MITSUBISHI ELECTRIC

Mitsubishi Electric Industrial Robot

CR800-D series controller
CR750-D/CR751-D series controller
CRnD-700 series controller

DeviceNet Slave Interface Instruction Manual

2D-TZ571

MELFA

BFP-A8753-D

⚠ Safety Precautions

Always read the following precautions and the separate "Safety Manual" before starting use of the robot to learn the required measures to be taken.

⚠CAUTION All teaching work must be carried out by an operator who has received special training.
(This also applies to maintenance work with the power source turned ON.)
→Enforcement of safety training

⚠CAUTION For teaching work, prepare a work plan related to the methods and procedures of operating the robot, and to the measures to be taken when an error occurs or when restarting. Carry out work following this plan.
(This also applies to maintenance work with the power source turned ON.)
→Preparation of work plan

⚠WARNING Prepare a device that allows operation to be stopped immediately during teaching work.
(This also applies to maintenance work with the power source turned ON.)
→Setting of emergency stop switch

⚠CAUTION During teaching work, place a sign indicating that teaching work is in progress on the start switch, etc.
(This also applies to maintenance work with the power source turned ON.)
→Indication of teaching work in progress

⚠DANGER Provide a fence or enclosure during operation to prevent contact of the operator and robot.
→Installation of safety fence

⚠CAUTION Establish a set signaling method to the related operators for starting work, and follow this method.
→Signaling of operation start

⚠CAUTION As a principle turn the power OFF during maintenance work. Place a sign indicating that maintenance work is in progress on the start switch, etc.
→Indication of maintenance work in progress

⚠CAUTION Before starting work, inspect the robot, emergency stop switch and other related devices, etc., and confirm that there are no errors.
→Inspection before starting work

The points of the precautions given in the separate "Safety Manual" are given below.
Refer to the actual "Safety Manual" for details.

DANGER When automatic operation of the robot is performed using multiple control devices (GOT, programmable controller, push-button switch), the interlocking of operation rights of the devices, etc. must be designed by the customer.

CAUTION Use the robot within the environment given in the specifications. Failure to do so could lead to faults or a drop of reliability.
(Temperature, humidity, atmosphere, noise environment, etc.)

CAUTION Transport the robot with the designated transportation posture. Transporting the robot in a non-designated posture could lead to personal injuries or faults from dropping.

CAUTION Always use the robot installed on a secure table. Use in an instable posture could lead to positional deviation and vibration.

CAUTION Wire the cable as far away from noise sources as possible. If placed near a noise source, positional deviation or malfunction could occur.

CAUTION Do not apply excessive force on the connector or excessively bend the cable. Failure to observe this could lead to contact defects or wire breakage.

CAUTION Make sure that the workpiece weight, including the hand, does not exceed the rated load or tolerable torque.
Exceeding these values could lead to errors or faults.

WARNING Securely install the hand and tool, and securely grasp the workpiece. Failure to observe this could lead to personal injuries or damage if the object comes off or flies off during operation.

WARNING Securely ground the robot and controller. Failure to observe this could lead to malfunctioning by noise or to electric shock accidents.

CAUTION Indicate the operation state during robot operation. Failure to indicate the state could lead to operators approaching the robot or to incorrect operation.

WARNING When carrying out teaching work in the robot's movement range, always secure the priority right for the robot control. Failure to observe this could lead to personal injuries or damage if the robot is started with external commands.

CAUTION Keep the jog speed as low as possible, and always watch the robot. Failure to do so could lead to interference with the workpiece or peripheral devices.

CAUTION After editing the program, always confirm the operation with step operation before starting automatic operation. Failure to do so could lead to interference with peripheral devices because of programming mistakes, etc.

CAUTION Make sure that if the safety fence entrance door is opened during automatic operation, the door is locked or that the robot will automatically stop. Failure to do so could lead to personal injuries.

CAUTION Never carry out modifications based on personal judgments, non-designated maintenance parts. Failure to observe this could lead to faults or failures.

WARNING When the robot arm has to be moved by hand from an external area, do not place hands or fingers in the openings. Failure to observe this could lead to hands or fingers catching depending on the posture.

CAUTION Do not stop the robot or apply emergency stop by turning the robot controller's main power OFF. If the robot controller main power is turned OFF during automatic operation, the robot accuracy could be adversely affected. Also a dropped or coasted robot arm could collide with peripheral devices.

CAUTION Do not turn OFF the robot controller's main power while rewriting the robot controller's internal information, such as a program and parameter. Turning OFF the robot controller's main power during automatic operation or program/parameter writing could break the internal information of the robot controller.

DANGER Do not connect the Handy GOT when using the GOT direct connection function of this product. Failure to observe this may result in property damage or bodily injury because the Handy GOT can automatically operate the robot regardless of whether the operation rights are enabled or not.

DANGER Do not connect the Handy GOT to a programmable controller when using an iQ Platform compatible product with the CR800-R/Q series. Failure to observe this may result in property damage or bodily injury because the Handy GOT can automatically operate the robot regardless of whether the operation rights are enabled or not.

DANGER Do not remove the SSCNET III cable while power is supplied to the multiple CPU system or the servo amplifier when using an iQ Platform compatible product with the CR800-R/Q series.
Do not look directly at light emitted from the tip of SSCNET III connectors or SSCNET III cables of the Motion CPU or the servo amplifier.
Eye discomfort may be felt if exposed to the light.
(Reference: SSCNET III employs a Class 1 or equivalent light source as specified in JIS C 6802 and IEC 60825-1 (domestic standards in Japan).)

DANGER Do not remove the SSCNET III cable while power is supplied to the controller.
Do not look directly at light emitted from the tip of SSCNET III connectors or SSCNET III cables. Eye discomfort may be felt if exposed to the light.
(Reference: SSCNET III employs a Class 1 or equivalent light source as specified in JIS C 6802 and IEC60825-1 (domestic standards in Japan).)

DANGER Attach the cap to the SSCNET III connector after disconnecting the SSCNET III cable. If the cap is not attached, dirt or dust may adhere to the connector pins, resulting in deterioration connector properties, and leading to malfunction.

CAUTION Make sure there are no mistakes in the wiring. Connecting differently to the way specified in the manual can result in errors, such as the emergency stop not being released. In order to prevent errors occurring, please be sure to check that all functions (such as the teaching box emergency stop, customer emergency stop, and door switch) are working properly after the wiring setup is completed.

CAUTION Use the network equipments (personal computer, USB hub, LAN hub, etc) confirmed by manufacturer. The thing unsuitable for the FA environment (related with conformity, temperature or noise) exists in the equipments connected to USB. When using network equipment, measures against the noise, such as measures against EMI and the addition of the ferrite core, may be necessary. Please fully confirm the operation by customer. Guarantee and maintenance of the equipment on the market (usual office automation equipment) cannot be performed.

CAUTION To maintain the safety of the robot system against unauthorized access from external devices via the network, take appropriate measures. To maintain the safety against unauthorized access via the Internet, take measures such as installing a firewall.

■ Revision History

Printing date	Manual No.	Description
2009-07-23	BFP-A8753	Initial edition
2016-08-05	BFP-A8753-A	The cover and corporate logo mark of this manual was changed.
2017-05-31	BFP-A8753-B	The CR800-D series controller was added.
2018-02-01	BFP-A8753-C	Safety Precautions was revised. (The CR800-Q controller was added.)
2023-09-14	BFP-A8753-D	・ Added the CR860 controller. ・ Changed some sections.

■ Introduction

Thank you for purchasing Mitsubishi Electric Industrial Robot.

The DeviceNet Slave Interface (2D-TZ571) is an optional device which, installed into the Robot Controller, permits you to connect the Robot Controller to a DeviceNet network.

Before using the Interface, read this manual and familiarize yourself with all pages to ensure safe operation and obtain maximum satisfactory service from the DeviceNet Slave Interface (2D-TZ571).

Note: All descriptions in this manual assume that the user has an adequate understanding about basic operating procedures and functions which pertain to the Mitsubishi Industrial Robot. For detailed information about the basic operating procedures, refer to the "Instruction Manual - Detailed Explanations of Functions and Operations" which is separately issued.

The CR800-D series indicates the CR800-D and CR860-D controllers.

■ Safety notation used in this manual:

⚠ *DANGER*	Indicates an immediately hazardous situation which, if not properly dealt with, will result in death or serious injury.
⚠ *WARNING*	Indicates a hazardous situation which, if not properly dealt with, could result in death or serious injury.
⚠ *CAUTION*	Indicates a hazardous situation which, if not properly dealt with, could result in injury, or property damage alone.

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1. Before Using DeviceNet Slave Interface

This section explains checks or precautions that you should perform or take before using the DeviceNet Slave Interface (2D-TZ571).

1.1 About Terms Used in This Manual

Table 1-1 Terms Used in This Manual

Generic name/abbreviation	Description
DeviceNet	A field network developed for FA applications by Allen-Bradley of the United States. At present, DeviceNet is a registered trademark of Open DeviceNet Vendor Association, Inc. (ODVA).
2D-TZ571	DeviceNet Slave Interface for SD Series (a complete set of products)
2D-TZ571 Card	DeviceNet Slave Interface Card for SD Series (TZ571)
Master station	A station that controls a data link system. At least one Master Station must be present in any one data link system.
Slave station	A station that is allowed to communicate with the Master Station.
Station number	A number assigned to Master Station or Slave Station. Numbering is in the range of 0 to 63.
Trunk line	A line that serves as a main in a networked system.
Drop line	A branch line that connects via a branch tap to a trunk line. Connection topologies usable for equipment on a branch line include "T-branch," "star connection," "daisy chain connection," and "branching."
Mutidrop	A topology in which equipment is connected directly to a trunk line.
Terminator resistor	Resistor connected to the DeviceNet network at each end.
Polling	One of connection types used during I/O communication. A mode in which a master station communicates with one slave station after another in sequence.

1.2 How to Use This Manual

This manual describes the functions of the 2D-TZ571 Card with its constituent sections organized as shown in the table below. For information about the functions available from the standard Robot Controller and the operating method thereof, refer to the "Instruction Manual" that is supplied with the Robot Controller.

Table 1-2 Organization of This Instruction Manual

Section	Title	Contents
1	Before Using 2D-TZ571	This section describes how to use this document (DeviceNet Slave Interface Instruction Manual). Read and familiarize yourself with the information contained before using the 2D-TZ571.
2	Features and specification of 2D-TZ571 Card	This section describes the features and specification of the Robot DevinceNet Interface.
3	Out of the Package	Upon receipt of the 2D-TZ571, check to see that all component parts are in the package and that the version of the Robot Controller is as specified.
4	Connections and Wiring	This section describes the method used to connect the 2D-TZ571 Card to the Master Station via cable.
5	Communication Test	This section describes the procedure followed to carry out a communication test before incorporating the 2D-TZ571 into the existing system.
6	Startup Procedure	This section describes the procedure followed to start the system.
7	Troubleshooting	This section presents information that helps find solutions when operational anomalies or errors are encountered during the use of the 2D-TZ571. Make reference to this section as occasion arises.
8	Appendix	The appendix explains the method for displaying information about the 2D-TZ571 Card on the screen by using RT ToolBox2/RT ToolBox3.

2. Features and Specification of 2D-TZ571 Card

2.1 Features

The 2D-TZ571 Card has the following features:

(1) A DeviceNet Slave interface variant for CRnD-700/CR750-D/CR751-D/CR800-D series.

(2) Compliant with the DeviceNet Specification, Release 2.0.

(3) An interface specifically designed for robotics applications, which operates as a slave station alone.

(4) Communication parameters for the DeviceNet can be established by using any of parameter setting functions listed following : R32TB, R56TB, or RT ToolBox2/RT ToolBox3

(5) I/O communication with a master station can be performed with input of up to 128 bytes (1,024 points) and output of up to 128 bytes (1,024 points).

(6) Polling can be used for I/O communication with a master station.

⚠ Caution

Connectivity with DeviceNet products from other suppliers:

The 2D-TZ571 may be expected to have connectivity with most of commercially available DeviceNet products. But Melco disclaims all warranties which pertain to such connectivity.

2.2 System Configuration

2.2.1 Overall Configuration

The DeviceNet permits you to connect a total of up to 64 stations, including master, slave and master/slave stations. Each station is connected either via a tap or directly to a trunk line. The following diagram shows an example of system configuration.

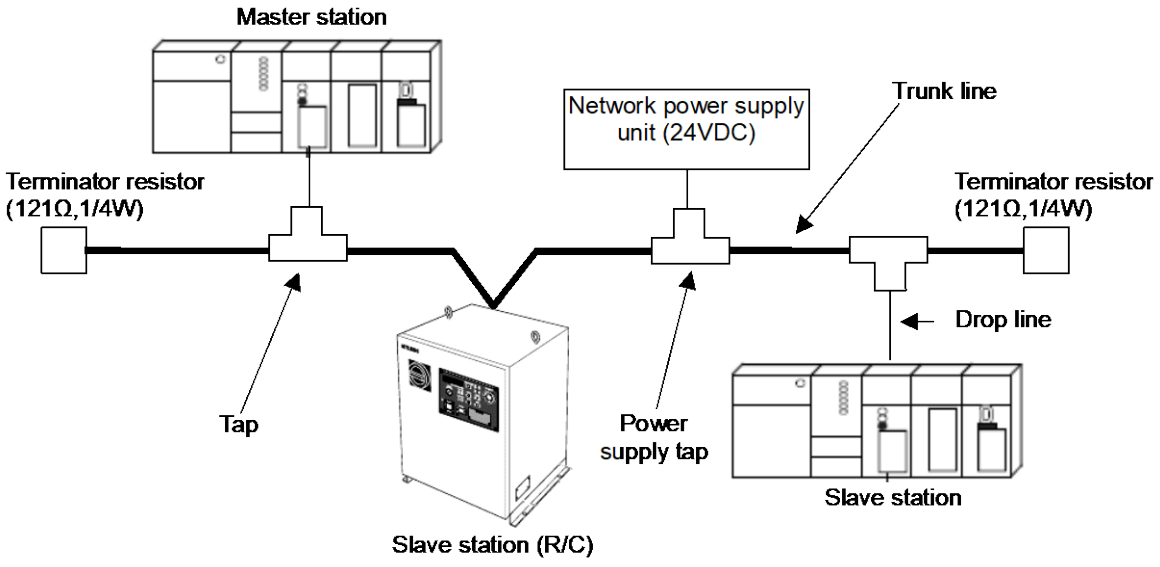


Figure 2-1 DeviceNet - Overall System Configuration

(1) Robot controller is connected via a 2D-TZ571 Card to a DeviceNet network.

(2) 2D-TZ571 Card can be used only as a slave station, not as a master station or a master/slave station.

(3) A total of up to 64 stations, including master and slave stations, can be connected.

(4) Master stations or slave stations need not be arranged in sequence based on station number.

(5) Network cabling consists of a trunk line and drop line(s), and the trunk line must be provided with a terminator resistor at each end.

(6) A network power supply is required in addition to the power supply which feeds individual stations.

(7) The terminator resistors to be used may be ones that are supplied with the 2D-TZ571 or ones that are furnished by the user.

2.2.2 Network Specification

The following is a description of a DeviceNet network specification incorporating the 2D-TZ571 Card.

(a) Communication speed

Communication speed of 125, 250 or 500 kbaud is user-selectable. Selection of a communication speed is accomplished by choosing a setting of the mode selector switch on the 2D-TZ571 Card. For switch setting details, see "Table 2-9 A Listing of Mode Switch (SW3) Settings." It should be noted that maximum usable cable length varies with communication speed. For more information, see "Table 2-2 Transmission Specification" and "Table 2-3 Transmission Speed in Mixed Thick/Thin-Cable Configuration".

(b) Network Power Supply

Network power is supplied to individual stations in the following manner:

[1] A dedicated power supply tap is installed on the trunk line cable and a network power supply unit is connected to the tap.

[2] Power from the network power supply unit is fed to individual stations over the network cable.

2.3 Specification

Table 2−1 General Specification (2D-TZ571 Card Specification)

Item		Specification	Remark
Type name of DeviceNet Slave Interface Card		TZ571	-
Communication capability		Both **bit** data and **word** data can be handled.	-
Option slots which accept an interface card		Slot **1**/ Slot **2**/Slot **3**	Only one slot is usable at any time. **(CR1D is provided with Slot 1 only.)**
Number of cards accepted in slot		One	No more than one card is accepted.
Concurrent use with other fieldbus (*1)		Not permitted	-
DeviceNet specification supported		Release 2.0	-
Type of station * Type of station: master or slave		**Intended to serve as a slave station alone**	**Not intended to serve as a master station**
Type of node		DeviceNet slave (Group2 server)	-
Transmission speed		125, 250, or 500 kbaud	Rotary switch-selectable
Station number		0~63	Rotary switch-selectable (Default setting: 0)
Number of connections that can be generated (I/O connections)		One (polling)	-
Number of I/O communication points per robot controller	Transmission	**1,024** maximum	128 bytes
	Reception	**1,024** maximum	128 bytes
Head number of input/output to/from robot controller		**2000~**	For more information about signal assignment, see "Table 2-6 A Listing of DeviceNet Signals."
Terminator resistor		Uninstalled	-
Input/output signal access		2D-TZ571 Card send/receive data is assigned to input/output signal No. 2000 and up. In a MELFA-BASIC V network, these signals are treated as input/output signals like parallel I/O signals are.	-

(*1)CC-Link Interface Card and Device Net Interface Card (both under development).

Table 2-2 Transmission Specification

Item	Specification					
Medium	Thick cable and thin cable					
Network configuration	Bus type (trunk line/drop line)					
Data link method	Polling					
Maximum length of cable (*1)	Transmission speed	Trunk line			Drop line	
		Thick cable	Thin cable	Mixed Thick/Thin-Cable	Maximum	Total
	125kbps	500m	100m	see"Table2-3"	6m	156m
	250kbps	250m				78m
	500kbps	100m				39m

(*1)The maximum length of cable applies to DeviceNet specifications Release2.0 Volume1 and Volume2.

Table 2-3 Transmission Speed in Mixed Thick/Thin-Cable Configuration

Transmission Speed	Maximum transmission speed in mixed thick/thin cable configuration
125kbps	Length of thick cable + 5 x thin cable ≤ 500m
250kbps	Length of thick cable + 2.5 x thin cable ≤ 250m
500kbps	Length of thick cable + thin cable ≤ 100m

Table 2-4 A Listing of Robot Parameters Used in DeviceNet

Item	Initial value	Setting range	Description
STOP2	-1, -1	-1 ~ 19999	A dedicated input parameter used to specify a dedicated input signal which causes robot program to be suspended. Please set 2000-3023 when setting it to the Input/Output signals of 2D-TZ571 Card. [Element 1] Stop input [Element 2] Pausing output (Because the parameter "STOP" is fixed at "0," DeviceNet uses "STOP 2" to define a suspend signal from outside.)
ORST2000 ORST2032 . . ORST2992	00000000, 00000000, 00000000, 00000000	0/1/*	Value of data sent over DeviceNet at signal output reset is specified. For more information, see "2.5 General-purpose Output Resetting Function."
DNSDLN	8	0 ~ 128	Number of transmission bytes in I/O communication over DeviceNet (0~128)
DNRDLN	8	0 ~ 128	Number of reception bytes in I/O communication over DeviceNet (0~128)
DNERR	0	0/1	A parameter specified for a temporary reset to clear error condition at the occurrence of error about DeviceNet. (1: reset enabled (but communication not to be performed) / 0: error at all times while anomaly exists in the link) *** This parameter returns to initial value "0" when the operator resets power supply to the robot controller.**
DNFIL	5000, 200	0 ~ 32767	The communication abnormality detection filter is specified. This error occurs if each error continues during specified time. [Element 1] Error 8410, 8440, 8441, 8442, 8460 [Element 2] Error 8430 [Unit]ms

2.4 Robot Controller Input/Output Signals

Input/output signals handled in the Robot Controller are in the range of 2000~3023 maximum irrespective of station numbers.

Table 2-5 DeviceNet Input/Output Number

	Input (received from master station)	Output (sent to master station)
Number	2000 ~ 3023	2000 ~ 3023

The data size of input/output signal is determined by specifying associated parameter (DNSDLN for transmission or DNRDLN for reception) with a number of bytes.

The range of parameter settings is 0 to 128 bytes and an initial value is 8 bytes.

Table 2-6 A Listing of DeviceNet Signals

Number of bytes	Usable number of points	Start End
0	0	- to -
1	8	2000 to 2007
2	16	2000 to 2015
3	24	2000 to 2023
4	32	2000 to 2031
5	40	2000 to 2039
6	48	2000 to 2047
7	56	2000 to 2055
8	64	2000 to 2063
9	72	2000 to 2071
10	80	2000 to 2079
11	88	2000 to 2087
12	96	2000 to 2095
13	104	2000 to 2103
14	112	2000 to 2111
15	120	2000 to 2119
16	128	2000 to 2127
17	136	2000 to 2135
18	144	2000 to 2143
19	152	2000 to 2151
20	160	2000 to 2159
21	168	2000 to 2167
22	176	2000 to 2175
23	184	2000 to 2183
24	192	2000 to 2191
25	200	2000 to 2199
26	208	2000 to 2207
27	216	2000 to 2215
28	224	2000 to 2223
29	232	2000 to 2231
30	240	2000 to 2239
31	248	2000 to 2247
32	256	2000 to 2255
33	264	2000 to 2263
34	272	2000 to 2271
35	280	2000 to 2279
36	288	2000 to 2287
37	296	2000 to 2295
38	304	2000 to 2303
39	312	2000 to 2311
40	320	2000 to 2319
41	328	2000 to 2327
42	336	2000 to 2335
43	344	2000 to 2343
44	352	2000 to 2351
45	360	2000 to 2359
46	368	2000 to 2367
47	376	2000 to 2375
48	384	2000 to 2383
49	392	2000 to 2391
50	400	2000 to 2399
51	408	2000 to 2407
52	416	2000 to 2415
53	424	2000 to 2423
54	432	2000 to 2431
55	440	2000 to 2439
56	448	2000 to 2447
57	456	2000 to 2455
58	464	2000 to 2463
59	472	2000 to 2471
60	480	2000 to 2479
61	488	2000 to 2487
62	496	2000 to 2495
63	504	2000 to 2503
64	512	2000 to 2511
65	520	2000 to 2519
66	528	2000 to 2527
67	536	2000 to 2535
68	544	2000 to 2543
69	552	2000 to 2551
70	560	2000 to 2559
71	568	2000 to 2567
72	576	2000 to 2575
73	584	2000 to 2583
74	592	2000 to 2591
75	600	2000 to 2599
76	608	2000 to 2607
77	616	2000 to 2615
78	624	2000 to 2623
79	632	2000 to 2631
80	640	2000 to 2639
81	648	2000 to 2647
82	656	2000 to 2655
83	664	2000 to 2663
84	672	2000 to 2671
85	680	2000 to 2679
86	688	2000 to 2687
87	696	2000 to 2695
88	704	2000 to 2703
89	712	2000 to 2711
90	720	2000 to 2719
91	728	2000 to 2727
92	736	2000 to 2735
93	744	2000 to 2743
94	752	2000 to 2751
95	760	2000 to 2759
96	768	2000 to 2767
97	776	2000 to 2775
98	784	2000 to 2783
99	792	2000 to 2791
100	800	2000 to 2799
101	808	2000 to 2807
102	816	2000 to 2815
103	824	2000 to 2823
104	832	2000 to 2831
105	840	2000 to 2839
106	848	2000 to 2847
107	856	2000 to 2855
108	864	2000 to 2863
109	872	2000 to 2871
110	880	2000 to 2879
111	888	2000 to 2887
112	896	2000 to 2895
113	904	2000 to 2903
114	912	2000 to 2911
115	920	2000 to 2919
116	928	2000 to 2927
117	936	2000 to 2935
118	944	2000 to 2943
119	952	2000 to 2951
120	960	2000 to 2959
121	968	2000 to 2967
122	976	2000 to 2975
123	984	2000 to 2983
124	992	2000 to 2991
125	1000	2000 to 2999
126	1008	2000 to 3007
127	1016	2000 to 3015
128	1024	2000 to 3023

2.5 General-purpose Output Resetting Function

The factory default setting sets all general-purpose output signals to OFF (0) at power up. The status of general-purpose output signals after power up can be changed by changing the following parameter. Note that this parameter also affects the general-purpose output signal reset operation (called by dedicated I/O signals) and the reset pattern after executing the Clr instruction.

The following table lists parameters for 2D-TZ571 Card which pertain to general-purpose output resetting.

Table 2-7 A Listing of General-purpose Output Reset Pattern Parameters

Parameter name	Head number	Last number
ORST2000	2000	2031
ORST2032	2032	2063
ORST2064	2064	2095
ORST2096	2096	2127
ORST2128	2128	2159
ORST2160	2160	2191
ORST2192	2192	2223
ORST2224	2224	2255
ORST2256	2256	2287
ORST2288	2288	2319
ORST2320	2320	2351
ORST2352	2352	2383
ORST2384	2384	2415
ORST2416	2416	2447
ORST2448	2448	2479
ORST2480	2480	2511
ORST2512	2512	2543
ORST2544	2544	2575
ORST2576	2576	2607
ORST2608	2608	2639
ORST2640	2640	2671
ORST2672	2672	2703
ORST2704	2704	2735
ORST2736	2736	2767
ORST2768	2768	2799
ORST2800	2800	2831
ORST2832	2832	2863
ORST2864	2864	2895
ORST2896	2896	2927
ORST2928	2928	2959
ORST2960	2960	2991
ORST2992	2992	3023

Parameter ORSTOOOO has the initial values of "0000000, 00000000, 00000000, and 00000000". The value corresponds to bits from the left. Setting is "0", "1", or "*".

"0" = Set to off "1" = Set to on "*" = Maintain status with no change. (Set to off at power up.)

For example, if ORST2000 is set to "*0000001, 00000000, 11110000, and 00000000," the following will result when power is turned back on to the Robot Controller:

Output No. 2000: Holds a state which existed before reset the Robot Controller

Output No. 2007: ON

Output Nos. 2016 ~ 2019: ON

Others: OFF

2.6 Hardware of 2D-TZ571 Card

The following subsections explain the steps followed to choose the rotary switch settings and LED indications on the 2D-TZ571 Card.

2.6.1 Overall View

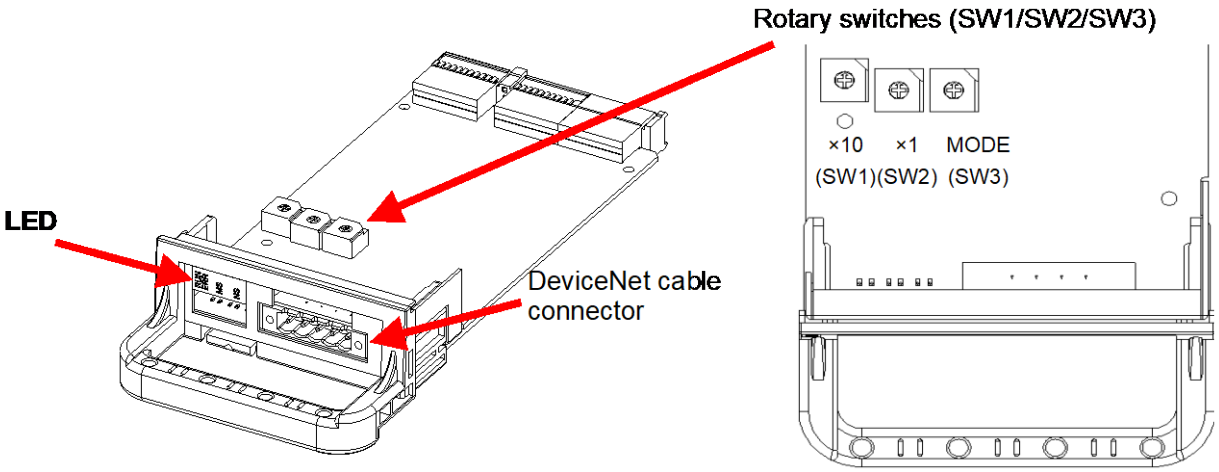


Figure 2-2 Overall View of 2D-TZ571 Card

2.6.2 Rotary Switch

There are three rotary switches (SW1/SW2/SW3) provided on the 2D-TZ571 Card. The table below shows settings which can be chosen from the rotary switches.

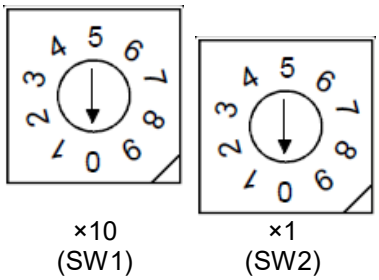
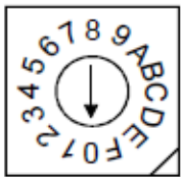


Table 2-8 A Listing of Station Number Selector Switch (SW1/SW2) Settings

Name	Item	Default setting	Description	Remark
Station number selector switch	x10	0	Specifies the tens digit of station number	Setting range: 0~63 (If any setting outside the range of 0 to 63 is chosen, Error 8421 (DEVICENET Unit number switch is outside) will result with the "ERR." LED lighting up.) * Be careful to avoid selecting station numbers which overlap one another.
	x1	0	Specifies the units digit of station number	

◇◆◇ " Assign as small a number to the Master Station as possible " ◇◆◇
Station number can be chosen from a range of 0 to 63, but the characteristic of a DeviceNet network is such that a smaller station number carries a higher transmission priority. Therefore, it is advisable that as small a number as possible be assigned to Master Station.



MODE
(SW3)

Table 2-9 A Listing of Mode Switch (SW3) Settings

Name	Setting	Function	Description	Remark
Mode switch	0	**Prohibited from use**		Use of these settings will result in Error 8420 (DEVICENET Mode switch is outside).
	1			
	2			
	3	Slave function	Card acts as a slave station. Communication speed: 125 Kbaud	
	4		Card acts as a slave station. Communication speed: 250 Kbaud	
	5		Card acts as a slave station. Communication speed: 500 Kbaud	
	6	**Prohibited from use**		Use of these settings will result in Error 8420 (DEVICENET Mode switch is outside).
	7			
	8			
	9	**Prohibited from use**		Use of these settings will result in Error 8420 (DEVICENET Mode switch is outside).
	A	Communication test	Transmission/reception test is carried out. Communication speed: 125 Kbaud	
	B		Transmission/reception test is carried out. Communication speed: 250 Kbaud	
	C		Transmission/reception test is carried out. Communication speed: 500 Kbaud	
	D-F	**Prohibited from use**		Use of these settings will result in Error 8420 (DEVICENET Mode switch is outside).

2.6.3 LEDs

There are five LEDs provided on the 2D-TZ571 Card, each of which lets you know the operating state of the Interface Card by going on, flickering, or going off.

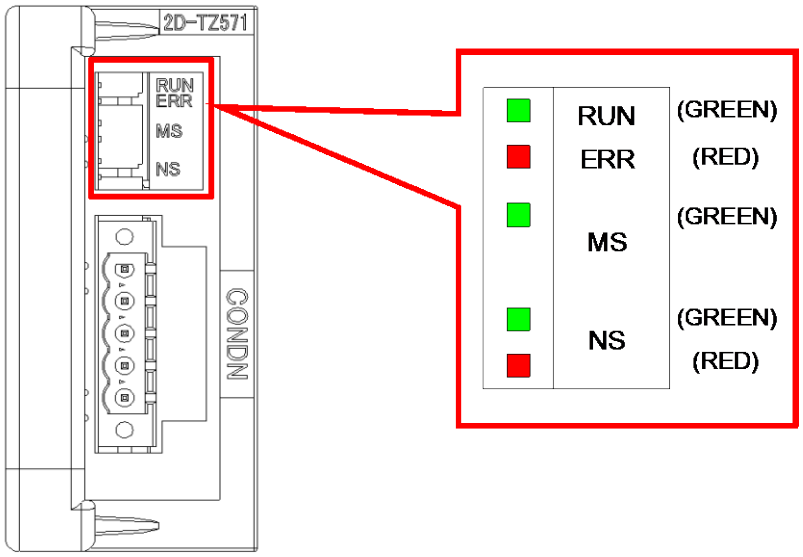


Figure 2-3 Placement of LEDs

Table 2-10 A Listing of LEDs (in Mode 3~5)

LED name	Color	Indications
RUN	Green	On: Operating normally
		Off: Watchdog timer error
ERR	Red	On: Station number setting error
		Flickering: Change has been made to Station Number Selector Switch and/or Mode Selector Switch settings during the operation of the unit.
MS	Green	On: Communication enabled
		Flickering: Parameter error
NS	Green	On: Communication going on
		Flickering: Waiting for communication (robot being in initialization process or waiting for other equipment to get ready to start communication)
	Red	On: There are overlapping station numbers. Bus off error (anomaly in communication line)
		Flickering: Communication with Mater Station is suspended.
	Green/red	Off: Network power supply is not lost.

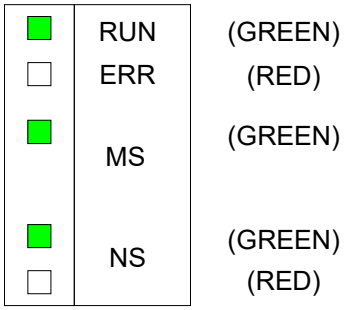


Figure 2-4 On-Off State of LEDs under Normal Operation

Table 2-11 A Listing of LEDs (in Mode A~C: Communication Test)

RUN	MS	ERR State	
On	Flickering	Off	Communication test going on
On	On	Off	Normal completion
On	Off	On	Abnormal completion

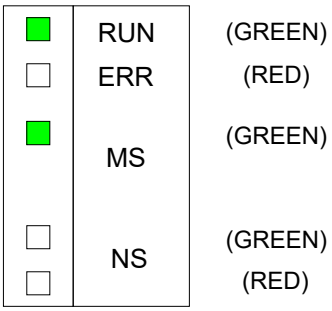


Figure 2-5 On-Off State of LEDs at Normal Completion

3. Out of the Package

3.1 Checking Component Parts

The product you purchased comes standard with the components listed in the table below. Check the product to ensure that it is complete with these components.

Table 3-1 Standard Components of Product

No.	Item name	Type name	Quantity
[1]	Instruction manual (CD-ROM)	BFP-A8758	1
[2]	DeviceNet Slave Interface Card (2D-TZ571 Card)	TZ571	1
[3]	Ferrite core	E04SR301334	1
[4]	Online connector for communication	MSTB2.5/5-STF-5.08AU M	1

Note: Numbers in the table corresponds to those in the figure below.

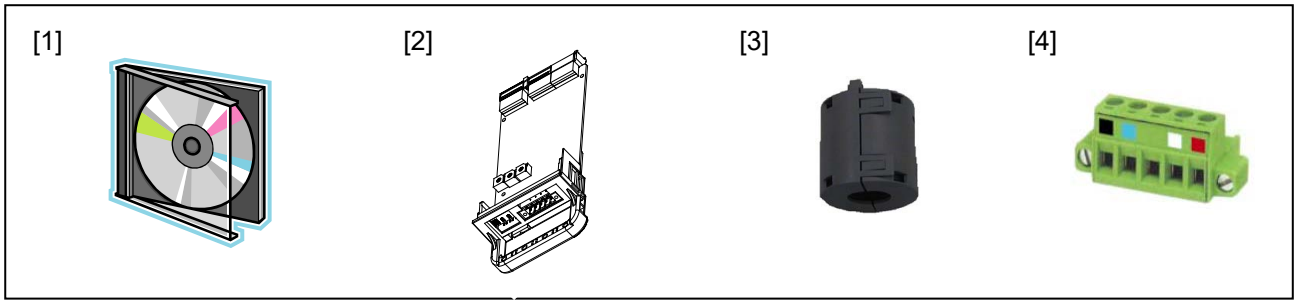


Figure 3-1 A Listing of Components Supplied with the Product

3.2 Compatible Versions

Please confirm the Compatible version of the Robot controller and the PC support software. (Refer to 2.4 Compatible Versions)

3.3 Items To Be Furnished by User

The following table shows the items that the user is required to have ready before using the 2D-TZ571 Card.

Table 3-2 Items To Be Furnished by User

Item	Requirements
Master station	DeviceNet-compliant master station
Communication cable (*1)	Cable specifically designed for use with DeviceNet Melco disclaims all guarantees of DeviceNet system performance if any cable other than those described herein is used. There are limits to maximum total cable length and inter-station cable length.

(*1) For more information, visit **"ODVA" website at http://www.odva.org/**.

4. Connection and Wiring

4.1 Installing 2D-TZ571 Card

For instructions on how to install an optional card onto the Robot Controller, see the section under the heading "Installing Optional Devices" which is included in the controller's instruction manual "Controller Setup - From Basic Operating Procedure to Maintenance."

Only one 2D-TZ571 Card is permitted to be installed into either of the option slots (1 ~ 3) of the Robot Controller. If more than one card is installed into the slots, Error 8450 (DEVICENET Install more than one) will occur.

4.1.1 For CR800-D Controller

Remove one interface cover of the option slots 1-2 in the robot controller front, and mount the 2D-TZ571 card there. Please use the handle of the interface card at mounting of the interface card.

<CR800 controller (Front side)>

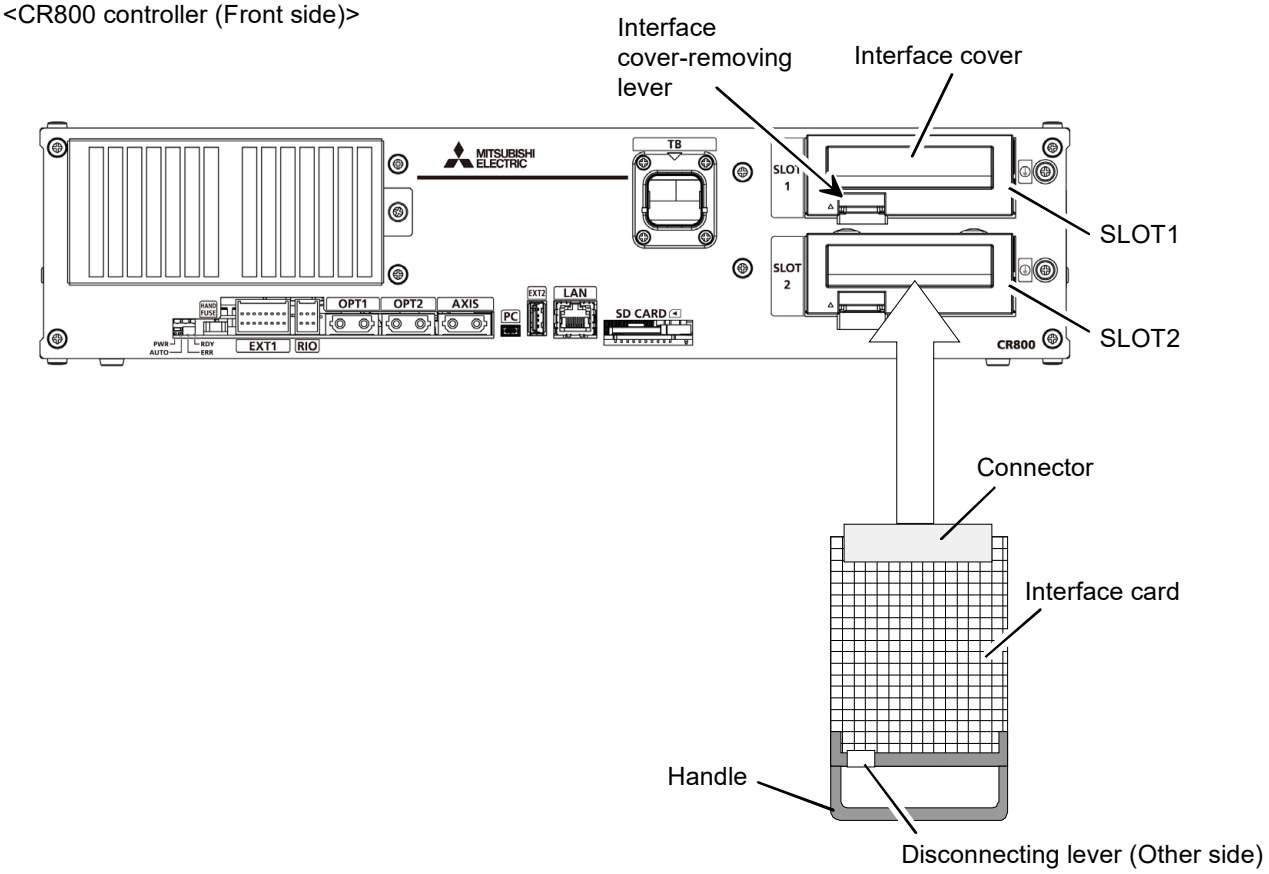


Figure 4-1 Installing 2D-TZ571 Card (in the case of CR800-D Controller)

4.1.2 For CR860-D controller

Remove the interface cover of option slot 1 or 2 on the front of the R800CPU module, and mount the 2D-TZ571 card there.

Please use the handle of the interface card at mounting of the interface card.

<CR860-D controller front>

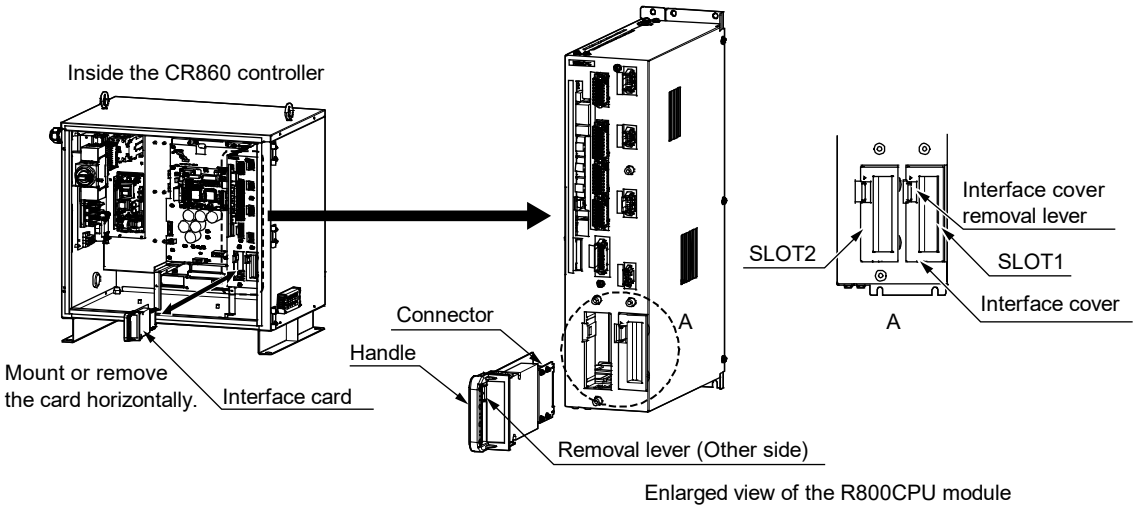


Figure 4-2 Installing 2D-TZ571 Card (in the case of CR860-D Controller)

4.1.3 For CR750-D/CR751-D Controller

Remove one interface cover of the option slots 1-2 in the robot controller front or rear, and mount the 2D-TZ571 card there. Please use the handle of the interface card at mounting of the interface card.

<CR750 controller (Rear side)>

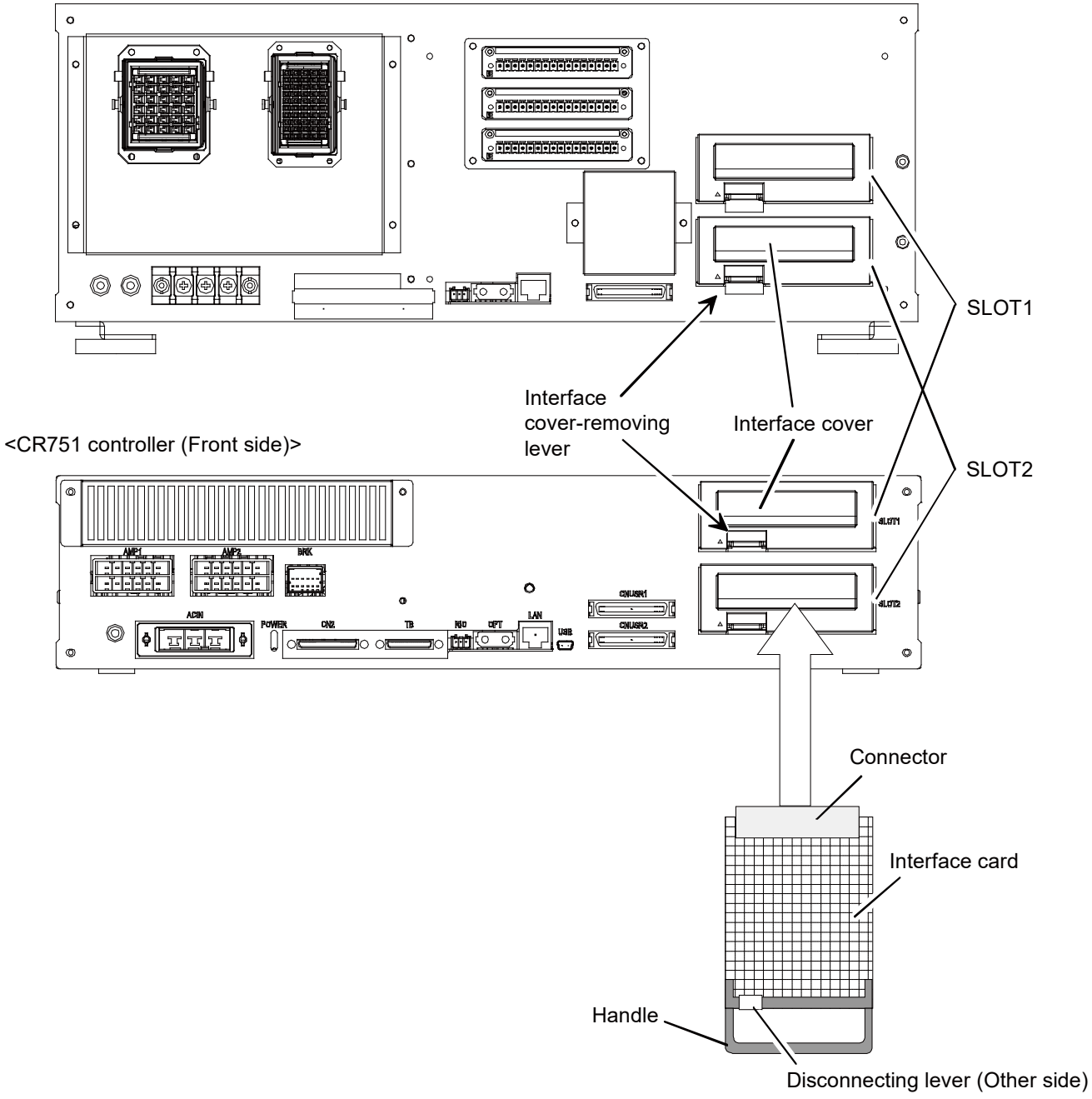


Figure 4-3 Installing 2D-TZ571 Card (in the case of CR750-D/CR751-D Controller)

4.1.4 For CR1D Controller

Remove the option slot interface cover on the rear of the Controller and install a 2D-TZ571 Card into the slot. During installation, use the handle fitted to the Interface Card.

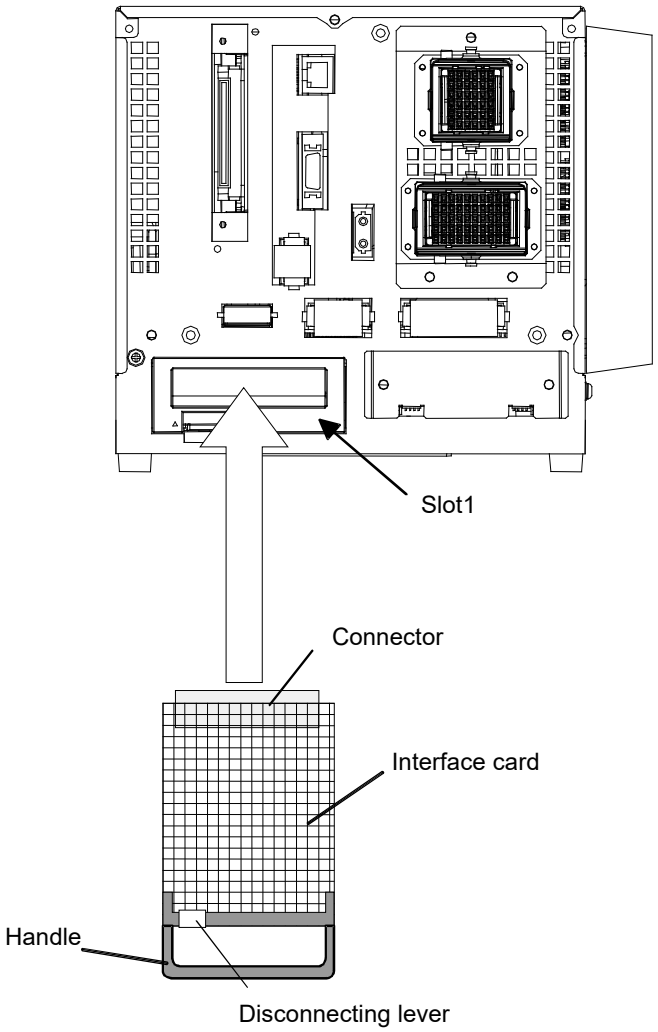


Figure 4-4 Installing 2D-TZ571 Card (in the case of CR1D Controller)

4.1.5 For CR2D Controller

Remove any one of the interface covers provided for the option slots 1 to 3 on the rear of the Controller and install a 2D-TZ571 Card into the slot. During installation, use the handle fitted to the Card.

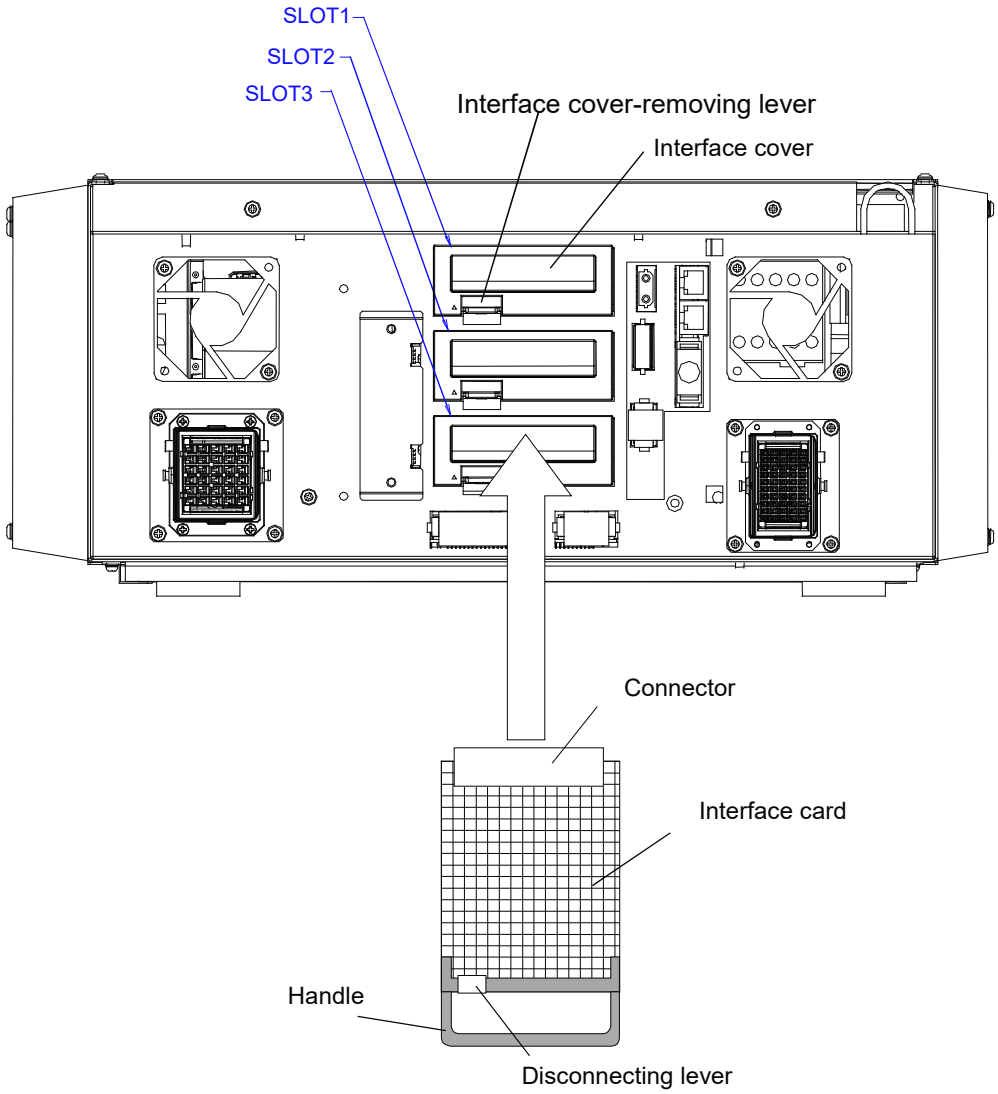


Figure 4-5 Installing 2D-TZ571 Card (in the case of CR2D Controller)

4.1.6 For CR3D Controller

Open the door of the Robot Controller and you will see R700 CPU unit located at the right-hand end. Remove any one of the interface covers provided for the option slots 1 to 3 on the CPU unit and install a 2D-TZ571 Card into the slot.

During installation, use the handle fitted to the Card.

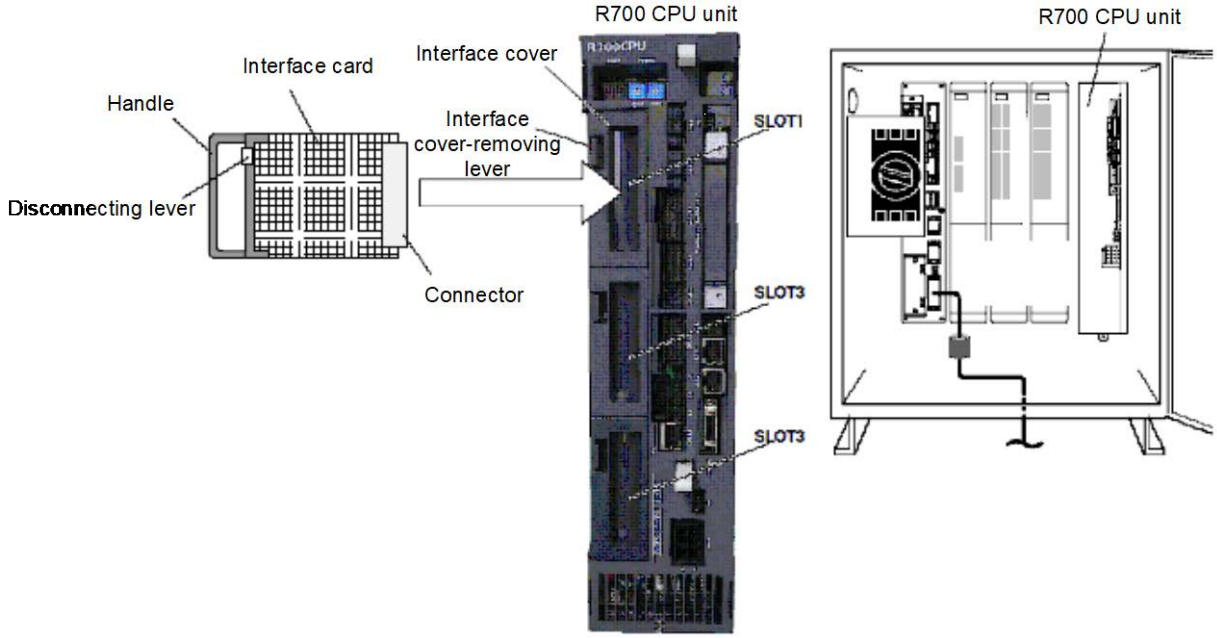


Figure 4-6 Installing 2D-TZ571 Card (in the case of CR3D Controller)

4.2 Connecting Communication Cable to 2D-TZ571 Card

4.2.1 Connecting Communication Cable

The DeviceNet connector on the 2D-TZ571 Card is arranged as shown below. It is affixed with adhesive labels, each having a color corresponding to the color of the communication cable. Connect the communication cable, noting the color-coding of the connector labels and the cables.

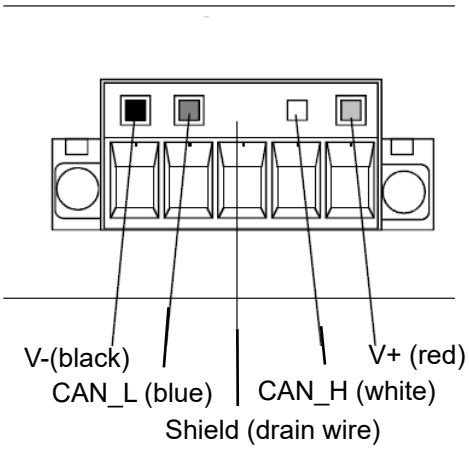


Figure 4-7 DeviceNet Connector Pin Assignment

4.2.2 Grounding Network

The DeviceNet network uses a single-point ground. Establish a ground near the mid-part of the network.

Connect the shield (drain wire) of the cable to the ground of the power supply unit, using Class D (Class 3) grounding.

If more than one power supply unit exists on the network, ground only the power supplier unit closer to the mid-part of the network, doing away with grounding elsewhere.

Also, if more than one power supply unit is employed on the network, use a power supply tap.

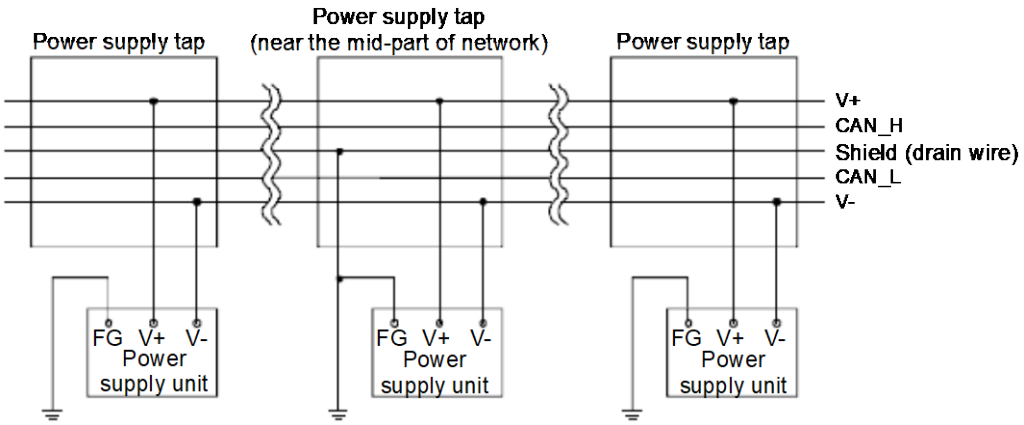


Figure 4-8 Grounding DeviceNet Network

4.3 Precautions about Network Power Supply

4.3.1 Arranging Network Power Supply Unit(s)

Follow the procedure given below to decide on the arrangement of network power supply unit(s):

[1] Figure up a sum of current consumptions by individual stations which are connected to the network.

[2] Take measurement of the network's total length.

[3] Referring to Table 4-1 Maximum Current Capacity Sufficient for Master/Slave Stations Relative to Length of Thick-cable Network and Table 4-2 Maximum Current Capacity Sufficient for Master/Slave Stations Relative to Length of Thin-cable Network, determine a maximum current capacity which corresponds to the distance covered by the network and the type of cable used.

[4] If the sum obtained in Step [1] is no greater than that obtained in Step [3], any of the power supply unit arrangements described in the next subsection may be used.

[5] If the sum obtained in Step [1] is greater than that obtained in Step [3], check to see, by reference to the description in the next subsection, whether a power supply unit being located near the mid-part of the network is sufficient to supply power to all the stations.

If the check made in Step [5] shows that a single power supply unit is not sufficient to feed all the stations, increase the number of power supply units.

Table 4-1 Maximum Current Capacity Sufficient for Master/Slave Stations

Relative to Length of Thick-cable Network

Length of network (m)	0	25	50	100	150	200	250	300	350	400	450	500
Maximum current (A)	8.00	8.00	5.42	2.93	2.01	1.53	1.23	1.03	0.89	0.78	0.69	0.63

Table 4-2 Maximum Current Capacity Sufficient for Master/Slave Stations

Relative to Length of Thin-cable Network

Length of network (m)	0	10	20	30	40	50	60	70	80	90	100
Maximum current (A)	3.00	3.00	3.00	2.06	1.57	1.26	1.06	0.91	0.80	0.71	0.64

⚠ Caution

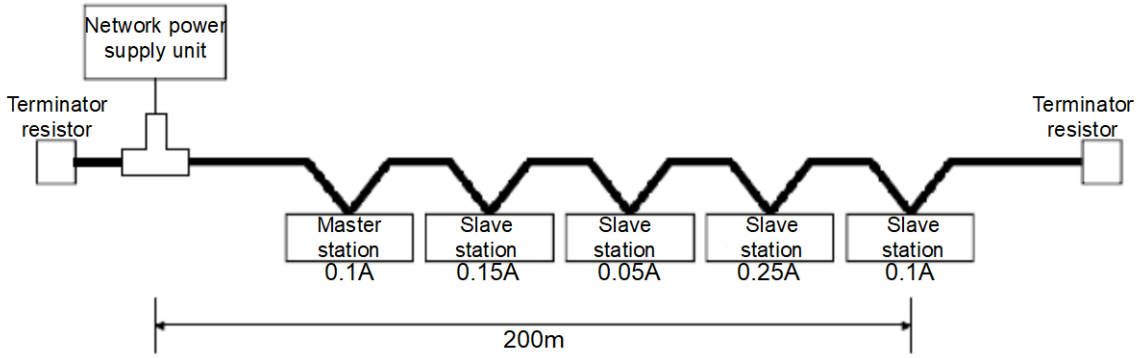
About current capacity of network power supply unit

Network power supply unit should be such that current capacity available is greater than total current consumption required. If current capacity is found insufficient, more than one power supply unit may be used. However, when using plural power supply units, install a power supply tap.

4.3.2 Arrangement of Network Power Supply Unit and Calculation of Current Capacity

(1) In the case power supply unit is connected at the end of network

Calculation of current capacity is shown below, provided that a power supply unit is connected at the end of a network which is 200m in total length and uses thick cable.



Total length of cable receiving power = 200m

Total current capacity = 0.1A + 0.15A + 0.05A + 0.25A + 0.1A = 0.65A

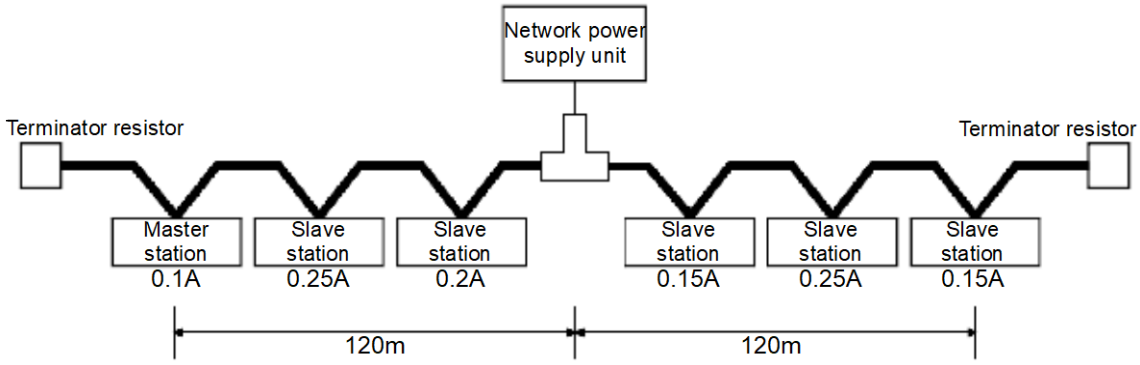
Maximum amount of current allowed to flow through the 200m-long thick-cable network (see Table 4-1 Maximum Current Capacity Sufficient for Master/Slave Stations

Relative to Length of Thick-cable Network) = 1.53A

Therefore, this arrangement allows power to be supplied to all the stations that are connected.

(2) In the case power supply unit is connected near the mid-part of network

Calculation of current capacity is shown below, provided that a power supply unit is connected near the mid-part of a network which is 200m in total length and uses thick cable. This arrangement allows twice as much current to flow as the one having a power supply unit connected at the end.



Total length of cable receiving power on the left side = total length of cable receiving power on the right side = 120m

Total current capacity on the left side = 0.1A + 0.25A + 0.2A = 0.55A

Total current capacity on the right side = 0.15A + 0.25A + 0.15A = 0.55A

Maximum amount of current allowed to flow through the 120m-long thick-cable network section (see Table 4-1 Maximum Current Capacity Sufficient for Master/Slave Stations

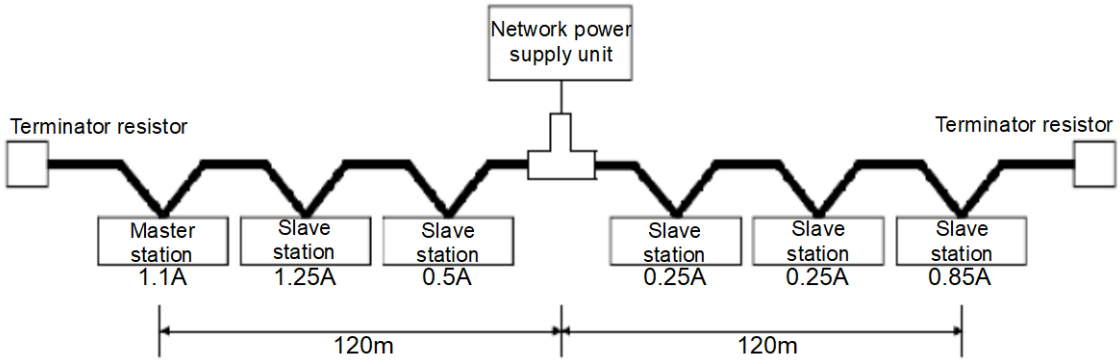
Relative to Length of Thick-cable Network)

= roughly 2.56A (determined by linear approximation in the interval between 100m and 150m)

Therefore, this arrangement allows power to be supplied to all the stations that are connected.

(3) In the case the current capacity of a network power supply unit is insufficient

This involves an arrangement of a network power supply unit in a thick-cable network as shown below.



Total length of cable receiving power on the left side = total length of cable receiving power on the right side = 120m

Total current capacity on the left side = 1.1A + 1.25A + 0.5A = 2.85A

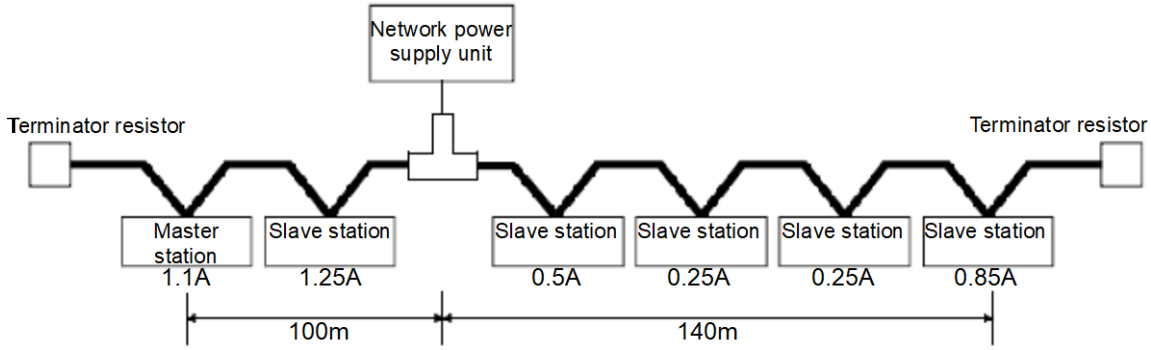
Total current capacity on the right side = 0.25A + 0.25A + 0.85A = 1.35A

Maximum amount of current allowed to flow through the 120m-long thick-cable network section (see Table 4-1 Maximum Current Capacity Sufficient for Master/Slave Stations Relative to Length of Thick-cable Network)

= roughly 2.56A (determined by linear approximation in the interval between 100m and 150m)

As stated above, this arrangement is deficient in current capacity on the left side.

To get rid of the deficiency, the network power supply unit should be shifted in the direction where the deficiency is noted (to left side in the figure above).



Total length of cable receiving power on the left side = 100m

Total length of cable receiving power on the right side = 140m

Total current capacity on the left side = 1.1A + 1.25A = 2.35A

Total current capacity on the right side = 0.5A + 0.25A + 0.25A + 0.85A = 1.85A

Maximum amount of current allowed to flow through the 100m-long thick-cable network section (see Table 4-1 Maximum Current Capacity Sufficient for Master/Slave Stations Relative to Length of Thick-cable Network) = roughly 2.93A

Maximum amount of current allowed to flow through the 140m-long thick-cable network section (see Table 4-1 Maximum Current Capacity Sufficient for Master/Slave Stations Relative to Length of Thick-cable Network) = roughly 2.19A

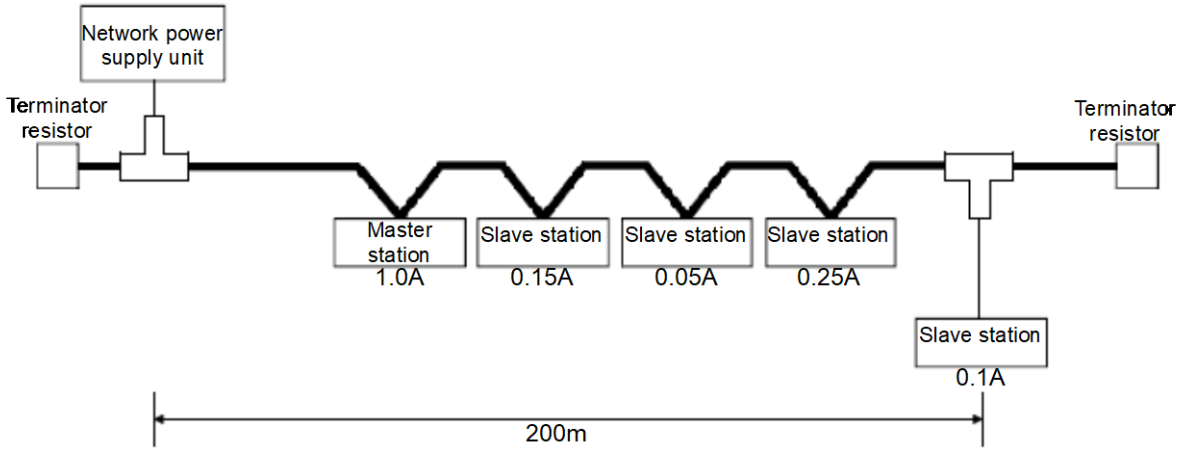
(Last two values determined by linear approximation in the interval between 100m and 150m)

As a result of the power supply unit being shifted so as to rectify the deficiency, the arrangement has become

capable of allowing power to be supplied to all the stations that are connected.

(4) In the case both a trunk line and a drop line are included in a network

Calculation of current capacity is shown below, provided that a power supply unit is connected to a network comprised of a 200m-long thick-cable trunk line and a 6m-long thin-cable drop line.



Total length of thick cable receiving power = 200m

Total length of thin cable receiving power = 6m

Total current capacity = 0.5A + 0.15A * 0.05A * 0.25A + 0.1A = 1.05A

Maximum amount of current allowed to flow through the 200m-long thick-cable section

(see Table 4-1 Maximum Current Capacity Sufficient for Master/Slave Stations

Relative to Length of Thick-cable Network) = 1.53A

Maximum amount of current allowed to flow through a 6m-long drop line

(see Table 4-3 Maximum Current Capacity Corresponding to Length of Drop-line Cable) = 0.75A

Total amount of current to equipment connected to the drop line = 0.1A

Therefore, this arrangement allows power to be supplied to all the stations that are connected.

Table 4-3 Maximum Current Capacity Corresponding to Length of Drop-line Cable

Length of drop line (m)	0.30	0.90	1.50	2.25	3.00	4.50	6.00
Maximum amount of current (A)	3.00	3.00	3.00	2.00	1.50	1.00	0.75

4.4 Checking Connections

Before placing the 2D-TZ571 Card in service, go through the following checklist to avoid any oversights.

Table 4-4 Checklist for Proper Connections

No.	Item confirmed	Check
1	Is the 2D-TZ571 Card securely installed into the Controller's slot?	
2	Is the DeviceNet Cable link between the 2D-TZ571 Card and the user's external equipment properly established?	
3	Is the equipment installed at each end of the DeviceNet network provided with a terminator resistor?	
4	Is the ferrite core is installed in place?	

5. Communication Testing

This section describes the procedure followed to perform transmission/reception tests on the 2D-TZ571 Card being connected one-to-one to other DeviceNet devices over a communication cable.
There are no limits to the number settings for the stations at the other end of the line, but they may not overlap those for the 2D-TZ571 Card. The description below assumes that settings for the master station are completed. For instructions on settings for the master station, refer to the manual that accompanies.

5.1 Communication Test Procedure

[1] Set the station number switch on the 2D-TZ571 Card to an appropriate number.

[2] Set the mode switch on the 2D-TZ571 Card to any of A, B, and C. (Communication speed of the Card need to be matched to that of the DeviceNet device at other end of the line.)

[3] Install the 2D-TZ571 Card into the option slot on the Robot Controller.

[4] Connect the 2D-TZ571 Card to the DeviceNet device at other end of the line using the DeviceNet Cable.

[5] Turn on power to the network.

[6] Turn on power to the DeviceNet station at other end of the line.

[7] Turn on power to the Robot Controller.

[8] The 2D-TZ571 Card will automatically begin a communication test, and the MS LED will keep on flashing green during the test.

[9] If the MS LED is lit green while the ERR LED is off, this indicates a normal completion of the test.
* Normal completion will result in the occurrence of Error 8490
(DeviceNet communication test mode).
If the MS LED is off while the ERR LED is lit, this indicates an abnormal completion of the test.
* Abnormal completion will result in the occurrence of Errors 8491-8494

⚠ CAUTION

About the operation of the Robot Controller while in communication test mode
While in communication test mode, the Robot Controller operates as it would if the DeviceNet Interface Card is not installed.

6. Startup Procedure

This section describes the procedure which is necessary when constructing a DeviceNet system. Note: The description below assumes that the master station and other network components are in a state of readiness to operate and that the initial setup of the robot is completed.

6.1 Initial Startup

The following procedure is used to accomplish initial startup:

[1] Set the station number switch on the 2D-TZ571 Card to an appropriate number.

[2] Set the mode switch on the 2D-TZ571 Card to any of 3, 4, and 5. (Communication speed of the Card need be matched to that of the devices on the network.)

[3] Install the 2D-TZ571 Card into the option slot on the Robot Controller.

[4] Connect the DeviceNet cable to the 2D-TZ571 Card.

[5] Turn on power to the network.

[6] Turn on power to the other devices on the network.

[7] Turn on power to the Robot.

[8] If any error associated with the DeviceNet network is generated on the robot side, set parameter E8430 or DNERR to enable a temporary recovery from such error. (Resetting step will permit you to clear such error.)

[9] Specify the number of reception bytes (DNRDLN) and the number of transmission bytes (DNSDLN). (For information about the relevant parameters, see "Table 2-4 A Listing of Robot Parameters Used in DeviceNet".)

[10] Turn off power to the robot, and then back on.

6.2 Normal Operation

For normal operation, the following startup procedure is used:

[1] Turn ON power to the network.

[2] Turn ON power to the other devices on the network.

[3] Turn ON power to the Robot.

This will let the robot to establish connection with the DeviceNet network and start I/O communications with the master station.

7. Troubleshooting

Check this section before concluding that your system is out of order.

7.1 A Listing of Errors

◇◆◇ An error number contains information as listed below ◇◆◇

□OOOO ✱

- An error marked with an asterisk ✱ requires a power reset.
  Take a corrective action which is stated in the "Solutions" section of the table below.
- The type of error is indicated by a 4-digit number.
- Errors are sorted into three classifications:
  H: High-level error ..... Servo mechanism is shut down.
  L: Low-level error ..... Operation is suspended.
  C: Caution ..... Operation is allowed to continue.

Table 7-1 A Listing of DeviceNet-related Errors

Error No.	Causes and Solutions	
H.8410*	Error message	DEVICENET Card failure
	Cause	Abnormality of the DEVICENET card is detected
	Solution	Please exchange the DEVICENET card
H.8420*	Error message	DEVICENET Mode switch is outside
	Cause	The mode switch is outside
	Solution	Please correct the mode switch
H.8421*	Error message	DEVICENET Unit number switch is outside
	Cause	The unit number switch is outside
	Solution	Please correct the unit number switch
H.8430	Error message	DEVICENET Communication error
	Cause	Network fail or Master setting is illegal
	Solution	Please confirm the network (speed, cable, terminator) or the master unit
H.8440	Error message	DEVICENET Unit number overlaps
	Cause	There are more than one unit with the same unit number on the network
	Solution	Please confirm the other unit number
H.8441	Error message	DEVICENET Network power failure
	Cause	Network power is turned off
	Solution	Please turn on network power
H.8442	Error message	DEVICENET Other units not found
	Cause	Other units are not connected on the network
	Solution	Please confirm the other units
H.8450	Error message	DEVICENET Install more than one
	Cause	Only one 2D-TZ571 card can be installed
	Solution	Please install only one 2D-TZ571 card
H.8451	Error message	DEVICENET Set other fieldbus
	Cause	Only one. fieldbus card can be installed
	Solution	Only one fieldbus card is installed
L.8460	Error message	DEVICENET Timeout
	Cause	The I/O communication was can not be done in time.
	Solution	Please confirm the other units or power supply of network.

H.8470*	Error message	DEVICENET Param load write error (*1)
	Cause	Parameter can not be load and written
	Solution	Turn the power OFF and ON once
H.8471*	Error message	DEVICENET Send byte is outside
	Cause	Send byte number setting of is out of range
	Solution	Please correct the send byte number setting
H.8472*	Error message	DEVICENET Receive byte outside
	Cause	Receive byte number setting is outside
	Solution	Please correct the receive byte number setting
H.8473*	Error message	DEVICENET Send-receive are 0
	Cause	Both receive and send byte number setting are 0
	Solution	Please change receive or send byte number setting
C.8490	Error message	DEVICENET Communication test mode
	Cause	It is communication test mode.
	Solution	Please change the mode switch to 3-5 after the test ends.
H.8491*	Error message	DEVICENET Comm-test unit number (*2)
	Cause	Unit numbers overlap is detected by communication test
	Solution	Please confirm the other units number
H.8492*	Error message	DEVICENET Comm-test busoff (*2)
	Cause	Busoff is detected by communication test
	Solution	Please confirm communication speed, cable, terminator
H.8493*	Error message	DEVICENET Comm-test net power (*2)
	Cause	Network power off is detected by communication test
	Solution	Please turn on network power
H.8494*	Error message	DEVICENET Comm-test send-receive (*2)
	Cause	Data can not send and receive normal by communication test
	Solution	Please confirm connection situation of others, communication speed, cable and terminator

(*1)Pram : Parameter

(*2)Comm : Communication

7.2 At the Occurrence of Error 8460

(DEVICENET Timeout)

When this error occurred, take the corrective action suggested in the troubleshooting chart in Section 7.1. If the error still persists, check to see the following:

(1) Is power to the Master Station unit on?

(2) Is the Master Station functioning properly?

* 8460 occurs unless the Master Station is up and running before power is turned on to the Robot Controller.

* If Master Station provides function to set it's parameter automatically and the function is used, it is late for running and 8460 may occur.

(3) Is the Master Station properly connected?

(4) Are the parameter settings on the Master Station consistent with those on the Robot Controller?

(5) Doesn't any of the peripheral equipment contain a noise emission source?

(6) If it is desired to ignore Error 8460, change DNERR parameter setting.

8. Appendix

8.1 Displaying Information about Optional Cards

RT ToolBox2/RT ToolBox3 (Options) lets you to have information about the option cards displayed on the screen. Expand the workspace tree and click "Slotn:DEVICENT" entry under "Option Cards." Information about the 2D-TZ571 Card will appear on the property window.

Properties are displayed.

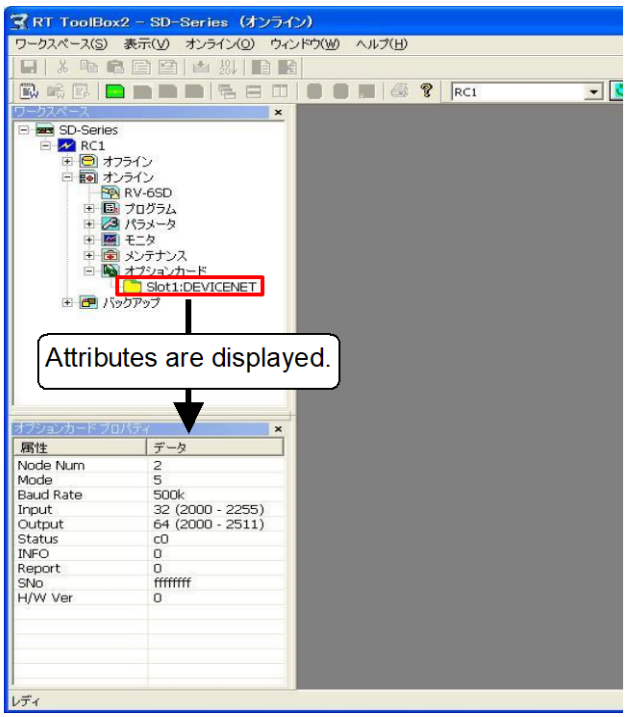


Figure 8-1 Information about Optional Cards from RT ToolBox2

Table 8-1 Information about the 2D-TZ571 Card

Display item		Example	Meaning	Remark
Card name		DEVICENET	Card designation	
Card information	[Node Num]	63	Station number switch	Station number: 0~63
	[Mode]	3	Mode switch	Mode switch (0~F)
	[Baud Rate]	125k	Communication speed	125k 250k 500k
	[Input]	8(2000 - 2063)	Number of reception bytes (signal number)	0 (-) ~ 128 (2000 – 3023)
	[Output]	8(2000 - 2063)	Number of transmission bytes (signal number)	0 (-) ~ 128 (2000 – 3023)
	[Status]	00C0	I/O communication state	0000: offline 0040: stop 0080: communication-ready 00C0: I/O communication going on
	[Info]	0000	Error information	Slave function error code
	[SNo]	12345678	Serial number	Serial number
	[H/W Ver]	0	Card group number	

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