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**NT31 and NT31C**  
**Programmable Terminals**

**Setup Manual**

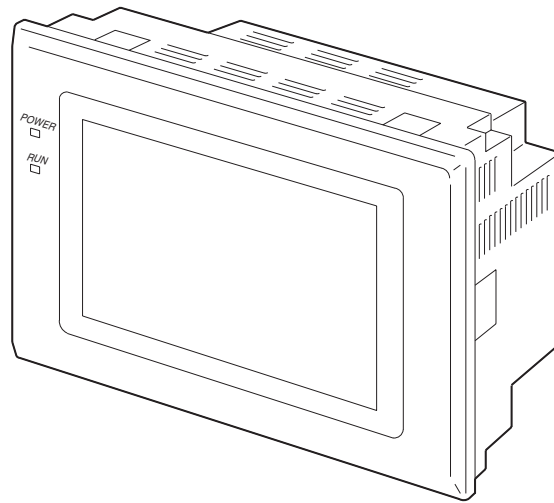
**OMRON**



# NT31 and NT31C Programmable Terminals

## Setup Manual

*Revised October 2010*








## **Notice:**

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

 **DANGER** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Additionally, there may be severe property damage.

 **WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.

 **Caution** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

## **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 “PLC” means Programmable Controller. “PC” is used, however, in some Programming Device displays to mean Programmable Controller.

## **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 connecting the NT-series NT31 and NT31C Programmable Terminals to a PLC (Programmable Controller) or other host and peripheral devices and the settings required for communications and applications. It 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 Programmable Terminal.

**Section 1** provides fundamental information about the functions and features of the PTs, types of connection, communications methods, etc. This information will enable you to understand the applications of the PTs.

**Section 2** describes the connection methods that are possible with the PTs, and the functions of the parts of PTs, as the required knowledge before connecting to the host and to the peripheral devices.

**Section 3** describes the settings of the PTs and methods for connection to peripheral devices.

**Section 4** describes the method for connecting to the host using the RS-232C port of the PT.

**Section 5** describes the method for connecting to the host using the RS-422A/485 port of the PT.

**Section 6** describes the operation of the System Menu, focusing on the procedure to start the PT. Functions that are convenient when using the PT and those that are useful for system maintenance are also explained here.

**Section 7** describes the action to take when errors occur in the PT, and how to carry out maintenance and inspection to prevent the occurrence of errors.

The **Appendices** provide specifications, dimensions, procedures for using an RS-232C/RS-422A Adapter, procedures for transporting and storing the PT, information on cable preparation, information on the relationship between the system program and hardware, and product lists.



**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.

## ***Related Manuals:***

Related manuals are listed below.

The □ symbol at the end of the catalog number is the revision number.

## ***Connecting and Setting Up the Programmable Terminal***

- NT31 and NT31C PT Setup Manual (V062-E1-□, this manual)

This manual describes connecting the Programmable Terminals to a host and peripheral devices and settings required for communications and applications.

The functions and actual operating methods for the NT31 and NT31C PTs are provided in the *Reference Manual* (V064-E1-□).

## ***Programmable Terminal Functions and Operation***

- NT31/31C/631/631C PT Reference Manual (V064-E1-□)

This manual is used for any of the following PTs: NT31, NT31C, NT631, and NT631C. It describes screen configurations, part functions, host control methods, and other application information.

PT connection and setup procedures are described in the *NT31 and NT31C PT Setup Manual* (V062-E1-□).

## ***Creating and Transferring Screen Data, and Installing the System Program***

- NT-series Support Tool for Windows Ver. 4.□ Operation Manual (V061-E1-□)

The screens displayed on the NT31 and NT31C PTs are created with the Support Tool and transferred to the PT. This manual describes how to create and transfer screen data. It also describes how to download a system program to a PT using the System Installer.

The NT-series Support Tool for Windows is normally referred to as merely the Support Tool.

## ***Connecting to Controllers Not Made by OMRON***

- PLC Connection Manual (V042-E1-□)

The NT31 and NT31C PTs can be connected to controllers in the following series: Mitsubishi A Series and FX Series. This manual describes the connection and setup methods for these controllers.

The NT-series Support Tool for Windows Version 4.□ is required to connect the NT31 and NT31C PTs to these controllers.

- NT31/NT631 Multi Vendor Connection Manual (V060-E1-□)

The NT31 and NT31C PTs can be connected to controllers in the following series: Allen-Bradley SLC 500 Series, GE Fanuc 90-20 and 90-30 Series, and Siemens S7-300 and S7-400 Series. This manual describes the connection and setup methods for these controllers.

## ***Read and Understand this Manual***

Please read and understand this manual before using the product. Please consult your OMRON representative if you have any questions or comments.

## ***Warranty and Limitations of Liability***

### ***WARRANTY***

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

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In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

# ***Application Considerations***

## ***SUITABILITY FOR USE***

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

**NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.**

## ***PROGRAMMABLE PRODUCTS***

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

# **Disclaimers**

## ***CHANGE IN SPECIFICATIONS***

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

## ***DIMENSIONS AND WEIGHTS***

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

## ***PERFORMANCE DATA***

Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

## ***ERRORS AND OMISSIONS***

The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.



# 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 introducing FA systems into production facilities.
- Personnel in charge of designing FA systems.
- Personnel in charge of installing and connecting 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 above-mentioned 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 NT31/31C. The cautions, warnings, and dangers shown here contain important information related to safety. The instructions in these cautions, warnings, and dangers must be observed.


 **WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

 **Caution** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.


 **WARNING**


Do not attempt to take the unit apart and do not touch any internal parts while the power is being supplied. Doing either of these may result in electrical shock.




 **WARNING**

Switch OFF the NT31/NT31C power before replacing the backlight. Otherwise you could sustain an electric shock.



 **CAUTION**

Do not touch the backlight immediately after switching OFF the power supply. Otherwise burn injuries may result due to the high temperatures.





# SECTION 1

## General

This section provides fundamental information about the functions and features of the PTs, types of connection, communications methods, etc. This information will enable you to understand the applications of the PTs.

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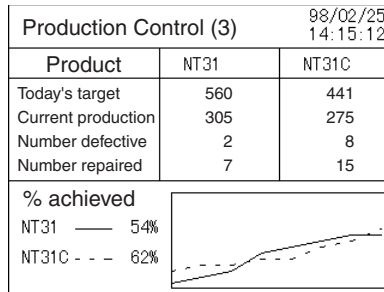
# 1-1 Role and Operation of the NT31/NT31C

The NT31/NT31C is a sophisticated display unit (Programmable Terminal) which automatically displays information and can also be used for operations when necessary. The following gives a general description of the role and operation of the NT31/NT31C for those using a programmable terminal (PT) for the first time.

## 1-1-1 Operation of an NT31/NT31C at an FA Production Site

### Production Line Status Monitoring

The NT31/NT31C displays real-time information about the system and equipment operating status, etc. Its power of expression is enhanced by graphs and other visuals, making the displays easy to understand.



### Directions to Workers on the Shop Floor

The NT31/NT31C warns of system or equipment failures and prompts the appropriate remedial action.

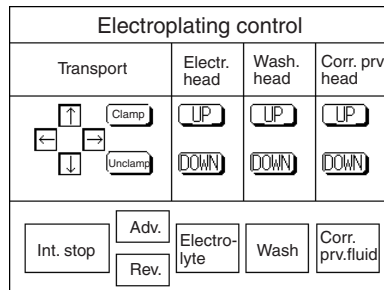
**Alarm**

Assembly line B  
Positioning pin  
is defective. Line stopped.  
Check the following.

1. Defective pin L3
2. Position of dog M2
3. Mounting of photosensor P5

### Panel Switch Functions

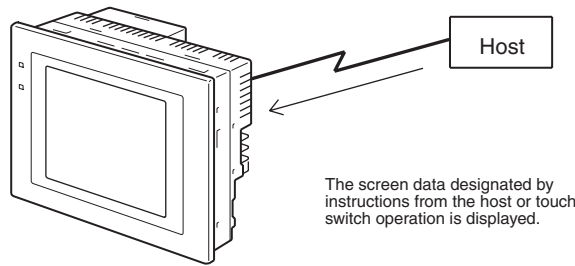
Setting touch switches on the NT31/NT31C allows workers to use the NT31/NT31C as an operating panel; the results of the operations are transmitted to the host.



### 1-1-2 Operations of the NT31/NT31C

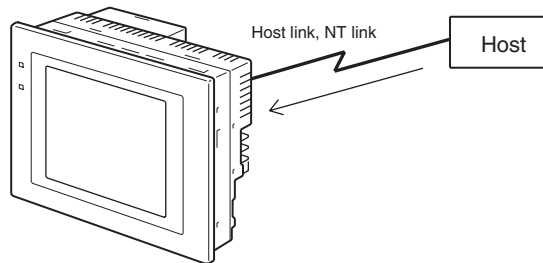
#### Displays Screens

The information to be displayed (screen data) can be created on a computer using the Support Tool and stored in the NT31/NT31C. The screen data can be displayed on the NT31/NT31C in response to instructions from the host or touch switch operation.



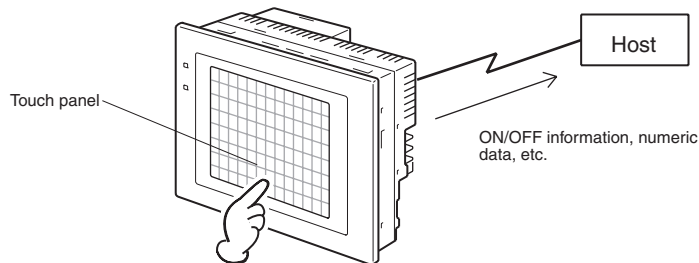
#### Receives Data from a Host

The NT31/NT31C can be connected to the host by a host link or NT link and receive necessary data from the host.



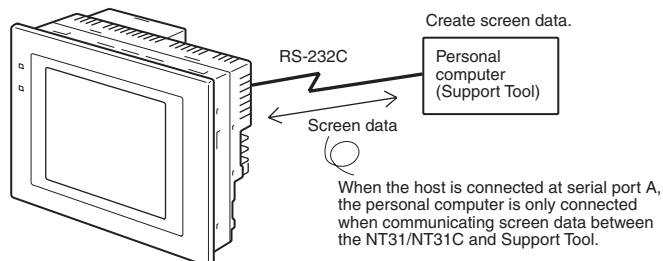
#### Sends Data to a Host

Data input using the touch panel (switch ON/OFF statuses, numeric values, character strings) can be transmitted to the host.



#### Screen Data

The screen data to be displayed on the NT31/NT31C can be created on a personal computer using the Support Tool. Connect the NT31/NT31C to the personal computer with an RS-232C cable and transmit the screen data to the NT31/NT31C.



## 1-2 Functions of the NT31/NT31C

The NT31/NT31C has the following features.

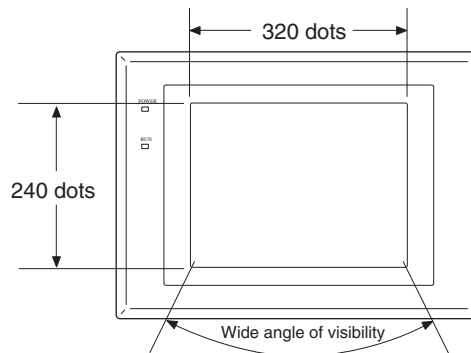
### 1-2-1 Features

#### Downsized Body

- Slim body (50 mm or less in the panel\*).
  - The communications cable connectors are housed in the unit so that they do not protrude from the unit.
- \*When mounted in a panel of the recommended thickness (page 30).

#### Construction Best Suited to the FA Environment

- The panel is an STN monochrome LCD type with backlight for the NT31 and an STN color LCD type with backlight for the NT31C.
  - The backlight unit and battery can be replaced at the operation site.
  - Protection equivalent to oil-proof IP65\*, and waterproof structure equivalent to the NEMA4 standard.
- \*The panel may not be usable in environments where it is exposed to oil for long periods.



#### Touch Switch Operation

Contrast and brightness are adjustable by touch switch operations.

#### Compatibility with Other PTs

- There is upward compatibility between the NT31/NT31C and the following models for screen data and user programs: NT11S, NT20S, NT30, NT30C, NT600S, NT610G, NT610C, NT620S, NT620C, NT625C, NT631, NT631. (After being read to the Support Tool, screens must be modified in accordance with the screen size. Depending on the function used, partial modification of programs may also be necessary. For details on the compatibility of screen data, refer to the *NT31/NT31C/NT631/NT631C Programmable Terminal Reference Manual* and the *NT-series Support Tool Operation Manual*.)
- The dimensions of the panel cut-out to accommodate the NT31/NT31C are the same as for the NT30/NT30C.

#### Two Ports Featured as Standard:

##### Port A for Common Use by Support Tool/Host and Port B for Exclusive Use by the Host

- Communications with the host are possible via another port while connected to the Support Tool.
- Reading bar code data from a bar code reader is possible via another port while communicating with the host.

**Rapid System Program & Screen Data Changes Possible Using a Memory Unit**

- Installing a Memory Unit (model NT-MF261) on the rear of the NT31/NT31C makes it easy to write screen data into the NT31/NT31C on site. This enables a rapid response to setup changes.
- NT31/NT31C can store a system program into a Memory Unit. This enables the system to handle more flexible setups.

**Screen Data Check Function**

Screen data can be checked simply by operations at the NT31/NT31C system menu, without connecting up to the Support Tool.

**Increased Screen Data Capacity**

The data capacity of 1 MB is twice that of the NT30/NT30C, enabling storage of a larger quantity of screen data.

**Large Increase in Maximum Number of Registered Elements**

The number of elements that can be registered on one screen has been considerably increased, making it possible to create more expressive screens. For details, refer to *Display Restrictions* in *Appendix A Specifications* of the *NT31/NT31C/NT631/NT631C Programmable Terminal Reference Manual*.

**Binary Data can be Read to/Written from the Host**

It is now possible to write binary data stored in words at the host directly to the NT31/NT31C. This makes data conversion by a program at the host unnecessary, reducing the load on the host.

**Character Display Using High Definition Fonts**

Any quadrupled characters are displayed with a 32 dot high-definition font.

**Simple Version Upgrades**

By using the system installer supplied with the Support Tool (Type NT-ZJCAT1-EV4), the system program at the NT31/NT31C can be changed easily from a personal computer.

**Complies with International Standards**

The NT31/NT31C meets UL/CSA standards and EC directives.

**Compatible with Other Vendors' Devices**

Compatible with Sequencers in the following series: Mitsubishi A-series (Calculator Link) and FX-series (Programming Console), Allen-Bradley SLC 500 Series, GE Fanuc 90-20 and 90-30 Series, and Siemens S7-300 and S7-400 Series. Specialized system programs can be installed that allow the NT31/NT31C to be controlled from other companies' Sequencers.

**Multiple Windows**

Up to 3 windows can be displayed simultaneously in the normal screen. A 9-word window control area has been allocated to the host; the contents of these 9 words can be changed from the Host to open, close, and move windows.

**High-speed 1:N NT Link**

The V2 versions are compatible with the high-speed 1:N NT Link as well as the earlier standard 1:N NT Link.

**Additional Mathematical Functions**

Operands (values referenced by formula) can be registered to allow the PT to perform calculations automatically and write the results of those calculations to numeral memory tables or words in the host.

**Device Monitor Function**

The new device monitor function can be used to change the PLC's operating mode or display/change values in the PLC's memory areas. The present values (PVs) of several words can be listed with the device monitor.

**Interlock Function**

PT operations and inputs can be disabled from the PLC if interlock bits have been allocated in the PLC for the corresponding PT touch switches, numeric inputs, or string inputs.

**Improved Lamp/Touch Switch Labels**

The following displays can be performed with lamp or touch switch labels:

- Display several lines of labels.
- Switch the display between different labels when OFF and ON.



- Display the numeral memory table contents as labels.
- Display the string memory table contents as labels.

**NT30/NT30C and NT620S/  
NT620C/NT625C  
Emulation**

The word configuration of the PT status control area and PT status notify area can be set to emulate those of the NT30/NT30C or NT620S/NT620C/NT625C; this mode is called NT30/620 compatible mode.

When the PT is operating in NT30/620 compatible mode, it will be equivalent to an NT30/NT30C or NT620S/NT620C/NT625C in the functions listed below. The PT retains full V2 functionality in all functions other than the ones listed below. Refer to *Appendix C* in the *NT31/NT31C/NT631/NT631C Programmable Terminal Reference Manual* for more details.

- Word configuration and functions of the PT status control area and PT status notify area
- Image/library codes
- Insertion of image/library data into character strings

**Additional CS/CJ-series  
Data Areas Accessible**

Data areas in CS/CJ-series PLCs that were previously inaccessible can be accessed. The data areas listed below can be accessed (read/written).

All banks in the EM area, timer completion flags (TU), counter completion flags (CU), Work areas (WR), Task flags (TK), and the HR area.

**Recipe Function**

You can set the data (numeric values) for multiple words in record units using the tabular elements on the PT screen, and write these settings in a single operation to words on the host (i.e., PLC or PT memory) using a touch switch operation on the PT Unit. Also, multiple words of numeric data can be read from the host in one operation. In this way, groups of parameter settings can be edited at the PT Unit, and written to or read from the host.

**Adjusting Contrast and  
Brightness During PT  
Operation**

You can display the brightness and contrast adjustment screen using either the touch switch or commands from the host, even while the PT is in operation.

**1-2-2 Comparison between NT31 and NT31C**

Two NT31 models — the NT31, which is capable of versatile graphic displays, and the NT31C, which is also capable of color display — are available. The differences between the NT31 and NT31C are tabled below:

Function	NT31	NT31C
Type	NT31-ST123-EV3 (Beige) NT31-ST123B-EV3 (Black)	NT31C-ST143-EV3 (Beige) NT31C-ST143B-EV3 (Black)
Display panel	STN monochrome LCD display type (with white backlight)	STN color LCD type (with white backlight)

Beige and black are the front panel colors of each NT31/NT31C types.

### 1-2-3 Comparison between NT30/NT30C and NT31/NT31C

Item	NT30/NT30C	NT31/NT31C
Support Tool used	NT-ZJCAT1-EV4 or NT-ZA3AT-EV2	NT-ZJCAT1-EV4
DIP switches	On rear of PT	None (software settings)
Use of B7A Unit	Possible	Not possible
Use of Memory Unit	Not possible	Possible
RS-232C interface	Connector (9-pin) also used as port for screen data transfer.	<ul style="list-style-type: none"> <li>Serial port A connector (also used for screen data transfer, 9-pin)</li> <li>Serial port B connector (for host communications only, 25-pin)</li> </ul>
RS-422A/485 interface	Terminal block	Serial port B (25-pin D-SUB connector)
Backlight color	White/red (selectable)	White only
Replacement backlight	NT30-CFL01/NT30C-CFL01	NT31C-CFL01 (Same for both the NT31-ST121□-EV2 and NT31C-ST141□-EV2). The backlight cannot be replaced by the user for the NT31-ST122□-EV2, NT31C-ST142□-EV2, NT31-ST123□-EV3, and NT31C-ST143□-EV3.)
NT31/NT31C system program data	NT-ZS3AT-EV1 (including system installer)	The system installer and system program data are supplied with the Support Tool.
High-speed 1:N NT Link	Not possible	Possible
Memory Link	System program	Exclusive use by Memory Link
	Screen data	Shared with OMRON connection
LCD contrast adjustment	By a control on the rear of the PT	By touch panel operation
Backlight brightness adjustment	Not possible	By touch panel operation
Number of user-registered screens	Maximum of 2000	Maximum of 3999
Screen data capacity*1 (User program memory)	512 KB	1 MB
Numeral string data	Maximum of 1000	Maximum of 2000
Character string data	Maximum of 1000	Maximum of 2000
Bit data	256	Maximum of 1000
Mathematical tables	None	256 max. Calculations can be executed automatically in the PT.
Image data	Maximum of 224	Maximum of 4095*2
Library data	Maximum of 896	Maximum of 12288*2
Method for storing numeric values (numeral memory data and PT status control area)	Fixed as BCD (binary coded decimal)	Selectable from BCD (binary coded decimal) or binary
PT status control area size	4 words	5 words (partial change of contents)*2
PT status notify area size	3 words	2 words (partial change of contents)*2
Window control area size	None	9 CH
Registering continuous screen	Possible	Not possible (Use a screen switchover as a substitute.)
Lamp/Touch switch labels	Fixed display (1 line only)	<ul style="list-style-type: none"> <li>Multiple lines can be displayed</li> <li>ON/OFF switching is possible</li> <li>Numeral display is possible</li> <li>Character string display is possible</li> </ul>
Interlock function	None	Operations can be disabled from the PLC by allocating interlock bits to the corresponding touch switch, numeral input, or character string input.
Device monitor function	Not possible	Possible
Recipe function	None	Possible
Accessible CS/CJ-series PLC data areas	---	The data areas listed below can be accessed in addition to the data areas accessible with the NT30/NT30C. <ul style="list-style-type: none"> <li>EM banks (EM_0 to EM_C)</li> <li>Timer completion flags (TU)</li> <li>Counter completion flags (CU)</li> <li>Work areas (WR)</li> <li>Task flags (TK)</li> <li>HR area</li> </ul>

\*1 This is the capacity of the flash memory that stores screen data.

\*2 The values are the same as the NT30/NT30C when the PT is in NT30/620 compatible mode.

For differences in programming, refer to *Appendix B* in the *NT31/NT31C/NT631/NT631C Programmable Terminal Reference Manual*.