

Pro-face®

ST3000 Series
Hardware Manual

Preface

Thank you for purchasing Pro-face's ST3000 Series Programmable Operator Interface (Hereafter referred to as the "ST unit").

Before operating your ST unit, be sure to read this manual to familiarize yourself with the ST unit's operation procedures and features.

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Essential Safety Precautions

All safety-related procedures stated in this document must be followed to operate the ST correctly and safely. Be sure to read this and any related documents thoroughly to understand the correct operation and functions of the ST unit.






Safety Icons

Throughout this manual, these icons provide essential safety information for ST operation procedures requiring special attention. These icons indicate the following levels of danger:

| | |
|--|---|
|  WARNING | Indicates situations where severe bodily injury, death or major equipment damage can occur. |
|  CAUTION | Indicates situations where slight bodily injury or minor equipment damage can occur. |
|  | Indicates actions or procedures that should NOT be performed. |
|  | Indicates actions or procedures that MUST be performed to ensure correct unit operation. |

WARNING

System Design

-  Do not create ST touch panel switches that could possibly endanger the safety of personnel or equipment. A malfunction of the ST unit, its I/O unit(s), cable(s), or other related equipment can cause unexpected output signals, leading to a serious accident. Be sure to design all important machine operation switches so they are operated via a separate control system, and not via the ST.
-  Do not create ST touch panel switches to control machine safety operations, such as an emergency stop switch. Install these switches as separate hardware switches, otherwise severe bodily injury or equipment damage can occur.
-  Be sure to design your system so that a communication fault between the ST and its host controller will not cause equipment to malfunction. This is to prevent any possibility of bodily injury or equipment damage.
-  Do not use the ST as a warning device for critical alarms that can cause serious operator injury, machine damage or can halt system operation. Critical alarm indicators and their control/activator units must be designed using stand-alone hardware and/or mechanical interlocks.
-  Do not use the ST with aircraft control devices, aerospace equipment, central trunk data transmission (communication) devices, nuclear power control devices, or medical life support equipment, due to these devices' inherent requirements of extremely high levels of safety and reliability.

- ❗ Be sure to design your system so that a communication fault between the ST and its host controller will not cause equipment to malfunction. This is to prevent any possibility of bodily injury or equipment damage.
- ⊘ After the ST unit's backlight burns out the touch panel is still active, unlike the ST unit's "Standby Mode". If the operator fails to notice that the backlight is burned out and touches the panel, a potentially dangerous machine operation error can occur. Therefore, do not create ST unit touch panel switches that may cause injury and/or equipment damage. If your ST unit's backlight suddenly turns OFF, use the following steps to determine if the backlight is actually burned out.
 - 1) If the ST unit's "Backlight Control" is not set and the screen has gone blank, your backlight is burned out.
 - 2) If the ST unit's "Backlight Control" is set to Standby Mode and the screen has gone blank, and touching the screen or performing another input operation does not cause the display to reappear, your backlight is burned out.

Handling

- ⊘ Do not modify the ST unit. Doing so may cause a fire or an electric shock.
- ⊘ Do not operate the ST in an environment where flammable gases are present, since it may cause an explosion.

Wiring


- ❗ To prevent an electric shock be sure to disconnect your ST unit's power cord from the power supply before wiring the ST.
- ⊘ Do not use voltage beyond the ST unit's specified range. Doing so may cause a fire or an electric shock.

Maintenance




- ⊘ Do not connect or disconnect Host and ST unit communication cables while the ST is turned ON.
- ⊘ Do not replace the ST unit's battery yourself. The ST uses a lithium battery for backing up its internal clock data and the battery may explode if it is replaced incorrectly. When replacement is required, please contact your local ST distributor.

CAUTION


Installation

-  Be sure all cable connectors are securely attached to the ST unit. A loose connection may cause incorrect input or output signals.








Wiring

-  Be sure to ground the ST unit's FG wire separately from other equipment FG lines. Also, be sure to use a grounding resistance of 100 or less and a 2mm² or thicker wire, or your country's applicable standard. Otherwise, electric shock or malfunctions may result.
-  Be sure to use only the designated torque to tighten the ST unit's terminal block screws. If these screws are not tightened firmly, it may cause a short-circuit, fire or incorrect unit operation.
-  Be sure that metal particles and wiring debris do not fall inside the ST unit. They can cause a fire, malfunction or incorrect unit operation.

Unit Disposal

-  When the product is disposed of, it should be done so according to your country's regulations for similar types of industrial waste.

General Safety Precautions

-  Do not press on the ST unit's display with excessive force or with a hard object, since it can damage the display. Also, do not press on the touch panel with a pointed object, such as the tip of a mechanical pencil or a screwdriver, since doing so can damage the touch panel.
-  Do not install the ST where the ambient temperature exceeds the specified range. Doing so may cause a unit malfunction.
-  To prevent abnormally high temperatures from occurring inside the ST, do not restrict or block the ST unit's rear-face ventilation slots.
-  Do not operate the ST in areas where large, sudden temperature changes can occur. These changes can cause condensation to form inside the ST, possibly causing it to malfunction.
-  Do not allow water, liquids or metal fragments to enter inside the ST unit's case, since they can cause either a malfunction or an electric shock. The allowable pollution degree is 2.
-  Do not operate or store the ST in locations where it can be exposed to direct sunlight, high temperatures, excessive dust, moisture or vibration.
-  Do not operate or store the ST where chemicals evaporate, or where chemicals are present in the air.
Corrosive chemicals: Acids, alkalines, liquids containing salt
Flammable chemicals: Organic Solvents

⊘ Do not use paint thinner or organic solvents to remove dirt or oil from the ST unit's surface. Instead, use a soft cloth moistened with a diluted neutral detergent.

⊘ Do not use or store the ST in areas with direct sunlight, since the sun's ultraviolet rays may cause the LCD's quality to deteriorate.

❗ Do not store the ST in an area where the temperature is lower than that recommended in the ST unit's specifications. Doing so may cause the LCD display's liquid to congeal, which can damage the LCD.

Also, if the storage area's temperature becomes higher than the specified level, the LCD's liquid may become isotropic, causing irreversible damage to the LCD. Therefore, only store the ST in areas where temperatures are within the ST unit's specifications.

❗ After turning OFF the ST, be sure to wait a few seconds before turning it ON again. The ST may not operate correctly if it is restarted too quickly.




❗ Due to the possibility of unexpected accidents, be sure to back up the ST unit's data regularly.

LCD Panel Usage Precautions

- The LCD panel's liquid contains an irritant. If the panel is damaged and any of this liquid contacts your skin, immediately rinse the area with running water for at least 15 minutes. If the liquid gets in your eyes, immediately rinse your eyes with running water for at least 15 minutes and consult a doctor.
- The ST unit's LCD screen may flicker or show unevenness in the brightness of certain images or at some contrast settings. This is an LCD characteristic and not a product defect.
- There's an individual difference in brightness and tone of LCD screen. Please be aware of this difference before using the lined-up plural units.
- Depending on the ambient temperature, LCD screens may sometimes look whitish (at high temperatures) or blackish (at low temperatures). This is an LCD characteristic and not a product defect.
- Some of ST unit's LCD screens may contain light or dark pixels. This is an LCD characteristic and not a product defect.
- Extended shadows, or "Crosstalk" may appear on the sides of screen images. This is an LCD characteristic and not a product defect.
- The color displayed on the ST unit's LCD screen may appear different when seen from outside the specified viewing angle. This is an LCD characteristic and not a product defect.
- When the same image is displayed on the ST unit's screen for a long period, an afterimage may appear when the image is changed. If this happens, turn off the ST, wait 10 seconds and then restart the unit. This is an LCD characteristic and not a product defect.
- To prevent an afterimage:
 - * Set the ST unit's display OFF feature when you plan to display the same screen image for a long period of time.
 - * Change the screen image periodically and try to not display the same image for a long period of time.

Information Symbols

This manual uses the following icons:

| | |
|---|--|
|  | Indicates a warning or a product limitation. Be sure to follow the instructions given with this icon to ensure the safe operation of the ST. |
| Screen Editor | Indicates the GP-Pro EX software. |
| PLC | Abbreviation for Programmable Logic Controller. |
| * | Indicates useful or important supplemental information. |
|  | Contains additional or useful information. |
|  | Indicates pages containing related information. |

ST3000 Series Model Name Indication

Model name

A ST 3 $\frac{**}{\overline{A\ B}}$ 1 - $\frac{*}{\overline{C}}$ 1 - $\frac{***}{\overline{D}}$

| | | |
|---|-----|--|
| A | 2 | ST-3200 series (3.8-inch): QVGA (320 x 240 dots) |
| B | 0 | ST-3200 series SIO type |
| | 1 | ST-3200 series MPI type |
| C | A | Monochrome Amber/Red LCD |
| D | D24 | DC type power supply is used. |

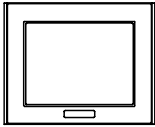

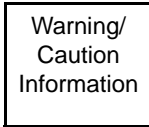

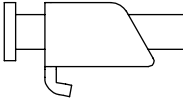
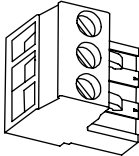
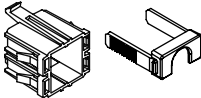
ST3000 Series Model Names

The term “ST3000” Series refers to the following ST model numbers:

| Series | | Model | Product number |
|---------------|----------------|-----------------|----------------|
| ST3000 series | ST-3200 series | AST-3201A (SIO) | AST3201-A1-D24 |
| | | AST-3211A (MPI) | AST3211-A1-D24 |

Package Contents

The following items are included in the ST unit's package. Before using the ST, please check that all items listed here are present.

| | | |
|---|---|---|
| <p>ST Unit: 1</p>  | <p>English and Japanese Installation Guides (One of each)</p>  | <p>Warning/Caution Information</p>  |
| <p>Installation Gasket: 1 (Attached to the ST unit)</p>  | <p>Installation Fasteners: 4 per set</p>  | |
| <p>DC Power Connector: 1 (Attached to the ST unit)</p> |  | |
| <p>USB Cable Clamp: 1 set Holder: 1, Cover: 1</p> |  | |

This unit has been carefully packed, with special attention to quality. However, should you find anything damaged or missing, please contact your local ST distributor immediately.

UL/c-UL Approval

The following units are UL/c-UL listed products. (UL File No.E220851)

| Product Model No. | UL/c-UL Registration Model No. |
|-------------------|--------------------------------|
| AST3201-A1-D24 | 3580205-01 |
| AST3211-A1-D24 | 3580205-02 |

This product conforms to the following standards:

- UL508 Industrial Control Equipment
- CSA-C22.2 No.142-M1987 (c-UL Approval) Standard for Process Control Equipment

<Cautions>

Be aware of the following items when building the ST into an end-use product:

- The ST unit's rear face is not approved as an enclosure. When building the ST unit into an end-use product, be sure to use an enclosure that satisfies standards as the end-use product's overall enclosure.
- The ST unit must be used indoors only.
- Install and operate the ST with its front panel facing outwards.
- If the ST is mounted so as to cool itself naturally, be sure to install it in a vertical panel. Also, it's recommended that the ST should be mounted at least 100 mm away from any other adjacent structures or machine parts. The temperature must be checked on the final product in which the ST is installed.

CE Marking

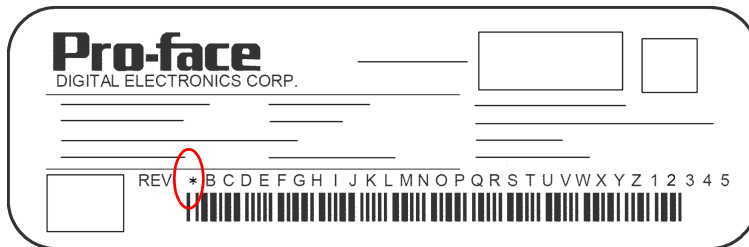
The following units are CE marked products complying with the EMC Directive.
They comply with EN55011 Class A, EN61131-2.

AST3201-A1-D24

AST3211-A1-D24

About Revision

The nameplate on the ST has the revision code of the ST. In the example below, the asterisk, which is placed at the “A” position, shows that the revision code is “A”.



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1 | Overview

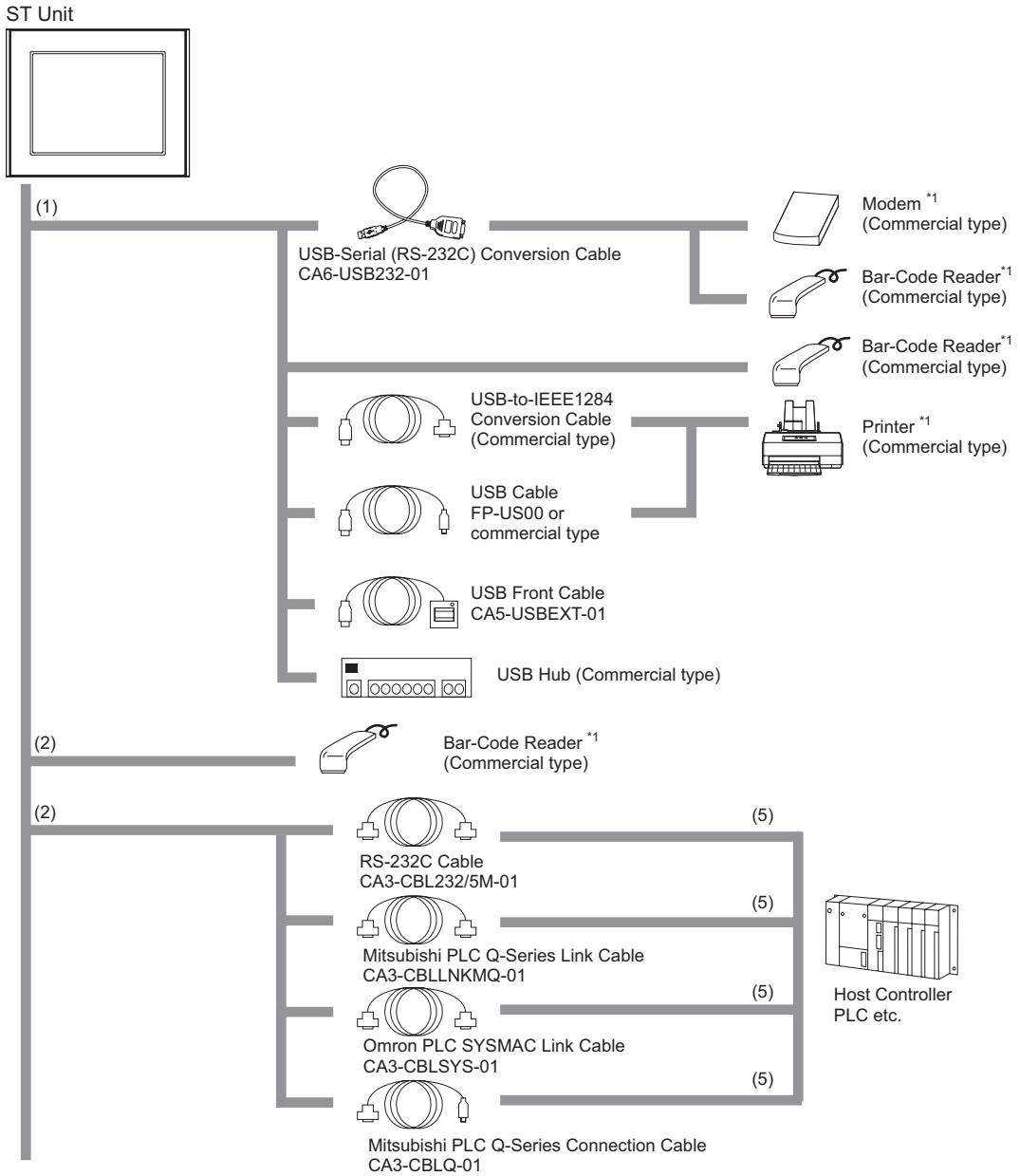
1. System Design
2. Accessories

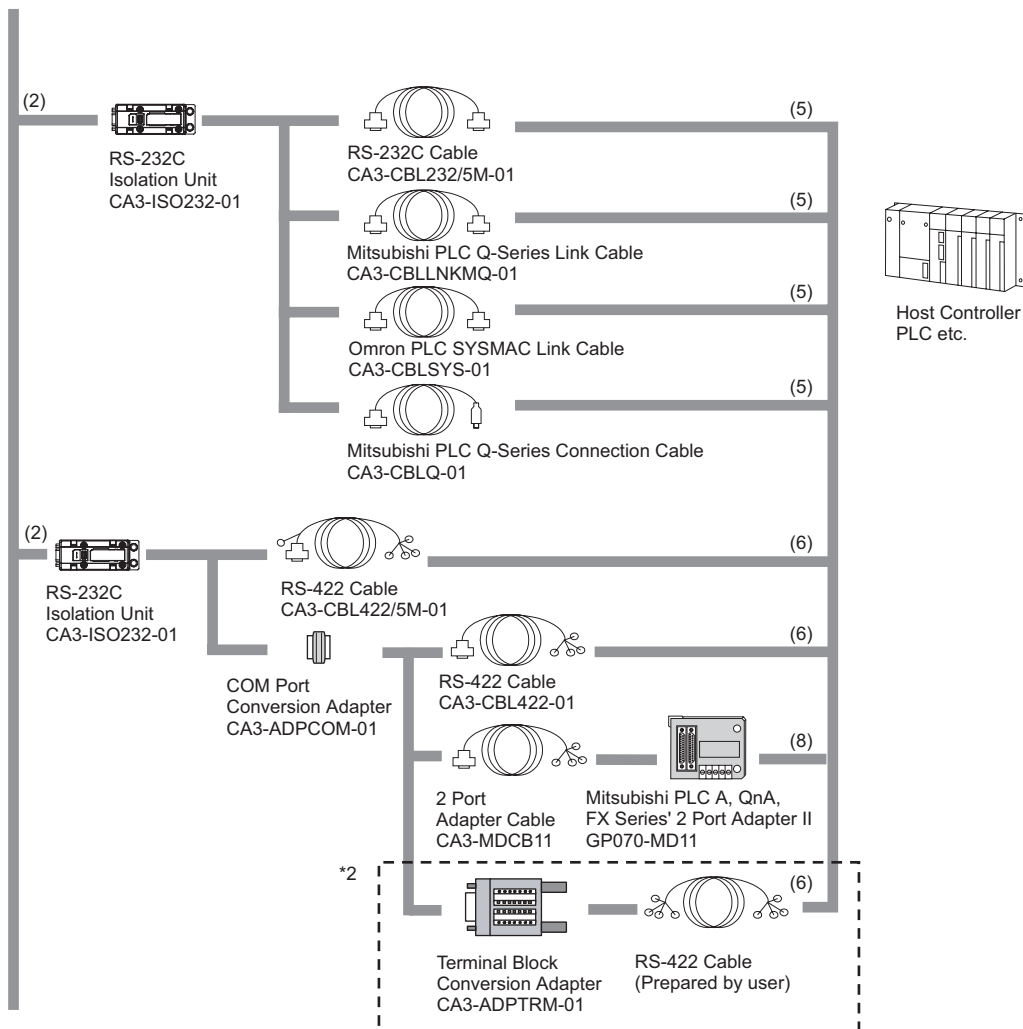
This chapter describes the peripheral devices that can be connected to the ST Series units.

1.1 System Design

The following diagram illustrates the standard range of items that can be connected to ST3000 Series units. For host controller (PLC, etc.) connection information, refer to the “GP-Pro EX Device/PLC Connection Manual”.

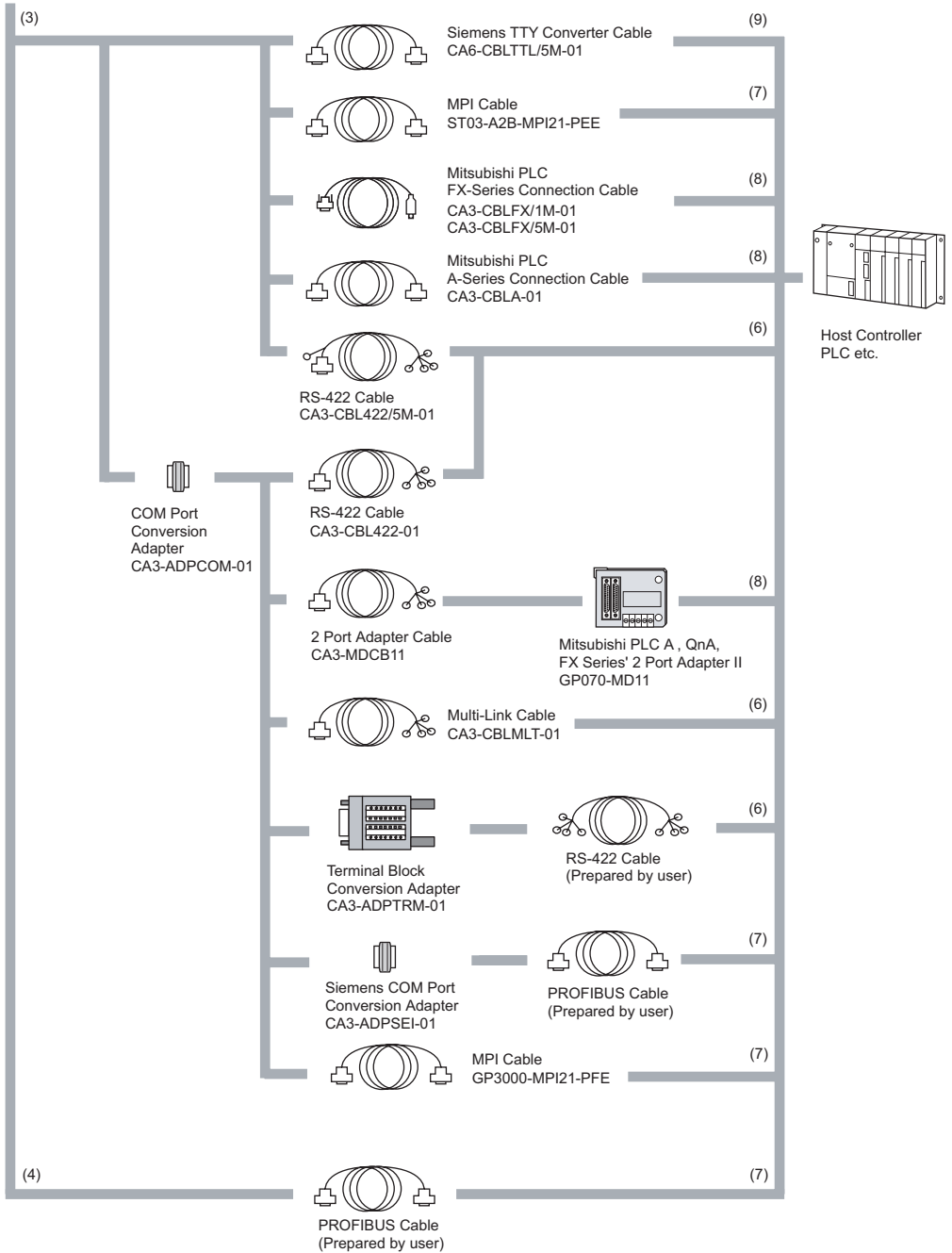
◆ ST RUN Mode Peripherals





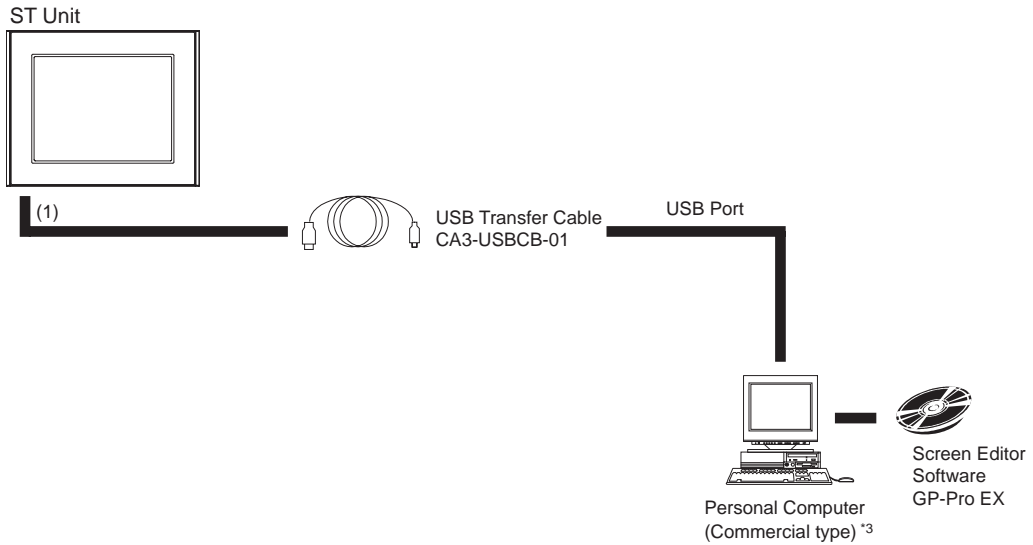
NOTE

- When connecting the CA3-ISO232-01, the 9 Pin's setting of COM port is required to be VCC.
COM port settings can be set with the GP-Pro EX or in ST's offline mode.



| ST Interfaces | PLC Interfaces |
|---|-----------------------------|
| (1) USB I/F | (5) RS-232C Port |
| (2) Serial Interface (COM1) | (6) RS-422 Port |
| (3) Serial Interface (COM2) (except AST-3211A) | (7) RS-485 Port |
| (4) Serial Interface (COM2) (AST-3211A only) | (8) Programing Console Port |
| | (9) PG Port |

◆ Edit Mode Peripherals



ST Interfaces

(1) USB Host Interface

- *1 For supported models, refer to Pro-face's support site "Otasuke Pro!" (<http://www.pro-face.com/otasuke/>). You can connect to this site by clicking the GP-Pro EX's [Help (H)] menu - [Connect to Support Site- "Otasuke Pro!" (O)] command.
- *2 Only the four-wire one-to-one connection type can be used.
- *3 Certain types and models of PCs cannot be used.

SEE → *GP-Pro EX Reference Manual*

1.2 Accessories

All accessories listed here are produced by Pro-face.

■ Serial Interface Item

| Product Name | Model No. | Description |
|--|--|---|
| RS-232C Cable | CA3-CBL232/5M-01 (5m) | Connects Mitsubishi PLC A-Series (or other host controller) to the ST. (RS-232C) |
| RS-422 Cable | CA3-CBL422/5M-01 (5m) | Connects a host controller to the ST. (RS-422) |
| Mitsubishi PLC Q-Series Link Cable | CA3-CBLLNKMQ-01 (5m) | Connects Mitsubishi PLC Q-Series (or other host controller) to the ST. (RS-232C) |
| Omron PLC SYSMAC Link Cable | CA3-CBLSYS-01 (5m) | Connects Omron PLC SYSMAC Series unit (or other host controller) to the ST. (RS-232C) |
| Mitsubishi PLC A-Series Connection Cable | CA3-CBLA-01 (5m) | Connects Mitsubishi PLC A, QnA Series programming console I/F to the ST. (Simultaneous use of programming console is not possible.) |
| Mitsubishi PLC Q-Series Connection Cable | CA3-CBLQ-01 (5m) | Connects Mitsubishi PLC Q-Series programming console I/F to the ST. (Simultaneous use of programming console is not possible.) |
| Mitsubishi PLC FX-Series Connection Cable | CA3-CBLFX/1M-01 (1m) CA3-CBLFX/5M-01 (5m) | Connects Mitsubishi PLC FX-Series programming console I/F to the ST. (Simultaneous use of programming console is not possible.) |
| 9-pin-to-25-pin RS-232C Conversion Cable | CA3-CBLCBT232-01 (0.2m) | The cable that connects the D-SUB 9-pin plug to D-SUB 25-pin socket. |
| 9-pin-to-25-pin RS-422 Conversion Cable | CA3-CBLCBT422-01 (0.2m) | The cable that connects the D-SUB 9-pin socket to D-SUB 25-pin socket. |
| RS-422 Cable | CA3-CBL422-01 (5m) | Connects a host controller to the ST. (RS-422) |
| 2 Port Adapter Cable | CA3-MDCB11 (5m) | Connects Mitsubishi PLC to the ST using 2 port adapter II (RS-422). |
| Mitsubishi PLC A, QnA, FX Series 2 Port Adapter II | GP070-MD11 | Allows simultaneous use of an ST Series unit and a Mitsubishi PLC A, QnA, FX Series peripheral device. |
| Multi-Link Cable | CA3-CBLMLT-01 (5m) | Connects a host controller to the ST for multi-link (n:1) communication. |
| Terminal Block Conversion Adapter | CA3-ADPTRM-01 | Connects output from a serial interface with an RS-422 terminal block. |
| COM Port Conversion Adapter | CA3-ADPCOM-01 | Connects optional RS-422 communication items to the ST unit's COM1 port. |
| Siemens COM Port Conversion Adapter | CA3-ADPSEI-01 | Connects Siemens PLCs to the ST. (for RS-485 communication) |
| Siemens TTY Converter Cable | CA6-CBLTTL/5M-01 (5m) | Connects Siemens PLC S5 Series to the ST. |

Continued

| Product Name | Model No. | Description |
|------------------------|--|---|
| MPI Cable | ST03-A2B-MPI21-PFE (3.5m) GP3000-MPI21-PFE (3.5m) | The interface cable that establishes MPI-communication between each of the hosts and the ST3000 Series. |
| RS-232C Isolation Unit | CA3-ISO232-01 | Connects a host controller to the ST and provides isolation. RS-232C / RS-422 switching unit. |

■ USB Host Interface

| Product Name | Model No. | Description |
|---------------------------------------|----------------------|--|
| USB Transfer Cable | CA3-USBCB-01 (2m) | Downloads project data created with the Screen Editor via the ST unit's Serial I/F. |
| USB Cable | FP-US00 (5m) | Connects a USB printer. (TYPE-B) |
| USB Front Cable | CA5-USBEXT-01 (1m) | Extension cable attaching USB port to front panel. |
| USB-Serial (RS-232C) Conversion Cable | CA6-USB232-01 (0.5m) | The conversion cable for using a ST's USB I/F as the Serial (RS-232C) I/F. Connects a Modem ^{*1} or a Bar-cord Reader ^{*1} for the RS-232C communication method. |

*1. For supported models, refer to Pro-face's support site "Otasuke Pro!" (<http://www.pro-face.com/otasuke/>).

You can connect to this site by clicking the GP-Pro EX's [Help (H)] menu - [Connect to Support Site- "Otasuke Pro!" (O)] command.

■ Option Items

| Product Name | Model No. | Description |
|-------------------------|-------------|--|
| Screen Protection Sheet | CA6-DFS4-01 | Disposable, dirt-resistant sheet for the ST unit's screen. (5 sheets/set) (Hard type) |

■ Maintenance Items

| Product Name | Model No. | Description |
|--|---------------|--|
| Installation Fastener | CA3-ATFALL-01 | Used to install the ST into a solid panel. |
| Installation Gasket | ST400-WP01 | Provides dust and moisture resistance when ST is installed into a solid panel. |
| Connector Cover | CA3-BUSCVR-01 | Protects the ST unit's rear face connector. |
| USB Cable Clamp (2 port) | CA5-USBATL-01 | USB Cable clamp products to prevent disconnection. |
| DC Power Supply Connector for Medium-sized Units | CA5-DCCNM-01 | Connector for attaching power supply to medium-sized units. |

2

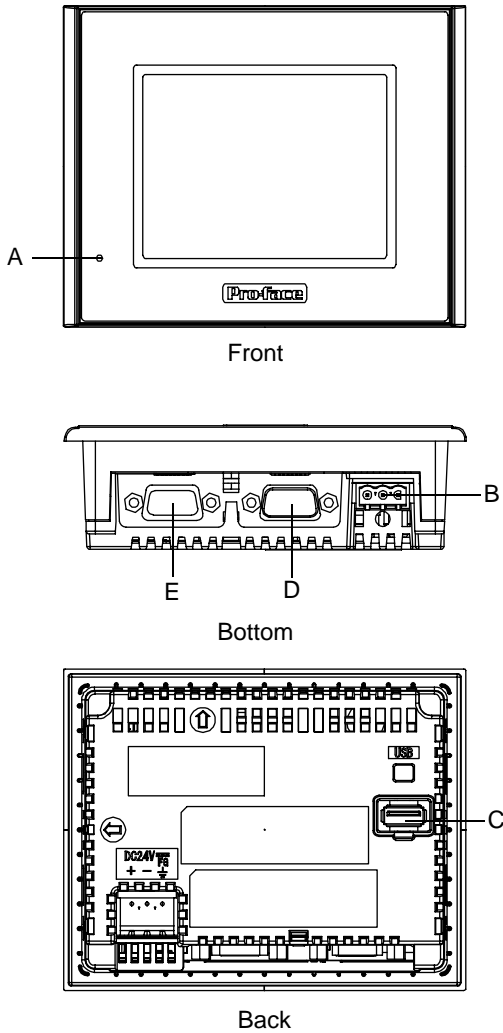


Part Names and Functions

1. ST-3200 Series

This chapter describes the names and functions of the components of the ST series.

2.1 ST-3200 Series



A: Status LED

This LED indicates the ST's status, e.g. power input, firmware RUN status or backlight condition.

| LED | ST Operation |
|-------------------|---|
| Green (lit) | Normal operation (power is ON.) or OFFLINE operation. |
| Orange (blinking) | During software startup. |
| Red (lit) | When power is turned ON. |
| Not lit | Power is OFF. |

B: Power Plug Connector

C: USB Host Interface (USB)

Complies with USB 1.1.

One port for TYPE-A connector.

Power supply voltage DC5V ±5%.

Maximum output current: 500mA

Maximum communication distance: 5m

Interfaces to transfer cable, USB-compatible printer, and such.

D: Serial Interface (COM1)

RS232C serial interface. D-sub 9-pin plug type connector.

E: Serial Interface (COM2)

AST-3201A:

RS422/RS485*1 serial interface. D-sub 9-pin plug type connector.

AST-3211A:

RS485 (MPI only) serial interface. D-sub 9-pin socket type connector.

*1 AST-3201A units with revision code "C" or later are compliant with RS485.

SEE → About Revision (page 12)

3 | Specifications

1. ST-3200 Series

This chapter describes the general specifications, functions, interfaces and external drawings of the ST.

3.1 ST-3200 Series

3.1.1 General Specifications

■ Electrical Specifications

| | | |
|-----------------------|------------------------|--|
| Power Supply | Input Voltage | DC24V |
| | Rated Voltage | DC19.2 to 28.8V |
| | Allowable Voltage Drop | 2ms (max.) |
| | Power Consumption | 13W (max.) |
| | In-Rush Current | 60A (max.) ^{*1} |
| Voltage Endurance | | AC1000V 20mA for 1 minute (between charging and FG terminals) |
| Insulation Resistance | | DC500V 10MΩ (min.) (between charging and FG terminals) |

*1. The FWHM (Full-width, half maximum) value is approximately 40μs. (When exceeding 30A)

■ Environmental Specifications

| | | |
|------------|--|---|
| Physical | Surrounding Air Temperature | 0 to +50°C ^{*1} |
| | Storage Temperature | -20 to +60°C |
| | Ambient Humidity | 10 to 90% RH (Wet bulb temperature: 39°C max. - no condensation.) |
| | Storage Humidity | 10 to 90% RH (Wet bulb temperature: 39°C max. - no condensation.) |
| | Dust | 0.1mg/m ³ and below (non-conductive levels) |
| | Pollution Degree | For use in Pollution Degree 2 environment. |
| | Atmosphere | Free of corrosive gases |
| | Air Pressure Vibration Resistance (availment altitude) | 800 to 1114hPa (2,000 meters above sea-level and below) |
| Mechanical | Vibration Resistance | IEC61131-2 compliant 5 to 9Hz single-amplitude 3.5mm 9 to 150Hz constant-accelerated velocity 9.8m/s ² X,Y,Z directions for 10 cycle (100 minute) |
| | Concussion Resistance | IEC61131-2 compliant (147m/s ² X,Y,Z directions for 3 time) |
| Electrical | Noise Immunity | Noise Voltage: 1000V _{p-p} Pulse Duration: 1μs Rise Time: 1ns (via noise simulator) |
| | Electrostatic Discharge Immunity | 6kV (complies with EN 61000-4-2 Level 3) |

*1. Extended use in environments where surrounding air temperature is 40°C or higher may degrade the display quality and result in decreased contrast.

■ Structural Specifications

| | | |
|--------------|----------------------|---|
| Installation | Grounding | Grounding resistance of 100Ω 2mm ² or thicker wire, or your country's applicable standard. (Same for FG and SG terminals) |
| | Structure*1 | Rating: Equivalent to IP65f NEMA #250 TYPE 4X/13 (Front surface at panel embedding) Feature size: All-in-one Installation configuration: Panel embedding |
| | Cooling Method | Natural air circulation |
| | Weight Approx. | 0.4kg[0.9lb] max. (unit only) |
| | External Dimensions | W130mm[5.12in] X H104mm[4.09in] X D40mm[1.57in] |
| | Panel Cut Dimensions | W118.5mm[4.67in] X H92.5mm[3.64in]*2 Panel thickness: 1.6mm[0.06in] to 5.0mm[0.20in] |

*1. The front face of the ST unit, installed in a solid panel, has been tested using conditions equivalent to the standards shown in the specification. Even though the ST unit's level of resistance is equivalent to these standards, oils that should have no effect on the ST can possibly harm the unit. This can occur in areas where either vaporized oils are present, or where low viscosity cutting oils are allowed to adhere to the unit for long periods of time. If the ST's front face protection sheet becomes peeled off, these conditions can lead to the ingress of oil into the ST and separate protection measures are suggested.

Also, if non-approved oils are present, it may cause deformation or corrosion of the front panel's plastic cover. Therefore, prior to installing the ST be sure to confirm the type of conditions that will be present in the ST's operating environment.

If the installation gasket is used for a long period of time, or if the unit and its gasket are removed from the panel, the original level of the protection cannot be guaranteed. To maintain the original protection level, be sure to replace the installation gasket regularly.

*2. As for dimensional tolerance everything +1/-0mm[+0.04/-0in] and R in angle are below R3[0.12].

3.1.2 Performance Specifications

■ Performance Specifications

| | | AST-3201A | AST-3211A |
|------------------|--------------------|---|---|
| Application*1 | | FLASH EPROM 6MB | |
| Data Backup | | SRAM 320K byte | |
| | | Used lithium battery for backup memory | |
| Interface | Serial Interface | COM1: RS232C Asynchronous Transmission Data Length: 7 bit/8 bit Parity: none, Odd or Even Stop Bit: 1bit/2bit Data transmission Speed: 2400 bps to 115.2Kbps Connector: DSUB-9pin plug | COM1: RS232C Asynchronous Transmission Data Length: 7 bit/8 bit Parity: none, Odd or Even Stop Bit: 1bit/2bit Data transmission Speed: 2400 bps to 115.2Kbps Connector: DSUB-9pin plug |
| | | COM2: RS422/RS485*2 Asynchronous Transmission Data Length: 7 bit/8 bit Parity: none, Odd or Even Stop Bit: 1bit/2bit Data transmission Speed: 2400 bps to 115.2 Kbps (RS422/RS485) 187.5 Kbps (MPI) Connector: DSUB-9pin plug | COM2: RS485(MPI only) Asynchronous Transmission Data Length: 7bit/8bit Parity: none, Odd or Even Stop Bit: 1bit/2bit Data transmission Speed: 187.5 Kbps (MPI) Connector: DSUB-9pin socket |
| | USB Host Interface | Complies with USB 1.1. (TYPE-A conn.) x 1 Power Supply Voltage: DC5V ± 5% Output Current: 500mA (Max.) Communication Distance: 5m (Max.) | |
| Clock Accuracy*3 | | ± 65 seconds/ month (at room temperature) | |

*1. It is user active capacity.

*2. AST-3201A units with revision code “C” or later are compliant with RS485.

SEE → *About Revision (page 12)*

*3. The ST’s internal clock has a slight error. At normal operating temperatures and conditions, with the ST operating from its lithium battery, the degree of error is 65 seconds per month. Variations in operating conditions and battery life can cause this error to vary from -380 to +90 seconds per month. For systems where this degree of error will be a problem, the user should be sure to monitor this error and make adjustments when required.

NOTE

- When the message “RAAA051 Low battery” is displayed, supply power to the display unit and fully charge the battery. The battery charges within 24 hours to a level which allows backup operation. Completing a full charge requires about 96 hours (4 days).
- A Lithium battery’s lifetime is: 10 years when the battery’s ambient temperature is 40°C or less. 4.1 years when the battery’s ambient temperature is 50°C or less. 1.5 years when the battery’s ambient temperature is 60°C or less.
 When used for backup:
 Approximately 100 days, with a fully charged battery.
 Approximately 6 days, with a half-charged battery.

■ Display Specifications

| | | |
|------------------------|---|---|
| Display Type | Monochrome Amber/Red LCD | |
| Resolution | W320 X H240 pixels | |
| Dot pitch | W0.24mm[0.01in] X H0.24mm[0.01in] | |
| Effective Display Area | W78.8mm[3.10in] X H59.6mm[2.35in] | |
| Color/Shade level | Black and White (8 Shades) | |
| Backlight | LED (Not replaceable) | |
| Brightness control | 16 levels of adjustment available via touch panel | |
| Contrast Adjustment | 8 levels of adjustment available via touch panel | |
| Display Service Life | MTBF value: 50, 000hrs. (TYP) (Backlight display service life is not included.) | |
| Backlight Service Life | 50,000hrs. or more (Time of continuous operation until the brightness of the backlight reaches 50% when the surrounding temperature is 25°C.) | |
| Language Fonts | Japanese: 6962 (JIS Standards 1 & 2)(including 607 non-kanji characters) ANK: 158 (Korean fonts, Simplified Chinese and Taiwanese traditional Chinese fonts are downloadable.) | |
| Text composition | Character Sizes | Standard font: 8X8, 8X16, 16X16 and 32X32 dot fonts Stroke font: 6 to 127dot fonts |
| | Font Sizes | Standard font: Width can be expanded up to 8 times. Height can be expanded up to 8 times ^{*1} |
| Text | 8 X 8 dots | 40 Char. X 30 rows |
| | 8 X 16 dots | 40 Char. X 15 rows |
| | 16 X 16 dots | 20 Char. X 15 rows |
| | 32 X 32 dots | 10 Char. X 7 rows |

*1. Font Sizes can be set up by software.

■ Touch Panel Specifications

| | |
|--------------|-------------------------|
| Type | Resistive Film (analog) |
| Resolution | 1024 X 1024 |
| Service Life | 1,000,000 times or more |

3.1.3 Interface Specifications

This section describes the specifications of each interface of the ST Series unit.

IMPORTANT

- The serial interface of the ST Series (except AST-3211A COM2) does not have an isolation function. When the host (PLC) unit is also not isolated, be sure to connect the #5 SG (Signal Ground) terminal to reduce the risk of damaging the RS232C/RS422/RS485 circuit.
- ST Series (except AST-3211A COM2) have the SG (signal ground) connection and the FG (frame ground) connection inside. When connecting an external device to the ST using the SG terminal, be sure to check that no short-circuit loop is created when you setup the system.
- The same type of connector is used for COM1 and COM2 of the AST-3201A. Be careful not to mistake one for the other. Connecting them incorrectly disables communication.

NOTE

- Connecting the RS-232C isolation unit (CA3-ISO232-01) to COM1 enables isolation if needed.

■ AST-3201A

◆ Serial Interfaces (COM1)

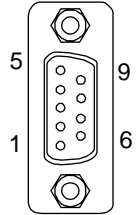
This interface is used to connect an RS232C cable. D-sub 9-pin plug connector is used.

<ST unit side>

| | |
|------------------|-----------------------------|
| ST Connector | XM2C-0942-502LX <OMRON Co.> |
| Interfit Bracket | #4-40 inch screws are used. |

<Cable side>

| | |
|-----------------------------|-----------------------|
| Recommended Cable Connector | XM2D-0901 <OMRON Co.> |
| Recommended Cable Cover | XM2S-0913 <OMRON Co.> |
| Recommended Jack Screw | XM2Z-0073 <OMRON Co.> |

| Pin Arrangement | Pin No. | RS232C | | |
|--|---------|-------------|-----------|---|
| | | Signal Name | Direction | Meaning |
|  <p>(ST unit side)</p> | 1 | CD | Input | Carrier Detect |
| | 2 | RD(RXD) | Input | Receive Data |
| | 3 | SD(TXD) | Output | Send Data |
| | 4 | ER(DTR) | Output | Data Terminal Ready |
| | 5 | SG | - | Signal Ground |
| | 6 | DR(DSR) | Input | Data Set Ready |
| | 7 | RS(RTS) | Output | Request to Send |
| | 8 | CS(CTS) | Input | Send Possible |
| | 9 | CI(RI)/VCC | Input/- | Called status display +5V±5% Output 0.25A *1 |
| | Shell | FG | - | Frame Ground (Common with SG) |

*1. The RI/VCC selection for Pin #9 is switched via software. The VCC output is not protected against overcurrent. To prevent damage or a unit malfunction, use only the rated current.

◆ Serial Interface (COM2)

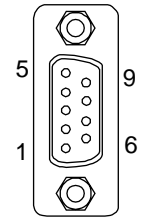
This interface is used to connect an RS422/RS485^{*1} serial cable. A D-sub 9-pin plug connector is used.

<ST unit side>

| | |
|------------------|-----------------------------|
| ST Connector | XM2C-0942-502LX <OMRON Co.> |
| Interfit Bracket | #4-40 inch screws are used. |

<Cable side>

| | |
|-----------------------------|-----------------------|
| Recommended Cable Connector | XM2D-0901 <OMRON Co.> |
| Recommended Cable Cover | XM2S-0913 <OMRON Co.> |
| Recommended Jack Screw | XM2Z-0073 <OMRON Co.> |

| Pin Arrangement | Pin No. | RS422/RS485 ^{*1} | | |
|--|---------|---------------------------|-----------|----------------------------------|
| | | Signal Name | Direction | Meaning |
|  (ST unit side) | 1 | RDA | Input | Receive Data A(+) |
| | 2 | RDB | Input | Receive Data B(-) |
| | 3 | SDA | Output | Send Data A(+) |
| | 4 | ERA | Output | Data Terminal Ready A(+) |
| | 5 | SG | - | Signal Ground |
| | 6 | CSB | Input | Send Possible B(-) |
| | 7 | SDB | Output | Send Data B(-) |
| | 8 | CSA | Input | Send Possible A(+) |
| | 9 | ERB | Output | Data Terminal Ready B(-) |
| | Shell | FG | - | Frame Ground (Common with SG) |

*1 AST-3201A units with revision code "C" or later are compliant with RS485.

SEE → About Revision (page 12)

■ AST-3211A

◆ Serial Interface (COM1)

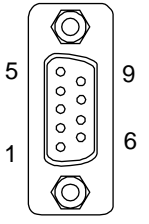
This interface is used to connect an RS232C serial cable. A D-sub 9-pin plug connector is used.

<ST unit side>

| | |
|------------------|-----------------------------|
| ST Connector | XM2C-0942-502LX <OMRON Co.> |
| Interfit Bracket | #4-40 inch screws are used. |

<Cable side>

| | |
|-----------------------------|-----------------------|
| Recommended Cable Connector | XM2D-0901 <OMRON Co.> |
| Recommended Cable Cover | XM2S-0913 <OMRON Co.> |
| Recommended Jack Screw | XM2Z-0073 <OMRON Co.> |

| Pin Arrangement | Pin No. | RS232C | | |
|--|---------|-------------|-----------|---|
| | | Signal Name | Direction | Meaning |
|  <p>(ST unit side)</p> | 1 | CD | Input | Carrier Detect |
| | 2 | RD(RXD) | Input | Receive Data |
| | 3 | SD(TXD) | Output | Send Data |
| | 4 | ER(DTR) | Output | Data Terminal Ready |
| | 5 | SG | - | Signal Ground |
| | 6 | DR(DSR) | Input | Data Set Ready |
| | 7 | RS(RTS) | Output | Request to Send |
| | 8 | CS(CTS) | Input | Send Possible |
| | 9 | CI(RI)/VCC | Input/- | Called status display +5V±5% Output 0.25A *1 |
| | Shell | FG | - | Frame Ground (Common with SG) |

*1. The RI/VCC selection for Pin #9 is switched via software. The VCC output is not protected against overcurrent. To prevent damage or a unit malfunction, use only the rated current.

◆ Serial Interface (COM2)

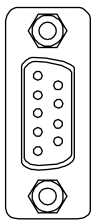
This interface is used to connect an RS485 (MPI only) serial cable. A D-sub 9-pin socket connector is used.

<ST unit side>

| | |
|------------------|-----------------------------|
| ST Connector | XM3B-0942-502LX <OMRON Co.> |
| Interfit Bracket | #4-40 inch screws are used. |

<Cable side>

| | |
|-----------------------------|-----------------------|
| Recommended Cable Connector | XM2A-0901 <OMRON Co.> |
| Recommended Cable Cover | XM2S-0913 <OMRON Co.> |
| Recommended Jack Screw | XM2Z-0073 <OMRON Co.> |

| Pin Arrangement | Pin No. | RS485 (MPI only) | | |
|--|---------|------------------|------------------|--|
| | | Signal Name | Direction | Meaning |
|  <p>(ST unit side)</p> | 1 | NC | - | - |
| | 2 | NC | - | - |
| | 3 | LINE(+) | Input/ Output | LINE(+) |
| | 4 | RS(RTS) | Output | Request to Send |
| | 5 | SG | - | Signal Ground ^{*1} |
| | 6 | 5V | - | 5V external output ^{*2 *3} |
| | 7 | NC | - | - |
| | 8 | LINE(-) | Input/ Output | LINE(-) |
| | 9 | NC | - | - |
| | Shell | FG | - | Frame Ground ^{*1} (Common with SG) |

*1. The SG and FG terminals are isolated.

*2. The 5V output for Pin # 6 is not protected against overcurrent. To prevent damage or unit malfunctions, use only the rated current.

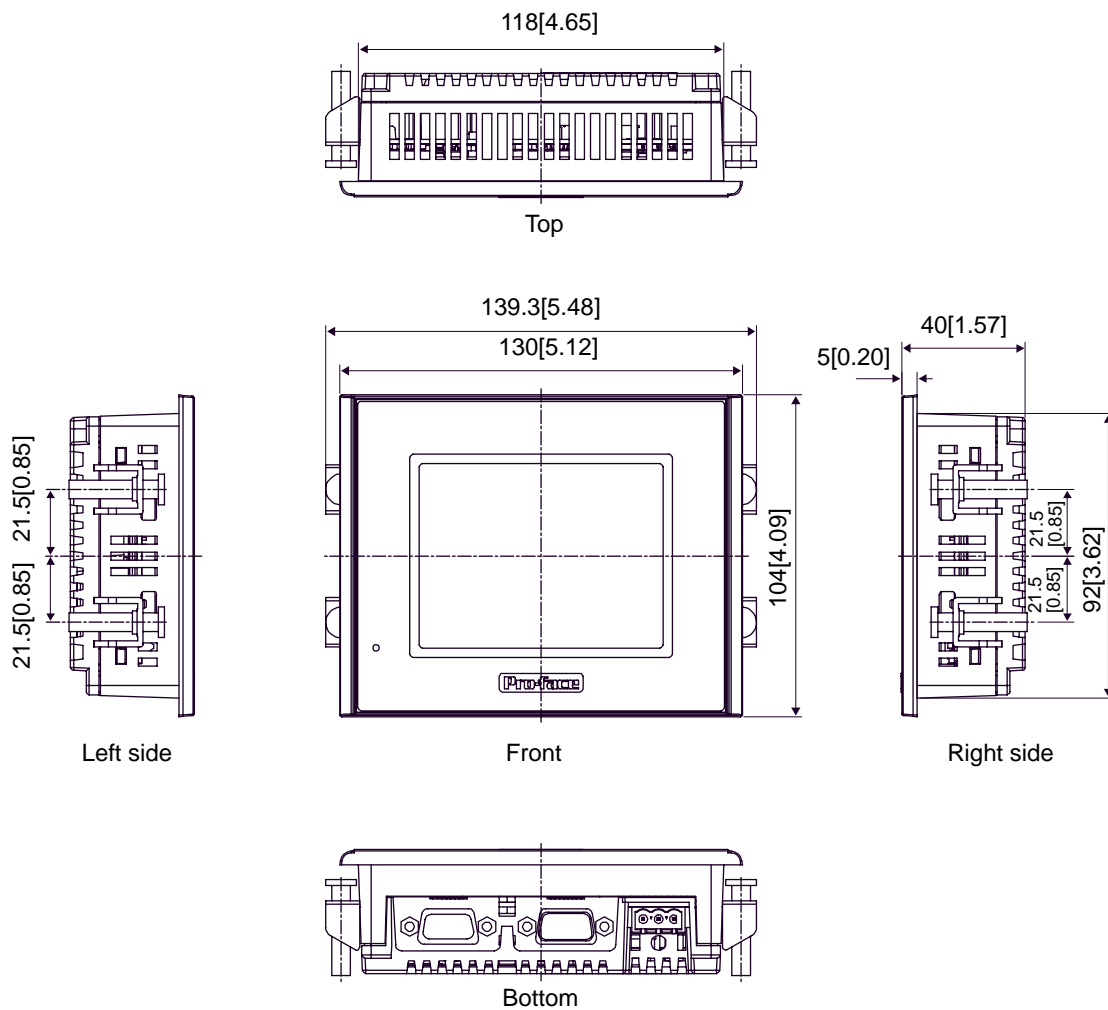
*3. When providing power via the Siemens Co.'s PROFIBUS connector, power cannot be connected to the Device/PLC.

3.1.4 Dimensions

The following dimensions apply to ST-3200 Series units.

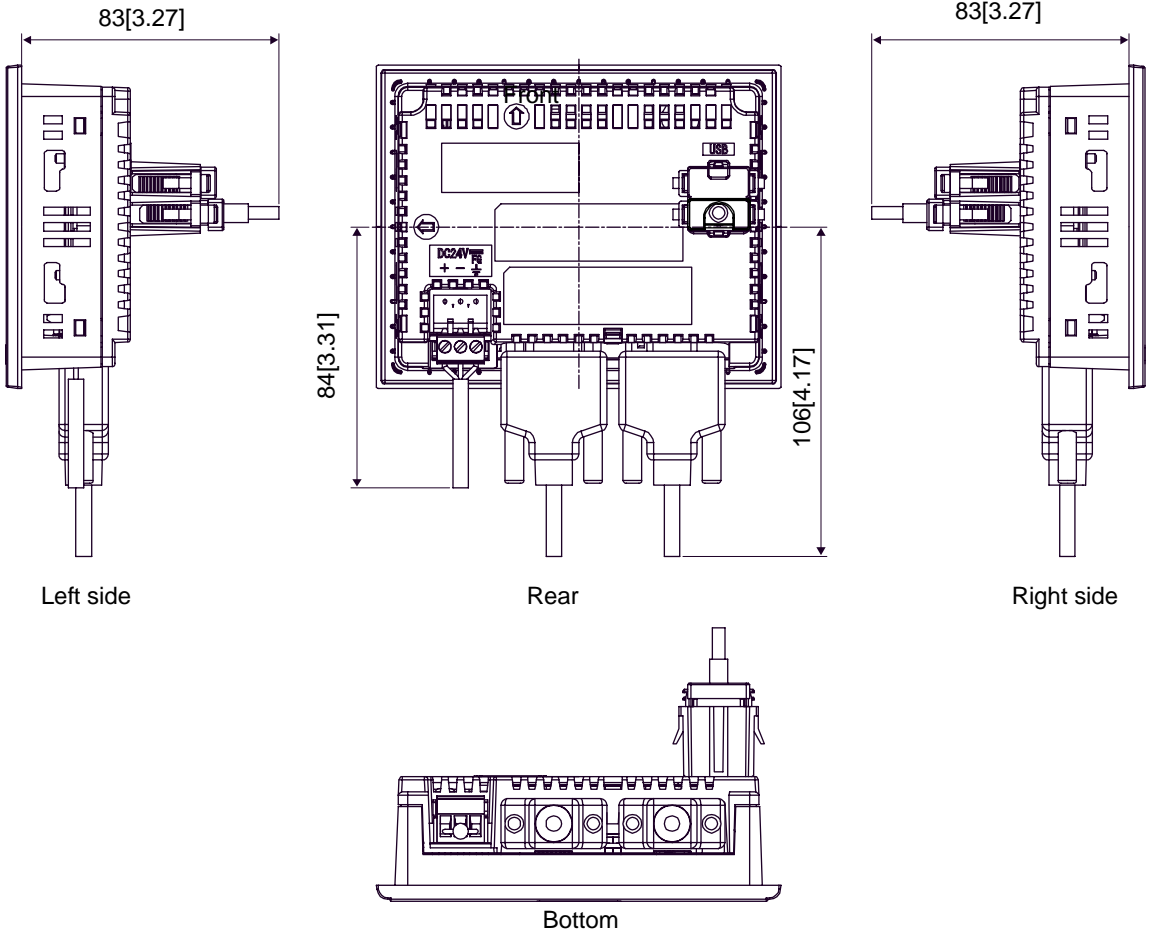
■ Installation Fasteners Attached Dimensions

Unit: mm[in.]



■ Cable Attached Dimensions

Unit: mm[in.]

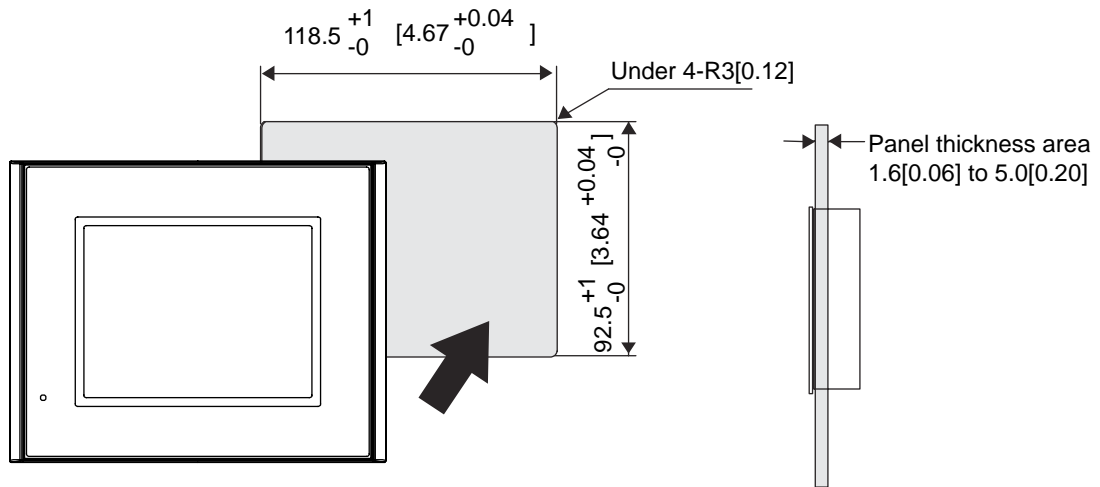


IMPORTANT

- Depending on the type of connection cable used, the dimensions shown above will change. The dimensions given here are representative values and are intended for reference only.

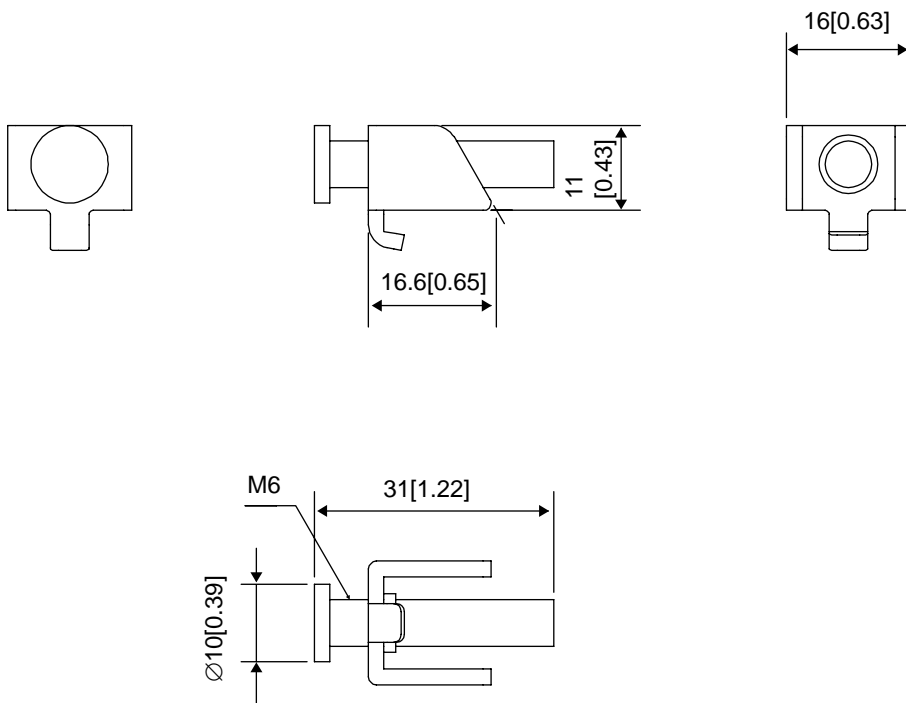
■ Panel Cut Dimensions

Unit: mm[in.]



■ Installation Fasteners

Unit: mm[in.]



4

Installation and Wiring

1. Installation
2. Wiring Precautions
3. USB Cable Clamp Attachment/Removal

This chapter describes the installation, cable arrangement of the ST Series and its peripheral equipment.

4.1 Installation

This section describes the procedures and precautions for installing the ST Series units.

■ Check the Installation Gasket's Seating

It is strongly recommended that you use the installation gasket, since it absorbs vibration in addition to repelling water.

For the procedure for attaching the installation gasket, refer to "[5.3 Replacing the Installation Gasket](#)".

SEE → *5.3 Replacing the Installation Gasket (page 5-4)*

IMPORTANT

- Before installing the ST into a cabinet or panel, check that the installation gasket is securely attached to the unit.
- A gasket which has been used for a long period of time may have scratches or dirt on it, and could have lost much of its dust and drip resistance. Be sure to change the gasket periodically (or when scratches or dirt become visible).

■ Creating a Panel Cut

Create the correct sized opening required to install the ST, using the installation dimensions given.

Determine the panel thickness according to the panel thickness range with due consideration of panel strength.

SEE → *ST-3200 Series*
■ *Panel Cut Dimensions (page 3-13)*

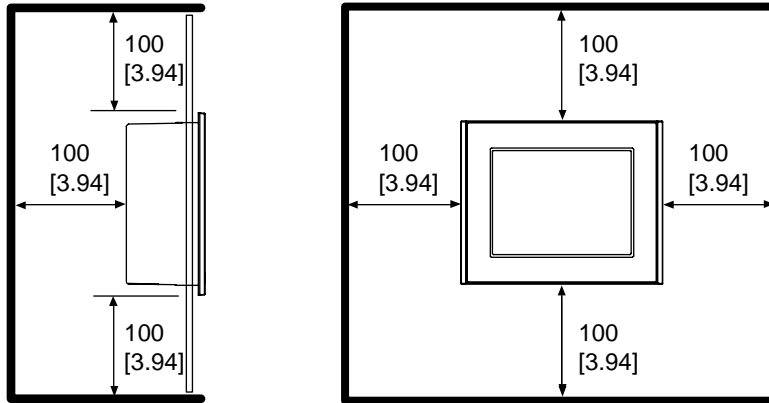
NOTE

- Check that the installation panel or cabinet's surface is flat, in good condition and has no jagged edges. Also, if desired, metal reinforcing strips can be attached to the inside of the panel, near the Panel Cut, to increase the panel's strength.

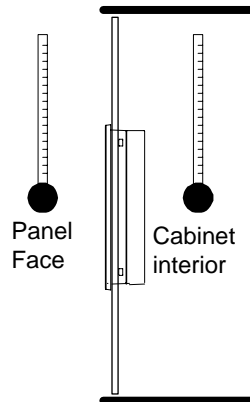
■ Installation Requirement

- For easier maintenance, operation, and improved ventilation, be sure to install the ST at least 100 mm [3.94 in.] away from adjacent structures and other equipment.

Unit: mm[im.]

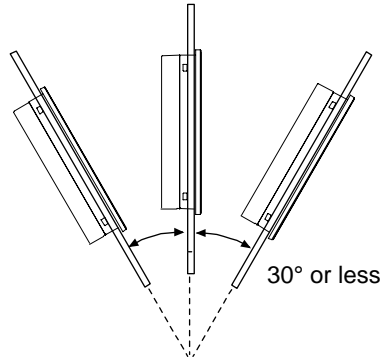


- Be sure that the ambient operation temperature and the ambient humidity are within their designated ranges. (Ambient operation temperature: 0 to 50°C, Ambient humidity: 10 to 90%RH, Wet bulb temperature: 39°C max.) When installing the ST on the panel of a cabinet or enclosure, “Ambient operation temperature” indicates both the panel face and cabinet or enclosure’s internal temperature.



- Be sure that heat from surrounding equipment does not cause the ST to exceed its standard operating temperature.

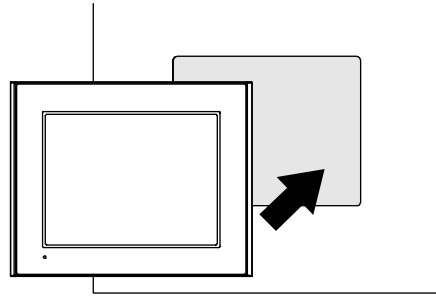
- When installing the ST in a slanted panel, the panel face should not incline more than 30°.



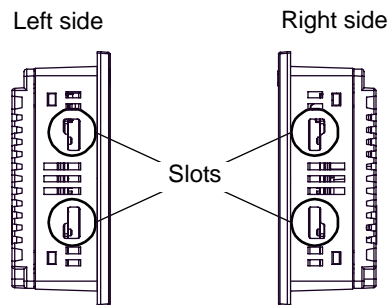
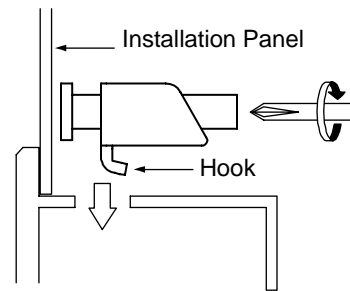
- When installing the ST in a slanted panel, and the panel face inclines more than 30°, the ambient temperature must not exceed 40°C. You may need to use forced air cooling (fan, A/C) to ensure the ambient operating temperature is 40°C or below.
- When installing the ST vertically, position the unit so that the Power Input Terminal Block is also vertical.

■ Installing the ST

- (1) Insert the ST into the panel cut, as shown.



- (2) Mount four pieces of the panel-mounting brackets on the right and left sides, or the top and bottom sides of the panel to secure the panel.



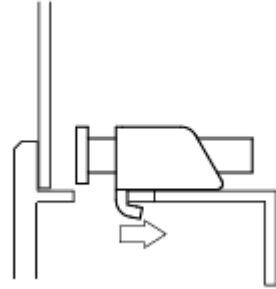
IMPORTANT

- Be sure to insert installation fasteners in the recessed portion of a installation fasteners hole. (Refer to the following figure) If the fasteners are not correctly attached, the ST unit may shift or fall out of the panel.

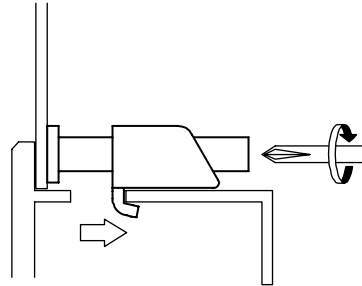


left and right

- (3) Insert each of the fasteners shown below.
Be sure to pull the fastener back until it is flush with the rear of the attachment hole.



- (4) Use a Phillips screwdriver to tighten each fastener screw and secure the ST in place.



IMPORTANT





- Tightening the screws with too much force can damage the ST unit's plastic case.
- The torque required to tighten these screws is 0.5 N•m.

4.2 Wiring Precautions

This section describes the procedures and precautions for wiring power cords.

4.2.1 Connecting the Power Cord

WARNING

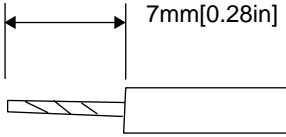
-  To avoid an electric shock, prior to connecting the ST unit's power cord terminals to the power terminal block, confirm that the ST unit's power supply is completely turned OFF, via a breaker, or similar unit.
-  Supplying a power voltage other than that specified will damage the power source and the ST unit.
-  Since there is no power switch on the ST unit, be sure to attach a breaker-type switch to its power cord.
-  When the FG terminal is connected, be sure the wire is grounded.

IMPORTANT

- When the FG terminal is connected, be sure the wire is grounded. Not grounding the ST unit will result in excess noise and vibration.
- ST Series (except AST-3211A COM2) have the SG (signal ground) connection and the FG (frame ground) connection inside.
When connecting the SG wire to another device, be sure that the design of the system/connection does not produce a shorting loop.

■ When using the DC Type

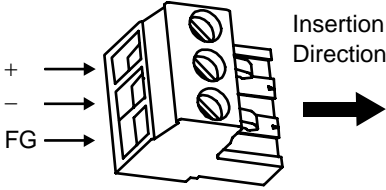
◆ Power Cord Specifications

| | |
|---------------------|---|
| Power Cord Diameter | 0.75 to 2.5mm ² (18-12AWG) |
| Conductor Type | Simple or Twisted Wire |
| Conductor Length |  |

IMPORTANT

- Use copper conductors only.
- If the Conductor's end (individual) wires are not twisted correctly, the end wires may either short against each other, or against an electrode.

◆ Power Connector (Plug) Specifications

| | | |
|--|----|---|
|  | + | 24V |
| | - | 0V |
| | FG | FG Grounding Terminal connected to the ST |

NOTE

- The power supply connector (plug) is CA5-DCCNM-01 (made by Pro-face) or MSTB2,5/3-ST-5,08 (made by Phoenix Contact^{*1}).

*1. For details, please contact your local Phoenix Contact distributor.

◆ Wiring

When connecting the Power Cord, use the following items when performing wiring. (Items are made by Phoenix Contact.)

| | |
|-------------------------------------|---|
| Recommended Driver | SZF 1-0.6x3.5 (1204517) |
| Recommended Pin Terminals | AI 0.75-8GY (3200519) AI 1-8RD (3200030) AI 1.5-8BK (3200043) AI 2.5-8BU (3200522) |
| Recommended Pin Terminal Crimp Tool | CRIMPFOX ZA3 (1201882) |

◆ Connecting the Power Cord

IMPORTANT

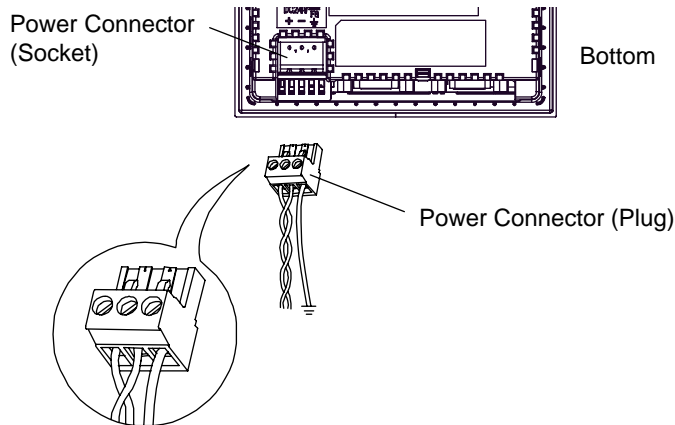
- Be sure to remove the connector from the ST unit prior to starting wiring. Failure to do so may cause an electric shock.
- The temperature rating of field installed conductors: 75°C only.

- (1) Confirm that the power cord is unplugged from the power supply.
- (2) Remove the power connector (plug) from the main unit.
- (3) Strip the membrane of the power cord, twist the wire ends, and connect them to the Power Connector.

IMPORTANT

- Use a flat-blade screwdriver (Size 0.6 X 3.5) to tighten the terminal screws. The torque required to tighten these screws is 0.5 to 0.6N•m[5-7Lb•in].
- Do not solder the cable connection.

- (4) Reattach the Power Connector.

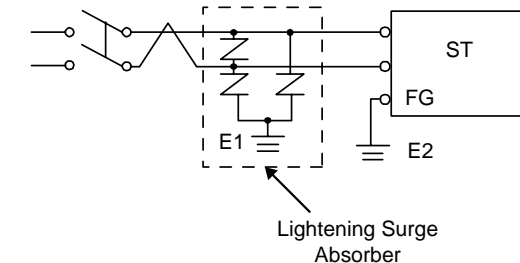
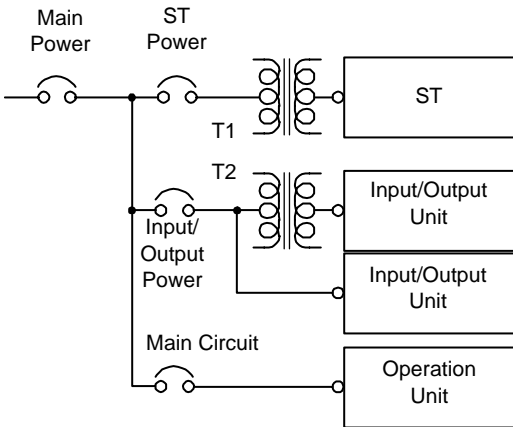
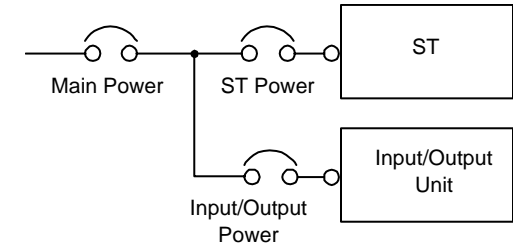
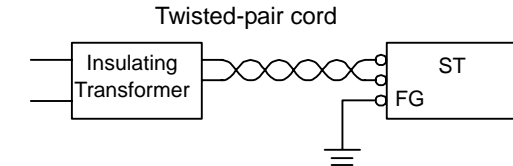
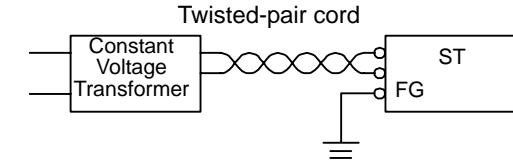


NOTE

- Be sure to twist the power cords together, up to the power connector.

4.2.2 Connecting the Power Supply

This section describes the precautions for supplying a power voltage.



- If the supplied voltage exceeds the ST unit's range, connect a constant voltage transformer.

SEE → Chapter 3 Specifications (page 3-1)

- For between the line and ground, select a power supply that is low in noise. If there is an excess amount of noise, connect an insulating transformer.

IMPORTANT

- Use constant voltage and insulating transformers with capacities exceeding Power Consumption value.

- When supplying power to the ST unit, be sure to separate the input/output and power lines, as shown.
- To increase the noise resistance quality of the power cord, simply twist each power wire before attaching the Ring Terminal.
- The power supply cable must not be bundled or positioned close to main circuit lines (high voltage, high current), or input/output signal lines.
- Connect a lightning surge absorber, as shown in the diagram, to deal with power surges.
- To avoid excess noise, make the power cord as short as possible.
- 24V DC input unit is must be used with a Class 2 power supply.

IMPORTANT

- Be sure to ground the surge absorber (E1) separately from the ST unit (E2).
- Select a surge absorber that has a maximum circuit voltage greater than that of the peak voltage of the power supply.

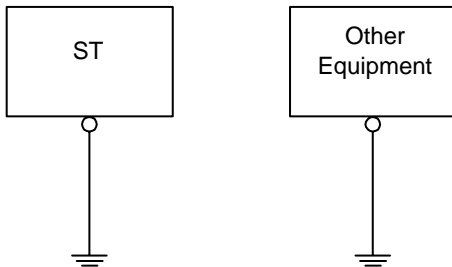
4.2.3 Grounding

This section describes the precautions for grounding the ST unit.

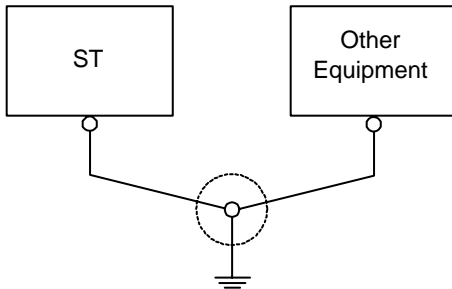
⚠ CAUTION

❗ Do not use common grounding, since it can lead to an accident or machine breakdown.

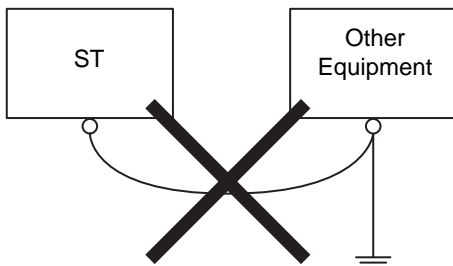
(a) Exclusive Grounding (BEST)



(b) Exclusive Grounding (OK)



(c) Common Grounding (Not OK)



- When supplying power to the ST unit, be sure to separate the input/output and power lines, as shown. [diagram (a)]

IMPORTANT

- Check that the grounding resistance is 100Ω or less.
- FG and SG terminals are internally connected in the ST. When connecting an external device to the ST using the SG terminal, be sure to check that no short-circuit loop is created when you setup the system.
- The grounding wire should have a cross sectional area greater than 2mm^2 . Create the grounding point as close to the ST unit as possible, and make the wire as short as possible. When using a long grounding wire, replace the thin wire with a thicker wire, and place it in a duct.

- If exclusive grounding is not possible, use a common grounding point. [diagram (b)] A D-type grounding or equivalent should be used for the grounding point.

NOTE

- If the equipment does not function properly when grounded, disconnect the ground wire from the FG terminal.

4.2.4 I/O Signal Line Placement

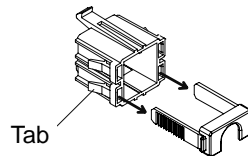
- Input and output signal lines must be separated from the power control cables for operating circuits.
- If this is not possible, use a shielded cable and connect the shield to the ST unit's frame.

4.3 USB Cable Clamp Attachment/Removal

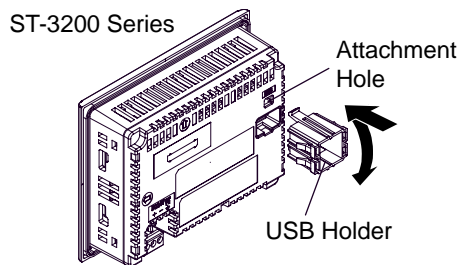
This clamp is used to prevent the USB cable connected to the USB Host Interface on the bottom of the ST unit from being unplugged due to vibration or other causes.

■ Attachment

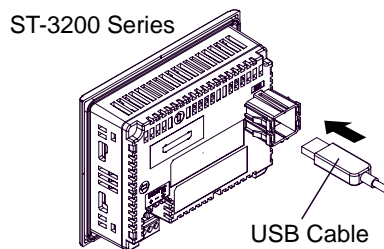
- (1) Before starting the procedure, lift up the tab on both sides of the USB Holder and remove the USB Cover.



- (2) Attach the USB holder to the USB Host Interface part of the main unit. Hook a pick of the USB holder to the attachment hole of the main unit and then insert the other (lower) pick to fix the USB holder.

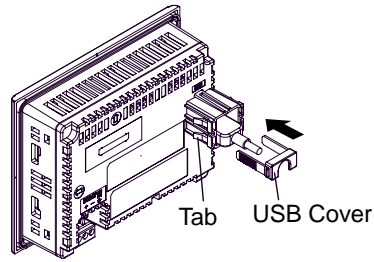


- (3) Insert the USB cable into the USB Host Interface.



- (4) Attach the USB cover to fix the USB cable. Insert the USB cover into the tab of the USB holder.

ST-3200 Series



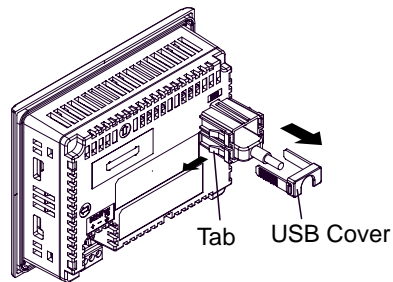
IMPORTANT

- Check the up/down orientation of the USB cover to ensure that the USB cable is secured properly.

■ Removal

- (1) Lift up the tab of the USB holder and then remove the USB cover as shown below.

ST-3200 Series



- (2) After removing the USB cable, remove the picks pushing the USB holder from both top and bottom.

5

Maintenance

1. Cleaning the Display
2. Periodic Check Points
3. Replacing the Installation Gasket
4. Replacing the Backlight

This chapter explains cautions and inspection criteria that will ensure trouble-free use of the ST.

5.1 Cleaning the Display

When the surface or frame of the display become dirty, soak a soft cloth in water with a neutral detergent, wring the cloth tightly, and wipe the display.

IMPORTANT

- Do not use paint thinner, organic solvents, or a strong acid compound to clean the unit.
- Do not use hard or pointed objects to operate the touch-screen panel, since it can damage the panel surface.

5.2 Periodic Check Points

To keep your ST unit in its best condition, please inspect the following points periodically.

■ ST Operation Environment

- Is the operating temperature within the allowable range (0°C to 50°C)?
- Is the operating humidity within the specified range (10%RH to 90%RH, dry bulb temperature of 39°C or less)?
- Is the operating atmosphere free of corrosive gasses?

When using the ST unit inside a panel, the ambient environment refers to the interior of the panel.

■ Electrical Specifications

- Is the input voltage appropriate?
DC19.2 to 28.8V

■ Related Items

- Are all power cords and cables connected properly? Have any become loose?
- Are all mounting brackets holding the unit securely?
- Are there many scratches or traces of dirt on the installation gasket?

5.3 Replacing the Installation Gasket

The installation gasket provides protection against dust and moisture.

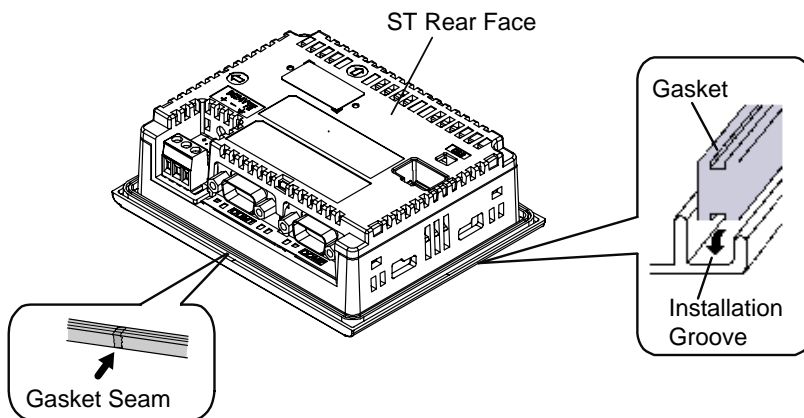
IMPORTANT

- A gasket which has been used for a long period of time may have scratches or dirt on it, and could have lost much of its water resistance. Be sure to change the gasket at least once a year, or when scratches or dirt become visible.
- The ST unit installation gasket's model number is as follows.

| | |
|----------------|------------|
| ST-3200 Series | ST400-WP01 |
|----------------|------------|

■ Installation Gasket Attachment Procedure

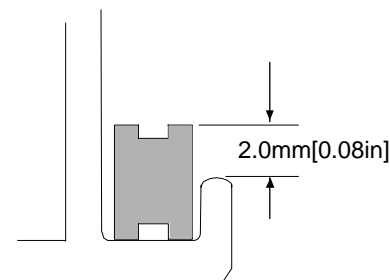
- (1) Place the ST on a flat, level surface facing the display face downwards.
- (2) Remove the gasket from the ST.
- (3) Attach the new gasket to the ST. Be sure to insert the gasket into the ST's groove so that the gasket's groove sides are vertical.



- (4) Check that the gasket is attached correctly to the ST.

IMPORTANT

- The gasket must be inserted correctly into the groove for the ST's moisture resistance to be equivalent to IP65f.
- Since the gasket is flexible but not elastic, be careful not to stretch it unnecessarily, as doing so could tear the gasket.
- Be sure the gasket's seam is not inserted into any of the unit's corners, only in the straight sections of the groove. Inserting it into a corner may lead to its eventually tearing.
- To ensure stable resistance against dust and moisture, insert the gasket so that the seam is at the bottom of the ST unit.
- The upper surface of the gasket should protrude approximately 2.0mm[0.08in] out from the groove. Be sure to check that the gasket is correctly inserted before installing the ST into a panel.



5.4 Replacing the Backlight

The backlights of the ST3000 Series are not replaceable. Although the backlights used are a long-life type, their lifetime may be shorter than the specified period depending on the ST3000 Series operating environment. We would like to replace the displays instead of replacing the backlights. Please contact your Pro-face local distributor.