



Mitsubishi Industrial Robot

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

PROFIBUS DP-V0 Slave Interface Instruction Manual

2D-TZ577



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 alarms 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 CR750-Q/CR751-Q/CR800-R/CR800-Q controller. 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. 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 IEC60825-1 (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.

Printing date	Manual No.	Description
2008-03-25	BFP-A8741	Initial edition
2008-04-15	BFP-A8741-A	<ul style="list-style-type: none"> ・Error in writing correction. ・The back cover was corrected. ・Hyper link was corrected.
2016-08-08	BFP-A8741-B	・The cover and corporate logo mark of this manual was changed.
2017-05-31	BFP-A8741-C	・The CR800-D series controller was added.
2018-02-01	BFP-A8741-D	・Safety Precautions was revised. (The CR800-Q controller was added.)

■ Introduction

Thank you for purchasing Mitsubishi Electric Industrial Robot.

The PROFIBUS DP-V0 Slave Interface (2D-TZ577) is an optional device which, installed into the CRnD-700 series, CR750-D/CR751-D series, or CR800-D series Robot Controller, permits you to connect the Robot Controller to a PROFIBUS DP-V0 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 PROFIBUS DP-V0 Slave Interface (2D-TZ577).

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 Description of Functions and Operation" which is separately issued.

■ 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 PROFIBUS DP-V0 Slave Interface

This chapter explains checks or precautions that you should perform or take before using the PROFIBUS DP-V0 Slave Interface (2D-TZ577).

1.1 About Terms Used in This Manual

Table 1-1 Terms Used in This Manual

Term	Description
PROFIBUS DP-V0	A basic version of PROFIBUS DP which permits the execution of the following functions: <ul style="list-style-type: none"> · Input/output data communications · Others
PROFIBUS DP-V1	A version of PROFIBUS DP which permits the execution of the following functions in additions to those available from PROFIBUS DP-V0: <ul style="list-style-type: none"> · A cyclic communications (asynchronous data communications) · Alarm notification · Others
PROFIBUS DP-V2	A version of PROFIBUS DP which permits the execution of the following functions in additions to those available from PROFIBUS DP-V1: <ul style="list-style-type: none"> · Time stamping · Others
2D-TZ577	PROFIBUS DP-V0 Slave Interface (a complete set of products)
2D-TZ577 Card	PROFIBUS DP-V0 Slave Interface Card (TZ577)
Master Station	A station residing in the equipment (typically, PLS or personal computer) which controls a data link system. There must be at least one Master Station in any system. As described below, Master Station comes in two varieties: Class 1 and Class 2.
Class 1 Master Station	Equipment which exchanges input/output data with Slave Stations.
Class 2 Master Station	Equipment which verifies station number settings and operating statuses through communications with Slave Stations. It serves as a network administration master station and takes care of such tasks as startup, maintenance service, and diagnosis.
Slave Station	A lower-level station which communicates with Master Station.
Repeater	A device which provides a link between the segments of a PROFIBUS DP network.
Terminator resistor	Resistor connected to the individual segments of a PROFIBUS DP network at each end. Actually, terminator resistors built in the connector used with a PROFIBUS network are enabled to fulfill intended purposes.
Slave parameter	Slave station parameter established by Master Station. Items of parameter information are stated on a GSD file.
Station number	A number assigned to Master Station or Slave Station. Numbering is in the range of 0 to 125.
I/O configuration information (data module)	Information about input/output configuration at Slave Station.
Input data	Data which is sent by 2D-TZ577 Card and received by Master Station. (Data inputted by Master Station)
Output data	Data which is sent by Master Station and received by 2D-TZ577 Card. (Data outputted by Master Station)
Global control	A function which allows Class 1 Master Station to send an input/output data synchronization command to Slave Stations.
Communication WDT	A watchdog timer established in the slave parameter at Master Station.
GSD file	An electronic file stating parameter settings at Slave Station. A data setting software compliant with Master Station, which is used to establish slave parameter settings.

1.2 How to Use This Manual

This manual discusses the functions of the 2D-TZ577 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 Controller.

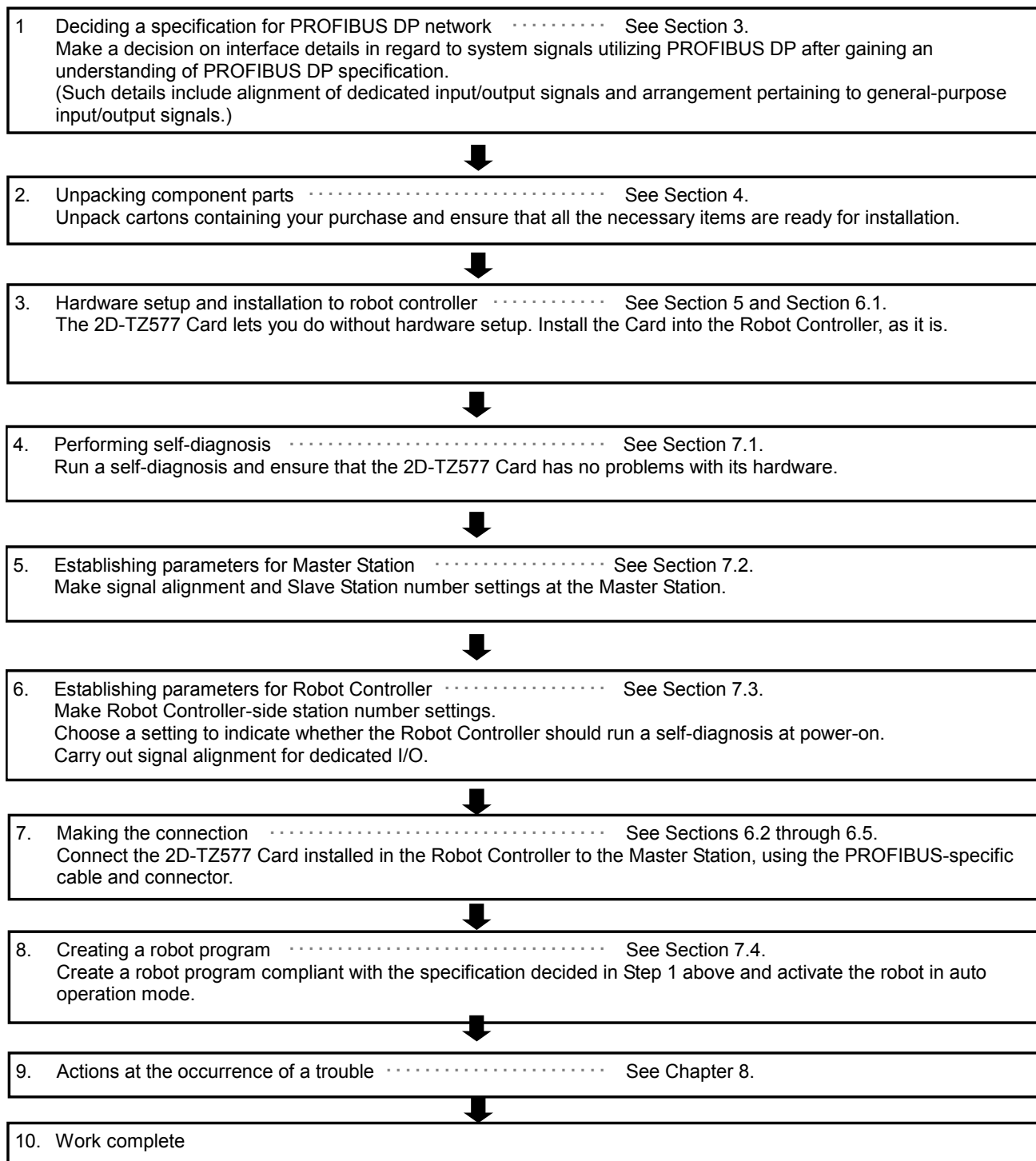
Table 1-2 Organization of This Instruction Manual

Section	Title	Contents
1	Before Using PROFIBUS DP-V0 Slave Interface	This section describes how to use this document (PROFIBUS DV-V0 Slave Interface Instruction Manual). Read and familiarize yourself with the information contained before attempting to use the 2D-TZ577 Card.
2	Workflow	This section describes the work necessary to build a PROFIBUS DP system. Carry out each work step exactly as indicated.
3	Features and Specification of 2D-TZ577 Card	This chapter describes the features and specification of the 2D-TZ577 Card.
4	Out of the Package	Upon receipt of the 2D-TZ577 Card, check to see that all items are in the package and that the version of the Robot Controller is as specified.
5	Hardware Setup	Hardware setup need not be done in regard to the product in question.
6	Connection and Wiring	This section describes the method used to connect the 2D-TZ577 Card to the Master Station via cables.
7	Procedure before Startup	This section describes steps you have to take before placing PROFIBUS DP system into operation.
8	Troubleshooting	This section presents information that helps find solutions when operational anomalies or errors are encountered during the use of the 2D-TZ577 Card. Make reference to this section as occasion arises.
9	Appendix	The appendix explains the method for displaying information about the 2D-TZ577 Card by means of RT ToolBox2/RT ToolBox3.

2. Workflow

Workflow you should follow to construct a PROFIBUS DP network system is shown below. Carry out each work step exactly as indicated.

2.1 Work Procedure



3. Features and Specification of 2D-TZ577 Card

3.1 What is PROFIBUS DP

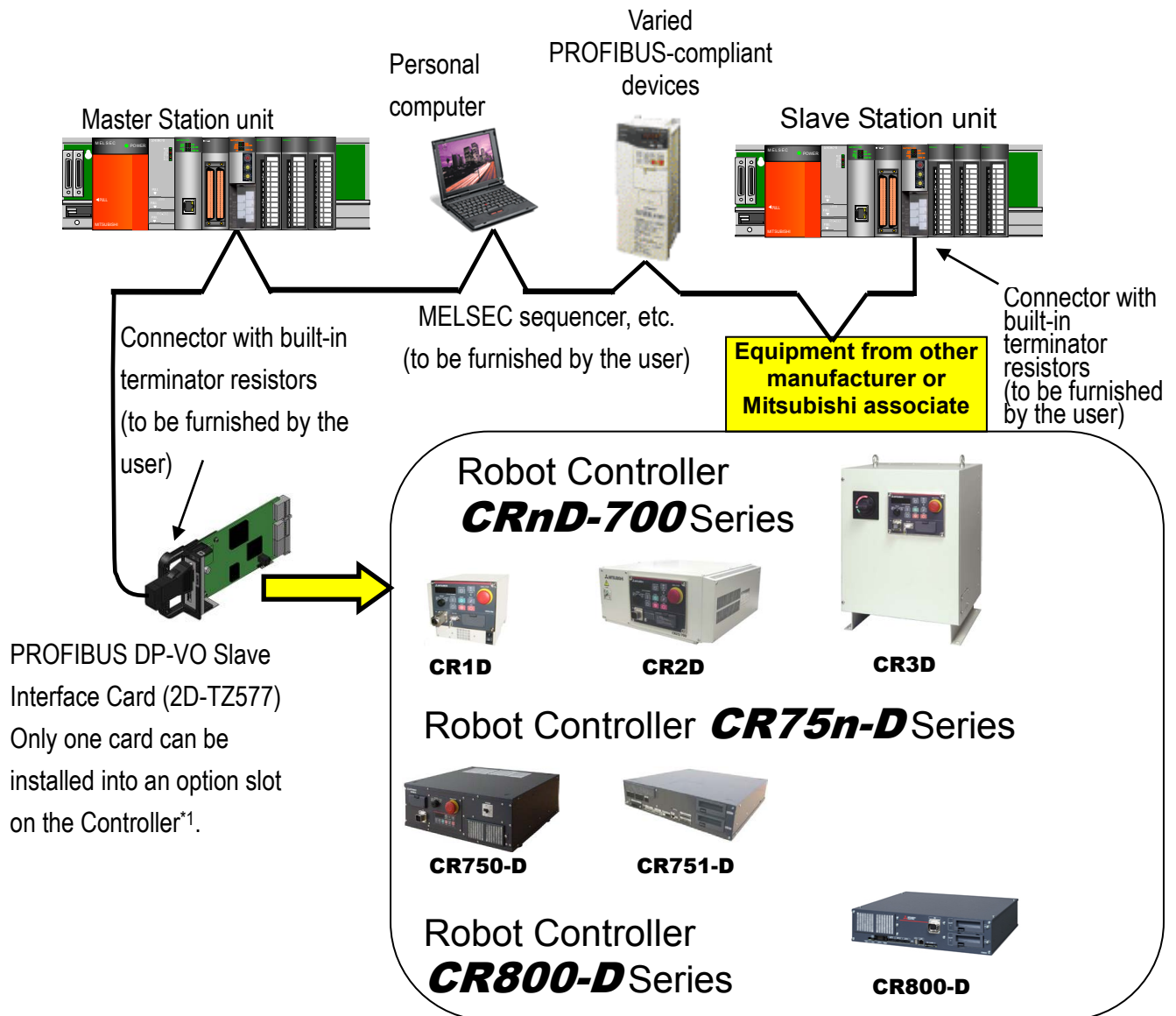


Figure 3-1 An Example of PROFIBUS Network Configuration

PROFIBUS is one of the recognized fieldbus standards. PROFIBUS comes in three variations: general-purpose PROFIBUS FMS, PROFIBUS DP for factory automation application, and PROFIBUS PA for process automation application.

The **2D-TZ577 Card** is intended to serve as a slave station which supports **PROFIBUS DP-V0** capabilities.

It does not support **PRORIBUS DP-V1** or **PROFIBUS DP-V2** which is an extension of **PROFIBUS DP-V0**.

(*1) Number of the option slots varies with the Controller you use.

CR1D: Provided only with Slot 1.

CR2/3D: Provided with Slots 1 thru 3 (only one of the three slots used to install the Card at any one time)

◆◆◆ Details about PROFIBUS ◆◆◆

To learn more about PROFIBUS, visit a Japan PROFIBUS Association website at <http://www.profibus.com/>

3.2 Features of 2D-TZ577 Card

The 2D-TZ577 Card has the following features:

- (1) Compliance with EN 50170 Volume 2 (Part 1, 2, 3, 4, and 8)

Designed to provide compliance with EN 50170 Volume 2 (Part 1, 2, 3, 4, and 8), the 2D-TZ577 Card serves only as **a slave station in a PROFIBUS DP-V0** network.

- (2) PROFIBUS DP-V0 Slave Interface Card for D-Type Robot Controller

The 2D-TZ577 Card is an optional card for use with the stand-alone type (D type) Robot Controller, not usable for iQ Platform compatible type (Q type or R type). To connect iQ Platform compatible type (Q type or R type) Robot Controller to a PROFIBUS DP network, use a MELSEC-Q Series PROFIBUS DP unit.

To connect R type Robot Controller to a PROFIBUS DP network, use a MELSEC iQ-R Series PROFIBUS DP unit.

- (3) Input/output data communications with Class 1 Master Station

The 2D-TZ577 Card is capable of conducting input/output data communications with PROFIBUS-DP Class 1 Master Station (Master Station which communicates with Slave Stations on a cyclic basis). **This card is intended to serve as a slave station which supports PROFIBUS DP-V0 capabilities. It does not support PROFIBUS DP-V1 or PROFIBUS DP-V2 which is an extension of PROFIBUS DP-V0.**

- (a) Communicatable number of pieces of data

A single 2D-TZ577 Card allows communications in the following number:

Input data - 122 words maximum	} 192 words in combined total
Output data - 122 words maximum	

- (4) Communications with Class 2 Master Station

The 2D-TZ577 Card is capable of conducting communications, as detailed below, with Class 2 Master Station (Master Station for network administration which takes care of startup, maintenance and diagnosis services).

- Reading from input send area/output receive area
- Reading I/O configuration information
- Changing station numbers

For instructions on using the each of the listed functions, see instruction manual which is supplied with Class 2 Master Station being installed.

(5) Input/output data swapping

The 2D-TZ577 Card permits upper/lower bytes to be swapped at the time when input/output data is sent to or received from Master Station. In a PROFIBUS DP network, the way the upper/lower bytes of input/output data is treated differs depending on the type of Master Station, but there is no need for making input/output data swapping at a program level.

(6) Global control

The 2D-TZ577 Card supports global control capability, enabling Class 1 Master Station to control input/output data updating on the 2D-TZ577 Card by commands it transmits (SYNC, UNSYNC, FREEZE, and UNFREEZE). For instructions on using the global control capability, see instruction manual which is supplied with Class 1 Master Station being installed.

3.3 Specification of 2D-TZ577 Card

The following table shows the specification of the 2D-TZ577 Card.

3.3.1 General Specification

Table 3-1 General Specification (2D-TZ577 Card)

Item	Specification	Remark
Type name	TZ577	
PROFIBUS specification complied with	EN50170 Volume2(Part1,2,3,4,8)	
PROFIBUS DP version supported	DP-V0 only	DP-V1 and DP-V2 not supported
Transmission rate	9.6k/19.2k/45.45k/93.75k/187.5k/500k/1.5M/3M/6M/12Mbaud	Set by parameters specified on Master Station
Station number	0 to 125	Set by parameters specified on Robot (default setting: 126 ^(*))
Maximum communicatable number of pieces of data	192 words as the combined number of pieces of input/output data (122 words as the total of pieces of input or output data)	
Option slot that accepts an interface card	Slot 1/Slot 2/Slot 3	Only one slot is used at any one time (CR1D is provided with Slot 1 only.) (CR750-D, CR751-D, and CR800-D are provided with Slot 1 and 2 only.)
Number of cards installed	One	Installation of more than one card is not permitted.
Concurrent use of 2D-TZ577 Card and other fieldbus option card ^(*)	Not permitted	
Robot controller input/output number	2000 to 3951	For details about signal alignment, see "Table 3-6 A Listing of PROFIBUS Signals."
Terminator resistor	Uninstalled	If the 2D-TZ577 Card is used as a terminal station, terminator resistor on a dedicated connector should be enabled. For information about the connector, see "Table 4-2 Items To Be Furnished by User."
Input/output signal access	2D-TZ577 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.	

(*) Station number 126 causes the interface to be isolated from the PROFIBUS network.

Specify station numbers in the range of 0 to 125 for the purpose of input/output data communications.

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

3.3.2 Transmission Specification

Table 3-2 Transmission Specification

Item		Specification			
Transmission specification	Electrical standard and characteristic	Compliant with EIA-RS485			
	Medium	Shielded twisted-pair cable (Type A)* ¹			
	Network configuration	Bus type (tree type when repeater(s) is (are) used)			
	Communication method	Polling			
	Transmission encoding method	NRZ			
	Transmission rate/maximum transmission range* ²	Transmission rate	Transmission range [m/segment]	Maximum transmission range with three repeaters being used [m/network]	
		9.6kbps	1200	4800	
		19.2kbps			
		45.45kbps			
		93.75kbps			
		187.5kbps	1000	4000	
		500kbps	400	1600	
		1.5Mbps	200	800	
		3Mbps	100	400	
		6Mbps			
	12Mbps				
Maximum number of intervening repeaters	3* ²				
Maximum number of units connected (per segment)	32 (including repeater(s))				
Number of nodes connected/segment	32				

(*1) Specified in EN 50170 standard

(*2) Maximum transmission distance achievable by the use of repeaters:

Maximum transmission distance [m/network] = (number of repeaters + 1) x transmission distance [m/segment]

3.3.3 Network Configuration

When creating a PROFIBUS DP network, note that the network comes in under the following design limits:

- (1) Number of units that can be connected to the entire network (when repeaters are used)
Master + Slave ≤ 126
- (2) Number of units which can be connected to a segment
Master + Slave + repeater*¹ ≤ 32
- (3) Maximum number of intervening repeaters
Up to 3 repeaters are allowed to intervene in the communication path between Master Station and 2D-TZ577 Card
- (4) It is necessary to enable terminator resistors on a dedicated connector installed at the terminal station of each segment.
- (5) Maximum number of Slave Stations which can be connected to a Master Station depends on the specification of the Master Station.

(*1) Repeater is counted in the number of units at each of the segments.

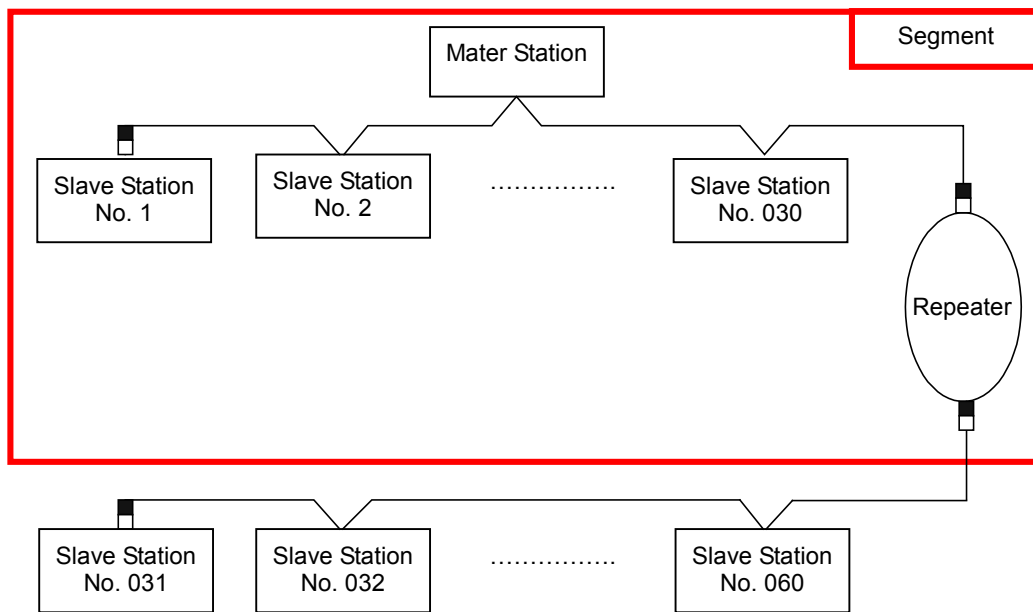


Figure 3-2 An Example of Basic PROFIBUS DP Network Configuration

3.3.4 Accommodated Versions

Table 3-3 Accommodated Versions

Name	Version
Robot Controller	P6k or later
Personal computer support software	RT Tool Box 2: Ver.1.0.1 or later * Ver. 1.3 or later is provided with a dialog box which can be used for making PROFIBUS-related settings. Even versions preceding 1.3 offer parameter a parameter setting screen that permits you to make PROFIBUS-related settings. For more information, see Section7.3 Parameter Settings on the Side of Robot Controller.

3.4 Robot Parameters

Table 3-4 A Listing of Robot Parameters Used with PROFIBUS

Parameter name	Initial value	Setting range	Description
STOP2	-1, -1	-1 /2000 to 3951	A parameter that specifies a dedicated input signal number to stop robot programs. (Because the parameter "STOP" is fixed at "0", 2D-TZ577 Card uses "STOP2" to define an external stop signal.)
ORST2000 ORST2032 : ORST3920	00000000, 00000000, 00000000, 00000000	0/1/*	A parameter that specifies value of output send data on the 2D-TZ577 Card at the time of signal output reset. (For details about related settings, see Section 3.8 Before Using PROFIBUS DP-V0 Slave Interface.)
PBMODE	0	0/2	A parameter that switches the operating mode of the 2D-TZ577 Card between "normal" and "self-diagnosis." Normal mode = 0, self-diagnosis mode = 2 <ul style="list-style-type: none"> When the self-diagnosis identifies an anomaly, an error message is displayed. ("H.8504: PROFIBUS self-diagnosis shows occurrence of an error.") Return the operating mode to normal to continue with normal operation.
PBMC	1	1/2	A parameter that designates Master Station as Class 1 or Class 2. Class 1 Master Station is designated at factory default. To use "Class 2," choose another parameter setting. 1: Class 1 Master (effected when the station number setting parameter PBNUM shown below is used) 2: Class 2 Master (effected when changes of station numbers are made from Class 2 Master Station - with PBNUM not being used)
PBNUM	126	-1 to 125	A parameter that specifies station number for the 2D-TZ577 Card. 0 to 125: Station number setting value (Rewriting of station number settings takes place within the flash ROM as well.) -1: Station number clear (Station number settings within the flash ROM are cleared.) * After the station numbers are cleared, the value 126 is taken on. * If "No_Add_Chg" is specified with "true" when making station number settings from Class 2 Master Station, 2D-TZ577 Card is disabled for change of station numbers. To cancel this setting, clear station numbers with "PBNUM = -1."
E8500	0	0/1	A parameter that is used to temporarily reset an error state when PROFIBUS-related error (indicated by a number in the 8500s) occurred. (1: Resettable (But no communications are to be carried out.) / 0: Always error during the occurrence of an anomaly in the link) * This parameter does not require power supply resetting on the Robot Controller. The initial value of 0 will return if power supply resetting is done.

Parameter name	Initial value	Setting range	Description
PBCNT	40	0 to 65535	<p>A parameter that specifies an interval at which the 2D-TZ577 Card is checked for error.</p> <p>Unit interval: msec</p> <p>In normal condition, use the 2D-TZ577 Card at its factory default (40).</p> <p>User may change the setting only when communication errors are frequently encountered under the undue influence from noise in his installation environment. Normally, a setting in the range of 40 to 70msec will do. Increase the setting with great care as this may result in the inability to generate an error indication even when one occurs in the 2D-TZ577 Card.</p> <p>With a value greater than "1" being specified (rounding-up checked), the Controller generates an error indication only when it has detected a 2D-TZ577 Card error continuously during a specified period of time. The Controller does not generate an error indication unless it has had continuous error detection.</p> <p>With "0" being specified, an error indication is generated immediately upon a 2D-TZ577 Card error being detected by the Controller.</p>

3.5 Robot Controller Input/Output Signals

Input/output signals processed in the Robot Controller are in the range of 2000 to 3951 maximum (equivalent to 192 words), respectively, irrespective of station numbers.

Table 3-5 PROFIBUS Input/Output Signal Numbers

	Input (received from Master Station)	Output (sent to Master Station)
Number	2000 to 3951	2000 to 3951

The data sizes of input/output signal are specified by parameter settings on the side of the Master Station. The combined number of pieces of input/output data is 192 words maximum while the respective number of pieces of input/output data is 122 words maximum.

Examples: (Input - 122 words) + (output - 70 words) = 192 words in total

(Input - 96 words) + (output - 96 words) = 192 words in total

(Input - 10 words) + (output - 10 words) = 20 words in total

Table 3-6 A Listing of PROFIBUS Signals

Number of words	Usable number of points	Start End	Number of words	Usable number of points	Start End	Number of words	Usable number of points	Start End
0	0	- to -	41	656	2000to2655	82	1312	2000to3311
1	16	2000to2015	42	672	2000to2671	83	1328	2000to3327
2	32	2000to2031	43	688	2000to2687	84	1344	2000to3343
3	48	2000to2047	44	704	2000to2703	85	1360	2000to3359
4	64	2000to2063	45	720	2000to2719	86	1376	2000to3375
5	80	2000to2079	46	736	2000to2735	87	1392	2000to3391
6	96	2000to2095	47	752	2000to2751	88	1408	2000to3407
7	112	2000to2111	48	768	2000to2767	89	1424	2000to3423
8	128	2000to2127	49	784	2000to2783	90	1440	2000to3439
9	144	2000to2143	50	800	2000to2799	91	1456	2000to3455
10	160	2000to2159	51	816	2000to2815	92	1472	2000to3471
11	176	2000to2175	52	832	2000to2831	93	1488	2000to3487
12	192	2000to2191	53	848	2000to2847	94	1504	2000to3503
13	208	2000to2207	54	864	2000to2863	95	1520	2000to3519
14	224	2000to2223	55	880	2000to2879	96	1536	2000to3535
15	240	2000to2239	56	896	2000to2895	97	1552	2000to3551
16	256	2000to2255	57	912	2000to2911	98	1568	2000to3567
17	272	2000to2271	58	928	2000to2927	99	1584	2000to3583
18	288	2000to2287	59	944	2000to2943	100	1600	2000to3599
19	304	2000to2303	60	960	2000to2959	101	1616	2000to3615
20	320	2000to2319	61	976	2000to2975	102	1632	2000to3631
21	336	2000to2335	62	992	2000to2991	103	1648	2000to3647
22	352	2000to2351	63	1008	2000to3007	104	1664	2000to3663
23	368	2000to2367	64	1024	2000to3023	105	1680	2000to3679
24	384	2000to2383	65	1040	2000to3039	106	1696	2000to3695
25	400	2000to2399	66	1056	2000to3055	107	1712	2000to3711
26	416	2000to2415	67	1072	2000to3071	108	1728	2000to3727
27	432	2000to2431	68	1088	2000to3087	109	1744	2000to3743
28	448	2000to2447	69	1104	2000to3103	110	1760	2000to3759
29	464	2000to2463	70	1120	2000to3119	111	1776	2000to3775
30	480	2000to2479	71	1136	2000to3135	112	1792	2000to3791
31	496	2000to2495	72	1152	2000to3151	113	1808	2000to3807
32	512	2000to2511	73	1168	2000to3167	114	1824	2000to3823
33	528	2000to2527	74	1184	2000to3183	115	1840	2000to3839
34	544	2000to2543	75	1200	2000to3199	116	1856	2000to3855
35	560	2000to2559	76	1216	2000to3215	117	1872	2000to3871
36	576	2000to2575	77	1232	2000to3231	118	1888	2000to3887
37	592	2000to2591	78	1248	2000to3247	119	1904	2000to3903
38	608	2000to2607	79	1264	2000to3263	120	1920	2000to3919
39	624	2000to2623	80	1280	2000to3279	121	1936	2000to3935
40	640	2000to2639	81	1296	2000to3295	122	1952	2000to3951

3.6 About Dedicated Input/Output

Signal numbers are assigned to 2D—TZ577 Cards. Assignment of these numbers to dedicated input/output parameters permits them to be used as dedicated input/output. For more information about the dedicated input/output, see Section 6 "Functions of External Input/Output" of the "Instruction Manual - Detailed Description of Functions and Operation" which is separately issued.

3.7 Specification Relative to Robot Language

The follow subsection explains robot language (MELFA-BASIC V) which pertains to the 2D-TZ577 Card.

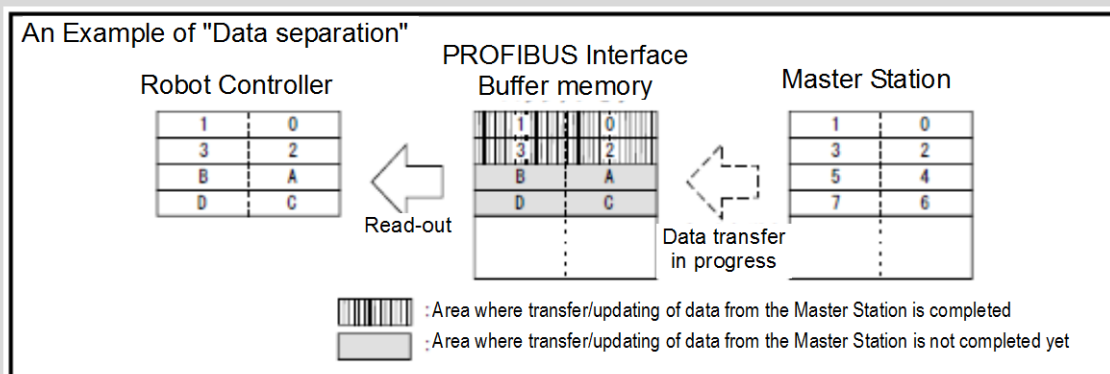
3.7.1 Robot System State Variables Relative to 2D-TZ577 Card

Table 3-7 A Listing of System State Variables Used for Data Input/Output

Item	Type	Function	Read/write
M_In	Integer 1	Reads one bit of data from specified input signal.	Read
M_Out	Integer 1	Writes one bit of data into specified output signal.	Write
M_Inb	Integer 1	Reads 8 bits of data from specified input signal.	Read
M_Outb	Integer 1	Writes 8 bits of data into specified output signal.	Write
M_Inw	Integer 1	Read 16 bits of data from specified input signal.	Read
M_Outw	Integer 1	Write 16 bits of data into specified output signal.	Write

◆◆◆ "Data separation" ◆◆◆

If data writing takes place on any of the robot programs before data transfer is completed on the Master Station, an phenomenon called "tearful parting" (a loss of compatibility between input/output data on the Robot Controller side and that on the Master Station side) is experienced. For example, suppose an application program is introduced which involves writing data consecutively into an identical output address, what may happen is that no values but the one last written are conveyed to the receiver at the other end. The following diagram shows a typical case of "Data separation" which results if data reading from the Robot Controller is initiated during the course of data transfer from the Master Station to the buffer memory.



To avoid "Data separation" a read/write interlock as shown below need be provided in the application concerned (robot program or PLC ladder).

An example of interlock being used where one-word data is sent from the Master Station to the robot is illustrated in the form of a flowchart below.

Table 3-8 An Example of Input/Output Signal Alignment between Master Station and Robot

Meaning	Master Station ^{*1}	Robot
Data send/receive region	Data send region	Input: 2000 to 2015
PLC data write completed flag	WRTFLG	Input No. 2016
Robot data write completed flag	RDFLG	Output No. 2020

- (^{*1}) For the purpose of explanation, a name is given to the Master Station input/output signal alignment. Actually, you can make any input/output signal alignment in accordance with a Master Station instruction manual that governs.

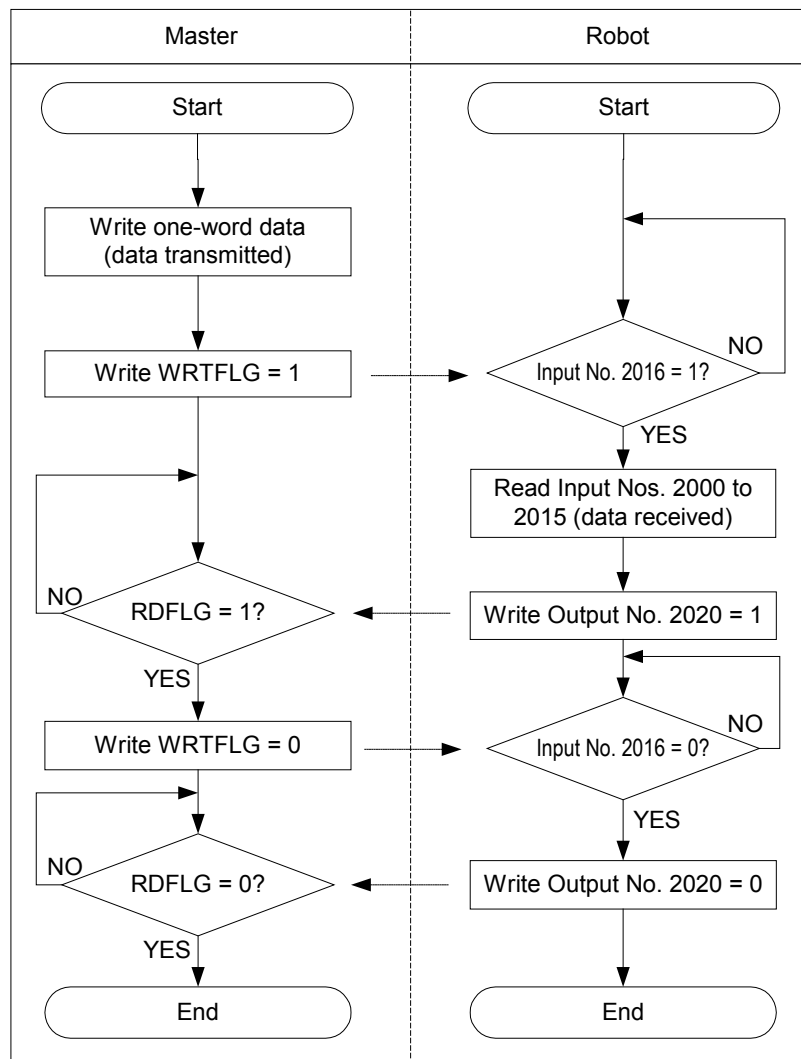


Figure 3-3 An Example of Use of Interlock

Below is an example of robot program which corresponds to the flowchart shown in Fig. 3-3. For information about the Master Station-side program (ladder, etc.), refer to the instruction manual for the equipment being used.

```

*Loop1: If M_In(2016) = 0 Then *Loop1
Mdata = M_InW(2000)
M_Out(2020) = 1
*Loop2: If M_In(2016) = 1 Then *Loop2
M_Out(2016) = 0

```


Table 3-9 A Listing of System State Variables Used to Verify Configuration

Variable name	Type	Designation	Function	Read/write
M_PBNUM	Integer 1	Number of station in action	Number of station which is currently in action	Read
M_PBFNUM	Integer 1	Station number settings in flash ROM	Number of station which is stored in flash ROM	Read
M_PBSYNM	Integer 1	SYNC mode signal	(a) Takes on the value "1" when 2D-TZ577 Card goes into SYNC mode in response to SYNC request from Master Station. (b) Takes on the value "0" when SYNC mode terminates due to UNSYNC request from Master Station/stopping of communications/reset. (c) Takes on the value "0" when communications with Master Station are stopped with "1" being an existing value and communication timeout error occurs. However, if communication WDT setting in Master Station-side parameter is disabled, the value "0" is not taken on because communication timeout error does not occur (output data is retained).	Read
M_PBFNZM	Integer 1	FREEZE mode signal	(a) Takes on the value "1" when 2D-TZ577 Card goes into FREEZE mode in response to FREEZE request from Master Station. (b) Takes on the value "0" when FREEZE mode terminates due to UNFREEZE request from Master Station/stopping of communications/reset. (d) Takes on the value "0" when communications with Master Station are stopped with "1" being an existing value and communication timeout error occurs. However, if communication WDT setting in Master Station-side parameter is disabled, the value "0" is not taken on because communication timeout error does not occur (output data is retained).	Read

For information about MELF-BASIC V commands and state variables other than those listed above, refer to the "Instruction Manual - Detailed Description of Functions and Operation" which is separately issued.

3.8 About Output Signal Reset Patterns

Factory default settings are such that startup takes place with all general-purpose output signals being off (0). You can change the state of general-purpose output signals at power-on by re-specifying the parameters listed in the table below. Note that these parameters are intended to serve the following purpose as well: performing general-purpose output signal reset operation (which is carried out with dedicated input signals) and selection of reset pattern during the execution of Clr command.

Parameter setting options include "off," "on," and "hold." The following table lists parameters which are used on the 2D-TZ577 Card for general-purpose output resetting.

Table 3-10 A Listing of Output Signal Reset Pattern Parameters

Parameter name	Leading number	Last number	Parameter name	Leading number	Last number
ORST2000	2000	2031	ORST3024	3024	3055
ORST2032	2032	2063	ORST3056	3056	3087
ORST2064	2064	2095	ORST3088	3088	3119
ORST2096	2096	2127	ORST3120	3120	3151
ORST2128	2128	2159	ORST3152	3152	3183
ORST2160	2160	2191	ORST3184	3184	3215
ORST2192	2192	2223	ORST3216	3216	3247
ORST2224	2224	2255	ORST3248	3248	3279
ORST2256	2256	2287	ORST3280	3280	3311
ORST2288	2288	2319	ORST3312	3312	3343
ORST2320	2320	2351	ORST3344	3344	3375
ORST2352	2352	2383	ORST3376	3376	3407
ORST2384	2384	2415	ORST3408	3408	3439
ORST2416	2416	2447	ORST3440	3440	3471
ORST2448	2448	2479	ORST3472	3472	3503
ORST2480	2480	2511	ORST3504	3504	3535
ORST2512	2512	2543	ORST3536	3536	3567
ORST2544	2544	2575	ORST3568	3568	3599
ORST2576	2576	2607	ORST3600	3600	3631
ORST2608	2608	2639	ORST3632	3632	3663
ORST2640	2640	2671	ORST3664	3664	3695
ORST2672	2672	2703	ORST3696	3696	3727
ORST2704	2704	2735	ORST3728	3728	3759
ORST2736	2736	2767	ORST3760	3760	3791
ORST2768	2768	2799	ORST3792	3792	3823
ORST2800	2800	2831	ORST3824	3824	3855
ORST2832	2832	2863	ORST3856	3856	3887
ORST2864	2864	2895	ORST3888	3888	3919
ORST2896	2896	2927	ORST3920	3920	3951
ORST2928	2928	2959	ORST3024	3024	3055
ORST2960	2960	2991	ORST3056	3056	3087
ORST2992	2992	3023	ORST3088	3088	3119

Parameter ORST○○○○ has the default values of "0000000, 00000000, 00000000, and 00000000", and can be set to specify "off," "on," and "hold" (= "0," "off," and "1") for 32 points. Leading number is assigned **from the left side**.

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

Output No. 2000: Holds a state in which it was before power to the robot controller has been turned on

Output No. 2007: On

Output Nos. 2016 to 2019: On

3.9 Hardware of 2D-TZ577 Card

The following subsections explain the hardware of the 2D-TZ577 Card.

3.9.1 Overall View

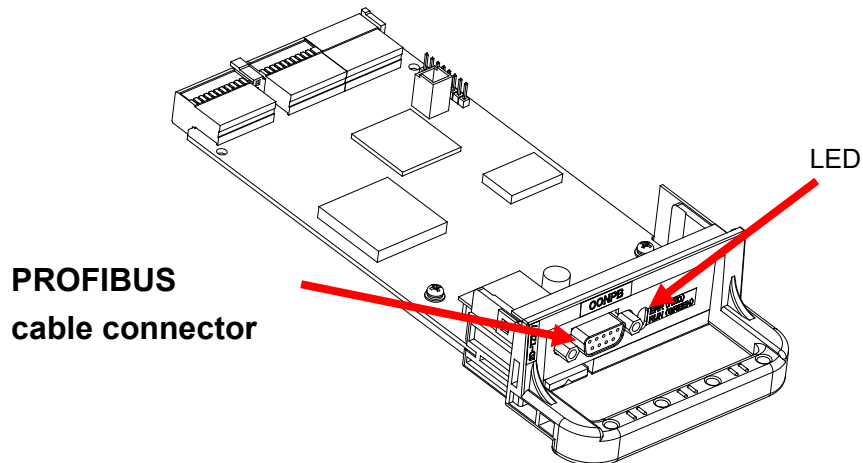


Figure 3-4 Overall View of 2D-TZ577 Card

3.9.2 LED

There are two LEDs provided on the 2D-TZ577 Card, each of which indicates the state of the Card by going on or off.

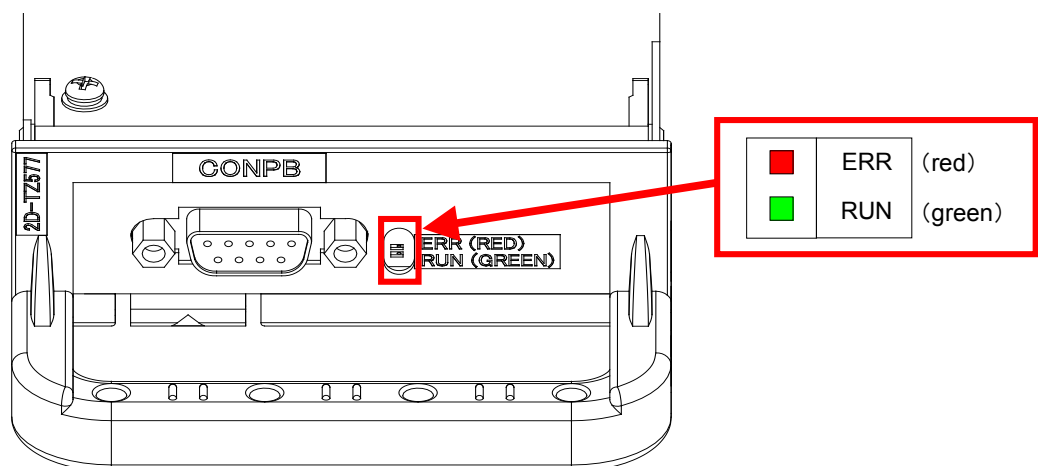


Figure 3-5 Location of LEDs

Table 3-11 A Listing of LEDs

LED name	Color	Indications
RUN	Green	On: Normal Off: Watchdog timer error occurred.
ERR	Red	On: Parameter setting error or unit error occurred. Off: Normal

4. Out of the Package

4.1 Checking Component Parts

The 2D-TZ577 Card comes standard with the component parts listed in the table below. Check your 2D-TZ577 Card to ensure that it is complete with these parts.

Table 4-1 2D-TZ577 Component Parts

No.	Item name	Type name	Quantity
[1]	Instruction manual (CD-ROM)	BFP-A8745	1
[2]	PROFIBUS DP-V0 Slave Interface Card	TZ577	1
[3]	Ferrite core	E04SR301334	2
[4]	GSD file (Included on the CD-ROM)	MLFA0BE4.gsd	1
[5]	Icon file for setting software (Included on the CD-ROM)	2DTZ577ICON.bmp	1
[6]	Cable clamp	AL4	1
[7]	Cable clamp	AL6	1

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

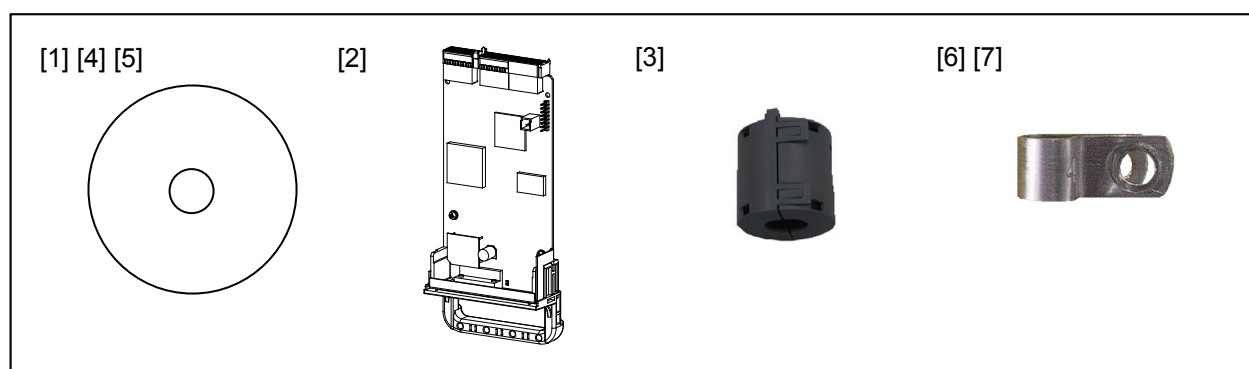


Figure 4-1 2D-TZ577 Component Parts (Illustrated)

4.2 Items To Be Furnished by User

The following table shows the items that the user is requested to have ready before using the 2D-TZ577 Card.

Table 4-2 Items To Be Furnished by User

Item	Requirement	Remark
Master Station* ¹	Master Station which is compatible with PROFIBUS DP	
Communication cable* ¹	Cable specifically designed for use with PROFIBUS DP * There are limits to maximum total cable length and inter-segment cable length. For details, see Figure 3-2 An Example of Basic PROFIBUS DP Network Configuration.	Mitsubishi Electric disclaims all guarantees of PROFIBUS system performance if any cable or connector other than those described here are used.

Connector ^{*1}	<p>Connector specifically designed for use with PROFIBUS, having built-in terminator resistors. Recommended type name: 6GK1 500-0FC00 *Siemens.</p> <p>* Use a connector of straight type (180° cable outlet). When using a connector of right-angle type (90° cable outlet), note that it may give rise to problems with the cable run including interference with other cables or the rear cover (CR2D)</p>	
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(*1) For more details, contact the International PROFIBUS Organization.

Association website at <http://www.profibus.com/>

5. Hardware Setup

5.1 Hardware Setup for 2D-TZ577 Card

Hardware setup need not be done in regard to the 2D-TZ577 Card.

Entire setup activity is performed by using parameter settings on the side of the Master Station and the Robot Controller.

For details, see Section 7.2 Parameter Settings on the Side of Master Station and Section 7.3 Parameter Settings on the Side of Robot Controller.

6. Connection and Wiring

6.1 Installing A 2D-TZ577 Card into Robot Controller

Note that only one 2D-TZ577 Card should be installed into an **option slot***1 of the Robot Controller at any one time. If more than one card are installed into the slots, Error H.8502 "More than one PROFIBUS Card is installed" will be indicated.

(*1) Number of the option slots varies with the Controller being used.

CR1D: Provided only with Option Slot 1

CR2/3D: Provided with Option Slots 1 thru 3

CR750-D/CR751-D: Provided with Option Slots 1 thru 2

CR800-D: Provided with Option Slots 1 thru 2

6.1.1 CR1D Robot Controller

Remove the option slot interface cover on the rear of the Controller and install a 2D-TZ577 Card into the slot. During installation, use the handle fitted to the Card.

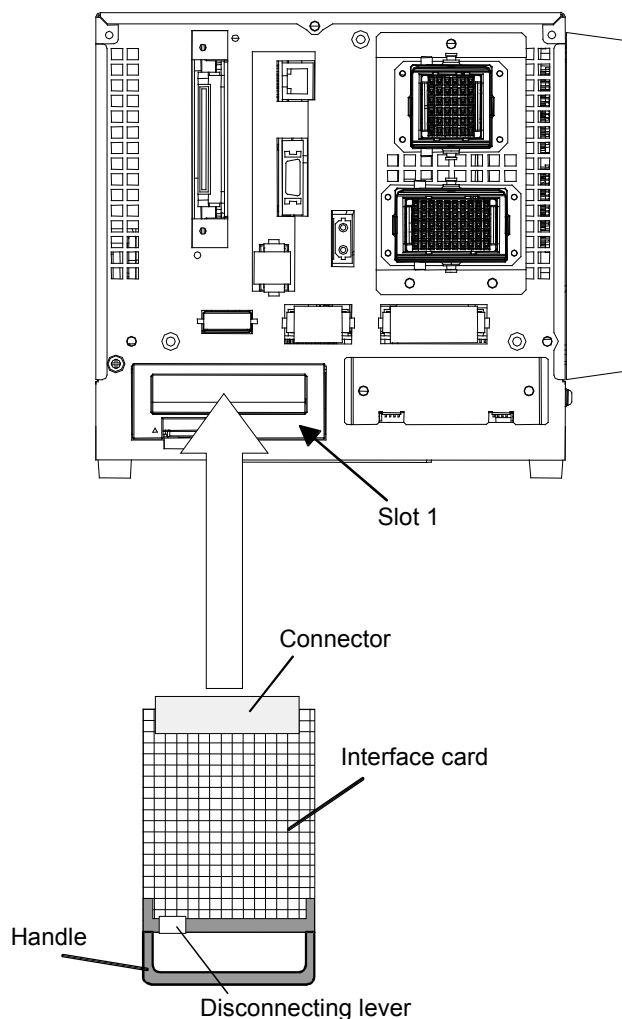


Figure 6-1 Installing A 2D-TZ577 Card (in the case of CR1D Controller)

6.1.2 CR2D Robot Controller

Remove any one of the interface covers provided for option slots 1 thru 3 on the rear of the Controller and install a 2D-TZ577 Card into the slot.

During installation, use the handle fitted to the Card.

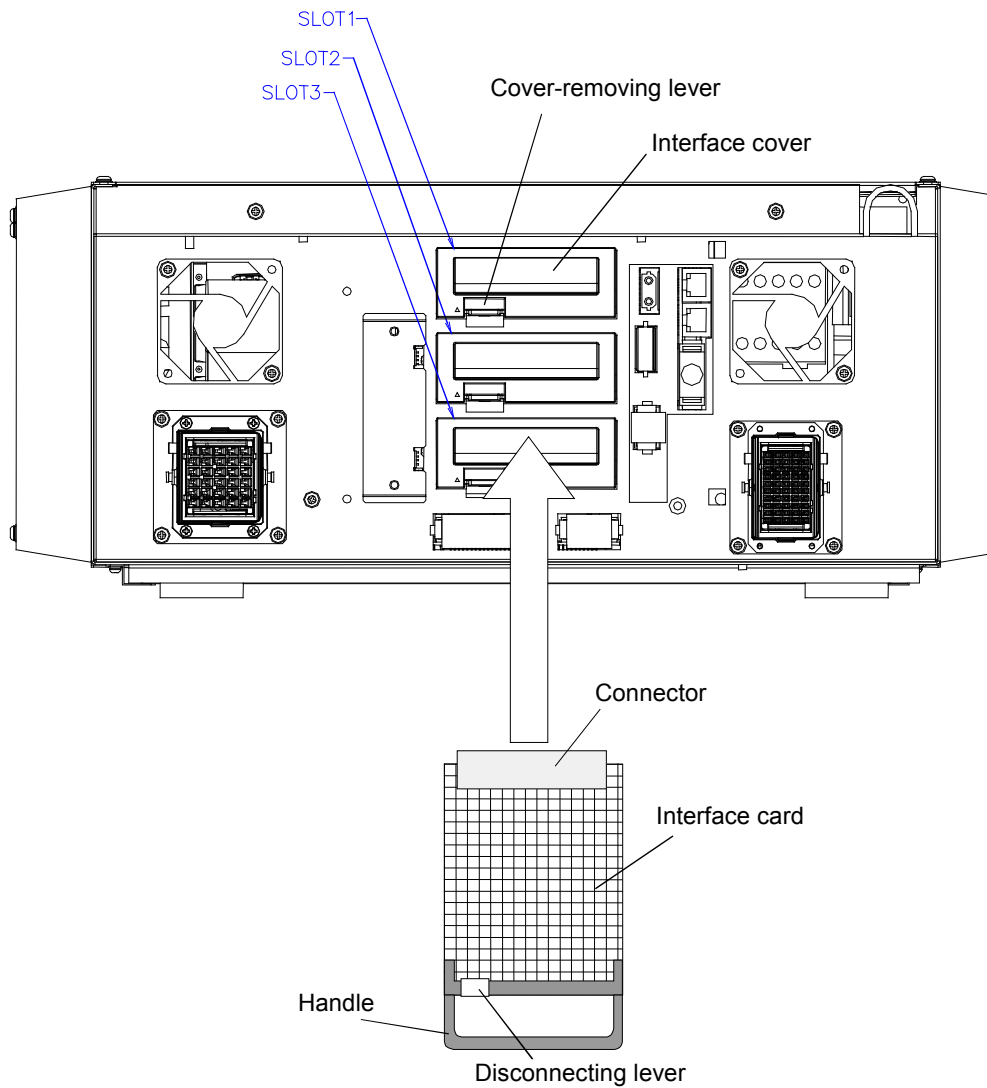


Figure 6-2 Installing A 2D-TZ577 Card (in the case of CR2D Controller)

6.1.3 CR3D Robot Controller

Open the door of the Robot Controller and you will see R700 CPU unit installed at the right-hand end. Remove any one of the option slot interface covers provided for option slot 1 thru 3 on the CPU unit and install a 2D-TZ577 Card into the slot.

During installation, use the handle fitted to the Card.

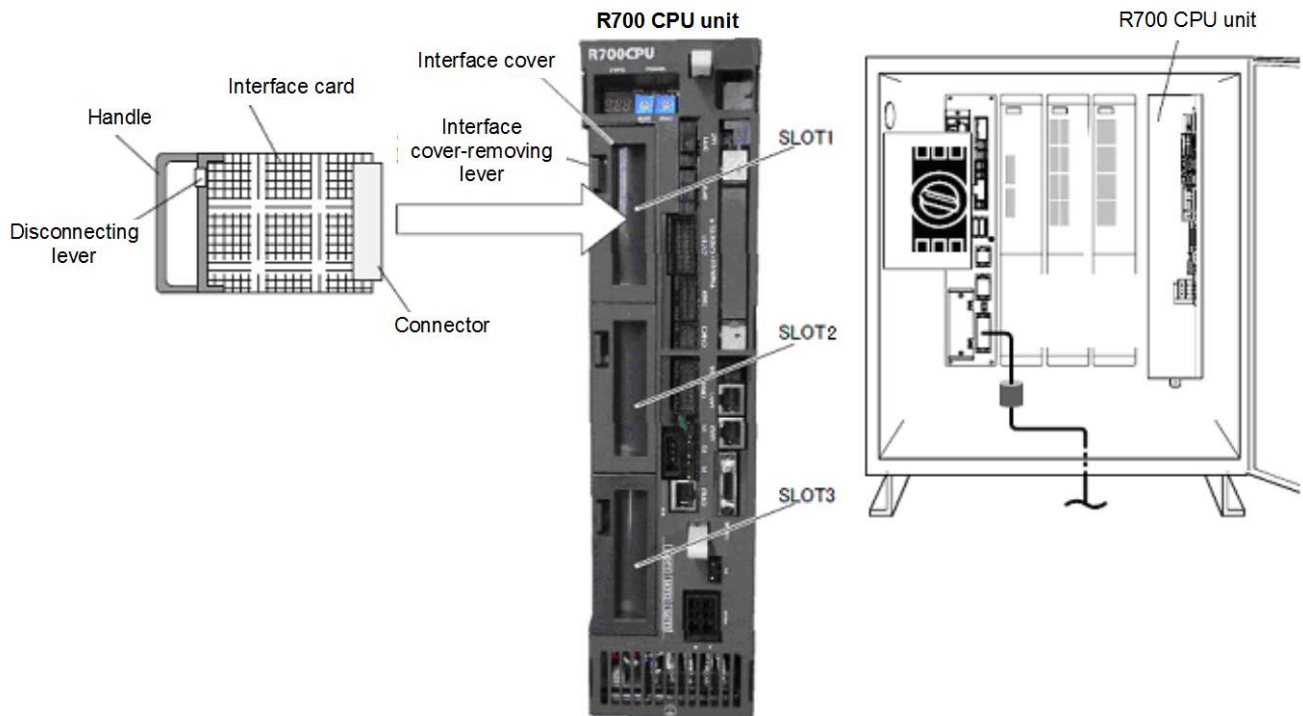
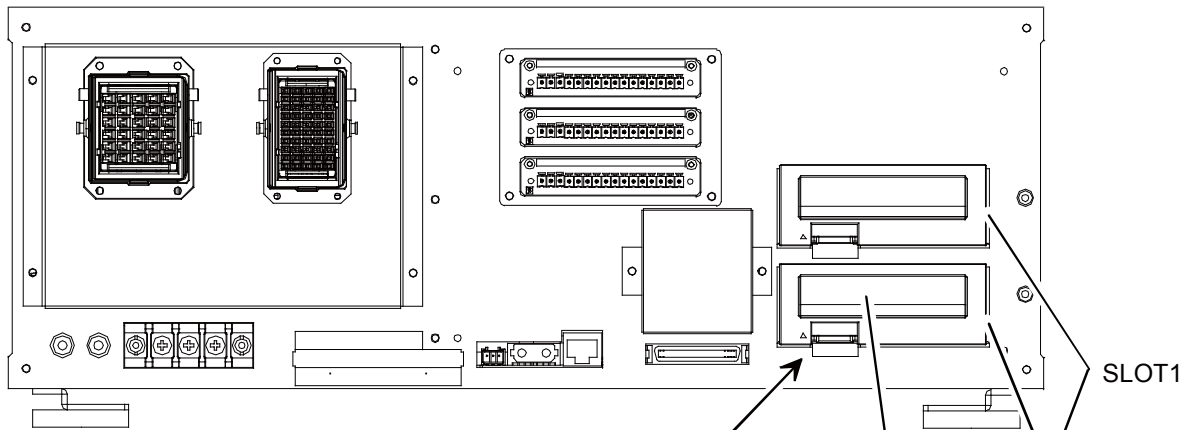


Figure 6-3 Installing A 2D-TZ577 Card (in the case of CR3D Controller)

6.1.4 CR750-D/CR751-D Robot Controller

Remove one interface cover of the option slots 1-2 in the robot controller front or rear, and mount the 2D-TZ577 card there. Please use the handle of the interface card at mounting of the interface card.

<CR750 controller (Rear side)>



<CR751 controller (Front side)>

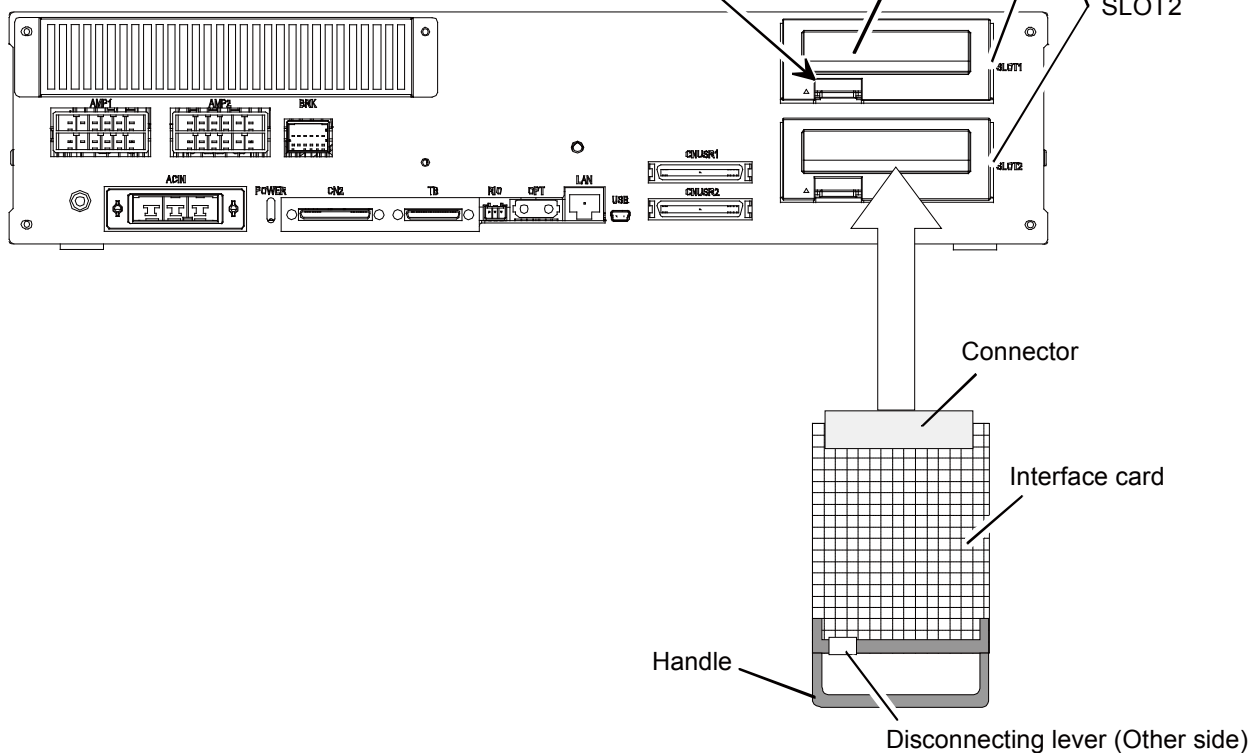


Figure 6-4 Installing A 2D-TZ577 Card (in the case of CR750-D/CR751-D Controller)

6.1.5 CR800-D Robot Controller

Remove one interface cover of the option slots 1-2 in the robot controller front, and mount the 2D-TZ577 card there. Please use the handle of the interface card at mounting of the interface card.

<CR800 controller (Front side)>

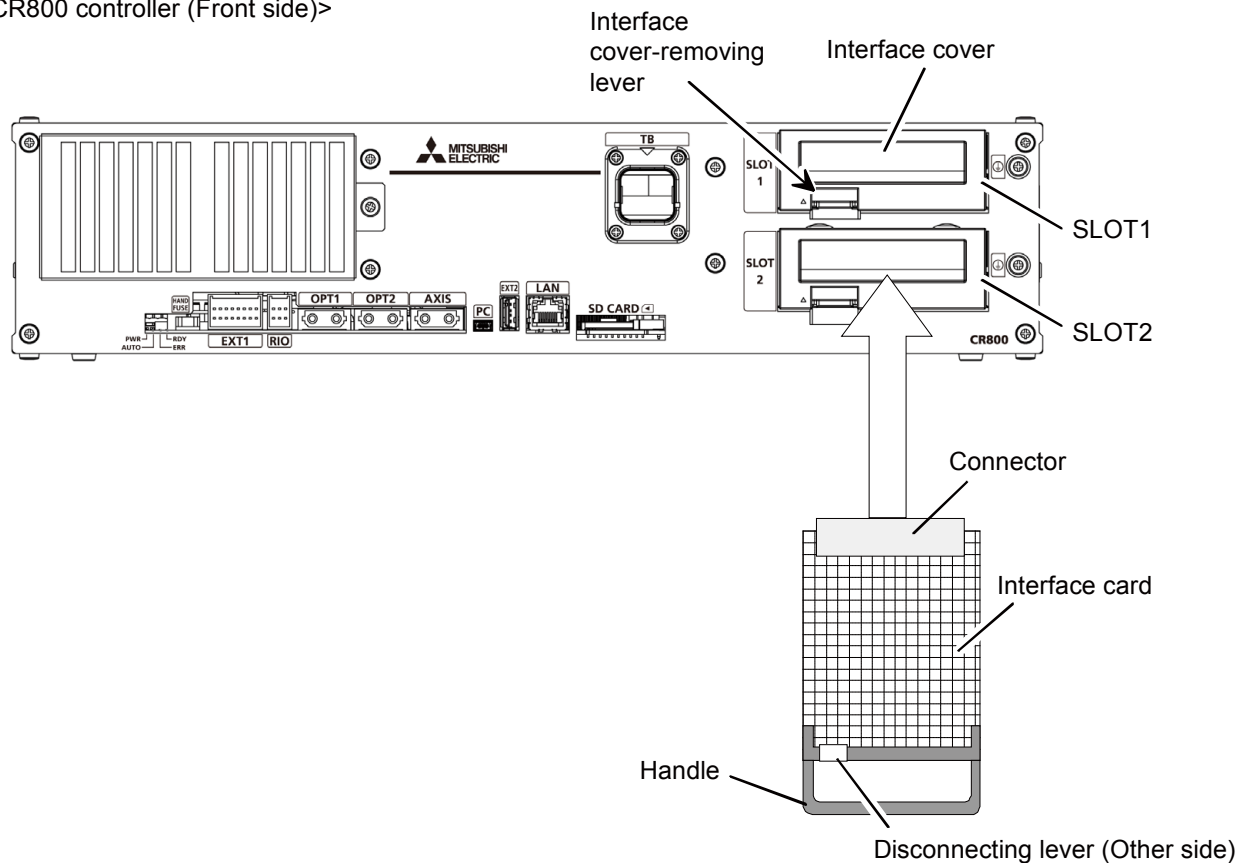


Figure 6-5 Installing A 2D-TZ577 Card (in the case of CR800-D Controller)

6.2 Connector Pin Configuration (D-SUB9 Pin)

Table 6-1 Connector Pin Configuration

Pin No.	Name	Service
1	Not assigned	-
2	Not assigned	-
3	RxD/TxD-P	Received/transmitted data-P
4	Not assigned	-
5	DGND (*1)	Data ground earth (0V)
6	VP(*1)	Voltage + (+5V)
7	Not assigned	-
8	RxD/TxD-N	Received/transmitted data-N
9	Not assigned	-

(*1) Signal used when terminator resistors are connected.

6.3 Wiring

The terminal station of each segment on a communication line need be provided with terminator resistors. Use a connector specifically designed for use with PROFIBUS which has built-in terminator resistors. Note: Terminator resistors are arranged so as to apply: 220Ω between (+) and (-), 390Ω between 5V and (+), and 390Ω between 0V and (-).

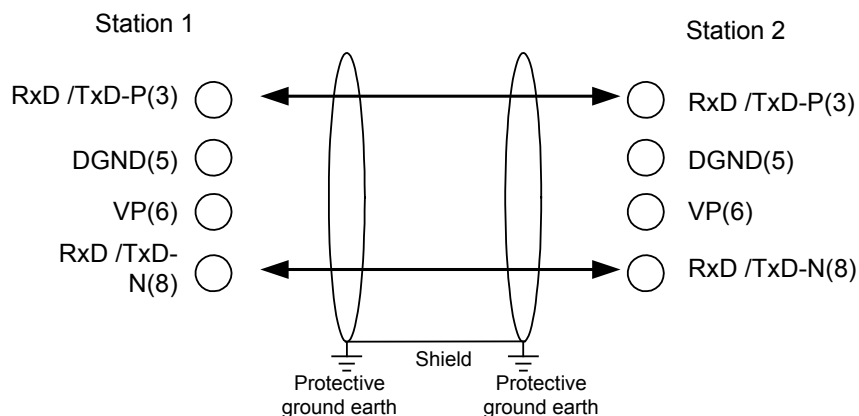


Figure 6-6 Cable Routing

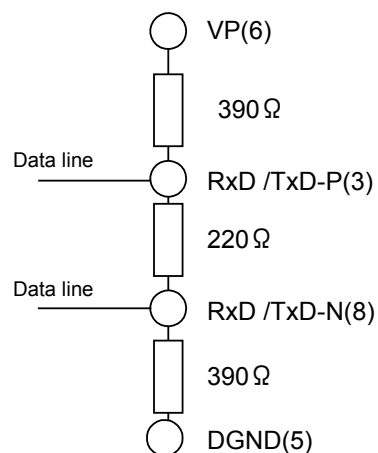


Figure 6-7 Bus Terminator Resistors

6.4 About Noise Control

To avoid an adverse impact from noise, strip off some sheath of the PROFIBUS cable, and attach the cable's metal blade portion to the controller casing with an earth clamp and install the accompanying ferrite core within 30cm of where the cable is clamped onto the casing.

Connection method is shown below by controller type.

6.4.1 CR1D Controller

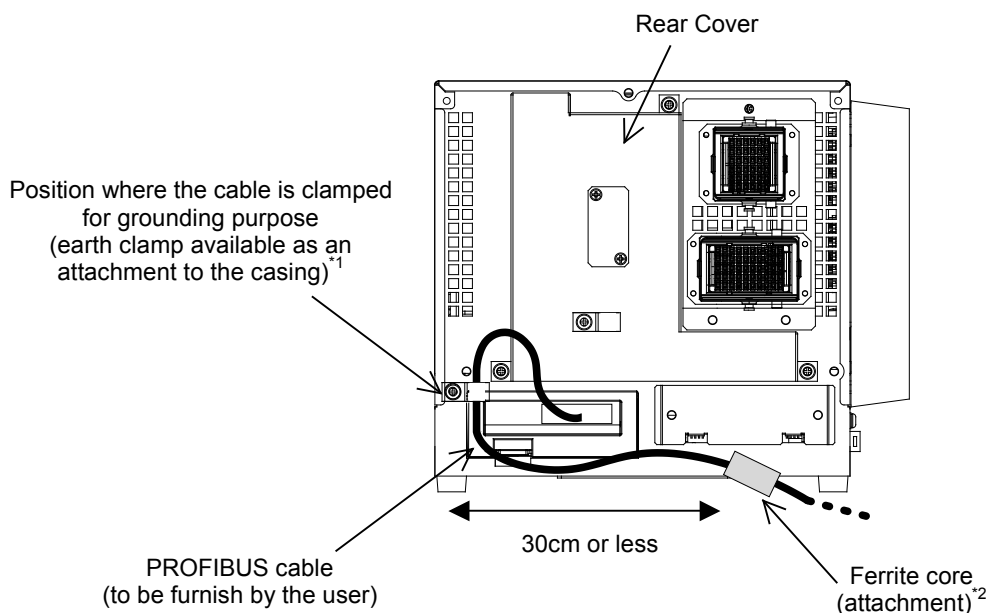


Figure 6-8 Installing PROFIBUS Cable (CR1D Controller)

6.4.2 CR2D Controller

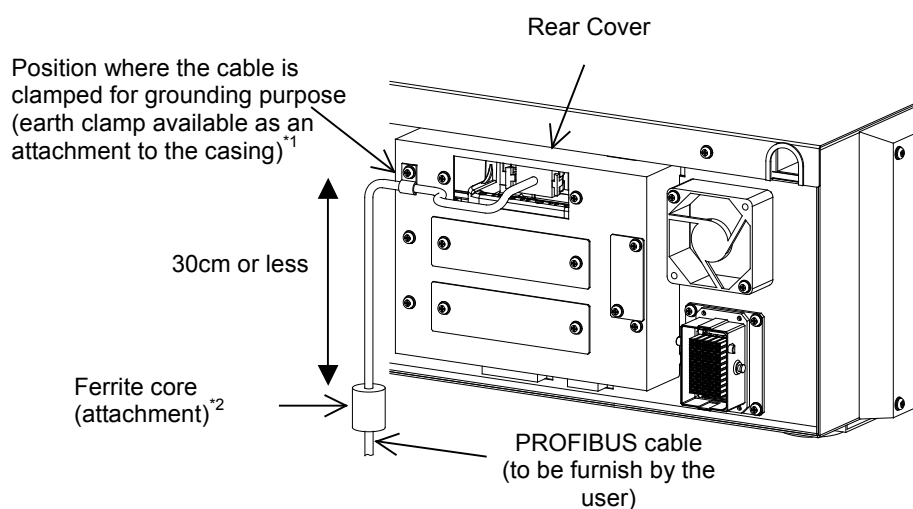


Figure 6-9 Installing PROFIBUS Cable (CR2D Controller)

6.4.3 CR3D Controller

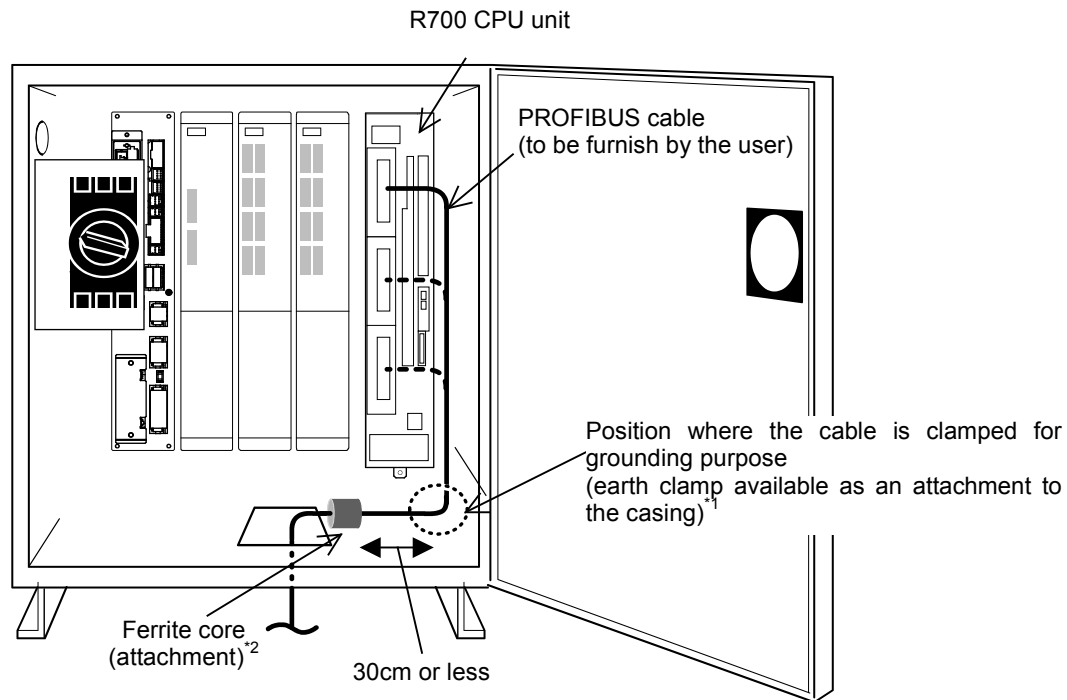
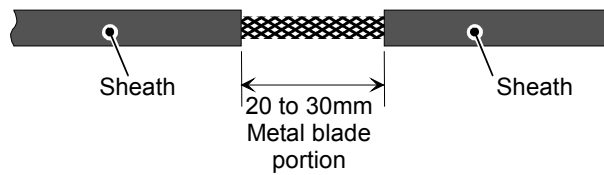
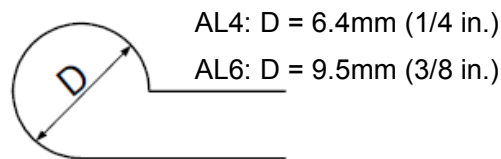


Figure 6-10 Installing PROFIBUS Cable (CR3D Controller)

- (*) Position where the cable is clamped for grounding purpose
Strip off some sheath of the cable and keep metal blade portion in contact with the controller casing.



- (*)2 When Siemens PROFIBUS FC standard cable (8.0mm O.D.) is used, recommended metal clamps are:
AL4 or AL6 *RICHCO INC



6.5 Checking Connections

Before placing the 2D-TZ577 Card in service, go through the following checklist to avoid oversights.

Table 6-2 Checklist for Proper Connections

No.	Item confirmed	Check
1	Is the 2D-TZ577 Card securely installed into the Controller's slot?	
2	Is the RPOFIBUS Cable linking the 2D-TZ577 Card to the user's external equipment properly connected?	
3	Is the special-purpose connector installed at each end of the PROFIBUS network configured to apply terminal resistance as specified?	
4	Is the ferrite core is installed in place?	

7. Procedure before Startup

The following diagram shows the procedure performed to place the 2D-TZ477 Card in operation.

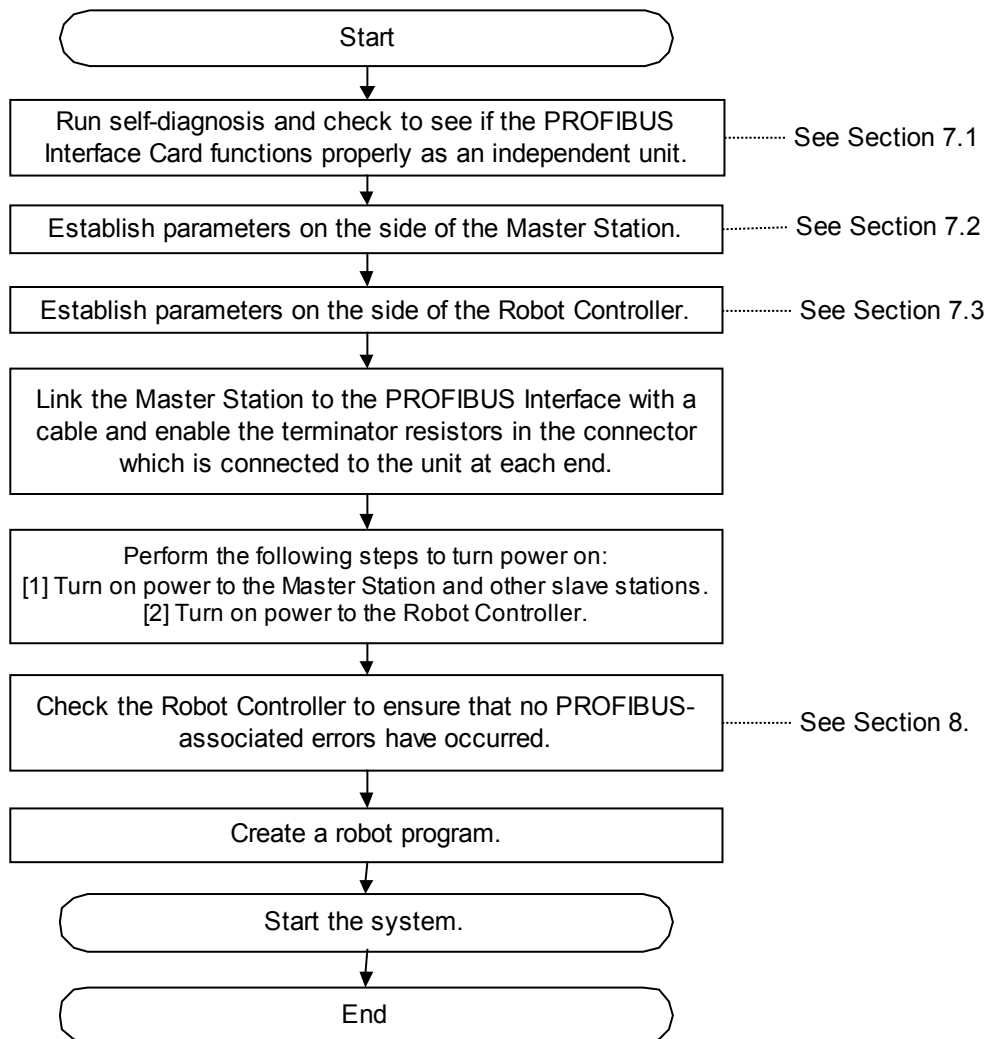


Figure 7-1 Procedure Before Startup



CAUTION

About setting station numbers from Class 2 Master Station

When setting station numbers from Class 2 Master Station, ensure that cable link is established between the Master Station and the PROFIBUS Interface Card.

7.1 Procedure for Running Self-diagnosis

The following subsections explain the procedure used to run self-diagnosis and states which are observed while the self-diagnosis goes on.

(1) Procedure for running self-diagnosis

- [1] Turn on power to the Robot Controller.
- [2] Set robot parameter to self-diagnosis mode. (Set robot parameter as "PBMODE = 2." For details, see "Table 3-4 A Listing of Robot Parameters Used with PROFIBUS".)
- [3] Turn off power to the Robot Controller and turn power back on.
- [4] While self-diagnosis goes on, display on the operation panel of the Robot Controller flashes like >777< ↔ blank.
- [5] If the results of self-diagnosis are "normal" The Robot Controller will start normally and the 2D-TZ577 Card will stand by for parameters from the Master Station.

If the results of self-diagnosis are "abnormal" .. H.8504 Error (error identified in PROFIBUS self-diagnosis) will occur.

- * Parameter need be set as "PBMODE = 0" if it is not desired to run self-diagnosis at the subsequent startup.

(2) Corrective actions at the occurrence of error

If the results of self-diagnosis are "error," replace the 2D-TZ577 Card.

When replacing the card, contact its manufacturer for advice.

7.2 Parameter Settings on the Side of Master Station

7.2.1 Procedure for Establishing Parameters

Establish parameters listed below on the side of Master Station.

Table 7-1 Master-side Parameters

Parameters established on the side of Master Station		Reference
Master parameters (parameters for Master Station itself)		-(*)
Bus parameters (communication parameters for PROFIBUS-DP network)		-(*)
Slave parameters (for 2D-TZ577 Card)	Station number (FDL Address)	For details, see "Table 7-2 A Listing of Slave Parameters."
	Communication WDT (Watchdog)	
	Minimum response time (Min T_sdr)	
	Group number (group identification number)	
	Data module setting	
	Data alignment setting	
	Swap setting	

- (*) For information about items of setting, see the instruction manual for the Master Station.

For method to specify parameter settings, refer to the instruction manual for the software that is used.

<Procedure for establishing 2D-TZ577 Card slave parameters to Master Station>

- [1] Read GSD file stored in the CD-ROM supplied with the 2D-TZ577 Card into a setting software which is compatible with the Master Station.
- [2] Establish 2D-TZ577 Card slave parameters, using the setting software.
- [3] Write the parameters into the Master Station.

For information about operating the setting software, refer to the instruction manual for the software that is used.

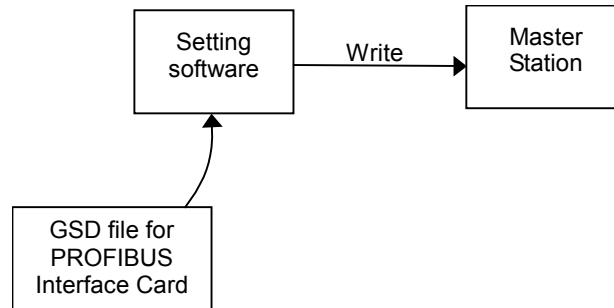


Figure 7-2 Conceptual illustration of GSD file being loaded

7.2.2 Slave Parameters

Parameters other than slave station numbers need be established as slave parameters for use in the Master Station. The following table shows slave parameters for use in the 2D-TZ577 Card.

Table 7-2 A Listing of Slave Parameters

Item	Setting range	Description	Remark
Station number (FDL Address)	0 to 125	Station number of 2D-TZ577 Card is defined.	If connection is made to Class 1 Master, station number need be set in the robot parameter "PBNUM" as well.
Communication WDT (Watchdog)	0/2 to 65000	Watchdog timer is defined. 0: Communication WDT setting is disabled. 2-65000: Communication WDT setting is enabled (set value x 10msec).	-
Minimum response time (Min T_sdr)	1 to 255	A minimum response time lapsed until response frames are permitted to be sent to the Master Station is defined.	-
Group number (Group identification number)	Grp1 to Grp8	Group to which a station belongs is defined. Any station is allowed to belong to more than one group (Grp 1 thru 8).	-
Data module settings (Module Configuration)	-	I/O configuration information (defined in "Cfg_Data" on the Master Station) · Types of settings: 48 patterns · Number of settings: 1 - 40	-
Data alignment mode settings (Data Alignment Mode)	0	Position of data in the output receive area/input send area of buffer memory (defined in "User_Prm_Data" on the Master Station) 0: Lump alignment mode (LUMP mode) * This parameter takes on "0" only. No change is permitted.	-

Item	Setting range	Description	Remark
Swap settings (Word Data Swap)	0 to 1	Indication as to whether there is swapping of word data sent/received at 2D-TZ577 Card (defined in "User_Prm_Data" on the Master Station) 0: No swapping takes place. 1: Swapping takes place.	-

(1) Number of data module settings

Make settings so that the number of data modules per 2D-TZ577 Card falls within the limits shown below:

- Number of data modules: 40 maximum
- Combined data size

Input data - 122 words maximum	}	192 words in combined total
Output data - 122 words maximum		

(2) Data module setting pattern

An appropriate pattern is selected from among 48 patterns which derive from a combination of 3 input/output options and 16 data sizes. Note that input/output notations are based on the Master Station being the origin. For more information, see Subsection (3) **Data alignment mode settings**.

Table 7-3 Data Module Settings

Item	Type
Input/output designation	Input/output/IO
Data size	1 to 16 words

(3) Data alignment mode settings

Method by which to align each module in the output receive area/input send area of buffer memory is specified. The 2D-TZ577 Card comes with a lump alignment mode (lump mode) alone, permitting no changes to these settings.

(a) Lump alignment mode (lump mode)

Input data/output data is aligned on the front in the input send area/output receive area, respectively, in the order of data module. The table below shows examples of usage statuses in the output receive area/input send area which occur on the data module settings shown.

Table 7-4 Examples of Data Module Settings

Data module settings		Output data	Input data
Data module 0	One-word input (1 word In)		One-word
Data module 1	2-word output (2 word Out)	2-word	
Data module 2	One-word input/output (1 word In, 1 word Out)	One-word	One-word
Data module 3	One-word output (1 word Out)	One-word	
Data module 4	2-word input (2 word In)		2-word
Data module 5	One-word output (1 word Out)	One-word	

Output receive area (robot input)		Input send area (robot output)	
Input 2000 to 2015	Used in data module 1	Output 2000 to 2015	Used in data module 0
Input 2016 to 2031		Output 2016 to 2031	Used in data module 2
Input 2032 to 2047	Used in data module 2	Output 2032 to 2047	
Input 2048 to 2063	Used in data module 3	Output 2048 to 2063	Used in data module 4
Input 2064 to 2079	Used in data module 4	Output 2064 to 2079	
Input 2080 to 2095		Output 2080 to 2095	
Input 2096 to 2111		Output 2096 to 2111	
Input 2112 to 2127		Output 2112 to 2127	

Figure 7-3 Example of Lump Alignment

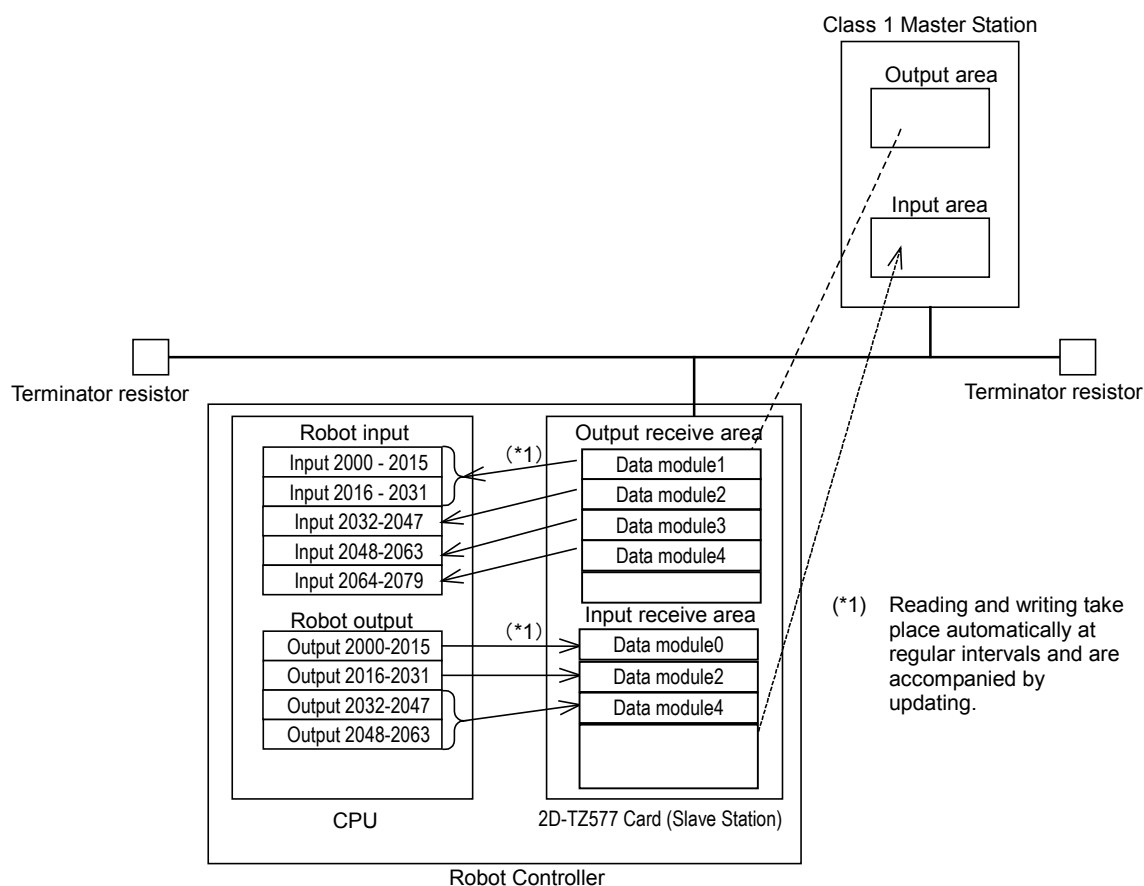


Figure 7-4 Flow of Data

7.3 Parameter Settings on the Side of Robot Controller

(1) Parameter settings under R32TB, R56TB, and RT ToolBox2 (versions earlier than Ver. 1.3)

To place the 2D-TZ577 Card in operation, it is necessary to establish three typical parameters, as listed below, on the Robot Controller. For information about what to do about other parameters, see Table 3-4 A Listing of Robot Parameters Used with PROFIBUS.

For information about changing parameters, refer to the "Instruction Manual - Detailed Description of Functions and Operation" which is separately issued.

Table 7-5 Parameters on the Side of Robot Controller

Parameter name	Initial value	Setting range	Description
PBMODE	0	0/2	A parameter that switches the operating mode of the 2D-TZ577 Card between "normal" and "self-diagnosis." Normal mode = 0, self-diagnosis mode = 2 <ul style="list-style-type: none"> When the self-diagnosis identifies an anomaly, an error message is displayed. ("H.8504: PROFIBUS Self-diagnosis shows occurrence of an error.") Return the operating mode to normal to continue with normal operation.
PBMC	1	1/2	A parameter that designates Master Station as Class 1 or Class 2. Class 1 Master Station is designated at factory default. To use "Class 2," choose another parameter setting. <ol style="list-style-type: none"> Class 1 Master (effected when the station number setting parameter PBNUM shown below is used) Class 2 Master (effected when changes of station numbers are made from Class 2 Master Station - with PBNUM not being used)
PBNUM	126	-1 to 125	A parameter that specifies station number for the 2D-TZ577 Card. 0~125: Station number setting values (Rewriting of station number settings takes place within the flash ROM as well.) <ul style="list-style-type: none"> -1: Station number clear (Station number settings within the flash ROM are cleared.) * After the station numbers are cleared, the value 126 is taken on. * If "No_Add_Chg" is specified with "true" when making station number settings from Class 2 Master Station, 2D-TZ577 Card is disabled for change of station numbers. To cancel this setting, clear station numbers with "PBNUM = -1."

(2) Parameter settings under RT ToolBox2 (versions later than Ver. 1.3) and RT ToolBox3

Under RT ToolBox2 versions later than 1.3, a PROFIBUS-specific setting window shown in Figure 7-5 is offered. You can establish three parameters shown in Table 7-5 on this screen.

In regard to the PROFIBUS Error Detection Filter (PBCNT), you may change its set values only when communication errors are frequently encountered under the undue influence from noise in your installation environment. (For more information, see Table 3-4 A Listing of Robot Parameters Used with PROFIBUS.)

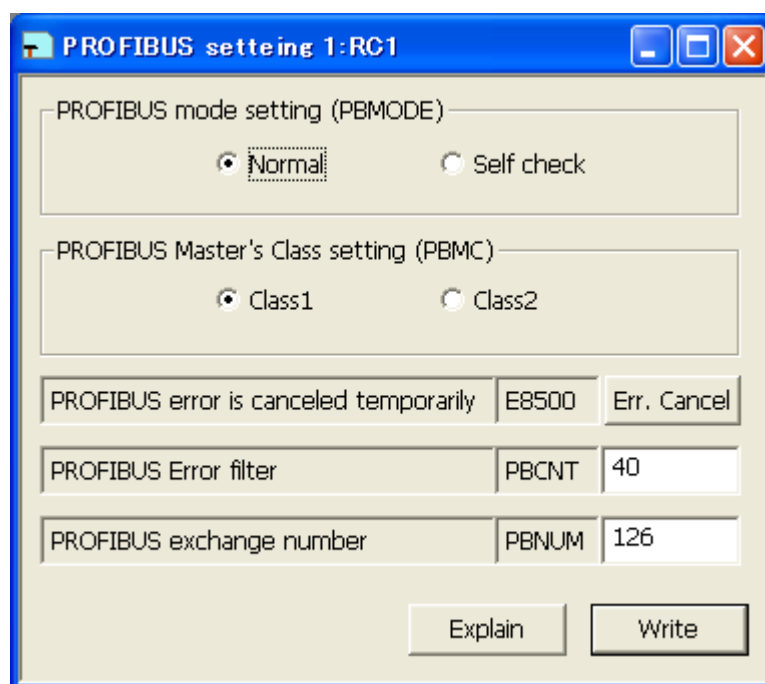


Figure 7-5 PROFIBUS Setting Screen

You can call up the PROFIBUS setting screen by expanding the Test tree under the Work Space and going through "Online" and "Parameter" and double-clicking the "PROFIBUS setting" entry or alternatively right-clicking this entry and clicking Open on the pull-down menu that appears.

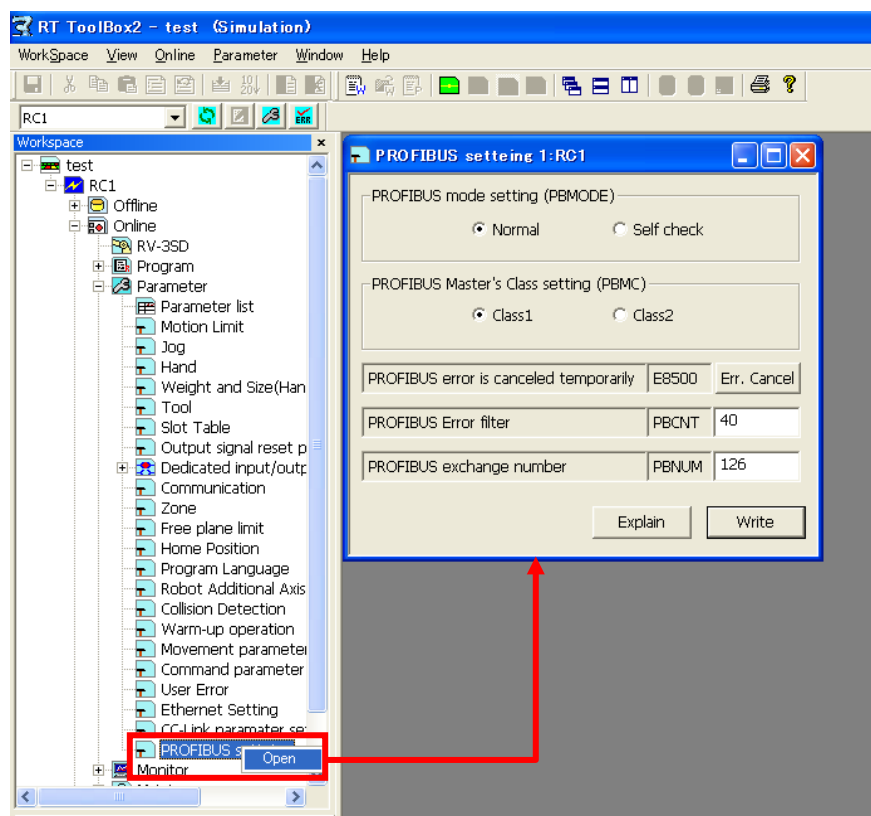


Figure 7-6 Opening PROFIBUS Setting Screen

7.4 Have A Try For It

7.4.1 Setting Dedicated Input/Output

Make settings for dedicated input/output as listed in the table. After changing the parameter settings, power the system off and on again.

For information about making these settings, refer to the "Instruction Manual - Detailed Description of Functions and Operation" which is separately issued.

Table 7-6 Setting Dedicated Input/Output

Parameter name	Input		Output	
	Meaning	Number	Meaning	No.
IOENA	Enable operating right.	2000	Operating right is being enabled.	2000
START	Start programs.	2001	Programs are being started.	2001
STOP2	Stop.	2002	During suspension.	2002
SLOTINIT	Program reset.	2003	Program selection is permitted.	2003
SRVON	Servo power on.	2004	Servo being turned on.	2004
SRVOFF	Servo power off.	2005		

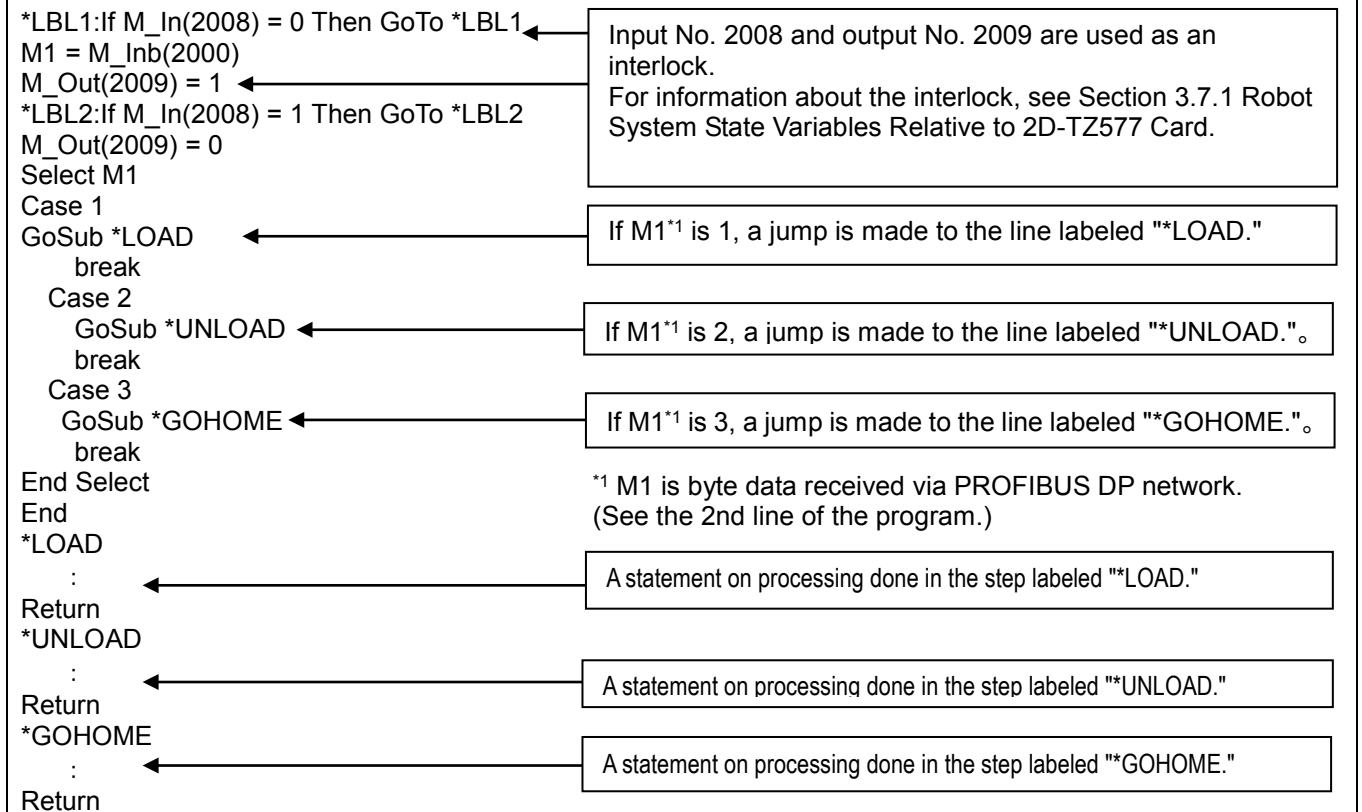
7.4.2 About General-purpose Input/Output

General-purpose input/output, too, are accessible by using system variables for I/O, such as M_In and M_Out. However, you are not permitted to make such access as spans beyond the region used in PROFIBUS, like 1999, by using variables which access a plurality of bits, including M_Inb, M_Inw, M_Outb, and M_Outw. Ensure that your programming stays within the region ranging from 2000 and 3951.

Correct example: M_In (2000), M_Inb (2010), M_Out (3000), M_Outb (3010), etc.

Incorrect example: M_Inb(1999), M_Inw (5070), M_Outb (1999), M_Outw (1999), etc.

7.4.3 Examples of Robot Program (Using General-purpose I/O)



7.4.4 A Sample Program for Checking Input/Output

Shown below is a sample program which can be used for checking input/output on the 2D-TZ577 Card.

Use this program during a checkup at startup or as otherwise required.

Table 7-7 Signal Alignment Conditions

Robot-side input (Master Station output)	Input 2000~3535 (equivalent to 96 words)
Robot-side output (Master Station input)	Output 2000~3535 (equivalent to 96 words)

Robot program specification

Input bits are copied in their entirety onto output bits.

[Robot Program - Example 1]

Input signals to the Robot are looped back in their entirety to output signals (for the purpose of bit check).

For M1 = 2000 To 3535

M_Out(M1) = M_In(M1) ' Copied in the form of a variable for bit

Next M1

End

[Robot Program - Example 2]

Input signals to the Robot are looped back in their entirety to output signals (for the purpose of byte check).

For M1 = 2000 To 3535 Step 8

M_Outb(M1) = M_Inb(M1) ' Copied in the form of a variable for byte

Next M1

End

[Robot Program - Example 3]

Input signals to the Robot are looped back in their entirety to output signals (for the purpose of word check).

For M1 = 2000 To 3535 Step 16

M_Outw(M1) = M_Inw(M1) ' Copied in the form of a variable for word

Next M1

End

Run this program and check the looped-back signals on the side of the Master Station.

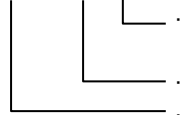
8. Troubleshooting

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

8.1 A Listing of Errors

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

□0000 *



- 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 continues.

Table 8-1 A Listing of PROFIBUS-related Errors

Error No.	Causes and Solutions	
H.8500	Error message	PROFIBUS Initial error
	Cause	An error was detected in the hardware. The hardware may be at fault.
	Solution	Replace the 2D-TZ577 Card. When replacing the card, contact its manufacturer for advice.
H.8501	Error message	PROFIBUS watch dog timer error
	Cause	An error was detected in the hardware. The hardware may be at fault.
	Solution	Replace the 2D-TZ577 Card. When replacing the card, contact its manufacturer for advice.
H.8502*	Error message	Plural PROFIBUS cards are set.
	Cause	Only one card is accepted at any one time.
	Solution	Install only one card.
H.8503*	Error message	PROFIBUS/CC-Link cards are set.
	Cause	Either PROFIBUS or CC-Link card is accepted at any one time.
	Solution	Install either a PROFIBUS card or a CC-Link card.
H.8504	Error message	Either of the following messages is displayed: (1) PROFIBUS self-check error n (n = 1~7). (2) PROFIBUS cannot self-check
	Cause	An error was detected in the hardware. The hardware may be at fault.
	Solution	Replace the 2D-TZ577 Card. When replacing the card, contact its manufacturer for advice.
H.8505	Error message	Illegal param (PBMODE)
	Cause	PBMODE parameters are not defined validly.
	Solution	Correct PBMODE parameters. (0 - normal, 2 - self-diagnosis)
H.8506	Error message	Exchange number cannot be set.
	Cause	Power the system off and on again.
	Solution	If the error recurs, contact the manufacturer for advice.
H.8507	Error message	Illegal param (PBMC)
	Cause	PBMC parameters are not defined validly.
	Solution	Correct PBMODE parameters. (1 - Class 1, 2 - Class 2)

Error No.	Causes and Solutions	
H.8510	Error message	PROFIBUS exchange No. is wrong.
	Cause	Either of the following causes may be responsible: (1) Station numbers stored in the flash memory are outside the prescribed range. (2) An attempt was made to change to a station number being outside the prescribed range.
	Solution	Specify PBNUM parameter with numbers in the range of 1 to 125.
H.8520	Error message	PROFIBUS St.number write error.
	Cause	An attempt was made to change station numbers when rewriting was disabled.
	Solution	Enter "-1" in the "station number" box (robot parameter "PBNUM = -1") so that the existing station numbers are cleared.
	Error message	An attempt was made to change station numbers when "No_Add_Chg" had been specified with "true" during station number setting from Class 2 Master Station.
H.8530	Error message	PROFIBUS St.number write error.
	Cause	More than 60 consecutive rewrite attempts were made on the flash ROM.
	Solution	Replace the 2D-TZ577 Card. When replacing the card, contact its manufacturer for advice.
H.8540	Error message	PROFIBUS flash ROM access error.
	Cause	An anomaly in the hardware.
	Solution	Replace the 2D-TZ577 Card. When replacing the card, contact its manufacturer for advice.
H.8550	Error message	PROFIBUS master bureau's parameter is illegal
	Cause	Any one of the following causes may be responsible: (1) Parameters established at the Master Station are incorrect. (2) Set value for communication WDT is too long. (3) Value specified for minimum response time Min_Tsdr is outside the prescribed range.
	Solution	Check the slave parameter settings on the Master Station. (Refer to the instruction manual for Master Station.)
H.8560	Error message	PROFIBUS communication chip ERR
	Cause	An anomaly in the hardware.
	Solution	Replace the 2D-TZ577 Card. When replacing the card, contact its manufacturer for advice.
H.8570	Error message	PROFIBUS communication Time-out
	Cause	Timeout occurred in the communications with the Master Station.
	Solution	Check Master Station state and cable connections, and choose a longer communication WDT setting.
H.8580	Error message	PROFIBUS I/O composition error.
	Cause	Any one of the following causes may be responsible: (1) Data module is not of word type. (2) Swap set value is outside the prescribed range. (3) Data alignment mode set value is outside the prescribed range. (4) Number-of-data modules set value is outside the prescribed range. (5) Data module settings are outside the prescribed range. (6) Parameter setting station numbers are invalid.
	Solution	Check the slave parameter settings on the Master Station. (Refer to the instruction manual for Master Station.)

8.2 At the Occurrence of Error 8570

(PROFIBUS Communication Timeout)

When this error occurred, take the corrective action suggested in the troubleshooting chart in Section 8.1. 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?
* H.8570 occurs unless the Master Station is up and running before power is turned on to the Robot Controller.
- (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 8570, change E8570 parameter setting.

9. Appendix

9.1 Displaying Option Card Information

You can call up information about the option card on the screen using the RT ToolBox2/RT ToolBox3 (Option) screen.

Clicking Slotn(n=1~3):PROFIBUS under the Option Card entry on the Work Space tree lets you have information about the 2D-TZ577 Card displayed on a property window.

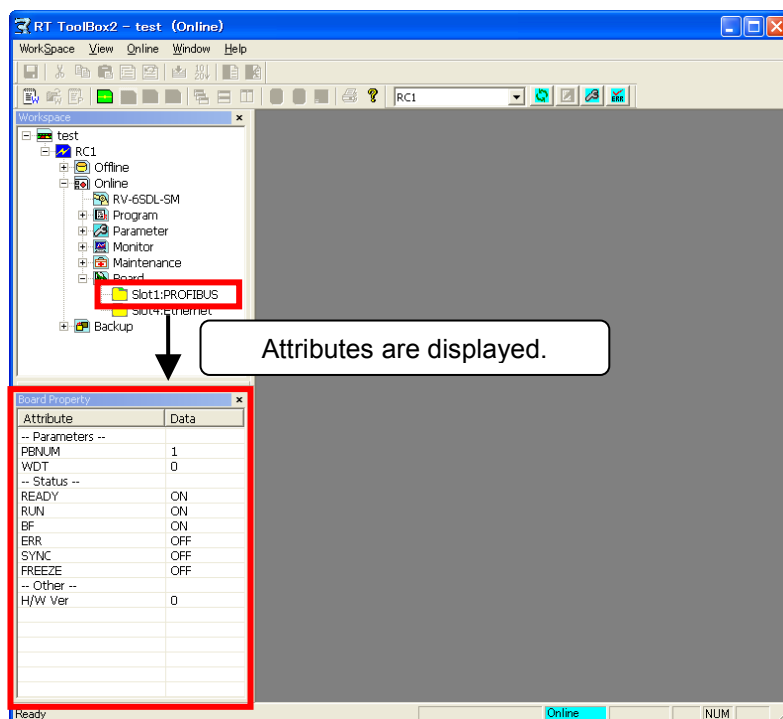


Figure 9-1 An Example of Option Card Information Displayed on RT ToolBox2 Window

Table 9-1 Information about 2D-TZ577 Card

Item of display		Example of information displayed	Meaning	Remark
Designation of card		PROFIBUS	Card name	
Card information	[PBNUM]	1	Number of station in action	Station number: 0 to 125 (Default setting: 126(*1))
	[WDT]	5	Watchdog timer	
	[Ready]	ON or OFF	Unit being in Ready state	
	[RUN]	ON or OFF	Run state	ON = normal, OFF = WDT error occurred
	[BF]	ON or OFF	BF state	ON = Before data communications or communications error detected OFF = Communications proceeding normally
	[ERR.]	ON or OFF	Error-occurred state	ON = Parameter setting error or unit error OFF = Communications proceeding normally
	[SYNC]	ON or OFF	SYNC-mode state	ON = SYNC-mode state
	[FREEZE]	ON or OFF	FREEZE-mode state	ON = FREEZE-mode state
	[H/W Ver]	0	Hardware version	

(*1) Station Number 126 gets the card isolated from a PROFIBUS network.

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