FnIO S–Series: NA-9112

DeviceNet Adapter

DOCUMENT CHANGE SUMMARY				
REV.	**PAGES**	**REMARKS**	**DATE**	**Editor**
N/A	New Document	Draft release with referring to NA-9111 Spec. by BH Kim.	2005/05/18	Go, Samsug
Draft B		Changed I/O LED, blue colored	2009/01/20	Go,Samsug

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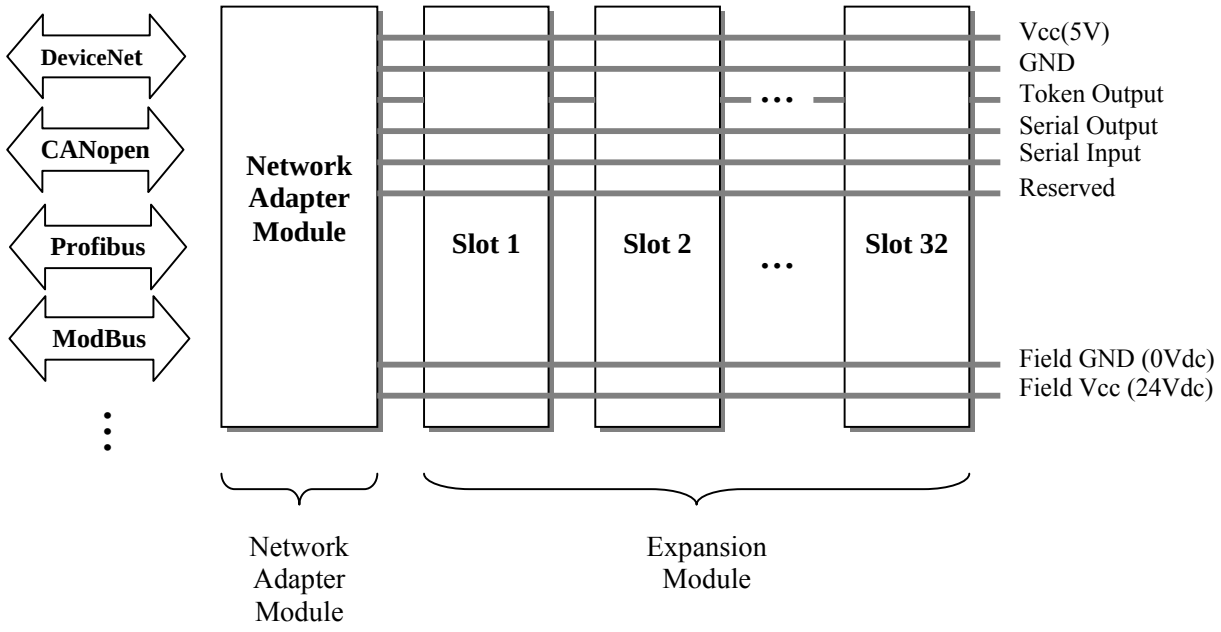
1. FNBUS OVERVIEW

1.1. FnBus System



Network Adapter Module
The Network Adapter Module forms the link between the fieldbus and the field devices with the Expansion Modules. The connection to different fieldbus systems can be established by each of the corresponding Network Adapter Module, e.g. for SynqNet, 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

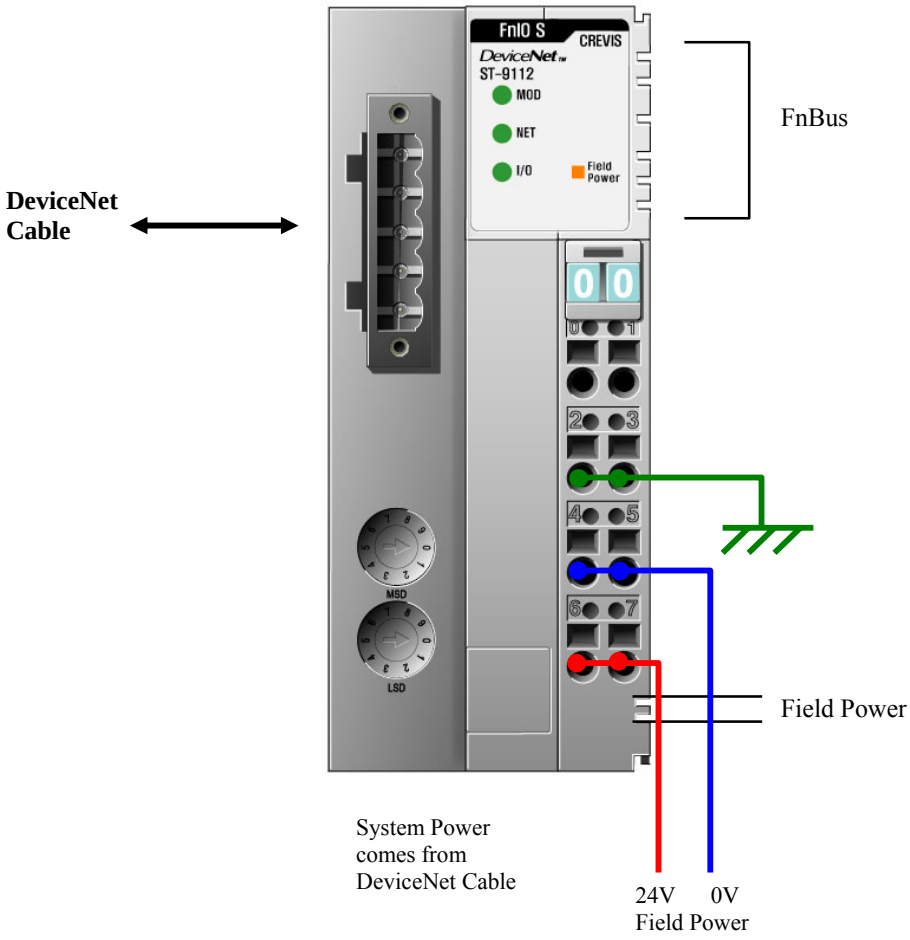
1.2. FnBus Pin Description

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).

2. DEVICENET ADAPTER MODULE

2.1. Shape

NA-9112 (DeviceNet)



2.2. DeviceNet Adapter Specification

■ **Specification**

Interface Specification, NA-9112 (DeviceNet Adapter)	
Adapter Type	Group 2 Only Slave
Max. Expansion Module	32 slots
Max. Input Size	252 bytes *
Max. Output Size	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
Indicator	4 LEDs 1 Green/Red, Module Status (MOD) 1 Green, Network Status (NET) 1 Green/Red Expansion I/O Module Status (I/O) 1 Green, Field Power Status
Module Location	Starter module – left side of FnIO system
Field Power Detection	About 11Vdc
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	1.5A @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	Refer to “Environment Specification”

* NA-9112 has same specification of NA-9111 except max input, output size.

2.3. LED Indicator

2.3.1. 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

2.3.2. Network Status LED (NET)

State	LED is :	To indicate :
Not Powered Not On-line	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

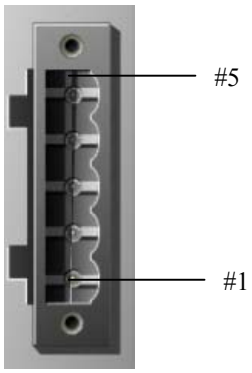
2.3.3. Expansion I/O Module Status LED (I/O)

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.

2.3.4. 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

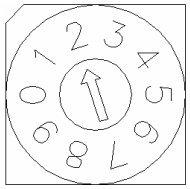
2.3.5. Adapter Electrical Interface



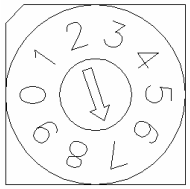
Pin#	Signal Name	Color	Description
5	V+	Red	11~28.8Vdc Power
4	CAN H	White	Transceiver High
3	Shield		Shield
2	CAN L	Blue	Transceiver Low
1	V-	Black	Power ground

2.3.6. DeviceNet MAC ID Setup

Each DeviceNet Adapter must have an 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)

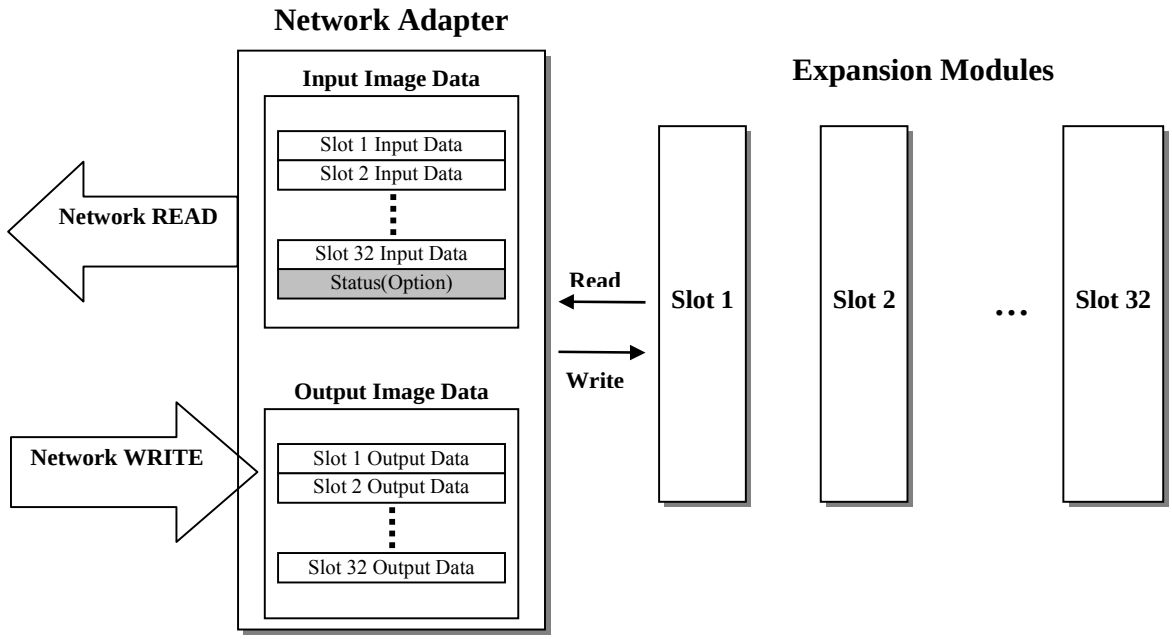


X 1 (LSD)

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

2.4. I/O Process Image Map

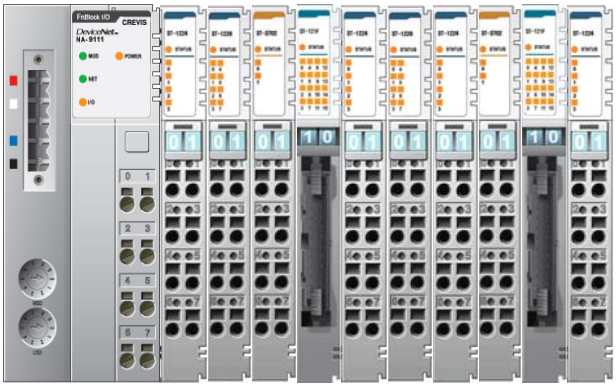
An expansion module may have 3 types of data as I/O data, configuration parameter and memory register.
The data exchange between network adapter and expansion modules is done via an I/O process image data by FnBus protocol. The following figure shows the data flow of process image between network adapter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



2.4.1. 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. Refer to 3.9.

■ **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

Status (1byte)

■ **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	FieldPower	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	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	FieldPower	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), **default input image**

Byte	Bit 7	Bit 6	Bit 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	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Analog Input Ch0 low byte (Slot#3)							
1	Analog Input Ch0 high byte (Slot#3)							

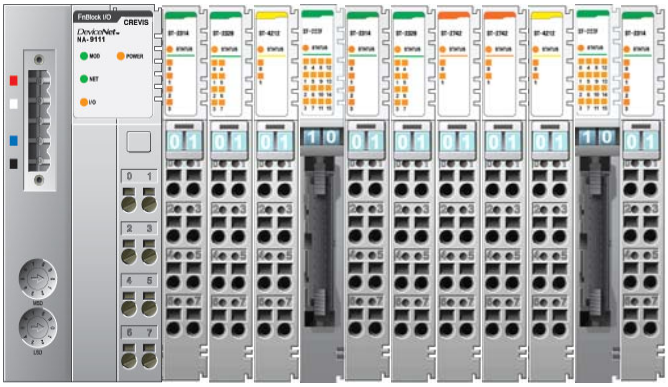
2	Analog Input Ch1 low byte (Slot#3)	
3	Analog Input Ch1 high byte (Slot#3)	
4	Analog Input Ch0 low byte (Slot#8)	
5	Analog Input Ch0 high byte (Slot#8)	
6	Analog Input Ch1 low byte (Slot#8)	
7	Analog Input Ch1 high byte (Slot#8)	
8	Discrete Input 8 pts (Slot#2)	
9	Discrete Input low 8 pts (Slot#4)	
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)

2.4.2. 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. Refer to 3.9.

- **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

- **Output Process Image Mode#0** (Uncompressed Output Processing Data), **default output image**

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)

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.

3.1. 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}

3.2. 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

3.3. Identity Object

Class Code: 01_{HEX}

3.3.1. 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	

3.3.2. Class Attributes

None

3.3.3. 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	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"
	9	Get	CRC	UINT	EEPROM Checksum Code
	100	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	Get	Firmware Code	USINT	112 : NA-9112
	103	Get	ODVA Conformance Test Revision	UINT	0x0A17 → "A-17"
	104	Get	Firmware Release Date	UDINT	0xYYYYMMDD ex) 0x20030417 → 2003/04/17
	107	Get	Inspection Date	UDINT	0xYYYYMMDD

3.4. Message Router Object

Class Code: 02_{HEX}

3.4.1. Common Services

None

3.4.2. Class Attributes

None

3.4.3. Instance Attributes

None

3.5. DeviceNet Object

Class Code: 03_{HEX}

3.5.1. 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

3.5.2. Class Attributes

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
0	1	Get	Revision	UINT	02, 00

3.5.3. 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	BOI	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	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	Get/Set	Quick Start	BOOL	0:Noarmal Start-up 1:Quick Start-up (Boot-up without Duplicate Mac message sending)

*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)

3.6. Assembly Object

Class Code: 04_{HEX}

3.6.1. Common Services

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

3.6.2. Class Attributes

None

3.6.3. Input Instance Attributes

■ **Input/Output Instance ID**

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

3.7. Connection Object

Class Code: 05_{HEX}

3.7.1. Common Services

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

3.7.2. Class Attributes

None

3.7.3. Instance Attributes for Explicit Messaging Connection

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
1	1	Get	state	USINT	Defined in Spec
	2	Get	instance_type	USINT	0: Explicit Message
	3	Get	transportClass_trigger	BYTE	83_{HEX}
	4	Get	produced_connection_id	UINT	
	5	Get	consumed_connection_id	UINT	
	6	Get	initial_comm_characteristics	BYTE	21_{HEX}
	7	Get	produced_connection_size	UINT	260
	8	Get	consumed_connection_size	UINT	260
	9	Get/Set	expacted_packet_rate	UINT	2500 (default) Timer Resolution of 8msec
	12	Get/Set	watchdog_timeout_action	USINT	1: Auto 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

3.7.4. 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	
	5	Get	consumed_connection_id	UINT	
	6	Get	initial_comm_characteristics	BYTE	01_{HEX}
	7	Get	produced_connection_size	UINT	0 to 252
	8	Get	consumed_connection_size	UINT	0 to 252
	9	Get/Set	expacted_packet_rate	UINT	Timer Resolution of 8msec
	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	

3.7.5. 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	
	5	Get	consumed_connection_id	UINT	
	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
	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	

3.7.6. 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	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

3.7.7. 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
	2	Get	instance_type	USINT	1: I/O Message
	3	Get	transportClass_trigger	BYTE	10_{HEX}
	4	Get	produced_connection_id	UINT	
	5	Get	consumed_connection_id	UINT	$0FFFF_{HEX}$
	6	Get	initial_comm_characteristics	BYTE	$0F_{HEX}$
	7	Get	produced_connection_size	UINT	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	0
	16	Get	consumed_connection_path	Array of USINT	Empty
	17	Get/Set	production_inhibit_time	UINT	00, 00

3.8. Acknowledge Handler Object

Class Code: $2B_{HEX}$

3.8.1. Common Services

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

3.8.2. Class Attributes

None

3.8.3. 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

3.9. FnBus Manager Object

Class Code: 70_{HEX}

3.9.1. Common Services

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

3.9.2. Class Attributes

None

3.9.3. 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 3.9.6. See Appendix A.1.
	5	Get/Set*	Selection of Produced Connection Type	USINT	See Table 3.9.1. Valid value range is 0,1,2,3 (default 2)
	6	Get/Set*	Selection of Consumed Connection Type	USINT	See Table 3.9.2. Valid value range is 0,1 (default 0)
	7	Get/Set*	Slot Active Flag	DWORD	See Table 3.9.3
	8	Get	Slot Live List	DWORD	See Table 3.9.4.
	9	Get	Slot Alarm List	DWORD	See Table 3.9.5.
	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
	12	Get	Output (Consumed) Byte Size	UINT	IO output byte size
	112	Set	Scan Command		Vendor only
	113	Get	Run Time Fault Code	Array of 4 USINT	Vendor only
	150	Get	FnBus Revision	UINT	Vendor only
	151	Get	Vendor Code	USINT	Vendor only
	224	Get	All ST- name	Array of UINTs	Vendor only

	226	Get	Scan Time	UINT UINT	Vendor only

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

■ **Table 3.9.1. Selection of Input (Produced) Process Image Mode**

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

■ **Table 3.9.2. Selection of Output (Consumed) Process Image Mode**

Selection Output Image Mode	Description	
0	Exp. Uncompressed Output Processing Data (default)	default
1	Exp. Compressed Output Processing Data	

■ **Table 3.9.3. 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 3.9.4. 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 3.9.5. 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 3.9.6. 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

3.10. Expansion Slot Object

Class Code: 71_{HEX}

3.10.1. Common Services

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

3.10.2. Class Attributes

None

3.10.3. 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 3.10.1.
	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 attribute 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 attribute 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	See Appendix A.2.
	9	Get/Set	R/W Configuration Data	n Byte	Data array size defined by attribute 8.
	10	Get	Register Data Length	USINT	See Appendix A.3.
	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 3.10.2. 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
	113	Get/Set	Expansion Class		Vendor only
	150	Get	FnBus Revision	Structure of: USINT USINT	Vendor only
	224	Get	ST- name	UINT	Vendor only
	225	Get	Module Descriptions	Short_String	Vendor only

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

■ **Table 3.10.1. 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 3.10.2. 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 Module

- **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

3.11. DeviceNet Reference

DeviceNet Reference Documents
http://www.odva.org

DeviceNet Tools
http://www.hilscher.com

APPENDIX A

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. Configuration Parameter

A.2.1. ST-1214 (4-sinking input, 24Vdc)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.2. ST-1224 (4-sourcing input, 24Vdc)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.3. ST-1218 (8-sinking input, 24Vdc)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.4. ST-1228 (8-sourcing input, 24Vdc)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.5. ST-121F (16-sinking input, 24Vdc)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.6. ST-122F (16-sourcing input, 24Vdc)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.7. ST-1314 (4-sinking input, 48Vdc)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.8. ST-1324 (4-sourcing input, 48Vdc)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.9. ST-1804 (4-ac input, 110Vac)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.10. ST-1904 (4-ac input, 220Vac)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.11. ST-2314 (4-sinking output, 24Vdc 0.5A)

- Valid Parameter length: 2 bytes
- Parameter Data:

Offset	Decimal Bit	Description	Default Value
0	00-03	Fault Action (ch0~ch3) 0: Fault Value, 1: Hold last state	0 (Fault Value)
	04-07	Reserved	0
1	00-03	Fault Value (ch0~ch3) 0: off, 1: on	0 (off)
	04-07	Reserved	0
2	00-07	Not used	0
3	00-07	Not used	0
4	00-07	Not used	0
5	00-07	Not used	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.12. ST-2324 (4-sourcing output, 24Vdc 0.5A)

- Valid Parameter length: 2 bytes
- Parameter Data:

Offset	Decimal Bit	Description	Default Value
0	00-03	Fault Action (ch0~ch3) 0: Fault Value, 1: Hold last state	0 (Fault Value)
	04-07	Reserved	0
1	00-03	Fault Value (ch0~ch3) 0: off, 1: on	0 (off)
	04-07	Reserved	0
2	00-07	Not used	0
3	00-07	Not used	0
4	00-07	Not used	0
5	00-07	Not used	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.13. ST-2318 (8-sinking output, 24Vdc 0.5A)

- Valid Parameter length: 2 bytes
- Parameter Data:

Offset	Decimal Bit	Description	Default Value
0	00-07	Fault Action (ch0~ch7) 0: Fault Value, 1: Hold last state	0 (Fault Value)
1	00-07	Fault Value (ch0~ch7) 0: off, 1: on	0 (off)
2	00-07	Not used	0
3	00-07	Not used	0
4	00-07	Not used	0
5	00-07	Not used	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.14. ST-2328 (8-sourcing output, 24Vdc 0.5A)

- Valid Parameter length: 2 bytes
- Parameter Data:

Parameter Data:

Offset	Decimal Bit	Description	Default Value
0	00-07	Fault Action (ch0~ch7) 0: Fault Value, 1: Hold last state	0 (Fault Value)
1	00-07	Fault Value (ch0~ch7) 0: off, 1: on	0 (off)
2	00-07	Not used	0
3	00-07	Not used	0
4	00-07	Not used	0
5	00-07	Not used	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.15. ST-221F (16-sinking output, 24Vdc 0.3A)

- Valid Parameter length: 4 bytes
- Parameter Data:

Offset	Decimal Bit	Description	Default Value
0	00-07	Fault Action (ch0~ch7) 0: Fault Value, 1: Hold last state	0 (Fault Value)
1	00-07	Fault Action (ch8~ch15) 0: Fault Value, 1: Hold last state	0 (Fault Value)
2	00-07	Fault Value (ch0~ch7) 0: off, 1: on	0 (off)
3	00-07	Fault Value (ch8~ch15) 0: off, 1: on	0 (off)
4	00-07	Not used	0
5	00-07	Not used	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.16. ST-222F (16-sourcing output, 24Vdc 0.3A)

- Valid Parameter length: 4 bytes
- Parameter Data:

Offset	Decimal Bit	Description	Default Value
0	00-07	Fault Action (ch0~ch7) 0: Fault Value, 1: Hold last state	0 (Fault Value)
1	00-07	Fault Action (ch8~ch15) 0: Fault Value, 1: Hold last state	0 (Fault Value)
2	00-07	Fault Value (ch0~ch7) 0: off, 1: on	0 (off)
3	00-07	Fault Value (ch8~ch15) 0: off, 1: on	0 (off)
4	00-07	Not used	0
5	00-07	Not used	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.17. ST-2414 (4-sinking output, Diag, 24Vdc 0.5A)

- Valid Parameter length: 2 bytes
- Parameter Data:

Offset	Decimal Bit	Description	Default Value
0	00-03	Fault Action (ch0~ch3) 0: Fault Value, 1: Hold last state	0 (Fault Value)
	04-07	Reserved	0
1	00-03	Fault Value (ch0~ch3) 0: off, 1: on	0 (off)
	04-07	Reserved	0
2	00-07	Not used	0
3	00-07	Not used	0
4	00-07	Not used	0
5	00-07	Not used	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.18. ST-2424 (4-sourcing output, Diag, 24Vdc 0.5A)

- Valid Parameter length: 2 bytes
- Parameter Data:

Offset	Decimal Bit	Description	Default Value
0	00-03	Fault Action (ch0~ch3) 0: Fault Value, 1: Hold last state	0 (Fault Value)
	04-07	Reserved	0
1	00-03	Fault Value (ch0~ch3) 0: off, 1: on	0 (off)
	04-07	Reserved	0
2	00-07	Not used	0
3	00-07	Not used	0
4	00-07	Not used	0
5	00-07	Not used	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.19. ST-2514 (4-sinking output, Diag, 24Vdc 2A)

- Valid Parameter length: 2 bytes
- Parameter Data:

Offset	Decimal Bit	Description	Default Value
0	00-03	Fault Action (ch0~ch3) 0: Fault Value, 1: Hold last state	0 (Fault Value)
	04-07	Reserved	0
1	00-03	Fault Value (ch0~ch3) 0: off, 1: on	0 (off)
	04-07	Reserved	0
2	00-07	Not used	0
3	00-07	Not used	0
4	00-07	Not used	0
5	00-07	Not used	0
6	00-07	Not used	0

7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.20. ST-2524 (4-sourcing output, Diag, 24Vdc 2A)

- Valid Parameter length: 2 bytes
- Parameter Data:

Offset	Decimal Bit	Description	Default Value
0	00-03	Fault Action (ch0~ch3) 0: Fault Value, 1: Hold last state	0 (Fault Value)
	04-07	Reserved	0
1	00-03	Fault Value (ch0~ch3) 0: off, 1: on	0 (off)
	04-07	Reserved	0
2	00-07	Not used	0
3	00-07	Not used	0
4	00-07	Not used	0
5	00-07	Not used	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.21. ST-2742 (2-relay output, 230Vac 2A)

- Valid Parameter length: 2 bytes
- Parameter Data:

Offset	Decimal Bit	Description	Default Value
0	00, 01	Fault Action (ch0, ch1) 0: Fault Value, 1: Hold last state	0 (Fault Value)
	02-07	Reserved	0
1	00, 01	Fault Value (ch0, ch1) 0: off, 1: on	0 (off)
	02-07	Reserved	0
2	00-07	Not used	0
3	00-07	Not used	0
4	00-07	Not used	0
5	00-07	Not used	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.22. ST-2852 (2-triac output, 120Vac 0.5A)

- Valid Parameter length: 2 bytes
- Parameter Data:

Offset	Decimal Bit	Description	Default Value
0	00, 01	Fault Action (ch0, ch1) 0: Fault Value, 1: Hold last state	0 (Fault Value)
	02-07	Reserved	0
1	00, 01	Fault Value (ch0, ch1) 0: off, 1: on	0 (off)
	02-07	Reserved	0
2	00-07	Not used	0
3	00-07	Not used	0
4	00-07	Not used	0

5	00-07	Not used	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.23. ST-3114 (4-current analog input, 0~20mA, 12bit)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.24. ST-3134 (4-current analog input, 0~20mA, 14bit)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.25. ST-3214 (4-current analog input, 4~20mA, 12bit)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.26. ST-3234 (4-current analog input, 4~20mA, 14bit)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.27. ST-3424 (4-voltage analog input, 0~10V, 12bit)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.28. ST-3444 (4-voltage analog input, 0~10V, 14bit)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.29. ST-3524 (4-voltage analog input, -10~10V, 12bit)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.30. ST-3544 (4-voltage analog input, -10~10V, 14bit)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.31. ST-3624 (4-voltage analog input, 0~5V, 12bit)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.32. ST-3644 (4-voltage analog input, 0~5V, 14bit)

- Valid Parameter length: 0 bytes
- Parameter Data: All of Parameter Data is not used.

A.2.33. ST-3702 (2- RTD/Resistance input)

- Valid Parameter length: 2 bytes
- Parameter Data:

Offset	**Decimal Bit**	**Description**	**Default Value**
0	00-07	The selection **Sensor Type** =00h:PT100, 0.00385, -200~850°C, 0.1°C /count =01h:PT200, 0.00385, -200~850°C, 0.1°C/count =02h:PT500, 0.00385, -200~850°C, 0.1°C/count =03h:PT1000, 0.00385, -200~350°C, 0.1°C/count =04h:PT50, 0.00385, -200~850°C, 0.1°C/count =10h:JPT100, 0.003916, -200~640°C, 0.1°C/count =11h:JPT200, 0.003916, -200~640°C, 0.1°C/count =12h:JPT500, 0.003916, -200~640°C, 0.1°C/count =13h:JPT1000, 0.003916, -200~350°C, 0.1°C/count =20h:NI100, 0.00618, -60~250°C, 0.1°C/count =21h:NI200, 0.00618, -60~250°C, 0.1°C/count =22h:NI500, 0.00618, -60~250°C, 0.1°C/count =23h:NI1000, 0.00618, -60~180°C, 0.1°C/count =30h:NI120, 0.00672, -80~250°C, 0.1°C/count =40h:CU10, 0.00427, -200~260°C, 0.1°C/count =80h:Resistance Input, 1~2000Ω, 100mΩ /1count =81h: Resistance Input, 1~327Ω, 10mΩ/1count =82h: Resistance Input, 1~620Ω, 20mΩ/1count =Others: Reserved	0: PT100
1	00	Temperature Type 0: Celsius(°C), 1: Fahrenheit(°F)	0: Celsius(°C)
	01-03	Reserved	0
	04	Filter Type 0: Normal Filter, 1: Enhanced Filter	0: Normal Filter
	05-07	Reserved	0
2	00-07	Not used	0
3	00-07	Not used	0
4	00-07	Not used	0
5	00-07	Not used	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.34. ST-3802 (2- Thermocouple/mV input)

- Valid Parameter length: 2 bytes
- Parameter Data:

Offset	Decimal Bit	Description	Default Value
0	00-07	The selection **Sensor Type** =00h: Type K, 0.1°C/count =01h: Type J, 0.1°C/count =02h: Type T, 0.1°C/count =03h: Type B, 0.1°C/count =04h: Type R, 0.1°C/count =05h: Type S, 0.1°C/count =06h: Type E, 0.1°C/count =07h: Type N, 0.1°C/count =08h: Type L, 0.1°C/count =09h: Type U, 0.1°C/count =0Ah: Type C, 0.1°C/count =0Bh: Type D, 0.1°C/count =80h: 10uV Input, -78.0~78.0mV, 10uV/count =81h: 1uV Input, -32.7~32.7mV, 1uV/count =82h: 2uV Input, -65.5~65.5mV, 2uV/count =Others: Reserved	0: Type K
1	00	Temperature Type 0: Celsius(°C), 1: Fahrenheit(°F)	0: Celsius(°C)
	01	0: Cold Junction Compensation 1: Disable Compensation	0
	02, 03	Reserved	0
	04	Filter Type 0: Normal Filter, 1: Enhanced Filter	0: Normal Filter
	05-07	Reserved	0
2	00-07	Not used	0
3	00-07	Not used	0
4	00-07	Not used	0
5	00-07	Not used	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.35. ST-4112 (2-current analog output, 0~20mA, 12bit)

A.2.36. ST-4212 (2-current analog output, 4~20mA, 12bit)

A.2.37. ST-4422 (2-voltage analog output, 0~10Vdc, 12bit)

A.2.38. ST-4522 (2-voltage analog output, -10~10Vdc, 12bit)

A.2.39. ST-4622 (2-voltage analog output, 0~5Vdc, 12bit)

- Valid Parameter length: 6 bytes
- Parameter Data:

Offset	**Decimal Bit**	**Description**	**Default Value**
0	00-01	Fault Action for channel 0 00: Fault Value, 01: Hold last state, 10: Low Limit, 11:High Limit	0 (Fault Value)
	02-03	Fault Action for channel 0 00: Fault Value, 01: Hold last state, 10: Low Limit, 11:High Limit	0 (Fault Value)
	04-07	Reserved	0
1	00-07	Reserved	0
2	00-07	Channel 0 Fault Value Low Byte	0
3	00-03	Channel 0 Fault Value High Byte	0
	04-07	Reserved	0
4	00-07	Channel 1 Fault Value Low Byte	0
5	00-03	Channel 1 Fault Value High Byte	0
	04-07	Reserved	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.2.40. ST-5101 (1 Channel High Speed Counter 5Vdc)

A.2.41. ST-5111 (1 Channel High Speed Counter 24Vdc)

- Valid Parameter length: 6 bytes
- Parameter Data:

Offset	**Decimal Bit**	**Description**	**Default Value**
0	00-03	Counter Mode	0
	04-07	Gate Function	0
1	00-03	Input Filter	0
	04-07	Gate Sampling Time	0
2	00-07	Not used	0
3	00-07	Not used	0
4	00-07	Not used	0
5	00-07	Not used	0
6	00-07	Not used	0
7	00-07	Not used	0

* All values are stored in Adapter's EEPROM.

A.3. Memory Register

A.3.1. ST-1214 (4-sinking input, 24Vdc)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.2. ST-1224 (4-sourcing input, 24Vdc)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.3. ST-1218 (8-sinking input, 24Vdc)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.4. ST-1228 (8-sourcing input, 24Vdc)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.5. ST-121F (16-sinking input, 24Vdc)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.6. ST-122F (16-sourcing input, 24Vdc)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.7. ST-1314 (4-sinking input, 48Vdc)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.8. ST-1324 (4-sourcing input, 48Vdc)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.9. ST-1804 (4-ac input, 110Vac)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.10. ST-1904 (4-ac input, 220Vac)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.11. ST-2314 (4-sinking output, 24Vdc 0.5A)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.12. ST-2324 (4-sourcing output, 24Vdc 0.5A)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.13. ST-2318 (8-sinking output, 24Vdc 0.5A)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.14. ST-2328 (8-sourcing output, 24Vdc 0.5A)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.15. ST-221F (16-sinking output, 24Vdc 0.1A)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.16. ST-222F (16-sourcing output, 24Vdc 0.1A)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.17. ST-2414 (4-sinking output, Diag, 24Vdc 0.5A)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.18. ST-2424 (4-sourcing output, Diag, 24Vdc 0.5A)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.19. ST-2514 (4-sinking output, Diag, 24Vdc 2A)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.20. ST-2524 (4-sourcing output, Diag, 24Vdc 2A)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.21. ST-2742 (2-relay output, 230Vac 2A)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.22. ST-2852 (2-triac output, 120Vac 0.5A)

- Memory Register length: 0 bytes
- Memory Register: none

A.3.23. ST-3114 (4-current analog input, 0~20mA, 12bit)

- Memory Register length: 10 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Input Data Low 8 bits	
1	R	00-03	Channel 0 Input Data High 4 bits	
		04-07	not used	0
2	R	00-07	Channel 1 Input Data Low 8 bits	
3	R	00-03	Channel 1 Input Data High 4 bits	
		04-07	not used	0
4	R	00-07	Channel 2 Input Data Low 8 bits	
5	R	00-03	Channel 2 Input Data High 4 bits	
		04-07	not used	0
6	R	00-07	Channel 3 Input Data Low 8 bits	
7	R	00-03	Channel 3 Input Data High 4 bits	
		04-07	not used	0
8	R	00-07	Reserved	0
9	R	00-07	Reserved	0

A.3.24. ST-3134 (4-current analog input, 0~20mA, 14bit)

- Memory Register length: 10 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Input Data Low 8 bits	
1	R	00-05	Channel 0 Input Data High 6 bits	
		06, 07	not used	0
2	R	00-07	Channel 1 Input Data Low 8 bits	
3	R	00-05	Channel 1 Input Data High 6 bits	
		06, 07	not used	0
4	R	00-07	Channel 2 Input Data Low 8 bits	
5	R	00-05	Channel 2 Input Data High 6 bits	
		06, 07	not used	0
6	R	00-07	Channel 3 Input Data Low 8 bits	
7	R	00-05	Channel 3 Input Data High 6 bits	
		06, 07	not used	0
8	R	00-07	Reserved	0
9	R	00-07	Reserved	0

A.3.25. ST-3214 (4-current analog input, 4~20mA, 12bit)

- Memory Register length: 10 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Input Data Low 8 bits	
1	R	00-03	Channel 0 Input Data High 4 bits	
		04-07	not used	0
2	R	00-07	Channel 1 Input Data Low 8 bits	
3	R	00-03	Channel 1 Input Data High 4 bits	
		04-07	not used	0
4	R	00-07	Channel 2 Input Data Low 8 bits	
5	R	00-03	Channel 2 Input Data High 4 bits	
		04-07	not used	0
6	R	00-07	Channel 3 Input Data Low 8 bits	
7	R	00-03	Channel 3 Input Data High 4 bits	
		04-07	not used	0
8	R	00-03	Alarm Status Bit for individual channels - Bit 00 corresponds to input channel 0, bit 01 corresponds to input channel 1, and so on. When set(1), the input signal is below the input channel's minimum range(3mA). And Input Data will be 0x8000(-32678)	
		04-07	Reserved	0
9	R	00-07	Reserved	0

A.3.26. ST-3234 (4-current analog input, 4~20mA, 14bit)

- Memory Register length: 10 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Input Data Low 8 bits	
1	R	00-05	Channel 0 Input Data High 6 bits	
		06, 07	not used	0
2	R	00-07	Channel 1 Input Data Low 8 bits	
3	R	00-05	Channel 1 Input Data High 6 bits	
		06, 07	not used	0
4	R	00-07	Channel 2 Input Data Low 8 bits	
5	R	00-05	Channel 2 Input Data High 6 bits	
		06, 07	not used	0
6	R	00-07	Channel 3 Input Data Low 8 bits	
7	R	00-05	Channel 3 Input Data High 6 bits	
		06, 07	not used	0
8	R	00-03	Alarm Status Bit for individual channels - Bit 00 corresponds to input channel 0, bit 01 corresponds to input channel 1, and so on. When set(1), the input signal is below the input channel's minimum range(3mA). And Input Data will be 0x8000(-32678)	
		04-07	Reserved	0
9	R	00-07	Reserved	0

A.3.27. ST-3424 (4-voltage analog input, 0~10V, 12bit)

- Memory Register length: 10 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Input Data Low 8 bits	
1	R	00-03	Channel 0 Input Data High 4 bits	
		04-07	not used	0
2	R	00-07	Channel 1 Input Data Low 8 bits	
3	R	00-03	Channel 1 Input Data High 4 bits	
		04-07	not used	0
4	R	00-07	Channel 2 Input Data Low 8 bits	
5	R	00-03	Channel 2 Input Data High 4 bits	
		04-07	not used	0
6	R	00-07	Channel 3 Input Data Low 8 bits	
7	R	00-03	Channel 3 Input Data High 4 bits	
		04-07	not used	0
8	R	00-07	Reserved	0
9	R	00-07	Reserved	0

A.3.28. ST-3444 (4-voltage analog input, 0~10V, 14bit)

- Memory Register length: 10 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Input Data Low 8 bits	
1	R	00-05	Channel 0 Input Data High 6 bits	
		06, 07	not used	0
2	R	00-07	Channel 1 Input Data Low 8 bits	
3	R	00-05	Channel 1 Input Data High 6 bits	
		06, 07	not used	0
4	R	00-07	Channel 2 Input Data Low 8 bits	
5	R	00-05	Channel 2 Input Data High 6 bits	
		06, 07	not used	0
6	R	00-07	Channel 3 Input Data Low 8 bits	
7	R	00-05	Channel 3 Input Data High 6 bits	
		06, 07	not used	0
8	R	00-07	Reserved	0
9	R	00-07	Reserved	0

A.3.29. ST-3524 (4-voltage analog input, -10~10V, 12bit)

- Memory Register length: 10 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Input Data Low 8 bits	
1	R	00-06	Channel 0 Input Data High 7 bits	
		07	Sign Bit	
2	R	00-07	Channel 1 Input Data Low 8 bits	
3	R	00-06	Channel 1 Input Data High 7 bits	
		07	Sign Bit	0
4	R	00-07	Channel 2 Input Data Low 8 bits	
5	R	00-06	Channel 2 Input Data High 7 bits	
		07	Sign Bit	0
6	R	00-07	Channel 3 Input Data Low 8 bits	
7	R	00-06	Channel 3 Input Data High 7 bits	
		07	Sign Bit	0
8	R	00-07	Reserved	0
9	R	00-07	Reserved	0

A.3.30. ST-3544 (4-voltage analog input, -10~10V, 14bit)

- Memory Register length: 10 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Input Data Low 8 bits	
1	R	00-06	Channel 0 Input Data High 7 bits	
		07	Sign Bit	
2	R	00-07	Channel 1 Input Data Low 8 bits	
3	R	00-06	Channel 1 Input Data High 7 bits	
		07	Sign Bit	0
4	R	00-07	Channel 2 Input Data Low 8 bits	
5	R	00-06	Channel 2 Input Data High 7 bits	
		07	Sign Bit	0
6	R	00-07	Channel 3 Input Data Low 8 bits	
7	R	00-06	Channel 3 Input Data High 7 bits	
		07	Sign Bit	0
8	R	00-07	Reserved	0
9	R	00-07	Reserved	0

A.3.31. ST-3624 (4-voltage analog input, 0~5V, 12bit)

- Memory Register length: 10 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Input Data Low 8 bits	
1	R	00-03	Channel 0 Input Data High 4 bits	
		04-07	not used	0
2	R	00-07	Channel 1 Input Data Low 8 bits	
3	R	00-03	Channel 1 Input Data High 4 bits	
		04-07	not used	0
4	R	00-07	Channel 2 Input Data Low 8 bits	
5	R	00-03	Channel 2 Input Data High 4 bits	
		04-07	not used	0
6	R	00-07	Channel 3 Input Data Low 8 bits	
7	R	00-03	Channel 3 Input Data High 4 bits	
		04-07	not used	0
8	R	00-07	Reserved	0
9	R	00-07	Reserved	0

A.3.32. ST-3644 (4-voltage analog input, 0~5V, 14bit)

- Memory Register length: 10 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Input Data Low 8 bits	
1	R	00-05	Channel 0 Input Data High 6 bits	
		06, 07	not used	0
2	R	00-07	Channel 1 Input Data Low 8 bits	
3	R	00-05	Channel 1 Input Data High 6 bits	
		06, 07	not used	0
4	R	00-07	Channel 2 Input Data Low 8 bits	
5	R	00-05	Channel 2 Input Data High 6 bits	
		06, 07	not used	0
6	R	00-07	Channel 3 Input Data Low 8 bits	
7	R	00-05	Channel 3 Input Data High 6 bits	
		06, 07	not used	0
8	R	00-07	Reserved	0
9	R	00-07	Reserved	0

A.3.33. ST-3702 (2- RTD/Resistance input)

- Memory Register length: 8 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Input Data Low 8 bits	
1	R	00-06	Channel 0 Input Data High 7 bits	
		07	Sign Bit	
2	R	00-07	Channel 1 Input Data Low 8 bits	
3	R	00-06	Channel 1 Input Data High 7 bits	
		07	Sign Bit	
4	R/W	00-07	Sensor Type (same as A.3.31)	0
5	R/W	00-07	Temperature Type (same as A.3.31)	0
6	R	00, 01	Alarm Status Bit for individual channels - Bit 00 corresponds to input channel 0, bit 01 corresponds to input channel 1. When set(1), the input signal is below the input channel's minimum range or above the input channel's maximum range. And Input Data will be 0x8000(-32678)	
		02-07	Reserved	0
7	R	00-07	Reserved	

* Offset 4,5: All values are not stored in Adapter's EEPROM.

A.3.34. ST-3802 (2- Thermocouple/mV input)

- Memory Register length: 12 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Input Data Low 8 bits	
1	R	00-06	Channel 0 Input Data High 7 bits	
		07	Sign Bit	
2	R	00-07	Channel 1 Input Data Low 8 bits	
3	R	00-06	Channel 1 Input Data High 7 bits	
		07	Sign Bit	
4	R/W	00-07	Sensor Type (same as A.3.32)	0
5	R/W	00-07	Temperature Type (same as A.3.32)	0
6	R	00, 01	Alarm Status Bit for individual channels - Bit 00 corresponds to input channel 0, bit 01 corresponds to input channel 1. When set(1), the input signal is below the input channel's minimum range or above the input channel's maximum range. And Input Data will be 0x8000(-32678)	
		02-07	Reserved	0
7	R	00, 01	Burn-Out Bit for individual channels - Bit 00 corresponds to input channel 0, bit 01 corresponds to input channel 1. When set(1), the input channel is burn-out. And Input Data will be 0x8000(-32678)	
		02-07	Reserved	0
8	R	00-07	Cold Junction Low 8 bits	
9	R	00-07	Cold Junction High 8 bits	
10	R/W	00-07	Cold Junction Offset Low 8 bits	
11	R/W	00-07	Cold Junction Offset High 8 bits	

* Offset 4,5,10,11: All values are not stored in Adapter's EEPROM.

A.3.35. ST-4112 (2-current analog output, 0~20mA, 12bit)

- Memory Register length: 12 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Output Data Low 8 bits	0
1	R	00-03	Channel 0 Output Data High 4 bits	0
		04-07	not used	0
2	R	00-07	Channel 1 Output Data Low 8 bits	0
3	R	00-03	Channel 1 Output Data High 4 bits	0
		04-07	not used	0
4	R	00-07	Reserved	0
5	R	00-07	Reserved	0
6	R/W	00-07	Fault Action (Same as A.3.35)	0
7	R/W	00-07	Reserved	0
8	R/W	00-07	Channel 0 Fault Value Low Byte (Same as A.3.35)	0
9	R/W	00-07	Channel 0 Fault Value High Byte (Same as A.3.35)	0
10	R/W	00-07	Channel 1 Fault Value Low Byte (Same as A.3.35)	0
11	R/W	00-07	Channel 1 Fault Value High Byte (Same as A.3.35)	0

* Offset 6-11: All values are not stored in Adapter's EEPROM.

A.3.36. ST-4212 (2-current analog output, 4~20mA, 12bit)

- Memory Register length: 12 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Output Data Low 8 bits	0
1	R	00-03	Channel 0 Output Data High 4 bits	0
		04-07	not used	0
2	R	00-07	Channel 1 Output Data Low 8 bits	0
3	R	00-03	Channel 1 Output Data High 4 bits	0
		04-07	not used	0
4	R	00-07	Reserved	0
5	R	00-07	Reserved	0
6	R/W	00-07	Fault Action (Same as A.3.35)	0
7	R/W	00-07	Reserved	0
8	R/W	00-07	Channel 0 Fault Value Low Byte (Same as A.3.35)	0
9	R/W	00-07	Channel 0 Fault Value High Byte (Same as A.3.35)	0
10	R/W	00-07	Channel 1 Fault Value Low Byte (Same as A.3.35)	0
11	R/W	00-07	Channel 1 Fault Value High Byte (Same as A.3.35)	0

* Offset 6-11: All values are not stored in Adapter's EEPROM.

A.3.37. ST-4422 (2-voltage analog output, 0~10Vdc, 12bit)

- Memory Register length: 12 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Output Data Low 8 bits	0
1	R	00-03	Channel 0 Output Data High 4 bits	0
		04-07	not used	0
2	R	00-07	Channel 1 Output Data Low 8 bits	0
3	R	00-03	Channel 1 Output Data High 4 bits	0
		04-07	not used	0
4	R	00-07	Reserved	0
5	R	00-07	Reserved	0
6	R/W	00-07	Fault Action (Same as A.3.35)	0
7	R/W	00-07	Reserved	0
8	R/W	00-07	Channel 0 Fault Value Low Byte (Same as A.3.35)	0
9	R/W	00-07	Channel 0 Fault Value High Byte (Same as A.3.35)	0
10	R/W	00-07	Channel 1 Fault Value Low Byte (Same as A.3.35)	0
11	R/W	00-07	Channel 1 Fault Value High Byte (Same as A.3.35)	0

* Offset 6-11: All values are not stored in Adapter's EEPROM.

A.3.38. ST-4522 (2-voltage analog output, -10~10Vdc, 12bit)

- Memory Register length: 12 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Output Data Low 8 bits	0
1	R	00-03	Channel 0 Output Data High 4 bits	0
		04-07	not used	0
2	R	00-07	Channel 1 Output Data Low 8 bits	0
3	R	00-03	Channel 1 Output Data High 4 bits	0
		04-07	not used	0
4	R	00-07	Reserved	0
5	R	00-07	Reserved	0
6	R/W	00-07	Fault Action (Same as A.3.35)	0
7	R/W	00-07	Reserved	0
8	R/W	00-07	Channel 0 Fault Value Low Byte (Same as A.3.35)	0
9	R/W	00-07	Channel 0 Fault Value High Byte (Same as A.3.35)	0
10	R/W	00-07	Channel 1 Fault Value Low Byte (Same as A.3.35)	0
11	R/W	00-07	Channel 1 Fault Value High Byte (Same as A.3.35)	0

* Offset 6-11: All values are not stored in Adapter's EEPROM.

A.3.39. ST-4622 (2-voltage analog output, 0~5Vdc, 12bit)

- Memory Register length: 12 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Channel 0 Output Data Low 8 bits	0
1	R	00-03	Channel 0 Output Data High 4 bits	0
		04-07	not used	0
2	R	00-07	Channel 1 Output Data Low 8 bits	0
3	R	00-03	Channel 1 Output Data High 4 bits	0
		04-07	not used	0
4	R	00-07	Reserved	0
5	R	00-07	Reserved	0
6	R/W	00-07	Fault Action (Same as A.3.35)	0
7	R/W	00-07	Reserved	0
8	R/W	00-07	Channel 0 Fault Value Low Byte (Same as A.3.35)	0
9	R/W	00-07	Channel 0 Fault Value High Byte (Same as A.3.35)	0
10	R/W	00-07	Channel 1 Fault Value Low Byte (Same as A.3.35)	0
11	R/W	00-07	Channel 1 Fault Value High Byte (Same as A.3.35)	0

* Offset 6-11: All values are not stored in Adapter's EEPROM.

A.3.40. ST-5101 (1 Channel High Speed Counter 5Vdc)

A.3.41. ST-5111 (1 Channel High Speed Counter 24Vdc)

- Memory Register length: 24 bytes
- Memory Register:

Offset	Access	Decimal Bit	Description	Default Value
0	R	00-07	Current count value Low byte	0
1	R	00-07	Current count value Middle byte	0
2	R	00-07	Current count value High byte	0
3	R	00-07	Always 0	0
4	R	00-07	Status Low (compared flags)	0
5	R	00-07	Status High (same as LED display)	0
6	R	00-07	Output Terminal (OT) Control	0
7	R	00-07	SSR(Special Selection Register)	0
8	R/W	00-07	Gate Function/Counter Mode (Same as A.3.36)	0
9	R/W	00-07	Gate Sampling Time/Input Filter (Same as A.3.36)	0
10	R/W	00-07	Don't care	0
11	R/W	00-07	Don't care	0
12	R	00-07	Stored count value Low byte	0
13	R	00-07	Stored count value Middle byte	0
14	R	00-07	Stored count value High byte	0
15	R	00-07	Always 0	0
16	R/W	00-07	Initial Counter Value Low byte (Initial counter or PWM Frequency value)	0
17	R/W	00-07	Initial Counter Value Middle byte (Initial counter or PWM Frequency value)	0
18	R/W	00-07	Initial count value High byte (Initial counter or PWM Frequency value)	0
19	R/W	00-07	Always 0	0

20	R/W	00-07	Compare count value Low byte	0
21	R/W	00-07	Compare count value Middle byte	0
22	R/W	00-07	Compare count value High byte	0
23	R/W	00-07	Always 0	0

* Offset 8-9: All values are not stored in Adapter's EEPROM.