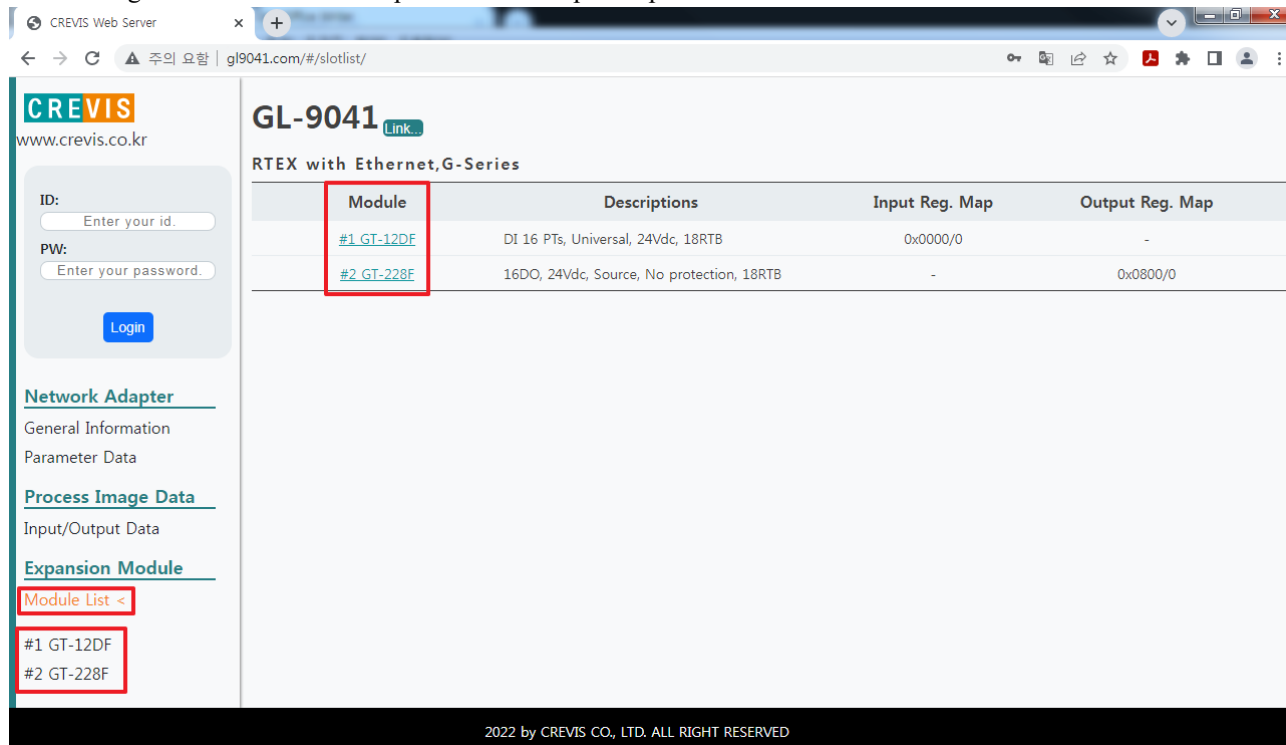


## 4.3.3. Expansion Module

### 1) Module List

'Module List' shows the expansion module connected to GL-9041.

Clicking on each slot shows the parameter and input/output information of each module.



## 2) Input Module

Pressing the “Read” button continuously updates the Input data.

After entering the parameter data, click the “Write” button in order to change the parameter value.

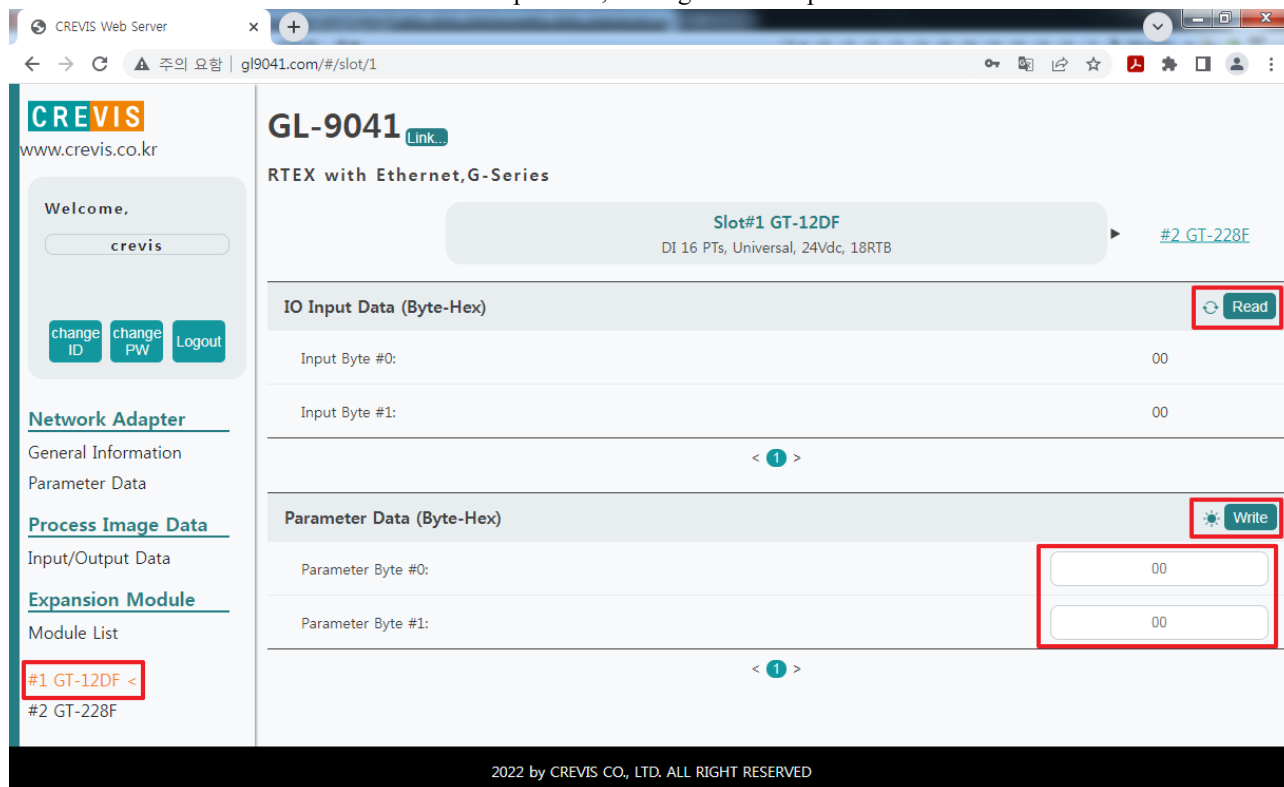
However, must log-in first to activate the “Write” button.

When the parameter data is successfully written, a sun-shaped symbol is displayed.

If “Read” fail, a cloud symbol is displayed.

If “Write” fail, a caution symbol is displayed.

When RTEX communication is in normal operation, writing cannot be performed.





### 3) Output Module

After entering the output data, click the “Write” button in order to change the output value.

After entering the parameter data, click the “Write” button in order to change the parameter value.

Write operation is unavailable when RTEX communication is in normal operation or when login is not performed.

When the output data or parameter data is successfully written, a sun-shaped symbol is displayed.

If “Write” fail, a caution symbol is displayed.

The screenshot shows the CREVIS Web Server interface for GL-9041. The interface is divided into a sidebar and a main content area. The sidebar contains navigation links for 'Network Adapter', 'Process Image Data', and 'Expansion Module'. The main content area displays 'IO Output Data (Byte-Hex)' and 'Parameter Data (Byte-Hex)' sections. Each section has input fields for bytes and a 'Write' button. The 'Write' buttons are highlighted with red boxes. Below the main area, there are two 'Write' buttons with a sun icon and a caution icon.



## 5. MODBUS TCP/ UDP INTERFACE

### 5.1. MODBUS TCP/ UDP Protocol

The MODBUS messaging service provides a Client/Server communication between devices connected on an Ethernet TCP/IP network. All MODBUS/TCP messages are sent via TCP on registered port 502.

Refer to Modbus\_Messaging\_Implementation\_Guide\_V1\_0a.pdf.

#### 5.1.1. Comparison of MODBUS TCP/ UDP And MODBUS/RTU

This header provides some differences compared to the MODBUS RTU application data unit used on serial line:

- The MODBUS 'slave address' field usually used on MODBUS Serial Line is replaced by a single byte 'Unit Identifier' within the MBAP Header. The 'Unit Identifier' is used to communicate via devices such as bridges, routers and gateways that use a single IP address to support multiple independent MODBUS end units.
- All MODBUS requests and responses are designed in such a way that the recipient can verify that a message is finished. For function codes where the MODBUS PDU has a fixed length, the function code alone is sufficient. For function codes carrying a variable amount of data in the request or response, the data field includes a byte count.
- When MODBUS is carried over TCP, additional length information is carried in the MBAP header to allow the recipient to recognize message boundaries even if the message has been split into multiple packets for transmission. The existence of explicit and implicit length rules, and use of a CRC-32 error check code (on Ethernet) results in an infinitesimal chance of undetected corruption to a request or response message.

#### MODBUS TCP/ UDP

MBAP Header	Function	Data
7 chars	1 char	Up to 252 chars

#### MODBUS RTU

Start	Address	Function	Data	CRC Check	END
≥ 3.5 char	1 char	1 char	Up to 252 chars	2 chars	≥ 3.5 char

Function and data field of MODBUS/TCP are identical to function and data field of MODBUS/RTU.

#### 5.1.2. MODBUS TCP/ UDP MBAP Header

The MBAP (MODBUS Application Protocol) header contains the following fields.

Fields	Length	Description	Client	Server
Transaction Identifier	2bytes	Identification of a MODBUS Request /Response transaction.	Initialized by the client	Recopied by the server from the received
Protocol Identifier	2bytes	0 = MODBUS protocol	Initialized by the client	Recopied by the server from the received
Length	2bytes	Number of following bytes	Initialized by the client (Request)	Initialized by the server (Response)
Unit Identifier	1byte	Identification of a remote slave connected on a serial line or on other buses.	Initialized by the client	Recopied by the server from the received

- Transaction Identifier - It is used for transaction pairing, the MODBUS server copies in the response the transaction identifier of the request.
- Protocol Identifier – It is used for intra-system multiplexing. The MODBUS protocol is identified by the value 0.
- Length - The length field is a byte count of the following fields, including the Unit Identifier and data fields.
- Unit Identifier – This field is used for intra-system routing purpose. Typically MODBUS server must be returned with the same value set by MODBUS client.

## 5.2. Supported MODBUS Function Codes

Function Code	Function	Description
1(0x01)	Read Coils	Read output bit
2(0x02)	Read Discrete Inputs	Read input bit
3(0x03)	Read Holding Registers	Read output word
4(0x04)	Read Input Registers	Read input word
5(0x05)	Write Single Coil	Write one bit output
6(0x06)	Write Single Register	Write one word output
8(0x08)	Diagnostics	Read diagnostic register
15(0x0F)	Write Multiple Coils	Write a number of output bits
16(0x10)	Write Multiple registers	Write a number of output words
23(0x17)	Read/Write Multiple registers	Read a number of input words /Write a number of output words

- Refer to MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1a

### 5.2.1. 1 (0x01) Read Coils

This function code is used to read from 1 to 2000 contiguous status of coils in a remote device. The Request PDU specifies the starting address, i.e. the address of the first coil specified, and the number of coils. In the PDU Coils are addressed starting at zero. Therefore coils numbered 1-16 are addressed as 0-15. The coils in the response message are packed as one coil per bit of the data field. Status is indicated as 1= ON and 0= OFF.

#### • Request

Field name	Example
Function Code	0x01
Starting Address Hi	0x10
Starting Address Lo	0x00
Quantity of Outputs Hi	0x00
Quantity of Outputs Lo	0x0A

#### • Response

Field name	Example
Function Code	0x01
Byte Count	0x02
Output Status	0x55
Output Status	0x02

- In case of address 0x1015~0x1000 output bit value: 10101010\_01010101.

## 5.2.2. 2 (0x02) Read Discrete Inputs

This function code is used to read from 1 to 2000 contiguous status of discrete inputs in a remote device. The Request PDU specifies the starting address, i.e. the address of the first input specified, and the number of inputs. In the PDU Discrete Inputs are addressed starting at zero. Therefore Discrete inputs numbered 1-16 are addressed as 0-15. The discrete inputs in the response message are packed as one input per bit of the data field. Status is indicated as 1= ON; 0= OFF.

### • Request

Field name	Example
Function Code	0x02
Starting Address Hi	0x00
Starting Address Lo	0x00
Quantity of Inputs Hi	0x00
Quantity of Inputs Lo	0x0A

### • Response

Field name	Example
Function Code	0x02
Byte Count	0x02
Input Status	0x80
Input Status	0x00

- In case of address 0x0015~0x0000 input bit value: 00000000\_10000000.

## 5.2.3. 3 (0x03) Read Holding Registers

This function code is used to read the contents of a contiguous block of holding registers in a remote device. The Request PDU specifies the starting register address and the number of registers.

The register data in the response message are packed as two bytes per register, with the binary contents right justified within each byte. For each register, the first byte contains the high order bits and the second contains the low order bit

### • Request

Field name	Example
Function Code	0x03
Starting Address Hi	0x08
Starting Address Lo	0x00
Quantity of Inputs Hi	0x00
Quantity of Inputs Lo	0x02

### • Response

Field name	Example
Function Code	0x03
Byte Count	0x04
Input Status	0x11
Input Status	0x22
Output Register#1 Hi	0x33
Output Register#1 Lo	0x44

- In case of address 0x0800, 0x0801 output register value: 0x1122, 0x3344.

## 5.2.4. 4 (0x04) Read Input Registers

This function code is used to read from 1 to approx. 125 contiguous input registers in a remote device. The Request PDU specifies the starting register address and the number of registers. The register data in the response message are packed as two bytes per register, with the binary contents right justified within each byte. For each register, the first byte contains the high order bits and the second contains the low order bits.

### • Request

Field name	Example
Function Code	0x04
Starting Address Hi	0x00
Starting Address Lo	0x00
Quantity of Register Hi	0x00
Quantity of Register Lo	0x02

### • Response

Field name	Example
Function Code	0x03
Byte Count	0x04
Input Register#0 Hi	0x00
Input Register#0 Lo	0x80
Input Register#1 Hi	0x00
Input Register#1 Lo	0x00

- In case of address 0x0000, 0x0001 input register value: 0x0080, 0x0000.

## 5.2.5. 5 (0x05) Write Single Coil

This function code is used to write a single output to either ON or OFF in a remote device. The requested ON/OFF state is specified by a constant in the request data field. A value of FF 00 hex requests the output to be ON. A value of 00 00 requests it to be OFF. All other values are illegal and will not affect the output

### • Request

Field name	Example
Function Code	0x05
Output Address Hi	0x10
Output Address Lo	0x01
Output Value Hi	0xFF
Output Value Lo	0x00

### • Response

Field name	Example
Function Code	0x05
Output Address Hi	0x10
Output Address Lo	0x01
Output Value Hi	0xFF
Output Value Lo	0x00

- Output bit of address 0x1001 turns ON.

## 5.2.6. 6 (0x06) Write Single Register

This function code is used to write a single holding register in a remote device. Therefore register numbered 1 is addressed as 0. The normal response is an echo of the request, returned after the register contents have been written.

### • Request

Field name	Example
Function Code	0x06
Register Address Hi	0x08
Register Address Lo	0x00
Register Value Hi	0x11
Register Value Lo	0x22

### • Response

Field name	Example
Function Code	0x06
Register Address Hi	0x08
Register Address Lo	0x00
Register Value Hi	0x11
Register Value Lo	0x22

- In case of address 0x0800 output register value: 0x0000 changes to 0x1122.

## 5.2.7. 8 (0x08) Diagnostics

MODBUS function code 08 provides a series of tests for checking the communication system between a client ( Master) device and a server ( Slave), or for checking various internal error conditions within a server.

The function uses a two-byte sub-function code field in the query to define the type of test to be performed. The server echoes both the function code and sub-function code in a normal response. Some of the diagnostics cause data to be returned from the remote device in the data field of a normal response.

### • Request

Field name	Example
Function Code	0x08
Sub-Function Hi	0x00
Sub-Function Lo	0x00
Data Hi	0x11
Data Lo	0x22

### • Response

Field name	Example
Function Code	0x08
Sub-Function Hi	0x00
Sub-Function Lo	0x00
Data Hi	0x11
Data Lo	0x22

## Sub-function 0x0000(0) Return Query Data

The data passed in the request data field is to be returned (looped back) in the response.  
The entire response message should be identical to the request.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x0000(0)	Any	Echo Request Data	

## Sub-function 0x0001(1) Restart Communications Option

The remote device could be initialized and restarted, and all of its communications event counters are cleared.  
Especially, data field 0x55AA make the remote device to restart with factory default setup of EEPROM.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x0001(1)	0x0000 or 0xFF00	Echo Request Data	Reset
0x0001(1)	0x55AA+0xAB7B+Sumcheck	Echo Request Data	Reset with Factory default <sup>1)</sup>
0x0001(1)	0x55AA+0xAA55+Sumcheck	Echo Request Data	Reset with Factory default <sup>2)</sup>

1) Watchdog time value, auto recovery will be the factory defaults value.

2) Resets IP address, subnet mask address, gateway address, web server ID/password, domain name, RTEX function, etc. to factory defaults.

## Sub-function 0x000A(10) Clear Counters and Diagnostic Register

The goal is to clear all counters and the diagnostic register. Counters are also cleared upon power-up.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x000A(10)	0x0000	Echo Request Data	

## Sub-function 0x000B(11) Return Bus Message Count

The response data field returns the quantity of messages that the remote device has detected on the communications system since its last restart, clear counters operation, or power-up.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x000B(11)	0x0000	Total Message Count	

## Sub-function 0x000C(12) Return Bus Communication Error Count

The response data field returns the quantity of CRC errors encountered by the remote device since its last restart, clear counters operation, or power-up.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x000C(12)	0x0000	CRC Error Count	

## Sub-function 0x000D(13) Return Bus Exception Error Count

The response data field returns the quantity of MODBUS exception responses returned by the remote device since its last restart, clear counters operation, or power-up.

Exception responses are described and listed in section 3.2.11.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x000D(13)	0x0000	Exception Error Count	

## Sub-function 0x000E(14) Return Slave Message Count

The response data field returns the quantity of messages addressed to the remote device, or broadcast, that the remote device has processed since its last restart, clear counters operation, or power-up.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x000E(14)	0x0000	Slave Message Count	

## Sub-function 0x000F(15) Return Slave No Response Count

The response data field returns the quantity of messages addressed to the remote device for which it has returned no response (neither a normal response nor an exception response), since its last restart, clear counters operation, or power-up.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x000F(15)	0x0000	Slave No Response Count	

## Sub-function 0x0064(100) Return Slave ModBus, Internal Bus Status

The response data field returns the status of ModBus and Internal Bus addressed to the remote device.

This status values are identical with status 1word of input process image.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x0064(100)	0x0000	ModBus, Internal Bus Status	Same as status 1word

## Sub-function 0x0065(101) Return Slave Watchdog Error Count

The response data field returns the quantity of watchdog error addressed to the remote device since its last restart, clear counters operation, or power-up.

Sub-function	Data Field (Request)	Data Field (Response)	Description
0x0065(101)	0x0000	Watchdog Error Count	

## 5.2.8. 15 (0x0F) Write Multiple Coils

This function code is used to force each coil in a sequence of coils to either ON or OFF in a remote device. The Request PDU specifies the coil references to be forced. Coils are addressed starting at zero. A logical '1' in a bit position of the field requests the corresponding output to be ON. A logical '0' requests it to be OFF.

The normal response returns the function code, starting address, and quantity of coils forced.

### • Request

Field name	Example
Function Code	0x0F
Starting Address Hi	0x10
Starting Address Lo	0x00
Quantity of Outputs Hi	0x00
Quantity of Outputs Lo	0x0A
Byte Count	0x02
Output Value#0	0x55
Output Value#1	0x01

### • Response

Field name	Example
Function Code	0x0F
Starting Address Hi	0x10
Starting Address Lo	0x00
Quantity of Outputs Hi	0x00
Quantity of Outputs Lo	0x0A

- In case of address 0x1015~0x1000 output bit value: 00000000\_00000000 changes to 00000001\_01010101.

## 5.2.9. 16 (0x10) Write Multiple Registers

This function code is used to write a block of contiguous registers (1 to approx. 120 registers) in a remote device.

The requested written values are specified in the request data field. Data is packed as two bytes per register.

The normal response returns the function code, starting address, and quantity of registers written.

### • Request

Field name	Example
Function Code	0x0F
Starting Address Hi	0x10
Starting Address Lo	0x08
Quantity of Registers Hi	0x00
Quantity of Registers Lo	0x02
Byte Count	0x04
Register Value#0 Hi	0x11
Register Value#0 Lo	0x22
Register Value#1 Hi	0x33
Register Value#1 Lo	0x44



## • Response

Field name	Example
Function Code	0x0F
Starting Address Hi	0x10
Starting Address Lo	0x08
Quantity of Registers Hi	0x00
Quantity of Registers Lo	0x02

- In case of address 0x0800, 0x0801 output register value: 0x0000, 0x0000 changes to 0x1122, 0x3344.

## 5.2.10. 23 (0x17) Read/Write Multiple Registers

This function code performs a combination of one read operation and one write operation in a single MODBUS transaction. The write operation is performed before the read. The request specifies the starting address and number of holding registers to be read as well as the starting address, number of holding registers, and the data to be written. The byte count specifies the number of bytes to follow in the write data field.

The normal response contains the data from the group of registers that were read. The byte count field specifies the quantity of bytes to follow in the read data field.

## • Request

Field name	Example
Function Code	0x17
Read Starting Address Hi	0x08
Read Starting Address Lo	0x00
Quantity of Read Hi	0x00
Quantity of Read Lo	0x02
Write Starting Address Hi	0x08
Write Starting Address Lo	0x00
Quantity of Write Hi	0x00
Quantity of Write Lo	0x02
Byte Count	0x04
Write Reg. Value#0 Hi	0x11
Write Reg. Value#0 Lo	0x22
Write Reg. Value#1 Hi	0x33
Write Reg. Value#1 Lo	0x44

## • Response

Field name	Example
Function Code	0x17
Byte Count	0x04
Read Reg. Value#0 Hi	0x11
Read Reg. Value#0 Lo	0x22
Read Reg. Value#1 Hi	0x33
Read Reg. Value#1 Lo	0x44

- In case of address 0x0800, 0x0801 output register value: 0x0000, 0x0000 changes to 0x1122, 0x3344.

## 5.2.11. Error Response

In an exception response, the server sets the MSB of the function code to 1. This makes the function code value in an exception response exactly 80 hexadecimal higher than the value would be for a normal response.

### • Exception Response Example

Field name	Example
Function Code	0x81
Exception Code	0x02

### • Exception Codes

Exception Code	Name	Description
01	Illegal Function	The function code received in the query is not an allowable action for the server (or slave).
02	Illegal Data Address	The data address received in the query is not an allowable address for the server (or slave).
03	Illegal Data Value	A value contained in the query data field is not an allowable value for server (or slave).
04	Slave Device Failure	An unrecoverable error occurred while the server (or slave) was attempting to perform the requested action.
05	Acknowledge	The server (or slave) has accepted the request and is processing it, but a long duration of time will be required to do so.
06	Slave Device Busy	Specialized use in conjunction with programming commands. The server (or slave) is engaged in processing a long-duration program command. The client (or master) should retransmit the message later when the server (or slave) is free.
08	Memory Parity Error	The server (or slave) attempted to read record file, but detected a parity error in the memory. The client (or master) can retry the request, but service may be required on the server (or slave) device.
0A	Gateway Path Unavailable	Specialized use in conjunction with gateways, indicates that the gateway was unable to allocate an internal communication path from the input port to the output port for processing the request.

- GL-9041 response exception code 01, 02, 03, 04 and 06.

## 5.3. MODBUS Special Register Map

The special register map can be accessed by function code 3, 4, 6 and 16. Also the special register map must be accessed by read/write of every each address (one address).

### 5.3.1. Adapter Identification Special Register (0x1000, 4096)

Address	Access	Type, Size	Description
0x1000(4096)	Read	1word	Vendor ID = 0x02E5(741), Crevis. Co., Ltd.
0x1001(4097)	Read	1word	Device type = 0x000C, Network Adapter
0x1002(4098)	Read	1word	Product Code = 0x9520
0x1003(4099)	Read	1word	Firmware revision, if 0x0101, revision 1.01
0x1004(4100)	Read	2words	Product unique serial number(not used, fixed 0xFFFF,0xFFFF)
0x1005(4101)	Read	String upto 18bytes	Product name string (ASCII) “GL-9041,RTEX with ETH,G-Series”
0x1006(4102)	Read	1word	Sum check of EEPROM
0x1010(4112)	Read	2words	Firmware release date
0x1011(4113)	Read	2words	Product manufacturing inspection date(not used, fixed 0xFFFF,0xFFFF)
0x101E(4126)	Read	15words - 2words - 2words - 2words - 3words - 1word - 1word - 1word - 1word - 2words	Composite Id of following address 0x1050(4176), IP address 0x1051(4177), Subnet mask 0x1052(4178), Gateway 0x1053(4179), Ethernet physical address (MAC ID) 0x1000(4096), Vendor ID 0x1001(4097), Device type 0x1002(4098), Product code 0x1003(4099), Firmware revision 0x1004(4100), Product serial number(not used, fixed 0xFFFF,0xFFFF)

- String Type consists of valid string length (first 1word) and array of characters

### 5.3.2. Other Time Special Register (0x1028, 4136)

Address	Access	Type, Size	Description
0x1028(4136)	Read	1 word	IO update time. (1usec unit)

## 5.3.3. Adapter TCP/IP Special Register (0x1040, 4160)

Address	Access	Type, Size	Description
0x1040(4160)	Read	1word	Reserved
0x1041(4161)	Read/ Write	1word	MODBUS/TCP connection timeout time. (0.5sec unit) Maximum time of ModBus connection to stay to be opened without receiving a ModBus request. 0~3600 The 120 (60sec) is default value. The value 0 disables connection time out specially.
0x1042(4162)	Read	2word	First word : Number of MODBUS/TCP Connections Second word : Number of total TCP Connections (MODBUS/TCP, WEB, etc.)
0x1043(4163)	Read	1word	ModBus/TCP port, fixed 502
0x1044(4164)	Read	1word	Ethernet Interface Speed, 10(10Mbps) or 100(100Mbps)
0x1045(4165)	Read/ Write	1word	IP Setting Method.* 0: BOOTP, 1:DHCP
0x1046(4166)	---	---	Reserved.
0x1047(4167)	Read	1word	Status of DIP SW#9 DHCP/BOOTP(Enable/Disable). 0 : OFF, 1 : ON
0x1048(4168)	Read	1word	Reserved.
0x1050(4176)	Read/ Write	2words	IP address. If 192.168.123.1, then 0xA8C0, 0x017B. After update this value, IP address, Subnet mask and Gateway are applied as new one.
0x1051(4177)	Read/ Write	2words	Subnet mask. If 255.255.255.0, then 0xFFFF, 0x00FF.
0x1052(4178)	Read/ Write	2words	Gateway. If 192.168.123.254, then 0xA8C0, 0xFE7B.
0x1053(4179)	Read	3words	Ethernet physical address (MAC-ID). If 11-22-33-44-55-66, then 0x2211, 0x4433, 0x6655.

\*Power off and then power on, this value is applied.

## 5.3.4. Adapter Information Special Register (0x1100, 4352)

Address	Access	Type, Size	Description				
0x1100(4352)	Read	1word	Reserved.				
0x1102(4354)	Read	1word	Start address of input image word register. =0x0000				
0x1103(4355)	Read	1word	Start address of output image word register. =0x0800				
0x1104(4356)	Read	1word	Size of input image word register.				
0x1105(4357)	Read	1word	Size of output image word register.				
0x1106(4358)	Read	1word	Start address of input image bit. = 0x0000				
0x1107(4359)	Read	1word	Start address of output image bit. =0x1000				
0x1108(4360)	Read	1word	Size of input image bit.				
0x1109(4361)	Read	1word	Size of output image bit.				
0x110A(4362)	Read	1word	Update time for cyclic data change (same as 0x1028)				
0x110D(4365)	Read	1word	Current Dip Switch State ex) DHCP/Booth enable, Dip SW(0x01) = 0x0101				
0x110E(4366)	Read	upto 33word	Expansion slot's GT-number including GL First 1word is adapter's number, if GL-9041, then 0x9041				
0x1110(4368)	Read	1word	Number of expansion slot				
0x1113(4371)	Read	upto 33word	Expansion slot Module code. First 1word is adapter's product code, if GL-9041, then 0x9520				
0x1116(4374)	Read	1word	IO Error Slot Number.				
0x1119(4377)	Read	1word	Hi byte is ModBus status, low byte is internal bus status. Zero value means ‘no error’.				
			<table><tr><th>ModBus status</th><th>Internal bus status(G-Bus)</th></tr><tr><td>0x00 : No Error 0x40 : ERR_CRC_LRC</td><td>0x00 : OPERATING 0x02 : CONNECT_FAULT 0x03 : CONFIG_FAULT 0x04 : NO_EXPANSION 0x05 : INVALID_ATTR_VALUE 0x06 : TOO_MUCH_DATA 0x07 : VENDOR_ERROR 0x08 : NOT_EXPECTED_SLOT 0x09 : CRC_ERROR</td></tr></table>	ModBus status	Internal bus status(G-Bus)	0x00 : No Error 0x40 : ERR_CRC_LRC	0x00 : OPERATING 0x02 : CONNECT_FAULT 0x03 : CONFIG_FAULT 0x04 : NO_EXPANSION 0x05 : INVALID_ATTR_VALUE 0x06 : TOO_MUCH_DATA 0x07 : VENDOR_ERROR 0x08 : NOT_EXPECTED_SLOT 0x09 : CRC_ERROR
			ModBus status	Internal bus status(G-Bus)			
0x00 : No Error 0x40 : ERR_CRC_LRC	0x00 : OPERATING 0x02 : CONNECT_FAULT 0x03 : CONFIG_FAULT 0x04 : NO_EXPANSION 0x05 : INVALID_ATTR_VALUE 0x06 : TOO_MUCH_DATA 0x07 : VENDOR_ERROR 0x08 : NOT_EXPECTED_SLOT 0x09 : CRC_ERROR						
0x111D(4381)	Read	1word	Adapter G-Series Revision. (Fixed 0x0100)				

## 5.3.5. Expansion Slot Information Special Resister (0x2000, 8192)

Each expansion slot has 0x20(32) address offset and same information structure.

Slot#1	0x2000(8192)~0x201F(8223)	Slot#2	0x2020(8224)~0x203F(8255)
Slot#3	0x2040(8256)~0x205F(8287)	Slot#4	0x2060(8288)~0x207F(8319)
Slot#5	0x2080(8320)~0x209F(8351)	Slot#6	0x20A0(8352)~0x20BF(8383)
Slot#7	0x20C0(8384)~0x20DF(8415)	Slot#8	0x20E0(8416)~0x20FF(8447)
Slot#9	0x2100(8448)~0x211F(8479)	Slot#10	0x2120(8480)~0x213F(8511)
Slot#11	0x2140(8512)~0x215F(8543)	Slot#12	0x2160(8544)~0x217F(8575)
Slot#13	0x2180(8576)~0x219F(8607)	Slot#14	0x21A0(8608)~0x21BF(8639)
Slot#15	0x21C0(8640)~0x21DF(8671)	Slot#16	0x21E0(8672)~0x21FF(8703)

Address Offset	Expansion Slot#1	Expansion Slot#2	Expansion Slot#3	Expansion Slot#4	.....	Expansion Slot#16
+ 0x00(+0)	0x2000(8192)	0x2020(8224)	0x2040(8256)	0x2060(8288)	.....	0x21E0(8672)
+ 0x01(+1)	0x2001(8193)	0x2021(8225)	0x2041(8257)	0x2061(8289)	.....	0x21E1(8673)
+ 0x02(+2)	0x2002(8194)	0x2022(8226)	0x2042(8258)	0x2062(8290)	.....	0x21E2(8674)
+ 0x03(+3)	0x2003(8195)	0x2023(8227)	0x2043(8259)	0x2063(8291)	.....	0x21E3(8675)
+ 0x04(+4)	0x2004(8196)	0x2024(8228)	0x2044(8260)	0x2064(8292)	.....	0x21E4(8676)
+ 0x05(+5)	0x2005(8197)	0x2025(8229)	0x2045(8261)	0x2065(8293)	.....	0x21E5(8677)
+ 0x06(+6)	0x2006(8198)	0x2026(8230)	0x2046(8262)	0x2066(8294)	.....	0x21E6(8678)
+ 0x07(+7)	0x2007(8199)	0x2027(8231)	0x2047(8263)	0x2067(8295)	.....	0x21E7(8679)
+ 0x08(+8)	0x2008(8200)	0x2028(8232)	0x2048(8264)	0x2068(8296)	.....	0x21E8(8680)
+ 0x09(+9)	0x2009(8201)	0x2029(8233)	0x2049(8265)	0x2069(8297)	.....	0x21E9(8681)
+ 0x0A(+10)	0x200A(8202)	0x202A(8234)	0x204A(8266)	0x206A(8298)	.....	0x21EA(8682)
+ 0x0B(+11)	0x200B(8203)	0x202B(8235)	0x204B(8267)	0x206B(8299)	.....	0x21EB(8683)
+ 0x0C(+12)	0x200C(8204)	0x202C(8236)	0x204C(8268)	0x206C(8300)	.....	0x21EC(8684)
+ 0x0D(+13)	0x200D(8205)	0x202D(8237)	0x204D(8269)	0x206D(8301)	.....	0x21ED(8685)
+ 0x0E(+14)	0x200E(8206)	0x202E(8238)	0x204E(8270)	0x206E(8302)	.....	0x21EE(8686)
+ 0x0F(+15)	0x200F(8207)	0x202F(8239)	0x204F(8271)	0x206F(8303)	.....	0x21EF(8687)
+ 0x10(+16)	0x2010(8208)	0x2030(8240)	0x2050(8272)	0x2070(8304)	.....	0x21E0(8688)
+ 0x11(+17)	0x2011(8209)	0x2031(8241)	0x2051(8273)	0x2071(8305)	.....	0x21E1(8689)
+ 0x12(+18)	0x2012(8210)	0x2032(8242)	0x2052(8274)	0x2072(8306)	.....	0x21E2(8690)
+ 0x13(+19)	0x2013(8211)	0x2033(8243)	0x2053(8275)	0x2073(8307)	.....	0x21E3(8691)
+ 0x14(+20)	0x2014(8212)	0x2034(8244)	0x2054(8276)	0x2074(8308)	.....	0x21E4(8692)
+ 0x15(+21)	0x2015(8213)	0x2035(8245)	0x2055(8277)	0x2075(8309)	.....	0x21E5(8693)
+ 0x16(+22)	0x2016(8214)	0x2036(8246)	0x2056(8278)	0x2076(8310)	.....	0x21E6(8694)
+ 0x17(+23)	0x2017(8215)	0x2037(8247)	0x2057(8279)	0x2077(8311)	.....	0x21E7(8695)
+ 0x18(+24)	0x2018(8216)	0x2038(8248)	0x2058(8280)	0x2078(8312)	.....	0x21E8(8696)
+ 0x19(+25)	0x2019(8217)	0x2039(8249)	0x2059(8281)	0x2079(8313)	.....	0x21E9(8697)
+ 0x1A(+26)	0x201A(8218)	0x203A(8250)	0x205A(8282)	0x207A(8314)	.....	0x21EA(8698)
+ 0x1B(+27)	0x201B(8219)	0x203B(8251)	0x205B(8283)	0x207B(8315)	.....	0x21EB(8699)
+ 0x1C(+28)	0x201C(8220)	0x203C(8252)	0x205C(8284)	0x207C(8316)	.....	0x21EC(8700)
+ 0x1D(+29)	0x201D(8221)	0x203D(8253)	0x205D(8285)	0x207D(8317)	.....	0x21ED(8701)
+ 0x1E(+30)	0x201E(8222)	0x203E(8254)	0x205E(8286)	0x207E(8318)	.....	0x21EE(8702)
+ 0x1F(+31)	0x201F(8223)	0x203F(8255)	0x205F(8287)	0x207F(8319)	.....	0x21EF(8703)

Address Offset	Access	Type, Size	Description
+ 0x02(+2) **	Read	1 word	Input start register address of input image word this slot.
+ 0x03(+3) **	Read	1 word	Input word's bit offset of input image word this slot.
+ 0x04(+4) **	Read	1 word	Output start register address of output image word this slot.
+ 0x05(+5) **	Read	1 word	Output word's bit offset of output image word this slot.
+ 0x06(+6) **	Read	1 word	Input bit start address of input image bit this slot.
+ 0x07(+7) **	Read	1 word	Output bit start address of output image bit this slot.
+ 0x08(+8) **	Read	1 word	Size of input bit this slot
+ 0x09(+9) **	Read	1 word	Size of output bit this slot
+ 0x0A(+10) **	Read	n words	Read input data this slot
+ 0x0B(+11) **	Read/Write	n words	Read/write output data this slot
+ 0x0E(+14)	Read	1 word	GT-number, if GT-1238, returns 0x1238
+ 0x0F(+15)	Read	String upto 72bytes	First 1 word is length of valid character string. If GT-1238, returns "00 1E 52 54 2D 31 32 33 38 2C 20 38 44 49 2C 20 32 34 56 64 63 2C 20 55 6E 69 76 65 72 73 61 6C 00 00" Valid character size = 0x001E =30 characters, "GT-1238, 8DI, 24Vdc, Universal"
+ 0x10(+16)	Read	1 word	Size of configuration parameter byte
+ 0x11(+17) **	Read/Write	n words	Read/write Configuration parameter data, Refer to each IO parameter Specification.
+ 0x17(+23)	Read	2 words	Firmware Revision ex) 0x00010010 (Major revision 1 /Minor revision 16, Rev 1.016)
+ 0x19(+25)	Read	2 words	Firmware release date.

\* After the system is reset, the new "Set Value" action is applied.

\*\* Nothing of output, input, memory or configuration parameter corresponding slot returns Exception 02.

## 5.4. MODBUS Reference

MODBUS Reference Documents

<http://www.modbus.org>

MODBUS Tools

<http://www.modbustools.com>, modbus poll

<http://www.win-tech.com>, modscan32