DeviceNet Network Adapter

NA-9111 / 9112

User Manual

Version 1.10

2013 CREVIS Co.,LTD

DOCUMENT CHANGE SUMMARY				
REV	PAGE	REMARKS	DATE	EDITOR
1.0	New Document	Draft	2011/05/27	MH Lee
1.01	36	Default status byte is 0 byte both NA-9111 and 9112	2011/06/22	MH Lee
1.02	11	IO LED status	2011/10/21	JE Kang
1.03	All	All page Revision (Rename to Table)	2011/10/31	JE Kang
1.04	6	Add your experience	2012/1/13	JE Kang
1.05	All	Modify the wrong letters, Changed Object, Changed Cover	2012/2/10	JE Kang
1.06	25	Add 'Description of Status byte'	2012/3/08	JE Kang
		Add certificate RoHS	2012/3/22	JE Kang
1.07		Changed Crevis TEL	2013/4/4	JE Kang
1.08		Environment Spec. 50℃→55℃ (UL Temp)	2013/7/3	JE Kang
1.09		Changed Power Dissipation	2013/7/17	JE Kang
1.10		Modify the Pin Description	2014/05/08	YMKIM

CONTENTS

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. FnBUS Pin.

1.1.3. Certification

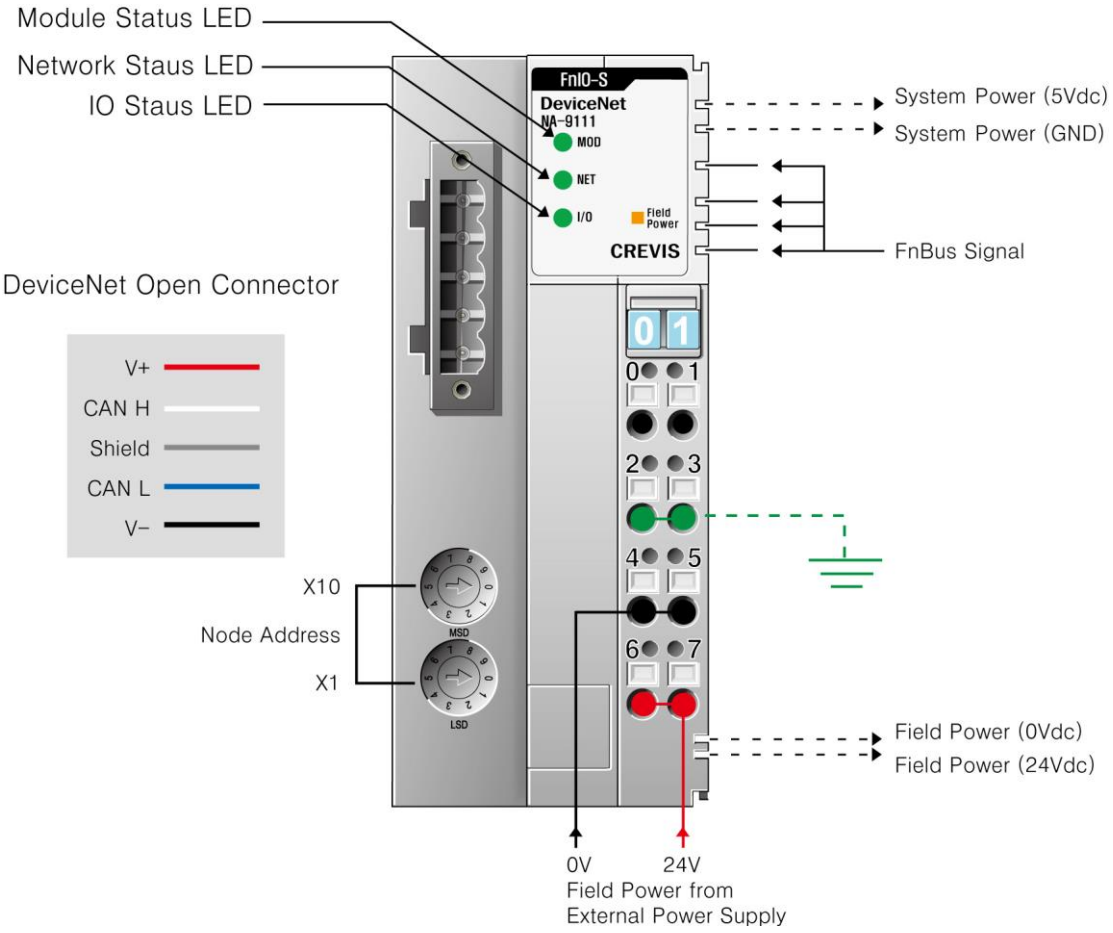
c-UL-us UL Listed Industrial Control Equipment, certified for U.S. and Canada
See UL File E235505

CE Certificate
EN 61000-6-2; Industrial Immunity
EN 61000-6-4; Industrial Emissions

FCC
RoHS (EU, CHINA)

2. Specification

2.1. The Interface



✓ The wiring diagram of NA-9111 and NA-9112 are the same.

2.2. General Specification

General Specification	
System Power	Supply voltage : 24Vdc nominal Supply voltage range : 11~28.8Vdc Protection : Output current limit(Min. 1.5A) Reverse polarity protection
Power Dissipation	40mA typical @24Vdc
Current for I/O Module	1.2A @5Vdc
Isolation	DeviceNet to internal logic : Non-isolation Internal logic to I/O driver : Isolation
Field Power	Supply voltage : 24Vdc nominal Supply voltage range : 11~28.8Vdc
Max. Current Field Power Contact	DC 10A Max.
Weight	155g
Module Size	42mm x 99mm x 70mm
Environment Condition	
Environmental Specifications	
Operating Temperature Storage Temperature Relative Humidity Operating Altitude Mounting	-20℃~55℃ -40℃~85℃ 5% ~ 90% non-condensing 2000m DIN rail
General Specifications	
Shock Operating	10g
Shock Non-Operating	30g
Vibration/shock resistance	Displacement : 0.012Inch p-p from 10~57Hz Acceleration : 2G's from 57~500Hz Sweep Rate : 1 octave Per Minute Axes to test : x, y, z Frequency Sweeps Per Axis : 10
EMC resistance burst/ESD	EMC Directive
Installation Pos. / Protect. Class	Variable/IP20
Product Certifications	UL/cUL, CE, FCC, DeviceNet(ODVA)

2.3. Device Net Specification

Interface Specification, NA-9111/9112 (DeviceNet Adapter)	
Adapter Type	Group 2 Only Slave
Max. Expansion Module	32 slots
Max. Input Size	NA-9111 : 32 bytes , NA-9112 : 252 bytes
Max. Output Size	NA-9111 : 32 bytes , NA-9112 : 252 bytes
Max. Length Bus Line	Max.100m@500Kbps, Max. 250m@250Kbps, Max. 500m@125Kbps
Max. Nodes	64 nodes
Communication Speed	125Kbps, 250Kbps, 500Kbps, auto baud supported
Network Protocol	Poll, Bit-Strobe, Cyclic, COS
Interface Connector	5pin Open male connector
Node MAC ID Setup	2 Rotary Switches
Module Location Field Power Detection	Starter module – left side of FnIO system About 11Vdc

2.4. LED Indicator

2.4.1. Module Status LED (MOD)

State	LED is:	To indicate:
No Power	Off	No power is supplied to the unit.
Device Operational	Green	The unit is operating in normal condition.
Device in Standby	Flashing Green	The EEPROM parameter is not initialized yet. Serial Number is zero value (0x00000000)
Minor Fault	Flashing Red	The unit has occurred recoverable fault in self-testing. - EEPROM checksum fault
Unrecoverable Fault	Red	The unit has occurred unrecoverable fault in self-testing. - Firmware fault

2.4.2. Network Status LED (NET)

State	LED is:	To indicate:
No Power	Off	Device is not on-line or may not be powered - Not completed the Dup-MAC_ID test yet
On-line, Not connected	Flashing Green	Device is on-line but has no connections in the established state. - Passed the 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. Expansion I/O Module Status LED (I/O)

State	LED is:	To indicate:
Not Powered No Expansion Module	Off	Device has no expansion module or may not be powered
FnBus On-line, Do not Exchanging I/O	Flashing Green	FnBus is normal but does not exchanging I/O data (Passed the expansion module configuration).
FnBus Connection, Run Exchanging IO	Green	Exchanging I/O data
FnBus connection fault during exchanging IO	Red	One or more expansion module occurred in fault state. - Changed expansion module configuration. - FnBus communication failure.
Expansion Configuration Failed	Flashing Red	Failed to initialize expansion module - Detected invalid expansion module ID. - Overflowed Input/output Size - Too many expansion module - Initial protocol failure - Mismatch vendor code between adapter and expansion module.

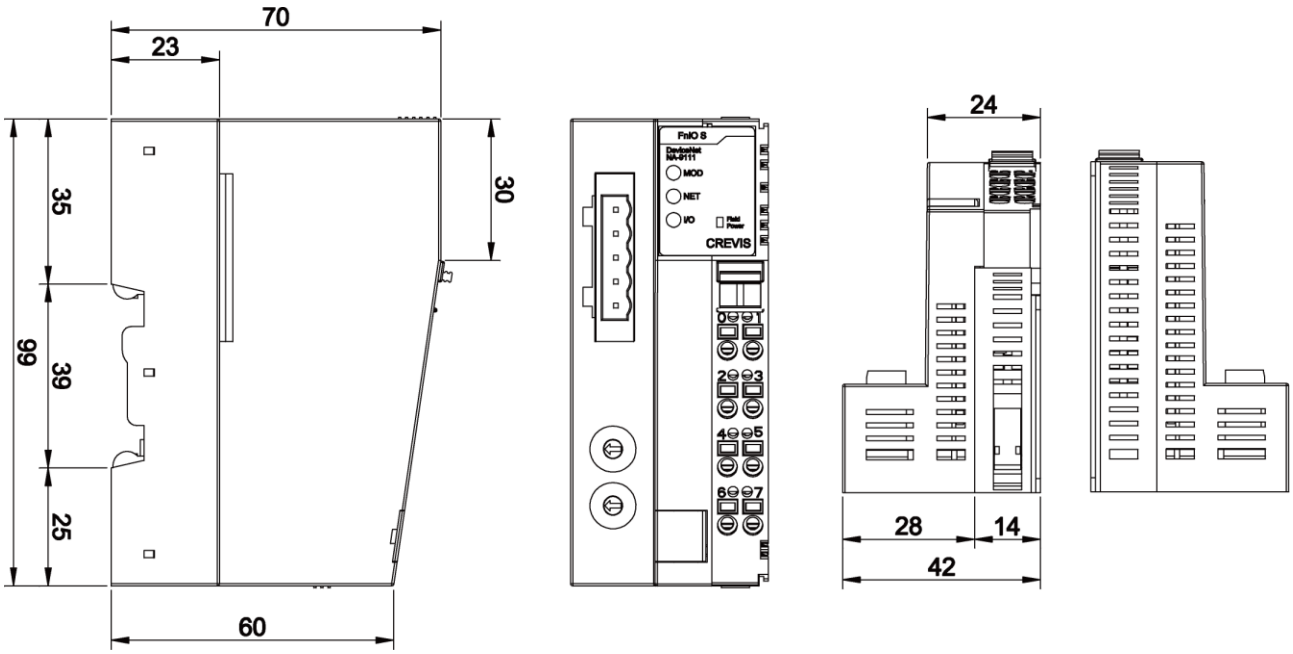
2.4.4. Field Power Status LED

State	LED is :	To indicate :
Not Supplied Field Power	Off	Not supplied 24V dc field power
Supplied Field Power	Green	Supplied 24V dc field power

3. Dimension

3.1. NA-9111/NA-9112

(mm)

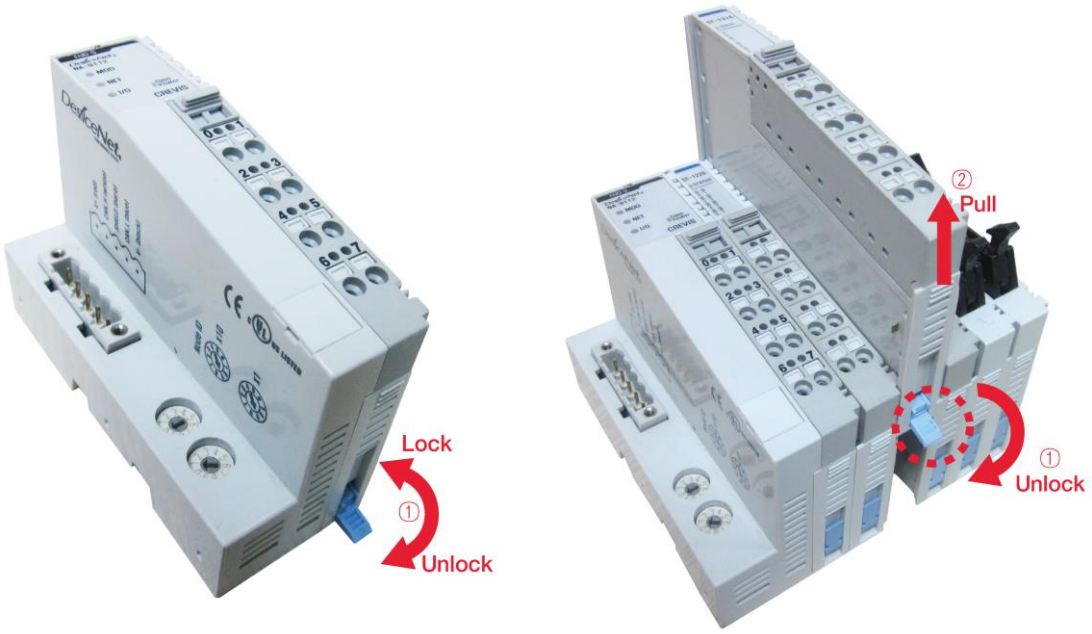


4. Mechanical Set Up

4.1. Total Expansion

The number of the module assembly that can be connected is 32. So the maximum length is 426mm Exception ST-2748 is excepted to calculate maximum length because that is double width module.

4.2. Plugging and Removal of the Components.



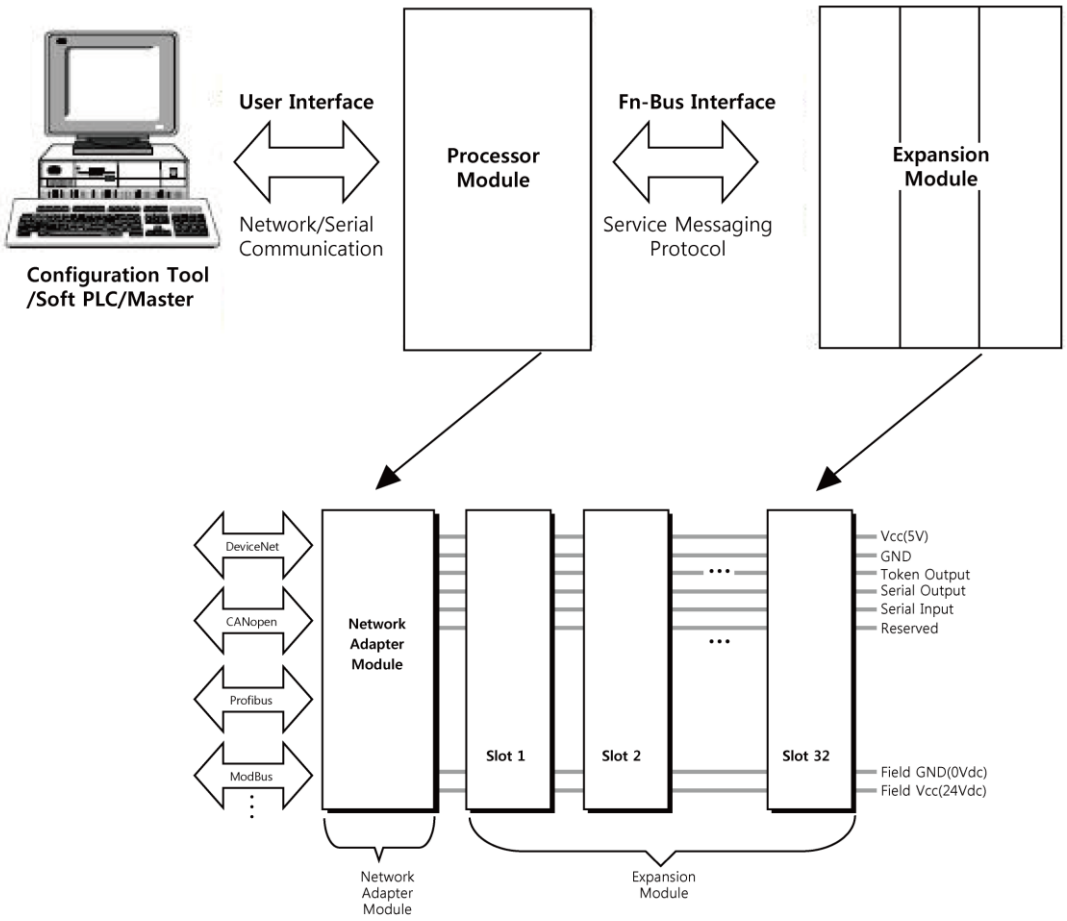
As above figure in order to safeguard the FnIO module from jamming, it should be fixed onto the DIN rail with locking level. To do so, fold on the upper of the locking lever.
To pull out the FnIO module, unfold the locking lever as below figure.

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

5. Configuration and Operation

5.1. FnBus Specification

5.1.1. FnBus 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.

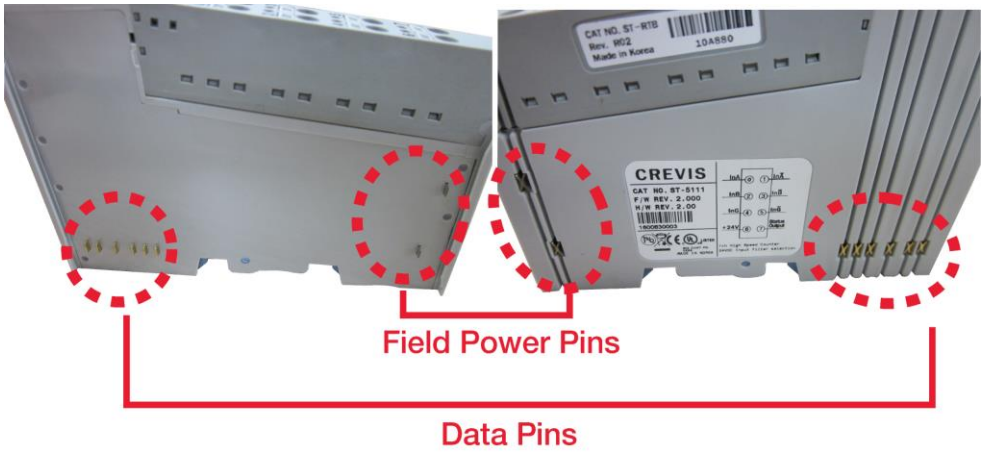
• Two types of FnBus Message

- Service Messaging

- I/O Messaging

5.1.2. FnBus 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

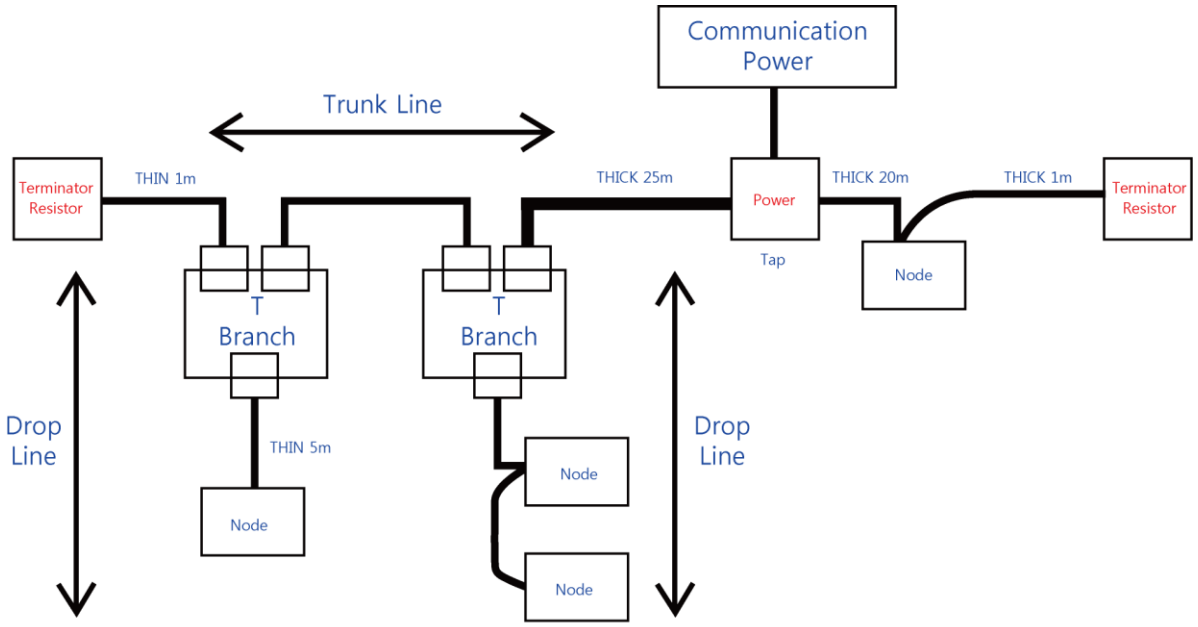


Figure 2. DeviceNet Network Example.

DeviceNet Network Installation

DeviceNet Network Set up is like following figure2.

Network Composition

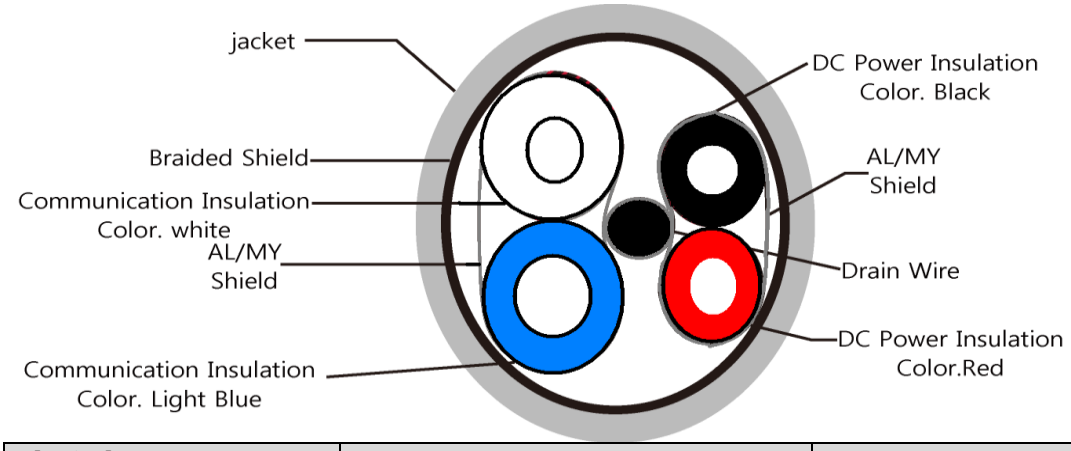
Name	Description
Node	Node is Slave that is charged each address number. DeviceNet is comprised of Master and Slave. Master manages DeviceNet and organizes external I/O in Slave. Slave contacts external I/O.
Trunk / Drop Line	Trunk line is cable that is installed terminator resistor. Drop line is cable 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 (NA-9112) 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

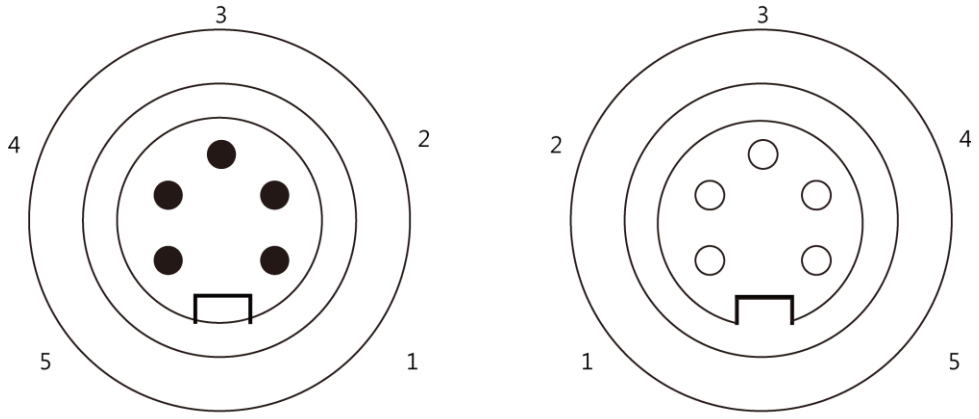
Communication rate	Truck Length	Truck Exchange (Thick Cable)	Cumulative drop	Maximum drop
125Kb	500m(1640ft)	1.0	156m(512ft)	6m(20ft)
250Kb	250m(820ft)	1.0	76m(256ft)	6m(20ft)
500Kb	100m(328ft)	1.0	38m(128ft)	6m(20ft)

-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)

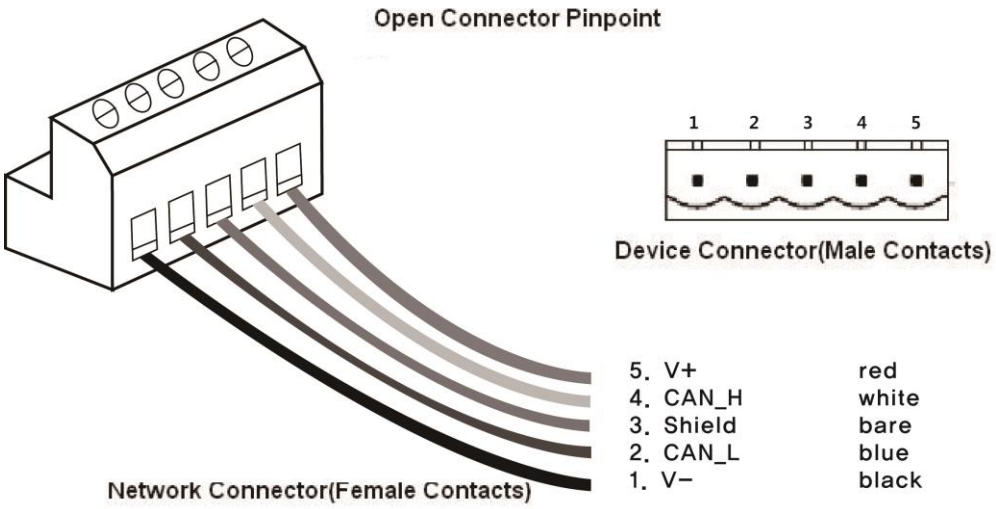
5.3.3. DeviceNet Connector Specification

Mini Connector Pinpoint



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

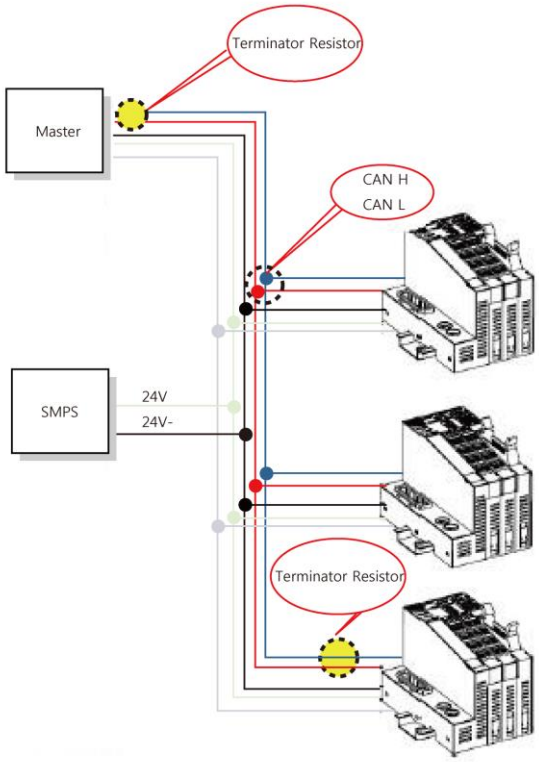
ATTENTION	The use of an incorrect supply voltage or frequency can cause severe damage to the component.

5.3.4. Terminator Resistor Specification

Terminator Resistor

Specification of terminator Resistors are Carbon film

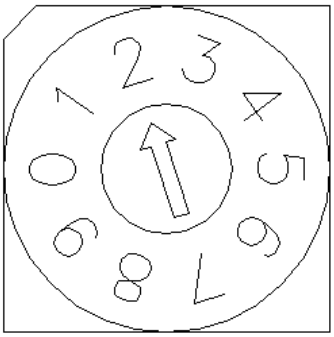
Resistor what Resistance Specification is 120Ω, 1%, 1/4W



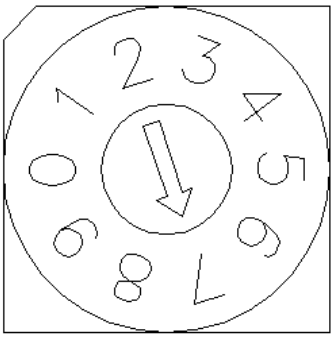
5.4. DeviceNet Module (NA-9112/9111) Configurations

5.4.1. DeviceNet MAC ID Setup

Each DeviceNet Adapter must have a unique MAC ID (from 0 to 63) so that it can be addressed independently from other nodes. If value range of 2 rotary switches is 64~99, the MAC ID can be set by from network (software).



X 10 (MSD)



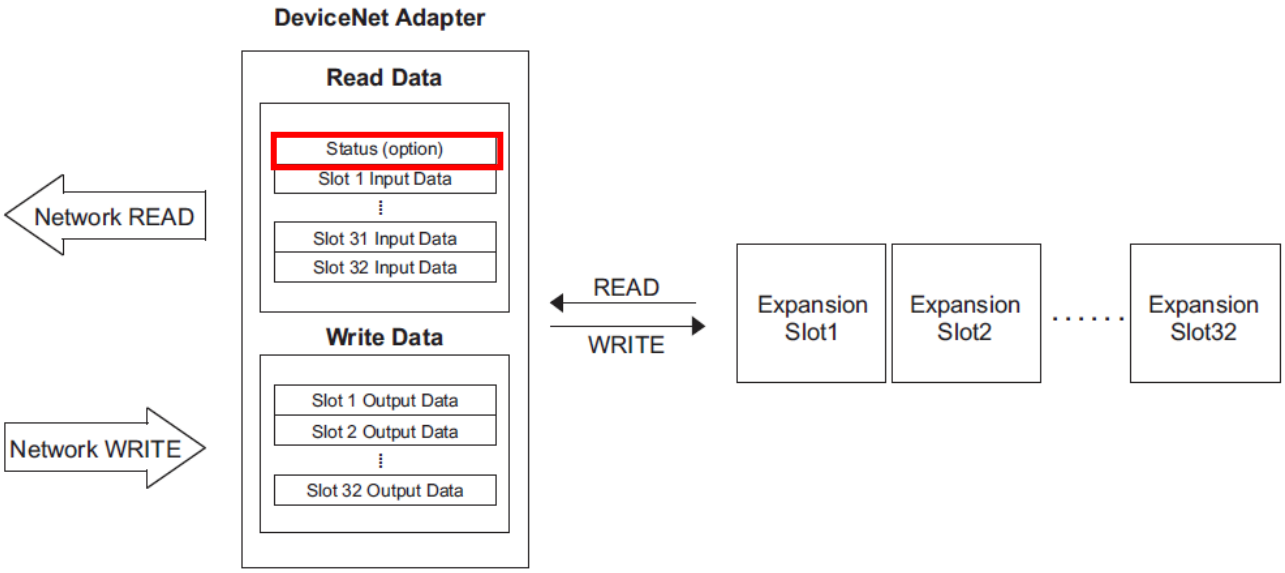
X 1 (LSD)

The above figure shows MAC ID 27(=2*10 + 7*1) of a slave

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 FnBus protocol. The following figure shows the data flow of process image between network adapter and expansion modules.



Status byte is set by default as not. How to set the Status byte is refer to 5.5.7.

Description of Status byte

Bit Description	Decimal Bit	Explanation
Explanation	00-03	0: Exchange IO data(normal operation) 1: Stop Exchanging IO(ready to exchange IO) 2: Fn-Bus Communication Fault 3: Slot Configuration Fault 4: No Expansion Slot
Reserved	04-06	Reserved
Field Power Status	07	0: 24Vdc Field Power On 1: 24Vdc Field Power Off

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	$2B_{HEX}$
FnBus Manager	Vendor-specific	1	70_{HEX}
Expansion Slot	Vendor-specific	1~32	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
FnBus Manager	Management functions for the Fn-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 Type	Value
1	1	Get	Vendor ID	UINT	741 (Crevis Co., Ltd)
	2	Get	Device Type	UINT	$0C_{HEX}$ (Communications Adapter)
	3	Get	Product Code	UINT	256(NA-9111), 257(NA-9112)
	4	Get	Revision - Major - Minor	Structure of: USINT USINT	 1 ~ 9 1 ~ 255
	5	Get	Status	WORD	Defined in Spec
	6	Get	Serial Number	UDINT	Unique Number
	7	Get	Product Name - String Length - ASCII String	Structure of: USINT STRING	24 “NA9112_DeviceNet_Adapter” or “NA9111_DeviceNet_Adapter”
	9	Get	CRC	UINT	EEPROM Checksum Code *0x11B8
	100(64h)	Get	Device Fault Code	USINT	00_{HEX} : Normal Operation Bit 0: No expansion slot Bit 1: Too many expansion slot Bit 2: Overflow I/O size Bit 3: I/O Configuration failure Bit 4: EEPROM Checksum fault Bit 6: Invalid Module ID Bit 7: Firmware fault
	Vendor-specific				
	102(66h)	Get	Firmware Code	USINT	111: NA-9111, 112 : NA-9112
	103(67h)	Get	ODVA Conformance Test Revision	UINT	0x0A17 → “A-17”
	104(68h)	Get	Firmware Release Date	UDINT	0xYYYYMMDD ex) 0x20030417 → 2003/04/17
	107(6Bh)	Get	Inspection Date	UDINT	0xYYYYMMDD

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 Type	Value
0	1	Get	Revision	UINT	02, 00

Instance Attributes

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
1	1	Get/Set*	MAC ID	USINT	0 ~ 63
	2	Get/Set**	Baud Rate	USINT	0=125K, 1=250K, 2=500K
	3	Get/Set	Bus off Interrupt	BOOL	faulted node recovery
	4	Get	Bus-Off Counter	USINT	0 ~ 255
	5	Get	Allocation Information - Allocation Choice - Master's MAC ID	Structure of: BYTE USINT	 0~63: Master MAC ID, 255: unallocated
	8	Get	MACID Switch Value	USINT	0 ~ 99 Actual value of Rotary Switch
	Vendor-specific				
	100(64h)	Get/Set	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) (Only NA-9112)	Get/Set	Quick Start, TBD	BOOL	0:Noarmal Start-up 1:Quick Start-up

*The MAC ID Rotary Switch value = 0~63: Not allowed to set the MAC ID from Network.
The MAC ID Rotary Switch value = 64~99: Allowed to set the MAC ID from Network.
Behavior: Changed new MAC ID → Device will be restarted.
**The Auto-Baud Action (attribute #100) value = 0: Not allowed to set the Baud Rate form Network
The Auto-Baud Action (attribute #100) value = 1: Allowed to set the Baud Rate form Network
Behavior: Changed new Baudrate → Device won't be restarted. (Waiting for reset service or power reset)

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	NA-9111: 38, NA-9112 : 259
	8	Get	consumed_connection_size	UINT	NA-9111: 38, NA-9112 : 259
	9	Get/Set	expacted_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	9111 : 0 to 33, 9112 : 0 to 252
	8	Get	consumed_connection_size	UINT	9111 : 0 to 32, 9112 : 0 to 252
	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	Get	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	0 to 8
	8	Get	consumed_connection_size	UINT	8
	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	9111 : 0 to 33, 9112 : 0 to 252
	8	Get	consumed_connection_size	UINT	0
	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	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	9111 : 0 to 33, 9112 : 0 to 252
	8	Get	consumed_connection_size	UINT	0
	9	Get/Set	expacted_packet_rate	UINT	Timer Resolution of 8msec * 0x00
	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: 16
	2	Get	Retry Limit	USINT	1
	3	Get	COS Producing Connection Instance	UINT	4

5.5.7. FnBus Manager Object

Class Code: 70_{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

Instance Attributes

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
1	1	Get	Number of Slot	USINT	(include deactivated slot)
	2	Get	Num of Activated Slot	USINT	
	3	Get	Num of Deactivated Slot	USINT	
	4	Get	External IDs	Array of 33 BYTE	See Table 5.6. See Appendix A.1.
	5	Get/Set*	Selection of Produced Connection Type	USINT	See Table 5.1. Valid value range is 0,1,2,3 (default 2)
	6	Get/Set*	Selection of Consumed Connection Type	USINT	See Table 5.2. Valid value range is 0,1 (default 0)
	7	Get/Set*	Slot Active Flag	DWORD	See Table 5.3
	8	Get	Slot Live List	DWORD	See Table 5.4.
	9	Get	Slot Alarm List	DWORD	See Table 5.5.
	10	Get	Fn-Bus Status	USINT	0: Normal Operation 1: Fn-Bus Standby 2: Fn-Bus Connection Fault 3: Expansion Configuration Fault 4: No Expansion Module
	11	Get	Input (Produced) Byte Size	UINT	IO input byte size(only NA-9112)
	12	Get	Output (Consumed) Byte Size	UINT	IO output byte size(only NA-9112)

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

Table 5.1. Selection of Input (Produced) Process Image Mode

Selection Input Image Mode	Description	
0	Status(1byte) + Uncompressed Input Processing Data	
1	Status(1byte) + Compressed Input Processing Data	
2	Uncompressed Input Processing Data	Default
3	Compressed Input Processing Data	

Table 5.2. Selection of Output (Consumed) Process Image Mode

Selection Output Image Mode	Description	
0	Uncompressed Output Processing Data	default
1	Compressed Output Processing Data	

Table 5.3. Slot Active Flag

DWORD(32bits)	Decimal Bit	Description
Get/Set	Bit 00	Activate/Deactivate flag for slot position #1 (0:Active, 1:Decative)
	Bit 01	Activate/Deactivate flag for slot position #2 (0:Active, 1:Decative)
	Bit 02	Activate/Deactivate flag for slot position #3 (0:Active, 1:Decative)
	. . .	. . .
	Bit 30	Activate/Deactivate flag for slot position #31 (0:Active, 1:Decative)
	Bit 31	Activate/Deactivate flag for slot position #32 (0:Active, 1:Decative)

Table 5.4. Slot Live List

DWORD(32bits)	Decimal Bit	Description
Get/Set	Bit 00	This bit is set (1) when slot position #1 is available to exchange IO
	Bit 01	This bit is set (1) when slot position #2 is available to exchange IO
	Bit 02	This bit is set (1) when slot position #3 is available to exchange IO
	. . .	. . .
	Bit 30	This bit is set (1) when slot position #31 is available to exchange IO
	Bit 31	This bit is set (1) when slot position #32 is available to exchange IO

Table 5.5. Slot Alarm List

DWORD(32bits)	Decimal Bit	Description
Get/Set	Bit 00	This bit is set (1) when an error is detected in slot position #1
	Bit 01	This bit is set (1) when an error is detected in slot position #2
	Bit 02	This bit is set (1) when an error is detected in slot position #3
	. . .	. . .
	Bit 30	This bit is set (1) when an error is detected in slot position #31
	Bit 31	This bit is set (1) when an error is detected in slot position #32

Table 5.6. External IDs (=Expansion Module ID)

Byte	Description
0	Network Adapter Module External ID = 0x00
1	External ID for slot position #1
2	External ID for slot position #2
3	External ID for slot position #3
4	External ID for slot position #4
5	External ID for slot position #5
6	External ID for slot position #6
7	External ID for slot position #7
8	External ID for slot position #8
9	External ID for slot position #9
10	External ID for slot position #10
11	External ID for slot position #11
12	External ID for slot position #12
13	External ID for slot position #13
14	External ID for slot position #14
15	External ID for slot position #15
16	External ID for slot position #16
17	External ID for slot position #17
18	External ID for slot position #18
19	External ID for slot position #19
20	External ID for slot position #20
21	External ID for slot position #21
22	External ID for slot position #22
23	External ID for slot position #23
24	External ID for slot position #24
25	External ID for slot position #25
26	External ID for slot position #26
27	External ID for slot position #27
28	External ID for slot position #28
29	External ID for slot position #29
30	External ID for slot position #30
31	External ID for slot position #31
32	External ID for slot position #32

5.5.8. Expansion Slot Object

Class Code: 71_{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

Instance Attributes

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
1~32 (Slot Address)	1	Get	Module External ID	USINT	See Appendix A.1.
	2	Get	I/O Data Code - Input Data Code - Output Data Code	Structure of: USINT USINT	See Table 5.7.
	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.
	7	Get/Set*	Active Flag	BOOL	0: This slot is activated 1: This slot is deactivated
	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.
	10	Get	Register Data Length	USINT	Refer to Configuration Parameter document
	11	Get/Set	R/W Register Data - Offset Low - Offset High - R/W Length - Write Data	Structure of: USINT USINT USINT n Byte	Read data array size defined by attribute 10. . R/W Length ≤ 32byte . Offset Length ≤ attribute 9

	15	Get/Set	R/W Maintenance Data - Module Serial ID - Offset - R/W Length - Write Data	Structure of: USINT USINT USINT n Byte	Vendor only Module Serial ID = Attribute 1 R/W Length ≤ 32byte
	100	Get	Product Code	4 Byte	See Table 5.8. And Appendix A.1.
	101	Get	Catalog Number	4 Byte	See Appendix A.1.
	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.

Table 5.7. I/O Data Code Format

Byte#	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
+0	Input Data Type		Input Data Length					
+1	Output Data Type		Output Data Length					

Input/output Type:
0 0: No I/O Data
0 1: Byte Data
1 0: Word Data
1 1: Bit Data

Input/output Data Length:
0 0 0 0 0 0 0: 0 Bit/Byte/Word
0 0 0 0 0 0 1: 1 Bit/Byte/Word
0 0 0 0 0 1 0: 2 Bit/Byte/Word
0 0 0 0 0 1 1: 3 Bit/Byte/Word
…
1 1 1 1 1 1 1: 63 Bit/Byte/Word

Table 5.8. Product Code Format

Byte#	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
+0	***Connection Type***							
+1	***Assembly Type***							
+2	***Output Information***							
+3	***Input Information***							

Connection Type

Byte#	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
+0	Reserved						**Mem**	**IO**

IO (Input/output Connection):
IO = 0: does not support Input/output Connection
IO = 1: support Input/output Connection

MEM (Memory Register Service):
MEM = 0: does not support Memory Register Service Connection
MEM = 1: support Memory Register Service Connection

Assembly Type

Byte#	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
+1	**Unit_Type**		**Priority**		**S**	Reserved		

Unit_Type:
0 0: Not Used
0 1: Input Module
1 0: Output Module
1 1: I/O Both Modules

Priority (Input/output Data Priority for assembly):
0 0: Priority 0 (low) - usually it is used by Byte/Bit Type Discrete module.
0 1: Priority 1
1 0: Priority 2 - usually it is used by Analog I/O module.
1 1: Priority 3 (high)

S (Status for Profibus Slot Diagnostic) :
0: No Status
1: Support Word Input Diagnostic(0x8000 = -32678)

for example: ST-3234(current analog input 4~20mA, 14bit)

Status	Input Data
Normal	0x0000 (4mA) ~ 0x3FFF (20mA)
Open Wire or Underrange (0~3mA)	0x8000 (-32678)

Input/ Output Information

Byte#	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
+2	**Data_Type**		**Data_Length**						Output Information
+3	**Data_Type**		**Data_Length**						Input Information

Data_Type :
0 0 : Byte Data
0 1 : Word Data
1 0 : Bit Data
1 1 : have no Input or Output Data

Data_Length :
0 0 0 0 0 0 0 : 1 Bit/Byte/Word
0 0 0 0 0 0 1 : 2 Bit/Byte/Word
0 0 0 0 0 1 0 : 3 Bit/Byte/Word
0 0 0 0 0 1 1 : 4 Bit/Byte/Word
0 0 0 0 1 0 0 : 5 Bit/Byte/Word
0 0 0 0 1 0 1 : 6 Bit/Byte/Word
0 0 0 0 1 1 0 : 7 Bit/Byte/Word
0 0 0 0 1 1 1 : 8 Byte/Word
0 0 0 1 0 0 0 : 9 Byte/Word
…
1 1 1 1 1 1 0 : 63 Byte/Word
1 1 1 1 1 1 1 : 64 Byte/Word

5.5.9. I/O Format Setting

DeviceNet I/O Data Format Setting

I/O Data Format of NA-9111/9112 can be changed by DeviceNet Configuration Software

Data format is set by change FnBUS Manager Object value in Configuration Software.

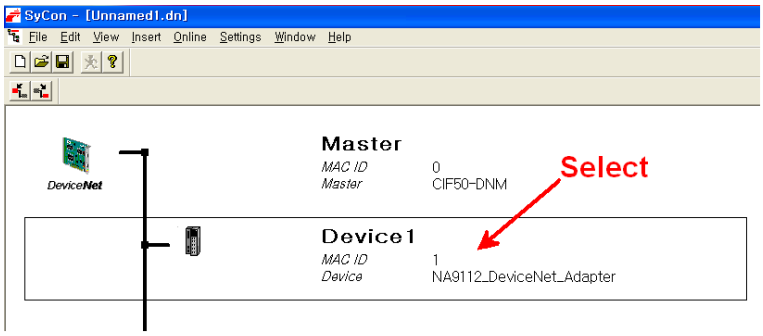
Refer FnBUS Manager Object for detail values.

5.5.9.1. Example

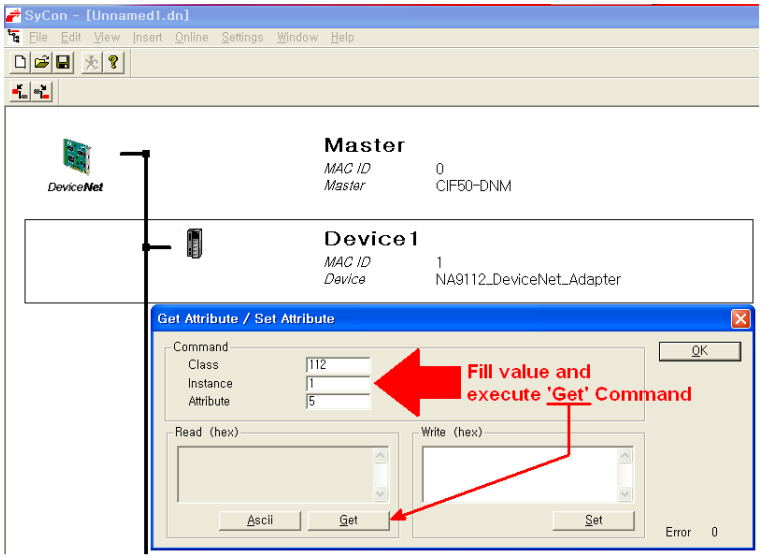
Example what Produced Connection Type of NA-9111 is changed from “Status(1byte) +Exp. Uncompressed Input Processing Data” to Exp. “Uncompressed Input Processing Data” with Sycon

Sycon

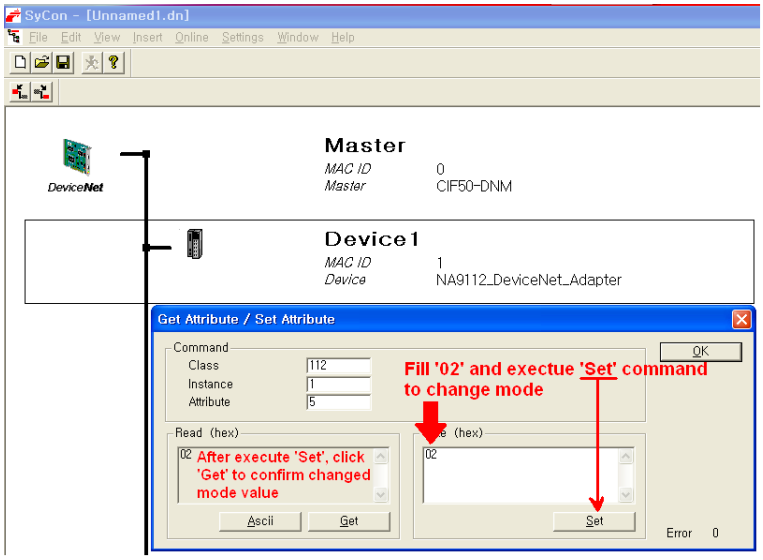
- After setting up NA-9111 and configuration system with Sycon, select NA-9111 as follows



- After Execution “Get Device Attribute / Set Device Attribute” menu in Online Menu, set 70hex(112dec) to Class Code, 1 to Instance ID, 5 to Attribute ID for ‘Change Produced Connection Type’ and execute “Get” command for confirming current value.

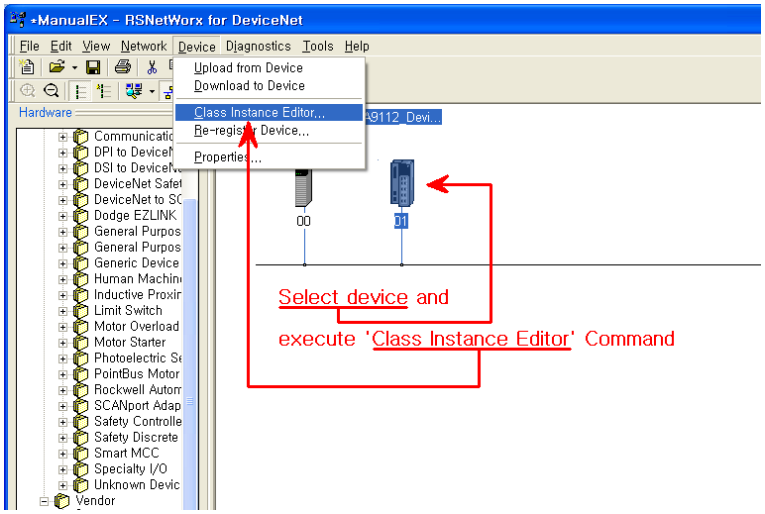


- Fill 02(refer to table 1) in setting value and execute “Set” command and then confirm what current value is 02 by executing “Get” command.

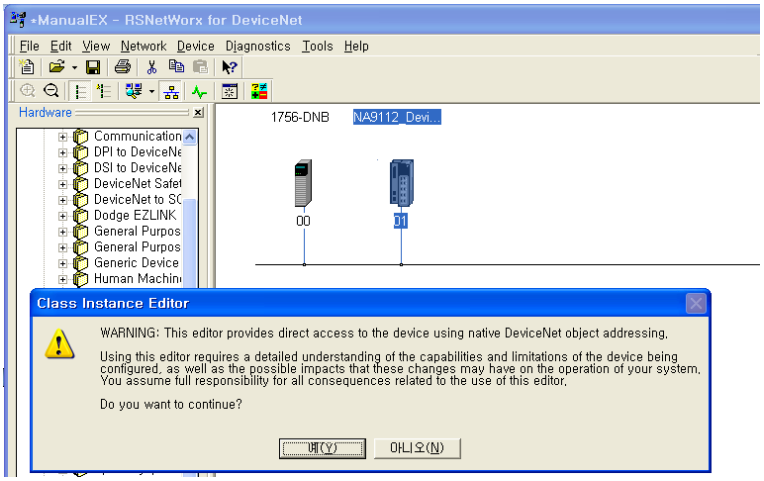


DeviceNet RSNetworx

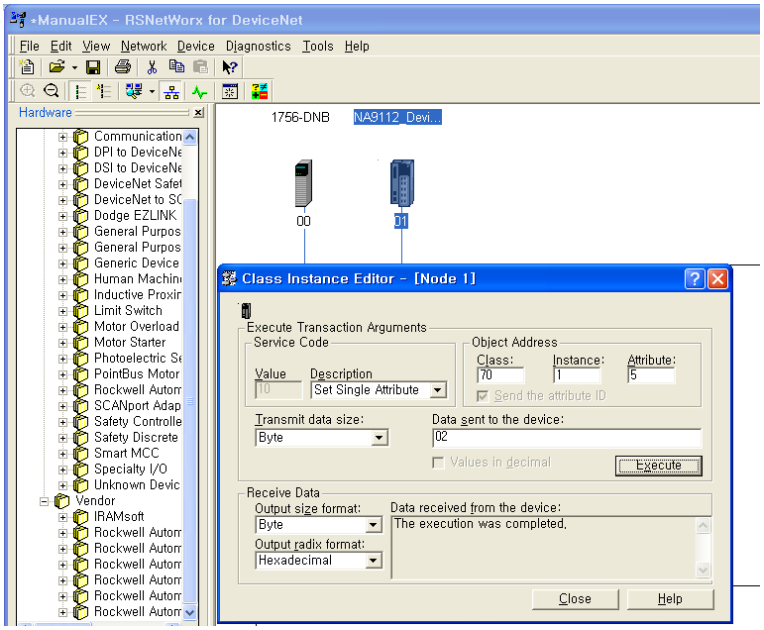
- After setting up NA-9111 and configuration system with DeviceNet RSNetworx then select NA-9111and execute ‘Class Instance Editor’ command as follows



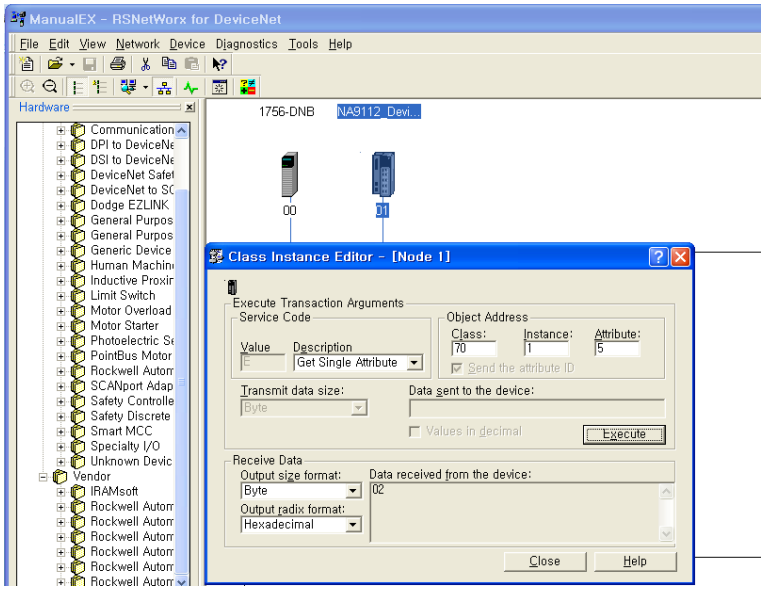
- This message is only that you have to understand its command in details. Click ‘Yes’.



- After setting below, click ‘execute’. The ‘Transmit data size’, ‘Output size format’ and ‘Output radix format is only format to show value. So that is not important. After execution if you can see ‘The execurtion was completed’ in region of ‘Data received from the device’, ‘Set’ command is completed.



- For confirming changed mode value, click ‘execute’ after setting below.



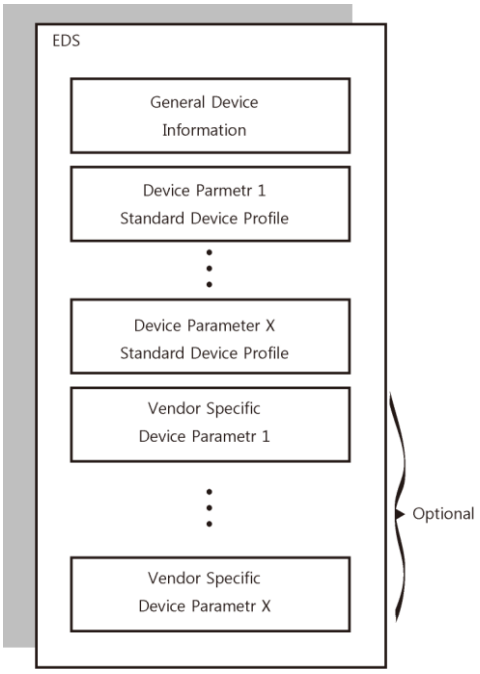
5.5.10. EDS Setting

EDS Setting

An Electronic 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 debive, including object addresses of each parameter

the application objects in a device represent the destination addresses for configuartion data. These addresses art encoded in EDS



General block diagram of an EDS fine

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.

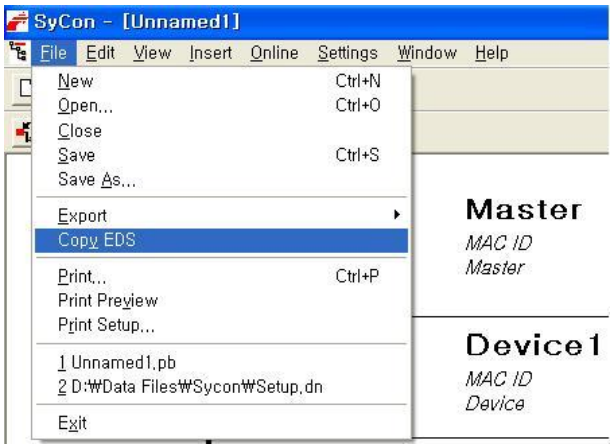
The EDS files of some vendors are available on the DeviceNet homepage http://www.odva.org or visit he homepage of the manufacturer.

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.

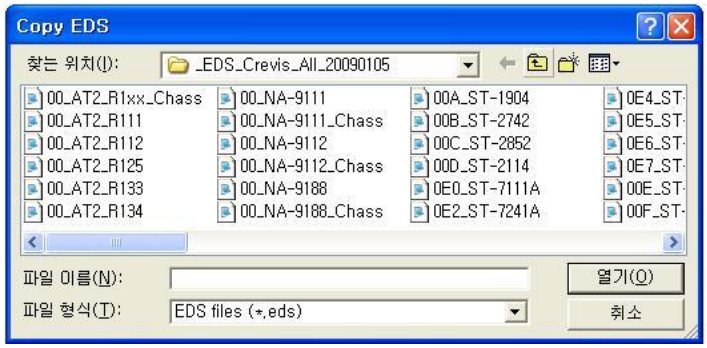
Exmple for addition EDS file with Sycon

- Execute “Copy EDS” command in File menu

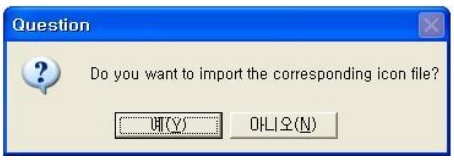


- After selection EDS file of NA-9111 and NA-9111_Chass, click “Open”.

(It is necessary to register Chassis EDS file because NA Series is product what can add Expansion Module.)

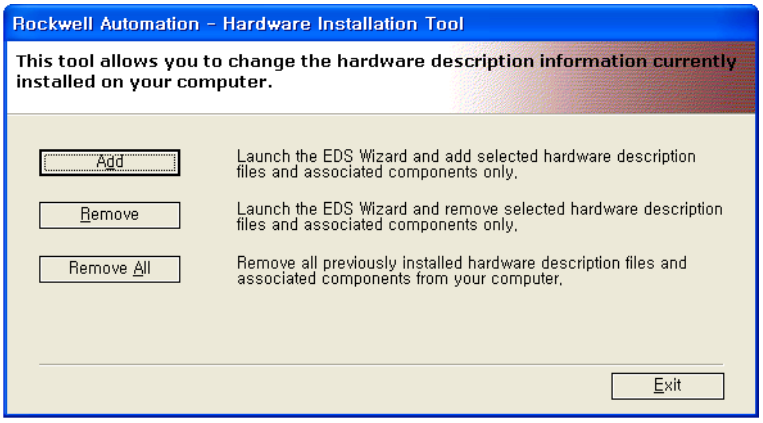


- Click Yes.

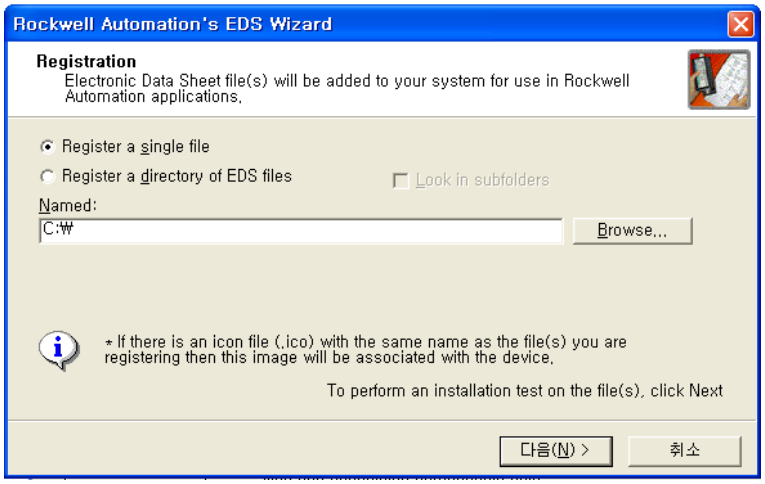


Exmple for addition EDS file with Hardware Installation Tool in RS Linx

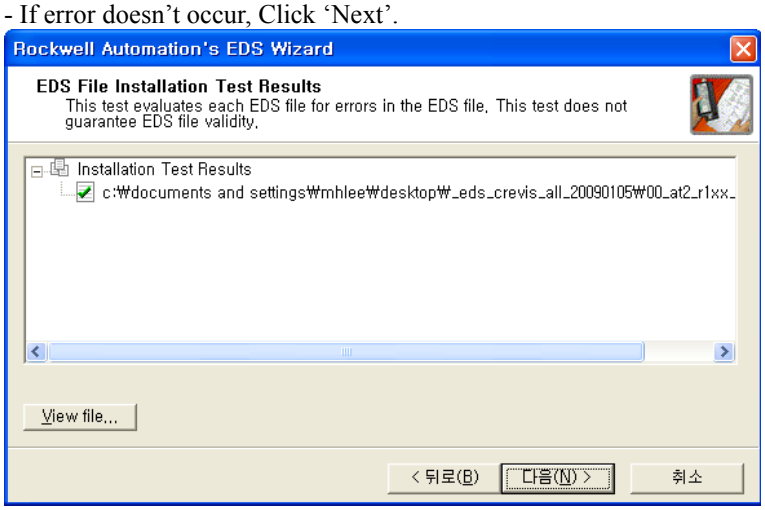
- Execute ‘Add’ command.



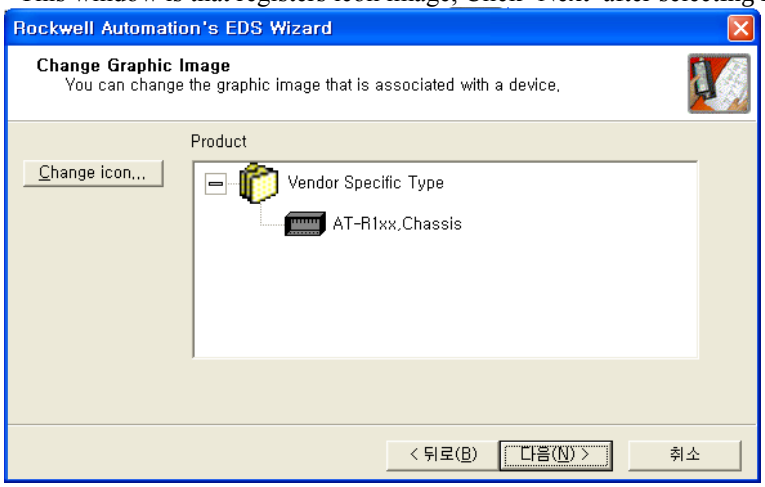
- ‘Register a single file’ is that registers one EDS file and ‘Register a directory of EDS files’ is that registers all EDS files in selected directory. In this example, it chooses ‘Register a single file’. Check ‘Register a single file’ and find out that you want to register EDS file to execute ‘Browser’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



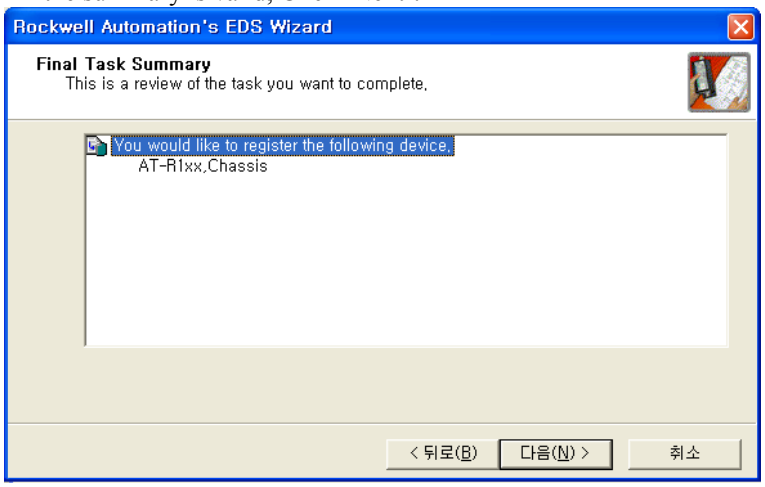
- If error doesn't occur, Click 'Next'.



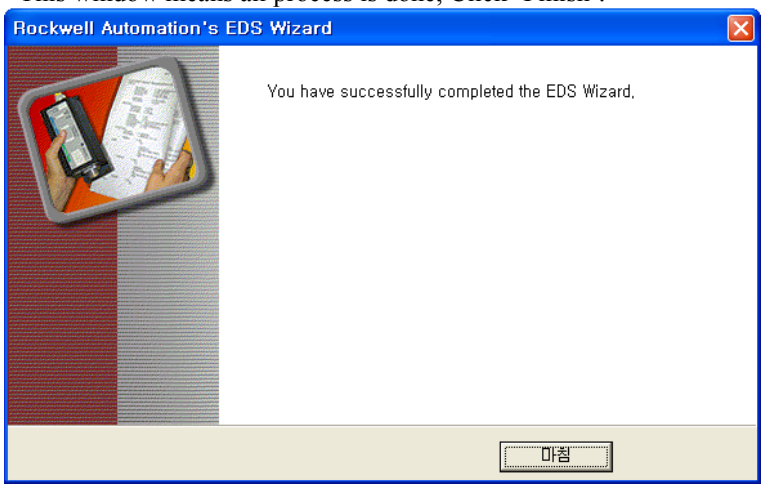
- This window is that registers icon image, Click 'Next' after selecting image.



- If the summary is valid, Click 'Next'.



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



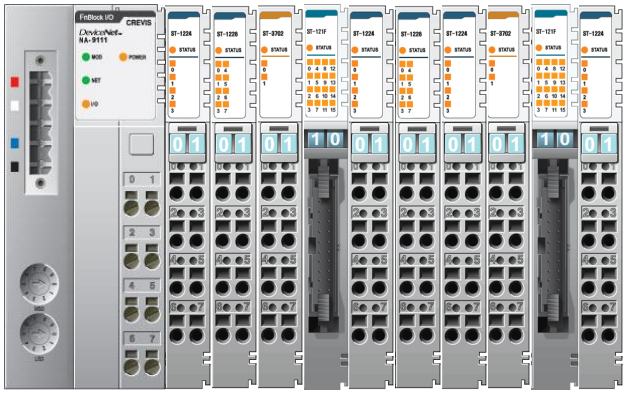
5.6. Example

5.6.1. Example of Input Process Image Map

Input image data depends on slot position and expansion slot data type. Input process image data is only ordered by expansion slot position when input image mode is uncompressed (mode 0, 2). But, when input image mode is compressed (mode 1, 3), input process image data is ordered by expansion slot position and slot data type.

Input process image mode can be set by FnBus Manager Object attribute#5.

For example slot configuration



Slot Address	Module Description
#0	DeviceNet Adapter
#1	4-discrete input
#2	8-discrete input
#3	2-analog input
#4	16-discrete input
#5	4-discrete input
#6	8-discrete input
#7	4-discrete input
#8	2-analog input
#9	16-discrete input
#10	4-discrete input

Input Process Image Mode#0 (Status(1byte) + Uncompressed Input Processing Data)

Byte	Bit 7	Bit 6	Bti 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Field Power	Fn-Bus Status						
1	Empty, Always 0				Discrete Input 4 pts (Slot#1)			
2	Discrete Input 8 pts (Slot#2)							
3	Analog Input Ch0 low byte (Slot#3)							
4	Analog Input Ch0 high byte (Slot#3)							
5	Analog Input Ch1 low byte (Slot#3)							
6	Analog Input Ch1 high byte (Slot#3)							
7	Discrete Input low 8 pts (Slot#4)							
8	Discrete Input high 8 pts (Slot#4)							
9	Empty, Always 0				Discrete Input 4 pts (Slot#5)			
10	Discrete Input 8 pts (Slot#6)							
11	Empty, Always 0				Discrete Input 4 pts (Slot#7)			
12	Analog Input Ch0 low byte (Slot#8)							
13	Analog Input Ch0 high byte (Slot#8)							
14	Analog Input Ch1 low byte (Slot#8)							
15	Analog Input Ch1 high byte (Slot#8)							
16	Discrete Input low 8 pts (Slot#9)							
17	Discrete Input high 8 pts (Slot#9)							
18	Empty, Always 0				Discrete Input 4 pts (Slot#10)			

Field Power:

0: 24Vdc Field Power On. 1: 24Vdc Field Power Off

Fn-Bus Status:

0: Normal Operation 1: Fn-Bus Standby

2: Fn-Bus Communication Fault 3: Slot Configuration Failed

4: No Expansion Slot

Status (1byte)

Input Process Image Mode#1 (Status(1byte) + Compressed Input Processing Data)

Byte	Bit 7	Bit 6	Bti 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Field Power	Fn-Bus Status						
1	Analog Input Ch0 low byte (Slot#3)							
2	Analog Input Ch0 high byte (Slot#3)							
3	Analog Input Ch1 low byte (Slot#3)							
4	Analog Input Ch1 high byte (Slot#3)							
5	Analog Input Ch0 low byte (Slot#8)							
6	Analog Input Ch0 high byte (Slot#8)							
7	Analog Input Ch1 low byte (Slot#8)							
8	Analog Input Ch1 high byte (Slot#8)							
9	Discrete Input 8 pts (Slot#2)							
10	Discrete Input low 8 pts (Slot#4)							
11	Discrete Input high 8 pts (Slot#4)							
12	Discrete Input 8 pts (Slot#6)							
13	Discrete Input low 8 pts (Slot#9)							
14	Discrete Input high 8 pts (Slot#9)							
15	Discrete Input 4 pts (Slot#5)				Discrete Input 4 pts (Slot#1)			
16	Discrete Input 4 pts (Slot#10)				Discrete Input 4 pts (Slot#7)			

Input Assembly Priority:

1) Analog Input Data (Word type)
2) 8 or 16 points Discrete Input Data (Byte type)
3) 4 points Input Data (Bit type)
4) 2 points Input Data (Bit type)

Input Process Image Mode#2 (Uncompressed Input Processing Data without Status)

Byte	Bit 7	Bit 6	Bti 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Empty, Always 0				Discrete Input 4 pts (Slot#1)			
1	Discrete Input 8 pts (Slot#2)							
2	Analog Input Ch0 low byte (Slot#3)							
3	Analog Input Ch0 high byte (Slot#3)							
4	Analog Input Ch1 low byte (Slot#3)							
5	Analog Input Ch1 high byte (Slot#3)							
6	Discrete Input low 8 pts (Slot#4)							
7	Discrete Input high 8 pts (Slot#4)							
8	Empty, Always 0				Discrete Input 4 pts (Slot#5)			
9	Discrete Input 8 pts (Slot#6)							
10	Empty, Always 0				Discrete Input 4 pts (Slot#7)			
11	Analog Input Ch0 low byte (Slot#8)							
12	Analog Input Ch0 high byte (Slot#8)							
13	Analog Input Ch1 low byte (Slot#8)							
14	Analog Input Ch1 high byte (Slot#8)							
15	Discrete Input low 8 pts (Slot#9)							
16	Discrete Input high 8 pts (Slot#9)							
17	Empty, Always 0				Discrete Input 4 pts (Slot#10)			

Input Process Image Mode#3 (Compressed Input Processing Data without Status)

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	Analog Input Ch0 low byte (Slot#3)							
1	Analog Input Ch0 high byte (Slot#3)							
2	Analog Input Ch1 low byte (Slot#3)							
3	Analog Input Ch1 high byte (Slot#3)							
4	Analog Input Ch0 low byte (Slot#8)							
5	Analog Input Ch0 high byte (Slot#8)							
6	Analog Input Ch1 low byte (Slot#8)							
7	Analog Input Ch1 high byte (Slot#8)							
8	Discrete Input 8 pts (Slot#2)							
9	Discrete Input low 8 pts (Slot#4)							
10	Discrete Input high 8 pts (Slot#4)							
11	Discrete Input 8 pts (Slot#6)							
12	Discrete Input low 8 pts (Slot#9)							
13	Discrete Input high 8 pts (Slot#9)							
14	Discrete Input 4 pts (Slot#5)				Discrete Input 4 pts (Slot#1)			
15	Discrete Input 4 pts (Slot#10)				Discrete Input 4 pts (Slot#7)			

Input Assembly Priority:

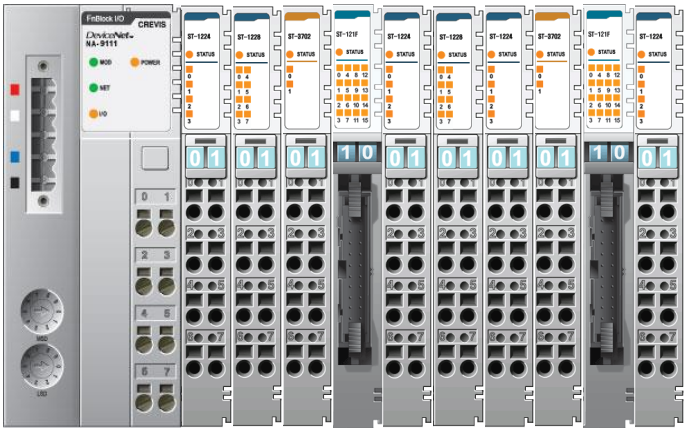
1) Analog Input Data (Word type)
2) 8 or 16 points Discrete Input Data (Byte type)
3) 4 points Input Data (Bit type)
4) 2 points Input Data (Bit type)

5.6.2. Example of Output Process Image Map

Output image data depends on slot position and expansion slot data type. Output process image data is only ordered by expansion slot position when output image mode is uncompressed (mode 0). But, when output image mode is compressed (mode 1), output process image data is ordered by expansion slot position and slot data type.

Output process image mode can be set by FnBus Manager Object attribute#6.

For example slot configuration



Slot Address	Module Description
#0	DeviceNet Adapter
#1	4-discrete output
#2	8-discrete output
#3	2-analog output
#4	16-discrete output
#5	4-discrete output
#6	8-discrete output
#7	2-realy output
#8	2-realy output
#9	2-analog output
#10	16-discrete output
#11	4-discrete output

Input Process Image Mode#0 (Status(1byte) + Uncompressed Input Processing Data)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Empty, Don't care				Discrete Output 4 pts (Slot#1)			
1	Discrete Output 8 pts (Slot#2)							
2	Analog Output Ch0 low byte (Slot#3)							
3	Analog Output Ch0 high byte (Slot#3)							
4	Analog Output Ch1 low byte (Slot#3)							
5	Analog Output Ch1 high byte (Slot#3)							
6	Discrete Output low 8 pts (Slot#4)							
7	Discrete Output high 8 pts (Slot#4)							
8	Empty, Don't care				Discrete Output 4 pts (Slot#5)			
9	Discrete Input 8 pts (Slot#6)							
10	Empty, Don't care						Discrete Output 2 pts (Slot#7)	
11	Empty, Don't care						Discrete Output 2 pts (Slot#8)	
12	Analog Output Ch0 low byte (Slot#9)							
13	Analog Output Ch0 high byte (Slot#9)							
14	Analog Output Ch1 low byte (Slot#9)							
15	Analog Output Ch1 high byte (Slot#9)							
16	Discrete Output low 8 pts (Slot#10)							
17	Discrete Output high 8 pts (Slot#10)							
18	Empty, Don't care				Discrete Output 4 pts (Slot#11)			

Output Process Image Mode#1 (Compressed Output Processing Data)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Analog Output Ch0 low byte (Slot#3)							
1	Analog Output Ch0 high byte (Slot#3)							
2	Analog Output Ch1 low byte (Slot#3)							
3	Analog Output Ch1 high byte (Slot#3)							
4	Analog Output Ch0 low byte (Slot#9)							
5	Analog Output Ch0 high byte (Slot#9)							
6	Analog Output Ch1 low byte (Slot#9)							
7	Analog Output Ch1 high byte (Slot#9)							
8	Discrete Output 8 pts (Slot#2)							
9	Discrete Output low 8 pts (Slot#4)							
10	Discrete Output high 8 pts (Slot#4)							
11	Discrete Input 8 pts (Slot#6)							
12	Discrete Output low 8 pts (Slot#10)							
13	Discrete Output high 8 pts (Slot#10)							
14	Discrete Output 4 pts (Slot#5)				Discrete Output 4 pts (Slot#1)			
15	Discrete Output 2 pts (Slot#8)		Discrete Output 2 pts (Slot#7)		Discrete Output 4 pts (Slot#11)			

Output Assembly Priority:

1) Analog Output Data (Word type)
2) 8 or 16 points Discrete Output Data (Byte type)
3) 4 points Output Data (Bit type)
4) 2 points Output Data (Bit type)

5.7. Check List

Configuration for master and slaves

Target	Description	Result
Master	Did you configurate communication baud rate?	☐
	Was communication baud rate same between master and slaves?	☐
	Did you configurate node address?	☐
	Didn't you configurate duplication node address each device?	☐
Slave	Did you configurate communication baud rate?	☐
	Were all devices same baud rate on the network?	☐
	Did you configurate node address?	☐
	Didn't you configurate duplication node address each device?	☐

Cabling

Target	Description	Result
Connector	Was connector and cable for master certainly contacted?	☐
	Was connector and cable for slave certainly contacted?	☐
	Was connector certainly connected?	☐
	Was not there risk what connector is fallen out by weight?	☐
Terminator Resistor	Did you install terminator resistor on the each edge of trunk line?	☐
Length of network	Was length of network cable in less than regular limit?	☐
Length of drop line	Was length of drop line in less than 6m?	☐
	Was total length of drop line in less than regular limit?	☐
Cable	Did you use regular cable for consumption current	☐

Power Supply

Target	Description	Result
Power capacity	Was capacity of your system considered inrush current?	☐
Isolation	Was your system isolated between AC input line and DC output line?	☐

6. Trouble Shooting

How to diagnose by LED indicator

LED Status	Cause	Action
All LED turns off	-No power	-Check main power Cable
	-System power is not supplied.	-Contact Sales team and send module for repair.
MOD LED flashes green	-Failure of initialization EEPROM parameter.	-Contact Sales team and send module for repair.
MOD LED flashes red	-Excess of expansion slot - Excess of IO size - Wrong IO composition -Occurrence of EEPROM checksum error	-Use expansion slot up to 32. -Compose that IO total size is not excess. -Check composition I/O Module
MOD LED is red	-Wrong address ID -Occurrence critical error in firmware	-Contact Sales team and send module for repair.
I/O LED turns off	-Failure of realization expansion Module -None expansion Module	-Check connector status both NA series and expansion module.
I/O LED flashes red	Failure of configuration baud rate	-Check communication cable with Master -Check power for master.
	Failure of initialization I/O	-Use expansion slot up to 32. -Compose that IO total size is not excess.
		NA series notice unidentified expansion module ID. Check status of expansion module.
I/O LED is red	Failure of exchanging I/O data	Check status of expansion IO connection.
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.

How to diagnose when device couldn’t communicate network

Inspection of wrong or omission cable connection.

- Check status of cable connection for each node.
- Check that all color matches between connector and cable.
- Check wire omission.

Terminator resistor

- If terminator resistor is not installed, install terminator resistor
- Check location of terminator resistor

Configuration of Node address

- Check duplication node address.

Configuration of Master

- Check configuration of master
- Check whether to do download or don’t
- Check composition is right
  Configuration of communication baud rate
  I/O size
  Configuration of each nodes

Ground and environment

- Check ground is contacted
- Check environment factor(temperature, humidity, etc) is in less than regular limit

Appendix

A.1. Product List

No.	ST-Number	Description	Module Id (hex)	Catalog Number	Product Code
1	ST-1214	4-sinking input, 24Vdc	03	00 03 00 41	83 C0 40 01
2	ST-1224	4-sourcing input, 24Vdc	04	00 04 00 41	83 C0 40 01
3	ST-1218	8-sinking input, 24Vdc	07	00 07 00 41	00 C0 40 01
4	ST-1228	8-sourcing input, 24Vdc	08	00 08 00 41	00 C0 40 01
5	ST-121F	16-sinking input, 24Vdc	13	00 13 01 41	01 C0 40 01
6	ST-122F	16-sourcing input, 24Vdc	14	00 14 01 41	01 C0 40 01
7	ST-1314	4-sinking input, 48Vdc	05	00 05 00 41	83 C0 40 01
8	ST-1324	4-sourcing input, 48Vdc	06	00 06 00 41	83 C0 40 01
9	ST-1804	4-ac input, 110Vac	09	00 09 00 41	83 C0 40 01
10	ST-1904	4-ac input, 220Vac	0A	00 0A 00 41	83 C0 40 01
11	ST-2314	4-sinking output, 24Vdc 0.5A	0E	00 0E 00 81	C0 83 80 01
12	ST-2324	4-sourcing output, 24Vdc 0.5A	10	00 10 00 81	C0 83 80 01
13	ST-2318	8-sinking output, 24Vdc 0.5A	11	00 11 00 81	C0 00 80 01
14	ST-2328	8-sourcing output, 24Vdc 0.5A	12	00 12 00 81	C0 00 80 01
15	ST-221F	16-sinking output, 24Vdc 0.3A	15	00 15 01 81	C0 01 80 01
16	ST-222F	16-sourcing output, 24Vdc 0.3A	16	00 16 01 81	C0 01 80 01
17	ST-2414	4-sinking output, diag, 24Vdc 0.5A	37	37 00 00 C1	83 83 C0 01
18	ST-2424	4-sourcing output, diag, 24Vdc 0.5A	38	38 00 00 C1	83 83 C0 01
19	ST-2514	4-sinking output, diag, 24Vdc 2A	35	35 00 00 C1	83 83 C0 01
20	ST-2524	4-sourcing output, diag, 24Vdc 2A	36	36 00 00 C1	83 83 C0 01
21	ST-2742	2-relay output, 230Vac 2A	0B	00 0B 00 81	C0 81 80 01
22	ST-2852	2-triac output, 120Vac 0.5A	0C	00 0C 00 81	C0 81 80 01
23	ST-3114	4-current analog input, 0~20mA, 12bit	1C	00 1C 43 41	43 C0 60 03
24	ST-3134	4-current analog input, 0~20mA, 14bit	1E	00 1E 43 41	43 C0 60 03
25	ST-3214	4-current analog input, 4~20mA, 12bit	1D	00 1D 43 41	43 C0 68 03
26	ST-3234	4-current analog input, 4~20mA, 14bit	1F	00 1F 43 41	43 C0 68 03
27	ST-3424	4-voltage analog input, 0~10V, 12bit	20	00 20 43 41	43 C0 60 03
28	ST-3444	4-voltage analog input, 0~10V, 14bit	22	00 22 43 41	43 C0 60 03
29	ST-3524	4-voltage analog input, -10~10V, 12bit	21	00 21 43 41	43 C0 60 03
30	ST-3544	4-voltage analog input, -10~10V, 14bit	23	00 23 43 41	43 C0 60 03
31	ST-3624	4-voltage analog input, 0~5V, 12bit	24	00 24 43 41	43 C0 60 03
32	ST-3644	4-voltage analog input, 0~5V, 14bit	25	00 25 43 41	43 C0 60 03
33	ST-3702	2-RTD/Resistance input	28	00 28 41 41	41 C0 68 03
34	ST-3802	2-Thermocouple/mV input	2A	00 2A 41 41	41 C0 68 03
35	ST-4112	2-current analog output, 0~20mA, 12bit	2C	00 2C 41 81	C0 41 A0 03
36	ST-4212	2-current analog output, 4~20mA, 12bit	2D	00 2D 41 81	C0 41 A0 03
37	ST-4422	2-voltage analog output, 0~10Vdc, 12bit	2E	00 2E 41 81	C0 41 A0 03
38	ST-4522	2-voltage analog output, -10~10Vdc, 12bit	2F	00 2F 41 81	C0 41 A0 03
39	ST-4622	2-voltage analog output, 0~5Vdc, 12bit	30	00 30 41 81	C0 41 A0 03
40	ST-5101	1 Channel, High Speed Counter, 5Vdc	34	34 05 01 C1	05 01 D0 03
41	ST-5111	1 Channel, High Speed Counter, 24Vdc	39	39 05 01 C1	05 01 D0 03
42	ST-5241	2-Axes Motion Controller *	41	41 07 07 C1	07 07 D0 01
43		1-channel RS232 Communication **			
44		2-channel RS232 Communication **			
45		1-channel RS422 Communication **			

46		1-channel RS485 Communication **			
47		2-channel RS485 Communication **			
48		4-input, 5Vdc **			
49		4-output, 5Vdc 20mA **			

* Under development.
** Under planning.

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.
- sinking : The method of input and output what device does not have power source.
- sourcing : The method of input and output what device have power source.