**SMART TERMINAL**
**EST-Z Series**

**User's Manual**
**Communications Connection**

**Thank you for purchasing the AP Editor for Smart Terminal EST-Z Series.**
**This manual contains information for ensuring correct use of the AP Editor for Smart Terminal EST-Z Series. It also provides necessary information for installation, maintenance, and troubleshooting.**
**This manual should be read by those who design and maintain devices that use the AP Editor for Smart Terminal EST-Z Series.**
**Be sure to keep this manual nearby for handy reference.**

Yamatake Corporation

## RESTRICTIONS ON USE

This product has been designed, developed and manufactured for general-purpose application in machinery and equipment.

Accordingly, when used in applications outlined below, special care should be taken to implement a fail-safe and/or redundant design concept as well as a periodic maintenance program.

- Units for concerning to control and safety of transportation vehicles (automobiles, trains and ships, etc.)
- Traffic control systems
- Anti-disaster systems, anti-crime systems
- Safety equipment
- Medical equipment (not specifically designed for life support)

Never use this product in applications which require extremely high reliability, such as those outlined below.

- Aeronautical machines
- Aerospace machines
- Submersible repeaters
- Nuclear reactor control systems
- Life support systems (medical equipment, etc.)

Never use this product in applications where human safety may be put at risk.

Never use this product as a safety switch or as an emergency stop switch.

Special care should be taken to implement a fail-safe and/or redundant design which takes into account the possibility of operational delay, unit damage and malfunction of this product.

## REQUEST

Ensure that this User's Manual is handed over to the user before the product is used.

Copying or duplicating this User's Manual in part or in whole is forbidden. The information and specifications in this User's Manual are subject to change without notice.

Considerable effort has been made to ensure that this User's Manual is free from inaccuracies and omissions.
If you should find any inaccuracies or omissions, please contact Yamatake Corporation.

In no event is Yamatake Corporation liable to anyone for any indirect, special or consequential damages as a result of using this product.

# The Role of This Manual

Outline of EST-Z Series Manuals

The below 9 manuals are provided to cover a range of EST-Z Series-related topics. Use the manual that best fits your application. In the event such a manual is not available, contact us or your local EST-Z Series dealer.

**Smart Terminal EST240Z User's Manual       Manual No.CP-UM-5145E**

This manual is packaged with the EST240Z body.

This manual should be read by those who produce units that use the Smart Terminal.

This manual contains safety precautions when using the Smart Terminal, installation methods, and descriptions for wiring the power supply and signal lines.

**Smart Terminal EST555Z User's Manual       Manual No.CP-UM-5229E**

This manual is packaged with the EST555Z body.

This manual should be read by those who produce units that use the Smart Terminal.

This manual contains safety precautions when using the Smart Terminal, installation methods, and descriptions for wiring the power supply and signal lines.

**Smart Terminal EST240Z User's Manual**
**Installation                                    Manual No. CP-SP-1065E**

This manual should be read by those who use the EST240Z to design units and those in charge of maintenance.

This manual describes safety cautions when using the Smart Terminal, how to install for incorporating into units, wiring methods, maintenance and inspection, troubleshooting, and hardware specifications.

**Smart Terminal EST555Z User's Manual**
**Installation                                    Manual No. CP-SP-1103E**

This manual should be read by those who use the EST555Z to design units and those in charge of maintenance.

This manual describes safety cautions when using the Smart Terminal, how to install for incorporating into units, wiring methods, maintenance and inspection, troubleshooting, and hardware specifications.

**Smart Terminal EST-Z Series User's Manual**
**Application Preparation**　　　　　　　**Manual No. CP-SP-1088E**

This manual should be read by those who design screens that are displayed on the EST-Z Series and operations.

This manual describes the environment of the personal computer on which AP Editor can be used, installation methods, startup, system settings, file operations, printing, how to paste smart objects, and other AP Editor operations.
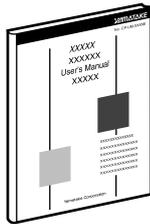
**Smart Terminal EST-Z Series User's Manual**
**Smart Object Library**　　　　　　　**Manual No. CP-SP-1089E**

Graphic elements that have functions for displaying on the EST-Z Series are called "smart objects."

This manual describes the concept of smart objects and the functions of each smart object.
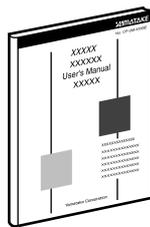
**Smart Terminal EST-Z Series User's Manual**
**Communications Connection**　　　　　　**Manual No. CP-SP-1090E**

This manual.

This manual should be read by those who combine the EST-Z Series with PLCs made by other manufacturers and dedicated board computers to build systems. This manual describes how to connect to PLCs, address maps that correspond to PLCs, how to paste smart objects, drawing, and other operations and settings required for making applications using PLCs.
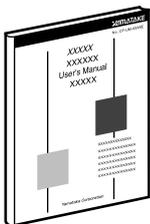
**Smart Terminal EST240Z User's Manual**
**DMC10 Package**　　　　　　　　**Manual No. CP-SP-1091E**

This package is used when constructing systems by connecting the EST240Z to Yamatake's Distributed Multi-channel Controller DMC10.

This manual describes the specifications of the software package, how to use the package, how to install the software, and how to operate the software.
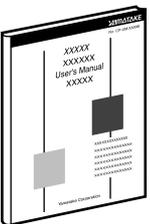
**Smart Terminal EST555Z User's Manual**
**DMC10 Package**　　　　　　　　**Manual No. CP-SP-1124E**

This package is used when constructing systems by connecting the EST555Z to Yamatake's Distributed Multi-channel Controller DMC10.

This manual describes the specifications of the software package, how to use the package, how to install the software, and how to operate the software.

# Organization of This User's Manual

This manual is organized as follows:

**Chapter 1.  COMMUNICATIONS WITH PLCS**

This chapter describes the settings that are required when reading from and writing to slave stations such as a PLC or temperature controller from the EST by communications.

**Chapter 2.  CONNECTING THE EST WITH OTHER MANUFACTURERS' PLCS**

This chapter describes examples of how to connect external devices made by other manufacturers' to the EST, the setting item menus on the EST, and how to set these setting items.

**Chapter 3.  SERIAL SLAVE STATION COMMUNICATIONS**

Serial slave station communications is a form of communications in which the user component for system control is defined as the master station so that data is exchanged with the EST.
This chapter describes how to set up for executing serial slave station communications, and how to read switch states.

**Chapter 4.  ADDRESS MAPS**

This chapter describes device names and addresses, and how to use these names and addresses.

**Chapter 5.  SERIAL COMMANDS**

This chapter describes the functions of each command when the EST is used as the serial slave station, and the command/response frame parameters.

# Conventions Used in This Manual

The following conventions are used in this manual:

⚠ **Handling Precautions**

: Handling Precautions indicate items that the user should pay attention to when handling the **EST-Z Series.**

📖 **Note**

: Notes indicate useful information that the user might benefit by knowing.

**(1), (2), (3)**

: The numbers with the parenthesis indicate steps in a sequence or indicate corresponding parts in an explanation.

[ABC]

: This indicates a button or message displayed on the screen on the personal computer.

[A] [B] [C] etc.

: This indicates a key on the personal computer's keyboard.

*"Addr"*

This indicates a 7-segment display indicated on a Yamatake product.

# Contents

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Conventions Used in This Manual

## Chapter 1.   COMMUNICATIONS WITH PLCS

## Chapter 2.   CONNECTING THE EST WITH PLCS

# Chapter 1. COMMUNICATIONS WITH PLCS

■ **What is the "PLC host link?"**

The "PLC Host Link" is a function for reading from and writing to devices such as PLCs or temperature controllers that respond as slave devices to the EST communications.

■ **EST application and PLC host link**

Application data must be prepared to run the Smart Terminal EST-Z Series (simply referred to as "EST" in this manual).
The smart object library, that brings together functions in individual groups, is provided to facilitate creation of the application data.
For details on smart objects, refer to the Smart Terminal EST-Z Series Smart Object Library Manual No. CP-SP-1089E.
In using the PLC Host Link to be used by the EST application data, the following operations are involved including use of the smart objects.

- The PLC device is specified as the device to be entered in the smart object dialog box, and the PLC Host Link is used.

- The PLC device is specified as the contact device for monitoring in the alarm monitoring information, and the PLC Host Link is used.

- Yamatake temperature controller devices are specified as the device in the recipe settings in the setting information.

- The PLC device is specified as the sending side device and the receiving side device in the setting information gateway, and data exchange is performed automatically.

■ **Setup required for using the PLC host link**

For details on the procedure for creating application data and operation methods, refer to the separate manual Smart Terminal EST-Z Series User's Manual Application Preparation  Manual No. CP-SP-1088E.
The following setup operations are required for using the PLC Host Link:

- Setting of the driver for the target model PLC to the channel on which the PLC Host Link is to be used in the Setting information: communications settings of the basic settings

- Setting of the PLC device as the device in the device entry field in the smart object dialog box, for example

The following describes these two operations:

■ **Configuration information: Configuration of the PLC driver in the communications settings of the general**

(1) Double-click [General] under Configuration Information in the Application Manager.
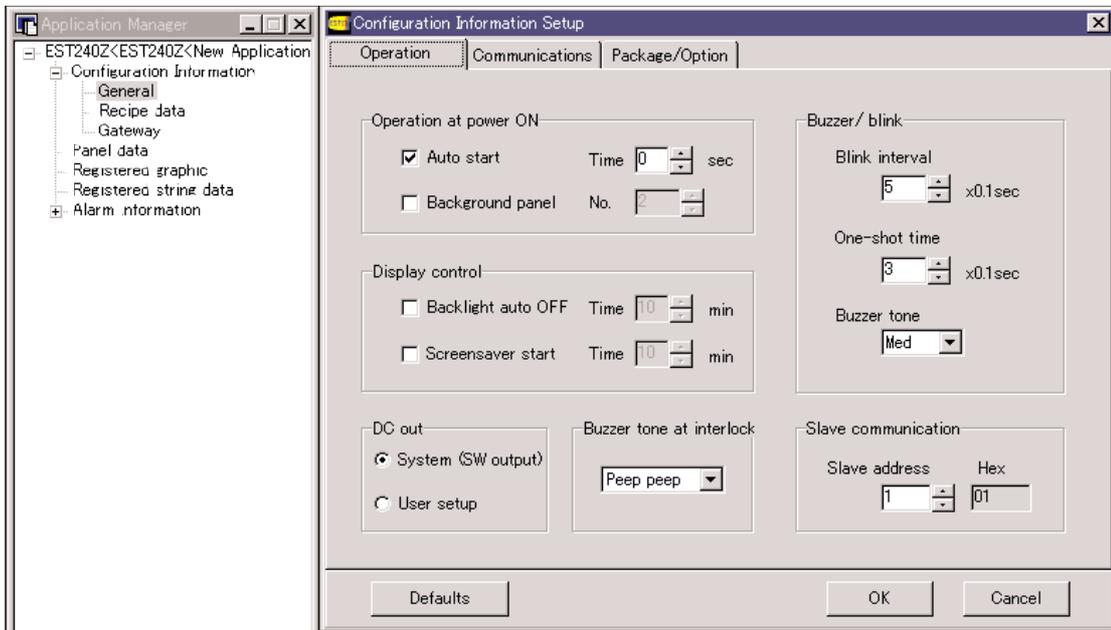


(2) Click the [Communications] tab under Configuration Information.

(3) Click the field for the channel on which communications is to be performed.
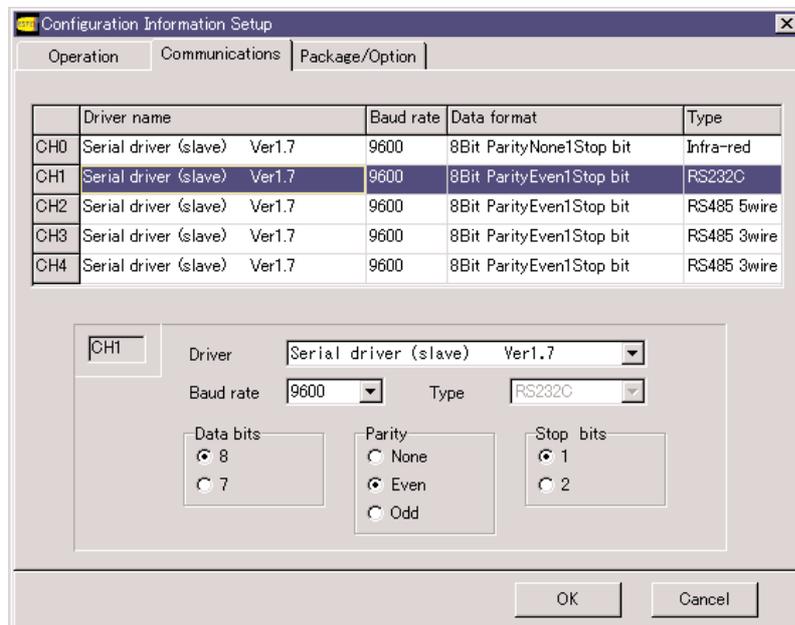


Four channel(CH)s 1 to 4 are provided. The mode of communications is fixed according to each channel.

CH1: 9-pin RS-232C D-Sub connector

CH2: 5-lead RS-485 terminal block

CH3, 4: 3-lead RS-485 terminal block. Mainly used for Yamatake temperature controllers.

(4) Select the PLC driver to be used for communications and set the communications format.
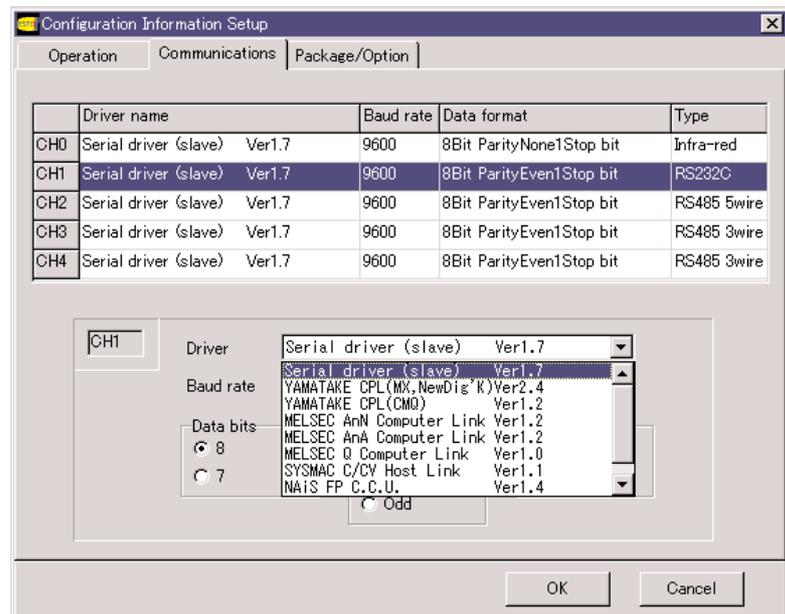


(5) Click [OK] at Configuration Information to apply the settings.

## ■ Configuration of the PLC device as the device

Conventions used for PLC devices are as follows:

Channel No.: device address No.@sub-address No.: device address

- Channel(CH) No.
  This is the channel number (1 to 4) described in the previous item.
  Communications are performed on the specified channel.

- Device address No.
  This is the device address of the PLC, Yamatake temperature controller, etc,
  connected to the specified channel. The device address range varies according to
  the particular device.

- Sub-address No.
  This is the device address of a unit connected on a separate communications
  channel/network of the communications controller connected on a specific
  channel of the EST.

- Device address
  This is the device address supported on the PLC, Yamatake temperature
  controller, etc. For details on device conventions, see "Chapter 2.
  CONNECTING THE EST WITH OTHER MANUFACTURERS' PLCS."

Example:   Enter the following if a Yamatake MX200 PLC: Device address 1 is
           to be used on CH2: 2:1:123.4

### ! Handling Precautions

- The sub-address No. is valid only on drivers that support sub-
  addresses. Do not set a sub-address No. if the driver does not
  support sub-addresses.
  The only driver that currently supports sub-addresses is "Yamatake
  CPU universal host link" in AP Editor versions 1.1 or later.

  Example:      If a DMC10 (device address 3) connected to a
                Yamatake CMC10B (device address 1) is to be used on
                CH4, enter the following: "4:1@3:3000"

- If CH3 is used simultaneously with IrDA(CH0), it is possible that
  communications errors may occur on CH3.

# Chapter 2.  CONNECTING THE EST WITH PLCS

## 2 - 1        List of supported PLCs

The following is a list of PLCs that can be connected to the EST:

| Manufactures | PLC/controller | Driver Name |
|---|---|---|
| Yamatake Corporation | MA500 | Yamatake CPL (MX, NewDig'K) |
| | CPL universal communications | |
| | MX series | |
| | CMQ | Yamatake CPL (CMQ) |
| Mitsubishi Electric | AqN series computer link | MELSEC AnN computer link |
| | AqA series computer link | MELSEC AnA computer link |
| | Q series computer link | MELSEC Q computer link |
| | MELSEC A CPU | MELSEC A CPU |
| | MELSEC FX | MELSEC FXn CPU |
| Omron | C/CV series | SYSMAC C/CV host link |
| Matsushita Electric Works | FP3/5/10 series | NAiS FP C.C.U |
| Yokogawa | FA-M3 series | Yokogawa FA-M3 CPU |
| Siemens K.K. | SeriesS7 (RK512) | Siemens SeriesS7 RK512 |
| Yaskawa | MP900 series | Yaskawa MP-900 |

### ⚠ Handling Precautions

The EST does not check the range of usable addresses.
For details on the range of addresses, refer to the Instruction Manual for each manufacturers' PLCs.

# 2 - 2　Yamatake devices

## ■ Supported devices

### ● Yamatake

As much as possible group together devices to be used in smart display objects and assign them to continuous areas. Cyclic communications are performed on groups with a maximum of 32 continuous words each.

Data can be displayed most efficiently if the devices to be used on each panel are contained within a single continuous area.

Communications with devices used in smart switch objects are performed using demand communications. For this reason, special attention is not required for the device allocation of smart switch objects.

- MA500

| Device Type | Address Range |
|---|---|
| Bit device | 0.0 to 255.F |
| Word device | 256 to 4095 |

On the MA500 personal computer loader, bit addresses are expressed as .00 to .15, but the form .0 to 0.F is used on the EST.

Annotation example　1:1:123.A

　　　　　　　　　　1:1:1320

- CPL universal communications, CMQ series

| Device Type | Address Range |
|---|---|
| Bit device | 0.0 to 65535.F |
| Word device | 0 to 65535 |

Annotation example　1:1:534.2

　　　　　　　　　　1:1:236

- MX series (MX200, MX100, MX50, MX30, MX20)

| Device Address | Device Type | Address Range | |
|---|---|---|---|
| | | MX200/MX50 | MX100/MX30/MX20 |
| 0.0 to 29.F | Input relay | X000 to X29F | X000 to X09F, X200 to X29F |
| 50.0 to 79.F | Output relay | Y000 to Y29F | Y000 to Y09F, Y200 to Y29F |
| 100.0 to 149.F | Latch relay | L000 to L49F | L000 to L49F |
| 150.0 to 159.F | Special relay | M900 to M99F | M900 to M99F |
| 200.0 to 289.F | Auxiliary relay | M000 to M89F | M000 to M49F |
| 300.0 to 315.F | Timer/counter T/C contact | T000 to T255 | T/C000 to T/C199 |
| 1000 to 1255 | Timer/counter T/C PV | T000 to T255 | T/C000 to T/C199 |
| 1400 to 1655 | Timer/counter T/C SP | T000 to T255 | T/C000 to T/C199 |
| 2000 to 2499 | General-purpose data register | R0000 to R0499 | R900 to R499 |
| 2500 to 2519 | Word input register | R0500 to R0519 | R500 to R519 (excluding MX30) |
| 2600 to 2619 | Word output register | R0600 to R0619 | R600 to R619 (excluding MX30) |
| 2900 to 2939 | Special register | R0900 to R0999 | R900 to R939 |
| 3000 to 6999 | General-purpose data register | R1000 to R4999 | – |
| 10000 to 13999 | Link register | P0000 to P3999 | – |

Annotation example　　1:1:534.2

　　　　　　　　　　　1:1:236

⚠ **Handling Precautions**

Set the device address to within 1 to 31.

## ■ Connection examples

### ● RS-232C connection
**Yamatake (host communications module) (1:1)**
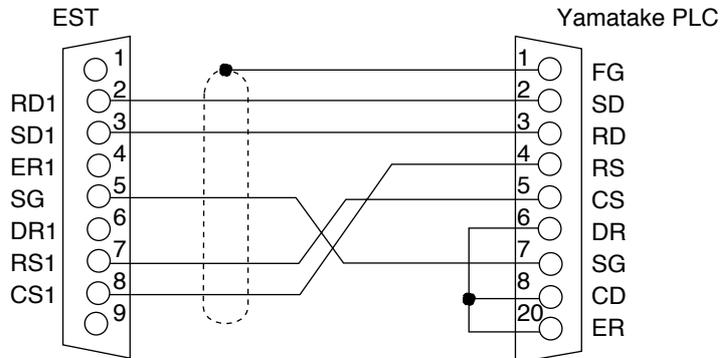


### ● RS-485 5-lead (CH2) connection
**Yamatake (host communications module) (1:1, 1:N)**



1 : 1 connection

1 : N connection  N = Max. 31 units
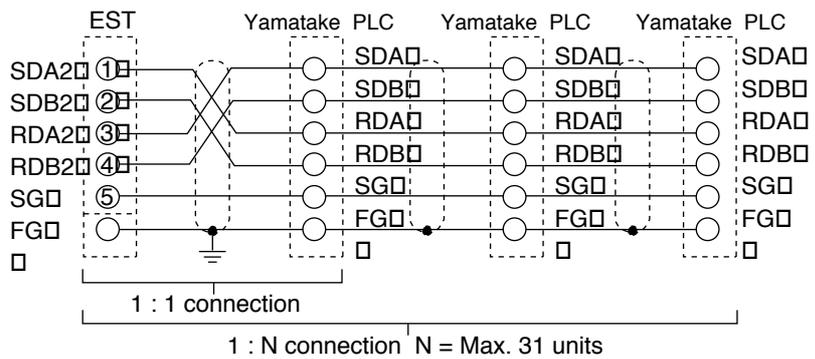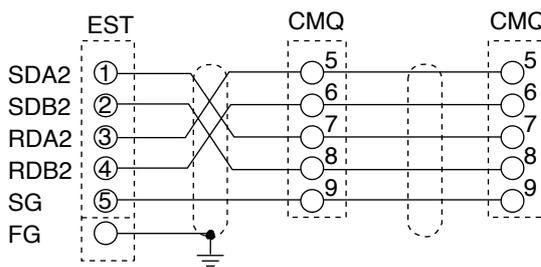
**Yamatake (CMQ)**



### ● RS-485 3-lead (CH3, 4) connection
**Yamatake (SDC10) (1:1, 1:N)**



1 : 1 connection

1 : N connection  N = Max. 31 units

**2-3**
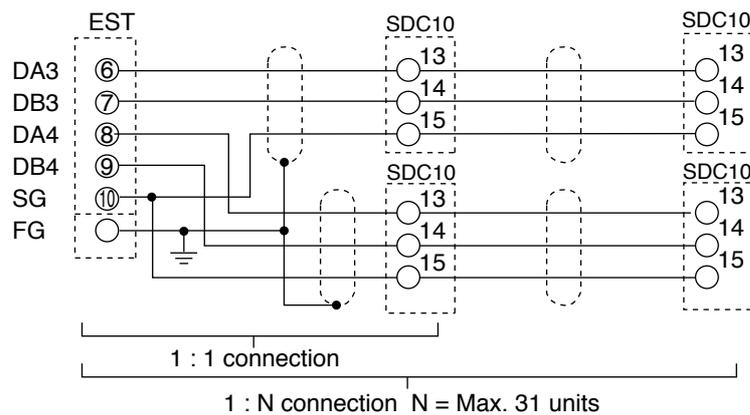
● **RS-485 3-lead (CH3, 4) connection**
   **Yamatake (DMC10) (1:1, 1:N)**
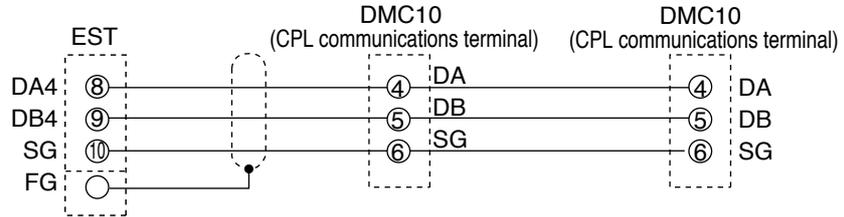


## ⚠ Handling Precautions

- When linking two or more DMC10s, ensure that the communications disconnection switch is set to the "CONNECT" side (factory default). Wiring is not needed in this case.
  For details, please look at the following Smart Terminal User's Manual "DMC10 Package Volume":
    EST240Z: Manual No. CP-SP-1091E
    EST555Z: Manual No. CP-SP-1124E
- The DMC10 has a built-in resistance equivalent to a terminator. Do not connect an external terminating resistor.

● **RS-485 3-lead (CH3, 4) connection**
   **Yamatake (CMC10) (1:1, 1:N)**
   • **EST to CMC10B connection**
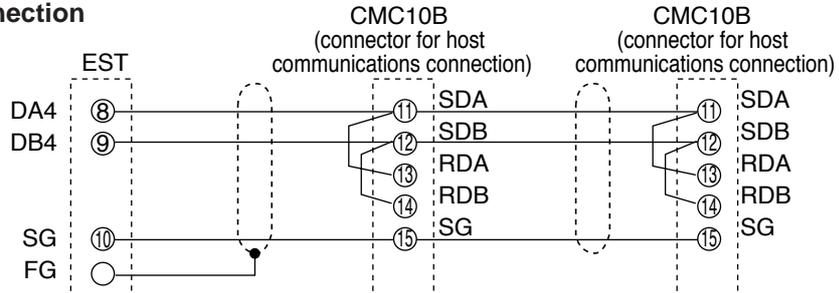


   • **CMC10B and DMC10 connection**
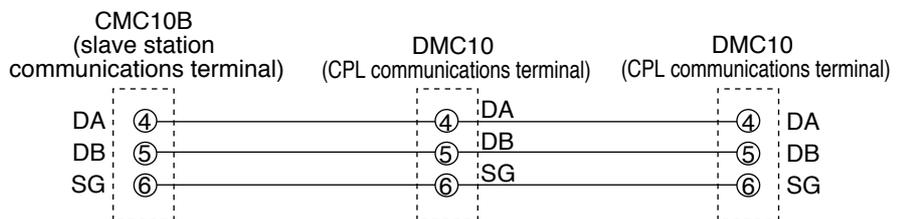


## ⚠ Handling Precautions

- When linking the DMC10 to a CMC10B, or two or more DMC10s, ensure that the communications disconnection switch is set to the "CONNECT" side (factory default). Wiring is not needed in this case.
  For details, please look at the following Smart Terminal User's Manual "DMC10 Package Volume":
    EST240Z: Manual No. CP-SP-1091E
    EST555Z: Manual No. CP-SP-1124E

- Connect a terminator (120 to 150Ω, 1/2W) to both ends of the EST and CMC10B.

- The DMC10 has a built-in resistance equivalent to a terminator. Do not connect an external terminating resistor.

## ■ Environment configuration examples

### ● MX200

The following table shows an example configuration for the MX200:

| PLC/ controller | MX200 |
|---|---|
| Communications unit | Direct link (ASCII connector) |
| Interface | RS-232C |
| Transmission speed | 19200bps |
| Data type | 8bits   Even parity   1 stop bit |

**• EST configuration**

・ Communications channel configuration
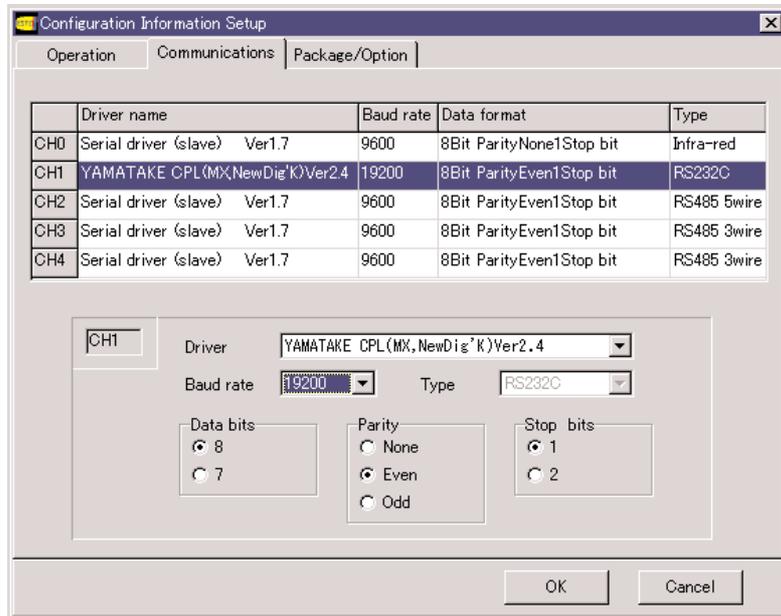


・ How to specify an address

1 : 1 : 01000

PLC device address

PLC communications address (1 to 127)
Set the PLC communications address to the same value as the station No. setting of the MX200 to be connected to the EST.

EST communications channel
The type of communications to the external device will be determined according to which channel is used.
For RS-232C communications with a PLC, channel "1" would be used.

- **MX200 configuration**

  ・ Configuring the communications address

  (1) Press the [DISP] key.
  ▶ The display shows *"Addr"*.

  (2) Press the [ENTER] key twice.
  ▶ The address setting mode is entered.

  (3) Set the communications address (1 to 127) using the cursor keys, and press the [ENTER] key.

  (4) Last of all, press the [DISP] key twice.

  ・ Configuring the communications format

  (1) Press the [DISP] key.
  ▶ The display shows *"Addr"*.

  (2) Press the [←] key twice.
  ▶ The display shows *"SEtU"*.

  (3) Press the [ENTER] key.
  ▶ The display enters the processor module mode.
  If *"stop"* is not displayed, press the [ENTER] key, set to *"stop"* by the [↑] key and press the [ENTER] key again.

  (4) Press the [←] key once.
  ▶ *"0."* is displayed.

  (5) Press the [↑] key four times.
  If *"4.opl"* not *"4.ASC"* is displayed, set to *"ASC"* by operating the [ENTER], [↑] and [ENTER] keys.

  (6) Press the [←] key three times.
  ▶ *"0."* is displayed followed by the communications address.

  (7) Press the [↑] key.
  ▶ *"1."* is displayed followed by the transmission speed.

  (8) Set the transmission speed to *"192"* by operating the [ENTER], [↑] and [ENTER] keys.

  (9) Press the [↑] key.
  ▶ *"0."* is displayed followed by the communications format.

  (10) Set the communications format to *"8E1"* by operating the [ENTER], [↑] and [ENTER] keys.

  (11) Finally, press the [DISP] key three times.

● **SCD10**

The following table shows an example configuration for the SDC10:

| PLC/controller | SDC10 |
| --- | --- |
| Communications unit | Direct link |
| Interface | RS-485 |
| Transmission speed | 9600bps |
| Data type | 8bits   Even parity   1 stop bit |

• **EST configuration**

・ Communications channel configuration
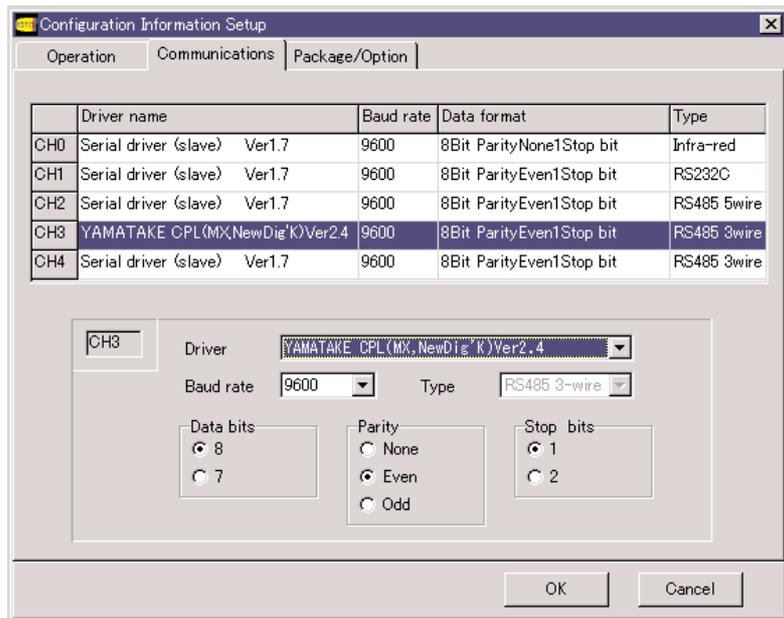


・ How to specify an address

3 : 1 : 00507

————— Temperature controller device address
Temperature controller device address (1 to 127)
  Set the device address of the SDC10 to the same value
  as the station No. setting of the temperature controller to
  be connected to the EST.
EST communications channel
  The type of communications to the external device will be
  determined according to which channel is used.
  For RS-485 (3-lead) communications, channel "3" would
  be used.

• **SDC10 configuration**

(1) Hold down the [PARA] key for three seconds.
  ▶ The parameter mode is entered.
(2) Hold down the [PARA] key for three seconds again.
  ▶ *"C01"* is displayed, and the setup mode is entered.
(3) Press the [PARA] key several times until *"C22"* is displayed.
(4) Set the device address (1 to 127) using the [↑] and [↓] keys.
(5) Press the [PARA] key until *"C23"* is displayed.
(6)  Set the transmission speed and data format using the [↑] and [↓] keys to *"0"*
  (9600bps, 8 bits, even parity, 1 stop bit).

⚠ **Handling Precautions**
  When *"loc"* is displayed when setting *C22* and *C23*, set *C01* to *"0"*.

● **SDC20/21, 30/31, 40A**

The following table shows an example configuration for the SDC20/21, 30/31, 40A:

| PLC/controller | SDC20/21, 30/31, 40A |
|---|---|
| Communications unit | Direct link |
| Interface | RS-485 |
| Transmission speed | 9600bps |
| Data type | 8bits  Even parity  1 stop bit |

• **EST configuration**

• Communications channel configuration
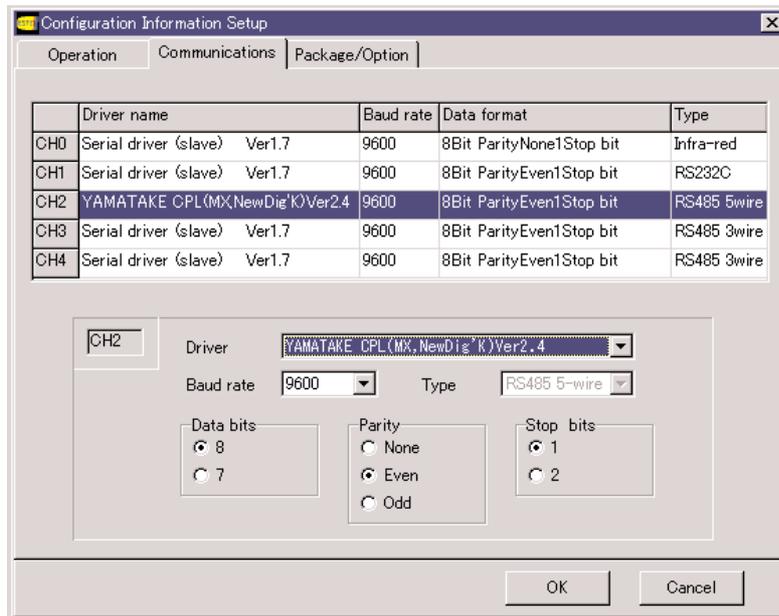


• How to specify an address

2 : 1 : 00603

Temperature controller device address
Temperature controller device address (1 to 127)
Set the device address of the temperature controller to the same value as the station No. setting of the temperature controller to be connected to the EST.
EST communications channel
The type of communications to the external device will be determined according to which channel is used.
For RS-485 (5-lead) communications, channel "2" would be used.

• **Configuration the temperature controller**

• SDC20/21, 30/31

(1) Press the [DISP] key to set to the basic display.

(2) Hold down the [ENTER] key and the [↓] key simultaneously for three seconds.

▶ *"C01"* is displayed, and the setup item setting mode is entered.

(3) Press the [ENTER] key several times until *"C31"* is displayed.
Set the device address (1 to 127).

(4) Press the [ENTER] key until *"C32"* is displayed.
Set the transmission speed to *"0"* (9600 baud).

(5) Press the [ENTER] key until *"C33"* is displayed.

Set the communications code to *"0"* (8 bits, even parity, 1 stop bit).

(6) Last of all, press the [DISP] key.

▶ The basic display is returned to.

**! Handling Precautions**

If *C31*, *C32* and *C33* are displayed but their settings cannot be changed, set *C01* to *"0"*.

・ SDC40A

(1) Press the [PARA] key several times until *"SetUp"* is displayed.

(2) Press the [ENTER] key.

▶ *"C01"* is displayed, and the setup item change mode is entered.

(3) Display *"C84"* by the [↑], [↓], [←] and [→] keys.

(4) Press the [ENTER] key.

Set the device address (1 to 127).

(5) Press the [ENTER] key.

▶ This applies the setting.

(6) Display *"C85"* by the [↑], [↓], [←] and [→] keys.

(7) Press the [ENTER] key.

Set baud rate code to *"0"* (9600 baud, even parity, 1 stop bit).

(8) Press the [ENTER] key.

▶ This applies the setting.

(9) Last of all, press the [DISP] key.

▶ The basic display is returned to.

**! Handling Precautions**

If *C84* and *C85* are displayed but their settings cannot be changed, set C01 to *"0"*.

● **DMC10**

Set the DMC10 using the Smart Loader Package SLP-D10.

For details, please look at the following Smart Terminal User's Manual "DMC10 Package Volume":

EST240Z: Manual No. CP-SP-1091E

EST555Z: Manual No. CP-SP-1124E

Also, refer to the Distributed Multi-channel Controller DMC10 User's Manual Description of Functions Manual No. CP-UM-5143E.

● **CMQ**

The following table shows an example configuration for the CMQ:

| PLC/ controller | CMQ |
|---|---|
| Communications unit | Direct link |
| Interface | RS-485 |
| Transmission speed | 9600bps |
| Data type | 8bits   Even parity   1 stop bit |

• **EST configuration**

• Communications channel configuration
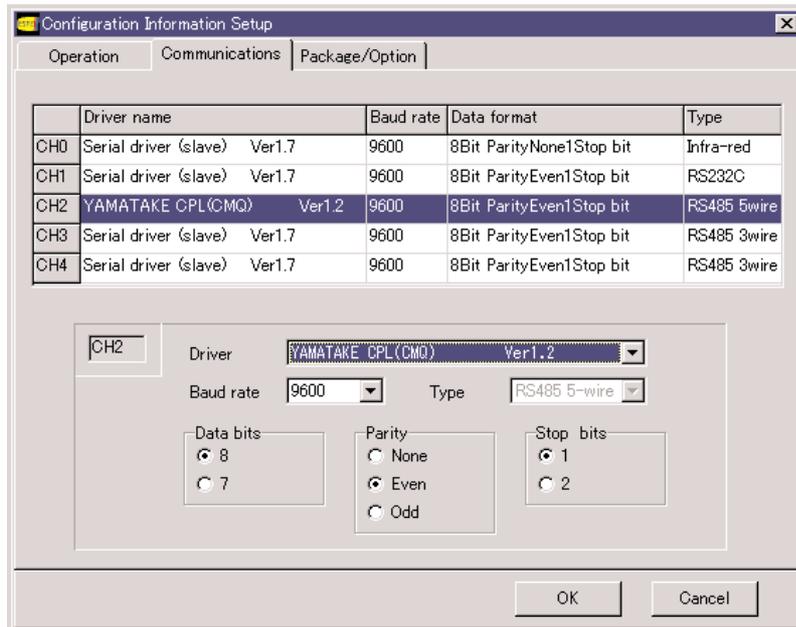


• How to specify an address

2 : 1 : 00507

CMQ device address

CMQ device address (1 to 127)
Set the device address of the CMQ to the same value as the station No. setting of the CMQ to be connected to the EST.

EST communications channel
The type of communications to the external device will be determined according to which channel is used.
For RS-485 (5-lead) communications, channel "2" would be used.

• **CMQ configuration**

(1) Press the DISP key to display instantaneous PV. (The "PV" and "L/min" lamps light.)

(2) Hold down the ▼ key and ENT key simultaneously for three seconds. The item No. *"C-01"* is displayed on the 7-segment display, and the function setting mode is entered.

(3) Press the ▲ or ▼ key to select *"C-30"* and press the ENT key.

(4) The current setting is displayed blinking on the 7-segment display. Press the ▲ or ▼ key to select the device address.

(5) When you have selected the desired setting, press the ENT key to apply the setting. The setting is updated at this moment. (The item No. display is returned to after about one second.)

(6) Press the ▲ or ▼ key to select *"C-31"* and press the ENT key.

(7) The current setting is displayed blinking on the 7-segment display. Press the ▲ or ▼ key to select transmission speed 0: 9600bps.

(8) When you have selected the desired setting, press the ENT key to apply the setting. The setting is updated at this moment. (The item No. display is returned to after about one second.)

(9) Press the ▲ or ▼ key to select *"C-32"* and press the ENT key.

(10) The current setting is displayed blinking on the 7-segment display. Press the ▲ or ▼ key to select communications condition 0: 8 bits, even parity and 1 stop bit.

(11) When you have selected the desired setting, press the ENT key to apply the setting. The setting is updated at this moment. (The item No. display is returned to after about one second.)

(12) Press the DISP key to return to the instantaneous PV display from the function settings mode.

## [!] Handling Precautions

• If you do not perform any operation for one minute after entering the function configuration mode, the regular display (instantaneous PV display) is automatically returned to.

• If you press the [DISP] key without pressing the [ENT] key after the operations in steps (4), (7) and (10), the settings revert to their previous values without being updated.

# 2 - 3    MITSUBISHI MELSEC PLCs (Computer Link)

## ■ Supported devices

### ● MITSUBISHI Electric  A❑N series/A❑A series/Q series  computer link

The continuity of devices need not be taken into account as communication between discrete areas is used for up to 20 devices on the A❑N series and up to 32 devices on the A❑A series.

When this limitation is exceeded, communications become cyclic within a continuous area for the number of devices exceeding this limitation. When this maximum number of devices is exceeded, the upper limit of the address range in the table below is set to a larger value as the order of priority for performing discrete communications.

Communications with devices used in smart switch objects are performed using demand communications. For this reason, special attention is not required for the device allocation of smart switch objects.

| Device Type | Address Range | | |
|---|---|---|---|
| | A❑N series | A❑A series | Q series |
| Input relay | X0000 to X0FFF | X000000 to X00FFFF | X00000 to X0FFFF |
| Output relay | Y0000 to Y0FFF | Y000000 to Y00FFFF | Y00000 to Y0FFFF |
| Internal relay | M0000 to M8999 | M000000 to M008999 | M00000 to M08191 |
| Special relay | M9000 to M9999 | M009000 to M009999 | SM00000 to SM02047 |
| Step relay | S0000 to S8191 | S000000 to S008191 | S00000 to S08191 |
| Link relay | B0000 to B0FFF | B000000 to B000FFF | B00000 to B01FFF |
| Latch relay | L0000 to L4095 | L000000 to L004095 | L00000 to L08191 |
| Annunciator | F0000 to F9999 | F000000 to F009999 | F00000 to F002047 |
| Timer (contact) | TS0000 to TS4095 | TS00000 to TS04095 | TS00000 to TS02047 |
| Timer (coil) | TC0000 to TC4095 | TC00000 to TC04095 | TC00000 to TC02047 |
| Total timer (contact) | – | – | SS00000 to SS02047 |
| Total timer (coil) | – | – | SC00000 to SC02047 |
| Counter (contact) | CS0000 to CS4095 | CS00000 to CS04095 | CS00000 to CS01023 |
| Counter (coil) | CC0000 to CC4095 | CC00000 to CC04095 | CC00000 to CC01023 |
| Data register | D0000 to D9999 | D000000 to D009999 | D00000 to D12287 |
| Link register | W0000 to WFFFF | W000000 to W00FFFF | W00000 to W01FFF |
| File register | R0000 to R9999 | R000000 to R009999 | ZR00000 to ZRFE7FF |
| Special register | D9000 to D9999 | D009000 to D009999 | SD00000 to SD02047 |
| Timer PV | TN0000 to TN9999 | TN00000 to TN09999 | TN00000 to TN02047 |
| Total timer PV | – | – | SN00000 to SN02047 |
| Counter PV | CN0000 to CN9999 | CN00000 to CN09999 | CN0000 to CN01023 |
| Other devices | Not supported | | |

Annotation example   1:1:M123
　　　　　　　　　　 1:1:D236

## ⚠ Handling Precautions

- The communications station No. of the Computer Link Unit A1SJ71C24-R2 and A1SJ71C24-PRF is fixed at "0".
  Annotation example  1:0:M123
                   1:0:D236

- MITSUBISHI communications protocol [3C frames, format4] is used for the Computer Link Unit.
  Set the MODE setting switch as follows:

| Computer Link Unit | Port Type | MODE Setup Switch |
|---|---|---|
| AJ71C24<br>AJ71C24-S3 | RS-232C | 4 |
| AJ71C24-S6<br>AJ71C24-S8<br>AJ71UC24<br>AJ71QC24N | RS-422 | 8 |
| A1SJ71C24-R2<br>A1SJ71C24-PRF | RS-232C | 4 |
| A1SJ71C24-R4 | RS-422/RS-485 | 8 |

- Be sure to set the checksum setting switch on the Computer Link Unit to "ON".

- Two discrete areas on the A☐N are occupied for input relay X. For this reason, when number of input relays n are located in discrete areas, the total number of devices between which discrete communications can be performed becomes 20-n.

  (Example)

  Input relay X    5

       Number of discrete communications devices to be occupied  10

  Output relay Y  10

       Number of discrete communications devices to be occupied  10

  Device total      15

       Number of discrete communications devices to be occupied  20

- Select one of the following under the communications driver configuration section of the configuration information when a MITSUBISHI Electric MELSEC PLC is to be used.

| Series Name | Driver Name |
|---|---|
| MELSEC  A☐N | MELSEC AnN Computer Link |
| MELSEC  A2C |  |
| MELSEC  A1S |  |
| MELSEC  A2S |  |
| MELSEC  A☐A | MELSEC AnA Computer Link |
| MELSEC  A☐U |  |
| MELSEC  A2US |  |
| MELSEC  Q☐☐CPU | MELSEC Q Computer Link |
| MELSEC  Q☐☐HCPU |  |

## ■ Connection examples

### ● RS-232C connection
### MITSUBISHI (MELSEC-A series) (1:1)
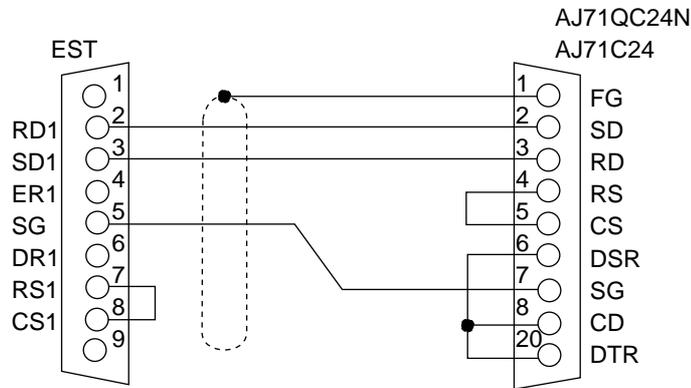


### MITSUBISHI (MELSEC-A1S series/Q series) (1:1)
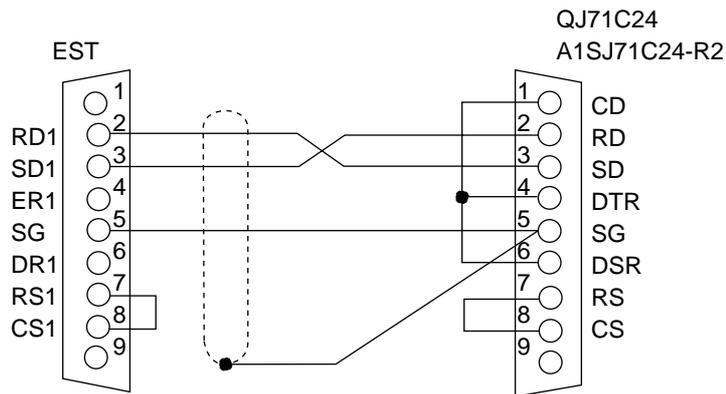


### ● RS-485 5-lead (CH2) connection
### MITSUBISHI (MELSEC-A series/Q series) (1:1, 1:N)



1 : 1 connection

1 : N connection   N = Max. 32 units
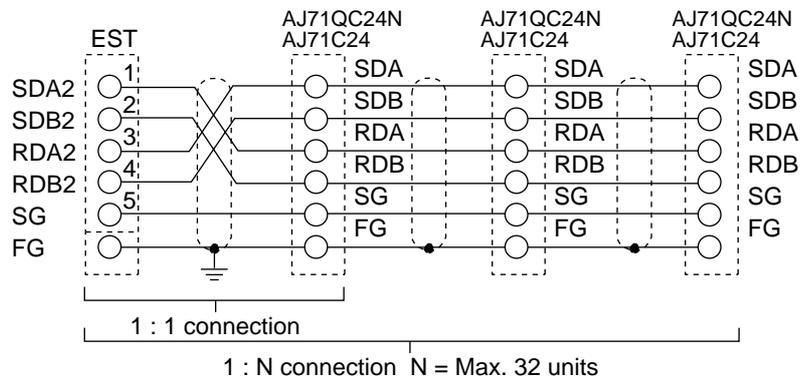
## ■ Environment configuration examples
### ● A❑N series

The following table shows an example configuration for the A❑N series:

| PLC | A2SH/A2S/A1SH/A1S/A1SJH/A1SJ |
|---|---|
| Communications unit | A1SJ71UC24-R2/A1SJ71UC24-PRF |
| Interface | RS-232C |
| Transmission speed | 9600bps |
| Data type | 8bits   Even parity   1 stop bit |

### • EST configuration

• Communications channel configuration
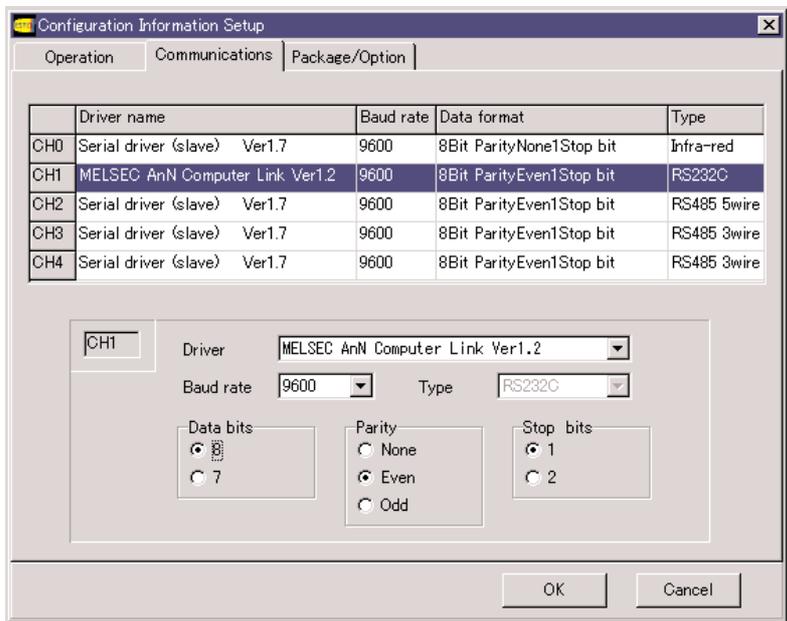


### ⚠ Handling Precautions

Select "MELSEC AnN Computer Link" as the Communications Driver setting. Communications will not be possible if "MELSEC AnA Computer Link" is selected.

• How to specify an address

1 : 0 : D100

———— PLC device address

PLC communications address (fixed to "0")
Set the PLC communications address to "0".
The station No. of the Computer Link Unit (A1SJ71UC24-R2/-PRF) is fixed to "0".

EST communications channel
The type of communications to the external device will be determined according to which channel is used.
For RS-232C communications with a PLC, channel "1" would be used.
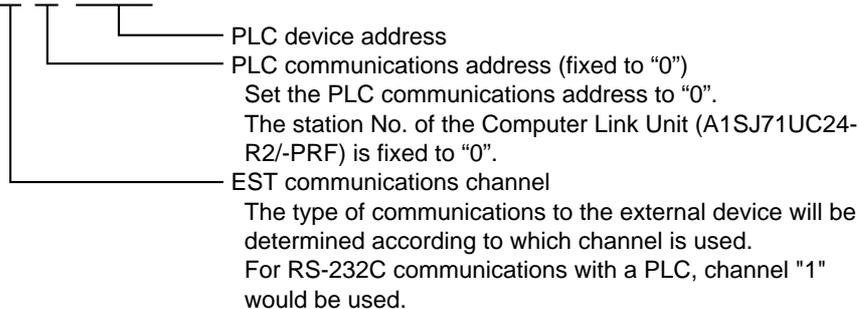
### • PLC configuration (A1SJ71UC24-R2/-PRF)

• Station No. switch configuration

There is no switch for setting the station No. The station No. is fixed to "0".

• Mode switch configuration

Set the rotary switch No. to "4" (format 4 protocol mode).

• Communications configuration

| Setup Switch Settings | Setup Switch | Setting Item | Setup Switch States | | |
|---|---|---|---|---|---|
| | | | ON | | OFF |
| SW03 SW04 | SW03 | Not used | — | | — |
| | SW04 | Write in Run mode | Possible | | Not possible |
| | | Baud rate | 4800 | 9600 | 19200 |
| SW05 ⋮ SW12 | SW05 | Transmission speed | OFF | ON | OFF |
| | SW06 | | OFF | OFF | ON |
| | SW07 | | ON | ON | ON |
| | SW08 | Data bit | 8bits | | 7bits |
| | SW09 | Parity bit | Available | | None |
| | SW10 | Parity | Even | | Odd |
| | SW11 | Stop bit | 2bits | | 1bit |
| | SW12 | Checksum | Available | | None |

The following setting items must be set:

• Write in Run mode:    ON (possible)

• Checksum:                  ON (available)

● **A❑A series**

The following table shows an example configuration for the A❑A series:

| PLC | A3A/A2A-S1/A2A |
|---|---|
| Communications unit | AJ71UC24 |
| Interface | RS-485 |
| Transmission speed | 9600bps |
| Data type | 8bits   Even parity   1 stop bit |

• **EST configuration**

• Communications channel configuration
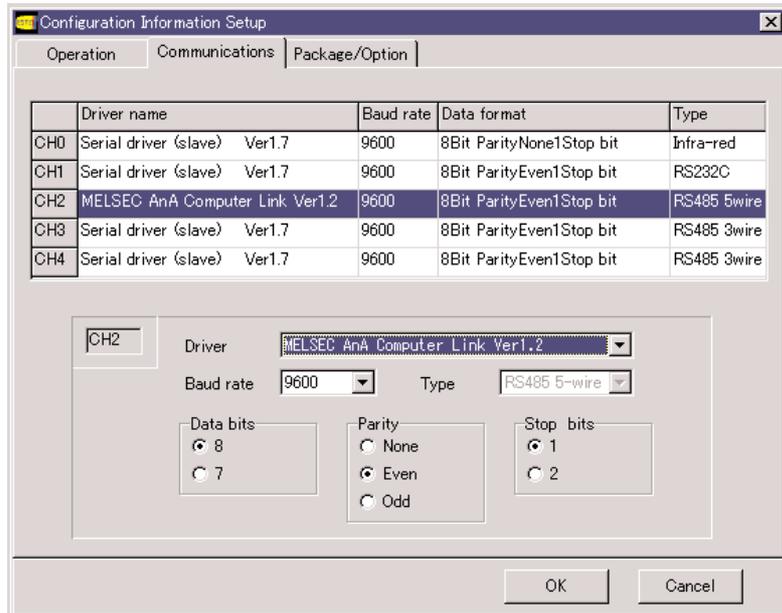


 **Handling Precautions**

Select "MELSEC AnA Computer Link" as the Communications Driver
setting. If "MELSEC AnN Computer Link" is selected, the range of
communicable devices is restricted to the same range as the A3HCPU,
and the extended device range of the AnACPU cannot be accessed.

• How to specify an address

2 : 1 : D100

PLC device address

PLC communications address (0 to 31)
Set the PLC communications address to the same value
as the station No. setting of the Computer Link Unit
(AJ71UC24) to be connected to the EST.

EST communications channel
The type of communications to the external device will be
determined according to which channel is used.
For RS-485 (5-lead) communications, channel "2" would
be used.

- **PLC configuration (AJ71UC24)**

  - Station No. switch configuration

    Set the Station No. of the AJ71UC24 to within the range 0 to 31.

  - Mode switch configuration

    Set the rotary switch No. to "8" (RS-485 side, format 4 protocol mode).

  - Communications configuration

| Setup Switch Settings | Setup Switch | Setting Item | Setup Switch States | | |
|---|---|---|---|---|---|
| | | | OFF | | ON |
| SW11 ··· SW18 | SW11 | Main channel | RS-232C | | RS-422/485 |
| | SW12 | Data bit | 7bits | | 8bits |
| | | Baud rate | 4800 | 9600 | 19200 |
| | SW13 | Transmission speed | OFF | ON | OFF |
| | SW14 | | OFF | OFF | ON |
| | SW15 | | ON | ON | ON |
| | SW16 | Parity bit | None | | Available |
| | SW17 | Parity | Odd | | Even |
| | SW18 | Stop bit | 1bit | | 2bits |
| SW21 ··· SW24 | SW19, 20 | Not used | — | | — |
| | SW21 | Checksum | None | | Available |
| | SW22 | Write in Run mode | Not possible | | Possible |
| | SW23 | Computer/multidrop link | Multidrop link | | Computer link |
| | SW24 | Not used | — | | — |

  The following setting items must be set:

  - Write in Run mode:          ON (possible)
  - Checksum:                        ON (available)
  - Computer/multidrop link:  ON (computer link)

● **Q series**

The following table shows an example configuration for the Q series:

| PLC | Q02/Q02H/Q06H/Q12H/Q25H |
|---|---|
| Communications unit | QJ71C24 |
| Interface | RS-232C |
| Transmission speed | 38400bps |
| Data type | 8bits   Even parity   1 stop bit |

• **EST configuration**

• Communications channel configuration
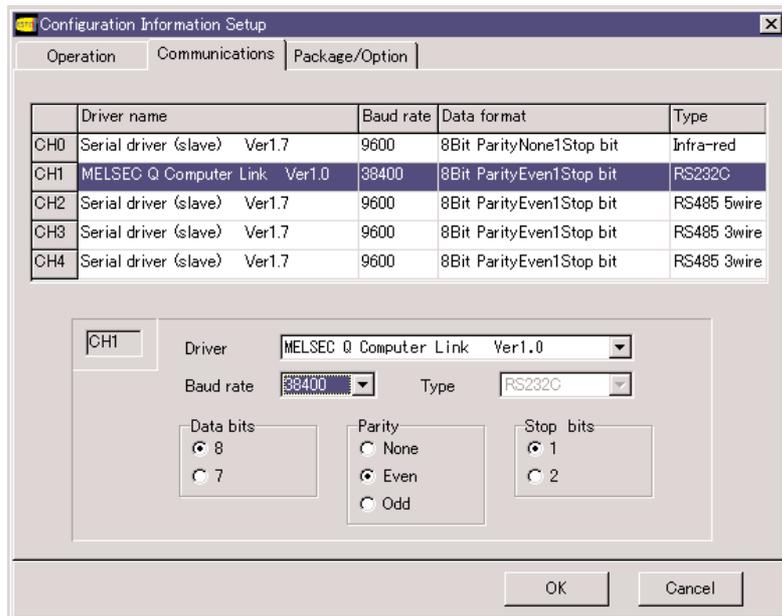


⚠ **Handling Precautions**

Select "MELSEC Q Computer Link" as the Communications Driver setting.

• How to specify an address

1 : 0 : D100

PLC device address

PLC communications address (0 to 31)
Set the PLC communications address to the same value as the station No. setting of the Computer Link Unit (QJ71C24) to be connected to the EST.

EST communications channel
The type of communications to the external device will be determined according to which channel is used.
For RS-232C communications with a PLC, channel "1" would be used.
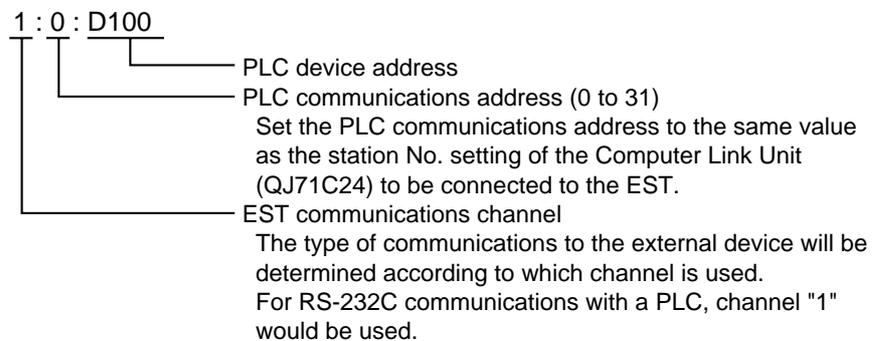
**• PLC configuration (QJ71C24)**

Set the following items on the PLC according to MITSUBISHI GPPW:

(1) I/O assignments

[GPPW] → [PC Parameters] → [Set I/O Assignments]

* For details on how to display screens, refer to the GPPW Operating Manual.

Set as follows:

| | |
|---|---|
| Type | "Intelligent" |
| Model name | "QJ71C24" |
| Number of points | "32" |

(2) Switches

[GPPW] → [PC Parameters] → [Set I/O Assignments] →
[Set Switches]

• Switch 1 (CH1 baud rate setting, CH1 transmission setting)

Bit assignments are as follows:



| | OFF | ON |
|---|---|---|
| Operation setting | Independent | Linked |
| Data bits | 7bits | 8bits |
| Parity bit | None | Available |
| Odd/even parity | Odd | Even |
| Stop bit | 1 | 2 |
| Checksum code | None | Available |
| Write in Run mode | Disabled | Enabled |
| Setting change | Disabled | Enabled |

| | |
|---|---|
| 0 | 300 bps |
| 1 | 600 |
| 2 | 1200 |
| 3 | 2400 |
| 4 | 4800 |
| 5 | 9600 |
| 6 | 14400 |
| 7 | 19200 |
| 8 | 28800 |
| 9 | 38400 |
| A | 57600 |
| B | 115200 |

In this example, the setting is 0 9 E E .
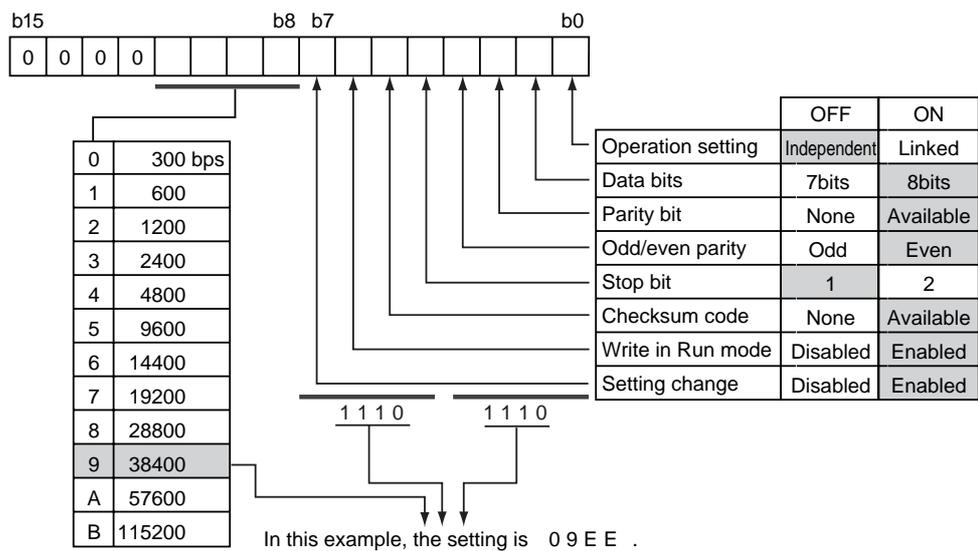
• Switch 2 (CH1 communications protocol setting)

Set to "4".

• Switch 3 (CH2 baud rate setting, CH2 transmission setting)

Set to "0".

• Switch 4 (CH2 communications protocol setting)

Set to "0".

• Switch 5 (station No. setting)

Set to "0".

# 2 - 4 MITSUBISHI PLCs (Direct Link)

## ■ Supported devices

### ● MITSUBISHI Electric A Series/FX series direct link

As much as possible group together devices to be used in smart display objects and assign them to continuous areas.

Communications are performed on groups with a maximum of 32 continuous words each.

Data can be displayed most efficiently if the devices used on each panel are contained within a single continuous area.

Communications with devices on smart switch objects are performed using demand communications. For this reason, special attention is not required for the device allocation of smart switch objects.

• A series CPU Direct Link

| Device Type | Address Range |
|---|---|
| Input relay * | X00000 to X007FF |
| Output relay | Y00000 to Y007FF |
| Internal relay | M00000 to M08191 |
| Special relay | M09000 to M09255 |
| Step relay | S00000 to S08191 |
| Link relay | B00000 to B01FFF |
| Latch relay | L00000 to L02047 |
| Annunciator | F00000 to F02047 |
| Timer (contact) | TS0000 to TS2047 |
| Timer (coil) | TC0000 to TC2047 |
| Counter (contact) | CS0000 to CS1023 |
| Counter (coil) | CC0000 to CC1023 |
| Data register | D00000 to D08191 |
| Link register | W00000 to W01FFF |
| File register | R00000 to R09999 |
| Special register | D09000 to D09255 |
| Timer PV | TN0000 to TN2047 |
| Counter PV | CN0000 to CN1023 |
| Other devices | Not supported |

• FX series CPU Direct Link

| Device Type | Address Range |
|---|---|
| Input relay | X0000 to X0337 |
| Output relay | Y0000 to Y0337 |
| Auxiliary relay | M0000 to M3071 |
| State | S0000 to S0999 |
| Timer relay | TS0000 to TS0255 |
| Counter relay | CS0000 to CS0255 |
| Data register | D0000 to D0999 |
| | D1000 to D2999 |
| | D3000 to D5999 (FX2N only) |
| | D6000 to D7999 |
| (special) | D8000 to D8255 |
| Timer register | TN0000 to TN0255 |
| Counter register | CN0000 to CN0199 |
| | CN0200 to CN0255 |
| Index Reg    Z | Z (FXn only) |
| V | V (FXn only) |

\* Read / write cannot be performed in the input relay area with the CPU unit for A❑ N and the CPU unit for A❑ S.

Annotation example  2:0:M123
                   2:0:D236

### ⚠ Handling Precautions

Select one of the following for the CH2 driver configuration of the configuration information when a MITSUBISHI Electric MELSEC PLC is to be used:

| Series Name | Driver |
|---|---|
| MELSEC A CPU | MITSUBISHI A series CPU direct link |
| MELSEC FX2C, FX0N | MITSUBISHI FXn CPU direct link |
| MELSEC FX2N | MITSUBISHI FX2N CPU direct link |

The devices are supported on IPL version 13.2.1 or later and AP Editor version of 1.1 or later.

The following table shows PLC models made by MITSUBISHI Electric for which operation has been confirmed:

| Type | Model No. | Compatibility |
|---|---|---|
| CPU unit for A❑ U | A2UCPU | Confirmed |
| CPU unit for A❑ A | A3ACPU, A3ACPUP21, A3ACPUR21, A2ACPU A2ACPUP21, A2ACPUR21, A2ACPU-S1 A2ACPUP21-S1, A2ACPUR21-S1 | Confirmed |
| CPU unit for A❑ N | A3NCPU, A3NCPUP21, A3NCPUR21, A2NCPU A2NCPUP21, A2NCPUR21, A2NCPU-S1 A2NCPUP21-S1, A2NCPUR21-S1, A1NCPU A1NCPUP21, A1NCPUR21 | Confirmed |
| CPU unit for A❑ S | A1SCPU, A2SCPU, A1SJCPU | Confirmed |
| CPU unit for A❑ US | A2USCPU, A2USCPU-S1 | Confirmed |
| FX CPU unit | FX2C, FX0N, FX2N | Confirmed |

The following table shows PLC models made by MITSUBISHI Electric for which operation has not been confirmed:

| Type | Model No. | Compatibility |
|---|---|---|
| A2C CPU unit | A2CCPU, A2CCPU-DC24V, A2CCPUC24 A2CCPUC24-PRF, A2CCPUP21, A2CCPUR21 | Unconfirmed |
| A2CJ CPU unit | A2CJCPU | Unconfirmed |
| A0J2H CPU unit | A0J2HCPU, A0J2HCPU-DC24V, A0J2HCPUP21 A0J2HCPUR21 | Unconfirmed |
| A0J2 CPU unit | A0J2CPU, A0J2CPU-DC24V A0J2CPUP23, A0J2HCPUR23 | Unconfirmed |

## ■ Using the 2-port adapter

Use the MITSUBISHI Electric 2-port adapter (FX-2PIF) to use the EST simultaneously with the GPP during system debugging.
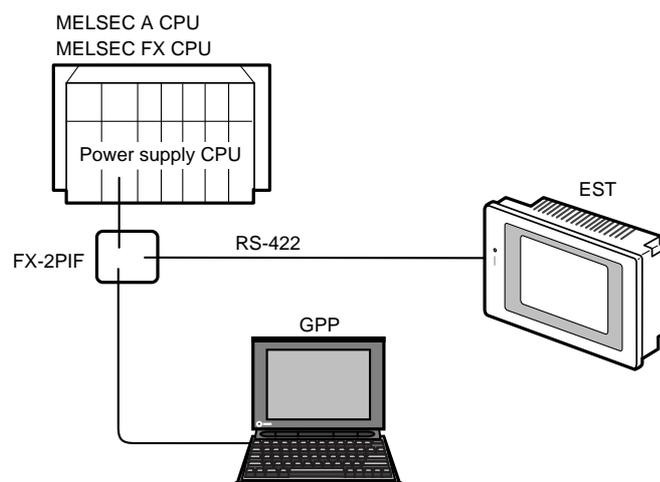


## ⚠ Handling Precautions

EST response slows down when the 2-port adapter (FX-2PIF) is used.

## ■ Connection examples

### ● MELSEC-A CPU/FX2C connection

| EST | | | FX2C |
|-----|---|---|------|
| SDA2 | 1 | 2 | RDA |
| SDB2 | 2 | 15 | RDB |
| RDA2 | 3 | 3 | SDA |
| RDB2 | 4 | 16 | SDB |
| SG | 5 | 7 | SG |
| DA3 | 6 | 4 | RSA |
| DB3 | 7 | 17 | RSB |
| FG | | 20 | SG |
| | | 21 | SG |
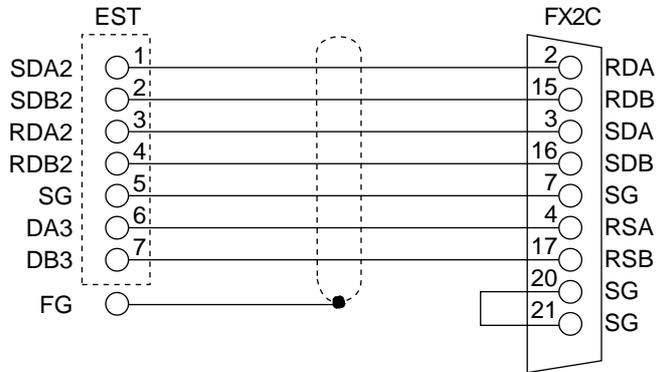
### ● MELSEC FX0N, FX2N CPU connection

| EST | | | FX0N |
|-----|---|---|------|
| SDA2 | 1 | 3 | |
| SDB2 | 2 | 4 | |
| RDA2 | 3 | 6 | |
| RDB2 | 4 | 1 | 7 |
| SG | 5 | 2 | 8 |
| FG | | | 5 |
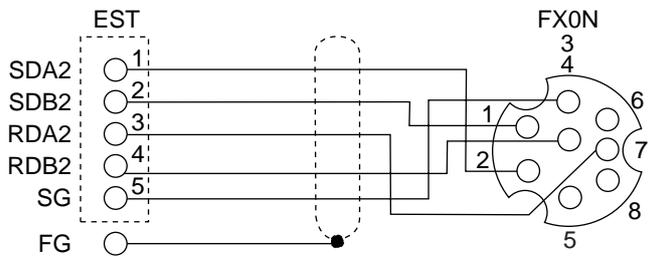
## ■ Environment configuration examples

### ● MITSUBISHI Electric A Series CPU direct link

The following table shows an example configuration for the MITSUBISHI Electric A Series CPU direct link:

| PLC | MELSEC A CPU |
|---|---|
| Communications unit | Direct link |
| Interface | RS-485 |
| Transmission speed | 9600bps |
| Data type | 8bits  Odd parity  1 stop bit |

#### • EST configuration
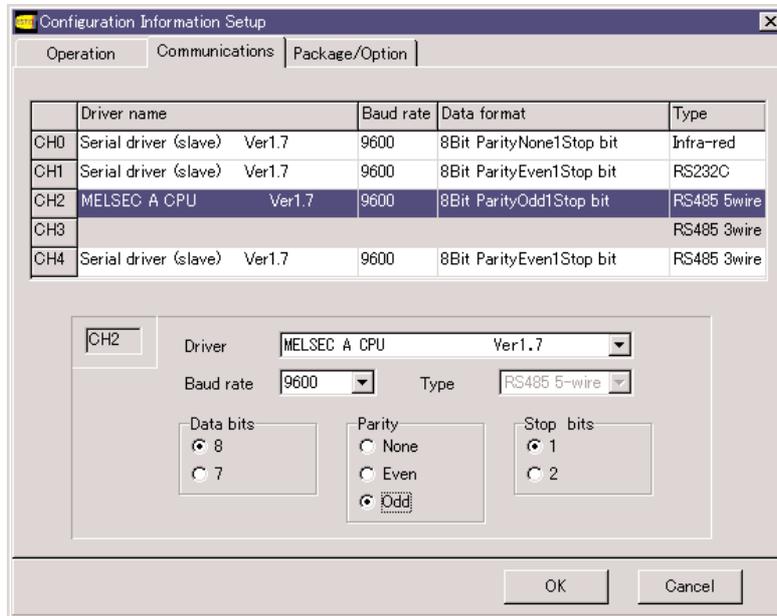
• Communications channel configuration



ⓘ **Handling Precautions**

This driver requires the two ports, channels 2 and 3, for communications.

Set "MELSEC A CPU" to channel 2 after "Serial driver (slave)" has been set to channel 3.

The transmission speed and communications format are 9600bps, 8 bits, odd parity and 1 stop bit.

• How to specify an address

2 : 0 : D100

— PLC device address

PLC communications address (fixed to 0 )
The PLC communications address need not be set. However, use 0 .

EST communications channel
The communications channel when connected directly to a Mitsubishi Electric A Series CPU is 2 .
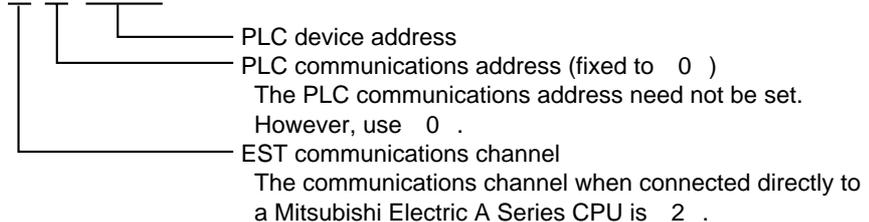
● **FX-0N/FX-2C direct link configuration**

The following table shows an example configuration for the FX-0N/FX-2C direct link:

| PLC | FX0N/FX2C |
|---|---|
| Communications unit | Direct link |
| Interface | RS-485 |
| Transmission speed | 9600bps |
| Data type | 7bits  Even parity  1 stop bit |
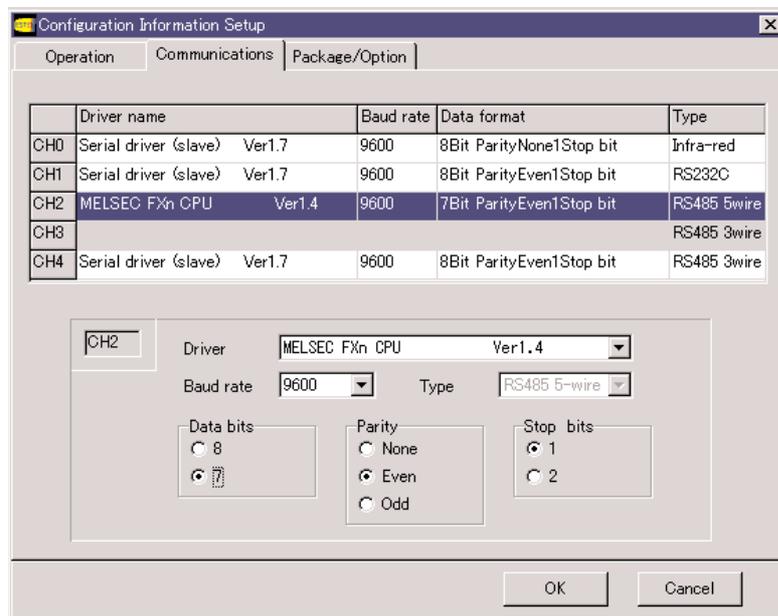
• **EST configuration**

• Communications channel configuration



ℹ️ **Handling Precautions**

This driver requires the two ports, channels 2 and 3, for communications.

Set "MELSEC FXnCPU" to channel 2 after "Serial driver (slave)" has been set to channel 3.

The transmission speed and communications format are 9600bps, 7 bits, even parity and 1 stop bit.

• How to specify an address

2 : 0 : D100

PLC device address

PLC communications address (fixed to "0")
The PLC communications address need not be set.
However, use "0".

EST communications channel
The communications channel when connected directly to a Mitsubishi Electric FX Series CPU is "2".
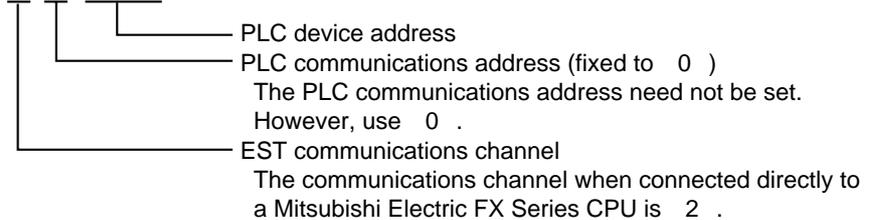
# 2 - 5　　Omron PLCs

## ■ Supported devices

### ● Omron C/CV series

As much as possible group together devices to be used in smart display objects and assign them to continuous areas.

Cyclic communications are performed on groups with a maximum of 32 continuous words each.

Data can be displayed most efficiently if the devices used on each panel are contained within a single continuous area.

Communications with devices used in smart switch objects are performed using demand communications. For this reason, special attention is not required for the device allocation of smart switch objects.

| Device Type | Address Range | |
|---|---|---|
| | C Series | CV Series |
| Input relay | 0000 to 409515 | 0000 to 409515 |
| Output relay | | (including hold relay on CV |
| Internal auxiliary relay | | series) |
| Special auxiliary relay | | |
| Link relay | LR0000 to LR409515 | – |
| Auxiliary storage relay | AR0000 to AR409515 | – |
| Hold relay | HR0000 to HR409515 | – |
| Timer | T0000 to T4095 | T0000 to T4095 |
| Counter | C0000 to C4095 | C0000 to C4095 |
| Data register | DM0000 to DM9999 | DM0000 to DM9999 |
| Timer (PV) | DT0000 to DT4095 | DT0000 to DT4095 |
| Counter (PV) | DC0000 to DC4095 | DC0000 to DC4095 |
| Other registers | Not supported | Not supported |

Annotation example　1:1:02311
　　　　　　　　　　　1:1:DM236

## ! Handling Precautions

- SYSMAC C series protocol is used for host link communications.

- Select one of the following under the communications driver configuration section of the configuration information when an Omron PLC is to be used:

| Series Name | Driver Name |
|---|---|
| C Series | Omron C/CV host link |
| CV Series | |

## ■ Connection examples

### ● RS-232C connection
### Omron (CV series) (1:1)
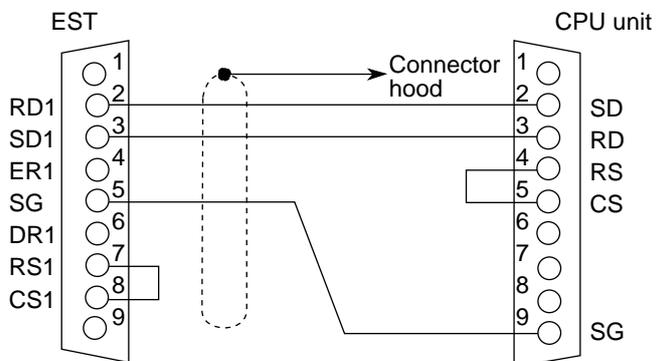


### Omron (CPU built-in RS-232C port on C200HS, CQM1 series, C200HX, C200HG, C200HE) (1:1)
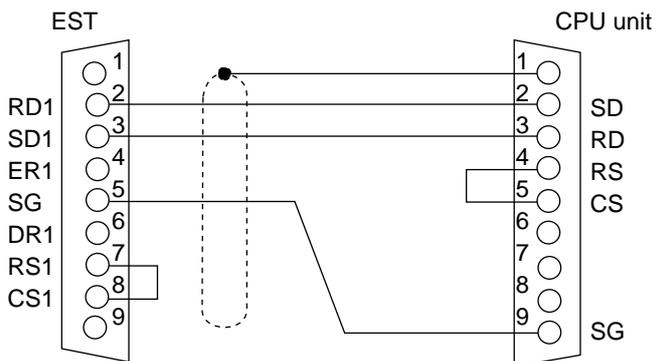


### Omron (C series) (1:1)
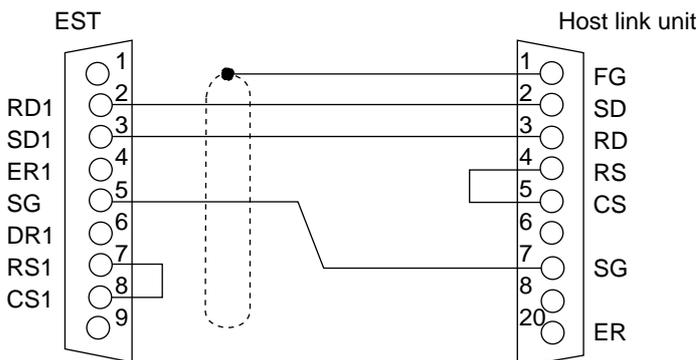
● **RS-485 5-lead (CH2) connection**
 **Omron (C series) (1:1, 1:N)**
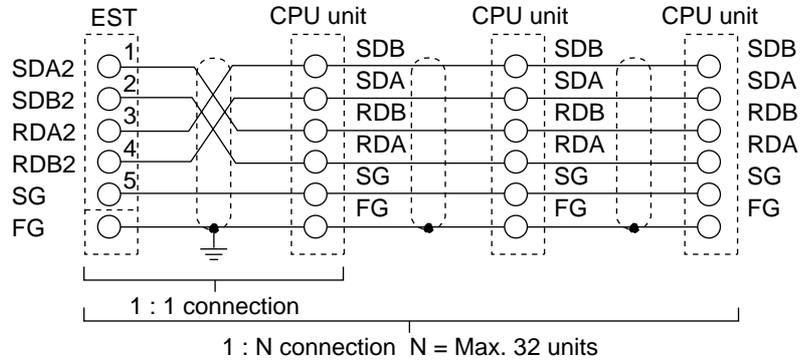


[!] **Handling Precautions**

Leave SG on the EST open when SG is not provided according to the model No.

**Omron (CV series) (1:N)**
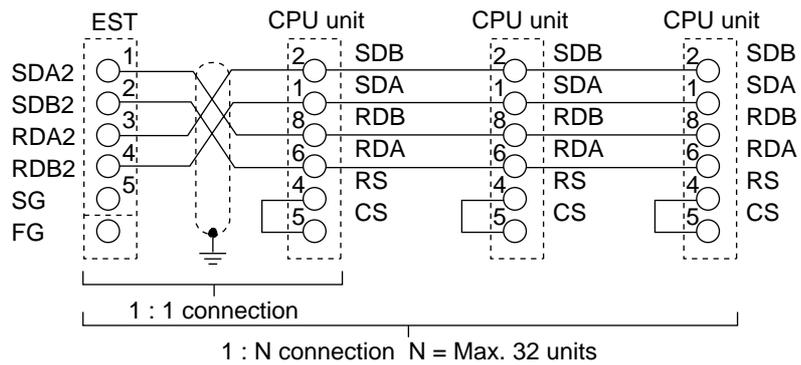
## ■ Environment configuration examples

### ● CV series

The following table shows an example configuration for the CV series:

| PLC | CVM1/CV500/CV1000/CV2000 |
|---|---|
| Communications unit | Connector for CPU host link connection |
| Interface | RS-232C |
| Transmission speed | 9600bps |
| Data type | 7bits  Even parity  2 stop bits |

#### • EST configuration

• Communications channel configuration



⚠ **Handling Precautions**

Select "SYSMAC C/CV Host Link" as the Communications Driver setting.

• How to specify an address

1 : 0 : DM100

PLC device address

PLC communications address (0 to 31)
Set the PLC communications address to the same value as the unit No. setting of the CPU unit to be connected to the EST.

EST communications channel
The type of communications to the external device will be determined according to which channel is used.
For RS-232C communications with a PLC, channel "1" would be used.
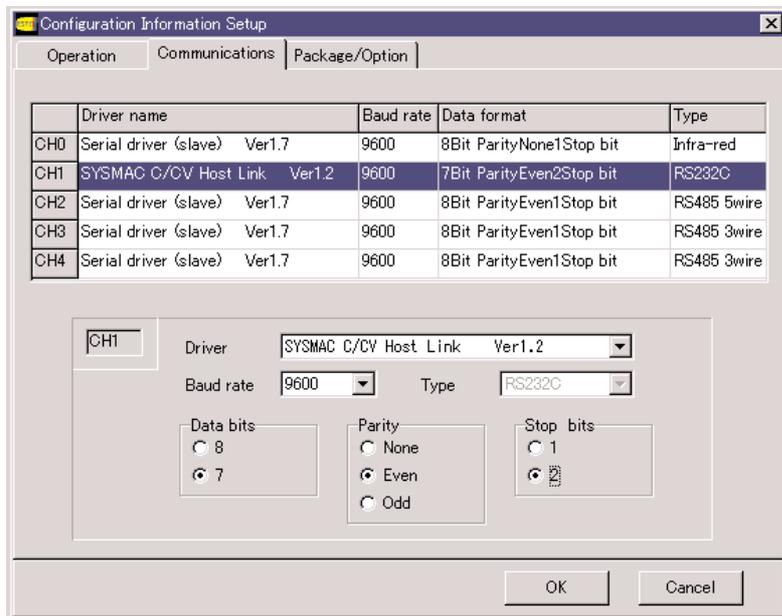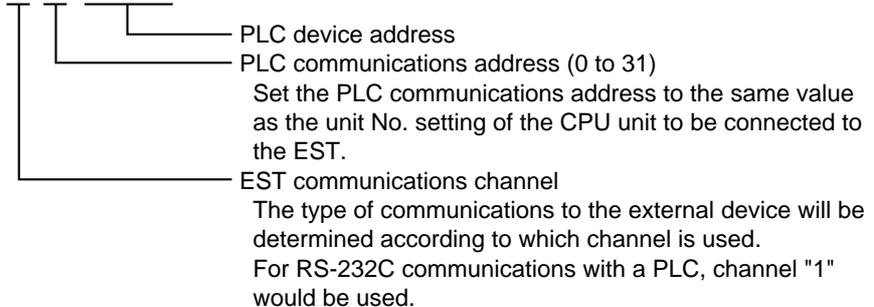
- **CPU unit configuration**

  - Communications path selector switch
    (host link RS-422/RS-232 selector switch)
    Set to "RS-232C".

  - DIP switch settings
    Open the cover of the memory card storage unit to set the DIP switch.
    Set switch Nos. 3 and 4 to "OFF".

  - Host link setting
    Set at "Host Link Setting" in the "PC System Settings" in FIT.

    | Setting Item | Description |
    |---|---|
    | Unit No. | Set within range 0 to 31 |
    | Transmission speed | 9600bps |
    | Data length | 7bits |
    | Parity | Even parity |
    | Stop bit | 2bits |

● **C series (host link unit)**

The following table shows an example configuration for the C series (host link unit):

| PLC | C200HX/HG/HE, C200HS, C200H |
|---|---|
| Communications unit | C500-LK202V1 |
| Interface | RS-485 |
| Transmission speed | 9600bps |
| Data type | 7bits   Even parity   2 stop bits |

• **EST configuration**

• Communications channel configuration
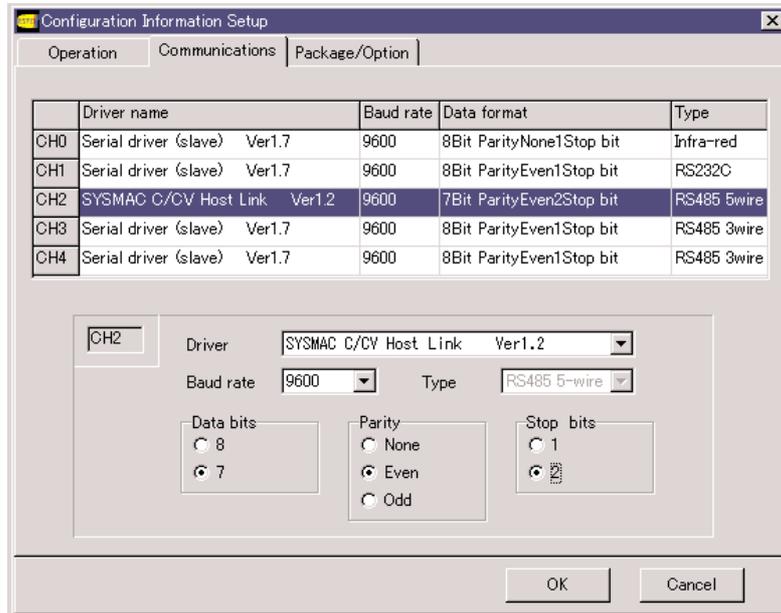


⚠ **Handling Precautions**

Select "SYSMAC C/CV Host Link" as the Communications Driver setting.

• How to specify an address

2 : 1 : DM100

— PLC device address

— PLC communications address (0 to 31)
Set the PLC communications address to the same value as the station No. setting of the host link unit (C200H-LK202-V1) to be connected to the EST.

— EST communications channel
The type of communications to the external device will be determined according to which channel is used.
For RS-485 (5-lead) communications, channel "2" would be used.

- **PLC configuration (C200H-LK202-V1)**
  - Station No. setting (SW1, SW2)

    Set the unit No. of the C200H-LK202 within the range 0 to 31.

  - Transmission speed setting (SW3)

    | SW3 | Transmission speed |
    | --- | --- |
    | 4 | 4800bps |
    | 5 | 9600bps |
    | 6 | 19200bps |

    Factory settings:  9600bps

  - Command level/parity/transmission code setting (SW4)

    | SW4 | Command Level | Parity | Transmission Code |
    | --- | --- | --- | --- |
    | 0 | Only level 1 enabled | Even | ASCII   7bits   2 Stop bits |
    | 4 | Only level 1 enabled | Odd | ASCII   7bits   2 Stop bits |
    | 8 | Only level 1 enabled | Even | JIS   8bits   1 Stop bit |
    | C | Only level 1 enabled | Odd | JIS   8bits   1 Stop bit |

    Factory settings:  SW4-0

  - Rear panel switch settings

    | Setting Item | ON | OFF |
    | --- | --- | --- |
    | Communications procedure | 1:1 procedure | 1:N procedure |
    | Terminator connection | Available | None |

    Factory settings:  OFF

    Set the terminator as necessary.

● **C series (CPU unit)**

The following table shows an example configuration for the C series (CPU unit):

| PLC | C200HX/HG/HE, C200HS |
|---|---|
| Communications unit | CPU  RS-232C port |
| Interface | RS-232C |
| Transmission speed | 9600bps |
| Data type | 7bits   Even parity   2 stop bits |

• **EST configuration**

• Communications channel configuration



⚠ **Handling Precautions**

Select "SYSMAC C/CV Host Link" as the Communications Driver setting.

• How to specify an address

1 : 0 : DM100

PLC device address

PLC communications address (0 to 31)
Set the PLC communications address to the same value as the unit No. setting of the CPU unit to be connected to the EST.

EST communications channel
The type of communications to the external device will be determined according to which channel is used.
For RS-232C communications with a PLC, channel "1" would be used.

- **CPU configuration**

  - DIP switch configuration

| Setup Switch Settings | Setup Switch | Setting Item | Setup Switch States | |
|---|---|---|---|---|
| | | | OFF | ON |
| SW01 ⁝ SW06 → ON | SW01 | Write to user memory area | Possible | Not possible |
| | SW02 | Memory cassette operation at power ON | Automatic reading OFF | Automatic reading ON |
| | SW03 | PLC messages | Japanese | English |
| | SW04 | Application instruction setting function | Disabled | Enabled |
| | SW05 | Communications port setting | Fixed settings canceled | Fixed settings |
| | SW06 | PLC | Console mode | Extended terminal mode |

Set switch No.5 to "OFF".

- RS-232C port configuration

| Channel No. | Bits | Functions | Setting | Description |
|---|---|---|---|---|
| DM6645 | 00 to 03 | Communications format | 0 | 0: 9600bps 7bits Even 2 Stop bits<br>1: According to DM6646 settings |
| | 04 to 07 | CTS control | 0 | None |
| | 08 to 11 | 1:1 link | 0 | – |
| | 12 to 15 | Mode setting | 0 | Host link |
| DM6646 | 00 to 07 | Baud rate | 03 | 02: 4800bps<br>03: 9600bps<br>04: 19200bps |
| | 08 to 15 | Format setting | 03 | 00: 7bits Even 1 Stop bit<br>03: 7bits Even 2 Stop bits<br>06: 8bits Even 1 Stop bit |
| DM6647 | 00 to 15 | Transmission delay | 0000 | 0000 to 9999 (BCD: X10ms) |
| DM6648 | 00 to 07 | Unit No. setting | 00 | 00 to 31 (BCD) |

The default PLC communications configuration is as follows:

- Mode                        :Host link
- Unit No.                    :0
- Communications format    :9600bps, 7 bits, even parity, 2 stop bits

When a connection is made using configuration is other than the above, set the communications format (DM6645) to "1", and set the baud rate, format (DM6646) and unit No. (DM6648).

# 2 - 6    Matsushita Electric Works PLCs

## ■ Supported devices

### ● Matsushita Electric Works FP3/5/10 series

As much as possible group together devices to be used in smart display objects and assign them to continuous areas.

Communications are performed on groups with a maximum of 32 continuous words each.

Data can be displayed most efficiently if the devices used on each panel are contained within a single continuous area.

Communications with devices used in smart switch objects are performed using demand communications. For this reason, special attention is not required for the device allocation of smart switch objects.

| Device Type | Address Range |
|---|---|
| External input | X0000 to X255F |
| External output | Y0000 to Y255F |
| Timer relay | T0000 to T1999 |
| Counter relay | C0000 to C2047 |
| Special internal relay | R9000 to R910F |
| Internal relay | R0000 to R875F |
| Link relay | L0000 to L639F |
| Data register | DT00000 to DT10239 |
| External input | WX000 to WX255 |
| External output | WY000 to WY255 |
| Internal relay | WR000 to WR875 |
| Link relay | WL000 to WL639 |
| Link register | LD0000 to LD8447 |
| File register | FL00000 to FL32764 |
| Timer, counter SP | SV0000 to SV2047 |
| Timer, counter PV | EV0000 to EV2047 |
| Index register | IX |
| | IY |
| Special data register | DT90000 to DT90255 |

Annotation example     1:1:Y002D

1:1:DT00125

## ■ Connection examples

### Matsushita Electric Works (FP3/FP5/FP10/FP10SH series) (1:1)
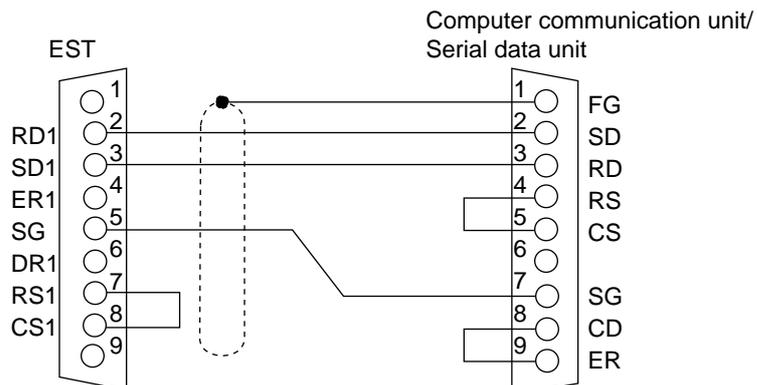
## ■ Environment configuration example

### ● Matsushita Electric Works FP3/5/10 series

| PLC | FP10SH |
|---|---|
| Communications unit | C.C.U |
| Interface | RS-232C |
| Transmission speed | 19200bps |
| Data type | 8bits　Even parity　1 stop bit |

#### • EST configuration

• Communications channel configuration
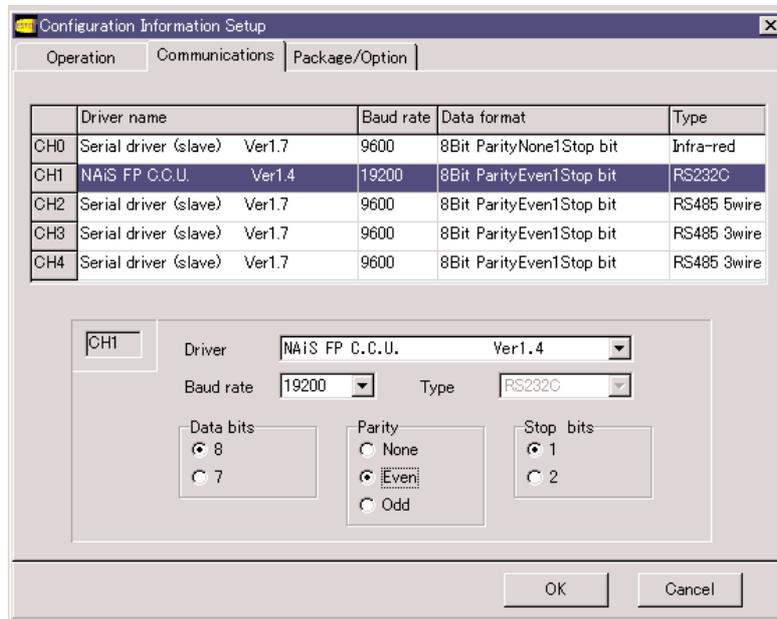


☒ **Handling Precautions**

Select "NAiS FP C.C.U." as the Communications Driver setting.

• How to specify an address

1 : 1: DT100

```
                 PLC device address
                 PLC communications address (1 to 63)
                 EST communications channel
```
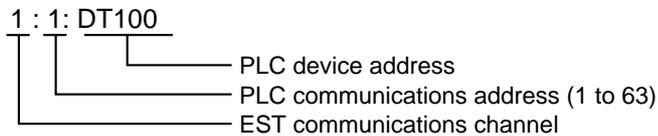
☒ **Handling Precautions**

In the case of 1:1 C.C.U. communications, set the PLC communications address to "1".

- **C.C.U. configuration**
  - DSW configuration

| Setup Switch Settings | Setup Switch | Setting Item | Description | | |
|---|---|---|---|---|---|
|  | SW01 to SW03 | Transmission speed | SW01 | SW02 | SW03 |
| | | 19200bps | ON | OFF | OFF |
| | | 9600bps | OFF | ON | OFF |
| | | 4800bps | ON | ON | OFF |
| | | 2400bps | OFF | OFF | ON |
| | | 1200bps | ON | OFF | ON |
| | | 600bps | OFF | ON | ON |
| | | 300bps | ON | ON | ON |
| | | | OFF | ON | |
| | SW04 | Data length | 7bits | 8bits | |
| | SW05 | Parity check | None | Available | |
| | SW06 | Parity setting | Odd | Even | |
| | SW07 | Stop bit | 1bit | 2bits | |
| | SW08 | Control signals | CS, CD disabled | CS, CD enabled | |

# 2 - 7      YOKOGAWA PLCs

## ■ Supported devices

### ● YOKOGAWA FA-M3 series

The continuity of devices need not be taken into account as communication between discrete areas is used for up to 32 devices on the FA-M3 series. When this limitation is exceeded, communications become cyclic within a continuous area for the number of devices exceeding this limitation. When this maximum number of devices is exceeded, the upper limit of the address range in the table below is set to a larger value as the order of priority for performing discrete communications.

Communications with devices used in smart switch objects are performed using demand communications. For this reason, special attention is not required for the device allocation of smart switch objects.

| Device Type | Address Range |
|---|---|
| Input relay | Xlmmnn<br>l   : unit No. (0 to 6)<br>mm : slot location (0 to 13)<br>nn  : terminal No.(1 to 64) |
| Output relay | Ylmmnn<br>l   : unit No. (0 to 6)<br>mm : slot location (0 to 13)<br>nn  : terminal No. (1 to 64) |
| Internal relay | I00001 to I65536 |
| Shared relay | E00001 to E65536 |
| Link relay | L00001 to L65536 |
| Special relay | M00001 to M65536 |
| Timer | TU0001 to TU9999 |
| Counter | CU0001 to CU9999 |
| Data register | D00001 to D65536 |
| Shared register | R00001 to R65536 |
| Index register | V00001 to V65536 |
| Link register | W00001 to W65536 |
| Special register | Z00001 to Z65536 |
| Timer SP * | TS0001 to TS9999 |
| Counter PV * | CS0001 to CS9999 |
| File register | B00001 to B65536 |

Annotation example      1:1:Y00101

                                      1:1:D00001

* The data of timer SP or counter PV cannot be changed by the EST.

## ■ Connection examples

### ● YOKOGAWA (COMPUTER LINK F3LC11-1N/F3LC11-1F) (1:1)
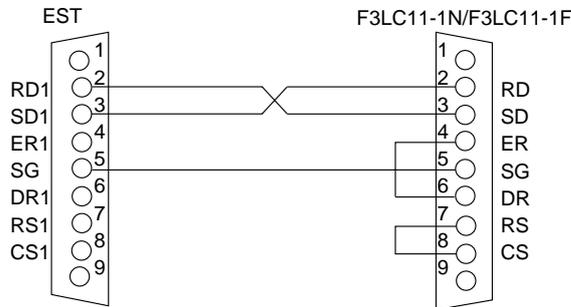


### ● YOKOGAWA (COMPUTER LINK F3LC11-2N/F3LC11-2F) (1:1, 1:N)



1 : 1 connection  N=Max. 32 units
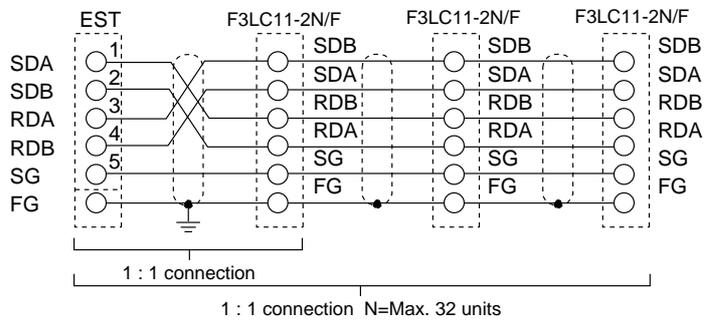
## ■ Environment configuration examples

### ● YOKOGAWA FA-M3 series

| PLC | F3SP28-3N |
|---|---|
| Communications unit | F3LC11-1F |
| Interface | RS-232C |
| Transmission speed | 19200bps |
| Data type | 8bits  Even parity  1stop bit |

### • EST configuration

#### • Communications channel configuration
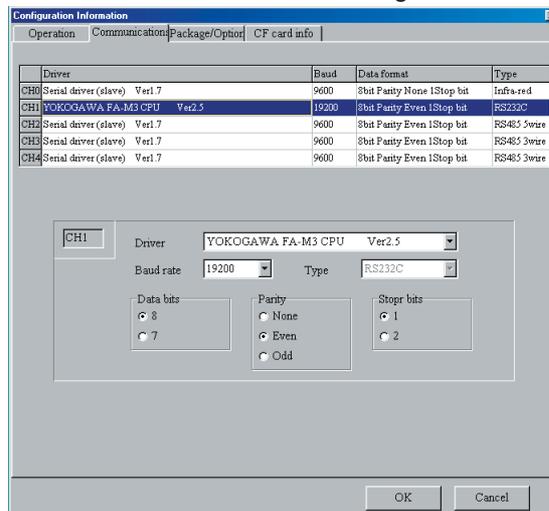


⚠ **Handling Precautions**

Select "YOKOGAWA FA-M3 CPU" as the Communications Driver setting.

• How to specify an address

1 : 1: D1234
PLC device address
PLC communications address (1 to 32 : Fixed at "01" for the RS-232C)
EST communications channel
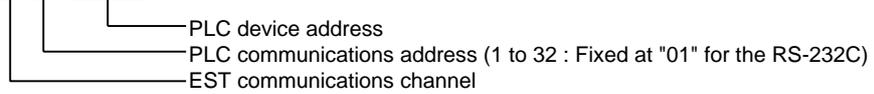
• **F3CL11-1F configuration**

• SW1 configuration

| No. | Transmission speed (bps) |
|-----|--------------------------|
| 0 | 300 |
| 1 | 600 |
| 2 | 1200 |
| 3 | 2400 |
| 4 | 4800 |
| 5 | 9600 |
| 6 | 14400 |
| 7 | 19200 |
| 8 | 28800 |
| 9 | 38400 |
| A | 57.6K |
| B | 76.8K |
| C | 115.2K |
| D | |
| E | |
| F | |
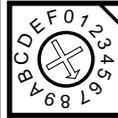
• SW2 configuration

| Setup Switch Settings | Setup Switch | Setting Item | Setup Switch States | |
|-----------------------|--------------|--------------|---------------------|--------|
| | | | OFF | ON |
| | SW01 | Data length | 7 bit | 8 bit |
| | SW02 | Parity check | None | Available |
| | SW03 | Parity setting | Ogg | Even |
| | SW04 | Stop bit | 1 bit | 2 bit |
| | SW05 | Checksum | None | Available |
| | SW06 | Termination letter | None | Available |
| | SW07 | Protection | None | Available |
| | SW08 | Password check | None | Available |

• SW3 configuration

| Setup Switch Settings | Setup Switch | Setting Item | Setup Switch States | |
|-----------------------|--------------|--------------|---------------------|--------|
| | | | OFF | ON |
| | SW01 | Not used | - (regular OFF) | - |
| | SW02 | Not used | - (regular OFF) | - |
| | SW03 | Not used | - (regular OFF) | - |
| | SW04 | Not used | - (regular OFF) | - |
| | SW05 | Not used | - (regular OFF) | - |
| | SW06 | Not used | - (regular OFF) | - |
| | SW07 | F3LM01 mode | None | Available |
| | SW08 | MODEM | None | None |

⚠ **Handling Precautions**

Set the PLC communications address to "1" for 1:1 communications.
Set COMPUTER LINK to "check sum available, termination letter available".

# 2 - 8    Siemens K.K. PLCs

## ■ Supported devices

### ● Siemens series S7

As much as possible group together devices to be used in smart display objects and assign them to continuous areas. Cyclic communications are performed on groups with a maximum of 16 word each for the timer and counter registers or a maximum of 32 continuous words each.

Data can be displayed most efficiently if the devices to be used on each panel are contained within a single continuous area.

Communications with devices used in smart switch objects are performed using demand communications. For this reason, special attention is not required for the device allocation of smart switch objects.

| Device Type | Address Range |
|---|---|
| Input device * | I000.0 to I255.7 |
| Output device * | Q000.0 to Q255.7 |
| Internal relay * | M000.0 to M255.7 |
| Data register | D000.W000 to D000.W510 |
| | D001.W000 to D001.W510 |
| | : |
| | D255.W000 to D255.W510 |
| | (W : even only) |
| Timer register * | T00000 to T00255 |
| Counter register* | C00000 to C00255 |

Annotation example     2:1:M012.5

                        2:1:D002.W004

\* The data other than the data register cannot be changed by the EST.

## ■ Connection examples

### Siemens S7-300 CP341(RS-422)
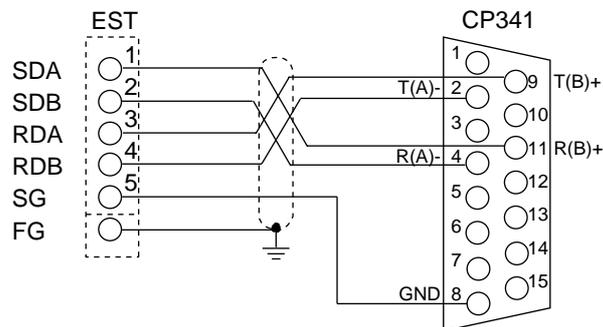
## ■ Environment configuration examples

### ● Siemens S7-300 CP341

| PLC | CP315 |
|---|---|
| Communications unit | CP341 |
| Interface | RS-422 |
| Transmission speed | 19200bps |
| Data type | 8bits  Even parity  1stop bit |

- **EST configuration**

    - Communications channel configuration
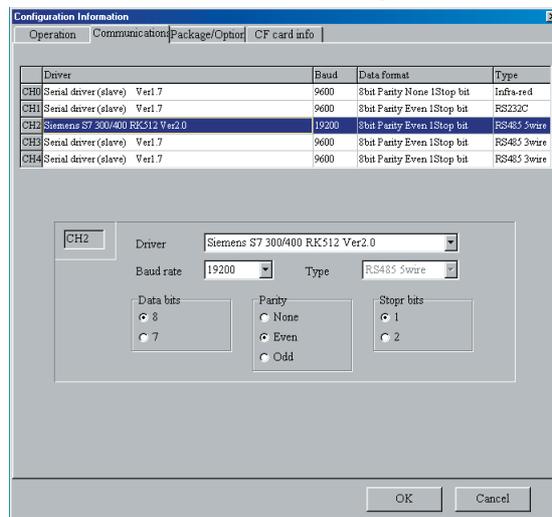


    **⚠ Handling Precautions**

    Select "Siemens S7 RK512" as the Communications Driver setting.

    - How to specify an address

    2 : 1: M123.4

    PLC device address
    PLC communications address (Not used. Input "1".)
    ST communications channel
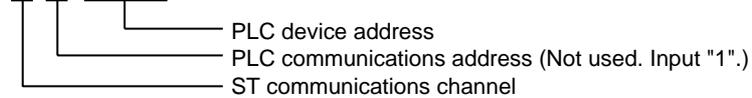
- **CP341 configuration**

    The PLC side is set with the SIMATEC manager.

    1. The CP341 is allocated to the hardware.

        (1) Select [Parameter] in the [CP341] objects.
        (2) Set the [Protocol] to "RK512"
        (3) Select the [Protocol].
        (4) Set the [Speed] to "19200".
        (5) Set the [Character Frame] to "1stop, even".

    2. Add the "Librarise¥CP PtP¥CP341¥FB7P_RCV_RK" library of the [Program elements].

        (Name should be met to the names of the following data block:)

    3. Prepare data block and allocate to FB7.

# 2 - 9     YASKAWA PLCs

## ■ Supported devices

### ● YASKAWA MP900 series

As much as possible group together devices to be used in smart display objects and assign them to continuous areas. Cyclic communications are performed on groups with a maximum of 32 continuous words each.

Data can be displayed most efficiently if the devices to be used on each panel are contained within a single continuous area.

Communications with devices used in smart switch objects are performed using demand communications. For this reason, special attention is not required for the device allocation of smart switch objects.

| Device Type | Address Range |
|---|---|
| coil | MB00000 to MB4095F |
| Input relay * | IB00000 to IB0FFFF |
| Holding register | MW00000 to MW32767 |
| Input register  * | IW0000 to IW7FFF |

Annotation example     2:1:IB0012D

2:1:MW1000

\* The data of input relay or input register cannot be changed by the EST.

## ■ Connection examples

### YASKAWA MP920 (CPU port1/2, CP-217IF CN1/2)
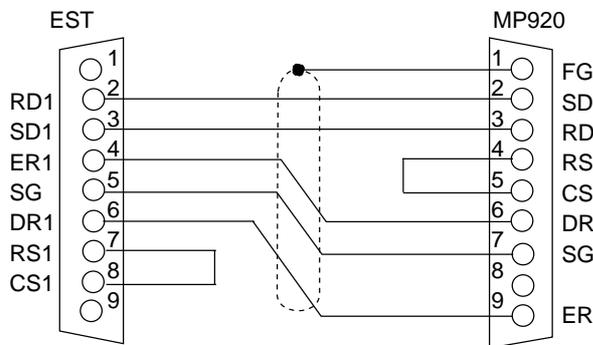


### YASKAWA MP920 (CP-217IF  CN3) (1:1, 1:N)



1 : 1 connection

1 : 1 connection  N=Max. 32 units
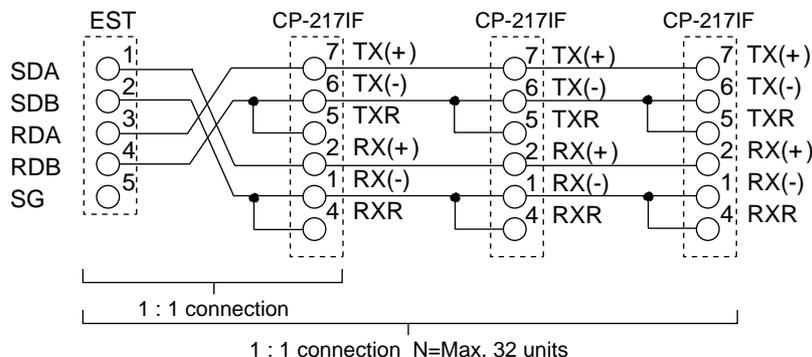
## ■ Environment configuration examples

### ● YASKAWA MP920

| PLC | MP920 |
|---|---|
| Communications unit | None |
| Interface | RS-232C |
| Transmission speed | 19200bps |
| Data type | 8bits  Even parity  1stop bit |

### • EST configuration

• Communications channel configuration
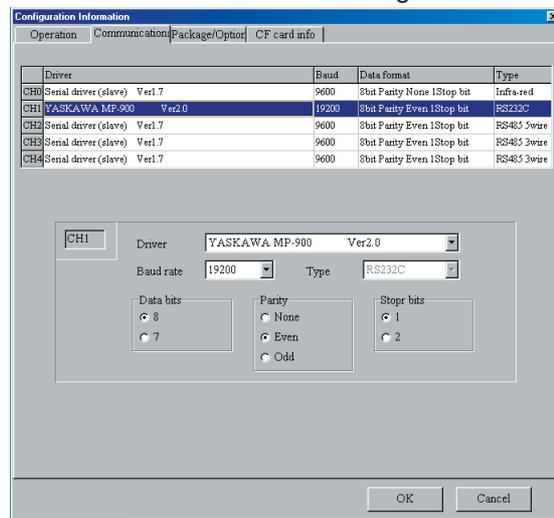


#### ⚠ Handling Precautions

Select "YASKAWA MP-900" as the Communications Driver setting.

• How to specify an address

1 : 1: MW1000

- PLC device address
- PLC communications address (1 to 63)
- EST communications channel

### • MP-920 configuration

The PLC side is set with the CP-717.

Make to the MP920 general-use setting for the module No.00 of the [Definition folder] → [Module configuration].

Set as follows:

- [Transmission protocol] to "memo bus".
- [Master/slave] to "slave".
- [Transmission mode] to "RTU".
- [Data length] to "8-bit".
- [Parity bit] to "even".
- [Stop bit] to "1 stop".
- [Borate] to "19.2K".

# Chapter 3. SERIAL SLAVE STATION COMMUNICATIONS

## 3 - 1 What is "Serial slave communications?"

When the EST performs communications with a PLC (Programmable Logic Controller), this mode of communications is referred to as "host link communications." Whereas, when data is exchanged between the EST and a microcomputer board, or personal computer (collectively referred to as "microcomputer board" hereinafter) designed by the user as a communications master system for system control, then the mode of communications is referred to as "Serial Slave communications."

If the microcomputer board is assumed to be a virtual PLC, then communications with the PLC can be performed in the same way. However, it is usually the case that the instrumentation takes the microcomputer board as the master station for communication. This is because it is difficult to define the microcomputer board as a virtual PLC (for reasons of producing command interpretation software and response speed), and control is performed by the timing of the software on the microcomputer board.
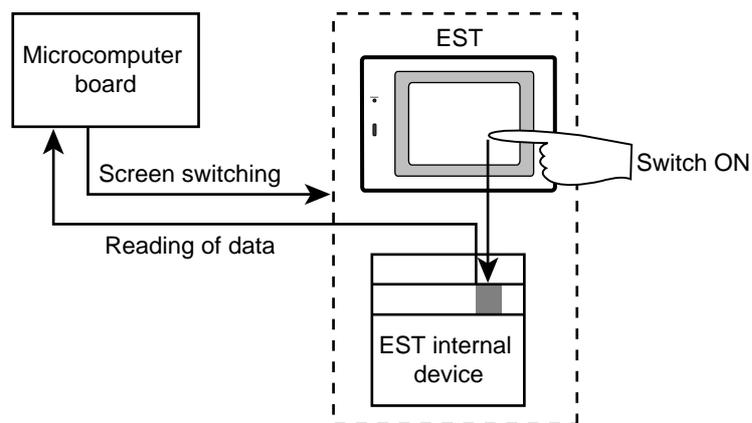


There are two ways of using EST internal devices as the serial slave station when the board is used by the EST application:

- Specify EST internal devices as the devices which are entered in the smart object dialog box.
- Specify EST internal devices as the contact devices to be monitored by the alarm monitoring information.

### ⚠ Handling Precautions

Sometimes responses to command are not returned due to noise on the communications path or the power ON timing. If this happens, processing (retry processing) must be performed when the response is not returned normally.

### ■ Retry processing

In serial communications, noise on the communications path or a power disruption to the peer device could prevent responses from being returned to commands, or corrupt responses. For this reason, the command frame must be re-issued if a response has not been returned after a preset time out period has elapsed. Generally, this re-issuing of the command frame is called "retry processing." Yet, if retry processing commences too soon, the returned response may be corrupted, responses to previous commands may be received by mistake (*), or other abnormalities may occur.
The standard wait time (time-out period) of the EST is three seconds. Note, however, that an even longer time is required if you are processing complex drawing or communicating large amounts of data. The time-out period must be fully confirmed and tested after preparing actual applications before the application is used.

### 📖 Note

(*) These abnormalities occur as the instruction message/response message pair is unclear in the EST's serial slave station communications protocol. This is a common limitation of simple communications protocols.

# 3 - 2　　　Setup required for using serial slave communications

For details on the procedure for making application data and operation methods, refer to the separate manual Smart Terminal EST-Z Series User's Manual Application Preparation　Manual No. CP-SP-1088E.
The following two setup operations are required for using serial slave station communications:

- Configuration of the communications parameters of the channel on which serial slave station communications is to be used in the communications tab of the general section of the configuration information.
- Using EST internal device as the device in the device entry field in the smart object dialog box, etc.

The following describes these two operations:

■ **Configuration information:　Configuring communications parameters in the communications section of the general configuration information**

(1) Double-click [General] under [Configuration Information] in the Application Manager.
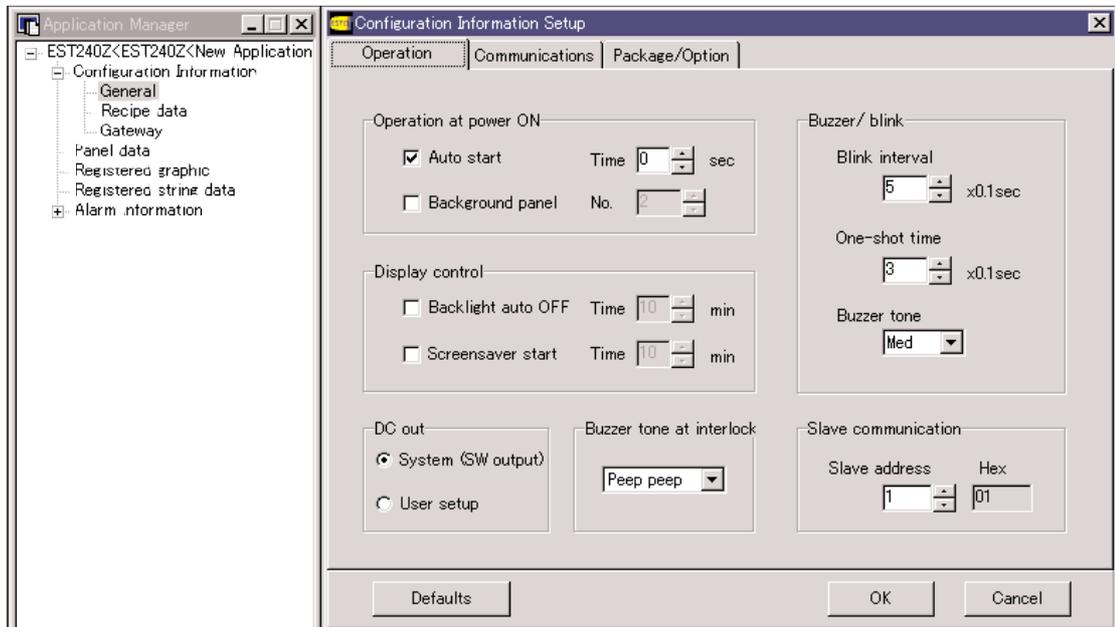


(2) Click the [Communications] tab under [Configuration Information].

(3) Click the field for the channel on which communications is to be performed.
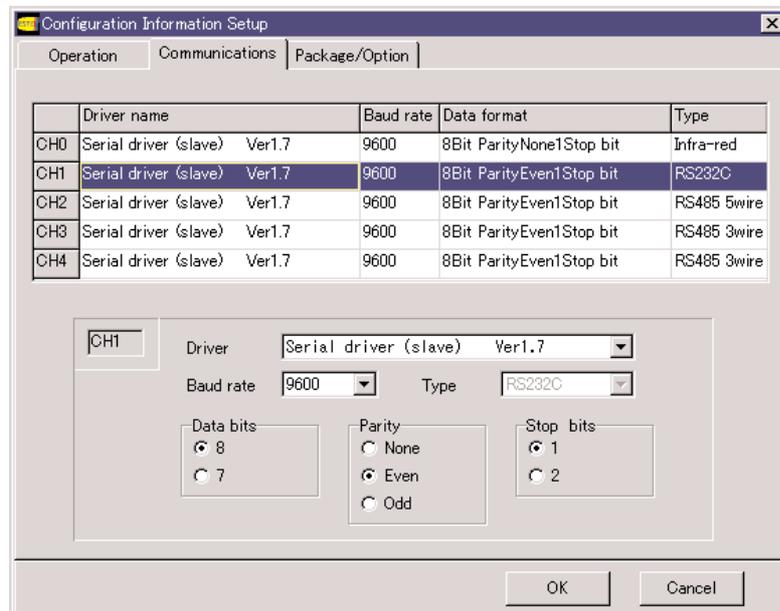
Four channels, 1 to 4 are provided. The type of communications is fixed according to each channel.

CH1:    9-pin RS-232C D-Sub connector
CH2:    5-lead RS-485 terminal block
CH3, 4: 3-lead RS-485 terminal block. Mainly used for Yamatake temperature controllers.

(4) Communications channel configuration.
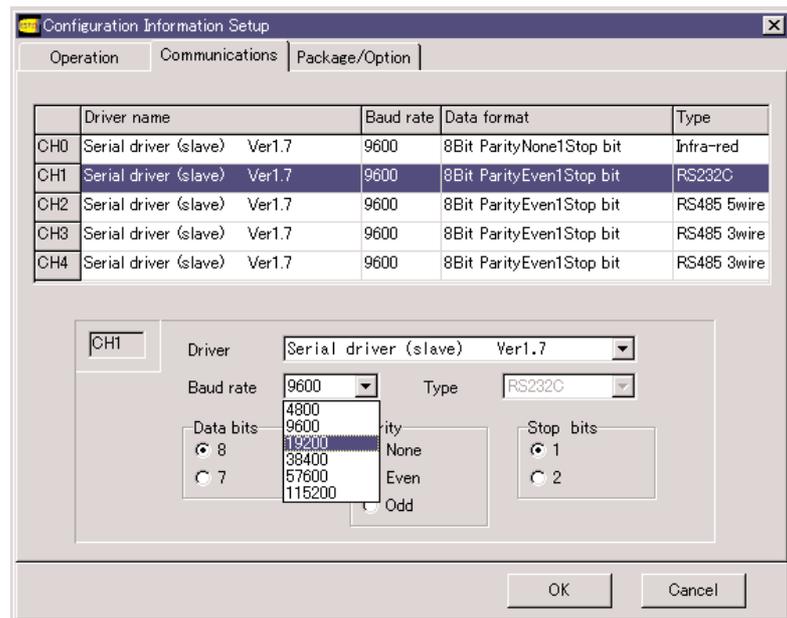


(5) Click [OK] to apply the configuration.

## ■ Using EST Internal Devices

For details on EST internal devices, see "Chapter 4. ADDRESS MAPS". This section gives a brief description of internal devices.
There are two types of EST internal devices: 1-word, 16-bit long word devices (internal registers) and 1-bit, bit devices (internal contacts).

### ● Internal registers

Internal registers are annotated as NR00000, etc, and are expressed in decimal. When entering an internal register, 0's preceding numerical values other than 0 can be omitted.
Special registers SR90000 onwards are also provided as auxiliary registers.

### ⚠ Handling Precautions

These NR registers are not backed up. So, the data must be initializ ed, since the contents of the NR registers are reset to 0 when the power is turned ON.

● **Internal contacts**

Internal contacts are annotated as NM000.0, etc. The 3-digit numerical value is expressed in decimal, and the following 1-digit numerical value is expressed in Hex.

When entering the 3-digit numerical value, 0's preceding numerical values other than 0 can be omitted.

Special registers SM900.0 onwards are also provided as auxiliary registers.

The following section describes how to read switch states. Though the EST is the slave device when it is used as the serial slave station, the EST can also generate output communications data for switches.

[!] **Handling Precautions**

In the same way as NR registers, NM contacts are not backed up. So, the data must be initializ ed after the power is turned ON.

# 3 - 3    Reading switch states

There are three ways of monitoring the switch states of the EST from the microcomputer board:

(1) By communicating switch inputs from the slave station in an RS-232C 1:1 connection

(2) By outputting DC outputs from the EST so that the switch states are read by the microcomputer board

(3) By monitoring the switch states at all times by communications

The following describes methods (1) and (2):

## ■ Communicating switch inputs from the slave station

When creating panels, select [Use SW Communications] for the smart switch object, enter the switch code and set switch notification. When this smart object is used, the EST issues communications instructions to the microcomputer board even though it is the slave device in communications.

Differentiation between communication responses to commands from the microcomputer board for data exchange /panel control, and these of switch operations is performed by strings in the command frames.

Create programs so that the communications master device can judge switches by switch codes.

In communications of switch inputs, switch operations are simultaneously output to all serial slave station communications channels.

## ■ How to read switches by DC output

The communications load on the microcomputer board increases if EST switch states are read by the microcomputer board. This is because the microcomputer board must read the state of EST switches by communications at all times when the EST is the serial slave station.

A standard specification EST has 1-bit switch indicating output. When a touch switch is touched, the DC output turns ON.

When creating panels, select [Use SW Communications] for the switch smart object, and set the switch code and [SW Communications Functions].

Create the program on the microcomputer board so that a software interrupt is generated when DC output turns ON to issue the switch communications buffer read command. The contact turns OFF when the switch communications buffer is read.
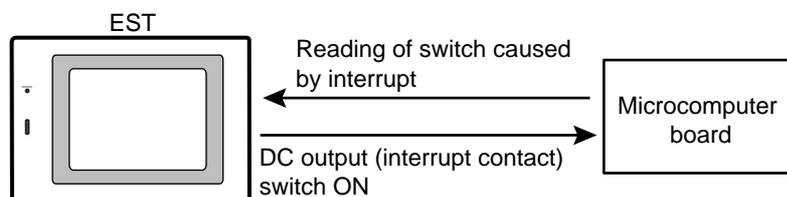


## ⚠ Handling Precautions

• Check the following settings when using DC output for switch indication. switches
  Application data setting information (operation setting)
  Selection of the system (SW output) by using DC output
  These settings are made on AP Editor.

• When the switch is a 2-touch switch, the switch code is stored to 2-touch switch communications buffer.
  Read the switch communications buffer until the DC output turns OFF.
  DC output is ON for the duration that the switch communications buffer contains a switch code.

## ■ How to wire DC outputs
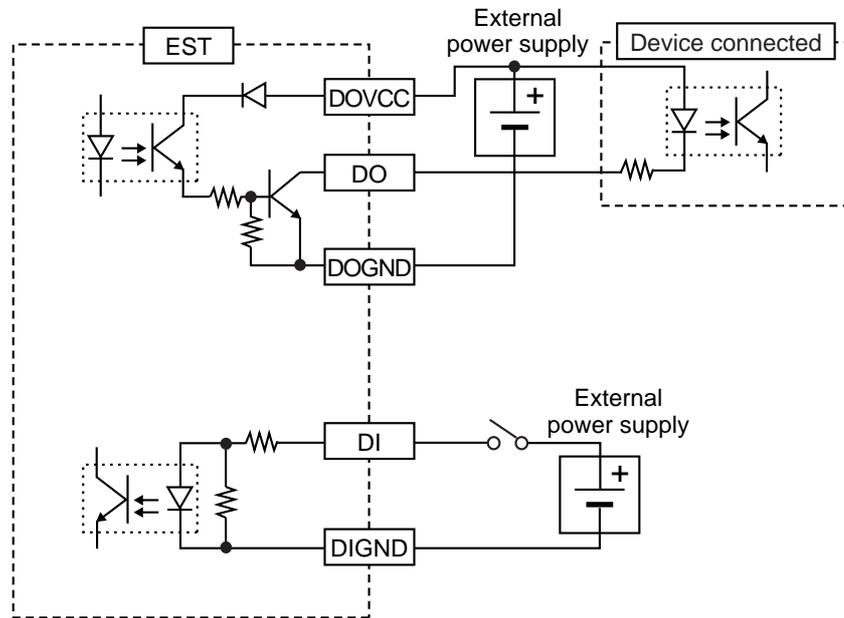
# 3 - 4　　　Retry Processing

In serial communications, noise on the communications path or a power disruption to the peer device could prevent responses from being returned to commands, or corrupt responses. For this reason, the command frame must be re-issued if a response has not been returned after a preset time out period has elapsed.

Generally, this re-issuing of the command frame is called "retry processing."

Yet, if retry processing commences too soon, the returned response may be corrupted, responses to previous commands may be received by mistake or other abnormalities may occur. This is because the instruction message/response message pair is unclear in the EST's serial slave station communications protocol, which is a general feature of simple communications.

The standard wait time (time-out period) of the EST is three seconds. Note, however, that an even longer time is required if you are processing complex drawing or communicating large amounts of data. The time-out period must be fully confirmed and tested after preparing actual applications before the application is used.

# Chapter 4.   ADDRESS MAPS

## 4 - 1      Names and Addresses of Areas

■ **Device Name/Address allocation table**

<div align="right">O : Possible   X : Not possible</div>

| Device Name | Device No. | | R | W |
|---|---|---|---|---|
| Input contact area | SX00.0 (EST240Z) | | O | X |
| Output contact area | SY00.0 (EST240Z) | | O | O |
| | SY00.0 to SY0.1(EST555Z) | | | |
| Physical switch monitor area | TS00.0 to TS22.F   (touch switch) | | O | X |
| Special contact area | SM900.0 to SM963.F | 64 words | O | O |
| | SM9064.0 to SM9255.5F | 192 words | O | O |
| Internal contact area | NM000.0 to NM255.F | 256 words | O | O |
| Special register area | SR90000 to SR98191 | 8192 words | O | O |
| Internal register area | NR00000 to NR32767 | 32768 words | O | O |
| Backup contact area | SM000.0 to SM255.F | 256 words | O | O |
| Backup register area (EST555Z) | SR00000 to SR32767 | 32768 words | O | O |
| Backup register area (EST240Z) * | SR00000 to SR16383 | 16384 words | O | O |

\* This area supported on AP Editor version of 3.0.00 or later.

⚠ **Handling Precautions**

- Writing to the special register area is performed by the WH and WI commands described later. However, two or more words cannot be written in a single operation by these commands.

- Writing to special contacts and special areas is performed by the WM command described later. However, two or more bits cannot be written in a single operation by this command.

- Some items cannot be written to within the special contacts and special register areas.

- The contents of the special contacts and special register areas are held when the power is turned OFF.

# 4 - 2    How to use each of the fevices

## ■ Input contact area

This area is used to read the DC input contacts mounted on the EST.  Writing to this area is not possible.
One point, SX00.0, is available in this area.

## ■ Output contact area

This area is used to turn contacts ON and OFF by writing bits to the DC output contacts mounted on the EST.
Output states can also be read.
One point, SY00.0, is available in this area.

## ■ Physical switch monitor area

This area is for enabling monitoring the ON/OFF states of EST switches. Writing to this area is not possible.

### ⚠ Handling Precautions

The siz e of dots on the LCD display is 20 dot x 20 dots.
Number of touch switches: 16 ✕ 12
Only even addresses are valid.

| TS00.0 | TS00.1 | • • • • • • • • • • • • • | TS00.F |
|--------|--------|---------------------------|--------|
| TS02.0 | TS02.1 | • • • • • • • • • • • • • | TS02.F |
| • | • | • | • |
| • | • | • | • |
| TS22.0 | TS22.1 | • • • • • • • • • • • • • | TS22.F |

## ■ Internal contact area

This area is used by the EST application as bit memory for storing status information, etc, and for handing status information over to the EST from external units.
NM000.0 to NM255.F are available in this area. Reading and writing are possible in this area.

## ■ Internal register area

This area is used by the EST application as word memory for storing data, etc, and for handing data over to the EST from external units.
NR00000 to NR32767 are available in this area.
Reading and writing are possible in this area.

## ■ Special contacts

EST internal status and alarm information are stored to special contacts. Special contacts are automatically rewritten by the system.
All special contacts can be read, however, only some special contacts can be written.

The table below shows the main contacts.

**O** : Possible   **X** : Not possible

| Address | Name | Description of Operation | W |
|---------|------|------------------------|---|
| SM900.B | Battery alarm | Low battery voltage | X |
| SM902.0 | ON in Run mode | ON in the Run mode | X |
| SM905.0 | ON at all times | ON at all times | X |
| SM905.1 | 1s clock | ON/OFF switching is repeated at 1s cycles. | X |
| SM905.2 | 5s clock | ON/OFF switching is repeated at 5s cycles. | X |
| SM905.3 | 10s clock | ON/OFF switching is repeated at 10s cycles. | X |
| SM905.F | OFF at all times | OFF at all times | X |
| SM907.0 | Touch switch indication contact | ON while one of the touch switches is physically ON. | X |
| SM907.3 | All switches indication contact | ON while any one of the switches is physically ON. | X |
| SM915.0 | Alarm being monitored | The alarm is being monitored. | X |
| SM915.1 | History being prepared | The alarm history is being prepared. | X |
| SM915.6 | Alarm generated | Some error has occurred. | X |
| SM915.7 | New alarm generated | New alarm has occurred. Turns ON for one scan. | X |
| SM916.0 | Alarm 1 | Monitor contact of alarm No. 1 | O |
| • | • | • | • |
| • | • | • | • |
| SM947.F | Alarm 512 | Monitor contact of alarm No. 512 | O |
| SM952.0 | Light ON | Backlight turns ON when ON. | O |
| SM953.0 | Sound ON | Sound turns ON when ON. | O |
| SM953.1 | Intermittent sound | Sound beeps on/off with blink setting when on. | O |

## ! Handling Precautions

SM900.0 to 963.F onwards are used by the system.
Do not use contact Nos. not listed in the above table.
Unit operation can not be guaranteed if contact Nos. other than those listed are used.

## ■ Special registers

EST configuration information, operation mode and active panel Nos. are stored in special registers. Though special registers are overwritten by the system, some settings can be rewritten by serial commands.

The table below shows the main registers.

**O** : Possible   **X** : Not possible

| Address | Size (W) | Name | Description of Operation | W |
|---|---|---|---|---|
| SR90024 | 1 | Auto run time | Wait time before operation after power ON (s) | X |
| SR90025 | 1 | Light OFF time | Wait time before when backlight automatically turns OFF (min) | O |
| SR90026 | 1 | Saver setting | Screen saver startup time (min) | O |
| SR90028 | 1 | Blink interval | Screen and sound blink interval (X 100ms) | O |
| SR90029 | 1 | One-shot | Sound and screen reversal time when switch is ON (X 100ms) | O |
| SR90030 | 1 | Tone setting | 3 = Low, 2 = Medium, 1 = High, 0 = OFF | O |
| SR90040 | 1 | Back No. | Indicates the No. of the background panel. | X |
| SR90041 | 1 | Number of active panels | Indicates the number of active panels excluding the background panel. | X |
| SR90042 | 1 | Panel 1 | Active panel No. 1 | X |
| SR90043 | 1 | Panel 2 | Active panel No. 2 | X |
| SR90044 | 1 | Panel 3 | Active panel No. 3 | X |
| SR90045 | 1 | Panel 4 | Active panel No. 4 | X |
| SR90046 | 1 | Panel 5 | Active panel No. 5 | X |
| SR90047 | 1 | Panel 6 | Active panel No. 6 | X |
| SR90048 | 1 | Panel 7 | Active panel No. 7 | X |
| SR90050 | 3 | Scan time | Execution time of conditional operation (previous/max./min.). (X 10ms) | O |
| SR90143 | 7 | Clock | Indicates the date (year/month/day/day of week) and time (hours/minutes/seconds). (See page 5-14.) | X |
| SR90300 | 1 | Number of alarms occurred | Number of ON alarms within alarms 1 to 512 | X |
| SR90301 | 100 | Current Alarms | Currently occurring alarm Nos. are stored in ascending order. | X |

## !  Handling Precautions

SR90000 to 98191 onwards are used by the system.
Do not use registers not listed in the above table.
Unit operation can not be guaranteed if registers other than those listed are used.

# Chapter 5.  SERIAL COMMANDS

## 5 - 1        Communications frame

This item describes the structure of the communications frame.

### ■ Description of data link layer

- The data link layer contains eight basic types of information for transmitting messages.
- The structure of instruction messages and response messages is the same in the data link layer.

Underlined characters are fixed at all times when used with this device.

Device category code
Sub-address
Device address
STX
ETX
Checksum
CR  LF

| 02H | 30H | 41H | 30H | 30H | 48H | 42H | 43H | 2CH | 4EH | 03H | 45H | 33H | 0DH | 0AH |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| STX | 0 | A | 0 | 0 | H | B | C | , | N | ETX | E | 3 | CR | LF |

Data link layer          Application layer          Data link layer
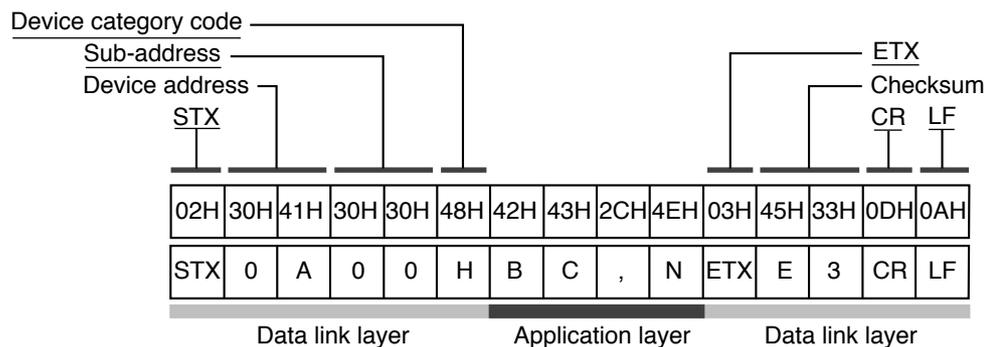
The following describes each of the functions of the data link layer:

### ● STX (Start of TeXt)

Role:        • This indicates the start of the text.

Description: • Fixed as 02 Hex.

- When the device receives "STX", STX is judged as the first character of a new instruction message, even if it is received midway through a message.

### ● Device address

Role:        • This specifies the transmission destination device. Communications is possible with only one specified device.

Description: • Set the device address as a value within the range 01 to 7E. 00 is invalid.

- Set the address as two characters in Hex according to the following example.

Example:     • When the device address of the peer communications device was 10:
  1. 10 (decimal) = 0A Hex
  2. Convert the device address to character codes.
     0 = 30
     A = 41 Hex
  3. "0A" (30 Hex, 41 Hex) calculated in 2. is used as the device address.

### !  Handling Precautions

The function of this command is completely different from the data address in the application layer. Be aware of this difference.

### ● Sub-address

Description: • Be sure to set "00" (30 Hex, 30 Hex) in the same format as the device address.

● **Device type code**

Description: • Only character code "H" (48 Hex) or "h" (68 Hex) can be specified with the EST.

● **ETX (End of TeXt)**

Role: • This indicates the end of the application layer part of the communications frame.

Description: • ETX is fixed as 03 Hex.

● **Checksum**

Role: • Checksum is a value for checking if the message was corrupted (e.g. noise) during communications.

Description: • Set the checksum as two characters in Hex.
• How to prepare the checksum
1. Add the message from STX through to ETX in single byte units.
2. Take the 2's complement of the addition result.
3. Convert the result to character codes.

Example: • The following describes an example taking the instance of the instruction message on the previous page.
1. Add the character codes from STX through to ETX one byte at a time.
02+30+41+30+30+48+42+43+2C+4E+03=21D
The lower 1 byte of the calculation result is 1D Hex.
2. Take the 2's complement of the addition result.
The result is E3 Hex.
3. Convert the result to character codes.
The result is (45 Hex) and (33 Hex) as "E3".
For details on conversion to character codes, refer to the device address example.

⚠ **Handling Precautions**

The checksum of instruction messages can be omitted. However, the checksum will not be included in the response to such messages. We recommend using the checksum to ensure correct reception and transmission of messages.

● **CR and LF (Carriage Return/Line Feed)**

Role: • CR and LF indicate the end of a message.

Description: • "CR" is (0D Hex) and "LF" is (0A Hex).
• CR and LF must be used as a pair.

⚠ **Handling Precautions**

• The device will not respond if the following kind of inconsistency are seen in the contents of the data link layer:
  - The communications conditions do not match. (For example, the transmission speed does not match, or a parity error occurred.)
  - The transmitted device address differs from the device address of the target device.

- The device address is set to "00".
- The sub-address is not "00".
- STX, ETX, CR or LF are not at the determined positions.
- The device type code is not "H" or "h".
- The device address, sub-address and checksum are not two characters.
- Calculation of the checksum does not match the checksum of the message.
- The communications frame contains invalid characters.

• The response message should have the same data link layer contents (excluding the checksum) as the instruction message.

• Use upper case characters "A" to "F" in the Hex numeric sections used for the device address and checksum.

## ■ Processing of Binary Data Shift Codes

Convert shift codes as follows to distinguish STX (02 Hex) and ETX (03 Hex) when the binary data 02 Hex, 03 Hex or 0F Hex is included in the message.

02 Hex → 0F Hex, 82 Hex
03 Hex → 0F Hex, 83 Hex
0F Hex → 0F Hex, 8F Hex
(example)
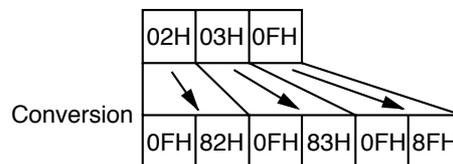


## Handling Precautions

The previously described checksum is calculated as 02 Hex even if the 0F, 82 Hex pair is transmitted. Ensure that the communications are configured for 8bits when the RI and WI commands are used.

## ■ Communications format

The communications format is as follows:

- The communications format is the same for both reception and transmission.
- The sub-address is fixed at "00".
- Limit communications to 256bytes from the STX to LF.

| STX | | | 0 | 0 | H | Command/<br>parameter section | ETX | Sum | Sum | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|

Device address — Sub-address

Application layer

Checksum
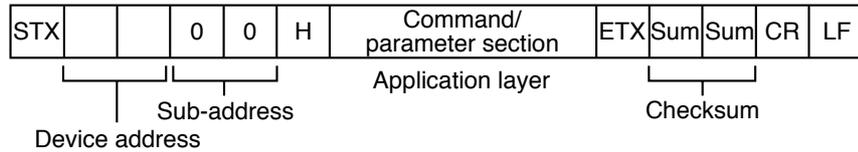
The response is returned after the command is received.

If the data requested by the command is available, it is included in the response message,

Subsequent commands are not accepted until transmission of the response message has been completed.

The end code is a numeric value for learning how the command was processed on the EST.

For details on end codes, see "5-3 Command Descriptions" (page 5-7).

(Example) When the response does not contain data.

Command

| STX | | | 0 | 0 | H | P | N | Parameter<br>section | ETX | Sum | Sum | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Device address

Application layer

Checksum

Response

| STX | | | 0 | 0 | H | 0 | 0 | , | p | n | ETX | Sum | Sum | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Device address

End code

Command (lower case)
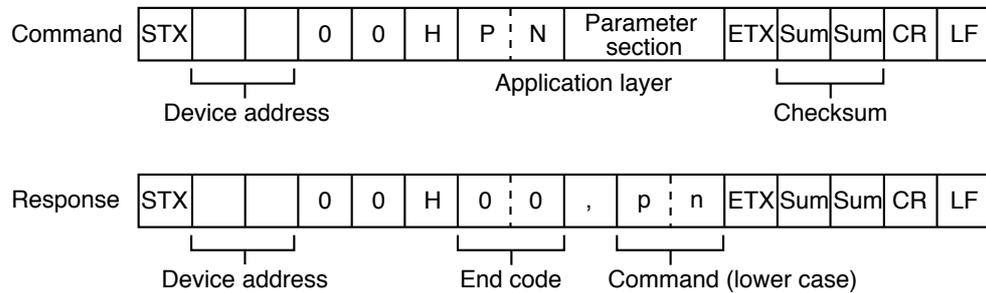
# 5 - 2    Reception and Transmission Timing

## ■ Timing Specifications for Instruction and Response Message

When a slave station is connected with the master station directly via the RS-232C or the CMC10L, the following precautions regarding the transmission timing of instruction messages from the master station and response messages from the slave station should be observed:

### ● Response time-out

The maximum response time from the end of the instruction message transmission by the master station until when the master station receives a response message from the slave station is 2s [(1) in figure]. So, the response time-out should be set to 2s.
Generally, when a response time-out occurs, the instruction message is resent.

### ● Transmission start time

A wait time of 10ms or more is required before the master station starts to transmit the next instruction message (to the same slave station or a different slave station) after the end of receiving a response message [(2) in figure].

・ RS-485 3-wire system
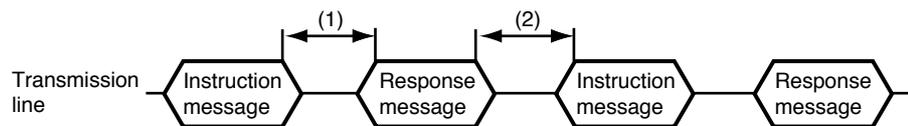


(1) End of master station transmission — Transmission start time of slave station = Max. 2000ms

(2) End of slave station transmission — Transmission start time of master station = Min. 10ms

## ■ RS-485 Driver Control Timing Specifications

When the transmission/reception on the RS-485 3-wire system is directly controlled by the master station, care should be paid to the following timing:
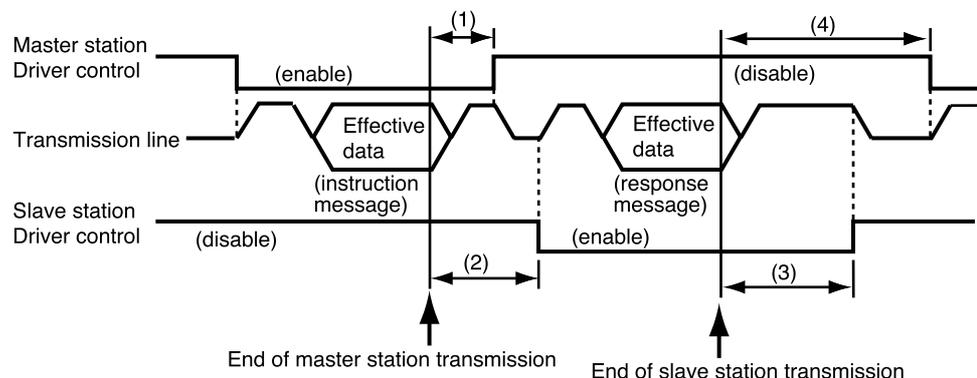


(1) End of master station transmission – Driver disable time = Max. 500$\mu$s

(2) End of slave station reception – Driver enable time = Min. 1ms

(3) End of slave station transmission – Driver disable time = Max. 10ms

(4) End of master station reception – Driver enable time = Min. 10ms

# 5 - 3    Communications command tables

## ■ By function

| Command | Command Name | Command Function | Page |
|---|---|---|---|
| PN | Select panel | Switches to the specified panel No. | 5-8 |
| BJ | Set block constant | Sets the constants from the smallest address towards the largest in the specified continuous register. | 5-10 |
| FK | Call registered graphic | Displays the registered graphic at any screen coordinates. | 5-11 |
| BC | Sound control | Sets sound ON/OFF, or to an intermittent beep. | 5-12 |
| BK | Set blink interval | Sets the screen region, sound, and display object blink interval. | 5-13 |
| LC | Backlight control | Controls ON/OFF of the LCD backlight. | 5-14 |
| RC | Read clock | Reads the contents of the EST internal calendar clock. | 5-15 |
| WC | Adjust clock | Adjusts the time of the EST internal calendar. | 5-16 |
| MD | Mode change | Application run/stop mode change. | 5-17 |
| sw | Switch notification (response only) | Notifies (outputs) the ON/OFF state of a switch specified in the application data. | 5-18 |
| SW | Read switch communications buffer | Reads the ON/OFF state of a switch specified in the application data. | 5-19 |
| RH | Read continuous area communications ASCII | Reads the specified continuous area data (ASCII) in word units. | 5-20 |
| WH | Write continuous area communications ASCII | Writes the specified continuous area data (ASCII) in word units. | 5-21 |
| RI | Read continuous area communications binary | Reads the specified continuous area binary data in word units. | 5-22 |
| WI | Write continuous area communications binary | Writes the specified continuous area binary data in word units. | 5-23 |
| WM | Manipulate continuous area communications bits | Manipulates (sets, resets) the bits of the specified continuous area data of the bit device in internal devices. | 5-24 |

## ■ In alphabetical order

| Command | Command Name | Command Function | Page |
|---|---|---|---|
| BC | Sound control | Sets sound ON/OFF, or to an intermittent beep. | 5-12 |
| BJ | Set block constant | Sets the constants from the smallest address towards the largest in the specified continuous register. | 5-10 |
| BK | Set blink interval | Sets the screen region, sound, and display object blink interval. | 5-13 |
| FK | Call registered graphic | Displays the registered graphic at any screen coordinates. | 5-11 |
| LC | Backlight control | Controls ON/OFF of the LCD backlight. | 5-14 |
| MD | Mode change | Application run/stop mode change. | 5-17 |
| PN | Select panel | Switches to the specified panel No. | 5-8 |
| RC | Read clock | Reads the contents of the EST internal calendar clock. | 5-15 |
| RH | Read continuous area communications ASCII | Reads the specified continuous area data (ASCII) in word units. | 5-20 |
| RI | Read continuous area communications binary | Reads the specified continuous area binary data in word units. | 5-22 |
| sw | Switch notification (response only) | Notifies (outputs) the ON/OFF state of a switch specified in the application data. | 5-18 |
| SW | Read switch communications buffer | Reads the ON/OFF state of a switch specified in the application data. | 5-19 |
| WC | Adjust clock | Adjusts the time of the EST internal calendar. | 5-16 |
| WH | Write continuous area communications ASCII | Writes the specified continuous area data (ASCII) in word units. | 5-21 |
| WI | Write continuous area communications binary | Writes the specified continuous area binary data in word units. | 5-23 |
| WM | Manipulate continuous area communications bits | Manipulates (sets, resets) the bits of the specified continuous area data of the bit device in internal devices. | 5-24 |

# 5 - 4    Command descriptions

## ■ Select panel (PN)

### ● Function

This command is for switching to the specified panel No.

### ✦ Command frame

| STX | Device address | Sub-address | H | P | N | , | 2 | , | 1 | , | 9 | 9 | 9 | , | 4 | 0 | , | 2 | 0 | ETX | | Sum | | CR | LF |
|-----|------|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 02 | ?? | ?? | 30 | 30 | 48 | 50 | 4E | 2C | 32 | 2C | 31 | 2C | 39 | 39 | 39 | 2C | 34 | 30 | 2C | 32 | 30 | 03 | ?? | ?? | 0D | 0A |

(Command: HPN; Switching method: 2; Redraw setting: 1; Panel No.: 999; X coord: 40; Y coord: 20; Sum may be omitted)

#### Parameter description

| Panel No. | Panel No.: 1 ≤ Panel No. ≤ 999 |
|-----------|------------------------------|
| X coordinate | X coordinate of top left of screen to be displayed: 0 ≤ X ≤ 319 |
| Y coordinate | Y coordinate of top left of screen to be displayed: 0 ≤ Y ≤ 239 |
| Redraw ON/OFF | Redraw specification when updating panel |
| 0 | : Redraw OFF (Other panels are displayed as they are.) |
| 1 | : Redraw ON (All displays are cleared and then redisplayed.) |

The required parameter items change as shown in the following table according to the selection method:

| Switching Method | Description | Parameter Specification (o : Specification required, –: Specification not required) | | | |
|------------------|-------------|-------------------|------------|------------|------------|
| | | Redraw ON/OFF | Panel No. | X coordinate | Y coordinate |
| 1 | The specified panel is started up, and the currently active panels are stopped. | o | o | o | o |
| | | o | o | o | o |
| 2 | The specified panel is started up. | o | o | – | – |
| 3 | The specified panel is stopped. | | | | |
| 6 | The specified panel is made the background panel and started up. | o | o | o | o |
| 7 | The background panel is stopped. | o | – | – | – |
| 9 | All currently active panels are restarted. | – | – | – | – |

### ◇ Response frame

| STX | Device address | Sub-address | H | End code | , | p | n | ETX | | Sum | | CR | LF |
|-----|------|------|----|------|----|----|----|----|----|----|----|----|----|
| 02 | ?? | ?? | 30 | 30 | 48 | | 2C | 70 | 6E | 03 | ?? | ?? | 0D | 0A |

#### Parameter description

| End code | 00: Normal end |
|----------|----------------|
| | 10: Parameter error |
| | 12: Mode error |
| | 13: Command execution error |

#### Operation/processing when an error occurs

- If this command is executed while the EST is stopped, a mode error occurs in the end code of the response frame.
- If this command is executed while a pop-up display is active on the EST, a command execution error occurs in the end code of the response frame.

### ⚠ Handling Precautions

- Two or more of the same panel cannot be made active.
- The maximum number of active panels is seven. When an already active panel is specified, that panel is stopped once and then restarted.

● **How to use the select panel command**

• Panel selector



Currently displayed panel    Original panel    New panel

This panel is displayed but does not function.

Command:  PN, 1, 0, 3, 200, 100

| Switching method | 0 | Specified panel 3 is started up, and currently active panels 1 and 2 are stopped. |
|---|---|---|
| Redraw | 1 | Redraw OFF |

📖 **Note**

When redraw is set to ON (1), panels 1 and 2 are cleared.

• Panel overlay display



Currently displayed panel

Currently displayed

Newly started up panel
Operation of the originally active panel at the rear of the section overlapped by the newly started up panel is stopped.
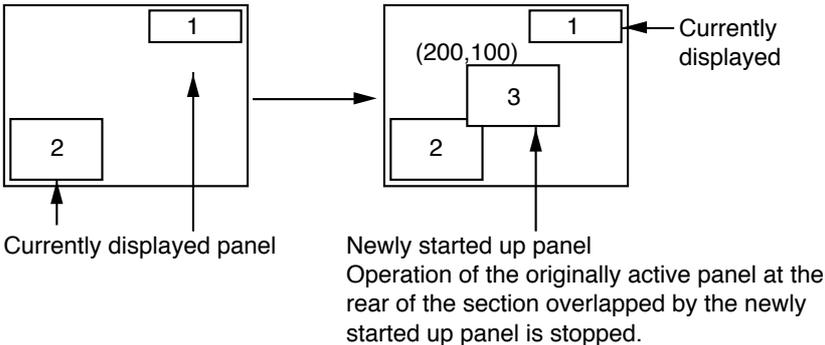
Command:  PN, 2, 0, 3, 200, 100

| Switching method | 2 | Specified panel 3 is started up. |
|---|---|---|
| Redraw | 0 | Redraw OFF |

• Pop-up display
Pop-up displays cannot be started up by serial commands.

• Clearing panels whose operation has stopped



Currently stopped

Currently operating

Command:  PN, 9

| Switching method | 9 | The currently active panels are restarted. |
|---|---|---|

## ■ Set block constant (BJ)

### ● Function

This command sets constant values into the specified continuous register area from the lowest address towards the highest.

### ❖ Command frame

| STX | Device address | Sub-address | H | B J Command | , | 1 | , | N R 2 0 0 0 0 Address 1 | , | N R 2 9 9 9 9 Address 2 | , | ⦃ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | ?? | ?? | 30 30 | 48 | 42 4A | 2C | 31 | 2C | 53 52 32 30 30 30 30 | 2C | 53 52 32 39 39 39 39 | 2C | |

| ⦃ | D | , | 1 0 0 0 5 Constants | , | - 3 2 7 6 8 Increments | ETX | Sum | CR LF |
|---|---|---|---|---|---|---|---|---|
| ⦃ | 44 | 2C | 31 30 30 30 35 | 2C | 2D 33 32 37 36 38 | 43 | ?? ?? | 0D 0A |

　　　　　└─ Decimal/Hex　　　　　　　　　　　　　　　　　　　└─ May be omitted

#### Parameter description

| Execution timing | This parameter specifies the execution timing. |
|---|---|
| | 0: Execution at the end of the conditional operation scan of all active panels. |
| | 1: Execution after the end of the currently executing conditional operation command. |
| Address 1 | Write destination address 1. Zero suppress is not allowed. |
| Address 2 | Write destination address 2. Zero suppress is not allowed. |
| Decimal/Hex | This parameter specifies the write data format. |
| | D: Decimal |
| | H: Hex |
| Constant | 1-word constant |
| | Decimal $-32768 \le$ constant $\le +32767$ |
| | Hex $0000 \le$ constant $\le$ FFFF |
| Increment | Increment for constants from address 1 to address 2 |
| | Decimal $-32768 \le$ increment $\le +32767$ |
| | Hex $0000 \le$ increment $\le$ FFFF |
| | When 0 or when omitted, the same constant is set to all addresses. |

### ◇ Response frame

| STX | Device address | Sub-address | H | End code | , | b | j | ETX | Sum | CR LF |
|---|---|---|---|---|---|---|---|---|---|---|
| 02 | ?? | ?? | 30 30 | 48 | | 2C | 62 | 6A | 03 | ?? ?? | 0D 0A |

#### Parameter description

| End code | 00: Normal end |
|---|---|
| | 10: Parameter error |

#### Operation/processing when an error occurs

A parameter error occurs if an out-of-range parameter is specified.

### ⚠ Handling Precautions

- The increment can be omitted. When the increment is omitted, the same constant is set. (The increment is interpreted as being "0".)

- In the case of bit devices, the bit specification is ignored, and the constant is written in word units (specified device bits 0 to F).

- Calculation of the increment is performed by calculating the 2's complement of one word, and increases and decreases in the number of digits are ignored.

## ■ Call registered graphic (FK)

### ● Function

This command displays the registered graphic at the specified screen coordinates.

### ❖ Command frame

| STX | Device address | Sub-address | H | F K Command | , | 9 9 9 Registered graphic No. | , | 1 0 0 X coord | , | 2 0 0 Y coord | , | N N | ETX | Sum | CR | LF |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 02 | ?? ?? | 30 30 | 48 | 46 4B | 2C | 39 39 39 | 2C | 33 32 30 | 2C | 32 30 30 | 2C | 4E 4E | 03 | ?? ?? | 0D | 0A |

Display method ⌐  └ May be omitted

### Parameter description

| Registered graphic No. | Registered graphic No. to be displayed: 1 ≤ registered graphic No. ≤ 999 |
|-----|-----|
| X coordinate | X coordinate of top left of screen to be displayed: 0 ≤ X ≤319 |
| Y coordinate | Y coordinate of top left of screen to be displayed: 0 ≤ Y ≤ 239 |
| Display method | This parameter specifies the screen update method. (The area to be cleared is the area in which the registered graphic is displayed.)<br>NN:  Display after the entire screen is cleared<br>NV:  Display with an overwrite image on the current screen<br>RN:  Display after the entire screen is cleared in a reverse state<br>RV:  Display with an overwrite image on the current screen in a reverse state |

### ◇ Response frame

| STX | Device address | Sub-address | H | End code | , | f | k | ETX | Sum | CR | LF |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 02 | ?? ?? | 30 30 | 48 | | 2C | 66 | 6B | 03 | ?? ?? | 0D | 0A |

### Parameter description

| End code | 00:  Normal end<br>10:  Parameter error<br>12:  Mode error |
|-----|-----|

### Operation/processing when an error occurs

- A parameter error occurs if an out-of-range parameter is specified.

- If the registered graphic is displayed at the specified coordinates, and the registered graphic protrudes from the effective display area, the registered graphic is displayed at the display able area.

- If this command is executed while the EST is stopped, a mode error occurs in the end code of the response frame.

Effective display area

Registered graphic
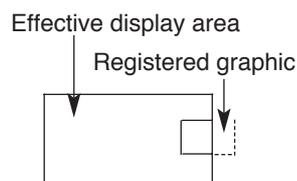
## ■ Sound control (BC)

● **Function**

This command sets sound ON, OFF, or to an intermittent beep.

❖ **Command frame**

| STX | Device address | Sub-address | H | B | C | , | N | ETX | Sum | CR | LF |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 02 | ?? | ?? | 30 | 30 | 48 | 42 Command 43 | 2C | 4E | 03 | ?? ?? | 0D | 0A |

Operation specification ⌐          └ May be omitted

**Parameter description**

| Operation specification | This parameter sets sound ON/OFF or to intermittent beep. |
|-----|-----|
| | N: Sound ON |
| | F: Sound OFF |
| | B: Intermittent beep |

◇ **Response frame**

| STX | Device address | Sub-address | H | End code | , | b | c | ETX | Sum | CR | LF |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 02 | ?? | ?? | 30 | 30 | 48 | | 2C | 62 | 63 | 03 | ?? ?? | 0D | 0A |

**Parameter description**

| End code | 00: Normal end |
|-----|-----|
| | 10: Parameter error |

## 🗆! Handling Precautions

Intermittent beeping is performed at the rate set by the Set blink interval (BK) command.

## ■ Set blink interval (BK)

### ● Function

This command sets, sound, and smart display object blink interval.

### ❖ Command frame
### Parameter description

| STX | Device address | Sub-address | H | B | K | , | 2 | 5 | 5 | ETX | Sum | | CR | LF |
|-----|------|------|----|----|----|----|----|----|----|----|----|----|----|----|
| | | | | Command | | | | | | | | | | |
| 02 | ?? | ?? | 30 30 | 48 | 42 | 4B | 2C | 32 | 35 | 35 | 03 | ?? ?? | 0D | 0A |

└ Interval     └ May be omitted

### ◇ Response frame

| Interval | This parameter sets the blink interval time.<br>The blink interval is set in units of 100ms.<br>Range: 1 to 255 (100ms to 25.5s) |
|----------|------------------------------------------------------------|

### Parameter description

| STX | Device address | Sub-address | H | End code | , | b | k | ETX | Sum | | CR | LF |
|-----|------|------|----|------|----|----|----|----|----|----|----|----|
| 02 | ?? | ?? | 30 30 | 48 | | 2C | 62 | 6B | 03 | ?? ?? | 0D | 0A |

| End code | 00: Normal end<br>10: Parameter error |
|----------|----------------------------------------|

## 🛈 Handling Precautions

- The blink state is as follows after the blink interval is set by the set blink interval (BK) command:

    (1) Blinks stays stopped and does not change when blinking is in a stopped state.

    (2) During blinking, blinking is performed at the specified blink interval.

- Blinking start/stop control is performed by the buzzer control (BC) command.

- The interval is set to 5 (blink interval 500ms) when the power is turned ON.

- When the blink interval time is set to "0", the blink ON/OFF specification is ignored, and blinking is stopped until a value other than "0" is specified.

## ■ Backlight control (LC)

### ● Function

This command controls the ON/OFF state of the LCD backlight.

### ❖ Command frame

| STX | Device address | Sub-address | H | L | C | , | N | ETX | Sum | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | ?? | ?? | 30 | 30 | 48 | 4C | 43 | 2C | 4E | 03 | ?? | ?? | 0D | 0A |

(Command: L C) — Operation specification ⌐ └ May be omitted

### Parameter description

| Interval | This parameter specifies the ON/OFF state of the LCD backlight.<br>N: Backlight ON<br>F: Backlight OFF |
|---|---|

### ◇ Response frame

| STX | Device address | Sub-address | H | End code | , | I | c | ETX | Sum | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | ?? | ?? | 30 | 30 | 48 | | 2C | 6C | 63 | 03 | ?? | ?? | 0D | 0A |

### Parameter description

| End code | 00: Normal end<br>10: Parameter error |
|---|---|

## ⚠ Handling Precautions

• The backlight goes ON when the power is turned ON.

• If the backlight is made to go OFF using this command, automatic lighting by touching a switch is not performed, in addition, touch switch input is not accepted.

## ■ Read Clock (RC)

### ● Function

This command reads the contents of the EST internal calendar clock.

### ❖ Command frame

| STX | Device address | Sub-address | H | R C Command | ETX | Sum | CR | LF |
|---|---|---|---|---|---|---|---|---|
| 02 | ?? | ?? | 30 | 30 | 48 | 52 | 43 | 03 | ?? | ?? | 0D | 0A |

└─ May be omitted

### Parameter description

None

### ◇ Response frame

| STX | Device address | Sub-address | H | End code | , | r c Command | , | 9 9 / 1 2 / 3 1 , 1 , | |
|---|---|---|---|---|---|---|---|---|---|
| 02 | ?? | ?? | 30 | 30 | 48 | | 2C | 72 63 | 2C | 39 39 2F 31 32 2F 33 31 2C 31 2C |

Year: 99 / Month: 12 / Day: 31

└─ Day of week

| 2 3 : 5 9 : 5 9 | ETX | Sum | CR | LF |
|---|---|---|---|---|
| h min s | | | | |
| 32 33 2A 35 39 2A 35 39 | 03 | ?? ?? | 0D | 0A |

### Parameter description

| End Code | 00: Normal end |
|---|---|
| | 10: Parameter error |
| Year | Lower 2 digits of calendar year    Range: (19) 50 to (20) 49 |
| Month | Month                                      Range: 01 to 12 (month) |
| Day | Day                                          Range: 01 to 31 (day) |
| Day of week | Day of week                            Range: 0 to 6 |
| | Code:        0    1    2    3    4    5    6 |
| | Day of week: Sun  Mon  Tue  Wed  Thu  Fri  Sat |
| h | Hours                                      Range: 00 to 23 |
| min | Minutes                                  Range: 00 to 59 |
| s | Seconds                                 Range: 00 to 59 |

## ⚠ Handling Precautions

- Year/month/day/day-of-week/hours/minutes/seconds are stored as continuous 7-word BCD starting from internal device SR90143.

- Response parameters are returned in two digits. For example, "9 minutes" is returned as "09". Note, however, that the day of the week is returned in one digit.

## ■ Adjust clock (WC)

### ● Function

This command adjusts the EST internal calendar time.

### ❖ Command frame

| STX | Device address | Sub-address | H | W Command | C | , | 9 | 9 | / | 1 | 2 | / | 3 | 1 | , | 2 | 3 | : | 5 | 9 | : | 5 | 9 |
|-----|------|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | | | | | | | Year | | | Month | | | Day | | | h | | | min | | | s | |
| 02 | ?? | ?? | 30 | 30 | 48 | 57 | 43 | 2C | 39 | 39 | 2F | 31 | 32 | 2F | 33 | 31 | 2C | 32 | 33 | 2A | 35 | 39 | 2A | 35 | 39 |

| ETX | Sum | | CR | LF |
|-----|-----|----|----|----|
| 03 | ?? | ?? | 0D | 0A |

└─ May be omitted

#### Parameter description

| Year | Lower 2 digits of calendar year | Range: (19) 50 to (20) 49 |
|------|--------------------------------|---------------------------|
| Month | Month | Range: 01 to 12 (month) |
| Day | Day | Range: 01 to 31 (day) |
| h | Hours | Range: 00 to 23 |
| min | Minutes | Range: 00 to 59 |
| s | Seconds | Range: 00 to 59 |

### ◇ Response frame

| STX | Device address | Sub-address | H | End code | | , | w | c | ETX | Sum | | CR | LF |
|-----|------|------|----|------|---|----|----|----|-----|-----|----|----|----|
| 02 | ?? | ?? | 30 | 30 | 48 | | | 2C | 77 | 63 | 03 | ?? | ?? | 0D | 0A |

#### Parameter description

| End code | 00: Normal end |
|----------|----------------|
| | 10: Parameter error |

## 🛈 Handling Precautions

- The day of the week is automatically calculated by the EST unit, and the day of the week code on the previous page is set to the internal device.

- Year/month/day/day of week/hours/minutes/seconds are stored as continuous 7-word BCD starting from internal device SR90143.

- Ensure that each command parameter is specified with two digits.

# ■ Mode change(MD)

## ● Function

This command changes the mode of the application between run/stop.

## ❖ Command frame

| STX | Device address | Sub-addres | H | M | D | , | S | ETX | Sum | | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | ?? | ?? | 30 | 30 | 48 | 4D | 44 | 2C | 4F | 03 | ?? ?? | 0D | 0A |

Command — 4D 44

Mode specification ⌐     └ May be omitted

### Parameter description

| Mode specification | This parameter runs/stops the application.<br>S: Stop<br>R: Run |
|---|---|

## ◇ Response frame

| STX | Device address | Sub-address | H | End code | , | m | d | ETX | Sum | | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | ?? | ?? | 30 | 30 | 48 | | 2C | 61 | 6C | 03 | ?? ?? | 0D | 0A |

### Parameter description

| End code | 00: Normal end<br>10: Parameter error<br>12: Mode error<br>13: Command execution error |
|---|---|

### Operation/processing when an error occurs

- If run is specified while the application is running, a mode error is returned.

- If stop is specified while the application has stopped, a mode error is returned.

## ⚠ Handling Precautions

- The current mode can be learned by referencing the ON contact (SM902.0) while the application is running.
  SM902.0 = 0: The application has stopped.
  SM902.0 = 1: The application is running.

- The next command sometimes cannot be answered for 200ms after a normal response to the MD command has been received.

## ■ Switch notification (response only) (sw)

### ● Function

This command notifies (outputs) the ON/OFF state of a switch specified in the application data.

### ✦ Command frame

There is no command frame.

### ✧ Response frame

| STX | Device address | Sub-address | H End code | , | s | w | , | + | 3 | 2 | 7 | 6 | 7 | , | N | ETX | Sum | CR | LF |
|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | | | | | | | | | | | Switch code | | | | | | | | |
| 02 | ?? | ?? | 30 30 | 48 | 00 00 | 2C | 53 | 77 | 2C | 2B | 33 | 32 | 37 | 36 | 37 | 2C | 4E | 03 | ?? ?? | 0D 0A |

Event ⌐

### Parameter description

| Switch Code | Switch code specified in the application data |
|-------------|------------------------------------------------|
| | Decimal values are zero-suppressed. |
| | Range: –32768 to +32767 |
| Event | N: ON state (switch touched) |
| | F: OFF state (switch released) |
| End Code | 00: Normal end |

### 🛈 Handling Precautions

- The response is generated by the ON edge and OFF edge when the switch is touched regardless of the switch mode.

- Specify "Switch Notification" in the application data. Otherwise, notification (output) is not generated.

- Set ⊙ ON switch notification or ⊙ ON/OFF switch notification in the smart switch object parameter settings when configuring smart switch objects.

- The checksum is always appended to the response.

- The switch code is prefixed with + (plus number, zero) or – (minus number) depending on its value.

- Switch communications are only performed if serial slave communications has been selected.

## ■ Read switch communications buffer (SW)

### ● Function

This command reads the ON/OFF state of a switch specified in the application data.

### ❖ Command frame

| STX | Device address | Sub-address | | H | S Command | W | ETX | Sum | | CR | LF |
|-----|--------|--------|----|----|----|----|-----|-----|----|----|----|
| 02 | ?? | ?? | 30 | 30 | 48 | 53 | 57 | 03 | ?? | ?? | 0D | 0A |

└ May be omitted

**Parameter description**

None

### ◇ Response frame

| STX | Device address | Sub-address | | H | End code | , | s | w | , | + | 3 | 2 | 7 | 6 | 7 | , | N | ETX | Sum | | CR | LF |
|-----|------|------|----|----|------|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|----|----|----|
| 02 | ?? | ?? | 30 | 30 | 48 | | 2C | 53 | 77 | 2C | 2B | 33 | 32 | 37 | 36 | 37 | 2C | 4E | 03 | ?? | ?? | 0D | 0A |

Switch code — Event ┘

**Parameter description**

| Switch Code | Switch code specified in the application data |
|-------------|-----------------------------------------------|
| | Decimal values are zero-suppressed. |
| | Range:  −32768 to +32767 |
| Event | N:  ON state (switch touched) |
| | F:  OFF state (switch released) |
| | E:  FIFO empty state |
| End Code | 00:  Normal end |
| | 10:  Parameter error |

## ⚠ Handling Precautions

- The switch code is prefixed with + (plus number, zero) or – (minus number) depending on its value.

- If the switch communications buffer is empty, <event> becomes E and <switch code> is undefined.

- Set ⊙ ON switch notification or ⊙ ON/OFF switch notification in the smart switch object parameter settings when configuring smart switch objects.

- After the data has been read, that data is deleted from the switch communications buffer.

- If there is data in the switch communications buffer, the DC output turns ON.

## ■ Read continuous area communications ASCII (RH)

### ● Function

This command reads the specified continuous area of EST internal devices in word units. (ASCII)

### ❖ Command frame

| STX | Device address | Sub-address | H | R | H | , | 1 | , | N | R | 2 | 9 | 0 | 0 | 0 | , | 3 | 2 | , | D | ETX | Sum | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Command | | | | | | Read start address | | | | | | | Number of reads | | | | | | | |
| 02 | ?? | ?? | 30 30 | 48 | 52 | 48 | 2C | 31 | 2C | 4F | 52 | 32 | 39 | 30 | 30 | 30 | 2C | 33 | 32 | 2C | 44 | 03 | ?? ?? | 0D | 0A |

Execution timing — | Decimal/Hex — | May be omitted

#### Parameter description

| Execution timing | This parameter specifies the execution timing. |
|---|---|
| | 0:  Execution at the end of the conditional operation scan of all active panels |
| | 1:  Execution after the end of the currently executing conditional operation command |
| Number of reads | Number of data items to read |
| | Range: 1 to 32 |
| Read start address | Start address of read source |
| | Zero suppression is not allowed. |
| Decimal/Hex | This parameter specifies the write data format. |
| | D:  Decimal |
| | H:  Hex |

### ◇ Response frame

| STX | Device address | Sub-address | H | End code | , | r | h | , | + | 1 | 2 | 3 | 4 | , | - | 9 | 9 | 9 | 9 | ETX | Sum | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Read data | | | | | | Read data | | | | | | | |
| 02 | ?? | ?? | 30 30 | 48 | | 2C | 61 | 68 | 2C | 2B | 31 | 32 | 33 | 34 | 2C | 2D | 39 | 39 | 39 | 39 | 03 | ?? ?? | 0D | 0A |

#### Parameter description

| End Code | 00:  Normal end |
|---|---|
| | 10:  Parameter error |
| Data | Read data (ASCII) |
| | Decimal  −32768 ≤ data ≤ +32767 |
| | Hex       0000 ≤ data ≤ FFFF |

### ⚠ Handling Precautions

• In the case of bit devices, the bit specification is ignored, and the data is read in word units (specified device bits 0 to F).

• If decimal is specified, the data is prefixed with + (plus number, zero) or − (minus number) depending on its value.

## ■ Write continuous area communications ASCII (WH)

### ● Function

This command writes the specified continuous area of EST internal devices in word units. (ASCII)

### ❖ Command frame

| STX | Device address | Sub-address | H | W | H Command | , | 1 | , | N | R | 2 | 9 | 0 | 0 | 0 | , | 3 | 2 Number of writes | , | D | , |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | ?? | ?? 30 30 | 48 | 57 | 48 | 2C | 31 | 2C | 4F | 52 | 32 | 39 | 30 | 30 | 30 | 2C | 33 | 32 | 2C | 44 | 2C |

Execution timing — (under "1")
Decimal/Hex — (under "D")

| 3 | 2 | 7 | 6 | 7 Write data | , | | ¥ ¥ ¥ | , | + | 9 | 9 | 9 | 9 Write data | ETX | Sum | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | 32 | 37 | 36 | 37 | 2C | | | 2C | 2B | 39 | 39 | 39 | 39 | 03 | ?? ?? | 0D | 0A |

May be omitted

### Parameter description

| Execution timing | This parameter specifies the execution timing. |
|---|---|
| | 0: Execution at the end of the conditional operation scan of all active panels |
| | 1: Execution after the end of the currently executing conditional operation command |
| Number of writes | Number of data items to write     Range: 1 to 32 |
| Write start address | Write start address |
| | Zero suppression is not allowed. |
| Decimal/Hex | This parameter specifies the write data format. |
| | D: Decimal |
| | H: Hex |
| Write data | Input data (ASCII) |
| | Decimal  −32768 ≤ data ≤ +32767 |
| | Hex     0000 ≤ data ≤ FFFF |

### ✧ Response frame
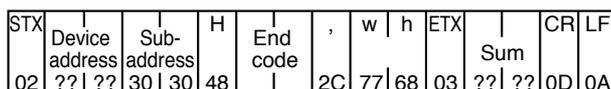
| STX | Device address | Sub-address | H | End code | , | w | h | ETX | Sum | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | ?? | ?? 30 30 | 48 | | 2C | 77 | 68 | 03 | ?? ?? | 0D | 0A |

### Parameter description

| End code | 00: Normal end |
|---|---|
| | 10: Parameter error |
| | 12: Mode error |

## 🛈 Handling Precautions

• In the case of bit devices, the bit specification is ignored, and the data is read in word units (specified device bits 0 to F).

• The + (plus number) sign for decimal write data can be omitted, and zero can be suppressed.
Note, however, that when the value is 0, it is expressed as "+0".
Be sure to prefix negative data with the − (minus) sign.

## ■ Read continuous area communications binary (RI)

● **Function**

This command reads the specified continuous area of EST internal devices in word units.(binary)

✦ **Command frame**

| STX | Device address | Sub-address | H | R | I | , | 1 | , | N | M | 1 | 2 | 3 | . | 0 | , | 3 | 2 | ETX | Sum | | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Command | | | | | | | Read start address | | | | | | Number of reads | | | | | | |
| 02 | ?? | ?? | 30 30 | 48 | 52 | 49 | 2C | 31 | 2C | 4F | 4D | 31 | 32 | 33 | 2E | 30 | 2C | 33 | 32 | 03 | ?? | ?? | 0D | 0A |

Execution timing (under 1)

May be omitted (under Sum)

**Parameter description**

| Execution timing | This parameter specifies the execution timing. |
| --- | --- |
| | 0: Execution at the end of the conditional operation scan of all active panels |
| | 1: Execution after the end of the currently executing conditional operation command |
| Number of reads | Number of words in data to read |
| | Range: 1 to 99 |
| Read start address | Start address of read source |
| | Zero suppression is not allowed. |

✧ **Response frame**

| STX | Device address | Sub-address | H | End code | , | r | i | , | Read data | ¥ ¥ ¥`¥ | Read data | ETX | Sum | | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | ?? | ?? | 30 30 | 48 | 2C | 72 | 69 | 2C | ?? ?? ?? ?? | | ?? ?? ?? ?? | 03 | ?? | ?? | 0D | 0A |

20  21

FEDCBA98 76543210

| Upper byte | Lower byte |
|---|---|
| 0010 0001 | 0010 0000 |

**Parameter description**

| End Code | 00: Normal end |
| --- | --- |
| | 10: Parameter error |
| Data | Read data (binary processed by shift code) |
| | 1-word data is output as it is in byte units. |

⚠ **Handling Precautions**

- In the case of bit devices, the bit specification is ignored, and the data is read in word units (specified device bits 0 to F).

- For details on processing shift codes, see "■ Processing of binary data shift codes" (page 5-3).

- When the RI command is used, ensure that the communications are configured for 8bits.

## ■ Write continuous area communications binary (WI)

### ● Function

This command writes the specified continuous area of EST internal devices in word units. (binary)

### ◈ Command frame

| STX | Device address | Sub-address | H | W | I | , | 1 | , | N | M | 1 | 2 | 3 | . | 0 | , | 3 | 2 | , |
|-----|------|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 02 | ?? | ?? | 30 30 | 48 | 57 | 49 | 2C | 31 | 2C | 4F | 4D | 31 | 32 | 33 | 2E | 30 | 2C | 33 | 32 | 2C |

Command — W I
Execution timing — 1
Write start address — N M 1 2 3 . 0
Number of writes — 3 2

| Write data | ¥ ¥ ¥ | Write data | ETX | Sum | CR | LF |
|-----|-----|-----|-----|-----|----|----|
| 20 21 22 23 24 | | 7C 7D 7E 7F 80 | 03 | ?? ?? | 0D | 0A |

May be omitted

FEDCBA98 76543210

| Upper byte | Lower byte |
|-----|-----|
| 0010 0001 | 0010 0000 |

### Parameter description

| Execution timing | This parameter specifies the execution timing.<br>0: Execution at the end of the conditional operation scan of all active panels<br>1: Execution after the end of the currently executing conditional operation command |
|-----|-----|
| Number of writes | Number of words in data to write   Range: 1 to 99 |
| Write start address | This parameter specified the write data format.<br>Zero suppression is not allowed. |
| Write data | Write data (binary processed by shift code)<br>2 bytes X <number of writes><br>1-word data is input in binary as it is in byte units. |

### ◇ Response frame
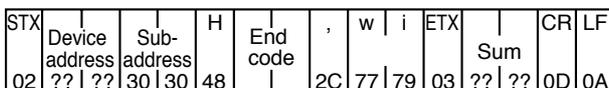
| STX | Device address | Sub-address | H | End code | , | w | i | ETX | Sum | CR | LF |
|-----|------|------|----|------|----|----|----|-----|-----|----|----|
| 02 | ?? | ?? | 30 30 | 48 | | 2C | 77 | 79 | 03 | ?? ?? | 0D | 0A |

### Parameter description

| End code | 00: Normal end<br>10: Parameter error<br>12: Mode error |
|-----|-----|

### 🔲 Handling Precautions

・ In the case of bit devices, the bit specification is ignored, and the data is read in word units (specified device bits 0 to F).

・ For details on processing shift codes, see "■ Processing of binary data shift codes" (page 5-3).

・ When the WI command is used, ensure that the communications are configured for 8bits.

## ■ Manipulate continuous area communications bits (WM)

### ● Function

This command manipulates (sets, resets) bits in the specified continuous area of EST internal bit devices.

### ❖ Command frame

| STX | Device address | Sub-address | H | | W | M | Command | , | 1 | , | N | M | 1 | 2 | 3 | . | 5 | , | 3 | 2 | , | N | , | F | , | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | ?? | ?? | 30 | 30 | 48 | 57 | 4D | 2C | 31 | 2C | 4F | 4D | 31 | 32 | 33 | 2E | 35 | 2C | 33 | 32 | 2C | 4E | 2C | 46 | 2C | 4E |

- Execution timing (under the "1" column)
- Write start address (under NM123.5)
- Number of writes (under 32)
- Operation (under N before F)
- Operation (under final N)

| | ETX | Sum | | CR | LF |
|---|---|---|---|---|---|
| | 03 | ?? | ?? | 0D | 0A |

— May be omitted

### Parameter description

| Execution timing | This parameter specifies the execution timing.<br>0: Execution at the end of the conditional operation scan of all active panels<br>1: Execution after the end of the currently executing conditional operation command |
|---|---|
| Number of writes | Number of bits to write   Range: 1 to 32 |
| Write start address | Start address of data write destination internal device<br>Zero suppression is not allowed. |
| Operation | Bit manipulation operation<br>N: Bit ON   The specified bit is set to "1".<br>F: Bit OFF   The specified bit is set to "0".<br>T: Toggle   The specified bit is reversed/toggled. |

### ◇ Response frame

| STX | Device address | Sub-address | H | End code | , | w | m | ETX | Sum | | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | ?? | ?? | 30 | 30 | 48 | | 2C | 77 | 6D | 03 | ?? | ?? | 0D | 0A |
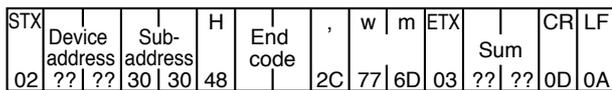
### Parameter description

| End code | 00: Normal end<br>10: Parameter error<br>12: Mode error |
|---|---|

# Revision History

| Printed Date | Manual Number | Edition | Revised pages | Description |
|---|---|---|---|---|
| 01-01 | CP-SP-1090E | 1st Edition | | |
| 01-03 | | 2nd Edition | | Fonts changed |
| 01-09 | | 3rd Edition | 2-21, 22, 23<br>4-1 | Book title and Model name changed EST240Z to EST-Z Series.<br>Applicatable PLS Series added.<br>Backup devices added. |
| 02-08 | | 4th Edition | 2-1<br><br>2-3<br>2-4<br><br><br><br>2-21<br>2-38 to 2-40<br>2-41 to 2-42<br>2-43 to 2-44<br>5-5<br>5-6<br><br><br>5-7<br>5-8<br><br><br>5-9 to 5-24 | Connected to the EST, YOKOGAWA, Siemens K.K. and YASKAWA added.<br>Yamatake (SDC10) (1:1,1:N) connection changed.<br>Yamatake (DMC10) (1:1,1:N) connection, EST to CMC10B connection and CMC10B and DMC10 connection changed<br>Address Range of Index Reg "(FXn only)" added.<br>2-7 YOKOGAWA PLCs added.<br>2-8 Siemens K.K. PLCs added.<br>2-9 YASKAWA PLCs added.<br>5-2 Reception and Transmission Timing added.<br>5-2 Communicatons command tables to 5-3 Communicatons command tables changed, OLd 5-5 page.<br>OLd 5-6 page.<br>5-3 Command descriptions to 5-4 Command descriptions changed, OLd 5-7 page.<br>OLd 5-8 to 5-23 page. |
| 02-12 | | 5th Edition | 2-21 | RESTRICTIONS ON USE changed.<br>Notes of an input relay added. |