DeviceNet

Operation Manual Eleventh Edition

X-SEL
TT
RCS-C
E-Con
SCON

IAI America, Inc.

Safety Precautions

Please read the information in “Safety Precautions” carefully before selecting a model and using the product.
The precautions described below are designed to help you use the product safely and avoid bodily injury and/or property damage.

Directions are classified as “danger,” “warning,” “caution” and “note,” according to the degree of risk.

⚠ Danger	Failure to observe the instruction will result in an imminent danger leading to death or serious injury.
⚠ Warning	Failure to observe the instruction may result in death or serious injury.
⚠ Caution	Failure to observe the instruction may result in injury or property damage.
Note	The user should take heed of this information to ensure the proper use of the product, although failure to do so will not result in injury.

This product has been designed and manufactured as a component for use in general industrial machinery.

Devices must be selected and handled by a system designer, personnel in charge of the actual operation using the product or similar individual with sufficient knowledge and experience, who has read both the catalog and operation manual (particularly the “Safety Precautions” section). Mishandling of the product poses a risk.
Please read the operation manuals for all devices, including the main unit and controller.
It is the user’s responsibility to verify and determine the compatibility of this product with the user’s system, and to use them properly.
After reading the catalog, operation manual and other materials, be sure to keep them in a convenient place easily accessible to the personnel using this product.
When transferring or loaning this product to a third party, be sure to attach the catalog, operation manual and other materials in a conspicuous location on the product, so that the new owner or user can understand its safe and proper use.
The danger, warning and caution directions in this “Safety Precautions” do not cover every possible case. Please read the catalog and operation manual for the given device, particularly for descriptions unique to it, to ensure its safe and proper handling.

⚠ Danger

[General]

- Do not use this product for the following applications:
  1. Medical equipment used to maintain, control or otherwise affect human life or physical health
  2. Mechanisms and machinery designed for the purpose of moving or transporting people
  3. Important safety parts of machinery
     This product has not been planned or designed for applications requiring high levels of safety. Use of this product in such applications may jeopardize the safety of human life. The warranty covers only the product as it is delivered.

[Installation]

- Do not use this product in a place exposed to ignitable, inflammable or explosive substances. The product may ignite, burn or explode.
- Avoid using the product in a place where the main unit or controller may come in contact with water or oil droplets.
- Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Doing so may result in fire.

[Operation]

- If you are using a pace maker or other mechanical implant, do not come within one meter of the product. The strong magnetic field generated by the product may cause the pace maker, etc., to malfunction.
- Do not pour water onto the product. Spraying water over the product, washing it with water or using it in water may cause the product to malfunction, resulting in injury, electric shock, fire, etc.

[Maintenance, Inspection, Repair]

- Never modify the product. Unauthorized modification may cause the product to malfunction, resulting in injury, electric shock, fire, etc.
- Do not disassemble and reassemble the components relating to the basic structure of the product or its performance and function. Doing so may result in injury, electric shock, fire, etc.

⚠ Warning

[General]

- Do not use the product outside the specifications. Using the product outside the specifications may cause it to fail, stop functioning or sustain damage. It may also significantly reduce the service life of the product. In particular, observe the maximum loading capacity and speed.

[Installation]

- If the machine will stop in the case of system problem such as emergency stop or power failure, design a safety circuit or other device that will prevent equipment damage or injury.
- Be sure to provide Class D grounding for the controller and actuator (formerly Class 3 grounding: Grounding resistance at 100 Ω or less). Leakage current may cause electric shock or malfunction.
- Before supplying power to and operating the product, always check the operation area of the equipment to ensure safety. Supplying power to the product carelessly may cause electric shock or injury due to contact with the moving parts.
- Wire the product correctly by referring to the operation manual. Securely connect the cables and connectors so that they will not be disconnected or come loose. Failure to do so may cause the product to malfunction or cause fire.

[Operation]

- Do not touch the terminal block or various switches while the power is supplied to the product. Failure to observe this instruction may result in electric shock or malfunction.
- Before operating the moving parts of the product by hand (for the purpose of manual positioning, etc.), confirm that the servo is turned off (using the teaching pendant). Failure to observe this instruction may result in injury.
- The cables supplied with the product are flexible, but they are not robot cables. Do not store the cables in a movable cable duct (cable bearer, etc.) that bends more than the specified bending radius.
- Do not scratch the cables. Scratching, forcibly bending, pulling, winding, crushing with heavy object or pinching a cable may cause it to leak current or lose continuity, resulting in fire, electric shock, malfunction, etc.

- Turn off the power to the product in the event of power failure. Failure to do so may cause the product to suddenly start moving when the power is restored, thus resulting in injury or product damage.
- If the product is generating heat, smoke or a strange smell, turn off the power immediately. Continuing to use the product may result in product damage or fire.
- If any of the internal protective devices (alarms) of the product has actuated, turn off the power immediately. Continuing to use the product may result in product damage or injury due to malfunction. Once the power supply is cut off, investigate and remove the cause and then turn on the power again.
- If the LEDs on the product do not illuminate after turning on the power, turn off the power immediately. The protective device (fuse, etc.) on the live side may remain active. Request repair to the IAI sales office from which you purchased the product.

[Maintenance, Inspection, Repair]

- Before conducting maintenance/inspection, parts replacement or other operations on the product, completely shut down the power supply. At this time, take the following measures:
  1. Display a sign that reads, “WORK IN PROGRESS. DO NOT TURN ON POWER” at a conspicuous place, in order to prevent a person other than the operator from accidentally turning on the power while the operation is working.
  2. When two or more operators are to perform maintenance/inspection together, always call out every time the power is turned on/off or an axis is moved in order to ensure safety.

[Disposal]

- Do not throw the product into fire. The product may burst or generate toxic gases.

⚠ Caution

[Installation]

- Do not use the product under direct sunlight (UV ray), in a place exposed to dust, salt or iron powder, in a humid place, or in an atmosphere of organic solvent, phosphate-ester machine oil, sulfur dioxide gas, chlorine gas, acids, etc. The product may lose its function over a short period of time, or exhibit a sudden drop in performance or its service life may be significantly reduced.
- Do not use the product in an atmosphere of corrosive gases (sulfuric acid or hydrochloric acid), inflammable gases or ignitable liquids. Rust may form and reduce the structural strength or the motor may ignite or explode.
- When using the product in any of the places specified below, provide a sufficient shield. Failure to do so may result in malfunction:
  1. Place where large current or high magnetic field is present
  2. Place where welding or other operations are performed that cause arc discharge
  3. Place subject to electrostatic noise
  4. Place with potential exposure to radiation
- Install the main unit and controller in a place subject to as little dust as possible. Installing them in a dusty place may result in malfunction.
- Do not install the product in a place subject to large vibration or impact (4.9 m/s2 or more). Doing so may result in the malfunctioning of the product.
- Provide an emergency-stop device in a readily accessible position so the device can be actuated immediately upon occurrence of a dangerous situation during operation. Lack of such device in an appropriate position may result in injury.
- Provide sufficient maintenance space when installing the product. Routine inspection and maintenance cannot be performed without sufficient space, which will eventually cause the equipment to stop or the product to sustain damage.
- Do not hold the moving parts of the product or its cables during installation. It may result in injury.
- Always use IAI’s genuine cables for connection between the controller and the actuator. Also use IAI’s genuine products for the key component units such as the actuator, controller and teaching pendant.

- Before installing or adjusting the product or performing other operations on the product, display a sign that reads, “WORK IN PROGRESS. DO NOT TURN ON POWER.” If the power is turned on inadvertently, injury may result due to electric shock or sudden activation of an actuator.

[Operation]
- Turn on the power to individual equipment one by one, starting from the equipment at the highest level in the system hierarchy. Failure to do so may cause the product to start suddenly, resulting in injury or product damage.
- Do not insert a finger or object in the openings in the product. It may cause fire, electric shock or injury.
- Do not bring a floppy disk or other magnetic media within one meter of the product. The magnetic field generated by the magnet may destroy the data in the floppy disk, etc.

[Maintenance, Inspection, Repair]
- Do not touch the terminals when performing an insulation resistance test. Electric shock may result. (Do not perform any withstand voltage test, since the product uses DC voltage.)

Note

[General]
- If you are planning to use the product under a condition or environment not specified in the catalogs and operation manual, or in an application requiring strict safety such as aircraft facility, combustion system, entertainment machine, safety device or other equipment having significant impact on human life or property, design operating ranges with sufficient margins from the ratings and design specifications or provide sufficient safety measures such as fail-safes. Whatever you do, always consult IAI’s sales representative.

[Installation]
- Do not place objects around the controller that will block airflows. Insufficient ventilation may damage the controller.
- Do not configure a control circuit that will cause the work to drop in case of power failure. Configure a control circuit that will prevent the table or work from dropping when the power to the machine is cut off or an emergency stop is actuated.

[Installation, Operation, Maintenance]
- When handling the product, wear protective gloves, protective goggles, safety shoes or other necessary gear to ensure safety.

[Disposal]
- When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste.

Others

- IAI shall not be liable whatsoever for any loss or damage arising from a failure to observe the items specified in “Safety Precautions.”
- If you have any question regarding the product, contact the IAI sales office near you. The addresses and phone numbers of our sales offices are listed at the end of the catalog.

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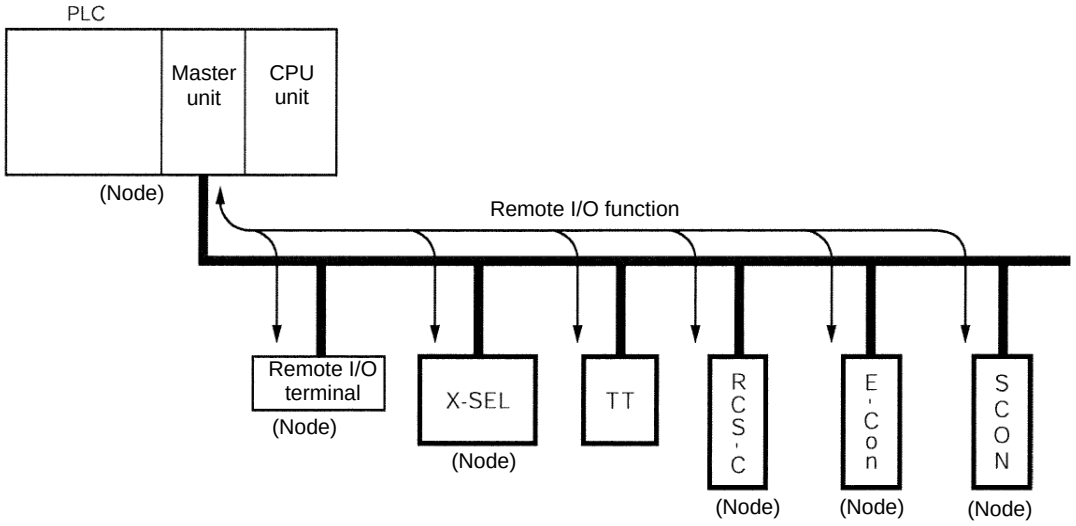
8. EDS File 57

1. Overview

DeviceNet, which is an open field network, is a multiple-bit type multi-vendor network that combines controls and data on a machine/line control level.
By connecting to DeviceNet, X-SEL, TT, RCS-C, E-Con and SCON controllers can be used to configure a system based on minimal wiring.

> X-SEL, TT, RCS-C, E-Con and SCON controllers are treated as remote I/O terminals on DeviceNet networks.

* For details of DeviceNet, refer to the operation manual for the programmable controller (hereinafter referred to as “PLC”) in which the master unit is installed.
When reading this Operation Manual, also refer to the operation manual for the X-SEL, TT, RCS-C, E-Con or SCON controller you are using.
Take note that operations and uses not expressly permitted in this Operation Manual should be considered prohibited.



2. X-SEL

2.1 Models

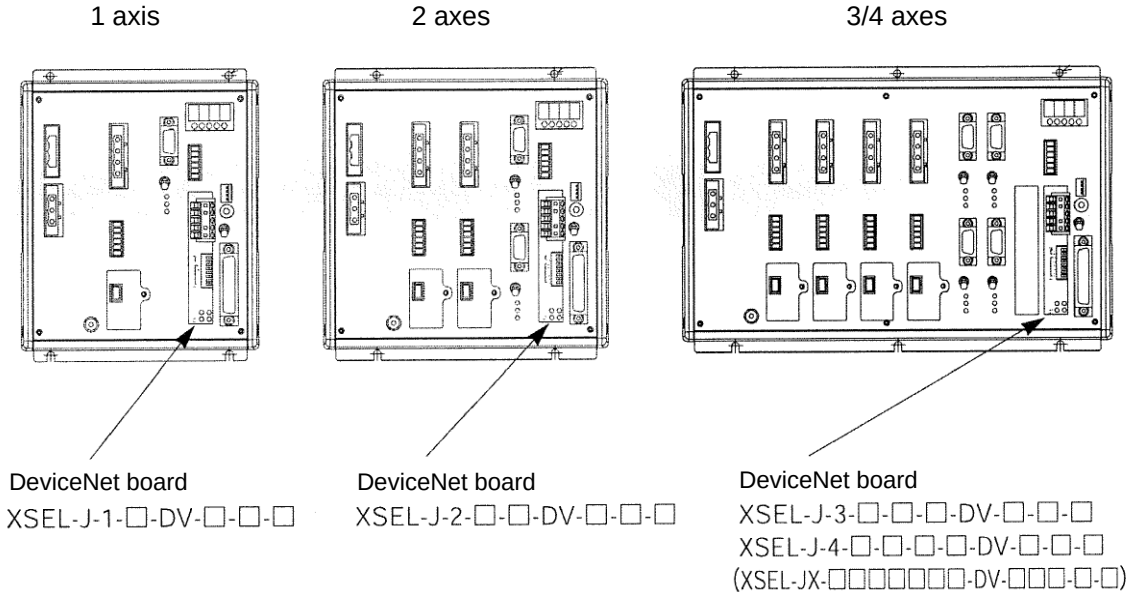
DeviceNet-ready X-SEL controllers come in six different models as specified below.

● Installation position of DeviceNet board

No.	Controller type	Network I/O points (maximum inputs/outputs)	Board installation position				X-SEL model		I/O slot arrangement
			Standard slot (I/O1)	Expansion slot 1 (I/O2)	Expansion slot 2 (I/O3)	Expansion slot 3 (I/O4)			
1	J type	256/256	●				1 axis	XSEL-J-1-□-DV-□-□-□	Fig. 2-1
							2 axes	XSEL-J-2-□-□-DV-□-□-□	
2			●				3 axes	XSEL-J-3-□-□-□-DV-□-□-□	
							4 axes	XSEL-J-4-□-□-□-□-DV-□-□-□	
3	K type	256/256	●				1 axis	XSEL-K-1-□-DV-□-□-□	Fig. 2-2
							⋮	⋮	
							4 axes	XSEL-K-4-□-□-□-□-DV-□-□-□	
4	JX type	256/256	●					XSEL-JX-□□□□□□□□-DV-□□□-□-□	*1
5	KX type	256/256	●					XSEL-KX-□□□□□□□□-DV-□□□-□-□	*2
6	P type	256/256	Installation position of field network board				1 axis	XSEL-P-1-□-DV-□-□-□-3	Fig. 2-3
							6 axes	XSEL-P-6-□-□-□-□-□-□-DV-□-□-□-3	
	Q type	256/256					1 axis	XSEL-Q-1-□-DV-□-□-□-3	*3
							6 axes	XSEL-Q-6-□-□-□-□-□-□-DV-□-□-□-3	
7	PX type	256/256	Installation position of field network board				4 axes	XSEL-PX4-□□□□□□□□-DV-	*3
							5 axes	XSEL-PX5-□□□□□□□□-□□□□□-DV-	
							6 axes	XSEL-PX6-□□□□□□□□-□□□□□-□□□□□□-DV-	
	QX type	256/256					4 axes	XSEL-QX4-□□□□□□□□-DV-	*3
							5 axes	XSEL-QX5-□□□□□□□□-□□□□□-DV-	
							6 axes	XSEL-QX6-□□□□□□□□-□□□□□-□□□□□□-DV-	

*1 The installation position of DeviceNet board is the same as the position for the 4-axis specification shown in Fig. 2-1.
*2 The installation position of DeviceNet board is the same as the position shown in Fig. 2-2.
*3 The installation position of DeviceNet board is the same as the position shown in Fig. 2-3. Even when there are five or six axes, the installation position of DeviceNet board is the same as the position for the 4-axis specification.

(1) Compact type (J type)



(Note) I/O boards cannot be installed in controllers of 1/2-axis specifications. Only one expansion I/O board (Note 1) can be installed in controllers of 3/4-axis specifications.

Fig. 2-1

(2) General-purpose type (K type)

- A DeviceNet board is installed in the standard slot (I/O1 --- the slot at the far left).
- Either an expansion I/O board (Note 1) or SIO board (Note 2) can be installed in each expansion slot.

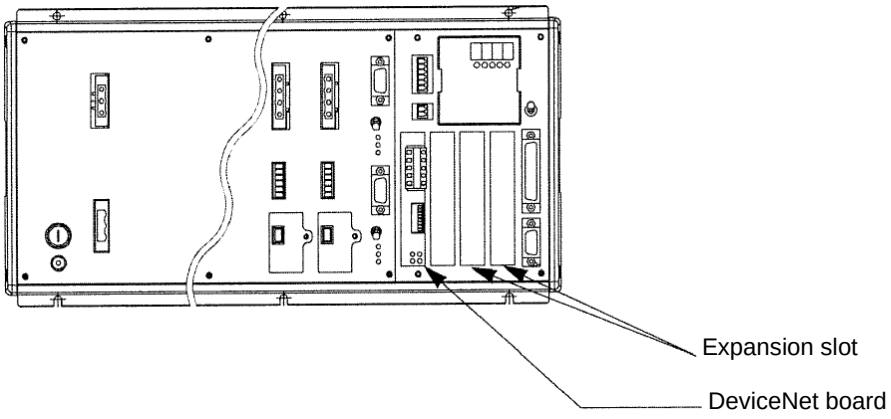
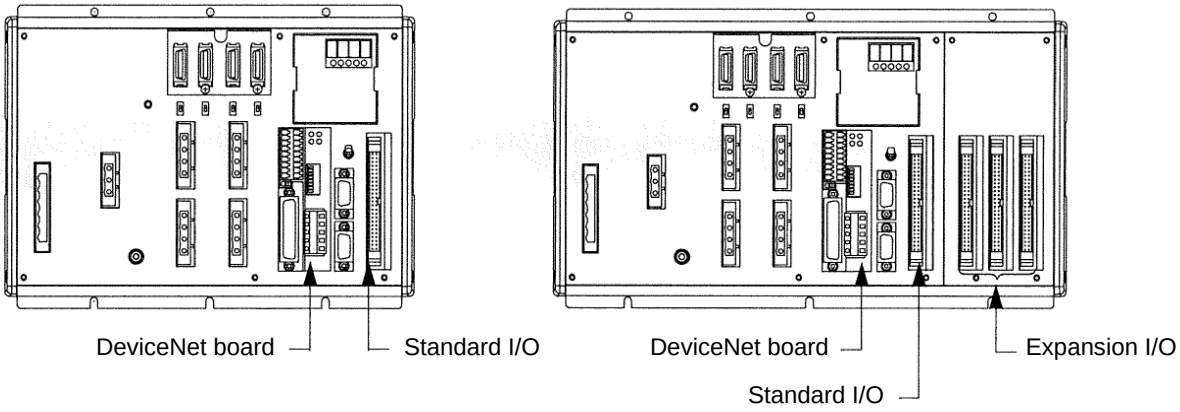


Fig. 2-2

(3) P/Q types

- A DeviceNet board is installed in the installation position of field network board.



X-SEL-P-1-☐-DV-☐-☐-☐-3
X-SEL-P-2-☐-☐-DV-☐-☐-☐-3
X-SEL-P-3-☐-☐-☐-DV-☐-☐-☐-3
X-SEL-P-4-☐-☐-☐-☐-DV-☐-☐-☐-3
X-SEL-P-5-☐-☐-☐-☐-☐-DV-☐-☐-☐-3
X-SEL-P-6-☐-☐-☐-☐-☐-☐-DV-☐-☐-☐-3

X-SEL-Q-1-☐-DV-☐-☐-☐-3
X-SEL-Q-2-☐-☐-DV-☐-☐-☐-3
X-SEL-Q-3-☐-☐-☐-DV-☐-☐-☐-3
X-SEL-Q-4-☐-☐-☐-☐-DV-☐-☐-☐-3
X-SEL-Q-5-☐-☐-☐-☐-☐-DV-☐-☐-☐-3
X-SEL-Q-6-☐-☐-☐-☐-☐-☐-DV-☐-☐-☐-3

Fig. 2-3

(Note 1) Expansion I/O board

Model [1] IA-103-X-32 (32 input points/16 output points, NPN specification)
[2] IA-103-X-32-P (32 input points/16 output points, PNP specification)
[3] IA-103-X-16 (16 input points/32 output points, NPN specification)
[4] IA-103-X-16-P (16 input points/32 output points, PNP specification)
[5] IA-IO-3204-NP (48 input points/48 output points, NPN specification)
[6] IA-IO-3204-PN (48 input points/48 output points, PNP specification)
[7] IA-IO-3205-NP (48 input points/48 output points, NPN specification)
[8] IA-IO-3205-PN (48 input points/48 output points, PNP specification)
(Note) [5] and [6] are used for K/P/Q types only, while [7] and [8] are used for J type only.

For details of each specification, refer to the “Operation Manual for X-SEL Controller.”

(Note 2) SIO board

Model [1] IA-105-X-MW-A (RS232C)
[2] IA-105-X-MW-B (RS422)
[3] IA-105-X-MW-C (RS485)

With all boards, one board supports two channels.

2.2 Interface Specifications

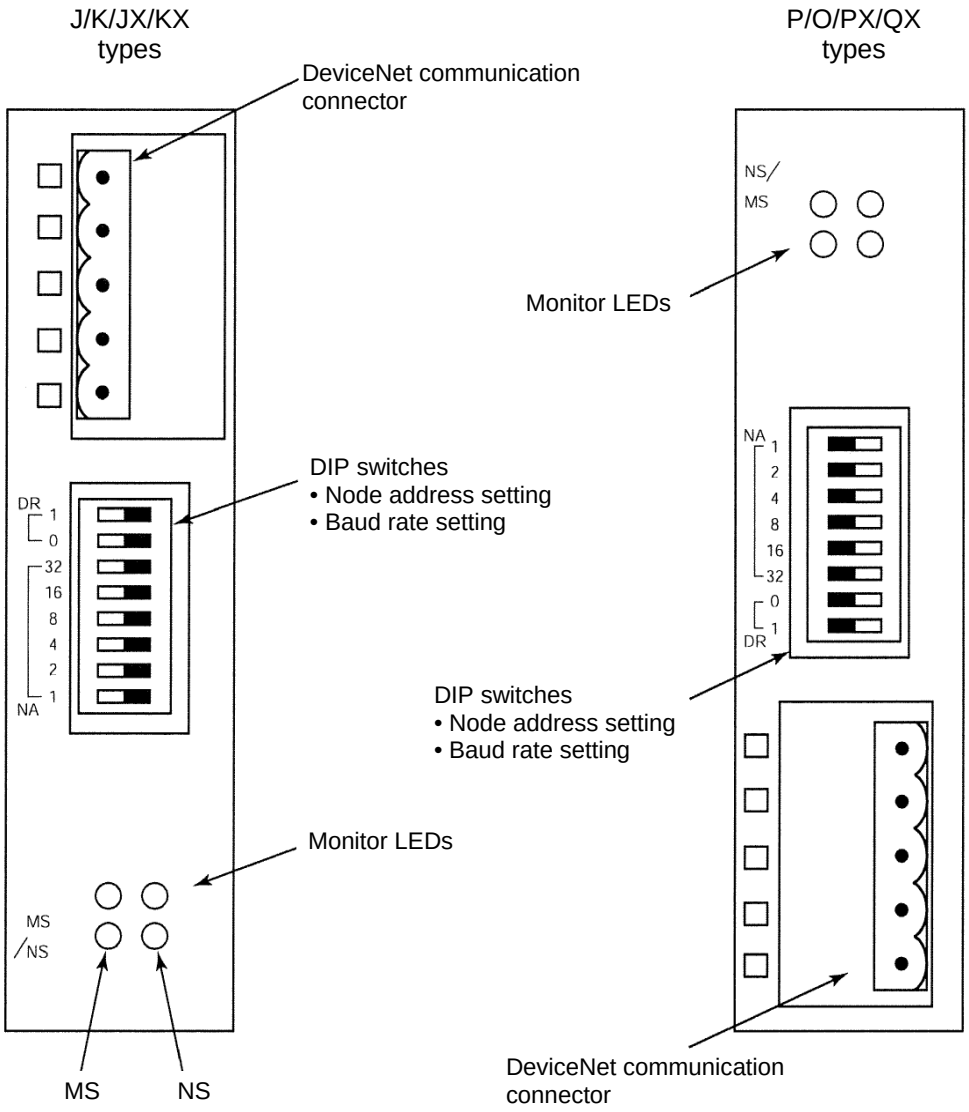
The DeviceNet interface specifications are summarized below.

<table>
<tr><th>Item</th><th colspan="4">Specification</th></tr>
<tr><td rowspan="3">Communication protocol</td><td colspan="4">A certified DeviceNet 2.0 interface module is used (certification pending).</td></tr>
<tr><td colspan="4">Group 2 only server</td></tr>
<tr><td colspan="4">Network-powered insulation node</td></tr>
<tr><td rowspan="3">Communication specification</td><td colspan="2" rowspan="3">Master-slave connection</td><td colspan="2">Bit strobe</td></tr>
<tr><td colspan="2">Polling</td></tr>
<tr><td colspan="2">Cyclic</td></tr>
<tr><td>Baud rate</td><td colspan="4">500 k / 250 k / 125 kbps (selectable by DIP switches)</td></tr>
<tr><td rowspan="5">Communication cable length</td><td>Baud rate</td><td>Maximum network length</td><td>Maximum branch line length</td><td>Total branch line length</td></tr>
<tr><td>500 kbps</td><td>100 m</td><td rowspan="3">6 m</td><td>39 m</td></tr>
<tr><td>250 kbps</td><td>250 m</td><td>78 m</td></tr>
<tr><td>125 kbps</td><td>500 m</td><td>156 m</td></tr>
<tr><td colspan="4">Note) When a large-size DeviceNet cable is used.</td></tr>
<tr><td>Communication power supply</td><td colspan="4">DC 24 V (supplied from DeviceNet)</td></tr>
<tr><td>Consumption current of communication power supply</td><td colspan="4">60 mA</td></tr>
<tr><td>Number of occupied nodes</td><td colspan="4">1 node</td></tr>
<tr><td>Connector</td><td colspan="4">MSTBA2.5/5-G-5.08AU M (*1) by Phoenix Contact</td></tr>
</table>

(*1) The cable-end connector is a standard accessory.
SMSTB2.5/5-ST-5.08AU by Phoenix Contact

2.3 DeviceNet board

2.3.1 Name of Each Part



2.3.2 DIP Switch Settings

The DIP switches are used to set the following items:
(1) Node address
(2) Baud rate
(Note) Turn off the X-SEL power before setting the DIP switches.

(1) Setting the node address (MAC ID)

Set the node address (MAC ID) using a hexadecimal value according to the table below.

1: ON 0: OFF

	DIP switches					
Node address (MAC ID)	NA32	NA16	NA8	NA4	NA2	NA1
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮
60	1	1	1	1	1	1
61	1	1	1	1	1	1
62	1	1	1	1	1	1
63	1	1	1	1	1	1

(Note) The node address corresponds to the remote I/O address in the PLC. This DeviceNet card supports a maximum of 256 input points and 256 output points. Accordingly, the node address corresponding to the I/O points used will be occupied in the PLC.
Take note that all node addresses must be unique.
(For details, refer to the operation manual for the PLC.)

(2) Setting the baud rate

Set the baud rate according to the table below.

1: ON 0: OFF

	DIP switches	
Baud rate	DR1	DR0
125 kbps	0	0
250 kbps	0	1
500 kbps	1	0
Setting prohibited	1	1

2.3.3 Monitor LED Indicators

The two LEDs, MS and NS, provided on the front panel of the board are used to check the board (node) condition and network condition. (The remaining two LEDs are not currently used.)
The LEDs illuminate in two colors (red and green), and you can monitor the conditions listed in the table below based on the illumination status and color of each LED.

MS (Module Status) LED: Condition of the board (node) itself
NS (Network Status) LED: Condition of the network

LED	Color	Illumination status	Description (meaning)
MS	Green	Steady light	The board is operating normally.
	Red	Steady light	A hardware error occurred. The board must be replaced.
		Blinking	A minor error occurred, such as a DIP switch setting error or configuration error. The error can be reset by, for example, reconfiguring the applicable setting.
	-	Off	Power is not supplied from the X-SEL controller. The X-SEL controller must be repaired or the board must be replaced.
NS	Green	Steady light	Network connection has been established and the board is communicating normally.
		Blinking	The board is online, but network connection is not yet established. Communication is stopped. (The network is normal.)
	Red	Steady light	Node address duplication or bus-off state was detected. Communication is not possible.
		Blinking	A communication error occurred (communication time-out occurred).
	-	Off	• The board is not online. • DeviceNet power is not supplied.

Self test is performed when the power is turned on.
During the test, the monitor LEDs cycle in the following sequence:

[1] NS turns off.
[2] MS illuminates in steady green (approx. 0.25 second).
[3] MS illuminates in steady red (approx. 0.25 second).
[4] MS illuminates in steady green.
[5] NS illuminates in steady green (approx. 0.25 second).
[6] NS illuminates in steady red (approx. 0.25 second).
[7] NS turns off.

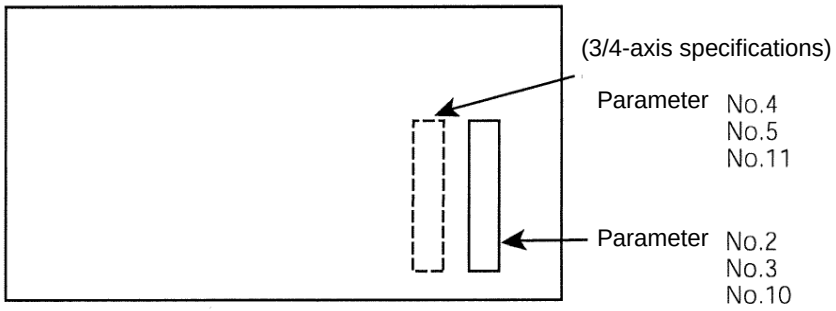
When the self test is finished and the board starts communicating normally, both the MS and NS LEDs change to steady green.

2.4 Setting of I/O Parameters (Assignment of I/O Ports)

Set the X-SEL I/O ports to be used in DeviceNet communication. X-SEL controllers support various I/O port settings through use of I/O parameters. (For details, refer to the “Operation Manual for X-SEL Controller.”)
A representative method to set I/O parameters is explained below.
The basic steps are to set I/O Parameter No. 1, “I/O port assignment type” to “Fixed assignment” and then set I/O port addresses for each I/O slot.

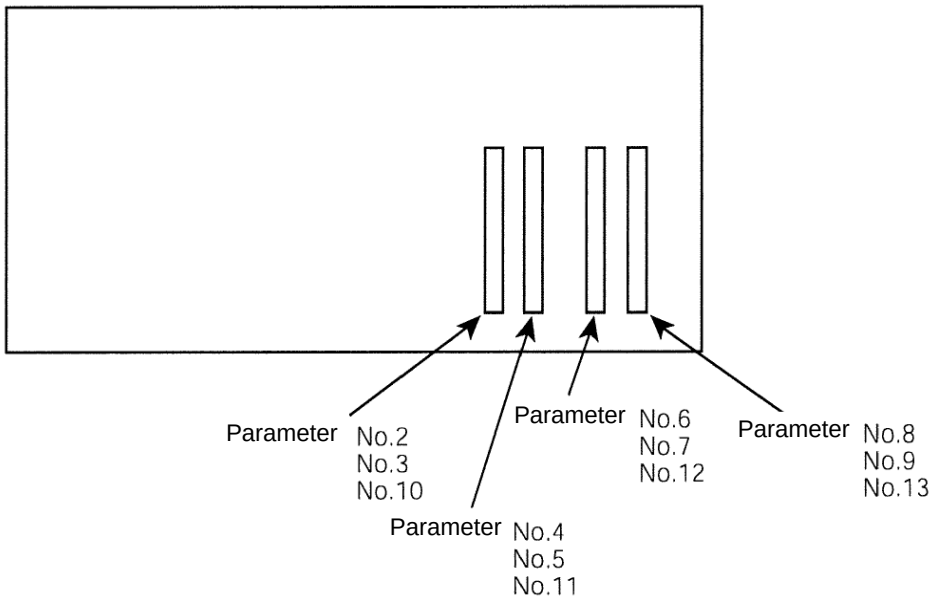
2.4.1 Board Installation Position (Slot) and I/O Parameter Numbers

(1) J type



(Note) On J-type controllers, Parameter Nos. 6 to 9 are all set to “-1,” while Parameter Nos. 12 and 13 are set to “0,” because expansion I/O slots 2 and 3 are not available.
On controllers of 1/2-axis specifications, similarly Nos. 4 and 5 are both set to “-1,” while No. 11 is set to “0.”

(2) K type



2.4.2 Factory-set Parameters

(1) Factory-set parameters for J/K types

No.	Parameter name	Input range	Setting	Remarks
1	I/O port assignment type	0 ~ 20	0	0: Fixed assignment 1: Automatic assignment (Priority: Assigned from slot 1) * Ports are assigned consecutively only for slots where a board is physically installed, starting from slot 1, for safety reasons.
2	Input port start number for standard I/O based on fixed assignment (I/O1)	-1 ~ 599	000	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
3	Output port start number for standard I/O based on fixed assignment (I/O1)	-1 ~ 599	300	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
4	Input port start number for expansion I/O1 based on fixed assignment (I/O2)	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.) (Slot immediately next to the standard I/O slot)
5	Output port start number for expansion I/O1 based on fixed assignment (I/O2)	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
6	Input port start number for expansion I/O2 based on fixed assignment (I/O3)	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
7	Output port start number for expansion I/O2 based on fixed assignment (I/O3)	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
8	Input port start number for expansion I/O3 based on fixed assignment (I/O4)	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
9	Output port start number for expansion I/O3 based on fixed assignment (I/O4)	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
10	Error monitor for standard I/O (I/O1)	0 ~ 5	2	0: Do not monitor 1: Monitor 2: Monitor (Do not monitor 24-V I/O power supply errors) (Main application version 0.55 or later) 3: Monitor (Monitor 24-V I/O power supply errors only) (Main application version 0.55 or later)
11	Error monitor for expansion I/O1 (I/O2)	0 ~ 5	0	
12	Error monitor for standard I/O2 (I/O3)	0 ~ 5	0	
13	Error monitor for expansion I/O3 (I/O4)	0 ~ 5	0	
14	Number of ports used for remote input via network I/F card	0 ~ 256	64	Multiple of 8
15	Number of ports used for remote output via network I/F card	0 ~ 256	64	Multiple of 8

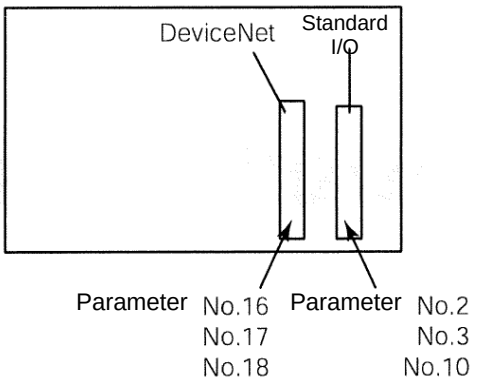
I/O1 through I/O4 indicate slot numbers.

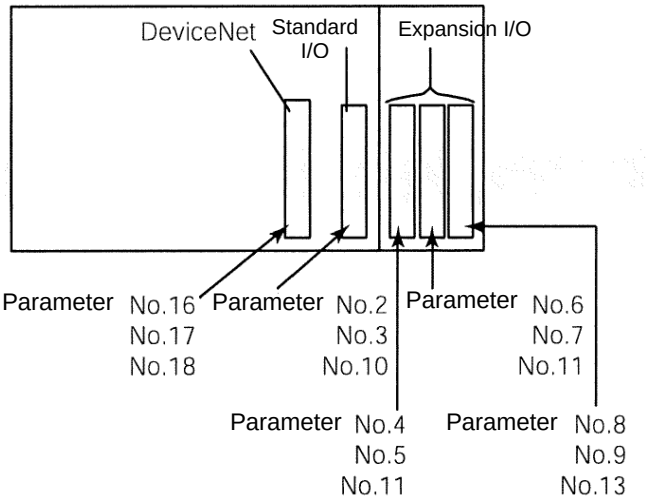
(2) Factory-set parameters for P/Q types

No.	Parameter name	Input range	Setting	Remarks
1	I/O port assignment type	0 ~ 20	0	0: Fixed assignment 1: Automatic assignment (Priority: Assigned from slot 1) * Ports are assigned consecutively only for slots where a board is physically installed, starting from slot 1, for safety reasons.
2	Input port start number for standard I/O based on fixed assignment (I/O1)	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
3	Output port start number for standard I/O based on fixed assignment (I/O1)	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
4	Input port start number for expansion I/O1 based on fixed assignment (I/O2)	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.) (Slot immediately next to the standard I/O slot)
5	Output port start number for expansion I/O1 based on fixed assignment (I/O2)	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
6	Input port start number for expansion I/O2 based on fixed assignment (I/O3)	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
7	Output port start number for expansion I/O2 based on fixed assignment (I/O3)	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
8	Input port start number for expansion I/O3 based on fixed assignment (I/O4)	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
9	Output port start number for expansion I/O3 based on fixed assignment (I/O4)	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
10	Error monitor for standard I/O (I/O1)	0 ~ 5	0	0: Do not monitor 1: Monitor 2: Monitor (Do not monitor 24-V I/O power supply errors) (Main application version 0.55 or later) 3: Monitor (Monitor 24-V I/O power supply errors only) (Main application version 0.55 or later)
11	Error monitor for expansion I/O1 (I/O2)	0 ~ 5	0	
12	Error monitor for standard I/O2 (I/O3)	0 ~ 5	0	
13	Error monitor for expansion I/O3 (I/O4)	0 ~ 5	0	
14	Number of ports used for remote input via network I/F card	0 ~ 256	64	Multiple of 8
15	Number of ports used for remote output via network I/F card	0 ~ 256	64	Multiple of 8
16	Input port start number for network I/F module based on fixed assignment	-1 ~ 599	0	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
17	Output port start number for network I/F module based on fixed assignment	-1 ~ 599	300	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
18	Error monitor for network I/F module	0 ~ 5	1	0: Do not monitor 1: Monitor * Some exceptions apply.

I/O1 through I/O4 indicate slot numbers.

(3) P/Q types


DeviceNet
Standard I/O
Parameter No.16 No.17 No.18
Parameter No.2 No.3 No.10


DeviceNet
Standard I/O
Expansion I/O
Parameter No.16 No.17 No.18
Parameter No.2 No.3 No.10
Parameter No.6 No.7 No.11
Parameter No.4 No.5 No.11
Parameter No.8 No.9 No.13

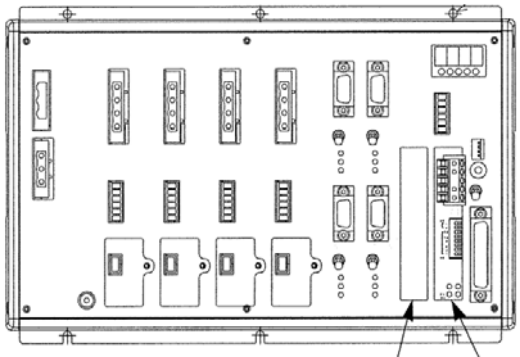
2.5 Parameter Setting Examples

2.5.1 Setting Example for J/K Types

(1) Setting example when only a DeviceNet board is installed

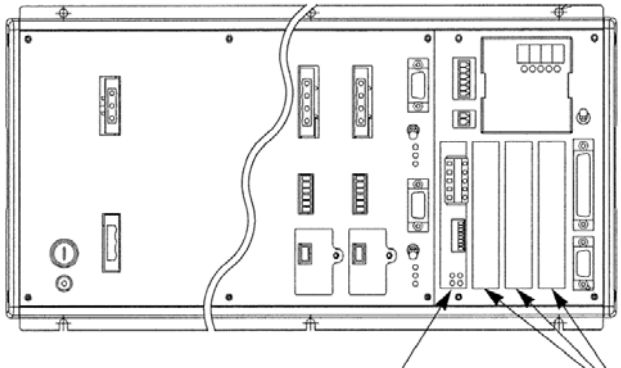
Assign 32 input points and 16 output points to the DeviceNet board from the first standard I/O port, as you would for the standard X-SEL I/O board (50-pin connector), and do not use any other I/O port.
* In this case, the I/O power connector need not be connected to 24 VDC (K type).

X-SEL (J type)



Not used.
(Not available on controllers of 1/2-axis specifications.)
Input port Nos. 000 to 031
Output port Nos. 300 to 315

X-SEL (K type)



Input port Nos. 000 to 031
Output port Nos. 300 to 315
Not used.

(This example assumes the installed condition shown in Fig. 2-1 and Fig. 2-2 under 2.1.)

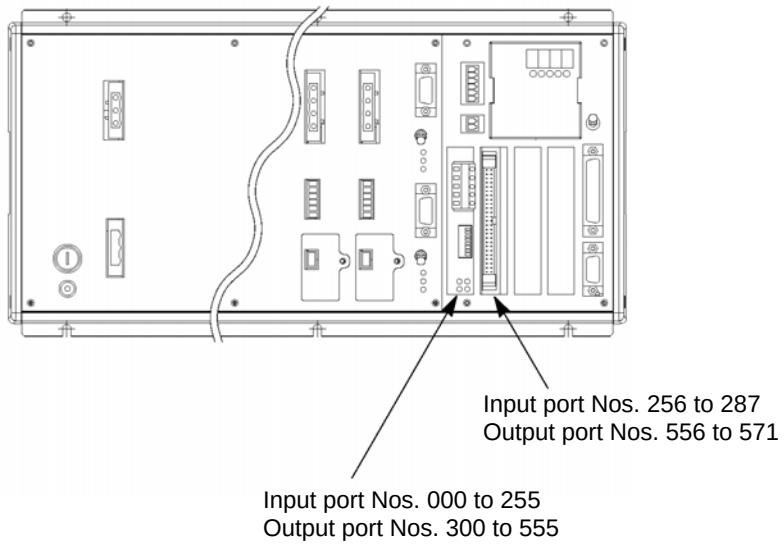
I/O parameters for X-SEL J/K types

No.	Parameter name	Default value (reference)	Input range	Setting	Remarks
1	I/O port assignment type	0	0 ~ 20	0	0: Fixed assignment 1: Automatic assignment (Priority: Assigned from slot 1) * Ports are assigned consecutively only for slots where a board is physically installed, starting from slot 1, for safety reasons.
2	Input port start number for standard I/O based on fixed assignment (I/O1)	000	-1 ~ 599	000	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
3	Output port start number for standard I/O based on fixed assignment (I/O1)	300	-1 ~ 599	300	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
4	Input port start number for expansion I/O1 based on fixed assignment (I/O2)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.) (Slot immediately next to the standard I/O slot)
5	Output port start number for expansion I/O1 based on fixed assignment (I/O2)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
6	Input port start number for expansion I/O2 based on fixed assignment (I/O3)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
7	Output port start number for expansion I/O2 based on fixed assignment (I/O3)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
8	Input port start number for expansion I/O3 based on fixed assignment (I/O4)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
9	Output port start number for expansion I/O3 based on fixed assignment (I/O4)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
10	Error monitor for standard I/O (I/O1)	2	0 ~ 5	2	0: Do not monitor 1: Monitor 2: Monitor (Do not monitor 24-V I/O power supply errors) (Main application version 0.55 or later) 3: Monitor (Monitor 24-V I/O power supply errors only) (Main application version 0.55 or later)
11	Error monitor for expansion I/O1 (I/O2)	1	0 ~ 5	0	
12	Error monitor for standard I/O2 (I/O3)	0	0 ~ 5	0	
13	Error monitor for expansion I/O3 (I/O4)	0	0 ~ 5	0	
14	Number of ports used for remote input via network I/F card	64	0 ~ 256	32	Multiple of 8
15	Number of ports used for remote output via network I/F card	64	0 ~ 256	16	Multiple of 8

I/O1 through I/O4 indicate slot numbers.

(2) Setting example when a DeviceNet board is used together with an expansion I/O board

a. Assign 256 input points and 256 output points to the DeviceNet board from the first standard I/O port, and assign the subsequent I/O port numbers to the expansion I/O board IA-103-X-32 (32 input points, 16 output points).
The same settings apply to J-type controllers.

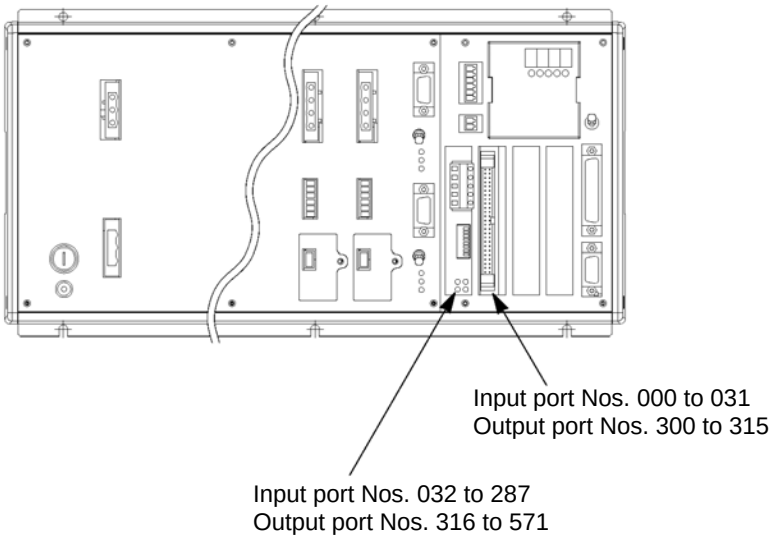


I/O parameters for X-SEL J/K types

No.	Parameter name	Default value (reference)	Input range	Setting	Remarks
1	I/O port assignment type	0	0 ~ 20	0	0: Fixed assignment 1: Automatic assignment (Priority: Assigned from slot 1) * Ports are assigned consecutively only for slots where a board is physically installed, starting from slot 1, for safety reasons.
2	Input port start number for standard I/O based on fixed assignment (I/O1)	000	-1 ~ 599	000	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
3	Output port start number for standard I/O based on fixed assignment (I/O1)	300	-1 ~ 599	300	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
4	Input port start number for expansion I/O1 based on fixed assignment (I/O2)	-1	-1 ~ 599	256	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.) (Slot immediately next to the standard I/O slot)
5	Output port start number for expansion I/O1 based on fixed assignment (I/O2)	-1	-1 ~ 599	556	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
6	Input port start number for expansion I/O2 based on fixed assignment (I/O3)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
7	Output port start number for expansion I/O2 based on fixed assignment (I/O3)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
8	Input port start number for expansion I/O3 based on fixed assignment (I/O4)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
9	Output port start number for expansion I/O3 based on fixed assignment (I/O4)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
10	Error monitor for standard I/O (I/O1)	2	0 ~ 5	2	0: Do not monitor 1: Monitor 2: Monitor (Do not monitor 24-V I/O power supply errors) (Main application version 0.55 or later) 3: Monitor (Monitor 24-V I/O power supply errors only)
11	Error monitor for expansion I/O1 (I/O2)	0	0 ~ 5	1	
12	Error monitor for standard I/O2 (I/O3)	0	0 ~ 5	0	
13	Error monitor for expansion I/O3 (I/O4)	0	0 ~ 5	0	
14	Number of ports used for remote input via network I/F card	64	0 ~ 256	256	Multiple of 16
15	Number of ports used for remote output via network I/F card	64	0 ~ 256	256	Multiple of 16

I/O1 through I/O4 indicate slot numbers.

b. Use the expansion I/O board IA-103-X-32 (32 input points, 16 output points) for standard I/O ports, and assign 256 input points and 256 output points to the DeviceNet board as general-purpose I/O ports. The same settings apply to J-type controllers.



I/O parameters for X-SEL J/K types

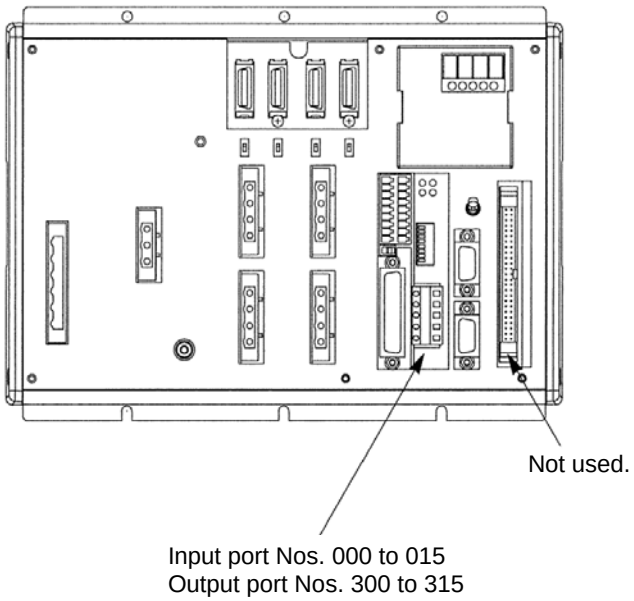
No.	Parameter name	Default value (reference)	Input range	Setting	Remarks
1	I/O port assignment type	0	0 ~ 20	0	0: Fixed assignment 1: Automatic assignment (Priority: Assigned from slot 1) * Ports are assigned consecutively only for slots where a board is physically installed, starting from slot 1, for safety reasons.
2	Input port start number for standard I/O based on fixed assignment (I/O1)	000	-1 ~ 599	032	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
3	Output port start number for standard I/O based on fixed assignment (I/O1)	300	-1 ~ 599	316	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
4	Input port start number for expansion I/O1 based on fixed assignment (I/O2)	-1	-1 ~ 599	000	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.) (Slot immediately next to the standard I/O slot)
5	Output port start number for expansion I/O1 based on fixed assignment (I/O2)	-1	-1 ~ 599	300	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
6	Input port start number for expansion I/O2 based on fixed assignment (I/O3)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
7	Output port start number for expansion I/O2 based on fixed assignment (I/O3)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
8	Input port start number for expansion I/O3 based on fixed assignment (I/O4)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
9	Output port start number for expansion I/O3 based on fixed assignment (I/O4)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
10	Error monitor for standard I/O (I/O1)	2	0 ~ 5	2	0: Do not monitor 1: Monitor 2: Monitor (Do not monitor 24-V I/O power supply errors) (Main application version 0.55 or later) 3: Monitor (Monitor 24-V I/O power supply errors only)
11	Error monitor for expansion I/O1 (I/O2)	1	0 ~ 5	1	
12	Error monitor for standard I/O2 (I/O3)	0	0 ~ 5	0	
13	Error monitor for expansion I/O3 (I/O4)	0	0 ~ 5	0	
14	Number of ports used for remote input via network I/F card	64	0 ~ 256	256	Multiple of 8
15	Number of ports used for remote output via network I/F card	64	0 ~ 256	256	Multiple of 8

I/O1 through I/O4 indicate slot numbers.

2.5.2 Setting Example for P/Q Types

(1) Setting example when only a DeviceNet board is installed

Assign 32 input points and 16 output points to the DeviceNet board from the first standard I/O port, as you would for the standard X-SEL I/O board (50-pin connector), and do not use any other I/O port.



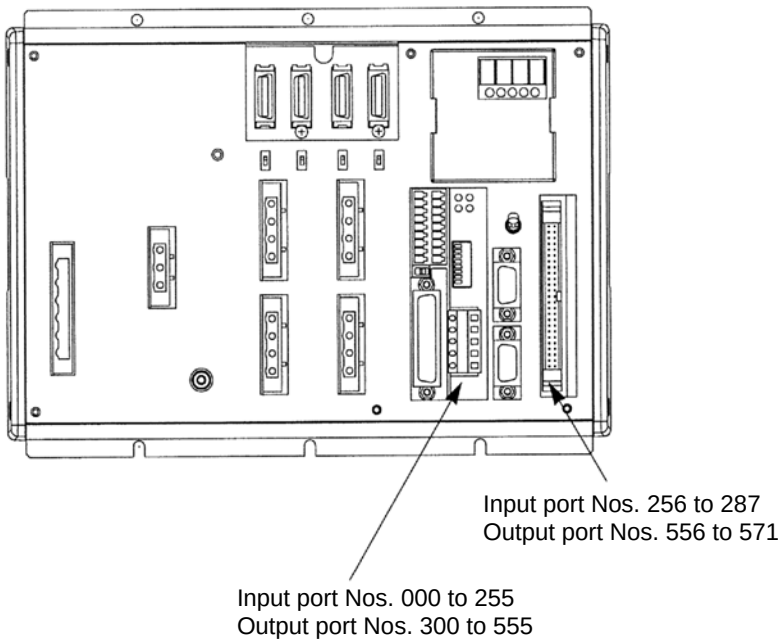
I/O parameters for X-SEL P/Q types

No.	Parameter name	Default value (reference)	Input range	Setting	Remarks
1	I/O port assignment type	0	0 ~ 20	0	0: Fixed assignment 1: Automatic assignment (Priority: Assigned from slot 1) * Ports are assigned consecutively only for slots where a board is physically installed, starting from slot 1, for safety reasons.
2	Input port start number for standard I/O based on fixed assignment (I/O1)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
3	Output port start number for standard I/O based on fixed assignment (I/O1)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
4	Input port start number for expansion I/O1 based on fixed assignment (I/O2)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.) (Slot immediately next to the standard I/O slot)
5	Output port start number for expansion I/O1 based on fixed assignment (I/O2)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
6	Input port start number for expansion I/O2 based on fixed assignment (I/O3)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
7	Output port start number for expansion I/O2 based on fixed assignment (I/O3)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
8	Input port start number for expansion I/O3 based on fixed assignment (I/O4)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
9	Output port start number for expansion I/O3 based on fixed assignment (I/O4)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
10	Error monitor for standard I/O (I/O1)	0	0 ~ 5	0	0: Do not monitor 1: Monitor 2: Monitor (Do not monitor 24-V I/O power supply errors) (Main application version 0.55 or later) 3: Monitor (Monitor 24-V I/O power supply errors only) (Main application version 0.55 or later)
11	Error monitor for expansion I/O1 (I/O2)	0	0 ~ 5	0	
12	Error monitor for standard I/O2 (I/O3)	0	0 ~ 5	0	
13	Error monitor for expansion I/O3 (I/O4)	0	0 ~ 5	0	
14	Number of ports used for remote input via network I/F card	64	0 ~ 256	32	Multiple of 8
15	Number of ports used for remote output via network I/F card	64	0 ~ 256	16	Multiple of 8
16	Input port start number for network I/F module based on fixed assignment	0	-1 ~ 599	0	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
17	Output port start number for network I/F module based on fixed assignment	300	-1 ~ 599	300	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
18	Error monitor for network I/F module	1	0 ~ 5	1	0: Do not monitor 1: Monitor * Some exceptions apply.

I/O1 through I/O4 indicate slot numbers.

(2) Setting example when a DeviceNet board is used together with a standard I/O board

a. Assign 256 input points and 256 output points to the DeviceNet board from the first standard I/O port, and assign the subsequent I/O port numbers to the standard I/O board.

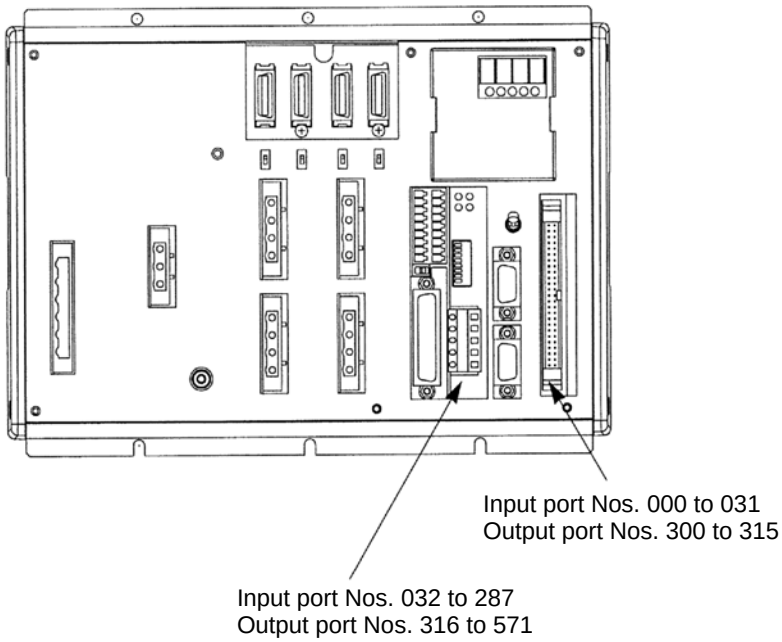


I/O parameters for X-SEL P/Q types

No.	Parameter name	Default value (reference)	Input range	Setting	Remarks
1	I/O port assignment type	0	0 ~ 20	0	0: Fixed assignment 1: Automatic assignment (Priority: Assigned from slot 1) * Ports are assigned consecutively only for slots where a board is physically installed, starting from slot 1, for safety reasons.
2	Input port start number for standard I/O based on fixed assignment (I/O1)	-1	-1 ~ 599	256	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
3	Output port start number for standard I/O based on fixed assignment (I/O1)	-1	-1 ~ 599	256	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
4	Input port start number for expansion I/O1 based on fixed assignment (I/O2)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.) (Slot immediately next to the standard I/O slot)
5	Output port start number for expansion I/O1 based on fixed assignment (I/O2)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
6	Input port start number for expansion I/O2 based on fixed assignment (I/O3)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
7	Output port start number for expansion I/O2 based on fixed assignment (I/O3)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
8	Input port start number for expansion I/O3 based on fixed assignment (I/O4)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
9	Output port start number for expansion I/O3 based on fixed assignment (I/O4)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
10	Error monitor for standard I/O (I/O1)	0	0 ~ 5	1	0: Do not monitor 1: Monitor 2: Monitor (Do not monitor 24-V I/O power supply errors) (Main application version 0.55 or later) 3: Monitor (Monitor 24-V I/O power supply errors only)
11	Error monitor for expansion I/O1 (I/O2)	0	0 ~ 5	0	
12	Error monitor for standard I/O2 (I/O3)	0	0 ~ 5	0	
13	Error monitor for expansion I/O3 (I/O4)	0	0 ~ 5	0	
14	Number of ports used for remote input via network I/F card	64	0 ~ 256	256	Multiple of 16
15	Number of ports used for remote output via network I/F card	64	0 ~ 256	256	Multiple of 16
16	Input port start number for network I/F module based on fixed assignment	0	-1 ~ 599	0	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
17	Output port start number for network I/F module based on fixed assignment	300	-1 ~ 599	300	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
18	Error monitor for network I/F module	1	0 ~ 5	1	0: Do not monitor 1: Monitor * Some exceptions apply.

I/O1 through I/O4 indicate slot numbers.

b. Use the standard I/O board IA-103-X-32 (32 input points, 16 output points) for standard I/O ports, and assign 256 input points and 256 output points to the DeviceNet board as general-purpose I/O ports. The same settings apply to J-type controllers.



I/O parameters for X-SEL P/Q types

No.	Parameter name	Default value (reference)	Input range	Setting	Remarks
1	I/O port assignment type	0	0 ~ 20	0	0: Fixed assignment 1: Automatic assignment (Priority: Assigned from slot 1) * Ports are assigned consecutively only for slots where a board is physically installed, starting from slot 1, for safety reasons.
2	Input port start number for standard I/O based on fixed assignment (I/O1)	-1	-1 ~ 599	000	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
3	Output port start number for standard I/O based on fixed assignment (I/O1)	-1	-1 ~ 599	300	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
4	Input port start number for expansion I/O1 based on fixed assignment (I/O2)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.) (Slot immediately next to the standard I/O slot)
5	Output port start number for expansion I/O1 based on fixed assignment (I/O2)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
6	Input port start number for expansion I/O2 based on fixed assignment (I/O3)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
7	Output port start number for expansion I/O2 based on fixed assignment (I/O3)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
8	Input port start number for expansion I/O3 based on fixed assignment (I/O4)	-1	-1 ~ 599	-1	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
9	Output port start number for expansion I/O3 based on fixed assignment (I/O4)	-1	-1 ~ 599	-1	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
10	Error monitor for standard I/O (I/O1)	0	0 ~ 5	1	0: Do not monitor 1: Monitor 2: Monitor (Do not monitor 24-V I/O power supply errors) (Main application version 0.55 or later) 3: Monitor (Monitor 24-V I/O power supply errors only) (Main application version 0.55 or later)
11	Error monitor for expansion I/O1 (I/O2)	0	0 ~ 5	0	
12	Error monitor for standard I/O2 (I/O3)	0	0 ~ 5	0	
13	Error monitor for expansion I/O3 (I/O4)	0	0 ~ 5	0	
14	Number of ports used for remote input via network I/F card	64	0 ~ 256	256	Multiple of 8
15	Number of ports used for remote output via network I/F card	64	0 ~ 256	256	Multiple of 8
16	Input port start number for network I/F module based on fixed assignment	0	-1 ~ 599	032	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
17	Output port start number for network I/F module based on fixed assignment	300	-1 ~ 599	316	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
18	Error monitor for network I/F module	1	0 ~ 5	1	0: Do not monitor 1: Monitor * Some exceptions apply.

I/O1 through I/O4 indicate slot numbers.

2.6 I/O Port Numbers for X-SEL

The table below lists the standard I/O port numbers for X-SEL controllers.
On X-SEL controllers, port numbers and function assignments can be changed using I/O parameters. (For details, refer to the “Operation Manual for X-SEL Controller.”)

	Port No.	Function		Port No.	Function
Input	000	Program start	Output	300	Alarm output
	001	General-purpose input		301	Ready output
	002	General-purpose input		302	Emergency stop output
	003	General-purpose input		303	General-purpose output
	004	General-purpose input		304	General-purpose output
	005	General-purpose input		305	General-purpose output
	006	General-purpose input		306	General-purpose output
	007	Program specification (PRG No. 1)		307	General-purpose output
	008	Program specification (PRG No. 2)		308	General-purpose output
	009	Program specification (PRG No. 4)		309	General-purpose output
	010	Program specification (PRG No. 8)		310	General-purpose output
	011	Program specification (PRG No. 10)		311	General-purpose output
	012	Program specification (PRG No. 20)		312	General-purpose output
	013	Program specification (PRG No. 40)		313	General-purpose output
	014	General-purpose input		314	General-purpose output
	015	General-purpose input		315	General-purpose output
	⋮	⋮		⋮	⋮

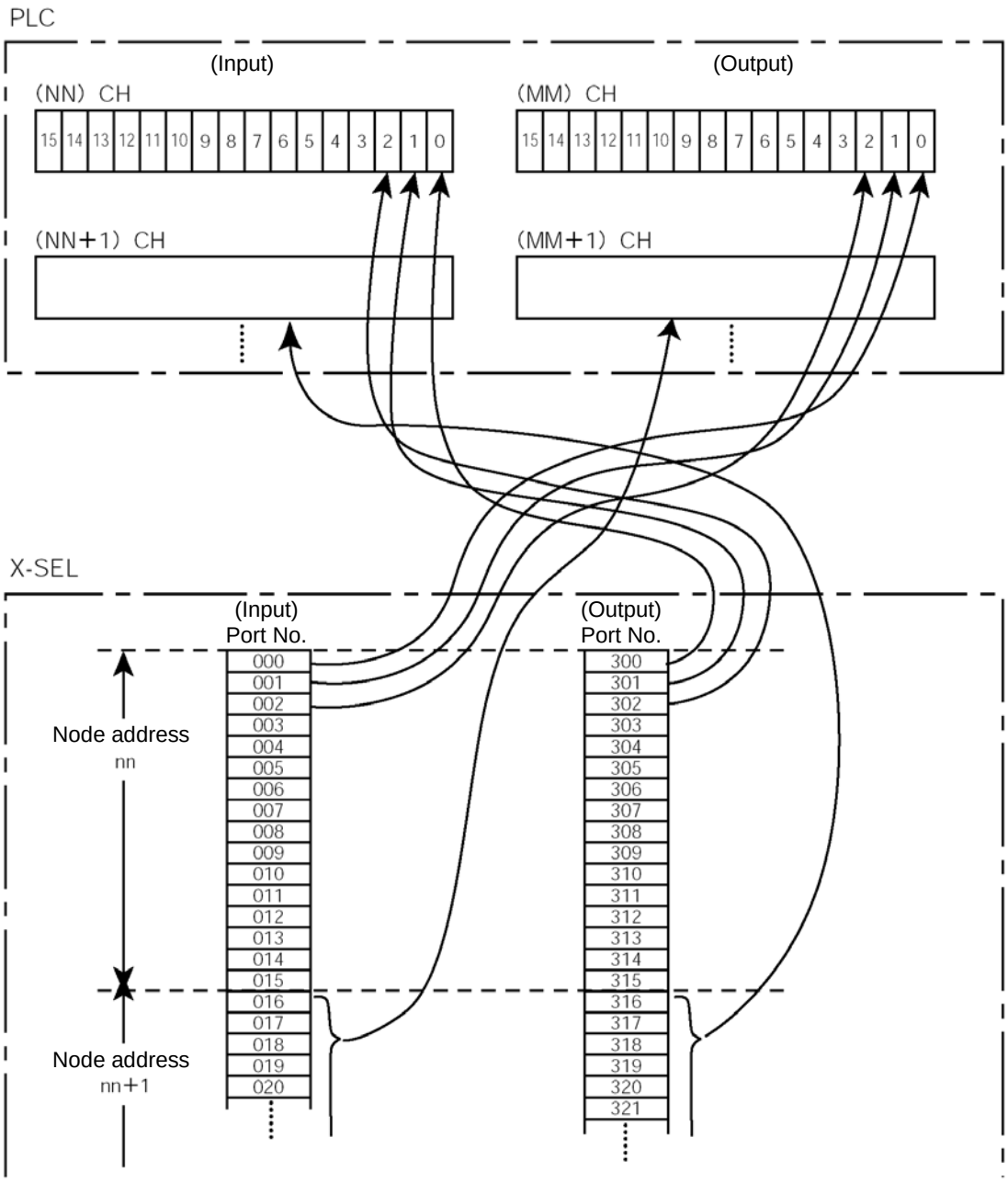
(Note) The numbers of I/O ports are as follows:

Inputs: 000 to 299 (maximum of 300 points)
Outputs: 300 to 599 (maximum of 300 points)

If DeviceNet and expansion I/O boards are used together, pay attention to the numbers of I/O ports.

Reference

Port numbers are assigned to bit addresses in the PLC in units of 16 points, starting from the channel corresponding to the node address set with the DIP switches.
(This does not apply if a configurator is used to assign port numbers.)

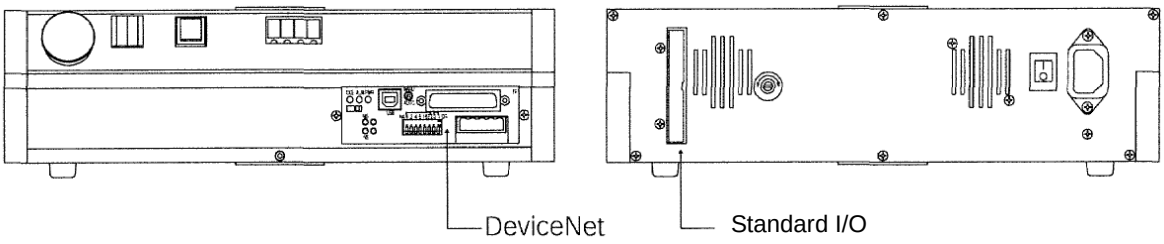


(NN) CH and (MM) CH as indicated above represent PLC channel addresses corresponding to node address nn.
As for nn, nn+1, nn+2, etc., bit addresses corresponding to each node address are occupied in accordance with the numbers of I/O points used. Accordingly, exercise caution to prevent node address duplication.

3. Tabletop Robot TT

3.1 Model

Model: TT-□-I-□-PV
Maximum numbers of network I/O points: 240/240



A DeviceNet board is installed in the installation position of field network board.

3.2 Interface Specifications

The DeviceNet interface specifications are summarized below.

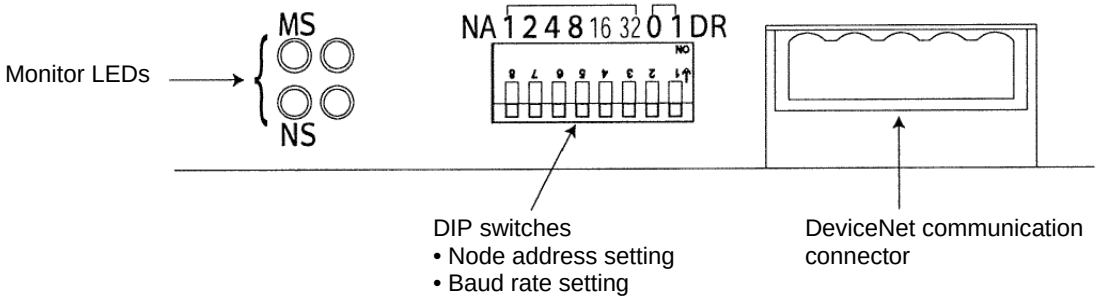
<table>
<tr><th>Item</th><th colspan="4">Specification</th></tr>
<tr><td rowspan="3">Communication protocol</td><td colspan="4">A certified DeviceNet 2.0 interface module is used (certification pending).</td></tr>
<tr><td colspan="4">Group 2 only server</td></tr>
<tr><td colspan="4">Network-powered insulation node</td></tr>
<tr><td rowspan="3">Communication specification</td><td colspan="2" rowspan="3">Master-slave connection</td><td colspan="2">Bit strobe</td></tr>
<tr><td colspan="2">Polling</td></tr>
<tr><td colspan="2">Cyclic</td></tr>
<tr><td>Baud rate</td><td colspan="4">500 k / 250 k / 125 kbps (selectable by DIP switches)</td></tr>
<tr><td rowspan="5">Communication cable length</td><td>Baud rate</td><td>Maximum network length</td><td>Maximum branch line length</td><td>Total branch line length</td></tr>
<tr><td>500 kbps</td><td>100 m</td><td rowspan="3">6 m</td><td>39 m</td></tr>
<tr><td>250 kbps</td><td>250 m</td><td>78 m</td></tr>
<tr><td>125 kbps</td><td>500 m</td><td>156 m</td></tr>
<tr><td colspan="4">Note) When a large-size DeviceNet cable is used.</td></tr>
<tr><td>Communication power supply</td><td colspan="4">DC 24 V (supplied from DeviceNet)</td></tr>
<tr><td>Consumption current of communication power supply</td><td colspan="4">60 mA</td></tr>
<tr><td>Number of occupied nodes</td><td colspan="4">1 node</td></tr>
<tr><td>Connector</td><td colspan="4">MSTBA2.5/5-G-5.08AU M (*1) by Phoenix Contact</td></tr>
</table>

(*1) The cable-end connector is a standard accessory.
SMSTB2.5/5-ST-5.08AU by Phoenix Contact

3.3 DeviceNet board

3.3.1 Name of Each Part

TT type



3.3.2 DIP Switch Settings

The DIP switches are used to set the following items:
(1) Node address
(2) Baud rate
(Note) Turn off the X-SEL power before setting the DIP switches.

(1) Setting the node address (MAC ID)

Set the node address (MAC ID) using a hexadecimal value according to the table below.

1: ON 0: OFF

	DIP switches					
Node address (MAC ID)	NA32	NA16	NA8	NA4	NA2	NA1
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮
60	1	1	1	1	1	1
61	1	1	1	1	1	1
62	1	1	1	1	1	1
63	1	1	1	1	1	1

(Note) The node address corresponds to the remote I/O address in the PLC. This DeviceNet card supports a maximum of 240 input points and 240 output points. Accordingly, the node address corresponding to the I/O points used will be occupied in the PLC.
Take note that all node addresses must be unique.
(For details, refer to the operation manual for the PLC.)

(2) Setting the baud rate

Set the baud rate according to the table below.

1: ON 0: OFF

	DIP switches	
Baud rate	DR1	DR0
125 kbps	0	0
250 kbps	0	1
500 kbps	1	0
Setting prohibited	1	1

3.3.3 Monitor LED Indicators

The two LEDs, MS and NS, provided on the front panel of the board are used to check the board (node) condition and network condition. (The remaining two LEDs are not currently used.)
The LEDs illuminate in two colors (red and green), and you can monitor the conditions listed in the table below based on the illumination status and color of each LED.

MS (Module Status) LED: Condition of the board (node) itself
NA (Network Status) LED: Condition of the network

LED	Color	Illumination status	Description (meaning)
MS	Green	Steady light	The board is operating normally.
	Red	Steady light	A hardware error occurred. The board must be replaced.
		Blinking	A minor error occurred, such as a DIP switch setting error or configuration error. The error can be reset by, for example, reconfiguring the applicable setting.
	-	Off	Power is not supplied from the TT robot. The TT robot must be repaired or the board must be replaced.
NS	Green	Steady light	Network connection has been established and the board is communicating normally.
		Blinking	The board is online, but network connection is not yet established. Communication is stopped. (The network is normal.)
	Red	Steady light	Node address duplication or bus-off state was detected. Communication is not possible.
		Blinking	A communication error occurred (communication time-out occurred).
	-	Off	• The board is not online. • DeviceNet power is not supplied.

Self test is performed when the power is turned on.
During the test, the monitor LEDs cycle in the following sequence:

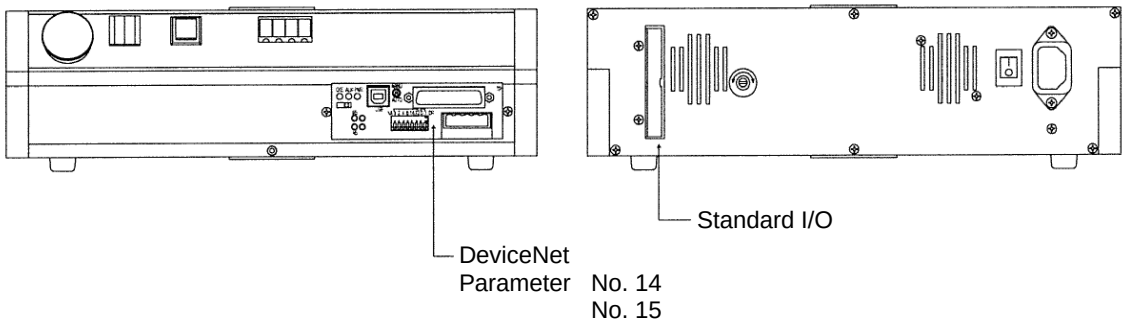
[1] NS turns off.
[2] MS illuminates in steady green (approx. 0.25 second).
[3] MS illuminates in steady red (approx. 0.25 second).
[4] MS illuminates in steady green.
[5] NS illuminates in steady green (approx. 0.25 second).
[6] NS illuminates in steady red (approx. 0.25 second).
[7] NS turns off.

When the self test is finished and the board starts communicating normally, both the MS and NS LEDs change to steady green.

3.4 Setting of I/O Parameters (Assignment of I/O Ports)

Set the TT I/O ports to be used in DeviceNet communication.

(1) Board Installation Position (Slot) and I/O Parameter Numbers



TT robots are shipped with the input ports and output ports used in DeviceNet communication both set to 64 points.

(2) Factory-set parameters for TT type

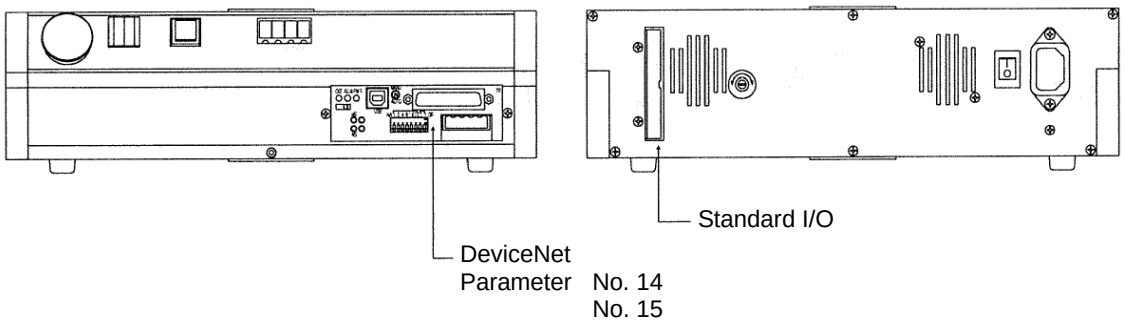
No.	Parameter name	Input range	Setting	Remarks
1	I/O port assignment type	0	Reference only	0: Fixed assignment
2	Input port start number for standard I/O1 based on fixed assignment	000	Reference only	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
3	Output port start number for standard I/O1 based on fixed assignment	300	Reference only	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
4	Input port start number for standard I/O2 based on fixed assignment	32	Reference only	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
5	Output port start number for standard I/O2 based on fixed assignment	316	Reference only	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
6	Input port start number for expansion I/O1 based on fixed assignment (Network I/F module)	48	-1 ~ 599	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
7	Output port start number for expansion I/O1 based on fixed assignment (Network I/F module)	348	-1 ~ 599	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
8	Reserved by the system	-1	-1 ~ 599	
9	Reserved by the system	-1	-1 ~ 599	
10	Error monitor for standard I/O1	0	0 ~ 5	0: Do not monitor 1: Monitor 2: Monitor (Do not monitor 24-V I/O power supply errors) 3: Monitor (Monitor 24-V I/O power supply errors only) * Some exceptions apply.
11	Error monitor for standard I/O2	0	0 ~ 5	0: Do not monitor 1: Monitor 2: Monitor (Do not monitor 24-V I/O power supply errors) 3: Monitor (Monitor 24-V I/O power supply errors only) * Some exceptions apply.
12	Error monitor for expansion I/O1 (Network I/F module)	1	0 ~ 5	0: Do not monitor 1: Monitor * Some exceptions apply.
13	Reserved by the system	1	0 ~ 5	
14	Number of ports used for remote input via network I/F card	64	0 ~ 240	Multiple of 16
15	Number of ports used for remote output via network I/F card	64	0 ~ 240	Multiple of 16

On TT robots, the numbers of available DeviceNet ports can be changed using applicable parameters.
The DeviceNet I/O port start numbers are fixed.
DeviceNet input port start No. 48
DeviceNet output port start No. 348

The I/O port numbers for standard I/Os (connected via the rear panel I/O connector) are fixed.
Standard input port Nos. 16 to 31
Standard output port Nos. 316 to 331

(3) Parameter setting example for tabletop robot TT

Assign 240 input points and 240 output points to the DeviceNet as general-purpose I/O ports.
On TT robots, the I/O port start numbers are fixed.
Input port start No. 48
Output port start No. 348
Port are assigned in units of 16 points. Since the port start numbers are fixed, the maximum numbers of input points and output points are set to 240, respectively.
Accordingly, set “240” in I/O Parameter Nos. 14 and 15.



I/O parameters for TT type

No.	Parameter name	Default value	Input range	Setting	Remarks
1	I/O port assignment type	0	Reference only	0	0: Fixed assignment
2	Input port start number for standard I/O1 based on fixed assignment	000	Reference only	000	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
3	Output port start number for standard I/O1 based on fixed assignment	300	Reference only	300	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
4	Input port start number for standard I/O2 based on fixed assignment	32	Reference only	32	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
5	Output port start number for standard I/O2 based on fixed assignment	316	Reference only	316	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
6	Input port start number for expansion I/O1 based on fixed assignment (Network I/F module)	48	-1 ~ 599	48	0 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
7	Output port start number for expansion I/O1 based on fixed assignment (Network I/F module)	348	-1 ~ 599	348	300 + (multiple of 8) (Invalid, if a value is entered with a negative sign.)
8	Reserved by the system	-1	-1 ~ 599	-1	
9	Reserved by the system	-1	-1 ~ 599	-1	
10	Error monitor for standard I/O1	0	0 ~ 5	0	0: Do not monitor 1: Monitor 2: Monitor (Do not monitor 24-V I/O power supply errors) 3: Monitor (Monitor 24-V I/O power supply errors only) * Some exceptions apply.
11	Error monitor for standard I/O2	0	0 ~ 5	0	0: Do not monitor 1: Monitor 2: Monitor (Do not monitor 24-V I/O power supply errors) 3: Monitor (Monitor 24-V I/O power supply errors only) * Some exceptions apply.
12	Error monitor for expansion I/O1 (Network I/F module)	1	0 ~ 5	1	0: Do not monitor 1: Monitor * Some exceptions apply.
13	Reserved by the system	1	0 ~ 5	1	
14	Number of ports used for remote input via network I/F card	64	0 ~ 240	240	Multiple of 16
15	Number of ports used for remote output via network I/F card	64	0 ~ 240	240	Multiple of 16

3.5 I/O Port Numbers for TT Robots

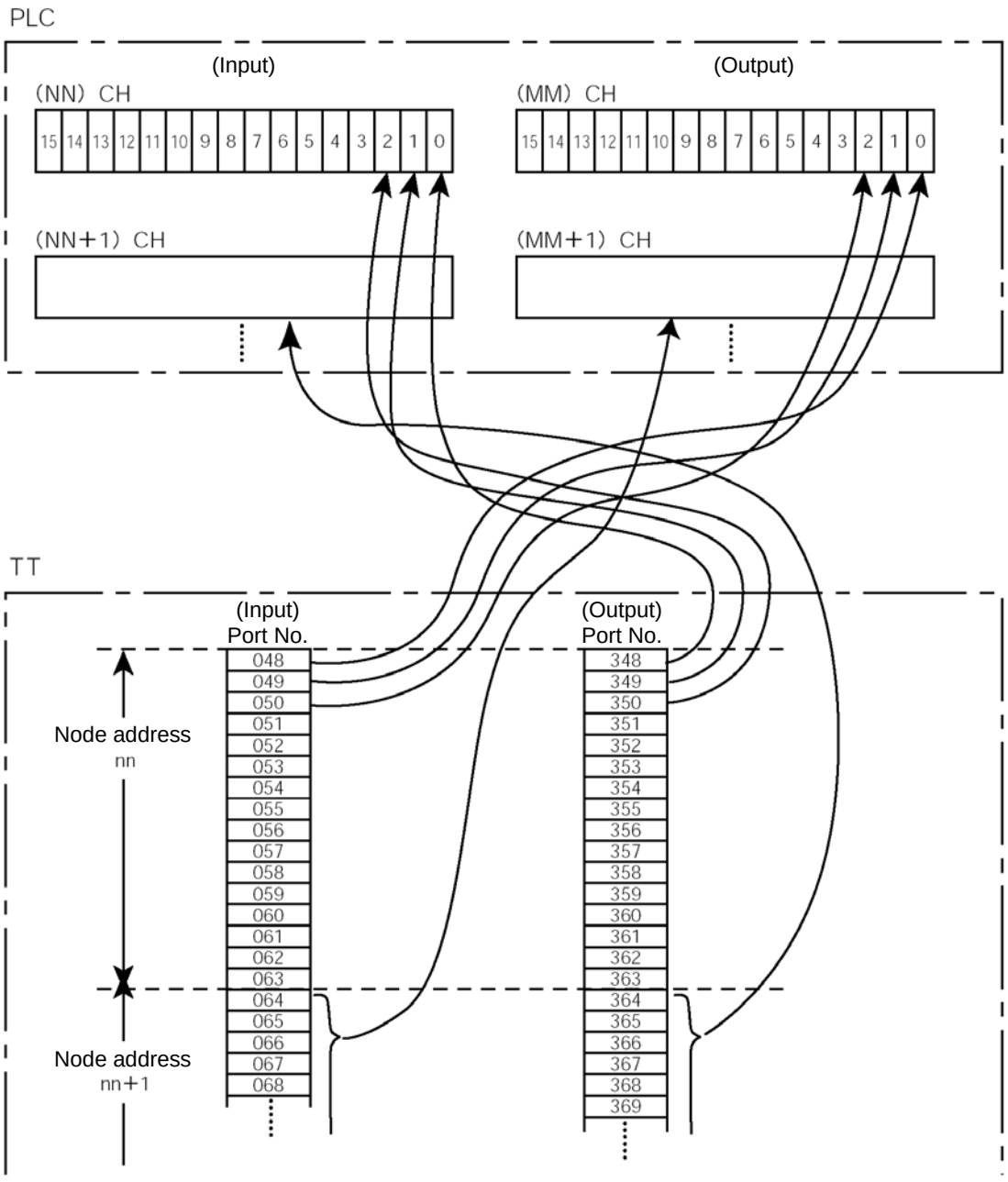
The table below lists the I/O port numbers for TT robots.
(For details, refer to the “Controller Operation Manual for Tabletop Robot TT.”)

	Port No.	Function		Port No.	Function
Internal DI	000	Start	Internal DO	300	ALM (front panel LED)
	001	(Soft reset)		301	RDY (front panel LED)
	002	(Servo on)		302	EMG (front panel LED)
	003	(Start via auto start)		303	Auto mode
	004	(Soft interlock)		304	HPS (front panel LED)
	005	(Pause release)		305	Reserved by the system
	006	(Pause)		306	Reserved by the system
	007	Digital program number specification switch for ones’ place		307	Reserved by the system
	008			308	Internal DI-No. 001 ON/OFF
	009			309	Internal DI-No. 002 ON/OFF
	010			310	Internal DI-No. 003 ON/OFF
	011	Digital program number specification switch for tens’ place		311	Internal DI-No. 004 ON/OFF
	012			312	Internal DI-No. 005 ON/OFF
	013			313	Internal DI-No. 006 ON/OFF
	014	(Drive-source cutoff input)		314	Internal DI-No. 014 ON/OFF
	015	(Home return, etc.)		315	Internal DI-No. 015 ON/OFF
External DI	016 ~ 031	General-purpose input (rear panel I/O connector)	External DO	316 ~ 331	General-purpose output (rear panel I/O connector)
Internal DI	032	Reserved by the system	Internal DO	332	Specification for 7-segment user display digits
	033			333	Specification for 7-segment user display digits
	034			334	Reserved by the system
	035			335	Reserved by the system
	036			336	Reserved by the system
	037			337	7-segment display refresh
	038			338	7-segment user display/system display switching
	039			339	Specification for 7-segment user display
	040			340	DT0 (7-segment user display bit)
	041			341	DT1 (7-segment user display bit)
	042			342	DT2 (7-segment user display bit)
	043			343	DT3 (7-segment user display bit)
	044			344	DT4 (7-segment user display bit)
	045			345	DT5 (7-segment user display bit)
	046			346	DT6 (7-segment user display bit)
	047			347	Reserved by the system

External DI	048 ~ 287	For DeviceNet	External DO	348 ~ 587	For DeviceNet

Reference

Port numbers are assigned to bit addresses in the PLC in units of 16 points, starting from the channel corresponding to the node address set with the DIP switches.
(This does not apply if a configurator is used to assign port numbers.)



(NN) CH and (MM) CH as indicated above represent PLC channel addresses corresponding to node address nn.
As for nn, nn+1, nn+2, etc., bit addresses corresponding to each node address are occupied in accordance with the numbers of I/O points used. Accordingly, exercise caution to prevent node address duplication.

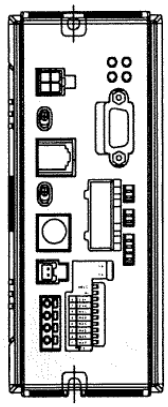
4. RCS-C and E-Con

4.1 Model

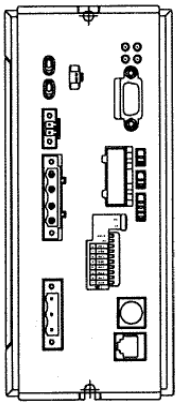
DeviceNet-ready RCS-C and E-Con controllers are shown below.

(1) RCS-C

Model: RCS-C-☐-DV-☐-☐
Number of I/O points: 8 dedicated input points, 10 dedicated output points



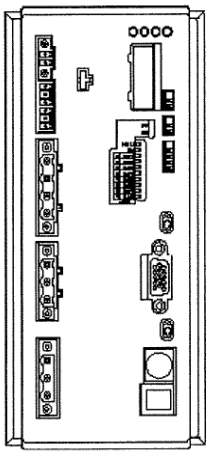
24-V type



100-V/200-V types

(2) E-Con

Model: ECON-☐-☐-DV-☐-☐
Number of I/O points: 10 dedicated input points, 12 dedicated output points



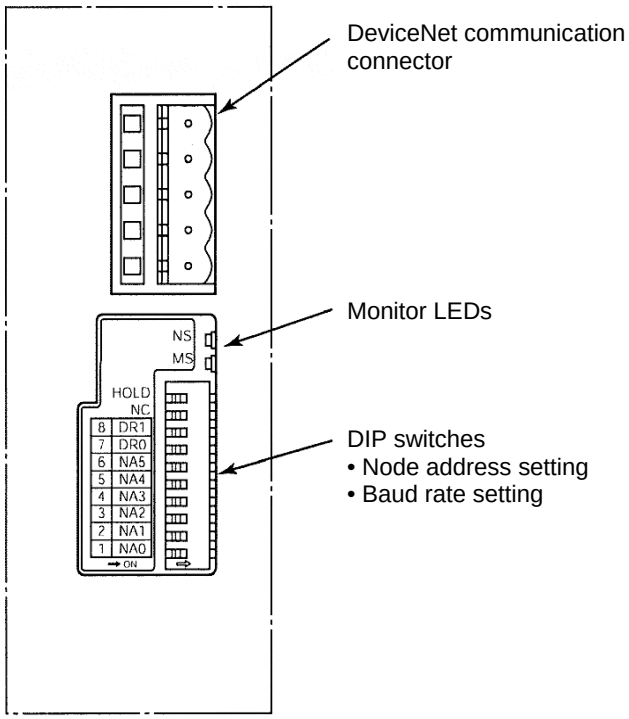
4.2 Interface Specifications

<table>
<tr><th>Item</th><th colspan="4">Specification</th></tr>
<tr><td rowspan="3">Communication protocol</td><td colspan="4">DeviceNet 2.0 (*1)</td></tr>
<tr><td colspan="4">Group 2 only server</td></tr>
<tr><td colspan="4">Network-powered insulation node</td></tr>
<tr><td rowspan="2">Support connection</td><td colspan="2" rowspan="2">Master-slave connection</td><td colspan="2">Bit strobe</td></tr>
<tr><td colspan="2">Polling</td></tr>
<tr><td>Baud rate</td><td colspan="4">500 k / 250 k / 125 kbps (selectable by DIP switches)</td></tr>
<tr><td rowspan="5">Communication cable length</td><td>Baud rate</td><td>Maximum network length</td><td>Maximum branch line length</td><td>Total branch line length</td></tr>
<tr><td>500 kbps</td><td>100 m</td><td rowspan="3">6 m</td><td>39 m</td></tr>
<tr><td>250 kbps</td><td>250 m</td><td>78 m</td></tr>
<tr><td>125 kbps</td><td>500 m</td><td>156 m</td></tr>
<tr><td colspan="4">Note) When a large-size DeviceNet cable is used.</td></tr>
<tr><td>Communication power supply</td><td colspan="4">DC 24 V (supplied from DeviceNet)</td></tr>
<tr><td>Consumption current of communication power supply</td><td colspan="4">60 mA</td></tr>
<tr><td>Number of occupied nodes</td><td colspan="4">1 node</td></tr>
<tr><td>Connector</td><td colspan="4">MSTBA2.5/5-G-5.08AU M (*2) by Phoenix Contact</td></tr>
</table>

(*1) RCS-C controllers are already certified (test version 15).
Certification is pending for E-Con controllers.
(*2) The cable-end connector is a standard accessory.
SMSTB2.5/5-ST-5.08AU by Phoenix Contact

4.3 DeviceNet Interface

4.3.1 Name of Each Part



4.3.2 DIP Switch Settings

The DIP switches are used to set the following items:
(1) Node address
(2) Baud rate
(Note) Turn off the X-SEL power before setting the DIP switches.

(1) Setting the node address (MAC ID)

Set the node address (MAC ID) using a hexadecimal value according to the table below.

1: ON 0: OFF

	DIP switches					
Node address (MAC ID)	NA5	NA4	NA3	NA2	NA1	NA0
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮
60	1	1	1	1	0	0
61	1	1	1	1	0	1
62	1	1	1	1	1	0
63	1	1	1	1	1	1

(Note) The node address corresponds to the remote I/O address in the PLC. (For details, refer to the operation manual for the PLC.)

(2) Setting the baud rate

Set the baud rate according to the table below.

1: ON 0: OFF

	DIP switches	
Baud rate	DR1	DR0
125 kbps	0	0
250 kbps	0	1
500 kbps	1	0
Setting prohibited	1	1

4.3.3 Monitor LED Indicators

The two LEDs, MS and NS, provided on the front panel of the controller are used to check the interface (node) condition and network condition.
The LEDs illuminate in two colors (red and green), and you can monitor the conditions listed in the table below based on the illumination status and color of each LED.

MS (Module Status) LED: Condition of the interface (node) itself
NS (Network Status) LED: Condition of the network

LED	Color	Illumination status	Description (meaning)
MS	Green	Steady light	The board is operating normally.
	Red	Steady light	A hardware error occurred. The controller must be repaired.
		Blinking	A minor error occurred, such as a DIP switch setting error or configuration error. The error can be reset by, for example, reconfiguring the applicable setting.
	-	Off	Power is not supplied from the X-SEL controller. The X-SEL controller must be repaired or the board must be replaced.
NS	Green	Steady light	Network connection has been established and the board is communicating normally.
		Blinking	The board is online, but network connection is not yet established. Communication is stopped. (The network is normal.)
	Red	Steady light	Node address duplication or bus-off state was detected. Communication is not possible.
		Blinking	A communication error occurred (communication time-out occurred).
	-	Off	• The board is not online. • DeviceNet power is not supplied.

Self test is performed when the power is turned on.
During the test, the monitor LEDs cycle in the following sequence:

[1] NS turns off.
[2] MS illuminates in steady green (approx. 0.25 second).
[3] MS illuminates in steady red (approx. 0.25 second).
[4] MS illuminates in steady green.
[5] NS illuminates in steady green (approx. 0.25 second).
[6] NS illuminates in steady red (approx. 0.25 second).
[7] NS turns off.

When the self test is finished and the board starts communicating normally, both the MS and NS LEDs change to steady green.

4.4 Input/Output (I/O)

The I/O specifications of RCS-C and E-Con controllers are as follows:
(1) RCS-C: 8 dedicated input points, 10 dedicated output points
(2) E-Con: 10 dedicated input points, 12 dedicated output points
The details are explained below.

(For details on each signal, refer to the “Operation Manual for RCS Series ROBO Cylinder Controller, RCS-C Type” or “Operation Manual for E-Con Controller.”)

(1) RCS-C signal assignments

8-bit input		10-bit output	
Input No.	Signal name	Output No.	Signal name
0	Command position 1	0	Completed position 1
1	Command position 2	1	Completed position 2
2	Command position 4	2	Completed position 4
3	Command position 8	3	Completed position 8
4	Start	4	Positioning complete
5	Reset	5	Home return complete
6	Servo on	6	Zone
7	*Pause	7	*Alarm
8	Not used	8	*Emergency stop
9	Not used	9	Moving
10	Not used	10	*Battery alarm (Note 1)
11	Not used	11	Not used (Note 2)
12	Not used	12	Not used
13	Not used	13	Not used
14	Not used	14	Not used
15	Not used	15	Not used

The signals denoted by * are always ON.
(Note 1) This signal is available only on controllers that operate on a mains voltage of 100 or 200 V. The ON/OFF state of the signal is indeterminable on 24-VDC controllers.
(Note 2) The ON/OFF state of signals denoted by “Not used” is indeterminable.

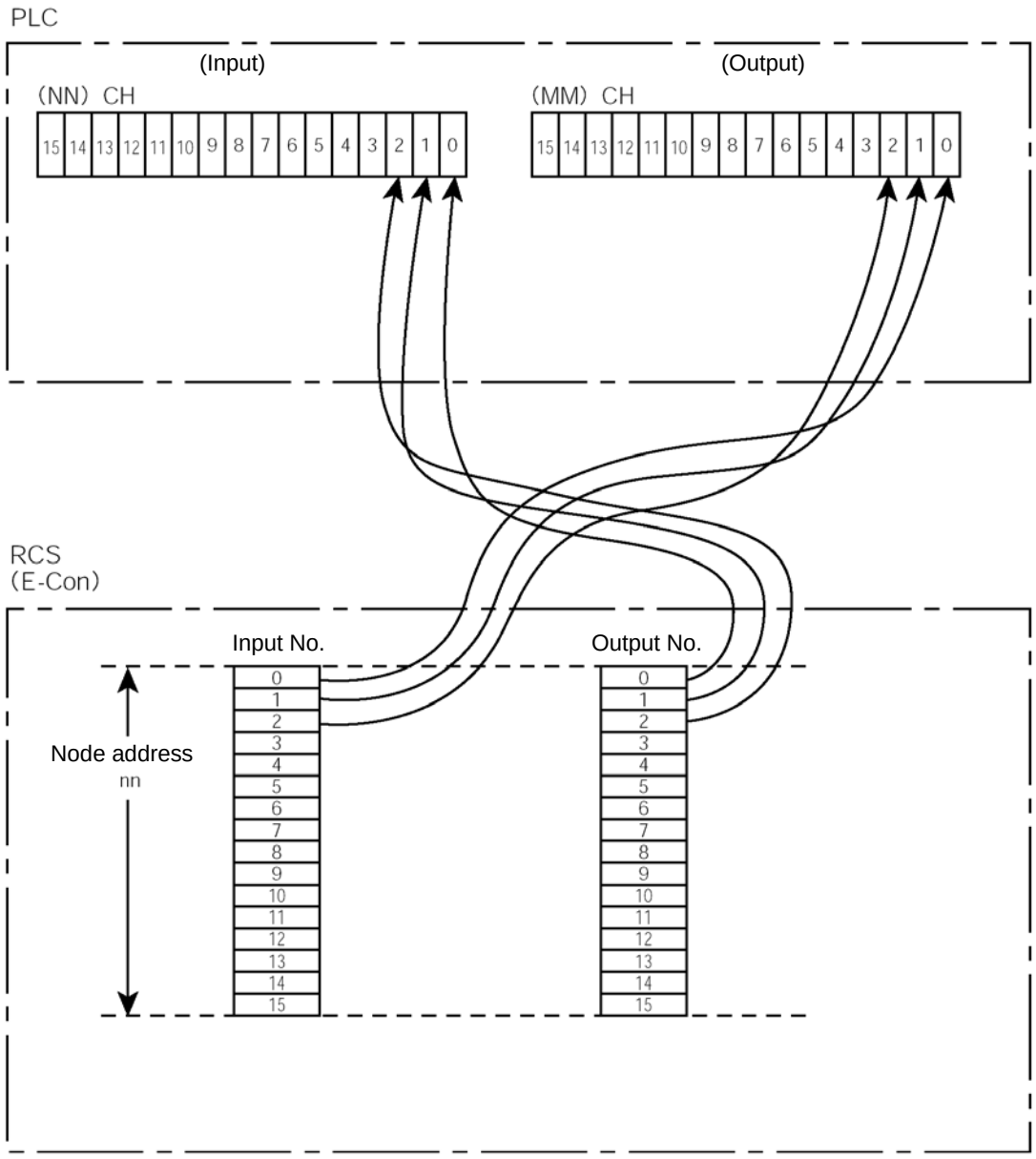
(2) E-Con signal assignments

10-bit output		12-bit output	
Input No.	Signal name	Output No.	Signal name
0	Command position 1	0	Completed position 1
1	Command position 2	1	Completed position 2
2	Command position 4	2	Completed position 4
3	Command position 8	3	Completed position 8
4	Command position 16	4	Completed position 16
5	Command position 32	5	Completed position 32
6	Not used	6	Not used (Note 2)
7	Not used	7	Not used (Note 2)
8	Start	8	Positioning complete
9	Reset	9	Home return complete
10	Servo on	10	Zone
11	*Pause	11	*Alarm
12	Not used	12	*Emergency stop
13	Not used	13	Moving
14	Not used	14	*Battery alarm (Note 1)
15	Not used	15	Not used (Note 2)

The signals denoted by * are always ON.
(Note 1) The ON/OFF state of this signal is indeterminable if an incremental encoder is used.
(Note 2) The ON/OFF state of signals denoted by “Not used” is indeterminable.

Reference

Inputs and outputs are assigned to bit addresses in the PLC sequentially from the youngest number, for the channel corresponding to the node address set with the DIP switches.



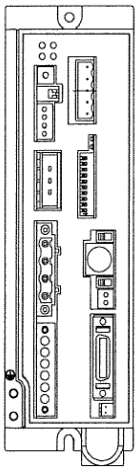
(NN) CH and (MM) CH as indicated above represent PLC channel addresses corresponding to node address nn.

5. SCON

5.1 Model

A DeviceNet-ready SCON controller is shown below.
SCON

Model: SCON-C-□□-DV-□-□
Number of I/O points: 16 dedicated input points, 16 dedicated output points



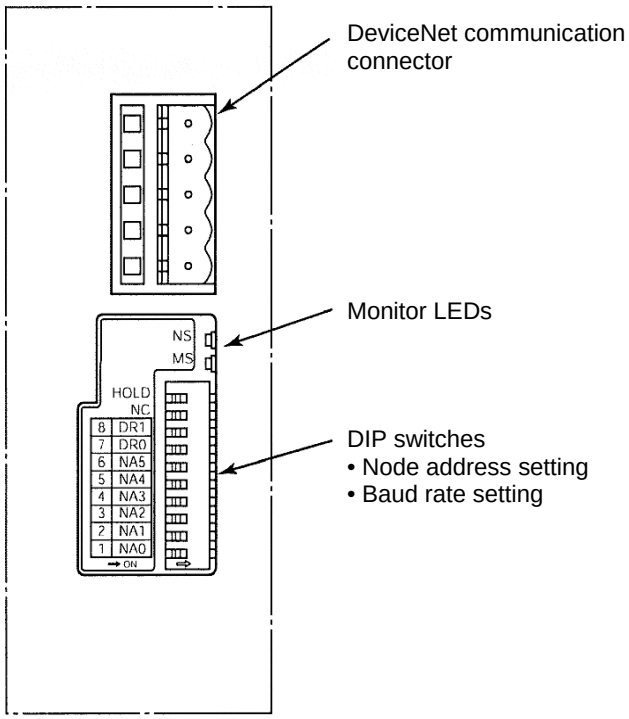
5.2 Interface Specifications

<table>
<tr><th>Item</th><th colspan="4">Specification</th></tr>
<tr><td rowspan="3">Communication protocol</td><td colspan="4">DeviceNet 2.0 (*1)</td></tr>
<tr><td colspan="4">Group 2 only server</td></tr>
<tr><td colspan="4">Network-powered insulation node</td></tr>
<tr><td rowspan="2">Support connection</td><td colspan="2" rowspan="2">Master-slave connection</td><td colspan="2">Bit strobe</td></tr>
<tr><td colspan="2">Polling</td></tr>
<tr><td>Baud rate</td><td colspan="4">500 k / 250 k / 125 kbps (selectable by DIP switches)</td></tr>
<tr><td rowspan="5">Communication cable length</td><td>Baud rate</td><td>Maximum network length</td><td>Maximum branch line length</td><td>Total branch line length</td></tr>
<tr><td>500 kbps</td><td>100 m</td><td rowspan="3">6 m</td><td>39 m</td></tr>
<tr><td>250 kbps</td><td>250 m</td><td>78 m</td></tr>
<tr><td>125 kbps</td><td>500 m</td><td>156 m</td></tr>
<tr><td colspan="4">Note) When a large-size DeviceNet cable is used.</td></tr>
<tr><td>Communication power supply</td><td colspan="4">DC 24 V (supplied from DeviceNet)</td></tr>
<tr><td>Consumption current of communication power supply</td><td colspan="4">60 mA</td></tr>
<tr><td>Number of occupied nodes</td><td colspan="4">1 node</td></tr>
<tr><td>Connector</td><td colspan="4">MSTBA2.5/5-G-5.08AU M (*2) by Phoenix Contact</td></tr>
</table>

(*1) RCS-C controllers are already certified (test version 15).
Certification is pending for E-Con controllers.
(*2) The cable-end connector is a standard accessory.
SMSTB2.5/5-ST-5.08AU by Phoenix Contact

5.3 DeviceNet Interface

5.3.1 Name of Each Part



5.3.2 DIP Switch Settings

The DIP switches are used to set the following items:
(1) Node address
(2) Baud rate
(Note) Turn off the X-SEL power before setting the DIP switches.

(1) Setting the node address (MAC ID)

Set the node address (MAC ID) using a hexadecimal value according to the table below.

1: ON 0: OFF

	DIP switches					
Node address (MAC ID)	NA5	NA4	NA3	NA2	NA1	NA0
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮
60	1	1	1	1	0	0
61	1	1	1	1	0	1
62	1	1	1	1	1	0
63	1	1	1	1	1	1

(Note) The node address corresponds to the remote I/O address in the PLC. (For details, refer to the operation manual for the PLC.)

(2) Setting the baud rate

Set the baud rate according to the table below.

1: ON 0: OFF

	DIP switches	
Baud rate	DR1	DR0
125 kbps	0	0
250 kbps	0	1
500 kbps	1	0
Setting prohibited	1	1

5.3.3 Monitor LED Indicators

The two LEDs, MS and NS, provided on the front panel of the controller are used to check the interface (node) condition and network condition.
The LEDs illuminate in two colors (red and green), and you can monitor the conditions listed in the table below based on the illumination status and color of each LED.

MS (Module Status) LED: Condition of the interface (node) itself
NS (Network Status) LED: Condition of the network

LED	Color	Illumination status	Description (meaning)
MS	Green	Steady light	The board is operating normally.
	Red	Steady light	A hardware error occurred. The controller must be repaired.
		Blinking	A minor error occurred, such as a DIP switch setting error or configuration error. The error can be reset by, for example, reconfiguring the applicable setting.
	-	Off	Power is not supplied from the X-SEL controller. The X-SEL controller must be repaired or the board must be replaced.
NS	Green	Steady light	Network connection has been established and the board is communicating normally.
		Blinking	The board is online, but network connection is not yet established. Communication is stopped. (The network is normal.)
	Red	Steady light	Node address duplication or bus-off state was detected. Communication is not possible.
		Blinking	A communication error occurred (communication time-out occurred).
	-	Off	• The board is not online. • DeviceNet power is not supplied.

Self test is performed when the power is turned on.
During the test, the monitor LEDs cycle in the following sequence:

[1] NS turns off.
[2] MS illuminates in steady green (approx. 0.25 second).
[3] MS illuminates in steady red (approx. 0.25 second).
[4] MS illuminates in steady green.
[5] NS illuminates in steady green (approx. 0.25 second).
[6] NS illuminates in steady red (approx. 0.25 second).
[7] NS turns off.

When the self test is finished and the board starts communicating normally, both the MS and NS LEDs change to steady green.

5.4 Assignment of I/O Signals

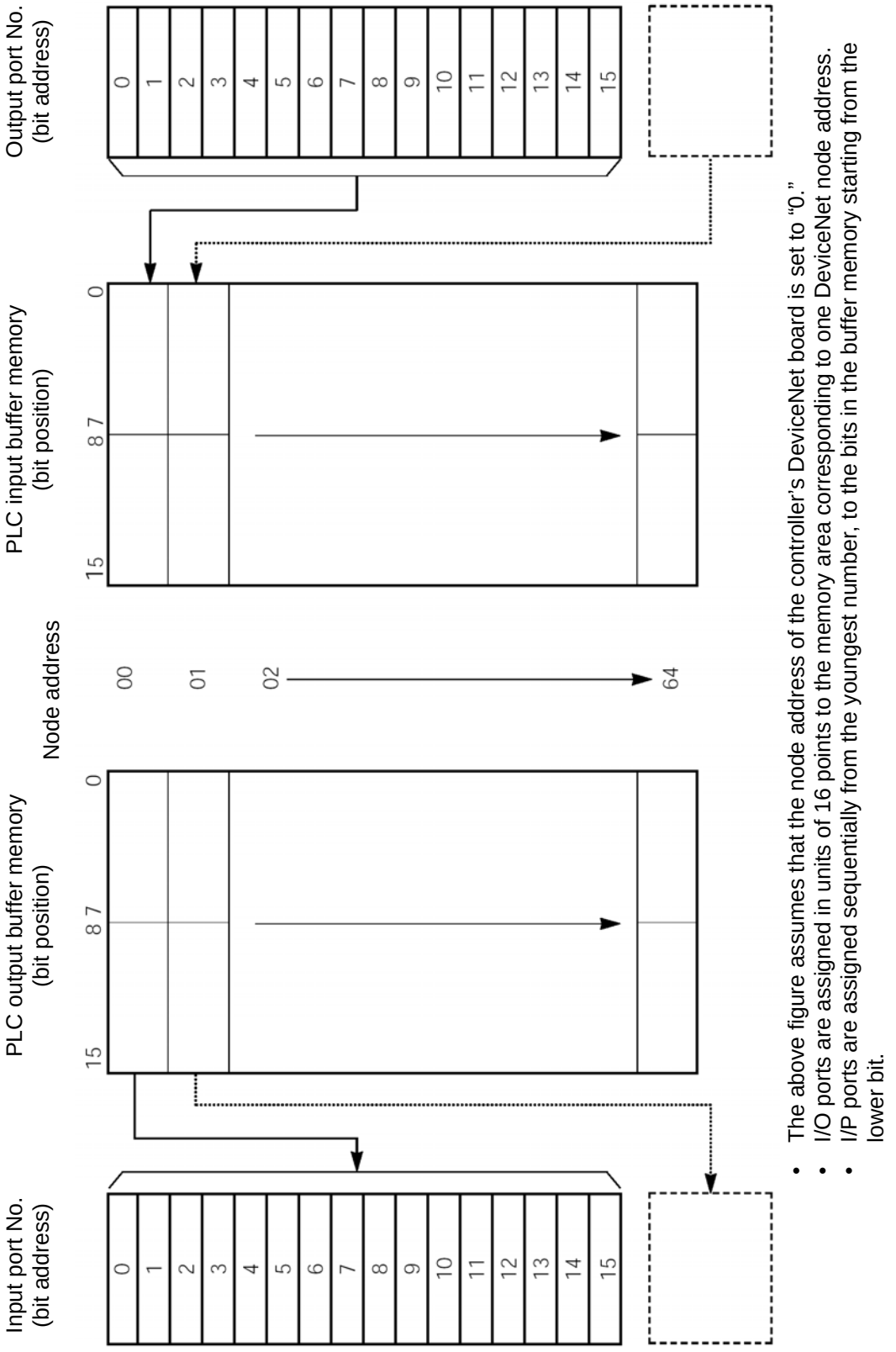
The I/O specifications of SCON controllers are as follows:
16 dedicated input points, 16 dedicated output points
The details are explained below.
Six I/O patterns are available, from which a desired pattern can be selected using Parameter No. 25 (PIO pattern selection).
For details on each signal, refer to the “Operation Manual for SCON Controller.”

Category	No.	Signal name		
		Setting of Parameter No. 25		
		0 Standard	1 Teaching type	2 256-point type
Input	0	Command position 1 (PC1)	Command position 1 (PC1)	Command position 1 (PC1)
	1	Command position 1 (PC2)	Command position 1 (PC2)	Command position 1 (PC2)
	2	Command position 1 (PC4)	Command position 1 (PC4)	Command position 1 (PC4)
	3	Command position 1 (PC8)	Command position 1 (PC8)	Command position 1 (PC8)
	4	Command position 1 (PC16)	Command position 1 (PC16)	Command position 1 (PC16)
	5	Command position 1 (PC32)	Command position 1 (PC32)	Command position 1 (PC32)
	6	Not used (Note 1)	Operation mode (MODE)	Command position 1 (PC64)
	7	Not used (Note 1)	Jog/inch switching (JISL)	Command position 1 (PC128)
	8	Not used (Note 1)	+Jog/inch (JOG+)	Not used (Note 1)
	9	Brake release (BKRL)	–Jog/inch (JOG-)	Brake release (BKRL)
	10	Running mode (RMOD)	Running mode (RMOD)	Running mode (RMOD)
	11	Home return (HOME)	Home return (HOME)	Home return (HOME)
	12	*Pause (*STP)	*Pause (*STP)	*Pause (*STP)
	13	Start (CSTR)	Start/current position write (CSTR/PWRT)	Start (CSTR)
	14	Alarm reset (RES)	Alarm reset (RES)	Alarm reset (RES)
	15	Servo on (SON)	Servo on (SON)	Servo on (SON)
Output	0	Completed position (PM1)	Completed position (PM1)	Completed position (PM1)
	1	Completed position (PM2)	Completed position (PM2)	Completed position (PM2)
	2	Completed position (PM4)	Completed position (PM4)	Completed position (PM4)
	3	Completed position (PM8)	Completed position (PM8)	Completed position (PM8)
	4	Completed position (PM16)	Completed position (PM16)	Completed position (PM16)
	5	Completed position (PM32)	Completed position (PM32)	Completed position (PM32)
	6	Moving (MOVE)	Moving (MOVE)	Completed position (PM64)
	7	Zone 1 (ZONE)	Mode status (MODES)	Completed position (PM128)
	8	Position zone (PZONE)	Position zone (PZONE)	Position zone (PZONE)
	9	Running mode status (RMDS)	Running mode status (RMDS)	Running mode status (RMDS)
	10	Home return complete (HEND)	Home return complete (HEND)	Home return complete (HEND)
	11	Positioning complete (PEND)	Positioning complete/write complete (PEND/WEND)	Positioning complete (PEND)
	12	Ready (SV)	Ready (SV)	Ready (SV)
	13	*Emergency stop (*EMGS)	*Emergency stop (*EMGS)	*Emergency stop (*EMGS)
	14	*Alarm (*ALM)	*Alarm (*ALM)	*Alarm (*ALM)
	15	*Battery alarm (*BALM) (Note 2)	*Battery alarm (*BALM) (Note 2)	*Battery alarm (*BALM) (Note 2)

The signals denoted by * are always ON.
(Note 1) The ON/OFF state of signals denoted by “Not used” is indeterminable.
(Note 2) The ON/OFF state of this signal is indeterminable if an incremental encoder is used.

Category	No.	Signal name		
		Setting of Parameter No. 25		
		3 512-point type	4 7-point type	5 3-point type
Input	0	Command position 1 (PC1)	Move to Position No. 0 (ST0)	Rear end move command (ST0)
	1	Command position 1 (PC2)	Move to Position No. 1 (ST1)	Front end move command (ST1)
	2	Command position 1 (PC4)	Move to Position No. 2 (ST2)	Intermediate point move command (ST2)
	3	Command position 1 (PC8)	Move to Position No. 3 (ST3)	Not used (Note 1)
	4	Command position 1 (PC16)	Move to Position No. 4 (ST4)	Not used (Note 1)
	5	Command position 1 (PC32)	Move to Position No. 5 (ST5)	Not used (Note 1)
	6	Command position 1 (PC64)	Move to Position No. 6 (ST6)	Not used (Note 1)
	7	Command position 1 (PC128)	Not used (Note 1)	Not used (Note 1)
	8	Command position 1 (PC256)	Not used (Note 1)	Not used (Note 1)
	9	Brake release (BKRL)	Brake release (BKRL)	Brake release (BKRL)
	10	Running mode (RMOD)	Running mode (RMOD)	Running mode (RMOD)
	11	Home return (HOME)	Home return (HOME)	Not used (Note 1)
	12	*Pause (*STP)	*Pause (*STP)	Not used (Note 1)
	13	Start (CSTR)	Not used (Note 1)	Not used (Note 1)
	14	Alarm reset (RES)	Alarm reset (RES)	Alarm reset (RES)
	15	Servo on (SON)	Servo on (SON)	Servo on (SON)
Output	0	Completed position (PM1)	Position No. 0 complete (PE0)	Rear end move complete (LS0)
	1	Completed position (PM2)	Position No. 1 complete (PE1)	Front end move complete (LS1)
	2	Completed position (PM4)	Position No. 2 complete (PE2)	Intermediate point move complete (LS2)
	3	Completed position (PM8)	Position No. 3 complete (PE3)	Not used (Note 1)
	4	Completed position (PM16)	Position No. 4 complete (PE4)	Not used (Note 1)
	5	Completed position (PM32)	Position No. 5 complete (PE5)	Not used (Note 1)
	6	Completed position (PM64)	Position No. 6 complete (PE6)	Not used (Note 1)
	7	Completed position (PM128)	Zone 1 (ZONE)	Zone 1 (ZONE)
	8	Completed position (PM256)	Position zone (PZONE)	Position zone (PZONE)
	9	Running mode status (RMDS)	Running mode status (RMDS)	Running mode status (RMDS)
	10	Home return complete (HEND)	Home return complete (HEND)	Home return complete (HEND)
	11	Positioning complete (PEND)	Positioning complete (PEND)	Not used (Note 1)
	12	Ready (SV)	Ready (SV)	Ready (SV)
	13	*Emergency stop (*EMGS)	*Emergency stop (*EMGS)	*Emergency stop (*EMGS)
	14	*Alarm (*ALM)	*Alarm (*ALM)	*Alarm (*ALM)
	15	*Battery alarm (*BALM) (Note 2)	*Battery alarm (*BALM) (Note 2)	*Battery alarm (*BALM) (Note 2)

5.5 Assignment of DeviceNet Addresses



- The above figure assumes that the node address of the controller's DeviceNet board is set to "0."
- I/O ports are assigned in units of 16 points to the memory area corresponding to one DeviceNet node address.
- I/P ports are assigned sequentially from the youngest number, to the bits in the buffer memory starting from the lower bit.

6. Troubleshooting

If you encountered a problem concerning DeviceNet, check the operating condition using the table below and remove the cause of the problem. The monitor LEDs, MS and NS, illuminate in two colors (red and green), and you can check the condition of DeviceNet based on the illumination status and color of each LED.

If an error occurred, MS or NS should change to steady or blinking red. If you spot a steady or blinking red light, check (reconfigure) the connections of the power supply and communication cable, DIP switch settings, parameter settings (X-SEL), etc., and then reconnect the power.

○: Steady light, ●: Blinking, ⊙: Off

Monitor LEDs				Condition	Remedial action
MS		NS			
Grn	Red	Grn	Red		
○	-	○	-	Operating normally	
○	-	●	●	Waiting for completion of node address duplication check by the master.	• Confirm that the baud rate of the master is the same as the baud rates of all slaves. If not, correct the applicable settings and then restart the system. • Confirm that the connectors are connected correctly. • Confirm that the communication power (24 VDC) is supplied. • Confirm that the master is operating correctly. • Confirm that the communication cable is not broken.
○	-	⊙	-	Waiting for connection to be established with the master.	• Confirm that the master is operating correctly. • Confirm that the applicable slave is registered in the master scan list.
-	○	●	●	A hardware error occurred.	• Contact IAI. (The DeviceNet board may have to be replaced.)
-	⊙	●	●	Incorrect DIP switch setting.	• Confirm that the baud rate of the slave is the same as the baud rate of the master. • Confirm that the configuration is correct. • After correcting the applicable settings, restart the system.
○	-	-	○	Detected a node address duplication or bus-off state (communication was stopped due to frequent data errors).	• Correct the node address, and then restart the system. • Confirm that the baud rate of the slave is the same as the baud rate of the master. • Confirm that the communication cable length is appropriate. • Check the communication cable for wire breakage or loose or disconnected connector. • Confirm that the terminal resistors are installed correctly. • Confirm that no noise sources are located nearby, that the communication cable is not wired in parallel with any power line, and that the system is not otherwise affected by noise. • After correcting the applicable settings, restart the system.
○	-	-	⊙	A communication time out occurred.	• Confirm that the baud rate of the slave is the same as the baud rate of the master. • Confirm that the communication cable length is appropriate. • Check the communication cable for wire breakage or loose or disconnected connector. • Confirm that the terminal resistors are installed correctly. • Confirm that no noise sources are located nearby, that the communication cable is not wired in parallel with any power line, and that the system is not otherwise affected by noise. • After correcting the applicable settings, restart the system.
NS switches repeatedly between steady green and blinking green. Or, NS switches repeatedly between blinking red and blinking green.				A communication error occurred.	• Confirm that the applicable slave is registered in the master scan list. • Confirm that any of the I/O area is not used by other slave. • Confirm that the I/O area does not exceed the area permitted for use by the master unit (in the case of fixed assignment).

7. Common Items and Others

7.1 Communication Cable

For the DeviceNet communication cable, use a dedicated 5-wire DeviceNet cable conforming to the DeviceNet Specification. There are two types of dedicated cables: large size and small size.
(Note) Take note that if a small-size cable is used, the maximum network length becomes 100 m or less regardless of the baud rate setting.

Cables by Omron or SWCC Showa Holdings

Item	Large-size cable (thick cable)		Small-size cable (thin cable)	
	Signal line	Power line	Signal line	Power line
Model	DCA2-5C10, TDN18 series		DCA1-5C10, TDN24 series	
Conductor cross-section area	0.86 mm^2	2.17 mm^2	0.20 mm^2	0.38 mm^2
Conductor outer diameter	1.21 mm	1.92 mm	0.60 mm	0.80 mm
Color	Blue, white	Red, black	Blue, white	Red, black
Impedance	120 Ω ± 10%	---	120 Ω ± 10%	---
Propagation delay	1.36 ns/ft	---	1.36 ns/ft	---
Attenuation ratio	500 kHz: 0.25 dB/ft 125 kHz: 0.13 dB/ft	---	500 kHz: 0.50 dB/ft 125 kHz: 0.29 dB/ft	---
Conductor resistance (at 20°C)	6.9 Ω/1000 ft 22.6 Ω/1000 m	2.7Ω/1000 ft 8.9Ω/1000 m	28 Ω/1000 ft 91.9 Ω/1000 m	17.5 Ω/1000 ft 57.4 Ω/1000 m
Maximum current	---	8A	---	3A
Outer diameter of finished cable	11.2 ~ 12.1 m		6.9 mm	

Cables by Allen-Bradley

Item	Large-size cable (thick cable)		Small-size cable (thin cable)	
	Signal line	Power line	Signal line	Power line
Model	1485C-P1-A50		1485C-P1-C50	
Conductor cross-section area	0.82 mm^2	1.65 mm^2	0.20 mm^2	0.33 mm^2
Conductor outer diameter	1.17 mm	1.68 mm	0.60 mm	0.79 mm
Color	Blue, white	Red, black	Blue, white	Red, black
Impedance	120 Ω ± 10%	---	120 Ω ± 10%	---
Propagation delay	1.36 ns/ft	---	1.36 ns/ft	---
Attenuation ratio	500 kHz: 0.25 dB/ft 125 kHz: 0.13 dB/ft	---	500 kHz: 0.50 dB/ft 125 kHz: 0.29 dB/ft	---
Conductor resistance	6.9Ω/1000 ft 22.6Ω/1000 m	3.6Ω/1000 ft 11.8Ω/1000 m	28 Ω/1000 ft 91.9 Ω/1000 m	17.5 Ω/1000 ft 57.4 Ω/1000 m
Maximum current	---	8A	---	3A
Outer diameter of finished cable	11.2 ~ 12.1 m		6.9 mm	

7.2 Connection of Communication Cable Connector

Connect the communication cable in accordance with the connector table below.

Pin No.	Cable wire color	Signal name	Description
1	Black	V-	Network power supply -
2	Blue	CAN_L	Signal wire, differential -
3	Shield	Drain	Drain (shield)
4	White	CAN_H	Signal wire, differential +
5	REd	V+	Network power supply +

Color-coded seals corresponding to the cable wire colors shown in the table above are attached on the supplied cable-end connector.

7.3 Power Supply Connection and Terminal Resistor

7.3.1 Power Supply Connection

The DeviceNet system supplies power to the network.
The supply voltage is 24 VDC, which is applied between the terminals for red (V+) and black (V-) wires in the main line (5-wire cable).
Use a dedicated power tap or T-junction tap to connect the power supply directly to the communication cable connector.

7.3.2 Terminal Resistor

A terminal resistor must be connected on both ends of the main DeviceNet line.
X-SEL, RCS-C and E-Con controllers have no built-in terminal resistors.
To connect a terminal resistor, prepare a dedicated terminal-block type terminal resistor (121 Ω ± 1%, 1/4 W) or terminal resistor with T-junction tap (121 Ω ± 1%, 1/4 W), or other resistor of equivalent specification, and connect it directly to the communication cable connector.

(Note) For details, refer to the operation manual for the master unit.

7.4 Useful Functions You Should Know When Adjusting an X-SEL Controller

(1) In the case of an X-SEL K-type controller in which a standard or expansion I/O board is installed, the X-SEL controller can be started on its own without connecting a 24-VDC I/O power supply.
(2) If a DeviceNet board is installed, the X-SEL controller can be started on its own before network connection is established.

In either case, the applicable parameters (I/O Parameter Nos. 10 to 13) must be set to “0: Do not monitor.”
(Note) After the necessary operation or adjustment is completed, be sure to reset the parameters to their original settings. If the parameters are not reset, error check will not be performed for the board in each applicable slot.

8. EDS File

All X-SEL controllers come with a floppy disk containing an EDS file. To have the master unit recognize the X-SEL controller and automatically configure the applicable settings using a configurator, install the EDS file in the PC. The EDS file can also be downloaded from IAI's website specified below. RCS-C, E-Con and SCON controllers do not come with this floppy disk. If you need an EDS file for any of these controllers, download it from IAI's website.

Website: http://www.iai-robot.co.jp

Reference

Using Omron's configurator

1. Install the EDS file in the configurator.
   On an X-SEL controller, the EDS file is installed under the name "AnyBus-S DeviceNet" in the "Communications Adapter" subfolder located in the "HMS Fieldbus Systems AB" folder.
   On an RCS-C, E-Con or SCON controller, the EDS file is installed under the name "RCS-C-DV," "ECON-C-DV" or "S-CON-C-DV," respectively, in the "Generic Device" subfolder located in the "IAI Corporation" folder.

2. Build and set up a network using the configurator.
   On an X-SEL controller, use the EDS file to perform the necessary settings.
   On an RCS-C, E-Con or SCON controller, 16 input points and 16 output points (fixed) are set as remote I/Os. It is also possible to set I/Os offline and then upload the settings. If the I/Os of the applicable device are fixed, uploading different settings will automatically set a number of bytes that can be used to store I/O property information.

[Setting for X-SEL controller]

(1) Use the EDS file to set the number of bytes to be used to store I/O property information. The number of bytes should correspond to the available I/O ports set by the applicable I/O parameters in the X-SEL controller.
If the EDS file has been installed in a PC, the necessary settings can be done offline and then uploaded.

(2) After the settings are complete, open the parameter window in the master (PLC). The applicable device should be found in the unregistered device list. Register the device in the registered device list.
(Note) Whether or not to select "Enable automatic assignment upon registration" should be determined in accordance with the assignment method selected for the entire system.

(3) If automatic assignment is not enabled at the time of registration, drag the registered device and insert it in the first address of the bytes to be used for I/O assignment. The byte addresses to be used will be assigned automatically. You can also select the edit function to specify the first address.
Repeat this process to set byte addresses for both inputs and outputs.

(4) Download the settings to the PLC.

(5) The X-SEL controller has been registered in the DeviceNet system (master PLC). Perform a final check to confirm that all settings are correct.

MEMO

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