DeviceNet Network Adapter

GN-9212

User Manual

Version 1.02

DOCUMENT CHANGE SUMMARY				
REV	PAGE	REMARKS	DATE	EDITOR
1.00	New Document		2018/07/30	MJ Kwon
1.01	14	G-bus system	2019/05/31	MJ Kwon
1.02	8	General specification	2020/07/08	MJ Kwon

1 Important Notes

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls describes some important differences between solid state equipment and hard-wired electromechanical devices.
Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.
In no event will CREVIS be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.
The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, CREVIS cannot assume responsibility or liability for actual use based on the examples and diagrams.

Warning!

- ✓ **If you don't follow the directions, it could cause a personal injury, damage to the equipment or explosion**
- Do not assemble the products and wire with power applied to the system. Else it may cause an electric arc, which can result into unexpected and potentially dangerous action by field devices. Arching is explosion risk in hazardous locations. Be sure that the area is non-hazardous or remove system power appropriately before assembling or wiring the modules.
- Do not touch any terminal blocks or IO modules when system is running. Else it may cause the unit to an electric shock or malfunction.
- Keep away from the strange metallic materials not related to the unit and wiring works should be controlled by the electric expert engineer. Else it may cause the unit to a fire, electric shock or malfunction.

Caution!

- ✓ **If you disobey the instructions, there may be possibility of personal injury, damage to equipment or explosion. Please follow below Instructions.**
- Check the rated voltage and terminal array before wiring. Avoid the circumstances over 55℃ of temperature. Avoid placing it directly in the sunlight.
- Avoid the place under circumstances over 85% of humidity.
- Do not place Modules near by the inflammable material. Else it may cause a fire.
- Do not permit any vibration approaching it directly.
- Go through module specification carefully, ensure inputs, output connections are made with the specifications. Use standard cables for wiring.
- Use Product under pollution degree 2 environment.

1.1 Safety Instruction

1.1.1 Symbols

DANGER 	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the Product.
ATTENTION 	Identifies information about practices or circumstances that can lead to personal injury, property damage, or economic loss. Attentions help you to identity a hazard, avoid a hazard, and recognize the consequences.

1.1.2 Safety Notes

DANGER 	The modules are equipped with electronic components that may be destroyed by electrostatic discharge. When handling the modules, ensure that the environment (persons, workplace and packing) is well grounded. Avoid touching conductive components, e.g. G-BUS Pin.

1.1.3 Certification

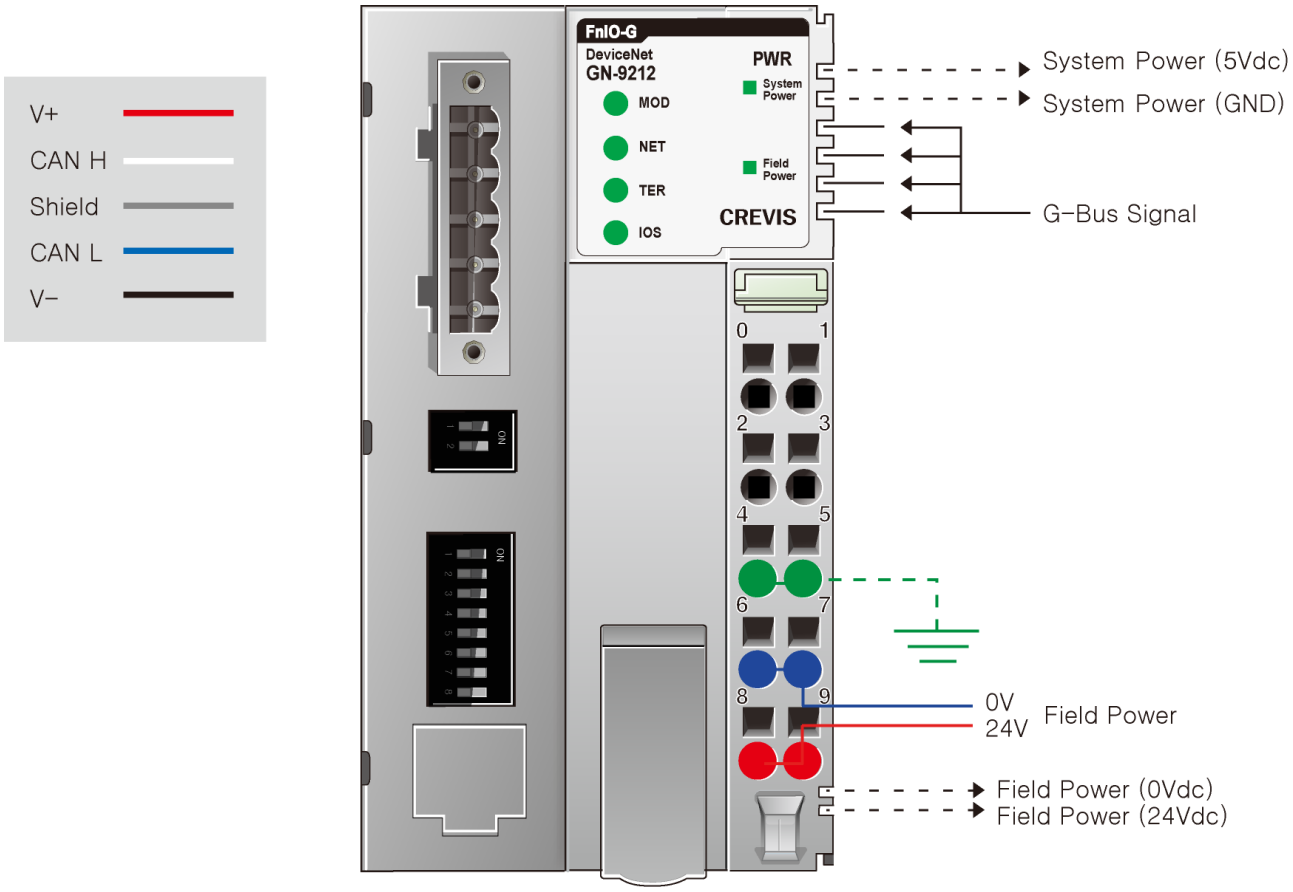
CE Certificate

EN 61000-6-2; Industrial Immunity

EN 61000-6-4; Industrial Emissions

2 Specification

2.1 The Interface



Pin No.	Signal Description	Signal Description	Pin No.
0	System Power, 24V	System Power, Ground	1
2	System Power, 24V	System Power, Ground	3
4	F.G	F.G	5
6	Field Power, Ground	Field Power, Ground	7
8	Field Power, 24V	Field Power, 24V	9

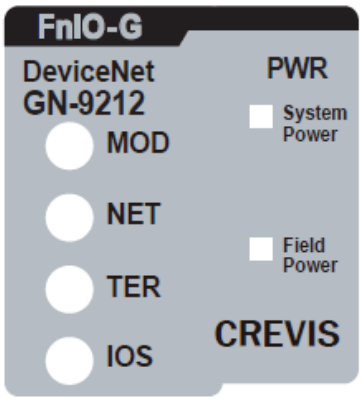
2.2 General Specification

General Specification	
UL System Power	Supply voltage : 24Vdc nominal, Class 2
System Power	Supply voltage : 24Vdc nominal Supply voltage range : 15~30Vdc Protection : Output current limit (Min. 1.5A) Reverse polarity protection
Power Dissipation	Max. 70mA @ 24Vdc
Current for I/O Module	1.5A @ 5Vdc (When using in ‘60℃ ~ 70℃’, temperature environment, the power dissipation is limited to 0.8A.)
Isolation	System power to internal logic : Non-Isolation System power I/O driver : Isolation
UL Field Power	Supply voltage : 24Vdc nominal, Class 2
Field Power	Supply voltage : 24Vdc typical (Max. 30Vdc) * Field Power Range is different depending on IO Module series. Refer to IO Module’s Specification.
Max. Current Field Power Contact	DC 10A Max
Wiring	I/O Cable Max. 2.0mm2(AWG 14)
Torque	0.8Nm(7 lb-in)
Weight	154g
Module Size	54mm x 99mm x 70mm
Environmental Specification	
Operating Temperature	60 ℃ ~ 70 ℃ : Power dissipation is limited to 0.8A. -40 ℃ ~ 60 ℃ : 1.5A full load is allowed.
UL Temperature	-20℃~60℃
Storage Temperature	-40℃~85℃
Relative Humidity	5% ~ 90% non-condensing
Mounting	DIN rail

2.3 Device Net Specification

Items	Specification
Communication Interface Specification	
Adapter Type	Group 2 Only Slave
Max. Expansion Slot	63 Slots
I/O Data Size	Max 128 bytes each slot
Max. Length Bus Line	Max.100m@500Kbps, Max. 250m@250Kbps, Max. 500m@125Kbps
Max. Network Node	64 Nodes
Baud Rate	125Kbps(Max. 500m) 250Kbps(Max. 250m) 500Kbps(Max. 100m)
Protocol	Poll, Bit-Strobe, Cyclic, COS
Node MAC ID Setup	DIP Switch
Terminating Resistance Setup	DIP Switch
Bus Connection	5 Pin Open-Style Connector
Other Serial Port	RS232 for MODBUS/RTU, Touch Panel or IOGuide
Serial Configuration (RS232)	Node : 1 (Fixed) Baud Rate : 115200 (Fixed) Data bit : 8 (Fixed) Parity bit : No parity (Fixed) Stop bit : 1 (Fixed)
Indicator	6 Status LEDs 1 Green/Red, Module Status (MOD) 1 Green/Red, Network Status (NET) 1 Green, Terminating Resistance Status (TER) 1 Green/Red, Expansion I/O Module Status (IOS) 1 Green, System Power Status 1 Green, Field Power Status
Module Location	Starter module left side of G-Series system
Field Power Detection	About 14Vdc

2.4 LED Indicator



LED No.	LED Function / Description	LED Color
MOD	Module Status	Green/Red
NET	Network Status	Green/Red
TER	Termination Resistance Status	Green
IOS	Extension module Status	Green/Red
System Power	System Power Enable	Green
Field Power	Field Power Enable	Green

2.4.1 Module Status LED (MOD)

Status	LED	To indicate
Not Powered	OFF	Power is not supplied to the unit.
Device Operational	Green	The unit is operating in normal condition.
Device in Standby	Flashing Green	EEPROM parameter is not initialized yet. Serial Number is zero value (0x00000000)
Minor Fault	Flashing Red	Device has a recoverable Fault.
Unrecoverable Fault	Red	Device has an unrecoverable fault.

2.4.2 Network Status LED (NET)

Status	LED	To indicate
Not Powered Not On-line	OFF	Device is not on-line or may not be powered. - Not completed Dup-MAC_ID test yet
On-line, Not connected	Flashing Green	Device is on-line but has no connections in the established state. - Passed Dup-MAC_ID test - Not allocated to a master
On-line, Connected	Green	Device is on-line and allocated to a master.
Connection Time-out	Flashing Red	One or more I/O connections are in the time-out state.
Critical Communication Failure	Red	Failed communication - Duplicate MAC ID - Bus-off

2.4.3 Terminating Resistance Status LED (TER)

Status	LED	To indicate
Not applied	OFF	Terminating resistance is not applied.
Applied	On	Terminating resistance is applied.

2.4.4 Expansion I/O Module Status LED (I/O)

Status	LED	To indicate
Not Powered No Expansion Module	OFF	Device has no expansion module or may not be powered.
G-Series Internal Bus On-line, Do not Exchanging I/O	Flashing Green	G-Series Internal bus is normal but does not exchanging I/O data. (Passed the expansion module configuration)
G-Series Internal Bus Connection, Run Exchanging I/O	Green	Exchanging I/O data.
G-Series Internal Bus Connection Fault during Exchanging I/O	Red	One or more expansion module occurred in fault state. - Changed expansion module configuration. - Internal Bus communication failure. - Mismatch vendor code between adapter and expansion module.
Expansion Configuration Failed	Red Flashing Red	Failed to initialize expansion module. - Detect invalid expansion module ID. - Overflow Input/ Output size. - Too many expansion module. - Initial protocol failure.

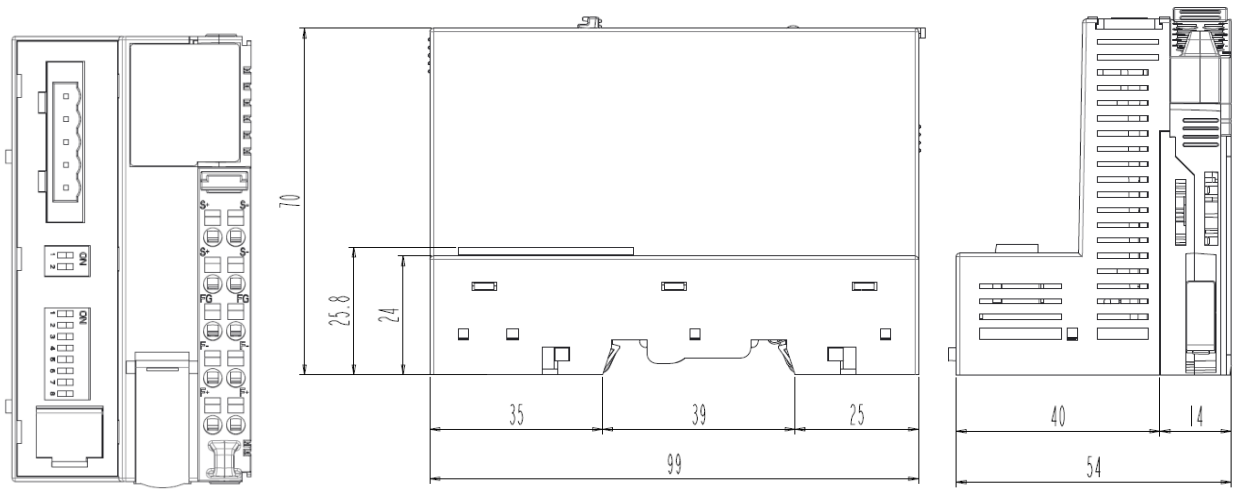
2.4.5 Field Power Status LED

Status	LED	To indicate
Not supplied field, system power	OFF	Not supplied 24Vdc field power, 5Vdc system power.
Supplied field, system power	Green	Supplied 24Vdc field power, 5Vdc system power.

3 Dimension

3.1 GN-9212

(mm)



4 Mechanical Set Up

4.1 Total Expansion

The number of the module assembly that can be connected is 63. So the maximum length is 810mm

4.2 Plugging and Removal of the Components

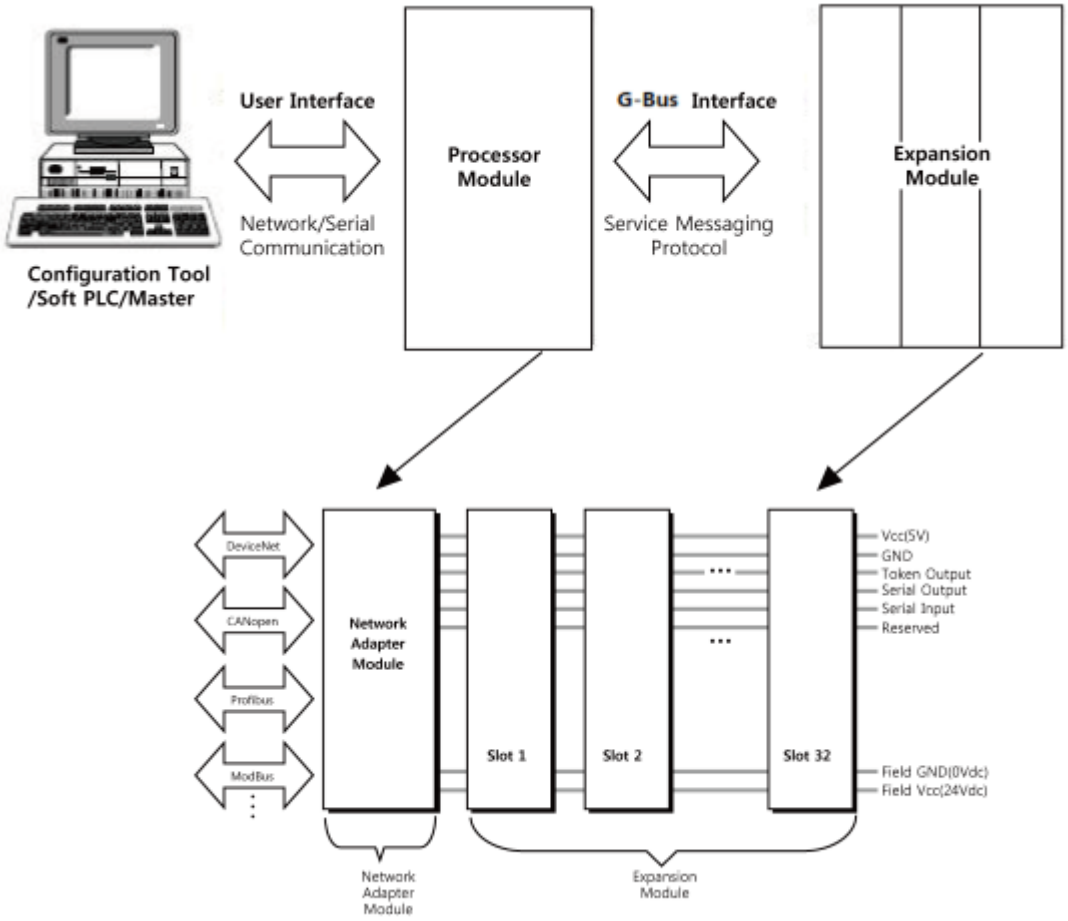
As above figure in order to safeguard the FnIO module from jamming, it should be fixed onto the DIN rail with locking level. To do so, fold on the upper of the locking lever.
To pull out the FnIO module, unfold the locking lever as below figure.

DANGER 	Before work is done on the components, the voltage supply must be turned off.

5 Configuration and Operation

5.1 G-Bus Specification

5.1.1 G-Bus system



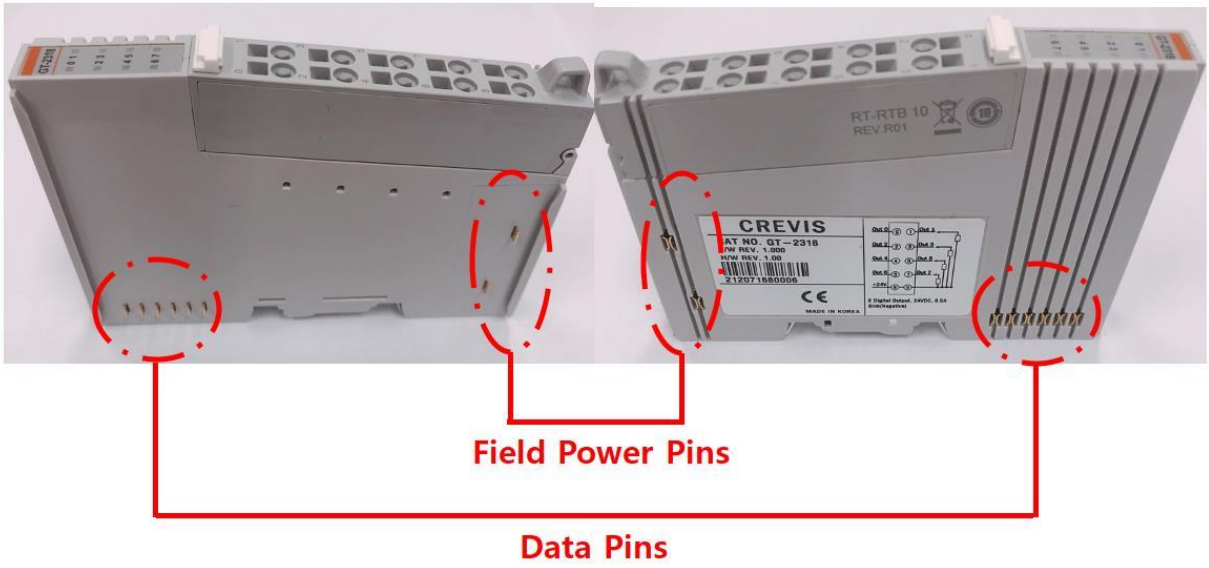
• Network Adapter Module
The Network Adapter Module forms the link between the field bus and the field devices with the Expansion Modules.
The connection to different field bus systems can be established by each of the corresponding Network Adapter Module, e.g. for SyncNet, PROFIBUS, CANopen, DeviceNet, Ethernet/IP, CC-Link, MODBUS/Serial, MODBUS/TCP etc.

• Expansion Module
The Expansion Modules are supported a variety of input and output field devices.
There are digital and analog input/output modules and special function modules.

• Two types of G-Bus Message
- Service Messaging
- I/O Messaging

5.1.2 G-Bus Pin Description

Communication between the NA series and the expansion module as well as system / field power supply of the bus modules is carried out via the internal bus. It is comprised of 6 data pin and 2 field power pin.



No.	Name	Description
1	Vcc	System supply voltage (5V dc).
2	GND	System Ground.
3	Token Output	Token output port of Processor module.
4	Serial Output	Transmitter output port of Processor module.
5	Serial Input	Receiver input port of Processor module.
6	Reserved	Reserved for bypass Token.
7	Field GND	Field Ground.
8	Field Vcc	Field supply voltage (24Vdc).

DANGER 	Do not touch data and field power pins in order to avoid soiling and damage by ESD noise.

5.2 DeviceNet Composition

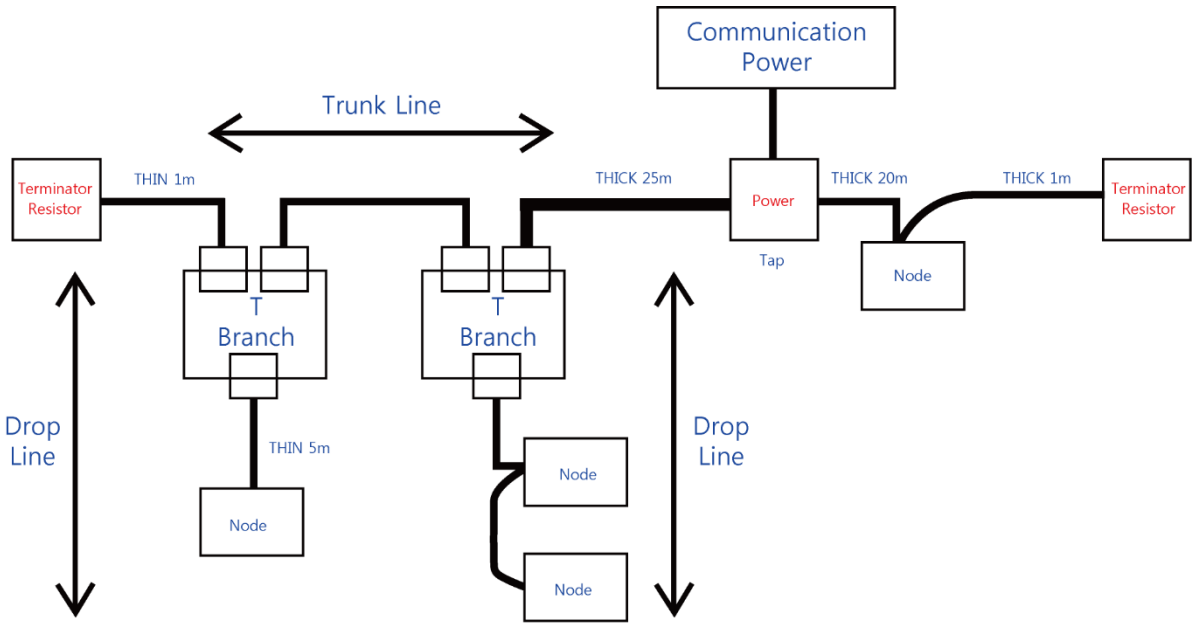


Figure 2. DeviceNet Network Example.

DeviceNet Network Installation

DeviceNet Network Set up is like following figure2.

Network Composition

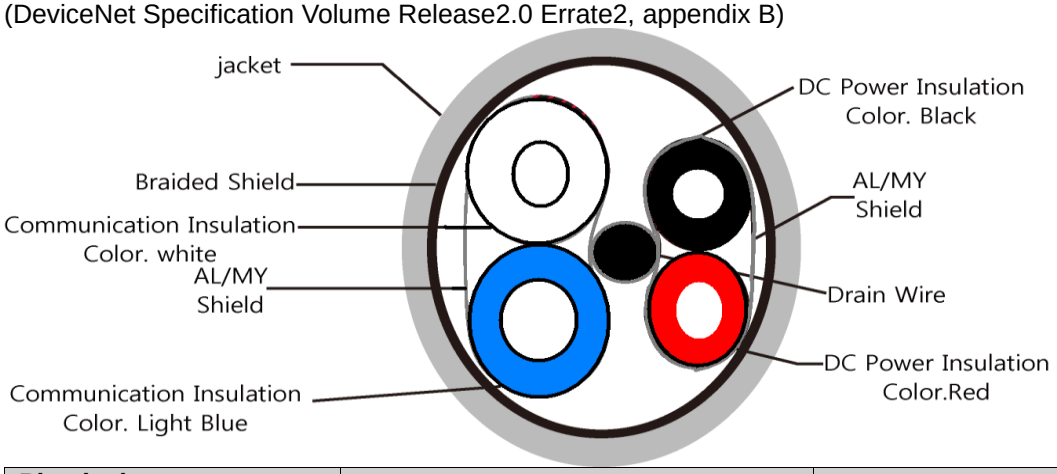
Name	Description
Node	Node is Slave that is charged each address number. DeviceNet is comprised of Master and Slave. Master manages DeviceNet and organizes external I/O in Slave. Slave contacts external I/O.
Trunk / Drop Line	Trunk line is cable that is installed terminator resistor. Drop line is cable that branch from trunk line In the DeviceNet, both trunk and drop line is used.
Connection Mode	Number of Connection mode for DeviceNet is 2 modes. First is T-branch and Second is multi-drop. T-branch is method that branches off drop-line by T-branch tap Multi drop is method what trunk and drop line contacts with node directly.
Terminator Resistor	Terminator resistor is that is installed for reduction a reflected wave in both ends trunk line.
Communication Power	For using DeviceNet, user must supply communication power to each node connector through the DeviceNet cable.

5.3 DeviceNet Module (GN-9212) Installations

5.3.1 DeviceNet Cable Specification

5.3.2 Communication Cable Specification

DeviceNet Cable Specification. In the DeviceNet Specification There is the exclusive cable bellows (DeviceNet Specification Volume Release2.0 Errate2, appendix B)



Physical Characteristics	Thick Cable Spec	Thin Cable Spec
Communication cable		
Conductor pair size	#18 Copper(minimum) : 19 strand min(individually tinned)	#24 Copper(minimum) : 19 strand min(individually tinned)
Insulation diameter	0.150 inches	0.077 inches
Colors	Light blue White	Light blue White
Pair twist/ft	3(approx.)	5(approx.)
Impedance	120Ω ± 10% (at 1MHz)	
Power pair		
Conductor pair size	#15 Copper(minimum) : 19 strand min(individually tinned)	#22 Copper(minimum) : 19 strand min(individually tinned)
Insulation diameter	0.098 inches	0.055 inches
Color	Red Black	Red Black
Tape shield over pair	1.0mil/1mil,Al/Mylar Al side out w/shorting fold (pull-on applied)	1.0mil/1mil,Al/Mylar Al side out w/shorting fold (pull-on applied)
Drain wire	#18 Copper(minimum) : 19 strand min	#22 Copper(minimum) : 19 strand min
Roundness	Radius delta to be within 15% of 0.5 0.D	
Agency certification	NEC(UL) type CL2(min.)	
Jacket marker	Vender name & part#, and additional	

The maximum length of network for each cable type is as follows.

-Thick Cable

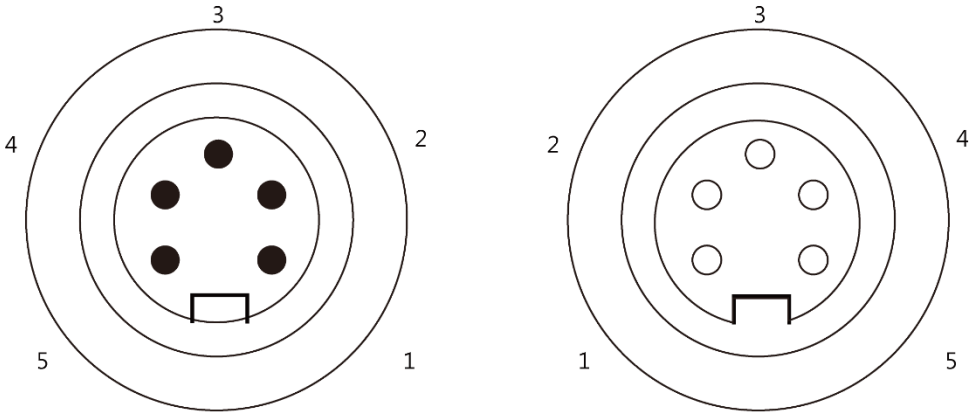
Communication rate	Truck Length	Truck Exchange (Thick Cable)	Cumulative drop	Maximum drop
125Kb	500m(1640ft)	1.0	156m(512ft)	6m(20ft)
250Kb	250m(820ft)	1.0	76m(256ft)	6m(20ft)
500Kb	100m(328ft)	1.0	38m(128ft)	6m(20ft)

-Thin Cable

Communication rate	Truck Length	Truck Exchange (Thick Cable)	Cumulative drop	Maximum drop
125Kb	100m(328ft)	5.0	156m(512ft)	6m(20ft)
250Kb	100m(328ft)	2.5	76m(256ft)	6m(20ft)
500Kb	100m(328ft)	1.0	38m(128ft)	6m(20ft)

5.3.3 DeviceNet Connector Specification

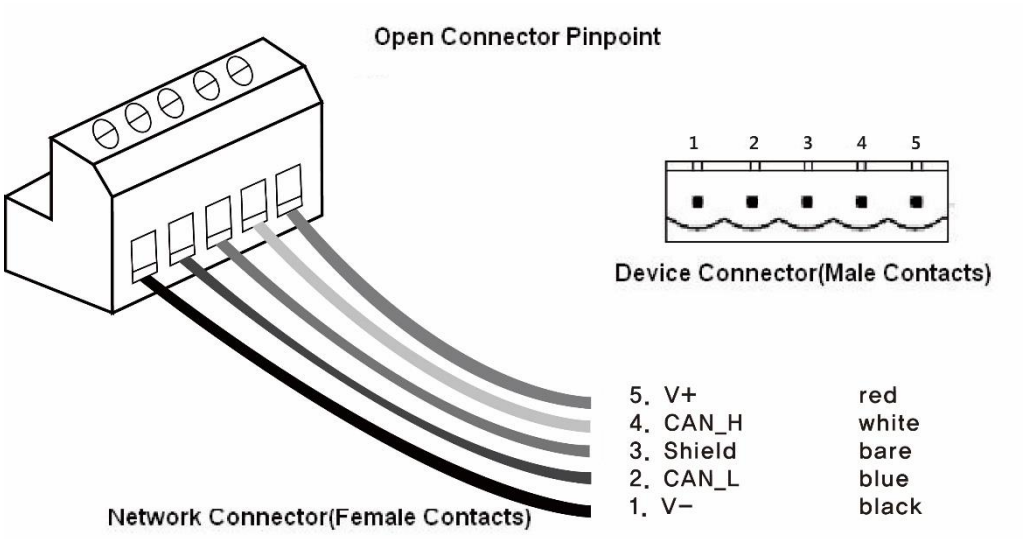
Mini Connector Pinpoint



Male(pins) **Female(sicjets)**

1. drain	**bare**
2. V+	**red**
3. V-	**black**
4. CAN_H	**white**
5. CAN_L	**blue**

Male General Characteristics	**Specification**
Number of Pins	5
Coupling Nut	Male
Coupling Nut Thread	7/8–166 UN-2A THD
Rotation	Optional
Pin out	Drain : Pin1, V+ : Pin2, V- : Pin3, CAN_H : Pin4, CAN_L : Pin5
Female General Characteristics	**Specification**
Number of Pins	5
Coupling Nut	Female
Coupling Nut Thread	7/8–166 UN-2B THD
Rotation	Required
Pin out	Drain : Pin1, V+ : Pin2, V- : Pin3, CAN_H : Pin4, CAN_L : Pin5
Physical Characteristics	**Specification**
Wiping Contact Plating Requirements	30 micro inch gold minimum over 50 micro inch nickel minimum or 5 micro inch gold minimum over 20 micro inch Palladium-nickel minimum over 50 micro inch nickels. All gold must be 24 karat

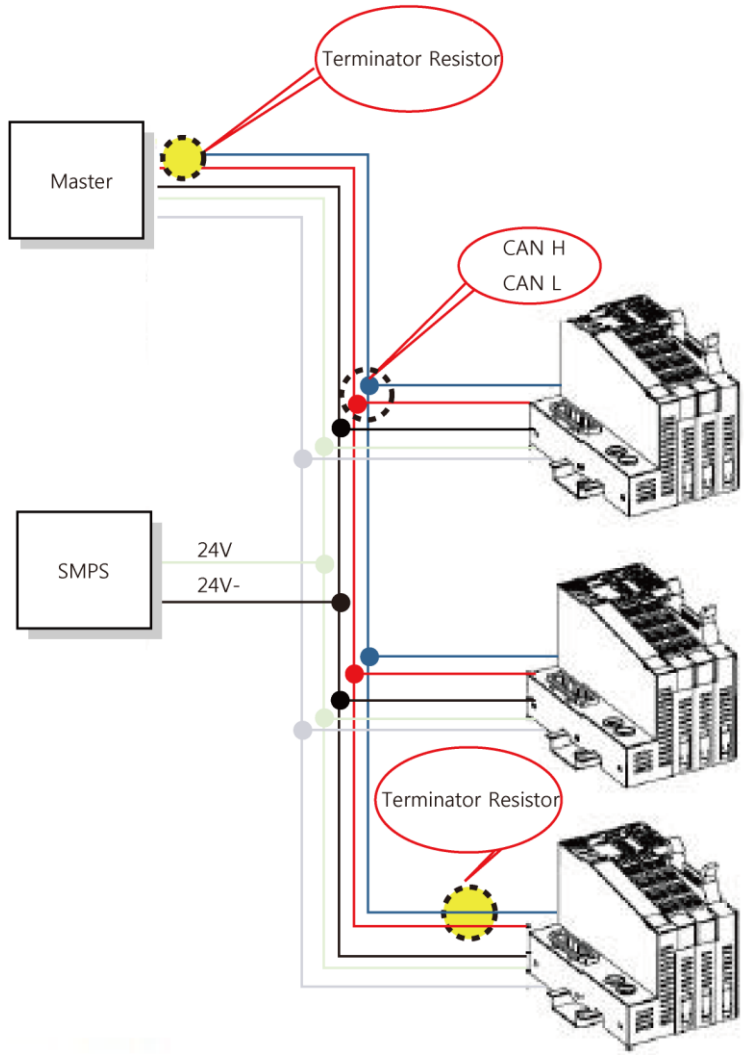


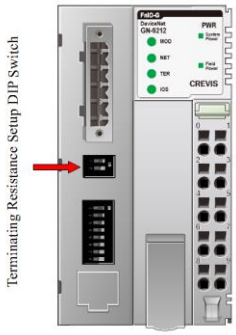
Male General Characteristics	Specification
Number of Pins	5
Coupling Nut	None
Coupling Nut Thread	None
Rotation	None
Pin out	V- : Pin1, CAN_L : Pin2, Shield : Pin3, CAN_H : Pin4, V+ : Pin5
Female General Characteristics	**Specification**
Number of Pins	5
Coupling Nut	None
Coupling Nut Thread	None
Rotation	None
Pin out	V- : Pin1, CAN_L : Pin2, Shield : Pin3, CAN_H : Pin4, V+ : Pin5
Physical Characteristics	**Specification**
Wiping Contact Plating Requirements	30 micro inch gold minimum over 50 micro inch nickel minimum or 5 micro inch gold minimum over 20 micro inch Palladium-nickel minimum over 50 micro inch nickels. All gold must be 24 karat
Wiping Contract Life	1000 insertion - extractions
Electrical Characteristics	**Specification**
Operating Voltage	25 Volt minimum
Contact Rating	8 Amps minimum

Device network power is 24V. Network and I/O field power must be separated
One power is provided per network

ATTENTION	The use of an incorrect supply voltage or frequency can cause severe damage to the component.

5.3.4 Terminator Resistor Specification



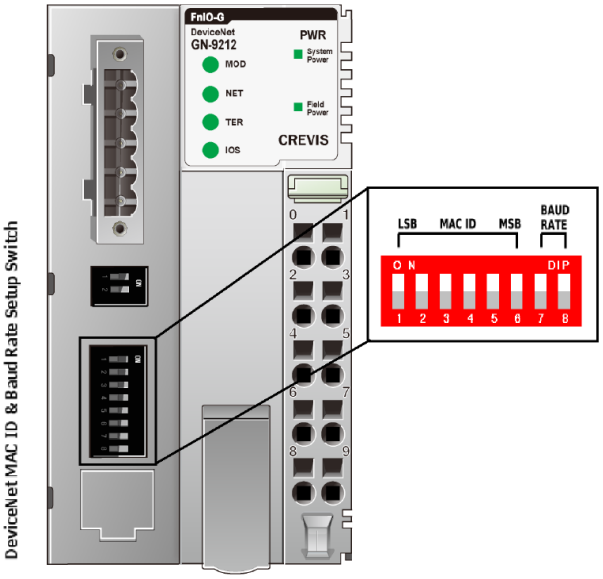


Terminating Resistance Switch	#1	#2
Applied	On	On
Not applied	Off	Off

5.4 DeviceNet Module Configurations

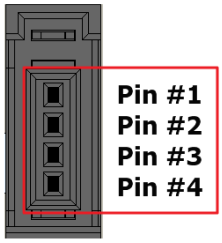
5.4.1 DeviceNet MAC ID & Baud Rate Setup

Each DeviceNet Adapter must have a unique MAC ID (from 0 to 63) so that it can be addressed independently from other nodes.



MAC ID	1	2	3	4	5	6	BAUD RATE	7	8
0	Off	Off	Off	Off	Off	Off	**125kbps**	Off	Off
1	On	Off	Off	Off	Off	Off	**250kbps**	On	Off
			~				**500kbps**	Off	On
63	On	On	On	On	On	On	**AUTO**	On	On

RS232 Port for MODBUS/RTU, Touch panel or IOGuide

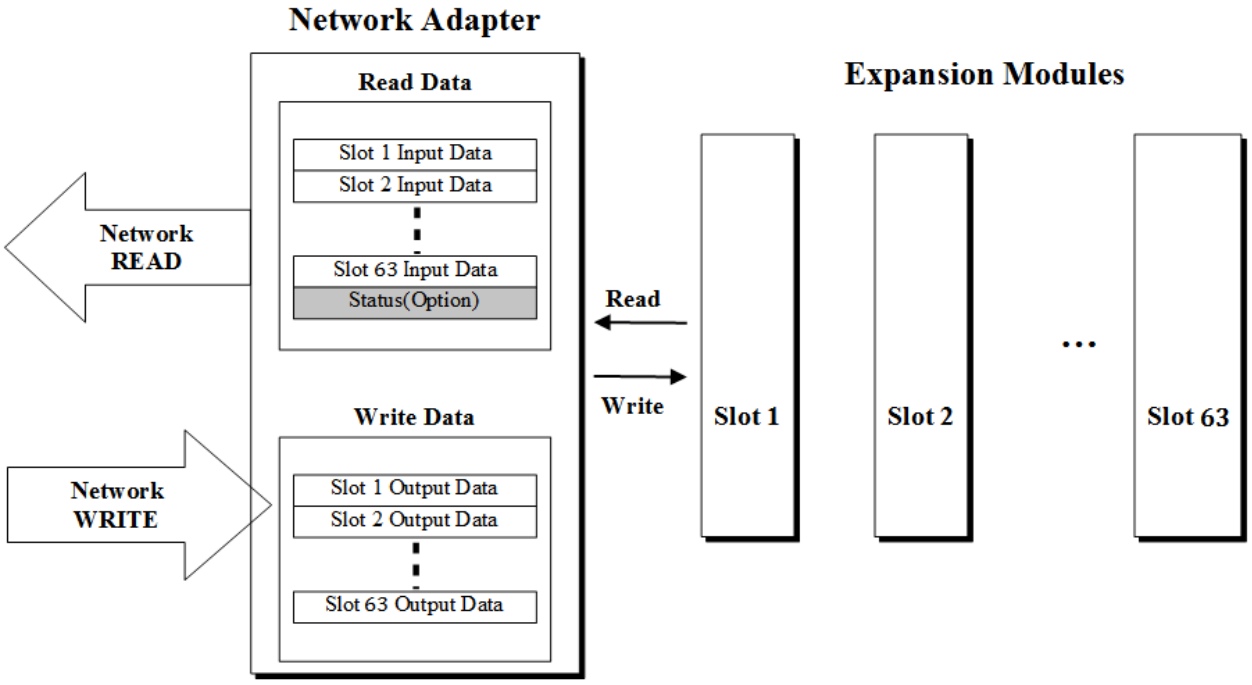


RS232 (37204-62A3-004PL/3M)		
Pin#	Signal Name	Description
1	Reserved	----
2	TXD	RS232 TXD
3	RXD	RS232 RXD
4	GND	RS232 GND

ATTENTION	MAC ID addresses have to be unique throughout the entire interconnected Networks

5.4.2 I/O Process Image Map

An expansion module may have 3 types of data as I/O data, configuration parameter and memory register. The data exchange between network adapter and expansion modules is done via an I/O process image data by G-Series Internal Bus protocol. The following figure shows the data flow of process image between network adapter and expansion modules.



5.4.3 Object Models

A DeviceNet node is modeled as a collection of Objects. An Object provides an abstract representation of a particular component within a product. The realization of this abstract object model within a product is implementation dependent. In other words, a product internally maps this object model in a fashion specific to its implementation.

The objects and their components are addressed by a uniform addressing scheme consisting of:
Media Access Control Identifier (MAC ID), an integer identification value assigned to each node on a DeviceNet network.
Class Identifier (Class ID), an integer identification value assigned to each Object Class accessible from the network.
Instance Identifier (Instance ID), an integer identification value assigned to an Object Instance that identifies it among all Instances of the same Class.
Attribute Identifier (Attribute ID), an integer identification value assigned to a Class and/or Instance Attribute.
Service Code, an integer identification value which denotes a particular Object Instance and/or Object Class function.
Supported Objects

- Device Type Number: $0C_{HEX}$ (Communications Adapter)

Name of Object	Type	Number of Instances	Class Code
Identity	Required	1	01_{HEX}
Message Router	Required	1	02_{HEX}
DeviceNet	Required	1	03_{HEX}
Assembly	Required	2	04_{HEX}
Connection	Required	4	05_{HEX}
Acknowledge Handler	Required	1	$2B_{HEX}$
G-Bus Manager	Vendor-specific	1	70_{HEX}
Expansion Slot	Vendor-specific	1~63	71_{HEX}

Objects Behavior, Interface

Object	Behavior	Interface
Identity	Device identification, reset service	Message Router
DeviceNet	Configures port attributes	Message Router
Assembly	Defines I/O data format and concatenates configuration data	I/O Connection or Message Router
Connection	Contains the number of logical ports into or out-of the device	Message Router
Acknowledge Handler	Manage the reception of message acknowledgments	Message Router
G-Series Internal Bus Manager	Management functions for the G-Series Internal Bus	Message Router
Expansion Slot	Management functions for the expansion slot	Message Router

5.5 Object Setting

5.5.1 Identity Object

Class Code: 01_{HEX}

Common Services

Service Code	Implemented for		Service Name	Value
	Class	Instance		
0x05	No	Yes	Reset	0: Reset Only 1: Reset and Factory Default
0x0E	No	Yes	Get_Attribute_Single	

Class Attributes

None

Instance Attributes

Instance ID	Attribute ID	Access Rule	Name	Data Size	Value
1	1	Get	Vendor ID	1 word	0x02E5 (741), Crevis. Co., Ltd.
	2	Get	Device Type	1 word	0x000C (Network Adapter)
	3	Get	Product Code	1 word	0x9020 (GN-9212)
	4	Get	Revision - Major - Minor	Structure of: 1 byte 1 byte	 1 ~ 9 01 ~ 255
	5	Get	Status	1 word	Defined in Spec (0x0005) *
	6	Get	Serial Number	2 word	Unique Number
	7	Get	Product Name - String Length - ASCII String	Structure of: 1 byte STRING	1A (26) “GN-9212_DeviceNet,G-Series”
	9	Get	Check Sum	1 word	EEPROM Checksum Code
	100(64h)	Get	I/O Main State	1 word	0x01: Init State 0x02: Idle State 0x03: Run State 0x04: Stop State 0x05: Fault State 0x06: Reset State 0x07: CRC error State
	Vendor-specific				
	102(66h)	Get	Firmware Code	1 byte	0x71
	103(67h)	Get	ODVA Conformance Test Revision	UINT	0x0A17 → “2002. 10. 22.”
	104(68h)	Get	Firmware Release Date	UDINT	0xYYYYMMDD ex) 0x20160817 → 2016/08/17
	107(6Bh)	Get	Inspection Date	UDINT	0xYYYYMMDD

* Spec. = The CIP Networks library, ODVA

5.5.2 Message Router Object

Class Code: 02_{HEX}

Common Services
None

Class Attributes
None

Instance Attributes
None

5.5.3 DeviceNet Object

Class Code: 03_{HEX}

Common Services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single
0x4B	No	Yes	Allocate_Master/Slave_Connection_Set
0x4C	No	Yes	Release_Master/Slave_Connection_Set

Class Attributes

Instance ID	Attribute ID	Access Rule	Name	Data Size	Value
0	1	Get	Revision	1 word	02, 00

Instance Attributes

Instance ID	Attribute ID	Access Rule	Name	Data Size	Value
1	1	Get/Set*	MAC ID	1 byte	0 ~ 63
	2	Get	Baud Rate**	1 byte	0=125K, 1=250K, 2=500K, 3=Auto
	3	Get/Set	Bus off Interrupt	BOOL	faulted node recovery, (0x01 : Enable)
	4	Get	Bus-Off Counter	USINT	0 ~ 255
	5	Get	Allocation Information - Allocation Choice - Master's MAC ID	Structure of: BYTE USINT	- Allocation Choice Defined in Spec. - Master's MAC ID 255: unallocated 0~63: Master MAC ID
	7	Get/Set	Master Fault Set	BOOL	0 : Master fault set off(default) 1 : Master fault set on
	8	Get	MACID Switch Value	USINT	0 ~ 99 Actual value of Switch
	9	Get	Baud Rate Switch Value	USINT	0 : 125kbps 1 : 250kbps

					2 : 500kbps 3 : Auto
	Vendor-specific				
	100(64h)	Get	Auto-Baud Action**	BOOL	0: Enabled (default) (Not allowed to set the Baud Rate from Network) 1: Disabled (Allowed to set the Baud Rate from Network)
	101(65h)	Get/Set	Quick Start	BOOL	0 : Normal Start-up (default) 1 : Quick Start-up***

*The MAC ID Switch value = 0~63: Not allowed to set the MAC ID from Network.
Behavior: Changed new MAC ID → Device will be restarted.
**Refer to 5.4.1 (DeviceNet MAC ID & Baudrate Setup)
***Baudrate only 500kbps.

5.5.4 Assembly Object

Class Code: 04_{HEX}

Common Services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

Class Attributes
None

Input Instance Attributes

Input/output Instance ID

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
100(64h)	3	Get	Input (Produced) Process Image Data	Array n BYTE	Input process current image data
150(96h)	3	Set/Get	Output (Consumed) Process Image Data	Array n BYTE	Output process current image data

5.5.5 Connection Object

Class Code: 05_{HEX}

Common Services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single
0x10	No	No	Set_Attribute_Single

Class Attributes
None

Instance Attributes for Explicit Messaging Connection

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
1	1	Get	state	USINT	Defined in Spec * 0x03: The connection has been validly/fully configured and the configuration has been successfully applied.
	2	Get	instance type	USINT	0: Explicit Message
	3	Get	transportClass_trigger	BYTE	83_{HEX}
	4	Get	produced_connection_id	UINT	*0x040B : MAC ID=01, Message group 2, Message ID 3
	5	Get	consumed_connection_id	UINT	*0x040C : MAC ID=01, Message ID 4
	6	Get	initial_comm_characteristics	BYTE	21_{HEX}
	7	Get	produced_connection_size	UINT	0x0206 (=518)
	8	Get	consumed_connection_size	UINT	0x0206 (=518)
	9	Get/Set	expected_packet_rate	UINT	2504 (default) Timer Resolution of 8msec
	12	Get/Set	watchdog_timeout_action	USINT	3 : Deferred Delete (default)
	13	Get	produced_connection_path_ length	UINT	00, 00
	14	Get	produced_connection_path	Array of USINT	Empty
	15	Get	consumed_connection_path_ length	UINT	00, 00
	16	Get	consumed_connection_path	Array of USINT	Empty

Attribute 3 transport Class trigger = 0x83 → Direction=Server,
Production Trigger=IGNORED,
Transport Class = 3.
This is the value assigned to this attribute within the server end-point of an Explicit Messaging Connection

Instance Attributes for Poll I/O Connection

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
2	1	Get	State	USINT	Defined in Spec
	2	Get	instance_type	USINT	1: I/O Message
	3	Get	transportClass_trigger	BYTE	82_{HEX}
	4	Get	produced_connection_id	UINT	* 0x03C1 : MAC ID=01, Message ID=6, Unconnected Explicit Request Message
	5	Get	consumed_connection_id	UINT	* 0x040D : MAC ID=01, Message ID=5, Group 2 message Identifier
	6	Get	initial_comm_characteristics	BYTE	01_{HEX}
	7	Get	produced_connection_size	UINT	Followed by IO process image
	8	Get	consumed_connection_size	UINT	Followed by IO process image
	9	Get/Set	expacted_packet_rate	UINT	Timer Resolution of 8msec * 200(decimal)
	12	Get	watchdog_timeout_action	USINT	0: Time Out (default)
	13	Get	produced_connection_path_ length	UINT	0 or 6
	14	Get	produced_connection_path	Array of USINT	
	15	Get	consumed_connection_path _ length	UINT	0 or 6
	16	Get	consumed_connection_path	Array of USINT	

Instance Attributes for Bit-Strobe I/O Connection

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
3	1	Get	state	USINT	Defined in Spec
	2	Get	instance_type	USINT	1: I/O Message
	3	Get	transportClass_trigger	BYTE	82_{HEX}
	4	Get	produced_connection_id	UINT	*0x0381 : MAC ID=01, Message ID=14, Message group 1
	5	Ge	consumed_connection_id	UINT	*0X0400 : MAC ID = 00, Message ID = 0, Message group 2
	6	Get	initial_comm_characteristics	BYTE	02_{HEX}
	7	Get	produced_connection_size	UINT	0x08
	8	Get	consumed_connection_size	UINT	0x08
	9	Get/Set	expacted_packet_rate	UINT	Timer Resolution of 8msec * 200
	12	Get	watchdog_timeout_action	USINT	0: Time Out (default)

	13	Get	produced_connection_path_ length	UINT	0 or 6
	14	Get	produced_connection_path	Array of USINT	
	15	Get	consumed_connection_path _ length	UINT	0 or 6
	16	Get	consumed_connection_path	Array of USINT	

Instance Attributes for COS I/O Connection (Acknowledged)

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
4	1	Get	State	USINT	Defined in Spec
	2	Get	instance_type	USINT	1: I/O Message
	3	Get	transportClass_trigger	BYTE	12_{HEX}
	4	Get	produced_connection_id	UINT	
	5	Get	consumed_connection_id	UINT	
	6	Get	initial_comm_characteristics	BYTE	1
	7	Get	produced_connection_size	UINT	Followed by IO Process image
	8	Get	consumed_connection_size	UINT	Followed by IO Process image
	9	Get/Set	expected_packet_rate	UINT	Timer Resolution of 8msec
	12	Get/Set	watchdog_timeout_action	USINT	0: Time Out (default)
	13	Get	produced_connection_path_ length	UINT	0 or 6
	14	Get	produced_connection_path	Array of USINT	
	15	Get	consumed_connection_path _ length	UINT	4
	16	Get	consumed_connection_path	Array of USINT	20 2B 24 01
	17	Get/Set	production_inhibit_time	UINT	00, 00

Instance Attributes for COS I/O Connection (Unacknowledged)

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
4	1	Get	State	USINT	Defined in Spec * 0x01 : Configuring
	2	Get	instance_type	USINT	1: I/O Message
	3	Get	transportClass_trigger	BYTE	10_{HEX}
	4	Get	produced_connection_id	UINT	* 0x0341 MAC ID : 01, Message ID=13, Message Group 1
	5	Get	consumed_connection_id	UINT	$0FFFF_{HEX}$
	6	Get	initial_comm_characteristics	BYTE	$0F_{HEX}$
	7	Get	produced_connection_size	UINT	Followed by IO Process image

	8	Get	consumed_connection_size	UINT	Followed by IO Process image
	9	Get/Set	expacted_packet_rate	UINT	Timer Resolution of 8msec
	12	Get/Set	watchdog_timeout_action	USINT	0: Time Out (default)
	13	Get	produced_connection_path_length	UINT	0 or 6
	14	Get	produced_connection_path	Array of USINT	
	15	Get	consumed_connection_path_length	UINT	0
	16	Get	consumed_connection_path	Array of USINT	Empty
	17	Get/Set	production_inhibit_time	UINT	00, 00

5.5.6 Acknowledge Handler Object

Class Code: $2B_{HEX}$

Common Services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single

Class Attributes
None

Instance Attributes

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
1	1	Set	Acknowledge Timer	UNIT	Default: 10
	2	Get	Retry Limit	USINT	1
	3	Get	COS Producing Connection Instance	UINT	4

5.5.7 G-Bus Manager Object

Class Code: $70_{HEX\ (112D)}$

Common Services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

Class Attributes
None

Instance Attributes

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
1	1	Get	Number of Slot	USINT	(include deactivated slot)
	4	Get	External IDs	Array of 128 BYTE	See Table 5.1.
	10	Get	G-Series Internal Bus Status	USINT	0x03 : Run state 0x04 : Stop state 0x05 : Fault state 0x07 : CRC state
	11	Get	Input (Produced) Byte Size	UINT	IO input byte size
	12	Get	Output (Consumed) Byte Size	UINT	IO output byte size
	113	Get	Run-time fault code	DWORD	#0 : G-bus error count #1: G-bus error code (Table 5.2.) #2 : Error slot number #3 : NA status
	150	Get	Firmware Revision	USINT	#0 : Major revision #1 : Minor revision

Table 5.1. External IDs (=Expansion Module ID)

Byte	Description
0	Network Adapter Module External ID = 0x9212
1	External ID for slot position #1
2	External ID for slot position #2
...	...
62	External ID for slot position #62
63	External ID for slot position #63

Table 5.2.G-bus error code

Byte	Description
0x00	Normal Operation
0x02	Connection Fault
0x03	Configuration Fault
0x04	No Expansion module
0x05	Invalid attribute value
0x06	Too much data
0x07	Vendor Error
0x08	Not expected slot
0x09	CRC error

5.5.8 Expansion Slot Object

Class Code: $71_{HEX\ (113D)}$

Common Services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

Class Attributes
None

Instance Attributes

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
1~63 (Slot Address)	1	Get	Module External ID	USINT	IO Name = External ID (2Byte) ex) IO Name : GT-1238 = External ID : 0x1238
	3	Get	Input Offset Table - Byte Offset - Bit Offset	Structure of: USINT USINT	Byte offset in the Input Assembly Corresponding bit offset in the byte (If Input data length is zero, then return Empty.)

	4	Get	Output Offset Table - Byte Offset - Bit Offset	Structure of: USINT USINT	Byte offset in the Output Assembly Corresponding bit offset in the byte (If Output data length is zero, then return Empty.)
	5	Get	Input Data	Array of BYTE	Read Input data size defined by attributes 2. If Input data length is zero, then return Empty.
	6	Get/Set	Output Data	Array of BYTE	Read/Write Output data size defined by attributes 2. If Output data length is zero, then return Empty.
	8	Get	Configuration Parameter Data length	USINT	Refer to Configuration Parameter document
	9	Get/Set	R/W Configuration Data	n Byte	Data array size defined by attributes 8.
	100	Get	Product Code	4 Byte	
	102	Get	Firmware Revision	Structure of: USINT USINT	Expansion Module Firmware Revision

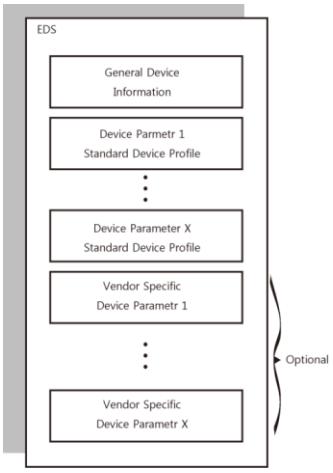
*After the system is reset, the new “Set Value” action is applied.
If changed slot location, set default value automatically.

5.5.9 I/O Format Setting

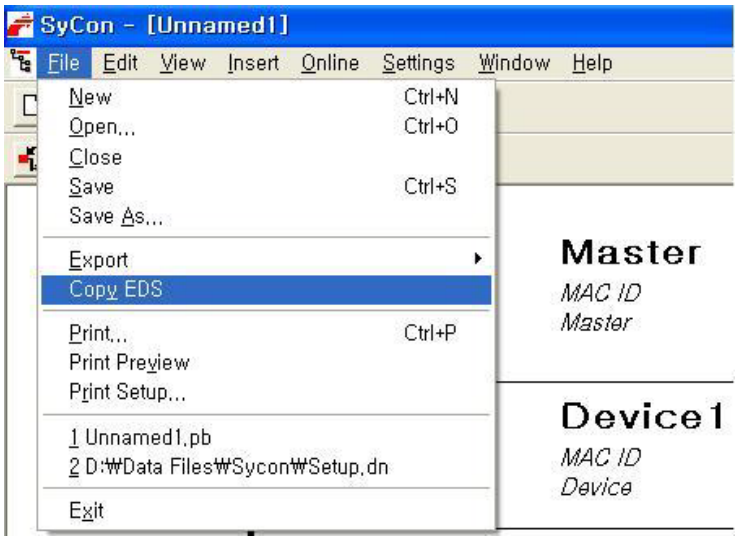
DeviceNet I/O Data Format Setting
I/O Data Format of GN-9212 can be changed by DeviceNet Configuration Software.
Data format is set by change G-BUS Manager Object value in Configuration Software.

5.5.10 EDS Setting

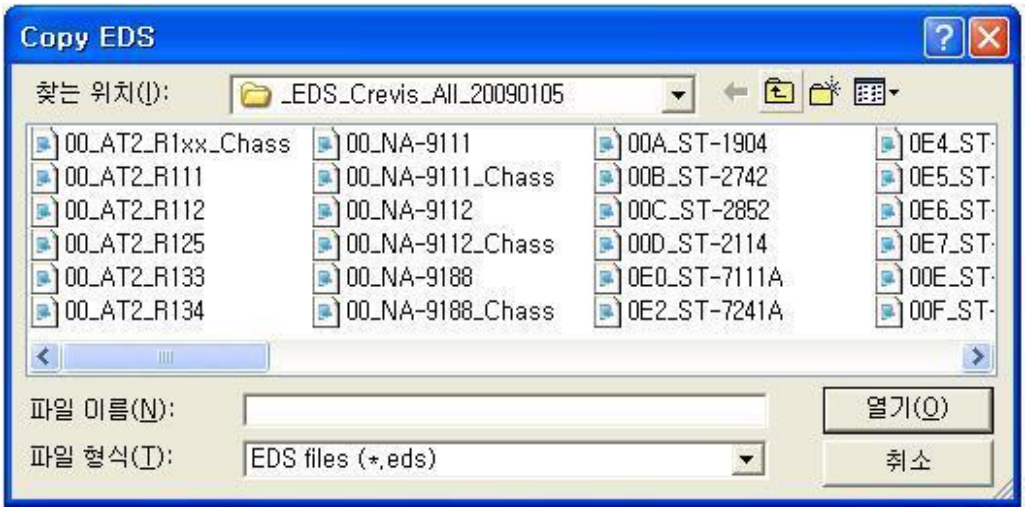
EDS Setting
An Electronics Data Sheet (EDS) provides information necessary to access and alter the configuration parameter of a device.
EDS is an external file that contains information about configurable attributes for the device, including object addresses of each parameter
The application objects in a device represent the destination addresses for configuration data. These addresses art encoded in EDS.



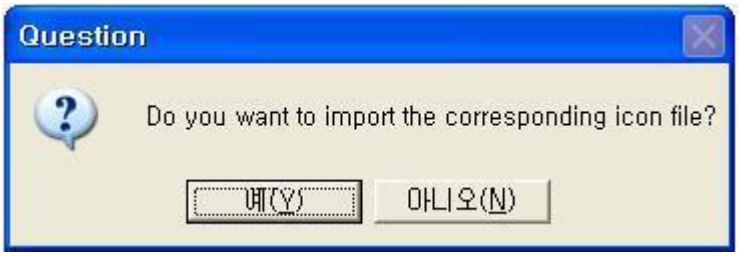
General block diagram of an EDS
When Configuration toll is started, it automatically retrieves all the EDS files stored in the EDS directory. The device names are placed into an internal list.
During the configuration, the device- specific data is retrieved directly from EDS files.
If a DeviceNet device does not appear in the selection list, a corresponding EDS file can be copied in to the EDS directory with File > Copy EDS.
The EDS files of some vendors are available on the DeviceNet homepage http://www.odva.org or visit he homepage of the manufacturer.
The EDS directory is adjustable. In order to alter the directory from a previous setting in another directory, use the menu Settings > Path.
All EDS files must be places in this directory.
Example for addition EDS file with Sycon
- Execute “Copy EDS” command in File menu



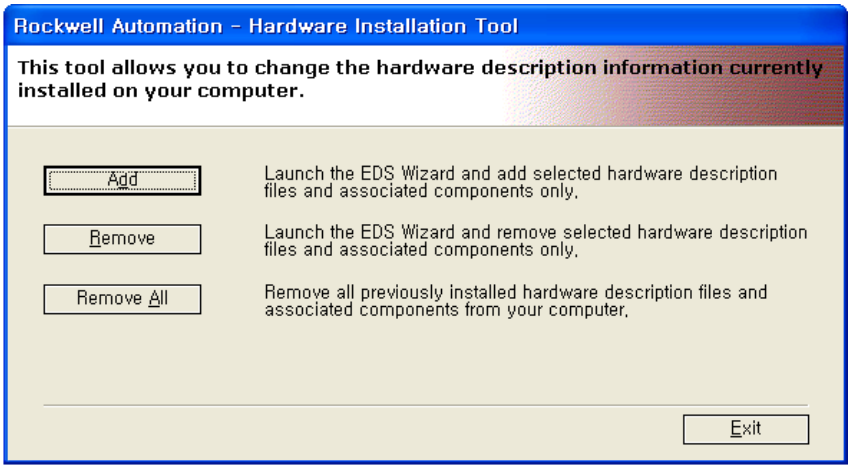
- After selection EDS file of NA-9211 and NA-9211_Chass, click “Open”.
(It is necessary to register Chassis EDS file because NA Series is product what can add Expansion Module.)



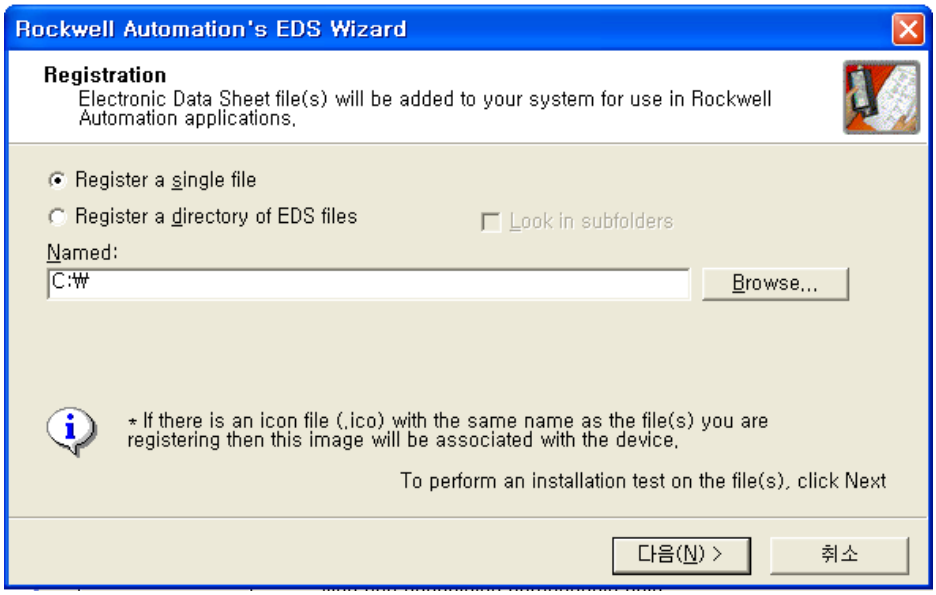
- Click Yes.



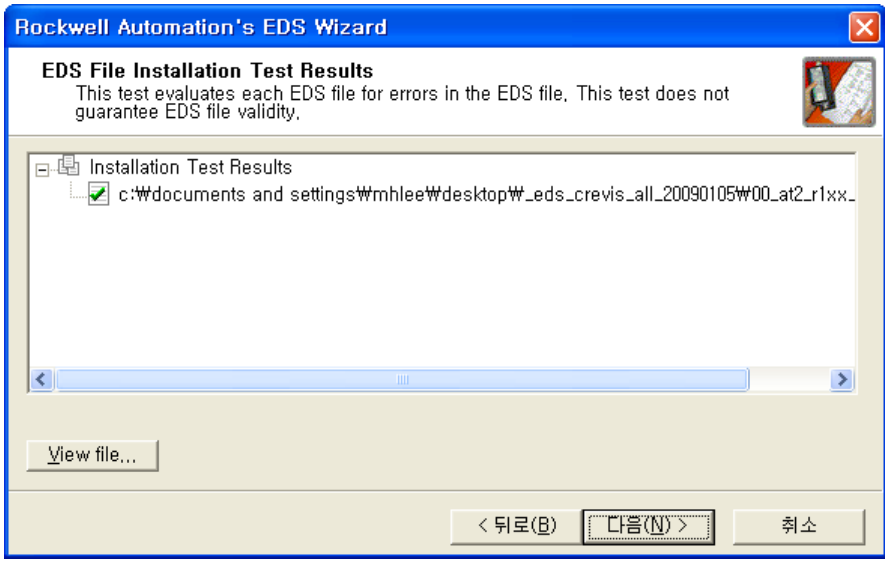
Example for addition EDS file with Hardware Installation Tool in RS Linx
Execute ‘Add’ command.



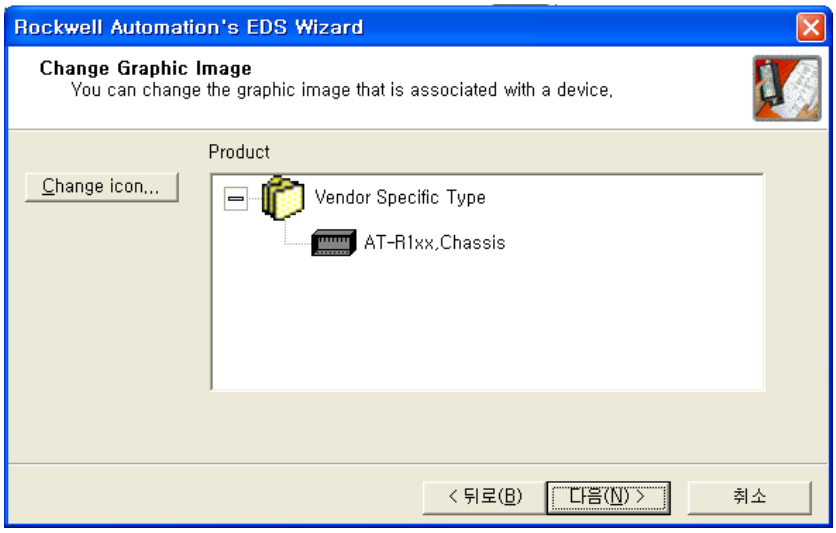
‘Register a single file’ is that register s one EDS file and ‘Register a directory of EDS files’ is that register s all EDS files in selected directory. In this example, it choose s ‘Register a single fi le’. Check ‘Register a single file’ and find out that you want to register EDS file to execute ‘Browser’ command. Click ‘Next’.



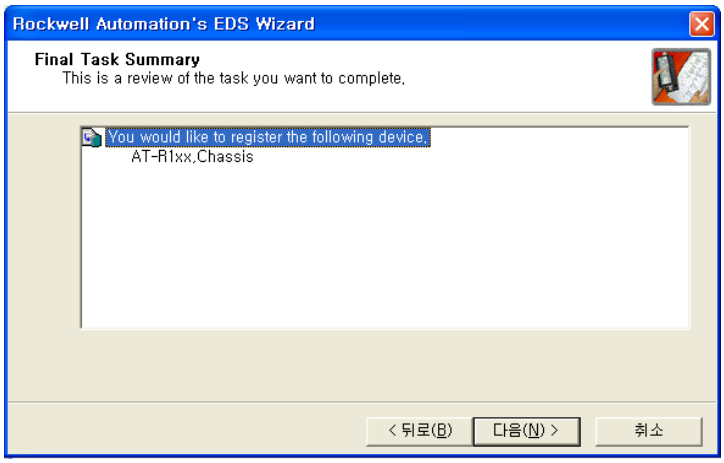
If error does not occur, Click ‘Next’.



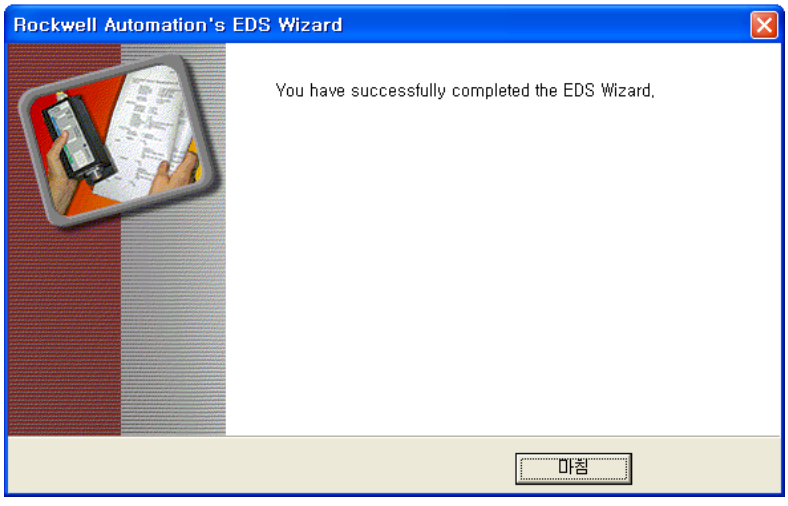
This window is that registers icon image, Click ‘Next’ after select ing image



If the summary is valid, Click ‘Next’.



This window means all process is done, Click ‘Finish’.



6 MODBUS INTERFACE

6.1 MODBUS Interface Register/Bit Map

Register Map

Start Address	Read/Write	Description	Func. Code
0x0000 ~	Read	Process input image registers (Real Input Register)	3,4,23
0x0800 ~	Read/Write	Process output image registers (Real Output Register)	3,16,23
0x1000 *	Read	Adapter Identification special registers.	3,4,23
0x1020 *	Read/Write	Adapter Watchdog, other time special register.	3,4,6,16,23
0x1100 *	Read/Write	Adapter Information special registers.	3,4,6,16,23
0x2000 *	Read/Write	Expansion Slot Information special registers.	3,4,6,16,23

* The special register map must be accessed by read/write of every each address (one address).

Register Map

Start Address	Read/Write	Description	Func. Code
0x0000~	Read	Process input image bits All input registers area are addressable by bit address. Size of input image bit is size of input image register * 16.	2
0x1000~	Read/Write	Process output image bits All output registers area are addressable by bit address. Size of output image bit is size of output image register * 16.	1,5,15

6.2 Supported MODBUS Function Codes

Function Code	Function	Description
1(0x01)	Read Coils (Read output bit)	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.
2(0x02)	Read Discrete Inputs (Read input bit)	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.
3(0x03)	Read Holding Registers (Read output word)	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 bits.
4(0x04)	Read Input Registers (Read input word)	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.
5(0x05)	Write Single Coil (Write one bit output)	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.
6(0x06)	Write Single Register (Write one word output)	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.
8(0x08)	Diagnostics (Read diagnostic register) *Refer to the 6.2.1	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.
15(0x0F)	Write Multiple Coils (Write a number of output bits)	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.
16(0x10)	Write Multiple registers (Write a number of output words)	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.
23(0x17)	Read/Write Multiple registers (Read a number of input words /Write a number of output words)	Read a number of input words /Write a number of output words 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.

- Refer to MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1a

6.2.18 (0x08) Diagnostics

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, 0xFF00	Echo Request Data	Reset Only

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 Status
The response data field returns the status of ModBus and Internal 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 Status	Same as status 1word

6.2.2 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 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.

6.2.3 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).

6.2.4 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 = 0x9020(GN-9212)
0x1003(4099)	Read	1word	Firmware revision, if 0x0101, revision 1.01
0x1004(4100)	Read	2word	Product unique serial number
0x1005(4101)	Read	String upto 34byte	Product name string (ASCII) "GN-9212_DeviceNet,G-Series"
0x1006(4102)	Read	1word	Sum check of EEPROM
0x1010(4112)	Read	2word	Firmware release date
0x1013(4115)	Read	1word	Firmware Code = 0x9212
0x101E(4126)	Read	7word - 1word - 1word - 1word - 1word - 1word - 2word	Composite Id of following address 0x1100(4352), Modbus RS232 Node. (Fixed 0x0001) 0x1000(4096), Vendor ID 0x1001(4097), Device type 0x1002(4098), Product code 0x1003(4099), Firmware revision 0x1004(4100), Product serial number

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

6.2.5 Adapter Watchdog Time, other Time Special Register (0x1020, 4128)

Address	Access	Type, Size	Description
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)
0x110C(4364)	Read	1word	Field power status
0x110D(4365)	Read	1word	Current Dip Switch State and Field Power Status (MSB) ex) Dip SW(0x01), Field Power On = 0x8001
0x110E(4366)	Read	upto 33word	Expansion slot's GT-number including GN First 1word is adapter's number, if GN-9289, then 0x9289
0x1110(4368)	Read	1word	Number of expansion slot
0x1113(4371)	Read	upto 33word	Expansion slot Module Id. Refer to Appendix A.1 Product List. First 1word is adapter's module id.
0x1119(4377)	Read	1word	Hi byte is ModBus status, low byte is internal status.

			Zero value means ‘no error’.
0x111D(4381)	Read	1word	Adapter G-Series Revision. If 0x013C, G-Series Revision is 1.60

*After the system is reset, the new “Set Value” action is applied.

** If the slot location is changed, set default value automatically (all expansion slot are live).

6.2.6 Expansion Slot Information Special Register (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)
Slot#17 0x2200(8704)~0x221F(8735)
Slot#18 0x2220(8736)~0x223F(8767)
Slot#19 0x2240(8768)~0x225F(8799)
Slot#20 0x2260(8800)~0x227F(8831)
Slot#21 0x2280(8832)~0x229F(8863)
Slot#22 0x22A0(8864)~0x22BF(8895)
Slot#23 0x22C0(8896)~0x22DF(8927)
Slot#24 0x22E0(8928)~0x22FF(8959)
Slot#25 0x2300(8960)~0x231F(8991)
Slot#26 0x2320(8992)~0x233F(9023)
Slot#27 0x2340(9024)~0x235F(9055)
Slot#28 0x2360(9056)~0x237F(9087)
Slot#29 0x2380(9088)~0x239F(9119)
Slot#30 0x23A0(9120)~0x23BF(9151)
Slot#31 0x23C0(9152)~0x23DF(9183)
Slot#32 0x23E0(9184)~0x23FF(9215)
Slot#33 0x2400(9216)~0x241F(9247)
Slot#34 0x2420(9248)~0x243F(9279)
…..
Slot#63 0x27C0(10176)~0x27DF(10207)

Address Offset	Expansion Slot#1	Expansion Slot#2	Expansion Slot#3	Expansion Slot#4	…	Expansion Slot#63
+ 0x00(+0)	0x2000(8192)	0x2020(8224)	0x2040(8256)	0x2060(8288)	…	0x27C0(10176)
+ 0x01(+1)	0x2001(8193)	0x2021(8225)	0x2041(8257)	0x2061(8289)	…	0x27C1(10177)
+ 0x02(+2)	0x2002(8194)	0x2022(8226)	0x2042(8258)	0x2062(8290)	…	0x27C2(10178)
+ 0x03(+3)	0x2003(8195)	0x2023(8227)	0x2043(8259)	0x2063(8291)	…	0x27C3(10179)
+ 0x04(+4)	0x2004(8196)	0x2024(8228)	0x2044(8260)	0x2064(8292)	…	0x27C4(10180)
+ 0x05(+5)	0x2005(8197)	0x2025(8229)	0x2045(8261)	0x2065(8293)	…	0x27C5(10181)
+ 0x06(+6)	0x2006(8198)	0x2026(8230)	0x2046(8262)	0x2066(8294)	…	0x27C6(10182)
+ 0x07(+7)	0x2007(8199)	0x2027(8231)	0x2047(8263)	0x2067(8295)	…	0x27C7(10183)
+ 0x08(+8)	0x2008(8200)	0x2028(8232)	0x2048(8264)	0x2068(8296)	…	0x27C8(10184)
+ 0x09(+9)	0x2009(8201)	0x2029(8233)	0x2049(8265)	0x2069(8297)	…	0x27C9(10185)
+ 0x0A(+10)	0x200A(8202)	0x202A(8234)	0x204A(8266)	0x206A(8298)	…	0x27CA(10186)
+ 0x0B(+11)	0x200B(8203)	0x202B(8235)	0x204B(8267)	0x206B(8299)	…	0x27CB(10187)
+ 0x0C(+12)	0x200C(8204)	0x202C(8236)	0x204C(8268)	0x206C(8300)	…	0x27CC(10188)
+ 0x0D(+13)	0x200D(8205)	0x202D(8237)	0x204D(8269)	0x206D(8301)	…	0x27CD(10189)
+ 0x0E(+14)	0x200E(8206)	0x202E(8238)	0x204E(8270)	0x206E(8302)	…	0x27CE(10190)

+ 0x0F(+15)	0x200F(8207)	0x202F(8239)	0x204F(8271)	0x206F(8303)	…	0x27CF(10191)
+ 0x10(+16)	0x2010(8208)	0x2030(8240)	0x2050(8272)	0x2070(8304)	…	0x27D0(10192)
+ 0x11(+17)	0x2011(8209)	0x2031(8241)	0x2051(8273)	0x2071(8305)	…	0x27D1(10193)
+ 0x12(+18)	0x2012(8210)	0x2032(8242)	0x2052(8274)	0x2072(8306)	…	0x27D2(10194)
+ 0x13(+19)	0x2013(8211)	0x2033(8243)	0x2053(8275)	0x2073(8307)	…	0x27D3(10195)
+ 0x14(+20)	0x2014(8212)	0x2034(8244)	0x2054(8276)	0x2074(8308)	…	0x27D4(10196)
+ 0x15(+21)	0x2015(8213)	0x2035(8245)	0x2055(8277)	0x2075(8309)	…	0x27D5(10197)
+ 0x16(+22)	0x2016(8214)	0x2036(8246)	0x2056(8278)	0x2076(8310)	…	0x27D6(10198)
+ 0x17(+23)	0x2017(8215)	0x2037(8247)	0x2057(8279)	0x2077(8311)	…	0x27D7(10199)
+ 0x18(+24)	0x2018(8216)	0x2038(8248)	0x2058(8280)	0x2078(8312)	…	0x27D8(10200)
+ 0x19(+25)	0x2018(8217)	0x2038(8249)	0x2058(8281)	0x2078(8313)	…	0x27D9(10201)
+ 0x1A(+26)	0x201A(8218)	0x203A(8250)	0x205A(8282)	0x207A(8314)	…	0x27DA(10202)
+ 0x1B(+27)	0x201B(8219)	0x203B(8251)	0x205B(8283)	0x207B(8315)	…	0x27DB(10203)
+ 0x1C(+28)	0x201C(8220)	0x203C(8252)	0x205C(8284)	0x207C(8316)	…	0x27DC(10204)
+ 0x1D(+29)	0x201D(8221)	0x203D(8253)	0x205D(8285)	0x207D(8317)	…	0x27DD(10205)
+ 0x1E(+30)	0x201E(8222)	0x203E(8254)	0x205E(8286)	0x207E(8318)	…	0x27DE(10206)
+ 0x1F(+31)	0x201F(8223)	0x203F(8255)	0x205F(8287)	0x207F(8319)	…	0x27DF(10207)

Address Offset	Access	Type, Size	Description
+ 0x02(+2) **	Read	1word	Input start register address of input image word this slot.
+ 0x03(+3) **	Read	1word	Input word's bit offset of input image word this slot.
+ 0x04(+4) **	Read	1word	Output start register address of output image word this slot.
+ 0x05(+5) **	Read	1word	Output word's bit offset of output image word this slot.
+ 0x06(+6) **	Read	1word	Input bit start address of input image bit this slot.
+ 0x07(+7) **	Read	1word	Output bit start address of output image bit this slot.
+ 0x08(+8) **	Read	1word	Size of input bit this slot
+ 0x09(+9) **	Read	1word	Size of output bit this slot
+ 0x0A(+10)**	Read	n word	Read input data this slot
+ 0x0B(+11)**	Read/Write	n word	Read/write output data this slot
+ 0x0E(+14)	Read	1word	GT-number, if GT-1238, returns 0x1238
+ 0x0F(+15)	Read	String upto 72byte	First 1word 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	1word	Size of configuration parameter byte
+ 0x11(+17)**	Read/Write	n word	Read/write Configuration parameter data, up to 8byte.
+ 0x17(+23)	Read	2word	Firmware Revision ex) 0x00010010 (Major revision 1 /Minor revision 1, Rev 1.001)
+ 0x19(+25)	Read	2word	Firmware release date.

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

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

6.3 Trouble Shooting

How to diagnose by LED indicator

LED Status	Cause	Action
All LED turns off	- No power	- Check main power Cable
MOD LED is red	- Occurrence critical error in firmware	- Contact Sales team and send module for repair.
NET LED turns off	- Failure of communication with Master	- Check main power for master and communication cable.
NET LED flashed green	- Failure of exchanging data with master	- Check status in software for Master configuration.
NET LED is red	- Communication connecting lost	- Check BUS line cable for connection with master. - Check duplication address.
IOS LED turns off	- Device may not be powered.	- Check main power Cable
IOS LED flashes red	- Adapter has no expansion module	- Add one or more expansion modules.
IOS LED is red	One or more expansion module occurred in fault state. - Detected invalid expansion module ID. - Overflowed Input/ Output Size - Too many expansion module - Initialization failure - Communication failure. - Changed expansion module configuration. - Mismatch vendor code between adapter and expansion module.	- Use expansion slot up to 63. - Compose that IO total size is not excess. - Check status of expansion IO connection. - Check the vendor code of module.
Field Power LED turns off	- Field power is not supplied.	- Check main power Cable - Contact Sales team and send module for repair.
System Power LED turns off	- System power is not supplied.	- Check main power Cable - Contact Sales team and send module for repair.

APPENDIX A

A.1 Product List

No.	GT-Number	Description	ID(hex)
Digital Input Module			
1	GT-1238	8 Points, Universal, 24Vdc, 10RTB	1238
2	GT-123F	16 Points, Universal, 24Vdc, 20P connector	123F
3	GT-12DF	16 Points, Universal, 24Vdc, 18RTB	12DF
4	GT-12FA	32 Points, Universal, 24Vdc, 40P connector	12FA
5	GT-1428	8 Sink Input / 8 Source Output with Diagnostic, 24Vdc	1428
6	GT-1804	4 Points, 120Vac, 10RTB	1804
7	GT-1904	4 Points, 240Vac, 10RTB	1904
Digital Output Module			
8	GT-2318	8 Points, Sink, 24Vdc/0.5A, 10RTB	2318
9	GT-2328	8 Points, Source, 24Vdc/0.5A, 10RTB	2328
10	GT-221F	16 Points, Sink, 24Vdc/0.3A, 20P connector	221F
11	GT-222F	16 Points, Source, 24Vdc/0.3A, 20P connector	222F
12	GT-225F	16 Points, Sink, 24Vdc/0.3A, 18RTB	225F
13	GT-226F	16 Points, Source, 24Vdc/0.3A, 18RTB	226F
14	GT-22BA	32 Points, Sink, 24Vdc/0.3A, 40P connector	22BA
15	GT-22CA	32 Points, Source, 24Vdc/0.3A, 40P connector	22CA
16	GT-2418	8 Channels Sink Output with Diagnostics	2418
17	GT-2428	8 Channels Source Output with Diagnostics	2428
18	GT-2618	8 Points, Sink, 24Vdc/2A, 10RTB	2618
19	GT-2628	8 Points, Source, 24Vdc/2A, 10RTB	2628
20	GT-2734	4 Points, MOS Relay, 240Vdc/ac, 0.5A, 10RTB	2734
21	GT-2738	8 Points, MOS Relay Output Terminal, 240Vdc, 0.5A	2738
22	GT-2744	4 Points, Relay, 24Vdc/2A, 240Vac/2A, 10RTB	2744
23	GT-2764	4 Points, MOS Relay, 24Vdc/ac, 2A, 10RTB	2764
24	GT-2768	8 Points, Relay Output Terminal, 24Vdc/ac, 2A	2768
25	GT-2784	4 Points, MOS Relay, 110Vdc/ac, 1A, 10RTB	2784
26	GT-2788	8 Points, Relay Output Terminal, 110Vdc/ac, 1A	2788
Analog Input Module			
27	GT-3002	2ch load cell input unit, strain gauge	3002
28	GT-3114	4 Channels, 0~20, 4~20mA, 12bits, 10RTB	3114
29	GT-3154	4 Channels, 0~20, 4~20mA, 16bits, 10RTB	3154
30	GT-3118	8 Channels, 0~20, 4~20mA, 12bits, 10RTB	3118
31	GT-3158	8 Channels, 0~20, 4~20mA, 16bits, 10RTB	3158
32	GT-311F	16 Channels, 0~20, 4~20mA, 12bits, 20P connector	311F
33	GT-315F	16 Channels, 0~20, 4~20mA, 16bits, 20P connector	315F
34	GT-317F	16 Channels, 0~20, 4~20mA, 12bits, 18RTB	317F
35	GT-319F	16 Channels, 0~20, 4~20mA, 16bits, 18RTB	319F
36	GT-3424	4 Channels, 0~10, 0~5, 1~5Vdc, 12bits, 10RTB	3424
37	GT-3464	4 Channels, 0~10, 0~5, 1~5Vdc, 16bits, 10RTB	3464
38	GT-3428	8 Channels, 0~10, 0~5, 1~5Vdc, 12bits, 10RTB	3428
39	GT-3468	8 Channels, 0~10, 0~5, 1~5Vdc, 16bits, 10RTB	3468
40	GT-342F	16 Channels, 0~10, 0~5, 1~5Vdc, 12bits, 20P connector	342F

41	GT-346F	16 Channels, 0~10, 0~5, 1~5Vdc, 16bits, 20P connector	346F
42	GT-347F	16 Channels, 0~10, 0~5, 1~5Vdc, 12bits, 18RTB	347F
43	GT-349F	16 Channels, 0~10, 0~5, 1~5Vdc, 16bits, 18RTB	349F
44	GT-3704	4 Channels, RTD, 10RTB	3704
45	GT-3708	8 Channels, RTD, 20P connector	3708
46	GT-3804	4 Channels, Thermocouple, 10RTB	3804
47	GT-3808	8 Channels, Thermocouple, 20P connector	3808
48	GT-3714	4 Channels, TEMP. Controller, RTD Input, SSR Output	3714
49	GT-3734	4 Channels, TEMP. Controller, RTD Input, Current Output	3734
50	GT-3814	4 Channels, TEMP. Controller, TC Input, SSR Output	3814
51	GT-3834	4 Channels, TEMP. Controller, TC Input, Current Output	3834
52	GT-3901	AC Measurement	3901
53	GT-3914	4 Channels, Differential, 0~20, 4~20, +/-20mA, 12Bits, 10RTB	3914
54	GT-3934	4 Channels, Differential, 0~20, 4~20, +/-20mA, 16Bits, 10RTB	3934
55	GT-3918	8 Channels, Differential, 0~20, 4~20, +/-20mA, 12Bits, 18RTB	3918
56	GT-3938	8 Channels, Differential, 0~20, 4~20, +/-20mA, 16Bits, 18RTB	3938
57	GT-3924	4 Channels, Differential, 0~5, 0~10, +/-5, +/-10Vdc, 12Bits, 10RTB	3924
58	GT-3944	4 Channels, Differential, 0~5, 0~10, +/-5, +/-10Vdc, 16Bits, 10RTB	3944
59	GT-3928	8 Channels, Differential, 0~5, 0~10, +/-5, +/-10Vdc, 12Bits, 18RTB	3928
60	GT-3948	8 Channels, Differential, 0~5, 0~10, +/-5, +/-10Vdc, 16Bits, 18RTB	3948
Analog Output Module			
61	GT-4114	4CH, 0~20mA, 12Bits, 10RTB	4114
62	GT-4154	4CH, 0~20mA, 16Bits, 10RTB	4154
63	GT-4118	8CH, 0~20mA, 12Bits, 10RTB	4118
64	GT-4158	8CH, 0~20mA, 16Bits, 10RTB	4158
65	GT-4214	4 Channels, Current Output, 4~20mA, 12bits	4214
66	GT-4254	4 Channels, Current Output, 4~20mA, 16bits	4254
67	GT-4218	8 CHANNELS CURRENT OUTPUT, 4~20mA, 12BIT	4218
68	GT-4258	8 CHANNELS CURRENT OUTPUT, 4~20mA, 16BIT	4258
69	GT-4424	4CH, 0~10Vdc, 12Bits, 10RTB	4424
70	GT-4464	4CH, 0~10Vdc, 16Bits, 10RTB	4464
71	GT-4428	8CH, 0~10Vdc, 12Bits, 10RTB	4428
72	GT-4468	8CH, 0~10Vdc, 16Bits, 10RTB	4468
73	GT-442F	16CH, 0~10Vdc, 12Bits, 20P Connector	442F
74	GT-446F	6CH, 0~10Vdc, 16Bits, 20P Connector	446F
75	GT-447F	16CH, 0~10Vdc, 12Bits, 18RTB	447F
76	GT-449F	16CH, 0~10Vdc, 16Bits, 18RTB	449F
77	GT-4524	AO 4 CHs, ±10Vdc, 12Bits, 10RTB	4524
78	GT-4564	AO 4 CHs, ±10Vdc, 16Bits, 10RTB	4564
Special Module			
79	GT-5102	2CH, Encoder, Input, 5Vdc, 10RTB	5102
80	GT-5112	High Speed Counter, 2CHs, 24Vdc, Encoder Input, 10RTB	
81	GT-5114	High Speed Counter, 4CHs, 24Vdc, Encoder Input, 10RTB	
82	GT-5211	1CH, RS 232, RTS/CTS, Full Duplex Type, 10RTB	5211
83	GT-5212	2CH, RS 232, Full Duplex Type, 10RTB	5212
84	GT-5221	1CH, RS 485, Full Duplex Type, 10RTB	5221
85	GT-5231	1CH, RS 485, Half Full Duplex Type, 10RTB	5231
86	GT-5232	2CH, RS 485, Half Full Duplex Type, 10RTB	5232

87	GT-5352	2CH, Synchronous Serial Interface Input, 10RTB	5352
88	GT-5442	PWM Output, 2CHs, 0.5A/24Vdc, Source, 18RTB	5442
89	GT-5444	PWM Output, 4CHs, 0.5A/24Vdc, Source, 18RTB	5444
90	GT-5642	Pulse Output, 2CHs, 0.5A/24Vdc, Source, 18RTB	5642
91	GT-5652	Pulse Output, 2CHs, RS422 (Differential), 18RTB	5652
92	GT-5521	1CH, Stepper Module (TBD)	5521
Power Module			
93	GT-7408	Shield Module	7408
94	GT-7508	Common for 0Vdc	7508
95	GT-7511	Power Expansion, In 24Vdc, Out 1A/5Vdc	7511
96	GT-7518	Common for 24Vdc	7518
97	GT-7588	Common for 0Vdc, 24Vdc	7588
98	GT-7641	Field Power, 5/24/48 Vdc, 110/220 Vac	7641
99	GT-7151	Noise Filter Module, 18RTB, None ID Type	7151
100	GT-7851	Noise Filter Module, 18RTB, ID Type	7851

A.2. Glossary

- System Power: The power for starting up CPU.
- Field Power: The power for input and output line.
- Terminator Resistor: Resistor for prevention reflected wave.
- EDS: Electronic Data Sheet.
- Sink: The method of in/output power supply if a device has no power source.
- Source: The method of in/output power supply if a device has the power source.