SMART TERMINAL
EST240Z

User's Manual

Installation

Thank you for purchasing the Smart Terminal EST240Z.
This manual contains information for ensuring correct use of the EST240Z. 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 EST240Z.
Be sure to keep this manual nearby for handy reference.

Yamatake Corporation

REQUEST

SAFETY PRECAUTIONS

■ About Icons

Safety precautions are for ensuring safe and correct use of this product, and for preventing injury to the operator and other people or damage to property. You must observe these safety precautions. The safety precautions described in this manual are indicated by various icons.

As the following describes the icons and their meanings, be sure to read and understand the descriptions before reading this manual:

⚠ **WARNING**	Warnings are indicated when mishandling this product might result in death or serious injury to the user.
⚠ **CAUTION**	Cautions are indicated when mishandling this product might result in minor injury to the user, or only physical damage to this product.

■ Examples

	Triangles warn the user of a possible danger that may be caused by wrongful operation or misuse of this product. These icons graphically represent the actual danger. (The example on the left warns the user of the danger of electric shock.)
	White circles with a diagonal bar notify the user that specific actions are prohibited to prevent possible danger. These icons graphically represent the actual prohibited action. (The example on the left notifies the user that disassembly is prohibited.)
	Black filled-in circles instruct the user to carry out a specific obligatory action to prevent possible danger. These icons graphically represent the actual action to be carried out. (The example on the left instructs the user to remove the plug from the outlet.)

⚠WARNING

❗	**Be sure to turn off the power when you wire, assemble or disassemble the EST.** **Otherwise, electric shock hazard could occur.**
⏚	**Ground the FG terminal to an Earth of less than 100Ω.** **Otherwise, electric shock hazard could occur.**
❗	**The display unit is very heavy. Make sure not to drop it when you replace it. Doing so can harm your body or the unit.**

⚠CAUTION

❗	**Prevent debris of wiring or other foreign materials from entering the EST. It may cause trouble or burning the EST.**
❗	**Be careful not to give a shock to the body, especially to the front face, or scratch it by something sharp-pointed. Otherwise, malfunction may occur.**
❗	**Be careful not to hit and break the front touch panel. Otherwise, the touch panel can be broken and the broken pieces may cause injury.**
🚫	**Do not connect to outdoor wiring, or lightening could cause malfunction.**
❗	**A thin plastic film is attached on the panel protective sheet to protect the surface from scratch. Remove it before using the EST.**
❗	**Input/output signal cable, power supply cable, and grounding cable should be wired separately from power unit cables. If routing these cables together cannot be avoided, use a shielded cable and ground one end of the shield.**
❗	**Be sure to turn off the power before you wire the EST.** **Otherwise, electric shock hazard can be caused.**
❗	**Be sure to turn off the power before the maintenance and inspection of the EST.** **Otherwise, electric shock hazard can be caused.**
🚫	**Do not touch the leads of IC and other electronic parts and the PWB patterns with bare hand. Internal electric devices can be damaged by static electricity. The use of antistatic work benches are highly recommended.**
❗	**The display unit is made of sheet metal.** **Be careful not to be injured by the sharp edges.**

⚠CAUTION

🚫	**Do not throw used batteries into fire or discard. If you discard them at your site, follow regulations and rules stipulated by your local self-governing body.**
🚫	**Do not short-circuit the batteries as they may overheat or catch fire also, do not expose them to water.**
❗	**When replacing the battery, please note the followings:** ・ **Clock data, user touch switch adjustment data and user contrast adjustment data will be initialized during battery replacement. In this case, please reconfigure the settings.** ・ **The trend data will be lost during battery replacement.** ・ **The changes that have been made to the recipe data using the EST will be lost during battery replacement.** **In case of the EST's system program of F/W (firmware) version R0021 or later, the changes are automatically written to the EST's memory during the application upload function of the AP Editor. In case of the F/W version R0020 and earlier, the changes are written into the memory by using the "Recipe data write" switch in the system menu.**
❗	**When you discard the EST, discard it as industrial waste, following regulations and rules stipulated by your self-governing body.**

Request

The protective sheet on the panel front has a thin plastic film protecting the panel surface.

After the works such as mounting and wiring are completed, please remove it as follows:
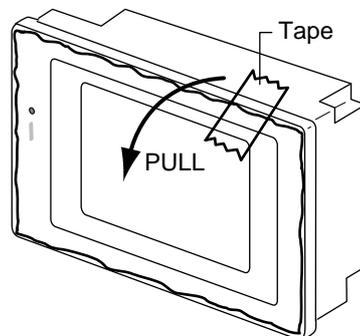
Tape a cellophane adhesive tape on the corner, and pull it in the arrow direction as shown to remove off the thin plastic film together.

🔲 Handling Precautions

Peeling off the protective film with your fingernail might scratch the surface of the EST.

The Role of This Manual
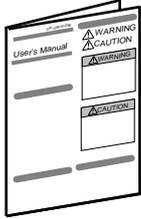
Smart Terminal EST240Z User's Manual   **Manual No.CP-UM-5145E**

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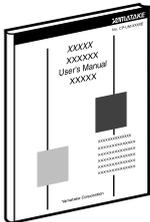
Smart Terminal EST240Z User's Manual
Installation   **Manual No. CP-SP-1065E**

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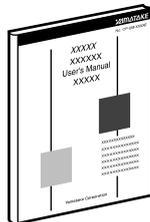
Smart Terminal EST-Z Series User's Manual
Application Preparation   **Manual No. CP-SP-1088E**

This manual should be read by those who design screens that are displayed on the EST240Z 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.
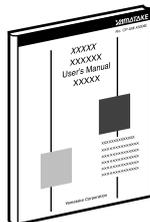
Smart Terminal EST-Z Series User's Manual
Smart Object Library   **Manual No. CP-SP-1089E**

Graphic elements that have functions for displaying on the EST240Z are called "smart objects."

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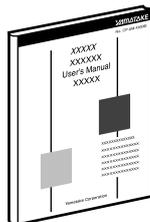
Smart Terminal EST-Z Series User's Manual
Communications Connection   **Manual No. CP-SP-1090E**

This manual should be read by those who combine the EST240Z 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.
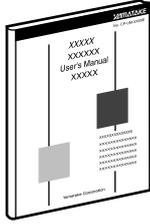
Smart Terminal EST240Z User's Manual
DMC10 Package   **Manual No. CP-SP-5149E**

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.

Organization of This User's Manual

The user's manual has the following configuration:

Chapter 1. PRODUCT OUTLINE

This chapter gives the EST240Z model numbers and describes EST240Z system configurations and related equipment.

Chapter 2. NOMENCLATURE AND FUNCTIONS

This chapter gives the nomenclature of EST240Z parts and describes their functions.

Chapter 3. INSTALLATION AND WIRING

This chapter describes the installation procedures and precautions required for installing the EST240Z.

Chapter 4. CONNECTIONS AND SETUP

This chapter describes how to connect the EST240Z to other equipment and how to use the EST setting menu.

Chapter 5. OPERATION PROCEDURES

This chapter describes downloading procedure of application data to EST240Z and how to start the operation.

Chapter 6. MAINTENANCE AND INSPECTION

This chapter describes inspection procedures and how to replace maintenance parts to ensure maximum service life of the EST240Z.

Chapter 7. TROUBLESHOOTING

This chapter describes check points and countermeasure when the EST240Z is not operating normally.

Chapter 8. DISPOSAL

This Chapter describes the precautions required for discarding the EST240Z.

Chapter 9. SPECIFICATIONS

This chapter gives the general specifications, performance specifications and the external dimensions of the EST240Z.

Contents

Chapter 5.   OPERATION PROCEDURES

Chapter 6.   MAINTENANCE AND INSPECTION

Chapter 7.   TROUBLESHOOTING

Chapter 8.   DISPOSAL

Chapter 9.　SPECIFICATIONS

Index

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 **EST240Z.**

📖 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]

: :Indicate commands, messages, and touch switch menus, displayed on the screen.

[Exit]button

: Indicate touch switch buttons displayed on the screen

>>

: Indicate messages displayed on the screen or the result of each operation.

Chapter 1. PRODUCT OUTLINE

1 - 1 Model Numbers

The model No. of EST240Z(occasionally described as EST) and the related products/parts are as follows:

■ EST240Z

Model No.	Display device	Type	Power Supply	Memory
EST0240Z05WBX00	Color STN LCD with 320x240(x3) pixels (white model)	256/64 colors	24Vdc	1M bytes
EST0240Z05BBX00	Color STN LCD with 320x240(x3) pixels (black model)	256/64 colors	24Vdc	1M bytes

■ AP Editor, package software

Model No.	Description
ESTX240SWWEC000	AP Editor for Windows 98, Me, XP ;　CD
ESTX220D1AE3001	Package for DMC10 ;　floppy disk

■ Accessories

Model No.	Description
ESTX939FB00	Mounting braket

■ Maintenance parts

Model No.	Description
ESTX924BL60	Middle size color STN LCD backlight (For the EST240Z not yet complying with the CE marking)
ESTX924BL61	Middle size color STN LCD backlight (For the EST240Z complying with the CE marking)
ESTX92XSS60	Panel protective sheet (For white model)
ESTX92XSS61	Panel protective sheet (For black model)
81446345-001	Battery

For the EST240Z complying with the CE marking, the CE mark is applied to the label of terminal block signal table available on the left side of the EST body.

■ Optional parts

Model No.	Description
CBL232AFT02	RS-232C cable (2m) D-sub25pin pin contact – D-sub9pin socket contact
CBL232FFT02	RS-232C cable (2m) D-sub9pin pin contact – D-sub9pin socket contact

📖 Note

The touch switches of the EST240Z are analog, and can be arranged freely.

1 - 2 Connections and Configuration

Since the EST has several communication ports, the EST can be connected to devices such as PLCs, controllers and PCs without any special programs.
This allows the data exchange between PLCs and controllers, or the controller's configuration changes to be performed easily.

● **Configuration example**
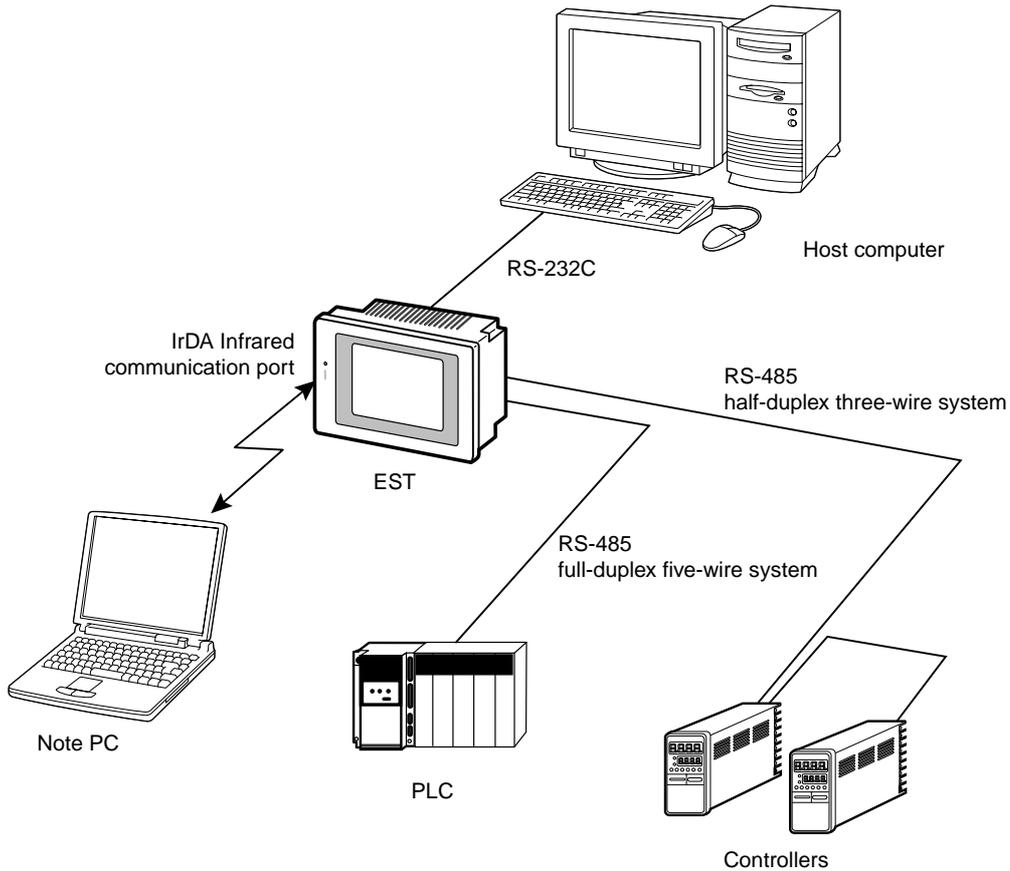
Chapter 2. NOMENCLATURE AND FUNCTIONS

2 - 1 Nomenclature and Functions

■ Front view

Mode indicator lamp
   Orange : Downloading
   Green   : Operating
   Red flashing: System error (for example: shortage of work-memory)
   Red   : Error, or in ROM-Write mode
   Green flashing: System Screen is displayed.

POWER

LCD
   Touch switches are mounted
   on the display surface.

Panel protective sheet
   Protects the touch switches
   from dust and water.

Infrared communication port(CH0)
   For infrared communication.

■ Rear view

CH1 9pinDSUB connector
RS-232C based communication port

Rear cover

RS-232C

CH2, CH3, CH4
   RS-485 based communication port

24V GND FG

DC input/output
   (behind the rear cover)

Power supply terminals
   For 24V DC power supply
   and the grounding

Case packing
   Prevents water and other liquids
   fromentering the EST.

2 - 2 Materials Used

The table below shows the materials that the EST is made with and their environmental durability.

Part name	Material	Resistance to chemicals and oil
Case/option cover	PC / ABS	These materials are resistant to water, alcohol, oil, salts and weak acids. However, alkali, aromatic hydrocarbons, halogenated hydrocarbons and other substances may cause them to swell or dissolve.
Touch switch panel Panel protective sheet	PET (polyethylene terephthalate)	PET is used in the panels. Although it is permeable to strong acid, alkali, boiling water and steam, it is highly resistant to organic solvents and oils. It is a thermoplastic material and a crystalline resin.
Case packing	Nitrile rubber (JIS B2401 1A) (JIS complying O ring for mineral oil.)	Though it is highly resistant to gasoline, alcohol, inorganic acid, and alkali, the resistance to benzene, toluene, trichloroethylene, ether, ketone, acetic ether, organic acid, etc. is poor.

Chapter 3. INSTALLATION AND WIRING

3 - 1 Attention before the installation

■ Installation environment

In order to ensure the reliability of the system and to take full advantage of the EST's functions, the user should heed the instructions given below.

Do not install the EST outside or in the following locations where:
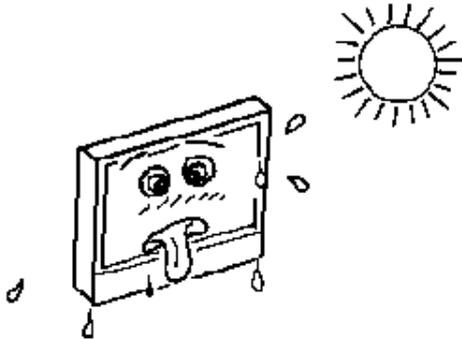
• Ambient temperature exceeds 50 °C.
• Equipment is exposed to direct sunlight.
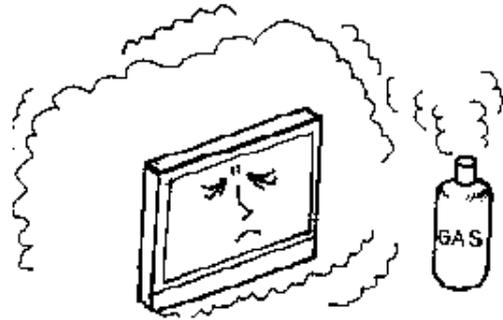
• Equipment is exposed to corrosive or inflammable gas.
• Equipment is exposed to large amounts of dust, salt, iron powder and other conductive substances or organic solvents.
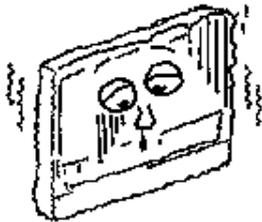
• Ambient temperature is below 0 °C.

• Equipment would be directly exposed to vibrations or shocks.
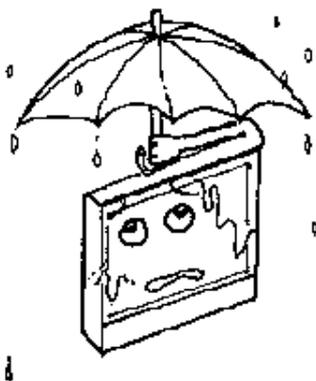
• Ambient humidity exceeds 85%.
• Equipment is exposed to sudden temperature fluctuations and dew condensation.
• Equipment would be exposed to water, oil or chemical spills (panel surfaces satisfy the IP65 standard).
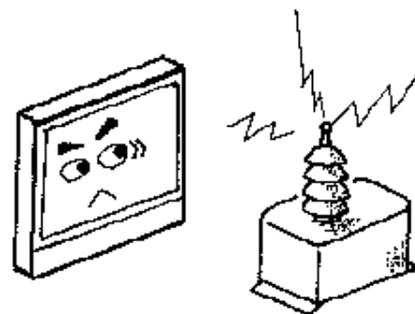
• Equipment would be exposed to strong electric or magnetic fields.

■ **Precautions to be taken in installation and wiring**

⚠ **WARNING**
🚫 Be sure to turn off the power when you wire, assemble or disassemble the EST. Otherwise, electric shock hazard can be caused.

⚠ **Handling Precautions**

The following section describes precaution to be taken when the EST is mounted in an operation panel. Observe the instructions listed below to ensure optimum resistance to environmental conditions and guarantee ease of use and maintenance.

• Provide sufficient free space around the EST to ensure good ventilation.

• Do not mount the EST directly above transformers or high capacity resistors that dissipate large amounts of heat.

• Do not install the EST together with high voltage devices or motors. Preferably, install the EST in a different panel.

• Make sure the EST is properly grounded to improve noise resistance. Use a grounding cable with a diameter of at least 2mm^2. When a long grounding cable is required, use a thick insulated cable and route it through a conduit.

• Do not bundle the EST communications cables or data lines with a noise source such as the power cable of a motor. If routing theses cables in the same duct cannot be avoided, use a shielded cable and connect the shield to the ground.

• Mount the EST on a flat, even surface as performance may otherwise not meet the IP65 standard.

• Packings are subject to aging and all packings that have lost their elasticity through long use should be replaced with new ones.

• Note that if the screws of the mounting bracket are over tightened, the panel protective sheet on the display surface may crease. Should this happen, loosen the screws.

• Install the EST in a vertical attitude to ensure natural convection. Horizontal and oblique installation will affect operating temperature range and should be avoided.
Consult Yamatake for technical advice when normal installation is not possible.

EST body
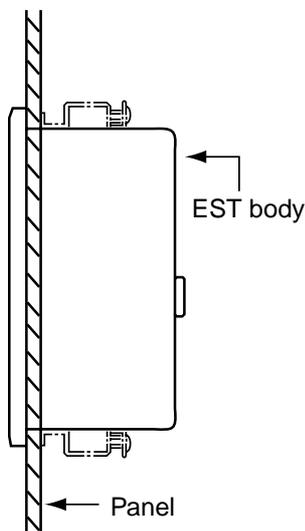
Panel

3 - 2 Installation

■ Panel cut-out dimensions

The figure below shows the dimensions of the panel cut-out required.
The panel thickness should be 1.6 to 5 mm.

Unit : mm

$126.5 \pm {}^{1}_{0}$

$196.5 \pm {}^{1}_{0}$ up to 4-R3
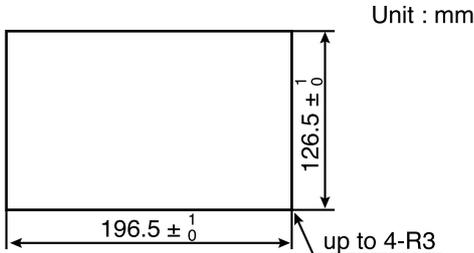
■ Installation

Insert the body in the cut-out panel.
Use the provided four mounting bracket screws to secure the top and bottom of the EST to the panel.
When the heads of the screws of the four mounting bracket are flush with the panel and there is no looseness, turn the screws an extra half to one full turn to ensure that the EST is firmly secured.

Unit : mm

71

7   60.5

126   146.4   Four mounting brackets;
for top and bottom holes

TYP.
SPEC.
SER No.

Panel
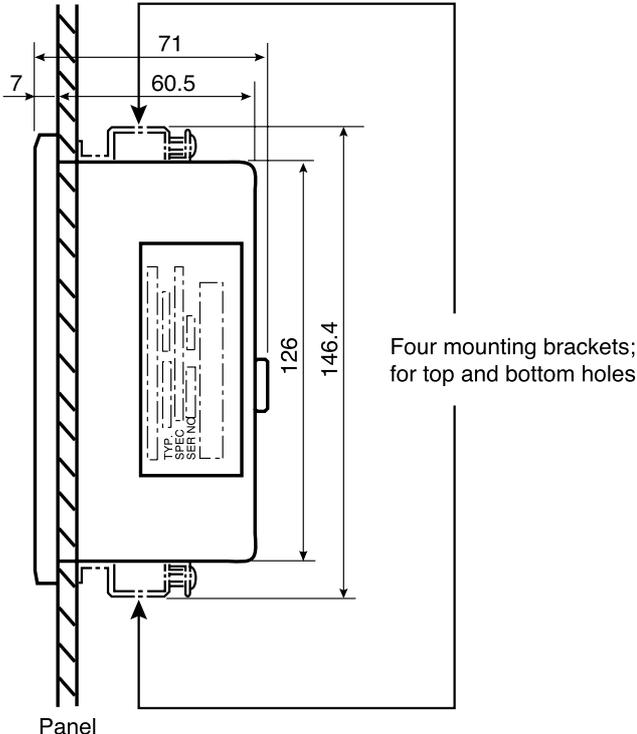
⚠ Handling Precautions

Over tightening the screws of the four mounting bracket can deform or damage the case.

Chapter 4. CONNECTIONS AND SETUP

4 - 1 Preparations

⚠ WARNING
❗ Be sure to turn off the power when you wire, assemble or disassemble the EST. Otherwise, electric shock hazard can be caused.

⚠ CAUTION
❗ Prevent debris of wiring or other foreign materials from entering the EST. It may cause trouble or burning the EST.
❗ Be careful not to give a shock to the body, especially to the front face, or scratch it by something sharp-pointed. Otherwise, malfunction may occur.
❗ Be careful not to hit and break the front touch panel. Otherwise, the touch panel can be broken and the broken pieces may cause injury.
🚫 Do not connect to outdoor wiring, or lightening could cause malfunction.
❗ Connectors and crimp contacts are required for wiring the EST. Be sure to use crimp contacts when wiring the terminal block.
❗ A thin plastic film is attached on the panel protective sheet to protect the surface from scratch. Remove it before using the EST.

■ Connection points and required parts

Connection points	Required parts
Power supply terminal, CH2, CH3, CH4, terminal block	Crimp type terminal lug
CH1 9pins DSUB connector	DDK Ltd. 17JE-13090-02(D8C2) or the equivalent

DC input/output connector	EST side J.S.T. MFG CO,.LTD B5B-XH-AM
	
	Recommended connector
	          Housing J.S.T. MFG CO,.LTD XHP-5
	          Contact J.S.T. MFG CO,.LTD BXH-001T-P0.6
	                    (for AWG28 to 22(0.08 to 0.33mm^2), single-
	                    unit selling)

■ Recommended crimp-type terminal lug and tightening torque

Terminal	X [mm]	Screw	Recommended crimp contact JIS specifications	Suitable cross-sectional area of the wire [mm^2]	Parts No. of J.S.T. MFG CO., Ltd
Power supply terminal	6.4	M3	RAV1.25-3	0.25 to 1.65	V1.25-3
Communication terminal	7.2				

Xmm
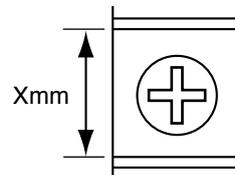
⚠ Handling Precautions

· To prevent the short circuit in case of the screws' loosening, use the Crimp type terminal lug with insulator.

· The tightening torque should be 0.4 to 0.5N·m for power supply terminals, and 1.0 to 1.2N·m for communication terminals.
(Please note that the tightening torque for the mounting brackets is different.)

4 - 2 EST Connections

⚠ WARNING

❗	Ground the FG terminal(Power supply terminal) to an Earth of less than 100Ω. Otherwise, electric shock hazard could occur.
❗	Be sure to turn off the power when you wire, assemble or disassemble the EST. Otherwise, electric shock hazard could occur.

⚠ CAUTION

❗	Prevent debris of wiring or foreign materials from entering the EST. It may cause trouble or burning the EST.
❗	Be careful not to give a shock to the body, especially to the front face, or scratch it by something sharp-pointed. Otherwise, malfunction can be caused.
❗	Be careful not to hit and break the front touch panel. Otherwise, the touch panel can be broken and the broken pieces may cause injury.
🚫	Do not connect outdoor wiring, or lightening could cause malfunction.
❗	Input/output signal cable, power supply input cable, and grounding cable should be wired separately from power cables. If routing these cables together cannot be avoided, use a shielded cable and ground one end of the shield.

Concerning the wiring of EST with PLC's or Yamatake's temperature controllers, please refer to the following manual : EST-ZSeries User's Manual Communication Connection, Manual No. CP-SP-1090E

■ **Power supply connection**
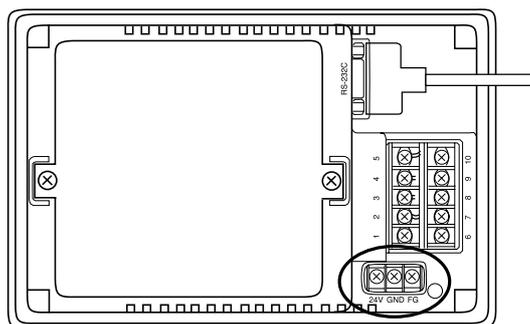
Terminal block screw size : M3
Tightening torque   : Not more than 0.5N·m
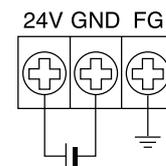
24V	GND	FG

Signal	Description
24V	Power supply positive side (+24V)
GND	Power supply ground(0V)
FG	Ground

Power supply terminal signals

🛈 **Handling Precautions**

· The power supply is 24VDC only. If other voltage is supplied, the EST will be damaged.

· Make sure that the polarity of power supply connections is correct.

· Use crimp contact for the connections.

· Be sure to connect the FG terminal to the dedicated ground (ground resistance lower than 100Ω).

· Attach a circuit breaker to the EST's power supply input, or use a DC power supply with current limiting.

■ CH1 (RS-232C based communication port)
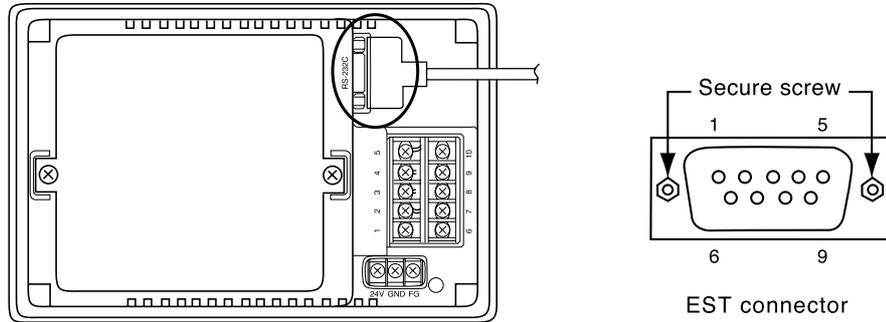
Recommended connector
    DDK Ltd. 17JE-13090-02(D8C2)
    or equivalent (Secure screw : #4-40 UNC)

EST connector

Pin No.	Signal	Description	Channel	Input/Output
1	NC	No connection		
2	RD1	Reception data	CH1	Input
3	SD1	Transmission data	CH1	Output
4	ER1	Connected with DR(6-pin) internally	CH1	
5	SG	Signal ground		
6	DR1	Connected with ER (4-pin) internally	CH1	
7	RS1	Transmission request	CH1	Output
8	CS1	Transmission permission	CH1	Input
9	NC	No connection		
Shell	-	No connection		

CH1 Connector Signals

● **Connection examples**
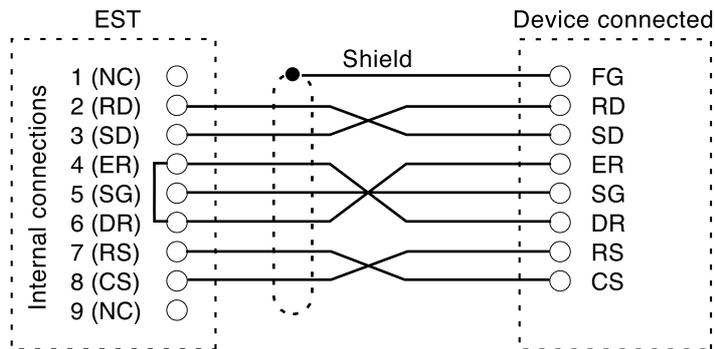
■ CH2 (RS-485 based full-/half- duplex communication port)
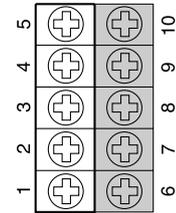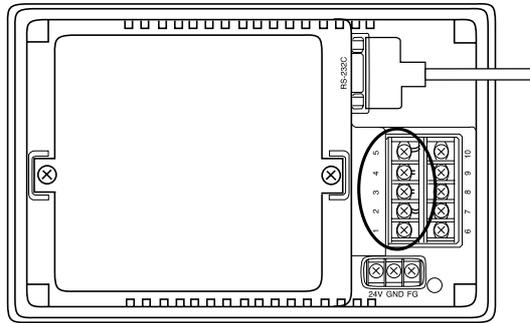
Terminal block screw size : M3
Tightening torque   : Not more than 1.2N·m

Pin No.	Signal	Description	Channel	Input/Output
5	SG	Signal ground		
4	RDB2	Reception data(-)	CH2	Input
3	RDA2	Reception data(+)	CH2	Input
2	SDB2	Transmission data(-)	CH2	Output
1	SDA2	Transmission data(+)	CH2	Output

CH2 Connector Signals

● **Connection examples**
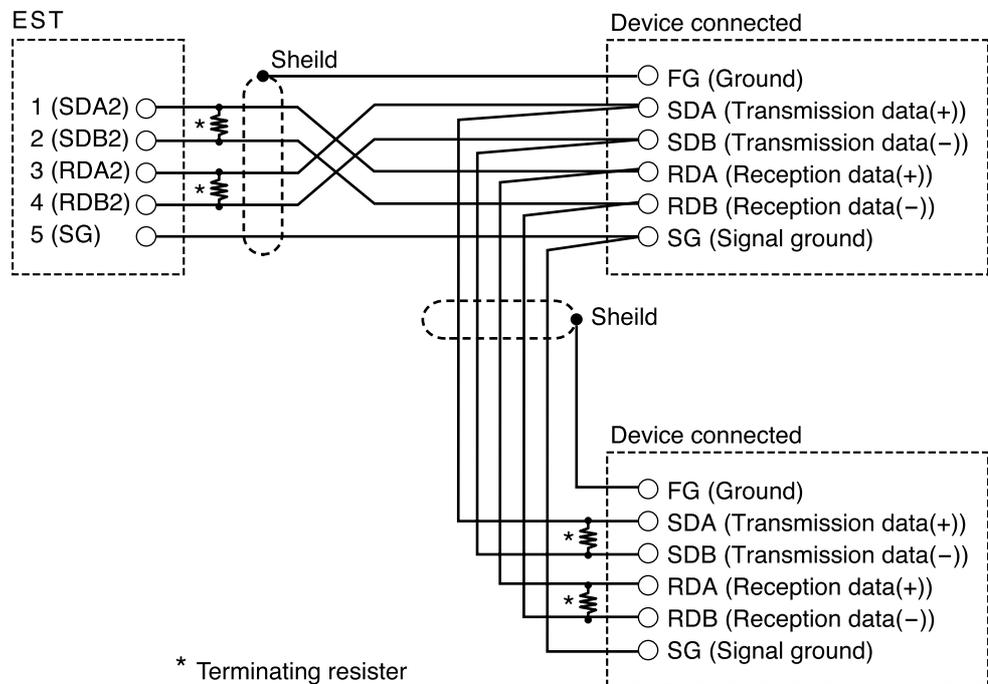
* Terminating resister

Connection with full-duplex device
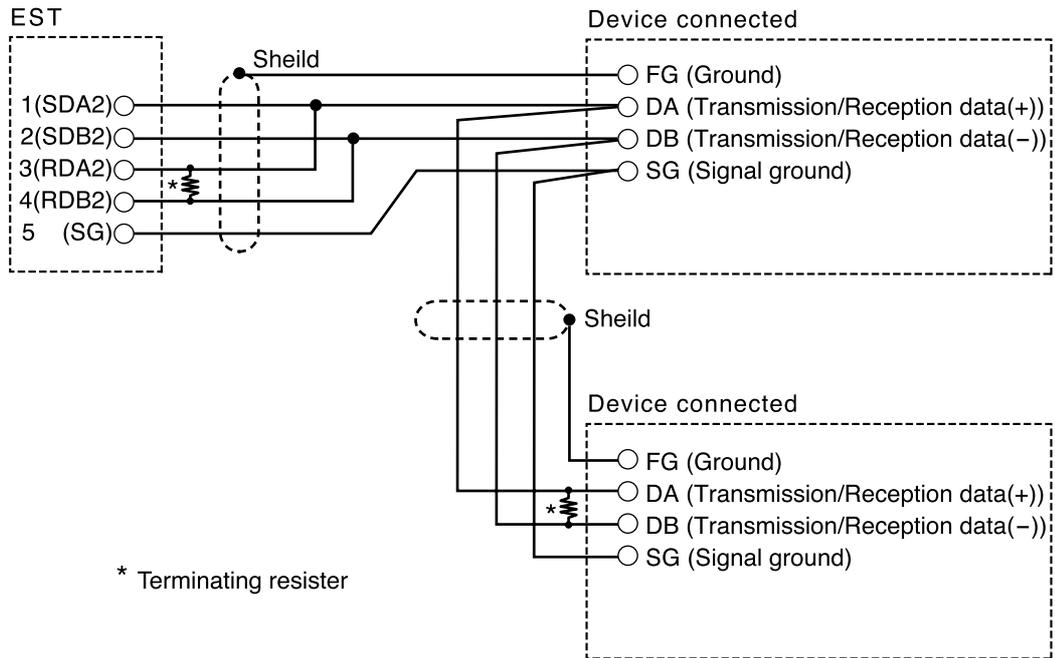
Connection with half-duplex device

⚠ Handling Precautions

• Other device manufacturers may use different signal names.

• For wiring, use twisted pair-cable with shield, and ground the shields at one point.

• When connecting multiple devices, connect them in a multi drop configuration, and connect terminating resistors (120 to 150Ω, 1/2W) at each end.

■ CH3, 4 (RS-485C based half-duplex communication port)
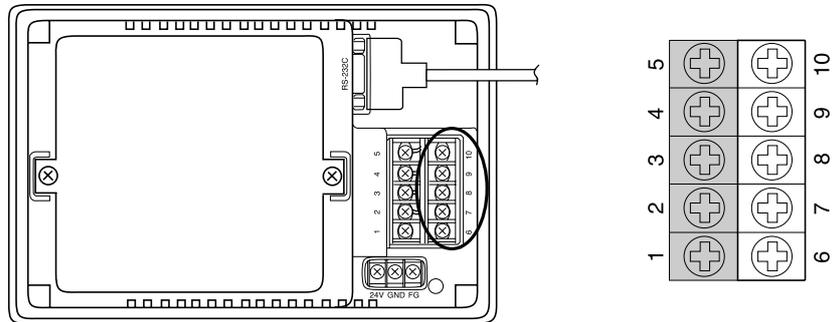
Terminal block screw size : M3
Tightening torque   : Not more than 1.2N·m

Pin No.	Signal	Description	Channel	Input/Output
10	SG	Signal ground	common for CH3/CH4	
9	DB4	Transmission/Reception data(-)	CH4	Input/Output
8	DA4	Transmission/Reception data(+)	CH4	Input/Output
7	DB3	Transmission/Reception data(-)	CH3*	Input/Output
6	DA3	Transmission/Reception data(+)	CH3*	Input/Output

CH3, CH4 Connector Signals

CH3 and CH4 are for the RS-485 based half-duplex communication.
* When CH2 is specified as the direct connection mode for the MITSUBISHI
  CPU, CH3 becomes an output-only terminal (RSA, RSB).

● **Connection examples**
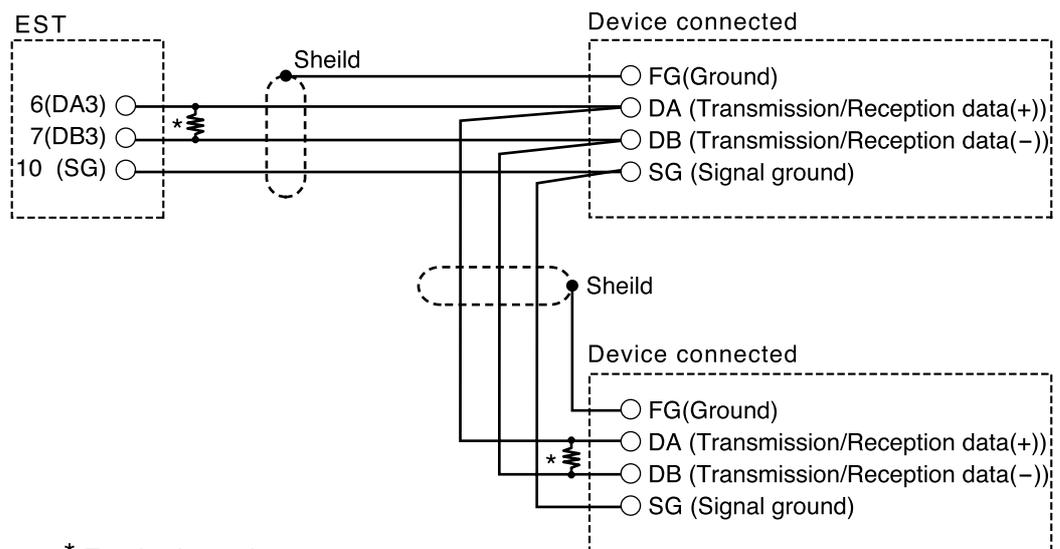
EST

6(DA3)
7(DB3)
10 (SG)

Sheild

Device connected

FG(Ground)
DA (Transmission/Reception data(+))
DB (Transmission/Reception data(−))
SG (Signal ground)

Sheild

Device connected

FG(Ground)
DA (Transmission/Reception data(+))
DB (Transmission/Reception data(−))
SG (Signal ground)

* Terminating resister

* Terminating resister

⚠ Handling Precautions

- Other device manufacturers may use different signal names.

- For wiring, use twisted pair-cable with shield, and ground the shields at one point.

- When connecting multiple devices, connect them in a multidrop configuration , and connect terminating resistors (120 to 150 Ω, 1/2W) at each end.

■ DC input/output connector (behind the rear cover)
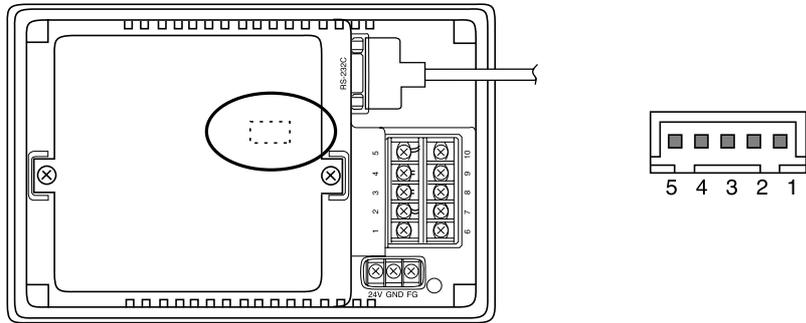
Recommended connector

J.S.T. MFG CO., LTD B5B-XH-AM (a suitable contact is also required.)

Pin No.	Signal	Description	Input/Output
1	DOVCC	Power supply for the output signal(+)	
2	DO	Output signal	Output
3	DOGND	Output signal ground	
4	DI	Input signal	Input
5	DIGND	Input signal ground	

DC input/output connector

⊡ Handling Precautions

· Wrong polarity, excess voltage, or the wrong wiring may cause malfunction.

· There is no hole for the input/output cables on the standard rear cover. If necessary, please contact us.

● **Connection examples**
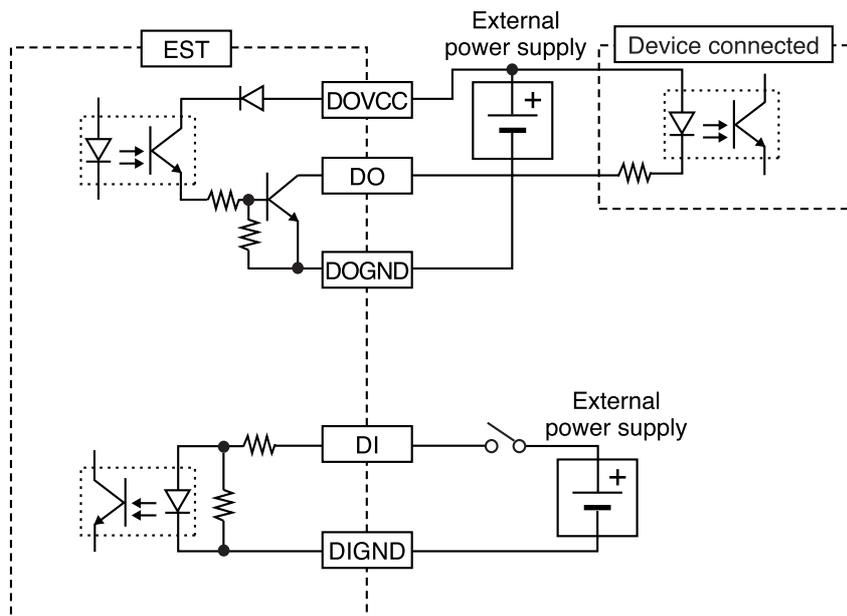
4 - 3 EST Setup

The settings of EST are basically made in the application data However, they can be also changed on the EST afterwards.
To change the settings on the EST, call up the system menu on the EST and select the desired items.

■ Screen shown at the first start up

⚠ Handling Precautions

- The system is not installed in the EST240Z when shipped from the factory.
- If the system has not been downloaded, the system menu screen does not appear.
- When downloading the application from AP Editor for the first time, the system is downloaded at the same time. Then the system menu can be called up.
  (System downloading is only at the first application downloading.)

● **Before downloading the system**

>>When the EST is switched on for the first time, the following screen will be displayed.


```
              System firm ware not found.
              Please download system firm ware.


IPL/BIOS:
 1737-001 Rxxxx.xx.xx Ed:xxxxxxx Bld:xxxxxx
Firm Ware:
 none.
Font:
 none.
System Menu:
 none.
```
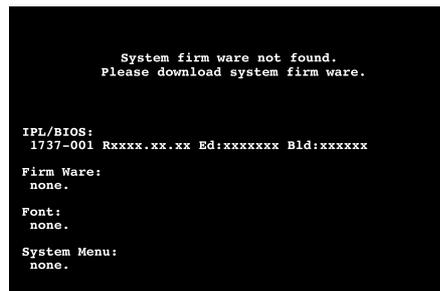
● **After downloading the system**

Press the square area of 13mm X 7.5mm at the upper left corner of the screen or the lower right corner of the screen for at least 5 sec.
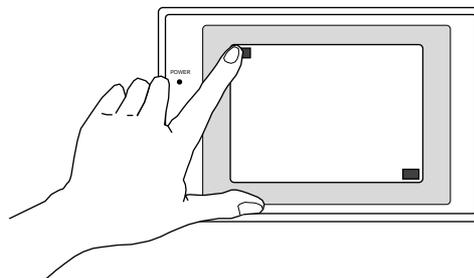
>>The mode indicator lamp (LED) flashes, and the following screen will be displayed.


```
   System Menu          EST-Z Series
        1.Application info.
        2.Memory switch conf.
        3.Communications conf.
        4.Self diagnostics
        5.Clock settings
        6.Error reset
        7.Touch switch calib.
IPL Ver. RXXXX.XX.XX
F/W Ver. RXXXX.XX.XX
   Conf.      Garbage      Start
   Write     collection  application
```

■ System menu
● Menu items

The system menu has the following items.

1. Application info
2. Memory switch conf.
3. Communications conf.
4. Self diagnostics
5. Clock settings
6. Error reset
7. Touch switch calib.

Item No.4 "Self diagnostics" is separately explained in the next section on 4-4 Self-Diagnostic Function (page 4-18).

● Function of the buttons

[Conf. Write] :

Touch to write the settings which were set in [2. Memory switch conf.] and [3.Communications conf.] Those written settings remain effective even after rebooting the EST.

[Garbage collection] :

The user program memory becomes full with the unwanted files, when the function "Download changed settings" has been used, for example. In such a case, use this button to delete unwanted data and make more space available. It is not necessary to use this button in other situations.

After touching this button : [Cleaning up application data...] will be displayed.

When the garbage collection has been completed
: [Application data clean-up completed.] will be displayed.

The time to complete the garbage collection depends on the size of the application and the location of the unwanted data. It may take a few tens of sec.

[Start application] : Touch to start the application.

⚠ Handling Precautions

· These functions are not effective if the application data has not been downloaded.
· The settings made in the [2.Memory switch conf.] and [3.Communications conf.] will be lost unless they have been written by [Conf. Write]. (except the contrast adjusting)

● **When the message "Version warning" is displayed:**

The following message may be displayed at the lower right of the screen if the EST and AP Editor were purchased at different times:
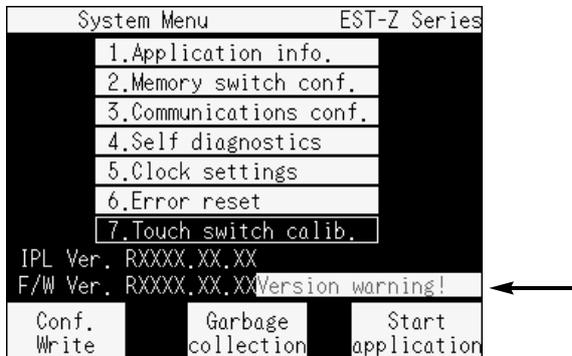
This message warns the user that one of the four components of the EST system program is old and that some functions will not work. Those functions will mostly be newly added functions that are supported by the current AP Editor.
This message does not mean that all the functions will not work.
For more detailed information, please refer to the following manual:
EST-ZSeries User's Manual Application Preparation,
 Manual No.CP-SP-1088E

>>Touch the message [Version warning!]. The following screen will be displayed:
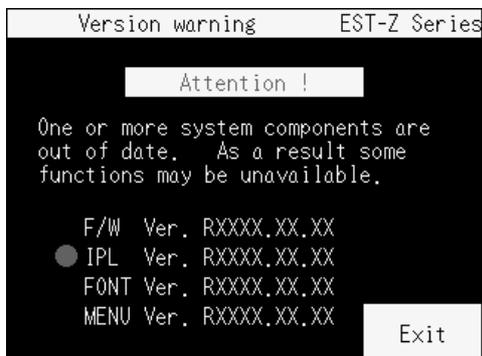
The program component concerned is indicated with a red dot.
The above example shows that the IPL/BIOS Program is old.

The system program consists of the following four components.
    1) F/W   : Main body of the system program.
                         Downloaded by AP editor.
    2) IPL(IPL/BIOS) :This program activates the EST's originally contained
                         basic functions.
    3) FONT   :Character font data and auxiliary program.
                         Downloaded by AP Editor.
    4) MENU   :System menu program. Downloaded by AP Editor.

Since F/W, FONT, and MENU are downloaded by AP Editor, they are upgraded automatically when the AP Editor is upgraded.

[!] **Handling Precautions**

• IPL/BIOS has upward compatibility. Older program can be downloaded into a new EST and the warning message will not necessarily appear. (The warning message only appears in the case where there is an incompatibility.)

• The version of IPL/BIOS cannot be upgraded by the user. If necessary, please contact us.

■ **Application info.**

Information on the application stored in the EST can be checked with this menu.

Touch [1. Application info] in the system menu.

>>The following screen will be displayed:

```
Application info.      EST-Z Series

 Application name:
   XXXXXX

 Comment:
   XXXXXXXXXXXXX

 Download date:
   xx/xx/xx xx:xx:xx

 Free memory:
   xxxxxxx   Bytes        Exit
```

The items displayed on the screen are as follows:

Item	Description
Application name	The name of the application file
Comment	Comment on the application file
Download date	Date of download
Free memory	available memory space(in bytes) in user program memory

Touch [Exit] to go back to the system menu.

⚠ **Handling Precautions**

To change the application name, be sure to use the AP editor.
Otherwise, the application name will not be displayed correctly on the
above screen.

■ **Memory switch conf.**

All EST settings can be changed with this menu.

Touch [2. Memory switch conf.] in the system menu.

>>The following screen will be displayed:

```
Memory switch conf.    EST-Z Series
 □ Auto Run Mode    xx sec    ▲
 □ Backlight off     xx min
 □ Screen saver      xx min    ▼
   Buzzer tone       Med
   LCD contrast      4         Exit

        Message1

        Message2
```

To activate Auto Run Mode, Backlight off, and Screen saver, touch □ on the left.

An activated item will be indicated with ☑ .

Touch the check-box again to deactivate the item.

To change the time, the buzzer tone, and LCD contrast, highlight the value that is
to be changed, by touching it.

Change the value using the up-down keys(▲ and ▼) on the right.

Messages in the message area (upper side)

Selected item	Message
Auto Run Mode	Use the Up/Down keys to set the RUN mode delay after power up.
Backlight off	Use the Up/Down keys to set the automatic backlight shutdown delay.
Screen saver	Use the Up/Down keys to set the screen saver start delay.
Buzzer tone	Use the Up/Down keys to select the buzzer tone.
LCD contrast	Use the Up/Down keys to adjust LCD contrast.

Messages in the message area 2

Unless the new conf is saved with CONF WRITE, it will be lost at power down.

Touch [Exit] to go back to the system menu.

⚠ Handling Precautions

Be sure to save the setting changes with "Conf. Write". Unwritten changes will be lost at reboot.
(Except LCD contrast)

■ Communications conf.

This menu is to change or check the EST communication settings.
Touch [3. Communications conf.] in the system menu.
>>The following screen will be displayed.

Each time when you touch the switch marked ▼, the indication changes.
For example, when you touch the parity switch, the indication changes
"E"→ "O"→"N", and back to Even.

Messages displayed in the message area:

Unless the new conf is saved with CONF WRITE, it will be lost at power down.

⚠ Handling Precautions

・The settings made in this menu become effective at the operation start.
・Be sure to save the setting changes by [Conf. Write]. Unwritten changes will be lost at reboot and the settings return to the factory set value.

Touch [Exit] to go back to the system menu.

By touching [Drivers], the following screen appears and the driver settings can be checked. The driver settings cannot be changed on this screen.

```
 Communications drivers   EST-Z Series


CH0 : Serial driver (slave)

CH1 : Serial driver (slave)

CH2 : Serial driver (slave)

CH3 : Serial driver (slave)

CH4 : Serial driver (slave)


                              Exit
```
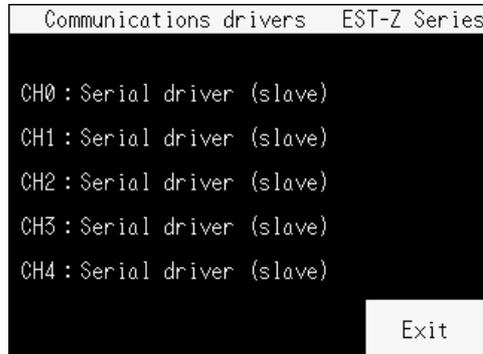
Touch [Exit] to go back to the "Communication conf." menu.

!] Handling Precautions

The drivers displayed on this screen are used only when the application is running.

When the application is not running, all the ports will use the Serial Driver (Slave).

* Format of the Serial Driver (Slave)

    CH0   : 9600bps, no parity, 1 stop-bit

    CH1 to CH4 : Just after rebooting : 9600bps, Even parity, 1 stop-bit

                        After the application start: Settings of the application are active.

■ Self diagnostics

For the self diagnostics, please refer to 4-4 Self-Diagnostic Function (page 4-18).

■ Clock settings

The internal EST clock is set as described below.
Touch [5. Clock settings] in the system menu.
>>The following screen will be displayed:
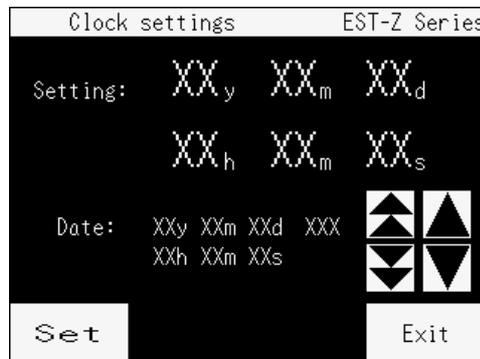
Touch any number of the "Setting" to highlight it. It can now be changed
with the following keys.

Touch the ▲ or ▼ keys to select the next higher or lower value.

Hold the ⬆ or ⬇ keys to continuously change the value.
Any year between 1950 and 2035 can be set. The year is set by the last two digits.
The day of the week is automatically set.

[Set] Touch to change the currently selected value.
[Exit] Touch to return to the system menu.

⚠ Handling Precautions

If [Exit] key is touched before the [Set] key, or the power is turned off
before the [Set] key is touched, the clock setting will not be changed.

■ Error reset

Clear the system error.
Touch [6. Error reset] in the system menu.
>>The following screen will be displayed:
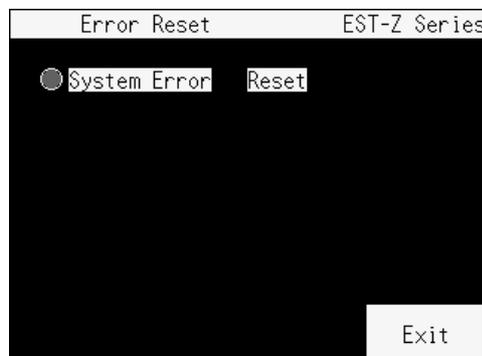
When the system error is generating, the red circle on the left of the
"System Error" keeps lighting. In this case, touch the [Reset] button to
clear the system error.

■ **Touch switch calibration**

To calibrate the EST touch switches.

Press [7. touch switch calib.] for at least 5sec.

>>The following screen will be displayed:

```
Stop touching screen to begin
calibration of touch panel...

[Press the cross on the next
 two screens to calibrate]
```

>>Remove finger from touching the screen to begin calibration of the touch panel.
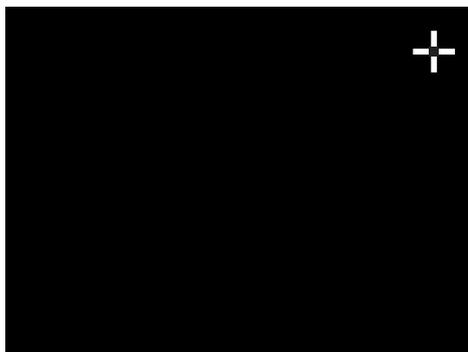
📖 **Note**

There are two ways for touch switch calibration as follows:

• Calibration by touching the touch switch.
• Selecting the touch switch calibration in the system menu.

Refer to the Section 4-5 Touch Switch Calibration (page 4-22) for the way to calibrate by touching the touch switch.

4 - 4 Self-Diagnostic Function

If the EST does not operate correctly, you can check its condition using these functions.

The conditions these functions diagnose are as follows:

1. Abnormal display (strange color, part of the screen is not displayed, etc.)
2. The touch switches do not respond in some areas.
3. Erratic operation just after downloading application data.
4. Communication error in spite of correct wiring.
5. DC input/output interface does not operate correctly.

Touch [4. Self diagnostics] in the system menu.

>>The following screen will be displayed:

```
┌─────────────────────────────────┐
│ Self diagnostics    EST-Z Series │
├─────────────────────────────────┤
│                                 │
│      ┌─────────────────────┐    │
│      │ 1. Display test     │    │
│      └─────────────────────┘    │
│      ┌─────────────────────┐    │
│      │ 2. Touch switch test│    │
│      └─────────────────────┘    │
│      ┌─────────────────────┐    │
│      │ 3. Memory test      │    │
│      └─────────────────────┘    │
│                                 │
│                    ┌──────────┐ │
│                    │   Exit   │ │
│                    └──────────┘ │
└─────────────────────────────────┘
```
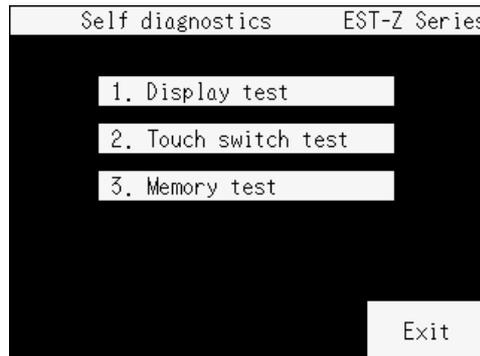
■ Display test

This is to check if the LCD elements are operation normally.

Touch [1. Display test] in the self diagnostics menu.

>>The following screen will be displayed:

```
┌─────────────────────────────────┐
│ Display test        EST-Z Series │
├─────────────────────────────────┤
│  ┌───────────────────────────┐  │
│  │When you touch the screen the│ │
│  │color will change.         │  │
│  │                           │  │
│  │After touching it 5 times, you│ │
│  │will be returned to this screen.│
│  │                           │  │
│  │Press the start button to begin.│
│  └───────────────────────────┘  │
│  ┌────────┐        ┌──────────┐ │
│  │ Start  │        │   Exit   │ │
│  └────────┘        └──────────┘ │
└─────────────────────────────────┘
```
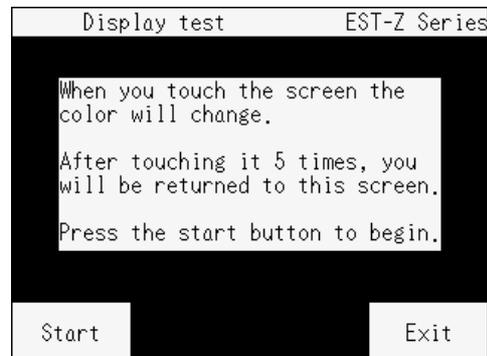
[Start] By touching this button, the screen will change in the following order.
Screen shown above → all white → all red → all green → all blue → all black → back to display test menu.

[Exit] Touch to return to the self diagnostics menu.

📖 Note

There may be some permanently lit/unlit pixels, this is not a fault.

■ Touch switch test

To test the EST touch switches.

Touch [2. Touch switch test] in the self diagnostics menu.

>>The following screen will be displayed:

```
┌─────────────────────────────────┐
│ Touch switch test    EST-Z Series│
│                                  │
│                                  │
│                                  │
│                                  │
│                                  │
│              ┌──────┐            │
│              │ Exit │            │
│              └──────┘            │
│                                  │
│                                  │
└─────────────────────────────────┘
```
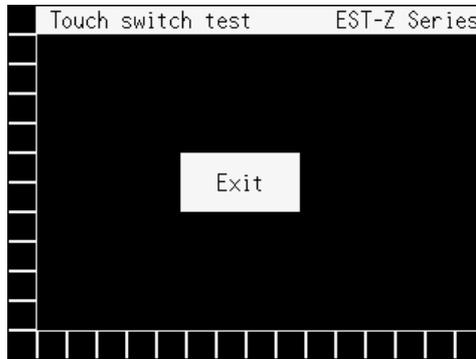
Each cell framed with white lines is one touch area.

When a cell is touched, an $\boxed{OK}$ sign is displayed.

When the cell is touched again, the $\boxed{OK}$ sign is cleared.

[Exit] Touch to return to the self diagnostics menu.

■ Memory test

To test the EST memory.

Touch [3. Memory test] in the self diagnostics menu.

>>The following screen appears and the memory test is performed:

After a few seconds, the test result is displayed.

```
┌─────────────────────────────────┐
│ Memory test          EST-Z Series│
│                                  │
│   ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐     │
│                                  │
│   │      Message          │     │
│                                  │
│   └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘     │
│                                  │
│                       ┌──────┐   │
│                       │ Exit │   │
│                       └──────┘   │
└─────────────────────────────────┘
```

The messages are as follows:

Test result	Messages
Good	"Memory test completed. No errors found."
No good	"Memory test detected an error."

[Exit] Touch to return to the self diagnostics menu.

If "Memory test detected an error." is displayed, contact the Yamatake
sales/service office, or the dealer from whom you purchased the equipment.

4 - 5 Touch Switch Calibration

This function is used to recalibrate the touch switches which may shift slightly with time.

Start up procedure in this case is different from the usual.

When the battery is replaced, the setting returns to the factory-set value and it must be recalibrated again.

● Required item

A soft round rubber stick

(for example: stick style eraser; If you do not need very accurate positioning, you can adjust it using your finger.)

■ Touch switch calibration procedure

Turn off the power of the EST.

While touching the screen (any part is OK), turn the power on and hold 10 sec.

>>The following screen will be displayed:

Touch the center of the mark in the upper right corner

>>The following screen will be displayed:
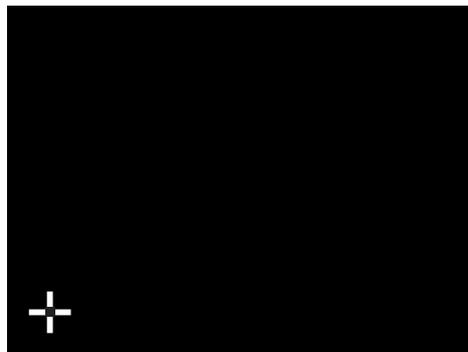
Touch the center of the mark in the lower left.

When the calibration is completed, the system menu appears.

⚠ Handling Precautions

・Do not touch the touch switches with anything sharp or hard.
The touch switches will be damaged.

・If the wrong part of the screen is touched during the adjustment
procedure, it may cause the touch switches to not respond. In this case,
perform the adjustment procedure from the beginning again.

・This function is not available if the system program has not been
downloaded.

Chapter 5. OPERATION PROCEDURES

5 - 1 Downloading

The program used to operate the EST is referred to as application data. The application data is downloaded from a PC to start up an EST.

For more detailed information on download procedure, please refer to the following manual: EST-Z Series Application Preparation, Manual No.CP-SP-1088E

● **Required items**

　　　　　　　　　　• AP Editor (for EST series only; option)
　　　　　　　　　　• Connection cable
　　　　　　　　　　　If downloading by CH1　　: RS-232C cable with DSUB9pin
　　　　　　　　　　　　　　　　　　　　　　RS-232C cable is in our accessory line-up of
　　　　　　　　　　　　　　　　　　　　　　EST240Z.
　　　　　　　　　　　If downloading by CH2: RS-485 cable
　　　　　　　　　For the model No. of the above items, please refer to 1-1 Model Numbers
　　　　　　　　　(page 1-1).

● **Download procedure**

　　　　　　　　　(1) Turn off the EST.
　　　　　　　　　(2) Install the AP Editor into a PC.
　　　　　　　　　　　Connect the EST to that PC with a communications cable (RS-232C or RS-485).
　　　　　　　　　(3) Turn on the EST.
　　　　　　　　　(4) Start up the AP Editor and select the file to download and start downloading.
　　　　　　　　　　　On the EST screen, the following messages are displayed to indicate the progress of the download:
　　　　　　　　　　　First,
　　　　　　　　　　　>> [Initializing application data, please wait ...]
　　　　　　　　　　　Then,
　　　　　　　　　　　>> [Downloading data, please wait ...]
　　　　　　　　　　　When the download is completed, the following message window is displayed on the AP Editor.
　　　　　　　　　　　>> [Start application in EST]

⚠ **Handling Precautions**

　　　　　　　　　When you download the AP Editor for the first time after purchasing the EST, the System Program is downloaded automatically at the same time. In this case, the progress is a little different from the above procedure, and it takes 3 or 4 minutes longer.

5 - 2 Operation Start

The operation can be started by one of the following procedures:

If the Auto Run Mode is selected in the application data, the operation starts automatically after turning on the EST again.

(1) The following message is displayed on the AP editor after the download.
[Start application in EST]
Then, select [Yes].

(2) Turn on the EST again, and touch [Start Application] on the system menu screen.

(3) Touch the upper left of the panel until the system menu screen appears. Touch [Start Application] on that screen.

⚠ Handling Precautions

Auto Run Mode is used when EST is connected to a device with long start-up time.

Timing to start the EST operation can be specified.

When a long time delay is set, the screen stays black before operation starts, this is not abnormal behavior.

Chapter 6. MAINTENANCE AND INSPECTION

6 - 1 Maintenance

Regular or daily inspection will ensure a long service life for your Smart Terminal.

The order of the replacements is as follows:

```
┌─────────────────────────────────────────┐
│    Replacing the panel protective sheet  │
└─────────────────────────────────────────┘
                     │
                     ▼
┌─────────────────────────────────────────┐
│         Replacing the display unit       │
└─────────────────────────────────────────┘
         │                    │
         ▼                    ▼
┌──────────────────┐  ┌──────────────────────┐
│Battery replacement│  │Touch switch replacement│
└──────────────────┘  └──────────────────────┘
                                │
                                ▼
                      ┌──────────────────────┐
                      │ Backlight replacement │
                      └──────────────────────┘
```
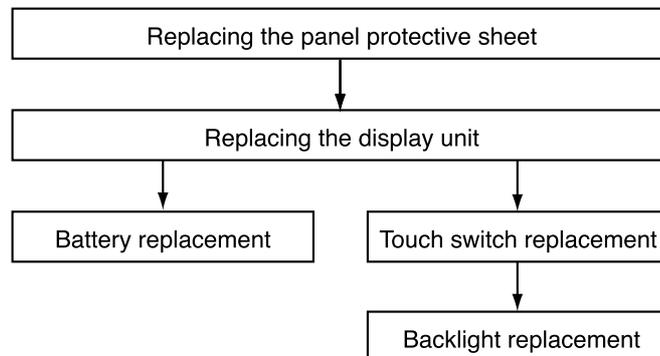
The model No. of the replacement parts are listed on 1-1 Model Numbers (page 1-1).

⚠ CAUTION	
❶	Be sure to turn off the power before the maintenance and inspection of the EST. Otherwise, electric shock hazard can be caused.
🚫	Do not touch the leads of IC and other electronic parts and the PWB patterns with bare hand. Internal electric devices can be damaged by static electricity. The use of antistatic work benches are highly recommended.
❶	The display unit is made of sheet metal. Be careful not to be injured by the sharp edges.

⚠ Handling Precautions

- Maintenance should not be done by a person who does not have experience in handling or assembling electronic equipment.

- Replacement of parts requires close attention. Be careful not to lose or damage disassembled parts like screws.

■ Replacing the panel protective sheet

Replace the panel protective sheet when it becomes dirty or scratched.

This replacement can be performed when the EST is mounted in a control panel or other equipment.

● Required items

- New panel protective sheet
- Small flat-head screwdriver

● **Replacement procedure**

The sheet is attached to the display with an adhesive.

(1) There is a semi-circular recess at the lower right part of the screen.
Insert a small flat-head screwdriver into this recess and gently pull off the sheet.
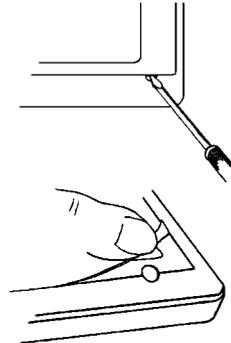
(2) Remove dirt and remaining adhesive from the display screen.

(3) Remove the exfoliate paper on the backside of the new panel protective sheet.

⚠ **Handling Precautions**

Make sure that no dirt get stuck in the adhesive.

(4) Attach the sheet aligning the long side of the sheet with the lower and upper side of the screen.

(5) Make sure that the sheet is properly attached to the screen.

(6) The panel protective sheet has a thin plastic film protecting the surface.
After the works (including mounting and wiring) have been completed, remove it as follows.

⚠ **Handling Precautions**

Peeling off the film with your fingernail may scratch the surface of the EST.
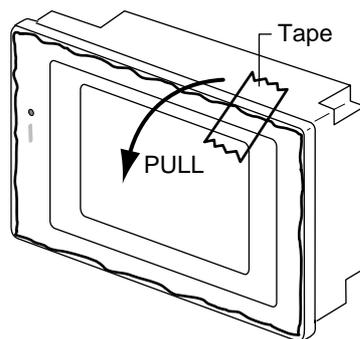
Tape a cellophane adhesive tape on the corner, and pull it in the arrow direction as shown to remove off the thin plastic film together.

⚠ **Handling Precautions**

• The surface of the touch switches is very sensitive and the dirt and dust cannot be removed. Be careful not to touch the surface, and protect it from dirt and dust.

• The panel protective sheet that is once removed has no adhesive power. Do not use it again, and replace with a new protective sheet.

• Make sure the panel protective sheet is properly attached as dirt on the side of the adhesive will lower the power of the adhesive and make it impossible to meet its specified drip-proof specifications.

■ **Replacing the display unit**

⚠ **WARNING**
🛑 The display unit is very heavy. Make sure not to drop it when you replace it. Doing so could harm you, or the unit.

⚠ **CAUTION**
🛑 The display unit is made of sheet metal. Be careful not to be injured by the sharp edges.

● **Required items**

- New panel protective sheet
- Small flat-head screwdriver
- Torque driver for flat-head screws

● **Remove the display unit**

(1) Remove the panel protective sheet.
  (Follow the instructions on ■Replacing the panel protective sheet (page 6-1).)

(2) Loosen the mounting screws with a torque driver for flat-head screws.
  Unscrew them just from the case, but do not remove them from the chassis.

Mounting screw ⟶ ← Chassis ← Case
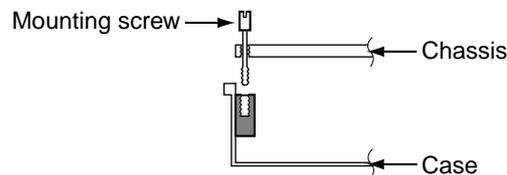
⚠ **Handling Precautions**
  Do not touch the touch switches. Prevent them from being scratched.

(3) Remove the display unit from the body by lifting the mounting screws.
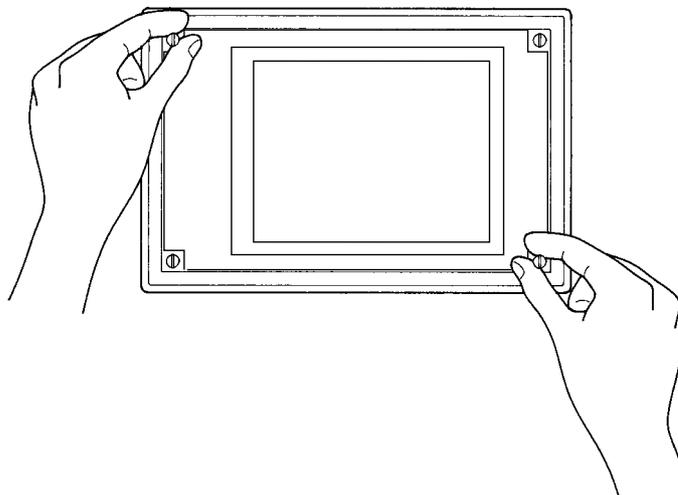
● **Mounting the display unit**

(1) Install the new display unit by inserting the mounting screws to the holes.
Hold the left screws higher than the right and fit the connector by pushing it
lightly till the right side of the bracket snaps on.

(2) Tighten the screws with a flat-head torque driver with the torque of 0.4 to 0.5
N·m.

⚠ **Handling Precautions**

Do not tighten the screws with too much torque. Otherwise, the chassis
may become deformed and the display unit cannot be installed properly.

(3) Attach the panel protective sheet, and remove the thin plastic film on the
surface.
(Follow the instructions on ■ Replacing the panel protective sheet (page
6-1).)

⚠ **Handling Precautions**

• The surface of the touch switches is very sensitive and dirt and dust
cannot be removed. Be careful not to touch the surface, and protect it
from dirt and dust.

• The panel protective sheet that is once removed has no adhesive power.
Do not use it again, and replace with a new protective sheet.

• Make sure the panel protective sheet is properly attached as dirt on the
side of the adhesive will lower the power of the adhesive and make it
impossible to meet its specified drip-proof specifications.

• Protect the display unit from static, water, oil and dust, since it has a
precision printed wired board.
Do not touch the leads on the printed wired board and the printed wired
board surface.

• Do not put the display unit in a dusty place. In case the display unit is laid
with the touch switch side down, it should be laid on a soft surface without
dust and should be protected from oil and dust.

■ **Battery replacement**

⚠ CAUTION

🚫 Do not throw used batteries into fire or discard. If you discard them at your site, follow regulations and rules stipulated by your local self-governing body.

🚫 Do not short-circuit the batteries as they may over heart or catch fire, also do not expose them to water.

❗ When replacing the battery, please note the followings:
- Clock data, user touch switch adjustment data and user contrast adjustment data will be initialized during battery replacement. In this case, please reconfigure the settings.
- The trend data will be lost during battery replacement.
- The changes that have been made to the recipe data using the EST will be lost during battery replacement.
  In case of the EST's system program of F/W (firmware) version R0021 or later, the changes are automatically written to the EST's memory during the application upload function of the AP Editor. In case of the F/W version R0020 and earlier, the changes are written into the memory by using the "Recipe data write" switch in the system menu.

● **Required items**

- New battery
- New panel protective sheet
- Small flat-head screwdriver
- Flat-head torque driver
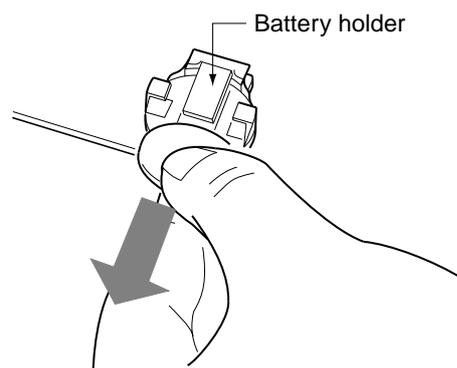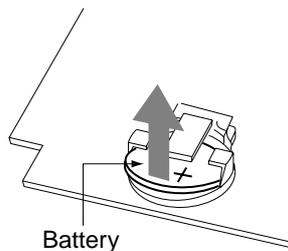
● **Replacement procedure**

(1) Remove the panel protective sheet.

(Follow the instructions on ■Replacing the panel protective sheet (page 6-1).)

(2) Remove the display unit.

(Follow the instructions on ■Replacing the display unit (page 6-3).)

! **Handling Precautions**

Be careful not to dirty or scratch the display unit, especially the touch switches.

(3) Lift the battery and pull it off as shown below.

(4) Insert the new battery.

Fit it into the battery holder with the positive side up.

(5) Install the display unit.

(Follow the instructions on ■Replacing the display unit (page 6-3).)

! **Handling Precautions**

Be careful not to dirty or scratch the display unit, especially the touch switches.

(6) Attach the new panel protective sheet, and remove the thin plastic film on the surface.

(Follow the instructions on ■Replacing the panel protective sheet (page 6-1).)

! **Handling Precautions**

• The surface of the touch switches is very sensitive and dirt and dust cannot be removed.   Be careful not to touch the surface, and protect it from dirt and dust.

• The panel protective sheet that is once removed has no adhesive power. Do not use it again, and replace with a new protective sheet.

• Make sure the panel protective sheet is properly attached as dirt on the side of the adhesive will lower the power of the adhesive and make it impossible to meet its specified drip-proof specifications.

• Protect the display unit from static, water, oil and dust, since it has a precision printed wired board.
Do not touch the leads on the printed wired board and the printed wired board surface.

• Do not put the display unit in a dusty place. In case the display unit is laid with the touch switch side down, it should be laid on a soft surface without dust and should be protected from oil and dust.

• When removing the battery, be careful not to be injured by the battery holder, not to scratch the surroundings by it, and not to break the battery holder itself.

■ Touch switch panel replacement

⚠ CAUTION
❗ The display unit is made of sheet metal. Be careful not to be injured by the sharp edges.

● **Required items**

- New panel protective sheet
- Small flat-head screwdriver
- Flat-head torque driver

● **Remove the display unit**

(1) Remove the panel protective sheet.

(Follow the instructions on ■Replacing the panel protective sheet (page 6-1).)

(2) Remove the display unit.

(Follow the instructions on ■Replacing the display unit (page 6-3).)

🔲 **Handling Precautions**

Be careful not to dirty or scratch the display unit, especially the touch switches.

(3) Pull out the tail (see the figure below).

Pull the connector CN3 forward till it snaps in the printed mark on the printed wired board.

Extract the tail tip.

Connector CN3

Tail

Printed mark on the printed wired board
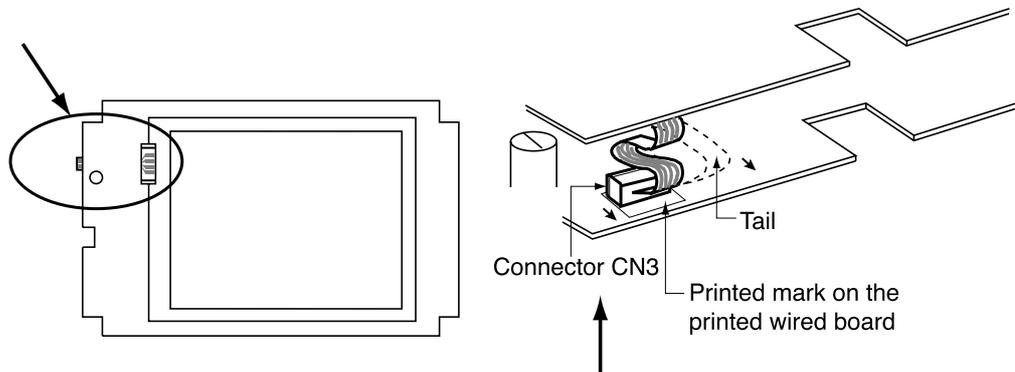
🔲 **Handling Precautions**

Do not pull the connector before the connector-latch is completely unlatched.

Otherwise, the touch switch panel or the connector will be damaged.

(4) Remove the four(4) touch switch panel securing screws, and remove the touch switch panel.

🔲 **Handling Precautions**

The surface of the LCD unit is very sensitive and dirt and oil cannot be removed.   Be careful to not get it dirty.

● **Mounting the display unit**

(1) Insert the tail tip of the new touch switch till it hits the connector CN3. Push back the connector to the original position. Now the tail is secured.
Bend the tail backwards, so that it will not be pinched by the panels when assembling.

⊡ **Handling Precautions**

Be sure to insert the tail and latch the connector completely. Otherwise, the touch switches may not respond correctly.

(2) Secure the new touch switch panel by the screws.
(3) Install the display unit.
(Follow the instructions on ■Replacing the display unit (page 6-3).)

⊡ **Handling Precautions**

Be careful not to dirty or scratch the display unit, especially the touch switches.

(4) Attach the new panel protective sheet, and remove the thin plastic film on the surface.
(Follow the instructions on ■Replacing the panel protective sheet (page 6-1).)

⊡ **Handling Precautions**

- The touch switch is made of glass. Make sure not to drop it and not to touch the end face.

- The surface of the touch switches is very sensitive and the dirt and dust cannot be removed. Be careful not to touch the surface, and protect it from dirt and dust.

- The surface of the LCD unit is very sensitive and dirt and dust cannot be removed.
Be careful not to touch the surface, and protect it from dirt and dust.

- The panel protective sheet that is once removed has no adhesive power. Do not use it again, and replace with a new protective sheet.

- Make sure the panel protective sheet is properly attached as dirt on the side of the adhesive will lower the power of the adhesive and make it impossible to meet its specified drip-proof specifications.

- Protect the display unit from static, water, oil and dust, since it has a precision printed wired board.
Do not touch the leads on the printed wired board and the printed wired board surface.

- Do not put the display unit in a dusty place. In case the display unit is laid with the touch switch side down, it should be laid on a soft surface without dust and should be protected from oil and dust.

■ Backlight (CFL) replacement

⚠ CAUTION

🛈 The display unit is made of sheet metal. Be careful not to be injured by the sharp edges.

● **Required items**

- New backlight
- New panel protective sheet
- Small flat-head screwdriver
- Torque driver for flat-head screws
- Phillips-head screwdriver

● **Replacement procedure**

(1) Remove the panel protective sheet.

(Follow the instructions on ■Replacing the panel protective sheet (page 6-1).)

(2) Remove the display unit.

(Follow the instructions on ■Replacing the display unit (page 6-3).)

🛈 **Handling Precautions**

Be careful not to dirty or scratch the display unit, especially the touch switches.

(3) Remove the touch switch panel.

(Follow the instructions on ■ Touch switch panel replacement (page 6-7).)

🛈 **Handling Precautions**

Be careful not to touch the surface of the LCD unit and touch switches. Protect them from dirt and dust.

(4) Turn over the display unit.

CN1

CN2

CN6

Battery
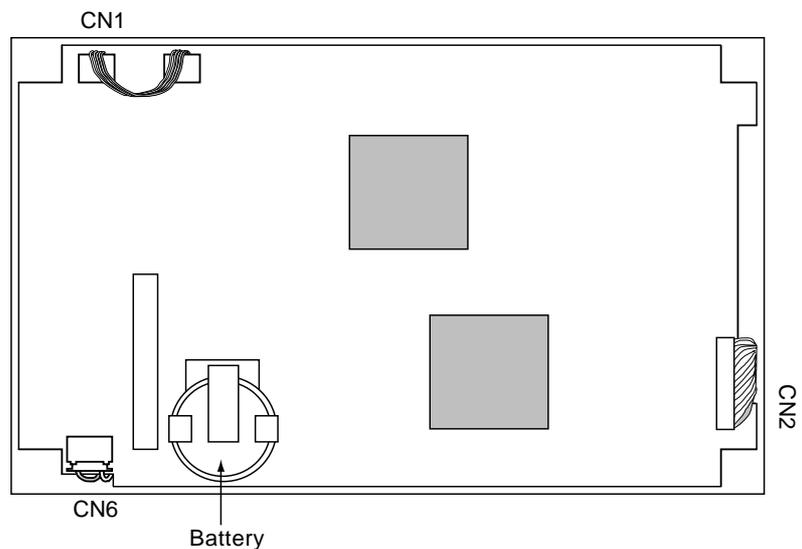
(5) Disconnect the CFL connector (CN6).

(6) Place the display unit with the display panel side up and remove the four(4) securing screws. Pull out the CFL connector from the hole on the chassis.

Chassis
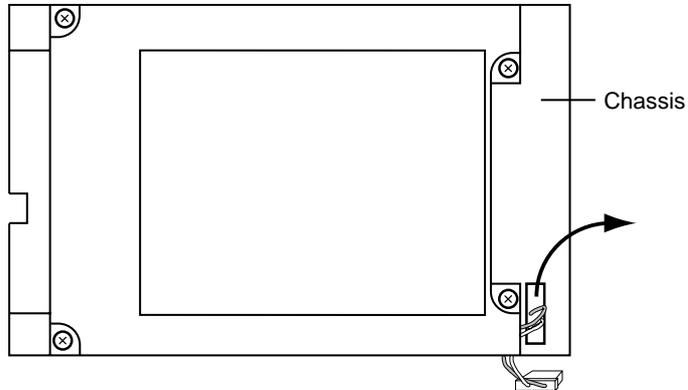
(7) Lift the LCD unit and turn it upside down. Be careful not to disconnect CN2 connector.

⚠ **Handling Precautions**

The surface of the LCD unit is very sensitive and dirt and oil cannot be removed.
Be careful to not get it dirty.

Backlight unit   Backlingt unit securing screw   CN2   Chassis   Printed wired board   Connector hole
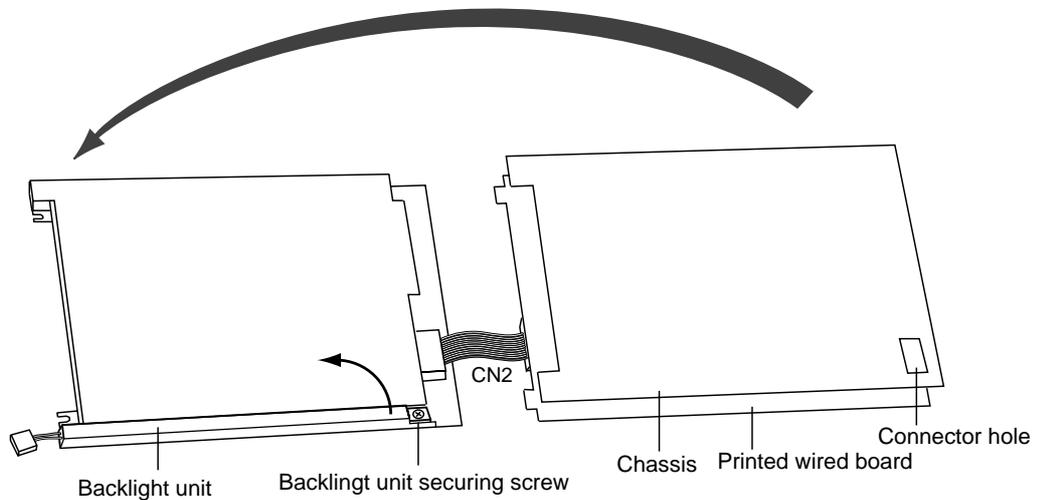
(8) Unscrew the backlight securing screw. Remove the backlight unit by lifting its lower right-hand corner (where the screw was) firstly.

(9) Install the new backlight unit and secure them with the screw.

(10) Put the CFL connector through the hole on the chassis and place the display unit back into position. Secure it with the screws.

(11) Reconnect the CFL connector (CN6). The connector cable should be put near the battery, so that it will not be pinched when assembling.

(12) Install the touch switch panel.
(Follow the instructions on ■ Touch switch panel replacement (page 6-7).)

(13) Install the display unit in the body.
(Follow the instructions on ■Replacing the display unit (page 6-3).)

(14) Attach the panel protective sheet, and remove the thin plastic film on the surface.
(Follow the instructions on ■Replacing the panel protective sheet (page 6-1).)

[!] Handling Precautions

- The touch switch is made of glass. Make sure not to drop it and not to touch the end face.

- The surface of the touch switches is very sensitive and dirt and dust cannot be removed. Be careful not to touch the surface, and protect it from dirt and dust.

- The surface of the LCD unit is very sensitive and the dirt and dust cannot be removed.
  Be careful not to touch the surface, and protect them from dirt and dust.

- The panel protective sheet that is once removed has no adhesive power. Do not use it again, and replace with a new protective sheet.

- Make sure the panel protective sheet is properly attached as dirt on the side of the adhesive will lower the power of the adhesive and make it impossible to meet its specified drip-proof specifications.

- Protect the display unit from static, water, oil and dust, since it has a precision printed wired board.
  Do not touch the leads on the printed wired board and the printed wired board surface.

- Do not put the display unit in a dusty place. In case the display unit is laid with the touch switch side down, it should be laid on a soft surface without dust and should be protected from oil and dust.

6 - 2 Inspections

This section describes inspections that should be performed regularly.

■ Notes on inspections

- Do not use organic solvents or alkali for cleaning.
- Turn off the power before cleaning.
- Tighten terminals and screws to specified torque.

■ Inspection procedures

Check points	Check	Correction
Mounting bracket, power supply terminals, connector connection sand connector securing screws	All screws must be properly tightened and all connectors and terminals properly connected.	Tighten or correct as necessary.
Ambient temperature and humidity Environmental conditions	Temperature and humidity must be within the prescribed range. There must be no corrosive gas, dust or condensation.	If the temperature is too high, install a fan to lower the temperature. Adjust environment to ensure proper ventilation.
Panel protective sheet	The display should be easy to view. The panel protective sheet must be properly attached. There must not be any dust on the panel protective sheet.	Wipe the panel protective sheet with a soft damp cloth or use a soft brush. If required, replace the panel protective sheet.
Power supply voltage	The power supply voltage must be within the following ranges DC power supply: 20.4 to 27.6Vdc	Check the power supply, power voltage and wiring.
Battery life	The battery must be less than 4 years old. No battery alarms should have been generated.	Battery replacement.

Chapter 7. TROUBLESHOOTING

7 - 1 Error Messages and Countermeasure

The error messages of the EST and the counter measures are as follows.

[CHx communications error]

An error has occurred in communications on CHx.

Probable causes are as follows:

1) The settings (node numbers, communication baud rate, communication format, etc.) of the application program and of the connected equipment do not match each other.

2) Incorrect connections, broken cables, noise.

3) Reading or Writing of such sorts that are prohibited in the connected equipment.

(unreadable or unwritable address, writing of the values that exceed max. or min. value, etc.)

[Too many smart objects used, Can NOT display correctly]

Reduce the number of smart objects used.

Press anywhere on the touch switches for 5sec to clear the error display.

[Display buffer memory full, Can NOT display correctly]

Reduce the number of trend graphs or variable length character string data.

Press anywhere on the touch switches for 5sec to clear the error display.

⚠ Handling Precautions

• In the following cases, check the "Application info." in the system menu.

· Operation does not start, though it is in " Auto Run Mode" .

· Operation does not start after pushing the [Start application] button.

If there is any incorrect application data, [Apli data not found.] is displayed. Then, download the application data again.

• If there is any system error during operation, the initial screen, which is normally shown only at the first startup, may appear.   Should this happen, please contact us.

• There is no battery alarm indication. If the battery alarm indication is necessary, it can be displayed by the application program. Be sure to replace the battery before the expiration.

7 - 2 Checks to be Performed in the Event of a Problem

Symptoms	Check points	Checks
The backlight does not go on.	Power supply	Is the correct voltage being supplied?
	Application data	Is the backlight set to OFF?
No data is displayed.	Download	1. Has the system been downloaded? 2. Has the application been downloaded? 3. Was the download correctly completed?
	Temperature	Is the ambient temperature too low?
	Power supply	Is the correct voltage being supplied?
Display is faded.	Panel protective sheet	Has the thin protective film on the panel protective sheet been taken off completely?
Download cannot be performed.	Cables	Are the cables connected to the correct communication ports on the PC?
EST and PLC communications not possible.	PLC	Are the node no., baud rate and checksum of the communication module correctly set?
	EST240Z	Are the communications settings correct?
	Application data	Are the device settings of the smart objects, communications port and node no. settings correct?
Switches do not respond.	Damage	Are the touch switches damaged?
	Application data	Are the device settings of the smart objects, communications port and node no. settings correct?
Communication is impossible by IrDA	Environment	Is the distance between the EST and the personal computer appropriate? (Proper distance: 40 to 100 cm) Is there any disturbing light coming in?
	PC	Is the IrDA effective? *
	Version	Is the version of the EST system screen coping with IrDA? *

* For more detailed information, please refer to the following manual:
EST-Z Series User's Manual Application Preparation, Manual No.CP-SP-1088E

⚠ **Handling Precautions**

- When the instrument is powered up after having been left in a cold location, the display will remain dark for about 10 minutes. When the instrument is used in a cold environment, the display change takes time and an after image remains. These are only characteristics of the LCD and not a malfunction.

- Visibility and color of LCD differ according to the view angle, this is not a malfunction.

- There may be some permanently lit/unlit pixels, this is not a fault.

- When displaying straight line, for example, on LCD display, a linear like a shadow may appear on its extension. This is not a malfunction. (This is called a cross-talk, and occurs depending on the displayed objects.)

- Interference fringes like a rainbow may appear on the touch switch surface, but this is not a malfunction. (This is called a Newton-ring, and appears according to the little change of the gaps between touch switches.)

- The areas around the perimeter of the screen may be whitish, but this is not a malfunction. (This is due to the backlight.)

Chapter 8. DISPOSAL

8 - 1   Precautions on discarding EST

⚠ **CAUTION**	8-1
❗ When you discard the EST, discard it as industrial waste, following regulations and rules stipulated by your local self-governing body.	

Chapter 9. SPECIFICATIONS

9 - 1 General Specifications

■ Electrical specifications

Items	Specifications
Power supply voltage	24Vdc ±15% (20.4 to 27.6V)
Current	1A or less
Withstand voltage	500Vac for 1 min. (Power supply - FG, signal cables - power supply /FG)
Insulation resistance	More than 10MΩ(500Vdc) (Power supply - FG, signal cables - power supply /FG)
Grounding	Less than 100Ω

■ Environmental specifications

Items	Specifications
Storage temperature	-20 to +60°C
Operating temperature range	0 to 50°C
Storage and operating humidity	30 to 85% RH, non-condensing (In case the ambient temperature is 40°C or more, the storage and operating humidity should be same as the absolute humidity at 40°C85%)
Storage and operating atmosphere	No presence of corrosive gas
Vibration resistance	Conforms to JIS C0911, the equipment is exposed to 10 to 55Hz vibrations, 9.8m/s^2 in X, Y and Z directions, single sweep: 6 minute., 2 hours in each direction
Impact resistance	Conforms to JIS C0912: 98m/s^2 for 20ms or less
Noise resistance	DC power supply ±1000V, 100ns to 1μs (using impulse noise simulator)
Degree of protection	IP65(dust-protected, water-proof)

■ Mechanical specifications

Items	Specifications
External dimensions	140(H) × 210(W) × 71.2(D)[mm]
Mass	1.3kg
Mounting Structure	Vertical panel mounting, secured by auxiliary mounting brackets from backside
Cooling	Natural convection
Torque of terminal block screws	Recommended torque: 0.5N·m
Torque of rear cover	Recommended torque: 1.2N·m
Tightening of EST body metal fittings*	Turn screws an extra half to 1 turn when the EST is seated.
Applicable standards	EN50081-2,EN61000-6-2

*If the screws are tightened too strongly, the EST may be damaged.

9 - 2 Performance Specifications

Items	Specifications
Display devices	5.7 inch Color STN LCD
Display color	256 colors BMP(images)*1 / 64 colors(smart objects)
Effective display area	115 × 86
Display characters	16 × 16 pixels : 20 characters × 15 lines
Resolution	320 × 240
Service life of LCD	approx. 50,000h *2
Service life of backlight	40,000h typ *3
Type of touch switches	Transparent resistor membrane (analogue)
Service life of touch switches	1 million times
Material of panel protective sheet	PET
Clock precision	±120s/month (Ta=25°C)
Battery life	4 years (Ta=25°C)
User memory	1M bytes (program) 256K bytes (back-up RAM)
Communication port	Infrared (IrDA) *4, RS-232C × 1ch, RS-485 × 1ch RS-485 half -duplex × 2ch
Others	1 digital input, 1 digital output, buzzer

*1: 256 colors display may flicker depending on the colors.

*2: This service life is estimated by (25°C, 65%) and is not the guaranteed value.

*3: It is the time until the brightness goes down to 50% at the normal temperature and humidity (25°C, 65%).

*4: The area in which communications are possible, is as per the following diagram:
However, it may change depending on the performance of communication mating between devices. Also, communication may not be feasible due to the effects of disturbance light such as reflected light.

    Minimum half angle   ±15°
    Communication distance   40 to 100cm
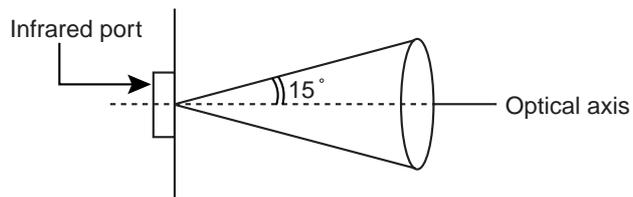
9 - 3 Interface Specifications

■ Interface specifications

Channel	Interface	Communication speed	No.of units to connect	Transmission distance[m]	Notes
CH0	Infrared communication	9600 to 115.2kbps	1	1	Front (conform to IrDA1.0)
CH1	RS-232C based	9600 to 115.2kbps	1	15	DSUB 9 pins (SD,RD,RS,CS)
CH2	RS-485 based (full/half duplex)	9600 to 115.2kbps	31	1000	M3 terminal box
CH3	RS-485 based (half duplex)	4800 to 38.4kbps	31	1000	M3 terminal box
CH4	RS-485 based (half duplex)	4800 to 38.4kbps	31	1000	M3 terminal box

■ DC input/output interface specifications

	Power supply voltage	Level H	Level L	Input/Output current
Input	–	4.5 to 27.6Vdc	0 to 0.8Vdc	max. 10mA
Output	4.5 to 27.6Vdc	Leakage current max. 100μA	max. 0.5V	max. 10mA

For information on the crimp contact for the connector, please refer to the
■Connection points and required parts (page 4-2).

⚠ Handling Precautions

On the standard rear cover, there is no hole for the input/output signal cables.
In case such hole is necessary, please contact us.

9 - 4 External Dimensions

Unit : mm

Index

Revision History

Printed Date	Manual Number	Edition	Revised pages	Description
00-09	CP-SP-1065E	1st Edition		
01-02		2nd Edition	iv, v, 4-3, 4-10 5-1	Manual name changed
02-01		3rd Edition	iii iv 1-1 2-2 3-2~3-3, 4-2, 6-12 4-5~4-8 4-12 4-15 4-16 4-17 4-20 6-1 6-5 6-7~6-8 7-2 9-2	Contents about "battery" were changed. Manual name changed Model Numbers was changed Contents of "Option cover" were changed. metal fittings → mounting bracket Connection example was changed. "6.Error reset", "7.Touch switch calib" was added to System menu. Self diagnostics was added. Error reset was added. Touch switch calibration was added. ("Interface(I/F) test" (4-17~4-18 page of old) was deleted.) Touch switch adjustment → Touch switch calibration WARNING was deleted. CAUTION was changed. CAUTION was changed. Replacement procedure was divided to Remove the display unit and Mounting the display unit. Communication is impossible by IrDA was added. Contents of "*4" were changed.
02-12		4th Edition	 9-1	RESTRICTIONS ON USE changed. Mechanical specifications Metal fittings changed to mounting brackets. Applicable standards added.
04-06		5th Edition	v 1-1 2-2 4-10	Manual No. SP-1091E→UM-5149E AP Editor, package software AP Editor for Windows 95,98,CD→ AP Editor for Windows 98,Me,XP; CD "Option cover" added as PC/ABS, row of option cover deleted ●After downloading the system changed