e-Front runners

# MICREX-SX series

# SPH

## USER'S MANUAL

# General Purpose Communication Module

## Type: NP1L-RS1 (RS-232C: 1CH, RS-485: 1CH)
## NP1L-RS2 (RS-232C: 1CH)
## NP1L-RS3 (RS-232C: 2CH)
## NP1L-RS4 (RS-485: 1CH)
## NP1L-RS5 (RS-485: 2CH)

FEH225d

# Preface

This User's Manual explains the system configuration of SPH general purpose communication module, the specifications and operation of the modules.
Read this manual carefully to ensure correct operation. When using modules or peripheral devices, be sure to read the corresponding user's manuals listed below.

**<Relative manuals for the SX-Programmer Expert (D300win)>**

| Title | Manual No. | Contents |
|---|---|---|
| User's Manual Instruction, MICREX-SX series | FEH200 | Explains the memory, language and system definitions of the MICREX-SX series. |
| User's Manual Hardware, MICREX-SX series SPH | FEH201 | Explains the system configuration, the specifications and operations of modules in the MICREX-SX series. |
| User's Manual D300win <Reference>, MICREX-SX series | FEH254 | Explains the menu and icon of D300winV2 and all of the operations of D300winV2. |
| User's Manual D300win <Reference>, MICREX-SX series | FEH257 | Explains the menu and icon of D300winV3 and all of the operations of D300winV3. |
| User's Manual Standard Extended FB, MICREX-SX series | FEH255 | Explains the specification of Standard Extended FB of the attachment to D300win. |

**<Relative manuals for the SX-Programmer Standard (Standard Loader)>**

| Title | Manual No. | Contents |
|---|---|---|
| User's Manual Instruction, MICREX-SX series | FEH588 | Explains the memory, language and system definitions of the MICREX-SX series. |
| User's Manual Hardware, MICREX-SX series SPH | FEH201 | Explains the system configuration, the specifications and operations of modules in the MICREX-SX series. |
| User's Manual SX-Programmer Standard <Reference>, MICREX-SX series | FEH590 | Explains the menu and icon of the SX-Programmer Standard and all of the operations of the SX-Programmer Standard. |

*This manual is structured to be applicable to both D300win and Standard Loader.
*In addition to the above manuals, the following Fuji Electric FA Components & Systems Co., Ltd. site offers various manuals and technical documents associated with MICREX-SX.

**URL http://www.fujielectric.co.jp/fcs/eng/index.html**

**Notes**

1. This manual may not be reproduced in whole or part in any form without prior written approval by the manufacturer.
2. The contents of this manual (including specifications) are subject to change without prior notice.
3. If you find any ambiguous or incorrect descriptions in this manual, please write them down (along with the manual No.shown on the cover) and contact FUJI.

# Safety Precautions

Be sure to read the “Safety Precautions” thoroughly before using the module.
Here, the safety precaution items are classified into “Warning” and “Caution.”

**Warning** : Incorrect handling of the device may result in death or serious injury.

**Caution** : Incorrect handling of the device may result in minor injury or physical damage.

Even some items indicated by “Caution” may also result in a serious accident.
Both safety instruction categories provide important information. Be sure to strictly observe these instructions.

**Warning**

- ◊ Never touch any part of charged circuits as terminals and exposed metal portion while the power is turned ON. It may result in an electric shock to theoperator.
- ◊ Turn OFF the power before mounting, dismounting, wiring, maintaining or checking, otherwise, electric shock, erratic operation or troubles might occur.
- ◊ Place the emergency stop circuit, interlock circuit or the like for safety outside the PLC. A failure of PLC might break or cause problems to the machine.
- ◊ Do not connect in reverse polarity, charge (except rechargeable ones), disassemble, heat, throw in fire or short-circuit the batteries, otherwise, they might burst or take fire.
- ◊ If batteries have any deformation, spilled fluids, or other abnormality, do not use them. The use of such batteries might cause explosion or firing.
- ◊ Do not open the FG terminal with the LG-FG short circuited. (It must be grounded, otherwise it might cause electric shock.)

# Safety Precautions

**⚠ Caution**

◊ Do not use one found damaged or deformed when unpacked, otherwise, failure or erratic operation might be caused.
◊ Do not shock the product by dropping or tipping it over, otherwise, it might be damaged or troubled.
◊ Follow the directions of the operating instructions when mounting the product.
If mounting is improper, the product might drop or develop problems or erratic operations.
◊ Use the rated voltage and current mentioned in the operating instructions and manual. Use beyond the rated values might cause fire, erratic operation or failure.
◊ Operate (keep) in the environment specified in the operating instructions and manual. High temperature, high humidity, condensation, dust, corrosive gases, oil, organic solvents, excessive vibration or shock might cause electric shock, fire, erratic operation or failure.
◊ Select a wire size to suit the applied voltage and carrying current. Tighten the wire terminals to the specified torque. Inappropriate wiring or tightening might cause fire, malfunction, failure, or might cause the product to drop from its mounting.
◊ Contaminants, wiring chips, iron powder or other foreign matter must not enter the device when installing it, otherwise, erratic operation or failure might occur.
◊ Remove the dust-cover seals of modules after wiring, fire, accidents, failue or fault might occur.
◊ Connect the ground terminal to the ground, otherwise, an erratic operation might occur.
◊ Periodically make sure the terminal screws and mounting screws are securely tightened.
Operation at a loosened status might cause fire or erratic operation.
◊ Put the furnished connector covers on unused connectors, otherwise, failure or erratic operation might occur.
◊ Install the furnished terminal cover on the terminal block, otherwise, electric shock or fire might occur.
◊ Sufficiently make sure of safety before program change, forced output, starting, stopping or anything else during a run.
The wrong operation might break or cause machine problems.
◊ Engage the loader connector in a correct orientation, otherwise, an erratic operation might occur.
◊ Before touching the PLC, discharge any static electricity that may have been collected on your body.
To discharge it, touch a grounded metallic object. Static electricity might cause erratic operation or failure of the module.
◊ Be sure to install the electrical wiring correctly and securely, observing the operating instructions and manual. Wrong or loose wiring might cause fire, accidents, or failure.
◊ When disengaging the plug from the outlet, do not pull the cord, otherwiase, break of cable might cause fire or failure.
◊ Do not attempt to change system configurations (such as installing or removing I/O modules) while the power is ON, otherwise, failure or erratic operation might occur.
◊ Do not attemp to repair the module by yourself contact your Fuji Electric agent. When replacing the batteries, correctly and securely connect the battery connectors, otherwise, fire, accidents or failure might occure.
◊ To clean the module, turn power off and wipe the module with a cloth moistened with warm water. Do not use thinner or other organic solvents, as the module surface might become deformed or discolored.
◊ Do not remodel or disassemble the product, otherwise, a failure might occur.
◊ Follow the regulations of industrial wastes when the device is to be discarded.
◊ The modules covered in these operating instructions have not been designed or manufactured for use in equipment or systems which, in the event of failure, can lead to loss of human life.
◊ If you intend to use the modules covered in these operating instructions for special applications, such as for nuclear energy control, aerospace, medical, or transportation, please consult your Fuji Electric agent.
◊ Be sure to provide protective measures when using the module covered in these operating instructions in equipment which, in the event of failure, may lead to loss of human life or other grave results.
◊ External power supply (such as 24V DC power supply) which is connected to DC I/O should be strongly isolated from AC power supply.

# Revisions

*Manual No. is shown on the cover.

| Printed on | *Manual No. | Revision contents |
|---|---|---|
| Sep. 1998 | FEH225 | First edition |
| Jan. 2002 | FEH225a | Contents changed according to changes of extended FB specifications.<br>• Contents changed according to inclusion of a part of the non-procedural FB in the firmware and reduction of the capacity of the non-procedural FB.<br>• Contents changed according to addition of the modem loader function.<br>• Descriptions of the standard extended FB in Appendix 2 deleted and reprinted in "Standard Extended FBs for General Purpose Communication Module (FEH255)." |
| Mar. 2004 | FEH225b | • The content of "6-2 Wiring method" was reviewed.<br>• Wrong description in paragraph 3-2-7 was corrected.<br>• Communication specifications for "Modem loader" and "Programming loader" modes were added to paragraph 2-3-2. |
| Jan. 2005 | FEH225c | • NP1L-RS3 was added<br>• Wrong description in paragraph 3-4-1 was corrected.<br>• Paragraph 4-3-1 Note2 was added.<br>• Wrong description in paragraph 6-2-2 was corrected.<br>• Appendix 2-3-1 Memory type code 00h, 01h deleted. |
| Jul. 2006 | FEH225d | • NP1L-RS5 was added (Appendix 4) |

# Contents

## Preface

## Safety Precautions

## Revisions

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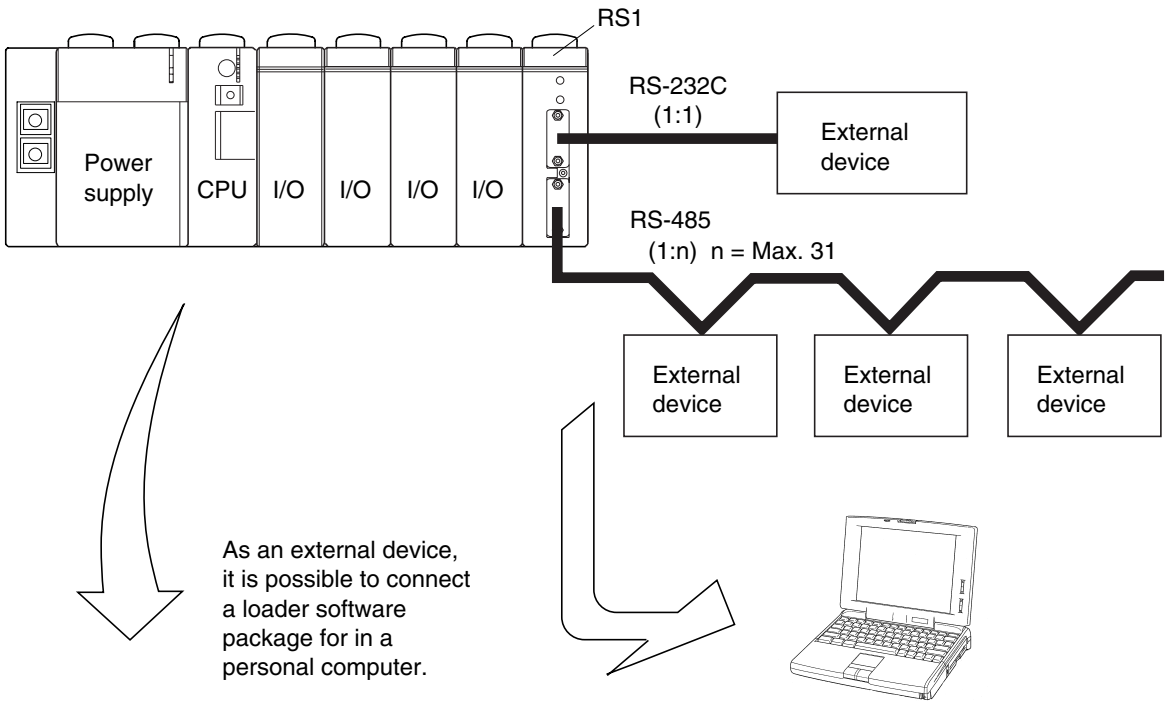
# Contents

# Section 1 General

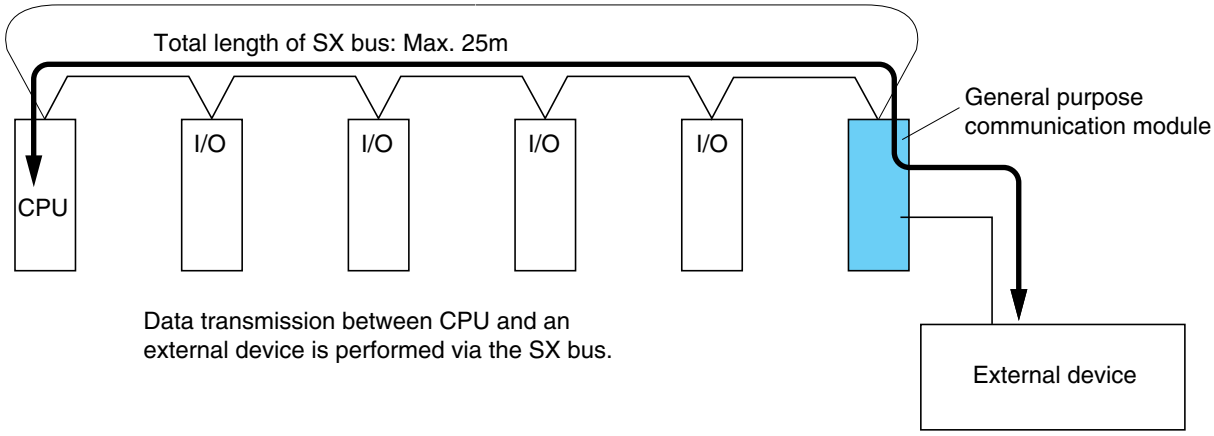
# Section 1 General
## 1-1 General

NP1L-RS1/2/4 are communication modules which enable data communication between a CPU module and external devices, and which are connected to the base board (on the SX bus) of MICREX-SX series. (NP1L-RS1/2/4 are sometimes abbreviated as RS1/2/4.)
The port type and the number of ports are as follows:

| Type | No. of ports |
|---|---|
| NP1L-RS1 | RS-232C: 1 channel, RS-485: 1 channel |
| NP1L-RS2 | RS-232C: 1 channel |
| NP1L-RS4 | RS-485: 1 channel |

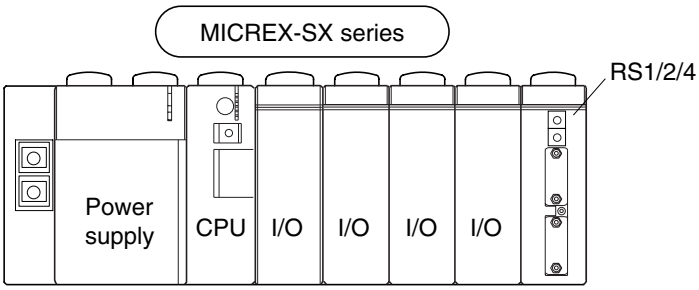



**<Overview of SX bus connection>**



# 1-2 Selections and Programs for the Communication

The following preparations are necessary for RS1/2/4 to communicate between a CPU module of MICREX-SX series and external devices.




<CPU modules side>

· Initializing parameters for a RS-232C port and a RS-485 port.
(Transmission speed, data length, parity bit, stop bits etc.,)
· Application software for the communication.

FA packages are optionally provided for each external device.

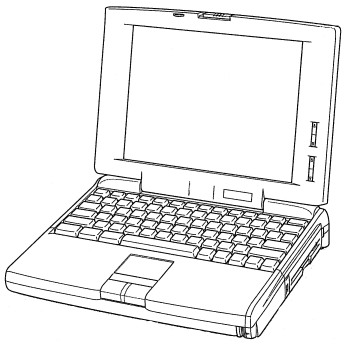
<RS1/2/4 side>

Selection switch of the module is used.
· RS-485 station No. selection switch (0 to F)
If RS-485 port is not used, the selection is not necessary.

· Mode selection switch
Device selection of RS-232C port and RS-485 port, Data conversion

· RS-485 terminating resistor ON/OFF switch
ON/OFF of terminating resistor is selected.
If RS-485 port is not used, this switch is ignored.

External device



<External device side>

· Transmission speed, data length, parity bit, stop bits etc.

· Application software for the communication.

# 1-3 General Purpose Communication Package for Factory Automation Machine

Nonsequenced FB is provided for NP1L-RS1/2/4 to communicate with external serial devices. (Included in D300win.)
General purpose communication package for Factory Automation machine (NP4N-COMF) is provided to communicate with specified external serial devices.
NP4N-COMF includes following function blocks.

| Procedure | FB name | Device |
|---|---|---|
| Temperature controller | _CrkREX | RIKA KOGYOU CO., LTD. REX-F, REX-D, FAREX-SR series |
| | _Com AX | OMRON Corporation. Digital temperature controller E5AX, E5XJ series |
| | _ComCK | OMRON Corporation. Digital temperature controller E5CK series |
| | _CymSDC | Yamatake Corporation. Digitronic temperature controller SDC40A/40G series |
| ID system | _ComV6 | OMRON Corporation. V600 series |
| | _CshDS | SHARP MANUFACTURING SYSTEM CORPORATION. Microwave ID plate system DS series |
| | _CymWAM | Yamatake Corporation. Code distinguish ID system WAM120 series |
| | _CizFP | IDEC IZUMI CORPORATION. Data carrier system FP1A series |
| Bar code reader | _CtkTCD | THOKEN Co., Ltd. TCD8200/8500, TLMS-3200RV series |
| | _CndBCC | NIPPON ELECTRIC INDUSTRY CO., LTD. BCC2600 series, BL500, BL700 |
| | _CkyBL | KEYENCE CORPORATION. BL180 series |
| | _CizDS | IZUMI DATA LOGIC CO., LTD. Bar code reader DS series |
| SECS | _C_SECS | SECS procedure semiconductor manufacturing system (for SECS-I only) |

Note: General purpose communication FB in the table below is included in D300win.

| Type | FB name | | FB Overview |
|---|---|---|---|
| Non-procedural FB | _C_free | (Note 1) | Non-procedural FB Send: 512 words Receive: 512 words |
| | _Cfr252 | (Note 1) | Non-procedural FB Send: 252 words Receive: 252 words |
| | _Cfr128 | (Note 1) | Non-procedural FB Send: 128 words Receive: 128 words |
| | _Cfr64 | (Note 1) | Non-procedural FB Send: 64 words Receive: 64 words |
| | _Cfr32 | (Note 1) | Non-procedural FB Send: 32 words Receive: 32 words |
| | _Cfrpr | (Note 1) | Non-procedure FB which built into communication protocol<br>Send: 512 words Receive: 512 words<br>The program capacity is reduced by performing a part of the communication processing with the module. |
| | _Cfrp2 | (Note 2) | Non-procedure FB which built into communication protocol<br>Send: 512 words Receive: 512 words<br>The program capacity is reduced by performing a part of the communication processing with the module.In addition, communication processing can be mabe high-speed by using two SX bus message ports. |
| For FUJI Inverter | _CfdFRN | (Note 2) | For FUJI Inverter FRENIC series |
| | _CfdFVR | (Note 2) | For FUJI Inverter FVR-C11 series (FGI-BUS) |
| | _Cfvrpr | (Note 2) | For FUJI Inverter FVR-C11 series (FGI-BUS)<br>The program capacity is reduced by performing a part of the communication processing with the module. |
| For FUJI heater | _CfdPYX | (Note 2) | For FUJI heater PYX series and PYH series |
| For FUJI bar code | _CfdPK | (Note 2) | For FUJI bar code reader PK2 series |

Note 1: Refer to Section 4 in this manual.
Note 2: For _Cfrp2, _CfdFRN, _CfdFVR, _Cfvrpr, _CfdPYX, and _CfdPK, refer to “MICREX-SX USER'S MANUAL STANDARD EXTENDED FB (FEH255).”

# 1-4 Product Versions and Supported Functions

For the general purpose communication module, supported functions and available FBs depend on the product version.

### 1-4-1 Supported functions

Note 2: ○: supported ×: Not supported

| Format and version | Modem-based loader function 1 | Modem-based loader function 2 |
|---|---|---|
| Earlier than NP1L-RS1 V.1031 | x | x |
| Earlier than NP1L-RS2 V.1031 | x | x |
| Earlier than NP1L-RS4 V.1031 | —Note 1 | —Note 1 |
| NP1L-RS1 V.1031 or later | o | x |
| NP1L-RS2 V.1031 or later | o | x |
| NP1L-RS4 V.1031 or later | —Note 1 | —Note 1 |
| NP1L-RS1 V.2535 or later | o | o |
| NP1L-RS2 V.2535 or later | o | o |
| NP1L-RS4 V.2535 or later | —Note 1 | —Note 1 |

Note 1: The modem-based loader functions are functions which realize remote operation and programming by connecting a modem to the RS-232C port and using the public circuit. These functions cannot be used with the NP1L-RS4 which is provided only with the RS-485 port.
Note 2: With modem-based function 1, the transmission rate between this module and a commercial modem is fixed to 19200 bps. With modem-based function 2, the transmission rate can be selected from 9600, 19200, and 38400 bps.

### 1-4-2 Available standard extended FB

| FB Name | FB Overview | Applicable version of general purpose communication module |
|---|---|---|
| _C_free | Non-procedural FB Send: 512 words Receive: 512 words | All versions |
| _Cfr252 | Non-procedural FB Send: 252 words Receive: 252 words | |
| _Cfr128 | Non-procedural FB Send: 128 words Receive: 128 words | |
| _Cfr64 | Non-procedural FB Send: 64 words Receive: 64 words | |
| _Cfr32 | Non-procedural FB Send: 32 words Receive: 32 words | |
| _Cfrpr | Non-procedure FB which built into communication protocol<br>Send: 512 words Receive: 512 words<br>The program capacity is reduced by performing a part of the communication processing with the module. | V.2535 or later |
| _CfRP2 | Non-procedure FB which built into communication protocol<br>Send: 512 words Receive: 512 words<br>The program capacity is reduced by performing a part of the communication processing with the module.In addition,communication processing can be mabe high-speed by using two SX bus message ports. | V.2536 or later |
| _CfdFRN | For FUJI Inverter FRENIC series | All versions Note 1 |
| _CfdFVR | For FUJI Inverter FVR-C11 series (FGI-BUS) | All versions Note 1 |
| _Cfvrpr | For FUJI Inverter FVR-C11 series (FGI-BUS)<br>The program capacity is reduced by performing a part of the communication processing with the module. | V.2536 or later Note 1 |
| _CfdPYX | For FUJI heater PYX series and PYH series | All versions Note 1 |
| _CfdPK | For FUJI bar code reader PK2 series | All versions Note 2 |

Note 1: This FB uses the RS-485 port. Cannot be used with the NP1L-RS2 which is provided only with the RS-232C port.
Note 2: This FB uses the RS-232C port. Cannot be used with the NP1L-RS4 which is provided only with the RS-485 port.

# Section 2 Specifications

Page

# Section 2 Specifications

## 2-1 General Specifications

| Item | | Specification |
|---|---|---|
| Physical environmental conditions | Operating ambient temperature | 0 to 55° C |
| | Storage temperature | -25 to +70° C |
| | Relative humidity | 20 to 95%RH no condensation |
| | Pollution degree | 2 |
| | Corrosion immunity | Free from corrosive gases. Not stained with organic solvents. |
| | Operating altitude | 2000m or less above sea level (Transport condition: 70kPa or more) |
| Mechanical service conditions | Vibration | Half amplitude: 0.15mm, Constant acceleration: 19.6m/s$^2$ |
| | Shock | Acceleration peak: 147m/s$^2$ |
| Electrical service conditions | Noise immunity | 1.5kV (1kV: clamping to transmission line) , rise time 1ns, pulse width 1μs (noise simulator) |
| | Electrostatic discharge | Contact discharge: ±6kV<br>Aerial discharge: ±8kV |
| | Radioelectromagn-etic field | 10V/m (80MHz to 1000MHz) |
| Construction | | Panel-mounted type |
| Cooling | | Air cooling |
| Isolation method | | Photocoupler |
| Dielectric strength | | 445V AC 1 minute (between I/O connector pins and ground) |
| Insulation resistance | | 10MΩ or more with 500V DC megger (between I/O connector pins and ground) |
| Internal current consumption | | NP1L-RS1: 24V DC, 110mA or less<br>NP1L-RS2: 24V DC, 90mA or less<br>NP1L-RS4: 24V DC, 80mA or less |
| Mass | | NP1L-RS1: Approx. 170g<br>NP1L-RS2: Approx. 160g<br>NP1L-RS4: Approx. 160g |
| Dimensions | | Described in 2-4 |

| Item | | | Specification | |
|---|---|---|---|---|
| | | | RS-232C | RS-485 |
| Type | | | NP1L-RS1, NP1L-RS2, NP1L-RS4 | |
| External interface | Port | NP1L-RS1 | 1 channel | 1 channel |
| | | NP1L-RS2 | 1 channel | — |
| | | NP1L-RS4 | — | 1 channel |
| | Communication method | | half-duplex communication (Note 1) | |
| | Synchronization method | | Start-stop synchronous transmission | |
| | Transmission speed | | 1200/2400/4800/9600/19200/38400/57600 bps (Note 2)<br>(for RS1, max. 57600bps or less in total of 2 channels) (Note 3) | |
| | Transmission distance | | 15m or less | 1km or less (transmission speed: 19.2kbps or less) |
| | No. of connectable modules | | 1:1 (One external device) | 1:31 (Max.) |
| | Connection method | | D-sub, 9-pin connector (female) | D-sub, 9-pin connector (male) |
| Transmission protocol | | | Depends on the application program (FB) in the CPU module.<br>Non-procedural FB (Included in D300win) | |
| Occupied slot | | | 1 slot | |
| Status indication LED | | | ONL: Normally running — Green<br>ERR: General purpose communication module — Red | |
| | | | ALM: Communication error — Red<br>RXD: Signal receiving — Green<br>TXD: Signal sending — Green | ALM: Communication error — Red<br>RXD: Signal receiving — Green<br>TXD: Signal sending — Green |
| | | | TS1, TS2: Self-diagnosis — Green | |

Note 1: The use of the non-procedural FB allows this mode to be used like the full-duplex mode on applications.
Note 2: Transmission rates 300, 600, 76800, and 115200 bps can be used in the following combinations:

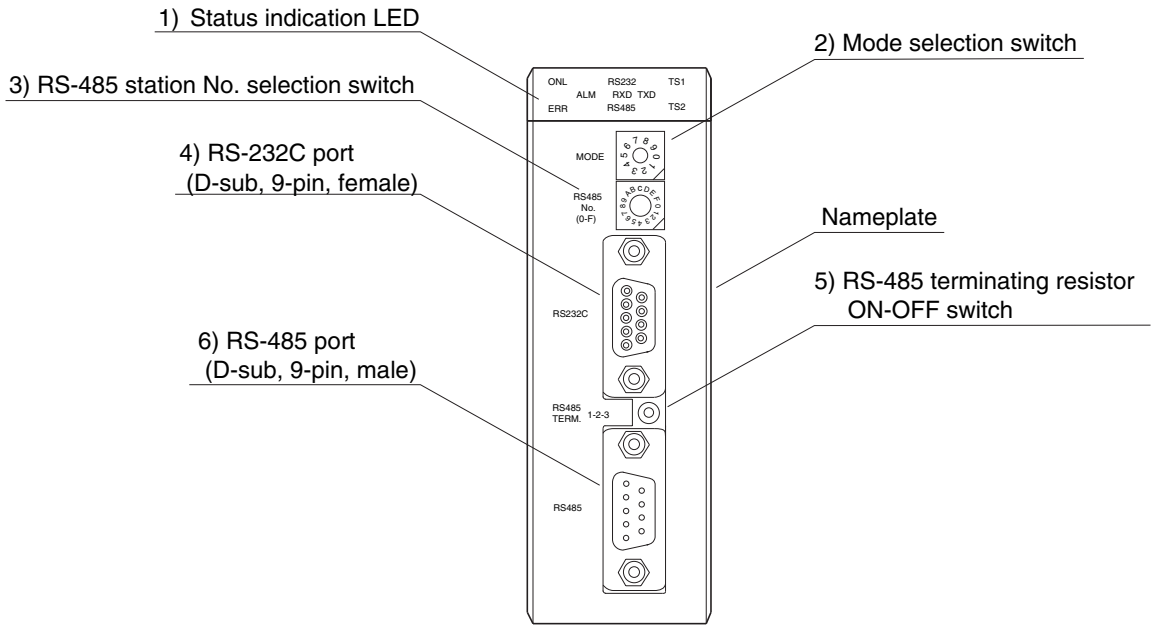
| Version of general purpose communication module | Standard extended FB |
|---|---|
| V.2535 or later | _Cfrpr (Non-procedural FB with built-in protocol) |
| V.2536 or later | _Cfrp2 (Non-procedural FB with built-in protocol, 2-message version)<br>_Cfvrpr (Inverter procedure FB with built-in protocol) |

Note 3: This limitation is applied to RS1 before version V2535.

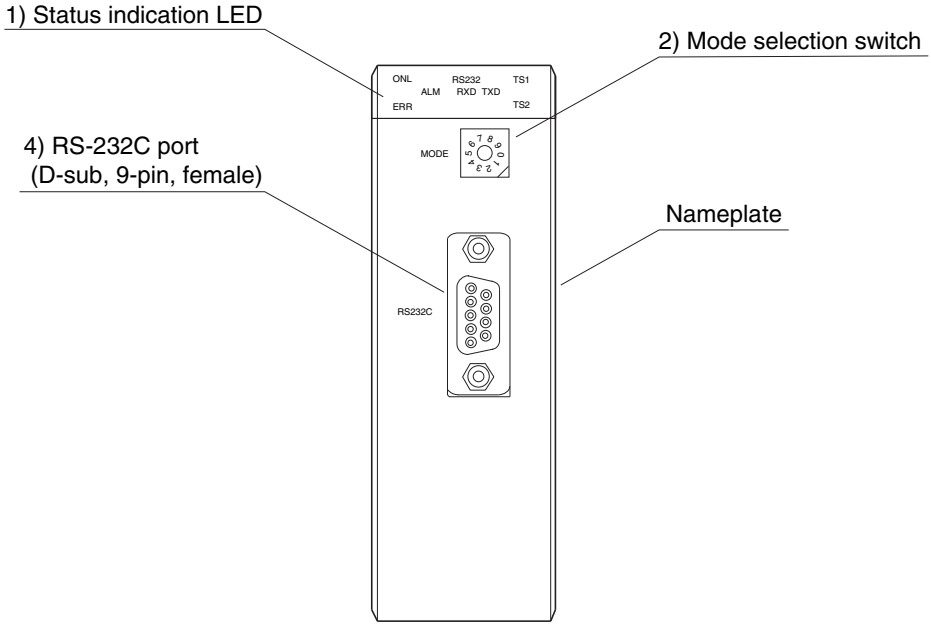
# 2-3 Names and Functions

## 2-3-1 Names

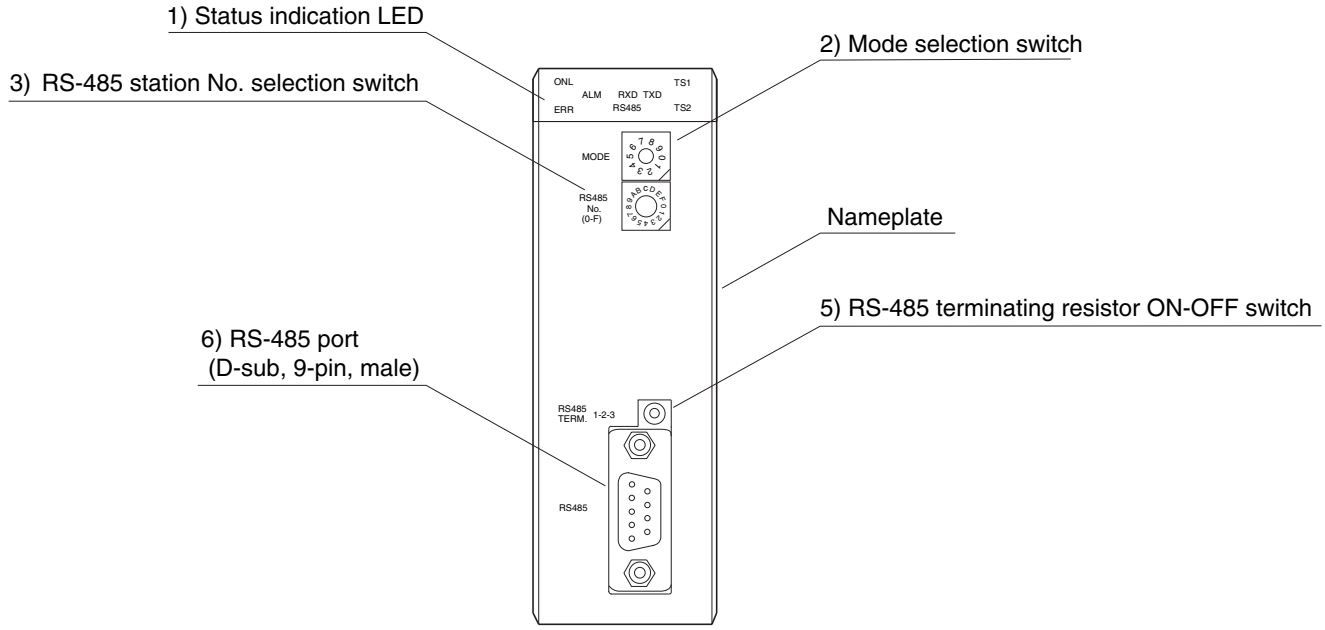
### (1) NP1L-RS1




### (2) NP1L-RS2



**(3) NP1L-RS4**

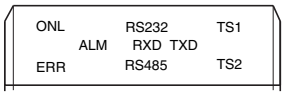



## 2-3-2 Functions

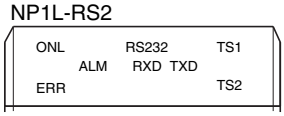
**1) Status indication LED**

This LED indicates the running status of NP1L-RS1/2/4.

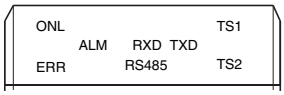
NP1L-RS1




NP1L-RS2




NP1L-RS4




| Symbol | Color | Description |
|---|---|---|
| ONL | Green | Turns on when the module is ready to communicate with the SX bus. |
| ERR | Red | Turns on when the module is abnormal. |
| RS232C ALM | Red | Turns on when the communication data via RS-232C is abnormal. |
| RS232C RXD | Green | Turns on when the RS-232C port is receiving data. |
| RS232C TXD | Green | Turns on when data is being sent from the RS-232C port. |
| RS485 ALM | Red | Turns on when the communication data via RS-485 is abnormal. |
| RS485 RXD | Green | Turns on when the RS-485 port is receiving data. |
| RS485 TXD | Green | Turns on when data is being sent from the RS-485 port. |
| TS1 | Green | Blinks when internal RAM error is detected in self-diagnosis mode 7. Blinks when RS-232C turning back test is abnormal in self-diagnosis mode 8. (RST-CTS turning-back error) |
| TS2 | Green | Blinks when RS-232C turning back test is abnormal in self-diagnosis mode 8. (DTR-DSR turning-back error) |

*** Example of LED status by module status**

| | ONL | ERR | ALM |
|---|---|---|---|
| Fatal fault of module | OFF | ON | — |
| Nonfatal fault of module | ON | ON | — |
| Data error | ON | OFF | ON |

**2) Mode selection switch**

This switch is used to select a connectable device, the signal conversion and the self-diagnosis for the RS-232C port and the RS-485 port.

**MODE**


| Switch No. | Mode | | | Remarks |
|---|---|---|---|---|
| | RS-232C port | RS-485 port | RS-232C ⇔ RS-485 Signal conversion | |
| 0 | General purpose device | General purpose device | Not available | |
| 1 | Programming loader | General purpose device | Not available | |
| 2 | General purpose device | Programming loader | Not available | |
| 3 | Programming loader | Programming loader | Not available | Applies to V2535 or later. |
| 4 | General purpose device | General purpose device | Available | |
| 5 | Not used | | | |
| 6 | Modem-loder 19200 bps | General purpose device | Not available | Applies to V1031 or later. |
| 7 | Self-diagnosis mode 1 (diagnoses internal memory and LED) | | | |
| 8 | Self-diagnosis mode 2 (diagnoses RS-232C, RS-485 turning back) | | | |
| 9 | Modem-loder 19200 bps | Programming loader | Not available | Applies to V1031 or later. |
| A | Modem-loder 9600 bps | General purpose device | Not available | Applies to V2535 or later. |
| B | Modem-loder 9600 bps | Programming loader | Not available | |
| C | Modem-loder 38400 bps | General purpose device | Not available | |
| D | Modem-loder 38400 bps | Programming loader | Not available | |
| E | Modem-loder 76800 bps | General purpose device | Not available | Applies to V2536 or later. |
| (Note 5) F | Modem-loder 115200 bps | Modem-loder 115200 bps | — | |

Note 1: For details of the function mode, refer to “3-2 System configuration.”
Note 2: For the self-diagnosis, refer to “3-4 Self-diagnosis.”
Note 3: “Programming loader” is the mode for connecting to D300win. Communication specifications are fixed to” 38400 bps” for transmission speed, “8 bits” for data length, “1 bit” for stop bits, and “even” for parity.
Note 4: “Modem-loader" is the mode that is basically used to connect to D300win loader via a modem. In general, for modems, “none” is specified for parity. Therefore, in this mode, communication specifications become “8 bits” for data length, “1 bit” for stop bits, and “none” for parity.
Note 5: Either channel is selected and used.

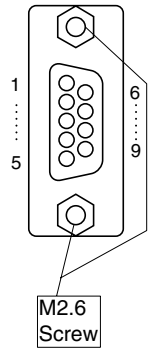
**3) RS-485 station No. selection switch**

This switch used to select a RS-485 station number of NP1L-RS1 or NP1L-RS4. Selecting range is 0 to F.

**RS485 No. (0-F)**

**4) RS-232C port**

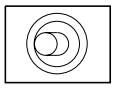
This port is D-sub, 9-pin connector (female). This connector is connected to D-sub, 9-pin connector (male).




| Pin No. | Signal name | Signal direction RS1/2 to external device | Description |
|---|---|---|---|
| 1 | CD | ⇐ | Carrier detect |
| 2 | RD | ⇐ | Receive data |
| 3 | SD | ⇒ | Send data |
| 4 | ER | ⇒ | Data terminal ready |
| 5 | SG | | Signal ground (common return) |
| 6 | DR | ⇐ | Data set ready |
| 7 | RS | ⇒ | Request to send |
| 8 | CS | ⇐ | Clear to send |
| 9 | RI | ⇐ | Call indication |

**5) RS-485 terminating resistor ON/OFF switch**

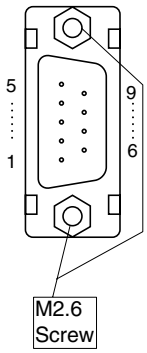
This switch used to select the ON/OFF of the RS-485 terminating resistor. There are three positions for this switch.



| Switch position | Status |
|---|---|
| Left | 2-wire type, Terminating resistor is available. |
| Center | Terminating resistor is not available. |
| Right | 4-wire type, Terminating resistor is available. |

**6) RS-485 port**

This port is D-sub, 9-pin connector (male). This connector is connected to D-sub, 9-pin connector (female).

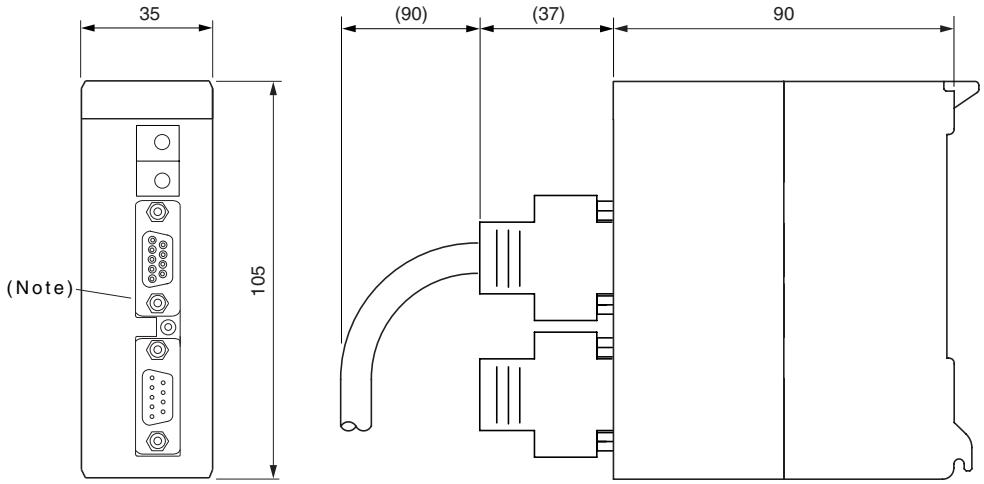



| Pin No. | Signal name | Signal direction RS1/4 to External device | Description |
|---|---|---|---|
| 1 | SDB | ⇒ | Send data signal line (-) |
| 2 | SDA | ⇒ | Send data signal line (+) |
| 3 | (SDB) | ⇒ | (Send data signal line (-)) |
| 4 | (SDA) | ⇒ | (Send data signal line (+)) |
| 5 | SG | | Signal ground (common return) |
| 6 | FG | | Frame ground |
| 7 | | | |
| 8 | RDB | ⇐ | Receive data signal line B (-) |
| 9 | RDA | ⇐ | Receive data signal line A (+) |

Note: For wiring, refer to “6-2 Wiring.”

# 2-4 Dimensions

Dimensions are same for NP1L-RS1,NP1L-RS2 and NP1L-RS4.




Note: Front formation depends on each type.

# Section 3 System Configuration

Page

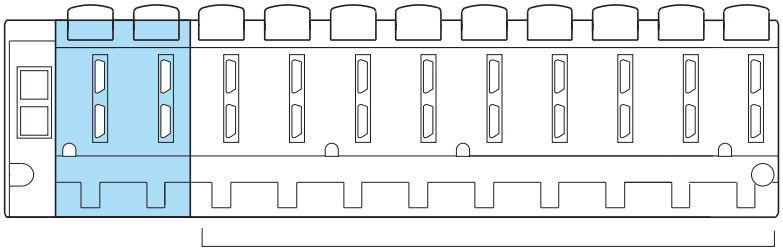
# Section 3 System Configuration
## 3-1 Mounting Restrictions

### 3-1-1 Mounting position

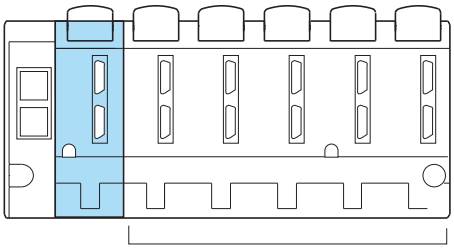
NP1L-RS1/2/4 is a general purpose communication module which is connected to the SX bus of MICREX-SX series. The mounting position on the base board is restricted as follows:

They can be mounted in any slot except those for the power supply module (the two slots from the left on the base board).

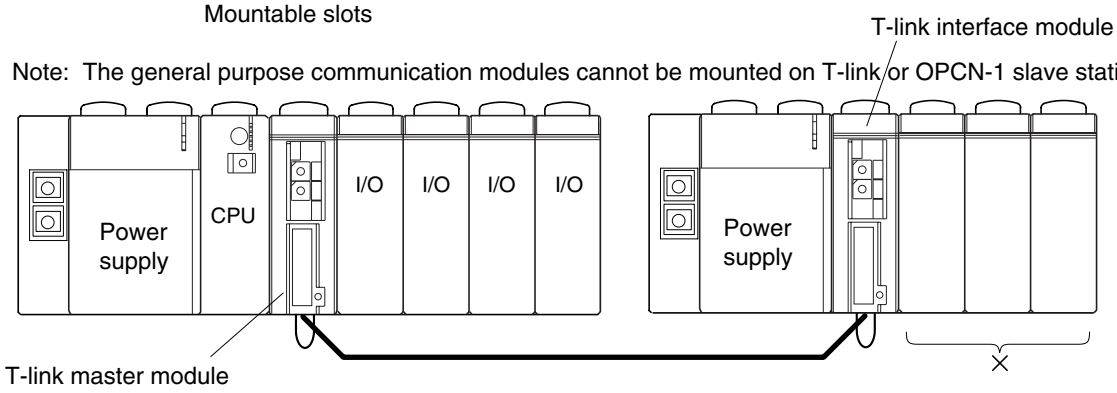
**<Base board other than 6-slots base board>**




**<6-slots base board>**




Note: The general purpose communication modules cannot be mounted on T-link or OPCN-1 slave station base boards.




### 3-1-2 Number of mountable modules

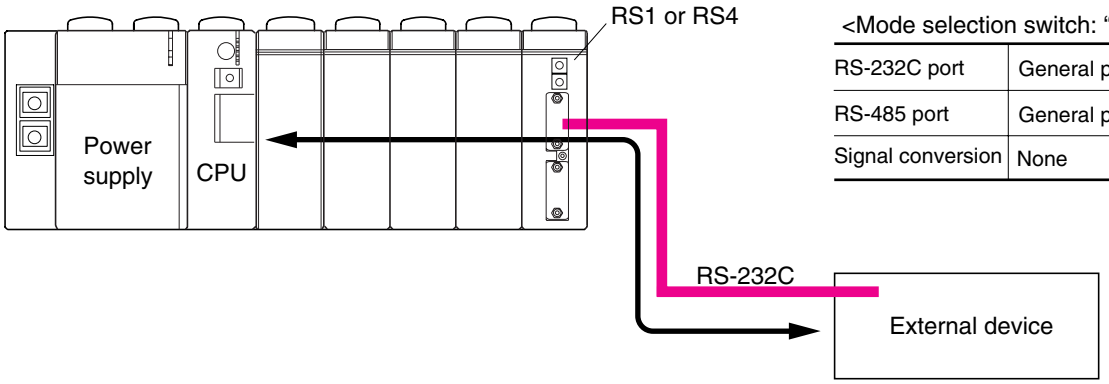
A maximum of 16 modules per configuration can be connected. However, when other communication related modules are used in the same configuration, the maximum number of 16 is the total of these and NP1L-RS1/2/4 modules.

P-link module (NP1L-PL1)
PE-link module (NP1L-PE1)
FL-net (OPCN-2) module (NP1L-FL1)
General purpose communication module (NP1L-RS1/2/4)
PC card interface module (NP1F-PC2)
Memory card interface module (NP1F-MM1)

] Maximum of 16 modules per configuration.

### 3-2-1 1:1 Connection using RS-232C port

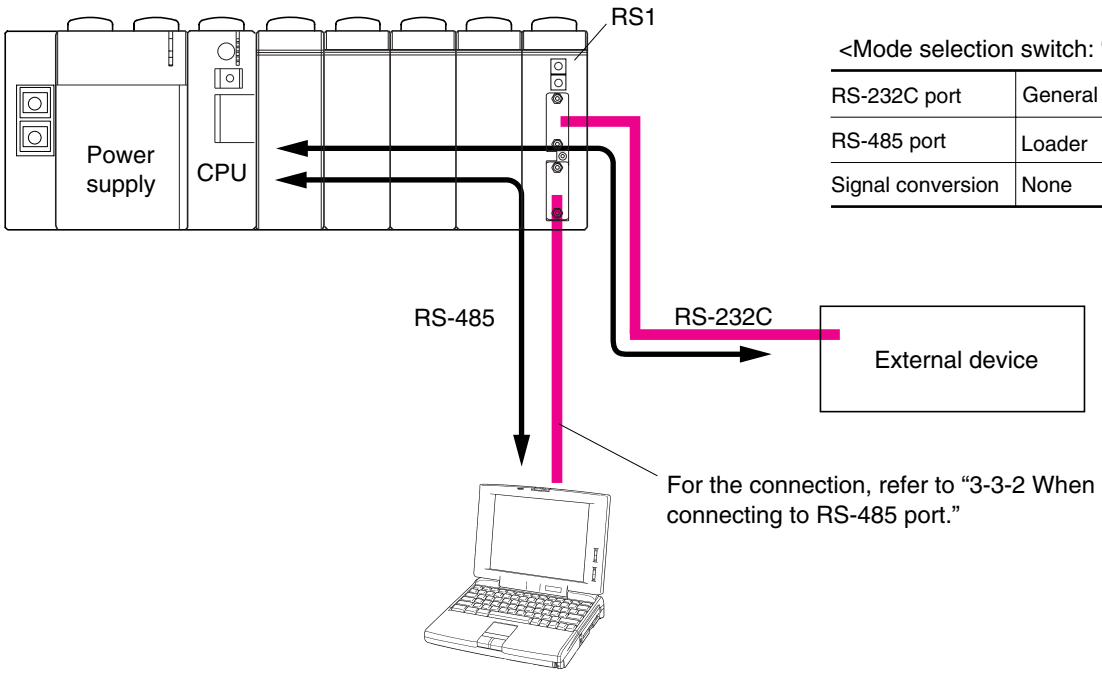
This configuration connects to an external device having an RS-232C interface via the RS-232C port.
The mode selection switch is set to “0” (zero).




<Mode selection switch: “0”>

| | |
|---|---|
| RS-232C port | General purpose device |
| RS-485 port | General purpose device |
| Signal conversion | None |

* With RS1, a D300win personal computer loader can be connected to an RS-485 port which is not used.
  In this case, the mode selection switch needs to be set to “2.”

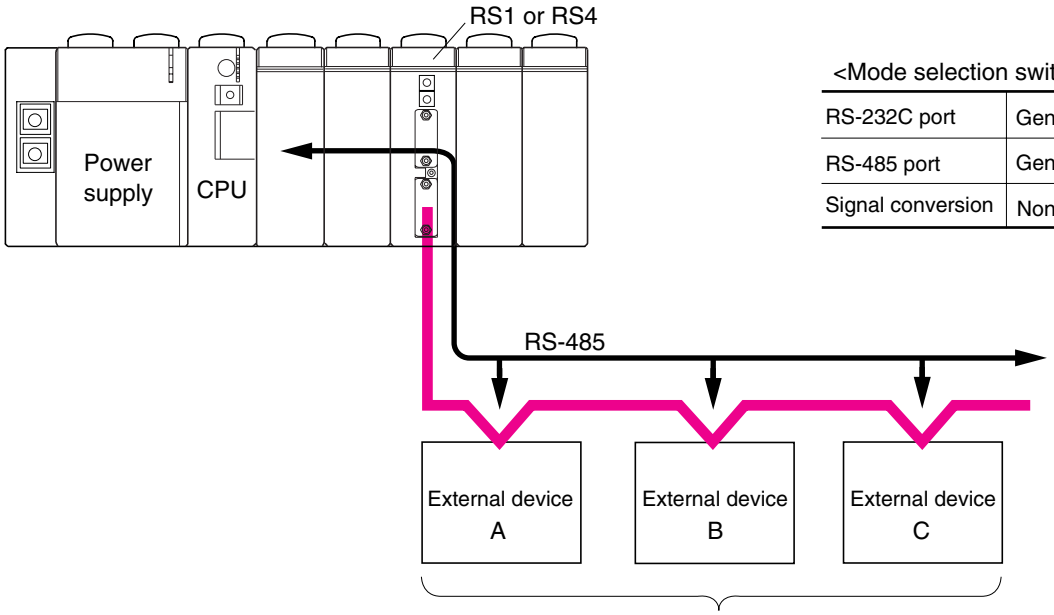



<Mode selection switch: “2”>

| | |
|---|---|
| RS-232C port | General purpose device |
| RS-485 port | Loader |
| Signal conversion | None |

### 3-2-2 1:N Connection using RS-485 port (N = max. 31 modules)

This configuration connects to external devices having an RS-485 interface via the RS-485 port. The mode selection switch is set to "0." A maximum of 31 external devices can be connected. However, when all external devices are RS1 or RS4, the maximum number is limited to 15 because only 0 to F are available for addressing.

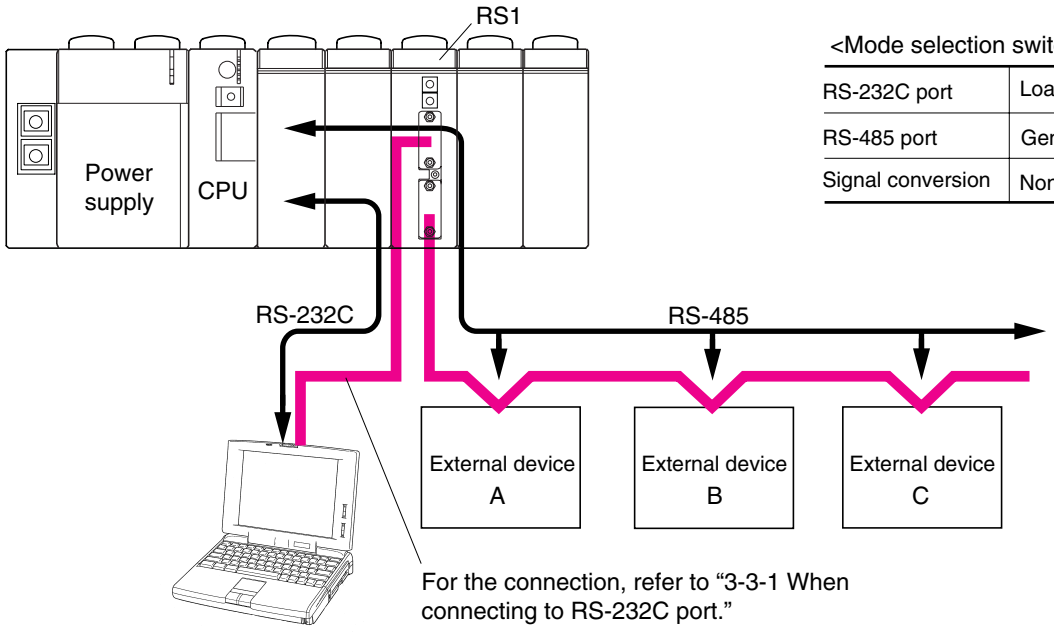



<Mode selection switch: "0">

| | |
|---|---|
| RS-232C port | General purpose device |
| RS-485 port | General purpose device |
| Signal conversion | None |

Note: External devices A , B and C must be the same in type as well as communication protocol. For example, this connection is not available when A and B are temperature controllers and C is a bar code reader.

* With NP1L-RS1, a D300win personal computer loader can be connected to an RS-232C port which is not in use. In this case, the mode selection switch needs to be set to "1."

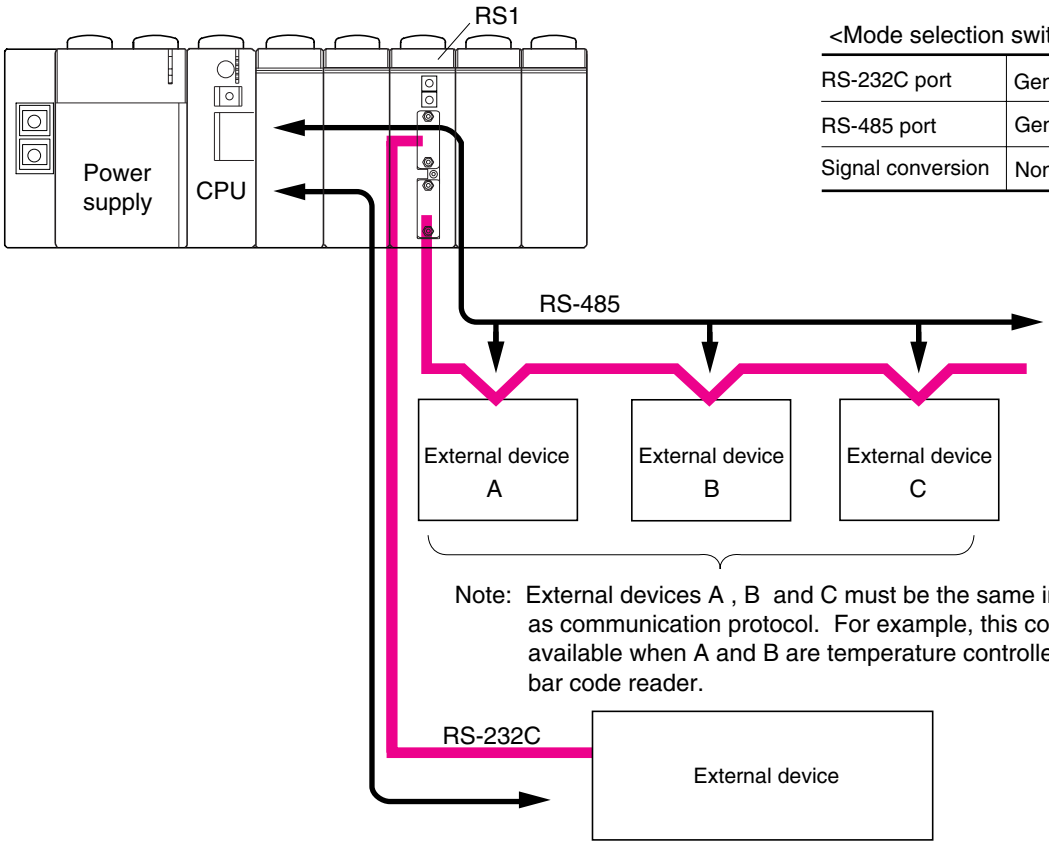



<Mode selection switch: "1">

| | |
|---|---|
| RS-232C port | Loader |
| RS-485 port | General purpose device |
| Signal conversion | None |

### 3-2-3 Connecting independently to RS-232C and RS-485 ports

This configuration connects to external devices using the RS-232C port and RS-485 port. In this case, communication through these ports is performed independently.



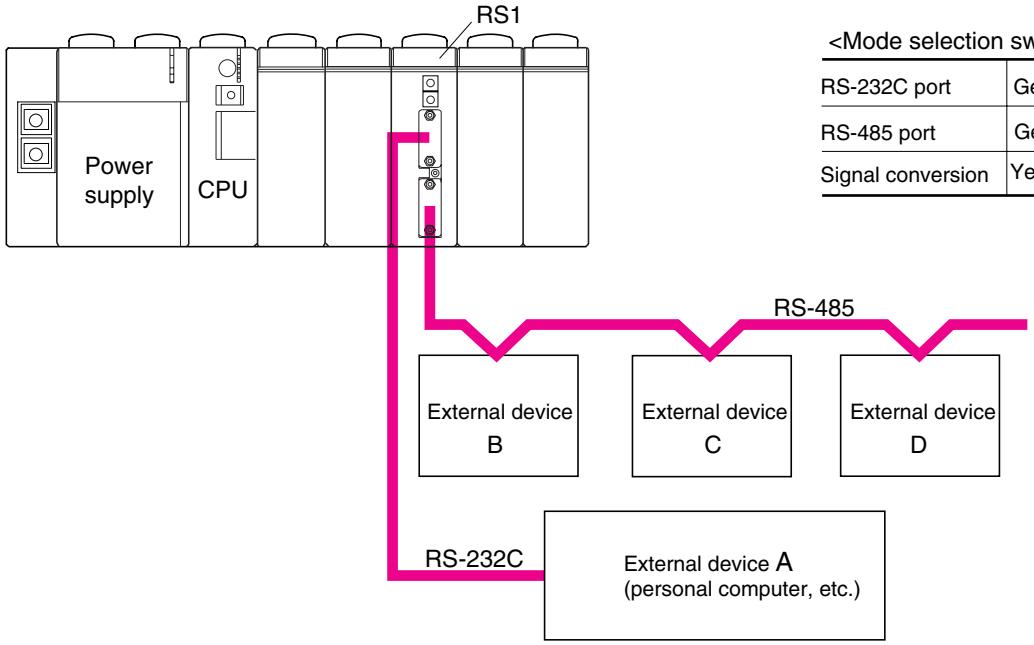

<Mode selection switch: "0">

| | |
|---|---|
| RS-232C port | General purpose device |
| RS-485 port | General purpose device |
| Signal conversion | None |

Note: External devices A , B and C must be the same in type as well as communication protocol. For example, this connection is not available when A and B are temperature controllers and C is a bar code reader.

### 3-2-4 Connection using RS-232C and RS-485 ports (2)

This configuration connects to external devices using the RS-232C port and RS-485 port.




<Mode selection switch: "0">

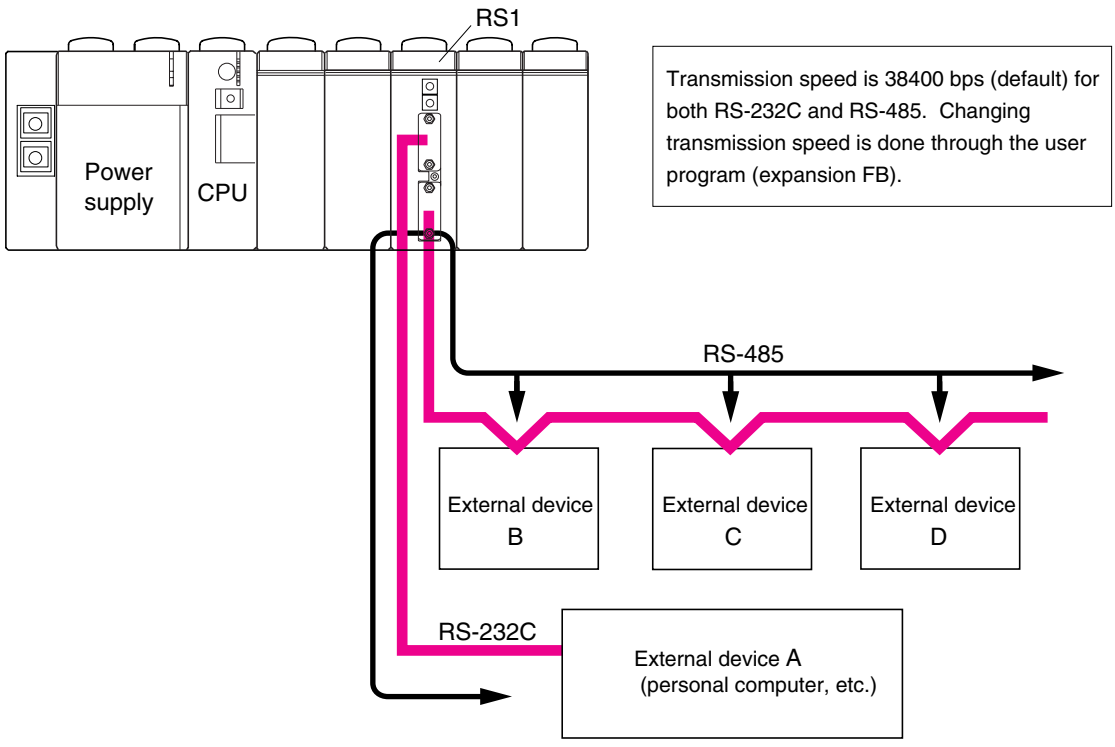
| | |
|---|---|
| RS-232C port | General purpose device |
| RS-485 port | General purpose device |
| Signal conversion | Yes |

With this configuration, the following communications can be performed :

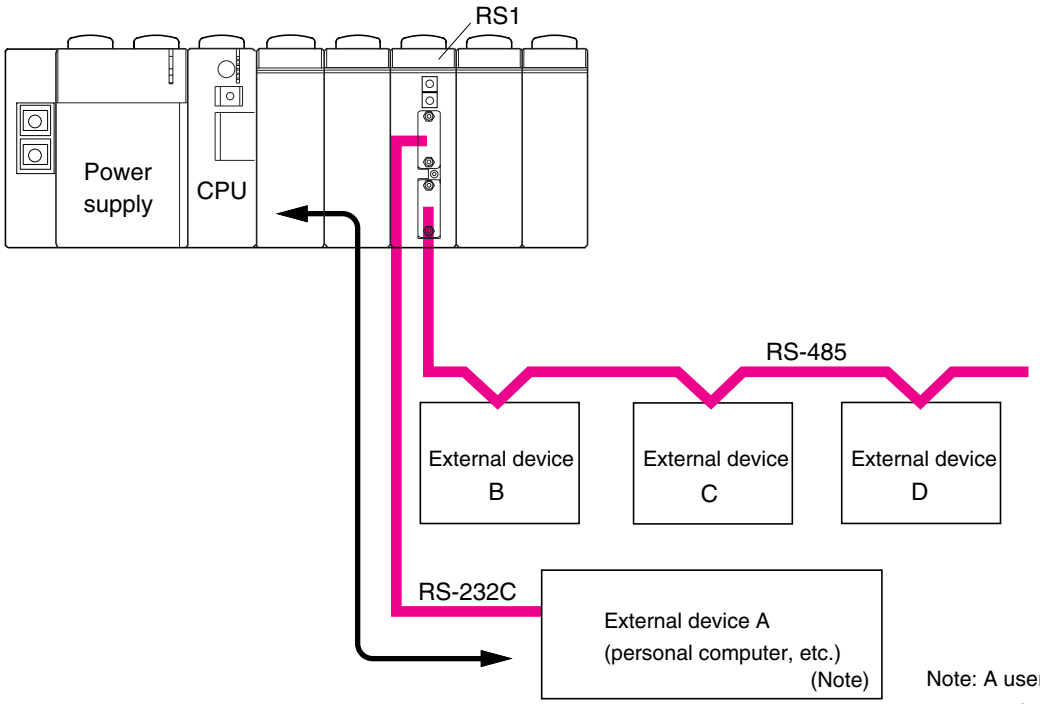
1) Communication between external device A and external device B, C or D (not via the CPU module)
2) Communication between external device A and CPU module
3) Communication between external device B, C or C and CPU module

**<1) Communication between external device A and external device B, C or D>**

This communication is performed directly, namely not via the CPU module.

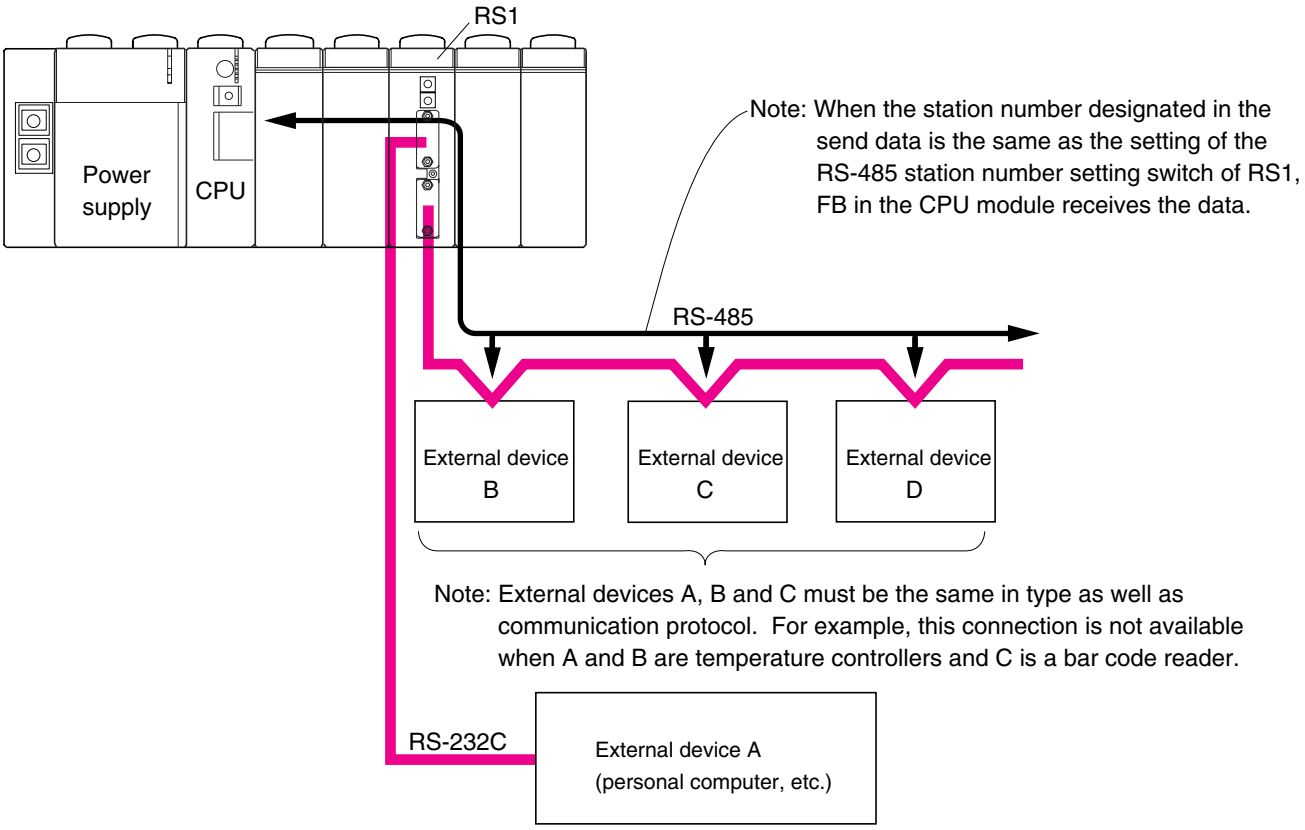


**<2) Communication between external device A and the CPU module>**



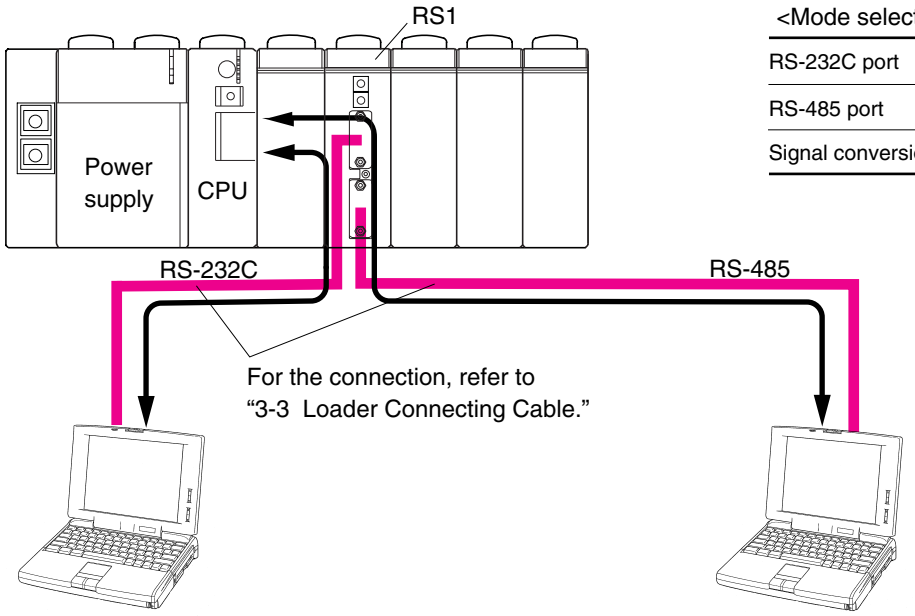

Note: A user program for controlling external device A is necessary.

**<3) Communication between external device B, C or D and the CPU module>**



### 3-2-5 Connecting a personal computer loader to the RS-232C port and RS-485 port

This configuration connects a D300win personal computer loader to each of RS-232C and RS-485 ports.




<Mode selection switch: “3”>

| | |
|---|---|
| RS-232C port | Loader |
| RS-485 port | Loader |
| Signal conversion | None |

### 3-2-6 Loader network configuration using RS-485

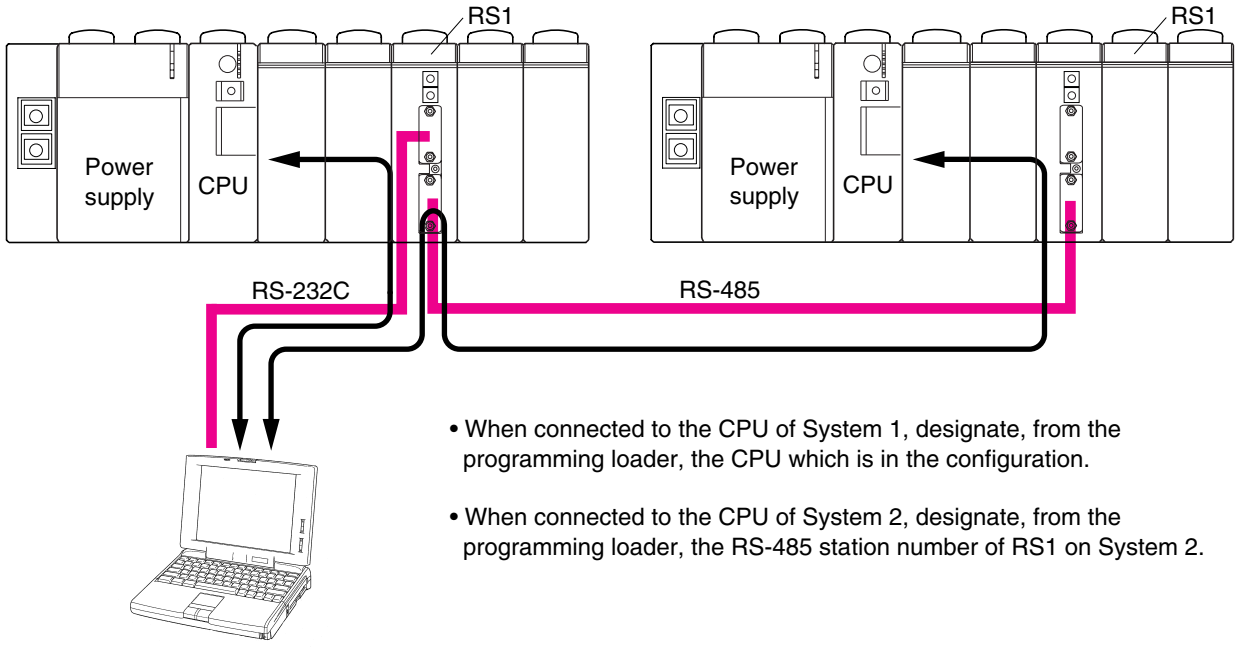
This configuration connects a D300win personal computer loader to the RS-232C port of RS1 on System 1.
A D300win can communicate with both CPUs of System 1 and System 2.

<Mode selection switch of System 1: “5”>

| | |
|---|---|
| RS-232C port | Loader |
| RS-485 port | General device/loader |
| Signal conversion | Yes |

<Mode selection switch of System 2: “2”>

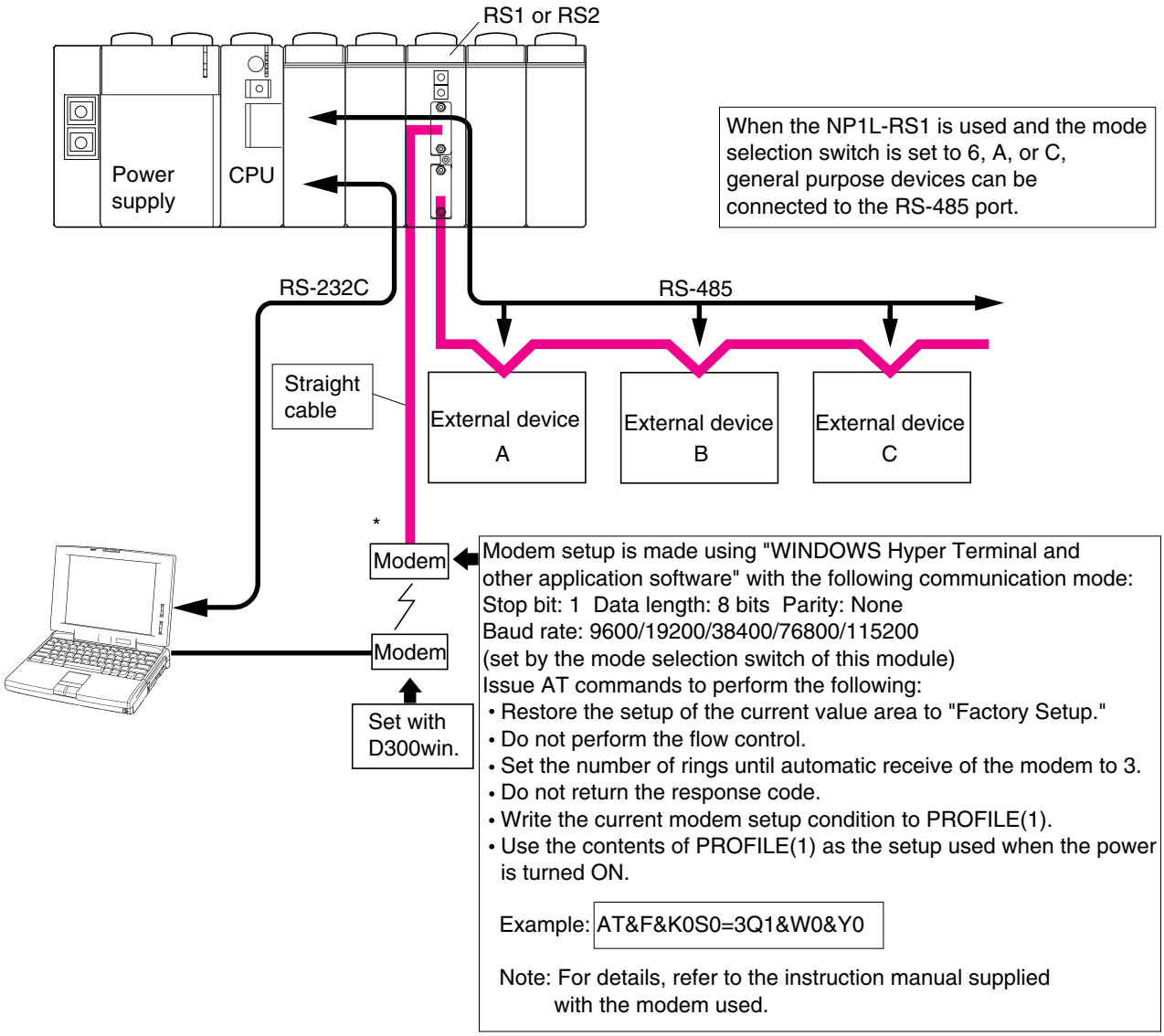
| | |
|---|---|
| RS-232C port | —— |
| RS-485 port | Loader |
| Signal conversion | Normal |




- When connected to the CPU of System 1, designate, from the programming loader, the CPU which is in the configuration.
- When connected to the CPU of System 2, designate, from the programming loader, the RS-485 station number of RS1 on System 2.

### 3-2-7 Loader network configuration using modems (1)

This configuration enables remote programming using the public circuit by connecting a modem to the RS-232C port.

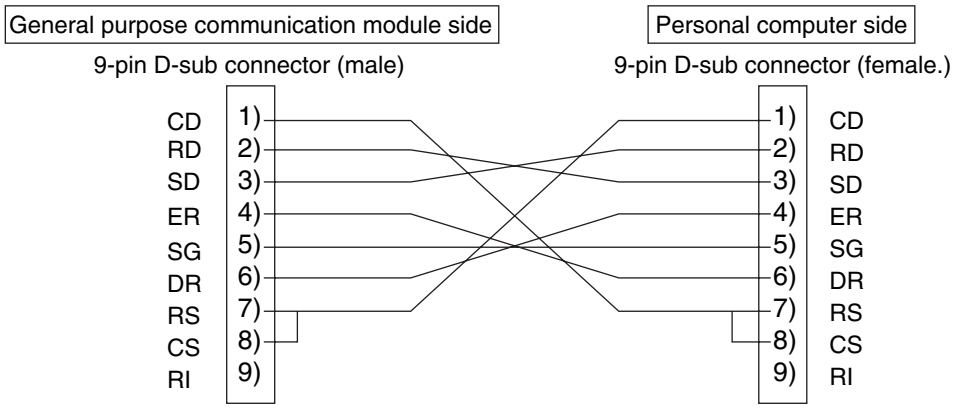


# 3-3 Loader Connecting Cable

To connect a D300win personal computer loader to the RS-232C or RS-485 port of the general purpose communication module, the cable must be connected in the following manner.

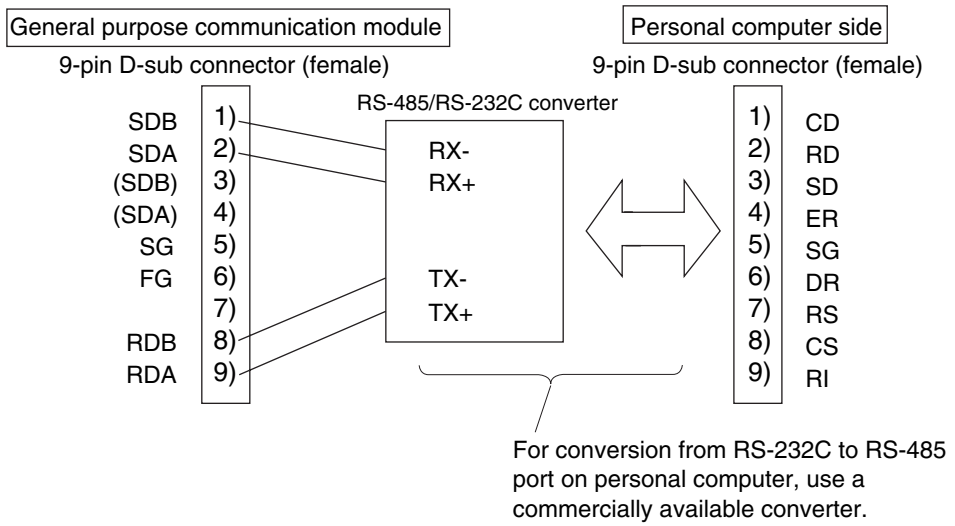
### 3-3-1 When connecting to RS-232C port

Because the RS-232C connector of the general purpose communication module is “female,” attach the male connector onto the cable connector for the general purpose communication module, as shown in the figure below:




### 3-3-2 When connecting to RS-485 port

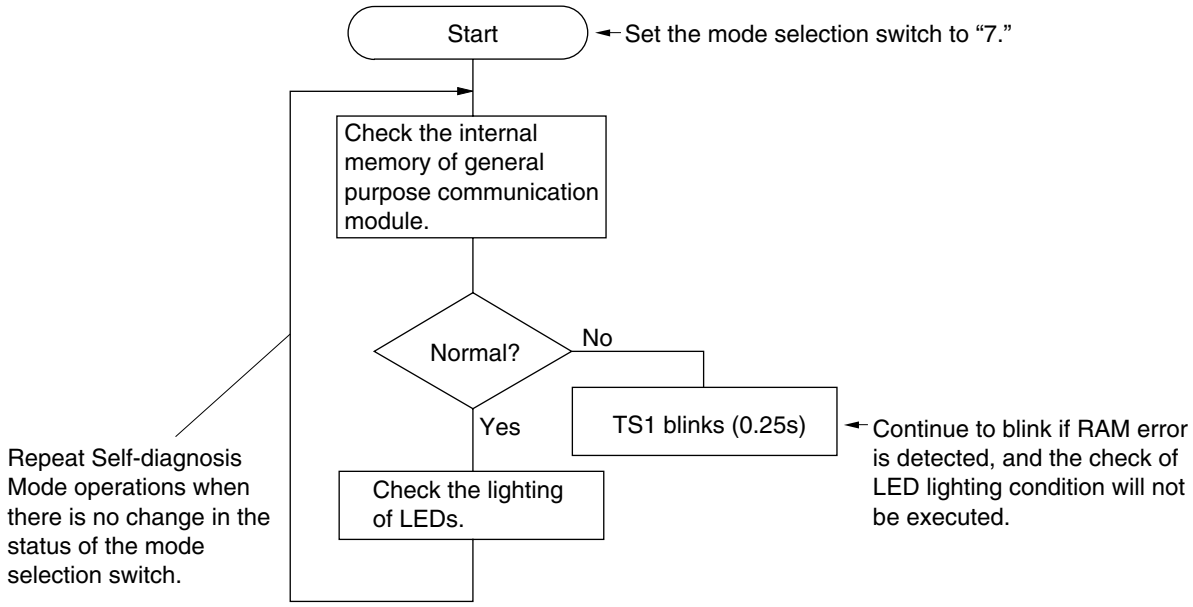
Because the RS-485 connector of the general purpose communication module is “male,” attach the female connector onto the cable connector for the general purpose communication module, as shown in the figure below:



### 3-4-1 Self-diagnosis mode 1

Setting the mode selection switch of the module to “7” activates Self-diagnosis Mode “1.”
This mode is used to check the internal memory and the lighting condition of LEDs.

**<Diagnosis flow>**



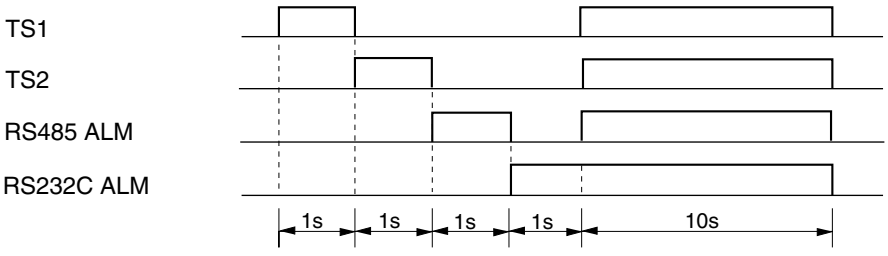

**1) Internal memory check**

After the completion of LED lighting check, automatically returns to the diagnosis of the internal memory of general purpose communication module.
If an internal memory error is detected, “TS1” blinks.

**2) LED lighting check**

Of the external LEDs of the module, the lighting condition of those operated by the general purpose communication module are checked. When the mode selection switch is set to “7,” “TS1,” “TS2,” “RS-485 ALM” and “RS-232C ALM” LEDs light up in this order.

**<Normal lighting condition of LEDs>**



### 3-4-2 Self-diagnosis mode 2

This mode is used to check the completeness of communications by looping back sent data and control signals via the communication port.

**(1) RS to CS signal check**

In this check, the general purpose communication module turns RS signal ON to check whether CS signal is looped back and turns ON, and then checks that this signal turns OFF.

When normal, "TS2" lights up; proceeds to step (2).

If abnormal, "TS2" blinks (at 0.5-second intervals) after 5 seconds; proceeds to step (2).

**(2) ER to DR signal check**

In this check, the general purpose communication module turns ER signal ON to check whether DR signal is looped back and turns ON, and then checks that this signal turns OFF.

When normal, "TS1" lights up; proceeds to step (3).

If abnormal, "TS1" blinks (at 0.5-second intervals) after 5 seconds; proceeds to step (3).

**(3) RS-232C/RS-485 data check**

The general purpose communication modules sends 16 bytes of data once and checks the looped back data received.

If both ports are normal, "RS-232C ALM" and "RS-485 ALM" light up; proceeds to step (4).

If RS-485 is abnormal, "RS-232C ALM" lights up after 10 seconds and "RS-485 ALM" blinks (at 0.5-second intervals); proceeds to step (4).

If RS-232C is abnormal, "RS-232C ALM" blinks (at 0.5-second intervals) after 10 seconds and "RS-485 ALM" lights up (at 0.5-second intervals); proceeds to step (4).

If both ports are abnormal, "RS-232C ALM" and "RS-485 ALM" blinks (at 0.5-second intervals); proceeds to step (4).

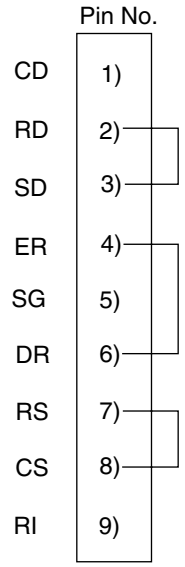
**(4) Preservation of the result of the check**

After 10 seconds of displaying the results from (3) above, the module returns to step (1). Here, if the setting of the mode selection switch has been changed, Self-diagnosis Mode 2 is ended to enter the designated mode.

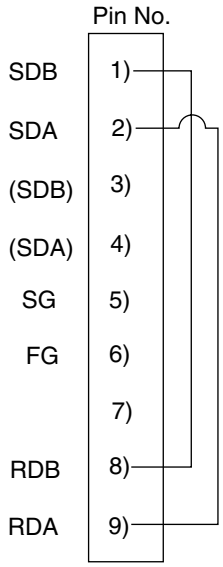
Note 1: When an RS-232C dedicated module (NP1L-RS2) is used, "RS-485 ALM" is kept turned off. When an RS-485 dedicated module (NP1L-RS4) is used, "RS-232C ALM," "TS1" and "TS2" are kept turned off.

Note 2: When judged as "normal," the next operation is started without any waiting time. Therefore, after all LEDs have turned off at the start of diagnosis, the corresponding LED lights up instantaneously.

<RS-232C loop-back connector>




<RS-485 loop-back connector>



# Section 4 Software Interface

Page

# Section 4 Software Interface
## 4-1 General

The non-procedural FB supplied with the D300wind is used for communication between the NP1L-RS1/2/4 and external devices. The non-procedural FB performs data communication between the CPU module and external devices based on the start-stop synchronous transmission protocol.
The following seven types of non-procedural FBs are offered.

| FB Name | Specification Overview |
|---|---|
| _C_free | Non-procedural FB Send: 512 words, Receive: 512 words |
| _Cfr252 | Non-procedural FB Send: 252 words, Receive: 252 words |
| _Cfr128 | Non-procedural FB Send: 128 words, Receive: 128 words |
| _Cfr64 | Non-procedural FB Send: 64 words, Receive: 64 words |
| _Cfr32 | Non-procedural FB Send: 32 words, Receive: 32 words |
| _Cfrpr | Non-procedural FB Send: 512 words, Receive: 512 words<br>A part of communication processing is processed by the firmware in the module. |
| _Cfrp2 | Non-procedural FB Send: 512 words, Receive: 512 words<br>A part of communication processing is processed by the firmware in the module and two message boards are used to increase the processing speed. |

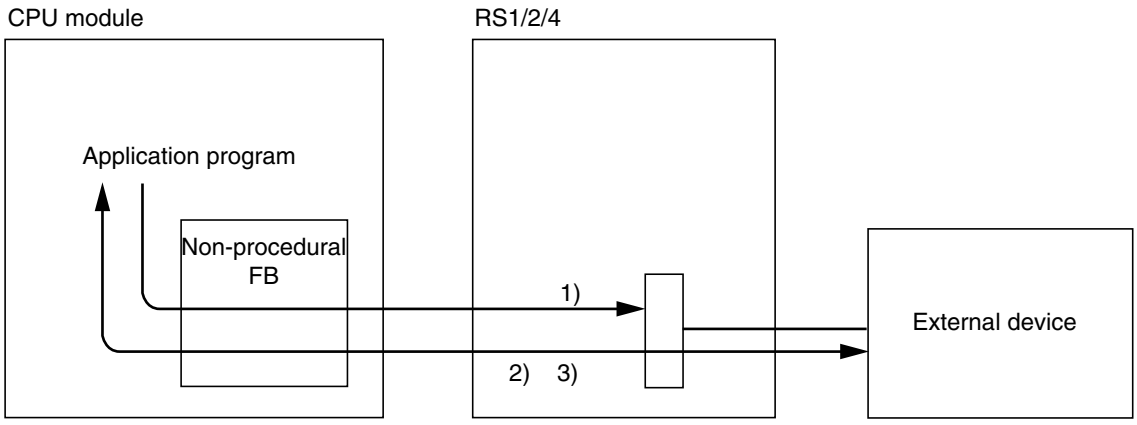
Note 1: _Cfrpr FB can be used with V.2535 or later versions of the NP1L-RS1, JP1L-RS2, and NP1L-RS4. The functions of the non-procedural FB are shown below.
Note 2: _Cfrp2 FB can be used with V.2536 or later versions of the NP1L-RS1, JP1L-RS2, and NP1L-RS4. For the specifications of _Cfrp2, refer to “EXTENDED FB FOR COMMUNICATION USER’S MANUAL FH255.”

**1) Initialization of communication ports**
Initializes RS-232C and RS-485 ports (sets transmission speed, data bit length, parity bits, etc., so as to match the external device.)

**2) Data sending/receiving function**
Sends the data from an application program in the CPU of MICREX-SX series via RS1 to an external device, or outputs the data received via the general purpose communication module to an application program.

**3) Monitoring of transmission condition**
Monitors the condition of data transmission and, if abnormal, outputs error information.

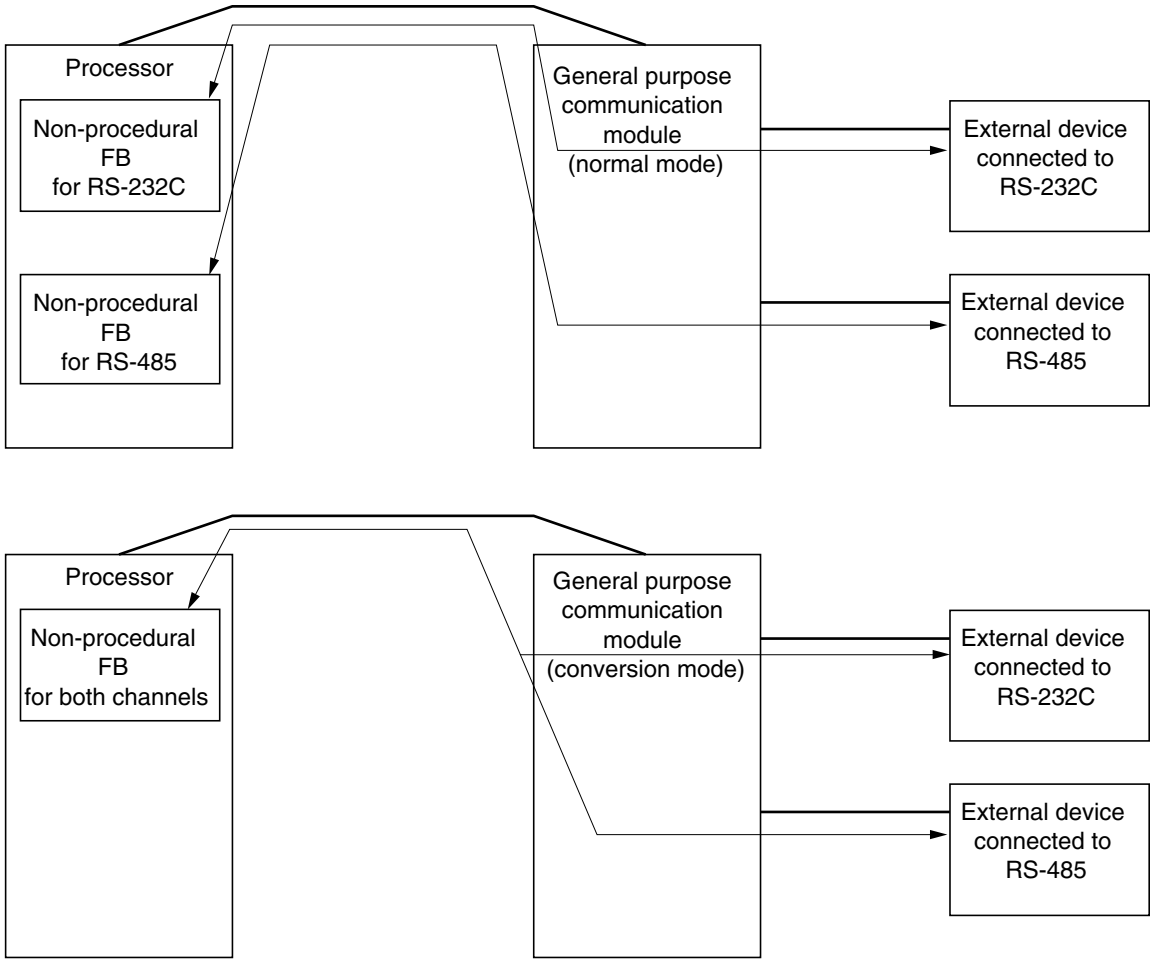
**<Function diagram of Non-procedural FB>**



**<FB operating conditions>**

**System configuration:**

One FB is necessary for each external device which is connected by RS-232C or RS-485 to one general purpose communication module. However, when RS-232C/RS-485 signal conversion is enabled (the mode selection switch is set to 4) for the general purpose communication module, each FB is used by two channels.




* When used in RS-232C/RS-485 conversion mode, channel number for the parameter (PARA [1]) is 1 (= RS-485).

**Memory capacity:**

| FB Name | Program capacity (Step) | Instance memory for user FB | Standard memory | Retain memory | Instance memory for system |
|---|---|---|---|---|---|
| _C_free | 2656 | 402 words | 3656 words | 0 words | 82 words |
| _Cfr252 | 2757 | 474 words | 2174 words | 0 words | 82 words |
| _Cfr128 | 2757 | 474 words | 1886 words | 0 words | 82 words |
| _Cfr64 | 2757 | 474 words | 1758 words | 0 words | 82 words |
| _Cfr32 | 2757 | 474 words | 1672 words | 0 words | 82 words |
| _Cfrpr | 1190 | 122 words | 1608 words | 0 words | 82 words |

Note 1: The above memory capacity includes that of non-procedural FB itself as well as of the sub-FB which is called from non-procedural FB.

Note 2: “Standard memory” or “Retain memory” includes the memory capacity necessary for data transmissin.

### 4-2-1 Communication specification

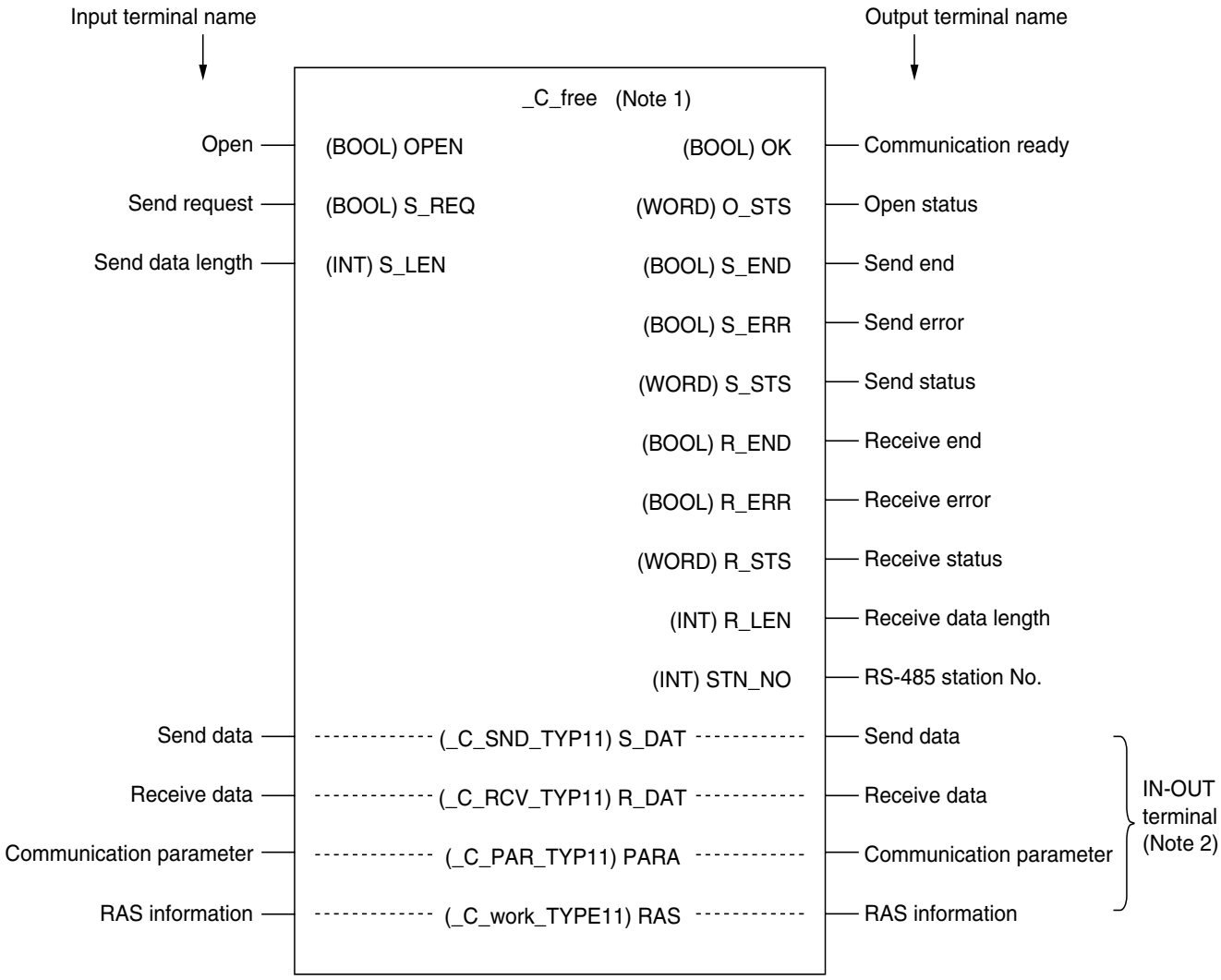
| Item | | Specification |
|---|---|---|
| Transmission speed | | 1200/2400/4800/9600/19200/38400/57600 bps (Note) |
| Data bits | | Selected from 7/8 bits |
| Parity bit | | None/odd/even |
| Stop bits | | Selected from 1/2 bits |
| DCE | | Selected from DTE/DCE/modem DTE mode<br>Modem DTE mode: Turn CD ON when receiving |
| Signal control | DTE mode | ER: always ON |
| | DCE mode | DR: always ON |
| Signal flow control | DTE mode | Off RS: always ON; Sending: unconditional<br>On RS: ON during sending; Sending: when CS is ON |
| | DCE mode | Off CS: always ON; Sending: unconditional<br>On CS: ON when RS is ON; Sending: when ER is ON |
| XON/XOFF control | | Selectable |
| RS-485 mode | | Selected from 4-wire/2-wire |
| Code conversion | | Selected from None/ASCII conversion/ EBCDIC conversion<br>(Convert binary data into character string variable.) |
| Frame detection | None | Disable frame detection function. |
| | Fixed length | Designate the number of receive data bytes |
| | Variable length | Designate start and end codes. |
| Horizontal parity (BCC) | None | None |
| | Upper order/Lower order | Calculation range designation. Designate position.<br>Formula: Selected from add/add and invert/EOR/CRC<br>BCC code: Selected from character code/binary code |
| | Lower order/Upper order | |
| Transmission timer value | | x10ms |

Note: Transmission rates 300, 600, 76800, and 115200 bps can be used in the following combinations:

| Version of general purpose communication module | Standard extended FB |
|---|---|
| V.2535 or later | _Cfrpr (Non-procedural FB with built-in protocol) |
| V.2536 or later | _Cfrp2 (Non-procedural FB with built-in protocol, 2-message version) |

# 4-2 Specifications for Non-procedural FB

### 4-2-2 FB format




* ( ) indicates data type.

Note 1: All non-procedural FBs have the same pin assignment.
Note 2: Only the FB pins necessary for control are used by connecting variables to them. However, be sure to connect variables to the IN-OUT pins.

### 4-2-3 FB terminals

**<Terminal list>**

| Terminal name | Terminal name | Data type | I/O | Description |
|---|---|---|---|---|
| Open | OPEN | BOOL | IN | ON: Sends the "communication parameters" to the general purpose communication module to initialize communication. When communication becomes possible, "communication ready" turns ON.<br>OFF: Performs the processing for ending communication. "Communication ready" turns OFF. |
| Send request | S_REQ | BOOL | IN | Starts to send data. When sending has ended, this needs to be turned OFF by the application program. |
| Send data length | S_LEN | INT | IN | Designates the length of send data by the number of bytes. |
| Send data | S_DAT | Array of WORD (Note) | IN_OUT | Stores send data. |
| Communication parameter | PARA | Array of INT (Note) | IN | Stores the initialization parameters. |
| Communication ready | OK | BOOL | OUT | Turns ON when initialization has ended normally to indicate that the system is ready for sending/receiving data. |
| Open status | O_STS | WORD | OUT | 2-digit hexadecimal code to indicate the result of initialization. |
| Send end | S_END | BOOL | OUT | Turns ON when sending has completed. |
| Send error | S_ERR | BOOL | OUT | Turn ON if a send error has occurred. |
| Send status | S_STS | WORD | OUT | Code to indicate the result of sending |
| Receive end | R_END | BOOL | OUT | Turns ON when receiving has completed. |
| Receive error | R_ERR | BOOL | OUT | Turns ON if a receive error has occurred. |
| Receive status | R_STS | WORD | OUT | Code to indicate the result of receiving |
| Receive data length | R_LEN | INT | OUT | Outputs the received data length. |
| Receive data | R_DAT | Array of WORD (Note) | IN_OUT | Stores received data. |
| RS-485 station No. | STN_NO | INT | OUT | The condition of the RS-485 station number setup switch of the general purpose communication module is output to this pin. |
| RAS information | RAS | Structure (Note) | IN_OUT | Operating information of this FB.<br>For details, refer to 4-6, "RAS Information." |

Note: The data format differs for each non-procedural FB.

**<Send data S_DAT(WORD array)>**

**<Variable declaration example>**

```
VAR
    S_DAT:_C_SND_TYP11;
END_VAR
```

**<Data type list>**

| FB Name | Data type of S_DAT |
|---|---|
| _C_free | _C_SND_TYP11 |
| _Cfr252 | _C_SND_TYP16 |
| _Cfr128 | _C_SND_TYP14 |
| _Cfr64 | _C_SND_TYP13 |
| _Cfr32 | _C_SND_TYP15 |
| _Cfrpr | _C_SND_TYP11PR |

| | Upper order | Lower order | |
|---|---|---|---|
| S_DAT [0] | Data 2 | Data 1 | |
| S_DAT [1] | Data 4 | Data 3 | |
| ⋮ | ⋮ | ⋮ | |
| S_DAT [31] | Data 64 | Data63 | Up to here is assigned to _Cfr32. |
| ⋮ | ⋮ | ⋮ | |
| S_DAT [63] | Data 128 | Data127 | Up to here is assigned to _Cfr64. |
| ⋮ | ⋮ | ⋮ | |
| S_DAT [127] | Data 256 | Data255 | Up to here is assigned to _Cfr128. |
| ⋮ | ⋮ | ⋮ | |
| S_DAT [251] | Data 504 | Data503 | Up to here is assigned to _Cfr252. |
| ⋮ | ⋮ | ⋮ | |
| S_DAT [511] | Data 1024 | Data1023 | Up to here is assigned to _C_free,_Cfrpr. |

# 4-2 Specifications for Non-procedural FB

**<Receive data R_DAT(WORD array)>**
**<Variable declaration example(_C_free)>**

```
VAR
    R_DAT:_C_RCV_TYP11;
END_VAR
```

**<Data type list>**

| FB Name | Data type of R_DAT |
|---|---|
| _C_free | _C_RCV_TYP11 |
| _Cfr252 | _C_RCV_TYP16 |
| _Cfr128 | _C_RCV_TYP14 |
| _Cfr64 | _C_RCV_TYP13 |
| _Cfr32 | _C_RCV_TYP15 |
| _Cfrpr | _C_RCV_TYP11PR |

| | Upper order | Lower order | |
|---|---|---|---|
| R_DAT [0] | Data 2 | Data 1 | |
| R_DAT [1] | Data 4 | Data 3 | |
| ⋮ | ⋮ | ⋮ | |
| R_DAT [31] | Data 64 | Data63 | Up to here is assigned to _Cfr32. |
| ⋮ | ⋮ | ⋮ | |
| R_DAT [63] | Data 128 | Data127 | Up to here is assigned to _Cfr64. |
| ⋮ | ⋮ | ⋮ | |
| R_DAT [127] | Data 256 | Data255 | Up to here is assigned to _Cfr128. |
| ⋮ | ⋮ | ⋮ | |
| R_DAT [251] | Data 504 | Data503 | Up to here is assigned to _Cfr252. |
| ⋮ | ⋮ | ⋮ | |
| R_DAT [511] | Data 1024 | Data1023 | Up to here is assigned to _C_free,_Cfrpr. |

**<Communication parameter PARA(INT array)>**
**<Variable declaration example(_C_free)>**

```
VAR
    PARA:_C_PAR_TYP11;
END_VAR
```

**<Data type list>**

| FB Name | Data type of PARA |
|---|---|
| _C_free | _C_PAR_TYP11 |
| _Cfr252 | _C_PAR_TYP16 |
| _Cfr128 | _C_PAR_TYP14 |
| _Cfr64 | _C_PAR_TYP13 |
| _Cfr32 | _C_PAR_TYP15 |
| _Cfrpr | _C_PAR_TYP11PR |

**Variable name**

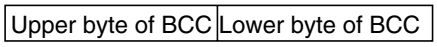
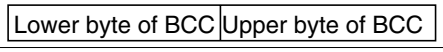
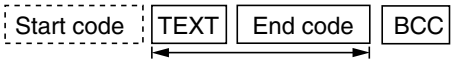
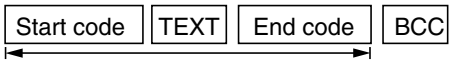
| | |
|---|---|
| PARA[ 0] | General purpose communication module station No. |
| PARA[ 1] | Port No. |
| PARA[ 2] | Message port No. |
| PARA[ 3] | Reserved |
| PARA[ 4] | Transmission speed |
| PARA[ 5] | Data bit |
| PARA[ 6] | Parity bit |
| PARA[ 7] | Stop bit |
| PARA[ 8] | DCE designation |
| PARA[ 9] | DTR/DSR signal control |
| PARA[10] | RTS/CTS signal flow control |
| PARA[11] | XON/XOFF control |
| PARA[12] | RS-485 mode |
| PARA[13] | Reserved |
| PARA[14] | Reserved |
| PARA[15] | Reserved |
| PARA[16] | Code conversion |
| PARA[17] | Frame detection |
| PARA[18] | Number of receive data bytes |
| PARA[19] | Number of start code bytes |
| PARA[20] | Start code 1 |
| PARA[21] | Start code 2 |
| PARA[22] | Start code 3 |
| PARA[23] | Start code 4 |
| PARA[24] | Start code 5 |
| PARA[25] | Number of end code bytes |
| PARA[26] | End code 1 |
| PARA[27] | End code 2 |
| PARA[28] | End code 3 |
| PARA[29] | End code 4 |
| PARA[30] | End code 5 |
| PARA[31] | BCC designation |
| PARA[32] | Calculation range, position |
| PARA[33] | Formula |
| PARA[34] | Code type |
| PARA[35] | Send timer value |
| PARA[36] | Reserved |
| PARA[37] | Reserved |
| PARA[38] | Reserved |
| PARA[39] | Reserved |

* After FBopens, the parameter from "PARA [16]" to "PARA [35]" is effective.

### 4-3-1 Initialization parameters

In order to initialize each individual port of the general purpose communication module, it is necessary to set values which match the communication specifications of the object external device to the individual communication parameters. The table below shows the setting contents of these parameters.

| No. | Item | | Description |
|---|---|---|---|
| 0 | General purpose communication module station No. | | Sets the station number of the general purpose communication module on the SX bus. |
| 1 | Port No. | | Designates an interface port on general purpose communication module.<br>0: RS-232C port<br>1: RS-485 port |
| 2 | Message port No. | | Designates a port No. for sending/receiving messages to/from a general purpose communication module (1 to 127).<br>Note: Avoid designating a port No. which is already used for sending/receiving messages to/from other module. |
| 3 | Reserved | | Not used. |
| 4 | Transmission speed | | Designates the transmission speed.<br>0: 1200 1: 2400 2: 4800 3: 9600 4: 19200 5: 38400 6: 57600 bps |
| 5 | Data bit | | Designates the data bit length. When "7" is selected, 7 bits make up one data; when "8," 8 bits make up one data.<br>0: 7 bits<br>1: 8 bits |
| 6 | Parity bit | | This is a bit which is added to data for the purpose of error detection. Designate the proper one to match the setting of the device at the other end.<br>0: None 1: Odd 2: Even |
| 7 | Stop bit | | This bit indicates the end of data. Designate the proper one to match the setting of the device at the other end.<br>0: 1 bit 2: 2 bits |
| 8 | DCE designation | | When signal line control is not performed, there is no difference in functions between DCE and DTE modes. The RS-232C of the general purpose communication module is of DTE specification, however, it can be used as a DCE specification interface when signal lines are converted as follows:<br>No. 7 pin (RS) to CS<br>No. 8 pin (CS) to RS<br>No. 6 pin (DR) to ER<br>No. 4 pin (ER) to DR<br>0: DTE 1: DCE 2: Modem DTE |
| 9 | ER/DR signal control | | 0: None |
| 10 | Signal flow control | DTE mode | 0: Off RS: always ON; Sending: unconditional<br>1: On RS: ON while sending; Sending: when CS is ON |
| | | DCE mode | 0: Off CS: always ON; Sending: unconditional<br>1: On CS: ON when RTS is ON; Sending: when ER is ON |
| 11 | XON/XOFF control | | Because communication between sender and receiver is performed asynchronously, flow control may be necessary. The receiver sends an XOFF signal to indicate that it cannot receive data for a while and then sends an XON signal to cancel the XOFF condition. To use XON/OFF control, the device at the other end must also have this function.<br>0: NO 1: YES |
| 12 | RS-485 mode | | Selects 4-wire or 2-wire for RS-485.<br>0: 4-wire 1: 2-wire |
| 13 | Reserved | | Not used |
| 14 | Reserved | | |
| 15 | Reserved | | |
| 16 | Code conversion | | Converts binary data into a character string variable.<br>0: None 1: ASCII conversion 2: EBCDIC conversion |
| 17 | Frame detection | | Designates data receiving method.<br>0: None Receiving completes when data is received.<br>1: Variable length Receiving completes when the data in a range between start and end codes is received.<br>2: Fixed length Receiving completes when receive data reaches the specified number of receive data bytes. |

| No. | Item | Description |
|---|---|---|
| 18 | Number of receive data bytes | Designates the number of receive data bytes when "Fixed length" is selected for frame detection. When "Variable length" is selected, set this item to "0." |
| 19 | Number of start code bytes | Designates the number of start code bytes when "Variable length" is selected. "0" means no start code. |
| 20 | Start code 1 | Designates start code when "Variable length" is selected. |
| 21 | Start code 2 | |
| 22 | Start code 3 | |
| 23 | Start code 4 | |
| 24 | Start code 5 | |
| 25 | Number of end code bytes | Designates the number of end code bytes when "Variable length" is selected. |
| 26 | End code 1 | Designates end code when "Variable length" is selected. |
| 27 | End code 2 | |
| 28 | End code 3 | |
| 29 | End code 4 | |
| 30 | End code 5 | |
| 31 | BCC designation | Sets whether or not to add horizontal parity for checking text data transmission error.<br>0: None<br>1: Set in the order of upper- and lower-order byte<br>  <br>2: Set in the order of lower and upper byte<br>  |
| 32 | Calculation range, position | Sets the calculation range and BCC position. ◄——► : Calculation range<br>0: Calculates the text part and enters it ahead of the end code.<br>  <br>1: Calculates text part and end code and inserts them behind the end code.<br>  <br>2: Calculates start code and text part and inserts them ahead of the end code.<br>  <br>3: Calculates start code, text part and end code and inserts them behind the end code.<br>  <br>Note: In this case, the BCC code type cannot be designated as "binary." Specify other than CRC-16 for the BCC expression. |

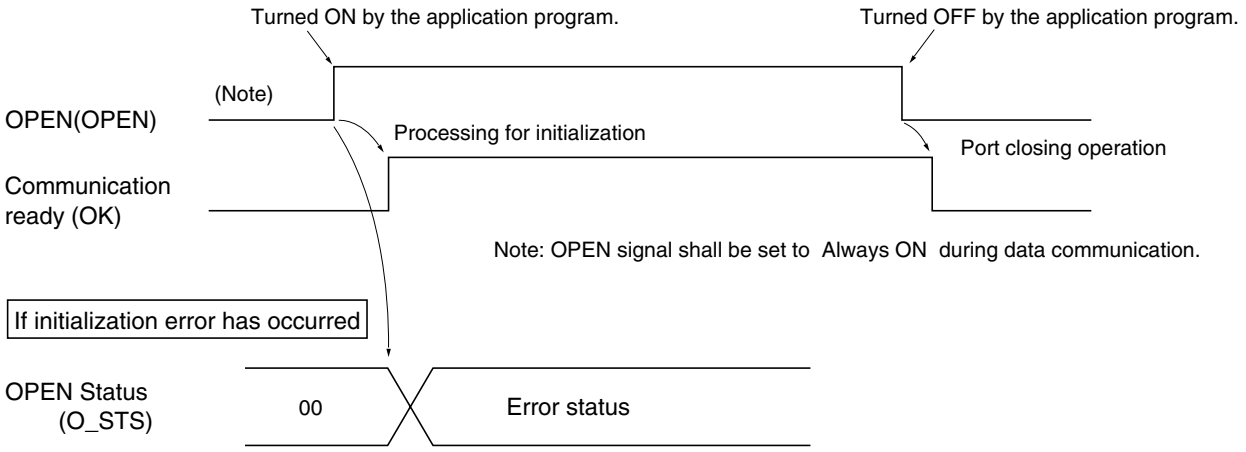
| No. | Item | Description |
|---|---|---|
| 33 | BCC calculation formula | Calculation method to check for transmission error.<br>  <br><br>0: Add<br>D1 + D2 + ... + Dn<br>1: Add and invert<br>Inversion of (D1 + D2 + ... + Dn)<br>2: EOR<br>D1 EOR D2 EOR ... EOR Dn<br>3: CRC * When CRC is selected, specify "BCC Code Format" to "0: Binary."<br>CRC-16:$X^{16}+X^{15}+X^{2}+1$ |
| 34 | BCC code type | Designates the code type of BCC data.<br>0: Binary<br>1: ASCII<br>2: EBCDIC |
| 35 | Send timer value | The timer value for monitoring transmission since the data send request has been sent from the CPU module onto the RS-232C line until sending is completed. Normally set to 100 (1 second) (in 0.01-second steps). |
| 36<br>:<br>39 | Reserved<br>:<br>Reserved | Not used. |

Note 1: Parameter Nos. 16 to 35 are valid even if changed after opening.
After opening, if parameter Nos.16 to 35 are changed and a setup error occurs, or if other parameters are changed, an open error results and communication “OK” is turned OFF.
Note 2: If you use “EBCDIC” at parameter No. 16 and/ or 34, make sure to select “8 bit” at parameter No. 5.
Note 3: This module ignore data when error detected while receiving data.
We recommend to use No. 6 (Parity), No. 31 (BCC) to detect data error if you use this module on noise environment.
In this case, external device also support parity, BCC.

# 4-3 Initialization

### 4-3-2 Initialization procedure

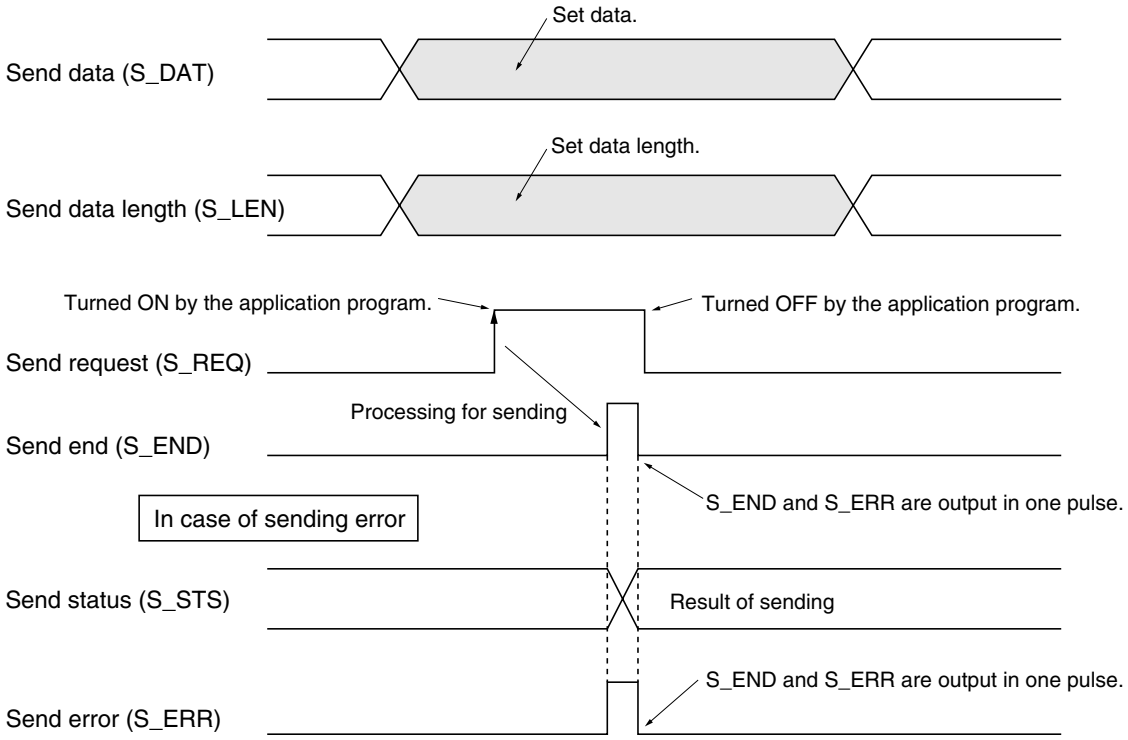
When the OPEN terminal of FB is turned ON, communication parameters are transferred to the general purpose communication module, which executes processing for initialization. If initialization is impossible due to a communication parameter setting error or hardware error, FB outputs the corresponding error code (word type) to the OPEN Status (O_STS).




### 4-3-3 OPEN status list

| No. | Result of initialization | Remarks |
|---|---|---|
| '00' | Ended normally | |
| '01' | Transmission speed error | Error detection on general purpose communication module |
| '02' | Data bit length error | Error detection on general purpose communication module |
| '03' | Parity bit error | Error detection on general purpose communication module |
| '04' | Stop bit error | Error detection on general purpose communication module |
| '05' | DCE designation error | Error detection on general purpose communication module |
| '06' | Signal flow control setting error | Error detection on general purpose communication module |
| '07' | XON/XOFF control setting error | Error detection on general purpose communication module |
| '08' | RS-485 mode setting error | Error detection on general purpose communication module |
| '3F' | Parameter modification error | Parameter modification error after OPEN |
| '40' | Code conversion setting error | |
| '41' | Frame detecting method setting error | |
| '42' | Start code setting error | |
| '43' | End code setting error | |
| '44' | BCC code setting error | |
| '45' | BCC calculation range setting error | |
| '46' | BCC calculation formula setting error | |
| '47' | BCC code type setting error | |
| '48' | Transmission timer specify setting error | Do not specify a minus value for the send timer |
| '80' | General purpose communication module station No. setting error | |
| '81' | Channel No. setting error | |
| '82' | Message port No. setting error | |
| '93' | Open error | SX bus is abnormal. |
| '94' | Open error | Failed the general purpose communication module initialization |
| 'A3' | Processing impossible because in code conversion mode. | Error detection on general purpose communication module |
| 'A5' | Processing impossible because in loader mode. | Error detection on general purpose communication module |
| 'A6' | Processing impossible because self-diagnosis is being executed. | Error detection on general purpose communication module |

### 4-4-1 Data sending procedure



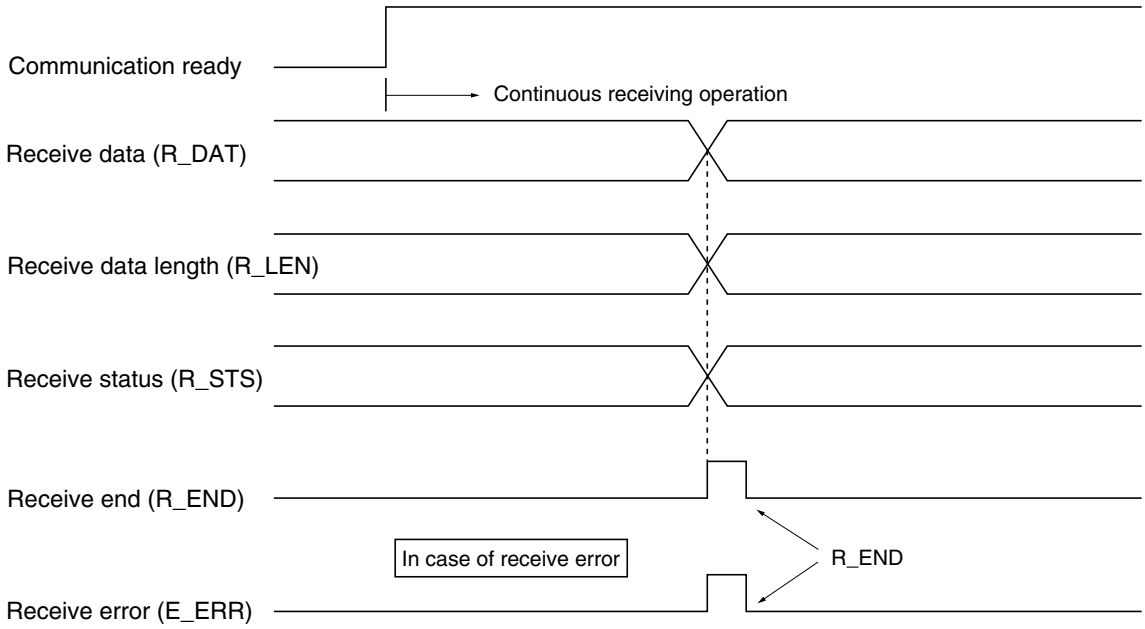

After setting send data and its data length, turn S_REQ (send request) ON by the application program. Then FB detects the rising edge to execute the processing for sending.
When sending has ended, S_END (send end) flag is turned ON (for only one pulse). If a send error has occurred, S_END (send end) and S_ERR (send error) are turned ON (for only one pulse), and the corresponding error code is output to S_STS (send status) (“00” when ended normally).

# 4-4 Data Sending

### 4-4-2 Send status list

| No. | Result of sending | Remarks |
|---|---|---|
| '00' | Normally ended | |
| '01' | Send buffer has overflowed. | |
| '02' | Reserved | |
| '03' | Reserved | |
| '04' | Reserved | |
| '05' | Reserved | |
| '06' | Reserved | |
| '40' | Data send time-out | |
| '41' | Protocol response error | |
| '42' | Reserved | |
| '90' | General purpose communication module disconnected. | Not detected |
| '91' | SX bus send error | |
| '92' | SX bus receive error | Not detected |
| 'A0' | Object port error | Specified port No. is neither 0 nor 1. |
| 'A3' | Processing impossible because in code conversion mode. | |
| 'A5' | Processing impossible because in loader mode. | |
| 'A6' | Processing impossible because self-diagnosis is being executed. | Error detection on general purpose communication module |
| 'C0' | Hardware error detected during receiving | Error detection on general purpose communication module |
| 'C1' | Receive buffer has overflowed. | Error detection on general purpose communication module |
| 'C2' | Send buffer has overflowed. | Error detection on general purpose communication module |
| 'C3' | Send data size over | Error detection on general purpose communication module |

### 4-5-1 Data receiving procedure




While the communication ready flag is turned ON, whether the data to be received exists or not is checked continuously and, when it exists, the operation for receiving is executed. When a delimiter between data frames is detected, the received data and the number of receive data bytes are stored in R_DAT (receive data) and R_LEN (receive data length), respectively, and the R_END (receive end) flag is turned ON (for only one pulse). The result of receiving is stored in R_STS (receive status). If a receive error has occurred, R_END (receive end) and E_ERR (receive error) are turned ON (for only one pulse).

# 4-5 Data Receiving

### 4-5-2 Receiving status list

| No. | Result of receiving | Remarks |
|---|---|---|
| '00' | Ended normally | |
| '01' | Reserved | |
| '02' | Receive buffer has overflowed. | |
| '03' | Reserved | |
| '04' | Reserved | |
| '05' | Reserved | |
| '06' | Reserved | |
| '40' | Reserved | |
| '41' | Reserved | |
| '42' | BCC error | |
| '90' | General purpose communication module disconnected. | |
| '91' | SX bus send error | |
| '92' | SX bus receive error | |
| 'A0' | Object port error | Error detection on general purpose communication module |
| 'A3' | Processing impossible because in code conversion mode. | Error detection on general purpose communication module |
| 'A5' | Processing impossible because in loader mode. | Error detection on general purpose communication module |
| 'A6' | Processing impossible because self-diagnosis is being executed. | Error detection on general purpose communication module |
| 'C0' | Hardware error detected during receiving (Parity error,Franming error, etc.) | Error detection on general purpose communication module |
| 'C1' | Receive buffer has overflowed. | Error detection on general purpose communication module |
| 'C2' | Send buffer has overflowed. | Error detection on general purpose communication module |
| 'C3' | Send data size over | Error detection on general purpose communication module |

Note: Receiving conditions
The processing for receiving differs with the setting of parameter “Frame detection.”
None: Receiving completes when data is received.
Fixed length: Receiving completes when receive data reaches the specified number of receive data bytes.
Variable length: Receiving completes when the data in a range between start and end codes is received.

Operating status of FB is stored in the RAS infomation area.

**<Variable declaration example of RAS (_C_free)>**

```
VAR
    RAS:    _C_work_TYPE11;
END_VAR
```

**< Data type list >**

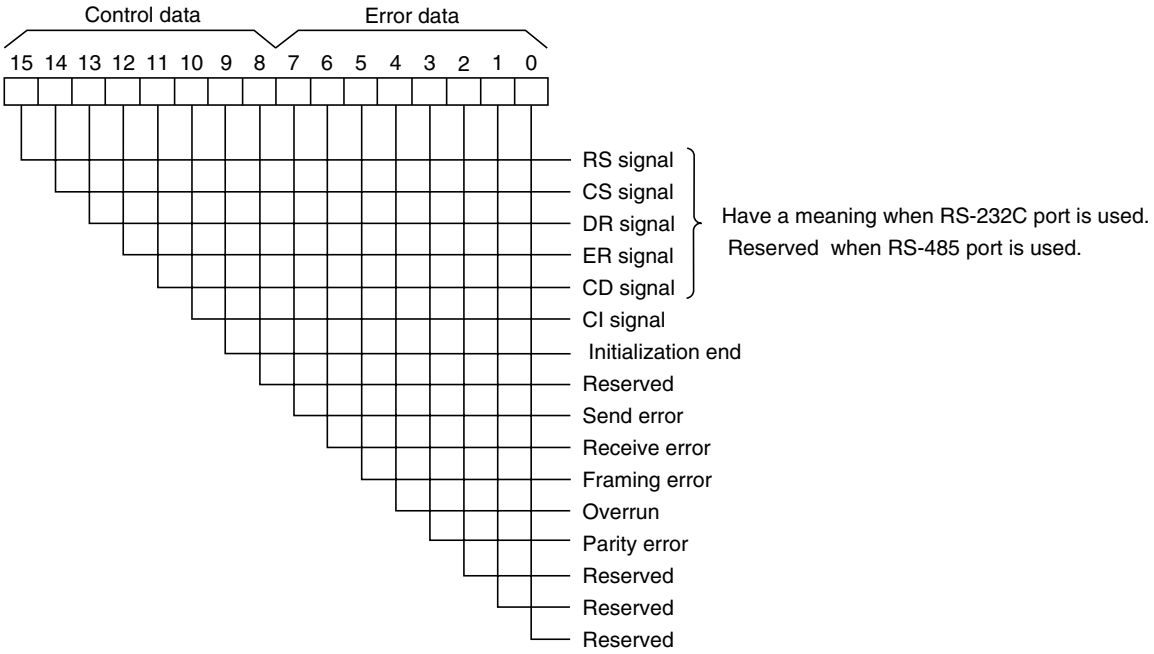
| FB Name | Data type of RAS |
|---|---|
| _C_free | _C_work_TYPE11 |
| _Cfr252 | _C_work_TYPE16 |
| _Cfr128 | _C_work_TYPE14 |
| _Cfr64 | _C_work_TYPE13 |
| _Cfr32 | _C_work_TYPE15 |
| _Cfrpr | _C_work_TYPE11PR |

**<RAS information area (INT array)>**

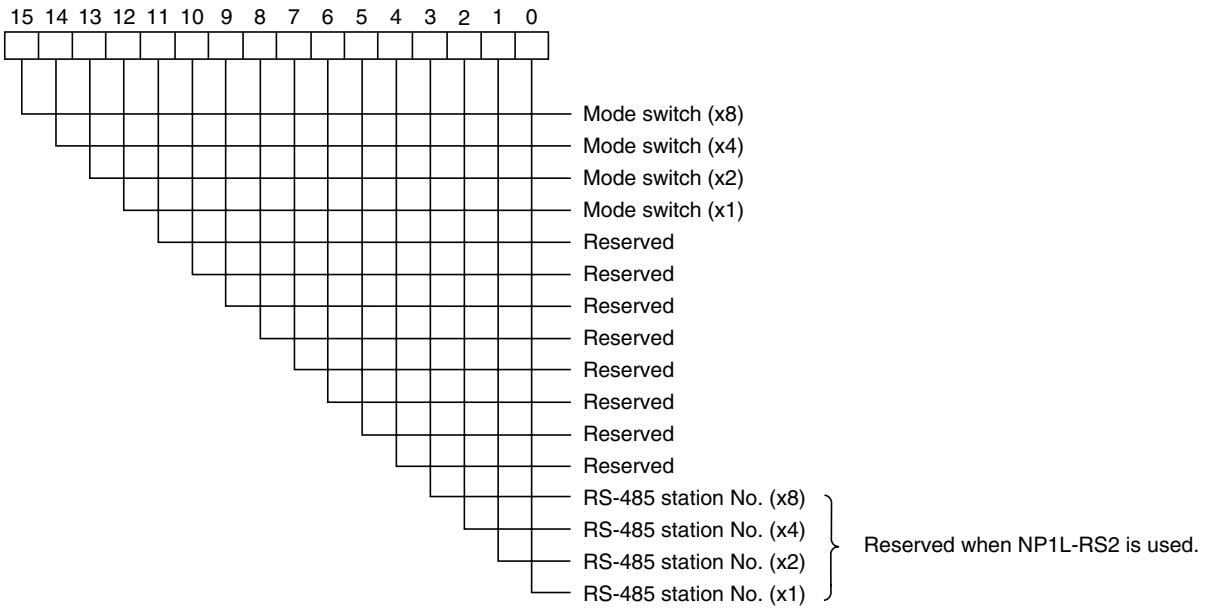
| | | |
|---|---|---|
| RAS.RAS[ 0] | Port status | –> Refer to next page. |
| RAS.RAS[ 1] | Status of general purpose communication module | –> Refer to next page. |
| RAS.RAS[ 2] | Send request count | |
| RAS.RAS[ 3] | Send end count | |
| RAS.RAS[ 4] | Receive count | |
| RAS.RAS[ 5] | Frame detection count | |
| RAS.RAS[ 6] | M_OPEN status | |
| RAS.RAS[ 7] | M_SEND status | |
| RAS.RAS[ 8] | M_RECEIVE status | |
| RAS.RAS[ 9] | M_SEND error count | |
| RAS.RAS[10] | M_RECEIVE error count | |
| RAS.RAS[11] | Reserved | |
| RAS.RAS[12] | Reserved | |
| RAS.RAS[13] | Reserved | |
| RAS.RAS[14] | Reserved | |
| RAS.RAS[15] | Reserved | |
| RAS.RAS[16] | Reserved | |
| RAS.RAS[17] | Reserved | |
| RAS.RAS[18] | Reserved | |
| RAS.RAS[19] | Reserved | |

# 4-6 RAS Information

**• Port status**




**• Status of general purpose communication module**



# Section 5 Programming

Page

# Section 5 Programming

## 5-1 Communication Program Creating Procedure

Taking non-procedural FB (_C_free) for example, the procedure for creating a communication program is explained below:

1) Install the standard expansion FB.
   Refer to “5-2 Installation Procedure of Standard Extended FB.”
2) Register the library in the project tree.
   Refer to “5-3 Registration in Library.”
3) Paste non-procedural FB (_C_free) onto the program work sheet.
   Refer to “5-4 Pasting Non-procedural FB.”
4) Assign values (baud rate, start/end cord, etc.) to the communication parameters.
   Refer to “5-5 Setting Communication Parameters.”
5) Write send data.
   Refer to “5-6 Writing Send Data.”
6) Connect variables or commands to each terminal of the expansion FB.
   Refer to “5-7 Connecting Variables and Commands to FB Terminals.”

# 5-2 Installation Procedure of Standard Extended FB

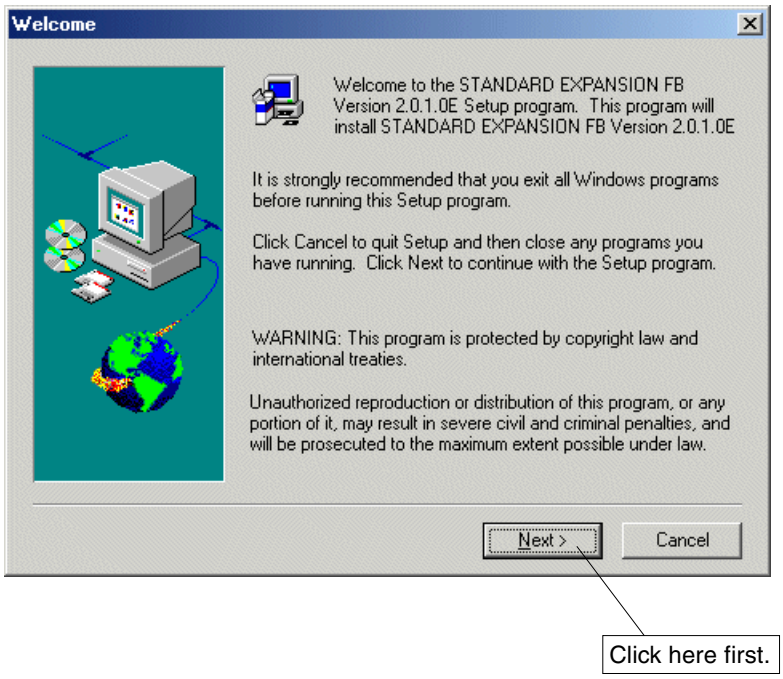
The standard extended FB is included in the Programming Support Tool D300win System Software Package (CD-ROM).

**< Operating Procedure >**

(1) Activate Windows and then insert the product CD-ROM into the CD-ROM drive. The following dialog appears.

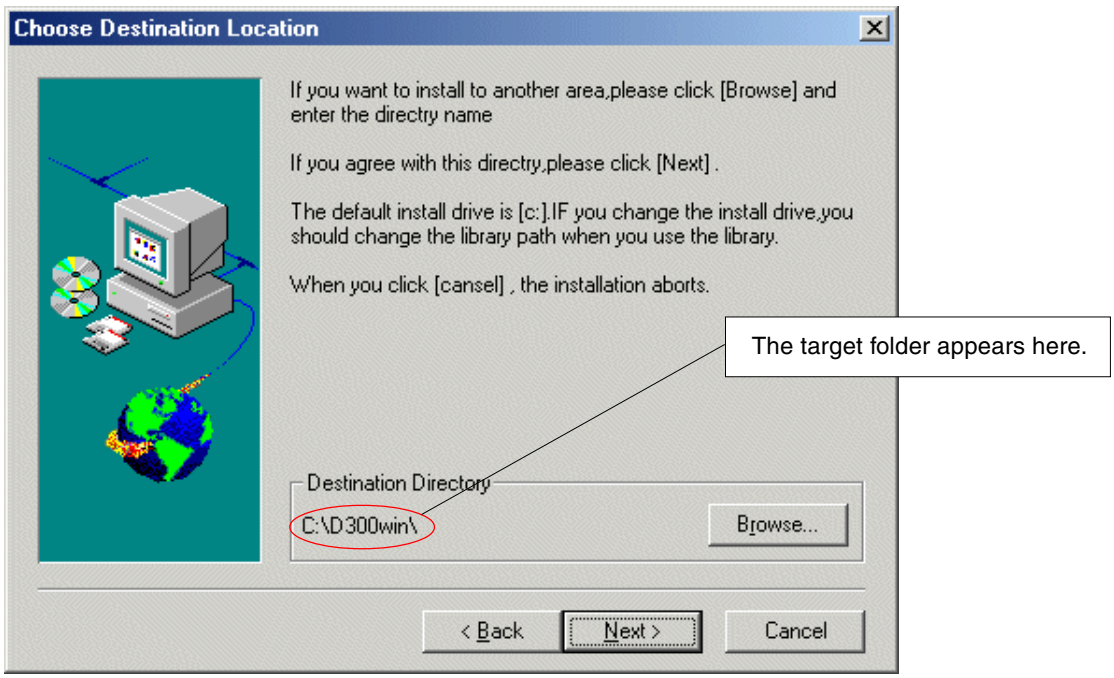

Note: If the installation dialog box does not appear, perform the following operations.
Click [Start] and then [Run], enter: \autorun.exe, then click the [OK] button.

(2) When you click [Standard Expansion FB Setup], the following [Welcome] dialog box appears.

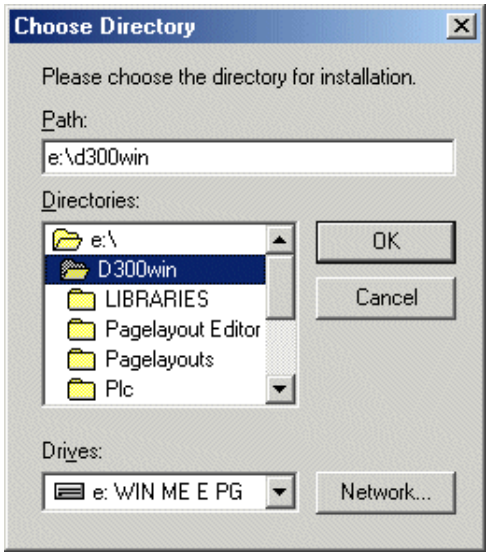


# 5-2 Installation Procedure of Standard Extended FB

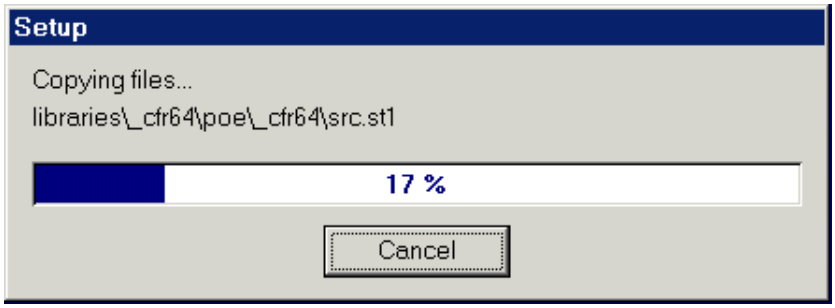
(3) When you click the [Next>] button in the [Welcome] dialog box, the [Choose Destination Locarion] dialog box appears.



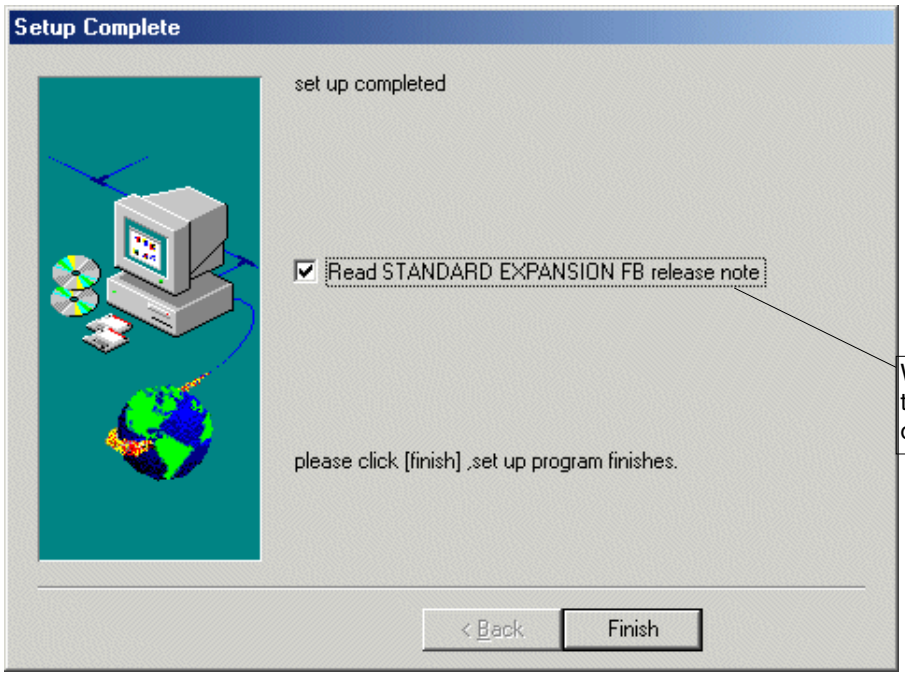

To change the target folder, click the [Browse...] button. The following [Choose Directory] dialog box appears. Specify a folder and then click the [OK] button. Control returns to the [Choose Destination Location] dialog box.




(4) When you click the [Next>] button in the [Choose Destination Location] dialog box, the installation processing is started.



(5) When installation is completed, the following [Setup Complete] dialog box appears. Click the [OK] button to complete the installation procedure.




When you check here and then click the [OK] button, the product information of the standard extended FB appears.

**<Example of release note>**

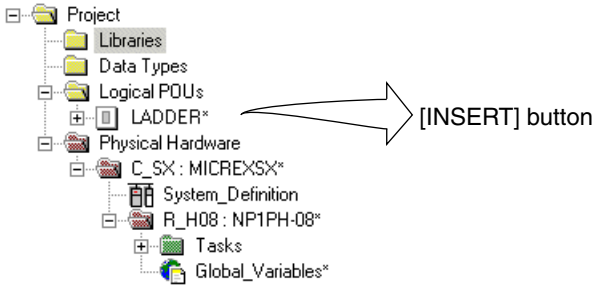
README - Notepad

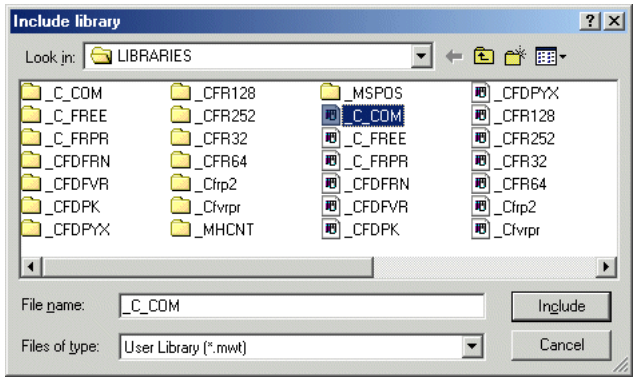
File Edit Search Help

```
                    STANDARD EXPANSION FB RELEASE NOTE  V2.0.1.0E

Thank you for useing this FB. This is an update description.

V2.0.1.0E
_Cfrp2  library          :V2.0.0.1 added
_Cfvrpr library          :V2.0.0.2 added
---------+---------+---------+---------+---------+---------+---------+---------
V2.0.0.2E
_C_COM  library          :V2.0.0.1 comment change
_C_free library          :V2.0.0.1 bug fixed  for bit length7 BCC,comment change
_Cfr32  library          :V2.0.0.1 bug fixed  for bit length7 BCC,comment change
_Cfr64  library          :V2.0.0.1 bug fixed  for bit length7 BCC,comment change
_Cfr128 library          :V2.0.0.1 bug fixed  for bit length7 BCC,comment change
_Cfr252 library          :V2.0.0.1 bug fixed  for bit length7 BCC,comment change
_C_frpr library          :V2.0.0.2 new FB
_CfdFRN library          :V2.0.0.1 comment change
_CfdFVR library          :V2.0.0.1 comment change
_CfdPK  library          :V2.0.0.1 comment change
_CfdPYX library          :V2.0.0.1 bug fixed  for MAX. word length
_MHCNT  library          :V2.0.0.0 no change
_MSPOS  library          :V2.0.0.0 no change
---------+---------+---------+---------+---------+---------+---------+---------

V2.0.0.1E
This is the original.
```

Individual communication FBs included in the standard expansion FB package can be used when registered in a library under a created project.

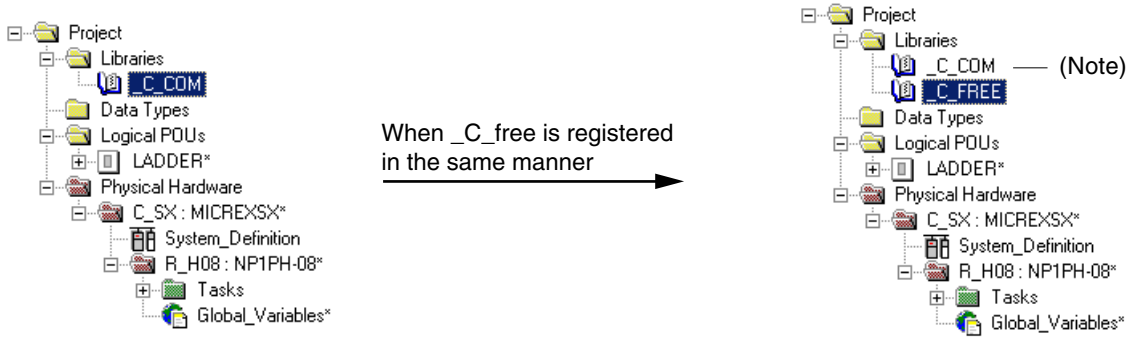
(1) Left-click the [Libraries], a subtree in the “Project” tree, and then on the [Insert...] button. Then the [Include library] dialog box will appear on the screen.



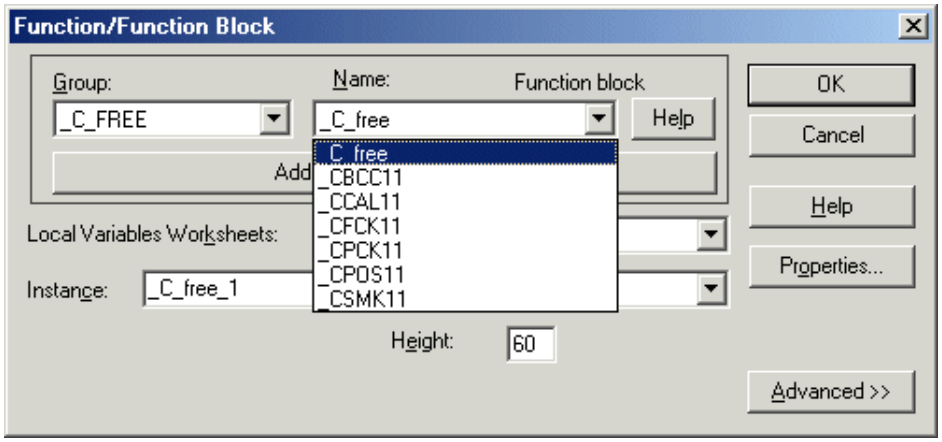

(2) Select an FB (file name) which you want to register in the library, and left-click the [Insert] button.

(3) The FB is registered in the library, as shown in the figure below.




Note: The common FB “_C_COM” is required when using any communication FB. “_C_COM” is used inside each extended communication FB. It is not necessary to call it on the code worksheet and use it.

(4) FBs in the project registered in the library can be selected from the [Function/Function Block] dialog box. In this case, child FBs (FBs which start with “C” like _CBCCII, etc.) used inside _C_free or other extended communication FBs are also displayed. However, use only parent FBs (_C_free, etc.) on the code worksheet.

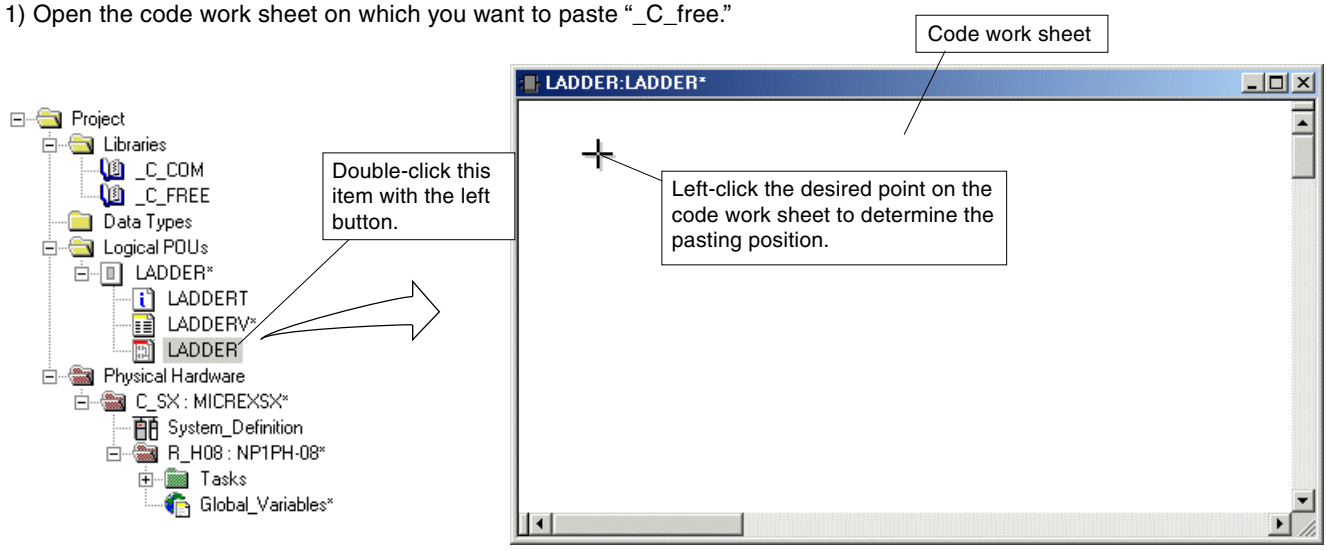


# 5-4 Pasting Non-procedural FB

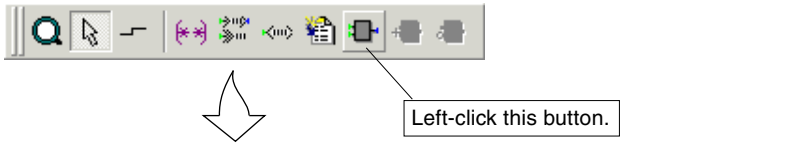
The following procedure pastes non-procedural FB "_C_free" on the LADDER code worksheet.

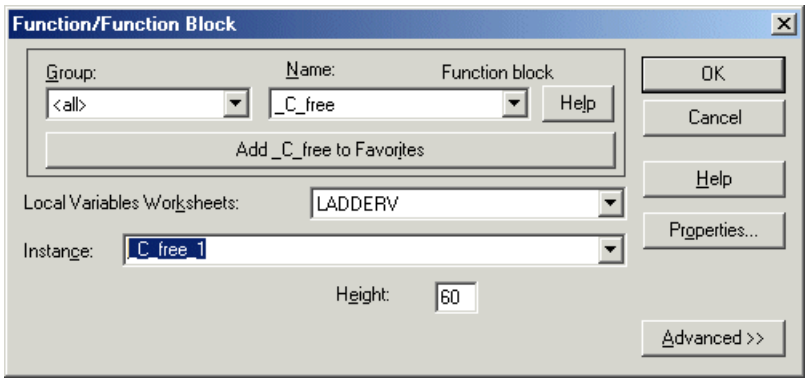
**<Pasting procedure>**

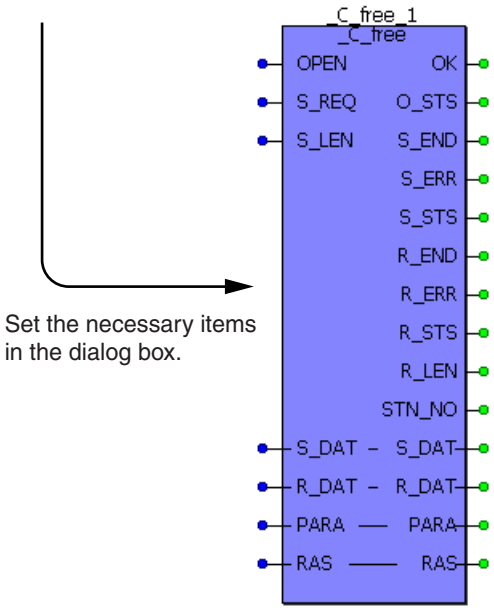
1) Open the code work sheet on which you want to paste "_C_free."




2) Select non-procedural FB "_C_free".



# 5-5 Communication Parameters Setting

Parameter values are assigned to the variables (INT type array data) which are connected to the communication parameter terminal “PARA” of non-procedural FB. In this paragraph, how to do this using ST language is described.

**<Sample variable declaration>**

Because it is used by the POU on which an expansion FB is pasted, communication parameter variable "PARA" must be global. Therefore, it is necessary to make a variable declaration in 2 locations, as below:

**Local variable declaration**

```
VAR_EXTERNAL
  PARA : _C_PAR_TYP11 ;
  PSET :  BOOL ;
END_VAR
```

Data type "_C_PAR_TYP11" is automatically declared when non-procedural FB is pasted.

Setting operation flag

**Global variable declaration**

```
VAR_GLOBAL
  PARA   : _C_PAR_TYP11 ;
  PSET   : BOOL := TRUE ;
  SDAT   : _C_SND_TYP11 ;
  SSET   : BOOL := TRUE ;
END_VAR
```

Used by the POU for writing send data

**<Sample setting program>**

This sample program assigns necessary communication parameter values to INT type array data "PARA."
When no setting changes are required, setting is made during the first scan. It is not necessary for each scan.

```
IF PSET THEN
  PARA[0]   :=  INT#1 ;     (*SX station No.*)
  PARA[1]   :=  INT#0 ;     (*SX station No.*)
  PARA[2]   :=  INT#50 ;    (*Message port No.*)
  PARA[4]   :=  INT#3 ;     (*Transmission speed: 9600 bps*)
  PARA[5]   :=  INT#1 ;     (*8 bits*)
  PARA[6]   :=  INT#1 ;     (*Even parity*)
  PARA[7]   :=  INT#1 ;     (*Stop bit: 1*)
  PARA[8]   :=  INT#0 ;     (*DTE designation*)
  PARA[9]   :=  INT#1 ;     (*Signal control*)
  PARA[10] :=  INT#0 ;     (*Signal flow control: None*)
  PARA[11] :=  INT#1 ;     (*XON/XOFF control: None*)
  PARA[16] :=  INT#0 ;     (*Code conversion: None*)
  PARA[17] :=  INT#1 ;     (*Frame detection variable length*)
  PARA[18] :=  INT#0 ;     (*Received bytes: Variable length*)
  PARA[19] :=  INT#1 ;     (*Number of starting code bytes: 1*)
  PARA[20] :=  INT#2 ;     (*Starting code: STX*)
  PARA[25] :=  INT#1 ;     (*Number of end code bytes: 1*)
  PARA[26] :=  INT#2 ;     (*End code: ETX*)
  PARA[31] :=  INT#1 ;     (*BCC: none*)
  PARA[34] :=  INT#1 ;     (*Code type: ASCII*)
  PARA[35] :=  INT#1000 ;(*Send timer: 10 s*)
  PSET  :=   FALSE  ;
END_IF
```

Starting and end codes are also set by INT type. For example, when you want to set ":" for starting code, it is described by "INT 16#003A" or "INT #58" because the code for ":" is "3A."

After all necessary parameters are set, the processing for the above setting will not be executed from the next scan when the flag is set to "FALSE."

Send data is written in the variables (WORD type array data) which are connected to send data terminal “S_DAT.” When the volume of send data is small, the send data writing program is created on the same work sheet as that for expansion FB; when the volume is large, it is better to create the program on separate work sheet or POU. This paragraph describes how to create a send data writing program on a POU other than that including the non-procedural FB.

**<Sample variable declaration>**

Because it is used by the POU on which an expansion FB is pasted, the send data variable "SDAT" must be global. Therefore, it is necessary to make variable declaration at 2 locations, as below:

**Local variable declaration**

```
VAR_EXTERNAL
  SDAT : _C_SND_TYP11;
  SSET :  BOOL ;
END_VAR
```

Data type "_C_SND_TYP11" is automatically declared when non-procedural FB is pasted.

Setting operation flag

**Global variable declaration**

```
VAR_GLOBAL
  PARA   : _C_PAR_TYP11;
  PSET   : BOOL := TRUE ;
  SDAT   : _C_SND_TYP11 ;
  SSET   : BOOL := TRUE ;
END_VAR
```

Used by the POU for setting parameter values

**<Sample setting program>**

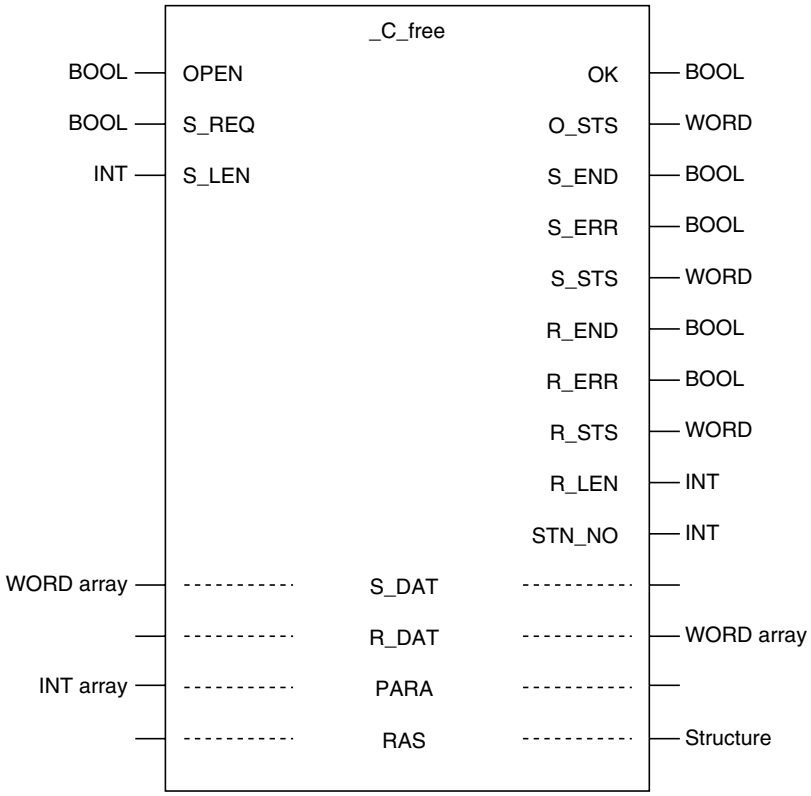
To set a desired value for WORD type array data "SDAT"

```
IF SSET THEN
  SDAT[0]  :=  WORD#16#0000 ;
  SDAT[1]  :=  WORD#16#0001 ;
  SDAT[2]  :=  WORD#16#0002 ;
  SDAT[3]  :=  WORD#16#0003 ;
  SDAT[4]  :=  WORD#16#0004 ;
  SDAT[5]  :=  WORD#16#0005 ;
  SDAT[6]  :=  WORD#16#0006 ;
  SDAT[7]  :=  WORD#16#0007 ;
  SDAT[8]  :=  WORD#16#0008 ;
  SSET  :=   FALSE  ;
END_IF
```

After all necessary values are set, the processing for the above setting will not be executed from the next scan when the flag is set to "FALSE."

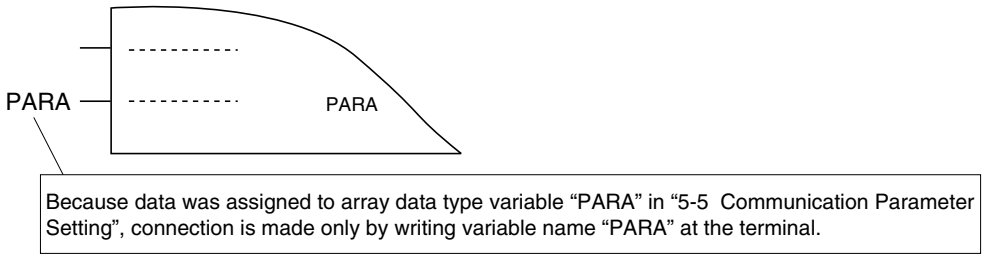
# 5-7 Connecting Variables and Commands to FB Terminals

This paragraph describes how to program for each expansion FB terminal.



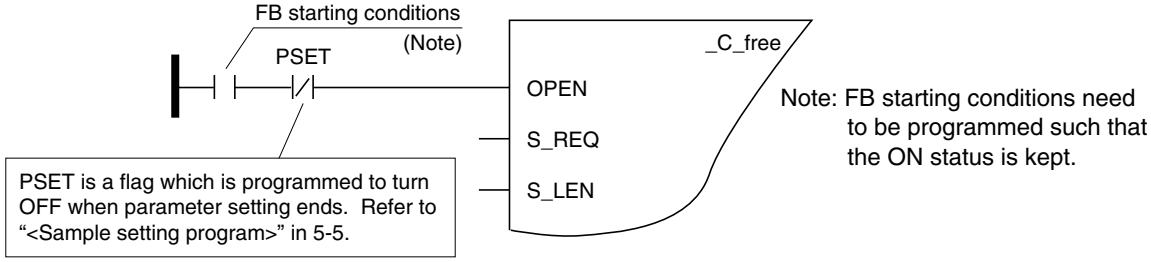

### 5-7-1 Connecting variable to "PARA" terminal

The variable which was assigned data in "5-5 Communication Parameter Setting" is connected to communication parameter terminal "PARA."




### 5-7-2 Operation for starting FB

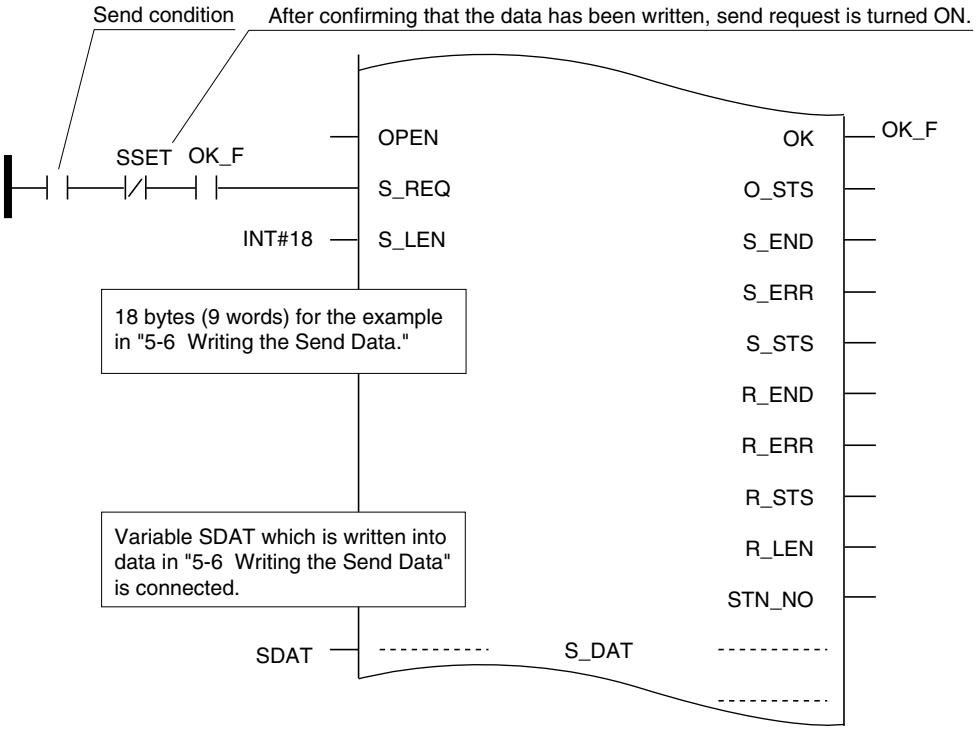
After all necessary communication parameters are set, initialization will start when the input terminal "OPEN" is turned ON. When initialization ends, the output terminal "OK" turns ON, and communication becomes possible.



# 5-7 Connecting Variables and Commands to FB Terminals

### 5-7-3 Operation for sending data

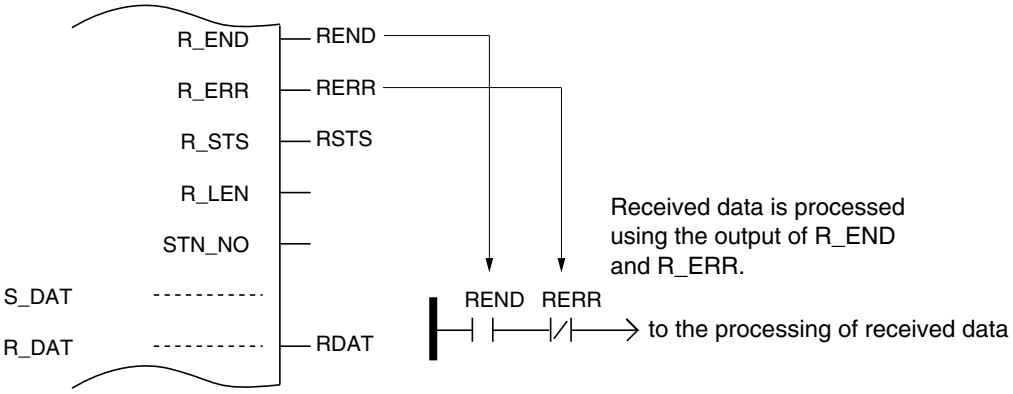
Send request is made after send data and its byte length are set.




Note: When data sending is completed, send end flag “S_END” turns ON only for one scan. In case of sending error, send error flag “S_ERR” turns ON only for one scan.
As the content of sending error is stored in send status “S_STS,” judge the occurred error according to the S_STS data stored when S_ERR has turned ON.

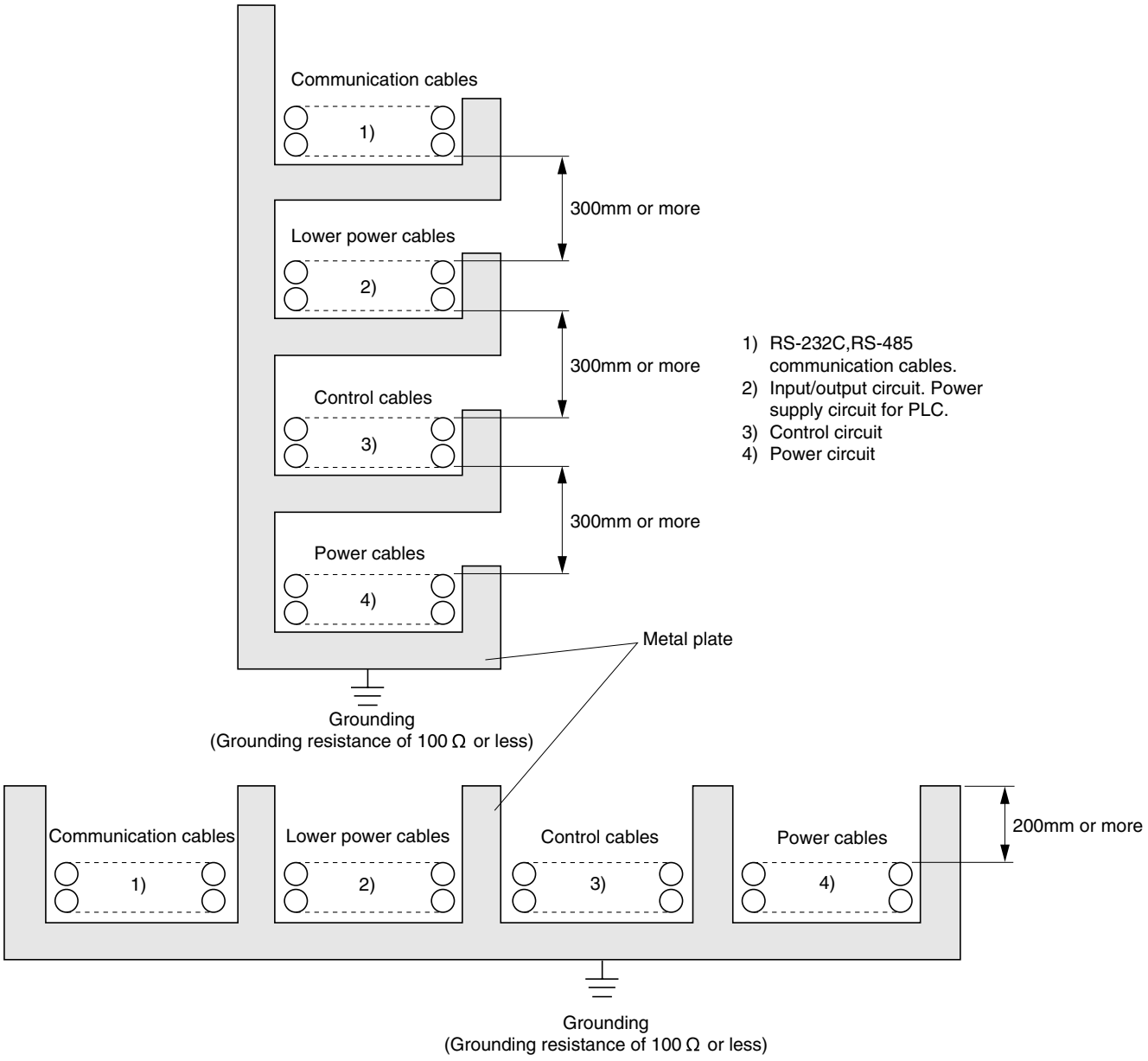
### 5-7-4 Data receiving operation

When communication ready terminal “OK” is turned ON, non-procedural FB continuously checks whether there is any data to be received and, when it exists, executes operations for data receiving. When the delimiter between received data frames is detected, R_END (receive end) turns ON for one scan, and receive data and receive status are stored in R_DAT and R_STS, respectively.
In case of receiveing error, R_ERR (receive error) also turns ON for one scan.



# Section 6 Wiring

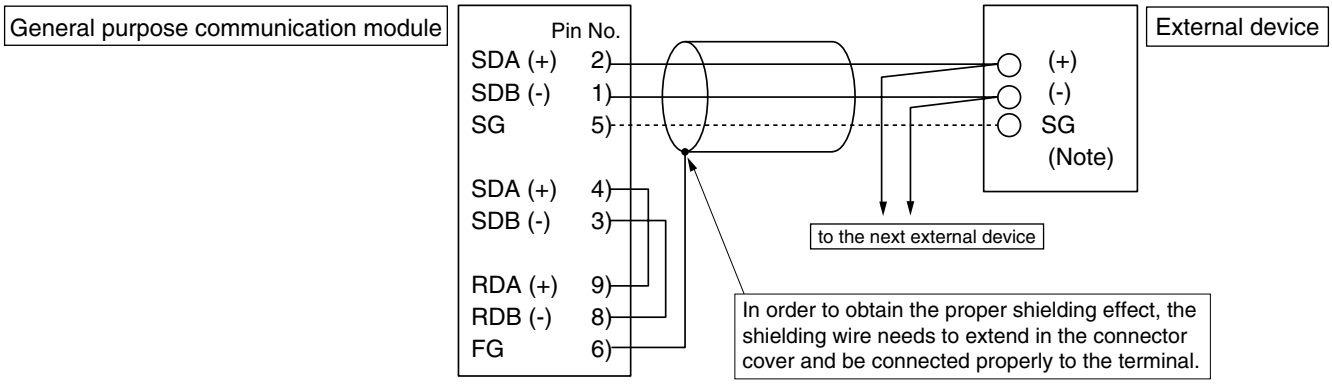
(1) Before removing the connector, remove the fixing screws.
(2) Communications cables must be isolated from high-voltage cables and power cables as far as possible. Communication cables must not be run parallel with those cables.
(3) These cables should be installed as shown in the following figure. Shielding cables should be used.



# 6-2 Wiring Method

### 6-2-1 When RS-485 is used (2-wire)

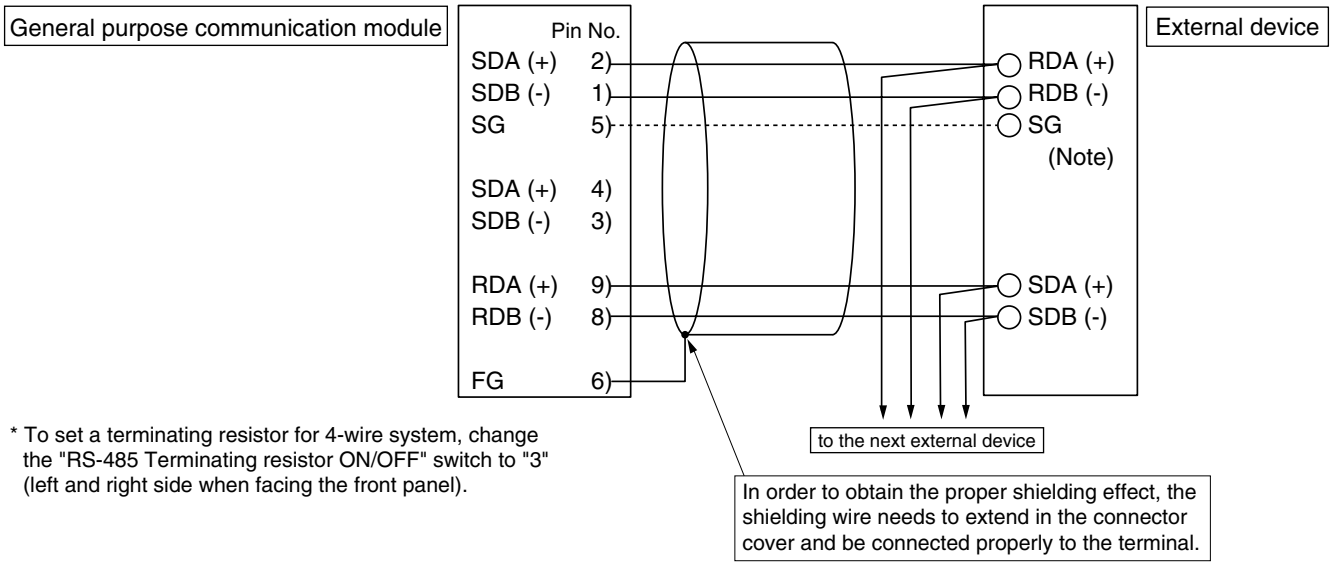
To make a 2-wire system, as shown in the figure below, 4) and 9) as well as 3) and 8) are short-circuited in the connector, and 1) (SDB), 2) (SDA) and 5) (SG) are used to connect to external devices.




* To set a terminating resistor for a 2-wire system, change the "RS-485 Terminating resistor ON/OFF" switch to "1"(left side when facing the front panel).

### 6-2-2 When RS-485 is used (4-wire system)

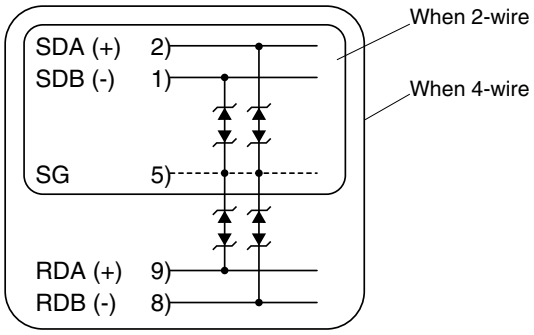
To make a 4-wire system, 1), 2), 5), 8) and 9) are used as in the figure below:




* To set a terminating resistor for 4-wire system, change the "RS-485 Terminating resistor ON/OFF" switch to "3" (left and right side when facing the front panel).

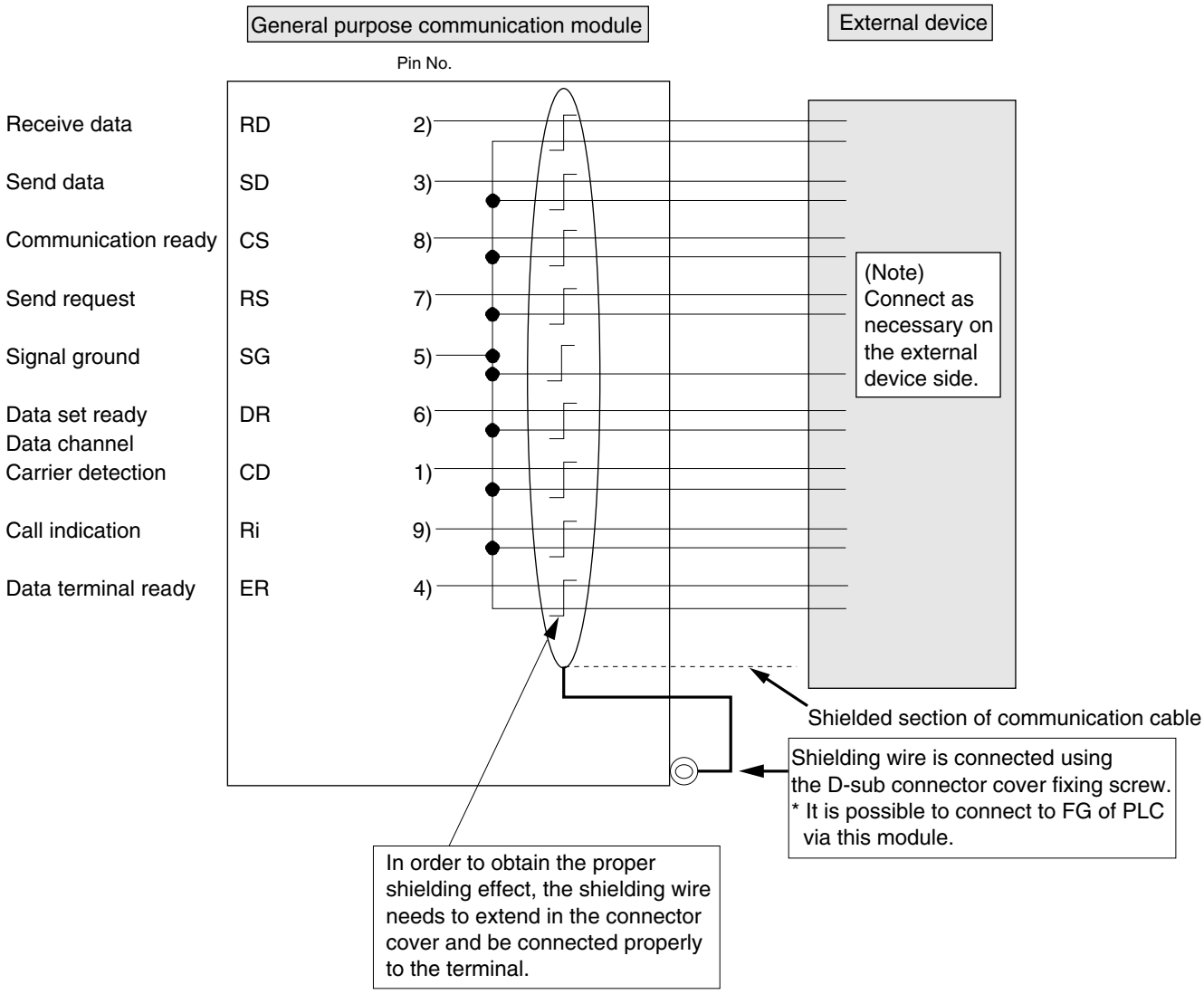
**Note: Precaution when there is no SG terminal on the external device**

SG wire cannot be connected if there is no SG terminal on the external device. Depending on the ambient environment, in the worst, module internal element might be damaged. To avoid this, connect a Zener diode (of 6 V Zener voltage, RD6.2F from NEC or equivalent) between signal cable and SG terminal in the connector on this module side.




* RS1, RS4 V2738 or later version has built-in zener diode.
RS5 has zener diode.

### 6-2-3 When RS-232C is used




Note 1: Generally, a plastic cover is used for connection as shown in the above figure.
Commercially available plastic cover :1) DE-C4-J6 from JAE
2) HDE-CTF or HDE-CTF1 from Hirose Electric Co., Ltd.
Or their equivalent

Note 2: When the on-site operating environment requires stricter EMC measures, it is more effective to make this cable using commercially available metallic covers.
Metallic cover : 1) DE-CE-J6 from JAE (aluminum die cast)
2) HDB-CTH1 from Hirose Electric (Ni coated plastic)
3) 17JX-09H-1A from DDK, Ltd. (Ni coated plastic)
Or their equivalent

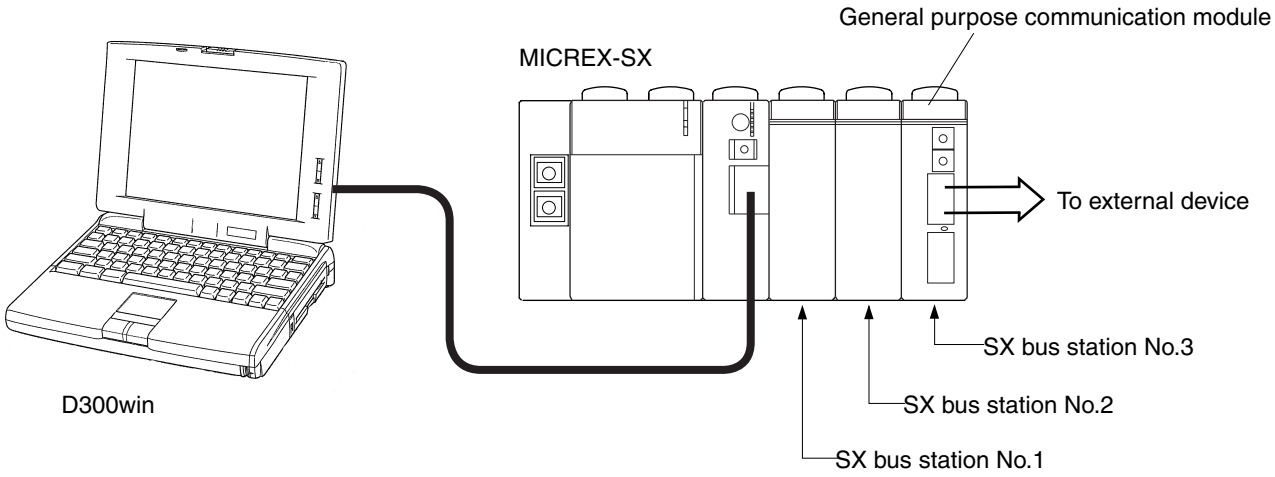
# Section 7 RAS

# Section 7 RAS

## 7-1 RAS Information of General Purpose Communication Module

The following describes the procedure for monitoring and analyzing the RAS information of the general purpose communication module using the D300win.

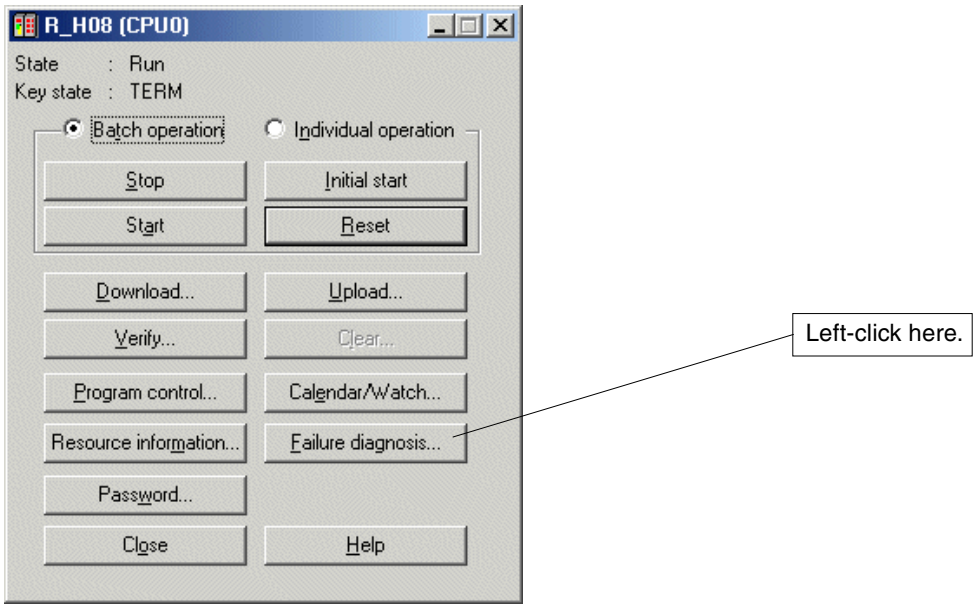
**< Example system configuration >**



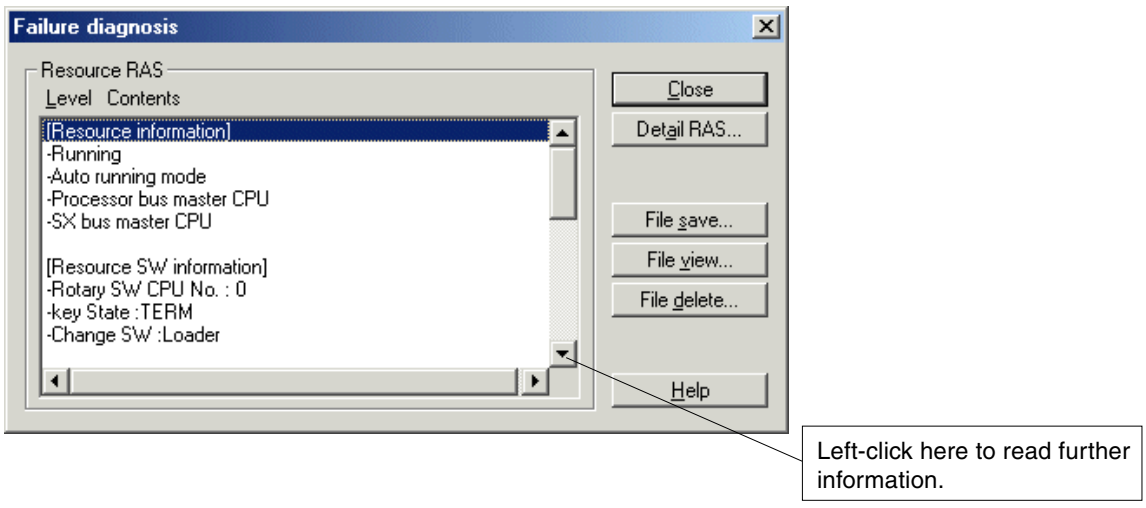

**< Monitoring/analysis procedure >**

The following describes the monitoring/analysis procedure using the above system as an example.

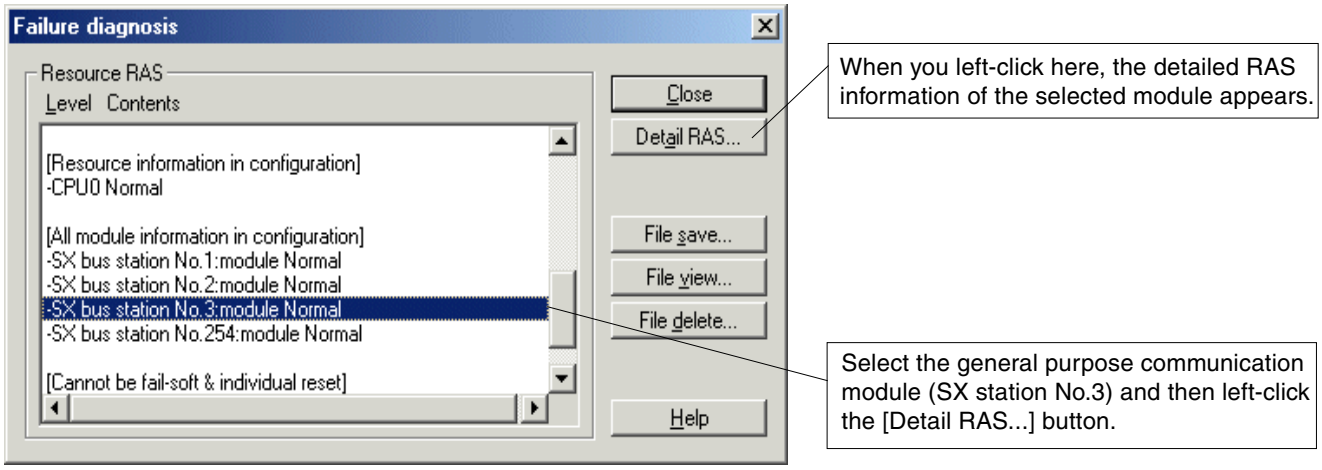
(1) Connect the D300win to the MICREX-SX series CPU module to display the following [Control] dialog box.



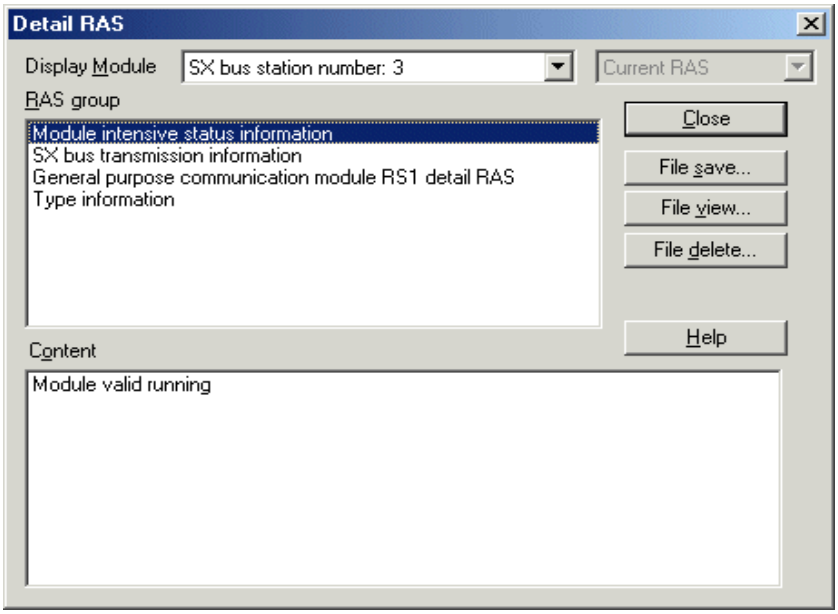

(2) The following [Failure diagnosis] dialog box appears.



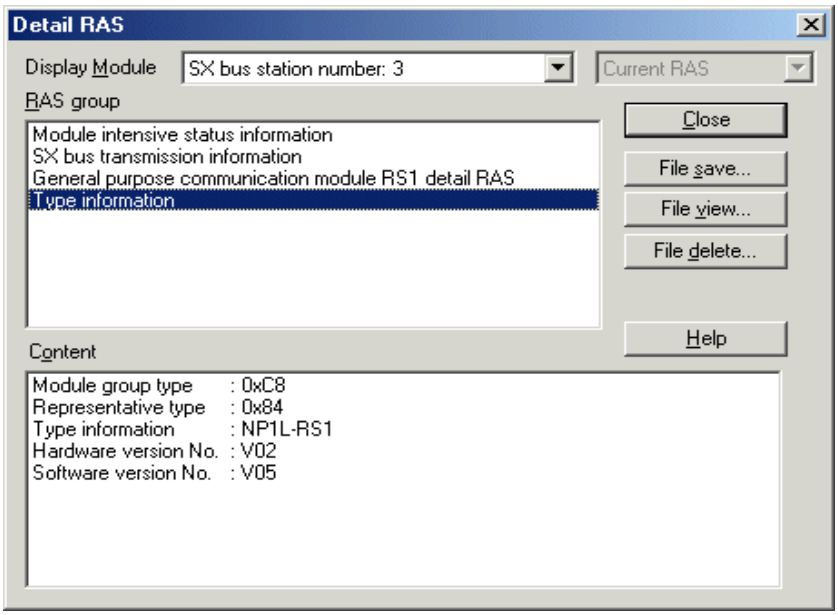
# 7-1 RAS Information of General Purpose Communication Module




(3) The following [Detail RAS] dialog box of the general purpose communication module appears. First, the "Module intensive status information" appears.

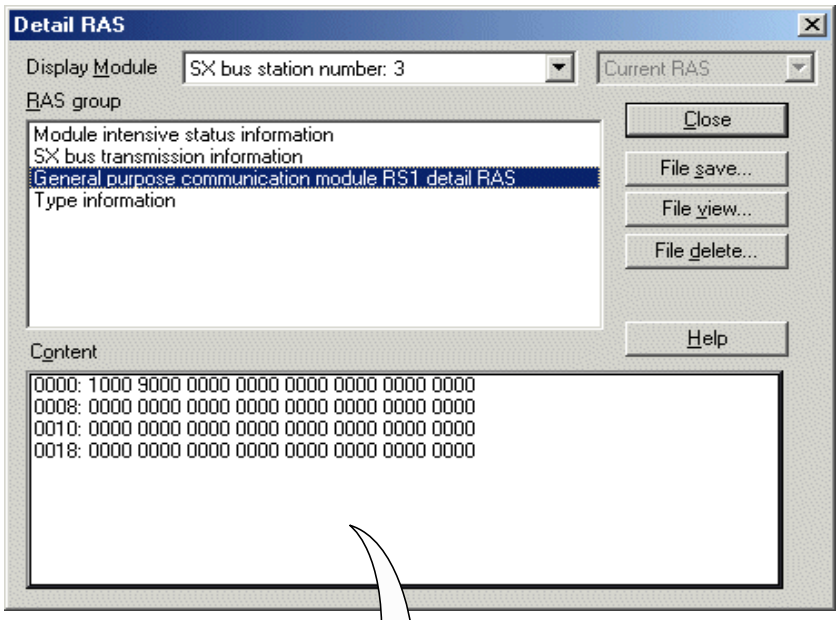


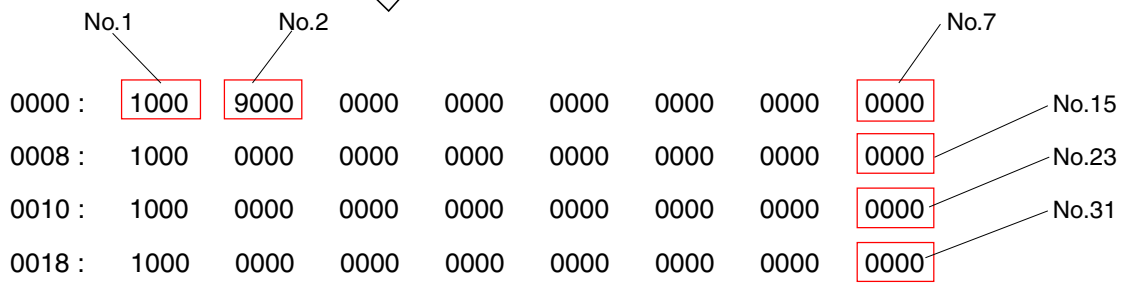

(4) When you select [Type information], the module format, software version number, and other information appear in Contents, as shown below.



# 7-1 RAS Information of General Purpose Communication Module

(5) When you select [General purpose communication module RS1 detail RAS], the detailed RAS information appears in Contents, as shown below.




* One word (16 bits) represents each detailed RAS item. The detailed RAS corresponding to each number is shown below.

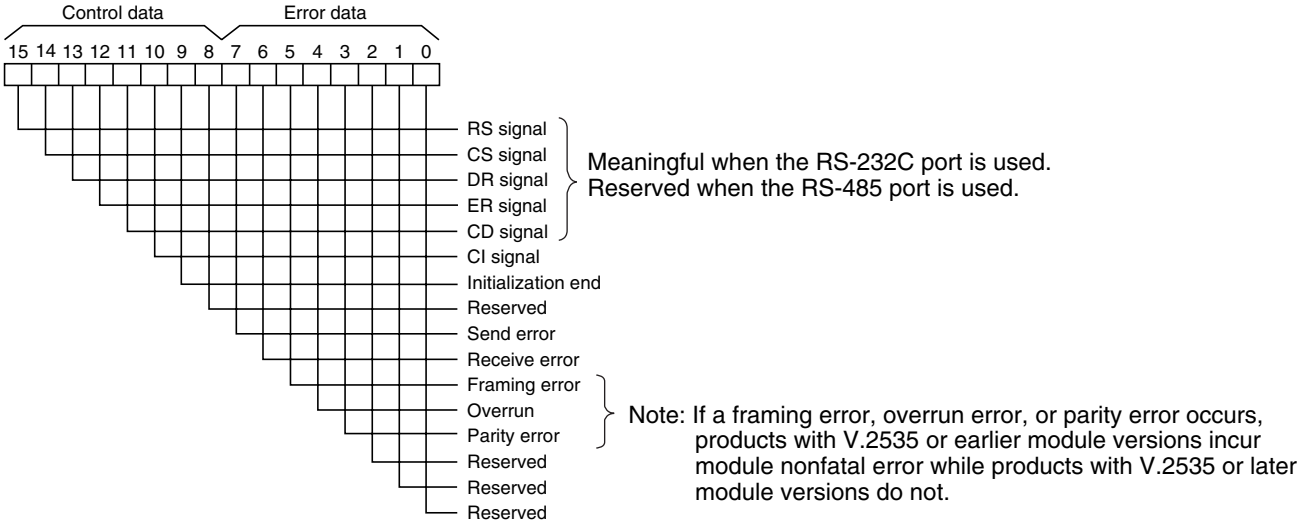
**< Detailed RAS information >**

| | | |
|---|---|---|
| 0 | Status of general purpose communication module | |
| 1 | Status of RS-232C port | |
| 2 | Status of RS-485 port | |
| 3-5 | Not used | |
| 6,7 | Not used | |
| 8 | Number of parity error occurrences | RS-232C |
| 9 | Number of framing error occurrences | |
| 10 | Number of overrun error occurrences | |
| 11 | Send buffer overflow | |
| 12 | Receive buffer overflow | |
| 13 | Loopback buffer overflow | |

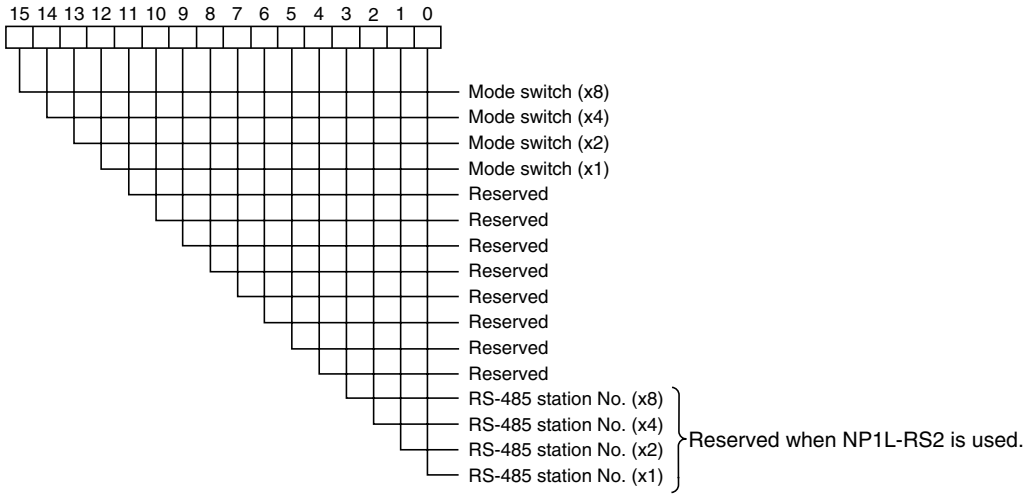
| | | |
|---|---|---|
| 14,15 | Not used | |
| 16 | Number of parity error occurrences | RS-485 |
| 17 | Number of framing error occurrences | |
| 18 | Number of overrun error occurrences | |
| 19 | Send buffer overflow | |
| 20 | Receive buffer overflow | |
| 21 | Loopback buffer overflow | |
| 22,23 | Not used | |
| 24 | Number of SX bus send error interrupts | SX bus |
| 25 | Number of SX bus receive error interrupts | |
| 26 | Number of error message data receptions | |
| 27 | Number of invalid message data receptions | |
| 28-31 | Not used | |

# 7-1 RAS Information of General Purpose Communication Module

**• RS-232C/RS-485 Port status**




**• General purpose module communication status**




• Framing error: It becomes ON when stop bit is not detected while receiving data.
• Overrun error: It becomes ON when data receive process of firmware failed while receiving data.
• Parity error: It becomes ON when parity error detected while receiving data.

Those error bit remains until initialize this module or power off.

# Appendix 1 JIS Code

# Appendix 1 JIS Code

The following table shows the character-code in Japan Industrial Standards (JIS).

## ■ JIS 7-bit Codes

| | b7<br>b6<br>b5 | 0<br>0<br>0 | 0<br>0<br>1 | 0<br>1<br>0 | 0<br>1<br>1 | 1<br>0<br>0 | 1<br>0<br>1 | 1<br>1<br>0 | 1<br>1<br>1 |
|---|---|---|---|---|---|---|---|---|---|
| b4 to b1 | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0000 | 0 | NUL | TC7(DLE) | SP | 0 | @ | P | 、 | p |
| 0001 | 1 | TC1(SOH) | DC1 | ! | 1 | A | Q | a | q |
| 0010 | 2 | TC2(STX) | DC2 | " | 2 | B | R | b | r |
| 0011 | 3 | TC3(ETX) | DC3 | # | 3 | C | S | c | s |
| 0100 | 4 | TC4(EOT) | DC4 | $ | 4 | D | T | d | t |
| 0101 | 5 | TC5(ENQ) | TC8(NAK) | % | 5 | E | U | e | u |
| 0110 | 6 | TC6(ACK) | TC9(SYN) | & | 6 | F | V | f | v |
| 0111 | 7 | BEL | TC10(ETB) | ' | 7 | G | W | g | w |
| 1000 | 8 | FE0(BS) | CAN | ( | 8 | H | X | h | x |
| 1001 | 9 | FE1(HT) | EM | ) | 9 | I | Y | i | y |
| 1010 | 10 | FE2(LF) | SUB | * | : | J | Z | j | z |
| 1011 | 11 | FE3(VT) | ESC | + | ; | K | [ | k | { |
| 1100 | 12 | FE4(FF) | IS4(FS) | , | < | L | ¥ | l | \| |
| 1101 | 13 | FE5(CR) | IS3(GS) | - | = | M | ] | m | } |
| 1110 | 14 | SO | IS2(RS) | . | > | N | ` | n | ¯ |
| 1111 | 15 | SI | IS1(US) | / | ? | O | _ | o | DEL |

## ■ JIS 8-bit Codes

Unlike 7-bit codes, JIS 8-bit codes assign different codes for alphabetic characters than for katakana characters.
(The table below shows the codes for alphabetic characters.)

| | b8<br>b7<br>b6<br>b5 | 0<br>0<br>0<br>0 | 0<br>0<br>0<br>1 | 0<br>0<br>1<br>0 | 0<br>0<br>1<br>1 | 0<br>1<br>0<br>0 | 0<br>1<br>0<br>1 | 0<br>1<br>1<br>0 | 0<br>1<br>1<br>1 |
|---|---|---|---|---|---|---|---|---|---|
| b4 to b1 | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0000 | 0 | NUL | TC7(DLE) | SP | 0 | @ | P | 、 | p |
| 0001 | 1 | TC1(SOH) | DC1 | ! | 1 | A | Q | a | q |
| 0010 | 2 | TC2(STX) | DC2 | " | 2 | B | R | b | r |
| 0011 | 3 | TC3(ETX) | DC3 | # | 3 | C | S | c | s |
| 0100 | 4 | TC4(EOT) | DC4 | $ | 4 | D | T | d | t |
| 0101 | 5 | TC5(ENQ) | TC8(NAK) | % | 5 | E | U | e | u |
| 0110 | 6 | TC6(ACK) | TC9(SYN) | & | 6 | F | V | f | v |
| 0111 | 7 | BEL | TC10(ETB) | ' | 7 | G | W | g | w |
| 1000 | 8 | FE0(BS) | CAN | ( | 8 | H | X | h | x |
| 1001 | 9 | FE1(HT) | EM | ) | 9 | I | Y | i | y |
| 1010 | 10 | FE2(LF) | SUB | * | : | J | Z | j | z |
| 1011 | 11 | FE3(VT) | ESC | + | ; | K | [ | k | { |
| 1100 | 12 | FE4(FF) | IS4(FS) | , | < | L | ¥ | l | \| |
| 1101 | 13 | FE5(CR) | IS3(GS) | - | = | M | ] | m | } |
| 1110 | 14 | SO | IS2(RS) | . | > | N | ` | n | ¯ |
| 1111 | 15 | SI | IS1(US) | / | ? | O | _ | o | DEL |

# Appendix 2 Data Access by Command

Page

# Appendix 2 Data Access by Command

## Appendix 2-1 Command Overview

When accessing data inside the MICREX-SX series CPU module from a personal computer or other intelligent devices, data read and write operations are possible by issuing request commands from the personal computer, without preparing send and receive application programs in the CPU module. The following 10 commands are prepared.

| Function | Command name | Command | Mode | Overview |
|---|---|---|---|---|
| Read | Read Data | 00h | 00h | Reads data from the specified data memory. |
| Write | Write Data | 01h | 00h | Writes data to the specified data memory. |
| PC control | Activate All CPUs at One Time | 04h | 00h | Activates all the CPUs in the configuration at one time. |
| | Initialize and Activate All CPUs at One Time | | 01h | Initializes and activates all the CPUs in the configuration at one time |
| | Deactivate All CPUs at One Time | | 02h | Deactivates all the CPUs in the configuration at one time. |
| | Reset All CPUs at One Time | | 03h | Resets all the CPUs in the configuration at one time. |
| | Activate a CPU Separately | | 04h | Activates a specified CPU in the configuration separately. |
| | Initialize and Activate a CPU Separately | | 05h | Initializes and activates a specified CPU in the configuration separately |
| | Deactivate a CPU Separately | | 06h | Deactivates a specified CPU in the configuration separately. |
| | Reset a CPU Separately | | 07h | Resets a specified CPU in the configuration separately. |

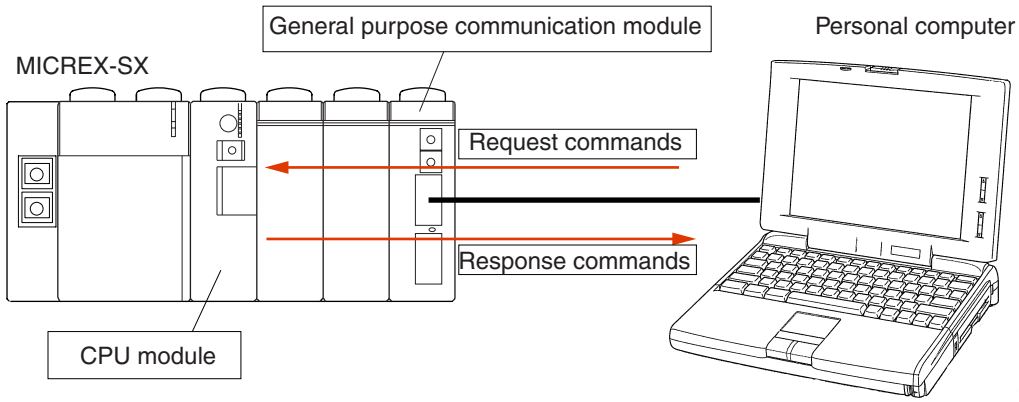
Note: When the “Initialize and Activate All CPUs at One Time” command or “Initialize and Activate a CPU Separately” command is executed, the retain memory is cleared before activation.

**< Data access image >**

Create request commands by means of an application program in the personal computer and then send them to the CPU module via the general purpose communication module. The CPU which receives request commands returns response commands.

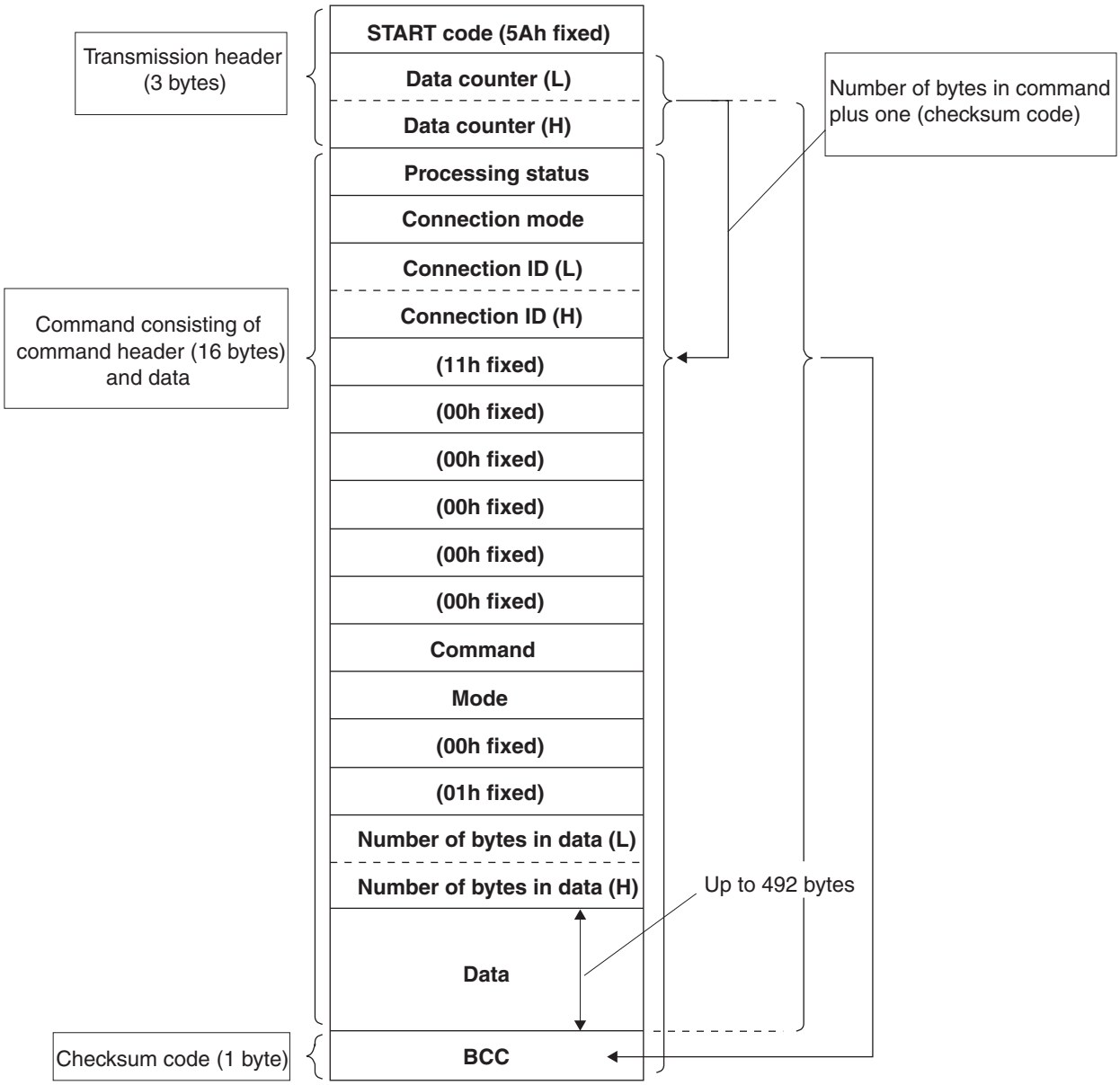
The data communication program is not required as an application program in the CPU module.

* Set the MODE switch of the general communication module to "1".



# Appendix 2-2 Send Data Format of Commands

The send data of request and response commands consist of the “transmission header”, “loader command”, and “checksum code”. The format of a request command is the same as that of response command.
All data are transmitted as HEX code (Not ASCII code).




**< Detailed send data >**

**1) START code**
Starting code of send data (request command and response command). Fixed to “5Ah”.

**2) Data counter**
Indicates the number of bytes in command plus one (checksum code (BCC)).

**3) Processing status**
Indicates the result of execution of each processing requested by commands. Checked by response commands. Request commands are issued with the processing status fixed to “FFh.”

**< Status list >**

| Code | Status | Description |
|---|---|---|
| 00h | Normal end | Command processing is normally completed. |
| 10h | CPU error | The CPU failed and command cannot be executed. |
| 11h | CPU is operating | Cannot execute command because the CPU is operating. |
| 12h | Command execution not possible | Cannot execute command because of CPU key switch condition. |
| 20h | Undefined command | The CPU received an undefined command or mode. |
| 22h | Parameter error | The command header contains a wrong specification. |
| 23h | Transmission interlocked | Transmission is interlocked by a loader command from other device. |
| 28h | Command processing in progress | Processing other command. Cannot execute the request command. |
| 2Bh | Other loader processing in progress | Processing the D300win loader. Cannot execute the request command. |
| 2Fh | Initialization not completed | System initialization in progress. Cannot execute the request command. |
| 40h | Data specification error | An invalid data type/number was specified. |
| 41h | Specified data not found | The specified data does not exist. |
| 44h | Memory address specification error | The specified address is out of the valid range. |
| 45h | Memory size exceeded | The number of addresses and read/write words exceeds the valid range. |
| A0h | Command target specification error | The specified target station number is assigned no module. |
| A2h | No command response | No response data from the target module. |
| A4h | SX bus send error | An error occurred on the SX bus. Cannot send or receive commands. |
| A5h | SX bus send NAK | A NAK occurred on the SX bus. Cannot send or receive commands. |
| FFh | When the request-command is specified | |

**4) Target module specification, connection ID**

Specifies the target module.

| Target module | Connection mode | Connection ID (L) | Connection ID (H) |
|---|---|---|---|
| CPU0 | 7Ah | 00h | 00h |
| CPU1 to CPU7 | 7Bh | SX bus station number for the target CPU | 00h |
| P/PE link FL-net | 7Bh | SX bus station number for the target module | 00h |

**5) Command, mode**

Command: Major category code of commands
Mode: Detailed code of commands
For details on commands and modes, refer to “Appendix 2-3 Loader Command Details.”

**6) Number of bytes in data**

Indicates the number of bytes in data. The total number of bytes in the request command during data write operation and the response command during data read operation must not exceed 492 bytes.

**7) BCC (block check character)**

Checksum code for send data check. The BCC, consisting of one byte, is obtained by the following expression:

BCC = 00h- { ( Data counter ) + ( Connection status) + · · · + ( Data ) }

# Appendix 2-3 Loader Command Details

## Appendix 2-3-1 Read data

**1) Function**

This command reads the specified number of words from the specified address of the specified data memory. If the requested number of words exceeds the range of the specified memory, up to the end of the specified memory is read.

**2) Command/mode code**

Command: 00h, Mode: 00h

**3) Data format of request command/response command**

Data format of request command

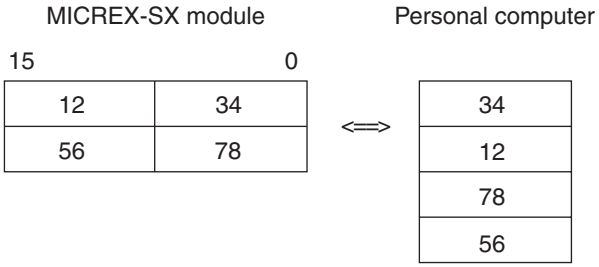
| Memory type |
|---|
| Memory address (L) |
| Memory address (M) |
| Memory address (H) |
| Number of words of read data (L) |
| Number of words of read data (H) |

Data format of response command

| Memory type |
|---|
| Memory address (L) |
| Memory address (M) |
| Memory address (H) |
| Number of words of read data (L) |
| Number of words of read data (H) |
| Read data<br>.<br>.<br>. |

**4) Arrangement of read data**

The read data is arranged as shown below.




**5) Example of Read Data command**

When reading 2-word data from standard memory %MW1.1000 of the CPU module (CPU station No.0), request and response commands are as shown below. (Data: %MW1.1000=WORD#16#1234, %MW1.1001=WORD#16#5678)

Request command : FF7A000011000000000000000001060002E803000200

Response command : 007A000011000000000000000010A0002E80300020034127856

**< Memory type code >**

The memory type code for each memory of the MICREX-SX module is shown below.

| Target module | Memory type | Area name | Remarks |
|---|---|---|---|
| CPU module | 02h | Standard memory (%MW1) | |
| | 04h | Retain memory (%MW3) | |
| | 08h | System memory (%MW10) | |
| PE link module | FFh | Broadcast area (%MW □ .1) | (Note 1) |
| P link module | FFh | Broadcast area (%MW □ .1) | (Note 2) |
| FL-net module | FFh | Common memory, etc. (%MW □ .1) | |

Note 1: When accessing the broadcast area of the PE link module by means of a command, the address does not start with 0. Refer to the following address correspondence table.

Note 2: When accessing the broadcast area of the P link module by means of a command, the high-speed bit area, high-speed word area, and low-speed word area are not continuous. Refer to the following address correspondence table.

**< Address correspondence table of PE link >**

| | Access from application | Access from loader command | | |
|---|---|---|---|---|
| | | H | M | L |
| High-speed 1 area (high-speed bit area) | %MW □ .1.0 \| %MW □ .1.511 | 00 \| 00 | 1E \| 1F | 00 \| FF |
| High-speed 2 area | %MW □ .1.512 \| %MW □ .1.8703 | 00 \| 00 | 20 \| 3F | 00 \| FF |
| Low-speed 1 area | %MW □ .1.8704 \| %MW □ .1.12799 | 00 \| 00 | 40 \| 4F | 00 \| FF |
| Low-speed 2 area | %MW □ .1.12800 \| %MW □ .1.25087 | 00 \| 00 | 50 \| 7F | 00 \| FF |

**< Address correspondence table of P link >**

| | Access from application | Access from loader command | | |
|---|---|---|---|---|
| | | H | M | L |
| High-speed 1 area (high-speed bit area) | %MW □ .1.0 \| %MW □ .1.511 | 00 \| 00 | 00 \| 01 | 00 \| FF |
| High-speed 2 area | %MW □ .1.512 \| %MW □ .1.1663 | 00 \| 00 | 02 \| 06 | 00 \| 7F |
| Low-speed 1 area | %MW □ .1.1664 \| %MW □ .1.14735 | 00 \| 00 | 08 \| 13 | 00 \| FF |
| Low-speed 2 area | %MW □ .1.14736 \| %MW □ .1.17807 | 00 \| 00 | 14 \| 1F | 00 \| FF |

### Appendix 2-3-2 Write data

**1) Function**

This command writes the specified number of words to the specified address of the specified data memory.

**2) Command/mode code**

Command: 01h, Mode: 00h

**3) Data format of request command/response command**

Data format of request command

| Memory type |
|---|
| Memory address (L) |
| Memory address (M) |
| Memory address (H) |
| Number of words of write data (L) |
| Number of words of write data (H) |
| Write data<br>.<br>.<br>. |

Data format of response command

| Memory type |
|---|
| Memory address (L) |
| Memory address (M) |
| Memory address (H) |
| Number of words of write data (L) |
| Number of words of write data (H) |

**4) Arrangement of write data**

The write data is arranged as shown below.

MICREX-SX module

| 15 | 0 |
|---|---|
| 12 | 34 |
| 56 | 78 |



Personal computer

| |
|---|
| 34 |
| 12 |
| 78 |
| 56 |

**5) Example of Write Data command**

When writing 1-word data to retain memory %MW3.0 of the CPU module (CPU station No.0), request and response commands are as shown below. (Write data: WORD#16#1234)

Request command : FF7A000011000000000001000001080004000000001003412

Response command : 007A000011000000000001000001080004000000100

### Appendix 2-3-3 Batch Start of CPUs

**1) Function**

This command activates all the CPUs in the configuration at one time.
Each CPU cold-starts or warm-starts depending on the condition. CPUs already activated or CPUs with the key switch set to the “RUN” position do not perform any processing. They respond normally without error.

**2) Command/mode code**

Command: 04h, Mode: 00h

**3) Data format of request command/response command**

None

**4) Batch start command of CPUs**

When activating all the CPUs at one time, request and response commands are as shown below.

Request command : FF7A000011000000000040000010000

Response command : 007A000011000000000040000010000

### Appendix 2-3-4 Batch Initialization Start of CPUs

**1) Function**

This command initializes and activates all the CPUs in the configuration at one time.
Each CPU cold-starts. CPUs already activated or CPUs with the key switch set to the “RUN” position do not perform any processing. They respond normally without error.

**2) Command/mode code**

Command: 04h, Mode: 01h

**3) Data format of request command/response command**

None

**4) Batch initialization start command of CPUs**

When initializing and activating all the CPUs at one time, request and response commands are as shown below.

Request command : FF7A000011000000000040100010000

Response command : 007A000011000000000040100010000

### Appendix 2-3-5 Batch Stop of CPUs

**1) Function**

This command deactivates all the CPUs in the configuration at one time.
CPUs already activated or CPUs with the key switch set to the “RUN” position do not perform any processing. They respond normally without error.

**2) Command/mode code**

Command: 04h, Mode: 02h

**3) Data format of request command/response command**

None

**4) Batch stop loader command of CPUs**

When deactivating all the CPUs at one time, request and response commands are as shown below.

Request command : FF7A000011000000000040200010000

Response command : 007A000011000000000040200010000

# Appendix 2-3 Loader Command Details

### Appendix 2-3-6 Batch Reset of CPUs

**1) Function**

This command Resets all the CPUs in the configuration at one time.
This command is executed regardless of the key switch position of the CPU.

**2) Command/mode code**

Command: 04h, Mode: 03h

**3) Data format of request command/response command**

None

**4) Batch reset command of CPUs**

When resetting all the CPUs at one time, request and response commands are as shown below.

Request command : FF7A000011000000000040300010000

Response command : 007A000011000000000040300010000

### Appendix 2-3-7 Individual Start of CPU

**1) Function**

This command activates a specified CPU in the configuration separately.
Each CPU cold-starts or warm-starts depending on the condition. If the specified CPU has already been activated, an error result. CPU specification is made with the connection mode and connection ID.

**2) Command/mode code**

Command: 04h, Mode: 04h

**3) Data format of request command/response command**

None

**4) Example of individual start command of CPU**

When activating a CPU separately (CPU1 in a multi-CPU system), request and response commands are as shown below.

Request command : FF7BFD00110000000000040400010000

Response command : 007BFD00110000000000040400010000

### Appendix 2-3-8 Individual Initialization Start of CPU

**1) Function**

This command Initializes and activates a specified CPU in the configuration separately.
The specified CPU cold-starts. If the specified CPU has already been activated or the key switch is set to the RUN/STOP position, an error result. CPU specification is made with the connection mode and connection ID.

**2) Command/mode code**

Command: 04h, Mode: 05h

**3) Data format of request command/response command**

None

**4) Example of individual initialization start command of CPU**

When initializing and activating a CPU separately (CPU1 in a multi-CPU system), request and response commands are as shown below.

Request command : FF7BFD00110000000000040500010000

Response command : 007BFD00110000000000040500010000

### Appendix 2-3-9 Individual Stop of CPU

**1) Function**

This command deactivates a specified CPU in the configuration separately.
If the specified CPU has already been deactivated or the key switch is set to the RUN/STOP position, an error result. CPU specification is made with the connection mode and connection ID.

**2) Command/mode code**

Command: 04h, Mode: 06h

**3) Data format of request command/response command**

None

**4) Example of individual stop command of CPU**

When deactivating a CPU separately (CPU1 in a multi-CPU system), request and response commands are as shown below.

Request command : FF7BFD00110000000000040600010000

Response command : 007BFD00110000000000040600010000

### Appendix 2-3-10 Individual Reset of CPU

**1) Function**

This command resets a specified CPU in the configuration separately.
If the key switch is set to the RUN/STOP position, an error result. CPU specification is made with the connection mode and connection ID.

**2) Command/mode code**

Command: 04h, Mode: 07h

**3) Data format of request command/response command**

None

**4) Example of individual reset command of CPU**

When resetting a CPU separately (CPU1 in a multi-CPU system), request and response commands are as shown below.

Request command : FF7BFD00110000000000040700010000

Response command : 007BFD00110000000000040700010000

# Appendix 3 Additional Explanation for NP1L-RS3

Page

# Appendix 3 Additional Explanation for NP1L-RS3

Communication module (Type: NP1L-RS3) has two RS-232C port. Function is almost same as other modules (Type: NP1L-RS1/RS2/RS4).
Here explains difference between NP1L-RS3 and other modules (NP1L-RS1/RS2/RS4).
As for common function with other modules, please read main chapter of this manual.

## Appendix 3-1 Applicable Version for NP1L-RS3

(Related page: p1-4)

| Type | | Support version |
|---|---|---|
| CPU | SPH200 | **30 or later (include NP1L-RS1/2/4) |
| | SPH300 | **25 or later (include NP1L-RS1/2/4) |
| Loader | D300win V2 | V2.2.6.0 or later |
| | D300win V3 | V3.1.4.0 or later |
| | Standard Loader | V2.1.0.0 or later |

If you use NP1L-RS3, you need to use with above mentioned version CPU and Loader.
* NP1L-RS3 supports “Modem-based loader function” and “Standard extended FB”.

## Appendix 3-2 General Specifications

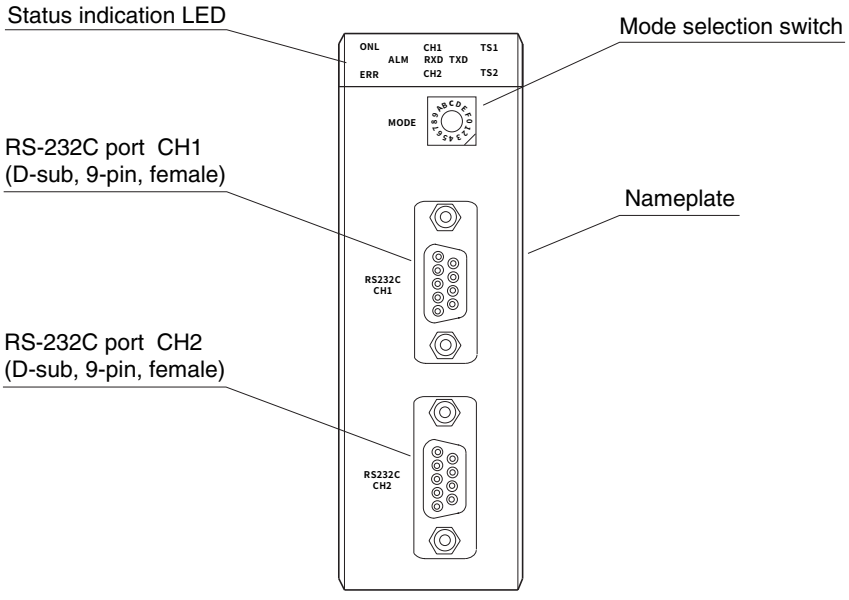
(Related page: p2-1)

| Item | Specification |
|---|---|
| Isolation method | Not isolated |
| Internal current consumption | 110mA or less |
| Mass | Approx. 140g |

## Appendix 3-3 Names and Functions

(Related page: p2-3 to 2-6)

**Appendix 3-3-1 Names**



# Appendix 3 Additional Explanation for NP1L-RS3

### Appendix 3-3-2 Functions

**1) Status indication LED**

Here explains difference for NP1L-RS3.

| Symbol | Color | Description |
|---|---|---|
| CH1 ALM | Red | Turns on when the communication data via CH1 is abnormal. |
| CH1 RXD | Green | Turns on when the CH1 is receiving data. |
| CH1 TXD | Green | Turns on when data is being sent from CH1. |
| CH2 ALM | Red | Turns on when the communication data via CH2 is abnormal. |
| CH2 RXD | Green | Turns on when the CH2 is receiving data. |
| CH2 TXD | Green | Turns on when data is being sent from CH2. |

**2) Mode selection switch**

| Switch No. | Mode | | Remarks |
|---|---|---|---|
| | CH1 | CH2 | |
| 0 | General purpose device | General purpose device | |
| 1 | Programming loader | General purpose device | |
| 2 | General purpose device | Programming loader | |
| 3 | Programming loader | Programming loader | |
| 4 | Not used | | |
| 5 | Not used | | |
| 6 | Modem-loader<br>19200 bps | General purpose device | |
| 7 | Self-diagnosis mode 1 (diagnoses internal memory and LED) | | |
| 8 | Self-diagnosis mode 2 (diagnoses CH1, CH2 turning back) | | |
| 9 | Modem-loader<br>19200 bps | Programming loader | |
| A | Modem-loader<br>9600 bps | General purpose device | |
| B | Modem-loader<br>9600 bps | Programming loader | |
| C | Modem-loader<br>38400 bps | General purpose device | |
| D | Modem-loader<br>38400 bps | Programming loader | |
| E | Modem-loader<br>76800 bps | General purpose device | |
| F | Modem-loader<br>115200 bps | Modem-loader<br>115200 bps | |

* In case of switch No. F, use either CH1 or CH2 (Can't be used simultaneously).

**3) RS-232C port**

Same type connector and pin assignment as NP1L-RS2.

In case of NP1L-RS3, SG (Pin No. 5) and FG (M2.6 Screw) are internally connected. Generally, connect shield wire of RS-232C cable to FG of NP1L-RS3. However, if communication failed because of noise, connect shield wire of RS-232C cable to both FG of NP1L-RS3 and FG of external device (Ground on both device).

# Appendix 3-4 Self-diagnosis

(Related page: p3-10 to p3-11)

### Appendix 3-4-1 Self-diagnosis mode 1

Function of self-diagnosis is same as NP1L-RS1/2/4. However, LED name is different.

**(1) LED lighting check**

Of the external LEDs of the module, the lighting condition of those operated by general purpose communication module are checked. When the mode selection switch is set to "7," "TS1," "TS2," "CH2 ALM" and "CH1 ALM" LEDs light up in this order.

### Appendix 3-4-2 Self-diagnosis mode 2

**(1) RS to CS signal check**

In this check, the general purpose communication module turns RS signal ON to check whether CS signal is looped back and turns ON, and then checks that this signal turns OFF.

When both CH1 and CH2 are normal, "TS2" lights up; proceeds to step (2).

IF CH1 and/or CH2 is abnormal, "TS2" blinks (at 0.5-second intervals) after 5 seconds ; proceeds to step (2).

If CH1 is abnormal, "ERR" lights up while "TS2" blinks.

If CH2 is abnormal, "CH2 ALM" lights up while "TS2" blinks.

**(2) ER to DR signal check**

In this check, the general purpose communication module turns ER signal ON to check whether DR signal is looped back and turns ON, and then checks that this signal turns OFF.

When both CH1 and CH2 are normal, "TS1" lights up; proceeds to step (3).

IF CH1 and/or CH2 is abnormal, "TS1" blinks (at 0.5-second intervals) after 5 seconds ; proceeds to step (3).

If CH1 is abnormal, "ERR" lights up while "TS1" blinks.

If CH2 is abnormal, "CH2 ALM" lights up while "TS1" blinks.

**(3) RS-232C data check**

The general purpose communication modules sends 16 bytes of data once and checks the looped back data received.

When both CH1 and CH2 are normal, "CH1 ALM" lights up; proceeds to step (4).

IF CH1 and/or CH2 is abnormal, "CH1 ALM" blinks (at 0.5-second intervals) after 10 seconds ; proceeds to step (4).

If CH1 is abnormal, "ERR" lights up while "CH1 ALM" blinks.

If CH2 is abnormal, "CH2 ALM" lights up while "CH1 ALM" blinks.

**(4) Preservation of the result of the check**

After 10 seconds of displaying the results from (3) above, the module returns to step (1). Here, if the setting of the mode selection switch has been changed, Self-diagnosis Mode 2 is ended to enter the designated mode.

# Appendix 3-5 Initialization Parameters

(Related page: p4-7)

| No. | Item | Specification |
|---|---|---|
| 1 | Port No. | Designates an interface port on general purpose communication module.<br>0: CH1<br>1: CH2 |
| 12 | RS-485 mode | Not used in case of NP1L-RS3. |

# Appendix 3 Additional explanation for NP1L-RS3

## Appendix 3-6 Detailed RAS

(Related page: p7-3)

No. 4 and No. 5 information newly added to detailed RAS information.
(To NP1L-RS3 module. Currently, NP1L-RS1/RS2/RS4 doesn't support this information.)

| | |
|---|---|
| 0 | Status of general purpose communication module |
| 1 | Status of CH1 |
| 2 | Status of CH2 |
| 3 | Not used |
| 4 | Self-diagnostic 1 |
| 5 | Self-diagnostic 2 |
| 6 | Not used |
| 7 | Not used |
| 8 | Number of parity error occurrences |
| 9 | Number of framing error occurrences |
| 10 | Number of overrun error occurrences |
| 11 | Send buffer overflow |
| 12 | Receive buffer overflow |
| 13 | Loopback buffer overflow |

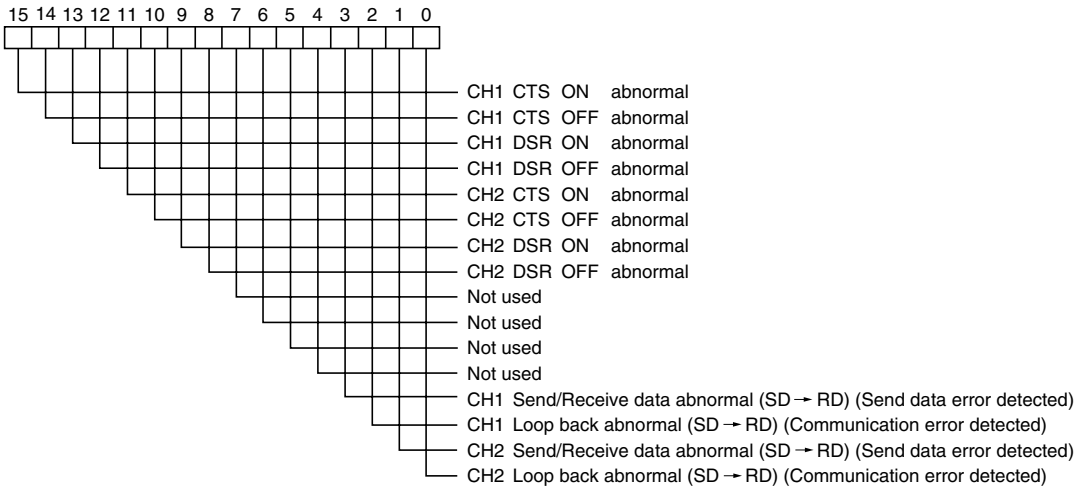
RS-232C

No.4 (Self-diagnostic 1)

Bit 0: External RAM abnormal

Bit 1 to 15: Not used

No.5 (Self-diagnostic 2)



# Appendix 4 Additional Explanation for NP1L-RS5

Page

# Appendix 4 Additional Explanation for NP1L-RS5

Communication module (Type: NP1L-RS5) has two RS-485 port. Function is almost same as other modules (Type: NP1L-RS1/RS2/RS4).
Here explains difference between NP1L-RS5 and other modules (NP1L-RS1/RS2/RS4).
As for common function with other modules, please read main chapter of this manual.

## Appendix 4-1 Applicable Version for NP1L-RS5

(Related page: p1-4)

| Type | | Support version |
|---|---|---|
| CPU | SPH200 | **30 or later (include NP1L-RS1/2/4) |
| | SPH300 | **25 or later (include NP1L-RS1/2/4) |
| Loader | D300win V2 | Not supported |
| | D300win V3 | V3.3.2.0 or later |
| | Standard Loader | V2.2.2.1 or later |

If you use NP1L-RS5, you need to use with above mentioned version CPU and Loader.
* NP1L-RS5 supports “Modem-based loader function” and “Standard extended FB”.

## Appendix 4-2 General Specifications

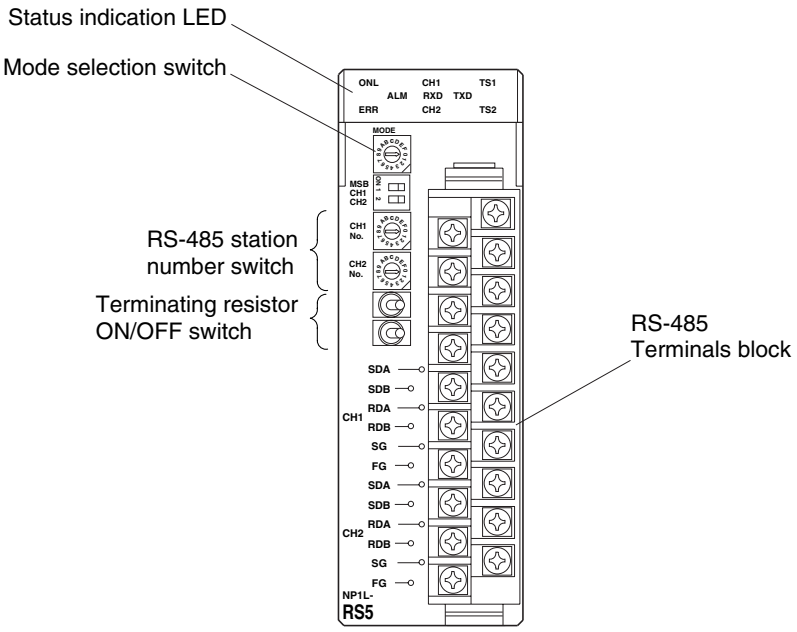
(Related page: p2-1)

| Item | Specification |
|---|---|
| Internal current consumption | 110mA or less |
| Mass | Approx. 190g |

## Appendix 4-3 Names and Functions

(Related page: p2-3 to 2-6)

### Appendix 4-3-1 Names



# Appendix 4 Additional Explanation for NP1L-RS5

### Appendix 4-3-2 Functions

**1) Status indication LED**

Here explains difference for NP1L-RS5.

| Symbol | Color | Description |
|---|---|---|
| CH1 ALM | Red | Turns on when the communication data via CH1 is abnormal. |
| CH1 RXD | Green | Turns on when the CH1 is receiving data. |
| CH1 TXD | Green | Turns on when data is being sent from CH1. |
| CH2 ALM | Red | Turns on when the communication data via CH2 is abnormal. |
| CH2 RXD | Green | Turns on when the CH2 is receiving data. |
| CH2 TXD | Green | Turns on when data is being sent from CH2. |
| TS1 | Green | Blinks when internal RAM error is detected in self-diagnosis mode 7. |
| TS2 | Green | Not used |

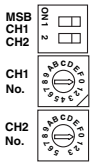
**2) Mode selection switch**

| Switch No. | Mode | | Remarks |
|---|---|---|---|
| | CH1 | CH2 | |
| 0 | General purpose device | General purpose device | |
| 1 | Programming loader | General purpose device | |
| 2 | General purpose device | Programming loader | |
| 3 | Programming loader | Programming loader | |
| 4 | Not used | | |
| 5 | Not used | | |
| 6 | Modem-loader<br>19200 bps | General purpose device | |
| 7 | Self-diagnosis mode 1 (diagnoses internal memory and LED) | | |
| 8 | Self-diagnosis mode 2 (diagnoses CH1, CH2 turning back) | | |
| 9 | Modem-loader<br>19200 bps | Programming loader | |
| A | Modem-loader<br>9600 bps | General purpose device | |
| B | Modem-loader<br>9600 bps | Programming loader | |
| C | Modem-loader<br>38400 bps | General purpose device | |
| D | Modem-loader<br>38400 bps | Programming loader | |
| E | Modem-loader<br>76800 bps | General purpose device | |
| F | Modem-loader<br>115200 bps | Modem-loader<br>115200 bps | |

* In case of switch No. F, use either CH1 or CH2 (Can't be used simultaneously).

**3) RS-485 station No. switch**

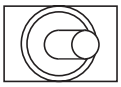
Used to set RS-485 station No. for CH1, CH2 individually.
Range: 00 to 1F (HEX)




The second digit is set by dip switch.
OFF: 0
ON: 1
The first digit is set by rotary switch. (0 to F)

**4) Terminating resistor ON/OFF switch**

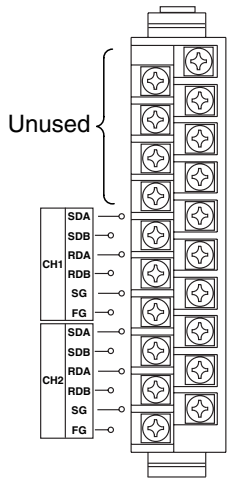
This switch used to select the ON/OFF of the RS-485 terminating resistor. There are three positions for this switch.



| Switch position | Status |
|---|---|
| Right | 2-wire type, terminating resistor is available. |
| Center | Terminating resistor is not available. |
| Left | 4-wire type, terminating resistor is available. |

**5) RS-485 terminal block**

It is used to connect RS-485 cable (20 poles, M3 screw).




| Signal name | Signal direction RS5 ⟺ External device | Description |
|---|---|---|
| SDA | ⇒ | Send data signal line (+) |
| SDB | ⇒ | Send data signal line (-) |
| RDA | ⇐ | Receive data signal line (+) |
| RDB | ⇐ | Receive data signal line (-) |
| SG | | Signal ground (Common return) |
| FG | | Frame ground |

For wiring, please refer “6-2 Wiring Method”.
However, in case of 2-wire, short SDA and RDA (+), SDB and RDB (-) and connect to other device.
In case of RS5, no need to connect zener diode as it is already included in module.

# Appendix 4 Additional Explanation for NP1L-RS5

## Appendix 4-4 Self-diagnosis

(Related page: p3-10 to p3-11)

### Appendix 4-4-1 Self-diagnosis mode 1

Function of self-diagnosis is same as NP1L-RS1/2/4. However, LED name is different.

**(1) LED lighting check**

Of the external LEDs of the module, the lighting condition of those operated by general purpose communication module are checked. When the mode selection switch is set to “7,” “TS1,” “TS2,” “CH2 ALM” and “CH1 ALM” LEDs light up in this order.

### Appendix 4-4-2 Self-diagnosis mode 2

**(1) RS-485 data check**

The general purpose communication modules sends 16 bytes of data once and checks the looped back data received.
When both CH1 and CH2 are normal, “CH1 ALM” lights up; proceeds to step (2).
If CH1 is abnormal, “CH1 ALM” blinks (at 0.5-second intervals) and “ERR” turns ON after 10 seconds; proceeds to step 2.
If CH2 is abnormal, “CH2 ALM” blinks (at 0.5-second intervals) and “ERR” turns ON after 10 seconds; proceeds to step 2.

**(2) Preservation of the result of the check**

After 10 seconds of displaying the results from (1) above, the module returns to step (1). Here, if the setting of the mode selection switch has been changed, Self-diagnosis Mode 2 is ended to enter the designated mode.

## Appendix 4-5 Initialization Parameters

(Related page: p4-7)

| No. | Item | Specification |
|---|---|---|
| 1 | Port No. | Designates an interface port on general purpose communication module.<br>0: CH1<br>1: CH2 |
| 8 | DCE designation | Not used in case of NP1L-RS5 |
| 9 | ER/DR signal control | Not used in case of NP1L-RS5 |
| 10 | Signal flow control | Not used in case of NP1L-RS5 |

## Appendix 4-6 Loader Network Functions

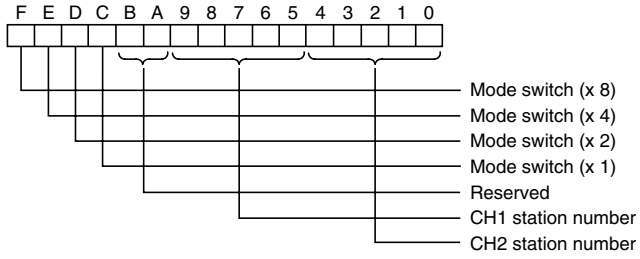
(Related page: p3-7)

If you use this module on loader network configuration, connect cable to CH2.

## Appendix 4-7 Detailed RAS

(Related page: p7-3)

RS-485 station No. switch setting appears on bit 5 to 9, 0 to 4 on communication status area.




No. 4 and No. 5 information newly added to detailed RAS information.
(Almost same as RS3 specification)

| | |
|---|---|
| 0 | Status of general purpose communication module |
| 1 | Status of CH1 |
| 2 | Status of CH2 |
| 3 | Not used |
| 4 | Self-diagnostic 1 |
| 5 | Self-diagnostic 2 |
| 6 | Not used |
| 7 | Not used |
| 8 | Number of parity error occurrences |
| 9 | Number of framing error occurrences |
| 10 | Number of overrun error occurrences |
| 11 | Send buffer overflow |
| 12 | Receive buffer overflow |
| 13 | Loopback buffer overflow |

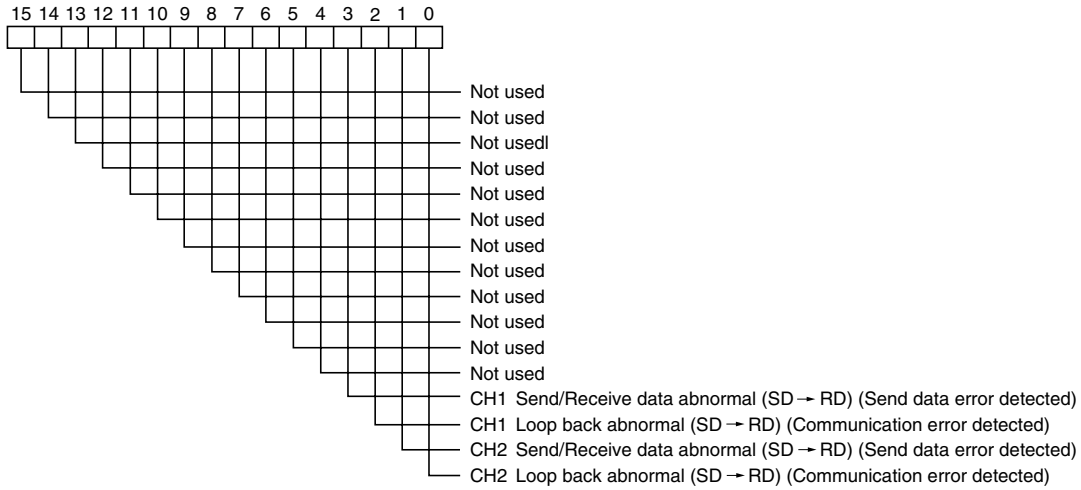
RS-232C

No.4 (Self-diagnostic 1)

Bit 0: External RAM abnormal

Bit 1 to 15: Not used

No.5 (Self-diagnostic 2)



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