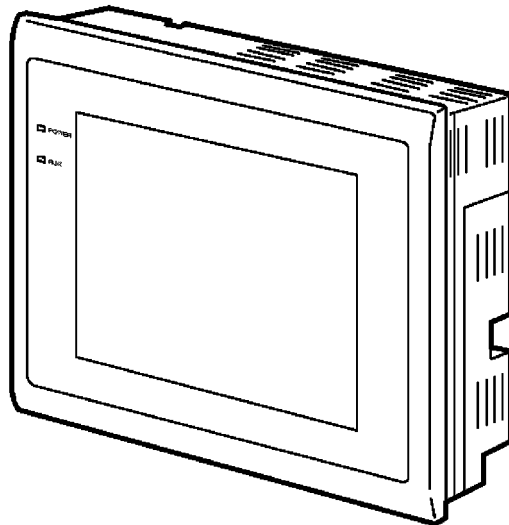


NT610C

Programmable Terminal

Operation Manual

Produced May 1997



OMRON Product References

All OMRON products are capitalized in this manual. The word "Unit" is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation "Ch," which appears in some displays and on some OMRON products, often means "word" and is abbreviated "Wd" in documentation in this sense.

The abbreviation "PC" means Programmable Controller and is not used as an abbreviation for anything else.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1, 2, 3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

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About this Manual:

This manual describes the basic functions and operation procedures of the NT-series programmable terminal NT610C, its operations when connected to a PC, and includes the sections described below.

Please read this manual carefully and be sure you understand the information provided before attempting to install and operate the NT-series programmable terminal NT610C.

 **WARNING** Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

SECTION 1 Capabilities of NT610C

This section describes the functions and mechanism of the NT610C.

SECTION 2 Hardware Settings and Connections

This section describes the NT610C settings, mounting of mountable optional devices, connection to the PLC, and the hardware settings.

SECTION 3 How to Use the NT610C

This section describes the procedure prior to operation of the NT610C, and useful functions when using the NT610C.

SECTION 4 NT610C Functions and Operation

This section describes the basic functions used when operating the NT610C and when creating screen data using the support tool.

SECTION 5 Troubleshooting and Maintenance

This section describes the action to take when the NT610C is not operating normally.

APPENDIX This section describes the specifications of the NT610C, the specifications and wiring for the expansion I/O unit, and how to make the cable for connecting the support tool.

PRECAUTIONS

This section provides general precautions for using the Programmable Terminal.

The information contained in this section is important for the safe and reliable application of the Programmable Terminal. You must read this section and understand the information contained before attempting to set up or operate a Programmable Terminal.

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1 Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of installing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of managing FA systems and facilities.


2 General Precautions


The user must operate the product according to the performance specifications described in the operation manuals.

Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

This manual provides information for using the Programmable Terminal. Be sure to read this manual before attempting to use the software and keep this manual close at hand for reference during operation.

 **WARNING** It is extremely important that Programmable Terminals and related devices be used for the specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult with your OMRON representative before applying Programmable Terminals to the abovementioned applications.

 **WARNING** Do not use input functions such as PT touch switches for applications where danger to human life or serious damage is possible, or for emergency switch applications.


3 Safety Precautions


Read these safety precautions carefully and make sure you understand them before using the Programmable Terminal so that you can use it safely and correctly.

Safety Conventions and their Meanings

This operation manual uses the following conventions and symbols to indicate cautions, warnings, and dangers in order to ensure safe use of the PT. The cautions, warnings, and dangers shown here contain important information related to safety. The instructions in these cautions, warnings, and dangers must be observed.

The conventions used and their meanings are presented below.

 **WARNING** Indicates information that, if not heeded, could possibly result in loss of life or serious injury.

 **Caution** Indicates information that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

 **WARNING**

- Do not attempt to take the NT610C apart and do not touch any internal parts while the power is being supplied. Doing either of these may result in electrical shock.
- Do not touch any of the terminals or terminal blocks while the power is being supplied. Doing either of these may result in electrical shock.
- Switch off the power before replacing the backlight. Otherwise you could sustain an electric shock.
- Tighten the screws on the terminal block to the torque specified in relevant manuals. The loose screws may result in short-circuit, malfunction, or burning.

 **Caution**

- Do not use input functions such as PT touch switches for applications where danger to human life or serious property damage is possible or for emergency switch applications.
- On unpacking the NT610C, check its external appearance and confirm that there is no damage. Also confirm that there is no abnormal noise on shaking the NT610C lightly. The product may malfunction if it is damaged.
- When connecting the expanded I/O unit, make sure that the power supply is cut.

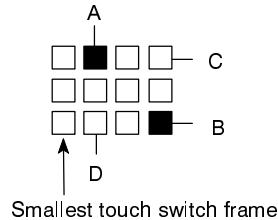
Safety Precautions

- Do not touch the surface of the board on which the components are mounted with your bare hands. Discharge the static electricity from your body before handling the board. Otherwise static electricity may cause the components to malfunction.
- During work at the panel, take care to ensure that no metal scraps enter the unit. Otherwise the product may malfunction.
- For the connection to the power supply terminal block, twisted wires of 2 mm² or greater cross sectional area and M3.5 size crimp terminals must be used. Tighten the screws on the terminal block to a torque of 0.8 N·m. Otherwise fire may occur.
- Do not connect the wires to the power input terminal.
- When removing the terminal block, do not forcibly pull it up with the terminal block cover held by hand.
- Do not insert the screwdriver to the full. Because it may damage internal boards.
- Do not install the NT610C at sites subject to the following conditions. Otherwise the product may malfunction.
 - Severe temperature variations
 - Temperatures or humidities outside the ranges stated in the specifications
 - High humidity, condensation
 - Splashing chemical agents
 - Severe oil splashing
 - Corrosive or flammable gases
 - Strong vibrations or shocks
 - Direct exposure to wind and rain (outdoor sites)
 - Strong ultra-violet irradiation
- Take adequate measures to ensure shielding if the NT610C is used at a location subject to any of the following conditions. Otherwise the product may malfunction.
 - Static electricity, or severe noise from other equipment
 - Strong electromagnetic fields
 - Nearby power cables
 - Potential exposure to radioactivity
- Grounding wiring should be performed individually. If a common grounding wire is used with other equipment, the Terminal may be affected adversely.
- Confirm system safety before turning the power ON/OFF or resetting. Otherwise the system may operate unpredictably.
- Press touch switches with a force of no greater than 50 N. Applying higher force may cause glass to break, cause injuries, and prevent operation.
- If touch switches are pressed in rapid succession, their inputs may not be successfully received.
Confirm that the input of a touch switch has been successfully received before moving on to the next operation.

- Caution on pressing touch switches at 3 points

Example 1

When switches are created at positions A and B and at the points where the vertical and horizontal lines extending from these two points intersect, i.e. points C and D:



- When switches A, B, and C are switched on at the same time, switch D is also assumed to have been switched on due to the configuration of the touch switches.
- When switches A, B, and D are switched on at the same time, switch C is also assumed to have been switched on due to the configuration of the touch switches.

- Do not press touch switches carelessly while the backlight is off or while nothing is displayed on the screen.
Otherwise the system may operate unpredictably.
Only press touch switches after confirming system safety.
- After replacing the CFL units, be sure to perform the I/O check touch switch test and verify proper operation by performing a test run.
- Do not disassemble for repairs or modification.
Otherwise the product may malfunction.
- The disposal of NT610C (including batteries to be disposal, backlight) may be regulated by national or local authorities. Dispose of them in accordance with the laws and regulations of the relevant country and local authority.
- Never short the battery terminals, attempt to charge the battery or take it apart, heat it, or discard it into fire. In the worst case, explosion may occur.
- When the extended I/O check is performed (in the maintenance mode), signals are output to the output terminals. If there is equipment connected to the output terminals, confirm safety before performing this test.
- Depending on how the power is switched ON/OFF, the entire system may stop. Follow the correct procedure when switching the power ON/OFF. Otherwise the system may operate unpredictably.
- Set so that there is no overlap between the PT status control area and PT status notify area. Otherwise the system may operate unpredictably.

SECTION 1

Capabilities of NT610C

NT610C is a programmable terminal with a large screen of 8-color display.

This section gives examples of NT610C usage and the NT610C facilities so that you will understand a general idea of the NT610C and the procedures up to those for operating the system.

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1-1 Getting Starting

To ensure that the NT610C works correctly, carefully observe the following when installing and handling it.

Location

Do not install the NT610C in a location subject to the following conditions;

- Near a computer, radio transmitter or receiver, etc.
- Dust, chemicals, or steam
- Severe temperature fluctuations
- High humidity and condensation
- Strong electrical or magnetic fields
- Poor ventilation
- Severe vibration
- Direct sunlight

Handling

Do not;

- Subject the NT610C to strong shocks or vibrations
- Put heavy objects on the NT610C
- Supply a voltage different from the specified voltage
- Disassemble or modify the NT610C

1-2 Operation and Mechanism of NT610C

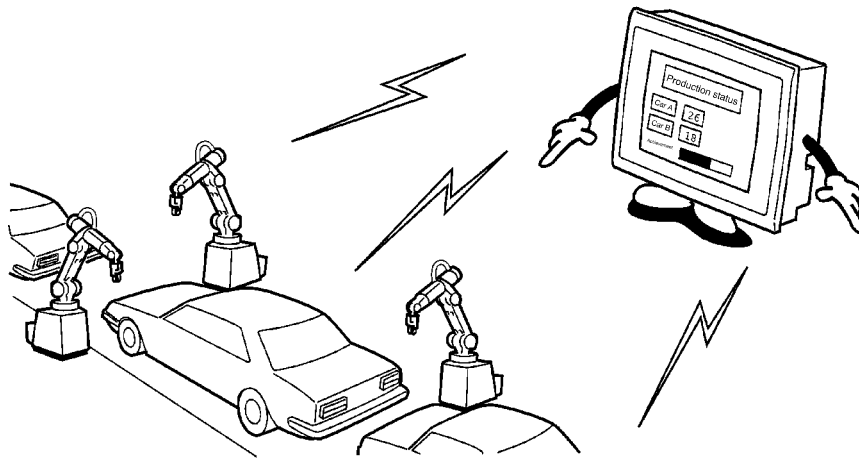
NT610C is a programmable terminal with a large liquid crystal screen of 8-color display. This section gives the basic knowledge of the NT610C for those who use a programmable terminal (PT) for the first time.

1-2-1 Function of the NT610C at a Factory

NT610C performs various activities in production fields, such as displaying information in the factory and communicating information to the host.

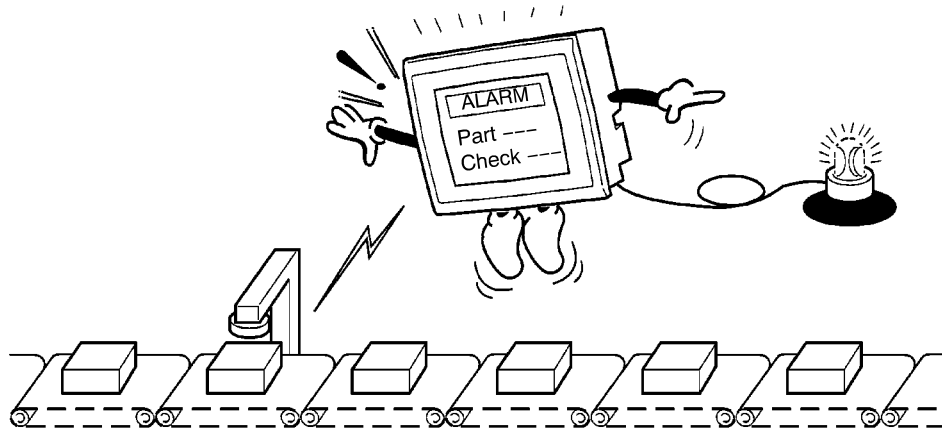
Monitoring of Production Line Operational Statuses

NT610C displays on a real-time basis such information as sent from host units such as programmable logic controllers (PLC).



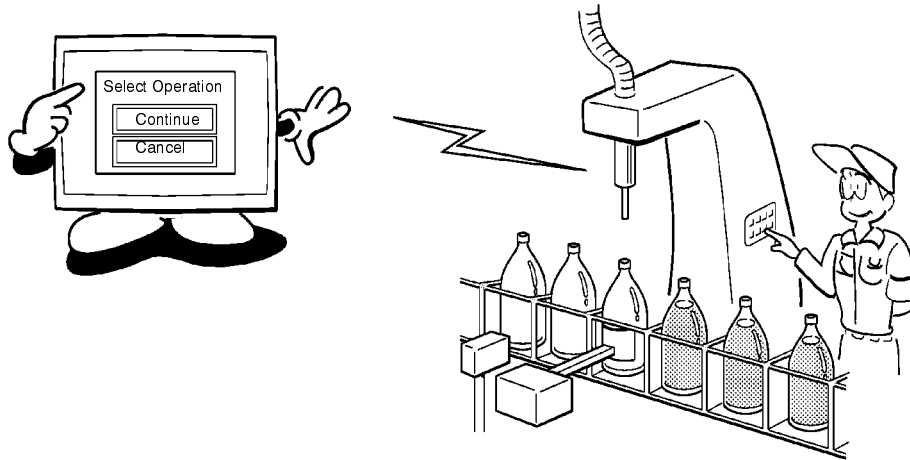
Instructions to Factory Workers

By displaying on the screen or giving the alarm, the NT610C notifies workers of various information such as work procedures and system or equipment failures in order to prompt the appropriate work or remedial action.



Switch Function on the NT610C

NT610C sends, to host units, data input from touch panels or expanded I/O units. The NT610C may be used as an operating panel or an outside unit control terminal.

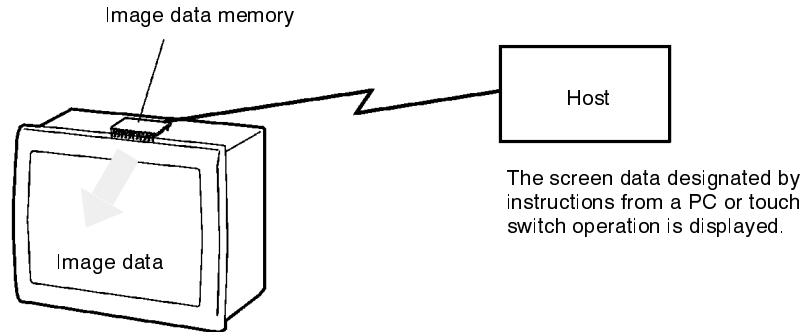


1-2-2 Operations of NT610C

The NT610C performs four major activities as described below.

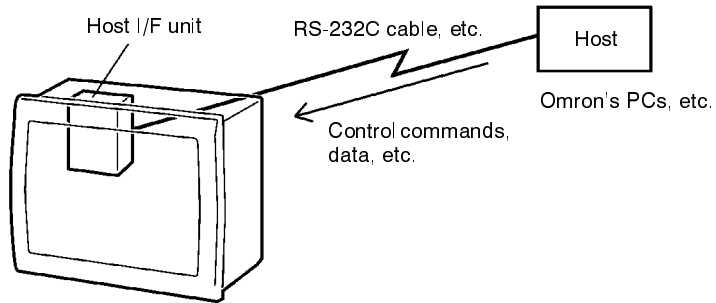
(1) Display of screens

The information to be displayed (screen data) can be created on a personal computer by using support tools and held in the image data memory of the NT610C. The screen data may be displayed on the NT610C in response to the instructions from host units or touch switch operation.



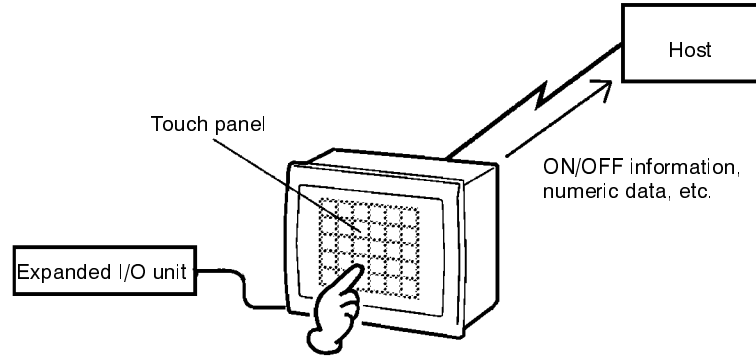
(2) Receiving of control and data from host units

NT610C can be connected to a programmable logic controller (PLC) through the host I/F units installed in the NT610C body. The NT610C may be controlled with commands entered from its host or various data may be sent to the NT610C from the host.



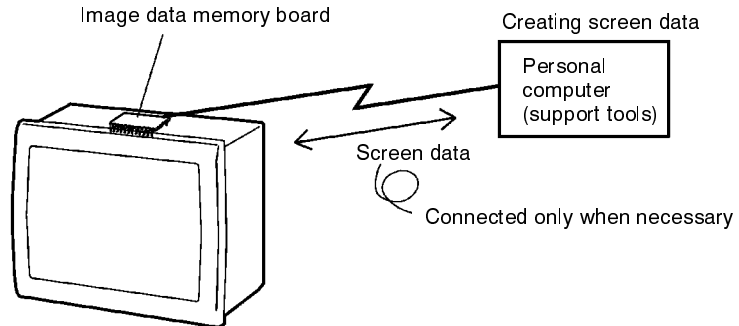
(3) Sending of input data to host units

Data input through a touch panel or an expanded I/O unit can be sent to host units.



(4) Creation of screen data

The screen data to be displayed on the NT610C can be created on a personal computer by using support tools. The created screen data is then transferred to the NT610C through a communication cable so that it will be held in the screen data memory of the NT610C.



1-3 Features

NT610C has the following features which differ from those of existing NT-series PTs:

Large Screen of 640 x 480 Resolution

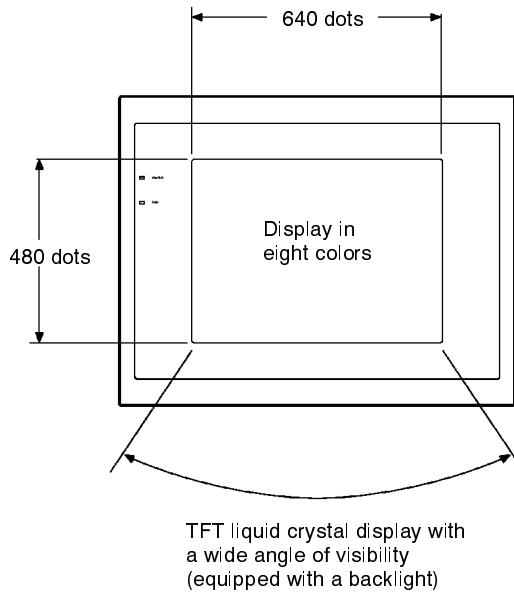
The number of vertical dots has been increased by 80 dots as compared with other NT-series large PTs, enabling higher resolution characters and graphics to be displayed.

Display in Eight Colors

Eight colors can be chosen for characters or figures, which lets the user express them in various ways by specifying background, ordinary display, or input colors. This feature also allows neutral tints to be displayed by using a tiling pattern.

TFT Liquid Crystal Display with a Wide Angle of Visibility

Easy-to-read TFT liquid crystal screen with a wide angle of visibility has been adopted for the display unit. As the unit is equipped with a backlight, it is easy to read the screen in the factory.



High Resolution Touch Switch

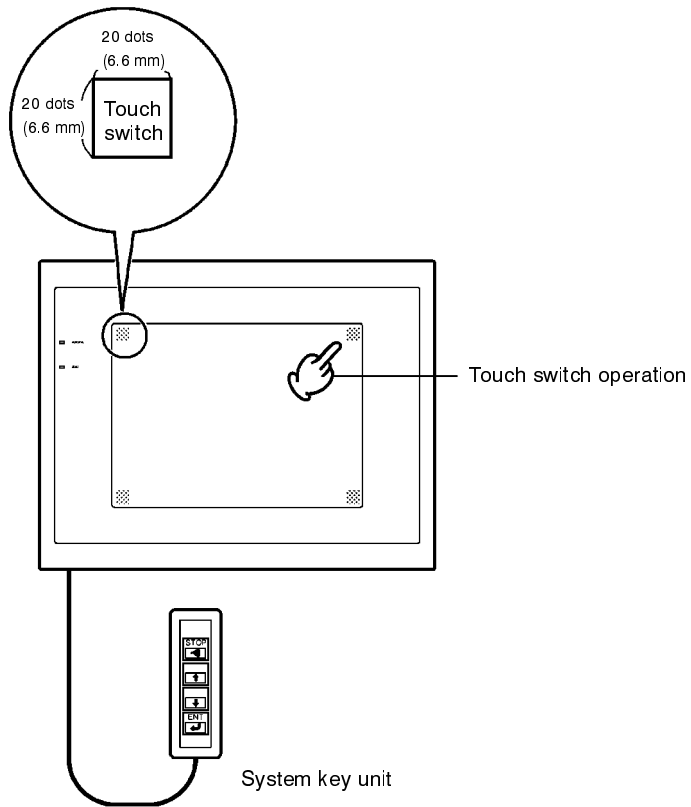
The smallest size of touch switch has been reduced to 20 x 20 dots. On the screen, up to 768 touch switch cells are available lying on 24 lines and in 32 columns.

Touch Switch Operation on the System Menu

The touch switches located in the four screen corners is the system menu display switches. The system menus can be chosen or input by only touching menu items.

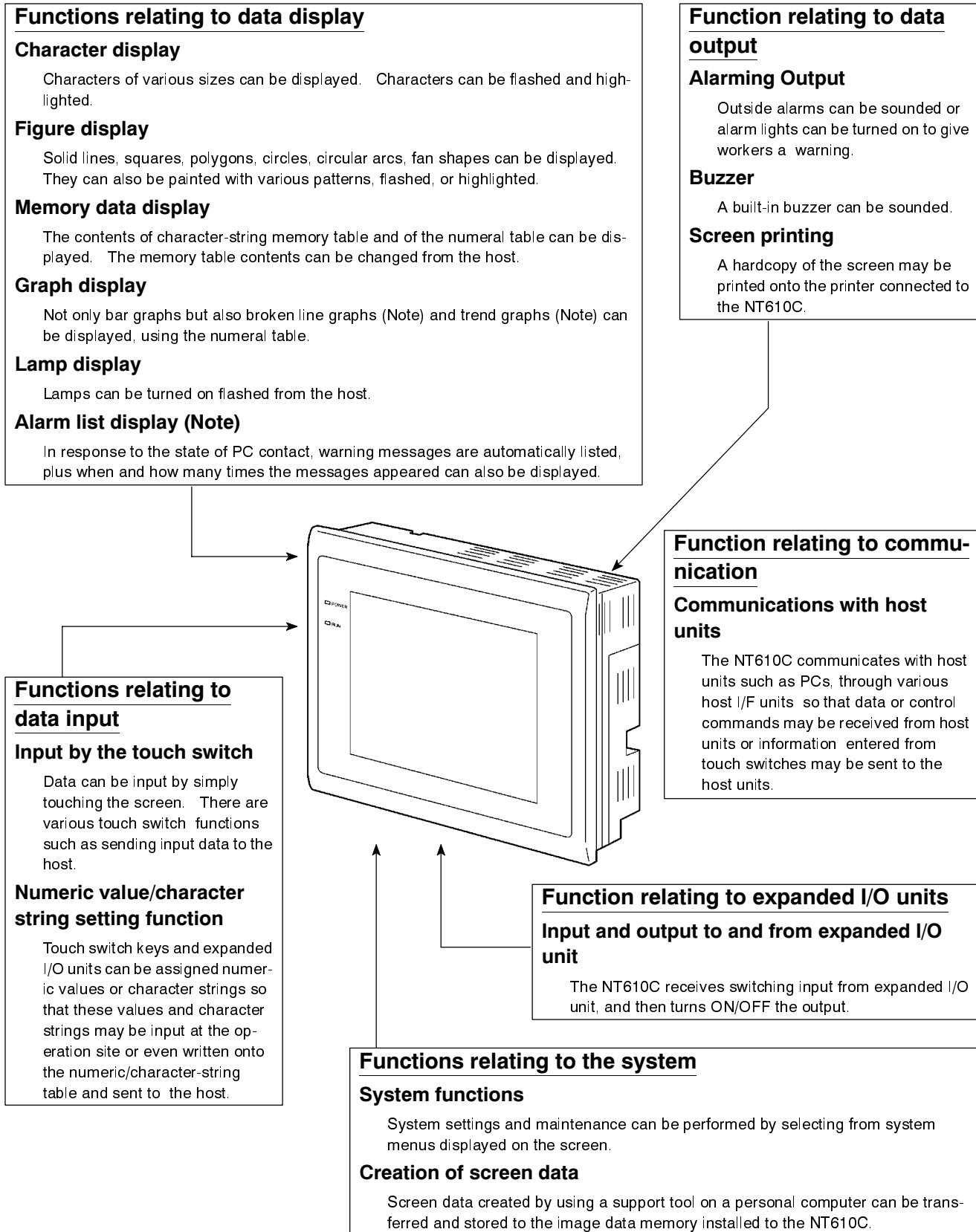
Easy-to-use System Keys

The systems keys located on the front side of existing NT-series PTs have been removed for the NT610C. With the NT610C, these keys are provided as a separate unit connected to the NT610C through a cable so that the keys can be used in a wide range. This unit is optional.



1-4 Principal Functions of NT610C

The following are the principal functions of the NT610C:

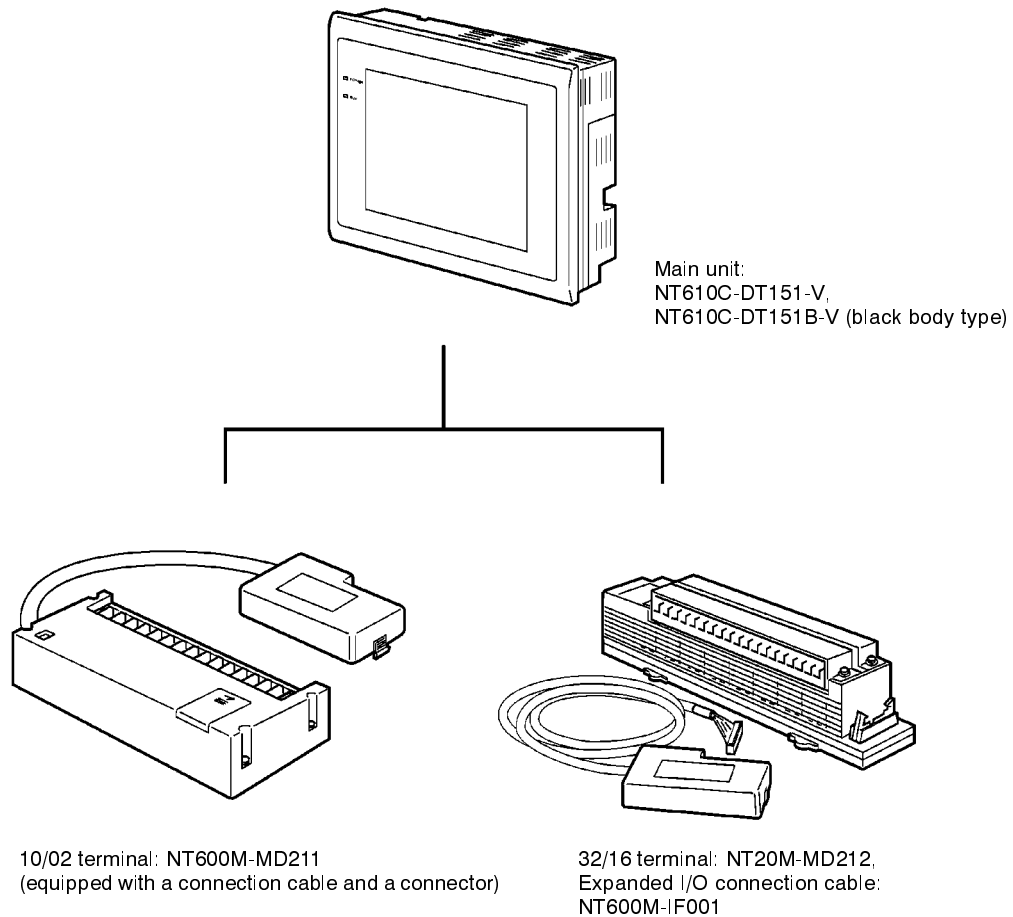


1-5 Extension of NT610C

Connecting optional expanded I/O units enables extension of the input and output function. I/O units may be chosen according to purposes.

Expanded I/O Unit Configuration

Input and output functions may be extended by connecting to the NT610C the expanded I/O units shown in the figure below. Inputs to the NIT610C may be made from the touch panel of the liquid crystal screen or from the expanded I/O units at the time of direct connection.



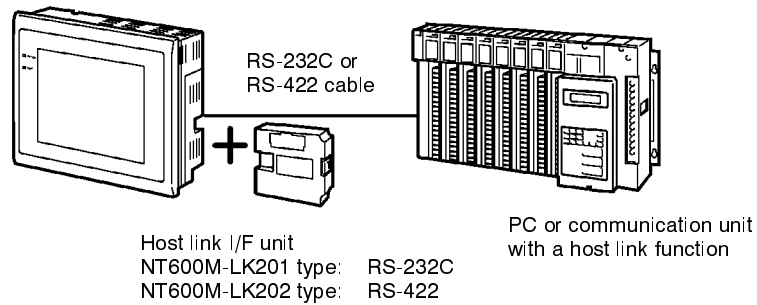
1-6 Connection of NT610C and Host Units

The NT610C may be connected to host units such as PCs through host I/F units. According to ways of connection, suitable host I/F units will be installed in the NT610C. The following are the supported connections:

Host Link

NT610C can be connected to a PC by means of the host link method. In this case, the host I/F unit must be installed in the NT610C and connected to the host unit through the RS-232C or RS-422 cable. The host I/F reads information about host unit contacts and channel operation into the NT610C and controls these contacts and channels or displays the information.

Refer to the "NT-series Direct Connection Operation Manual." (V026-E1-1)

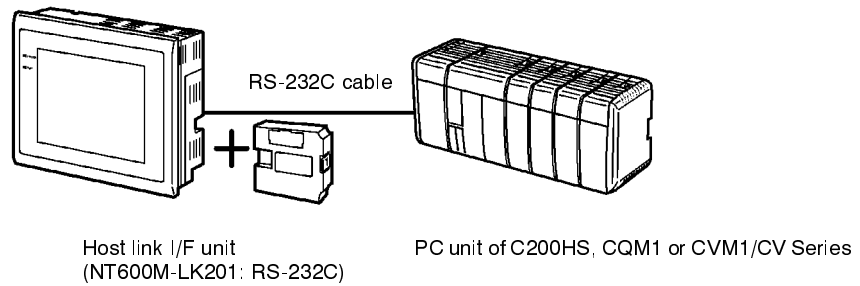


NT Link

Where a PC is that of the CQM1 or CVM1/CV series, the NT610C may be connected to the PC, using a host link method. In this case, a host link I/F unit must be installed in the NT610C and connected to the host unit through the RS-232C cable while a system ROM is used that is different from the ordinary ROM for the host link.

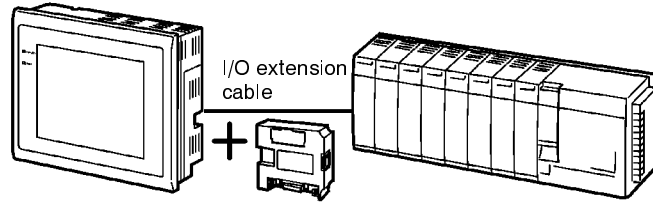
The host link I/F unit uses the NT link system to read information about host unit contacts and channel operations into the NT610C and controls these contacts and channels or displays the information.

For the NT link system, refer to the "NT-series Direct Connection Operation Manual." (V026-E1-1)



C200H

NT610C can be connected to C200H, C200HS, C20H, C28H, C40H, or C60H by the communication method exclusively used for them. In this case, the C200H I/F unit must be installed in the NT610C and connected to the PC through the C200H I/O extension cable. The C200H I/F unit reads information about host unit contacts and channel operations into the NT610C and controls these contacts and channels or displays the information. Refer to the "NT-series Direct Connection Operation Manual." (V026-E1-1)

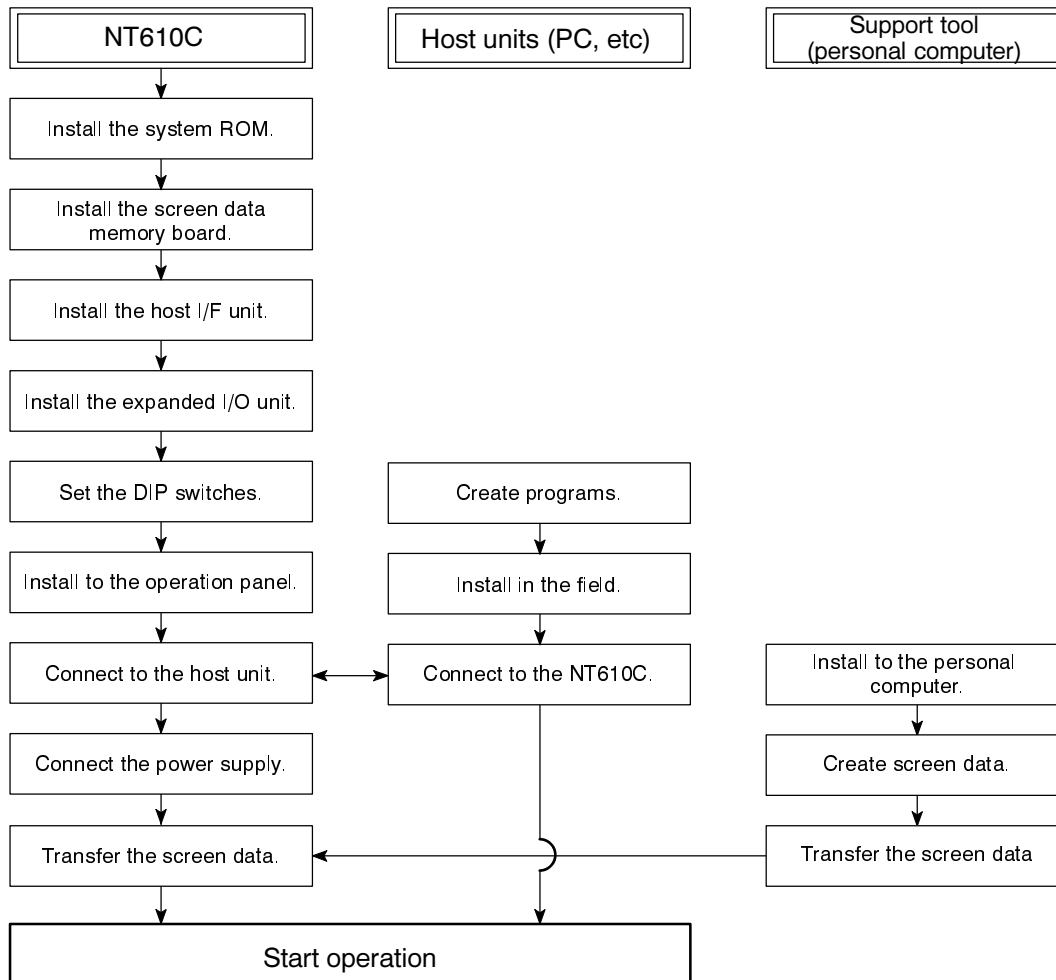


C200H I/F unit (NT600M-LB122-V1 type)

- SYSMAC
- C200H
- C200HS
- C20H
- C28H
- C40H
- C60H

1-7 Before Operating

Follow the procedures below to start the system of the NT610C.



- Reference:**
- For the screen data memory board, select one that has the required capacity.
 - Choose the I/F unit that meet the communication method.
 - System ROMs will differ according to the types of host I/F units.
 - When connecting an expanded I/O unit, make sure that the number of I/O points is suitable for the number of I/O points to be used.

SECTION 2

Hardware Settings and Connections

This section gives hardware settings such as main unit setting, optional unit installation and connections with host units.

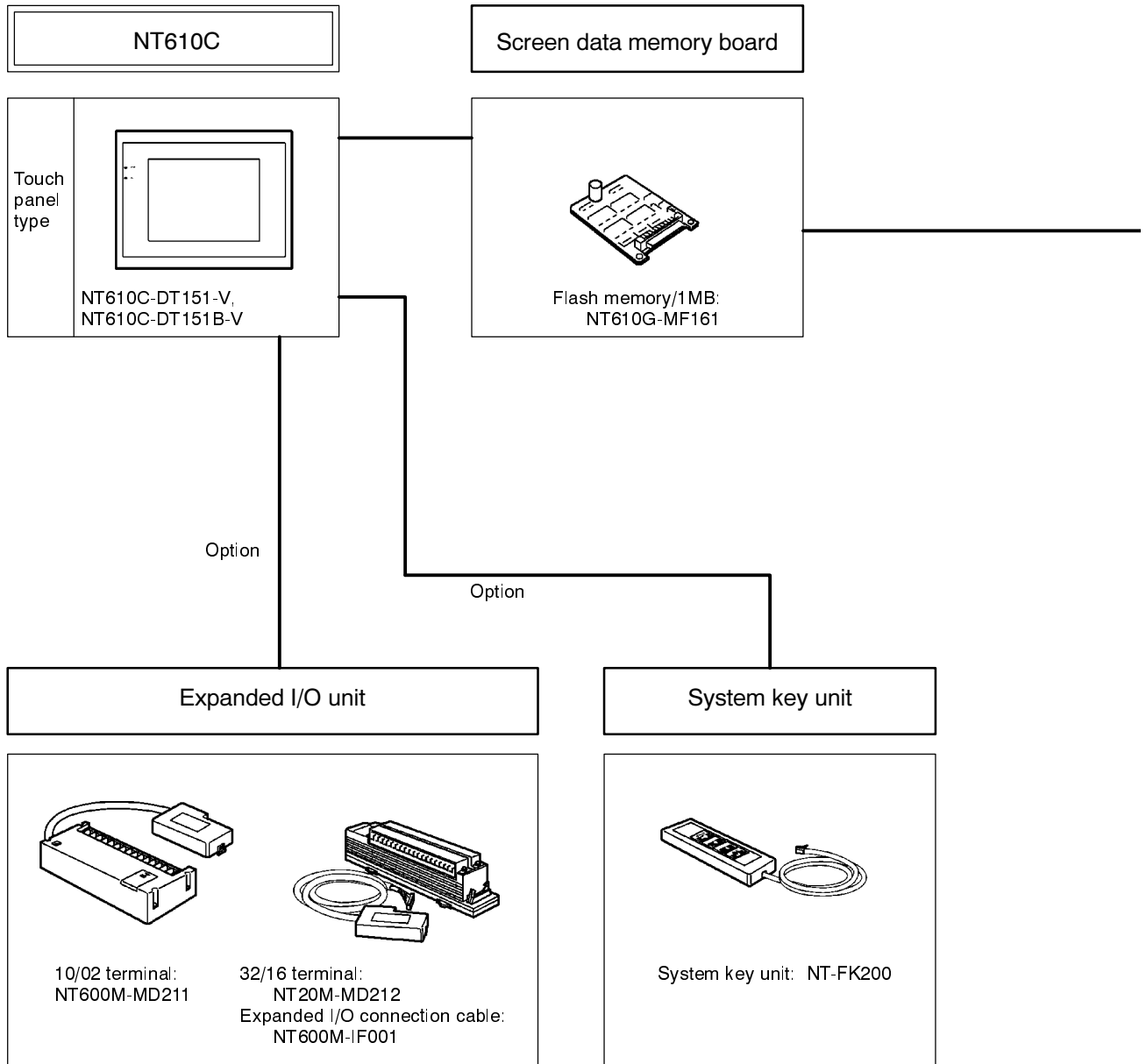
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2-4-1	Connecting the 10/02 Terminal	44
2-4-2	Connecting the 32/16 Terminal	46
2-5	Connecting the System Key Unit	48
2-6	Connecting to the Support Tool	49
2-7	Connecting a Printer	50

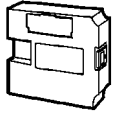

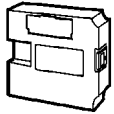

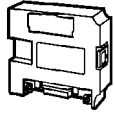

2-1 Units to be Prepared

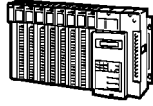
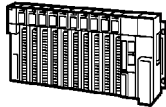

Different types of units are required according to main unit types and communication methods. Make sure to prepare the units that meet your purposes.

2-1-1 NT610C System Configuration

The following figure shows the configuration of the NT610C.





	Host I/F Unit	System ROM
Host link	 NT600M-LK201/LK202	 NT610C-SMR31-EV2
NT link	 NT600M-LK201	 NT610C-SMR34-EV2
C200H	 NT600M-LB122-V1	 NT610C-SMR32-EV1

Host Units
C-series PC 
CCM1/CV-series PC 
Computer 

Tools to create screen data and peripheral tools

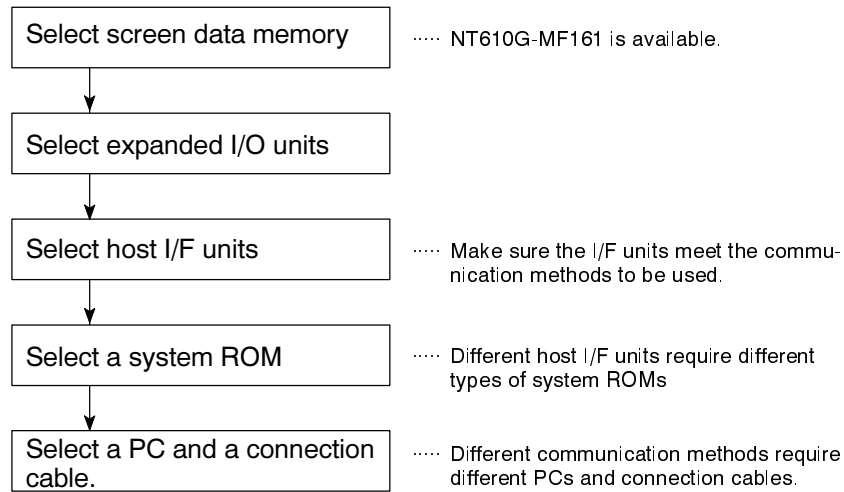
Computer

Support tool Ver.3
NT610G-ZA3AT-EV3 (for IBM PC/AT)

2-1-2 Selecting Necessary Units

Different I/O or communication methods require different units. Choose the units or parts you need, in accordance with the following chart.

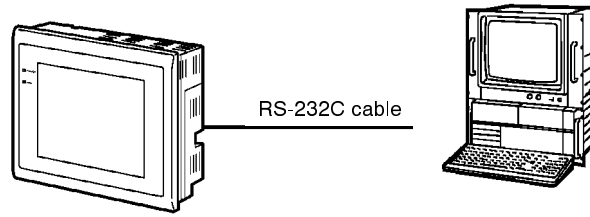


2-1-3 Selecting a Screen Memory Board

The screen data memory board (hereinafter called the “memory board”) is equipped with a flash memory for holding screen data, character string data, numeric data and so on from which to form various screens.

Feature Of Flash Memory Type

Flash memory has the priorities of both RAM (Random Access Memory), which data can be written into and deleted from any time, and ROM (Read Only Memory), from which data is not deleted even when the power supply is cut. With a flash memory board, screen data can be transferred directly from support tools, plus the data in the memory of the board is not deleted even when the power of the NT 610C is turned off. Moreover, the flash memory board is equipped with a switch for prohibiting or permitting data being written into so that it will be possible to set data to be transferred from support tools or to set screen data protected from being deleted by memory initialization.



- Type of memory board

Memory Capacity	Type
1 Mbytes	NT610G-MF161

Relations between Memory Capacities and the Number of Registered Screens

The table below gives you some idea of how many screens can be registered. The more data on the screen, the less the number of screens.

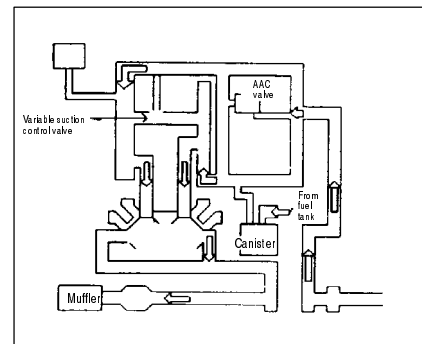
Screen Data Memory Capacity	Number of Screens Registered	
	Screens mainly with messages	Screens mainly with figures and patterns
1 Mbytes	about 1550	about 435

Screens mainly with messages

Screens mainly with graphics

OMRON's unique functions and features

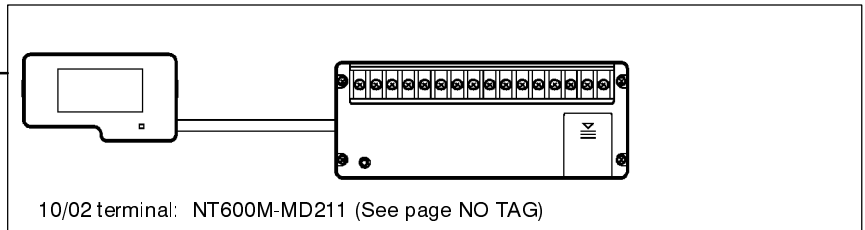
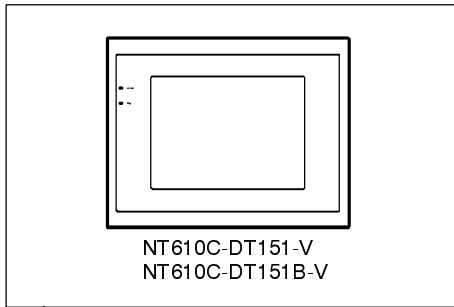
- 640 × 480 dot wide screen**
TFT 8-color LCD screen is larger than competitive products by 20% in the vertical direction. Gives more space in the top to bottom direction than ever.
- Backlight can be replaced.**
The backlight can be replaced with a new one by the operator at the operation side. Expensive TFT screen can be used up to its maximum life expectancy. (Competitive products need to be removed and sent to the manufacture for replacement.)



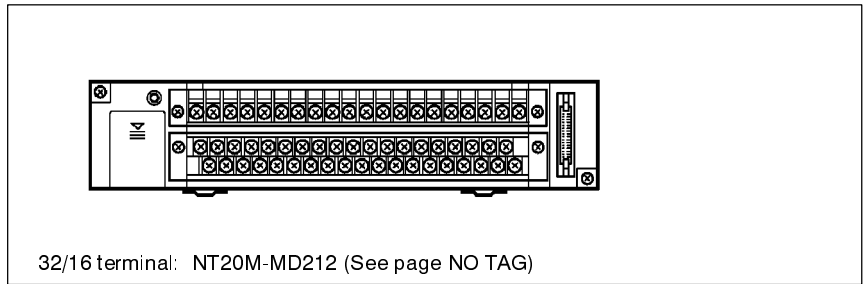
Note The maximum data capacity per screen is 16 Kbytes.

2-1-4 Selecting Expanded I/O Unit

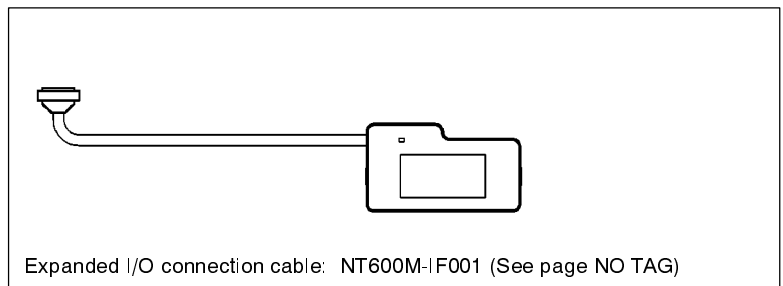
Where the direct connection system is used, various expanded I/O units can be installed for inputs to and outputs from external units. The expanded I/O units may be used together with touch switches. The following two types are available.



This unit has a 10-pin input connector and a 2-pin output connector and is connected to the back side of the NT610C.

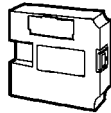


This unit has a 32-pin input terminal and a 16-pin output terminal and is connected to the NT610C through an expanded I/O connection cable.



2-1-5 Use with the Host Link System

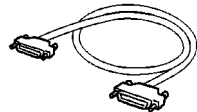
Connecting the NT610C to a PC by the host link requires the following units and software:



- Host link I/F unit
NT600M-LK201 (RS-232C type)
NT600M-LK202 (RS-422 type)



- System ROM
NT610C-SMR31-EV2 (compatible)



- Connection cable
For the use of the RS-232 cable or the RS-422 cable, refer to the “NT-series Direct Connection Operation Manual.” (V026-E1-1)
- Support tool
NT610G-ZA3AT-EV3

Reference: To convert a host link system using the RS-232C to that using the RS-422 or that using fiber-optic cables or to convert that using RS-422 to that using RS-232C, the following units and cables are required:

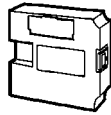
- (1) Unit
 - Link adopter
 - Optical module
- (2) Cable
 - RS-422 cable
 - Fiber-optic cable

For details, refer to the following manuals:

NT-series Direct Connection Operation Manual (V026-E1-1)

2-1-6 Use with the NT Link System

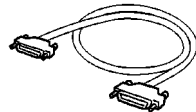
Connecting the NT610C to a PC by the NT link requires the following units and software:



- Host link I/F unit
NT600M-LK201



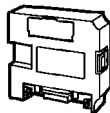
- System ROM
NT610C-SMR34-EV2



- Connection cable
For the use of a cable, refer to the “NT-series Direct Connection Operation Manual.” (V026-E1-1)
- Support tool
NT610G-ZA3AT-EV3

2-1-7 Use with the C200H

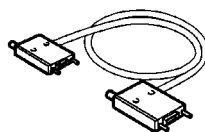
The following units and software are required to communicate with SYSMAC-series PCs, C200H, C200HS, C20H, C28H, C40H, or C60H:



- C200H I/F unit
NT600M-LB122-V1



- System ROM
NT610C-SMR32-EV2



- Connection cable
Besides C200H-CN211, C20H-CN222, and NT20M-CNP211 (2 m), there are cables with lengths of 30 cm, 70 cm, 5 m, and 10 m.
- Support tool
NT610G-ZA3AT-EV3

Reference: Different types of PCs or communication distances require different cables. For details, refer to the “NT-series Direct Connection Operation Manual.” (V026-E1-1)

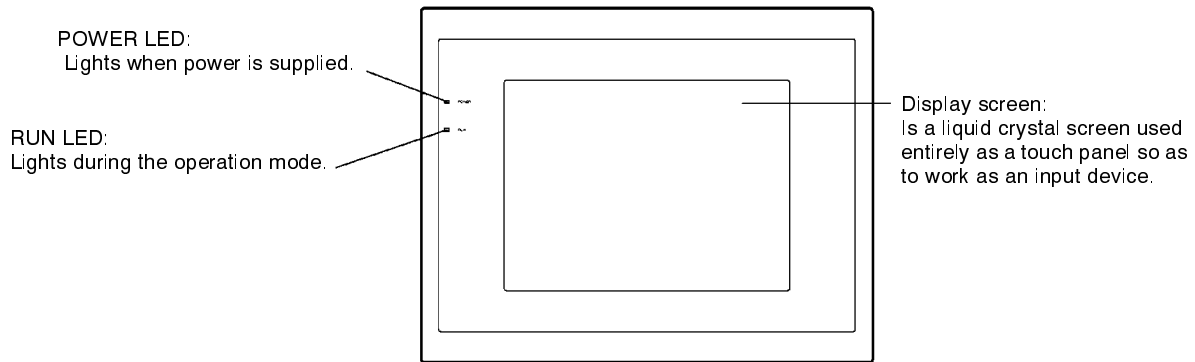
2-2 Setting the NT610C

This section gives NT610C settings such as installing necessary units and setting DIP switches.

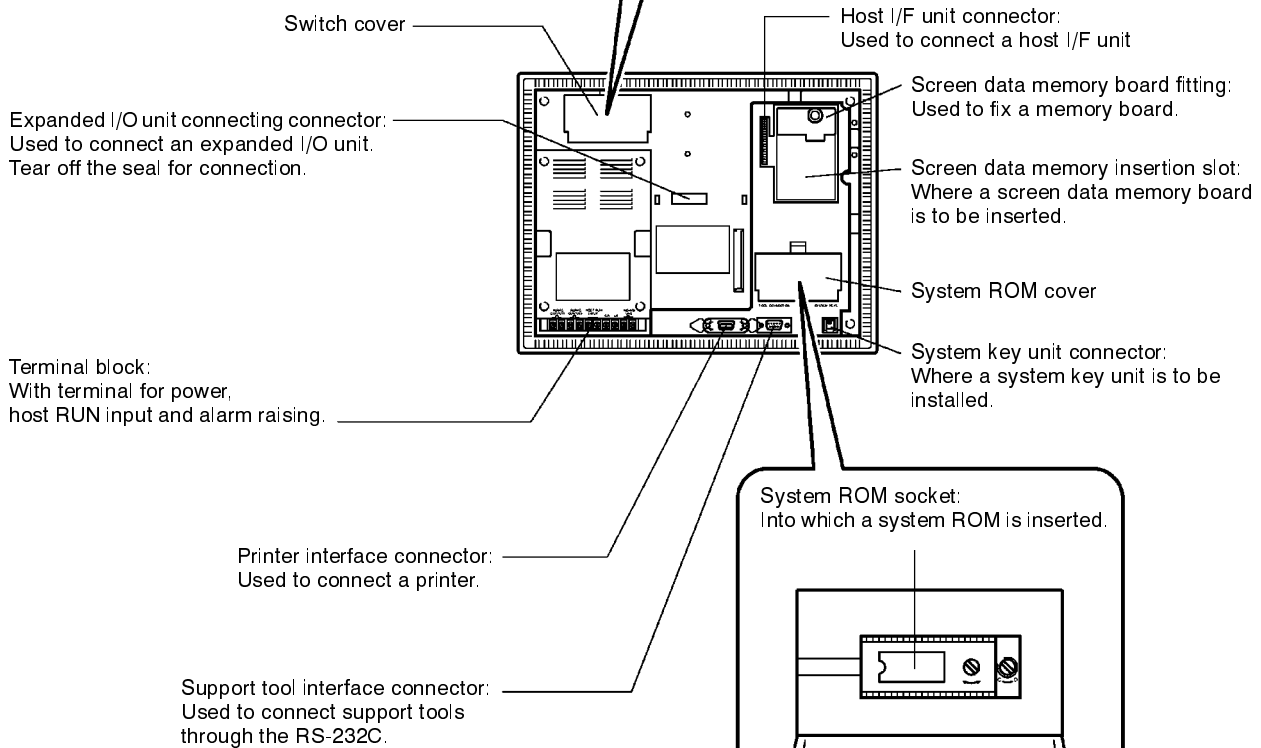
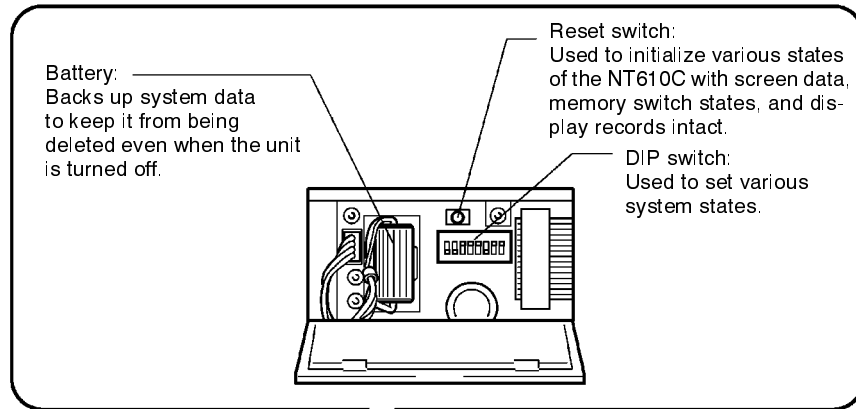
2-2-1 Names and Functions of Unit Sections

Before starting the preparation work, make sure of the name and function of each unit section.

Front



Back



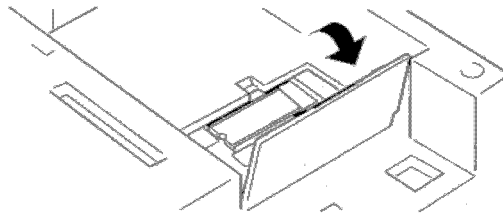
2-2-2 Installing a System ROM

This section gives how to install a system ROM. Different host I/F units require different system ROMs. For details, see Section 2-1 “Units to be Prepared.” (page 16)

Note: Make sure to shut off the power before installing the system ROM.

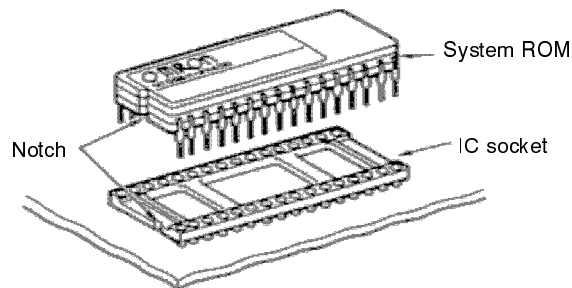
Insert the system ROM fully home at the correct position.

- (1) Open the system ROM cover on the back side by pulling it in the direction as indicated with an arrow.



- (2) Insert the system ROM to the IC socket.

Make sure to align the notch in the ROM with the notch in the IC socket.

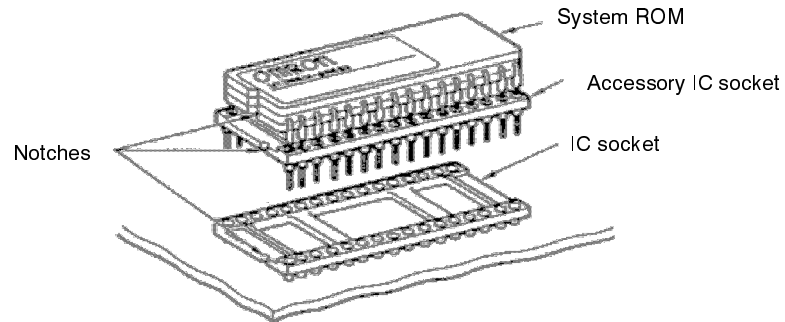


- (3) Before switching the PT power on, make sure again that the system ROM is correctly inserted.

(4) Close the system ROM cover.

- If the system ROM cannot be inserted easily:

If the system ROM cannot be inserted easily into the IC socket, use of the accessory IC socket will facilitate this work. If the accessory IC socket is used, the position of the notch in it must also be aligned with the notch in the system ROM and the IC socket in the unit.



- If the system ROM is installed in a wrong direction:

If the system ROM is installed in the IC socket incorrectly, remove it from the IC socket and insert it in the IC socket correctly. Never switch on the power with the system ROM installed incorrectly.

Reference: When pulling out the system ROM from the IC socket, use the special tool supplied for system ROM removal. If the system ROM cannot be removed from the IC socket, please contact OMRON Corporation.

2-2-3 Installing a Screen Memory Board

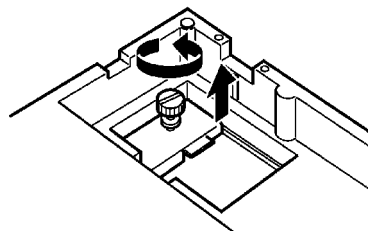
This section explains how to install a screen data memory board in the NT610C.

Note: Make sure to shut off the power before installing the memory board.

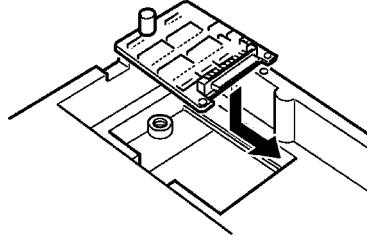
If the memory board is not inserted far enough it may not be possible to transfer screen data. Insert the memory board fully home at the correct position.

Caution Do not touch the surface of the board on which the components are mounted with your bare hands. Discharge the static electricity from your body before handling the board. Otherwise static electricity may cause the components to malfunction.

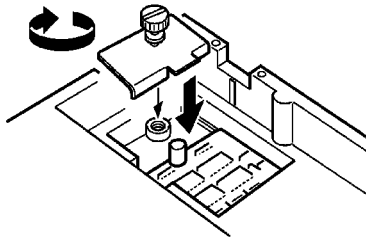
- (1) Loosen the screw of the fitting and pull it upward. The fitting should come out of the memory board insertion slot.



- (2) Align the memory board connector with the NT610C connector, and holding the white knob, push until you hear a click the board in the arrow indicated direction as illustrated below.

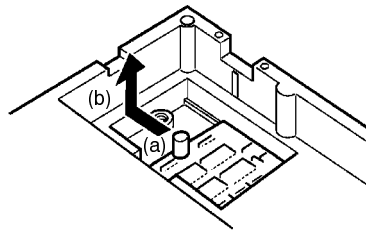


- (3) Place the fitting in the original place and tighten the screw to secure the memory board.



Reference: Removing the memory board

- (1) Shut off the power of the NT610C.
- (2) Remove the memory board fitting.
- (3) Holding the memory board knob (spacer), pull the board in the direction (a) first and then in the direction (b) as illustrated in the figure below.

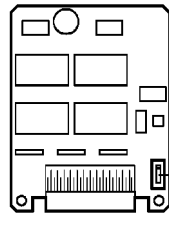


Setting the write switch of the flash memory type

The flash memory type of memory board is equipped with a write switch (SW1) for prohibiting or permitting data being written into the memory. Setting this write switch to "INHIBIT" after transferring screen data prevents registered screen data from being deleted by mistake due to initialization operation , etc.

To change the write switch setting, remove the host I/F unit first and the memory board next. The data in the memory will be held intact.

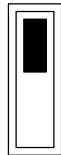
The write switch is set to "ENABLE" when shipped from the factory.



Write switch

- Setting the write switch to permit writing in of data

ENABLE



Set the switch to "ENABLE" (upper side). This mode allows screen data transfer and memory initialization.

INHIBIT

- Setting the write switch to prohibit writing in of data

ENABLE



Set the switch to "INHIBIT" (lower side). This mode does not allow screen data transfer or memory initialization.

INHIBIT

2-2-4 Installing a Host I/F Unit

Different host I/F units are to be used according to communication method. For details, see Section 2-1 "Units to be Prepared." (page 16)

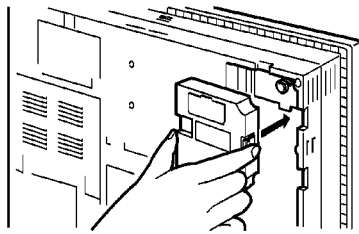
Note: Always switch the power off before installing or removing a host I/F unit.

If the host I/O unit is not inserted far enough, communication may stop and operation may not be possible. Insert the host I/F unit fully home at the correct position.

Caution Do not touch the surface of the board on which the components are mounted with your bare hands. Discharge the static electricity from your body before handling the board. Otherwise static electricity may cause the components to malfunction.

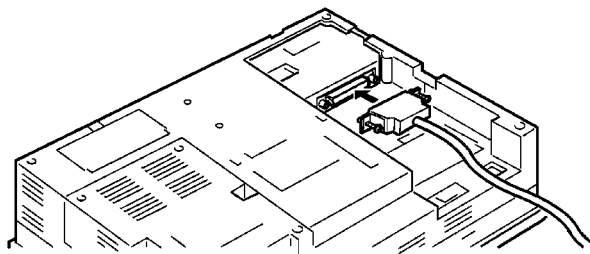
Depending on the type of host I/F unit, switch settings may be required for host I/F units before installation.

- (1) Until you hear a click, insert the host I/F unit in the arrow-indicated direction as illustrated below.



- (2) Connect a cable to the host I/F unit.

Example: In the case of Host link I/F unit



Reference: For installation of a different type of I/F unit, refer to the operation manual for that type.

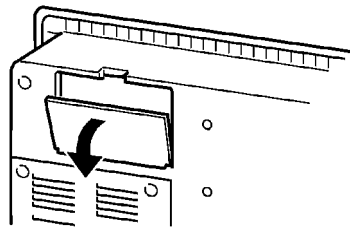
2-2-5 DIP Switch Settings

Set the NT610C fundamental operational status with the DIP switches located on the rear side of the body.

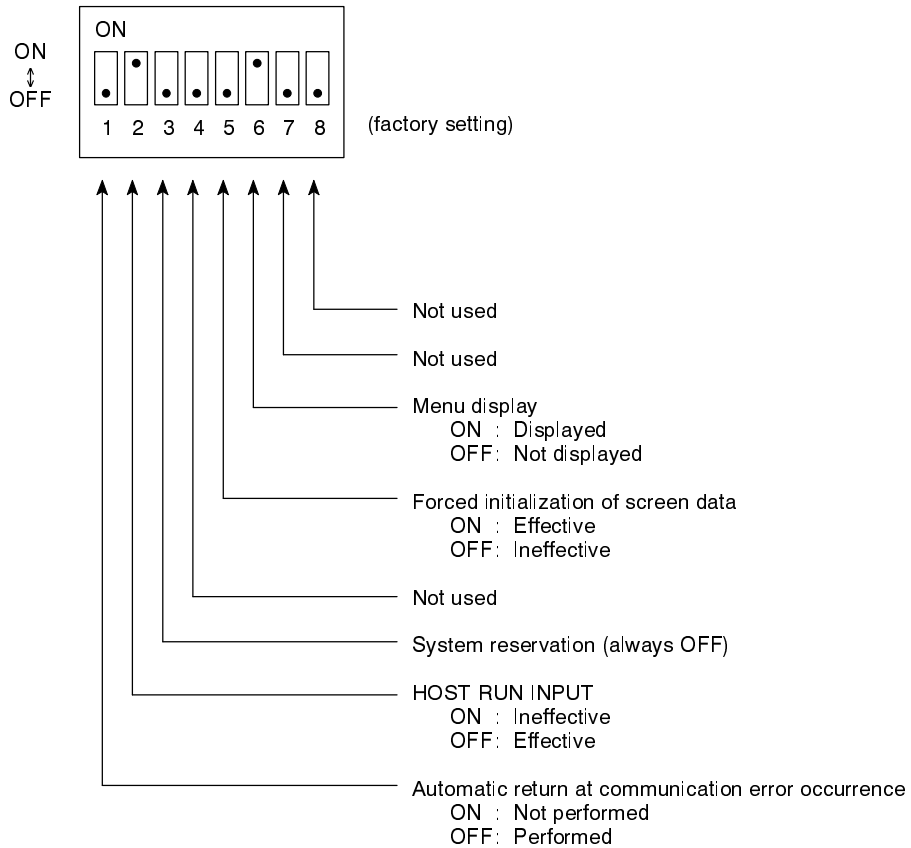
Note: After changing the switch settings, always reset operation or turn the power off and then back on.

Setting Procedures

- (1) Pull the upper edge of the cover switch as illustrated in the figure below.
Do not use any tool such as a screwdriver.



- (2) Set the DIP switches to "ON" or "OFF" referring to the figure and table below.



Setting Contents


Switch #	Function	Setting Result	
1	Automatic return at communication error occurrence	ON	If a communication error occurs, the operation will stop with an error message displayed.
		OFF	Even if a communication error occurs, the operation will continue with no error message displayed.
2	Making host RUN input effective or ineffective (See page NO TAG)	ON	The status of the host RUN input connector will be ignored.
		OFF	The status of the host RUN input connector will be monitored. If input from the connector is cut off (inactive state of host unit), the operation will stop with a message "Host Error" displayed.
3	System reservation	ON	—
		OFF	Must always be set to "OFF"
4	Not used	ON	—
		OFF	—
5	Making screen data forced initialization effective or ineffective (*1)	ON	The NT610C will start in a special RUN mode in which the memory is only initialized.
		OFF	The NT610C will start in ordinary RUN mode.
6	Displaying or not displaying of menu (*2)	ON	The System Menu can be displayed. (See page NO TAG)
		OFF	The System Menu cannot be displayed.
7	Not used	ON	—
		OFF	—
8	Not used	ON	—
		OFF	—

*1: Turning this switch in the ON position and then turning ON the power will display the memory initialization menu. For details, see Section NO TAG "Initializing Memory." (page NO TAG)

*2: Turning this switch in the OFF position does not allow the System Menu to be displayed in the ordinary operation. If an error occurs during a start-up, the System Menu will be automatically displayed. However, "transfer mode" cannot be entered.

2-3 Installation and Connection

The NT610C needs to be installed to the operation panel. In this section, we explain the installation and connection with the host unit and power.

 **Caution** Do not install the NT610C at sites subject to the following conditions. Otherwise the product may malfunction.

- Severe temperature variations
- Temperatures or humidities outside the ranges stated in the specifications
- High humidity, condensation
- Splashing chemical agents
- Severe oil splashing
- Corrosive or flammable gases
- Strong vibrations or shocks
- Direct exposure to wind and rain (outdoor sites)
- Strong ultra-violet irradiation

Take adequate measures to ensure shielding if the NT610C is used at a location subject to any of the following conditions. Otherwise the product may malfunction.

- Static electricity, or severe noise from other equipment
- Strong electromagnetic fields
- Nearby power cables
- Potential exposure to radioactivity

2-3-1 Installation to the Operation Panel

The NT610C is to be installed, embedded in a hole in the operation panel.

Use the panel fittings included in the product package and tools and follow the procedure below.

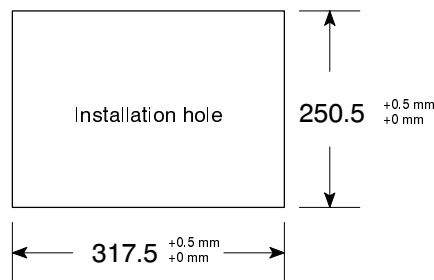
⚠ Caution On unpacking the NT610C, check its external appearance and confirm that there is no damage. Also confirm that there is no abnormal noise on shaking the NT610C lightly. The product may malfunction if it is damaged.

Note: The thickness of the panel wall in which the NT610C is installed should be 1.6 to 4.8 mm.

All fittings must be tightened uniformly to a torque of 0.5 to 0.6 N·m in order to ensure water- and dust-resistance. The panel must not be soiled or warped, and must be able to support an installation that will remain secure and strong.

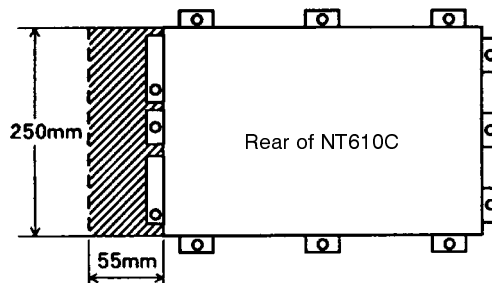
⚠ Caution During work at the panel, take care to ensure that no metal scraps enter the unit. Otherwise the product may malfunction.

(1) Open a unit installation hole in the panel as illustrated below.



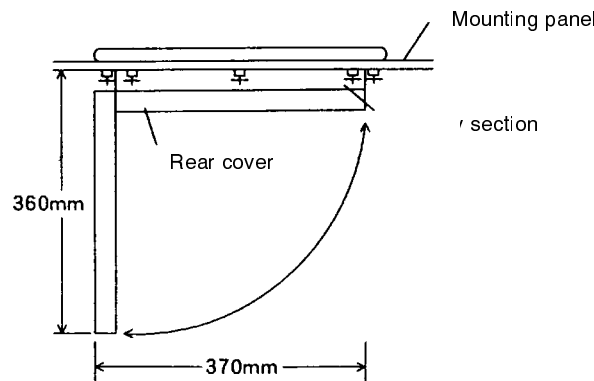
Provide Sufficient Space for Replacement of Backlight.

- Left side (rear side)

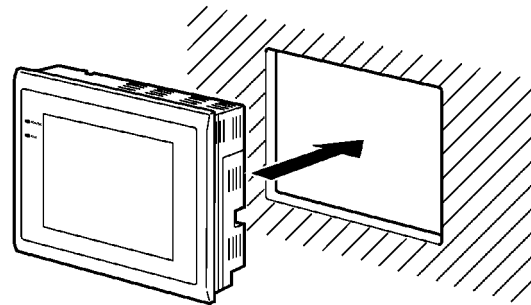


Do not install other equipment at the place indicated by an oblique line.

- Depth

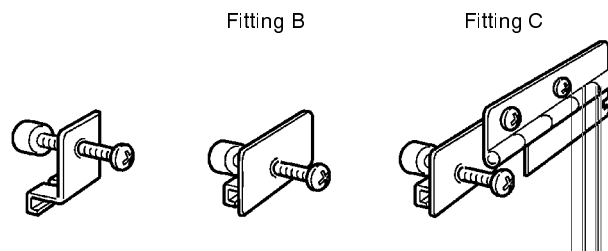


- (2) Install the NT610C from the front side of the panel.

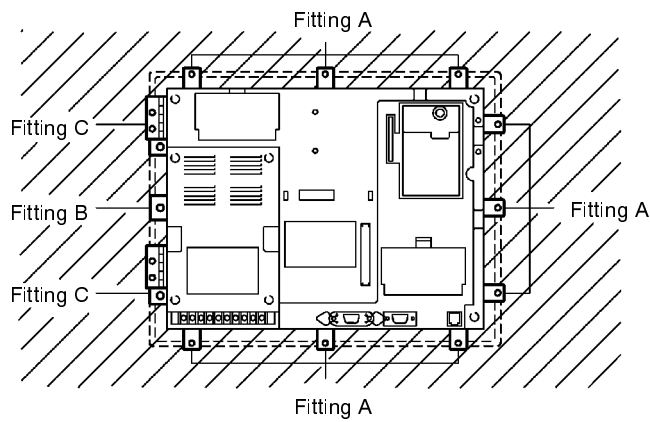


- (3) Attach the panel fittings at the positions shown in the figure below.
There are three types for the fittings.

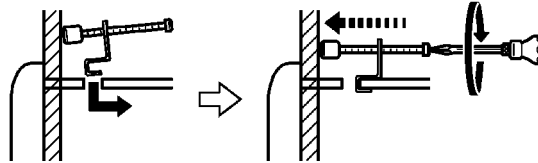
[Types of the panel fittings]



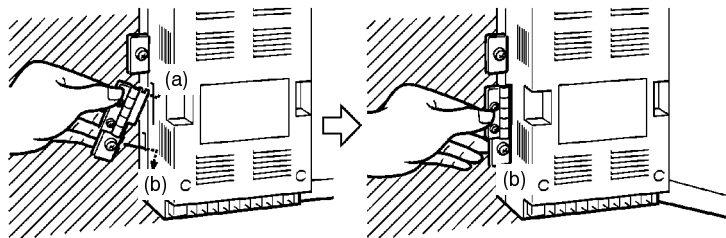
[Attachment position]



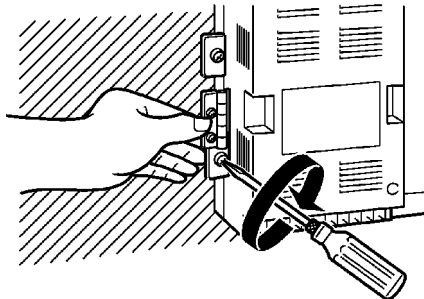
- (4) Attach Fittings A and B at their positions first. Fit the hook of the fitting in the square hole in the body and tighten the screw with a Phillips head screwdriver while lightly pulling the fitting.



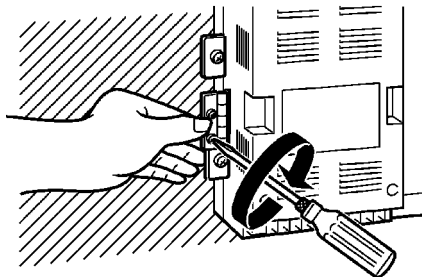
- (5) Attach Fitting C at its place. Fit the hook of the hinge in the slit (a) and then insert the bottom part into the square hole (b).



- (6) While holding the fixing, tighten the screw with a Phillips head screwdriver to secure the fitting to the panel.



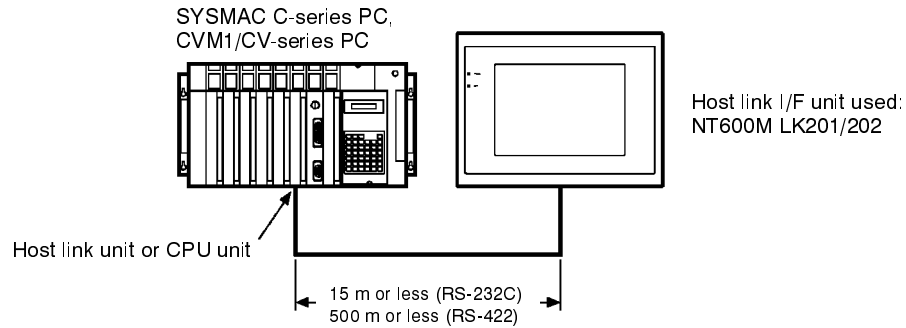
- (7) Tighten the screws of the hinge section with a Phillips head screwdriver.



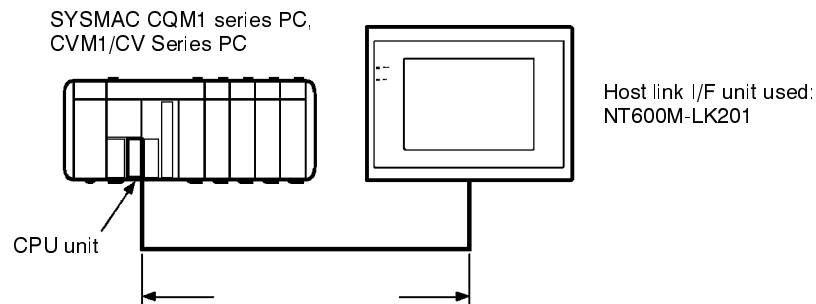
2-3-2 Connecting the NT610C to a Host Unit

Connect the NT610C to a host unit (such as a PC and a computer) with a cable. Different host I/F units require different connection methods and cables. The following figures show connection of some host units to the NT610C. For connection, refer to the user's manual of each host I/F unit.

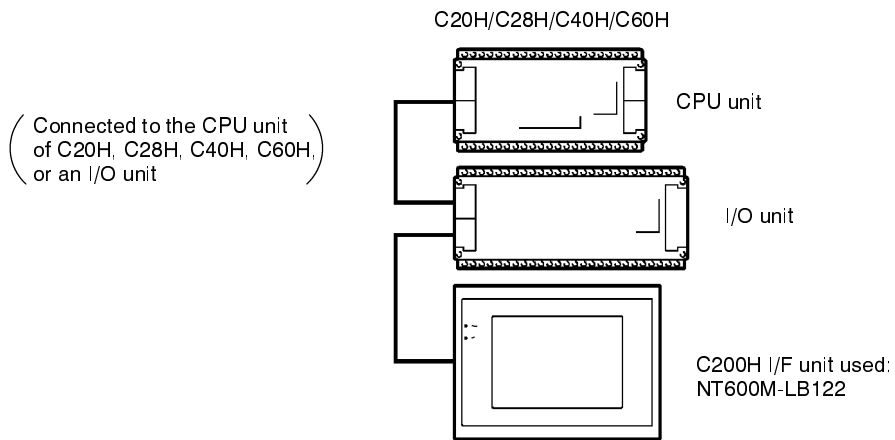
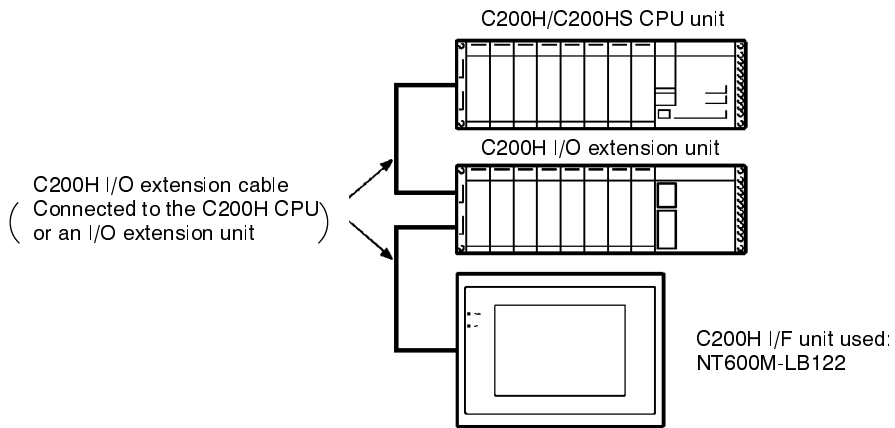
Where a Host I/F Unit is Used



Where the NT Link System is Used



Where the C200H I/F Unit is Used



2-3-3 Power Supply Connection

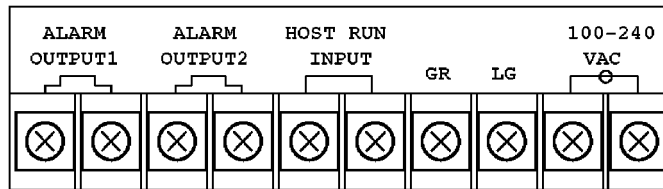
Connect the power supply to the power input terminals.

⚠ WARNING Do not touch any of the terminals or terminal blocks while the power is being supplied. Doing either of these may result in electrical shock.

Tighten the screws on the terminal block to the torque specified in relevant manuals. The loose screws may result in short-circuit, malfunction, or burning.

Terminal Arrangement

The power input terminals on the rear side of the body are arranged as illustrated below.



Note: Perform the wiring correctly and be sure to lock the terminal block.

Parts Used for the Connection

Use solderless terminals to connect the power supply to the power input terminals.

Use the recommended terminals for M3.5, given below. The appropriate tightening torque is 0.8 N·m.

⚠ Caution Do not connect the wires to the power input terminal.

For the connection to the power supply terminal block, twisted wires of 2mm² or greater cross sectional area and M3.5 size crimp terminals must be used.

Tighten the screws on the terminal block to a torque of 0.8 N·m.

Otherwise fire may occur.

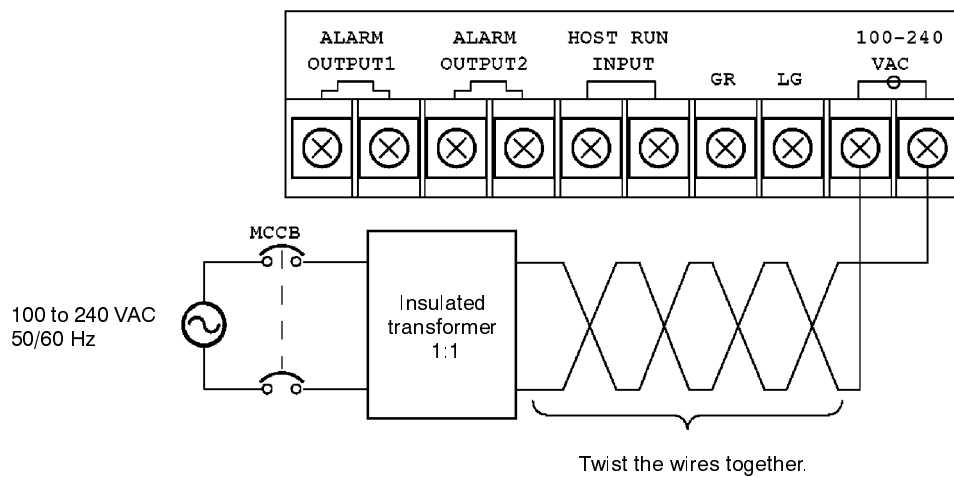


Recommended terminals

Maker	Type (fork type)	Type (round type)	Applicable Wire (twisted wire)
J.S.T. MFG. Co. Ltd.	2-YS3A	2-3.5	1.04 to 2.63 mm ²
FUJI TERMINAL INDUSTRY	2-YAS3.5	V2-S3.5	

Power Supply Connection

Connect a power supply of 100VAC to 240VAC to the power input terminals as illustrated below.



Note: Use DC and AC power supplies with low voltage and frequency fluctuations.
 Rated power supply voltage: 100 to 240 VAC (permitted range: 85 to 264 VAC)
 Capacity: 95 W (VA) max.
 Use 2 mm² or thicker wires to prevent voltage drop. Twist the wires together for wiring.

• **Noise prevention**

The NT610C has a noise preventive feature against the power supply noise. To further reduce the noise, connect a 1-to-1 insulated transformer to the power supply line. (See the above figure) This will drastically reduce the ground noise. The secondary side of the insulated transformer must be ungrounded.

• **Power supply specifications**

Applicable power supply specifications are as follows:

Item	Value
Power supply voltage	100 to 240 VAC 50/60 Hz
Allowable power supply voltage fluctuation range	85 to 264 VAC
Power supply capacity	95 VA

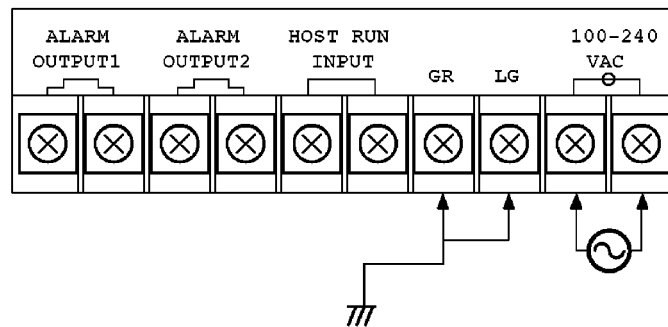
Grounding

Ground the NT610C to prevent malfunctions and shocks. Short-circuit the noise filter neutral terminal (LG) to the grounding terminal (GR). Then connect the ground wire (2 mm² or thicker) to the GR terminal, setting up class 3 kind grounding (100 Ω or less). The appropriate length of the ground wire is 20 m or less.

Note: Grounding must be done correctly.

Do not allow another unit to share the ground wire or connect the ground wire to a construction frame. It may cause bad effects.

To conduct the withstand voltage test, disconnect the LG terminal and measure across FG and all power supply terminals collectively.



2-3-4 Connecting External I/O

Connect the external I/O (alarm output, host RUN input) to the relevant terminals.

Connecting to the Alarm Output Terminals

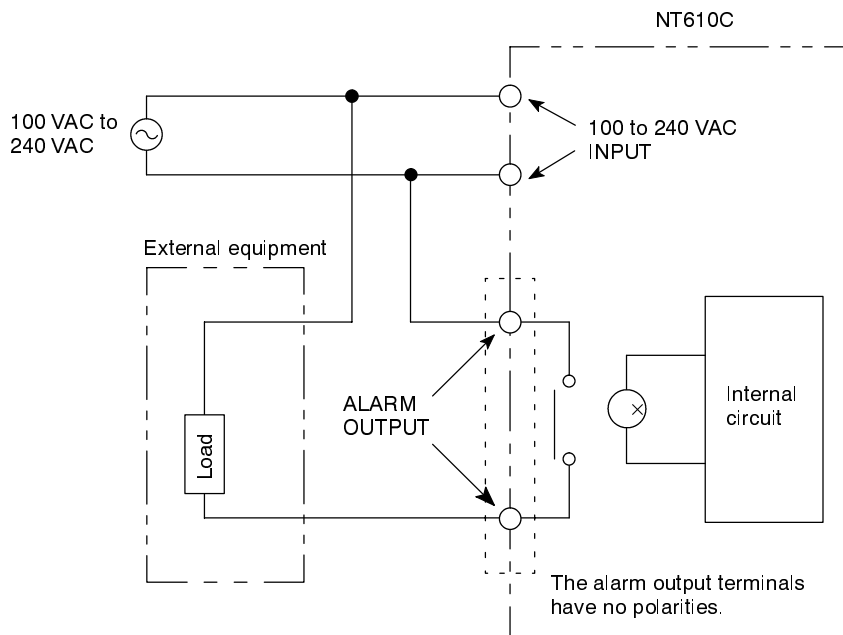
Connect to the alarm output terminals such external units as a warning lamp and a audio unit. These terminals can be turned on and off with an alarm output instruction from the host unit. For alarm output, see Section NO TAG "Various System Functions." (Page NO TAG)

As the alarm output terminals can be turned on and off on either AC or DC, units using either AC or DC can be connected. External I/O can be connected by the following two methods according to the type of external unit power supply.

Reference: The only available alarm output terminal is Alarm Output 1. Alarm Output 2 does not function.

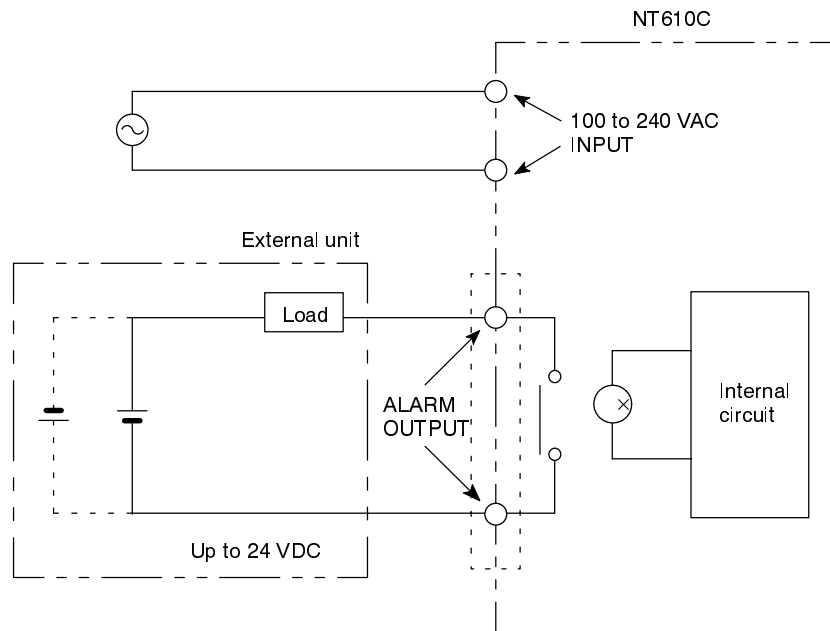
- **Where AC is used as the external unit power supply**

Power can be supplied to the external units from the NT610C.



- Where DC is used as the external unit power supply

DCs of up to 24 V can be used.



- Specifications of alarm output terminal

Item	Value
Output	Relay output
Rated load	240 VAC 2 A or 24 VDC 2 A
Maximum load current	2 A
Minimum switching performance	5 VDC 10 mA

Connecting to the HOST RUN INPUT Terminals

When monitoring the operational status of the host units such as the PC, connect the PC to the HOST RUN INPUT terminals.

When host RUN input becomes off, a message “Host Error” will be displayed immediately, then the operation of the PT will be suspended. When host RUN input becomes on again, the operation will be resumed.

Whether to set the terminals on or off can be made with a DIP switch (SW1) of the NT610C. When they are set to ON, host RUN input is ignored.

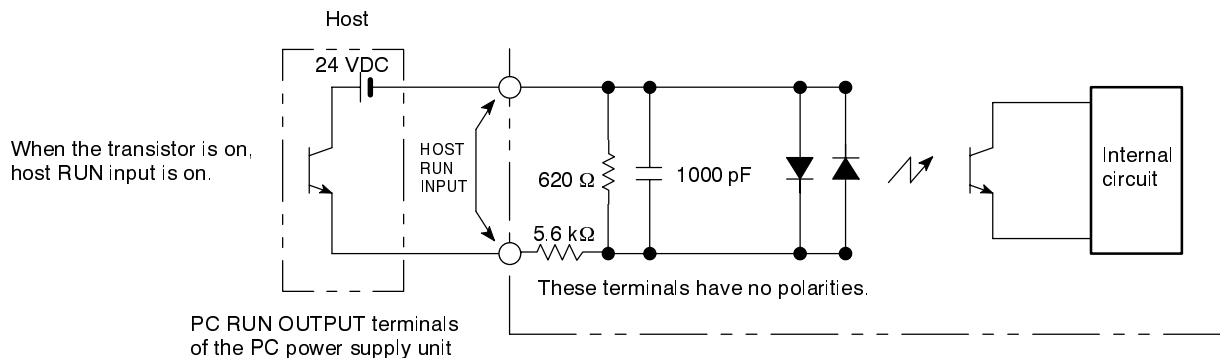
For details, refer to “DIP Switch Settings.” (page 30)

On mode : Set DIP Switches 1-2 to OFF.

Off mode: Set DIP Switches 1-2 to ON.

• **Connection**

Connect the HOST RUN INPUT terminals of the NT610C to the PC RUN OUTPUT terminals of the PC power supply unit. The connection circuit must be loaded with a 24 VDC. The connection terminals on both the PT and PC sides have no polarities, so they can be connected in either of the combinations.



• **Terminal specifications**

The specifications of the HOST RUN INPUT terminals are as follows.

Item	Value
Rated input voltage	24 VDC –15% to 24 VDC + 10%
Input impedance	5.6 kΩ
Input current	4.1 mA TYP. (24 VDC)
ON voltage	14.4 V (minimum)
OFF voltage	5.0 V (maximum)

Note: Carefully check the wiring before switching on the power.

2-4 Connecting the Expanded I/O Unit

The following two types of expanded I/O units are provided to the NT610C.

- 10/02 Terminal (NT600M-MD211)
- 32/16 Terminal (NT20M-MD212)

(The 32/16 terminal requires the expanded I/O connection cable NT600M-IF001.)

⚠ Caution When connecting the expanded I/O unit, make sure that the power supply is cut.

2-4-1 Connecting the 10/02 Terminal

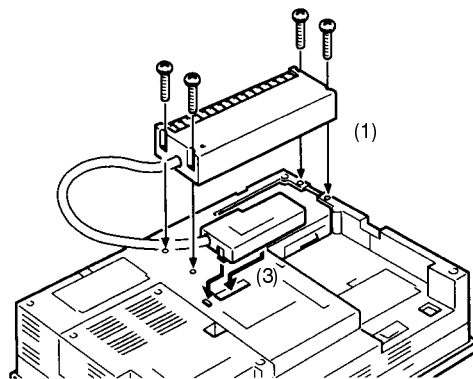
The 10/02 terminal is an expanded I/O unit to which 10 input points and 2 output points can be connected.

It can be installed in two ways as illustrated below.

Where the Terminal Portion is Installed to the NT610C

The terminal portion can be installed on the rear side of the NT610C.

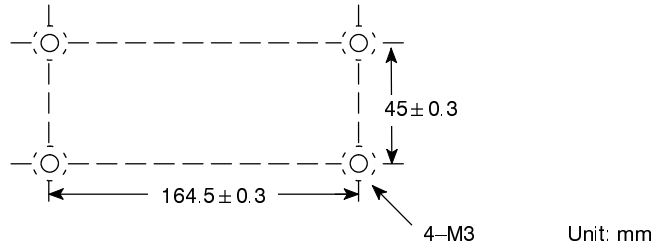
- (1) Install the terminal portion on the rear side of the NT610C and secure the four places with the screws provided.
- (2) Remove the connector seal on the same side.
- (3) Connect the connector to the NT610C connector on the same side.



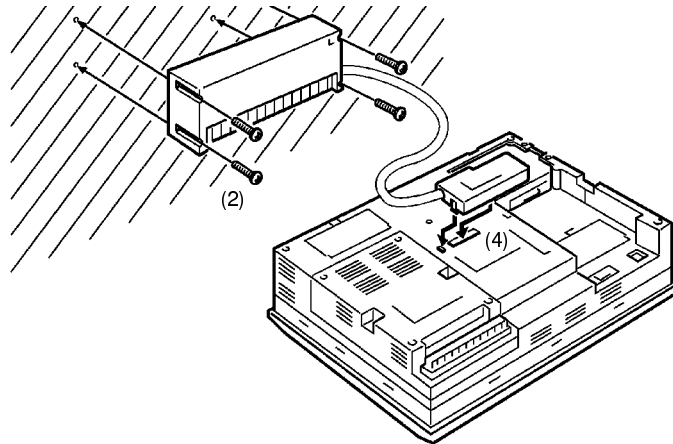
Where the Terminal Portion is Installed on the Operation Panel

The terminal portion may also be installed on the operation panel.

- (1) Drill attaching screw holes in the operation panel according to the dimension below.



- (2) Secure the terminal portion to the operation board with screws.
- (3) Remove the connector seal on the rear side of the NT610C.
- (4) Connect the connector to the NT610C connector on the same side.



2-4-2 Connecting the 32/16 Terminal

The 32/16 terminal is an expanded I/O unit to which 32 input points and 16 output points can be connected.

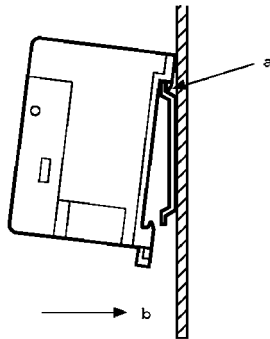
Connect the terminal to the NT610C with an expanded I/O connection cable.

Reference: The 32/16 terminal cannot be installed to the NT610C.

(1) Install the terminal portion on a DIN rail or on the operation panel.

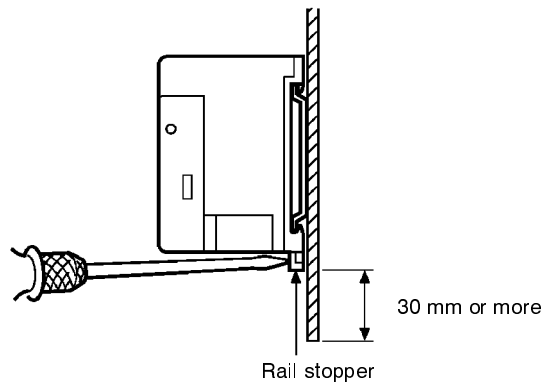
- **Where Installed on a Support DIN rail**

Hook the upper hook “a” of the rear side of the body on the upper edge of the DIN rail, and push the body in the direction “b” as illustrated below. Then, attach end places to the both ends of the terminal and secure the terminal.



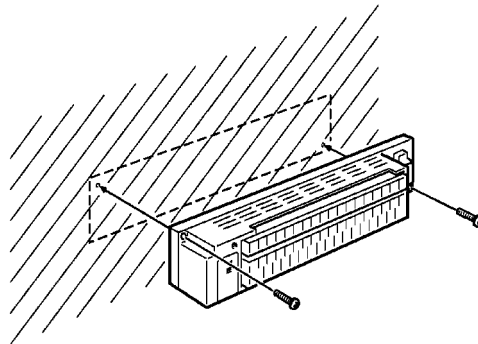
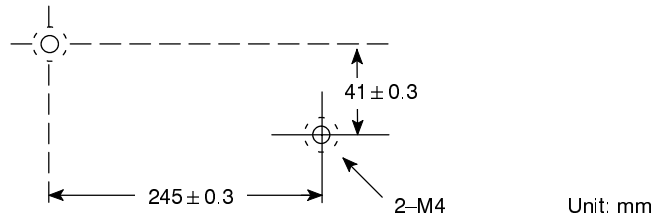
Reference: Removing the 32/16 Terminal from the DIN rail

Insert a flat-blade screwdriver into the rail stopper on the bottom side of the terminal body and pull out the rail stopper.

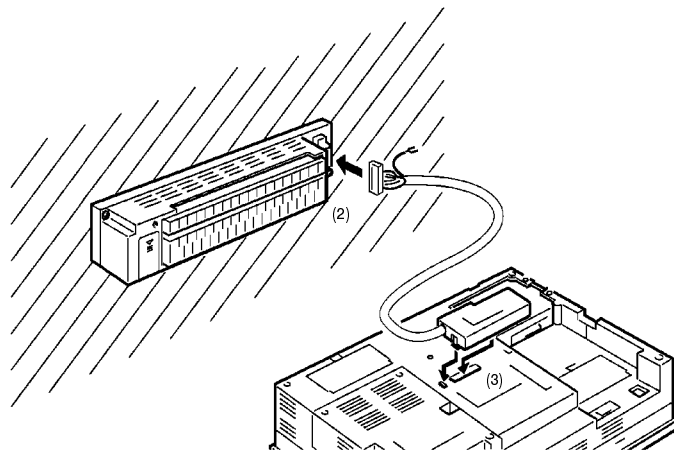


• Where Installed Directly on the Operation Panel

Drill attaching screw holes in the operation panel according to the dimension below and secure the terminal portion to the operation panel with screws.



- (2) Connect the expanded I/O connection cable to the 32/16 terminal unit with the notch in the correct side.
- (3) Connect the connector to the NT610C.



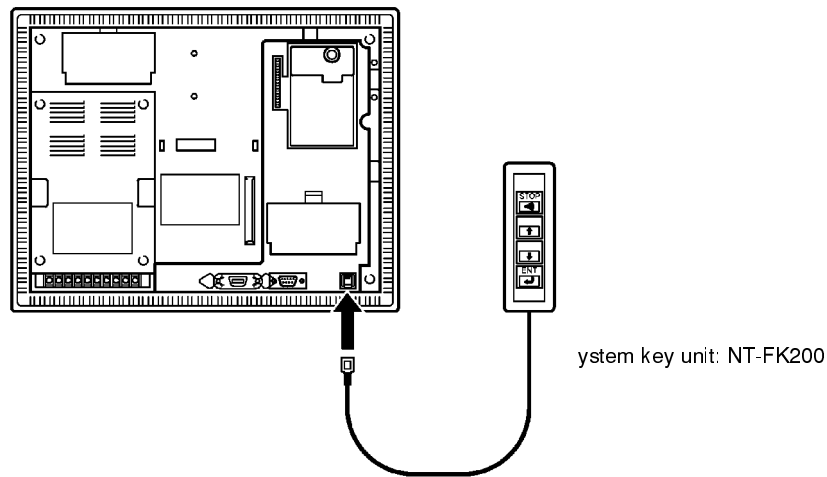
2-5 Connecting the System Key Unit

Connect the system key unit to the NT610C.

Reference: Since the system key unit is an optional product, obtain it separately when needed.

Connection

Insert the modular jack of the system key unit into the system key unit connector on the rear side of the NT610C.



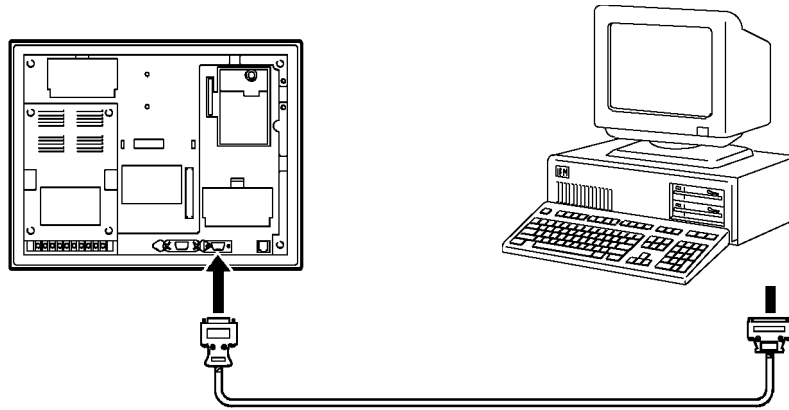
- Reference:**
- Operations may be performed by pressing the system keys or system menus displayed on the screen. For details, refer to “Operations with the System Menu” (page NO TAG).
 - The operations performed with the system key unit can also be performed by inputting from the 32/16 terminal unit. For details, refer to Section NO TAG “Operation of Expanded I/O Unit” (page NO TAG).
 - If making a system key unit yourself, refer to Appendix E “How to Make Your Own System Key Unit” (page NO TAG).

2-6 Connecting to the Support Tool

Connect the NT610C to a personal computer to transfer to the NT610C the screen data created by using a support tool.

How to Connect

Connect the NT610C to the personal computer with an RS-232 cable.



- Type of support tool

The following support tool (Ver. 2.□) is provided to the personal computer.

NT610G-ZA3AT-EV3

- Communication condition

Conditions for communications with the PT610C are set when a support tool is started.

Reference: For preparing a connection cable, refer to Appendix F “How to Make a Support Tool Connecting Cable” (page NO TAG).

2-7 Connecting a Printer

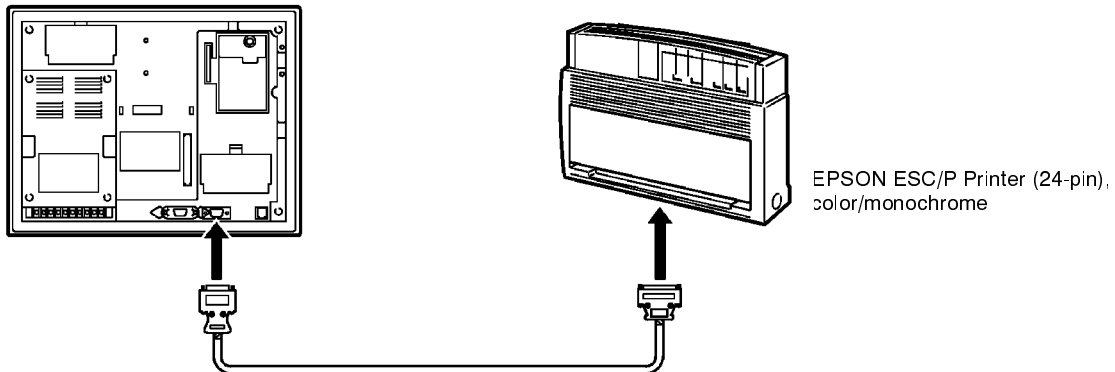
Hardcopies of screens can be printed (printing of screen images) onto a printer connected to the NT610C.

How to Connect

Connect the printer to the NT610C with a Centronics cable. The length of the cable should not exceed 3 meters.

Reference: If the connection cable is connected or disconnected while the power of the printer is on, the NT610C may malfunction. Make sure to turn off the power of the printer before connecting or disconnecting the connection cable.

Note: After connecting the connection cable, be sure to lock the connectors with the screws.



- **Recommended connection cable**

The following connection cable is recommended.

CV500-CN127 connection cable (1.5 m, 14-pin to 36-pin)

- **Recommended printer**

EPSON ESC/P Printer (24-pin), Color or Monochrome

If using other printer, such printer should conform to ESC/P 24-J83C, which is the printer control standard of Epson, or be capable of emulating the PC-PR201H (NEC).

Reference: If using a monochrome printer, set up “gray scale printing” with the corresponding memory switch displayed on the NT610C. (See page NO TAG)

To make a hardcopy with the connected printer, create a touch switch on the screen to print out when creating the screen with the support tool, or enter a printing instruction from the host.

For details, refer to Section NO TAG “Touch Switches” (page NO TAG) and Section NO TAG “Various System Functions” (page NO TAG).

SECTION 3

How to Use the NT610C

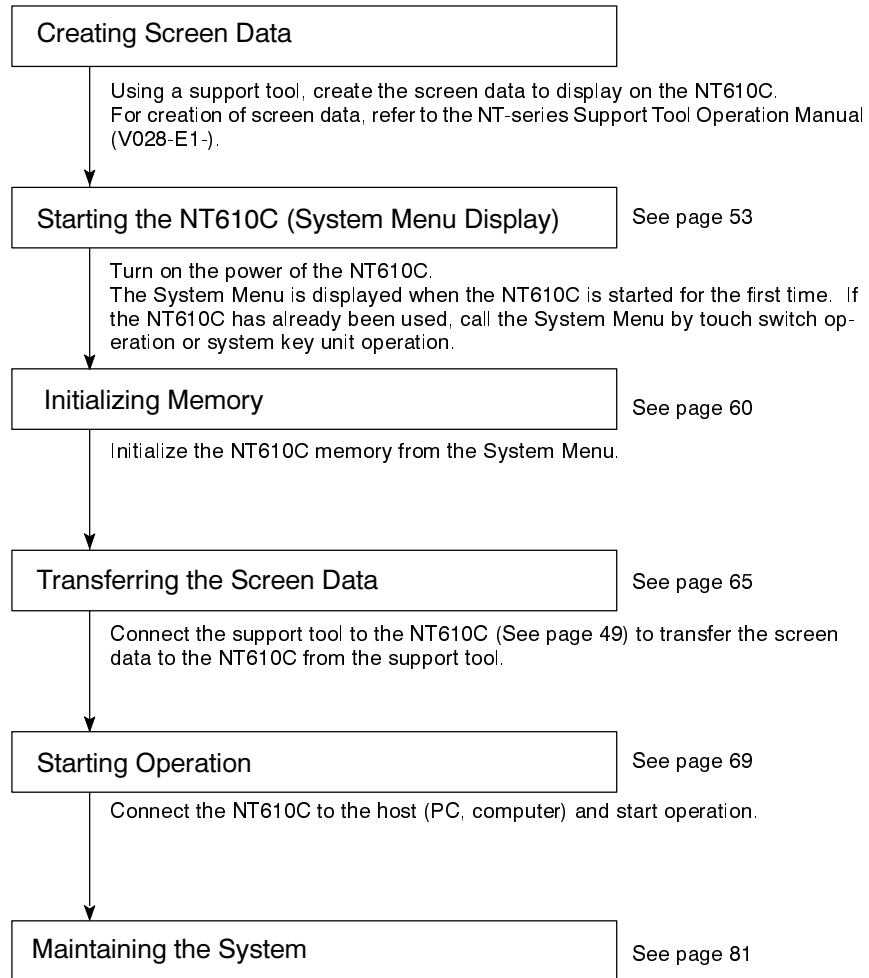
This section explains the procedures up to those for operating the NT610C.

It also explains how to set up the features convenient in operating the NT610C, such as key input sound setting, and the features to facilitate system maintenance, such as display history recording history.

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3-1 Outline of Operation

Follow the procedure below when using the NT610C for the first time or changing the system settings.



If an abnormal condition has occurred during operation, check the display history record, I/O, setting status, etc.

3-2 Starting the NT610C

⚠ Caution Depending on how the power is switched ON/OFF, the entire system may stop. Follow the correct procedure when switching the power ON/OFF. Otherwise the system may operate unpredictably.

Turning on the power starts the NT610C.

When the NT610C is started, it will enter the RUN mode if system settings and screen data registration have been completed. In other cases, the start-up operations and the system state following the start-up will differ according to case as mentioned below.

⚠ Caution Confirm system safety before turning the power ON/OFF or resetting. Otherwise the system may operate unpredictably.

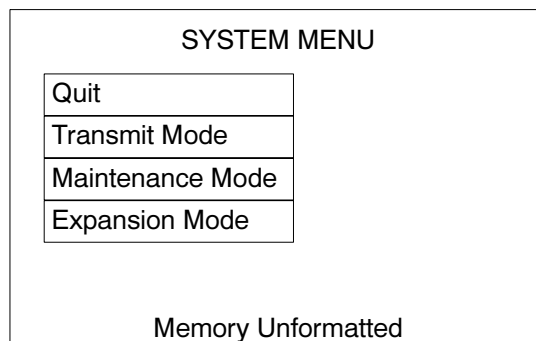
3-2-1 Starting the NT610C for the First Time

If the NT610C is started for the first time after purchase, follow the procedure below.

- (1) Make sure that:
 - the Write switch on the screen data memory board is set to “ENABLE.” (upper side) (See page 28)
 - DIP SW1-6 (Switch to the System Menu displayed/not displayed) of the NT610C is set to ON (displayed). (See page 30)
 - DIP SW1-5 (Screen data forced initialize effective/ineffective) of the NT610C is set to OFF (ineffective). (See page 30)

- (2) Turn ON the power to the NT610C.

The following menu will be displayed.



- (3) Initialize the memory.

For the memory initializing procedure, refer to Section 3-4 “Initializing Memory” (page 60).

3-2-2 Changing the System Settings, etc.

Follow the procedure below to change the system settings or screen data contents.

(1) Make sure that:

- the Write switch on the screen data memory board of flash memory type is set to "ENABLE." (upper side) (See page 28)
- DIP SW1-6 (Switch to the System Menu displayed/not displayed) is set to ON (displayed). (See page 30)
- DIP SW1-5 (Screen data forced initialize effective/ineffective) of the NT610C is set to OFF (ineffective). (See page 30)

(2) Turn on the power to the NT610C.

The NT610C will enter the RUN mode and the start-up screen will be displayed. The start-up screen varies according to registered screen data.

(3) Display the System Menu to change the system settings, etc. (See page 56)

Reference: If the NT610C has failed to start up normally; an error message is displayed or no screen is displayed, memory needs to be initialized. For the memory initializing procedure, refer to Section 3-4 "Initializing Memory" (page 60).

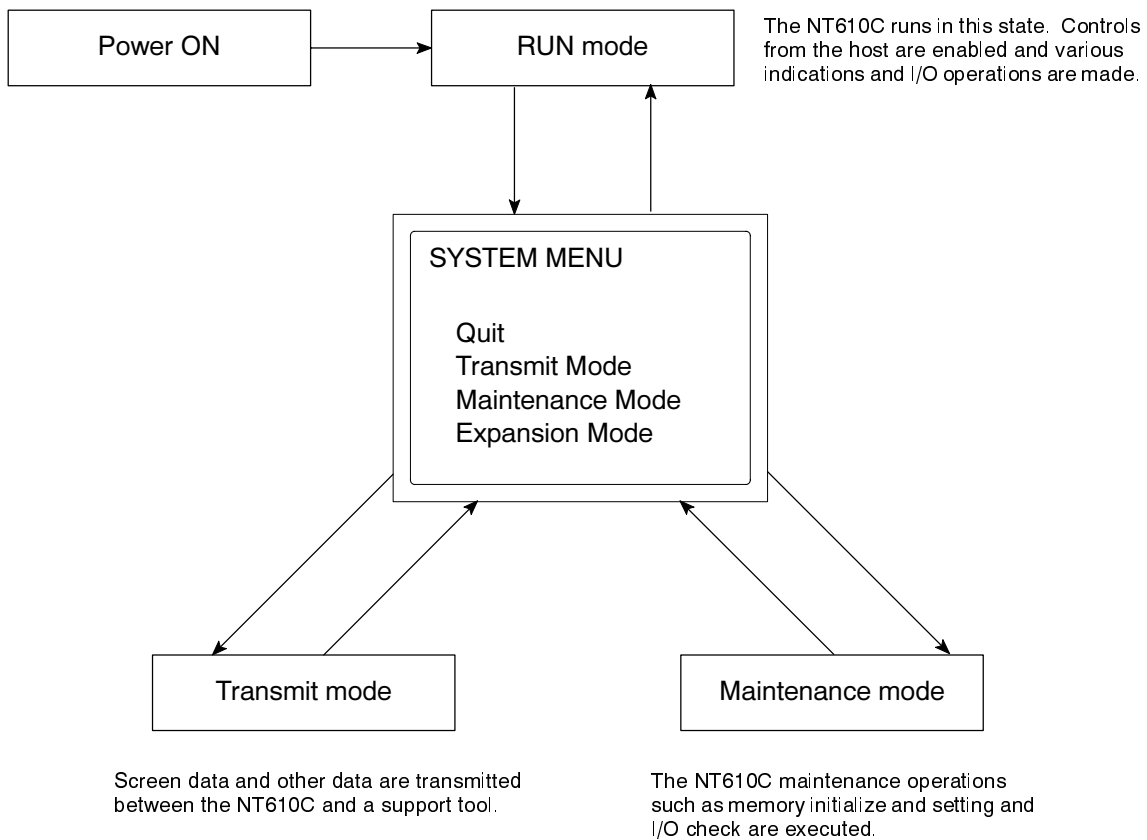
3-3 Operation Modes and the System Menu

The NT610C operates in either “RUN”, “Transmit”, “Maintenance”, or “Expansion” mode. The operation mode can be switched by using the System Menu.

3-3-1 System Menu and the Operation Modes

The NT610C will enter the RUN mode when the power is turned on. Select an operation mode by pressing the corresponding touch switch in the System Menu or the corresponding key of the system key unit.

The operation modes with respect to the System Menu are related to each other as shown below. For mode changing, refer to “Selecting the Menu Items” (page 58).



3-3-2 Operations with the System Menu

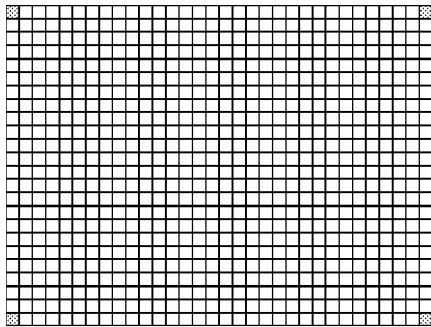
The following gives the procedure to call the System Menu, select the menu items, and other operations with the System Menu.

Reference: Make sure that DIP SW1-6 (Switch to the System Menu displayed/not displayed) is set to ON (displayed). If the setting is OFF (not displayed), the System Menu will not be displayed by the following procedure given below.

Displaying the System Menu

The System Menu can be displayed by either one of the following operations. The "RUN" LED goes off when the System Menu is displayed.

- **Display by touch switch**



6.6 mm x 6.6 mm

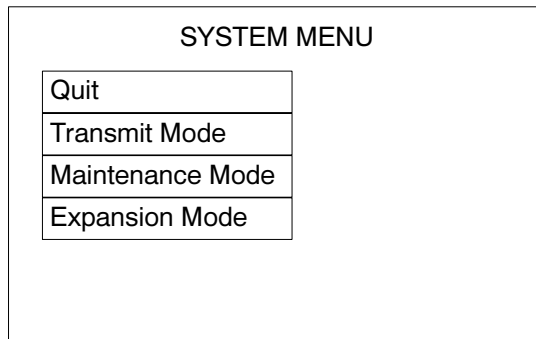
The NT610C display screen has four touch switches to display the System Menu, in the four corners (6.6 mm x 6.6 mm). Press any two of these switches at the same time to call the System Menu screen.

However, these switches are not displayed on the screen. If a touch switch displayed in a corner is pressed first, the touch switch will function and the System Menu will not be displayed.

To successfully call the System Menu, first press a corner where no touch switch key is displayed, and then, press any other corner regardless of the presence of a touch key.






The System Menu is displayed.

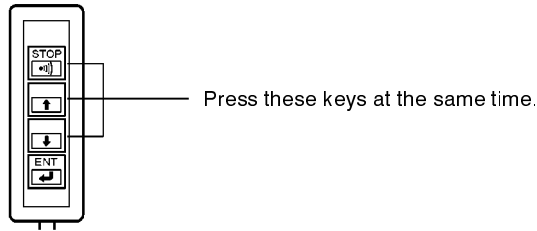


Reference: Avoid registering the touch switches at all of the four corners. If registered, it is impossible to call the System Menu from the screen.

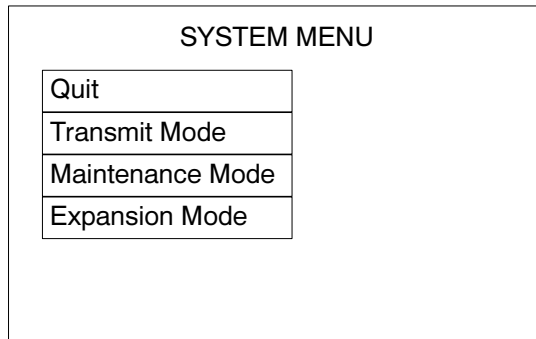
A “system key” function can be assigned to a touch switch. Pressing the touch switch so assigned on the screen can easily display the System Menu. For the relationship between the system key and the touch switch, refer to 4-4 “Allocation of System Key” (page NO TAG)

• **Display by the system key unit**

Pressing the  ,  , and  keys at the same time calls the System Menu.



The System Menu is displayed.



Reference: The expanded I/O unit can be used instead of the system key unit by assigning the system keys to input terminals of the expanded I/O unit. For details, refer to Section NO TAG “Operation of the Expanded I/O Unit” (page NO TAG).

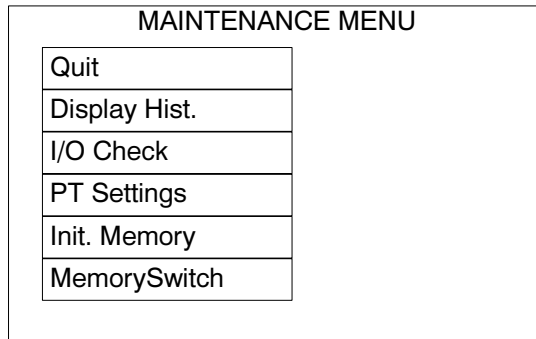
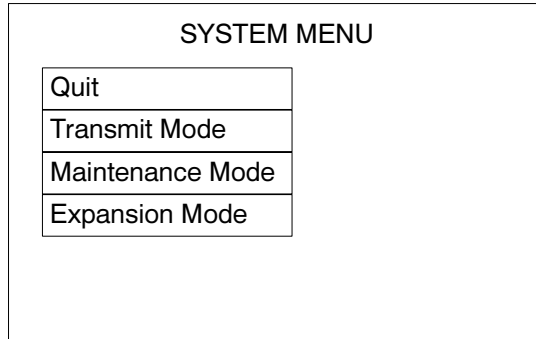
However, the system key functions assigned to the expanded I/O unit are enabled only during the RUN mode. After the System Menu is displayed, the system key unit will only become enabled.

Selecting the Menu Items







Press (touch) a menu item on the screen to select the item.

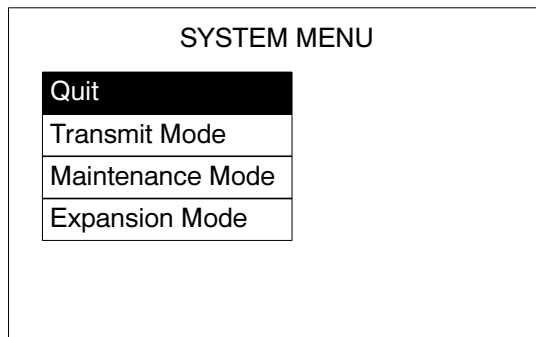
For an ON/OFF selection item, the setting option "ON" alternates with "OFF" each time its touch switch is pressed.

Example



Reference: The menu items can be selected with the system key unit. In this case, follow the procedures below.

- (1) Call the System Menu.
- (2) Press the  key or  key.
Pressing the  key highlights "Extension Mode".
Pressing the  key highlights "Quit".
- (3) Use the  key or  key to highlight the item to be selected, and press the return key to select the item.



System Menu Items

The System Menu items and the functions are as given below.

Menu Item	Function
Quit	The System Menu screen will be cleared and the NT610C will return to the RUN mode.
Transmit Mode	The Transmit Mode allows the transmission of the screen data between the support tool and the NT610C. (See page 65)
Maintenance Mode	The Maintenance Mode menu will be displayed to allow the maintenance of the NT610C.

Switching from the System Menu to the RUN mode

The NT610C will exit the System Menu and switch to the RUN mode in the cases mentioned below.

- Selecting “Quit” in the System Menu.
- The screen (touch switches) or any other key is not pressed for over 10 seconds.

3-4 Initializing Memory

If the NT610C is used for the first time, if a start-up error has occurred and the NT610C cannot be normally started, or if the NT-610C has unexpectedly malfunctioned during operation, the memory needs to be initialized.

How to Initialize Memory

The memory initialization is required in the cases mentioned below.

When a screen memory board is used for the first time or when an error message indicating that the screen data is corrupted etc. when the NT610C is started.

Use the "Init. Memory" of "MAINTENANCE MENU" in the System Menu.

If the NT610C causes malfunction such as blackout of the screen and the buzzer sounds, disabling the memory initializing from the system menu, use DIP SW1-5 on the NT610C.

- For memory initialization from the System Menu, refer to "Initialization by Using the System Menu". (page 60)
- For memory initialization with a DIP switch of the NT610C, refer to "Initialization by Using the DIP Switch". (page 62)

Initialization by Using the System Menu

When initializing the screen data memory, follow the procedure given below.

- (1) Call the System Menu by touch panel operation or system key operation.

When the power is turned on for the first time, the System Menu is displayed together with a message "Memory Unformatted".

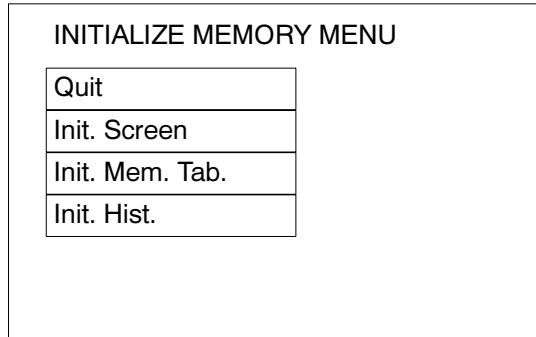
- (2) Select "Maintenance Mode".

The "MAINTENANCE MENU" will be displayed.

MAINTENANCE MENU	
	Quit
	Display Hist.
	I/O Check
	PT Settings
	Init. Memory
	MemorySwitch

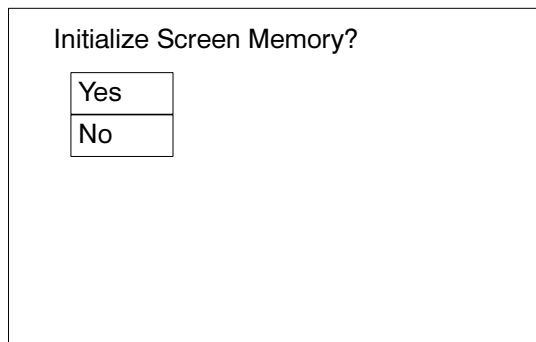
- (3) Select "Init. Memory".

The "INITIALIZE MEMORY MENU" will be displayed.



- (4) Select "Init. Screen".

The following screen will be displayed.



- (5) Select "Yes".

The screen data memory will be initialized. During the initialization, the "Initializing" message will be displayed.

Reference:

- If the Write switch on the screen data memory board is set to "Can not Write" (lower side), an error message "Screen memory can not write. Can not Initialize." will be displayed.

- Initializing the screen data memory will erase entire screen data registered in the NT610C. Make sure that there are backup copies of the screen data in the support tool before starting the initialization.
- Select "No" to cancel the memory initialization. The NT610C will return to the "INITIALIZE MEMORY MENU" without the memory initialized.

- (6) When the screen data memory initialization has been completed, the NT610C will return to "INITIALIZE MEMORY MENU".

When initializing the other memory (for display history record or memory table), repeat the steps from Step (4).

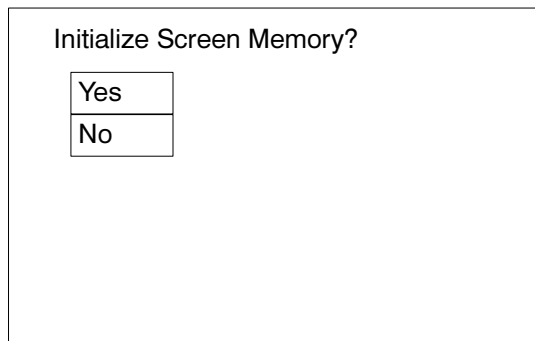
Reference: The item “Initialize memory table” displayed in the “INITIALIZE MEMORY MENU” from the System Menu is the switch of the function to initialize the NT610C memory table by using the memory table data transferred from the support tool to the NT610C. For its use, refer to Section 3-5 “Registering the Screen Data” (page 65).

Initialization by Using the DIP Switch (Forced Initialization)

Follow the procedure below to initialize the screen data memory.

- Reference:**
- Be sure to turn the power off before setting the NT610C DIP switch.
 - Set the Write switch on the screen data memory board to “ENABLE” (upper side).
- (1) Set DIP SW1-5 (Screen data forced initialize effective/ineffective) to ON (effective).
 - (2) Turn the NT610C power to ON.

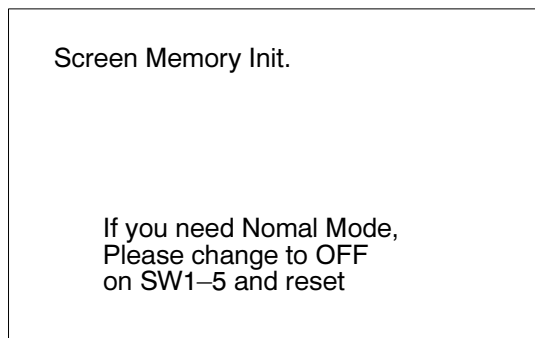
The following screen will be displayed.



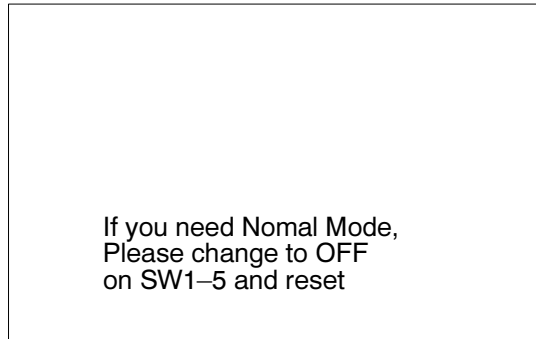
- (3) Select “Yes”.

The screen data memory is initialized. During the initialization, the “Initializing” message will be displayed.

When the initialization has been completed, the following screen will be displayed.



Reference: If “No” is selected here, the memory initialization will be cancelled and the following screen will be displayed.



- (4) Turn the NT610C power to OFF.
- (5) Set DIP SW1-5 (Screen data forced initialize effective/ineffective) to OFF (ineffective).
- (6) Turn the NT610C power to ON.

The NT610C will be started in the normal RUN mode. To change the system settings or to register the screen data, call the System Menu. (See page 55)

- Reference:** • If the Write switch on the screen data memory board is set to “Can not Write” (lower side), the following screen will be displayed. Set the write switch to “Write OK” (upper side) and repeat the operation from the beginning.

Screen Memory can not Write

If you need Nomal Mode,
Please change to OFF
on SW1-5 and reset

- If no screen data memory board is installed, the following screen will be displayed.

Install the screen memory data board and set the write switch to “Write OK” (upper side) and repeat the operation from the beginning.

No Screen Memory

If you need Nomal Mode,
Please change to OFF
on SW1-5 and reset

- If the memory has not been normally initialized, the following screen will be displayed. In this case, repeat the operation from the beginning. If the same error recurs, the memory board may have served its life or be inferior, so replace it.

Initialize Error

If you need Nomal Mode,
Please change to OFF
on SW1-5 and reset

3-5 Registering the Screen Data

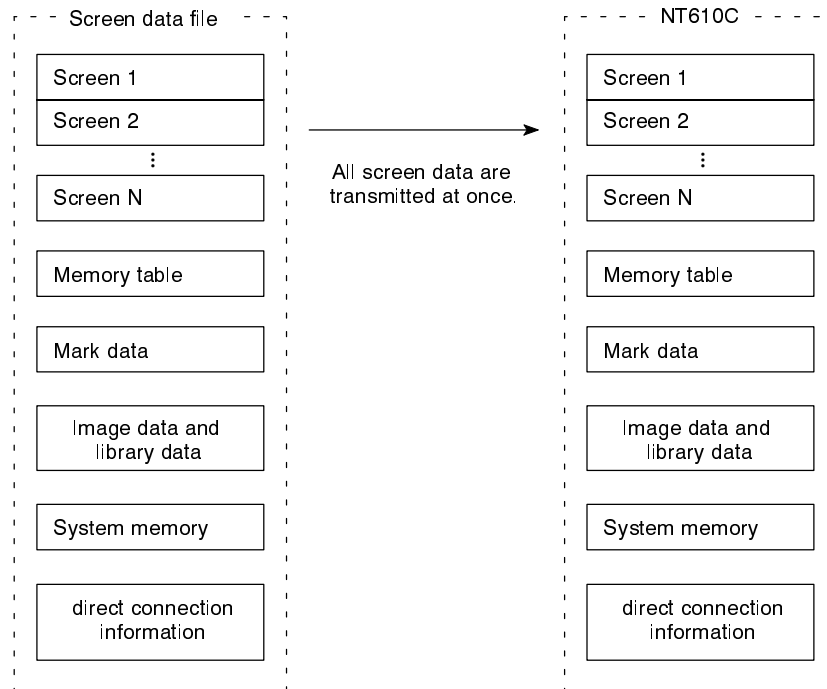
The screen data is created by using the support tool and registered in the NT610C screen data memory. This section describes the procedures to register the screen data in screen data memory. For the screen data creation and the support tool operation, refer to NT-series Support Tool Operation Manual (V028-E1-).

3-5-1 How to Register the Screen Data

Connect the support tool to the NT610C with an RS-232C cable in order to transfer the screen data directly. The screen data will be transmitted in file units.

Transmission in File Units




All screen data intended for registration in one NT610C unit are stored in one file by the support tool. Therefore, specifying a screen data file transmits at a time all the screen data needed for one PT. In this case, the screen data already registered in the PT will all be replaced with the transmitted data.



Reference: The NT610C cannot transmit the screen data in units of screens.

Precautions to be Observed During the Screen Data Transmission

When any of the following or a system error occurs during the screen data transmission, the transmitted data will cause the NT610C to malfunction.

- The power to the NT610C is interrupted or the reset button is pressed during the screen data transmission.
- The power to the computer on which the support tool is running is interrupted during the screen data transmission.
- The cable connecting the NT610C to the computer on which the support tool is running is disconnected or broken.
- The Cancel touch switch of the NT610C is pressed (or the system key unit keys  ,  , and  are pressed at the same time) to interrupt the transmission.
- The ESC key on the support tool is pressed to interrupt the transmission.

When the power to the NT610C is turned ON or reset, the screen data is checked. However, if any of the above occurs during the screen data transmission, the screen may disappear and other unexpected problems may occur.

In the case of such problems, follow the procedures mentioned in “Initialization by Using the DIP Switch (Forced Initialization)” (page 62).

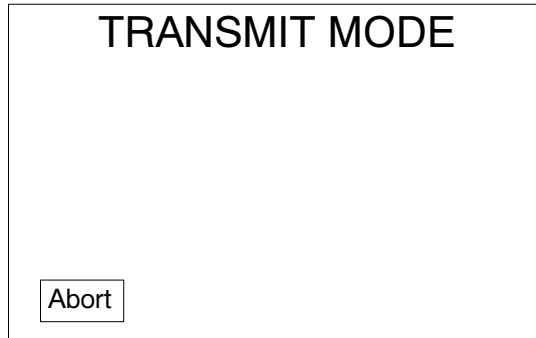
Transmitting the Screen Data from the Support Tool




To transmit the screen data from the support tool to the NT610C, follow the procedure below.

- Reference:**
- When the screen data transmission is attempted, the screen data memory in the NT610C is automatically initialized before new screen data is transmitted. It is not necessary to initialize the screen data memory before the screen data transmission.
 - If the “Communication Mode” is set to “High speed” in the Tool Settings of the support tool, the time it takes to transmit the screen data will be shortened. But set it to “Standard” in environments with lots of noises.

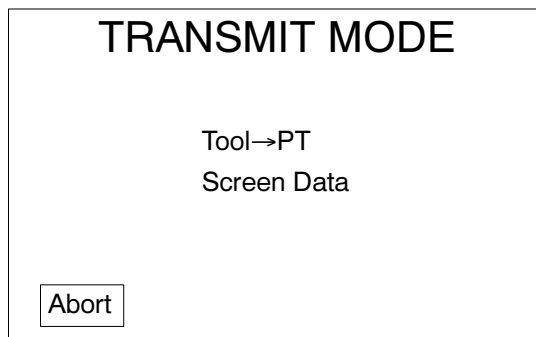
- (1) Before beginning the screen data transmission:
 - Set the Write switch on the screen data memory board to “ENABLE” (upper side). (See page 28)
 - Connect the NT610C to the computer on which the support tool is being used. (See page 49)
 - Turn on the NT610C.
 - Start up the support tool.
- (2) Enter the Transmit Mode by calling the System Menu and then by selecting “TRANSMIT MODE”.

The following screen will be displayed.



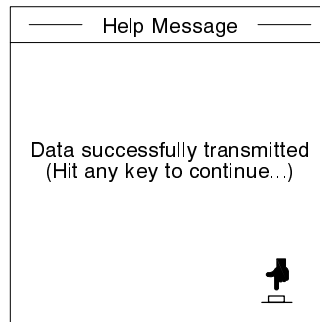
- Reference:** To interrupt the screen data transmission, press “Abort” on the touch panel or the , , and  keys of the system key unit at the same time. The NT610C will return to the System Menu.

- (3) Transmit the screen data from the support tool.
 - The NT610C will display the following screen when the screen data is being transmitted.



- When the screen data transmission is completed, the support tool will display the following screen.

<Screen of the support tool>



Press any key on the support tool to return to the File Selection screen.

- (4) Leave the Transmit Mode and return to the System Menu by touching "Abort" on the touch panel or by pressing the \square , \uparrow , and \uparrow keys of the system key unit at the same time.

3-5-2 Initializing the Memory Table

When the screen data transmission has been completed, initialize the memory table in the NT610C.

The initialization of the memory table is to replace the data in the NT610C memory table with the initial values set by the support tool.

The memory table may be initialized by the following two methods.

[Method 1]

Turn on the power of the NT610C again or rest the NT610C. However, when the Resume Function (See page 76) is enabled, the memory table cannot be initialized by this method.

In this case, disable the Resume Function or use Method 2.

[Method 2]

Enter the "Maintenance Mode" from the System Menu and follow the procedure described in Section 3-4 "Initializing Memory".




3-6 Starting the Operation

After completing the screen data transmission, connect the NT610C to the host and start the operation.

Check at Start-up of the Operation

Always check the following items when starting the operation to make sure that the NT610C is normally operating.

(1) Switching to the RUN mode

Press the “Quit” touch switch in the System Menu or the ,  and  of the system key unit at the same time while the System Menu is displayed. The first screen in the RUN mode will be displayed.

If the first screen is not displayed and the System Menu is displayed together with an error message, refer to Section 5-2 “Responding to Displayed Error Messages” (page NO TAG) and take appropriate action.

(2) Confirming the Communications between the NT610C and the Host

Execute the host program and confirm the following operations are normally performed.

- Confirm the NT610C screens switch according to the PC program execution.

If the screens do not switch correctly, check the connection between the NT610C and the host and also check the settings.

Refer to Section 2 “Hardware Settings and Connections”.

- Confirm that the information selected by the NT610C touch switches or externally entered from the expanded I/O unit has been correctly sent to the host, by displaying the information of channels and contacts by using a peripheral tool (LSS etc.). If the information sent from the NT610C has not been correctly received by the host, check the screen data settings (especially the switch settings).

For details, refer to NT-series Support Tool Operation Manual (V028-E1-).

Reference: When the direct connection system is used, the screen will be displayed that is specified for “Screen Switching Settings” of “PT Status Control Area” at the start-up.

If no screen data is registered for the screen specified, the error message “Specified screen not registered” will be displayed and the NT610C enters the RUN mode directly.

For screens specified, refer to “Screen Composition and Display Elements” (page NO TAG).

3-7 Various System Functions

The NT610C can set a variety of functions which are convenient during the operation.

3-7-1 Memory Switch

The NT610C has a function to register system function settings in memory. The contents of such settings can be changed freely from the System Menu. This function is called the memory switch.

Since the memory is backed up by the battery built in the NT610C, the settings in the memory are not erased even if the power is turned off.

Reference: If the backup by the built-in battery fails, the settings in the memory will be replaced with the initial values set with the support tool.

When the message "Battery lowered" is displayed during the operation of the NT610C, replace the built-in battery. For replacement of the battery, refer to "Replacing the Battery".

Functions that can be Set

The following system functions can be assigned to memory switches. For the details of the functions, see subsequent pages.

- Key press sound (page 72)
- Buzzer sound (page 73)
- Backlight Off function (Screen saver function) (page 75)
- Resume function (page 76)
- Alarm output (page 77)
- Printer type selection (page 78)

Memory SW Menu

The memory switches can be set by in the Memory Switch Menu from the System Menu.

MEMORY SWITCH MENU	
Quit	Printer ESC/P COL.
Key Press Sound	ON
Buzzer Sound	ON
Screen Saver	1hour
Resume Function	ON
Alarm Output	ON

Setting the Memory Switch Initial Values by Using the Support Tool

Memory switch initial values can be set by using the support tool.

When the screen data is transmitted to and registered in the NT610C, the memory switch initial values are also transmitted and registered at the same time.

Right after the screen data transmission, the transmitted initial values are directly set to the memory switches. When a change has been made to the setting after the screen data transmission, the value assigned in the change will become effective.

If the built-in battery has served its life and has drained, reapplying power to the NT610C will set to the memory switch the initial values registered from the support tool.

For details, refer to NT-series Support Tool Operation Manual (V028-E1-).

3-7-2 Setting the Key Press Sound

It is possible to set whether to give the key press sound when the NT610C system key or NT610C touch switch is pressed or the input terminals of the expanded I/O unit become on.

The factory setting has been set to give the key press sound when the touch key is pressed.

Set the key press sound by the menu operation from the Memory SW Menu as mentioned below.

- (1) Call the System Menu.

For how to use the System Menu screen, refer to “Operations with the System Menu” (page 56).

- (2) Select “Maintenance Mode”.

The Maintenance Mode Menu will be displayed.

- (3) Select “Memory Switch”.

The Memory SW Menu will be displayed.

- (4) Select "Key Press Sound".
- (5) Set the touch switch to ON or OFF.

Each time the "Key Press Sound" touch switch or return key is pressed, the setting option "ON" alternates with "OFF".

ON: The key press sound will be given for 0.2 seconds when a touch key is pressed.

OFF: The key press sound will not be given when a touch key is pressed.

- (6) Select "Quit."

The NT610C will return to the Maintenance (Mode) Menu.

3-7-3 Using the Buzzer

The NT610C can set a buzzer to indicate the occurrence of an emergency. The factory setting has been so made as to give no buzzer sound.

Setting the Buzzer

To set the buzzer to sound, the following two procedures can be used.

- Setting with a command from the host


Send a system control command from the host during operation.


For details, see the operation manual of the host I/F unit in use.

- Setting the buzzer as a screen attribute by using the support tool

When creating the screen data by using the support tool, set the buzzer as a screen attribute so that the buzzer will sound. When the screen in which this attribute has been set is displayed, the NT610C will give the buzzer sound. For details, refer to NT-series Support Tool Operation Manual (V028-E1-).

The buzzer sound can be stopped by the following operations.

- Send the buzzer stop command from the host.
- Switch the screen to screen which does not have a buzzer attribute.
- Press the touch switch to which the buzzer stop attribute has been set.
- Press the  key of the system key unit.

Reference: If a buzzer stop attribute has been set to a touch switch created on the screen in which the buzzer attribute has been set, such touch switch can be used to stop the buzzer sound. This touch switch will have the same function the  key has.

For the touch switch setting, refer to Section NO TAG "Touch Switches" (page NO TAG).

Types of the Buzzer Sounds The following three buzzer sounds can be set.

Type	Sound
Continuous sound	The buzzer continues to sound.
Short intermittent sound	The buzzer sounds intermittently at constant intervals, each sound continuing for 0.5 seconds.
Long intermittent sound	The buzzer sounds intermittently at constant intervals, each sound continuing for 1 second.

- Reference:**
- If buzzer sounds are designated by the screen display and a command simultaneously, the command designation will take priority.
 - If two types or the three types of buzzer sounds are instructed by commands at the same time, the continuous sound, short intermittent sound, and long intermittent sound will be given in that order. If both the continuous buzzer and the intermittent buzzer are instructed at the same time, the continuous buzzer will sound.

Setting Whether to Sound the Buzzer

Use the MEMORY SWITCH MENU to set whether to sound the buzzer when the buzzer sound is instructed.

- (1) Call the MEMORY SWITCH MENU.

For the operation, refer to “Setting the Key Press Sound” (page 72).

- (2) Select “Buzzer Sound”.
- (3) Set the “Buzzer Sound” touch switch to ON, OFF, or ERR ON

Each time the “Buzzer Sound” touch switch or return key is pressed, the setting option will switch among “ON”, “OFF” and “ERR ON”.

- OFF: The buzzer will not sound at all during the operation.
- ON: The buzzer will sound when a command from the host is given, the screen attribute has been set, or an error has occurred.
- ERR ON: The buzzer will sound only when an error has occurred.

- (4) Select “Quit”.

The NT610C will return to the “MAINTENANCE MENU”.

- Reference:** The buzzer will sound when “Buzzer” is selected in the I/O Check Menu from the “MAINTENANCE MENU”, regardless of the memory switch setting.

3-7-4 Backlight Off Function (Screen Saver Function)

The NT610C has a function that turns off the backlight of the LCD panel to maximize its service life if no operation is performed for a certain period of time.

Turning on the Backlight

When the backlight is off by the backlight function, the backlight will turn on again when one of the following operations is performed.

- A key or a touch switch on the NT610C has been pressed.
- The input terminals of the expanded I/O unit, to which the Backlight Off Canceling Attribute is set, have become on.
- A command has been received. (screen switching)
- A system control command from the host has been received. (redisplay of the screen)

Setting the Backlight Off function

Use the Memory SW Menu to set whether or not the Backlight Off function is used. (The touch switch for the function is shown as the "Screen Saver" on the Memory SW Menu.)


- (1) Call the Memory Switch Menu. (See page 72)
- (2) Select "Screen Saver".
- (3) Set the function to "10 minutes", "1 hour", or "None".

Each time the "Backlight Off" touch switch or return key is pressed, the setting option will switch among "10 minutes", "1 hour", or "None".

- | | |
|-------------|---|
| None: | The backlight will continue to light. |
| 10 minutes: | The backlight will be turned off when none of the above four operations have been performed for 10 minutes. |
| 1 hour: | The backlight will be turned off when none of the above four operations have been performed for 1 hour. |

- (4) Select "Quit".

The NT610C will return to the "MAINTENANCE MENU".

 **Caution** Do not press touch switches carelessly while the backlight is off or while nothing is displayed on the screen. Otherwise the system may operate unpredictably. Only press touch switches after confirming system safety.

Note: After images may remain if the same pattern is displayed for a long period (approx. 1 hour).
To prevent the formation of an afterimage, either use the screen saver function or periodically switch screens.

3-7-5 Resume Function

The NT610C has a function to protect the contents of the memory table (value setting key input, data from the host, etc.) from being erased even if the power to the NT610C is shut off during operation. This function is called the resume function. Setting the resume function protects the memory table from being initialized even when the power is turned on or reset or when the mode is switched to the "RUN" mode by the System Menu operation.

The screen displayed before the power is turned off will be displayed again when the NT610C is started next time.

Set the resume function in the MEMORY SWITCH MENU.

- (1) Call the MEMORY SWITCH MENU. (See page 72)
- (2) Select "Resume Function".
- (3) Set the "Resume Function" touch switch to OFF or ON.

Each time the "Resume Function" touch switch or return key is pressed, the setting option "ON" alternates with "OFF".

OFF: The resume function will be disabled and the memory table will be initialized when the power to the NT610C is turned on or reset or when the mode is switched to the "RUN" mode.

ON: The resume function will be enabled and the memory table will not be initialized.

- (4) Select "Quit".

The NT610C will return to the "MAINTENANCE MENU" mode.

Reference: If the "Init. Memory Table" is selected in Initialize Memory Menu from the "MAINTENANCE MENU", the memory table will be initialized regardless of whether or not the resume function is set to ON or OFF. For the memory table initialization, refer to "Initializing Memory" (page 60).

3-7-6 Using the Alarm Output Function

Besides the buzzer (See page 73), the NT610C has an alarm output function as a means of giving an alarm for a state of emergency, etc. A siren, a lamp, etc. can be connected to the alarm output terminals of the NT610C so that an alarm for a state of emergency can be given by sound or light.

For how to connect external units to the alarm output terminals, refer to "Connecting to the Alarm Output Terminals" (page 41).

Setting the Alarm Output Function to ON

When alarm output is made, the connected external unit will operate. The alarm output can be enabled or disabled by issuing a command from the host or by registering the ON/OFF setting as a screen attribute when screen data is created with the support tool.

- **Making the Alarm Output Setting by Sending a Command From the Host**

During the operation of the NT610C, send a System Control command from the host to switch the setting of the alarm output function to ON or OFF.

For details, refer to the Operation Manual of the host I/F unit in use.

- **Making the Alarm Setting by Registering it with the Support Tool as a Screen Data Attribute**

When creating screen data with the support tool, set the alarm output function as a screen data attribute. For details, refer to NT-series Support Tool Operation Manual (V028-E1-).

Displaying the screen sets the alarm output function enabled to operate the external unit.

To set the alarm output function disabled, send a system control command from the host.

Reference: If the alarm output function is set by a command and as a screen attribute at the same time, the setting by the command will become effective.

Setting Whether or not an Alarm is Given

Set, in the MEMORY SWITCH MENU, whether to actually give an alarm when alarm giving is specified.

- (1) Call the MEMORY SWITCH MENU. (See page 72)
- (2) Select "Alarm Output".
- (3) Set the "Alarm Output" touch switch to ON or OFF

Each time the "Alarm Output" touch switch or return key is pressed, the setting option "ON" alternates with "OFF".

OFF: The alarm output function will be disabled.

ON: The alarm output function will be enabled by sending a command from the host or by setting the function as a screen attribute.

- (4) Select "Quit".

The NT610C will return to the "MAINTENANCE MENU".

3-7-7 Screen Printing Function

The NT610C can print a hardcopy of the displayed screens onto a printer connected to the NT610C. This function is called the screen printing function. The NT610C will continue operating even when such a hardcopy is being printed.

For printer connection, refer to "Connecting a Printer" (page 50).

Printing Screens

Screen printing can be performed by using a touch switch for which screen printing/interruption function is set or by giving a screen printing command from the host.

• Using the Touch Switch

When creating screen data with the support tool, set the screen printing function to a touch switch. For details, refer to NT-series Support Tool Operation Manual (V028-E1-).

Pressing the touch switch so set as to start hardcopy printing prints a hardcopy of the screen displayed. To interrupt the printing, press the touch switch to which hardcopy printing interruption is set.

• Giving Instruction from the Host

Set up a PT status control area (PC → PT) and then start printing the screen.

For details, refer to the Operation Manual of the I/F unit in use.

However, printing of screen hardcopies may not be interrupted from the host.

Setting Screen Printing

Set the type of the printer and a way of printing in the MEMORY SWITCH MENU.

- (1) Call the MEMORY SWITCH MENU. (See page 72)
- (2) Select "Printer".
- (3) Set the printer type and a way of printing.

Each time the "Printer" touch switch or return key is pressed, the setting option switches among the following modes.

PR201H color: Specify this for a printer that can emulate the NEC PC-PR201. Hardcopies will be made in colors.

PR201H gray scale: Specify this for a printer that can emulate the NEC PC-PR201H. Hardcopies will be made in monochrome with colors expressed by gray scale levels.

ESC/P color: Specify this for a printer, such as the EPSON ESC/P Printer (24-pin), that conforms to the printer control standard ESC/P. Hardcopies will be made in colors.

ESC/P gray scale: Specify this for a printer, such as the EPSON ESC/P Printer (24-pin), that conforms to the printer control standard ESC/P. Hardcopies will be made in monochrome with colors expressed by gray scale levels.

- (4) Select "Quit."

The NT610C will return to the "MAINTENANCE MENU".

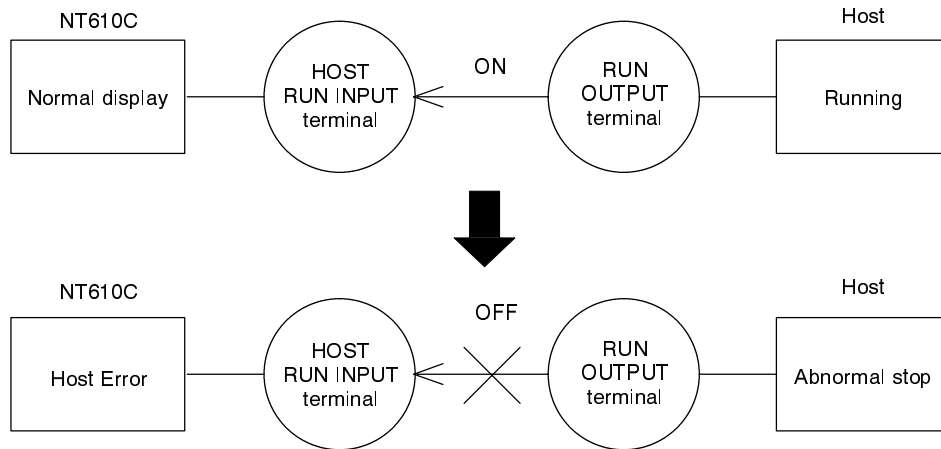
3-7-8 Using the HOST RUN INPUT Function

The NT610C has a function to monitor the host operation. This function is called the host RUN input function.

When using this function, connect the RUN OUTPUT terminals of the host to the HOST RUN INPUT terminals of the NT610C. For this connection, refer to the "Connecting to the HOST RUN INPUT terminals" (page 43).

Operations Performed by the HOST RUN INPUT Function

The HOST RUN INPUT function responds to the operational status of the host.



A message "Host Error" is displayed and the operation stops.

Reference: Registering the screen data for Screen 2000 displays this screen instead of the message "Host Error" when the host operation has stopped. For screen number, refer to the "Screen Composition and Display Elements" (page NO TAG).

Setting the HOST RUN INPUT Function Enabled or Disabled

Set the HOST RUN INPUT function enabled or disabled by using DIP SW1-2 of the NT610C. (See page 30)

Enabled: Set SW1-2 to OFF

Disabled: Set SW1-2 to ON

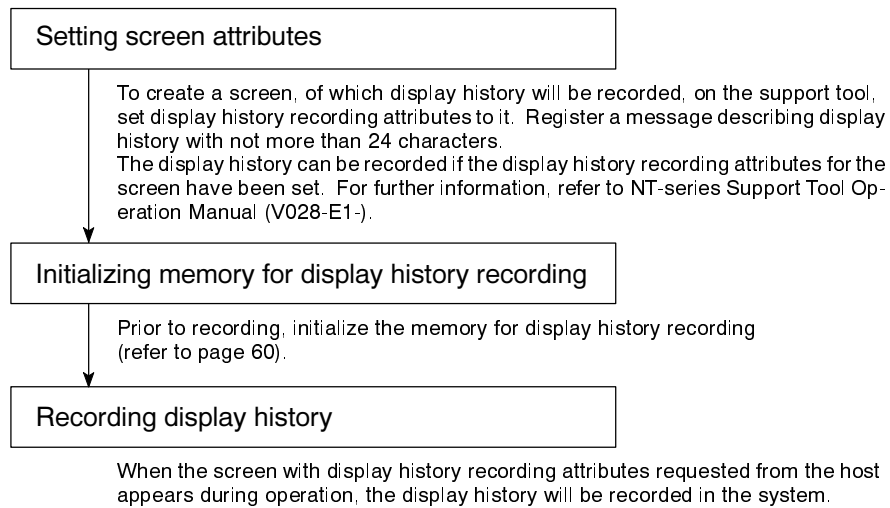
3-8 System Maintenance

The NT610C has self-maintenance functions, such as screen data recording, I/O check and PT setting display. These functions are accessible mainly from the Maintenance Mode.

3-8-1 Using the Display History Recording Function

The screen data recording function is used to record the display sequence and frequency of screens during operation. The data recorded can be displayed and confirmed on the system screen.

Recording Display History Display history is recorded in the following procedure:



Display History Recording Format

Display history includes the following items related to the screen displayed:

- Screen number
- Date and time of display
- Message outlining screen data

Maximum Number of Screens to be Recorded

Up to 1023 screens can be recorded. The maximum number of recording times per screen is 255.

Since the data recorded is retained by the battery, it will not be lost even if the power to the system is turned off.

Confirming Display History Recorded

There are two ways to confirm display history recorded: by the maintenance mode, and by displaying the screen by the display history recording function during operation.

Recorded data can be displayed in order of occurrence or frequency.

• **In order of “occurrence”**

Recorded data is displayed in order of occurrence.

Screen#	(Y/	M/	D	H: M)	(X)	Message	1/10
8	(93/	5/	30	23: 30)	()		
101	(93/	5/	31	02: 17)	()		
45	(93/	5/	31	11: 05)	()		End
10	(93/	5/	31	21: 48)	()		
8	(93/	5/	31	22: 06)	()		
8	(93/	5/	31	23: 50)	()		
68	(93/	6/	1	03: 05)	()		
45	(93/	6/	1	09: 25)	()		
125	(93/	6/	1	15: 13)	()		
101	(93/	6/	1	16: 49)	()		↑
3	(93/	6/	1	20: 35)	()		
45	(93/	6/	1	22: 23)	()		
53	(93/	6/	2	01: 11)	()		
101	(93/	6/	2	02: 35)	()		↓
101	(93/	6/	2	09: 17)	()		
3	(93/	6/	2	10: 51)	()		
45	(93/	6/	2	12: 23)	()		
45	(93/	6/	2	13: 11)	()		
125	(93/	6/	2	14: 58)	()		
45	(93/	6/	2	16: 11)	()		
10	(93/	6/	2	16: 25)	()		
68	(93/	6/	2	17: 25)	()		
8	(93/	6/	2	18: 23)	()		
53	(93/	6/	2	19: 49)	()		
88	(93/	6/	2	20: 35)	()		
101	(93/	6/	2	22: 53)	()		
8	(93/	6/	2	23: 58)	()		

• **In order of “frequency”**

Recorded data is displayed in order of display frequency with the accumulated number of times each screen has been displayed.

Screen#	(Y/	M/	D	H: M)	(X)	Message	1/1
8	(/	/	/	:)	(126)		
45	(/	/	/	:)	(76)		
101	(/	/	/	:)	(53)		End
68	(/	/	/	:)	(43)		
125	(/	/	/	:)	(40)		
3	(/	/	/	:)	(35)		
53	(/	/	/	:)	(24)		
10	(/	/	/	:)	(8)		↑
88	(/	/	/	:)	(5)		↓

In either case, the system screen shows up to 27 screen numbers and their data at a time.

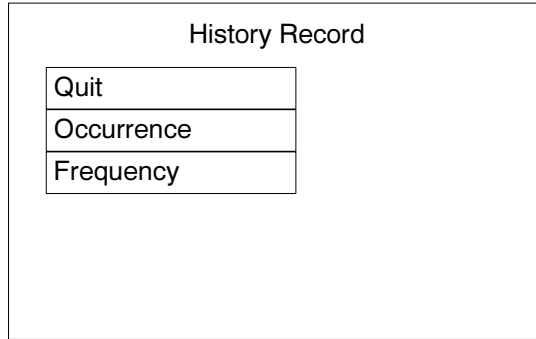
To take a look at data that is not on the display, press the ↑ or ↓ key on the touch panel or on the system key unit to scroll up or down the screen.

When no screen data is recorded, the message “History Record Not Found” appears, and the screen returns to the “History Record” after about two seconds.

• **Confirming recorded display history by the maintenance mode**

- (1) Get the "MAINTENANCE MENU" screen displayed (refer to page 72).
- (2) Select "Display History".

The "History Record" screen will appear.



- (3) Select "Occurrence" or "Frequency".

Press the touch panel, or the \uparrow or \downarrow key to move the cursor to the desired item and press the \square key on the system key unit.

The recorded data will be displayed in the selected order.

- (4) Press the "Quit" touch switch on the touch panel, or the \square , \uparrow and \downarrow keys on the system key unit together.

The screen will return to the "MAINTENANCE MENU".

• **Confirming recorded display history during operation**

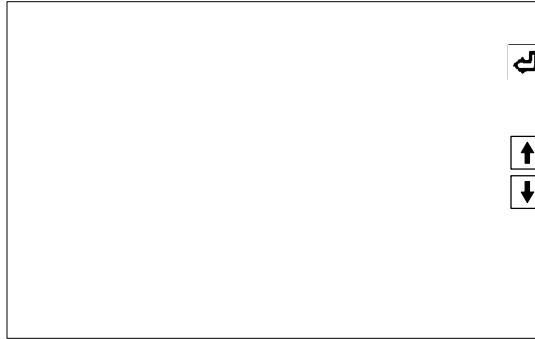
Screens No. 1997 and No. 1998 are for displaying recorded display history.

Either screen will be displayed according to the data display order selected.

Screen No. 1997: In order of occurrence

Screen No. 1998: In order of frequency

- Reference:**
- Screens No. 1997 and No.1998 are reserved for recorded display history. They are unavailable for any other purpose.
 - When recorded display history is displayed during operation, the touch switches that can scroll up or down the screen do not appear. Create [↑] and [↓] touch switches as illustrated below in the right-end 40-dot wide column (for two touch switches) on the screen in advance. Select “white” for the background color.



3-8-2 I/O Check

The I/O check function diagnoses whether NT610C input and output devices, including the touch switches, expanded I/O unit, screen display and buzzer, and communications with the host link unit or support tool are normal.

How to Perform an I/O Check

An I/O check begins by selecting “I/O Check” on the Maintenance Mode Menu.

- (1) Get the “MAINTENANCE MENU” screen displayed (refer to page 72).
- (2) Select “I/O Check”.

The “I/O CHECK MENU” screen will appear.

I/O CHECK MENU	
Quit	LED Check
Exp. I/O Unit	
Touch Switch	
Comm. Check	
LCD Display	
Buzzer Check	

- (3) Select the item to check.
An I/O check will begin.
- (4) Return to the “I/O CHECK MENU” screen.
- (5) Select “Quit”.

The NT610C will return to the “MAINTENANCE MENU”.

Items Covered by I/O Check

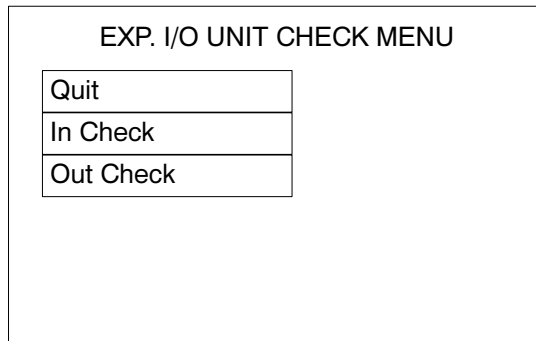
An I/O check is performed on the following items:

- Expanded I/O unit (page 85)
- Touch switches (page 88)
- Communications (page 88)
- LCD display (page 89)
- Buzzer (page 89)
- LED (page 89)

• **Expanded I/O unit check**

This menu is to check the expanded I/O unit connected to the system.

Select “Exp. I/O Unit” on the “I/O CHECK MENU” screen. The “Exp. I/O UNIT CHECK MENU” screen will appear.



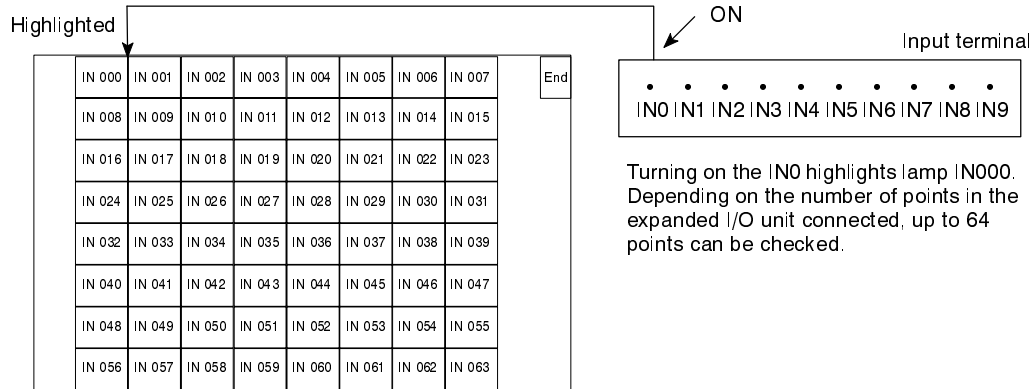
Reference: When “Exp. I/O Unit” is selected with no expanded I/O unit connected, the message “No Exp. I/O Unit Exists” is displayed, and the “I/O CHECK MENU” screen reappears after about two seconds.

⚠ Caution When the extended I/O check is performed (in the maintenance mode), signals are output to the output terminals. If there is equipment connected to the output terminals, confirm safety before performing this test.

[When “F Key Input Check” is selected]

This menu is to check the input function of the expanded I/O unit loaded in the system.

As soon as the unit’s input terminals are turned on, the corresponding lamps on the screen are highlighted. The following figure shows an example of 10/02 terminals.



The relationship between the input terminals of each unit and the screen lamps is as follows:

- 10/02 terminals
Input terminal contacts IN0 to IN9 correspond to lamps IN000 to IN009.
- 32/16 terminals
The input terminal contacts correspond to lamps IN000 to IN031, as shown in the table below:

Lamp	IN000	IN001	IN002	IN003	IN004	IN005	IN006	IN007
Contact Name	A0	A1	A2	A3	A4	A5	A6	A7

Lamp	IN008	IN009	IN010	IN011	IN012	IN013	IN014	IN015
Contact Name	A9	A10	A11	A12	A13	A14	A15	A16

Lamp	IN016	IN017	IN018	IN019	IN020	IN021	IN022	IN023
Contact Name	B0	B1	B2	B3	B4	B5	B6	B7

Lamp	IN024	IN025	IN026	IN027	IN028	IN029	IN030	IN031
Contact Name	B9	B10	B11	B12	B13	B14	B15	B16

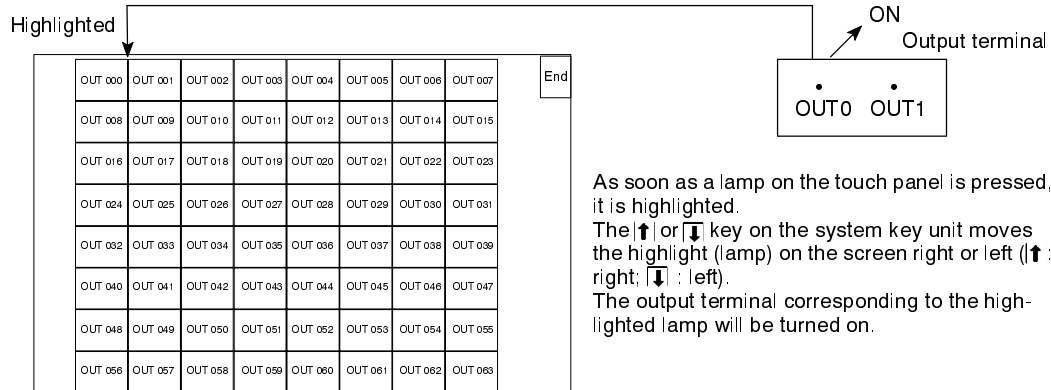
After the check is completed, press the “End” touch switch. The screen will return to the “I/O CHECK MENU”.

- Reference:**
- When the memory switch for key press sound is set for ON on the “MEMORY SWITCH MENU”, a key press sound will be heard every time an input terminal is turned on.
 - The function key numbers corresponding to the input terminals turned on are not reported to the host link unit.

[When “Lamp Output Check” is selected]

This menu is to check the output function of the expanded I/O unit loaded in the system.

Highlighting a lamp on the touch panel on the screen turns on the corresponding output terminal. The \uparrow or \downarrow key on the system key unit moves the highlight right or left. The lamps cannot be highlighted from the host link unit. The following figure shows an example of 10/02 terminals.



The relationship between the output terminals of each unit and the screen lamps is as follows:

- 10/02 terminals

Output terminal contacts OUT0 and OUT1 correspond to lamps OUT000 and OUT001, respectively.

- 32/16 terminals

The output terminal contacts correspond to lamps OUT000 to OUT015, as shown in the table below:

Lamp	OUT000	OUT001	OUT002	OUT003	OUT004	OUT005	OUT006	OUT007
Contact Name	C18	C16	C15	C14	C13	C12	C11	C10

Lamp	OUT008	OUT009	OUT010	OUT011	OUT012	OUT013	OUT014	OUT015
Contact Name	C9	C8	C7	C6	C5	C4	C3	C2

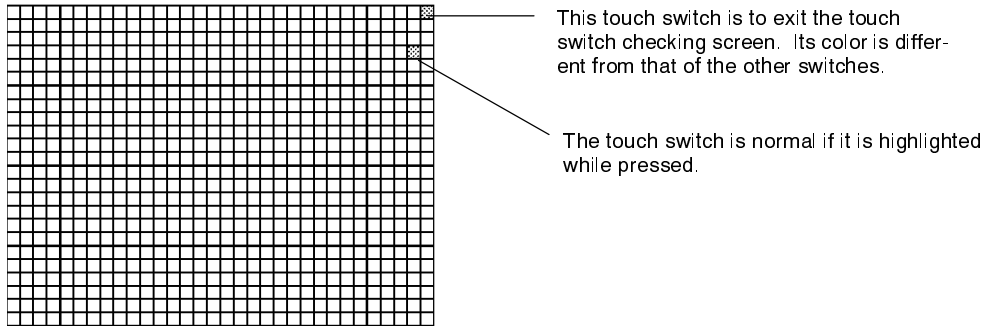
After the check is completed, press the “End” touch switch, or the \square , \uparrow and \downarrow keys simultaneously on the system key unit. The screen will return to the “I/O CHECK MENU”.

Reference: Before checking the expanded I/O unit, remove as many external devices connected to the output terminals as possible, because the external devices (buzzer, warning lamp, etc.) will be actuated every time an output terminal is turned on and checked.

• **Touch switch check**

This menu is to check the touch switches for functioning.

Select "Touch Switch" on the "I/O CHECK MENU" screen. A checking screen, which shows switches of 24 rows and 32 column, will be displayed.



After the check is completed, press the touch switch in the upper right corner. The screen will return to the "I/O CHECK MENU".

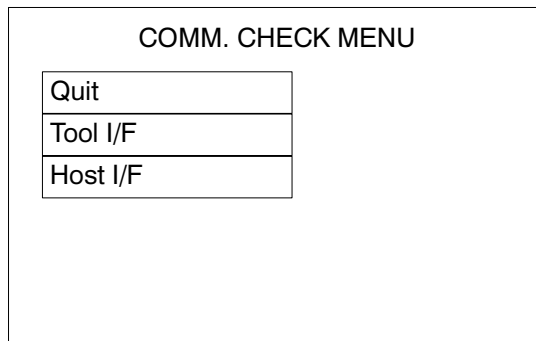
Reference: • When the memory switch for key press sound is set for ON on the "MEMORY SWITCH MENU", a key press sound will be heard every time a touch switch is pressed.

• The pressed touch switch number is not reported to the host link unit.

• **Communications check**

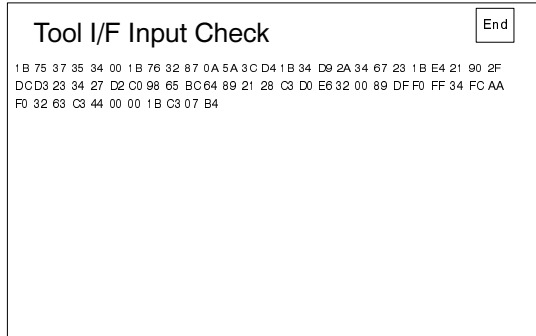
This menu is to check communications between the system and the support tool or host link unit.

Select "Comm. Check" on the "I/O CHECK MENU" screen. The following "COMM. CHECK MENU" screen will be displayed. Then, select "Tool I/F" or "Host I/F".



[When “Tool I/F” is selected]

The data transmitted from the support tool connected to the system is displayed in hexadecimal.



• **LCD display**

This menu is to check the LCD display function of the system display.

Select “LCD Display” on the “I/O CHECK MENU” screen. The color of the screen will change line by line from the dot (or point which is the smallest element of the screen) in the upper left corner. After the entire screen is displayed in the same color, the color will change to the next one.

The sequence of colors is black, blue, violet, white, yellow, green and black.

When all dots are displayed normally, the screen will return to the “I/O CHECK MENU”. To cancel the check, press the upper right corner touch switch on the touch panel, or the , and keys on the system key unit together. The “I/O CHECK MENU” will reappear.

• **Buzzer check**

This menu is to check the buzzer for functioning.

Select “Buzzer Check” on the “I/O CHECK MENU”.

If the buzzer is normal, the system buzzer begins to sound continuously.

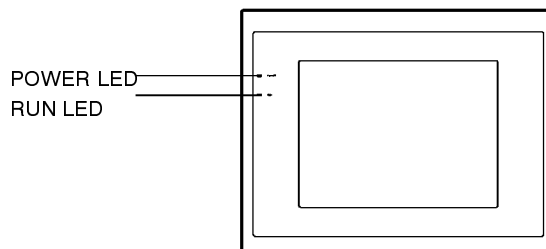
The buzzer can be stopped by pressing “Buzzer Check” touch switch on the touch panel or the key on the system key unit.

Reference: Even if the memory switch for the buzzer is set for OFF on the “MEMORY SWITCH MENU”, the buzzer will sound when a buzzer check is executed.

• **LED check**

This menu is to check whether the LEDs come on.

Select “LED Check” on the “I/O CHECK MENU” screen. The “RUN” LED on the front of the system will flicker. The “POWER” LED will remain on.



After the check is completed, press the “LED Check” touch switch on the touch panel or the key on the system key unit.

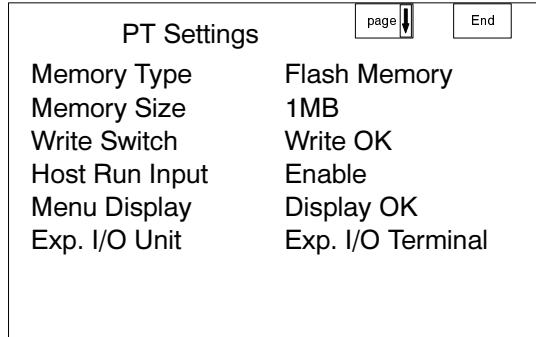
3-8-3 Confirming PT Settings

The settings of the NT610C and its host I/F unit can be displayed.

To display the settings, press the “Exit” touch switch on the touch panel. The screen will return to the “MAINTENANCE MENU”.

Confirming the System Settings

On the “MAINTENANCE MENU” screen, select “PT Settings”. The following screen showing the current system settings will appear:



- “Memory Type” and “Memory Size” indicate the memory type and capacity of the image data memory board loaded in the system.
- “Write Switch” indicates the state of the image data memory board write switch: “ENABLE” or “INHIBIT”.
- “Host RUN Input” indicates whether input from the host RUN input terminal is valid or invalid. “Enable” or “Disable” is displayed according to the setting of DIP switch SW1-2 on the system.
- “Menu Display” indicates whether the system menu can be displayed. “Display OK” or “Can not Display” is displayed according to the setting of DIP switch SW1-6 on the system or command.
- “Exp. I/O Unit” indicates whether an extended. I/O unit is loaded with either of the following abbreviations:

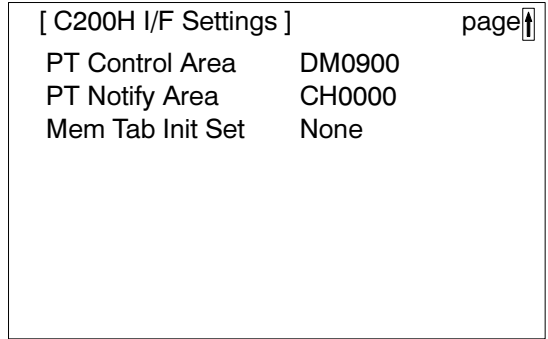
Abbreviation	Meaning
Exp. I/O Terminal	10/02 or 32/16 terminals are connected.
Unconn.	No expanded I/O unit is connected.

Reference: Pressing the “Next Screen [↵]” touch switch or the [↵] key on the system key unit will display the next screen (Host Interface Setting Screen).

Host Interface Setting Screen

The Host Interface Setting Screen shows the settings of the host I/F unit loaded in the system. The information is different depending on the type of the unit connected.

The following screen is an example of a C200H I/F unit.



Pressing the “Previous Screen [Left Arrow]” touch switch or the [Left Arrow] key on the system key unit will display the previous screen.

- Reference:**
- For display of the settings of other I/F units, refer to the manual for the host I/F unit – NT-series Direct Connection Operation Manual (V026-E1-1).

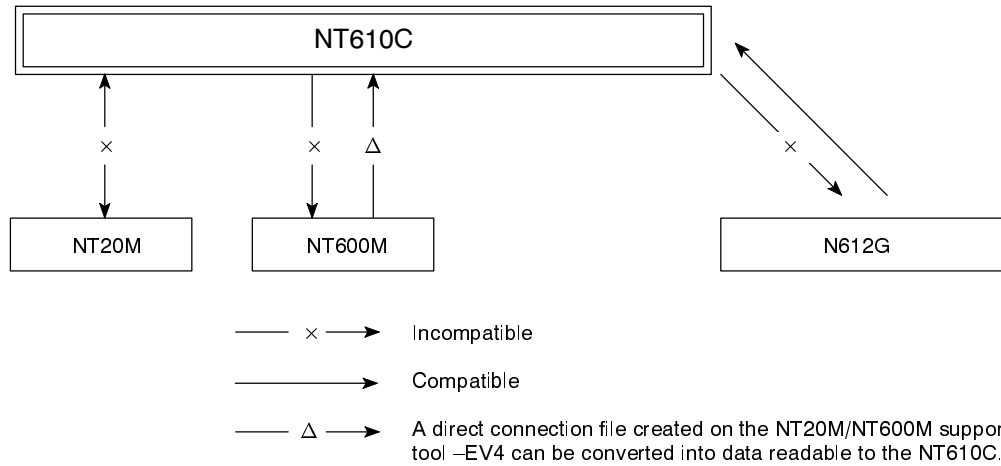
3-9 Compatibility of Screen Data

This section describes the compatibility of screen data for the NT610C with screen data for other NT series PTs.

Compatibility with Screen Data for Other NT Series PTs

The screen data for the NT610C is compatible with screen data for the following NT series PTs.

[Compatibility of Screen Data]



For example, the NT610C can handle screen data for the NT612G, however, screen data for the NT610C is incompatible with the NT612G.

Reference: Converted data must be set again according to the specifications of the destination system. For details, refer to NT-series Support Tool Operation Manual (V028-E1-).

SECTION 4

NT610C Functions and Operation

This section describes the basic functions of the PT. The basic functions are the basis for the use of the NT610C and the creation of screen data on the support tool. Please read through this section before operating the PT. This section also includes a description of helpful functions, such as stand-alone and terminal.

For further information on these functions, refer to each host I/F unit operation manual and the “NT-series Support Tool Operation Manual” (V028-E1-).

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4-1 Outline of Functions

The NT610C is an 8-color display PT.

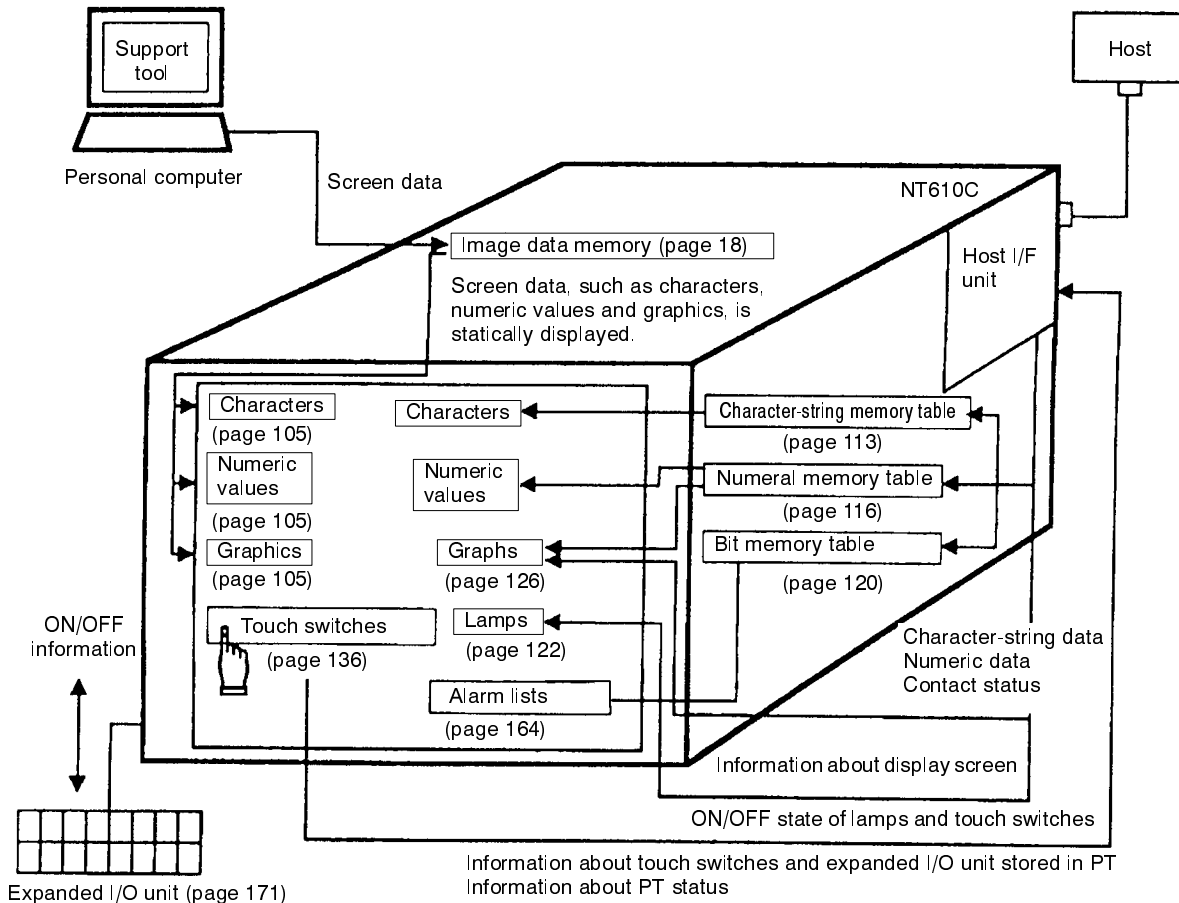
Using its functions and communications with the host (PC, etc.) through the host I/F unit, the system can provide a wide range of operations for factory automation (FA).

The NT610C has the following two main functions:

- Display function: The NT610C displays various information, including characters and graphics, on the PT screen in eight colors.
- Notification function: The NT610C transmits to the host link unit information it stores or requested by the unit.

Each function comprises NT610C's standard functions, as well as those which may be available from the host I/F unit connected. Some functions, such as terminal, are unavailable unless a specific host I/F unit is loaded.

Below is a diagram of NT610C's functions.



4-2 Communications with Host

The NT610C, through the host I/F unit loaded in it, can communicate with the host, control the PT from the host, or transmit data from the PT to the host link unit. The communication method is different depending on the host I/F unit connected.

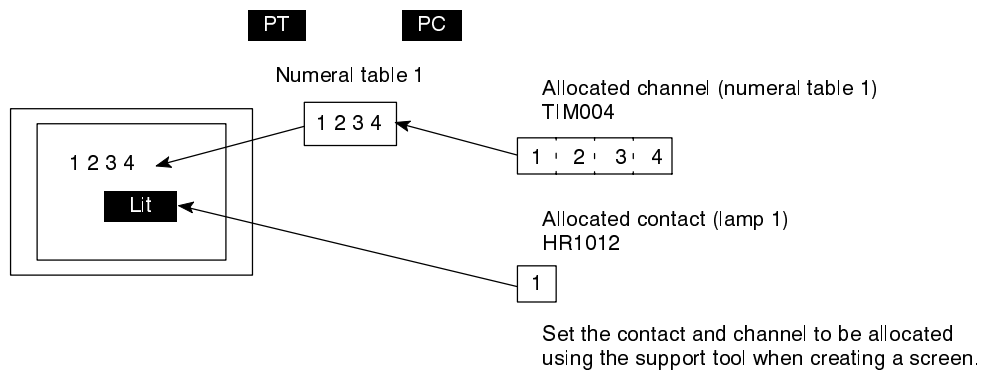
4-2-1 Communication Method

The NT610C communicates with the host. The communication method is different depending on the host I/F unit used.

- Host link, C200H, etc.

An NT610C equipped with a host I/F unit can verify elements necessary for display, or allocate input data storage contacts and channels to the area of the PC. By writing or reading data to or from the allocated contacts and channels from the PT, display will be changed, or the status of the NT610C will be notified or controlled.

The following figure shows a system with a numeral table allocated to the timer (TIM) and a lamp to a holding relay (HR).



4-2-2 Control and Notification

The host can control PT display screen switching, numeral memory table data changes, etc. through the host I/F unit.

The PT can notify the host of touch switch input data and display screen numbers.

PT Operation Control from the Host

Described below are the NT610C operations controllable from the host.

Functions which the host can control are different depending on the type of the host I/F unit.

Screen control:	Display of a specific screen, inquiry about a screen number, etc.
Memory table operation:	Writing data to a memory table, copying of a memory table, etc.
Lamp and touch switch control:	Instruction to display data, inquiry about display state, input disabled setting, etc.
System control:	Buzzer and alarm ON/OFF, inquiry about status, screen data initialization, screen data printing, etc.

Notification of Data from the NT610C to the Host

The NT610C transmits data to the host in the following two cases:

- (1) In response to an inquiry from the host.
- (2) When data is entered through touch switches.

The notification function is different depending on the type of the host I/F unit, system itself or expanded I/O unit.

- (1) In response to an inquiry from the host

The NT610C transmits data in response to an inquiry from the host.


It can respond to inquiries about:

- Screen data: Screen number displayed, etc.
- Lamps and touch switches: ON/OFF state of lamps and touch switches
- System: Internal status of the NT610C

- (2) When data is entered from touch switches, etc.

The NT610C has the following three input functions:

- Touch switches on the screen which allow data input simply by touching them
- External expanded I/O unit
- Numeric values and character-strings entered from touch switches or expanded I/O unit

 **Caution** Set so that there is no overlap between the PT status control area and PT status notify area. Otherwise the system may operate unpredictably.

4-3 Display Functions of the NT610C

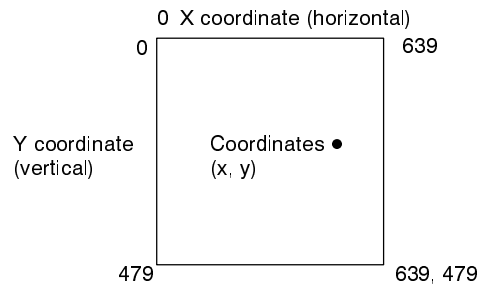
The NT610C screen can display a wide variety of graphics, such as circles and polygons, as well as characters and numeric values, in eight colors. Also, setting attributes enables the system to represent lamps controllable from the host link unit, touch switches which serve as an operating panel and allow data input, graphs of which sizes can be changed in proportion to the data stored in the numeral memory table, and other elements necessary for workshop operations.

4-3-1 Screen Composition and Display Elements

Screen Composition

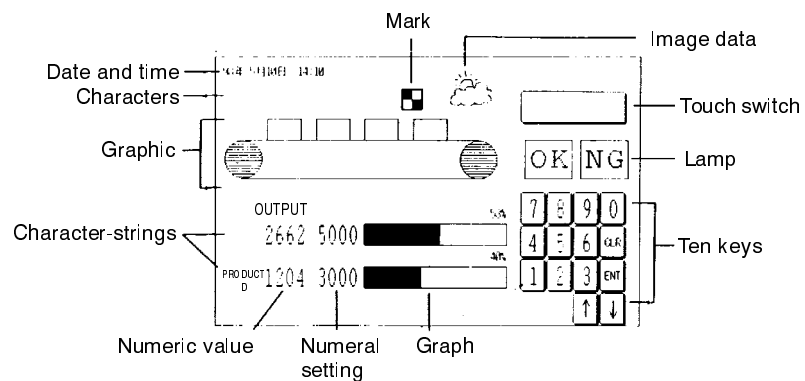
The NT610C screen is 640 dots wide by 480 dots long. Each dot is set by a combination of an X coordinate (horizontal) and a Y coordinate (vertical).

The coordinate origin (0, 0) is positioned in the upper left corner of the screen.



Display Elements

The screen can display the following elements. Each element is called a display element.



Screen Management

All screens displayed on the NT610C are managed by their screen numbers.

A screen number can be assigned at the time of the creation of a screen by the use of the support tool. Up to 2000 screens can be created, and screen numbers from 1 to 2000 can be given to each of them as desired. The screen number is very helpful in switching the screen being displayed to a desired one from the host, or in specifying the screen to be displayed at the startup of the system (initial display screen).

Special Screen Numbers

Screens No. 0 and No. 1997 through No. 2000 are kept for the following special purposes:

- Screen No. "0"

Screen No. 0 is reserved with the system as the no-display screen. Select this screen when there is no need to display data on the screen.

- Screen No. "1997"

Screen No. 1997 is reserved with the system as the screen for History Record in order of occurrence. Select this screen to display screen data in order of occurrence.

- Screen No. "1998"

Screen No. 1998 is reserved with the system as the screen for History Record in order of frequency. Select this screen to display screen data in order of frequency.

- Screen No. "1999"

Screen No. 1999 can be defined as the "Connecting to host" screen. Without registering this screen, a screen with the message "Connecting To Host" automatically appears when the power is turned on, or the mode is shifted to operation.

- Screen No. "2000"

Screen No. 2000 can be defined as the "HOST ERROR" screen. Without registering this screen, a screen with the message "HOST ERROR" automatically appears whenever an error occurs in the host.

- Reference:**
- Screens No. 1980 through No. 1996 may be used for extension functions. Use care in adding extension functions.
 - Screens No. 1900 through No. 1979 may be used for character-string setting keyboard screens. In other cases, they are usable as normal screens.
 - Create screen data, which will be displayed on the screen, on the support tool, and register it in the image data memory of the NT610C. For registration of screen data, refer to "3-5 Registering of Screen Data" (page 65).

4-3-2 Color Display

The NT610C can display the entire screen and screen elements, such as characters and graphics, in eight different colors. Specify a color as an attribute for each display element when creating a screen on the support tool.

Available Colors

The following eight colors can be selected:

Red, green, blue, yellow, magenta, cyan, white, black

The four color combinations below are exclusive ORed. The combination of two exclusive ORed colors means that if the color of a display element is the same as that of the background, it will be displayed in a different color.

Yellow, for example, is exclusive ORed with blue.

Red ↔ Cyan Green ↔ Magenta Blue ↔ Yellow White ↔ Black

The following display elements are displayed in the above combinations of colors:

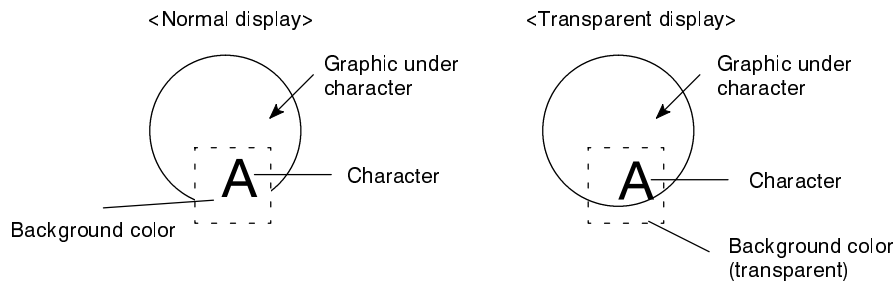
- Input area display frame and background colors of numeral and character-string setting screen (Refer to pages 145 and 156.)
- Lamp colors when they are on, and lamp guide display character colors (Refer to page 122.)
- Touch switch colors when they are on, and guide display character colors (Refer to page 136.)
- Display color of eight dots beyond the top of a bar graph, and screen background color (Refer to page 126.)

Transparent Display

When two display elements overlap with each other, the background color of the overlying element conceals the underlaid display element.

Besides the above eight colors, the color of “transparency” is available for the background of some display elements.

When “transparency” is set, nothing appears behind a display element, and the display element or screen background color under it becomes visible.



[Display elements which can be displayed in the color of “transparency”]

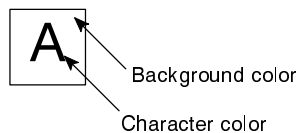
- Normal display characters
- Lamp (or touch switch) guide display characters
- Lamps (or touch switches) when they are off
- Filled graphic patterns

[Display elements which cannot be displayed in the color of “transparency”]

- Display character-strings in character-string memory table
- Display numeric values in numeral table
- Numeric values and character-strings on numeral and character-string setting screen
- Characters indicating percentage (%) on graphs

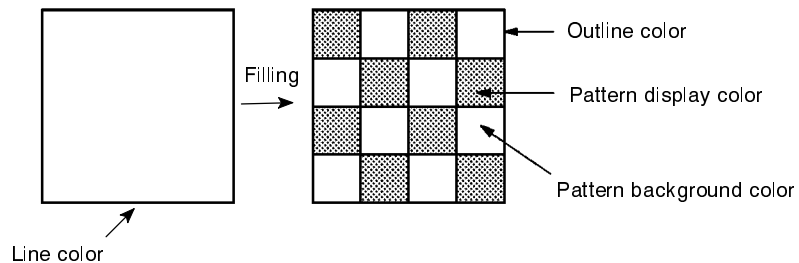
Color Display of the Screen The background color of the entire screen can be specified. Set the background color as a screen attribute when creating screen data on the support tool.

Color Display of Characters The color of characters (character color) and that of the square frame (background color) can be specified.



Color Display of Graphics The outline of a graphic can be drawn in a specified color, and the graphic can be filled in a pattern in specified colors.

As filling pattern colors, the display color of the pattern itself, the pattern background color and the filled area boundary line color can be set.



Reference: When a lamp, a touch switch and a graphic are to be displayed in specific colors, part of the frames of the display elements may be invisible because of the combination of the background, outline and filling colors. This is a phenomenon peculiar to a color LCD, not a failure with the system.

In such a case, change the color combination.

4-3-3 Screen Types

The following three screen types are expected from the NT610C. Select an appropriate screen according to the application, and create characters, graphics or other screen data on it.

- Normal screen
- Overlapping screen
- Continuous screen

The details of each screen are described below.

Reference: Designate the type of each screen on the “Screen Selection” screen on the support tool.

Normal Screen

The normal screen is the basic screen of the NT610C. It is not necessary to select a screen type (overlapping or continuous) when screen data is to be created on this screen.

Once the normal screen is selected, the screen having been displayed will disappear, and the normal screen will appear.

Overlapping Screen

Two or more normal screens can be overlapped and displayed as one screen. A group of overlapped screens is called an overlapping screen.

Normal screens are displayed in designated order, and form an overlapping screen. Up to eight normal screens can be overlapped.

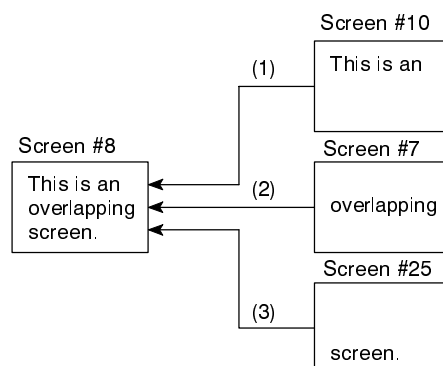
The overlapping screen is called a “parent screen”, and each normal screen comprising the overlapping screen is called a “child screen”.

On a parent screen, all display elements can be used.

[Example]

Parent screen No.: 8

Child screen Nos.: 10, 7, 25



* The screens are overlapped in the order of (1), (2), and (3).

- Reference:**
- Only one numeral setting screen (refer to page 145) and one character-string setting screen (refer to page 156) can be registered as a child screen.
 - Be careful not to set the same touch switch or numeric value position on two or more normal screens on an overlapping screen. The setting may not function as intended. Make sure on the support tool that there is no conflicting position.
 - As background color and other screen attributes, the settings for the parent screen are effective.



Continuous Screen

Two or more normal screens can be switched continuously as a group. Such a group of normal screens is called a continuous screen. Up to eight screens can be registered as continuous screens with one screen number.

The screen with a screen number registered for continuous screens is called a “parent screen”, and each registered continuous screen is called a “child screen”.

According to the setting made during the creation of a screen, the number of the current continuous screen can be displayed together with the total number of continuous screens in the upper right corner of the screen.

On a continuous screen, all display elements, except “numeral settings” (refer to page 145) and “character-string settings” (refer to page 156), can be used.

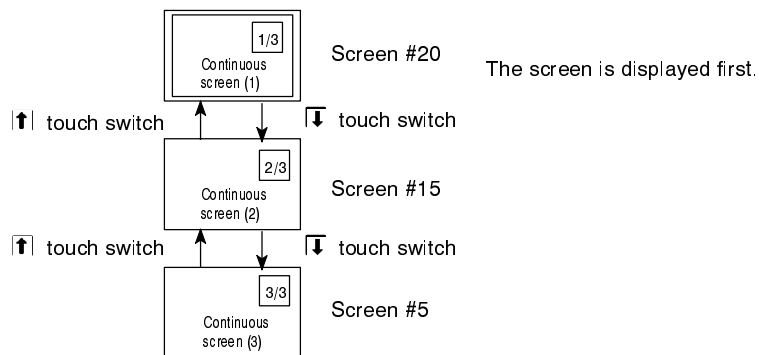
Continuous screens can be switched by touch switches, system keys allocated to the expanded I/O unit or  or  key on the system key unit.

[Example]

Parent screen No.: 10*

Child screen Nos.: 20, 15, 5

When screen No. 10 (continuous screen) is designated, the continuous screens included in the group will be displayed as shown below:

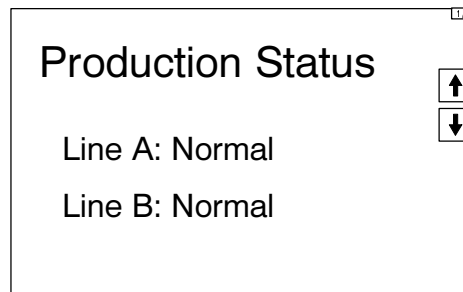


* Since screen No. 10 has been set for a group of continuous screens, the screen cannot be displayed alone. Screen No. 20, the first continuous screen, will appear when screen No. 10 is selected.

- Reference:**
- Continuous screens are displayed in the color of the parent screen background. The rest of the screen attributes for the parent screen are also applied.
 - The display mode of the touch switches \uparrow and \downarrow with a system key function is different depending on the “numeral setting” (“system” or “user”) among the screen attributes set on the support tool.

<When “system” is selected for the numeral setting attribute>

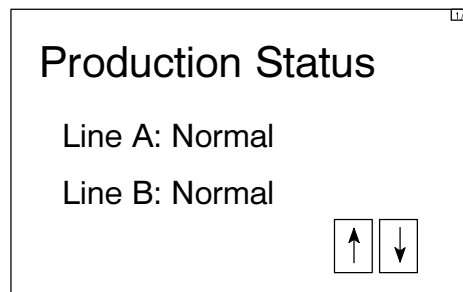
As shown in the figure below, the system keys are automatically displayed in the upper right section of the continuous screen.



<When “user” is selected for the numeral setting attribute>

The system keys can be displayed in any position on the continuous screen.

Set the positions of the touch switches with a system key function at the time of the creation of a screen.



- For details of touch switches and system keys allocated to the expanded I/O unit, refer to “4-4 Allocation of System Key” (page 111).

4-3-4 Screen Attributes

Once attributes are set to a screen, specific functions can be executed when the screen is displayed. For example, when a screen with a “buzzer” attribute appears, the buzzer of the NT610C starts sounding.

Two or more attributes can be given to one screen.

The following attributes can be set:

Alarm Attribute

When a screen with an alarm attribute is displayed, the external output alarm contact of the NT610C will be turned on.

A warning lamp can be connected and used as an external warning.

A screen without an alarm attribute will turn off the alarm contact.

Buzzer Attribute

When a screen with a buzzer attribute appears, the buzzer of the NT610C will sound.

There are three types of buzzer sound:

Continuous sound (The buzzer sounds continuously.)

Short intermittent sound (The buzzer sounds at intervals of 0.5 second.)

Long intermittent sound (The buzzer sounds at intervals of 1.0 second.)

Screen Display History Attribute

When a screen with this attribute appears, the screen number, date and time (hour, minute, second), frequency and messages will be recorded as screen data.

Screen data can be read in the maintenance mode or on the support tool.

Screens No. 1997 and No. 1998 can be used to read the data (refer to page 98).

Numeral Setting Attribute

This attribute displays special keys, such as system keys, as touch switches on a numeral setting or continuous screen. For example, by setting the “system” attribute, the system keys will be displayed in fixed positions as touch switches.

For further information, refer to “Continuous Screen” (page 102) or “Numeral Setting Functions” (page 145).

Reference: Set screen attributes to each screen on the “Screen Selection” screen on the support tool.

4-3-5 Types and Attributes of Characters and Graphics

On a screen, various elements, including characters, graphics, image data and library data, can be displayed. Giving these display elements attributes enables the screen to inverse, flash and use other expression patterns.

Set these attributes in creating a screen on the editing screen on the support tool.

Character Types and Attributes

On the NT610C, the following types of character can be entered and displayed:

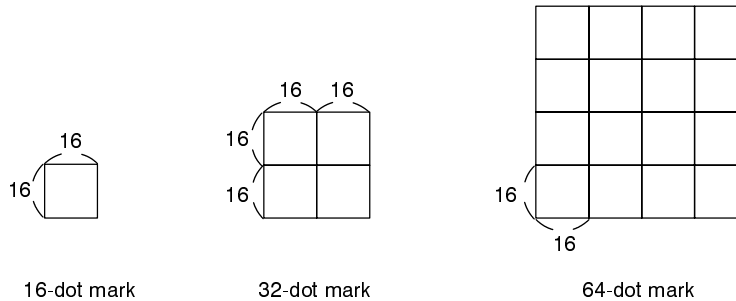
Character Type	Number of Dots (Vertical x Horizontal)	Character Set	Maximum Number of Characters on One Screen (Without Overwriting)
Half height character	8 x 8	Alphanumeric characters and symbols	80 characters x 60 lines (4800 characters)
Normal character	8 x 16	Alphanumeric characters and symbols	80 characters x 30 lines (2400 characters)

The NT610C is provided with “marks”, “image data” and “library data” in addition to regular characters.

- **Marks**

A mark is a graphic pattern combining 16 x 16, 32 x 32 and 64 x 64 dots. 32-dot and 64-dot marks, however, are combinations of 4 (2 x 2) and 16 (4 x 4) 16-dot marks, respectively.

Up to 224 16-dot marks can be registered in one screen data file.



• **Image data**

Image data is a set of images of which sizes can be designated in units of 8 dots in a square area ranging from 8 x 8 dots to 640 x 480 dots (entire screen). Create images to be registered as image data by cutting part of another display screen or drawing them on the screen when creating screen data. All data displayed on the entire screen can also be registered as image data.

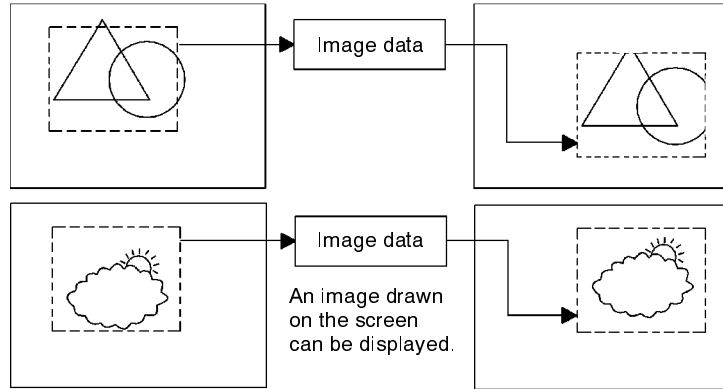


Image data of up to 224 images can be registered in a screen data file as code of FE20 to FEFF.

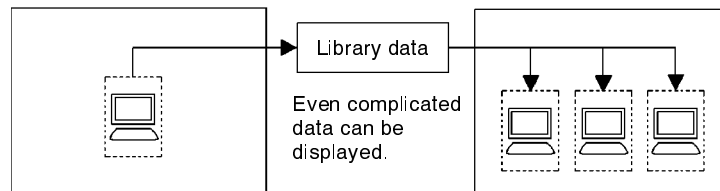
Basically, image data can be displayed in any position on the screen, however, the entire image may not be displayed in some specific positions.

• **Library data**

Library data is image data consisting of plural characters and graphics of which sizes can be designated in units of 1 dot in a square area ranging from 1 x 1 dots to 640 x 480 dots (entire screen).

The creation of library data starts by laying out characters and graphics with attributes on the screen in the same manner as regular screen data.

Next, specify the area to be registered. Only characters and graphics can be extracted from other screen data and registered as library data.



Once they are registered as library data, complicated images composed of characters and graphics can be displayed many times easily, and need not be created again. The image data memory can be saved at the same time.

Library data of up to 896 images can be registered in a screen data file as code of FA20 to FAFF, FB20 to FBFF, FC20 to FCFF and FD20 to FDFF.

Basically, library data can be displayed in any position on the screen. But, in a position where the entire library data cannot be displayed, it automatically moves to another position. Use care in setting a display position.

Library data cannot be registered as display elements.

Reference: Difference between image data and library data

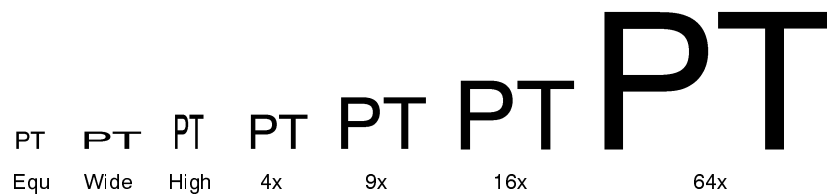
While image data can take any form as shown in the screen example, only images consisting of characters and graphics can be library data.

Because only drawn characters and graphic images are registered as library data, library data requires less memory capacity than image data of which the dots to be displayed on the screen are all registered.

• **Enlargement of characters and marks**

Characters and marks can be enlarged to the following scales. Image data and library data are exceptions.

Double-width scale, Double-height scale, x4 scales, x9 scales, x16 scales, x64 scales



• **Smoothing**

Characters (or marks) enlarged to x4 scales or larger are displayed with the outline automatically smoothed. This function is called “smoothing”. Image data and library data cannot be smoothed.

Enlarged Characters Enlarged Characters

With smoothing

Without smoothing

• **Color display**

Number of colors: 8

Number of background colors: 8 or “transparent”

• **Inverse display**

Characters and the background are inverted.

• **Flashing display**

Characters flash while being displayed. Normal display alternates with no- display.

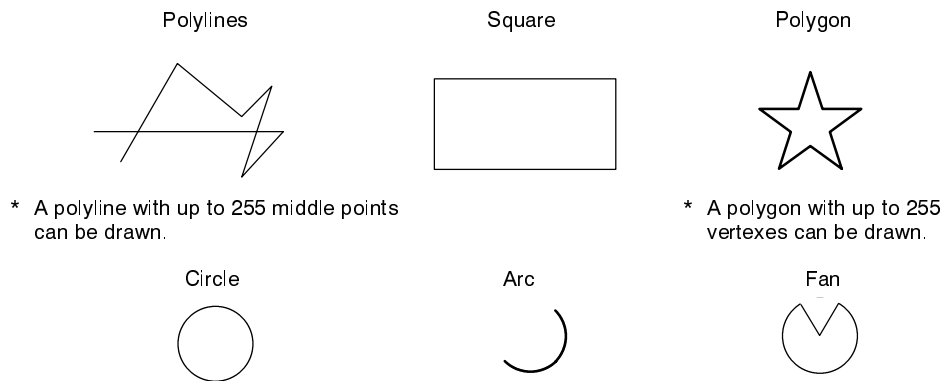
• **Inverse flashing display**

Inverse display alternates with normal display.

- Reference:**
- Image data cannot be inverted, flashed or inverted and flashed alternately.
 - Library data will be inverted, flashed or inverted and flashed alternately according to the setting at registration.

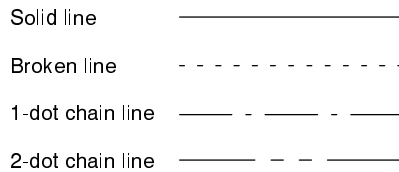
Graphic Types and Their Attributes

On the NT610C, the following types of graphic can be entered and displayed:



• **Designation of line types**

Straight lines are available in the following four types:



Other graphics can be drawn only with a polyline.

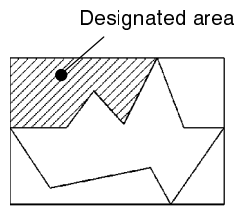
• **Filling**

The areas of graphics within the outline (closed areas) can be filled in a tiling pattern.

There are ten tiling patterns, as shown below:

Name	Pattern	Name	Pattern
Flat		Slant right	
Box		Crosshatch	
Slant left		Grid	
Stripe		Border	
Diamond		Halftone	

Reference: The area enclosed by the minimum square frame confining the polygon and the outline of the polygon can be filled, as illustrated in the figure below.



• **Color display**

Number of graphic frame colors: 8

Number of display colors (in filling): 8

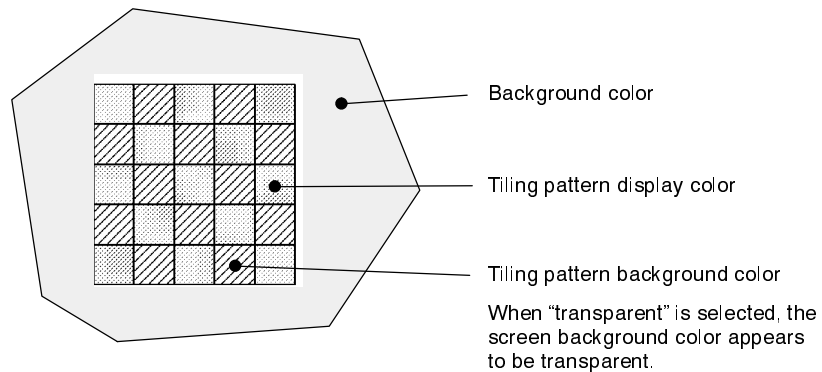
The tiling pattern colors are display colors.

Number of background colors (in filling): 8 or “transparent”

The color visible between the blocks of the tiling pattern is the background color. When “transparent” is selected, the display element under the graphic appears to be transparent.

Number of outline colors (in filling): 8

The color of the boundary line surrounding the area to be filled is the outline color.



Reference: Part of the graphic frame may be invisible because of the combination of the display (in filling), background and outline colors. This phenomenon is peculiar to a color LCD, not a failure with the system.

In such a case, change the color combination.

- **Normal display**

Only the outline of a graphic is displayed in a designated color.

- **Inverse display**

A graphic filled in the same color as that of the graphic outline is displayed.

- **Flashing display**

Normal display alternates with no-display.

- **Inverse flashing display**

Normal display alternates with inverse display.

Reference: • Polylines and arcs cannot be inverted, flashed or inverted and flashed alternately.


- Filling can be designated only with normal display.

- Do not fill graphics to which a flashing display or inverse flashing display attribute has been set.

If a graphic with a flashing display or inverse flashing display attribute is to be filled, the area outside the graphic may be filled in the same pattern when the system operates.







4-4 Allocation of System Key








The NT610C can allocate the system keys to the input terminals of touch switches and expanded I/O units. In direct connection system, the system keys can be allocated to any touch switches and input terminals. With these touch switches or input terminals, the system key can be used from the touch panel and expanded I/O units in the operating mode.

For example, when displaying a screen in which a buzzer is set to be sounded, the buzzer can be stopped using a touch key, with the  key indicated in the screen.

4-4-1 Allocation of System Keys to Touch Switches




Those system keys listed in the Table below can be allocated to the touch switches.

These touch switches, when displayed in the screen, serve the same functions as corresponding system keys. Now, the marking of  +  +  means that three keys of , , and  are pressed simultaneously.

System Key




 +  + 

- Automatic indication of system key

When the screen attribute “Numerical Setting” is set to “System” in the “Numerical Setting Screen” (See page 145) or “Continuous Screen” (See page 102), the system keys listed in the Table below will be displayed automatically.

Touch Switches Displayed
 *



*: In the Continuous Screen, these are not displayed.

For the touch switches, refer to the “4-8 Touch Switches” (page 136). For the setting method of the touch switches, refer to NT-series Support Tool Operation Manual (V028-E1-).

Reference: Even when the system keys on the touch panel are pressed, status of the touch switches will not be notified to the Host.

4-4-2 Allocation of System Keys to Expanded I/O Units

In the direct connection system, the expanded I/O units connected to the NT610C can be used in place of the system keys.

The system keys can be allocated to any input terminals of the expanded I/O units. For details, refer to the “4-13 Operation of expanded I/O unit” (page 171).

4-5 Memory Table

The NT610C has the memories capable of freely being overwritten from the Host. There are three kinds of memories: "Character-String Memory Table" for character data, "Numeral Memory Table" for numeric data, and "Bit Memory Table" (in direct connection system) for contact data.

4-5-1 Character-String Memory Table

The Character-String Memory Table is an internal memory for character data.

The NT610C can use a maximum of 1000 Character-String Tables. ("256" can also be selected by means of the "System Memory" setting for the Support Tool.) A maximum of 40 bytes of character data can be stored in a single Character-String Memory Table. Up to 50 character-String Tables can be registered in one screen.

Reference: Between 1000 and 256 of the number of Character-String Memory Tables, memory size for a screen differs by 29760 bytes.

Displaying Method of Character-string

The character-String Memory Tables are controlled with the number from 0 to 999 assigned.

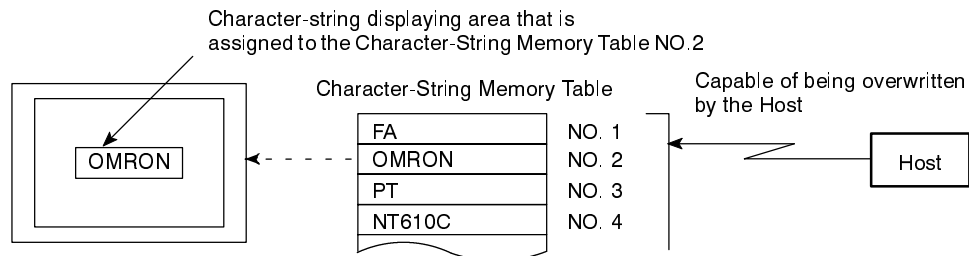
When screen data is made with the Support Tool, set an area in the screen in which the character-string is displayed and specify the number of Table to be displayed.

The Character-String Memory Tables are classified into two types depending on the numbers. Both read and write operations can be done freely in the Tables with the numbers from 0 to 255, but those Tables from 256 to 999 are only for read operation.

The Memory Tables of two types differ their utilizing method.

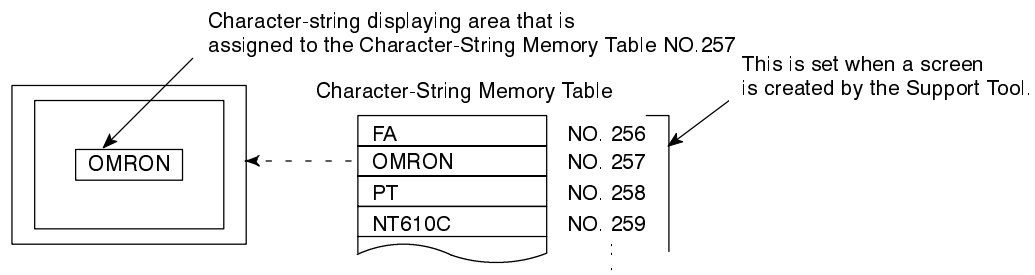
• Memory Table from 0 to 255

During PT operation, the character-string data in the Character-String Memory Table written from the Host is displayed in the screen. An initial value can also be set when screen data is created.



• Memory Table from 256 to 999 (read-only)

Data cannot be written by the host. Character-string data is set when screen data is created. This Memory Table can be set not to be used by the “System Memory” setting of the Support Tool.



[Displaying format of character-string]

The character-string data of the following character type and attribute can be displayed.

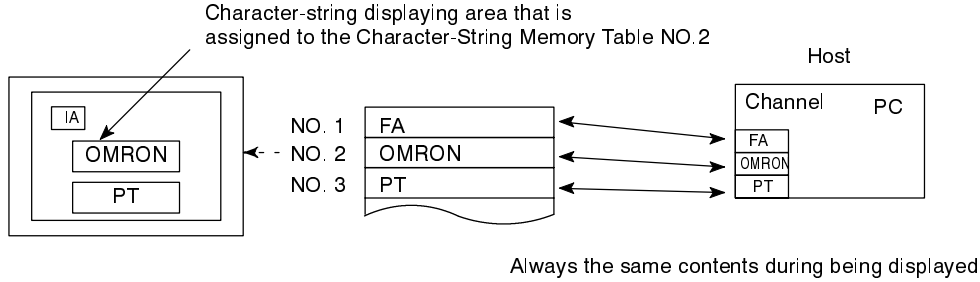
Character type:	half height, normal, mark (16 x 16 dots), image data (16 x 16 dots)
Magnification of character:	double width, double height, x4 scale, x9 scale, x16 scale, x64 scale
Display attribute:	normal, inverse, flashing, inverse flashing
Character displaying color:	8 colors
Character background color:	8 colors

Capable of specifying smoothing operation (to get rid of notches when magnifying characters equal to or greater than x4 scale)

However, magnification, smoothing, inverse, flashing, inverse flashing display of image data cannot be done.

Character-String Memory Table by Direct Connection System

The contents of the Character-String Memory Table being displayed is automatically updated so as to always be equivalent to the contents of the PC channel. Therefore, it is not necessary to overwrite the Character-String Memory Table by sending a command from the Host.



It is necessary to perform the following setting at every Table before creating screen data with the Support Tool.

• **Initialization**

This setting is used to determine whether or not the contents of the PC channel is initialized according to the contents of the Character-String the Memory Table when the power of the NT610C is turned on or reset.

However, the contents of the Character-String Memory Table differs depending on the setting of the NT610C. For details, refer to the “Initializing Memory Table” (page 68) and “Resume Function” (page 76).

• **Number of channels registered**

The number of PC channels required for storing the character-string data is specified up to 20 channels. In one channel, two characters can be stored.

• **Channel assignment**

The PC channels assigned to the Character-String Memory Table are set. Channel type and first channel are specified.

Symbol	C Series PC	CV Series PC	Allocated
DM	Data memory	Data memory	○
CH	I/O relay	I/O relay	○
TIM	Timer present value	Timer present value	×
CNT	Counter present value	Counter present value	×
HR	Holding relay	—	○
AR	Auxiliary storing relay	Special auxiliary relay	△
LR	Link relay	—	○

- : Possible (1/2 CH for numeric value)
- △: Possible for C series
Impossible for CV series
- ×: Impossible

4-5-2 Numeral Memory Table

The Numeral Memory Table is an internal memory for numeral data.

The NT610C can use a maximum of 1000 Numeral Memory Tables. ("512" can also be selected by means of the "System Memory" setting for the Support Tool.) A maximum of 4 bytes (8-digit including sign) of numeric data can be stored in a single Numeral Memory Table. Up to 50 Numeral Memory Tables can be registered in one screen.

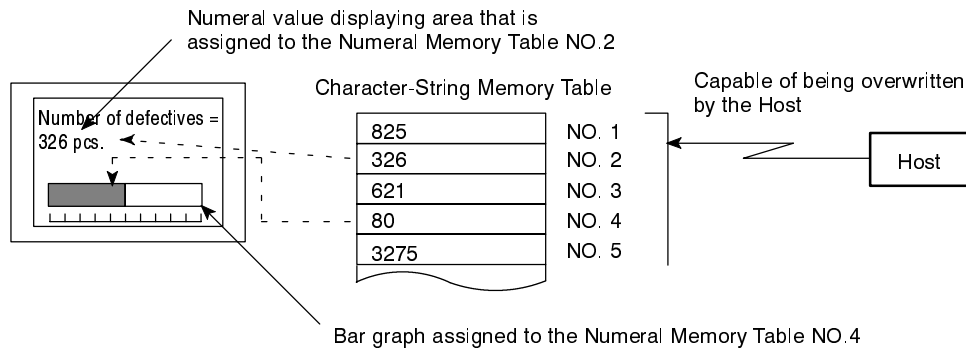
Reference: Between 1000 and 512 of the number of Numeral Memory Tables, memory size for a screen differs by 4880 bytes.

Displaying Method of Numeral Value

The Numeral Memory Tables are controlled with the number from 0 to 999 assigned.

When screen data is created with the Support Tool, set an area in the screen in which the numeral value is displayed and specify the number of Table to be displayed. During PT operation, the numeral data written in the Numeral Memory Table is displayed in the screen.

With the Numeral Memory Table assigned to the graph area, a graph is displayed according to the numeric value in the Numeral Memory Table.



[Displaying format of numeral value]

The numeral data of the following number of digits, character type and attribute can be displayed.

- Number of digits of integer part: 1 to 8-digit
- Number of digits of decimal fraction: 0 to 7-digit
- Character type: half height, normal
- Magnification of character:
 - double width, double height, x4 scale, x9 scale, x16 scale, x64 scale
- Display attribute: normal, inverse, flashing, inverse flashing
- Character displaying color: 8 colors
- Character background color: 8 colors
- Capable of specifying smoothing operation (to get rid of notches when magnifying characters equal to or greater than 16-fold size)
- Capable of specifying sign representation
- Capable of specifying decimal/hexadecimal representation
- Capable of specifying zero suppression

Reference: • Zero suppression

The numeric data is right-justified and displayed in the numeric value display area. Therefore, if the numeric data is less than the number of digits of the display area, the numeral zero is inserted into the remaining digits to the left.

When zero suppression is specified, the numeral zero is not displayed.

Example: When the number of display digits is 8-digit and the numeric data has 5-digit

Without zero suppression = 00012345

With zero suppression = 12345

Date and Time Setting & Displaying

The numbers from 247 to 255 in the Numeral Memory Table are assigned to storage of clock data.

By operating these Table numbers with the Support Tool or Host, date and time can be set and displayed.

• **Data & time setting**

When date or time is changed, the following Numeral Memory Table is changed by Support Tool or a command from the host. The clock starts ticking immediately after data is changed. The Support Tool has the functions to set the time.

For details, refer to NT-series Support Tool Operation Manual (V028-E1-).

Numeral Memory Table Number	Bit	Contents	Data	Remarks
254	0 to 7	Second	00 to 59	24-hour system
	8 to 15	Minute	00 to 59	
	16 to 23	Hour	00 to 23	
	24 to 31	Day	01 to 31	
255	0 to 7	Month	01 to 12	Last 2-digit of A.D. year From Sunday (00) to Saturday (06)
	8 to 15	Year	00 to 99	
	16 to 23	Day of the week	00 to 06	
	24 to 31	Reserved	Always 00	

Reference: With the numeric value setting functions, both date and time setting can directly be changed from the NT610C. The numeric value setting is carried out so that data can be entered in the numbers of 254 and 255 in the Memory Table.

For the numeric value setting, refer to the “4-9 Numeral Setting” (page 145).

• **Date and time displaying**

A clock data of which value is updated according to the built-in clock is stored in the Memory Table numbers from 247 to 253. When a screen is created by the Support Tool, provided the area in which the contents of these Table numbers is displayed has been set, current date and time can be displayed in the screen during PT operation.

Numeral Memory Table Number	Contents	Value
247	Second	0 to 59
248	Minute	0 to 59
249	Hour	0 to 23
250	Day	1 to 31
251	Month	1 to 12
252	Year	0 to 99 *1
253	Day of the week	0 to 06 *2

*1 Last 2-digit of A.D. year

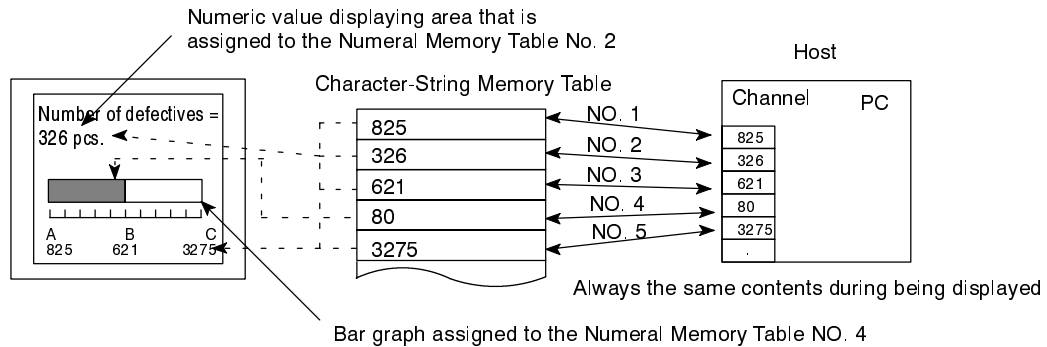
*2 Numeric value and day of the week correspond as shown below:

Day of the Week	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Value	00	01	02	03	04	05	06

Reference: The Memory Table numbers from 247 to 253 cannot be changed by the Host.

Numeral Memory Table

The contents of the Numeral Memory Table being displayed is automatically updated so as to always be equivalent to the contents of the PC channel. Therefore, it is not necessary to overwrite the Numeral Memory Table by sending a command from the Host.



When the Numeral Memory Table is used, it is necessary to perform the following setting at every Table before creating the screen data with the Support Tool.

• **Initialization**

This setting is used to determine whether or not the contents of the PC channel is changed according to the contents of the Numeral Memory Table when the power of the NT610C is turned on or reset.

However, the contents of the Numeral Memory Table differs depending on the setting of the NT610C. For details, refer to the “Initializing the Memory Table” (page 68) and “Resume Function” (page 76).

• **Number of channels registered**

The number of PC channels required for storing the numeric data is specified at one or two channels. A maximum of 4-digit can be stored in one channel, and a maximum of 8-digit in two channels.

• **Channel assignment**

Type and first channel of the PC channels assigned to the Numeral Memory Table are specified.

Symbol	C Series PC	CV Series PC	Allocated
DM	Data memory	Data memory	○
CH	I/O relay	I/O relay	○
TIM	Timer present value	Timer present value	△
CNT	Counter present value	Counter present value	△
HR	Holding relay	—	○
AR	Auxiliary storing relay	Special auxiliary relay	○
LR	Link relay	—	○

- : Possible (1/2 CH for numeric value)
- △: Possible for C series
Impossible for CV series
- ×: Impossible

4-5-3 Bit Memory Table

The Bit Memory Table is an internal memory for contact data.

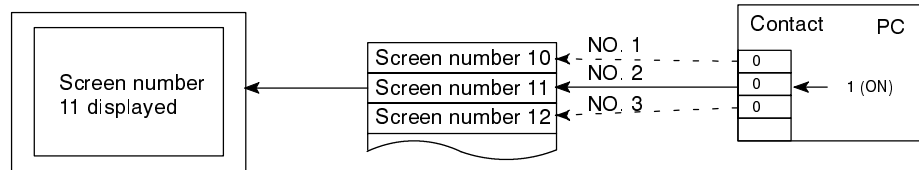
The NT610C can use a maximum of 256 Bit Memory Tables. One contact status on the PC can be stored in a single Bit Memory Table.

Functions of Bit Memory Table

There are two functions of Bit Memory Table:

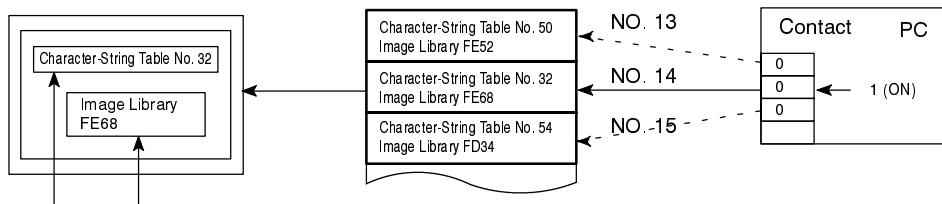
- **Screen changeover function**

When any contact on the PC to which the Bit Memory Table is assigned is changed from “0” (OFF) to “1” (ON), the screen is changed over to show a screen being set to that contact.



- **Alarm list function**

When any contact on the PC assigned to the Bit Memory Table is “1” (ON), the Character-String Memory Table (message) and Image Library being set are displayed. Since smaller Bit Memory Table number is displayed preferentially when multiple Bit Memory Tables have been set to the alarm list function, the order of priority can be given to the message to be displayed. For details, refer to the “4-12 Alarm List & History Display Functions” (page 164).



Message (character-string No. 32) and Image Library (FE68) set to the Bit Memory Table number 14

Bit Memory Table setting

When the Bit Memory Table is used, it is necessary to perform the following setting at each Table before creating the screen data with the Support Tool. For the setting used for alarm list and history display function, refer to the “4-12 Alarm List & History Display Functions” (page 164).

- **Recording in the Alarm History**

This setting is to determine whether a change of PC contact to which the Bit Memory Table is assigned is recorded in the Alarm History.

- **Screen changeover function**

This setting is to determine whether the Bit Memory Table is used for the screen changeover function.

- **Character-String Memory Table number**

The Character-String Memory Table number displayed as a message is set. This setting is not necessary when used for the screen changeover function.

- **Display color**

Color of the characters used for message is to be set. This setting is not necessary when used for the screen changeover function.

- **Image Library**

This is a setting of a code for Image Library data displayed together with a message. This setting is not necessary when used for the screen changeover function.

- **Screen changeover**

This is a setting of a screen number displayed for the screen changeover function or alarm list & history display function.

- **Contact**

This is a setting of a contact on the PC to which the Bit Memory Table is assigned.

Symbol	C Series PC	CV Series PC	Allocated
DM	Data memory	Data memory	○
CH	I/O relay	I/O relay	○
TIM	Timer present value	Timer present value	×
CNT	Counter present value	Counter present value	×
HR	Holding relay	—	○
AR	Auxiliary storing relay	Special auxiliary relay	○
LR	Link relay	—	○

○: Possible
×: Impossible

The Special Auxiliary Relay Area of CV series PC is used exclusively for special application in the system, and cannot be used for other application.

When the Data Memory (DM) is specified, a bit number (00 to 15) is also specified in conjunction with a channel number.

4-6 LAMP

LAMP is a graphic area capable of changing the displaying state according to an instruction from the Host. There are two kinds of LAMPs: Normal LAMP that changes the displaying state (OFF, ON, Flashing) of a graphic fixedly displayed and Image Library LAMP that displays separate graphics in OFF and ON states. LAMP is set when creating a screen data with the Support Tool.

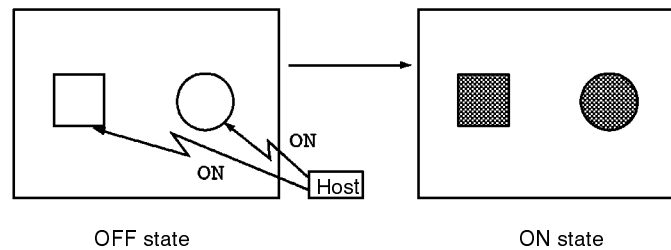
4-6-1 LAMP Setting

A maximum of 256 LAMPs can be set in a screen, and 1024 LAMPs can be registered in a screen data file.

Contents of the setting differs depending on the LAMP type (Normal LAMP, Image Library LAMP).

Normal LAMP Setting

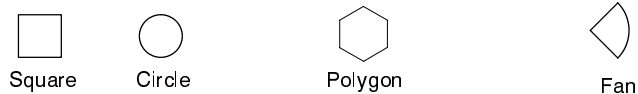
Normal LAMP is used to change the display state (inverse, inverse flashing, erase) of a graphic fixedly displayed according to an instruction (ON/OFF) from the Host.



The following attributes can be set for the Normal LAMPs.

- **Shape**

Any shape can be selected out of the following four kinds of shapes. Size can be specified freely.



- **External frame**

This attribute can be set to determine whether or not a boundary line of the LAMP is displayed. When an external frame is set to “not to be displayed”, only the guide display characters of the LAMP are displayed when the LAMP is not ON (or flashing).

• ON/Flashing

When LAMP is ON by an instruction from the Host, its displaying state can be specified out of ON (inverse illumination) or Flashing (inverse flashing).

• Color display

External frame color (in case of color display): 8 colors

OFF color: 8 colors or "clear"

ON/Flashing color: 8 colors

• Guide display

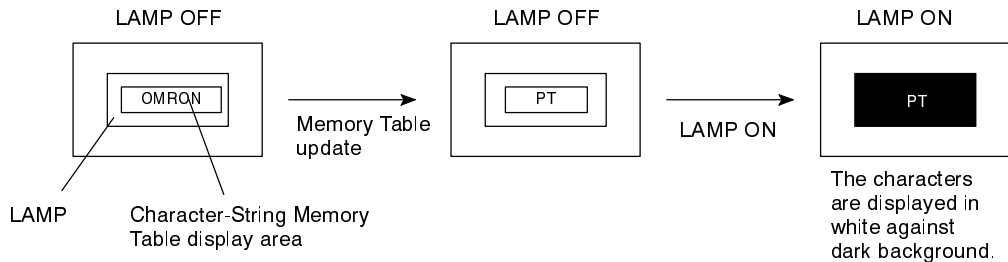
Guide display character can be attached to the LAMP. Attributes of the guide display character are the same as that of character display.

Refer to the "Character Types and Attributes" (page 105).

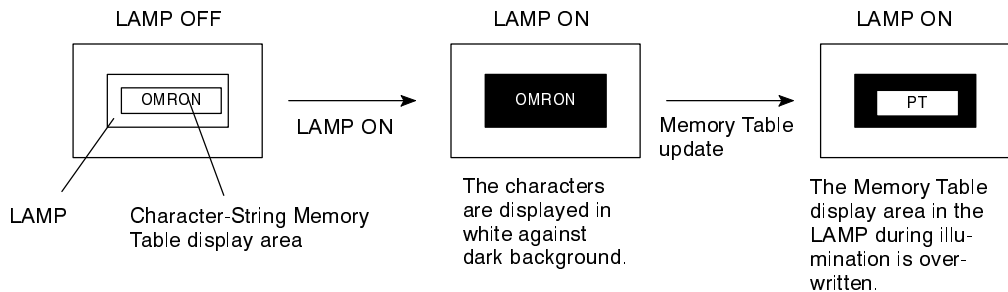
Reference: A part of external frame may be lost depending on a combination of external frame color of the normal LAMP and OFF color or ON/Flashing color. This is caused by the properties of the color LCD and does not indicate failure of equipment. When part of the external frame is lost, change a combination of colors.

The guide display character of the normal LAMP is a fixed character-string. In order to change the guide display of the normal LAMP according to the circumstances, display the display area of the Numeral Memory Table or Character-String Memory Table in conjunction with illumination of LAMP. However, depending on a timing of ON of normal LAMP and Memory Table update, the result of indication differs as shown in the examples below. Be careful when creating a control program.

Example 1: When the normal LAMP is turned on after updating the Memory Table



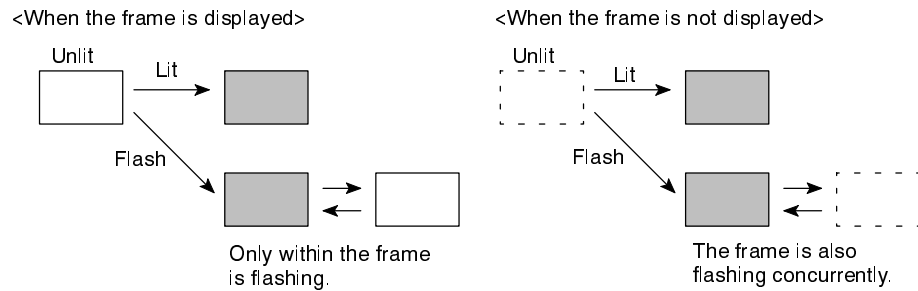
Example 2: When the Memory Table is updated while normal LAMP is ON



Reference: • Frame display and ON/Flashing

ON/Flashing operations differ depending on the presence of the frame display of the normal LAMP.

When the frame is displayed, only an area within the frame is ON or flashing. When the frame is not displayed, an area is ON or flashing together with the frame.



• Combined display of normal LAMP

With multiple LAMPs of the same number (or the same contact) registered, the LAMPs combined as shown below can be ON simultaneously.

<Display example>

The same number (or contact) is specified for the LAMPs L1 through L5.

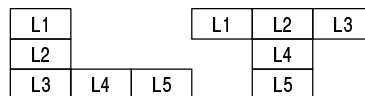
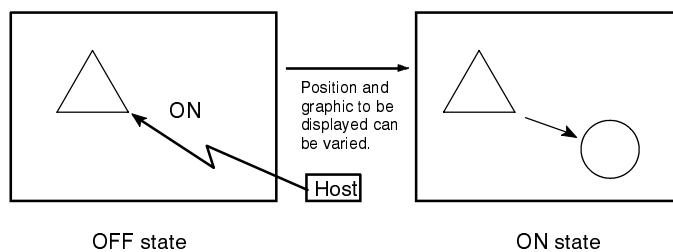


Image Library LAMP Setting The Image Library LAMP overwrites a different graphic and displays it at a separate position according to an instruction (ON/OFF) from the Host.



The following attributes can be set to the Image Library LAMP.

• LAMP code

Graphics to be displayed during ON and OFF are specified by the Library Data or Image Data code, respectively.

• Display position

Positions to be displayed during ON and OFF are specified.

Reference: For the Image Library LAMP, presence of external frame, ON/Flashing, color display, guide display, and so forth cannot be specified, unlike normal LAMP.

However, since the attributes of every display factors when registering the Library Data are displayed as they are, a range of application will be widened further.

4-6-2 LAMP ON/OFF

This section describes how to turn ON(Flashing)/OFF the LAMPs.

PC contact (LAMP contact) is assigned when creating the LAMPs. When the LAMP contact is turned ON at the PC side, the LAMP will be ON (Flashing). When the LAMP contact is turned OFF, the LAMP will be OFF.

(Contacts specified)

Auxiliary Storing Relay (AR)

Holding Relay (HR)

Link Relay (LR)

Data Memory (DM)

Relay Area (CH)

Timer (TIM) and Counter (CNT) cannot be set.

When Data Memory (DM) is specified, specify the bit number (00 through 15) as well as channel number.

4-7 Graphs

The Numeral Memory Table data can be displayed not only as a numeric value but also as a graph. There are three kinds of graphs that can be displayed: bar graph, trend graph and broken line graph. Graphs are set when a screen data is created with the Support Tool.

4-7-1 Bar Graph Setting

The values in the Numeral Memory Table are displayed by a bar graph as a percentage with respect to the value specified.

Up to 50 bars can be registered in a screen.

The following attributes can be set for the bar graph.

- **Position and size**

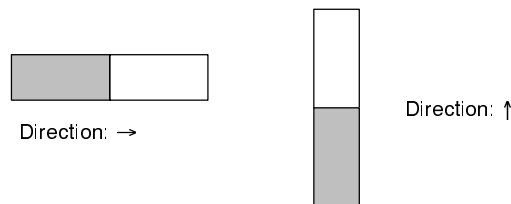
Position and size (length and width) can be specified.

- **Display and incremental direction**

Display and incremental direction of a bar graph can be specified.

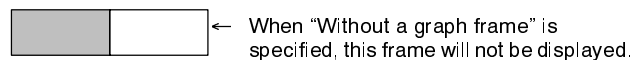
Direction of a bar graph can be selected out of upward (↑), downward (↓), leftward (←), and rightward (→).

For example, when upward (↑) is selected, a vertical bar graph increasing upward can be displayed.



- **With/without a graph frame**

Whether or not to display a frame indicating a display range of a bar graph (–100% to 100%) can be set.



• **% Data value**

Data value corresponding to 0%, 100%, -100% can be specified. % Data value can be specified by two methods: by directly specifying a numeric value and/or by referring to the Numeral Memory Table.

- Directly specifying method

Numeric value from 0 to 99999999 (max. 8-digit) is specified. It is necessary to set that 0% value is more than -100% one, and 100% value be more than 0% one without fail.

- Memory Table referring method

Numeral Memory Table number to be referred is specified instead of a numeric value. With this method specified, each data value can be changed from the Host during operation.

• **% Display**

% Value can be displayed.

% Value can be calculated according to the following equation:

$$\% \text{ Value} = \frac{\text{Referred Numeral Memory Table value} - 0\% \text{ Value}}{100\% \text{ Value} - 0\% \text{ Value}} \times 100$$

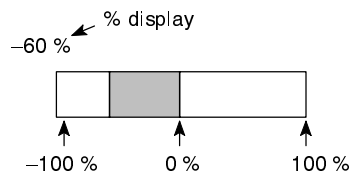
Attribute of numeric value displayed is the same as that for character display. Refer to the "Character Types and Attributes" (page 105).

• **Sign representation**

This attribute can specify whether or not a numeric value less than 0% value is displayed.

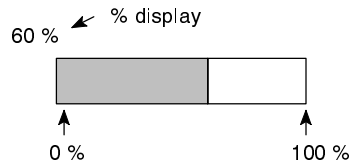
- When a sign is displayed:

A numeric value less than 0% value is also displayed in a graph. In this case, 0% position of a graph falls the center of a graph display area.



- When a sign is not displayed:

All values less than 0% are displayed as 0%. 0% position is at the end of a graph.



• **Color display**

Color of a graph to be displayed can be specified. For background of a graph, screen background color is displayed.

- Graph frame (in case of a graph frame): 8 colors
- + direction display area: 8 colors
- direction display area: 8 colors

• **Reference Table**

This attribute specifies, as the reference table, the Numeral Memory Table referred to for a value.

Referring method should be specified as well as Reference Table No. There are two referring methods: “Direct” and “Indirect”.

Reference: • When % value is in the following range, the graph displaying method is restricted as follows:

- (1) In case of negative % value

A graph is displayed differently depending on the sign representation.

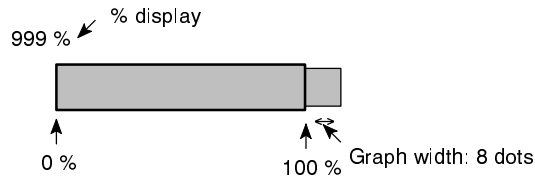
Without sign representation: Displayed in the same manner as 0%.

With sign representation: A graph is displayed in the negative direction.

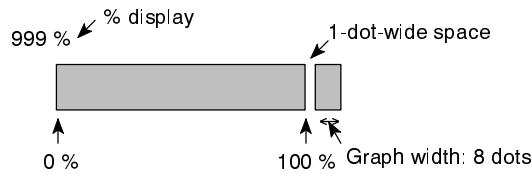
- (2) When an absolute value of % is from 100% to 999%

With sign not displayed, a value is displayed as shown below. A graph is displayed differently depending on the presence of a graph frame. A % value is displayed as it is.

<With a graph frame>



<Without a graph frame>



When a value of less than -100% is displayed with a sign, it is shown in the negative direction in a graph in the same way as the figure above.

- (3) When an absolute value of % is equal to or greater than 1000

A value is displayed in a graph in the same way as (2) at the % display position depending on the presence of a sign as follows:

With a sign not displayed: ***%

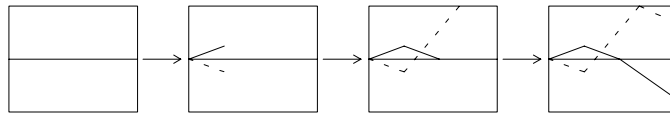
With a sign displayed: ****%

- Hexadecimal digit cannot be used for a bar graph. When hexadecimal digit is specified in the Reference Table, a graph will not be displayed. Avoid writing hexadecimal digit into the Numeral Memory Table to be referred.

4-7-2 Trend Graph Setting

A trend graph displays the displacement with the lapse of time as a locus while monitoring (sampling) the Numeral Memory Table value periodically. As time goes by, the displacement varies as shown below.

<Example of normal type that increases rightward with a sign displayed>



For a trend graph, a single graph frame can be shown in a screen and a maximum of 50 graphs can be registered in the graph frame.

The following attributes can be specified for the trend graph.

- **Graph frame**

This attribute specifies a rectangular area used to display a graph. Range of this area is a maximum of 480 dots in length by 640 dots in width.

The following setting can be performed for a graph frame.

- **Frame display**

With the “Frame Display” specified, 1-dot width frame line is displayed outside of the frame area. Color of a frame line can be selected out of eight colors.

- **Background color in a frame: 8 colors**

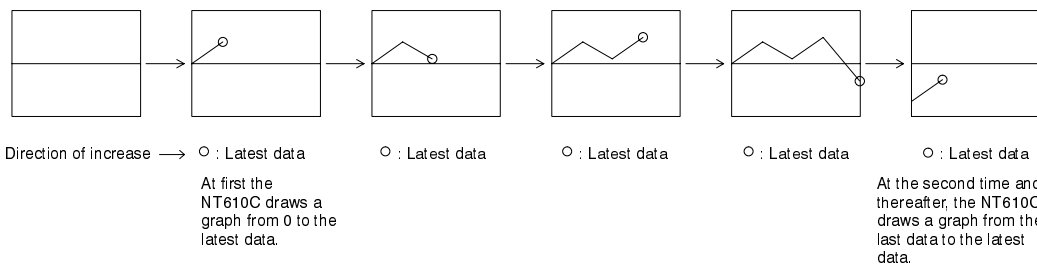
Separate background color can be specified for positive and negative value display area.

- **Displaying method**

A graph displaying method can be selected out of two types: normal type and pen recorder type.

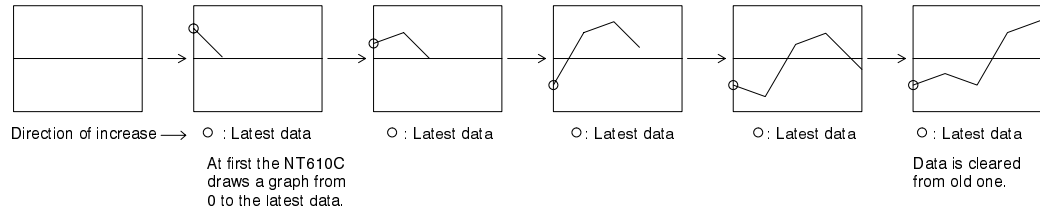
- **Normal type**

As time goes by, the latest data display position moves toward the direction of increase. When the displacement increases to the right, a graph varies as shown below. When a polygonal line reaches the end of a screen, it is cleared once and the NT610C starts drawing a polygonal line again from the first.



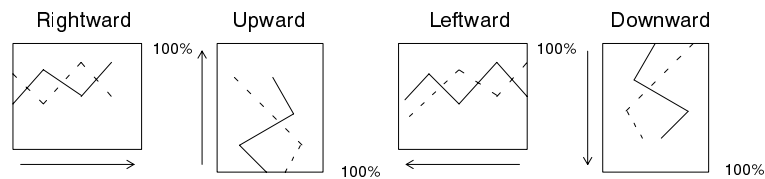
• Pen recorder type

The latest data is always displayed at the end of the screen. As time goes by, the graph already displayed moves in the direction of increase. When a graph increases to the right, it varies as shown in the figure below.



• Direction of movement

The normal type can select the direction that the display position of the latest data moves with the lapse of time. The pen recorder type can select the direction that entire graph moves.



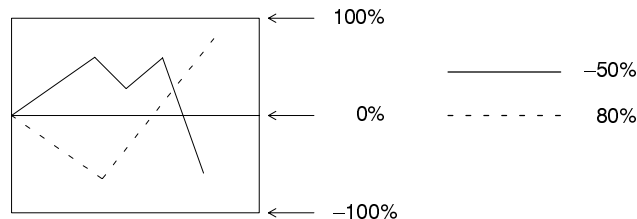
100% position is determined in accordance with the direction of scroll. 100% position falls to the right when a graph scrolls longitudinally and at the upper side when a graph scrolls laterally.

• Sign representation

This attribute can specify whether or not a numeric value less than 0% value is displayed.

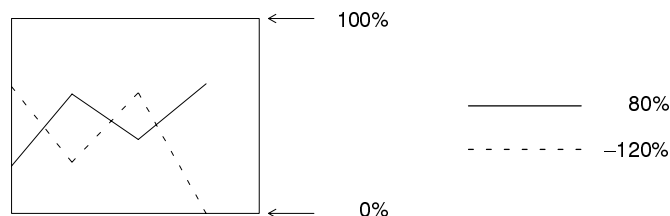
• When a sign is displayed:

A numeric value less than 0% value is also displayed in a graph. In this case, 0% position of a graph falls the center of a graph display area.



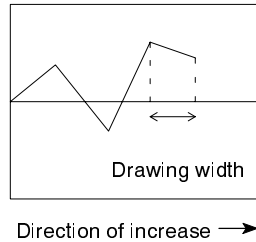
• When a sign is not displayed:

All values less than 0% are displayed as 0%. 0% position is at the end of a graph.



• **Drawing width**

Drawing width (direction of increase) must be specified from the previous data to the following data in the range of 1 to 640 dots. If a value more than the graph displaying frame is specified, a graph will not be displayed.



• **Sampling period**

Sampling period is the time interval applied when the NT610C samples and displays the Numeral Memory Table value and is specified in the range of 1 to 65535 in increments of 0.1 second.

Reference: Actual drawing timing varies depending on the operating conditions. This does not accurately coincide with the time interval specified.

• **Reference Table**

The same is also true as the bar graph. Refer to page 128.

• **% Data value**

The same is also true as the bar graph. Refer to page 127.

• **Graph line type**

This attribute specifies a graph line type among those as shown below. Line color can be selected out of eight colors. A graph width is fixed at one dot.

- Solid line _____
- Broken line - - - - -
- 1-dot chain line _____ - _____
- 2-dot chain line _____ - - - _____

• **% representation**

The same is also true as the bar graph. Refer to page 127.

Reference: • When % value is in the following range, the graph displaying method is restricted as follows:

(1) In case of negative % value

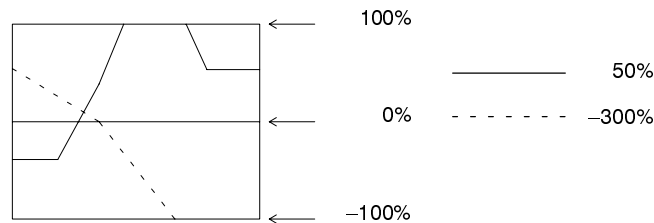
A graph is displayed differently depending on the sign representation.

Without sign representation: Displayed in the same manner as 0%.

With sign representation: A graph is displayed in the negative direction.

(2) When an absolute value of % is from 100% to 999%

A graph is not displayed in this range of %. Only a part of % value within the graph frame is displayed. A % value is displayed as it is.



(3) When an absolute value of % is equal to or greater than 1000%

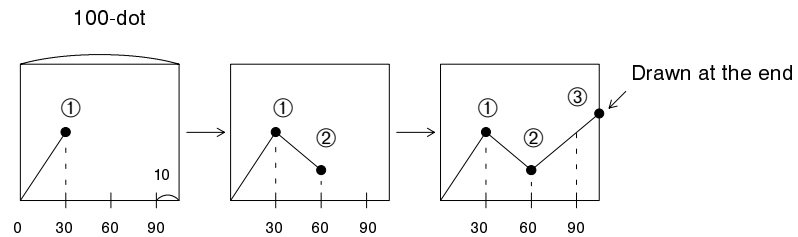
A value is displayed in a graph in the same way as (2) at the % display position depending on the presence of a sign as follows:

With a sign not displayed: ***%

With a sign displayed: ****%

• In the normal type, when a graph is over the graph frame next time, the NT610C draws a graph of the latest data at the end of the frame.

<Example: In case the graph width 100-dot and the drawing width 30-dot>

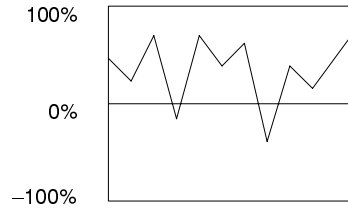


• Hexadecimal digit cannot be used for a trend graph. When hexadecimal digit is specified in the Reference Table, a graph will not be displayed. Avoid writing hexadecimal digit into the Numeral Memory Table to be referred.

Reference: If a graph is duplicated by drawing multiple graph lines of the same % value, it is overwritten and displayed in the order of setting. Similarly, when 0% value continues in a graph with a sign displayed, a graph line is overwritten and displayed with respect to the graph frame indicating 0%.

4-7-3 Broken Line Graph Setting

A broken line graph displays multiple present value of Numeral Memory Table by a single polygonal line. This allows variation of continuous values of the Numeral Memory Table to be seen at a time.



Example displaying 11 Numeral Memory Table values with signs

For a broken line graph, a single graph frame can be shown in a screen and a maximum of 256 graphs can be registered in the graph frame. A single broken line can display a maximum of 512 Numeral Memory Tables.

The following attributes can be specified for the broken line.

- **Graph frame**

This attribute specifies a rectangular area used to display a graph. Range of this area is 16-dot in length by 16-dot in width through 480 dots in length by 640 dots in width.

The following setting can be performed for a graph frame.

- **Frame display**

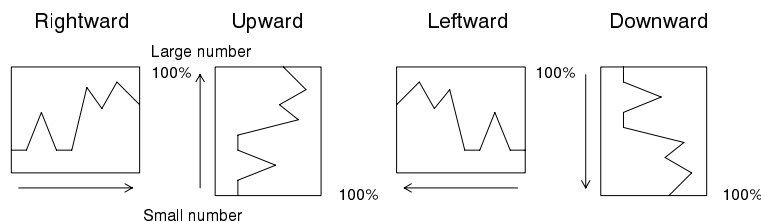
With the “Frame Display” specified, 1-dot width frame line is displayed outside of the frame area. Color of a frame line can be selected out of eight colors.

- **Background color in a frame: 8 colors**

Separate background color can be specified for positive and negative value display area.

- **Direction**

This attribute can select the direction of putting the referring Memory Table values in order.



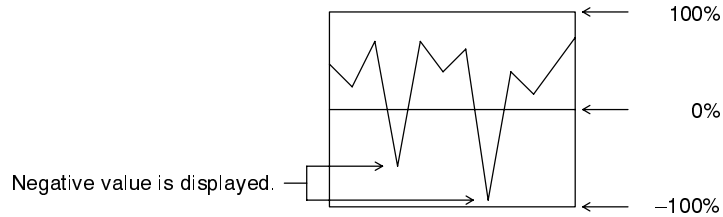
100% position is determined in accordance with the direction of putting the referring Numeral Memory Table values in order. 100% position falls to the right when putting those values longitudinally in order and at the upper side when putting those laterally.

- **Sign representation**

This attribute can specify whether or not a numeric value less than 0% value is displayed.

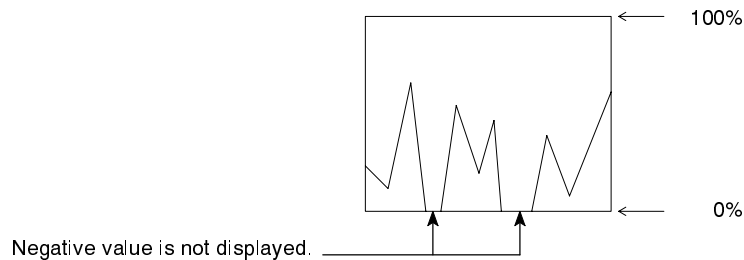
- When a sign is displayed:

A numeric value less than 0% value is also displayed in a graph. In this case, 0% position of a graph falls the center of a graph display area.



- When a sign is not displayed:

All values less than 0% are displayed as 0%. 0% position is at the end of a graph.



• **Number of apexes**

This specifies the number of Numeral Memory Tables to be referred to. One apex indicates a single Memory Table value.

Since a minimum of one dot width is required to display one Memory Table value as a polygonal line, maximum number of Memory Table capable of referring in accordance with a graph frame width is determined by the following equation.

$$\text{Graph frame width (number of dots)} \geq \text{Number of referring Memory Table}$$

• **Reference Table**

This specifies the first No. of a series of Memory Tables to be referred to. The direct connection system is “Direct” only.

• **% Data value**

This attribute specifies the % data value at every polygonal line. For the specifying method, the same is also true as the bar graph. Refer to page 127.

• **Graph line type**

This attribute specifies a graph line type among those as shown below. Line color can be selected out of eight colors. A graph width is fixed at one dot.

- Solid line _____
- Broken line - - - - -
- 1-dot chain line _____ - - _____
- 2-dot chain line _____ - - - _____

Reference: “% representation” cannot be performed for the polygon.

Reference: • When % value is in the following range, the graph displaying method is restricted as follows:

(1) In case of negative % value

A graph is displayed differently depending on the sign representation.

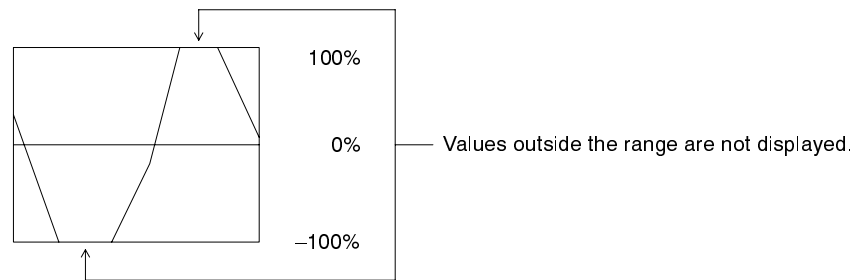
Without sign representation: Displayed in the same manner as 0%.

With sign representation: A graph is displayed in the negative direction.

(2) When an absolute value of % is from 100% to 999%

A graph is not displayed in this range of %. Only a part of % value within the graph frame is displayed.

The values outside of this range are not displayed.



(3) When an absolute value of % is equal to or greater than 1000%

A value is displayed in a graph in the same way as (2) at the % display position depending on the presence of a sign as follows:

With a sign not displayed: ***%

With a sign displayed: ****%

- Hexadecimal digit cannot be used for a polygon. When hexadecimal digit is specified in the Reference Table, a graph will not be displayed. Avoid writing any hexadecimal digit into the Numeral Memory Table to be referred.
- If a graph is duplicated by drawing multiple graph lines of the same % value, it is overwritten and displayed in the order of setting. At this time, since the part that the lines are duplicated is displayed by use of those colors of the Exclusive OR display (Refer to page 99), the line type and line color are displayed differently than that specified.
- Since a graph line is overwritten with respect to the graph frame when 0% value continues in a graph with a sign displayed, line type and line color are displayed differently than that specified.
- When creating a graph, apexes of polygon are placed in order at regular intervals within the frame width. Apex interval can be changed freely when correcting a polygonal line.

4-8 Touch Switches

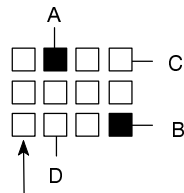
Touch Switch is the function capable of operating inputs with use of touch panel provided in a screen of NT610C. The Touch Switch is set when creating a screen data with the Support Tool.

The Touch Switch being set can also be ON (Flashing)/OFF in the same way as LAMPs.

- ⚠ Caution**
- Do not use input functions such as PT touch switches for applications where danger to human life or serious property damage is possible or for emergency switch applications.
 - Press touch switches with a force of no greater than 50 N. Applying higher force may cause glass to break, cause injuries, and prevent operation.
 - Do not press touch switches carelessly while the backlight is off or while nothing is displayed on the screen. Otherwise the system may operate unpredictably. Only press touch switches after confirming system safety.
 - Caution on pressing touch switches at 3 points

Example 1

When switches are created at positions A and B and at the points where the vertical and horizontal lines extending from these two points intersect, i.e. points C and D:



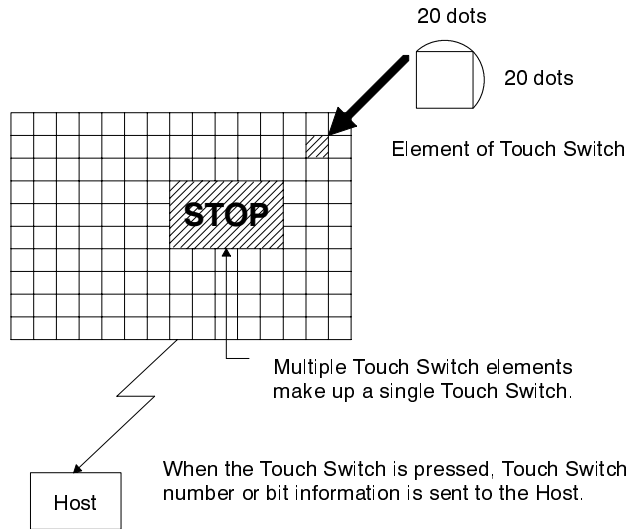
Smallest touch switch frame

- When switches A, B, and C are switched on at the same time, switch D is also assumed to have been switched on due to the configuration of the touch switches.
- When switches A, B, and D are switched on at the same time, switch C is also assumed to have been switched on due to the configuration of the touch switches.

- If touch switches are pressed in rapid succession, their inputs may not be successfully received.
Confirm that the input of a touch switch has been successfully received before moving on to the next operation.

4-8-1 Functions of Touch Switches

The Touch Switch consists of rectangular element of 20 dots in length by 20 dots in width. There are 768 Touch Switches (32 pcs. in columns by 24 pcs. in rows) in a screen.



Multiple Touch Switch elements make up a single Touch Switch.

4-8-2 Touch Switch Attributes

The following attributes can be set for the Touch Switches.

- **Display frame**

A display frame of the Touch Switch can be specified by the following two methods.

- Fixed-shape display frame

This is a frame displaying an area of display frame type that acts as Touch Switch. There are four kinds of display frames as shown in the Table below: "Standard", "Solid 1", "Solid 2", "No Display Frame".

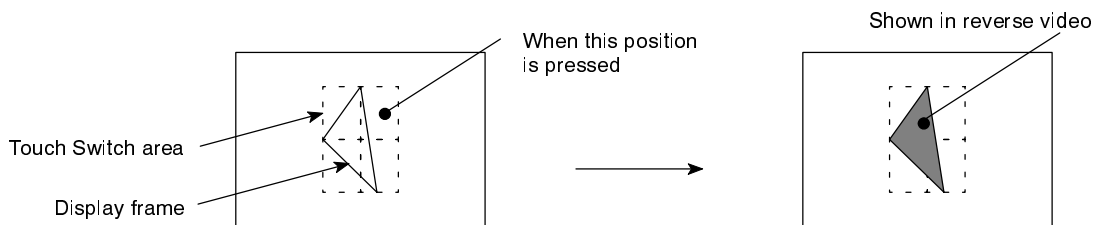
When "No Display Frame" is selected, there is not anything displayed in the screen unless ON (Flashing) instruction is sent from the Host or Touch Switch is pressed.

Display Frame Type	Switch OFF	Switch ON
Standard		
Solid 1		
Solid 2		
No display frame		

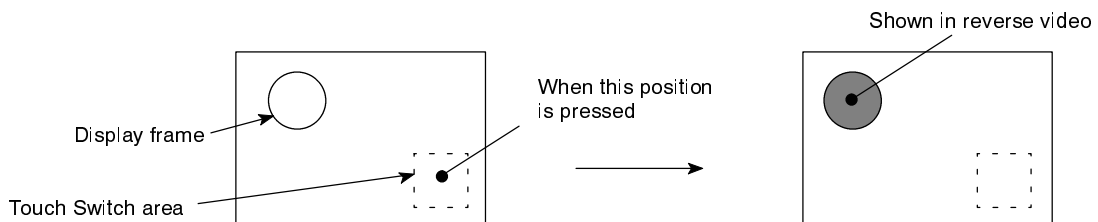
- Free-shape display frame

This is a display frame capable of freely setting the display position and shape irrespective of Touch Switch area. A shape to be specified can be selected out of "Square", "Circle", "Polygon", and "Fan".

For example, free-shape display frame can be used in the following manner.



<Example of setting a display frame inside the Touch Switch area>



<Example of setting a display frame outside the Touch Switch area>

- **Reverse video entry**

This attribute can specify the Touch Switch so as to be shown in reverse video when it is touched and operated.

- **Guide display**

A guide display character can be attached to the Touch Switch. Color of the guide display character varies into Exclusive OR color (Refer to page 99) when the Touch Switch is ON. Attributes of guide display characters are in the same way as character display. Refer to “Character Types and Attributes” (page 105).

- **ON/Flashing**

This attribute can specify whether or not the Touch Switch is allowed to be ON or flashing when the Touch Switch is ON or flashing according to an instruction from the Host.

- **Color display**

External frame color (when displayed): 8 colors

OFF color: 8 colors or “Clear”

ON/Flashing, entry color: 8 colors

4-8-3 Communicating Method

Notifying and controlling method of Touch Switches is described below.

The Touch Switches are controlled with the specified PC contacts assigned. There are the following contacts that can be specified:

Auxiliary Storing Relay (AR)

Holding Relay (HR)

Link Relay (LR)

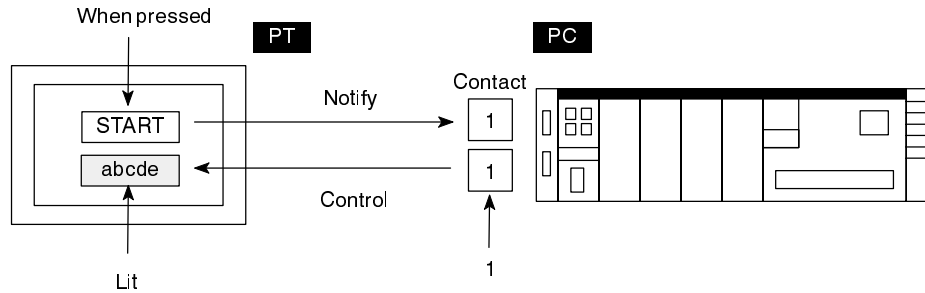
Data Memory (DM)

Relay Area (CH)

Timer (TIM) and Counter (CNT) cannot be specified. When Data Memory (DM) is specified, both channel No. and bit No. are specified.

• **Notifying and controlling method**

Both contact that controls ON (flashing) state (LAMP contact) and contact that notifies status can be assigned to the Touch Switches. The contact for notification changes when the Touch Switch is pressed. The Touch Switch is ON (flashing) when the LAMP contact is set to ON(1).



• **Notifying operation type**

Notifying operation when the Touch Switch is pressed can be specified by selecting out of the following four types:

• **MOMENTARY**

A contact turns ON when the Touch Switch is pressed and becomes OFF when it is released.

• **ALTERNATE**

ON and OFF of the contact alternates every time the Touch Switch is pressed.

• **SET**

A contact turns ON when the Touch Switch is pressed and remains ON when it is released.

• **RESET**

A contact turns OFF when the Touch Switch is pressed and remains OFF when it is released.

Reference: The touch switch notifying operation is of the following form.

Type of Notifying Operation	<ul style="list-style-type: none"> • When using Host Link, SYSMAC BUS/2 • When using NT link with DM area 	<ul style="list-style-type: none"> • When using C200H Direct Communication • When Using NT Link with other than DM area
MOMENTARY	(1) Notification in word units (other bits go OFF)	(3) Notification in bit units
ALTERNATE SET RESET	(2) Notification in word units (however, the word contents are read on display and notification is based on this reading)	(4) Notification in bit units

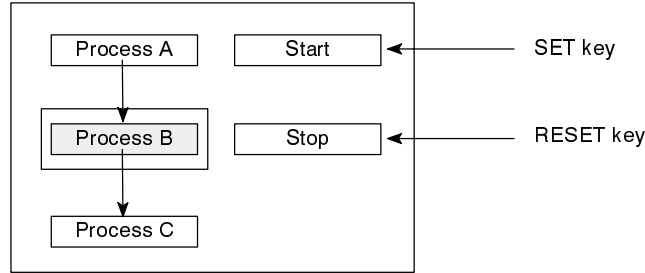
When using touch switch input notification, note the following points.

- In the case of (1) in the table above, the other bits in the same word as the notification bit are switched OFF by the notification operation.
- In the case of (2) in the table above, notification is executed on the basis of the contents of the word before display, which means that the other bits are not rewritten. However, even if the contents of the word are changed at the PC side during display, the data will be overwritten on the basis of the contents before display.
- If the screen is switched while a momentary key is being pressed, the touch switch itself disappears, and therefore the status "OFF" is notified. In the case of (1) in the table above, this means that the other bits in the word will also be turned OFF.
- When using the host link, SYSMAC BUS/2, or NT link with the DM area, do not allocate momentary touch switches and other types of touch switches to the same word, since the notification operations are different.

In the case of (3) and (4) in the table above, the notification operation has no influence on the other bits in the same word.

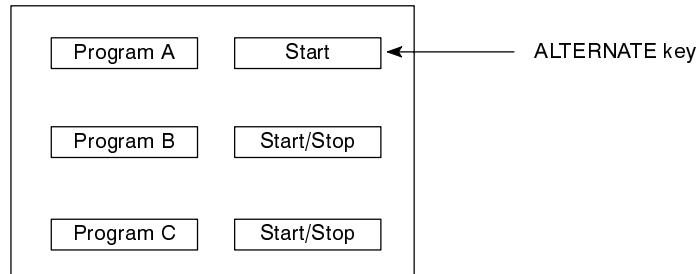
- Reference:**
- When the notifying contact is also specified as a LAMP contact of the Touch Switch, the Touch Switch can be allowed to be ON (flashing) when the Touch Switch notifying contact is ON. This method allows the setting state by the SET and RESET keys to be displayed.
 - The following example is come up with for use of SET, RESET, ALTERNATE keys:

<SET, RESET key>



The Touch Switch is used to start (SET key) and stop (RESET key) a process.

<ALTERNATE key>



A single switch is used to start and stop a ladder program.

4-8-4 Other Functions of Touch Switch

The Touch Switch is used as a key, to which the following functions are assigned, as well as the notifying function to the Host.

Screen Changeover Key

This is used as the Touch Switch for screen changeover, which is used for a stand-alone function (Refer to “4-11 Stand-Alone Functions”, page 162). Two kinds of functions can be performed according to the screen number assigned to the Touch Switch.

- When a screen number from 1 to 2000 is specified
When the Touch Switch is pressed, a screen is changed over to the screen of the number specified.

- When a screen number 0 is specified

The Touch Switch acts as a screen changeover return key. With this key being set, it is possible to return to the screen displayed before the current one.

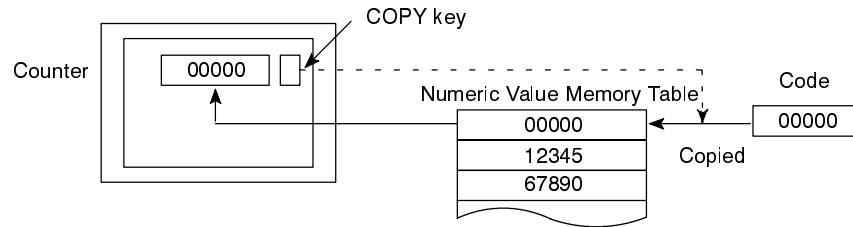
Reference: Only the Touch Switch has a function as a return key. When a screen number 0 is specified from the Host, nothing is displayed.

Numeral/Character-String Setting Input Key and System Key

This section describes the setting of input key and system key used for the numeric value setting function (Refer to “4-9 Numeral Setting”, page 145) and the character-string setting function (Refer to “4-10 Character-String Setting”, page 156).

COPY Key

When the Touch Switch is pressed, values or codes (constant) in the Memory Table input column are copied into other Memory Table or the numeral/character-string setting input column (Refer to “4-9 Numeral Setting” and “4-10 Character-String Setting”). The COPY key is useful to set the numeral/character-string display to its initial state and to enter the same value (initial value, etc.) into the multiple numeral/character-string setting input column.



<Example that the COPY key is used as a RESET key for the counter>

Copy source (Memory Table or code) and copy destination (Memory Table or numeral/character-string setting input column) are specified.

Numeral/Character-String Setting Cursor Moving Key

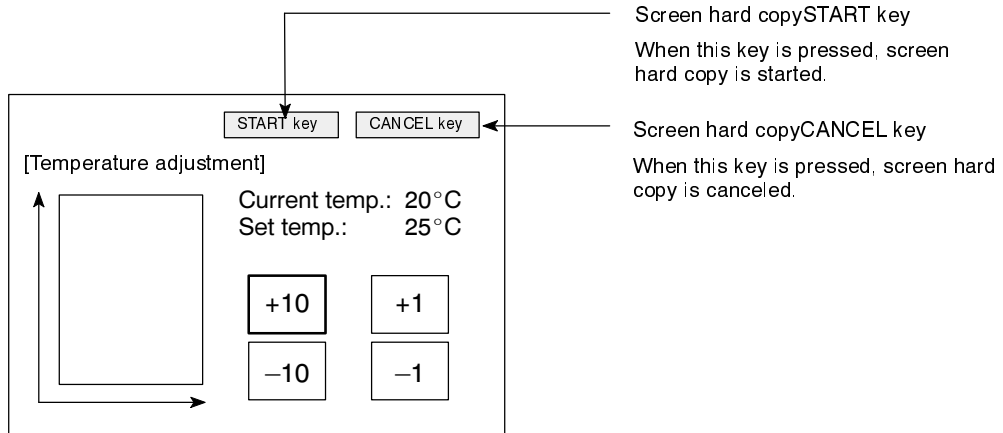
This is a Touch Switch to select the numeric value setting input column (ten-key type) and the character-string setting input column when entering data. When the Touch Switch is pressed, a cursor (display frame) is moved to the numeral/character-string setting input column specified to be ready for input operation (Refer to “4-9 Numeral Setting” and “4-10 Character-String Setting”). The numeric value/character-string setting input column is automatically produced with the Support Tool.

SCREEN PRINT Key

When the Touch Switch is pressed, a screen hard copy (screen image) is printed by a printer connected to the NT610C.

Two kinds of keys can be set: START key that starts the printing operation and CANCEL key that cancels the printing operation.

Reference: Even when the screen hard copy is being carried out, the NT610C continues operation.



4-9 Numeral Setting

The numeral setting is a function to enter the numeral values on the screen. The numeral setting allows the numeral value to be entered directly from the touch switch or expanded I/O unit into the numeral memory table, to be displayed in the screen, and further to be sent to the host.

The numeral setting is carried out when a screen is created with the support tool.

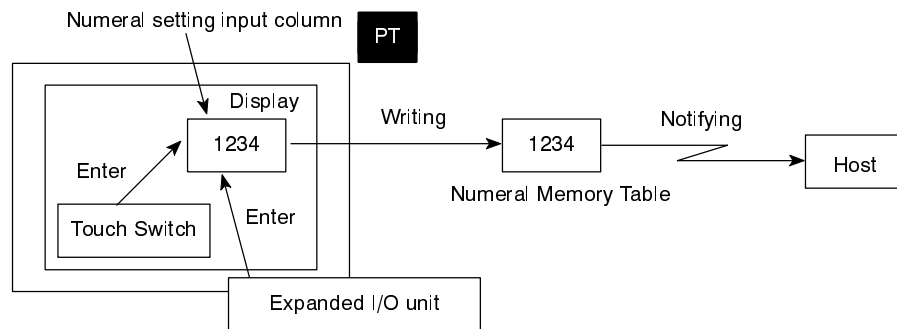
4-9-1 Numeral Setting Functions

The numeral setting has the following functions.

Basic Operation

The numeral setting operation is as follows:

- (1) A numeral value is entered from the touch panel or expanded I/O unit.
- (2) The numeral value entered is displayed in the numeral setting area in a screen.
- (3) When the numeral value entered is confirmed, it is written into the numeral memory table and simultaneously sent to the host.



Numeral Values Available for Inputs

Numeral values up to 8-digit (up to 7-digit for negative numbers) can be entered in decimal and hexadecimal notation.

- **Entry of decimal number**

When the display attribute is set to decimal number display, a numeral value can be entered in decimal.

- Range of numeral values

Range of numeral values that can be entered differs depending on a sign.

With a sign not displayed: 0 to 99999999 (8-digit)

With a sign displayed: -9999999 to +9999999 (7-digit negative number, 8-digit positive number)

- Decimal point

To the right of the decimal point, a maximum of 7-digit can be entered (up to 6-digit for negative numbers).

Reference: For a thumb rotary type, numeric values are up to 7-digit for both positive and negative numbers with signs displayed.

• **Entry of hexadecimal number**

When the display attribute is set to hexadecimal number display, a numeral value can be entered in hexadecimal.

• **Range of numeral values**

Range of numeral values that can be entered is from 0 to FFFFFFFF (8-digit).

Checking the Upper/Lower Limit

When the upper limit and lower limit of the input numeral values have been set, erroneous numeral values outside of the range can be prevented from being stored in the numeral memory table or notified to the host.

When the numeral values entered are confirmed, upper/lower limits are checked.

4-9-2 Type of Numeral Setting

There are two kinds of types of numeral setting: ten-key type and thumb rotary type. Though basic functions are the same, screen displaying and inputting methods differ between two types.

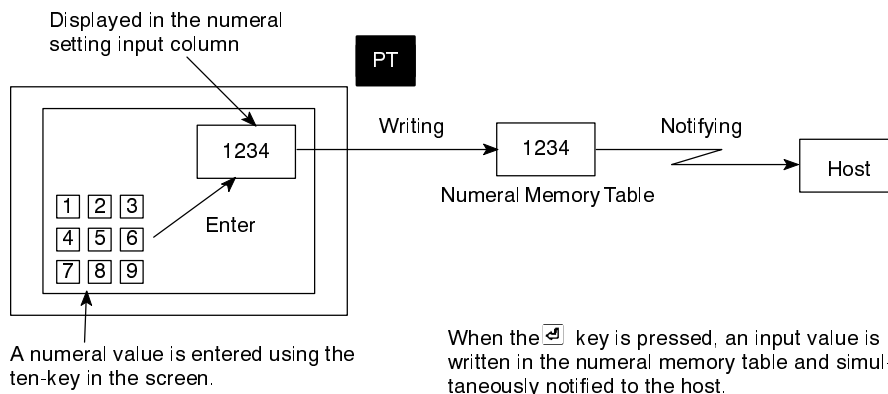
Ten-key Type

When any numeral value is entered by the ten-key (character key) assigned to the touch switch or expanded I/O unit, a numeral value just entered is displayed in a screen. When the RETURN key is pressed after an input operation is completed, the numeral value entered is written into the numeral memory table and then notified to the host.

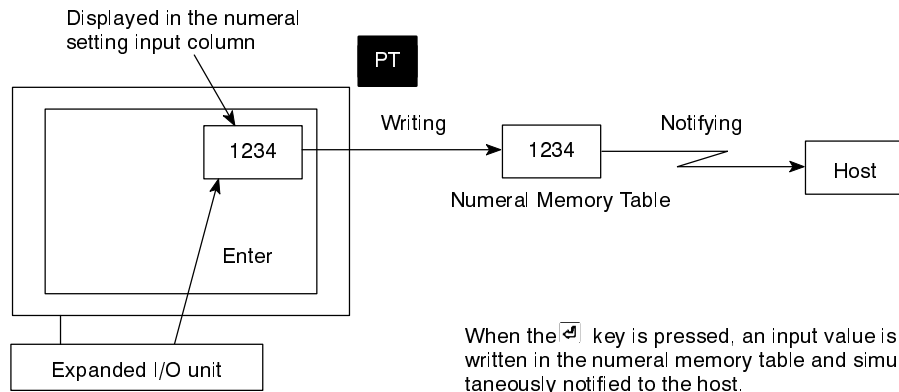
When there are multiple numeral setting input columns, a numeral setting input column for input operation is also selected by the ten-key.

To use the ten-key type, it is necessary to create not only the numeral setting input column in a screen but also the ten-key for input operation (Refer to page 147).

<When using a touch panel>




<When using an expanded I/O unit>

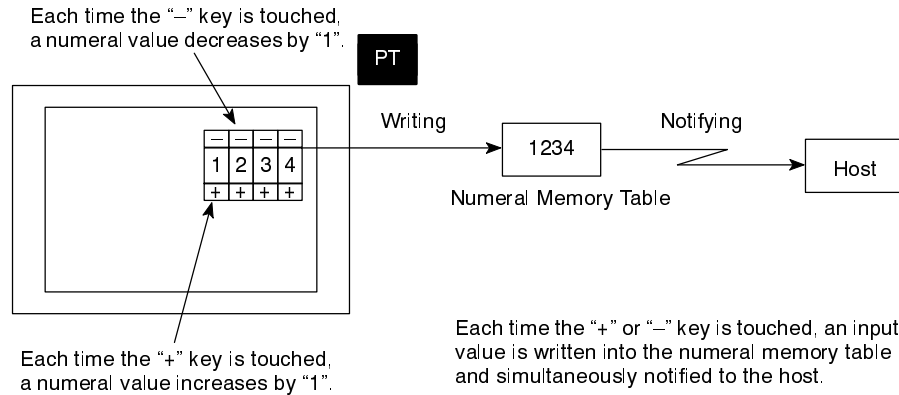


A numeral value is entered using the contact ten-key panel.

Thumb Rotary Type

By means of touch switches that can be increased/decreased every digit of numeral value, a numeral value can be entered from the numeral setting input column. Every time a numeral value displayed is changed, the numeral value displayed is written into the numeral memory table and simultaneously notified to the host. 

Therefore, the thumb rotary type can perform an entry of numeral value only by creating the numeral setting input column in a screen.



4-9-3 Ten-Key Creation

In order to use the ten-key type numeral setting, it is necessary to create not only the numeral setting input column in a screen but also a ten-key for performing an input operation.

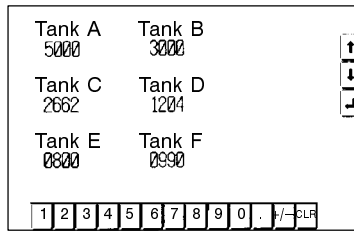
Screen Attribute Setting

A ten-key type can be selected by setting a screen attribute.

The “Numeral Setting” of the screen attribute is specified to “System” or “User”.

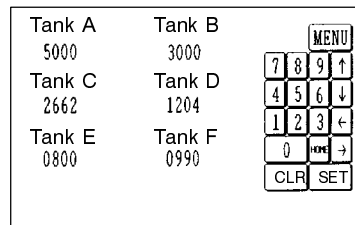
• **Screen when “System” is specified**

Ten-key display position and arrangement are fixed. In this screen, only the type of ten-key (system key) in the following page can be used.



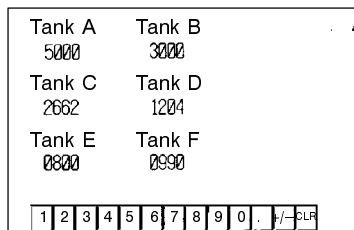
• **Screen when “User” is specified**

Display position and arrangement of the ten-key can be set freely by assigning to the touch switch (Refer to page 149).



Reference: • Even when the “Numeral Setting” of the screen attribute is “User”, the same ten-key as the “System” attribute can be displayed.

When the “User Ten-Key” of the “Input Setting” is specified to create data for the “Numeral Setting” screen, the following ten-key is displayed:



• Ten-key is created by the “Control key” for the “Input key” function of the touch switch. Out of the “Character key” of the “Input key” function, the normal characters of 0 to 9 and A to F can be used as ten-key.

Allocation of Ten-key

Ten-key can be allocated to the touch switches or expanded I/O unit.

• **Allocation to the touch switches**

When the touch switches are used as ten-key, the ten-key allocated when creating the touch switches is specified.

For creation of the touch switch, refer to the 4-8 “Touch Switches” (page 136).

Ten-key	Ten-key	Ten-key (system key)
0	A	↑
1	B	↓
2	C	←
3	D	→
4	E	↻
5	F	Ⓜ
6	CLR	↑
7	+/-	↓
8	.	MENU
9	HOME	

* The “MENU” key acts as the same entry when pressing the Ⓜ , ↑ , ↓ keys simultaneously.

• **Allocation to the expanded I/O unit**

Ten-key is allocated to each contact of expanded I/O unit. For details, refer to the 4-13 “Operation of Expanded I/O Unit” (page 171).

Reference: • When any touch switch allocated to the ten-key and system key in the numeral setting screen is pressed, it will not be notified to the host. Since the touch switch numbers 231 to 259 are reserved for ten-key and system key in the command method, there are the following restrictions:

Numbers 231 to 254: Cannot be used for numeral/character-string setting screen

Numbers 255 to 259: Cannot be used

- In the numeral setting screen, entry from the expanded I/O unit allocated to the ten-key and system key will not be notified to the host.
- The numeral setting screen cannot be registered as a child screen of continuous screens. When the numeral setting screen is displayed halfway during continuous screens, the system keys ↑ and ↓ act as numeral setting keys and it becomes impossible to scroll to other screens.
- In an overlapping screen, only one screen can be set to the numeral setting screen.

4-9-4 How to Use Ten-Key Type





In order to enter the numeral values using the ten-key type, the numeral setting input column subject to entry is specified to be ready for input operation before entering the numeral values using the ten-key.

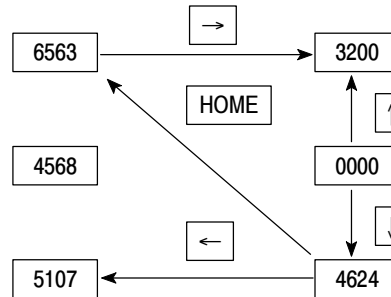
Specifying the Numeral Setting Input Column to be Entered

The numeral setting input column to be entered is specified by either ten-key, system key, or touch switch (numeral/character-string setting cursor moving key).

In the direct connection system, the frame (cursor) around the specified numeral setting input column and the cursor attributes can be specified.



- **Specifying the column using the ten-key**

The numeral setting input column is specified with the HOME, , , ,  keys out of the ten-keys. A cursor can be moved between the numeral setting input columns by these keys as shown below.



When the HOME key is pressed, the cursor can be moved at a stretch to an area at the upper left corner where a sum of XY coordinates is at a minimum (the numeral setting input column at the upper left in the example above).



- **Specifying the column using the system key**

When the system keys  and  of the touch panel or system key unit, a cursor can be moved in the order that the numeral setting input column is created by the support tool.

For example, when three numeral setting input columns are created, a cursor can be moved in due order as follows:

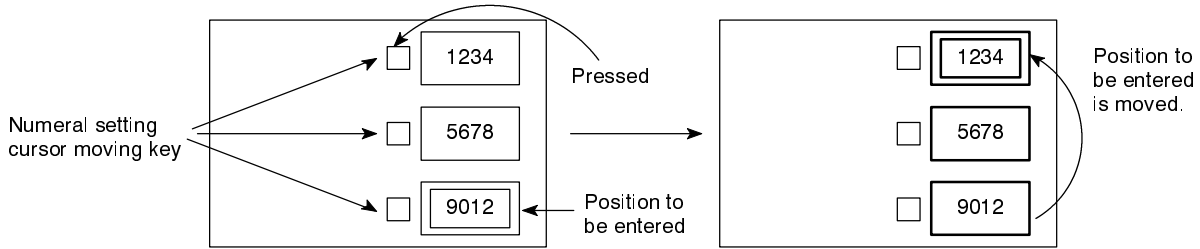
 key: First → Second → Third → First

 key: First → Third → Second → First

Reference: When the “Numeral Setting Screen” for the screen attribute is set to “System”, the order of movement using the system keys  and  can also be changed. For details, refer to NT-series Support Tool Operation Manual (V028-E1-).

• **Specifying the column using the numeral/character-string setting cursor moving key**

With the numeral/character-string setting cursor moving key of the touch switch being set, the numeral setting input column can be specified only by touching the key.



Entering the Numeral Values

The numeral values are entered using the ten-key numeric (0 to 9, A to F), decimal point (.), sign (+/-), clear (CLR), RETURN (↵) keys.

The numeral values can be entered in the same manner as a general electric calculator as follows:

• **Entering the integer part and decimal fraction**

An integer part is entered from the least significant digit. When an input numeral value is in excess of display digits, the numeral value shifts to the left from the least significant digit.

When a decimal point is entered, a decimal fraction can be entered thereafter. The decimal fraction is entered from the most significant digit. When an input numeral value is in excess of display digits, the numeral value shifts to the right from the most significant digit.

Key Entry	Numeral Value Display
(Initial state)	1234.5678
1	2341.5678
2	3412.5678
.	3412.5678
4	3412.4567

• **Changing the sign**

In case of sign display setting, the sign alternates from “+” to “-” and vice versa, each time the sign (+/-) key is pressed.

• **Confirming the input numeral value**

Be sure to press the RETURN key after an input operation is completed. When the RETURN key is pressed, the numeral value displayed is written into the numeral memory table and simultaneously notified to the host.

• **Initial operation of the input keys**

When the RETURN (↵), sign (+/-), and decimal point(.) keys are pressed initially (when pressing these keys immediately after displaying a screen or inputting the keys), the NT610C will operate as follows:

• RETURN (↵) key

The display is cleared by “0”. The NT610C starts entering the integer part.

• Sign (+/-) key

The display is cleared by “0”, but the sign is not reversed (when entering a decimal number or displaying a sign).

• Decimal point (.) key

The display is cleared by “0”. The NT610C starts entering the decimal fraction (when entering a decimal number or displaying a decimal fraction).

• **Checking the upper/lower limits**

The upper/lower limits are checked when pressing the RETURN key after an input operation is completed. If it is found that an input numeral value is in excess of limit as a result of checking, the contents of the numeral memory table (previous values prior to entry) is displayed again, but this is not notified to the host.

• **Example of input**

Numeral display varies as shown below when actually entering numeral values.

Input example 1) In case of decimal notation, sign displayed, integer part 4-digit, decimal fraction 3-digit

Order	Key	Numeral Display	Order	Key	Numeral Display	Order	Key	Numeral Display
	Initial value	0000.000	7	A	-1524.000	14	.	0000.000
1	1	0001.000	8	.	-1524.000	15	7	0000.700
2	5	0015.000	9	1	-1524.100	16	2	0000.720
3	2	0152.000	10	5	-1524.150	17	↵	0000.720
4	B	0152.000	11	2	-1524.152	18	±	0000.000
5	±	-0152.000	12	7	-1524.527	19	1	0001.000
6	4	-1524.000	13	↵	-1524.527	20	±	-0001.000

Input example 2) In case of decimal notation, sign not displayed, integer part 4-digit, decimal fraction 3-digit

Order	Key	Numeral Display	Order	Key	Numeral Display	Order	Key	Numeral Display
	Initial value	0000.000	5	±	0152.000	10	↵	1524.130
1	1	0001.000	6	4	1524.000	11	.	0000.000
2	5	0015.000	7	.	1524.000	12	9	0000.900
3	2	0152.000	8	1	1524.100	13	5	0000.950
4	B	0152.000	9	3	1524.130	14	↵	0000.950

4-9-5 How to Use a Thumb Rotary Type

For numeral setting of thumb rotary type, a numeric value is entered by directly touching the increment/decrement (+, -) keys. Keys such as ten-key are not required.

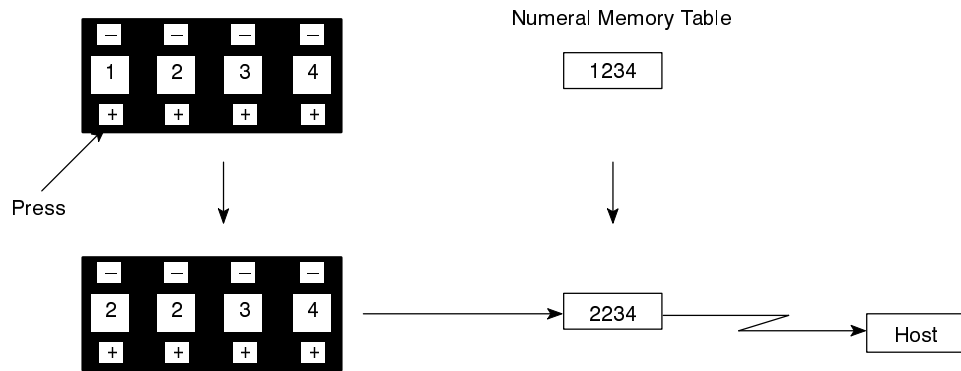
Entering the Numeric Values

The numeric values are entered using the increment/decrement (+, -) keys provided at each digit.

- **Specifying the numeric values**

When the increment/decrement (+, -) key is touched, the numeric value at that digit will increase/decrease by "1". Each time "+" or "-" key is touched, the numeric value just changed is notified to the host. It is not necessary to press the RETURN (↵) key unlike the ten-key type.

Thumb rotary numeric value setting



Numeric value increases by "1".

Reference: A numeric value cannot be entered into the thumb rotary type from the ten-key.

- **Changing signs**

In case of sign display setting, the sign "+" is specified by touching the "+" key of the digit for which the sign is displayed and the sign "-" by touching the "-" key.

- **Checking the upper/lower limits**

Upper/lower limits are checked when pressing the increment/decrement (+, -) keys. If it is found that an input numeral value is in excess of the limit as a result of checking, the contents of the numeral memory table (previous value before pressing the increment/decrement (+, -) keys) is displayed again, but this is not notified to the host.

4-9-6 Setting Items for Numeral Setting

For the numeral setting, the following items are set when being created with the support tool. However, for numeral setting of thumb rotary type, there are some restrictions on the setting of several items.

Items to be Set

- **Numeral Memory Table to be referred**

The number of the numeral memory table is specified to register the numeric values entered for the numeral setting.

- **Number of digits of numeric value entered**

The number of digits of numeric value entered is specified. Up to 8-digit can be specified by figuring out a sum of the number of digits of both integer part and decimal fraction. However, when displaying a sign, the number of negative numbers is limited to a maximum of 7-digit.

- **Upper/lower limit**

Upper limit and lower limit are set separately. A maximum of 8-digit numeric value (up to 7-digit for negative numbers) can be set.

If a negative number is set for an upper or lower limit, enter F in the 8th digit place.

Example: To set “-123” for an upper or lower limit, input F0000123.

- **Display attribute**

The same attributes as the numeral display are set. For details, refer to the “Displaying Method of Numeric Value” (page 116).

Restrictions and Additions When Creating the Thumb Rotary Type

For numeral setting for thumb rotary type, there are the following restrictions and additions when setting the items.

- **Number of digits of positive numbers to be entered with a sign displayed**

For the thumb rotary type, with a sign displayed, the number of digits of the positive numbers to be entered is also a maximum of 7-digit.

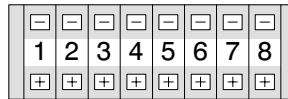
- **Display size**

There are only three kinds of size that can be specified. Size is specified by the touch switch size of the increment/decrement (+, -) keys. Display size is selected out of three size: minimum unit of touch switch (20 dots by 20 dots), 1 x 1 (small), 2 x 2 (medium), 3 x 3 (large). Entire size of the numeral setting input column is specified by the touch switch size just specified.

• **Shape (end plate)**

Either of the two kinds of shape as shown below can be set. Decoration (end plate) at both ends of the numeral setting input column differs.

<With end plate>



<Without end late>



• **Restricted display attributes**

There are the following restrictions on display attributes.

- Character type: 16 × 16 dots only
- Character magnification: Either of double, x4, or x9 in correspondence with display size specified
- Character display attribute: Normal display only (“reverse” and so forth are not available)
- Zero suppress: “Without zero suppress” only

4-10 Character-String Setting

Character-string setting is a function to enter a character-string on a screen.

The character-string setting allows a character-string to directly be entered from the touch switch into the character-string memory table, displayed in the screen, and also sent to the host.


The character-string setting is carried out when creating a screen with the support tool.

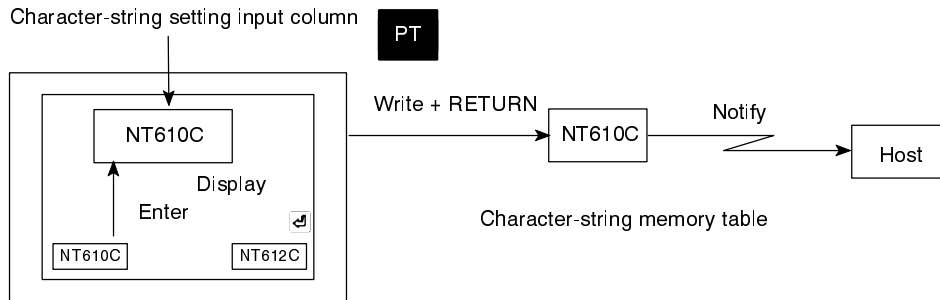
4-10-1 Functions of Character-String Setting

The character-string setting has the following functions.

Basic Operation

The NT610C operates the character-string setting as follows:

- (1) The touch switches (character key) are previously set by the support tool.
- (2) When the character key (“NT610C” in an example in the figure) is pressed, a guide character of the character key (“NT610C” in the example in the figure) is entered in the character-string setting input column.
- (3) When the Enter () key is pressed, the character-string of the character-string input column is written into the character-string memory table and simultaneously notified to the host.



Keyboard Switching

This section describes the “Keyboard switching” that is useful when setting the character-string.

• Description of keyboard

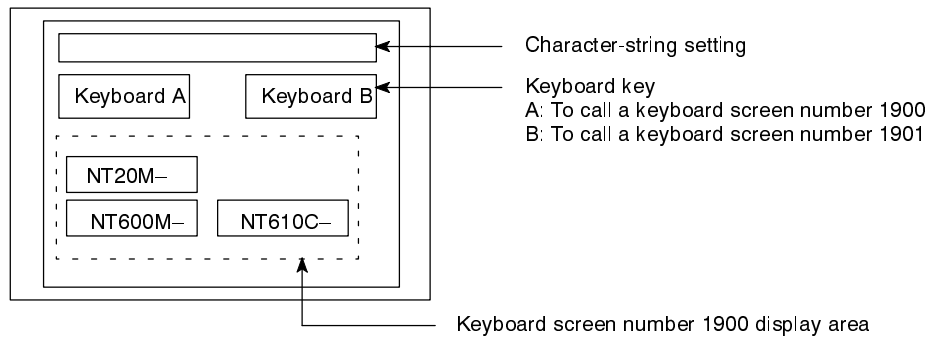
“Keyboard” is defined as a group of touch switches (character keys) used to enter the character-strings. By switching a keyboard to be used as occasion demands, it is possible to increase the number of character keys that can be used, allowing a variety of entry. Each keyboard is registered with a separate screen (keyboard screen) (Only those touch switches used for a keyboard are registered with a keyboard screen).

• How to switch over keyboards

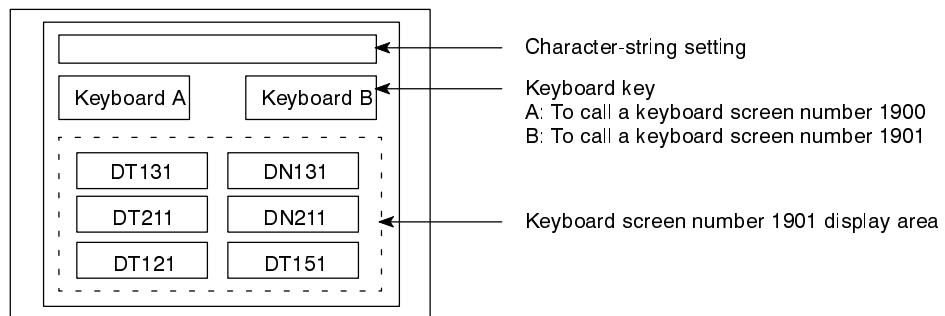
Keyboards are switched over with the use of the “Keyboard” out of the “Input key” function of the touch switches. A keyboard screen number to be switched over has been set to the keyboard key.

When the keyboard key is used, the keyboard display screen is as follows:

- When pressing the “Keyboard A” to call a keyboard screen number 1900



- When pressing the “Keyboard B” to call a keyboard screen number 1901



Reference: When it is not necessary to switch over the keyboards, use only the touch switches created in the character-string setting screen or the keyboard specified at the “Keyboard Display” of the “Input Setting” to enter the character-strings.

4-10-2 Creating the Keyboard

In order to use the character-string setting, it is necessary to create not only the character-string setting in the screen but also a keyboard for entering the character-strings.

There are the following two keyboard creating methods.

- By creating keyboards only in the character-string setting screen
- By creating keyboards in the keyboard screen that are switched over as occasion demands

This section chiefly describes the method to create the keyboards in the keyboard screen. When the keyboards are created only in the character-string setting screen, refer to the following paragraph “Creating the Character Keys”.

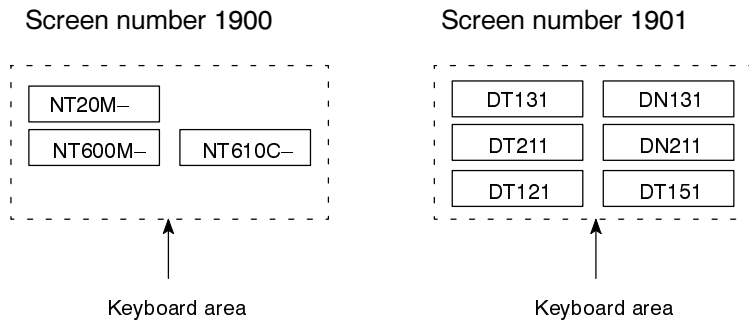
Creating the Character Keys The character keys are created to enter the character-strings in the input column of the character setting.

Reference: The character keys are created by the “Character” keys out of the “Input Key” functions of the touch switches.

It is also possible to use the “Character” keys out of the “Input Key” functions (However, four keys for alarm display cannot be used).

When the keyboard is created in the keyboard screen, be sure to create it in the screen of number 1900 to 1979. In other screens, it cannot be called as a keyboard. When the keyboards are created at the screen number 1900 to 1979, the “Keyboard Area” is specified to return to the “List of Screens” screen. When any keyboard is called in the character-string setting screen, the contents within the keyboard area specified is cleared to avoid overlapping before displaying the keyboard. In the keyboard area, the screen attribute “Background Color” of the keyboard screen being called becomes effective.

Example:

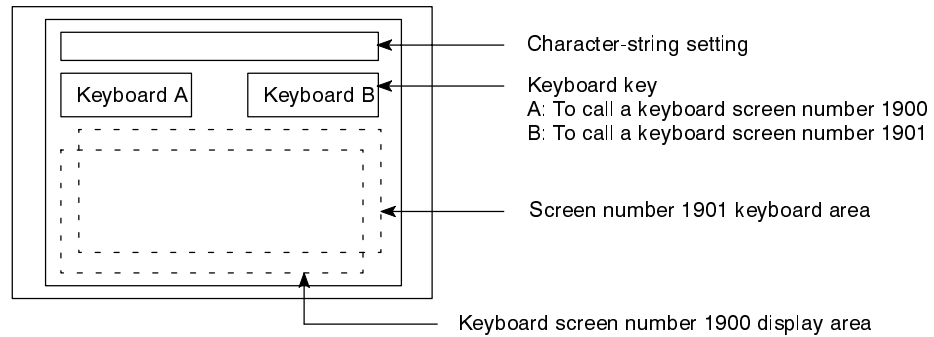


Reference: For the character-string setting, it is necessary to have a key to confirm an entry of character-strings. The Enter (↵) key out of the control keys should be assigned to the touch switch or expanded I/O unit, or the RETURN key of the system key unit is used.

Creating the Keyboard Switchover Keys

With the “Keyboard” out of the “Input Key” functions of the touch switches, the touch switches used as keyboard switchover keys are created in the character-string setting screen (Those keyboard keys can also be created in the keyboard screen).

Example:



Reference: When the character-string setting screen is created, the state of the screen when a keyboard is called can be made sure with the “Keyboard Display” of the “Input Setting”. In order to prevent necessary portion from being cleared by the keyboard being called, the state of the screen can previously be made sure. The state of the keyboard when the character-string setting screen has been created is registered as a state when the screen is switched over.

How to Enter the Character-Strings

An appropriate character-string setting input column is specified to be ready for an input operation before a character-string is entered by the character key.

• **Specifying the character-string setting input column to be entered**

The character-string setting input column to be entered is specified by either ten-key, system key, or touch switch (numeral/character-string setting cursor moving key).

The frame (cursor) around the specified character-string setting input column and the cursor attributes can be specified.


Concrete specifying method is the same as numeral setting. Refer to the “Specifying the Numeral Setting Input Column to be Entered” (page 150).

• **Entering the character-string**

The character-strings are displayed in the input column of the character-string setting in due order of the touch switches being pressed (A character is inserted at an input cursor position). At this time, the keyboard screen can also be switched over halfway.

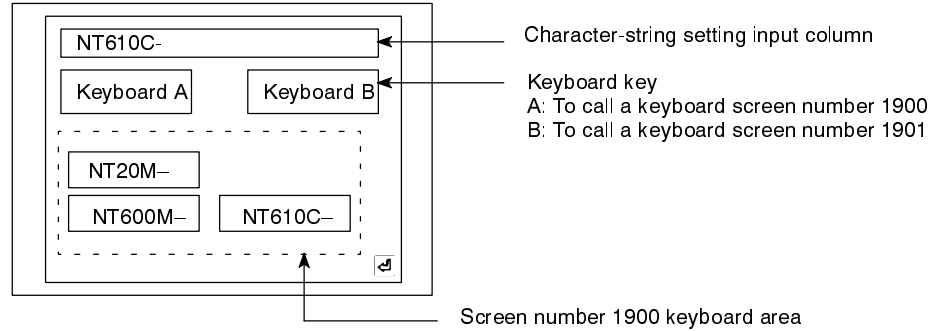
When entering the character-strings, the following control keys of the touch switches can be used.

Control Key	Function
CA	Used to cancel character-string entry
BS	Used to delete a character just before an input cursor
DEL	Used to delete a character at an input cursor
◀	Used to move an input cursor to the left by one character
▶	Used to move an input cursor to the right by one character
ENT	Used to confirm an input character (After confirming this, a cursor moves to the following input column)

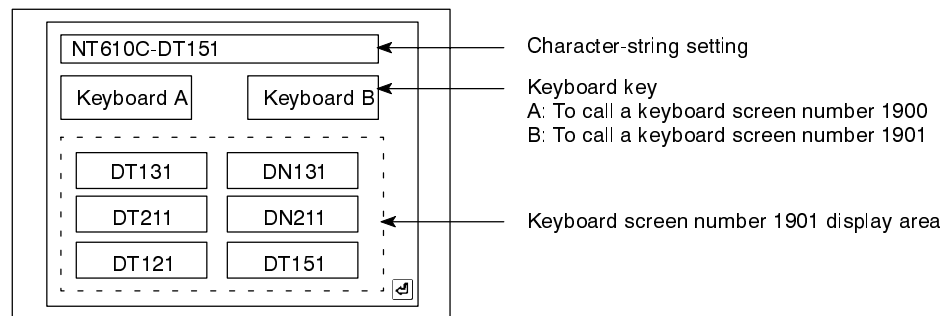
Be sure to press the Enter () key after an input operation is completed. At this time, the character-strings being displayed are written into the character-string memory table and simultaneously notified to the host.


Example:

- When the “Model NT610C-” is pressed after pressing the “Keyboard A” that calls the keyboard screen number 1900



- Then, when the “DT151” is pressed after pressing the “Keyboard B” that calls the keyboard screen number 1901



- Finally, when the Enter () key is pressed, the “Model NT610C-DT151” being displayed in the input column of the character-string setting is confirmed and written into the character-string memory table and simultaneously notified to the host.

Reference: When the COPY key (Refer to page 143) of the touch switch is used, the contents of the character-string memory table can be copied into the character-string setting input column immediately.

4-11 Stand-Alone Functions

The NT610C can switch over the screen only by operating the switches without instructions from the host. This function is referred to as “Stand-Alone Function”.

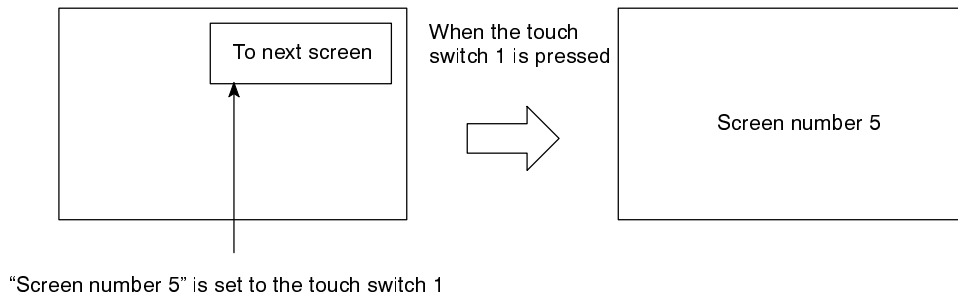
Setting the Stand-Alone Functions

When a screen data is created with the support tool, the screen number of a screen to be switched over is assigned to the input terminal of the touch switch or expanded I/O unit. When the touch switch is pressed or the input terminal is turned ON during operation, the screen of the number specified is displayed. At this time, the screen number just switched over is also notified to the host.

Assigning the Switchover Screen Number

The stand-alone function can assign a screen number to an input terminal of the touch switch and expanded I/O unit.

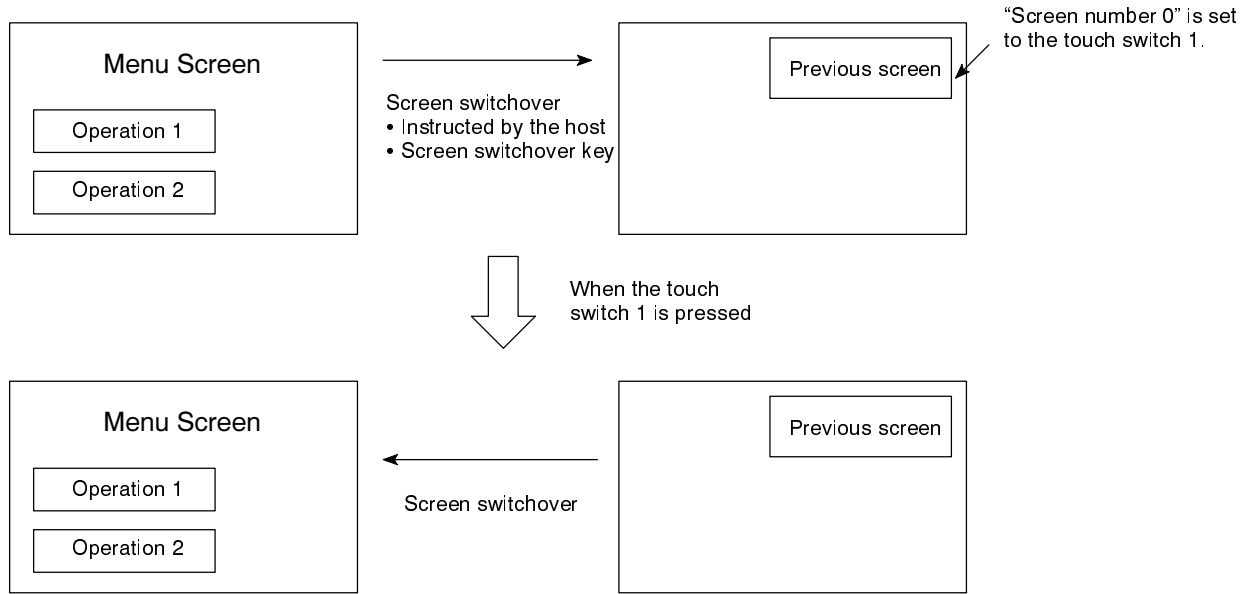
Assignment of screen number is set by the “Edit Screen” of the support tool. For the touch switches, a screen number is assigned by the “Screen Switch” of the “Touch Switch”. For the expanded I/O unit, a screen number is assigned by the “Exp. I/O”.



- Reference:**
- Even when the screen number of the stand-alone function is assigned to the numeral setting key in the numeral setting screen, screen changeover cannot be done.
 - Plural screen numbers cannot be assigned to one key in a single screen (or in a single overlapping screen).

Assignment of Screen Switchover Return Key

When a screen number 0 is assigned to an input terminal of the touch switch or expanded I/O unit, it can be used as a key to return to the screen displayed just immediately.



Reference: The number of screens that can be returned using the screen switchover return key is a maximum of 32 screens. However, it is assumed that the screen switchover return key has been set to all screens to be returned.

4-12 Alarm List & History Display Functions

The NT610C can monitor the state of PC contacts of the host and display the corresponding message (using the character-string memory table) or image library (alarm list display) when particular contact becomes “1” (ON).

The NT610C can record that those contacts become “1” (ON) and also display them in the order of frequency or occurrence (alarm history display).

4-12-1 Alarm List Display

Alarm list display has the following functions.

Displaying the Message (Character-String Memory Table) and Image Library

The NT610C monitors multiple contacts according to the setting of the bit memory table and displays the character-string memory table (message) set to the corresponding bit memory table when there is any contact that becomes “1” (ON). Since the display column of a message is also a touch switch, corresponding image library can be displayed by pressing the message being displayed.

If the description of alarms is provided in the character-string memory table and the corrective actions against those alarms are described in the image library, it is possible to take appropriate measures rapidly.

- To display multiple messages

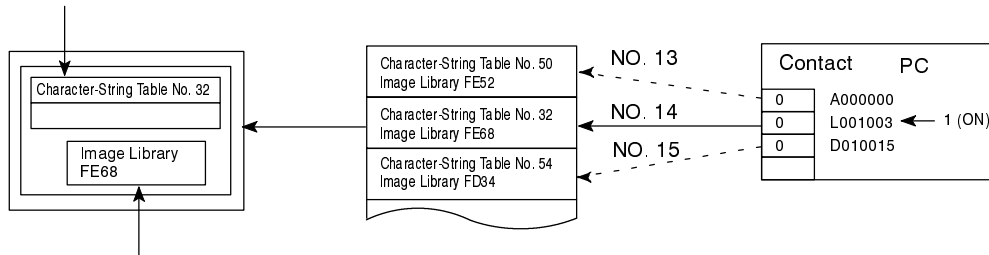
When multiple contacts become “1” (ON), the bit memory table with smaller table number is displayed preferentially.

When multiple messages can be displayed, the messages of higher priority (smaller bit memory table number) will be displayed earlier.

The display column of message and the image library displayed correspondingly are referred to as “Alarm Group” collectively. The NT610C can display up to four individual alarm group in one screen and simultaneously show up to 24 messages in one alarm group.

Example:

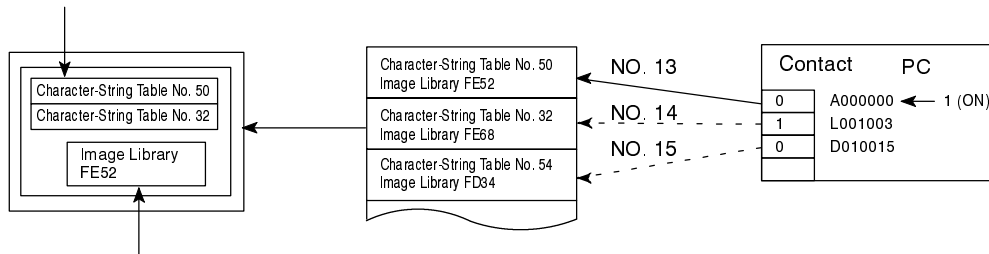
Message (character-string No. 32)
set to bit memory table number 14



When the message displayed is pressed, the image library (FE68) set to the bit memory table number 14 is displayed.

Now, when the contact A000000 turns ON

Message (character-string 50) set to
bit memory table number 13



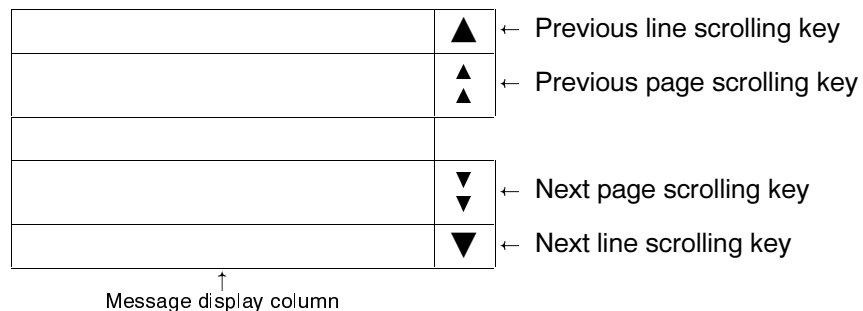
When the upper message displayed is pressed, the image library (FE52) set to the bit memory table number 13 is displayed.

When the contact corresponding to the message being displayed returns to “0” (OFF), the message is cleared and the next message is displayed according to the order of priority.

• **Scrolling the message**

When the message issued extends more than the number of lines set to message display, the message being displayed can be scrolled in unit of line or page.

When the number of lines for message display is set to four or more, the control keys for scrolling are automatically created as shown below.



When the number of lines for message display is set to one to three, only line scrolling keys are automatically created.

The scrolling key can also be set and corrected by the “Control” out of the “Input Key” functions of the touch switches.

- Scrolling keys shown in reverse video

Since these scrolling keys are automatically shown in reverse video when there are any messages in front or behind those keys, it is found whether or not there are any messages that are not displayed.

Switching the Image Library to be Displayed

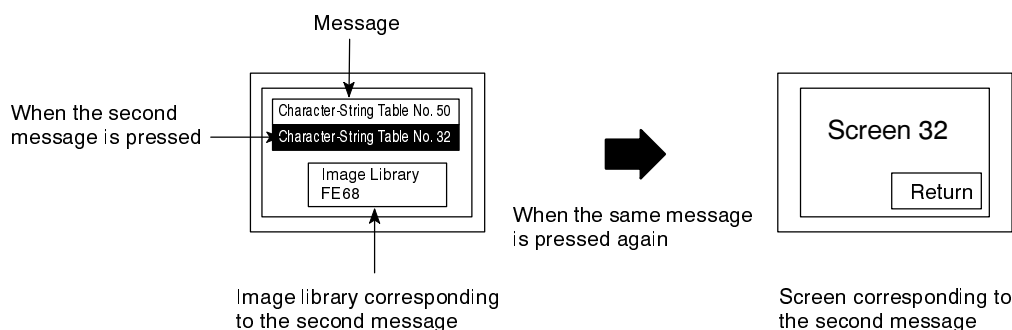
The message display column also serves as a touch switch. By selecting the message (touch switch) displayed, corresponding image library can be displayed.

Switching over to the Corresponding Screen

To the bit memory table used for the alarm list display function, corresponding screen number can be set, as well as corresponding character-string memory table (message) and image library.

When the screen number has been set, by pressing the message once again that is being selected in the section above “Switching the image library to be displayed”, it is possible to switch over to and display that screen.

Example:



Setting the Alarm List Display Function (Setting the Bit Memory Table)

When the alarm list display function is used, it is necessary to set the bit memory table and screen display function. This paragraph describes the setting of the bit memory table. For the display setting, refer to "NT-series Support Tool Operation Manual" (V028-E1-).

Reference: In order to set the message to continuous or duplicate screen, only the first sub-screen is effective.

In one alarm group, the bit memory tables less than continuous 128 can be used and the state of up to 128 contacts can be monitored. The smaller the bit memory table number, the higher the order of priority a message has.

The following settings are done to each bit memory table.

- **Recording the alarm history**

Setting of whether or not a change of PC contact to which the bit memory table is assigned is recorded.

- **Screen switchover function**

Setting of whether or not the screen switchover function is used.

- **Character-string memory table number**

Character-string memory table number displayed as a message is set.

- **Display color**

Character color of a message is set.

- **Image library**

Code of image library data displayed together with a message is set.

- **Screen switchover**

Screen number displayed by the alarm list and history display function is set.

- **Contact**

Contact on the PC, to which the bit memory table is assigned, is set.

Symbol	C Series PC	CV Series PC	Allocated
DM	Data memory	Data memory	○
CH	I/O relay	I/O relay	○
TIM	Timer present value	Timer present value	×
CNT	Counter present value	Counter present value	×
HR	Holding relay	—	○
AR	Auxiliary storing relay	Special auxiliary relay	○
LR	Link relay	—	○

○: possible
×: impossible

The Special Auxiliary Relay Area of CV series PC is used exclusively for special application in the system, and cannot be used for other application.

When Data Memory (DM) is specified, the bit number (00 to 15) is specified following the channel number.

Example of setting:

No.	Host	#	Table	Dsp Cl	Image & Lib	SwScreen	Bit	Comment
000	No	No					_____	
001	No	No					_____	
002	Ys	No	999	Red	FD20	2000	CH 000000	
003	Ys	No	123	Blue	FD21	1234	AR 000000	
004	No	No	124	Whit	FD22	1235	LR 001003	
005	No	No	125	Whit	FD23	1236	LR 001004	
006	No	No					_____	
007	No	No					_____	

In this example, four contacts of CH000000, AR000000, LR001003, LR001004 are monitored using four bit memory tables of bit memory table numbers 002 to 005.

4-12-2 Displaying the Alarm History

Alarm History always monitors the state of contact that has the “Record” setting in the item “Recording the alarm history” of the bit memory table, and records the date and time when the contact turns “1” (ON).

- Reference:**
- The contacts recorded in the alarm history are always monitored irrespective of the display screen of the NT610C. If the number of contacts are increased excessively, the processing speed of the NT610C may become slower.
 - Alarm history is common to all bit memory tables. Unlike the message display, it cannot deal with only a part of bit memory table.

Recording Format of Alarm History

For the alarm history, the following data is recorded in the memory concerning the contact that turns “1” (ON).

- Contact number
- Date and time of occurrence
- Message set in the bit memory table (the contents of the character-string memory table)

Maximum Number of Alarms to be Recorded

The number of alarms to be recorded is up to 256 in the order of occurrence.

Data recorded is backed up by a battery, so it is not lost even when the power supply is turned OFF.

- Reference:** • How to deal with alarm recording when the number of alarms capable of being recorded is exceeded is determined by the “Alarm First-in First-out” setting of the “System Memory” of the support tool as follows:

ON: Old history is cleared and new history is recorded.

OFF: Alarms in excess of 256 are not recorded (new alarms are discarded).

- In order to clear (initialize) the alarm history, the memory is initialized (Refer to page 68).

How to Make Sure of Alarm History

The alarm history can be displayed by the NT610C during operation by setting an area and displaying method when creating a screen data with the support tool.

There are two displaying methods: in the order of occurrence and frequency.

• **In the order of occurrence**

The alarm history is displayed in the order that a contact becomes “1” (ON). As more detailed information, date and time of occurrence can be displayed simultaneously.

Abnormal remote I/O	94/06/06	16:02	▲
Abnormal high function unit	94/06/07	09:21	▲
Cycle time over	94/06/17	15:44	
			▼
			▼

Occurrence of transmission abnormality

Check the remote I/O transmission line!

• **In order of frequency**

The alarm history is displayed in the order of frequency that a contact becomes “1” (ON). Number of occurrence is displayed simultaneously.

Cycle time over	114	▲
Abnormal high function unit	53	▲
Abnormal remote I/O	39	
		▼
		▼

Cycle time exceeds 100 msec!

The following countermeasure should be taken: Program is checked again. Setting of cycle time over not detected (DM6655:X1XX)

In either case, the number of alarms displayed can be set up to 24. When the alarm history is set, the scrolling keys are created automatically. Creating and using the scrolling keys are the same as the alarm list display. Refer to the “Scrolling the message” (page 165). Displaying the image library and switching over the screen are the same as the alarm list display. Refer to the “Switching the Image Library to be Displayed” and “Switching over to the Corresponding Screen” (page 166).

The alarm history can be displayed simultaneously in the order of occurrence and frequency in one screen, respectively.

Reference: The alarm history display function does not automatically update the contents of display even when the state of contact is changed during displaying operation. The contents of display is updated when pressing the scrolling keys.

4-13 Operation of Expanded I/O Unit

Expanded I/O unit can connect external equipment such as switch and indicator to the PT. This section describes the operation of the expanded I/O unit.

4-13-1 Expanded I/O Unit to be Connected

One of the following two expanded I/O units can be connected to the NT610C:

- 10/02 Terminal

This is an I/O unit with 10 inputs and 2 outputs and can be installed directly at the rear of the NT610C.

- 32/16 Terminal

This is an I/O unit with 32 inputs and 16 outputs and can be installed externally via the connecting cable.

4-13-2 Functions of I/O Terminal

The I/O terminal of expanded I/O unit has the following five functions:

- (1) When the input terminal is turned ON, it will be notified to the host.
- (2) The equipment connected to the output terminal can be controlled by turning ON/OFF the output terminal according to instructions from the host.
- (3) In the numeric value setting screen, the numeric value can be entered after assigning ten-keys to the input terminals.
- (4) With the system keys assigned to the input terminals, the input terminals can be used instead of the system keys (only during operation).
- (5) With the screen number assigned to the input terminal, it can be used as a screen switchover key.

4-13-3 Assignment of Functions

Those functions such as input notification, ten-key for numeric value/character-string setting, system key, screen switchover, external output can be freely assigned to each terminal of expanded I/O unit.

Terminal Designation Designation of I/O terminals, to which functions can be assigned, is as follows:

- **10/02 Terminal**

		Terminal Designation									
Input terminal		IN0	IN1	IN2	IN3	IN4	IN5	IN6	IN7	IN8	IN9
Output terminal		OUT0	OUT1	/	/	/	/	/	/	/	/

Reference: 10/02 output terminals are used for relay contact outputs. A relay can be exchanged with a non-contact relay.

- **32/16 Terminal**

		Terminal Designation															
Input terminal		A0	A1	A2	A3	A4	A5	A6	A7	A9	A10	A11	A12	A13	A14	A15	A16
		B0	B1	B2	B3	B4	B5	B6	B7	B9	B10	B11	B12	B13	B14	B15	B16
Output terminal		C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C18

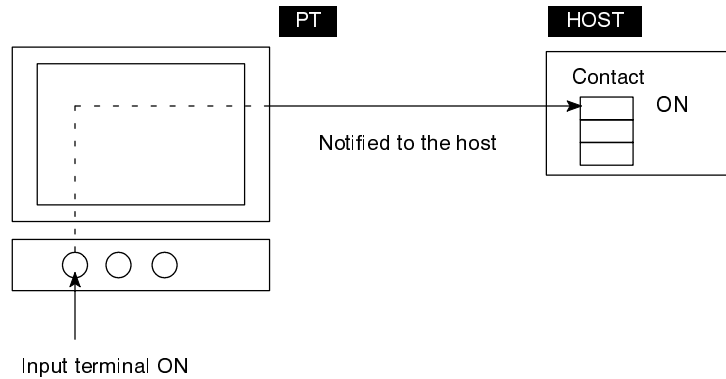
Reference: The output terminals C2 to C15 are used for transistor outputs, and C16 and C18 are for relay contact outputs. A relay can be exchanged with a non-contact relay.

Contents of Functions Details of each function is as follows:

- **Input notifying function**

With the PC contacts assigned to the input terminals, the state of input terminals can be notified to the host by turning ON/OFF the contacts specified in accordance with the state of the input terminals.

At this time, even when the contacts are turned ON simultaneously with the touch switches or multiple terminals, all input states are notified to the host.



• **Ten-key (system key) function**

With the ten-keys (system keys) assigned to the input terminals, the input terminals can function similar to those keys specified. However, with the system keys assigned to the input terminals, those terminals cannot be used as the system keys other than the operation mode (system menu, etc.).

The following ten-keys (system keys) can be assigned to the input terminals.

Ten-keys	1	2	3	4	5	6	7	8	9	0	A	B	☒	↑	↓	☑
	C	D	E	F	CR	±	.	HOME	↑	↓	←	→	☑	MENU		

Reference: When a screen switchover key for each screen is also assigned to the same input terminal, it acts as the screen switchover key.

• **Screen switchover function**

With the screen number assigned to the input terminal, it can function as the screen switchover key similar to the touch switch. However, with “0” specified to the screen number, it functions as the screen switchover return key (Refer to page 163).

Other than setting the input terminal as the screen switchover key that acts at each screen similar to the touch switch, it can also be set as the screen switchover key common to all screens. However, when the screen number common to all screens and the screen number for each screen are assigned concurrently to one input terminal, the screen number for each screen have priority.

• External output function

With the PC contacts assigned to the output terminals, those output terminals can be turned ON/OFF in accordance with the state of the contacts to which the output terminals are specified. External equipment connected to the output terminals can be controlled by the host.

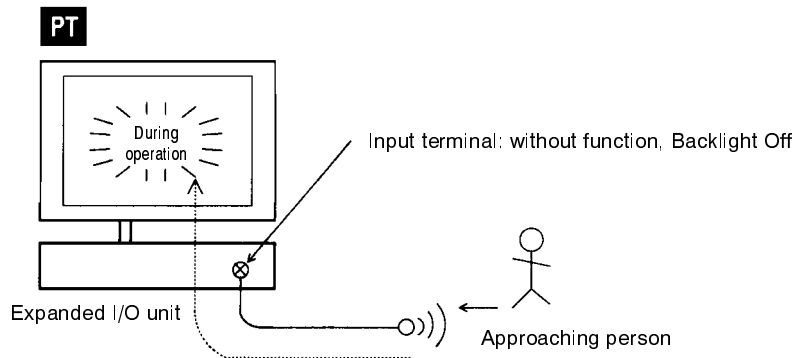
ON/OFF state of the output terminal is held unless the state of the contact is changed.

• Backlight Off function releasing attribute

With this attribute set to an input terminal, an OFF state is released when the input terminal turns ON, even if the backlight is turned OFF with the Backlight Off function activated (Refer to page 75).

However, for the terminals to which both ten-key and screen switchover functions are assigned, the Backlight Off function is always released. For the terminals to which the input notifying function is assigned and the terminals to which any function is not assigned, Backlight Off attribute and not-release attribute can be selected.

For example, with the Backlight Off attribute set to the terminals without this function, the PT screen can be displayed when a person approaches to the NT610C, by combining with a sensor as shown below.



Reference: When turning ON the terminal to which both screen switchover key and ten-key functions are assigned, with the Backlight Off, only the Backlight Off state is released and the function of those keys will not be implemented. However, in case of input notifying key, it is notified to the host irrespective of the Backlight Off release attribute.

• Key press sound

Though a key press sound does not sound under any circumstances for the input notifying key, “Sound” and “Not sound” can be selected for other function and non-function keys according to the memory switch setting.

SECTION 5

Troubleshooting and Maintenance


This section describes the action to take when NT610C errors occur, and how to carry out maintenance and inspections to prevent the occurrence of errors.

For troubleshooting, also refer to the “Host I/F Unit Operation Manual” and “Support Tool Operation Manual” supplied with this unit.

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5-3	Maintenance of NT610C	178
5-4	Inspection and Cleaning	187

5-1 Hardware Faults


When a fault relating to the operation of the NT610C occurs, find the symptoms in the table below and respond by following the corresponding “Remedy” indicated in the table.

 **Caution** Confirm system safety before turning the power ON/OFF or resetting. Otherwise the system may operate unpredictably.

NT610C Symptoms	Cause	Remedy
POWER LED fails to come ON	Power is not being supplied.	Check the connections and make sure that power is supplied correctly. (Refer to page 38.)
	Power supply fuse has blown	Contact your OMRON service center.
Nothing is displayed on the screen.	System ROM is not installed or connected improperly.	Check the system ROM for installation and connection. (Refer to page 25.)
	Screen #0 has been read at the host side.	This is not an error. Change the screen number. Refer to the Operation Manual of each host I/F unit.
Communication with the support tool not possible.	The Transmit Mode has not been established.	Display the system menu and select the Transmit Mode.(Refer to page 67.)
	Not connected to the support tool.	Check the installation of the connection cable. (Refer to page 49.)
Host I/F unit uses a serial communication type (RS-232C unit, host link unit) that cannot be communicated.	DIP switch setting is not correct.	Check the setting in the “PT Setting” of the Maintenance Mode, and match the host and NT610C settings. (Refer to page 90.)
	Host I/F unit and host are not correctly connected.	Check that the type, length and installation of the connection cable match the specifications. (Refer to page 36.)
	In a host link connection, the termination resistance setting is incorrect.	Set the termination resistance correctly. Refer to NT-series Direct Connection Operation Manual (V026-E1-1).
Buzzer sounds, RUN LED is OFF.	System ROM is not installed properly.	Check the system ROM for installation (Refer to page 25).
	Malfunction due to external noise.	Keep the communication cable apart from the source of noise and insert a noise filter in the power supply line.

5-2 Responding to Displayed Error Messages


When the NT610C displays the following error message, take an appropriate action according to the “Remedy”.

Message	Cause	Remedy
No Host I/F	The host I/F unit is not installed or the system ROM does not match the type of host I/F unit.	<ul style="list-style-type: none"> • Install the host I/F unit (Refer to page 29). • Install proper type of system ROM (Refer to page 25).
Screen Data Corrupted	There is an error in the registered screen data.	After initializing the screen data memory in the Maintenance Mode, register the screen data again with the support tool.
Memory Unformatted	The screen data memory is not initialized.	Initialize the screen data memory in the Maintenance Mode (Refer to page 60).
Initialize Error	The screen data memory cannot be initialized properly.	Perform the initialization operation once more. If the same error occurs again, there is a possibility that the screen memory board is deteriorated or at fault. If so, replace the screen data memory board with a new one.
Screen Memory can not Write Can not Initialize	The “Write Protect Switch” of the screen data memory board is set to “INHIBIT”.	Set the “Write Ptoect Switch” to “ENABLE” (upper position) and then perform the initialization operation once more.
No Screen Memory	When the screen data memory is initialized, the screen data memory board is not installed.	Install the screen data memory board before performing the initialization operation again.
Battery Lowered	Built-in battery’s voltage is low.	Replace the battery (Refer to page 178).
Host Error	When the host RUN input is effectively set by the DIP switches on the NT610C: <ul style="list-style-type: none"> • Power at the PC side is turned OFF. • Voltage of the host RUN input drops. 	<ul style="list-style-type: none"> • Turn on the power at PC side (Refer to page 43). • Apply 24 VDC to the host RUN input.
No Exp. I/O Unit Exists (Buzzer sounds simultaneously and continuously)	The expanded I/O unit connection cable that is connected when the power is ON is disconnected.	Press the  key to stop the buzzer from sounding. Then, turn OFF the power and connect the expanded I/O unit. After that, turn on the power to restore normal operation (Refer to page 44).
No direct Information is set. Use the Support Tool to set the PT Control Area and PT Notify Area	Assigned channels of PT state control area and PT state notifying area are not set.	Assign the channels to the PT state control area and PT state notifying area with the support tool.

*: This error message is not displayed if the expanded I/O unit is not installed when the power is turned ON (or reset).


5-3 Maintenance of NT610C

Carry out maintenance work in order to ensure that the NT610C is always used in its optimum condition.

 **WARNING** Do not attempt to take the NT610C apart and do not touch any internal parts while the power is being supplied. Doing either of these may result in electrical shock.

Spare PT

It is advisable to have a spare NT610C available to minimize system downtime in the event of an NT610C failure or if the screen display becomes difficult to read due to deterioration of the display unit.

 **Caution** Do not disassemble for repairs or modification. Otherwise the product may malfunction.

Replacement of Battery

The NT610C uses a lithium battery to back up the contents of a memory.

Service life of this battery is five years when used in an environment of 25°C. When the battery is used at higher temperature, its service life is shortened further. Replace a battery according to an environment it is used.

It is advisable to previously prepare a battery so that it can be replaced immediately as occasion demands.

- **Battery type**

Model C500-BAT08

- **Standard symptoms to be replaced**

Symptoms of replacement is as follows. When there is any sign below, replace a battery within five days.

- When five years have passed since a battery is installed on the NT610C.
- If a message "Battery Voltage Drop" is displayed when the power is turned ON or reset.

- **Replacing procedure**

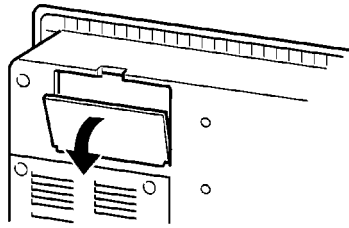
A battery is replaced with a new one according to the following procedure.

In order to protect the contents of a memory, replace a battery within five minutes.

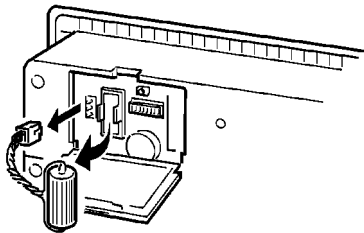
- (1) After the power supply is turned ON for one minute or more, turn it OFF.

Reference: Unless the power supply is conducted for one minute or more, the contents of a memory cannot be held without a battery for five minutes.

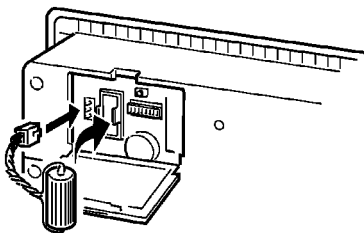
- (2) Open the switch cover at the rear of the NT610C.



- (3) Pull out a battery together with the connector.



- (4) Install a new battery. Insert the battery connector uprightly.



- (5) Close the switch cover.

Reference: A battery can be replaced even with the power supply turned ON. In this case, replacement period is not restricted.

⚠ Caution Never short the battery terminals, attempt to charge the battery or take it apart, heat it, or discard it into fire. In the worst case, explosion may occur.

Replacing Procedure of Backlight

When the backlight in the display is getting dim and the screen cannot be read easily, replace the backlight.

The backlight can be replaced at the rear of the NT610C while it is mounted in an operation panel.

WARNING Switch off the power before replacing the backlight. Otherwise you could sustain an electric shock.

- Caution**
- Do not press touch switches carelessly while the backlight is off or while nothing is displayed on the screen. Otherwise the system may operate unpredictably. Only press touch switches after confirming system safety.
 - The disposal of the backlight may be regulated by national or local authorities. Dispose of them in accordance with the laws and regulations of the relevant country and local authority.
 - After replacing the CFL units, be sure to perform the I/O check touch switch test and verify proper operation by performing a test run.

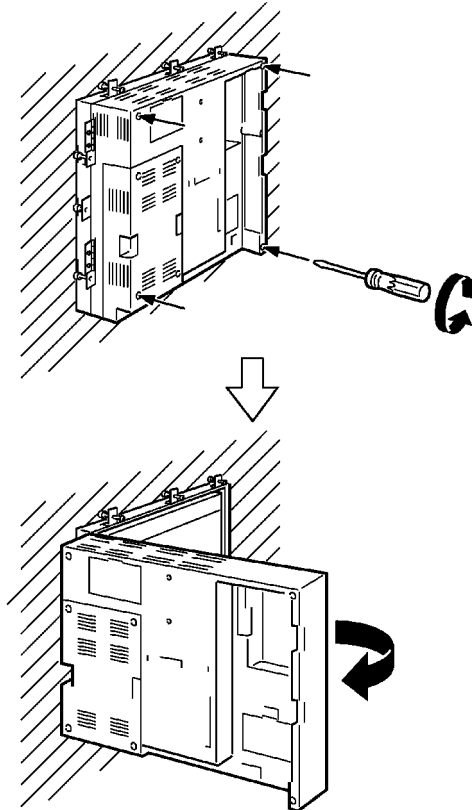
The model and replacement procedure of the replaceable backlight unit differ according to the model of the PT used.

PT	Backlight Unit Model	Replacement Interval (Guide)	Replacement Method
NT610C-DT151(B)-V1	NT610C-CFL01	Approx. 10000 hours	Refer to Page 181.
NT610C-DT151(B)-V2	NT610C-CFL02	Approx. 20000 hours	Refer to Page 184.

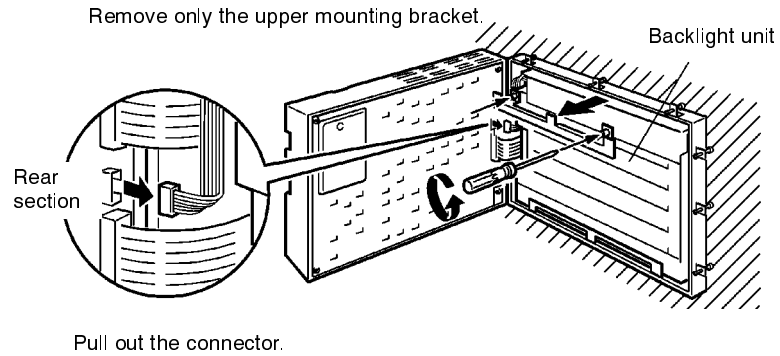
The service life of the backlight may vary depending on the environmental conditions. If the brightness of the display deteriorates or the display becomes hard to read, replace the backlight unit.

- Procedure for Replacing an NT610C-DT151(B)-V1 Backlight Unit
 - (1) Turn off the power of the PT.
 - (2) Check that the screws used to secure the fixtures of the PT against the panel are securely tightened.

When using fixtures with hinges, make sure that the notch covers the rear case sufficiently.
 - (3) Loosen the four screws on the rear panel of the NT610C and open out the rear panel.
 - (4) Turn off the power supply of the NT610C and then loosen four screws at the rear of it to open the rear cover.

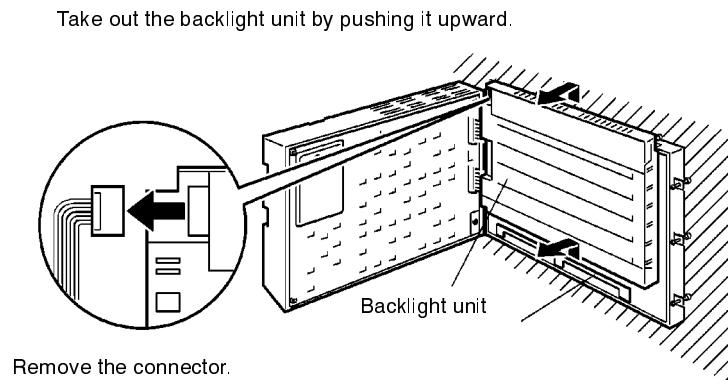


- (5) Pull out the connector at the rear, loosen two screws of the upper mounting bracket fixing the backlight unit, and remove the mounting bracket.

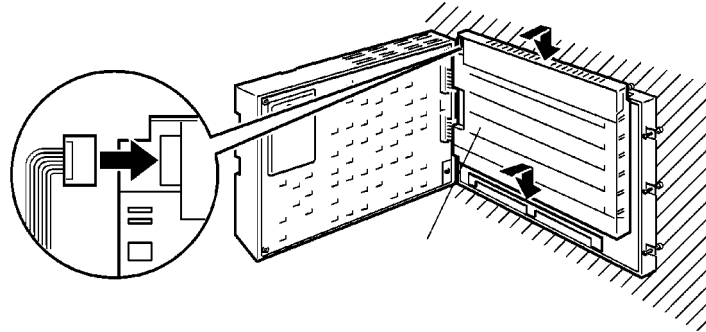


- Note:**
- Remove the lower mounting bracket with the backlight unit held by a hand to prevent it from falling.
 - The upper mounting bracket is heated by the backlight unit. Exercise care when removing it.

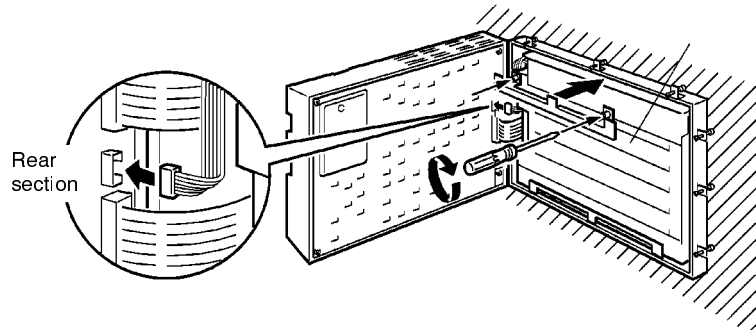
- (6) Remove the backlight unit and the connector.



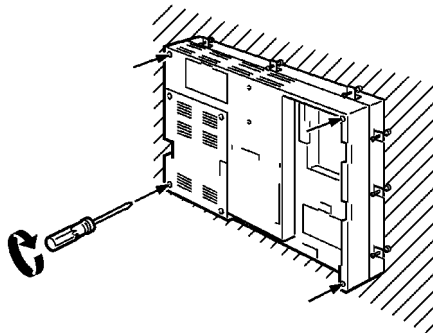
- (7) Connect the connector to a new backlight unit and set it to the NT610C.



- (8) Fix the backlight unit at two positions on the mounting bracket and connect the connector to the rear cover.



- (9) Close the rear cover and fix it with four screws.



- Procedure for Replacing an NT610C-DT151(B)-V2 Backlight Unit

Note: • When loosening the fixing screws of the CFL units, use whenever possible a thin magnetized Phillips screwdriver.

If using a non-magnetized screwdriver, remove the screws by holding them by their head, so that they don't fall inside.

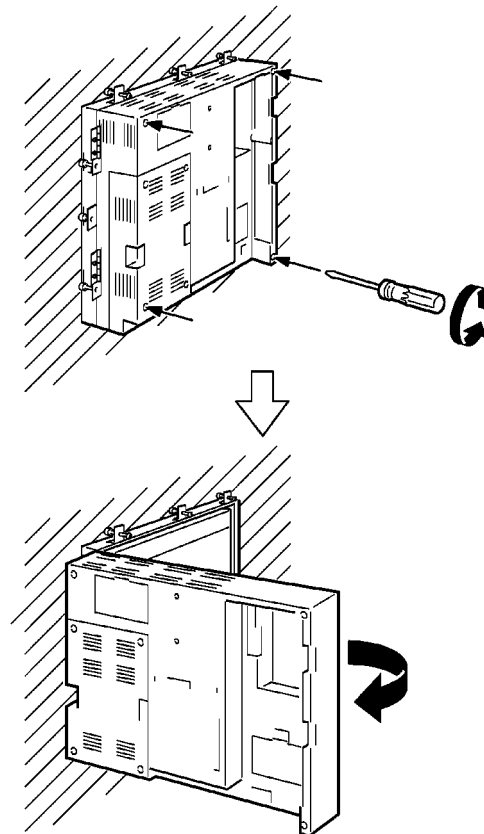
- When installing the CFL units, make sure that the cords do not stick out. If the cord is sticking out, be sure to store it in the slit before attaching the unit.

- (1) Turn off the power of the PT.

Be sure to turn off the power to avoid electric shocks.

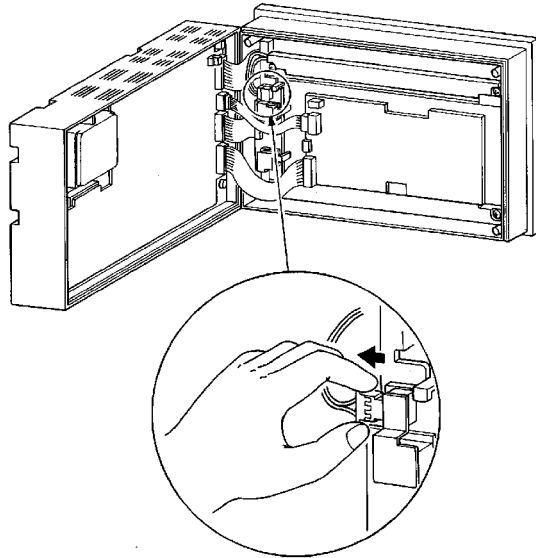
- (2) Check that the screws used to secure the fixtures of the PT against the panel are securely tightened.

When using fixtures with hinges, make sure that the notch covers the rear case sufficiently.

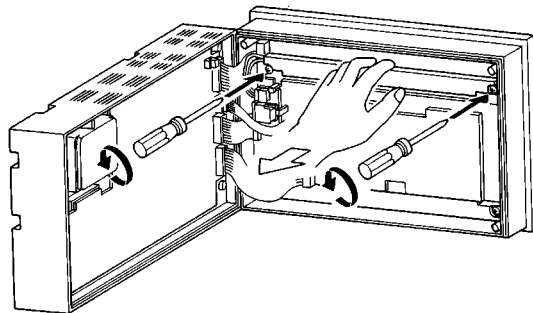


- (3) Loosen the four screws on the rear panel of the NT610C and open out the rear panel.

- (4) Pull out the 2 CFL unit connectors (top and bottom).

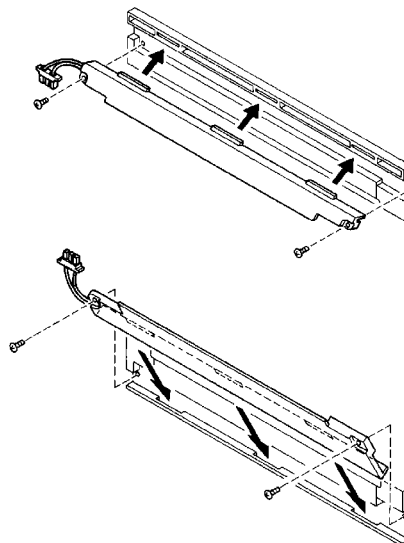


- (5) Loosen the 2 fixing screws of each CFL unit, and remove the units.

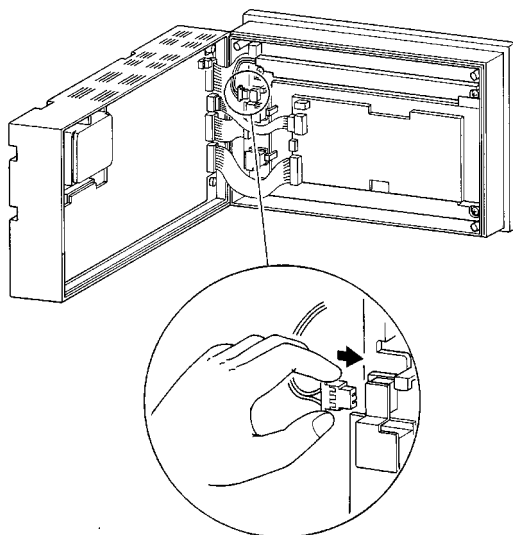


- (6) Install new CFL units.

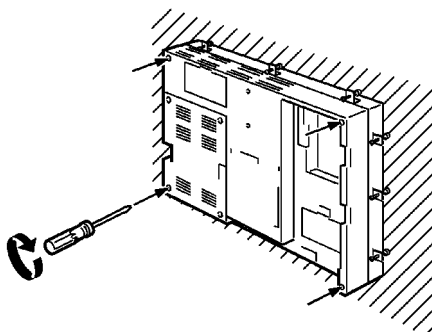
The top and bottom CFL units are not interchangeable. The CFL units each have 3 projecting parts. When installing the CFL units, insert these projecting parts in the corresponding slits in the PT, and hold the CFL units while tightening their screws.



- (7) Insert the CFL unit connectors to their respective top and bottom positions.



- (8) Close the rear panel and tighten the 4 screws.



5-4 Inspection and Cleaning

Clean and inspect the NT610C regularly to ensure that it is always used in its optimum condition.

Cleaning Method

If the display is dirty, the screen is difficult to use. Clean the screen from time to time as follows.

- In daily cleaning, wipe the display with a soft dry cloth.
- If the soiling cannot be removed with a dry cloth, wet the cloth with water, wring it out well and wipe the display with it.
- If rubber or vinyl products, tape, etc. are left stuck to the body for long periods, they will cause staining. If such items are stuck to the body, remove them during cleaning.

Note: Never use volatile solvents such as thinners or benzene, or chemical dusters.

Inspection Method

In normal environments, inspect the NT610C at intervals of between 6 months and a year.

In environments that are extremely hot and humid, or very dusty environments, shorten the inspection interval.

• Items required for the inspection


Prepare the following items before starting the inspection.

- The tools supplied with the NT610C
- Screwdrivers (Phillips, flat-blade)
- Tester (or digital voltmeter)
- Industrial alcohol and cotton cloth
- Thermometer (required in some cases)
- Hygrometer (required in some cases)
- Synchroscope (required in some cases)
- Pen-writing oscilloscope (required in some cases)

• **Points inspected**

Inspect the following points to determine if there is any divergence from the stated criteria. If there is, either improve the surrounding environment so that the values fall within the stated range, or adjust the NT610C.

Point Inspected	Inspection Details	Criterion	Inspection Instrument
Power supply voltage	Fluctuation in power supply terminal voltage	Permissible voltage fluctuation range	Tester
Ambient environmental conditions	Ambient temperature (temperature in the operation panel)	0 to 40°C	Thermometer
	Ambient humidity (humidity in the operation panel)	85%RH or less	Hygrometer
	Presence/absence of dust	Free of dust	Visual inspection
Mounting conditions	Looseness of host I/F unit, or mounting brackets for expanded I/O unit	Free of looseness	Accessory tools
	Connector connections of connecting cable	To be fully inserted and locked, with no looseness	
	Looseness of screws in external wiring	Free of looseness	Philips screwdriver
	Conditions of external connecting cables	Faults such as incipient disconnections.	Visual inspection
Components with limited lives	Brightness of the backlight	Must be sufficient brightness. Backlight life: Refer to page 180.	Visual inspection

 **Caution** The disposal of NT610C (including batteries to be disposal, backlight) may be regulated by national or local authorities. Dispose of them in accordance with the laws and regulations of the relevant country and local authority.

APPENDIX A

Specifications

General Specifications





Item	Specification
Rated power supply voltage	100 to 240 VAC, 50/60 Hz
Allowable power supply voltage range	85 to 264 VAC, 50/60 Hz
Power consumption	95 VA or less
Insulation resistance	20 Ω or more between AC external terminal of the power supply unit and batch grounding terminal (500 MegaVDC)
Grounding	Class 3 grounding
Ambient operating temperature	0 to +40°C
Ambient operating humidity	85%RH or less, with no condensation
Ambient storage temperature	-20 to +60°C
Ambient storage humidity	85%RH or less
Ambient operating environment	Free of corrosive gas
Operating environment	No corrosive gases.
Dielectric strength	2300 VAC, 50 Hz for one minute between AC external terminal of the power supply unit and batch grounding terminal
Noise resistance	1000 Vp-p, Pulse width 100 nsec to 1 μ sec, Rise time 1 nsec
Vibration resistance	10 to 57 Hz, Amplitude 0.075 mm, 30 minutes each in X, Y, and Z directions
Shock resistance	15G (147 m/s ²), 3 times each in X, Y, and Z directions
Dimensions (mm)	330 (W) x 265 (H) x 90 (D) mm
Weight	Approx. 4.0 kg max.
Enclosure ratings	Front panel: Equivalent to IP65F Rear case: IP20 Terminals: IP00

Performance Specifications

Display Specifications

Item	Specification		
		NT610C-CFL01	NT610C-CFL02
TFT color LCD panel	Number of dots (resolution)	480 dots (vertically) x 640 dots (horizontally)	
	Effective display area	158.4 mm (vertical) x 211.2 mm (horizontally)	
	View angle	Left/right direction: $\pm 35^\circ$, Up/down direction: $+15^\circ$ to -40°	
	Display color	8 colors (capable of displaying intermediate colors by means of tiling pattern)	
	Life expectancy	50,000 hours	
Backlight	Cold cathode tube	6 pcs.	
	Life expectancy	10,000 hours (when brightness halved)	20,000 hours (when brightness halved)
	Automatic turn-off	Capable of setting to turn off in 10 minutes or 1 hour, or to remain on.	
Indicators	Two types (front mounted)		
	Designation	Color	Function
	POWER	Green	Lit while the power is being supplied.
	RUN	Green	Lit during operation

Panel Specifications

Item	Specification
Touch panel	<ul style="list-style-type: none"> Number of switches: Max.256 registerable per screen Input: Pressure-sensitive type Operating force: 5 to 100 gf minimum Life expectancy: 1 million operations minimum
System key unit (model NT-FK200)	<ul style="list-style-type: none"> Four keys ( ,  ,  , ) Function: system menu selection, buzzer stop, bar cursor movement, numeral setting, continuous screen vertical scrolling
Expanded I/O unit	
10/02 Terminal (model NT600M-MD211)	<ul style="list-style-type: none"> Input: 10 Output: 2 (Exchangeable with noncontact output relay)
32/16 Terminal (model NT20M-MD212) Extended I/O connecting cable (model NT600M-IF001)	<ul style="list-style-type: none"> Input: 32 Output: 16 (Two outputs can be exchanged with noncontact output relay)

Display Capacity

	Item	Specification
Display elements (*1)	Character display	Fixed character data (character-strings registered for each screen)
	Character-string displays	256 strings per file (40 bytes per string) 50 positions per screen
	Numeral displays	512 displays per file, 50 positions per screen, 8-digit display
	Bar graph displays	50 positions per screen, % display, capable of displaying signs
	Trend graph	One frame per screen, 50 pcs. per frame
	Broken line graph	One frame per screen, 256 pcs. per frame, 512 points per pc.
	Graphic displays	Can be displayed wherever required.
	Lamps	Max. 1024 lamps per file, 256 positions per screen
	Touch switches	Max. 1024 lamps per file, 256 positions per screen
	Numeral settings	Display of setting numeral values, 50 per screen
	Character-string settings	Display of setting character-strings, 50 per screen
	Alarm message	4 groups per screen
	Alarm list	2 groups per screen (in the order of occurrence and frequency, group by group)
	Clock display	Time display of built-in clock by numeral display function
Screen types	Normal screen	Displays screens registered as normal
	Overlapping screen	A maximum of 8 registered screens can be displayed overlapped with each other.
	Continuous screen	A maximum of 8 registered screens can be displayed can be displayed sequentially by scrolling. (The screen can be scrolled by ↑ ↓ and system keys)
Screen attribute		Alarm, buzzer, display history, numeral setting display
Number of screens	Max. number of registered screens	2000 screens
	Screen number	0: No display 1 to 2000: User registered screens (However, 1997 screen is a display history occurrence order screen, 1998 screen is a display history frequency order screen, 1999 screen is a host connecting screen, and 2000 screen is a host abnormal screen) (*2)
Screen registration method		By transferring a screen data created using the support tool to the NT610C.
Screen saving method (screen data memory)		Flash memory (storing format unique to NT610C)

(*1) The total number of display elements for numeral display, graphs, and numeral settings must be 1024 or less.

(*2) The screens of 1997 and 1998 are reserved by the system.


Display Element Specifications

Item	Specifications
Display characters	Half height characters (8 x 8 dots): Alphanumerics and symbols Normal characters (8 x 16 dots): Alphanumerics and symbols Mark (16 x 16 dots): User-defined pictographs (32 x 32 dots) (64 x 64 dots) Image data (8 x 8 to 640 x 480 dots): User-defined image character size is set freely in the unit of 8 x 8 dots. Library data (1 x 1 to 640 x 480 dots)
Enlargement function	Double width, double height, and magnification of 4x, 9x, 16x, 64x
Smoothing processing	Available for enlarged characters with magnification of 4x or more
Character display attribute	Normal, inverse, flashing, inverse flashing, transparent display
Image data	Variable-size pictograph Size: Min. 8 x 8 dots, max. 640 x 480 dots Capable of setting a size in the unit of 8 dots Incapable of setting the enlarged display, smoothing processing, display attributes such as inverse/flashing.
Library data	Combination of any graphics Size: min. 1 x 1 dot, max. 640 x 640 dots Capable of setting any size Enlarged display, smoothing processing, and display attributes such as inverse/flashing are displayed according to the setting registered.
Graphics	Continuous straight line, circle, arc, sector, rectangle, polygon
Line type	4 types only for continuous straight line (solid line, broken line, alternate long and short dash, long and two short dashes)
Painting out	10 types
Graphic display attributes	Normal/inverse flashing, transparent display
Display color	8 colors (red, green, blue, yellow, magenta, cyan, white, black)
Color specification	Display color, background color, boundary color (line color)

Maximum Amount of Various Data

Item	Specifications
Character-string data	40 characters (normal) x 256 (capable of using up to 1000 in the direct connection system; 744 data are only for reading operation)
Numeral data	8-digit x 512 (capable of using up to 1000 in the direct connection system)
Bit data	One contact x 256
Mark data	224 (in terms of 16 x 16 dots)
Image data	224
Library data	896
Touch switches	Each 1024
Lamps	

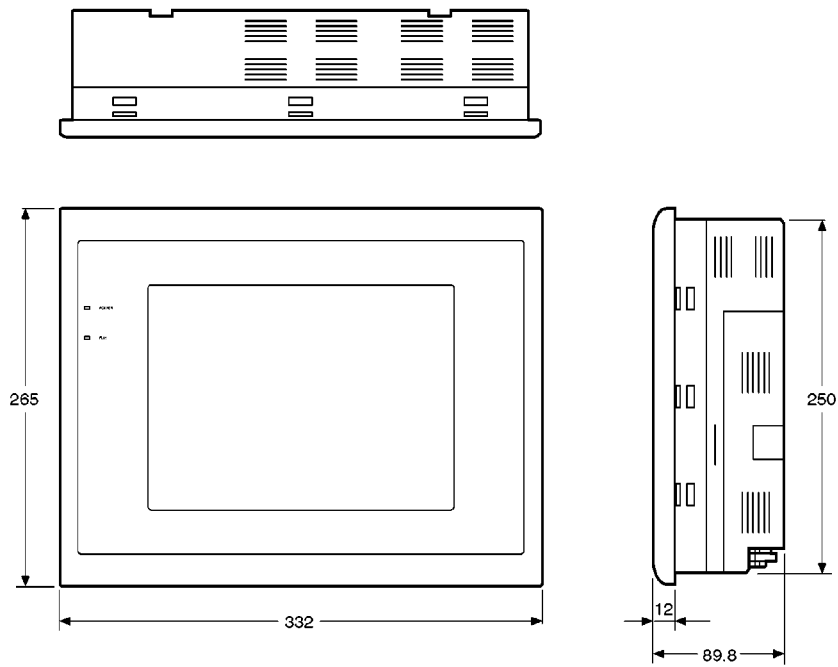
Special Features

Item	Specifications
Alarm function	Relay output from the terminal block at the rear of the NT610C Rating: 24 VDC, 2 A or 240 VAC, 2A at the resistance load Output condition: one NO contact (ON when receiving a command from the host or when displaying the alarm setting screen) Setting: Set the "Alarm Output" to "ON" in the "MEMORY SWITCH MENU"
Host RUN input	Photocoupler input from the terminal block at the rear of the NT610C Rating: 24 VDC + 10%, -15% "Host Error" is displayed with top priority.
Buzzer	Three kinds of sound (continuous sound, intermittent short-sound, intermittent long-sound) ON: Reception of a command from the host, buzzer setting screen display, error screen display such as abnormal reception OFF: Reception of a command from the host,  key input, screen display without buzzer setting Sound pressure: Min. 80 dB/Average 87 dB (measured at 10 cm in front) Setting: Set the "Buzzer Sound" to "ON" in the "MEMORY SWITCH MENU". "ERR ON" for only when an error occurs.
Maintenance function	<ul style="list-style-type: none"> • Self-test function, such as memory, switch • Setting condition confirmation function, such as communication condition • Communication check function
Battery retention	<ul style="list-style-type: none"> • Retention of display history data • Retention of NT610C memory data Battery life: Five years (25°C) When the voltage drops: A message "Battery Lowered" is displayed. Communication flag (BAT LOW) to the host is ON (1).
Key input sound setting	System key, expanded I/O unit input terminal (only in the direct connection), touch switch Input sound: Sounds for 0.2 second. Setting: Set the "Key Press Sound" to "ON" in the "MEMORY SWITCH MENU".
Resume function	To retain the contents without initializing the memory table (character-string/numerical value) when turning ON the power, resetting, changing over the operation mode. Setting: Set the "Resume Function" to "ON" in the "MEMORY SWITCH MENU".
Screen print function	To print the screen just displayed by means of printer interface connector. Setting: Set an output specification in the "MEMORY SWITCH MENU". ESC/P color: Conforms to ESC/P 24-J83C, color printing ESC/P tonality: Conforms to ESC/P 24-J83C, monochrome 8 grayscale levels PR201H color: Conforms to PC-PR201H, color printing PR201H tonality: Conforms to PC-PR201H, monochrome 8 grayscale levels

APPENDIX B

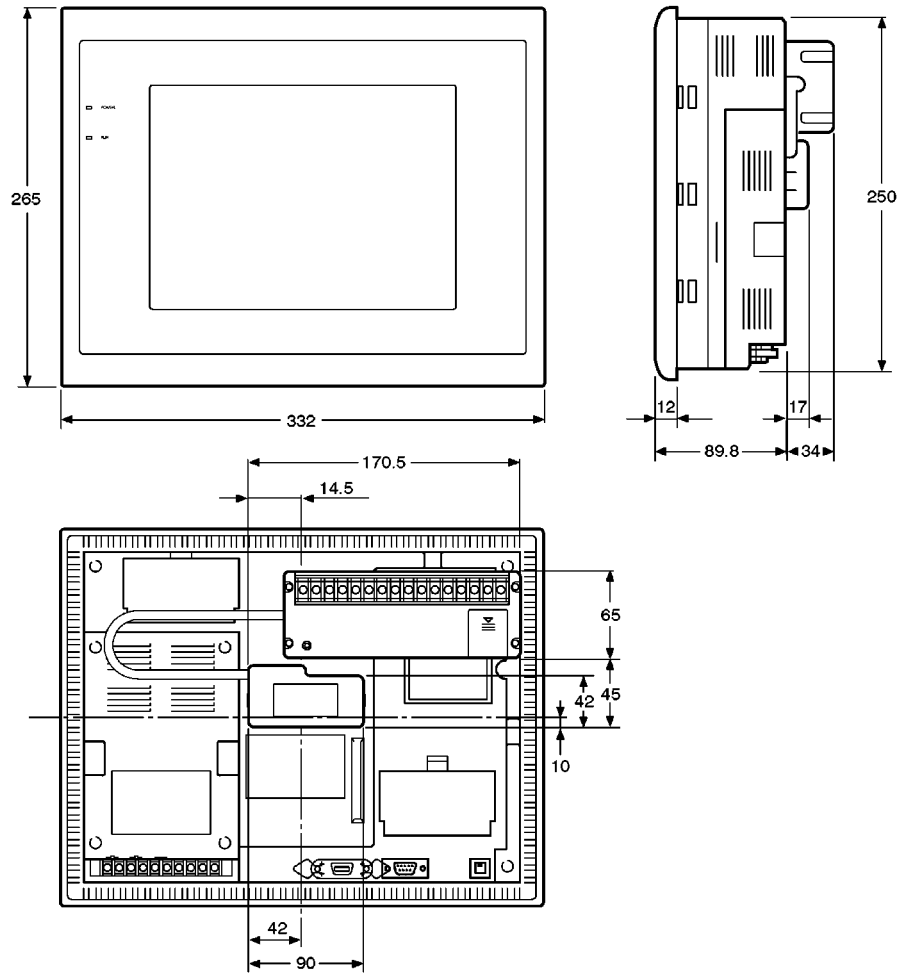
Dimensions

Body (NT610C-DT151-V, NT610C-DT151B-V)



Unit: mm

10/02 Terminal (NT600M-MD211) Body being Installed



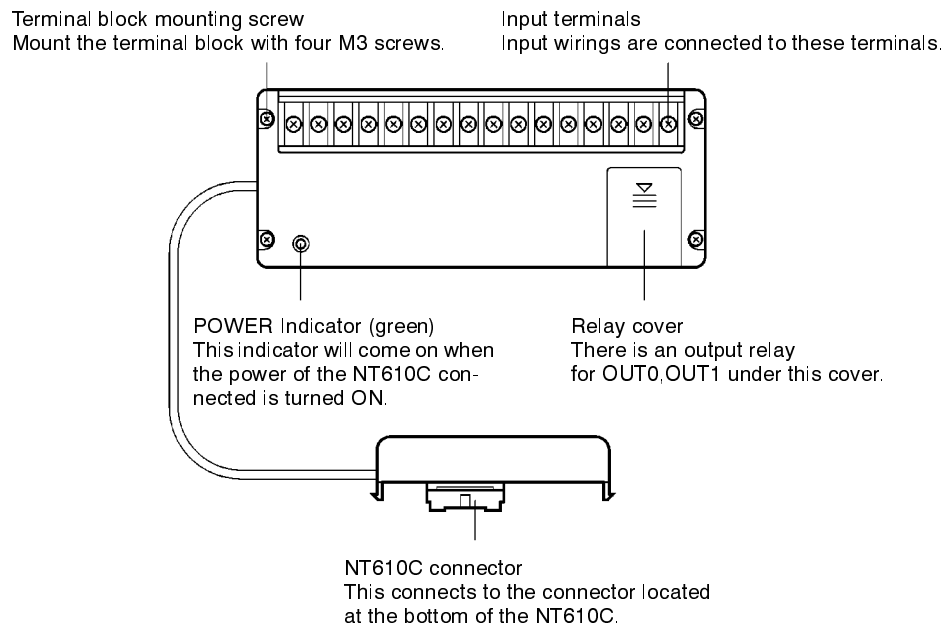
Unit: mm

APPENDIX C

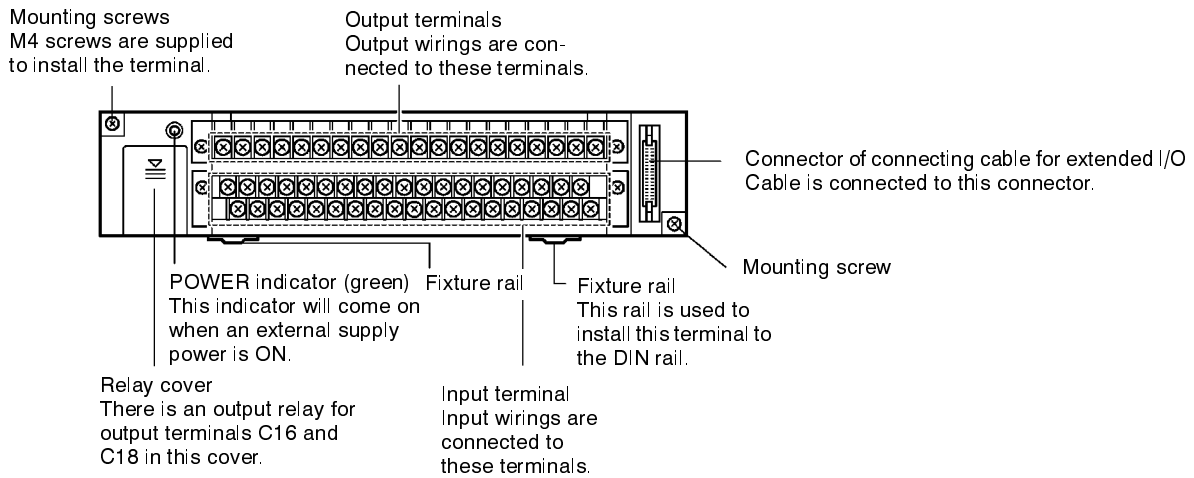
Expanded I/O Unit Specifications

Nomenclature

10/02 Terminal NT600M-MD211

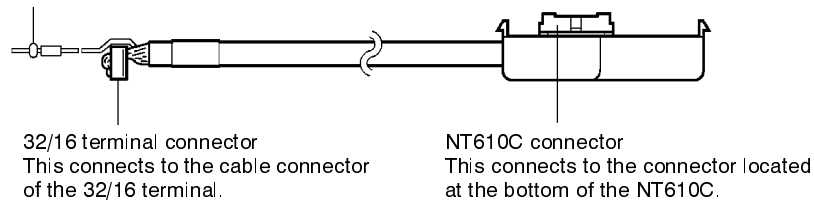


32/16 Terminal Model NT20M-MD212



Connecting Cable for Expanded I/O Unit NT600M-IF001

Terminal for shield
This is a terminal for the cable shield and connects to the input terminal A18 of the 32/16 terminal.



10/02 Terminal Specifications

Specifications of Input Section

Item	Specification
Rated input voltage	24 VDC +10%, -15%
Input impedance	3.3 k Ω
Input current	7 mA TYP.(24 VDC)
ON Voltage	Min. 14.4 VDC
OFF Voltage	Max. 5.0 VDC
ON Response time	3.0 msec or less + PT internal processing time (Refer to page 201.)
OFF Response time	5.5 msec or less + PT internal processing time (Refer to page 201.)
Number of circuits	10 circuits per common circuit

Specification of Output Section

Item	Specification
Output circuit	Relay contact output circuit
Maximum switching capacity	250 VAC/2 A ($\cos \varphi = 1$) 250 VAC/0.5 A ($\cos \varphi = 0.4$) 24 VDC/2 A
Minimum switching capacity	5 VDC 10 mA
Relay used	G6B-1174P-FD-US (5 VDC specification: OMRON) Replaceable with noncontact relay
Life expectancy of relay	Electrical life: 300 thousand times of resistance load 100 thousand times of inductive load Mechanical life: 50 million times
ON response time	15 msec or less + PT internal processing time (Refer to page 201.)
OFF response time	15 msec or less + PT internal processing time (Refer to page 201.)
Number of circuits	2 circuits (one circuit per common, multiplied by 2 circuits)

Assignment of Output Functions

Contact Designation	Remarks
OUT0	Relay contact output (replaceable with noncontact relay)
OUT1	

32/16 Terminal Specifications

Specifications of Input Section

Item	Specification
Rated input voltage	24 VDC +10%, -15%
Input impedance	3.3k Ω
Input current	7 mA TYP.(24 VDC)
ON Voltage	Min. 14.4 VDC
OFF Voltage	Max. 5.0 VDC
ON Response time	3.0 msec or less + PT internal processing time (Refer to page 201.)
OFF Response time	5.5 msec or less + PT internal processing time (Refer to page 201.)
Number of circuits	32 circuits (8 circuits per common circuit, multiplied by 4 circuits)

Restriction of Number of Inputs

Direction that a terminal is installed and maximum number of inputs that can always be turned ON are limited depending on the ambient temperature.

Ambient Temperature	0 to 45°C	45 to 50°C
Number of normally ON inputs	Max. 28 inputs	Max. 16 inputs (Note 1)
Direction of installation (Note 2)	Floor-, wall-mounting	Wall-mounting

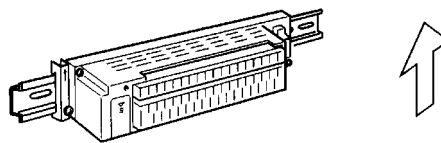
Note 1. Input contacts of other than normally ON can be entered only as a single pulse input.

Note 2. Direction of terminal installation

The terminal should be installed by one of the following methods:

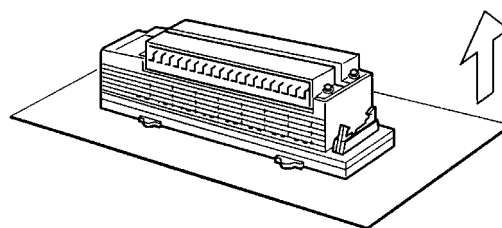
- Wall-mounting

Install the terminal with the output terminal block faced upward.



- Floor-mounting

Install the terminal with both input and output terminal blocks faced upward.



Specification of Output Section

Item	Specification	
Output circuit	Relay contact output circuit	Transistor output circuit
Maximum switching capacity	250 VAC/2 A (COS $\varphi = 1$) 250 VAC/0.5 A (COS $\varphi = 0.4$) 24 VDC/2 A	24 VDC + 10%, -15% 30 mA 0.42 A/common
Minimum switching capacity	5 VDC 10 mA	—
Leakage current	—	Less than 0.1 mA
Residual voltage	—	Less than 1.5 V
Relay used	G6B-1174P-FD-US (5 VDC specification: OMRON) Replaceable with noncontact relay	—
Life expectancy of relay	Electrical life: 300 thousand times of resistance load 100 thousand times of inductive load Mechanical life: 50 million times	—
Number of circuits	2 circuits (one circuit per common, multiplied by 2 circuits)	14 circuits per common, multiplied by one circuit
ON response time	15 msec or less + PT internal processing time (Refer to page 201.)	
OFF response time	15 msec or less + PT internal processing time (Refer to page 201.)	
External power supply	24 VDC \pm 10% 100 mA or more	

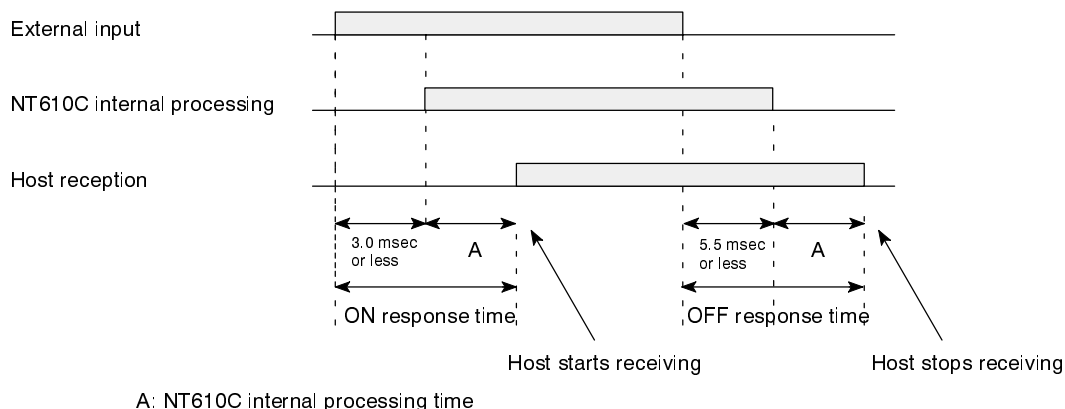
Assignment of Output Functions

Contact Designation	Remarks
C18	Relay contact output (replaceable with noncontact relay)
C16	
C2 to C15	Transistor output

I/O Response Time of NT610C

Input Response Time

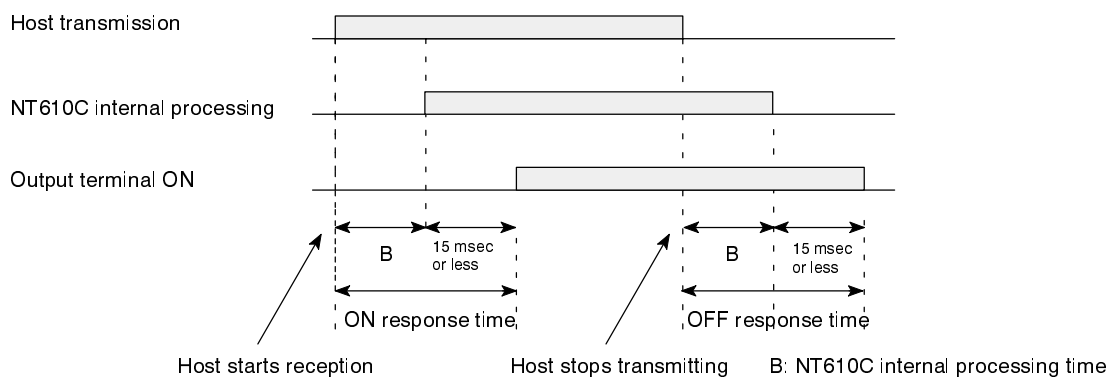
Input response time is defined as a time from when an input contact becomes ON until the NT610C starts transmitting to the host.



Reference: • The time from host reception until completion of internal processing differs depending on host's internal processing timing and cycle time. For details, refer to each host I/F unit's Operation Manual.

Output Response Time

Output response time is defined as a time from when the host sends output instruction until the output terminal of the terminal is turned ON.



NT610C Internal Processing Time of Each Host I/F Unit (Unit: msec)

Host I/F Unit	A: When NT610C is Transmitting to the Host	B: When the Host is Transmitting to NT610C
Host link	370	360
C200H	60	50

Replacing Procedure of Output Relay

Contact relays (model G6B) that can be installed and removed with sockets are used for each output relay of the output terminal OUT0 and OUT1 on the 10/02 terminal and the output terminal C18 and C16 on the 32/16 terminal.

When the relays are turned ON/OFF frequently, it is recommended to replace them with the noncontact relays as shown in the table below.

Designation	Transistor Relay	Triac Relay
Model	For 10/02 terminal: G3SD-Z01P-PD (5 VDC) NPN type (– common) For 32/16 terminal: G3SD-Z01P-PD (24 VDC) NPN type (– common)	For 10/02 terminal: G3S-201PL-PD (5 VDC) For 32/16 terminal: G3S-201PL-PD (24 VDC)
Max. switching capacity	5 to 24 VDC 0.3 A	85 to 250 VAC 0.3 A
Min. switching capacity	5 VDC 10 mA	100 VAC 10 mA 200 VAC 20 mA
Leakage power	100 μ A or less	2 mA or less (100 VAC) 5 mA or less (200 VAC)

- Reference:**
- 10/02 terminal and 32/16 terminal have different voltage specification of relay coil. Be careful when replacing a relay.
 - Contact relays (G6B) are installed at shipment. When noncontact relays are used, supply them separately.

Replacing Procedure

Replace a relay according to the following procedure.

- (1) Turn off the power of the NT610C.

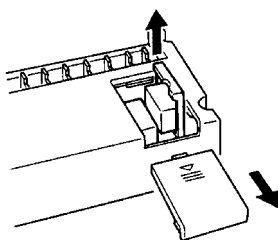
For the 32/16 terminal, turn off the external power supply, too.

- (2) Remove the relay cover and pull it out toward the direction of arrow by holding it with a pull-out tool supplied.

The pull-out tool is located inside the relay cover.

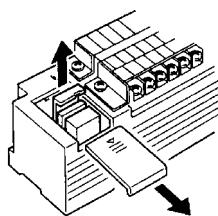
- 10/02 Terminal

(NT600M-MD211)



- 32/16 Terminal

(NT20M-MD212)



- (3) Install a new relay in the reverse manner as the step (2).

APPENDIX D

Wiring of Expanded I/O Unit

Materials Required for Wiring Works

Use the following recommended materials such as wire and terminal screw for wiring.

Wire

Wire size differs depending on the number of terminals on the terminal block.

Use the standard wires as shown in the table below.

Terminal Block Connector	Wire Size
16P, 20P	AWG22 to 18 (0.3 to 0.75 mm ²)
38P	AWG22 (0.3 mm ²)

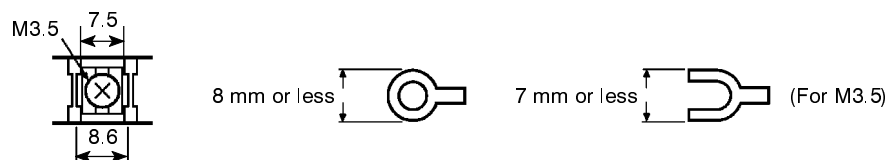
- Permissible current capacity of wire varies depending on the conditions such as ambient temperature, insulation thickness. Make sure of environmental conditions before selecting a wire.
- Common wire of larger size than the standard one in the table above can be used.

Terminal Screw and Solderless Terminal

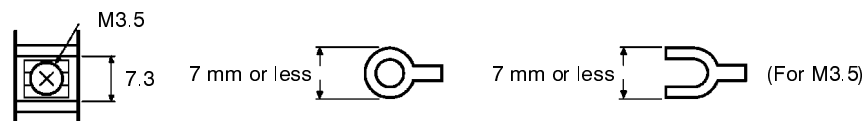
Note: Specification of terminal screw is M3.5. Solderless terminals for M3.5 are used for wiring. The terminal screws should be tightened within the tightening torque of 0.8 N·m.

- Dimensions of terminal section

10/02 Terminal (NT600M-MD211)



32/16 Terminal (NT20M-MD212)



- Example of applicable solderless terminals (fork shape)

Manufacturer	Model	Applicable Wire
J. S. T. MFG. Co. Ltd.	1.25 – YS3A	0.25 to 1.65 mm ²
Nippon Tanshi Co. Ltd.	VD1.25 – 3.5	

Confirming Items before Wiring

Make sure of the following items before wiring.

Note: Perform the wiring correctly.

Confirmation of I/O Specifications

Make sure that the input/output specifications of expanded I/O unit and external connecting equipment are satisfied before carrying out wiring works. Applying voltage in excess of rated one to the input section and/or voltage in excess of maximum switching capacity to the output section may cause failure, damage, and fire.

Condition of Each Unit Installed

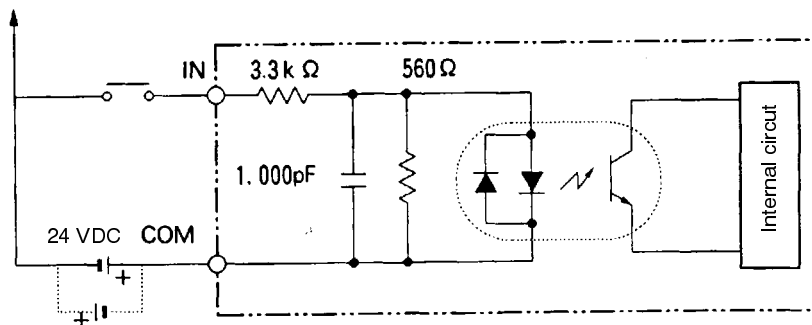
Make sure that the mounting screws on each unit are tightened firmly.

Wiring Works of Input Section

When wiring works is carried out at the input section, the following care should be exercised.

Input Power Supply

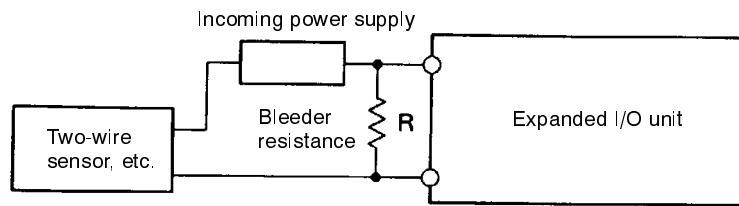
Both 10/02 and 32/16 terminals require 24 VDC for input power supply. Either PNP (common) or NPN (common) input can be used. However, note that the polarity of input equipment should not be mistaken.



Reduction of Leakage Current

When there is any leakage current, the two-wire sensors (photoelectric & proximity switches) may erroneously be activated or the LEDs of the limit switches may erroneously come on.

When the leakage current is 1.5 mA or more, connect a bleeder resistance to reduce the input impedance as shown below. When the leakage current is 1.5 mA or less, it is not necessary to do this.



$$R = \frac{17.14}{3.43 I - 5} \text{ k}\Omega \text{ or less}$$

- I: Leakage current of equipment (mA)
- R: Bleeder resistance (kΩ)
- W: Number of watts of bleeder resistance (W)

$$W = \frac{2.3}{R} \text{ W or more}$$

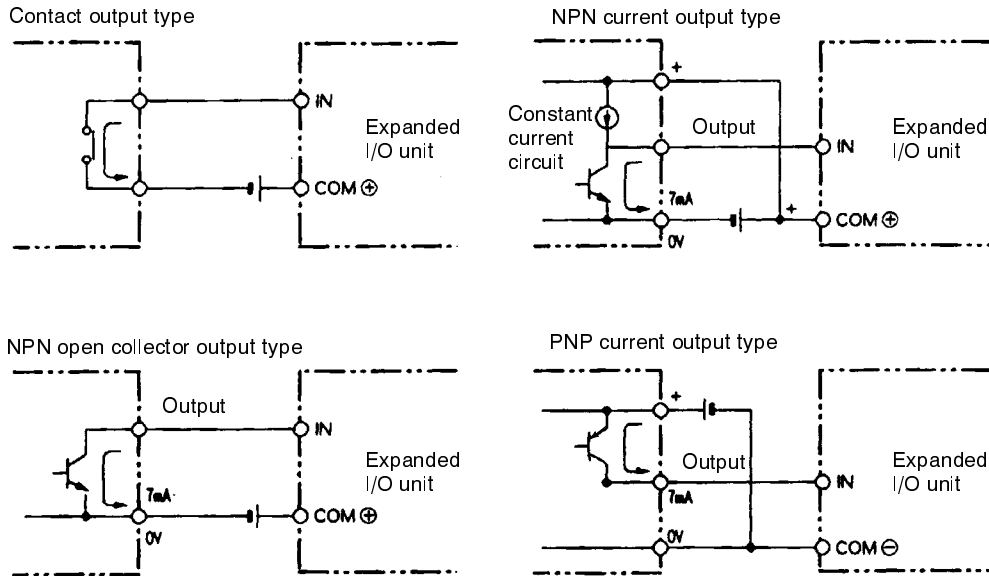
<Reference> R and W are calculated by the following equation.

$$I \times \frac{R \times \frac{\text{Input voltage (24)}}{\text{Input current (7)}}}{R + \frac{\text{Input voltage (24)}}{\text{Input current (7)}}} \cong \text{OFF voltage (5)}$$

$$W \cong \frac{\text{Input voltage (24)}}{R} \times \text{Input voltage (24)} \times \text{Tolerance (4)}$$

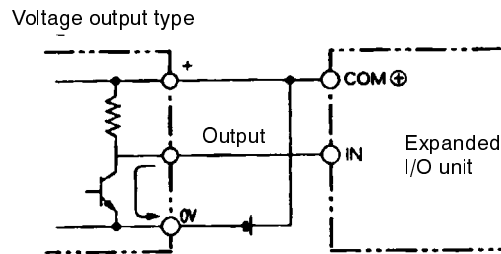
Example of DC Input Circuit

• DC Input equipment to be connected

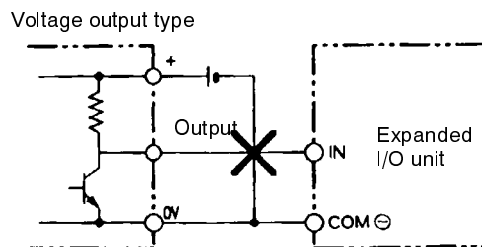


• Connection of voltage output type equipment

<Correct example of connection>



<Incorrect example of connection>



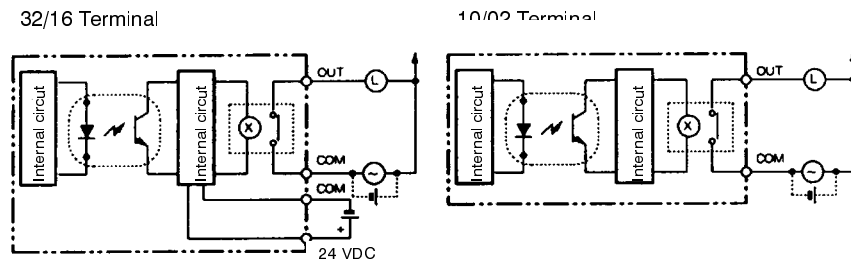
Wiring Works of Output Section

When wiring works is carried out at the output section, care should be exercised for the following items.

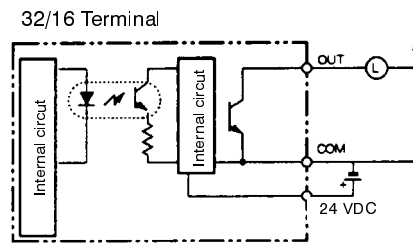
Output Type

There are two kinds of outputs of 32/16 terminal: relay contact output and transistor output. The 10/02 terminal has only relay contact output. Relays used for the relay contact output can be replaced with the noncontact relays (transistor relay or triac relay) (Refer to page 202).

- Relay contact output



- Transistor output



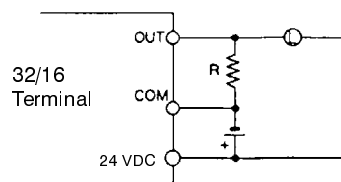
Protection against Short-Circuit

If a load connected to the output terminals is short-circuited, the output elements and printed circuit boards are damaged. Therefore, be sure to connect the protection fuses across the outputs.

Prevention of Inrush Current

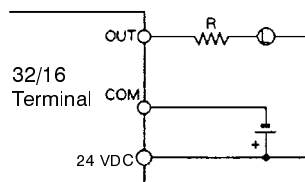
When a load with a large inrush current such as an incandescent lamp is connected to a noncontact relay, the output transistor may be damaged. Therefore, wire each element as shown in the table below to suppress the inrush current.

[Example of wiring 1]



A method to flow a dark current of one third of rating into an incandescent lamp.

[Example of wiring 2]



A method to install a limiting resistor.

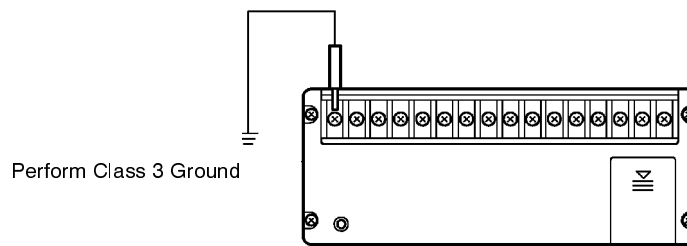
Grounding of Terminals

GR terminal of each Terminal is of grounding terminal type. In order to prevent from electrical shock, perform Class 3 Grounding (grounding resistance 100 Ω or less) using an exclusive grounding wire (wire of 2 mm² or more).

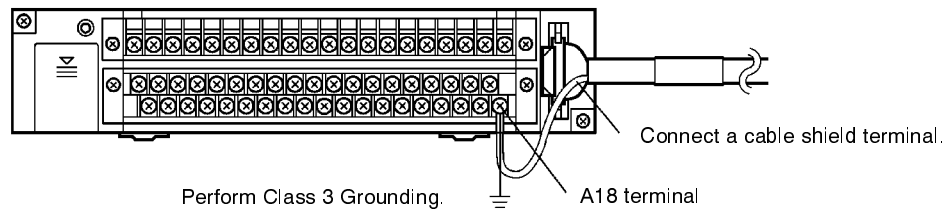
Make the grounding wire length within 20 m.

Wire each Terminal to earth as follows.

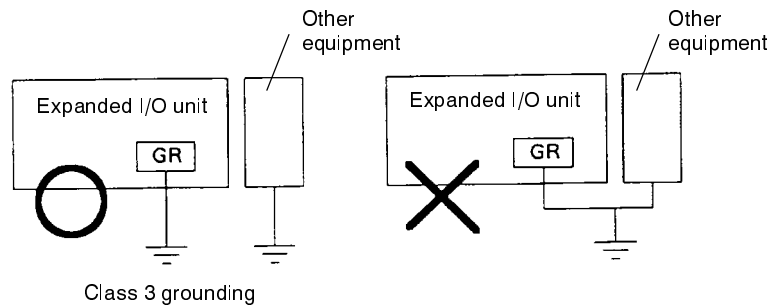
10/02 Terminal



32/16 Terminal



⚠ Caution • Grounding wiring should be performed individually. If a common grounding wire is used with other equipment, the Terminal may be affected adversely.



Noise Reduction of I/O Signals

Countermeasure should be taken against noise of I/O signals in the following manner.

Conduit of Signal Wires

I/O wires should not put in the conduit together with a high-voltage wire or power cable and/or placed in the same duct. If not, malfunction or damage may be caused by an inductive current.

If the I/O wires must be housed in the same duct, use a shielded cable. This can improve the noise immunity to some extent.

When a shielded cable is used, connect the shielded cable to the GR terminal of the Terminal.

Countermeasure against Inductive Load

When an inductive load is connected to an I/O, connect a surge suppressor or a diode in parallel with a load.

Set the surge suppressor and diode to be used as follows:

- Surge suppressor

Resistance: 50 Ω

Capacitor: 0.4 μF

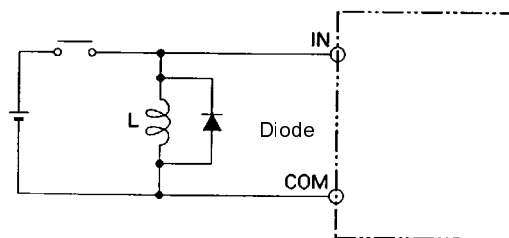
Voltage: 200 V

- Diode

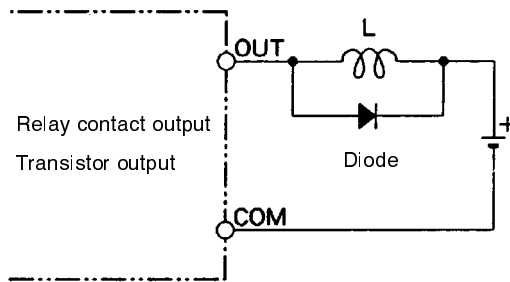
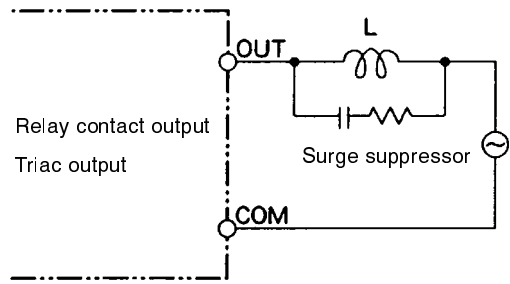
Peak reverse withstanding voltage: three times or more of load voltage

Average rectified current: 1 A

<Example of connection at the input section>



<Example of connection at the output section>



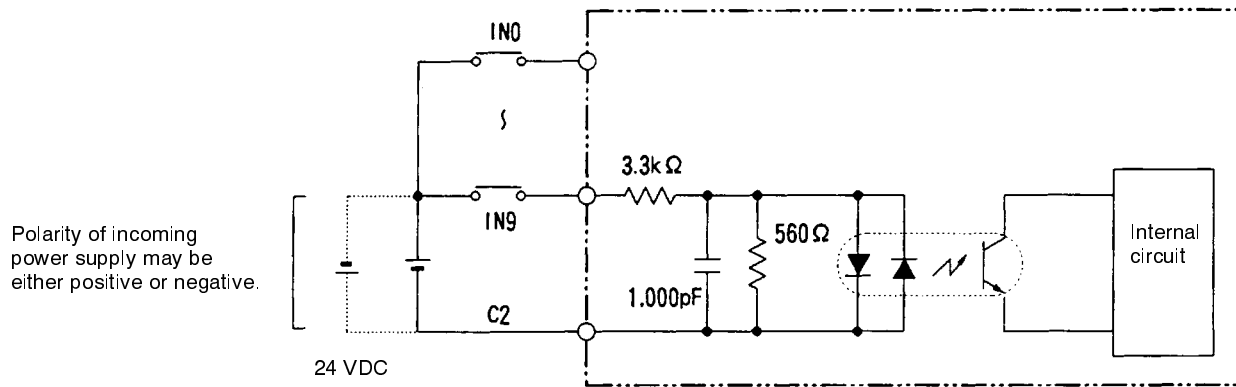
Wiring of 10/02 Terminal

The terminal block of the 10/02 Terminal cannot be removed. Therefore, when the 10/02 Terminal is replaced, all wirings must be taken out of the terminals.

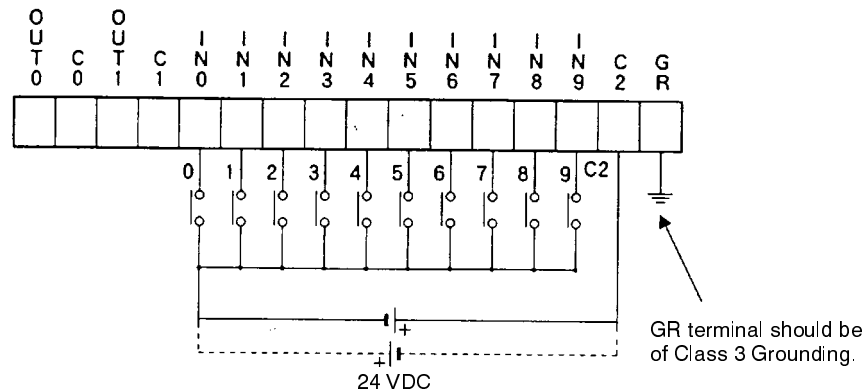
Distinction of each wire should previously be made so as not to make a mistake in connection of the wires just removed.

Wiring Diagram of Input Section

- Circuit configuration

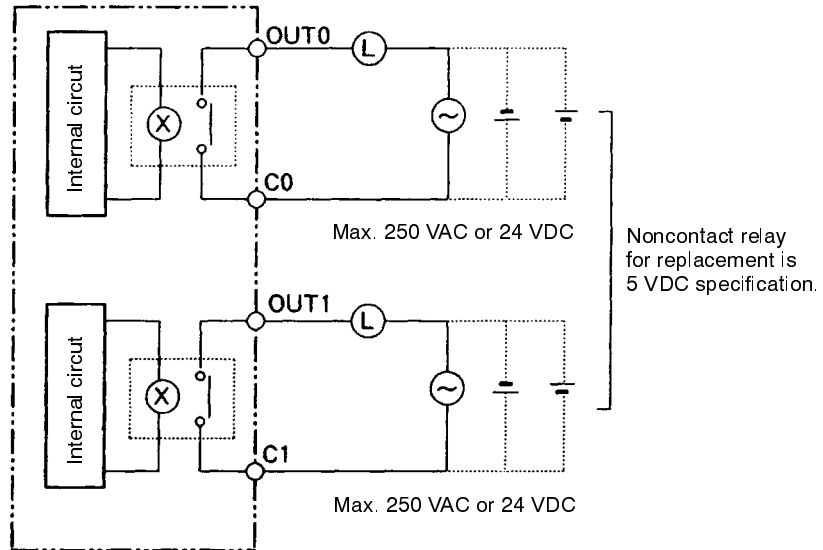


- Connection diagram of terminals

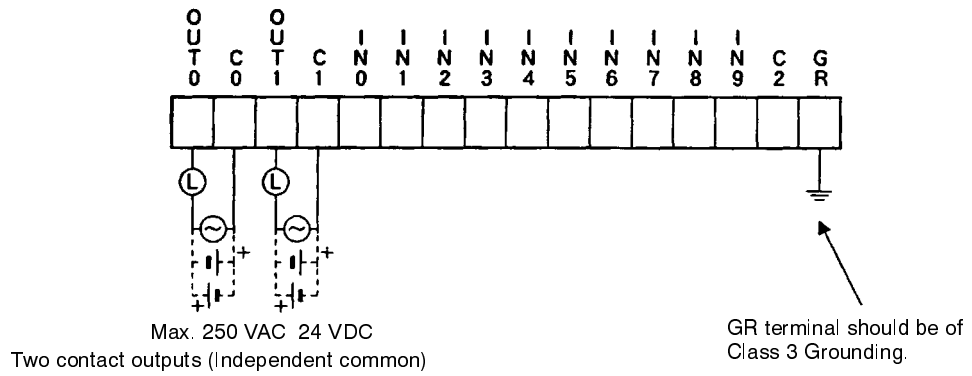


Wiring Diagram of Output Section

• Circuit configuration



• Connection diagram of terminals



Wiring of 32/16 Terminal

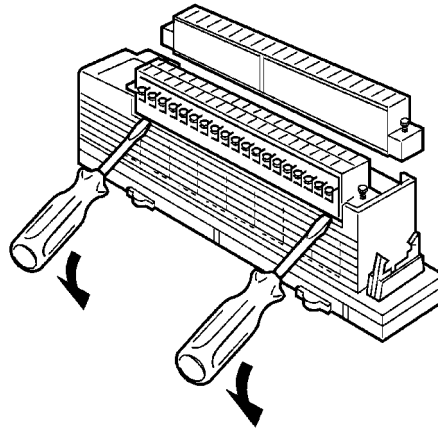
Precautions for Wiring

- **Terminal block**

The terminal block of 32/16 Terminal is connected with the Terminal body by a connector. It can be removed from the Terminal with the wires connected. When wiring or replacing the Terminal, it is advised to remove the terminal block before operations.

The terminal block is handled as follows.

- (1) Loosen two terminal block mounting screws.
- (2) With a thin flat-blade screwdriver inserted into a clearance of the terminal block, push up at both ends alternately to remove the terminal block.



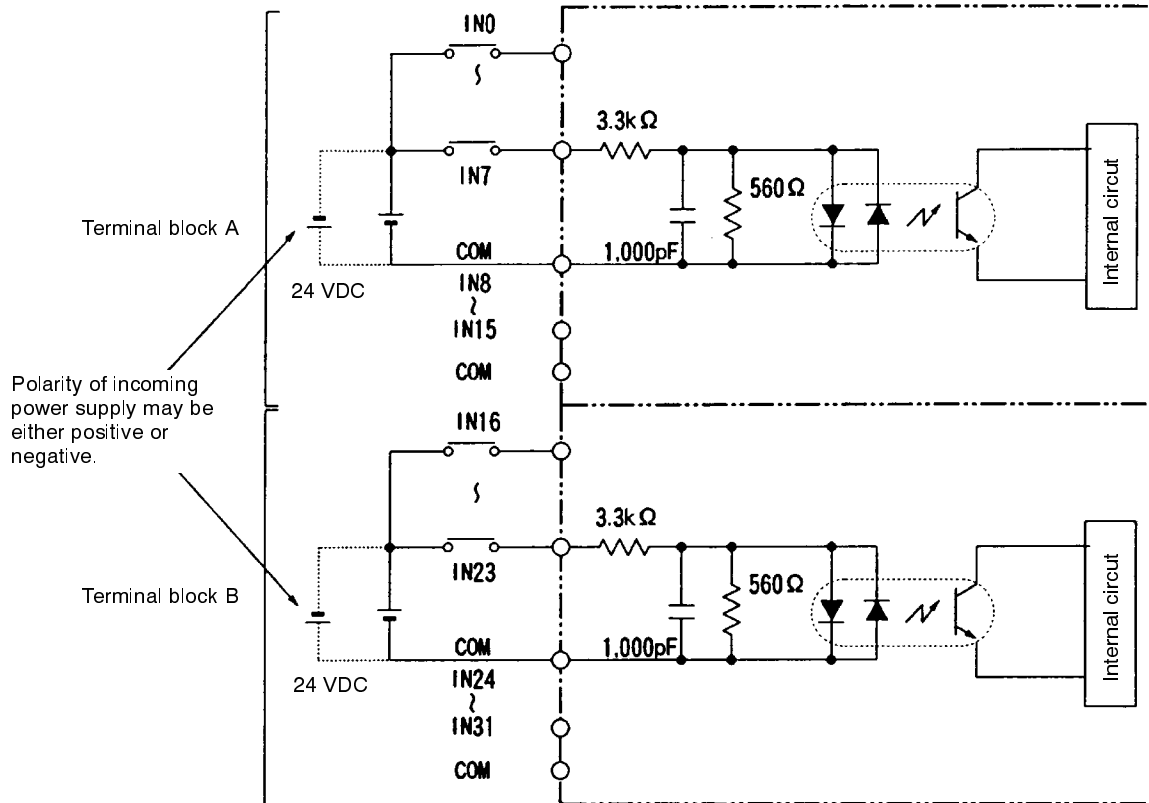
- ⚠ **Caution** • When removing the terminal block, do not forcibly pull it up with the terminal block cover held by hand.
- Do not insert the screwdriver to the full. Because it may damage internal boards.

- **Label**

Perform the wiring work with the side label attached so that wiring scraps may not intrude into the Terminal during wiring work. After the wiring work is completed, remove the label to radiate heat inside the Terminal.

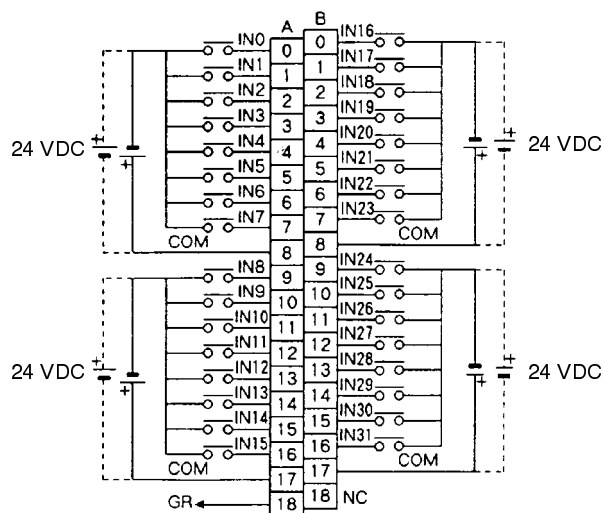
Wiring Diagram of Input Section

• Circuit configuration



Reference: • The number of elements that can normally turn ON inputs is limited depending on ambient temperature (Refer to page 199).

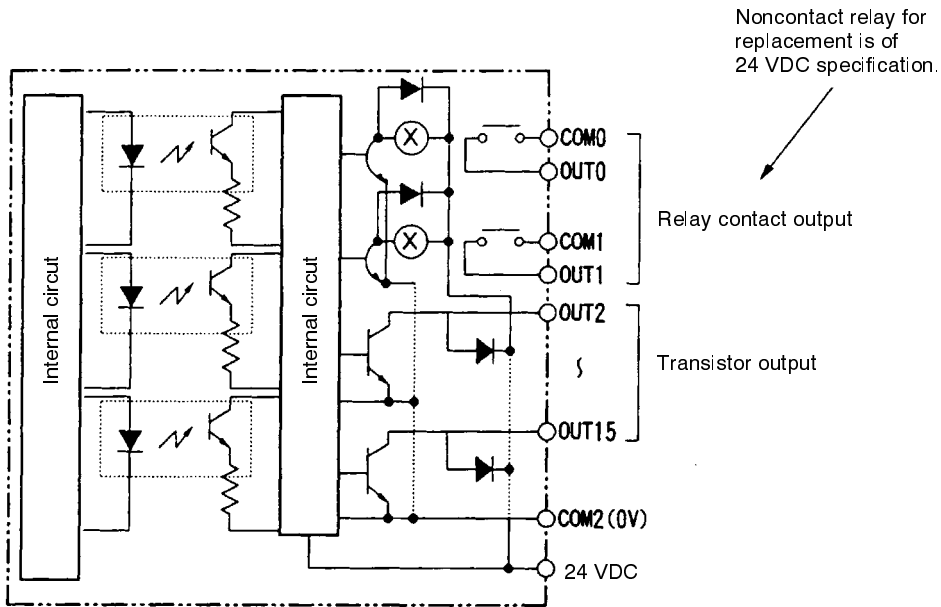
• Connection diagram of terminals



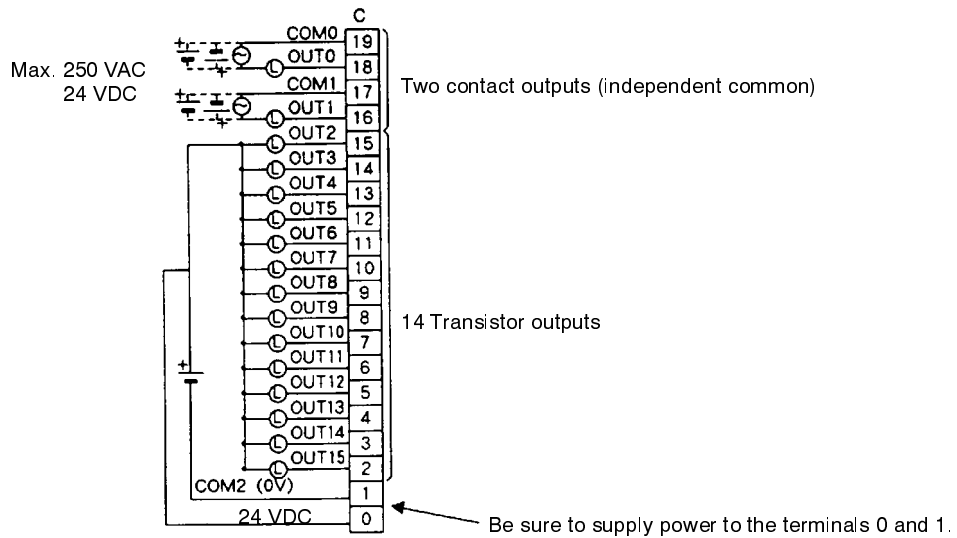
GR terminal (A10) should be of Class 3 Grounding.

Wiring Diagram of Output Section

• Circuit configuration



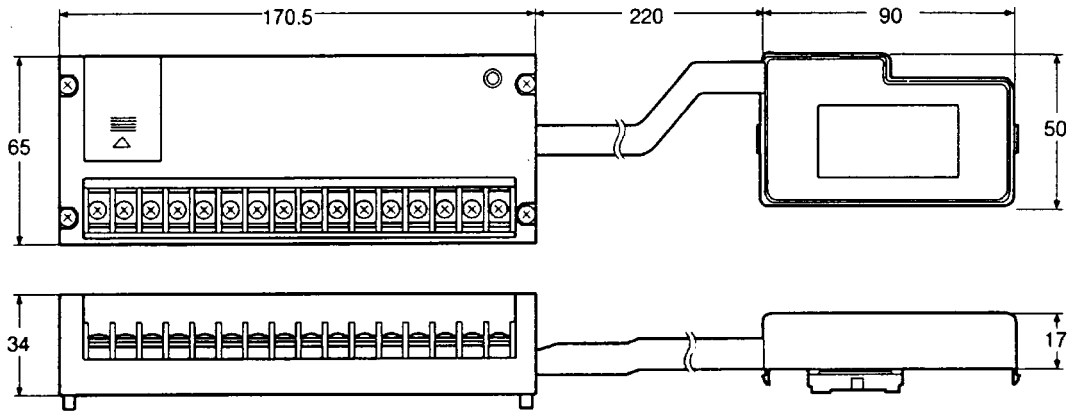
• Connection diagram of terminals (single terminal block)



Dimensions and Weight of Terminal

10/02 Terminal (NT600M-MD211)

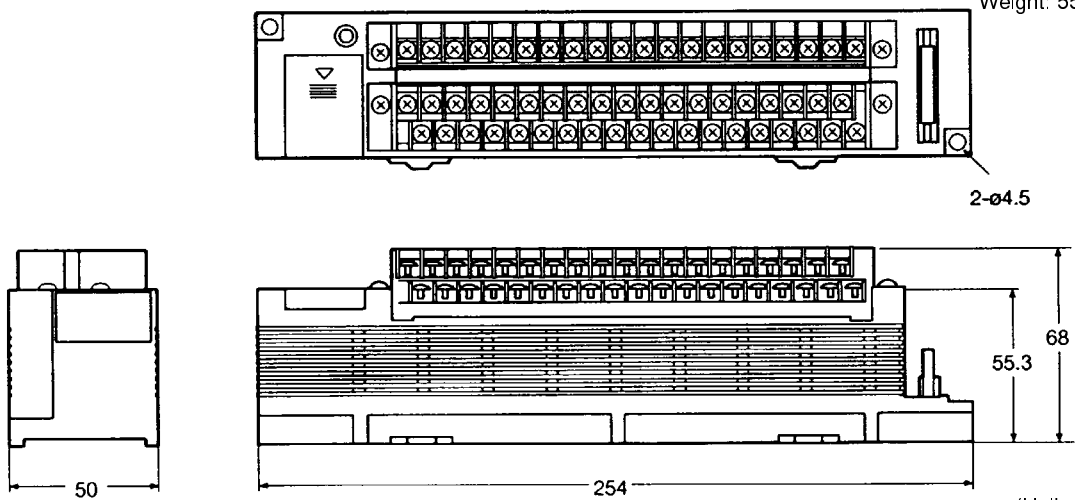
Weight: 300g or less



(Unit: mm)

32/16 Terminal (NT20M-MD212)

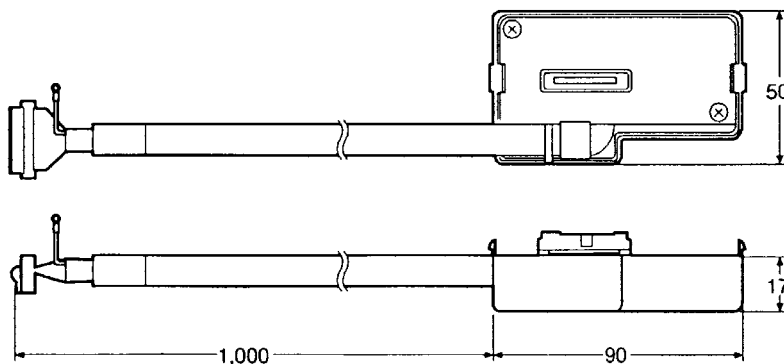
Weight: 550g or less



(Unit: mm)

Extended I/O connecting cable (NT600M-IF001)

Weight: 150g or less



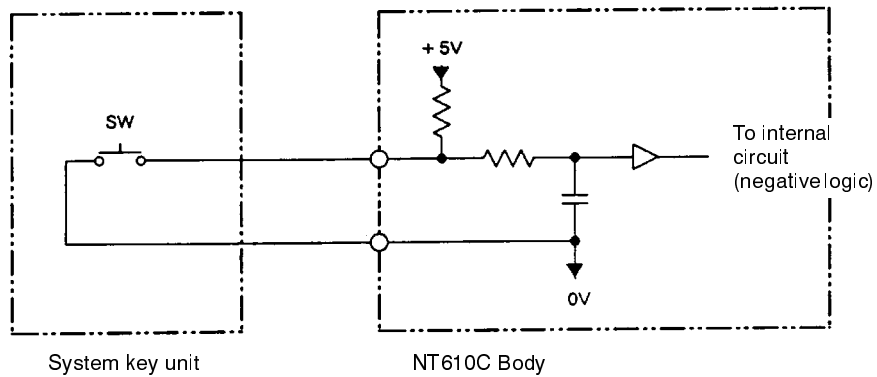
(Unit: mm)

APPENDIX E





How to Make Your Own System Key Unit

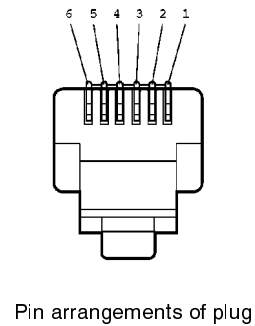
When a system key unit is made, refer to the following specifications.

Connection Circuit Diagram of System Key Unit



Pin Arrangements of Modular Plug

Pin No.	Function (Key Type)
1	ENT ()
2	DOWN ()
3	UP ()
4	STOP ()
5	SG (0V)
6	



Pin arrangements of plug

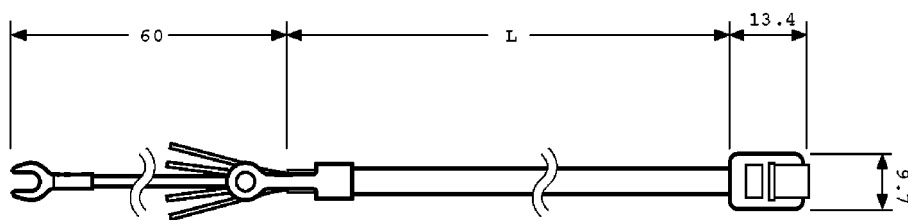
Precautions for One's Own Making

- Cable length

Length of cable that connects the system key unit and NT610C body should be 70 cm or less.

- Recommended cable with modular plug

TMIP-66P01-KS700 (HIROSE)



- Recommended modular plug

TM3P-66P (HIROSE ELECTRIC CO., LTD.)

APPENDIX F

How to Make a Support Tool Connecting Cable

When a support tool connecting cable is made, refer to the following specifications.

Components Required for Cable Making

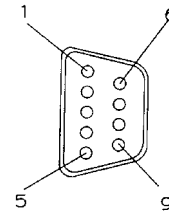
When an connecting cable is made, use the following recommended parts.

Designation	Model	Remarks
Connector	XM2D-0901	9-pin type OMRON, for personal computer
	XM2A-0901	9-pin type OMRON, for NT610C body
Connector hood	XM2S-0911	9-pin type OMRON
Cable	AWG28X5P IFVV-SB	Multicore shielded cable Fujikura, Ltd.
	CO-MA-VV-SB 5P × 28AWG	Multicore shielded cable Hitachi Cable, Ltd.

Specifications of NT610C Tool I/F Connector

Tool I/F connector in the NT610C in connection with the support tool is a female connector with the following pin arrangements.

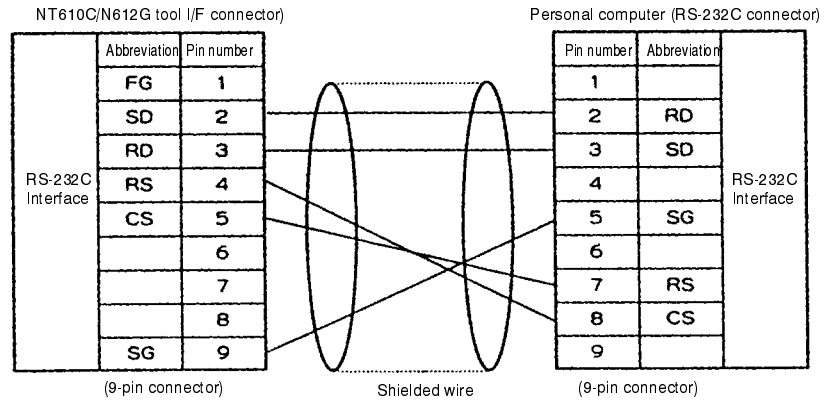
Pin No.	Signal Name	Designation
1	FG	Frame ground*
2	SD	Send data
3	RD	Receive data
4	RS	Request to send
5	CS	Clear to send
9	SG	Signal ground



* NT610C does not use the FG.

Wiring Diagram

The connecting cables are wired as shown in the figure below.

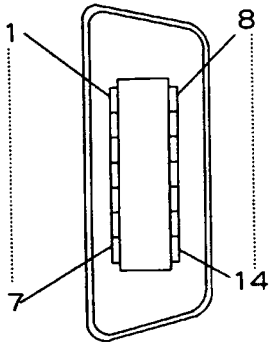


APPENDIX G

Specifications of Printer Interface

When a printer connecting cable for screen print function is made, refer to the following specifications.

Pin Number and Signal Name of Connector



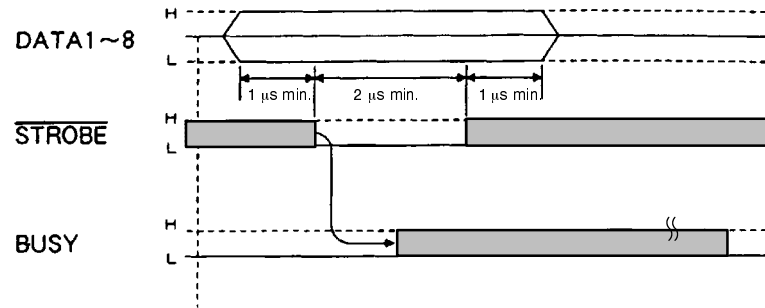
Pin Number	Signal Abbreviation	Signal Name	Direction of Signal (NT610C ↔ Printer)
1	$\overline{\text{STROBE}}$	Strobe	→
2	DATA 1	Send data	→
3	DATA 2	Send data	→
4	DATA 3	Send data	→
5	DATA 4	Send data	→
6	DATA 5	Send data	→
7	DATA 6	Send data	→
8	DATA 7	Send data	→
9	DATA 8	Send data	→
10	NC	Not used	–
11	BUSY	busy	←
12	NC	Not used	–
13	NC	Not used	–
14	GND (0V)	Ground	–

Applicable connector: 5-30140 (DDK)

Specifications of Communication

Item	Specification	
Communicating method	Simplex communication	
Handshaking method	Two-wire handshaking method by STROBE and BUSY	
Data transfer method	8-bit parallel transfer	
Interface	TTL level	L Level Output ≤ 0.5 V, Input ≤ 0.8 V
		H Level Output ≥ 2.4 V, Input ≥ 2.0 V

Timing Chart



APPENDIX H**List of Models****Products That Configure Basic System****NT610C Body**

Designation	Model	Remarks
NT610C	NT610C-DT151-V	Touch panel, TFT color LCD type
	NT610C-DT151B-V	Touch panel, TFT color LCD type, black case

Host I/F Unit

Model	Communicating Method	Remarks
NT600M-LK201	Host link NT link	RS-232C type
NT600M-LK202	Host link	RS-422 type
NT600M-LB122-V1	C200H	

System ROM

Model	Communicating Method	Remarks
NT610C-SMR31-EV2	Host link	Common to RS-232C/RS-422 types
NT610C-SMR32-EV2	C200H	
NT610C-SMR34-EV2	NT link	


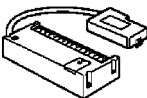


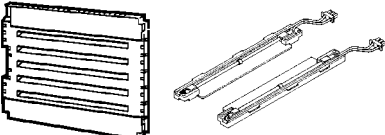

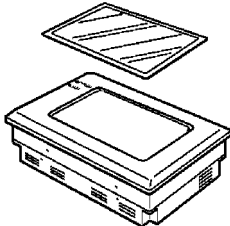
Screen Memory and Related Components

Designation	Specification	Model	Remarks
Screen memory board	Flash memory/1M byte	NT610G-MF161	

Support Tool and Related Components

Designation	Model	Remarks
Support tool	NT610G-ZA3AT-EV3	For IBM PC/AT, 3.5-inch FD

Optional Products

Designation	Model	Remarks
System key unit 	NT-FK200	
10/02 Terminal 	NT600M-MD211	10 Inputs, 2 Output With a connector With an connecting cable
32/16 Terminal 	NT20M-MD212	32 Inputs, 16 Outputs With a connector
Extended I/O connecting cable 	NT600M-IF001	Connecting cable exclusive for 32/16 Terminal
Backlight for replacement 	NT610C-CFL01 NT610C-CFL02	
Battery 	C500-BAT08	
Reflection preventive sheet 	NT610C-KBA04	Display section only

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Revision History

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Cat. No. V025-E1-2



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The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

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1	February 1995	Original production
2	May 1997	Revision due to addition of new model