No.EX##-OMK1009-A

Operation Manual

DeviceLogix™ SI Unit

PRODUCT NAME

EX250-SDL1-X142

MODEL/ Series

Output Block

PRODUCT NAME

EX9-OET1-X9

MODEL/ Series

SMC Corporation

Table of Contents

Safety Instructions

This manual contains essential information regarding proper handing and operation of the unit intended to prevent possible injury and damage to people and property.
Please review and understand the following messages (signs) before reading the remaining the text, and always follow the instructions.
Also carefully read the instruction manual for any relevant equipment or apparatus before use.

Indications

IMPORTANT MESSAGES	
Read this manual and follow the instructions. Signal words such as WARNING, CAUTION and NOTE, will be followed by important safety information that must be carefully reviewed.	
⚠WARNING	Indicates a potentially hazardous situation which could result in death or serious injury if you do not follow instructions.
⚠CAUTION	Indicates a potentially hazardous situation which if not avoided, may result in minor injury or moderate injury.
NOTE	Gives you helpful information.

Operator

- This manual has been written for those who have knowledge of machinery and apparatuses that use pneumatic equipment and have full knowledge of assembly, operation and maintenance of such equipment.
- Please carefully read and understand this manual before assembling, operating or performing maintenance on the SI Unit.

Usage Restrictions

- This product is designed to be used in general equipment for factory automation. Never use this product with equipment or apparatus that directly concerns human lives*1, or in which a malfunction or failure can cause a great loss.
  *1:Equipment or apparatus that directly concerns human lives refers to the following:
  - Medical equipment such as life support systems or equipment used in operating rooms
  - Compulsory equipment required by law such as the Fire Prevention Law, Construction Law and etc.
  - Equipment or apparatus that conforms with those mentioned above.
- Contact our sales department when plans are made for the product to be used for the system*2 including equipment that concerns itself with the safety of persons or that seriously affects the public. Such usage requires special consideration*3.
  *2:A system or equipment that concerns itself with the safety of persons or that seriously affects the public refers to the following:
  - Nuclear reactor control systems in a nuclear power plants, safety protection systems or other systems important for safety in nuclear power facility
  - Driving control system for a mass transportation system, and flight control systems
  - Equipment or apparatuses that comes in contact with foods or beverages

  *3:Special consideration refer to discussing usage with our engineers to establish a safe system designed as fool-proof, fail-safe, redundant and etc.
- Special consideration*4 should be taken regarding safety or maintainability to prevent a failure or malfunction which can cause a hazard or less. That is likely to occur under certain environmental stress (deterioration).
  *4:Special consideration means to fully review the equipment or apparatus in design stage and to establish a back up system in advance, such as a redundant system or fail-safe system.

⚠WARNING

1.The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.
Since the products specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and / or tests to meet your specific requirements.

2.Only trained personnel should operate pneumatically operated machinery and equipment.
Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3.Do not service machinery / equipment or attempt to remove components until safety is confirmed.
- Inspection and maintenance of machinery /equipment should only be performed after confirmation of safe locked-out control positions.
- When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for the equipment and exhaust all residual compressed air in the system.
- Before machinery / equipment is re-started, take measures to prevent quick extensions of the cylinder piston rod etc. (Bleed air info the system gradually to create back-pressure.)

4.Contact SMC if the product is to be used in any of the following conditions:
- Conditions and environments beyond the given specifications, or if product is used outdoors. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, or safety equipment.
- An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

♦ Do not disassemble, modify (including printed circuit board) or repair.
An injury or failure can result.

♦ Do not operate outside of the specification range.
Fire, malfunction or SI unit damage can result.
In this case, please use it only after confirming the specification.

♦ Do not use the product in environments with possible presence of flammable, explosive or corrosion gas.
Otherwise fire, explosion or corrosion can result.
The product is not designed to be explosion proof.

♦ Do not apply voltage exceeding 250V between a lead wire and a metal fitting.
- Pay attention to perform an insulation test because it could damage an insulation of the lead wire and accordingly cause failure and generate heat and smoke.

♦ These instructions must be followed when using the production in an interlocking circuit:
- Provide double interlocking thorough another system such as mechanical protection
- Check the product regularly to ensure proper operation

Otherwise a malfunction can cause an accident.

♦ These instruction must be followed while in maintenance:
- Turn off the power supply
- Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance work.

Otherwise it can cause injury.

⚠CAUTION

♦ Perform proper functional checks after completing maintenance work.
Stop operation when an abnormality is observed or the product is not working properly.
Safety cannot be secured due to unexpected malfunctions.

NOTE

♦ Follow the instructions given below when handling reduced-wiring system:
Or it will have a risk of being damaged and operating failure.
♦ The instructions on selection (installation, wiring, environment of use, adjustment, operation and maintenance) described below must also be followed.

∗Product specifications
• The direct-current power supply should be UL approved, and meet both of the following:
(1)Limited voltage current circuit in accordance with UL508
A circuit in which power is supplied by the secondary coil of a transformer and meets the following conditions:
· Maximum voltage (with no load) : less than 30Vrms (42.4V peak)
· Maximum current : (1) less than 8A(including when short circuited)
(2) limited by circuit protector (such as fuse) with the following ratings

No load voltage (V peak)	Max. current rating (A)
0 to 20 [V]	5.0
Above 20 to 30 [V]	100 / peak voltage

(2)A circuit using max. 30Vrms or less (42.4V peak), which power is supplied by Class-2 power supply unit in accordance with UL1310 or UL1585
• Operate reduced-wiring system with the specified voltage.
Operation with a voltage beyond specifications could cause malfunction or damage of the unit.
• Reserve a space for maintenance
Be sure to keep a space for maintenance when designing layout of the unit.
• Do not remove the nameplate.
Otherwise a maintenance error and/or misreading of the operation manual could cause damage or malfunction.
It may also result in nonconformance of safety standards.

♦ Handling Precautions

∗Installation
• Do not drop, hit or apply excessive shock to the unit. Doing so may result in damage to the unit.

• Tighten screws to the specified torque to guarantee IP40 protection.
Excessive tightening torque can break screws.

∗Wiring (including plugging in/out of connectors)
• Do not bend the cables or apply excessive force to them by pulling or placing heavy load.
Wiring subject to bending or tensile stress could cause the cables to break.
• Connect wires and cables correctly.
Incorrect wiring could permanently damage the system.
• Do not connect wires while the power is supplied.
Connecting live wires could permanently damage the system.
• Do not route power or high-voltage cables in the same wiring duct as those which service the EX250.
Otherwise noise or induced surge voltage from power or high-voltage lines could be coupled into the EX250, and cause malfunction.
Physically separate the wiring to the unit and each I/O device from power and high voltage lines.

•Verify the integrity of the wiring insulation.
Insulation failure (interference with other circuits, poor insulation between terminals etc.) could introduce excessive voltage or current to the reduced-wiring system or each I/O device and damage them.
•Separate power cables for solenoid valves from power cables for input and control unit.
Otherwise noise or induced surge voltage can be coupled to the EX250 causing malfunction.
•Take proper precaution (such as a line noise filter) to protect against noise when the EX250 is incorporated into equipment or devices.
Otherwise contamination with noise may cause malfunction.

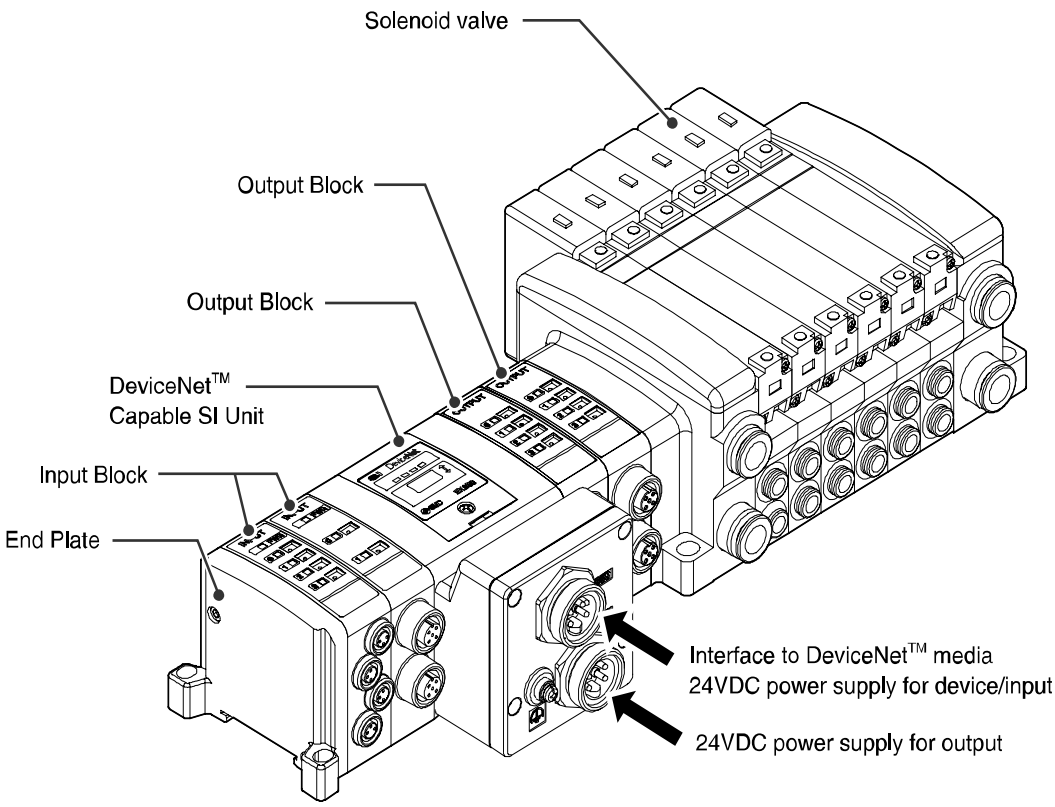
∗Environment
•Select an operation environment according to enclosure. (IP40)
•Take sufficient shielding measures when the unit is installed.
Insufficient measures could cause malfunction or failure.
Avoid installing the unit in the following locations.
(1) A place where noise due to static electricity is generated
(2) A place where electric field strength is high
(3) A place where there is radioactive irradiation
(4) A place near a high power line
•Do not use the unit near a source of excessive electrical surge.
Internal circuit elements of the EX250 can deteriorate or break down when subject to a large surge (electromagnetic lifter, high frequency induction furnace, motor, etc.) Provide surge protection, to protect against power line interference.
•Incorporate surge suppression (i.e. anti-flyback diode) to protect against a surge-generating loads such as solenoid valve(most SMC valves incorporate an internal surge suppression device)
•Prevent foreign matter such as remnant wires from entering the unit.
Take proper measures for the remnant material not to enter the reduced-wiring system in order to prevent failure or malfunction.
•Do not expose the EX250 to vibration and impact.
Otherwise failure or malfunction could be caused.
•Keep the specified ambient temperature range.
Otherwise malfunction could result.
Do not use the EX250 in a place where temperature suddenly changes even within the specified range.
•Do not expose the reduced-wiring system to heat radiation from a heat source.
Malfunction could be caused.

∗Adjustment and Operation
•Use precision screwdriver with a small flat blade for setting the Rotary switch (where applicable).

∗Maintenance
•Perform maintenance and check regularly.
Otherwise an unexpected malfunction of components could occur due to a malfunction of the whole unit.
•Perform a proper functional check.
Stop operation when an abnormality is observed such that the device doesn't work properly.
Otherwise an unexpected malfunction of the unit component can occur.
•Do not use solvents such as benzene, thinner or others to clean the EX250.
They could damage the surface of the body and erase the labels on the body.
Use a soft cloth to remove stains. For heavy stains, use a cloth soaked with diluted neutral detergent. Fully squeeze, then wipe up the stains again with a dry cloth.

Overview

Product Overview



The EX250-SDL1-X142 is a DeviceNet™ SI (Serial Interface) unit with built-in DeviceLogix™ function. It is an integral component of a system comprising pneumatic valve and manifold, as well as electrical discrete Input and Output Block components.
The system with built-in DeviceLogix™ function is a flexible, modular, and low cost valve I/O system for distributed pneumatic and/or electrical control applications.
SMC EX250-SDL1-X142 SI Unit can interface with up to 8 input blocks and up to 2 output blocks and 16 valves on single solenoid valve manifold blocks or 8 valves on double solenoid valve manifold blocks, for a maximum of 32 inputs and 24 outputs per valve I/O assembly.
Up to 48 consumed data bits and 40 produced data bits can be addressed on a single network node.
SMC DeviceLogix™ capable devices can support a total of 72 function blocks for local logic programming.
Built-in output short-circuit protection protects outputs against miswiring.
The SMC DeviceLogix™ capable pneumatic valve I/O system is ideal as an alternative for air logic control systems.
It is also well suited for applications that require quick and localized response to input events. without the sense-to-actuation delay imposed by network round-trip polling times.
It is also ideal for critical applications where an interruption in the network would stop a portion of the control system from functioning as it should.

DeviceLogix™ technology overview

DeviceLogix™ technology, developed by Rockwell Automation, Inc., enables a DeviceNet™ node to function autonomously from the network and provides control outputs and management of status information locally within the device for quick response, reduced network traffic, and a smaller control program.
Users can enable logic operation using the DeviceLogix™ Editor from Rockwell Automation, Inc. (i.e. RSNetWorx™ for DeviceNet™ version 3.0 or above).
DeviceLogix™ Editor from Rockwell Automation, Inc. is a software tool that provides a graphical interface for configuration of Function Blocks or Ladder Logic to provide local control within DeviceLogix™ capable devices. (Note, Ladder Logic is available with RSNetWorx™ for DeviceNet™ version 6.0 or above)

Refer to the following Rockwell Automation's user manual for detail information about DeviceLogix™ Editor.

Function Block User Manual : doc.# ACIG-UM001B-EN-P

Ladder Editor User Manual : doc.# ACIG-UM002A-EN-P

Applicable valves, I/O blocks

Applicable Solenoid Valve

VQC Series	VQC1000 (*), VQC2000 (*), VQC4000
SV Series	SV1000, SV2000, SV3000

(Note*) Negative common valve only

Applicable Output Block

Part Number	Description	Outputs	Connector	Polarity
EX9-OET1-X9	Digital Output	4	M12 female	-COM

Applicable Input Block

Part Number	Description	Inputs	Connector	Polarity
EX250-IE1-X141	Digital Input	2	M12 female	NPN/PNP
EX250-IE2-X141	Digital Input	4	M12 female	NPN/PNP
EX250-IE3-X141	Digital Input	4	M8 female	NPN/PNP

See the EX250 Series Input Block Technical Specification document,
Doc# : EX_-OME0004-A for details.

Glossary

No.	Term	Description
1	SI unit	Serial Interface unit, is a fieldbus adapter which provides control and management of discrete I/O
2	Input Block	EX250 series Discrete Input Block
3	Output Block	EX9 series Discrete Output Block
4	Status bits	Internal inputs which supply diagnostic message
5	DeviceLogix™	DeviceLogix™ technology, developed by Rockwell Automation, Inc., that enables a DeviceNet™ node to function autonomously (stand alone) from the network
6	Binding	A binding specifies the interconnection between logic elements such as function blocks and I/O points
7	Function Block	Function block programming is one of five languages for logic or control configuration supported by standard IEC 61131-3 for a control system such as a Programmable Logic Controller (PLC) or a Distributed Control System (DCS). A function block diagram describes a function between input variables and output variables. A function is described as a set of elementary blocks. Input and output variables are connected to blocks by connection lines.
8	Ladder Logic	Ladder logic is one of five languages for logic or control configuration supported by standard IEC 61131-3 for a control system such as a Programmable Logic Controller (PLC) or a Distributed Control System (DCS). It is a method of drawing electrical logic schematics and programs which resembles a ladder, with two vertical "rails" and a series of "rungs" between them.
9	Boolean	A boolean value is a truth value, either "true" or "false", often coded 1 and 0, respectively.
10	Bistable	Simple electronic circuit that remains in one of two stable states until it receives a pulse (logic 1 signal) through one of its inputs, upon which it switches, or ‘flips’, over to the other state.
11	AND	AND Function Block
12	OR	OR Function Block
13	XOR	Exclusive OR Function Block
14	NAND	Negative output AND Function Block
15	NOR	Negative output OR Function Block
16	XNOR	Negative output exclusive OR Function Block
17	RSL	SR (set dominant)-Latch Function Block
18	SRL	RS (reset dominant)-Latch Function Block
19	PUL	Pulse Timer Function Block
20	OND	On Delay Timer Function Block
21	OFD	Off Delay Timer Function Block
22	UPC	Up Counter Function Block
23	UPD	Up Down Counter Function Block

No.	Term	Description
24	DeviceNet™	DeviceNet™ is a digital, multi-drop network that connects and serves as a communication network between industrial controllers and I/O devices.
25	MAC ID	The MAC ID is a unique number that the adapter uses to identify itself on the network.
26	Bus off	Bus Off - A node in the bus off state is not allowed to have any influence on the bus. It is logically disconnected from the network.
27	Object	An abstract representation of a particular component within a product.
28	Class	A set of objects that all represent the same kind of system component. A class is a generalization of an object. All objects in a class are identical in form and behavior, but may contain different attribute values.
29	Instance	A specific and real (physical) occurrence of an object. The terms Object, Instance, and Object Instance all refer to a specific Instance.
30	Attribute	A description of an externally visible characteristic or feature of an object. Typically, attributes provide status information or govern the operation of an Object.
31	Behavior	A specification of how an object acts.
32	Service	A function supported by an object and/or object class.

Product part numbering

EX250-SDL1-X142

Special specification

142	Mini style (7/8 inch)connector

Communication Protocol

DL1	DeviceNet™ with DeviceLogix™ function

EX9-OET1-X9

Special specification

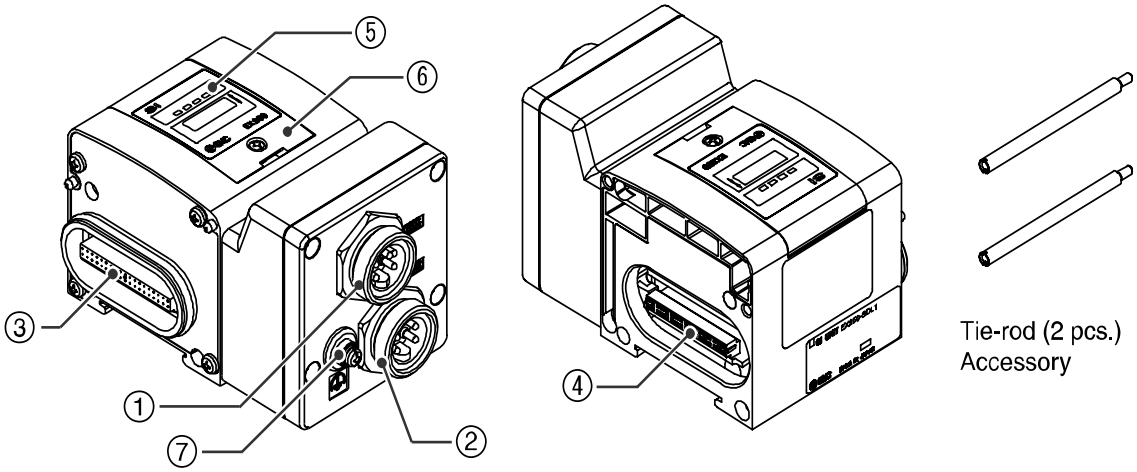
9	4 output (for out16-23 of EX250-SDL1-X142)

Function

OET1	Digital output (-COM)

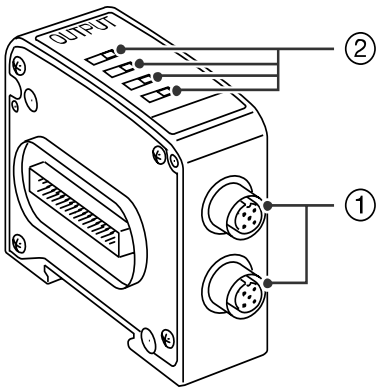
Product parts name and description

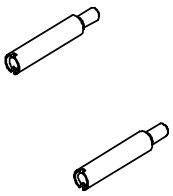
●EX250-SDL1-X142



No.	Name	Description
1	Communication Connector	Send/Receive communication signals through DeviceNet™ ODVA compliant Mini style connector Supplies power for the SI unit as well as Input Blocks
2	Power Connector	Supply power for Solenoid Valves as well as Output Blocks
3	Input Block connection Connector	Connected with Input Block
4	Output Block connection Connector	Connected with Valve Manifold as well as Output Block
5	Display Window	LED indication for the status of Network, Module and Power
6	Switch Cover	Set MAC_ID and Baud Rate via DIP Switches inside the cover
7	FG Terminal	Grounding to the FG

●EX9-OET1-X9





Tie-rod (2 pcs.)
Accessory

No.	Name	Description
1	Output connector	Connects with output device
2	Operation display LED	Indicates the output status

DeviceLogix™ function

Networked Operation and Stand-alone Operation

The SMC DeviceLogix™ capable device can be used as a stand-alone unit or as a slave in a DeviceNet™ network. Using the RSNetWorx™ for DeviceNet™ software, different setting must be enabled or disabled to configure the device as a stand-alone unit or as a slave on DeviceNet™ Network.

Stand-alone Settings

To configure your SMC DeviceLogix™ capable device to function as a stand-alone node, access the Device Parameter tab in device properties dialog box and then Enable the “Comm Status Override”

Refer to the DeviceLogix™ parameters setting section about “Comm Status Override” for details.

Networked Settings

To configure your SMC DeviceLogix™ capable node to function as a node on a DeviceNet™ network, access the Device Parameter tab in device properties dialog box and then either Enable or Disable the “Network Status Override” and “Comm Status Override” parameter.

Refer to the DeviceLogix™ parameters setting section about “Network Status Override” and “Comm Status Override” for details.

Network Settings with local logic back-up

Users may also have the DeviceLogix™ capable device to act in a local logic mode in cases when a network signal is lost. This is configured by enabling “Network Status Override” and “Comm Status Override” parameters. The attribute settings are the same as in the stand-alone settings section.

I/O Operation

Local Logic

The local logic of a DeviceLogix™ capable device consists of Function Blocks, inputs, outputs, and connections (wires) between them. Function Blocks contain connection points (hereafter called pins) and perform a specific function. Inputs and outputs also have connection pins and represent the actual hardware devices, networked data, and fault and status bits that are available for use in the local logic.

Output Source

The concept of a “Value Source Selector” is being introduced in modules equipped with local logic capability. Basically there are several sources that could affect an output point value, for example an I/O message, an explicit message, a local function block logic, a fault or idle values, or a forcing function.

The “Value Source Selector” selects the source of information that will be used to supply data to the value attribute of the point based on the configuration of the module, the current state of the module, and the state of the network.

Outputs that are under local control can run independently of DeviceNet™, however, monitoring of inputs and outputs as well as the forcing of outputs can be performed via DeviceNet™.

Since outputs can be controlled locally, the output must be “tied” to an internal source of data for its value. This concept is referred to as binding. In other word, when hardware output is going to be controlled locally, it must be “bound” first.

Local Output Function

Local output behavior is defined based on the following rule.

When a hardware output is going to be controlled locally,

- Its output no longer allows an explicit message to change its value attribute. Instead it will return an “Object State Conflict” error.
- It no longer uses the Consumed data from I/O connection to update the output value.
- and a “Receive Idle” event occurs, the output may override the Idle Action and Idle Value attributes based on the setting of the override attribute.
- It will enter the Idle State when local logic is disabled.
- and a connection times out, the output may override the Fault Action and Fault Value attributes based on the setting of the override attribute.

Forcing I/O

To aid in troubleshooting and debugging of the schematic, users can force Hardware Inputs and Hardware Outputs. Only Discrete Input Points & Discrete Output Points under local control can be forced. No other inputs or outputs can be forced within editor. Unbound inputs and outputs ignore these forcing.

Network I/O

Network I/O is the data that is consumed or produced by a DeviceLogix™ capable device that is not associated with any hardware on the device. The network I/O extends the capabilities of I/O modules by allowing them to produce and consume the data needed in their application. Network I/O is critical to the effective use of DeviceLogix™ based devices in a networked control system because of its ability to exchange information between the local control and external events being monitored by the master control. There are two types of network I/O

Produced Network I/O

Consumed Network I/O

Produced Network I/O (Also known as Network Outputs)

Under normal conditions, an I/O device will produce the state of its inputs and the status of any fault information on the device. However with local logic running on a device, a master controller may need to know the results of some intermediate state of logic. Using a special I/O assembly containing Network Outputs, the device can report the state of any portion of the logic.

Each Network Output has a bit reserved for it in the module’s produced I/O assembly. When a Network Output is connected to something in the local logic, its bit status will be reported in the produced data.

SMC DeviceLogix™ capable device has 8 Produce Network Bits (PNB). Refer to I/O memory map input table.

Consumed Network I/O (Also known as Network Inputs)

Under normal conditions, an I/O device would consume data to apply to its hardware outputs. A DeviceLogix™ capable device may consume additional information to use in local logic.

A DeviceNet™ assembly is a collection of parameters from one or more objects. The consumed I/O assembly for a device with digital outputs contains the “Value” parameters of the Discrete Output Point Objects representing the hardware outputs present on the device.

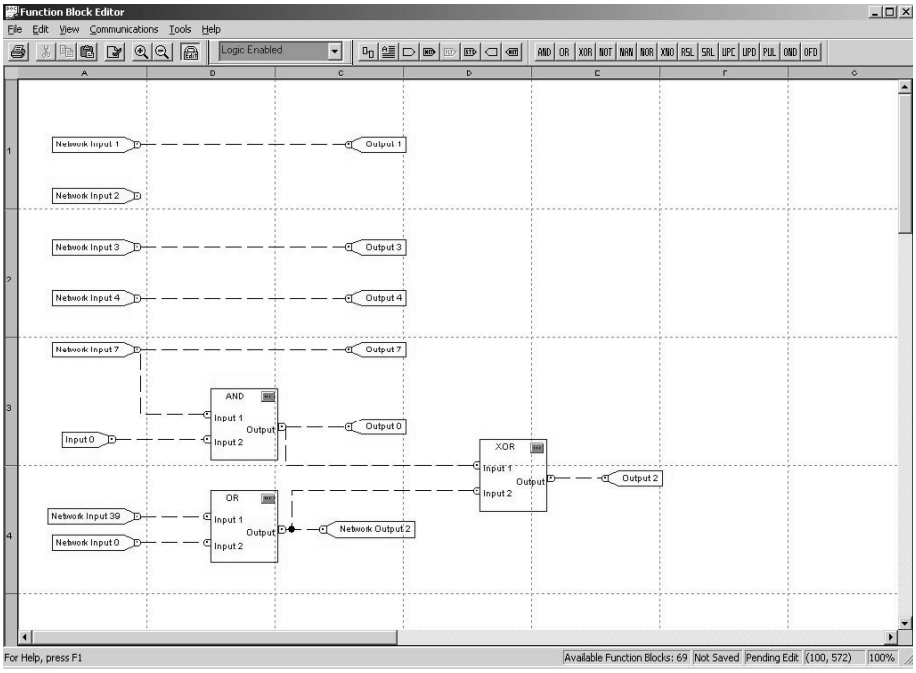
When local logic is being used, DeviceLogix™ capable devices treat all consumed I/O data as “Network Inputs”. That is to say that the device may consume any amount of data, regardless of hardware and treat it as generic input from the network. By default, the first Network Inputs provide the data for the hardware outputs found on the device. However, if you bind the hardware output to some other entity in the logic, the corresponding Network Input dose not provides the control for that output.

Each Network Input has a bit reserved for it in the consumed I/O assembly.

SMC DeviceLogix™ capable device has 40 Consumed Network Bits (CNB). Refer to I/O memory map output table.

Following are some of the important details about network inputs. These details are further explained in the following illustration (Logic Schematic).

- If an output is not used in the local logic, there is an assumed connection to the corresponding Network Input Bit in the Consumed Data. In the illustration this connection is shown explicitly for outputs1, 3, 4, and 7.
- Network Inputs can be used as input to more than one entity. The illustration shows that the data sent to control output 7 is also used in the logic.
- When an output is bound to logic, its corresponding Network Input can be used somewhere else or not used at all. The illustration shows Output 0 and 2 are being controlled by logic. Output 0’s corresponding Network Input Bit 0 is being used as an input to the OR gate. Output 2’s network input is not used.
- The number of Network Inputs is not directly associated with number of hardware outputs present on the device. For example SMC DeviceLogix™ capable device has 32 hardware Outputs but it has 40 Network Inputs. Illustration shows that Network Input Bit 39 is used even though the unit has only 24 hardware outputs.



DeviceLogix™ components

DeviceLogix™ components can be programmed using either the Function Block or Ladder Logic method. Ladder logic programming is available in RSNetworx™ version 6.0 or above. The programming method is selected via the Editor Style Selection dialog box as shown in the following screen shot.

Function Blocks are building blocks used to create the logic that will reside in the device. Four types of Function Blocks are available for SMC DeviceLogix™ capable device.

1. Boolean (AND, OR, XOR, NOT, NAND, NOR, XNOR)
2. Bistable (RSL, SRL)
3. Counter (UPC, UPD)
4. Timer (PUL, OND, OFD)

Boolean Function Blocks Truth Table

AND

Input1	Input2	Input3	Input4	Output		
				2IN	3IN	4IN
0	0	0	0	0	0	0
1	0	0	0	0	0	0
0	1	0	0	0	0	0
1	1	0	0	1	0	0
0	0	1	0		0	0
1	0	1	0		0	0
0	1	1	0		0	0
1	1	1	0		1	0
0	0	0	1			0
1	0	0	1			0
0	1	0	1			0
1	1	0	1			0
0	0	1	1			0
1	0	1	1			0
0	1	1	1			0
1	1	1	1			1

OR

Input1	Input2	Input3	Input4	Resultant Output		
				2IN	3IN	4IN
0	0	0	0	0	0	0
1	0	0	0	1	1	1
0	1	0	0	1	1	1
1	1	0	0	1	1	1
0	0	1	0		1	1
1	0	1	0		1	1
0	1	1	0		1	1
1	1	1	0		1	1
0	0	0	1			1
1	0	0	1			1
0	1	0	1			1
1	1	0	1			1
0	0	1	1			1
1	0	1	1			1
0	1	1	1			1
1	1	1	1			1

XOR (Exclusive OR)

Input1	Input2	Input3	Input4	Resultant Output		
				2IN	3IN	4IN
0	0	0	0	0	0	0
1	0	0	0	1	1	1
0	1	0	0	1	1	1
1	1	0	0	0	0	0
0	0	1	0		1	1
1	0	1	0		0	0
0	1	1	0		0	0
1	1	1	0		1	1
0	0	0	1			1
1	0	0	1			0
0	1	0	1			0
1	1	0	1			1
0	0	1	1			0
1	0	1	1			1
0	1	1	1			1
1	1	1	1			0

NOT

Input1	Resultant Output
0	1
1	0

NAND (Negative Output AND)

Input1	Input2	Input3	Input4	Resultant Output		
				2IN	3IN	4IN
0	0	0	0	1	1	1
1	0	0	0	1	1	1
0	1	0	0	1	1	1
1	1	0	0	0	1	1
0	0	1	0		1	1
1	0	1	0		1	1
0	1	1	0		1	1
1	1	1	0		0	1
0	0	0	1			1
1	0	0	1			1
0	1	0	1			1
1	1	0	1			1
0	0	1	1			1
1	0	1	1			1
0	1	1	1			1
1	1	1	1			0

NOR (Negative Output OR)

Input1	Input2	Input3	Input4	Resultant Output		
				2IN	3IN	4IN
0	0	0	0	1	1	1
1	0	0	0	0	0	0
0	1	0	0	0	0	0
1	1	0	0	0	0	0
0	0	1	0		0	0
1	0	1	0		0	0
0	1	1	0		0	0
1	1	1	0		0	0
0	0	0	1			0
1	0	0	1			0
0	1	0	1			0
1	1	0	1			0
0	0	1	1			0
1	0	1	1			0
0	1	1	1			0
1	1	1	1			0

XNOR (Negative Output Exclusive OR)

Input1	Input2	Input3	Input4	Resultant Output		
				2IN	3IN	4IN
0	0	0	0	1	1	1
1	0	0	0	0	0	0
0	1	0	0	0	0	0
1	1	0	0	1	1	1
0	0	1	0		0	0
1	0	1	0		1	1
0	1	1	0		1	1
1	1	1	0		0	0
0	0	0	1			0
1	0	0	1			1
0	1	0	1			1
1	1	0	1			0
0	0	1	1			1
1	0	1	1			0
0	1	1	1			0
1	1	1	1			1

Bistable Function Block Truth Table

RSL (RS-Latch)

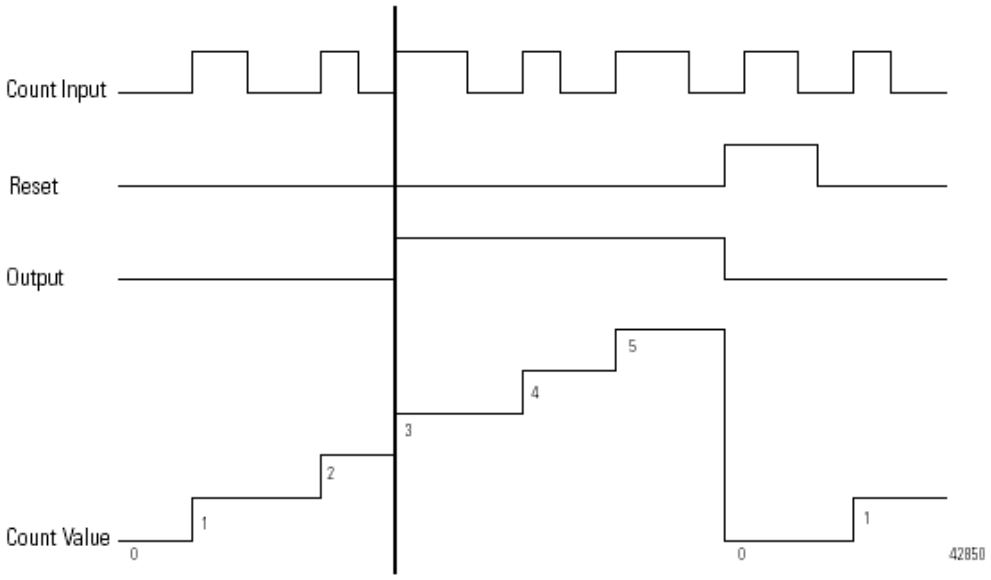
Reset	Input	Output @ time=t0	Output @ time=t0+1
0	0	0	0
0	1	0	1
1	0	0	0
1	1	0	0
0	0	1	1
0	1	1	1
1	0	1	0
1	1	1	0

SRL (SR-Latch)

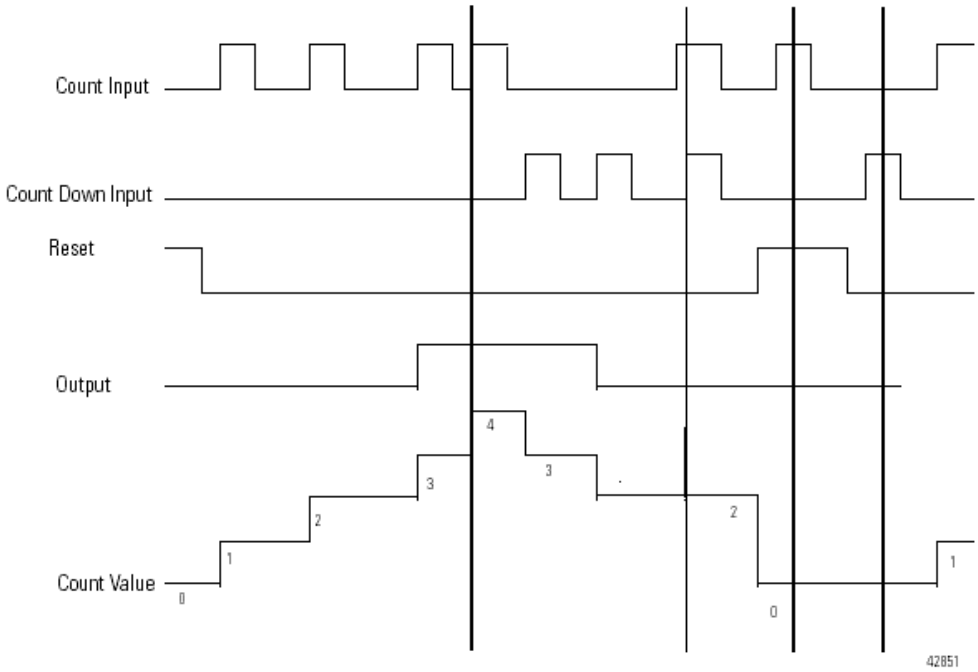
Reset	Input	Output @ time=t0	Output @ time=t0+1
0	0	0	0
0	1	0	1
1	0	0	0
1	1	0	1
0	0	1	1
0	1	1	1
1	0	1	0
1	1	1	1

Timing Diagram for the Counter FB

UPC (Up Counter) Function Block Timing diagram with a preset Value=3

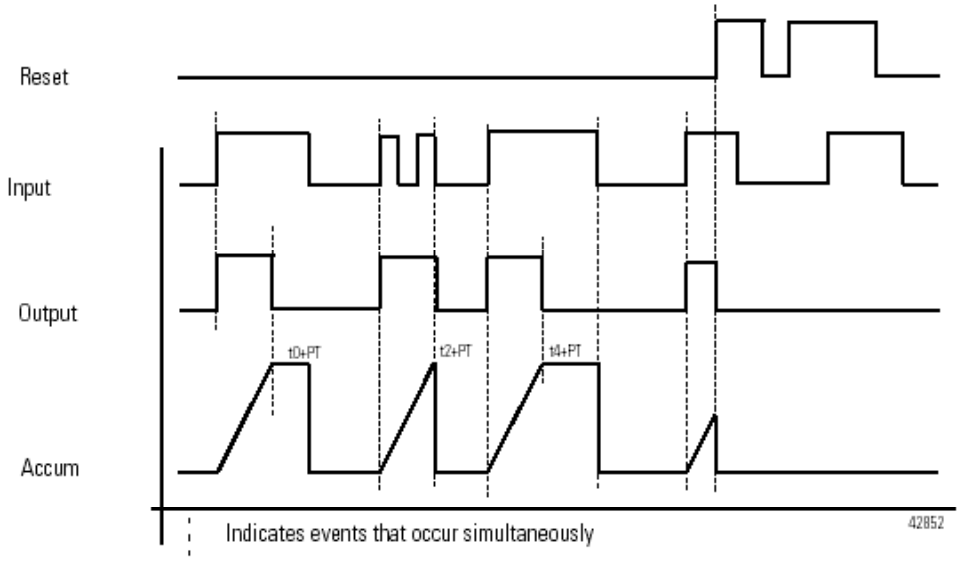


UPD (Up & Down Counter) Function Block Timing diagram with preset Value=3

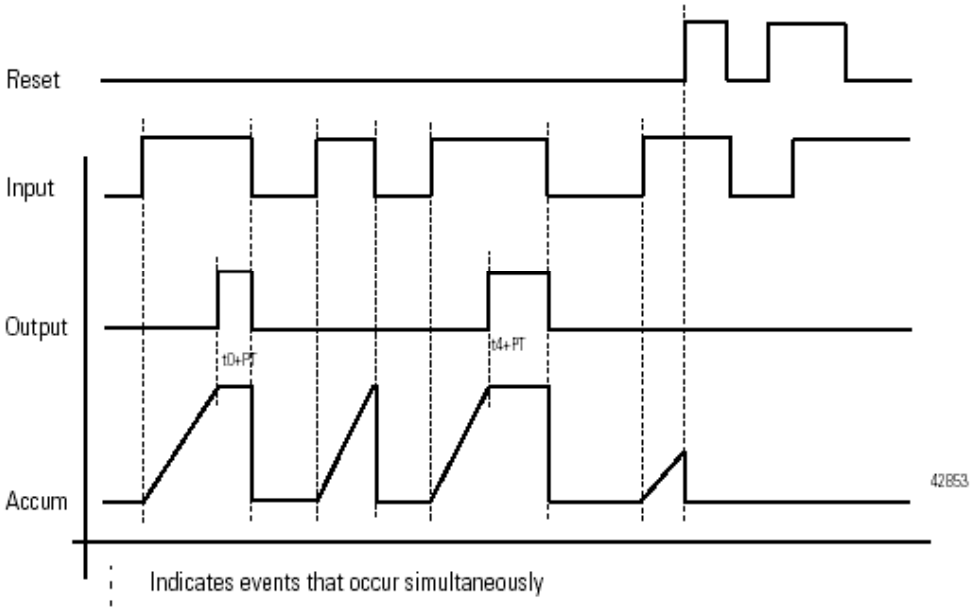


Timing Diagram for the Timer FB

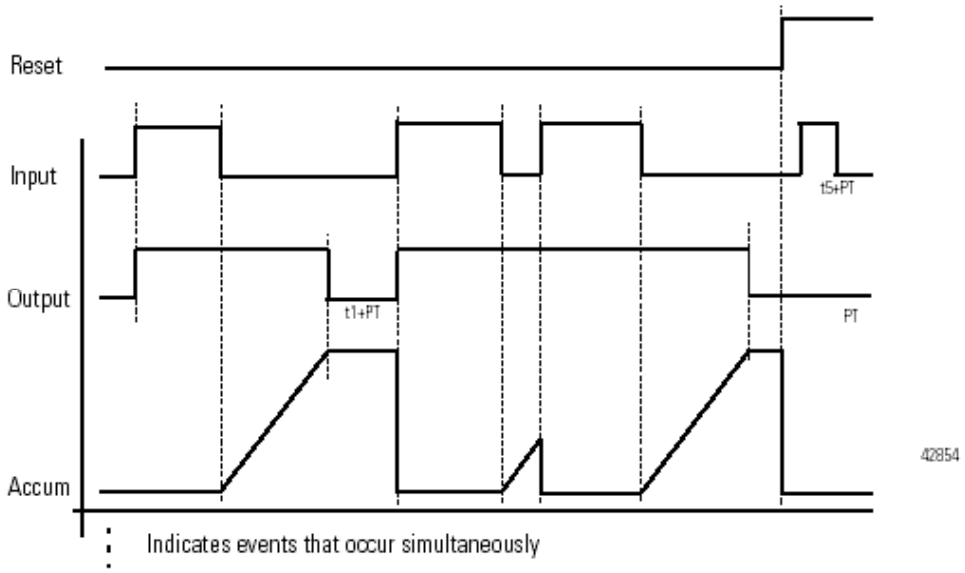
PUL (Pulse Timer) Function Block Timing diagram

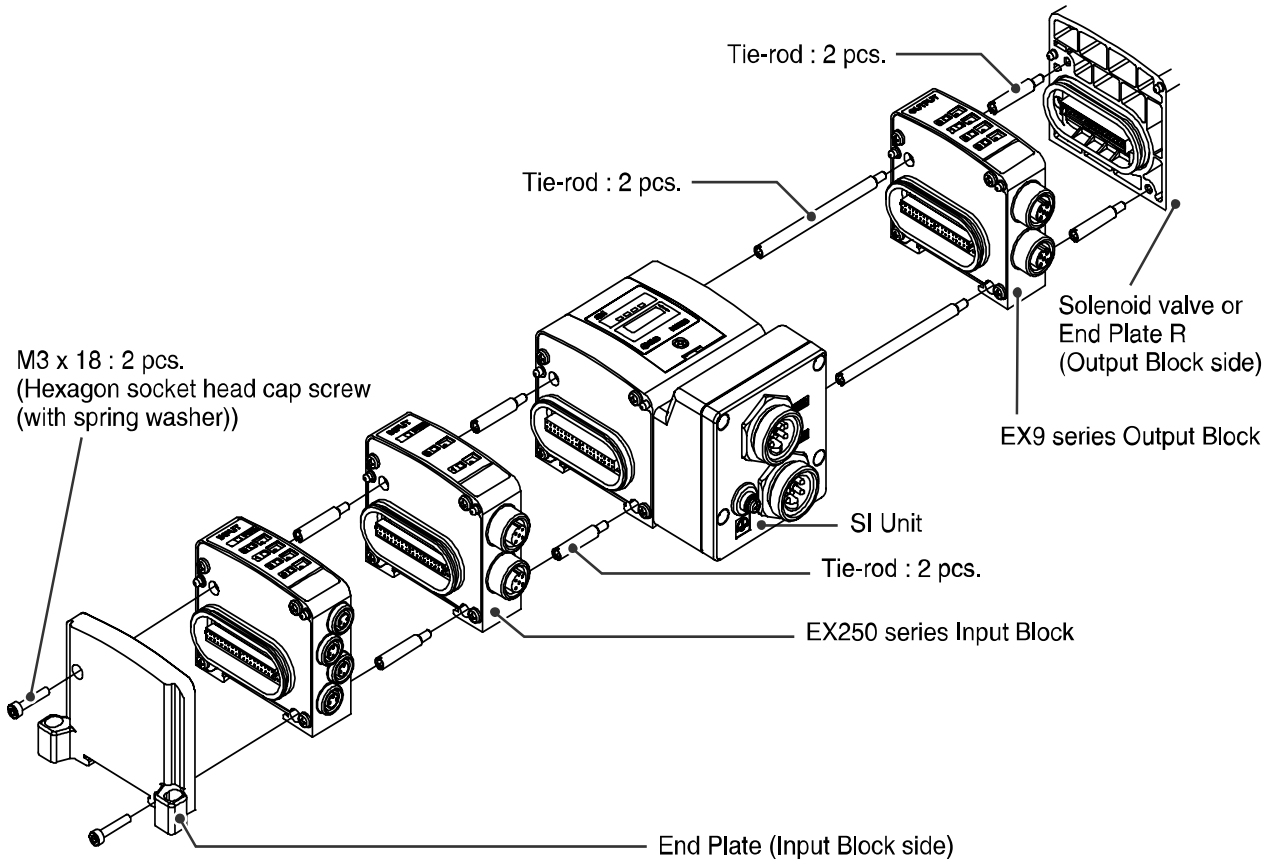


OND (On-Delay Timer) Function Block Timing diagram



OFD (Off-Delay Timer) Function Block Timing diagram





Note) Hold the SI Unit and the Input / Output Block in order to have to no clearance between them while tightening the bolt.
Be sure to tighten the bolts to the specified torque. (Tightening torque : 0.6N•m)

Layout of the Input Block

Position the Input Block on the left side of the SI Unit.
Maximum connected input blocks is 8 blocks.

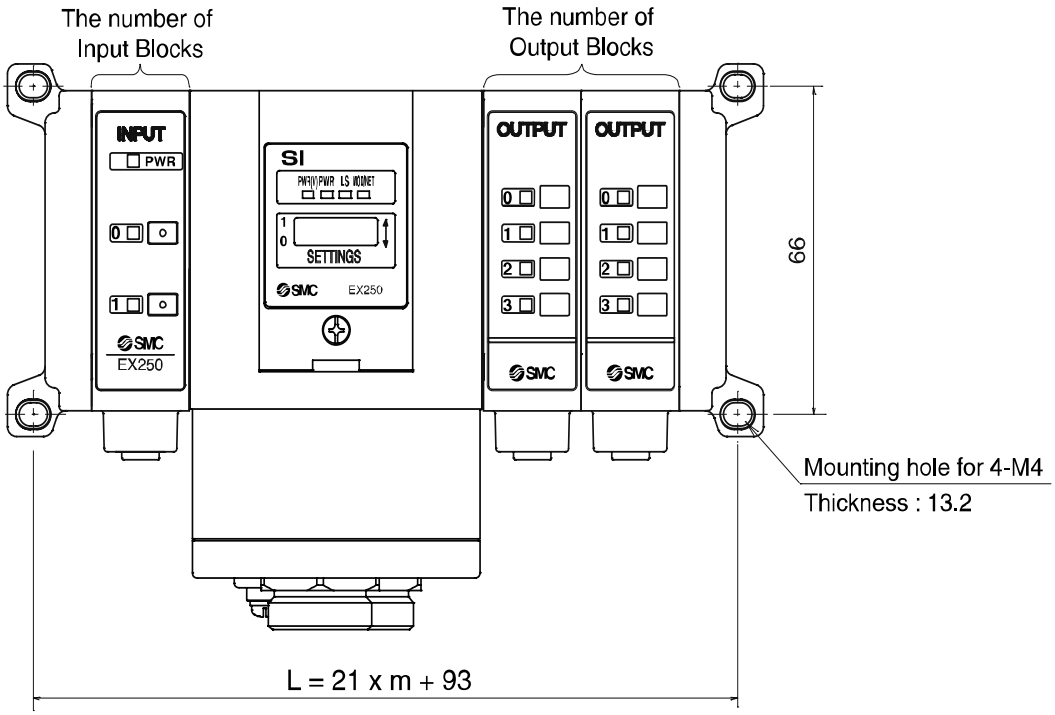
Layout of the EX9 series Output Block

Position the Output Block on the right side of the SI Unit and between the SI Unit and solenoid valve or End Plate R (on the Output Block side).
Maximum connected output blocks is 2 blocks.

Position of End Plate

Be sure to connect the End Plate (on the Input Block side) at the left end of the manifold.
When the valve is not connected, be sure to connect the End Plate R (on the Output Block side) at the right end of the manifold.

Installation example Dimensions with solenoid valves unconnected [Unit : mm]



* The number of Input Blocks + The number of Output Blocks = m

L	1	2	3	4	5	6	7	8	9	10
L	114	135	156	177	198	219	240	261	282	303

[mm]

* Each dimension shows the unit without solenoid valves connected and with an End Plate R (on the Output Block side) connected. Standard settings of L dimensions are with 10 or less m blocks. Ask SMC sales for the setting with over 10 blocks mounted.
Refer to the individual specifications for the dimensions when the solenoid valves are connected.

Wiring (power supply, communication, input / output) and piping are all on the same side of the assembly. Reserve adequate panel space for wiring and piping.

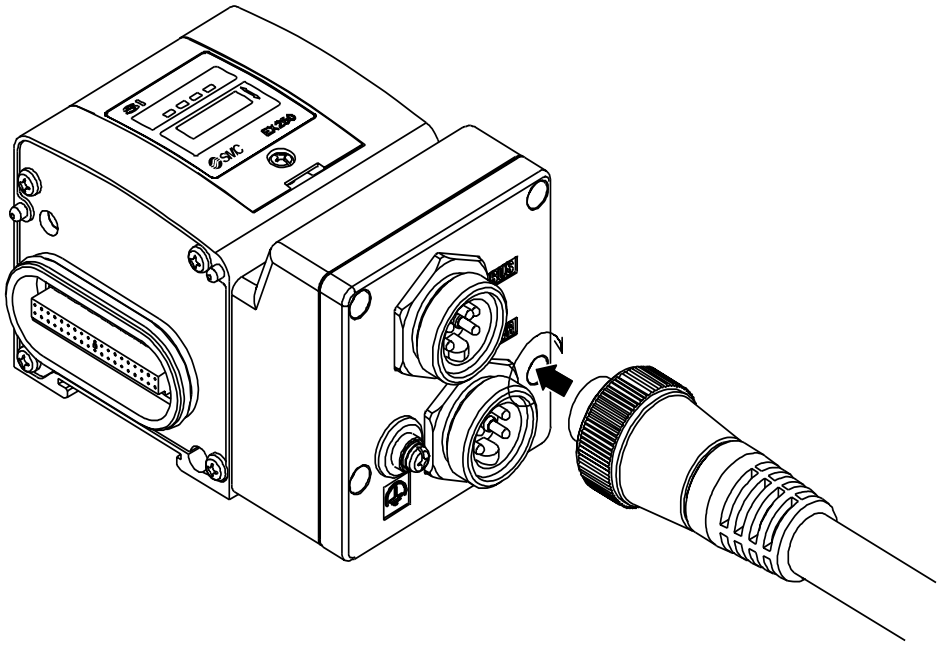
Wiring

Communication wiring

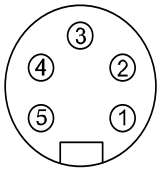
Connect the DeviceNet™ Communication Cable to the communication connector of SI Unit.

Cable connection

1. Aligning the key groove with the communication connector (5-pin, plug) of SI Unit, socket the DeviceNet™ Communication Cable (socket).
2. Tighten the lock nut on cable side by turning it clockwise by hand.
3. Confirm that the connector portion is fully seated and does not move.



Pin No.	Description	Function
1	Drain	Drain/Shield
2	V +	DeviceNet/Input Power 24VDC
3	V -	DeviceNet/Input Power 0VDC
4	CAN_H	CAN Signal H
5	CAN_L	CAN Signal L



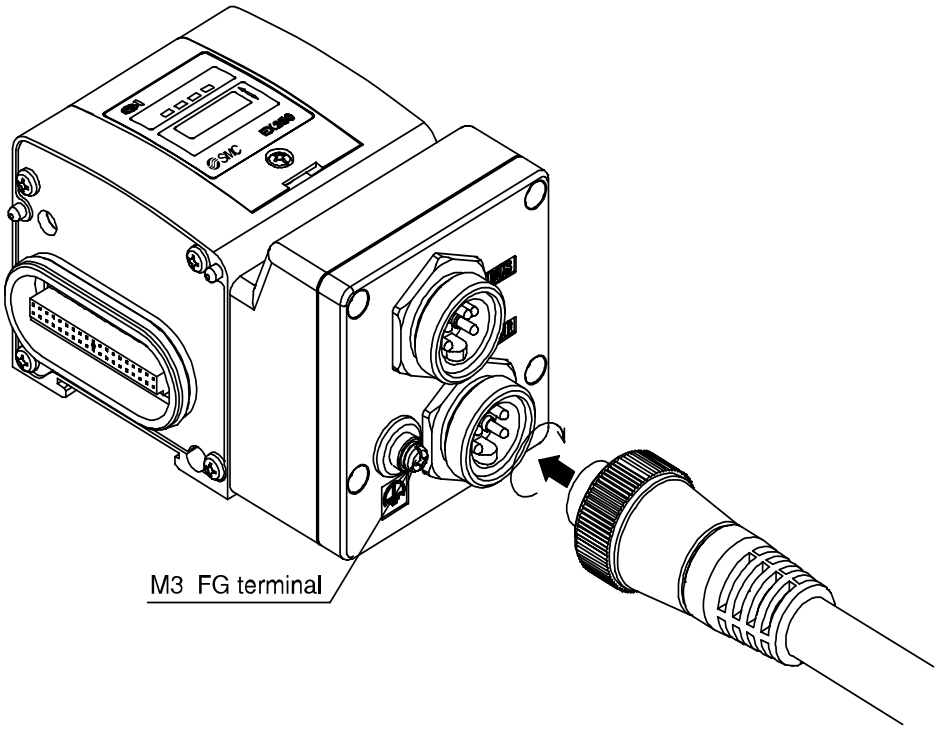
Communication Connector

Power supply wiring

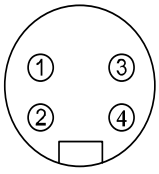
Connect the Power Supply Cable to the power supply connector of SI Unit.
When selecting the power supply, refer to "Precautions on handling" (page 4) in this manual.

Cable connection

1. Aligning the key groove with the power supply connector (plug) of SI Unit, plug the Power Supply Cable (socket).
2. Tighten the lock nut on cable side by turning it clockwise by hand.
3. Confirm that the connector portion is fully seated and does not move.



Pin No.	Description	Function
1	Out_24VDC	24VDC for Solenoid valve (24VDC for out 0-15)
2	OB_24VDC	24VDC for EX9-OET1-X9 and stand alone mode input block and processor (24VDC for out 16-23)
3	E	Earth
4	Out&OB_0VDC	0VDC for EX9-OET1-X9 and solenoid valve (0VDC for all output)



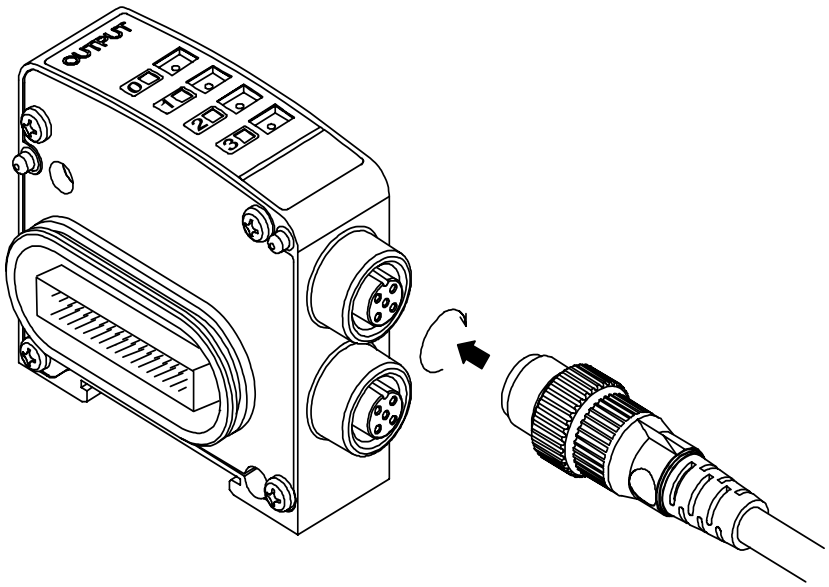
Power supply connector

Output wiring

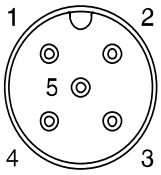
Connect the Output Cable to the output equipment connector of Output Block.

Cable connection

1. Aligning the key groove with the output equipment connector (socket) of Output Block, plug in the Cable with connector (plug).
2. Tighten the lock nut on cable side by turning it clockwise by hand.
3. Confirm that the connector portion is fully seated and does not move.



Pin No.	Function	
	Output connector 1	Output connector 2
1	NC	NC
2	OUT1	OUT3
3	GND	GND
4	OUT0	OUT2
5	NC	NC



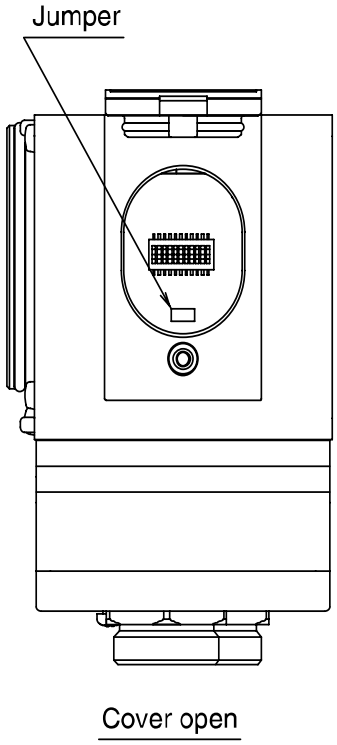
Output connector pin layout

DeviceNet and Aux power grounds

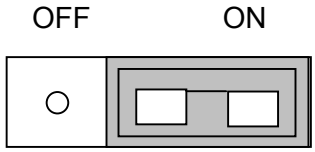
The ground connections of the DeviceNet connector and Aux power connector are connected internally in the SI unit by a jumper.
In the case of separate power supplies, the potential for ground loops exist. If ground currents are excessive, move the ground jumper to the ‘OFF’ position.

Please use a tweezer or tool with a thin head for moving the jumper socket, and pay attention to not drop the jumper socket inside of SI unit.

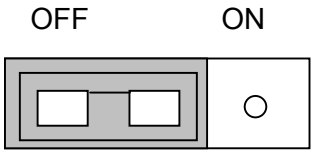
If the jumper accidentally drops inside, please detach the SI unit from the manifold and carefully remove it.



ON (Default)
The DeviceNet and Aux power grounds are connected.
In stand alone mode, this jumper must be in the ‘ON’ position.



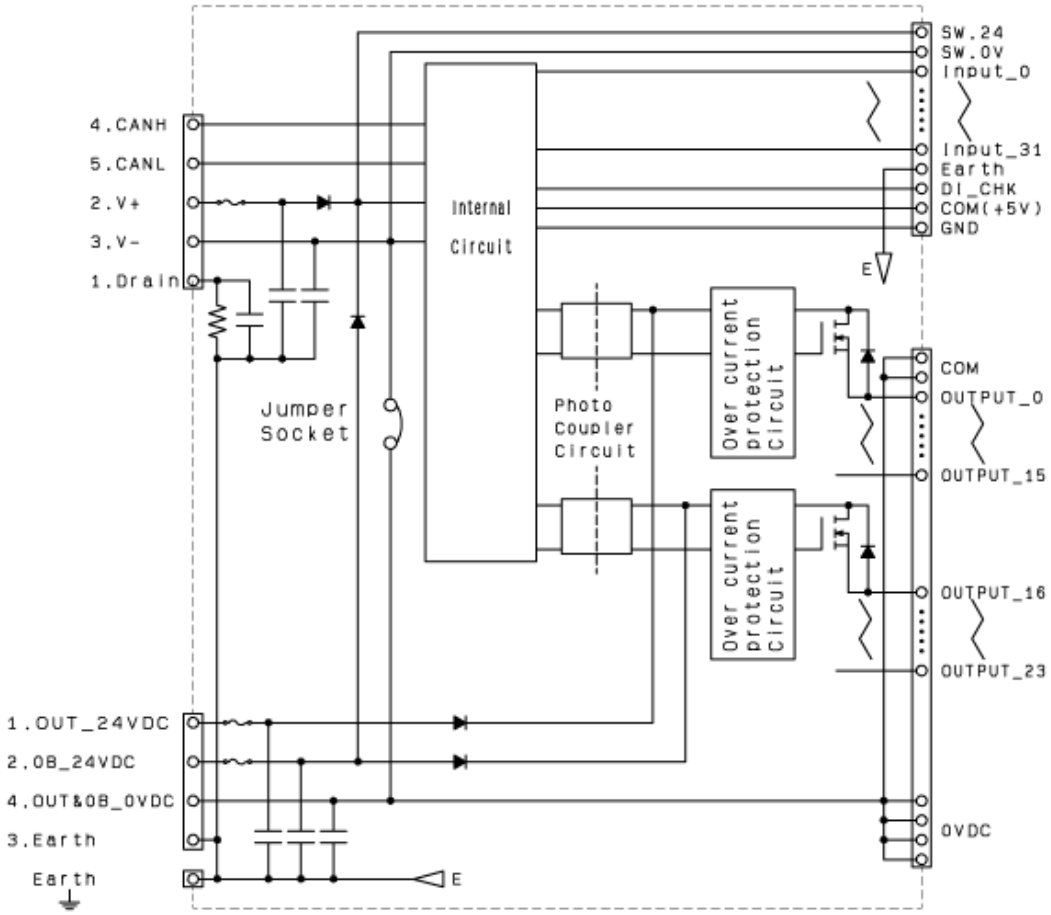
OFF
The DeviceNet and Aux power grounds are disconnected.



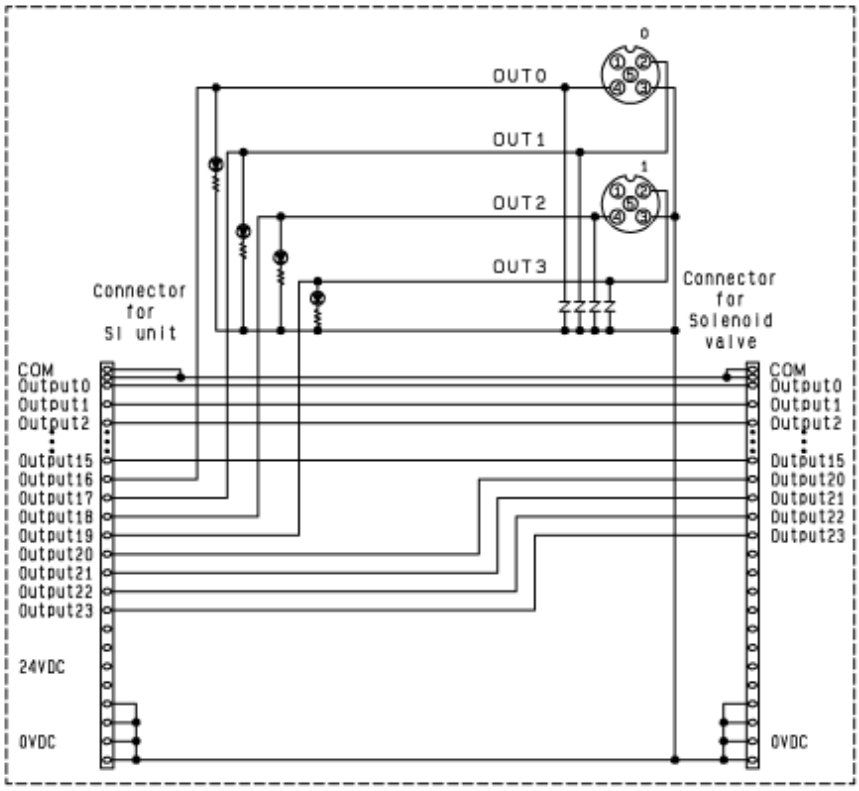
See drawing on page 28 for clarification.

Internal circuit

•EX250-SDL1-X142



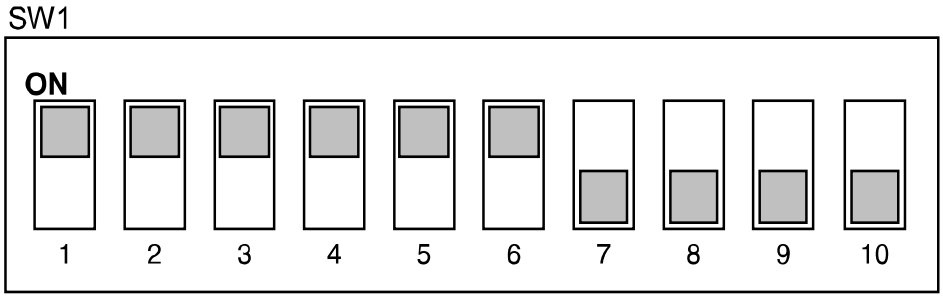
•EX9-OET1-X9


0
OUT0
OUT1
1
OUT2
OUT3
Connector
for
SI unit
Connector
for
Solenoid
valve
COM
Output0
Output1
Output2
Output15
Output16
Output17
Output18
Output19
Output20
Output21
Output22
Output23
24VDC
0VDC
COM
Output0
Output1
Output2
Output15
Output20
Output21
Output22
Output23
0VDC

Setting

Switch Settings

・MAC_ID & Baud Rate setting



Setting MAC ID

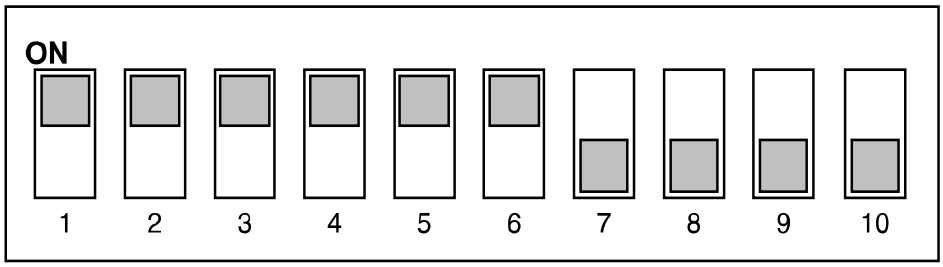
MAC ID	SW1-1	SW1-2	SW1-3	SW1-4	SW1-5	SW1-6
	2^0(1)	2^1(2)	2^2(4)	2^3(8)	2^4(16)	2^5(32)
0	OFF	OFF	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF
:						
62	OFF	ON	ON	ON	ON	ON
63 (default)	ON	ON	ON	ON	ON	ON

Setting Baud Rate

Baud Rate	SW1-7	SW1-8
125 kbps (default)	OFF	OFF
250 kbps	ON	OFF
500 kbps	OFF	ON
Not used	ON	ON

•Other setting

SW1



Setting Hold/Clear Last State in case of a Communication Fault

Hold/Clear	DIP switch SW1-9	Description
Clear (default)	0	Fault/Idle Action = 0, Fault/Idle Value = 0
Hold	1	Fault/Idle Action = 1, Fault/Idle Value = 0

This switch defines all outputs behavior in I/O connection timed-out, receiving fault message and/or Idle state.

When attribute ID 104 of SMC SI Object (64h) is 0 (DIP switch value is valid), the value of Fault Action & Idle Action and/or Fault Value & Idle Value (hereafter describe Fault/Idle Action/Value) in the DOP Object are ignored and DIP switch value is effective.

When the value of attribute ID 104 of SMC SI Object (64h) is 1, then the value of Fault/Idle Action/Value in the DOP Object saved at the EEPROM at power up is used, and if the value of Fault/Idle Action/Value in the DOP are changed, the EEPROM Fault/Idle Action/Value in the DOP variable shall be loaded with new value.

Note) Default value of attribute ID 104 of SMC SI Object (64h) is 0 (DIP switch value is valid).

Mode Setting

HW/SW	DIP switch SW1-10	Description
HW mode (default)	0	Valid switch values for MAC_ID and Baud_Rate are effective, they will be loaded into the corresponding EEPROM memory variables. Set_Attribute_Single request for setting of MAC_ID and Baud_Rate will be rejected.
SW mode	1	Switch values are ignored. The MAC_ID, Baud_Rate can be changed via Explicit message (Set_Attribute_Single request).

I/O Mapping

I/O Data Memory Map

INPUT TABLE (Produced I/O Data)								
Byte Offset	7	6	5	4	3	2	1	0
0	IN7	IN6	IN5	IN4	IN3	IN2	IN1	IN0
1	IN15	IN14	IN13	IN12	IN11	IN10	IN9	IN8
2	IN23	IN22	IN21	IN20	IN19	IN18	IN17	IN16
3	IN31	IN30	IN29	IN28	IN27	IN26	IN25	IN24
4	PNB7	PNB6	PNB5	PNB4	PNB3	PNB2	PNB1	PNB0
5	RSVD				DI_CHK	SOL_PWR	RSVD	LEB

Bit Description

Bit Name	Description	Bit Status	Default value
IN	Input (Discrete Input)	0 : Off 1 : On	0
PNB	Produced Network Bit (Network Output)	0 : Off 1 : On	0
DI_CHK	Status bit for input power	0 : Abnormal (fuse brown-up) 1 : Normal	1
SOL_PWR	Status bit for output power	0 : Abnormal (below 19V) 1 : Normal	1
LEB	Logic Enabled Bit	0 : Local Logic Disabled 1 : Local Logic Enabled	0
RSVD	Reserved	N/A	N/A

OUTPUT TABLE (Consumed I/O Data)								
Byte Offset	7	6	5	4	3	2	1	0
0	OUT7 /CNB7	OUT6 /CNB6	OUT5 /CNB5	OUT4 /CNB4	OUT3 /CNB3	OUT2 /CNB2	OUT1 /CNB1	OUT0 /CNB0
1	OUT15 /CNB15	OUT14 /CNB14	OUT13 /CNB13	OUT12 /CNB12	OUT11 /CNB11	OUT10 /CNB10	OUT9 /CNB9	OUT8 /CNB8
2	OUT23 /CNB23	OUT22 /CNB22	OUT21 /CNB21	OUT20 /CNB20	OUT19 /CNB19	OUT18 /CNB18	OUT17 /CNB17	OUT16 /CNB16
3	CNB31	CNB30	CNB29	CNB28	CNB27	CNB26	CNB25	CNB24
4	CNB39	CNB38	CNB37	CNB36	CNB35	CNB34	CNB33	CNB32

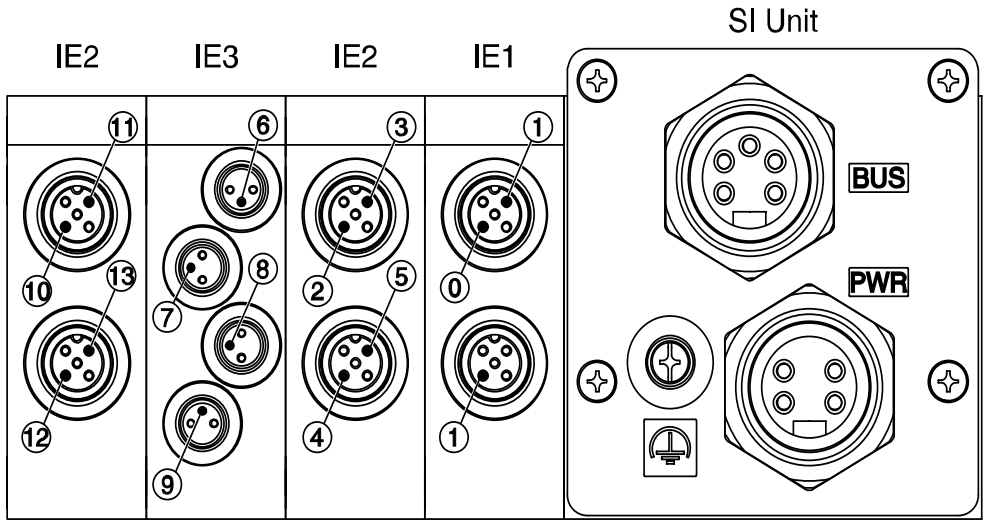
Bit Description

Bit Name	Description	Bit Status	Default value
OUT	Output (Discrete Output)	0 : Off 1 : On	0
CNB	Consumed Network Bit (Network Input)	0 : Off 1 : On	0

Physical I/O Map

You can plug together up to 8 input block and up to 2 output block and 16 valves into a valve I/O assembly, for a maximum of 32 inputs and 24 outputs per valve I/O assembly.

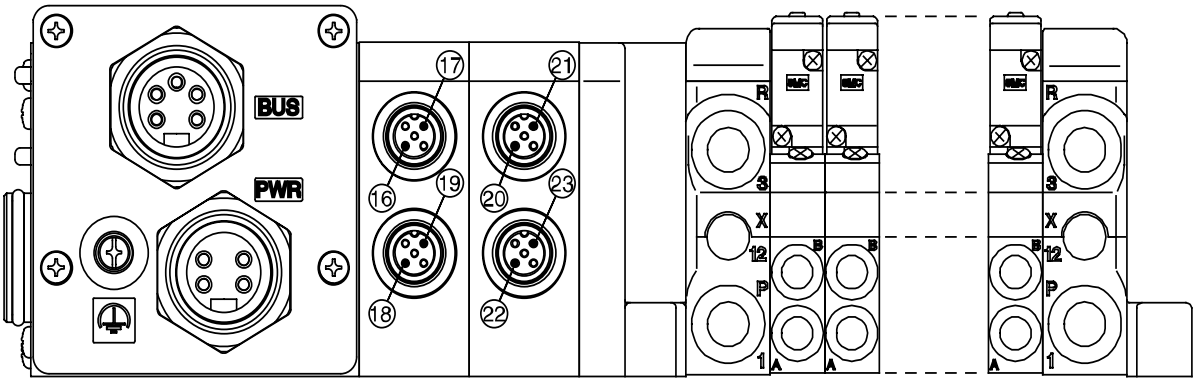
Physical I/O Map for input side



The input number is mapped from near side of the SI Unit.

Physical I/O Map for output side

Valve	1	2	·····	8
Port A	⓪	②	·····	⑭
Port B	①	③	·····	⑮



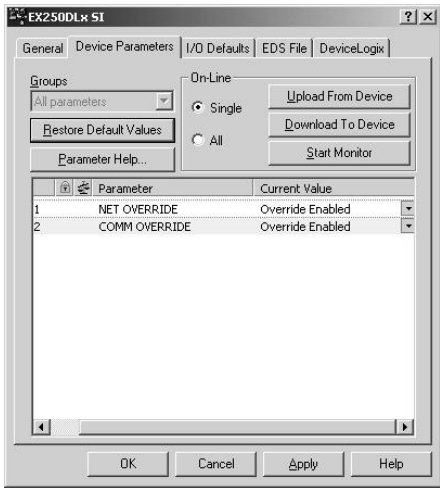
The output number is mapped from nearest side of the SI Unit. The valves are numbered as out 0-15 and Output Block are numbered as out 16-23.
The picture shown above is double solenoid valve manifold.
When Output block is not connected, the valves are also numbered as out 0-15.

DeviceLogix™ parameters setting

SMC DeviceLogix™ capable device supports the following two parameters.

- Network Status Override
- Comm Status Override

These parameters can be enabled or disabled by using DeviceLogix™ configuration tool (i.e. RSNetWorx™ for DeviceNet™) as shown below in the following screen shot.



Network Status Override

The network status override parameter controls whether local logic should control outputs when it detect duplicate MAC_ID or enters bus off condition. This parameter is used to override normal behavior during the following events.

Event	MNS LED status	Behavior with Network Status Override Parameter Disabled	Behavior with Network Status Override Parameter Enabled
Duplicate MAC_ID Failure	Red	Module in put into an inoperable state and all outputs remain off	Local logic can continue to update output values
Entering the bus off state at power up	Red	Module is put into an inoperable state and all outputs remain off	Local logic can continue to update output values
Entering the bus off state while network is running	Red	Module is put into an inoperable state and all outputs remain off	Local logic can continue to update output values

Comm Status Override

The Comm status override parameter controls whether local logic should control outputs when active I/O connection exist with device. This parameter is used to override normal behavior during the following events.

Event	MNS LED status	Behavior with Comm Status Override Parameter Disabled	Behavior with Comm Status Override Parameter Enabled
Communication not established - OR - The module is on line but has no connections	Flashing Green	Output remains in the Available state until an I/O connection is established	Local logic can update output values
An I/O connection transitions to timed out state	Flashing Green	Output value is Clear	Local logic can continue to update output values
An I/O connection is deleted	Flashing Red	Output enters the Available state until a new I/O connection is established	Local logic can continue to update output values
An Idle is received	Green	Output value is Clear	Local logic can continue to update output values

Note) Do not download the above parameters when local logic is Enabled. When you changing the parameter values, disable the local logic first, then download the changed parameters.

Object Implementers setting

This SI unit support the following Object Classes.

Class Code	Object Type
01h	Identity
02h	Message Router
03h	DeviceNet
04h	Assembly
05h	DeviceNet Connection
08h	Discrete Input Point
09h	Discrete Output Point
0Fh	Parameter
64h	SMC SI (vendor specific)
307h	Boolean Function Block
308h	Bistable Function Block
309h	Counter Function Block
30Ah	Timer Function Block
30Eh	Logic Supervisor
30Fh	Produced Network Data

1. Identity Object (Class ID : 01h)

1.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
-	-	-	-	-

1.2. Class Common Service

Service Code	Name
-	-

1.3. Instance Attribute

ID	Access Rule	Name	Data Type	Value
1	Get	Vender ID	UINT	07h : SMC Corporation
2	Get	Device Type	UINT	1Bh : Pneumatic Valve
3	Get	Product Code	UINT	102
4	Get	Revision	STRUCT	
		Major Revision	USINT	1
		Minor Revision	USINT	1
5	Get	Status	WORD	-
6	Get	Serial Number	UDINT	14h XXh XXh XXh
7	Get	Product Name	SHORT_STRING	Valve Manifold SIU
9	Get	Configuration Consistency Value	UINT	-

1.4. Instance Common Service

Service Code	Name
05h	Reset
0Eh	Get_Attribute_Single

1.5. Specific Service

None

2. Message Router Object (Class ID : 02h)

2.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
-	-	-	-	-

2.2. Class Common Service

Service Code	Name
-	-

2.3. Instance

ID	Access Rule	Name	Data Type	Value
-	-	-	-	-

2.4. Instance Common Service

Service Code	Name
-	-

2.5. Specific Service

None

3. DeviceNet Object (Class ID : 03h)

3.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	2

3.2. Class Common Service

Service Code	Name
0Eh	Get_Attribute_Single

3.3. Instance Attribute

ID	Access Rule	Name	Data Type	Value
1	Get/Set *	MAC_ID	USINT	0 to 63
2	Get/Set *	Baud Rate	USINT	0 to 2
3	Get/Set	BOI	BOOL	-
4	Get/Set	Buss-off Counter	USINT	0 to 255
5	Get	Allocation Information	STRUCT	-
		Allocation Choice Byte	BYTE	
		Master's MAC ID	USINT	
6	Get	MAC ID Switch Changed	BOOL	-
7	Get	Baud Rate Switch Changed	BOOL	-
8	Get	MAC ID Switch Value	USINT	0 to 63
9	Get	Baud Rate Switch Value	USINT	0 to 2

3.4. Instance Common Service

Service Code	Name
0Eh	Get_Attribute_Single
10h	Set_Attribute_Single

3.5. Specific Service

Service Code	Name
4Bh	Allocate_Master/Slave_Connection_set
4Ch	Release_Group_2_Identifier_Set

4. Assembly Object (Class ID: 04h)

4.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
-	-	-	-	-

4.2. Class Common Service

Service Code	Name
-	-

4.3. Instance 109 : 6Byte Input

ID	Access Rule	Name	Data Type	Value
3	Get	Data	BYTE_ARRAY	Input + Status data (4Byte+2Byte)

I/O Data Table

Offset	Bit							
	7	6	5	4	3	2	1	0
0	DIP7	DIP6	DIP5	DIP4	DIP3	DIP2	DIP1	DIP0
1	DIP15	DIP14	DIP13	DIP12	DIP11	DIP10	DIP9	DIP8
2	DIP23	DIP22	DIP21	DIP20	DIP19	DIP18	DIP17	DIP16
3	DIP31	DIP30	DIP29	DIP28	DIP27	DIP26	DIP25	DIP24
4	PNB7	PNB6	PNB5	PNB4	PNB3	PNB2	PNB1	PNB0
5	RSVD				DI_CHK	SOL_PWR	RSVD	LEB

DIP : Discrete Input Point
PNB : Produced Network Bit = Network Output
DI_CHK : Status bit for input power
SOL_PWR : Status bit for output power
LEB : Logic Enable Bit
RSVD : Reserved

4.4. Instance 110 (6Eh) : 5Byte Output

ID	Access Rule	Name	Data Type	Value
3	Set	Data	BYTE_ARRAY	Output (5Byte)

I/O Data Table

Offset	Bit							
	7	6	5	4	3	2	1	0
0	DOP7 /CNB7	DOP6 /CNB6	DOP5 /CNB5	DOP4 /CNB4	DOP3 /CNB3	DOP2 /CNB2	DOP1 /CNB1	DOP0 /CNB0
1	DOP15 /CNB15	DOP14 /CNB14	DOP13 /CNB13	DOP12 /CNB12	DOP11 /CNB11	DOP10 /CNB10	DOP9 /CNB9	DOP8 /CNB8
2	DOP23 /CNB23	DOP22 /CNB22	DOP21 /CNB21	DOP20 /CNB20	DOP19 /CNB19	DOP18 /CNB18	DOP17 /CNB17	DOP16 /CNB16
3	CNB31	CNB30	CNB29	CNB28	CNB27	CNB26	CNB25	CNB24
4	CNB39	CNB38	CNB37	CNB36	CNB35	CNB34	CNB33	CNB32

DOP : Discrete Output Point

CNB : Consumed Network Bit = Network Input

Note) Each Network Input has a bit reserved for it in the consumed I/O assembly. When local logic is being used, the SI unit treats all consumed I/O data as “Network Inputs”. By default, the first N Network Inputs provide the data for the N hardware outputs found on the device. However, if bind the hardware output to some other entity in the logic, the corresponding Network Input dose not provide the control for that output.

4.5. Instance 120 (78h) : Fault Action Configuration

ID	Access Rule	Name	Data Type	Value
3	Get/Set	Fault Action	BYTE_ARRAY	

Data Table

Offset	Bit							
	7	6	5	4	3	2	1	0
0	FA7	FA6	FA5	FA4	FA3	FA2	FA1	FA0
1	FA15	FA14	FA13	FA12	FA11	FA10	FA9	FA8
2	FA23	FA22	FA21	FA20	FA19	FA18	FA17	FA16

FA : Fault Action Setting

4.6. Instance 121 (79h) : Fault Value Configuration

ID	Access Rule	Name	Data Type	Value
3	Get/Set	Fault Value	BYTE_ARRAY	

Data Table

Offset	Bit							
	7	6	5	4	3	2	1	0
0	FV7	FV6	FV5	FV4	FV3	FV2	FV1	FV0
1	FV15	FV14	FV13	FV12	FV11	FV10	FV9	FV8
2	FV23	FV22	FV21	FV20	FV19	FV18	FV17	FV16

FV : Fault Value Setting

4.7. Instance 122 (7Ah) : Idle Action Configuration

ID	Access Rule	Name	Data Type	Value
3	Get/Set	Idle Action	BYTE_ARRAY	

Data Table

Offset	Bit							
	7	6	5	4	3	2	1	0
0	IA7	IA6	IA5	IA4	IA3	IA2	IA1	IA0
1	IA15	IA14	IA13	IA12	IA11	IA10	IA9	IA8
2	IA23	IA22	IA21	IA20	IA19	IA18	IA17	IA16

IA : Idle Action Setting

4.8. Instance 123 (7Bh) : Idle Value Configuration

ID	Access Rule	Name	Data Type	Value
3	Get/Set	Idle Value	BYTE_ARRAY	

Data Table

Offset	Bit							
	7	6	5	4	3	2	1	0
0	IV7	IV6	IV5	IV4	IV3	IV2	IV1	IV0
1	IV15	IV14	IV13	IV12	IV11	IV10	IV9	IV8
2	IV23	IV22	IV21	IV20	IV19	IV18	IV17	IV16

IV : Idle Value Setting

4.9. Instance Common Service

Service Code	Name
0Eh	Get_Attribute_Single
10h	Set_Attribute_Single

4.10. Specific Service

None

5. DeviceNet Connection Object (Class ID : 05h)

5.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
-	-	-	-	-

5.2. Class Common Service

Service Code	Name
-	-

5.3. Instance Attribute (Explicit Message)

ID	Access Rule	Name	Data Type	Value
1	Get	State	USINT	-
2	Get	instance_type	USINT	00
3	Get	transportClass_trigger	BYTE	83h
4	Get	produced_connection_id	UINT	-
5	Get	consumed_connection_id	UINT	-
6	Get	initial_comm._characteristics	BYTE	21h
7	Get	produced_connection_size	UINT	6300h
8	Get	consumed_connection_size	UINT	6360h
9	Get/Set	expected_packet_rate	UINT	-
12	Get/Set	watchdog_timeout_action	USINT	-
13	Get	produced_connection_path_length	USINT	0
14	Get	produced_connection_path	EPATH	0
15	Get	consumed_connection_path_length	UINT	0
16	Get	consumed_connection_path	EPATH	0
17	Get	production_inhibit_time	UINT	0

5.4. Instance Attribute (I/O : Poll Message)

ID	Access Rule	Name	Data Type	Value
1	Get	State	USINT	-
2	Get	instance_type	USINT	01h
3	Get	transportClass_trigger	BYTE	83h : Poll
4	Get	produced_connection_id	UINT	-
5	Get	consumed_connection_id	UINT	-
6	Get	initial_comm._characteristics	BYTE	01h
7	Get	produced_connection_size	UINT	6Byte
8	Get	consumed_connection_size	UINT	5Byte
9	Get/Set	expected_packet_rate	UINT	-
12	Get/Set	watchdog_timeout_action	USINT	0
13	Get	produced_connection_path_length	USINT	7
14	Get	produced_connection_path	EPATH	21h 04h 00h 24h 70h 30h 03h
15	Get	consumed_connection_path_length	UINT	7
16	Get	consumed_connection_path	EPATH	21h 04h 00h 24h 25h 30h 03h
17	Get	production_inhibit_time	UINT	-

5.5. Instance Common Service

Service Code	Name
0Eh	Get_Attribute_Single
10h	Set_Attribute_Single
05h	Reset

6. Discrete Input Object (Class ID : 08h)

6.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	2

6.2. Class Common Service

Service Code	Name
0Eh	Get_Attribute_Single

6.3. Instance Attribute

ID	Access Rule	Name	Data Type	Value
3	Get	Value	BOOL	0 : OFF 1 : ON
115	Get/Set	Force Enable	UINT	0 : Force Disabled 1 : Force Enabled
116	Get/Set	Force Value	UINT	0 : OFF 1 : ON

6.4. Instance Common Service

Service Code	Name
0Eh	Get_Attribute_Single
10h	Set_Attribute_Single

6.5. Specific Service

None

7. Discrete Output Object (Class ID : 09h)

7.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
2	Get	Max Instance	UINT	-
118	Get/Set	Net Status Override	BOOL	-
119	Get/Set	Comm Status Override	BOOL	-

7.2. Class Common Service

Service Code	Name
0Eh	Get_Attribute_Single
10h	Set_Attribute_Single

7.3. Instance Attribute

ID	Access Rule	Name	Data Type	Value
3	Get/Set	Value	BOOL	0 : OFF 1 : ON
4	Get	Status	BOOL	-
5	Get/Set	Fault Action	BOOL	0 : Fault Value 1 : Hold Last State
6	Get/Set	Fault Value	BOOL	0 : OFF 1 : ON
7	Get/Set	Idle Action	BOOL	0 : Idle Value 1 : Hold Last State
8	Get/Set	Idle Value	BOOL	0 : OFF 1 : ON
115	Get/Set	Force Enable	BOOL	0 : Force Disabled 1 : Force Enabled
116	Get/Set	Force Value	BOOL	0 : OFF 1 : ON
117	Get/Set	Binding Path	Struct of USINT EPATH and BOOL	-

7.4. Instance Common Service

Service Code	Name
0Eh	Get_Attribute_Single
10h	Set_Attribute_Single

7.5. Specific Service

None

8. Parameter Object (Class ID : 0Fh)

8.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
2	Get	Max Instance	UINT	2
8	Get	Parameter Class Descriptor	WORD	000Bh
9	Get	Configuration Assembly Instance	UINT	0

8.2. Class Common Service

Service Code	Name
0Eh	Get_Attribute_Single

8.3. Instance 1 : Network Status Override

ID	Access Rule	Name	Data Type	Value
1	Get	Parameter Value	Data Type Specified in Descriptor's Data Type and Data Size	0 : Override Disabled 1 : Override Enabled
2	Set	Link Path Size	USINT	7
3	Set	Link Path	Array of DeviceNet path	21h 0Fh 00h 24h 01h 30h 01h
		Segment type/port	BYTE	-
		Segment Address	EPATH	-
4	Get	Descriptor	WORD	0002h
5	Get	Data Type	EPATH	C1h
6	Get	Data Size	USING	1

8.4. Instance 2 : Comm Status Override

ID	Access Rule	Name	Data Type	Value
1	Get	Parameter Value	Data Type Specified in Descriptor's Data Type and Data Size	0 : Override Disabled 1 : Override Enabled
2	Set	Link Path Size	USINT	7
3	Set	Link Path	Array of DeviceNet path	21h 0Fh 00h 24h 02h 30h 01h
		Segment type/port	BYTE	-
		Segment Address	EPATH	-
4	Get	Descriptor	WORD	0002h
5	Get	Data Type	EPATH	C1h
6	Get	Data Size	USING	1

8.5. Instance Common Service

Service Code	Name
0Eh	Get_Attribute_Single
10h	Set_Attribute_Single

8.6. Specific Service

None

9. SMC SI Object (Class ID : 64h)

9.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
-	-	-	-	-

9.2. Class Common Service

Service Code	Name
-	-

9.3. Instance Attribute

ID	Access Rule	Name	Data Type	Value
100	Get	SOL_PWR Status (*1)	BOOL	0 : Voltage abnormal 1 : OK
103	Get	Input Unit Fuse Status (*2)	BOOL	0 : Input unit fuse brown-up 1 : OK
104	Get/Set	Hold/Clear (*3)	BOOL	0 : DIP switch value is valid (default) 1 : Fault/Idle Action is valid

*1 : Status bit for output power
*2 : Status bit for input power
*3 : Set individual output channel behavior, either Hold or Clear by Fault/Idle Action

9.4. Instance Common Service

Service Code	Name
0Eh	Get_Attribute_Single
10h	Set_Attribute_Single

9.5. Specific Service

None

10. Boolean Function Block Object (Class ID : 307h)

10.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1
8	Get	Member List	Struct of USINT and ARRAY of USINT	

10.2. Class Common Service

Service Code	Name
0Eh	Get_Attribute_Single
08h	Create

10.3. Instance Attribute

ID	Access Rule	Name	Data Type	Value
1	Get/Set	Type	USINT	0 : Not Configured 1-4 : Reserved 5 : AND 6 : OR 7 : XOR 8 : NOT 9 : NAND 10 : NOR 11 : XNOR
2	Get/Set	Input Bindings	STRUCT of USINT and ARRAY of STRUCT	
		Number of Input Members	USINT	Default=0
		Member Path Size	USINT	
	Path to Attribute	Member Path	Array of	
		Segment type/port	Byte	
		Segment Address	Path	
		Complement Flag	BOOL	
3	Get	Value	BOOL	0 : Off 1 : On

10.4. Instance Common Service

Service Code	Name
09h	Delete
0Eh	Get_Attribute_Single
10h	Set_Attribute_Single

10.5. Specific Service

None

11. Bistable Function Block Object (Class ID : 308h)

11.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1
8	Get	Member List	Struct of USINT and ARRAY of USINT	

11.2. Class Common Service

Service Code	Name
0Eh	Get_Attribute_Single
08h	Create

11.3. Instance Attribute

ID	Access Rule	Name	Data Type	Value
1	Get/Set	Type	USINT	0 : Not Configured 1 : SR set dominat 2 : RS reset dominant 3 : reserved
2	Get/Set	S Input Bindings	STRUCT of :	
		Member Path Size	USINT	Default=0
	Path to Attr.	Segment type/port	BYTE	
		Segment Address	Path	
		Complement Flag	BOOL	
3	Get/Set	R Input Binding	STRUCT of :	
		Member Path Size	USINT	Default=0
	Path to Attr.	Segment type/port	BYTE	
		Segment Address	Path	
		Complement Flag	BOOL	
4	Get	Value	BOOL	0 : Off 1 : On

11.4. Instance Common Service

Service Code	Name
09h	Delete
0Eh	Get_Attribute_Single
10h	Set_Attribute_Single

11.5. Specific Service

None

12. Counter Function Block Object (Class ID : 309h)

12.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1
8	Get	Member List	Struct of USINT and ARRAY of USINT	

12.2. Class Common Service

Service Code	Name
0Eh	Get_Attribute_Single
08h	Create

12.3. Instance Attribute

ID	Access Rule	Name	Data Type	Value
1	Get/Set	Type	USINT	0 : Not Configured 1 : Up-counter 2 : Reserved 3 : Up/Down-counter
2	Get/Set	Count Up Input Binding	STRUCT of :	
		Member Path Size	USINT	Default=0
	Path to Attr.	Segment type/port	BYTE	
		Segment Address	Path	
		Complement Flag	BOOL	
3	Get/Set	Reset Binding	STRUCT of :	
		Member Path Size	USINT	Default=0
	Path to Attr.	Segment type/port	BYTE	
		Segment Address	Path	
		Complement Flag	BOOL	
4	Get/Set	Preset Value Binding	STRUCT of :	
		Member Path Size	USINT	Default=0
	Path to Attr.	Segment type/port	BYTE	
		Segment Address	Path	
		Complement Flag		
5	Get/Set	Preset Value	UINT	Default=0000h
6	Get	Output	BOOL	
7	Get/Set	Count Value	UINT	0-65535 Hz
8	Get	Maximum Input Frequency	UINT	
9	Get/Set	Count Down Input Binding	STRUCT of :	Default=0
		Member Path Size	USINT	
	Path to Attr.	Segment type/port	BYTE	
		Segment Address	Path	
		Complement Flag	BOOL	

12.4. Instance Common Service

Service Code	Name
09h	Delete
0Eh	Get_Attribute_Single
10h	Set_Attribute_Single

12.5. Specific Service

None

13. Timer Function Block Object (Class ID : 30Ah)

13.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1
8	Get	Member List	Struct of USINT and ARRAY of USINT	

13.2. Class Common Service

Service Code	Name
0Eh	Get_Attribute_Single
08h	Create

13.3. Instance Attribute

ID	Access Rule	Name	Data Type	Value
1	Get/Set	Type	USINT	0 : Not Configured 1 : Pulse 2 : On-delay 3 : Off-delay
2	Get/Set	Input Binding	STRUCT of :	
		Member Path Size	USINT	Default=0
	Path to Attr.	Segment type/port	BYTE	
		Segment Address	Path	
		Complement Flag	BOOL	
3	Get/Set	Preset Timer Binding	STRUCT of :	
		Member Path Size	USINT	Default=0
	Path to Attr.	Segment type/port	BYTE	
		Segment Address	Path	
		Complement Flag	BOOL	
4	Get/Set	Preset Time	UINT	Default=0000h
5	Get/Set	Output	BOOL	
6	Get/Set	Reset Binding	STRUCT of :	
		Member Path Size	USINT	
	Path to Attr.	Segment type/port	BYTE	
		Segment Address	Path	
		Complement Flag	BOOL	
7	Get/Set	Elapsed Time	UINT	0000h-FFFFh
8	Get/Set	Time Base	USINT	0 : 1ms (default) 1 : 10ms

13.4. Instance Common Service

Service Code	Name
09h	Delete
0Eh	Get_Attribute_Single
10h	Set_Attribute_Single

13.5. Specific Service

None

14. Logic Supervisor Object (Class ID : 30Eh)

14.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
-	-	-	-	-

14.2. Class Common Service

Service Code	Name
-	-

14.3. Instance Attribute

ID	Access Rule	Name	Data Type	Value
1	Get/Set	Logic Enable	BOOL	0 : Logic Disabled 1 : Logic Enabled
2	Get	Data Table	ARRAY	
3	Get	Apply Attributes Additional Error Information	Struct of UINT and UINT	
101	Get/Set	Block Number per Scan	USINT	

14.4. Instance Common Service

Service Code	Name
05h	Reset
0Eh	Get_Attribute_Single
10h	Set_Attribute_Single

14.5. Specific Service

None

15. Produced Network Data Object (Class ID : 30Fh)

15.1. Class Attribute

ID	Access Rule	Name	Data Type	Value
-	-	-	-	-

15.2. Class Common Service

Service Code	Name
-	-

15.3. Instance Attribute

ID	Access Rule	Name	Data Type	Value
1	Get	Value	Specified in Data Type (Attribute #3)	
2	Get/Set	Binding	STRUCT of :	
		Member Path Size	USINT	Default=0
	Path to Attr.	Segment type/port	BYTE	
		Segment Address	Path	
		Complement Flag	BOOL	
3	Get	Data Type	USINT	

15.4. Instance Common Service

Service Code	Name
0Eh	Get_Attribute_Single
10h	Set_Attribute_Single

15.5. Specific Service

None

Specification

Specifications

General Specification

Item		Specification
Operating ambient temperature		+5 to +45°C
Storage ambient humidity		35 to 85%RH (No condensation)
Storage ambient temperature		-20 to 60°C
Vibration proof		10 to 57Hz, 0.35mm (Constant amplitude) 57 to 150Hz, 50m/s^2 (Constant acceleration)
Impact proof		147m/s^2 (peak), Three times each for 11ms for direction +/-X, Y and Z
Withstand voltage		500VAC for 1min. between body and external terminals
Insulation resistance		500VDC, 50M ohm or more between body and external terminals
Operating environment		No corrosive gas
Enclosure rating		IP67
Weight	EX250-SDL1-X142	400g or less
	EX9-OET1-X9	120g or less

Network Specification

Item	Specification
Applicable Fieldbus system	The CIP Networks Library Volume 1 : Common Industrial Protocol (CIP™) Volume 3 : DeviceNet™ Adaption of CIP
MAC ID setting range	0-63
Communication Rate	500kbps, 250kbps, 125kbps
Slave type	Group 2 only server
Media Connection type	T branch, Multi drop
Device Type	27
Product Code	102
Revision	Refer to EDS file
Vendor ID	7
Consumed connection size	6 bytes
Produced connection size	5 bytes
Supported message	Polled command (I/O message), Explicit message

DeviceLogix™ Specification

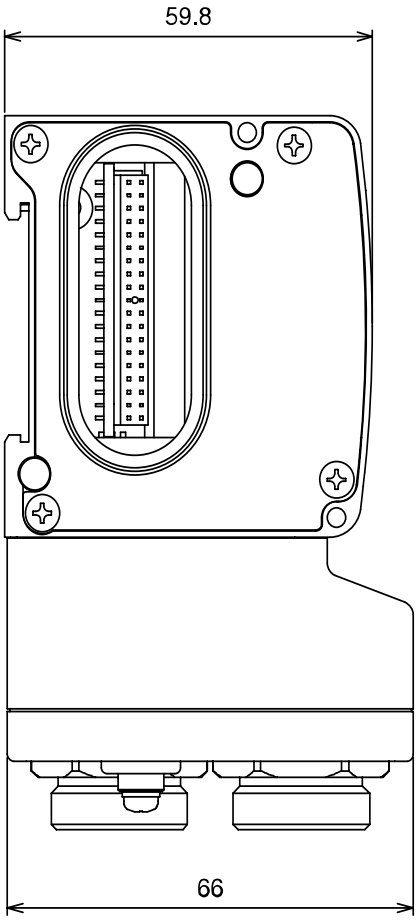
Item	Specification
Supported Function Block	• Boolean – AND, OR, XOR, NOT, NAND, NOR, XNOR • Latch (Bistable) – RSL and SRL • Timers – PUL, OND and OFD • Counters – UPC and UPD
Maximum number of function blocks	72
Physical Local input bits	32
Physical Local output bits	24
Network input bits (CNBs)	40
Network output bits (PNBs)	8
Force Input	Supported
Force Output	Supported
Parameters	Network Status Override Comm Status Override
Function Block processing time	1ms/ 24 function blocks
Timer Function Block time base	1ms, 10ms
Timer Function Block preset range	Up to 65535
Counter Function Block preset range	Up to 65535
Input Binding	AND, OR, XOR, NAND, NOR and XNOR will accept a maximum of 4 input binding and NOT will accepts only 1 input binding.

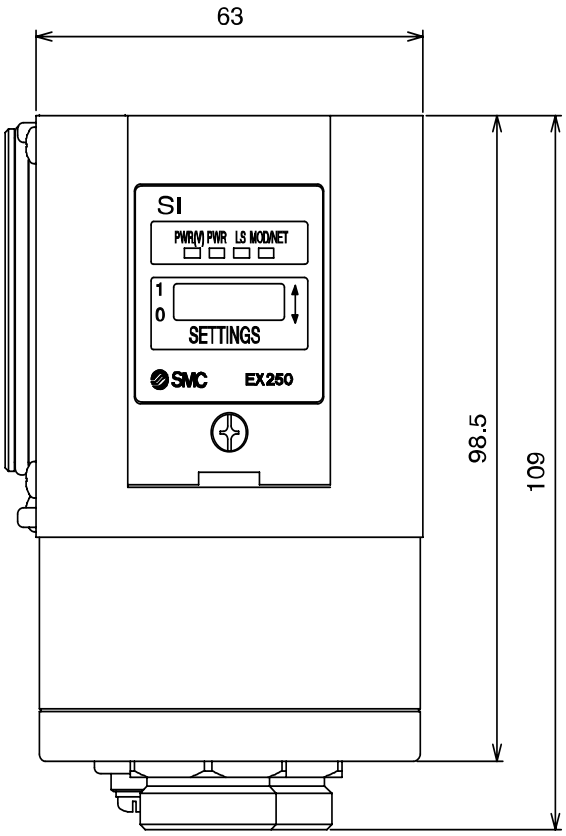
Electrical Specification

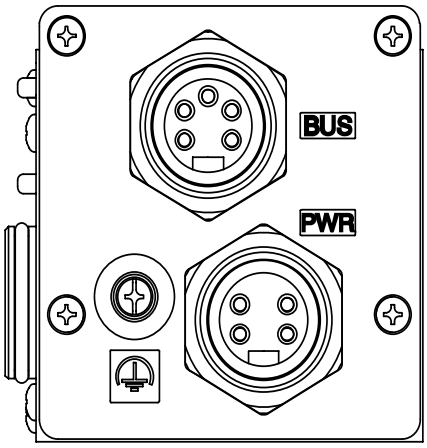
Item		Specification
Power voltage range Current consumption	Power for SI unit & Input Block	24VDC +4%, -15% Max 1.1A or less (Depending on the number of Input Block stations and sensor specifications)
	Power for Output (out 0-15)	24VDC +10%, -5% (Power voltage drop alarm occurs at approx. 19VDC) MAX 1.0A or less (Depending on number of Solenoid Valve stations and specifications)
	Power for Output Block (out 16-23)	24VDC +10%, -5% MAX 2.0A or less (Depending on number and specifications of load)
Input spec.	Number of Input point	32 points
	Input type	Digital input from EX250-IE*-X141
Output spec.	Number of Output Point	24 points
	Output type	Sourcing output (negative common)
	Load	・Out0-15 Solenoid valve made by SMC. (24VDC and 1.5W or less). ・Out16-23 Max.250mA per point. (EX9-OET1-X9)
	Short circuit protection	All output point

Outline Dimension

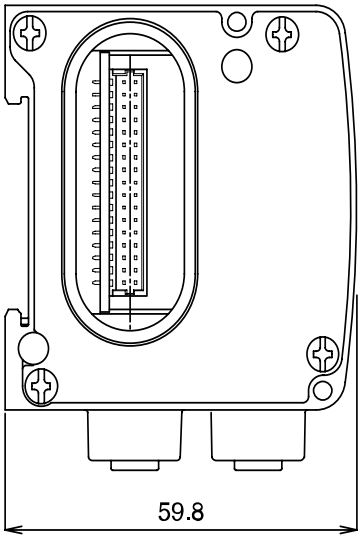
•EX250-SDL1-X142

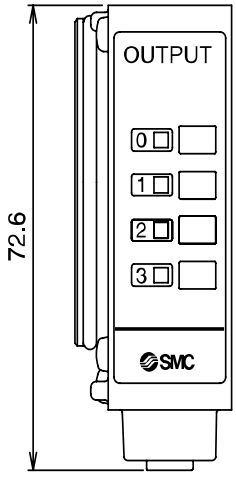


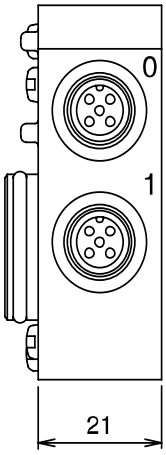




•EX9-OET1-X9







Diagnosis

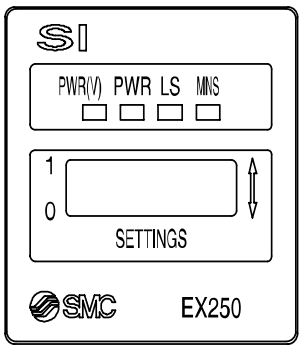
The following diagnostic feature is available on the EX250 DeviceLogix™ capable device.

Error Event	Diagnostic Description	Error Status Bit
Input Power short circuit	In the event of input power short circuit in the input block, SI unit can catch the error and report its status to the network	DI_CHK (*)
Aux. Power Voltage Drop	In the event of aux. power voltage drop below approx. 19V, SI unit can catch the error and report its status to the network	SOL_PWR (*)

(*) See the I/O Memory Map section in detail.

LED Indication

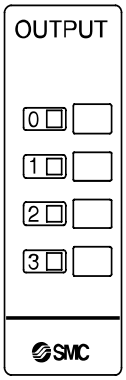
•EX250-SDL1-X142



The following table describes status indicators on SI Unit.

LED Name	Status	Description
PWR	Off	DeviceNet Power is Off
	Green	DeviceNet Power is ON Sufficient power (11-25VDC) present
PWR (V)	Off	Auxiliary Power is Off or insufficient (less than 20VDC)
	Green	Auxiliary Power is ON Sufficient power (22.8-26.4VDC) present
MNS	Off	No power applied to device/ Device is not online at networked setting mode or Under stand-alone setting mode
	Green	Online/Connected Device is operating normally and is online with connection established.
	Flashing Green	Online/Not Connected The device is on-line with no connections established.
	Flashing Red	Recoverable fault and/or an I/O Connection has timed-out.
	Red	Critical Fault The device has an unrecoverable fault and may need replacing.
	Flashing Red & Green	The device has detected a Network Access error
LS	Off	Logic disabled
	Green	Logic enabled
	Blinking Green	Local Forces applied and Logic enabled

•EX9-OET1-X9



The following table describes status indicators on SI Unit.

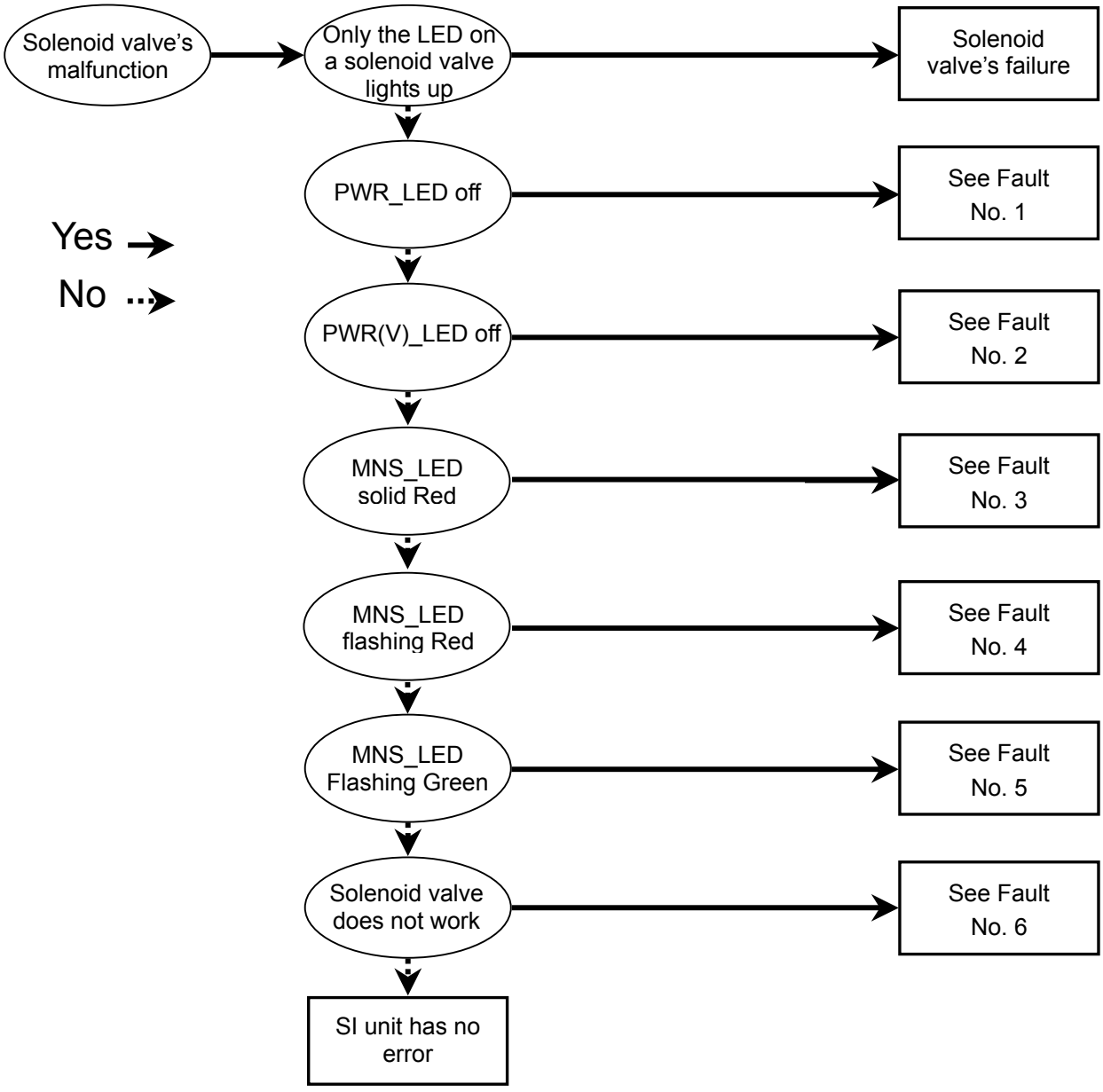
LED Name	Status	Description
0, 1, 2, 3	Lights up	Output corresponding to the number is ON.
	Off	Output corresponding to the number is OFF.

Troubleshooting

Troubleshooting

The following flow chart may help you as a guide for your troubleshooting for a node on a DeviceNet™ (Networked setting mode).

If the root cause of failure can not be found however the SI unit works fine after replacement, SI unit might be suspect. Fault might be happen depending on your usage environment, thus please consult SMC for the corrective action.



List of Fault and Countermeasures

Fault No.	Behavior	Probable cause	Check points	Take this action
1	PWR_LED off	DeviceNet power wiring fault	DeviceNet cable disconnected or loose Excessive bending and/or pulling force on the cable, causing a cable break	Tighten the DeviceNet cable connector Fix DeviceNet cable if damaged
			Check the DeviceNet communication line's wiring	Correct the DeviceNet wiring
		DeviceNet power fault	Check the DeviceNet power supply voltage	Turn DeviceNet power ON with sufficient voltage (i.e. 11VDC to 25VDC)
		Fuse blown out	N/A	Replace the SI unit
2	PWR(V)_LED off	Aux. power wiring fault	Auxiliary power cable disconnected or loose Excessive bending and/or pulling force on the cable causing a cable break	Correct aux. power wiring Tighten the aux. power cable connector Fix the aux. power cable if damaged
			Check the auxiliary power line's wiring.	Correct the wiring
		Aux. power fault.	Check the auxiliary power supply voltage	Turn aux. power ON with sufficient voltage (i.e. 24VDC +10% /-5%)
		Fuse blown	N/A	Replace the SI unit

Fault No.	Behavior	Probable cause	Check points	Take this action
3	MNS_LED solid Red	MAC_ID duplication	Check for MAC_ID duplication	Set MAC_ID correctly
		BUS OFF error	Check for noise generating equipment and/or high voltage line around the DeviceNet communication cable and aux. power cable	Move the DeviceNet cable and aux. power cable as far away from noise sources as possible Ground the FG terminal
			Check for short circuits on any wires within the DeviceNet cable Excessive bending and/or pulling force on the cable, causing a cable short.	Fix DeviceNet cable any short circuit or damaged is found
			Check DeviceNet communication Baud Rate	Correct Baud Rate setting
		Unrecoverable SI unit fault	N/A	Replace the SI unit

Fault No.	Behavior	Probable cause	Check points	Take this action
4	MNS_LED flashing Red	I/O connection time-out	DeviceNet cable disconnected or loose Excessive bending and/or pulling force on the cable, causing a cable break.	Tighten the DeviceNet cable connection Fix DeviceNet cable if any damage is found
			Check for Baud Rate-related length of DeviceNet communication cable and check for the terminating resistors	Correct DeviceNet media installation
			Check for noise generating equipment and/or high voltage line around the DeviceNet communication cable and aux. power cable	Move the DeviceNet cable and aux. power cable as far away from noise sources as possible

Fault No.	Behavior	Probable cause	Check points	Take this action
5	MNS_LED flashing Green	Waiting for I/O connection (off-line status)	DeviceNet cable disconnected or loose Excessive bending and/or pulling force on the cable, causing a cable break	Tighten the DeviceNet cable connection Fix DeviceNet cable if any damaged is found
			Check power to the DeviceNet master	Supply sufficient power to the master device
			Check the device configuration in the Master's Scan List	Correct the Master's Scan List configuration or Correct the slave's MAC_ID setting to match Master's Scan List, and recommission the SI unit
6	Solenoid valve dose not work	Wrong valve polarity installed	Check the solenoid valve's polarity	Install negative common valves or bi-polar valves
		Mismatch logical I/O addressing	Check for correlation between the Master's Scan List I/O configuration and I/O address in the control program	Correct the I/O address discrepancy between the control program and Master's Scan List I/O configuration

Note) When MNS_LED solid Red, SI unit won't resume without user intervention such as power recycling.

No.EX##-OMK1009-A

Revision history
A : Contents change

SMC Corporation

URL http://www.smcworld.com