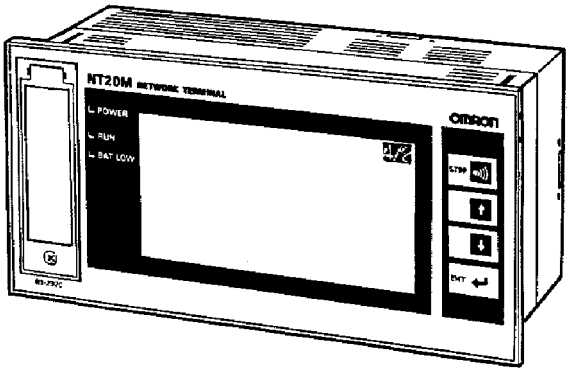
NT20M
Programmable Terminal

Operation Manual

November 1991



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 warnings in this manual. Always heed the information provided with them.

DANGER! Indicates information that, if not heeded, could result in loss of life or serious injury.

Caution Indicates information that, if not heeded, could result in minor injury or damage to the product.

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.

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MS-DOS is a registered trademark of Microsoft Corporation.

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... Indicates lists of one sort or another, such as procedures, precautions, etc.

TABLE OF CONTENTS

About this Manual:

This manual describes the installation and operation of the NT20M Programmable Terminals (PTs) and includes the sections described below. Further information is provided on manuals on the Host Interface Units and Support Tool. Refer to the list in *Section 1 Introduction*.

Please read this manual completely and be sure you understand the information provide before attempting to install and operation a Programmable Terminal.

Section 1 introduces the PTs, describes the terminology used in this manual, and provides examples of system configurations for programming and operation.

Section 2 provides procedures and specifications required to set up a PT system, including hardware switch settings and installation.

Section 3 provides steps required for initial PT operation.

Section 4 describes functions used to create screens and control display attributes on the PT. Included is automatic transfer of data from the host computer via character string and numeral tables.

Section 5 describes functions used to input data on-screen and transfer it to the host computer via the numeral table.

Section 6 describes basic data transfer and maintenance functions.

Section 7 describes transferring screens online to and from the host computer.

Section 8 provides troubleshooting and basic maintenance methods, including battery replacement.

Appendices of OMRON products used with PTs and PT specifications are provided at the back of the manual.

SECTION 1
Introduction

This section provides information necessary to familiarize you with the features and parts of a PT system.

1-1 Features

Clear Display The display is extremely clear due to an STN liquid crystal display with a backlight. For long life, the backlight can be set to turn off automatically.

Switch Input Function Up to 32 optional switches can be registered per screen for Terminals with a touch panel, and up to12 pushbutton inputs can be registered per screen for Terminals with function keys.

Drip-proof, Oil-proof Panel To enable on-site factory installation, the Terminals have a drip-proof front panel structure when the dust cover is mounted to protect the display area and the key input area. For protection against oil spray, the front-panel sheets and moulded parts use oil-resistant materials.

Communications Units The Host Interface Unit is ordered separately from a selection of communications standards to make possible connection to a wide range of devices.

Message Display Messages transmitted from the host can be displayed.

Transferring Values Values transferred from the host can be displayed at programmed locations. In addition, values from touch panel and function key inputs can be transferred back to the host.

System Configuration NT-series Terminals have common communications protocol and peripheral devices. Select the Terminal you need based on screen size, memory capacity, and host interface.

Program Reusability Programs for communicating with Programmable Controllers are upwardly compatible so the program can easily be reused when adding functions.

Screen Data Changes Screen data can be changed from the host through RS-232C or RS-422 communications.

Easy Screen Creation The peripheral device interface connector can be connected to personal computers to enable on-site creation and modification of screens.

Mark Registration Symbols (16 dots x 16 dots) can be created with NT20M/NT600M Support Tool and displayed.

Graphics Lines and circles can be drawn.

1-2 Terminology and NT-series Manuals

Names of items in this manual related to the NT Series of Programmable Terminal and SYSMAC C-series Programmable Controllers are defined next.

Abbreviations The following abbreviations are used in the text.

Abbreviation	Term	Meaning
PT	Programmable Terminal	Refers to an OMRON NT-series Programmable Terminal.
PC	Programmable Controller	Refers to an OMRON SYSMAC C-series or CV-series Programmable Controller, or programmable controllers manufactured by other companies.
I/F	interface	A communications device that connects the Programmable Terminal with peripheral devices.
I/O	input/output	Refers to PT and PC inputs and outputs.

SYSMAC Terminology

Terminology	Explanation
SYSMAC	A generic name for OMRON's Programmable Controllers.
Host Link System	A system employing SYSMAC C-series Host Link Units used to create a communications bus between PCs, between PCs and PTs, etc.
SYSMAC BUS	A remote I/O network created between SYSMAC C-series PCs and input/output devices.

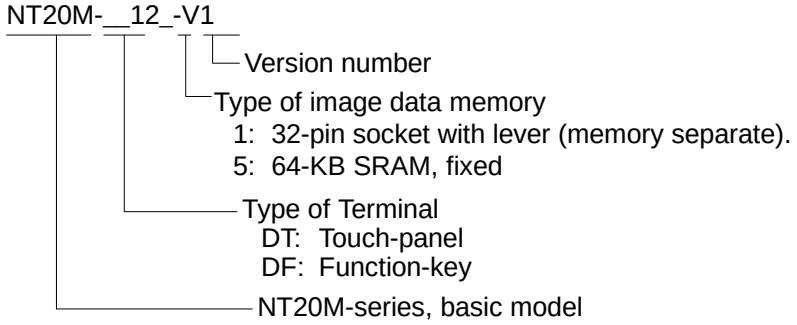
NT-series Manuals

The NT20M Series and NT600M Series are covered in the four manuals described below.

Name of Manual	Contents	Manual No.
NT20M/NT600M Support Tool Operation Manual	This manual covers methods for creating screens, including screen data preparation, switches, lights, and alarms.	V004-E1-1
NT600M Operation Manual	This manual provides specifications, functions, and operating instructions for NT600M Programmable Terminals.	V002-E1-1
NT20M Operation Manual	This manual provides specifications, functions, and operating instructions for NT20M Programmable Terminals.	V001-E1-1
NT-series Host Interface Unit Operation Manual	This manual covers the commands, controls, and communications specifications for operating the NT20M and the NT600M. Refer to this manual when programming host computer communications.	V003-E1-1

1-3 Models

1-3-1 NT20M Programmable Terminals



Memory Chips

Memory chips that can be mounted in the socket are listed in the table below.

Type	Memory capacity	Model
SRAM	32K	HM62256ALP-15 (Hitachi) or equivalent.
	128K	HM628128LP-10 (Hitachi) or equivalent.
EPROM	64K	HN27C512G-20 (Hitachi) or equivalent.
	128K	HN27C101AG-12 (Hitachi) or equivalent.

Note In order to operate the NT20M, a Host Interface Unit is required. The NT20M will not operate without one.

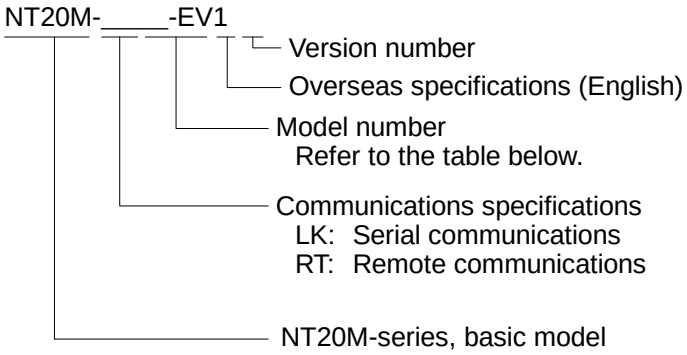
Memory Capacity and Number of Screens

Screen memory capacity varies according to which Screen Data Memory Board is installed. The screen memory capacity, in turn, determines the number of screens that can be registered. Use the table below as a guide to select the amount of memory suitable for your needs.

Screen memory capacity	Number of registered screens
32K	150 screens (mostly messages)
64K	250 screens (mostly messages)
128K	250 screens (when using many diagram screens)

Note The table above is strictly a guide. If the messages or other display data per screen increase, the number of screens that can be registered will decrease. Likewise, if the messages decrease, the number of screens (max. 250 screens) that can be registered will increase.

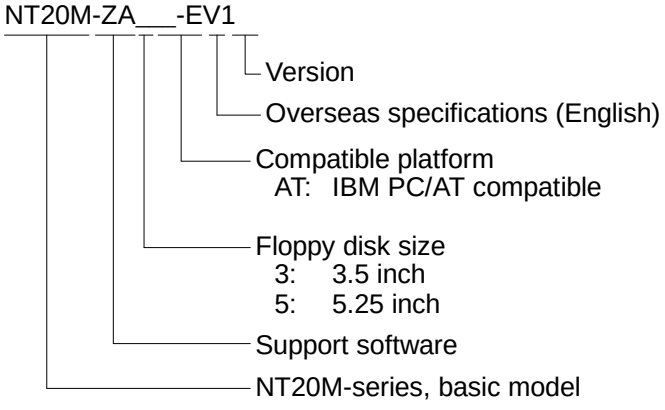
1-3-2 Host Interface Units



Model	Communications specifications
NT20M-LK201-EV1	RS-232C
NT20M-LK202-EV1	RS-422
NT20M-LK203-EV1	Host Link System (SYSMAC WAY)
NT20M-RT121-EV1	SYSMAC BUS (wire-type)

Note The Host Interface Unit for the NT20M Series can also be used as the Host Interface Unit for the NT600M Series. NT600M-series Host Interface Units cannot be used as Host Interface Units for the NT20M Series.

1-3-3 Support Tools



Note A Support Tool can be used with any of the NT20M or NT600M PTs.

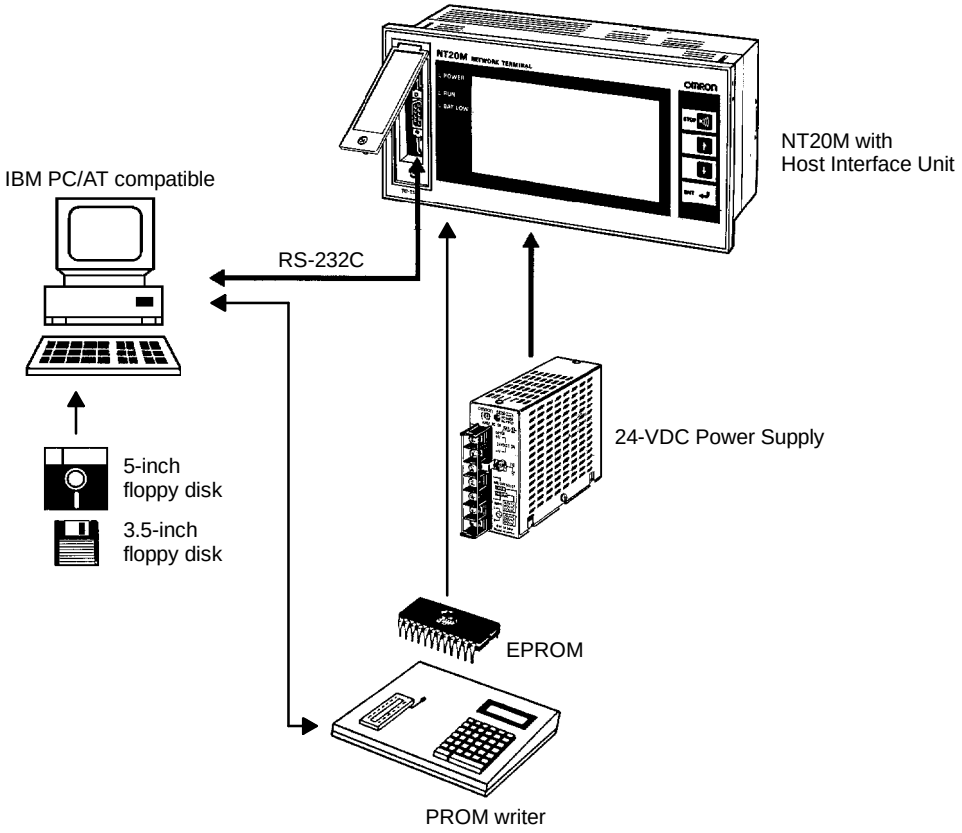
1-4 System Configuration

There are two types of system configuration required for a Programmable Terminal: one to transfer data from the Support Tool and one to actually operate the Programmable Terminals.

1-4-1 Communications with the Support Tool

Screen data from the NT20M/NT600M Support Tool is downloaded to the NT20M through the RS-232C interface on the front of the NT20M. Likewise, screen data from the NT20M can be uploaded to NT-series Support Tool.

Screen data created at these Support Tool can also be transmitted to a PROM writer through the RS-232C interface to save the data on EPROM chips. The EPROM chip can then be mounted into the NT20M. (NT20M-DT121-V1 or NT20M-DF121-V1).



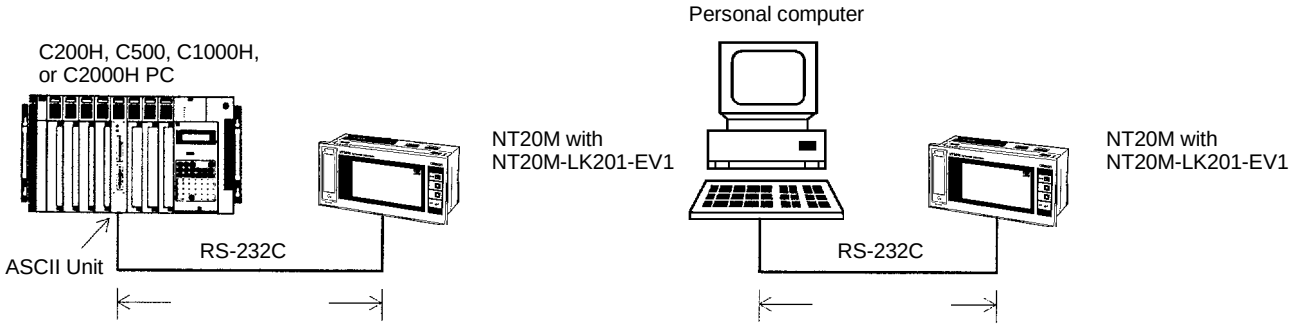
Note The NT20M must be used with a Host Interface Unit. If no Host Interface Unit is installed, the NT20M will not operate.

1-4-2 Operation

In actual operation, either a personal computer or a C-series PC (Programmable Controller) is connected as the host to the Host Interface Unit (sold separately) at the back of the NT20M. The following interfaces can be used for communications: RS-232C interface, RS-422 interface, SYSMAC BUS (Wired Remote I/O System) interface, or Host Link Unit interface. Refer to the NT-series Host Interface Unit Operation Manual for details on connecting between Host Interface Unit and the host.

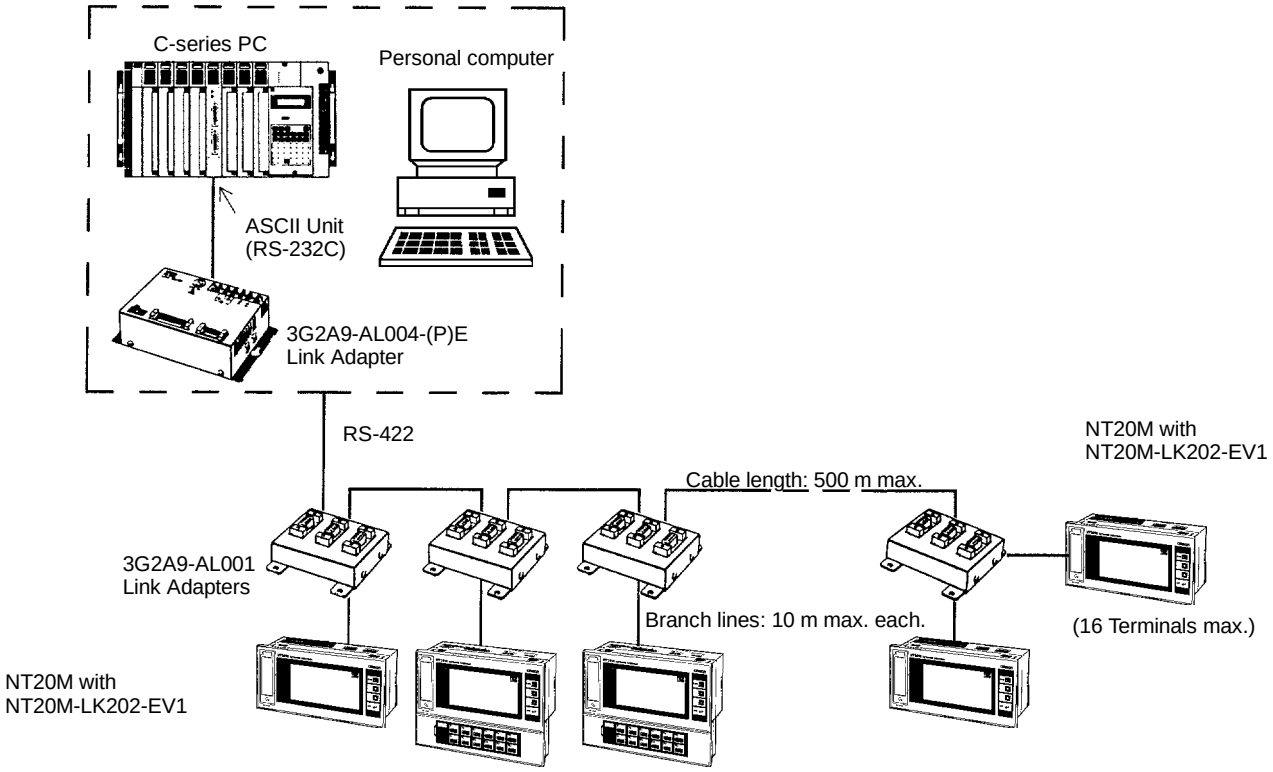
RS-232C Interface (NT20M-LK201-EV1)

Using the NT20M-LK201-EV1 Host Interface Unit, the Programmable Terminal can be connected one-to-one to a PC through an ASCII Unit, or to personal computer.



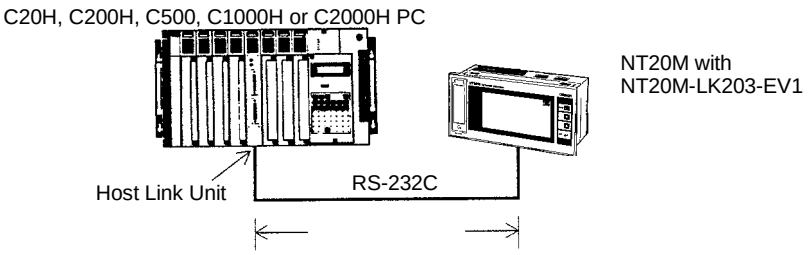
RS-422 Interface (NT20M-LK202-EV1)

Using NT20M-LK202-EV1 Host Interface Units, up to 16 Programmable Terminals can be connected to a PC through an ASCII Unit, or to a personal computer.



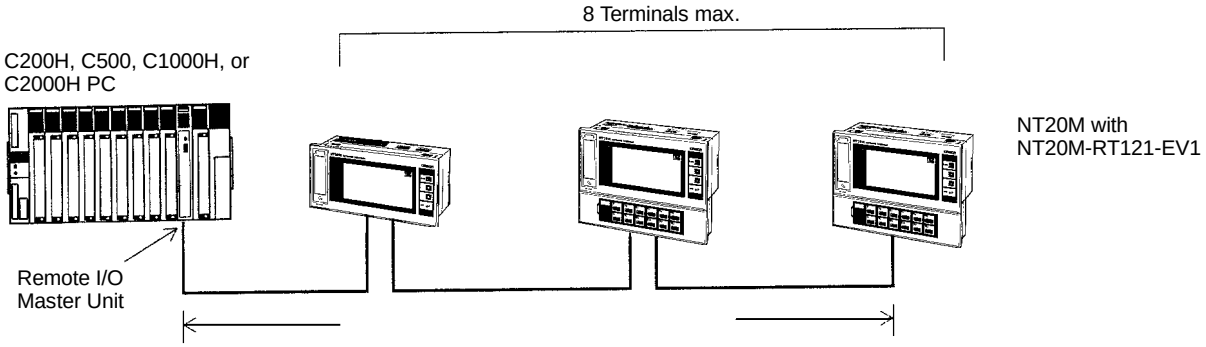
Host Link Unit Interface (NT20M-LK203-EV1)

Using the NT20M-LK203-EV1 Host Interface Unit, the Programmable Terminal can be connected one-to-one to a PC through a Host Link Unit.



Wired SYSMAC BUS Interface (NT20M-RT121-EV1)

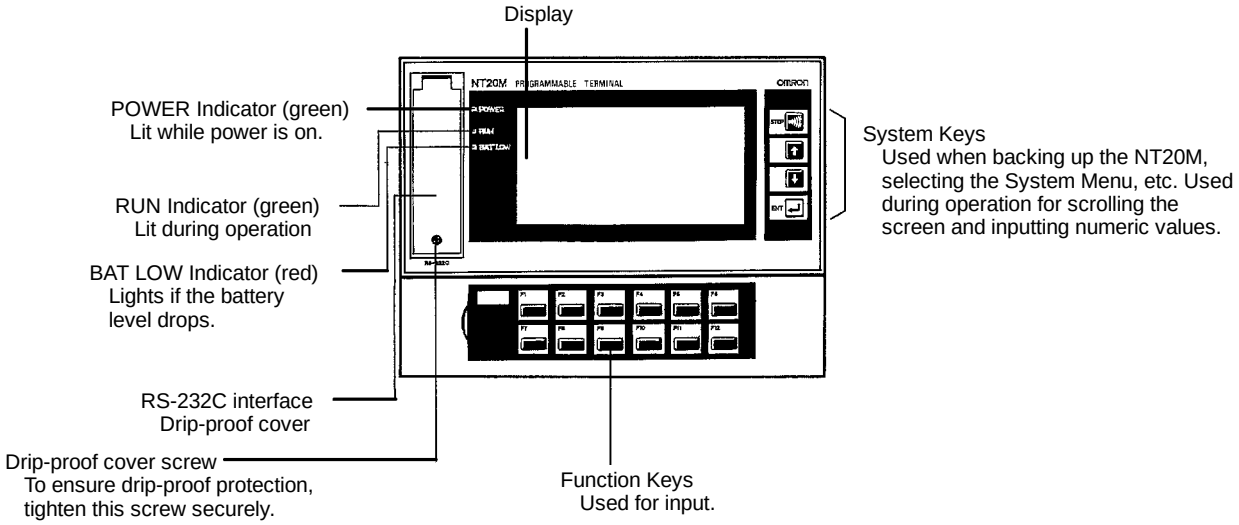
Using NT20M-RT121-EV1 Host Interface Units, up to 8 Programmable Terminals can be connected to a PC through a Wired Remote I/O Master Unit.



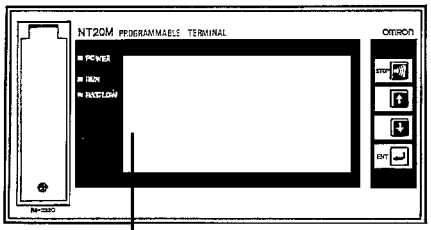
1-5 Nomenclature and Functions

1-5-1 Front Panel

NT20M-DF12_-V1: Programmable Terminals with Function Keys



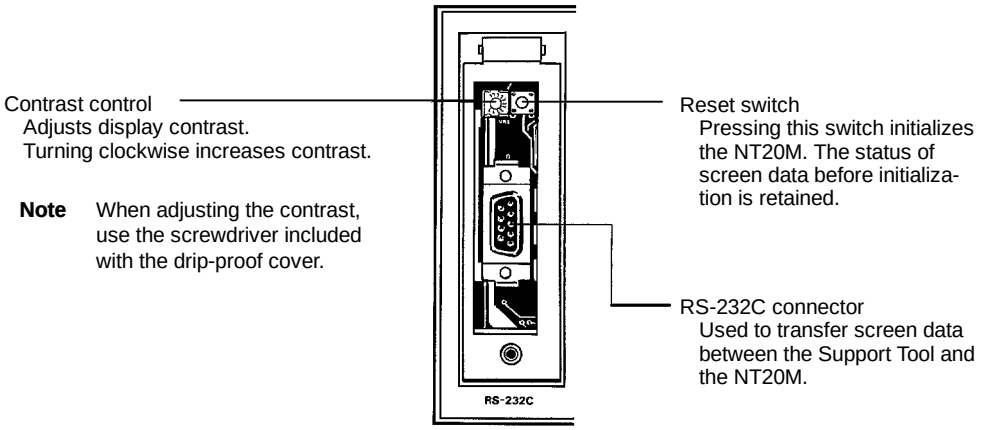
NT20M-DT12_-V1: Programmable Terminals with a Touch Panel



Note: Other components are the same as shown above for models with function keys.

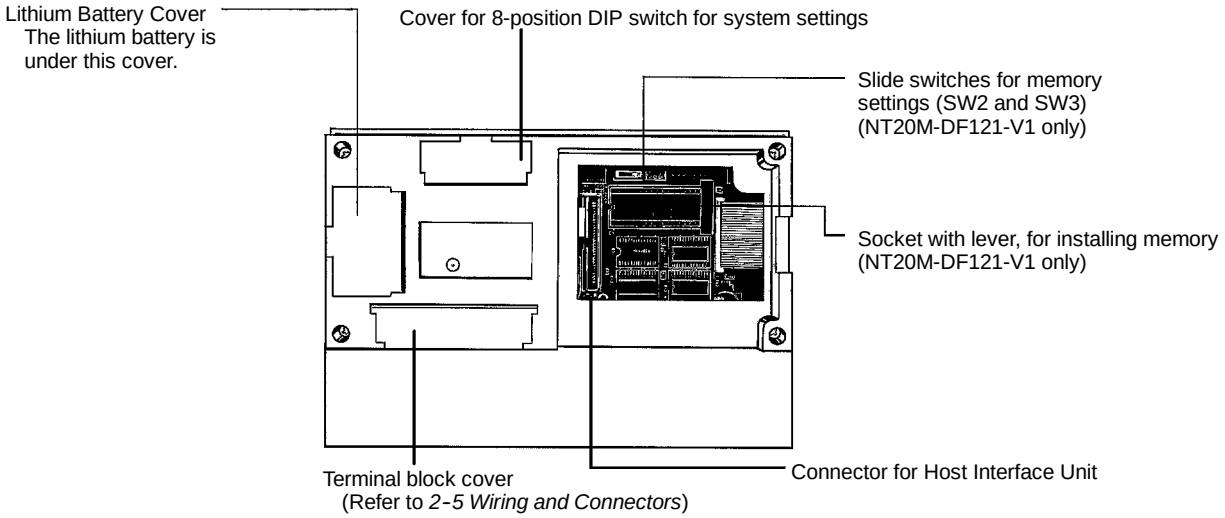
Display
Touch Switches
Used as an input device corresponding to the display screen.

Components under Drip-Proof Cover

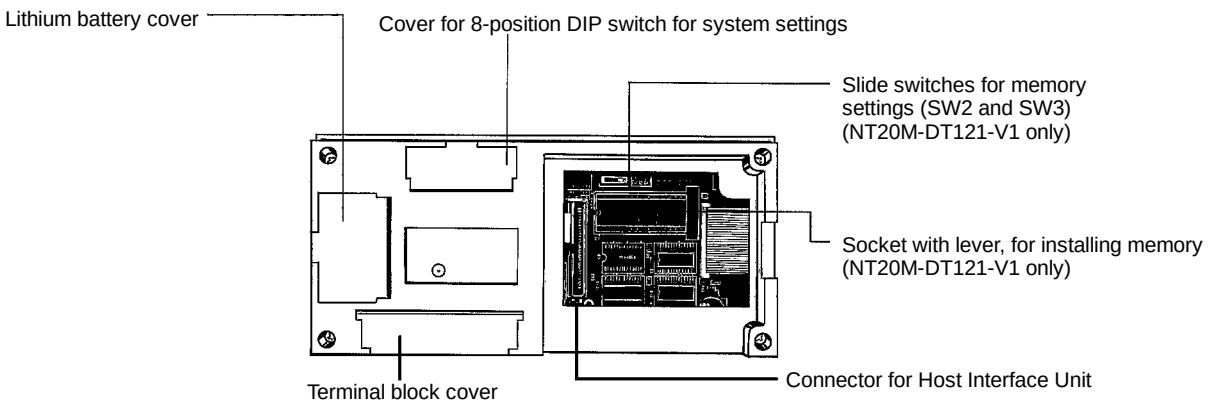


1-5-2 Rear Panel

NT20M-DF12_-V1: Programmable Terminals with Function Keys



NT20M-DT12_-V1: Programmable Terminals with a Touch Panel



SECTION 2
Switch Settings, Installation, and Wiring

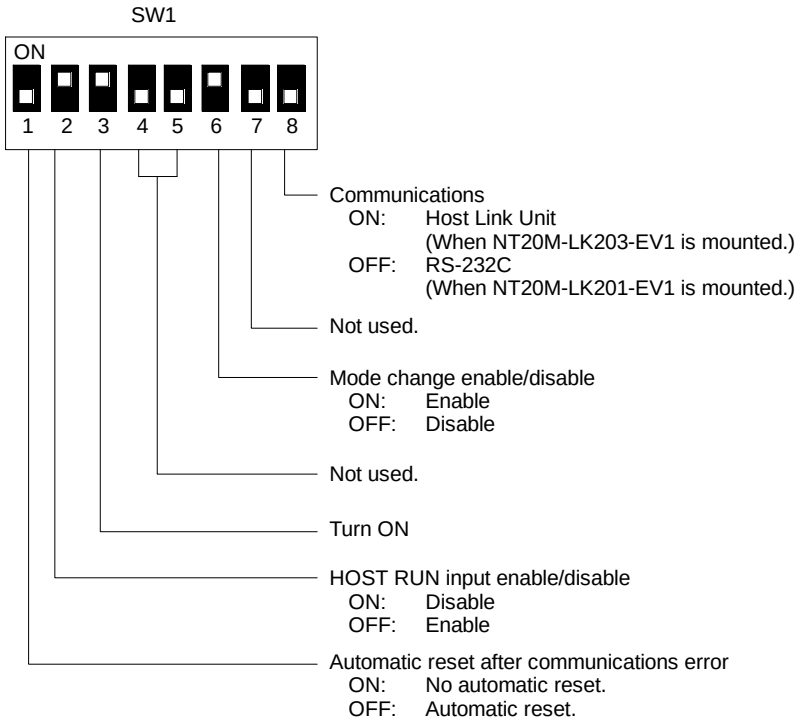
This section provides procedures to set hardware switches and install the PT.

2-1 Switch Settings

There are switches to set under the switch cover on the back of the Terminal, and also on each Host Interface Unit. For Host Interface Unit switch settings, refer to the *Host Interface Unit Operation Manual*. Be sure to set the switches before installation if the installation location prevents access to the switches after installation.

2-1-1 System DIP Switch Settings (SW1)

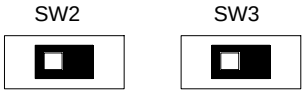
The 8-position DIP switch for system settings is located under the DIP switch cover on the back of the Terminal. Be sure that power is off when changing switch settings.



Communications	This setting is valid only when the Host Interface Unit is NT20M-LK201-EV1 or NT20M-LK203-EV1. If the setting is wrong when these Units is used, the Terminal will not operate.
Automatic reset after communications error	“Automatic reset” means that, when an error occurs, no error message will be displayed and the next command will be executed when received. “No Automatic reset” means that, when an error occurs, an error message will be displayed and operation will stop.
Mode change enable/disable	“Mode change” refers to whether or not the mode can be changed during operation by means of a communications command to Transfer Mode or Maintenance Mode . This is possible only when a RS-232C or RS-422 Host Interface Unit is used.
HOST RUN input enable/disable	If this pin is turned OFF then, when the HOST RUN INPUT turns OFF, Host Error will be displayed regardless of other conditions and processing will stop.
Pin 3	Pin 3 is factory-set to OFF and must be turned ON by the user. Screens will not be displayed properly unless this pin is ON.

2-1-2 Memory Settings (SW2 and SW3)

These switches are used to set the type of data memory to be installed in the socket at the back of the Terminal. It is applicable only for the NT20M-DT121-V1 and the NT20M-DF121-V1. (Other NT20M models do not have these switches.)



The factory-set default setting as shown at the left.

SW 2	SW 1	Screen data memory
Left	Left	SRAM
Right	Right	EPROM

Note
1. Be sure that the power is off when changing the setting.
2. Carefully check the switch settings and the memory chip before turning the power on.
3. If memory is not installed in accordance with this switch setting, the Terminal will not operate properly and memory may be destroyed.

2-2 Installation Environment

The NT20M has strong environmental resistance and high reliability, but you can maximize system reliability and make the most of its functions by observing the following considerations during installation.

2-2-1 Installation Site

Avoid installing the NT20M in a location where any of the following conditions exist.

- Ambient temperatures exceeding a range of 0% to 45%C.
- Abrupt temperature changes or condensation.
- Relative humidity exceeding a range of 35% to 85%.
- Corrosive or inflammable gasses.
- Strong magnetism.
- Excessive dust, salt, or iron dust.
- Direct vibration or shock.
- Direct sunlight.
- Spray from water, oil, or chemicals (the front panel is drip-proof).

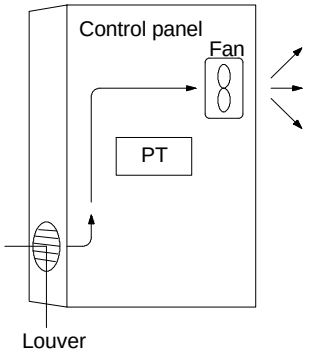
2-2-2 Mounting Position

The NT20M employs a liquid crystal display, so the angle of vision should be considered when mounting. Install the Terminal at a height and direction that make it easy for the operator to see.

Ambient Temperature

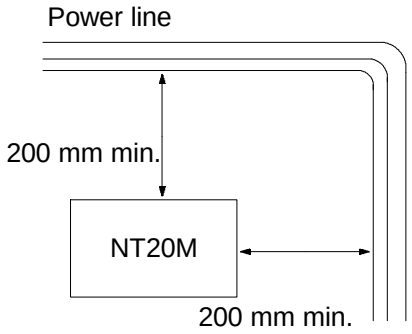
The ambient operating temperature range is 0% to 45%C. Take the following factors into consideration.

- Leave sufficient ventilation space.
- Do not install directly above machinery that radiates a lot of heat (e.g., heaters, transformers, high-capacity resistors).
- If the ambient temperature rises above 45%C, set up a fan or air conditioner.

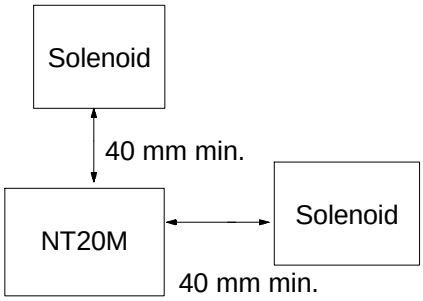


Operation and Maintenance For safety during operation and maintenance, place the Terminal as far as possible from high-voltage machinery and power equipment.

Improving Noise Resistance Do not install the NT20M in a panel with high-voltage devices and install it at least 200 mm from electric power lines.



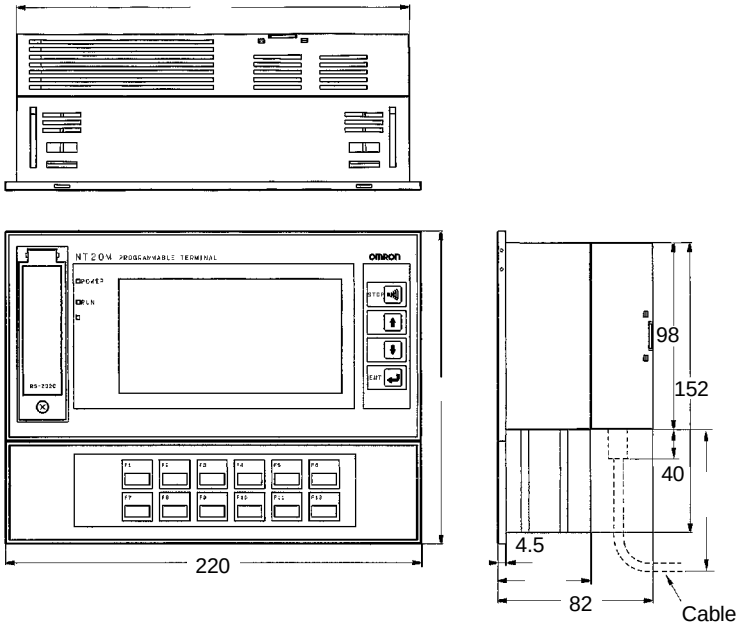
When installing the Terminal near devices with strong electrical or magnetic fields (such as solenoids), allow a distance of at least 40 mm, more if necessary.



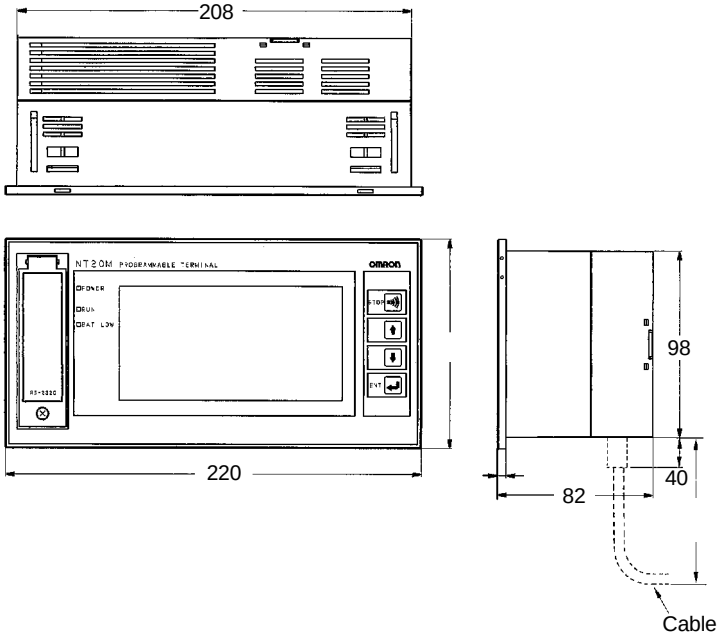
2-3 Dimensions

All dimensions are in millimeters.

2-3-1 Terminals with Function Keys (NT20M-DF12_-V1)



2-3-2 Terminals with Touch Panels (NT20M-DT12_-V1)

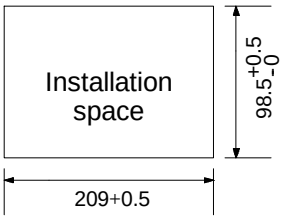


2-4 Installing in a Panel

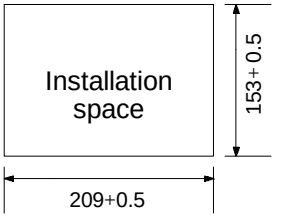
The NT20M is designed to be installed in a panel. Install it as follows:

1, 2, 3... 1. Cut a hole in the panel in accordance with the recommended dimensions shown below. The panel should be between 1.6 and 4.8 mm thick. All dimensions are in millimeters.

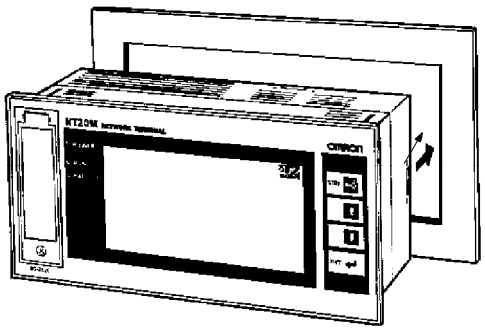
NT20M-DT12_-V1



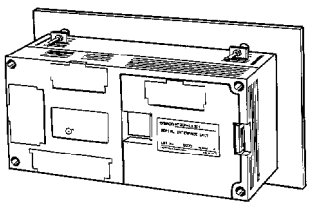
NT20M-DF12_-V1



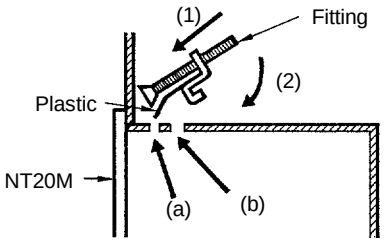
2. Insert the Terminal into the hole from the front of the panel.



3. Use the accessory metal fittings and tool to fasten the Terminal to the panel surface. Do not use a screwdriver. A screwdriver may damage the fittings or the Terminal.



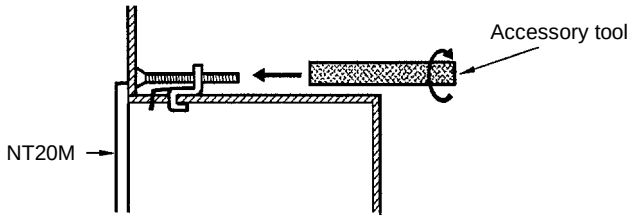
After setting the NT20M into the panel, secure it as shown below.



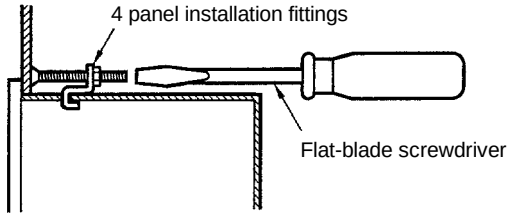
(1) First pass the plastic part of the fitting through slot (a).

(2) Next, put the hook of the fitting into slot (b) and pull so that the leg catches in the NT20M case.

Turn the screw with the tool that comes with the Terminal, and secure the Terminal to the panel. When you are finished, rotate the tool in the reverse direction and remove it from the screw.



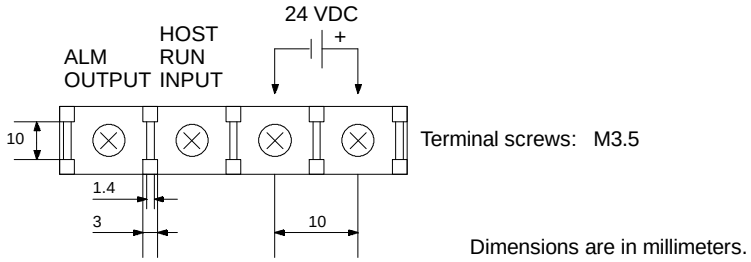
4. To remove the NT20M from the panel, use a flat-blade screwdriver.



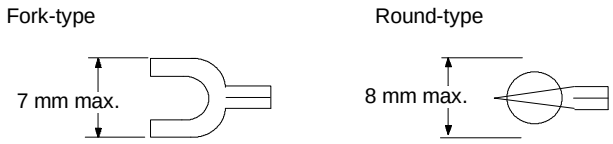
2-5 Wiring and Connectors

2-5-1 Terminal Block

The terminal block illustrated below is located under the terminal block cover.



Use crimp-style terminals for wiring. If twisted wires are connected directly, there is a possibility of poor contact or short-circuiting. Use crimp-style terminals with holes to match M3.5 screws.

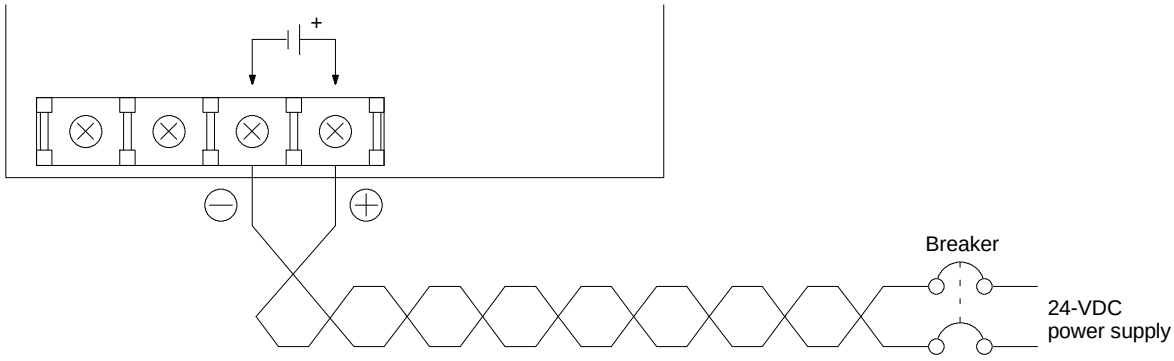


Conforming Crimp-style Terminals

Maker	Fork-type	Round-type	Conforming wire (twisted)
Nippon Crimp-Style Terminals	2-YS3A	2-3.5	1.04 to 2.63 mm^2
Fuji Terminals	2-YAS3.5	V2-S3.5	
Nichifu Terminals	2Y-3.5	2-3.5	

2-5-2 24-VDC Terminals

These are the power supply input terminals for running the NT20M.



Power Supply Wiring

- Provide 24-VDC power.
- Use a power supply within the allowable voltage range.

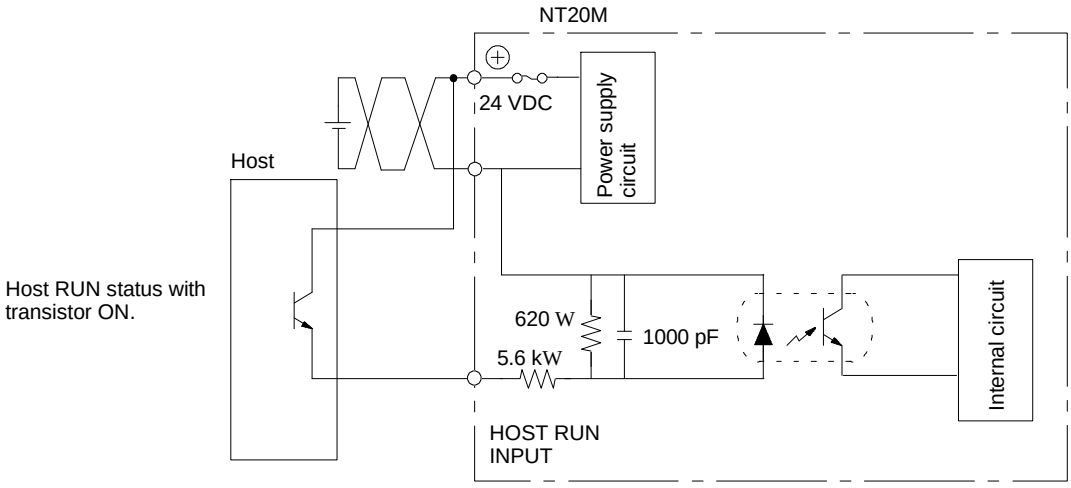
Power supply voltage	Allowable voltage range
24 VDC	20.4 to 26.4 VDC

- Use a power supply with a rated capacity of at least 15 W at 24 VDC.
- If power lines are long, then use wires of at least 2 mm^2 to avoid a drop in voltage.
- Use twisted-pair cables.
- Turn off the power before wiring.
- Be careful not to reverse the positive and negative terminals.
- Do not run the wiring between the 24 VDC power supply and the PT power supply input terminal parallel to or in close proximity with high-voltage or high-current power lines.
- If you anticipate noise levels exceeding specifications, use noise-prevention measures at the power supply.
- If you use a 24 VDC power supply with no output short-circuit prevention, then wire a breaker into the circuit.

2-5-3 HOST RUN INPUT Terminal

Use the HOST RUN INPUT when you want to monitor the RUN status of the host.

Enable: Turn OFF SW1, pin 2.
Disable: Turn ON SW1, pin 2.

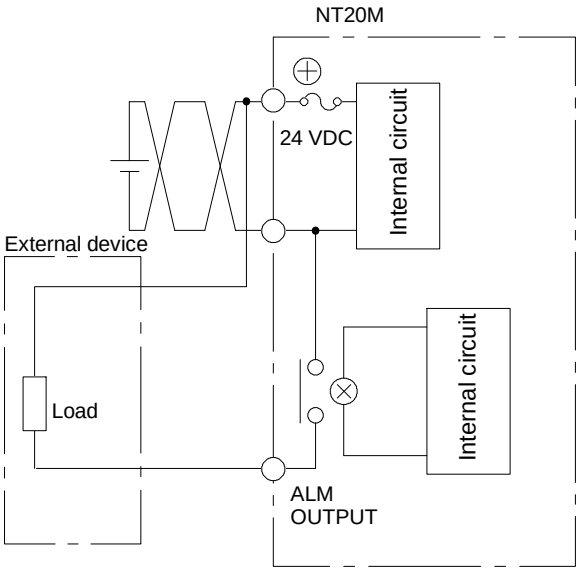


Item	Content
Rated input voltage	24 VDC $^{+10\%}/_{-15\%}$
Input impedance	5.6 kW
Input current	4.1 mA typical (at 24 VDC)
ON voltage	14.4 V min.
OFF voltage	5.0 V max.

If host RUN input goes OFF when this terminal is enabled, a host error is displayed regardless of other conditions and processing is halted.

2-5-4 ALM OUTPUT (Alarm Output)

This terminal outputs the NT20M alarm signal. Use this terminal when you want to externally monitor status.



Item	Content
Output type	Relay output
Rated load	24 VDC $^{+10\%}/_{-15\%}$
Maximum load current	1 A
Minimum switching capacity	10 mA at 5 VDC

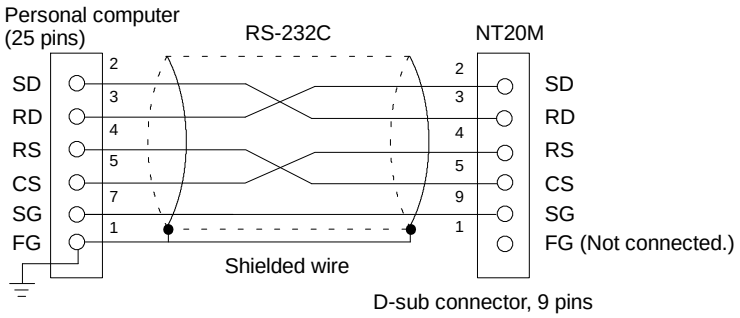
2-6 RS-232C Interface Connector

The RS-232C interface connector is used during communications between the NT20M and the Support Tool. It is located under the RS-232C interface connector cover on the front of the NT20M.

Pin Allocation

Pin no.	Symbol	Name
1	FG	Frame Ground (not used)
2	SD	Send Data
3	RD	Receive Data
4	RS	Request to Send
5	CS	Clear to Send
9	SG	Signal Ground

Connection Diagram



Note
1. RS-232C communications conditions are set automatically by the NT20M Support Tool.
2. Connectors can be connected and disconnected with power turned on.
3. This connection diagram cannot be used for the Host Interface Unit.

Applicable Connectors (Cable Side)

Plug: XM2A-0901 (OMRON) or equivalent.
Hood: XM2S-0911 (OMRON) or equivalent.

Recommended Cables

AWG28 x 5P IFVV-SB (Fujikura Cable, Ltd.)
CO-MA-VV-SB 5P x 28 AWG (Hitachi Cable, Ltd.)

Cable Set

CV500-CN228 (OMRON)
Cable length: 2 m

SECTION 3
Initial Operation

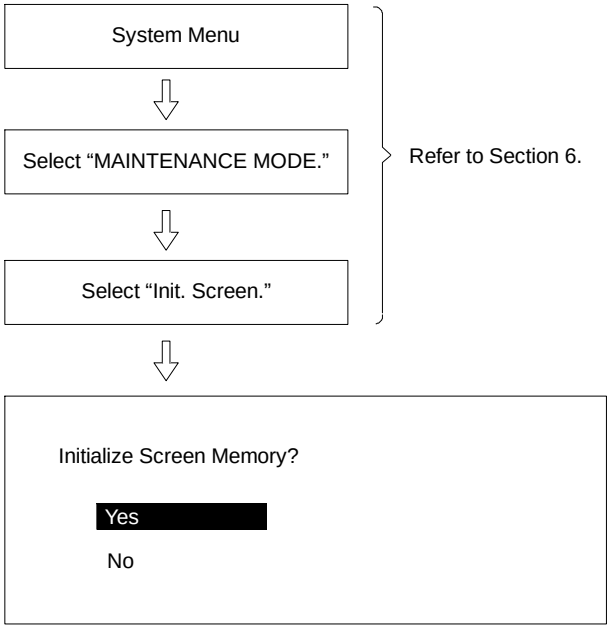
This section provides an introduction to the operations necessary to use a PT for the first time and to the menus and keys used to control PT operation.

3-1 Initialization

When using the NT20M for the first time after purchase, check to be sure that the Host Interface Unit (sold separately) is installed. Check to be sure that pin 3 of SW1 is ON, and then initialize the memory in the NT20M using the following procedure. This procedure can also be used later to completely delete data from the NT20M.

3-1-1 Initializing Memory

First install the system memory and access the system menu by simultaneously pressing the Buzzer Key, Up Key, and Down Key. Then proceed as shown below.



If you select yes, then memory will be initialized and all data used for displays will be erased. After initialization, operation will begin.

If you select no, then operation will begin without initialization.

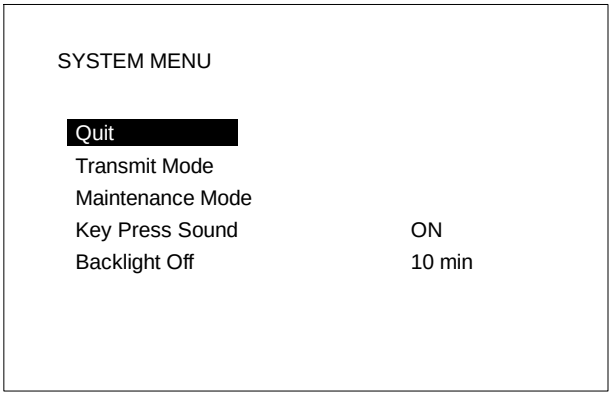
When entering RUN Mode after initialization, nothing will be displayed on the screen and the Terminal will wait for a command from the host.

Note
1. When using an NT20M-DT121-V1 or an NT20M-DF121-V1, first check to be sure that a memory chip is installed in the socket. If you are using an EPROM chip, this processing is unnecessary.
2. Be careful not to accidentally initialize and delete essential data.
3. When using the display history, execute “Init. Hist.” at the same time.

Caution Screen memory must be initialized before using a new PT. If the PT is used as shipped from the factory without initialization, messages indicating errors in the host will not be displayed properly.

3-1-2 Menus

The System Menu is called up by using the system keys during operation.



Using System Keys

Operation	Content
Press the Buzzer Key, Up Key, and Down Key simultaneously.	The System Menu shown above is displayed during operation. If actions are executed while the System Menu is being displayed, the system returns to operation. With the Buzzer Key pushed down, press the Up Key and Down Key simultaneously.
Press the Up Key.	Moves the bar cursor upward.
Press the Down Key.	Moves the bar cursor downward.
Press the Enter Key.	Selects the menu at the position of the bar cursor.

Quit

Leave the system menu and return to operation by either of the following methods.

1, 2, 3... 1. Select “Quit.”

OR

2. Press the Buzzer Key, Up Key, and Down Key simultaneously.
In addition, if there are no key inputs within 10 s of calling up the system menu, the system will automatically return to normal operation.

Selecting Items

To select an item, move the cursor to that item and press the Enter Key.

Selected item	Function
Quit	Quits and return to normal operation.
Transmit Mode	Shifts to Transmit Mode. Select when transferring data between the NT20M and Support Tool. For details, refer to *3-2 Transferring Data to and from the Support Tool.*
Maintenance Mode	Shifts to Maintenance Mode. Used to check the setting status of the NT20M and conducts self-testing.
Key Press Sound	Turns the key sound ON or OFF. The setting changes each time the Enter Key is pressed. Move the bar cursor to make the setting.
Backlight Off	Changes the period of time that the backlight stays lit before automatically turning off. Pressing the Enter Key changes the time from 10 minutes to 1 hour to none, and then repeats the cycle. If, for example, it is set to 10 minutes, then the backlight will stay lit for 10 minutes after a key input. If there is another key input during the 10-minute period, then the count will start again from that point. If there is a key input while the backlight is off, then it will light and stay on for another 10 minutes. If set to “No,” then the backlight will remain on. Move the bar cursor to make the setting.

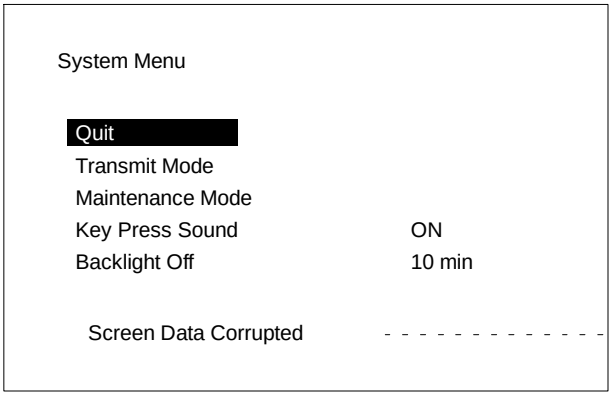
Prohibiting Mode Changes

If pin 6 of SW1 on the NT20M is set to prohibit (No), then a communications command from the host can be used to prohibit changes in the operating mode. This command can be used only with RS-232C specifications for the NT20M-LK201-EV1 and for the NT20M-LK202-EV1.

Communications command	Pin 6 ON	Pin 6 OFF
Enable	Mode shift possible.	Mode shift possible.
Disable	Mode shift possible.	Mode shift impossible.

Error Messages

When there is an error in screen data registered in the NT20M, the System Menu will appear before entering RUN Mode, and the error message will be displayed on the bottom line.



There are three types of error messages, as shown below. Operation will not begin again until the error has been corrected.

Error message	Error Content and Correction
Screen Data Corrupted	This is displayed when registered screen data is corrupted. Re-register the screen data. Operation will not begin again until the data is restored.
Mark Data Corrupted	This is displayed when registered mark data is corrupted. Re-register the mark data. Operation will not begin again until the data is restored.
Memory Not Formatted	This is displayed when the screen data area is not formatted. Initialize the screen data memory. All registered screen data, mark data, and system data will be deleted by the initialization, so they will have to be transferred again from the Support Tool. In addition, if you are using an NT20M-DT121-V1/DF121-V1, recheck the socket memory and its settings.

3-2 Transferring Data to and from the Support Tool

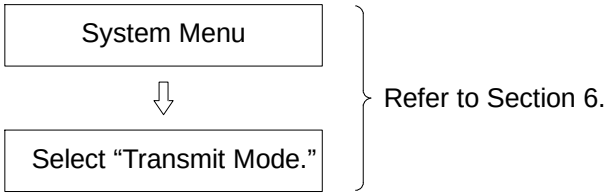
The following data can be transferred between the NT20M and the Support Tool.

Data	Support Tool to PT	PT to Support Tool
Screen data	All screens or one screen	All screens or one screen
Text string table	YES	YES
Numeral table	YES	YES
Mark data	YES	YES
Display history data	None	YES
System Memory* (Initial screen after power-up)	YES	YES

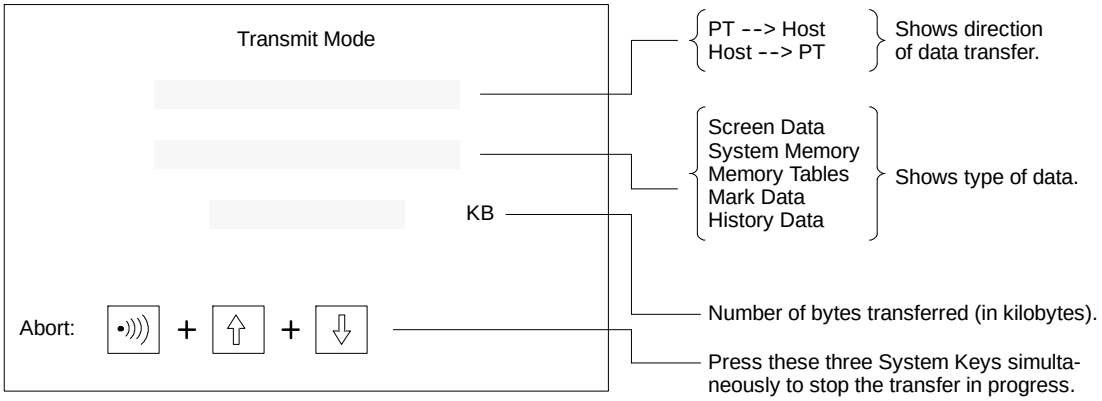
Note System Memory is the first (initial) screen after the NT20M is powered up.

Procedure Use the following procedure to transfer data.

1, 2, 3... 1. Connect the NT20M and personal computer running the Support Tool.
2. Select Transmit Mode from the System Menu.



3. Perform the transfer operation from the Support Tool. The screen shown below will be displayed during the transfer.



4. In the event of a disconnected cable or other disruption while the transfer is in progress, the NT20M screen will go blank and a message telling you that transfer was not possible will be displayed at the Support Tool. If the transfer is completed successfully, then at the end of the transfer the NT20M screen will go blank and a message telling you that the transfer has been completed will be displayed at the Support Tool.
5. To return from Transfer Mode to RUN Mode, press the Buzzer Key, Up Key, and Down Key simultaneously.

Note After completion of the transfer, be sure to change to Maintenance Mode. If power is turned off or the reset switch is pressed before changing to Maintenance Mode, there is a risk of damage to the data that was transferred.

3-3 Initial Settings

When power is turned on, the NT20M’s internal status is initialized to the following settings.

Item	Initial value
Character string memory	Screen data memory content
Numeral memory	Screen data memory content
Lamp/touch switch status	OFF
Key Press Sound	ON (When a battery is installed, the previously set value is retained.)
Backlight Off	10 minutes (When battery is installed, the previously set value is retained.)
Display	No display or initial screen (At the Support Tool you can set either no display or initial screen.)

SECTION 4
Display Functions

This section describes the functions used to create screens and control display attributes on the PT. Functions used to input data on-screen are described in *Section 5 Input Functions*. Data transfer and maintenance functions are described in *Section 6 System Menu*. Transferring screens online to and from the host computer is described in *Section 7 Online Transfer.*

4-1 Character Displays on Screen

The type, size, and attributes of characters that can be displayed on the NT20M screen are shown below. Character type, size, and attributes are set at the time of creation on the Support Tool. When an RS-232C or RS-422 Host Interface Unit is used, coordinates, characters, etc., can be designated with commands from the host in Terminal Mode.

4-1-1 Types of Characters

Half-size characters (8 x 8 dots)	Alphanumeric characters and symbols.
Normal-size characters (8 X 16 dots)	Alphanumeric characters and symbols.
Marks (16 X 16 dots)	Pictographs defined by the user (up to 64 possible).

4-1-2 Designating Display Positions

The display positions can be designated in increments of display dots. When characters overlap, characters written last overwrite those written earlier.

4-1-3 Character Scale

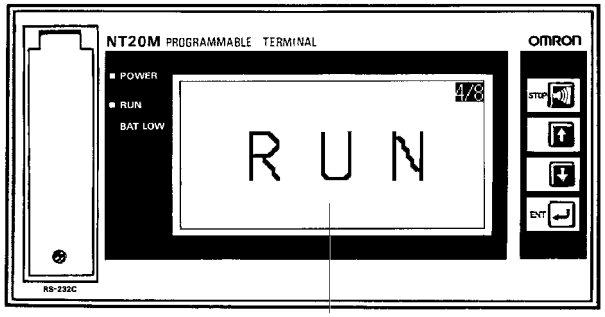
You can designate normal, double-width, double-height, 4x, 9x, or 16x character sizes. When enlarging by 4x or more, you can make the characters easier to read with the smoothing process (a process that removes the notches from characters when they are enlarged).

4-1-4 Display Attributes

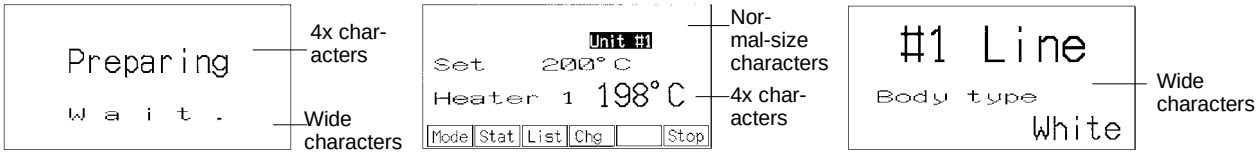
Besides the standard display (black characters on a white background), you can designate individual characters as inverse, blinking, or inverse/blinking.

Inverse Blinking ⟷ Inverse blinking ⟷ Inverse blinking

Note You cannot designate the blinking cycle.



16x characters



4-2 Display Graphics

Polylines (broken continuous lines) and circles can be created on the Support Tool for display on the PT. When using RS-232C or RS-422 communications, coordinates can also be designated through commands from the host in terminal mode.

Display positions for graphics can be designated at dot increments and can overlap characters on the display. When they overlap, graphics are displayed on top of characters.

Either continuous lines (called polylines) or circles can be designated. Line widths are 1 dot for either.

4-3 Normal Screen Changes

The displayed screen can be changed to another screen by designating the screen number from the host (a Programmable Controller or personal computer). The designated screen must have already been created at the Support Tool and downloaded to the NT20M.

4-3-1 Procedure for Changing Screens

1, 2, 3...

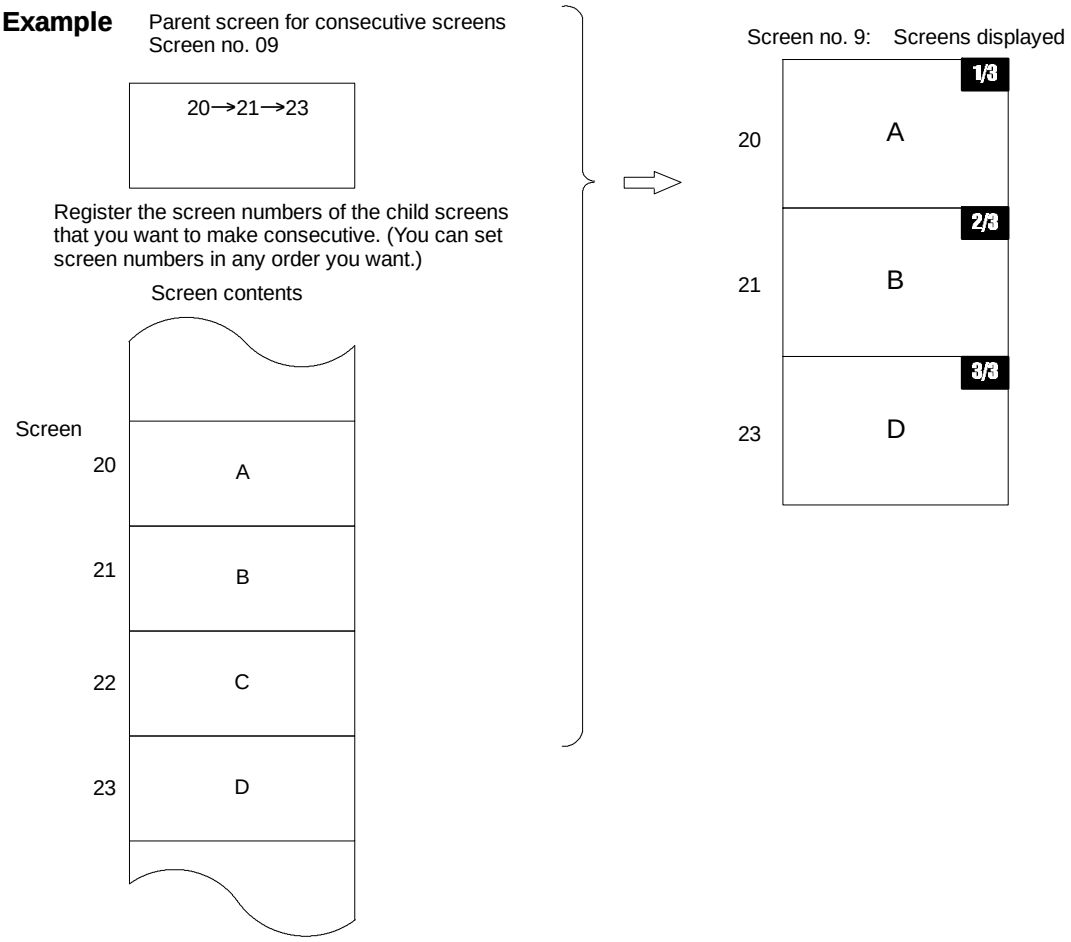
1. By designating a screen number (0 to 250) from the host, you can switch to the designated screen.
2. When an ordinary screen is displayed, the screens cannot be changed by means of the Up and Down Keys on the front panel of the NT20M.
3. For details on screen-changing procedures for each interface, refer to the *Host Interface Unit Operation Manual*.

Note Screen no. 0 is white with no characters.

4-4 Continuous Screens

Screens can be linked to display consecutively, without breaks. A maximum of eight screens can be made consecutive, and treated as one screen.

Example



1, 2, 3...

1. If screen 09 is designated from the host, screen 20 is displayed first.
2. Screens B and D will be displayed in order, either by line or screen scroll when the Down Key is pressed, depending on the scroll unit setting.

- With line scroll, pressing the Down or Up Key will scroll eight dots at a time.
- With screen scroll, one screen will be scrolled at a time.
- Line and screen scroll are designated by the Support Tool when registering continuous screens. Screens with variable character string displays, numeric displays, graph displays, touch switches, lamps, or numeric settings cannot be scrolled by line.

Note The parent screens (screen no. 09 in this case) cannot have screen data. They can be treated only as parent screens.

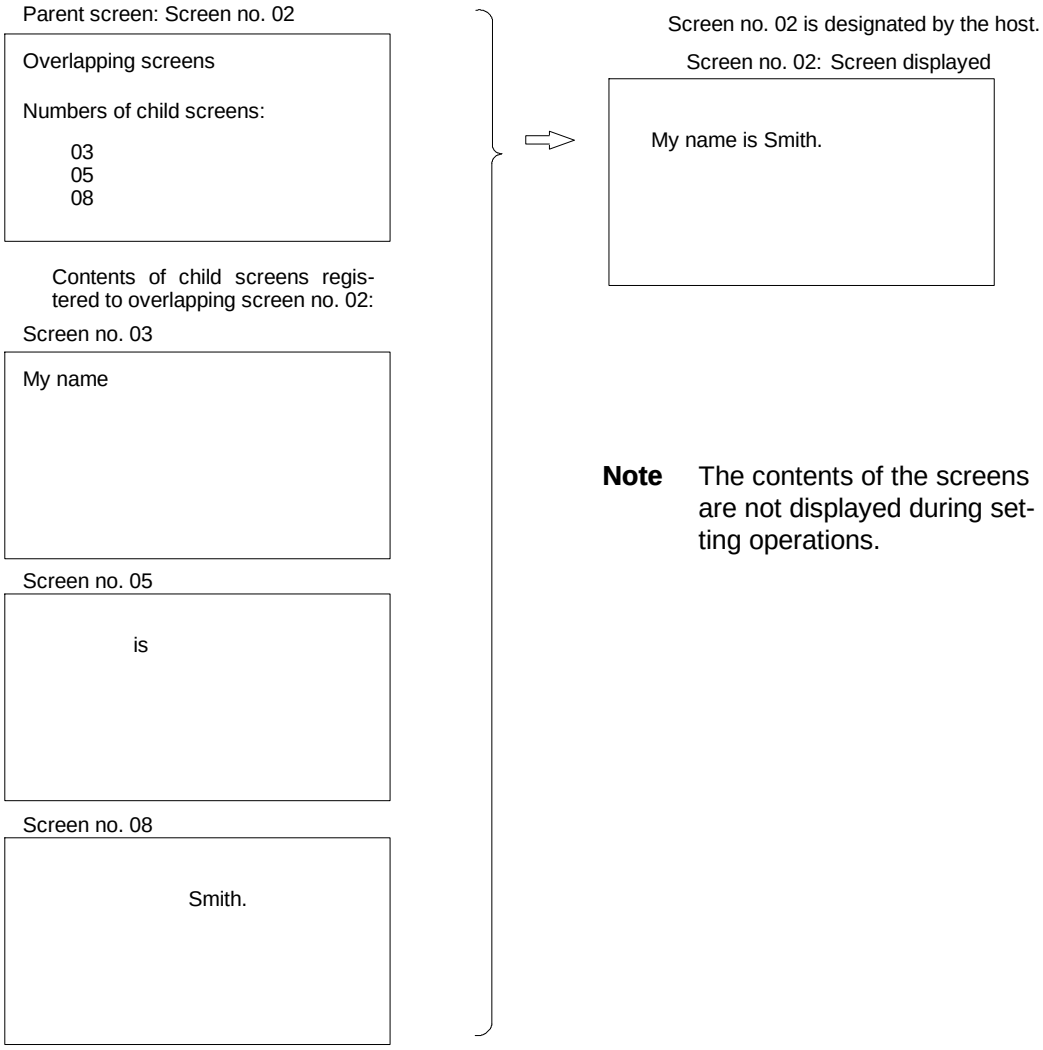
4-5 Overlapping Screens

The contents of multiple screens can be laid one on top of another and registered as one screen, when the screens are created on the Support Tool. Just as with ordinary screens, if the number of a screen registered as an overlapping screen is designated from the host, then the overlapping screens corresponding to that number are displayed.

- A maximum of eight screens may be overlapped.
- Screens with touch switches, lamps, graphs, character strings, and numeric displays can be overlapped. Screens with numeric settings, however, cannot be overlapped with screens with touch switches, lamps, or graphs.

- Parent screens of overlapping screens cannot be set for continuous screens.

Example If screen 02 is designated from the host, then screens 03, 05, and 08 are displayed.



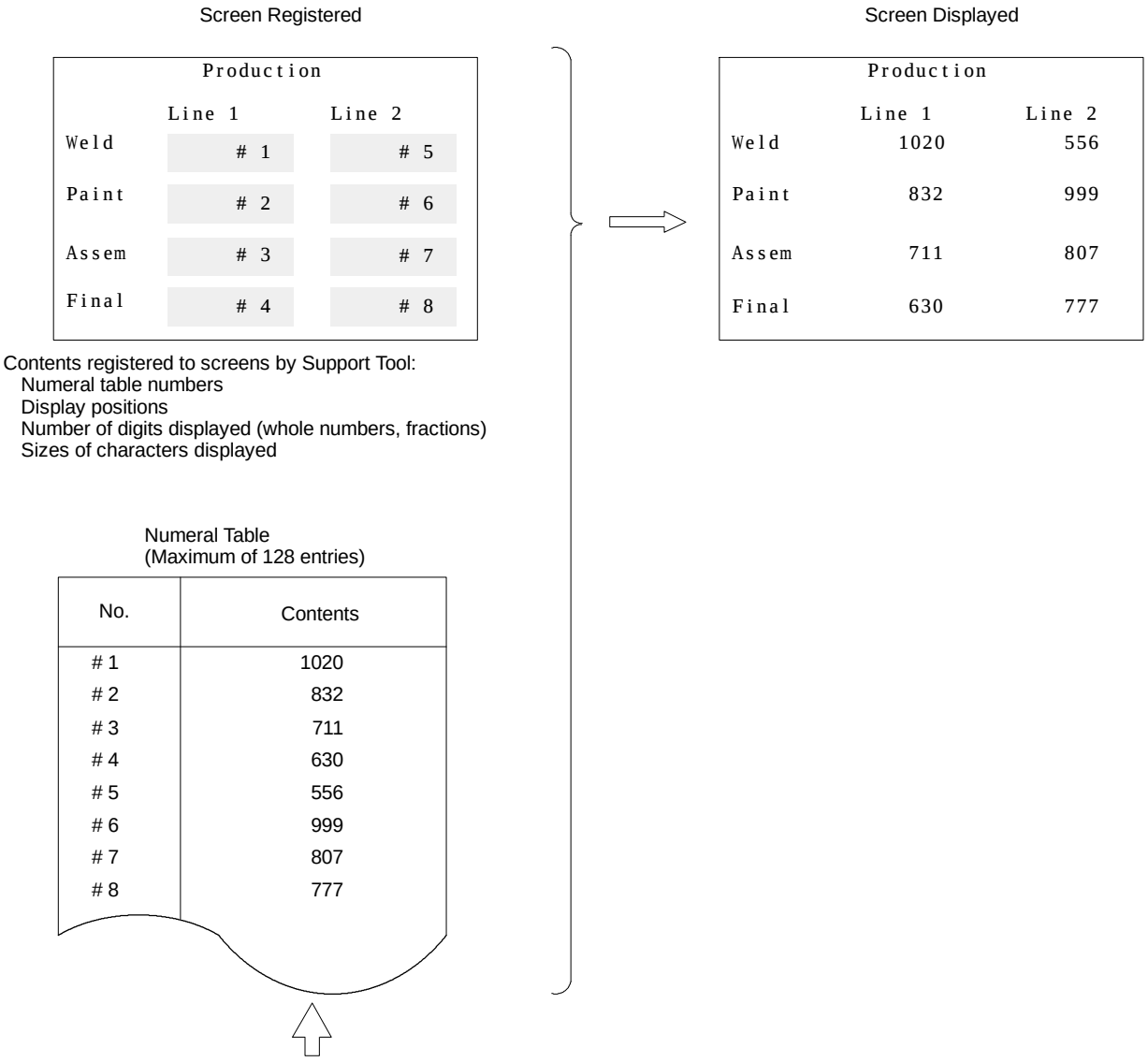
Note The contents of the screens are not displayed during setting operations.

Note The parent screens (screen 02 in this case) cannot have screen data. They can be treated only as parent screens.

4-6 Numeric Displays

A numeral table is stored in the NT20M, and you can display numeric values from the table at programmed positions on a screen. In addition, the values in the table can be transferred from the host so that they are renewed each time a new value is transferred. The display positions are set in advance with the Support Tool.

Example



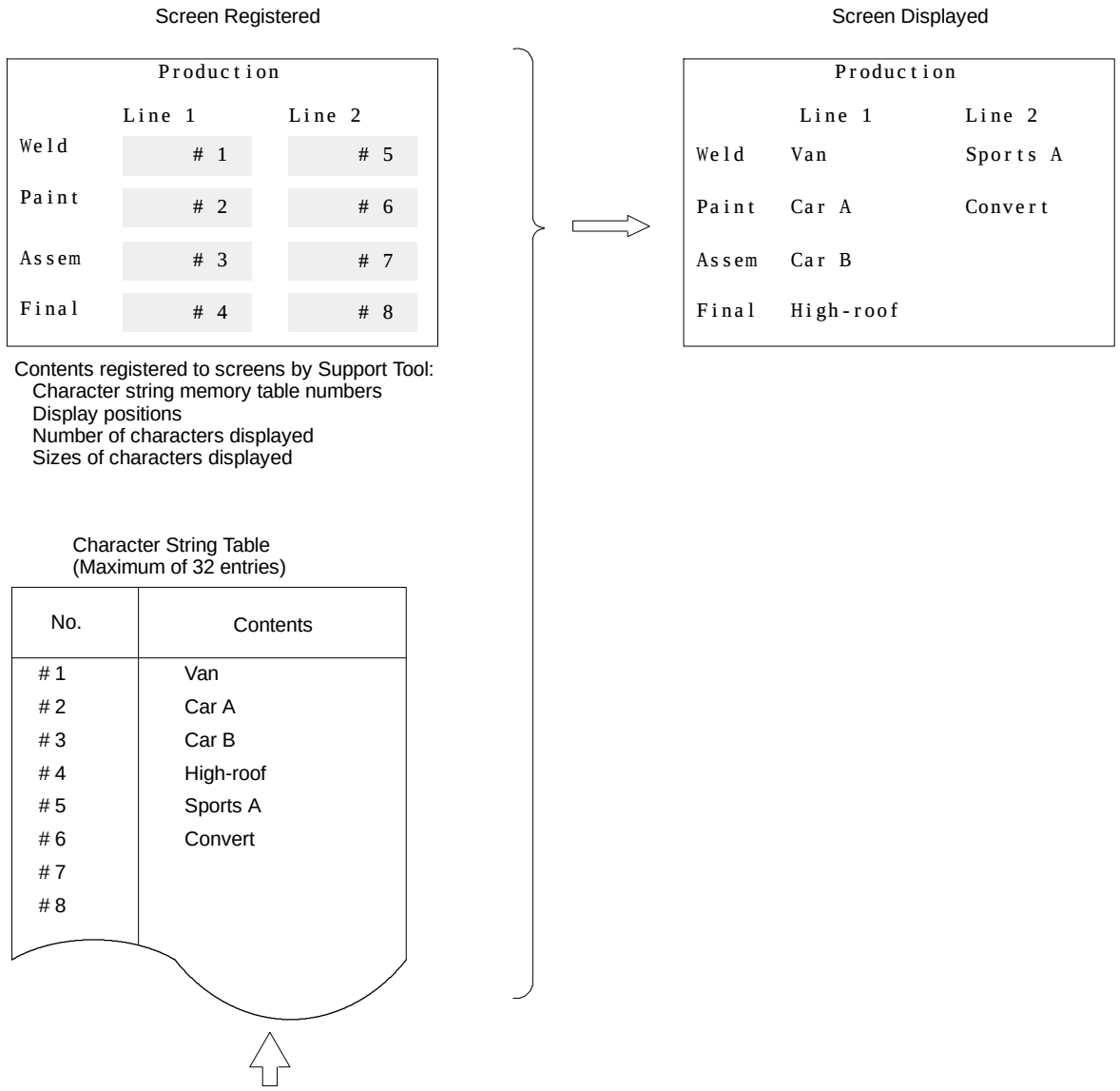
These contents are transmitted from the host.

When the PC is used as the host, for example, these values will be transferred via the Host Interface Unit and updated on screen when the contents of the DM Area are changed.

4-7 Character Strings

This function displays variable character strings on the screen. These character strings can be changed with transmissions from the host. A character string memory table is stored in the NT20M. By changing, from the host, the memory table values corresponding to the display position, you can update the characters displayed. The designation of the display positions is set in advance at the Support Tool.

Example



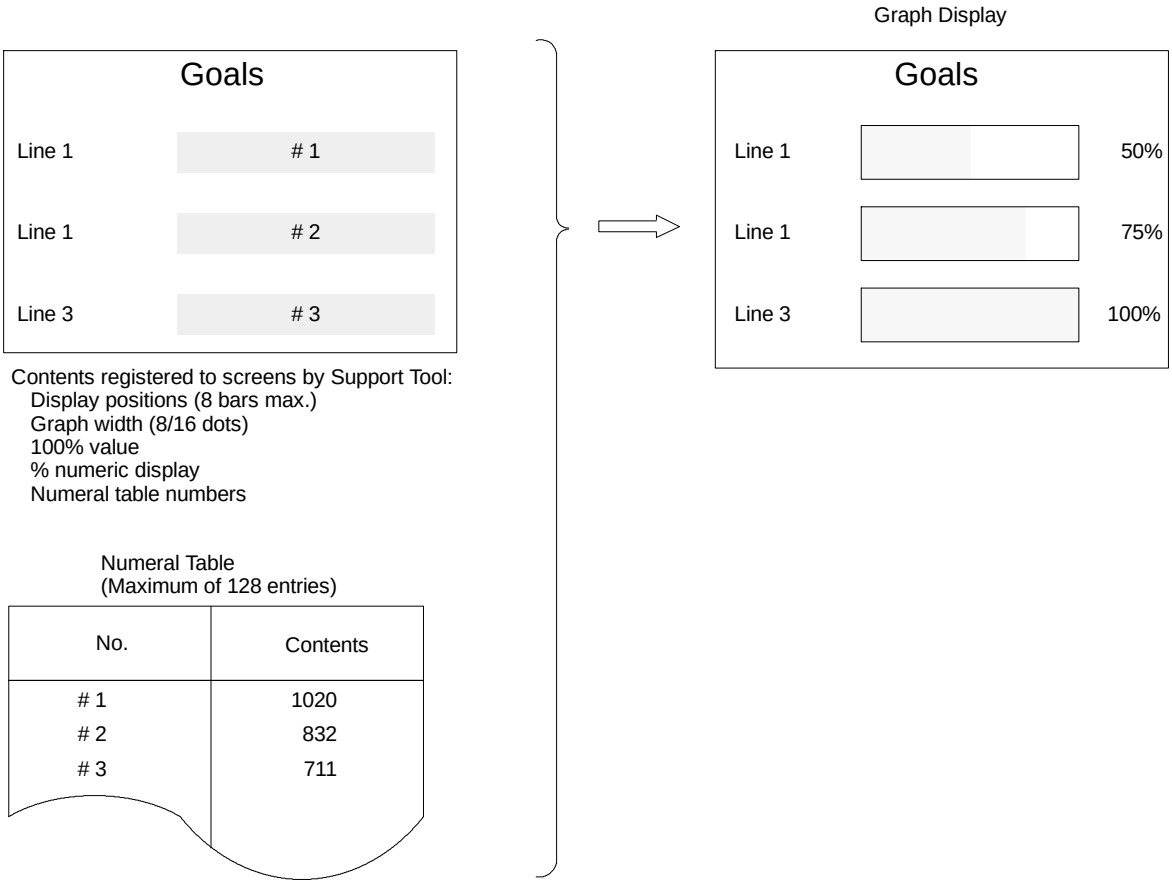
These contents are transmitted from the host.

When the PC is used as the host, for example, these values will be transferred via the Host Interface Unit and updated on screen when the contents of the DM Area are changed.

4-8 Bar Graphs

If, in advance, you input the numeric values you want to make into a bar graph a numeral table, then you can display that graph simply by designating the screen on which the graph is registered. Just as with numeric displays, the graph display is also updated when the contents of the numeral table are updated.

Example



4-9 Lamps

On the Support Tool you can set lamp areas in the display screen, and the lamps will light (or blink) by means of a designation from the host. Lamps are registered in advance at the Support Tool.

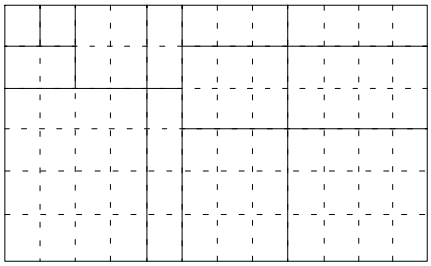
Display position:	Can be set as desired, but must match the switch frames when combining lamps with the switch function.
Size:	Can be freely set with a rectangular box.
Number of settings:	The total number of lamps must not be greater than 32 per screen.

Lamps set from the host can be turned on and off by either of two methods: number designation or bit designation. For details, refer to the *Host Interface Unit Operation Manual*.

Note Bit designation is possible with Host Interface Units NT20M-LK203-EV1 and NT20M-RT121-EV1.

Example 1: Usage with Switch Frames

If using a lamp together with a switch, then set the lamp within the switch frames, of which there are 12 horizontal and 6 vertical.



Example 2: Emphasis

The display of the number defective can be emphasized setting it to blink.

Goal	1234
Complete	600
Defective	2

4-10 Special Controls

The status of the NT20M to be controlled from the host during operation.

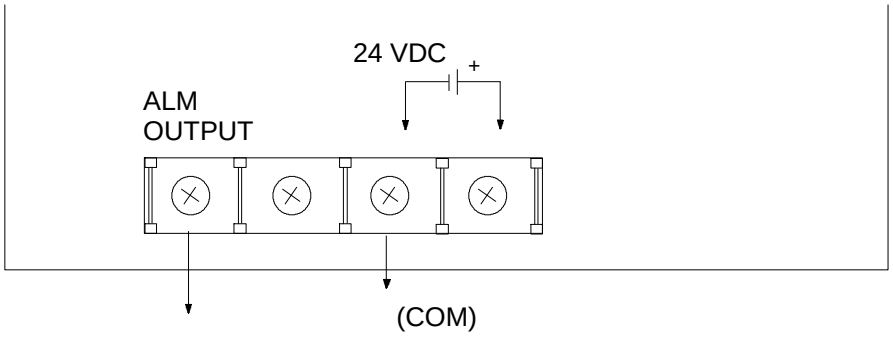
4-10-1 Backlight On/Off

In order to prolong the life of the backlight, the backlight can be set to turn off when it is not needed during operation.

Note If there is any key input or transmission while the backlight is off, the backlight will turn on again.

4-10-2 Alarm Output On/Off

The ALM OUTPUT terminal, located in the terminal block on the rear panel of the NT20M, can be turned ON and OFF from the host. The ALM OUTPUT terminal is turned ON and OFF when a screen registered for an alarm is displayed, and also when there is an NT20M error.



4-10-3 Buzzer On/Off

The built-in buzzer can be turned on and off from the host. There are two types of buzzers, continuous and intermittent. The buzzer also sounds when a screen registered with the buzzer is displayed. The buzzer stops when the Buzzer Key is pressed.

Continuous buzzer	———————————————	(Continuous sound)
Intermittent buzzer	———— ———— ————	(Intermittent sound)

4-10-4 Display History Clear

History data in the NT20M can be cleared (initialize) by the host. Until this operation is executed, history data continues to be registered.

4-10-5 Terminal Function

This function allows you the option of displaying, by transmission on command, the codes (coordinates, type, etc.) of characters and figures you want to display from the host, in addition to screens registered in advance. This function is possible only when the Host Interface Unit is the NT20M-LK201-EV1 or the NT20M-LK202-EV1. For details, refer to the terminal commands listed in the *Host Interface Unit Operation Manual*.

Item	Content
Display position	Optional
Character size	Normal, half-size, high, wide, 4x, 9x, or 16x
Display attributes	Normal, inverse, blinking, inverse blinking
Character designation	ASCII
Graphics	Polyline, circle

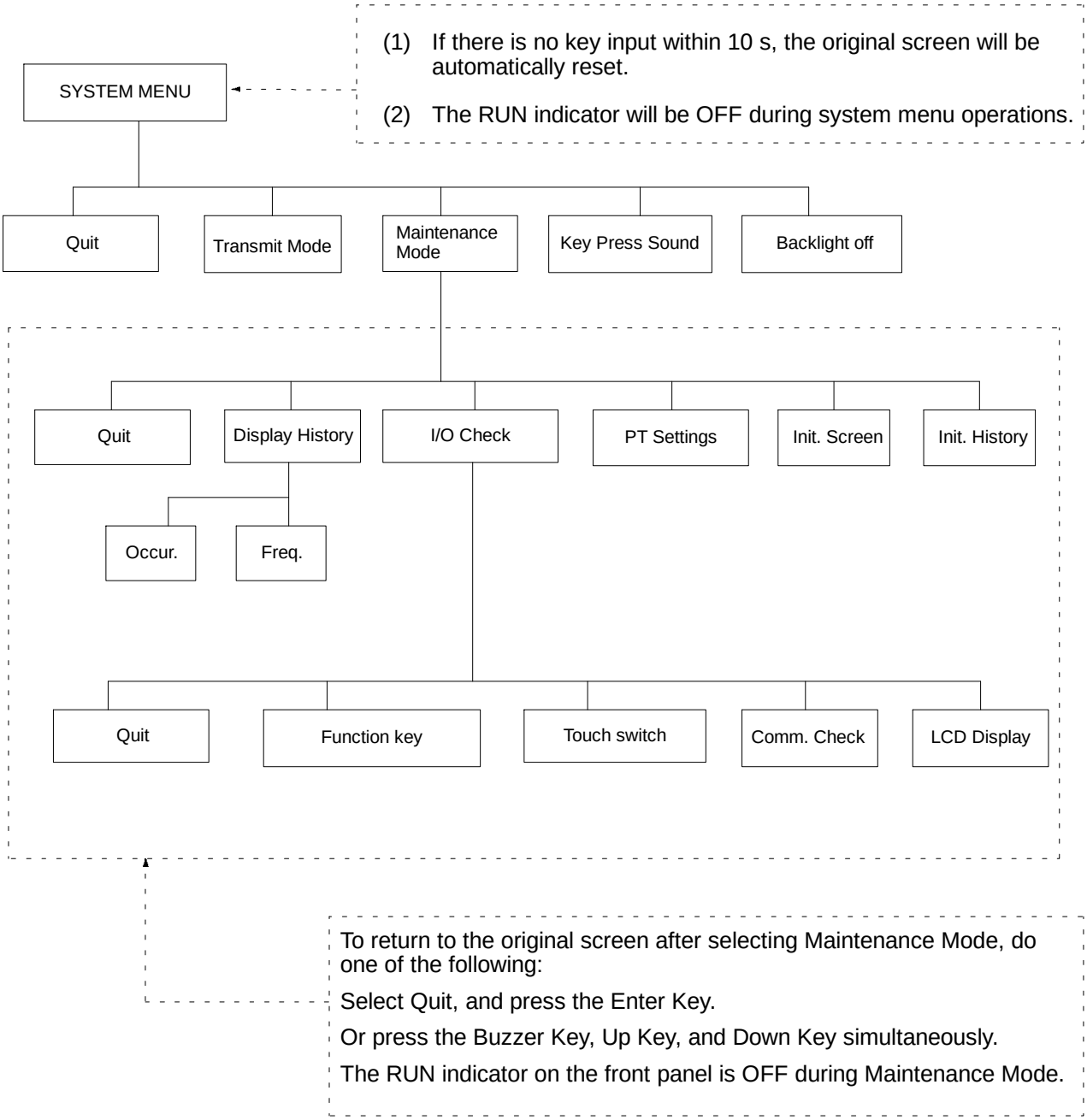
Note
1. If a displayed character string exceeds the line, that string is displayed beginning from the left side of the next line.
2. In addition, strings that do not fit at the bottom of the screen over-write from the left side of the same screen.

SECTION 6
System Menu

This section describes data transfer and maintenance functions. Functions used to create screens and control display attributes on the PT are described in *Section 4 Display Functions*. Functions used to input data on-screen are described in *Section 5 Input Functions*. Transferring screens online to and from the host computer is described in *Section 7 Online Transfer.*

6-1 Configuration of System Menu

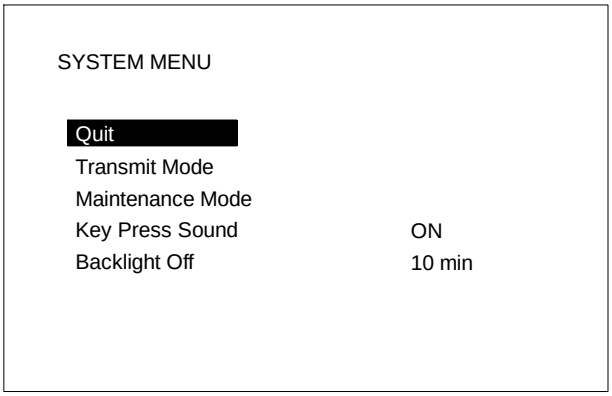
The system menu is used to set NT20M system parameters in advance and perform maintenance. With the system menu you can, in addition to determining the NT20M's status, check switch settings and perform simple I/O checks.



6-2 System Menu and Transmit Mode

6-2-1 Quit

The System Menu is called up by using the system keys during operation.



For details on key operation and content, refer to *3-1 Initialization*.

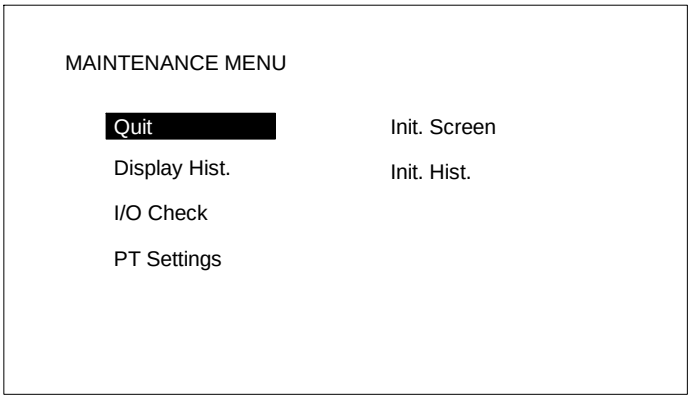
6-2-2 Transmit Mode

This mode is used to transfer data between the PT and the Support Tool.

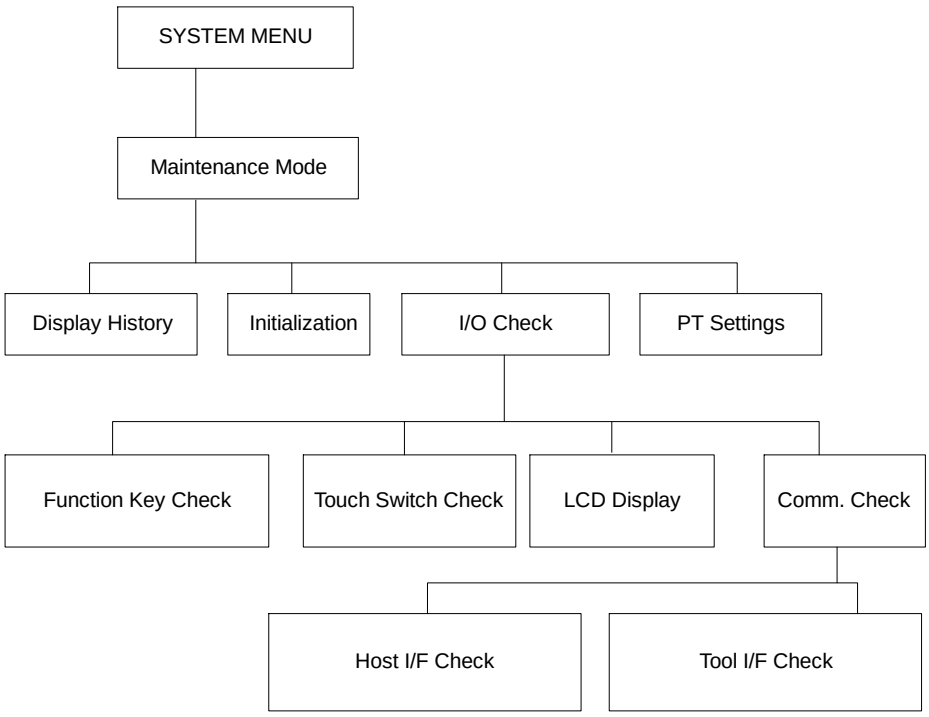
6-3 Maintenance Mode

When making initial settings or when there is an operating error, select Maintenance Mode and conduct all the checks.

Maintenance Mode Menu



Maintenance Mode Hierarchy



6-3-1 Display History

The NT20M saves into memory and can display the history of screens displayed during operation if the history attribute is set for them. The history can be displayed either in order of occurrence or in order of frequency. This function can be used to help identify the causes of malfunctions or to enable the operator to know which functions are often being used.

Setting History Data

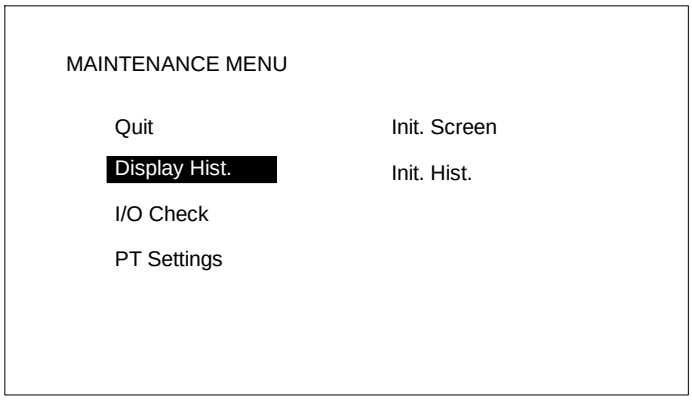
When creating screens with the Support Tool, use screen attribute designations to register history attributes and messages (within 24 characters) for the screens you want to save in the history.

Whenever the screen number registered for history attributes is designated by the host, the occurrence and message are saved in memory.

- The capacity of the history is 256 screens.
- The only things that can be recorded are screen numbers and messages. History record data is backed up by a battery, so, as long as the lithium battery is installed, the contents will be retained even when the power is turned off.
- Before beginning to record, initialize the history data by transmitting an Initialize History command from the host, or by selecting Init. Hist. from the Maintenance Mode.
- If the history data capacity is exceeded, newly occurring history data will not be saved.

Reading History Data

Enter Maintenance Mode from the System Menu.

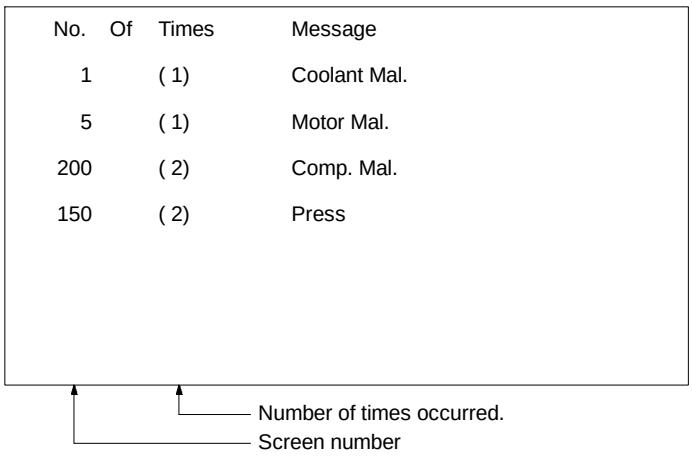


Move the bar cursor to History Record by pressing the Up and Down Keys. Then press the Enter Key.

Select whether the history is to be displayed in order of occurrence or in order of frequency. First move the bar cursor to your selection by means of the Up and Down Keys, and then press the Enter Key.

Order of Occurrence

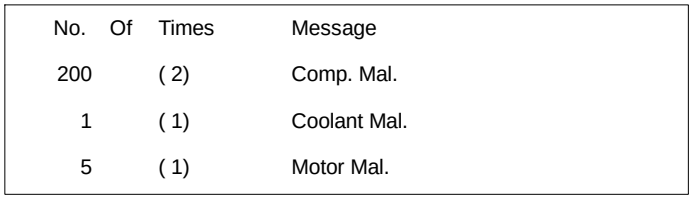
Record data is displayed in order of occurrence.



- If not all of the record data shows on the screen, then use the Down Key to scroll down.
- To return to RUN mode, press the Buzzer Key, Up Key, and Down Key simultaneously.

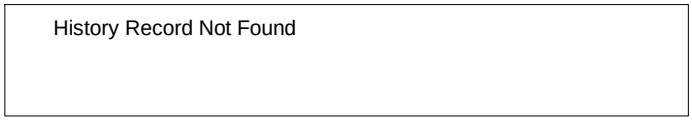
Order of Frequency

Record data is displayed in order of frequency.



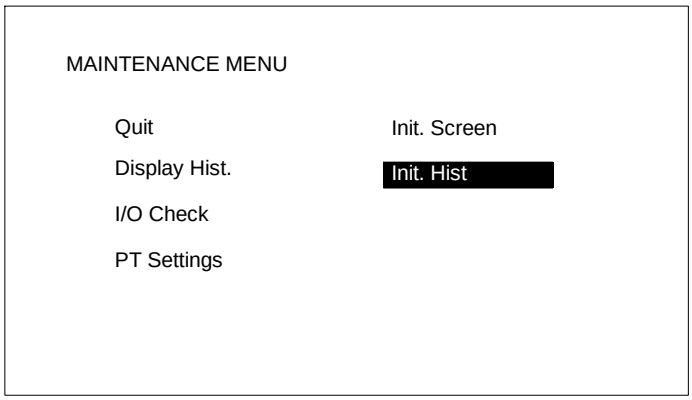
When different messages occur with the same frequency, they are displayed in order beginning with the lowest screen number.

When there is no display data, the following message will be displayed (for both order of occurrence and order of frequency).



Initializing History Data

If you select Init. Hist. from the Maintenance Mode menu, the history data which is currently recorded will be deleted. Select Maintenance Mode from the System Menu. The Maintenance Mode Menu will be displayed.

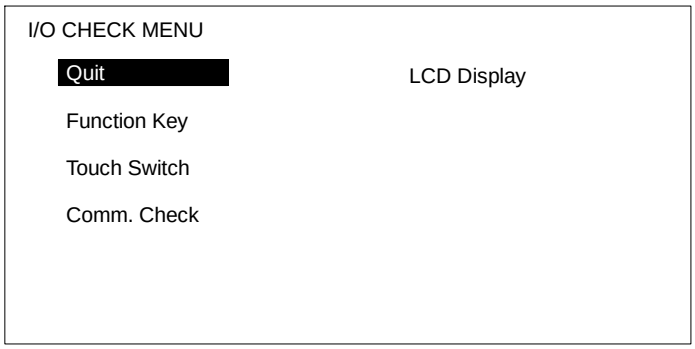


Move the bar cursor to Init. Hist. by pressing the Up and Down Keys. Then press the Enter Key.

Select whether or not the history will be initialized. If you select Yes, then initialization will be executed. All recorded history will be deleted. If you select No, then operation will commence without initialization.

6-3-2 I/O Checks

In the Maintenance Mode Menu, use the Up and Down Keys to move the bar cursor to I/O Check. When you then press the Enter Key, the following menu will be displayed.



Move the bar cursor to the item you want to check, and then press the Enter Key.

Function Key Check

This check is valid only for the NT20M-DF12_-V1.

F1	F2	F3	F4	F5	F6	F7	F8
F9	F10	F11	F12	F13	F14	F15	F16
F17	F18	F19	F20	F21	F22	F23	F24
F25	F26	F27	F28	F29	F30	F31	F32
F33	F34	F35	F36	F37	F38	F39	F40
F41	F42	F43	F44	F45	F46	F47	F48
F49	F50	F51	F52	F53	F54	F55	F56
F57	F58	F59	F60	F61	F62	F63	F64

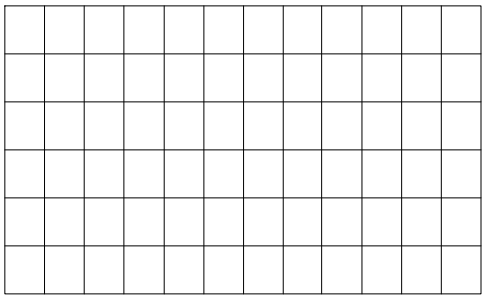
The operation of the function keys can be checked. Press a function key. If the number of that key is displayed in reverse video on the screen, then it is operating properly. Key numbers are not transmitted to the host during the check operation.

The NT20M-DF12_-V1 has 12 standard function keys, so you can use F1 to F12.

To return to the I/O Check Menu, press the Buzzer Key, Up Key, and Down Key simultaneously.

Touch Switch Check

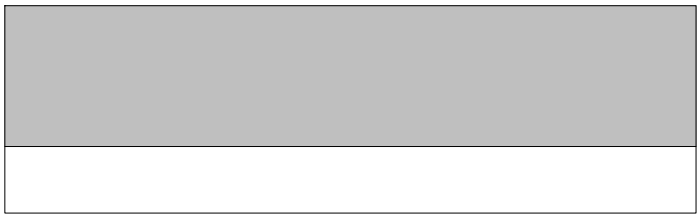
This check is valid only for the NT20M-DT12_-V1.



The operation of the touch switches can be checked. Press each switch displayed on the screen. If the switch that has been pressed is displayed for approximately 0.5 s in reverse video on the screen, then it is operating properly. Switch numbers are not transmitted to the host during the check operation.

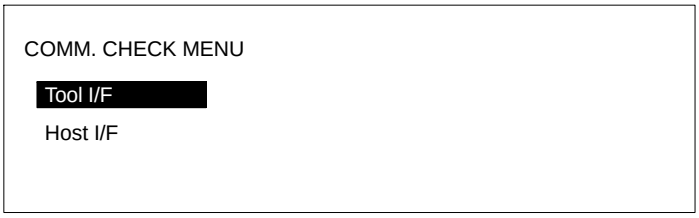
To return to the I/O Check Menu, press the Buzzer Key, Up Key, and Down Key simultaneously.

LCD Display Check



The lines of the display are reversed one at a time, starting from the top of the screen. When the reversal is finished, then they are cleared one at a time. When all of them have been cleared, the I/O Check Menu is returned to. You can interrupt the check and return to the I/O Check Menu by pressing the Buzzer Key, Up Key, and Down Key simultaneously while the check is in progress.

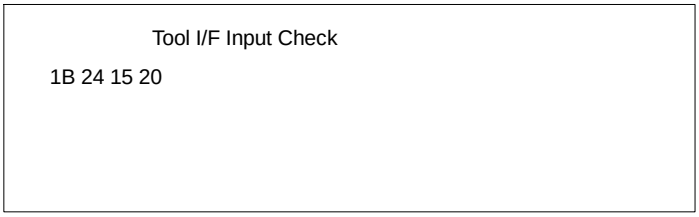
Communications Check



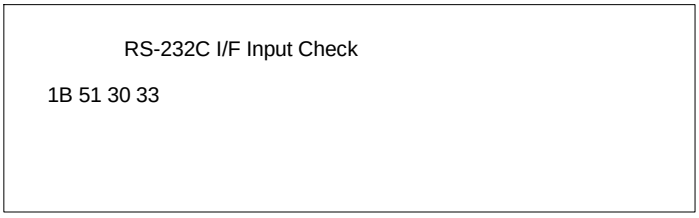
If you select Communications Check, the Communications Check Menu will be displayed. Use the Up and Down Keys to move the bar cursor to the item you want to check, and then press the Enter Key.

Tool Interface

Data transmitted from the Support Tool is displayed in hexadecimal.



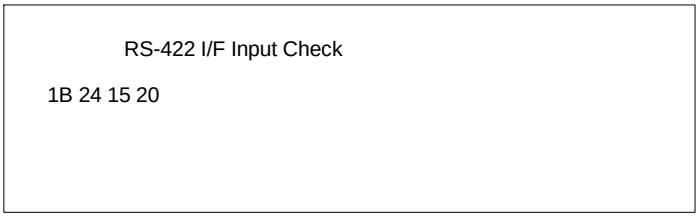
Host Interface Units with RS-232C Specifications (NT20M-LK201-EV1)



Data which is received will be displayed in hexadecimal.

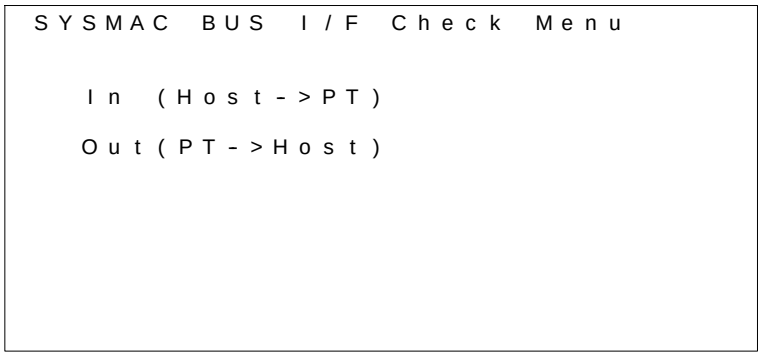
For details on other Host Interface Unit models, refer to the *Host Interface Unit Operation Manual*.

Host Interface Units with RS-422 Specifications (NT20M-LK202-EV1)



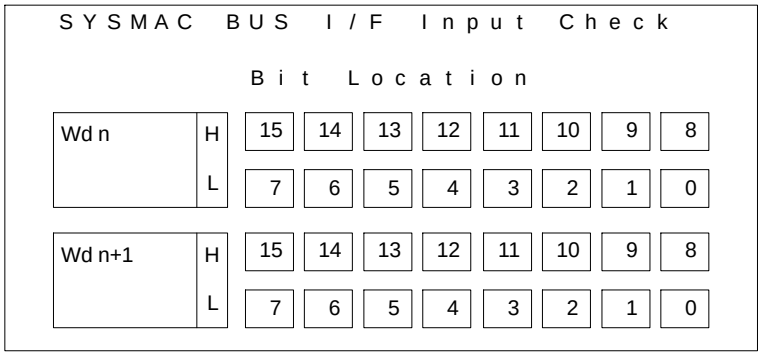
Data which is received will be displayed just as it is, in hexadecimal.

Wired SYSMAC BUS Host Interface Units (NT20M-RT121-EV1)

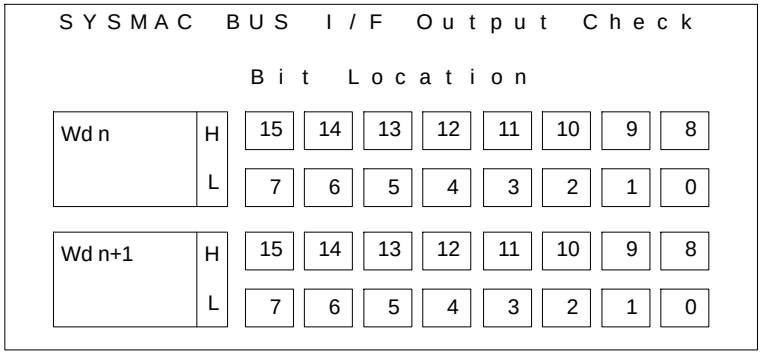


Wired SYSMAC BUS Host Interface Units have input and output checks as shown below.

Input Check
When an input turns ON, the corresponding lamp will be displayed in reverse video on the display shown below.



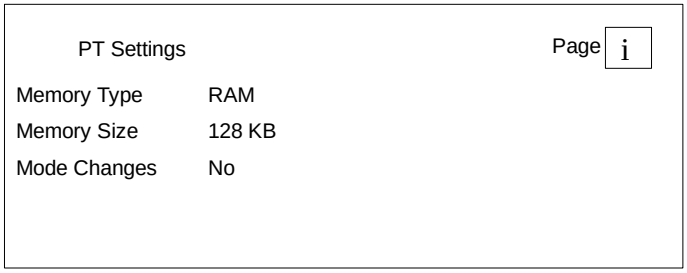
Output Check
When a lamp is displayed in reverse video, the corresponding output will turn ON. The Up and Down Keys can be use to change the output.



6-3-3 PT Settings Check

The status of the NT20M and Host Interface Unit can be displayed, as well as the settings of switches. There are two screens, and you can scroll up and down with the Up and Down Keys. You can return to normal operation by pressing the Buzzer Key, Up Key, and Down Key simultaneously.

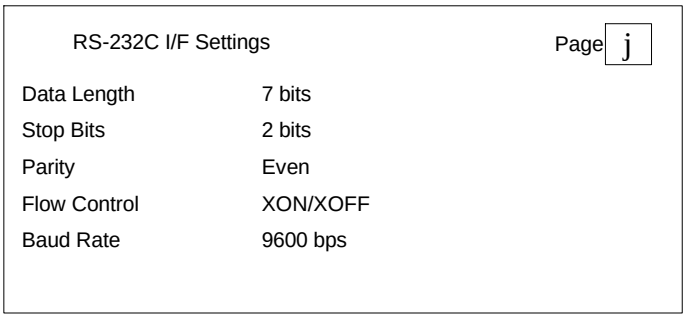
Internal Settings This displays the system status of the NT20M.



Note Memory type and memory size are displayed only when the screen data memory has been initialized. If it has not been initialized, then “N.A.” is displayed.

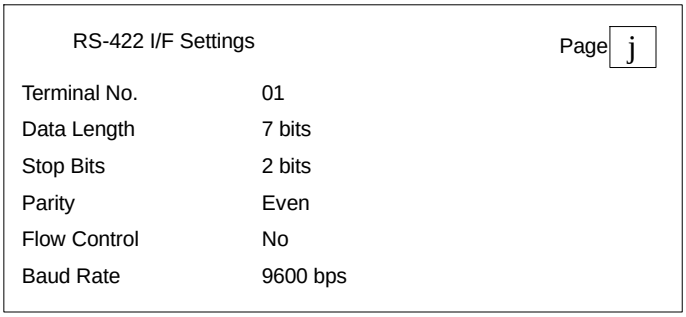
Host Interface Unit Settings The switch settings on the Host Interface Unit are displayed.

RS-232C Host Link Units (NT20M-LK201-EV1)

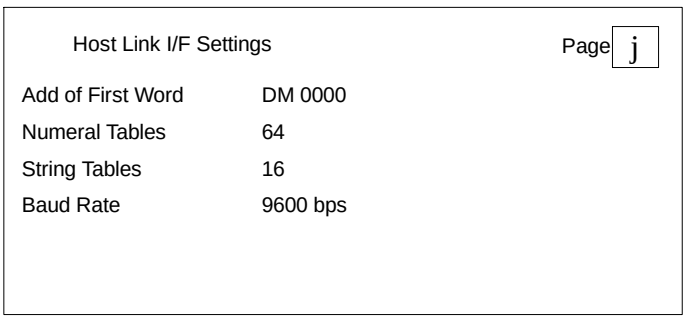


For details on other Host Interface Unit models, refer to the *Host Interface Unit Operation Manual*.

RS-422 Host Interface Units (NT20M-LK202-EV1)

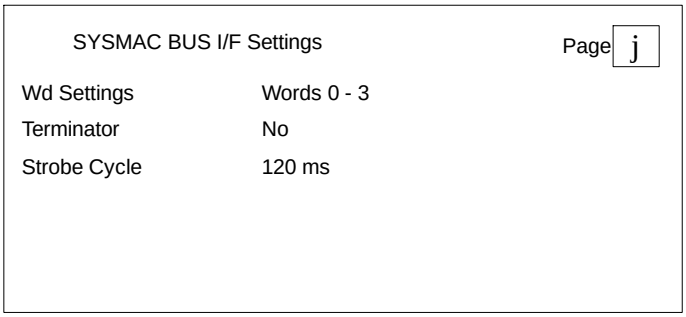


SYSMAC WAY Host Interface Units (NT20M-LK203-EV1)



Note In the above messages, “Numeral Tables” and “String Tables” indicate the size of the table, i.e., the number of items in the table.

Wired SYSMAC BUS Host Interface Units (NT20M-RT121-EV1)

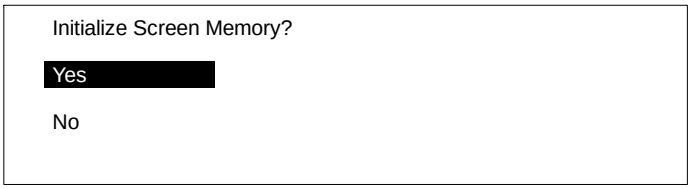


6-3-4 Initialization

You must initialize the internal memory when using the Terminal for the first time. Initialize, in addition, when you want to clear all of the data already registered in the NT20M.

Initializing Screen Memory

If you select Init. Screen in Maintenance Mode, the following screen will be displayed.



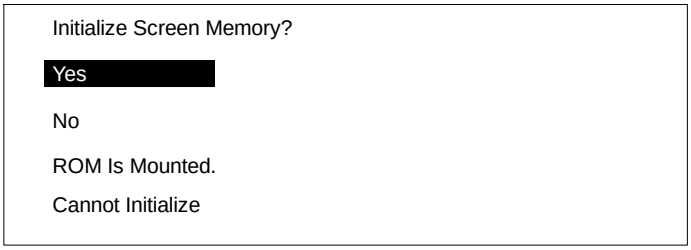
If you select Yes, then initialization will be executed and all screen data will be deleted. Operation will commence after initialization.

If you select No, then operation will commence without initialization.

When RUN Mode is entered after initialization, nothing will be displayed and a command from the host will be awaited.

Initialization Errors

If the screen memory is EPROM, an error will occur and the following message will be displayed.



Initializing Display History

If you select Init. History in Maintenance Mode, the following screen will be displayed.

If you select Yes, then initialization will be executed and history data will be deleted. If you select No, then operation will commence without initialization.

SECTION 7
Online Transfer

This section describes transferring screens online to and from the host computer. Functions used to create screens and control display attributes on the PT are described in *Section 4 Display Functions*. Functions used to input data on-screen are described in *Section 5 Input Functions*. Data transfer and maintenance functions are described in *Section 6 System Menu*.

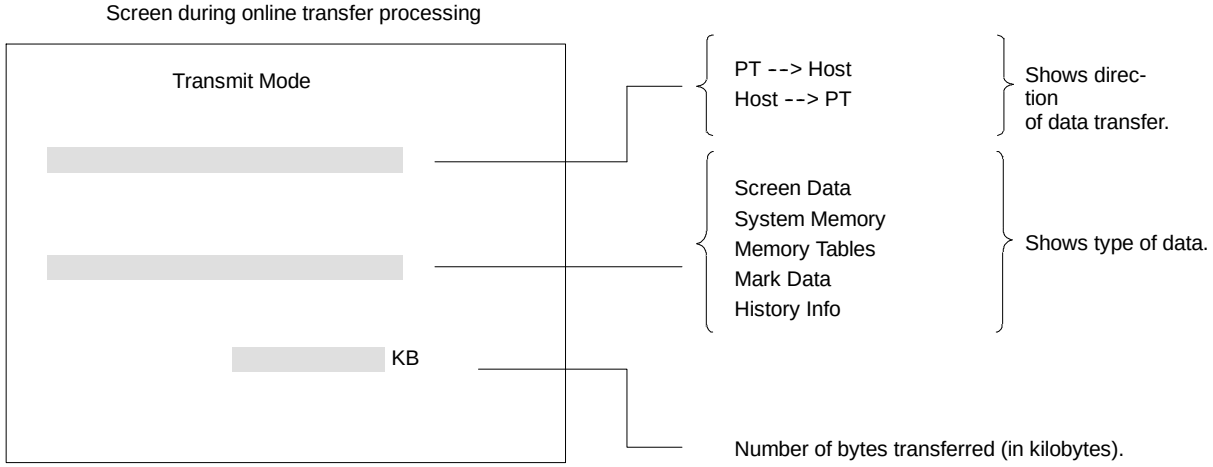
Screen data can be transmitted online (i.e., in RUN Mode) by means of a Host Interface Unit command. For details on commands, refer information on online transfers in the Host Interface Unit Operation Manual. This function is valid only for the NT20M-LK201-EV1 and the NT20M-LK202-EV1.

7-1 Host to PT

- Screen data can be transferred along with screen numbers. Set the desired screen number. If you set a screen number which is identical with one already registered in the NT20M, then the screen data for that number will be overwritten.
- In addition to screen data, you can transfer memory tables and marks.

7-2 PT to Host

- Screen data can be transferred along with screen numbers. Set the desired screen number. You can make a setting to transfer all screens or a screen of your choice.
- In addition to screen data, you can transfer memory tables, marks, and history.



Note Online transfer cannot be employed when screen memory is EPROM.

SECTION 8
Maintenance and Inspection

8-1 Checking Operation

The hardware status of the NT20M can be checked with the Maintenance Menu. Symptoms and corrective measures for errors that cannot be checked are shown in the table below.

Symptom	Probable cause	Corrective measures, processing
POWER indicator does not light.	Power is not being input, or power supply is connected in inverse.	Provide a power supply with a rated voltage of 24 VDC. Do not reverse polarity.
	A fuse is blown.	Contact your OMRON representative.
Screen does not display.	Host Interface Unit is not connected.	Connect a Host Interface Unit.
	The memory installed in the NT20M-DT121-V1 or NT20M-DF121-V1 does not match the settings of SW2 and SW3, or no memory chip is installed.	Install a memory chip in socket and set switches correctly.
	If the Host Interface Unit is an NT20M-LK201-EV1 or an NT20M-LK203-EV1, then the settings of pin 8 of SW1 is incorrect.	For NT20M-LK201-EV1, turn OFF pin 8 of SW1 to; for NT20M-LK203-EV1, turn ON pin 8 of SW1.
Cannot communicate with Support Tool.	PT is not in Transmit Mode.	Select Transmit Mode from the System Menu.
	There is a faulty connection with the Support Tool.	Check connecting cables.
Cannot communicate using Host Interface Unit (serial communications)	Switch settings are not correct.	Check PT settings under the Maintenance Mode and be sure that settings match the host settings.
	Host Interface Unit connections are faulty.	Check wiring of connecting cables. Use shielded wire. Check whether the cables are within the maximum lengths.
	For the NT20M-LK202-EV1, terminator settings are not correct.	When using RS-422 communications, specify only the last Terminal from the host as the terminator (turn on termination resistance on the last Terminal only).
Host errors are not displayed properly.	Pin 3 of SW1 is off or screen memory has not been initialized.	Make sure pin 3 of SW1 is on and initialize screen memory.
Screens are not displayed properly.	Pin 3 of SW1 is off.	Turn on pin 3 of SW1 and press the reset button or turn power off and on.

8-2 Changing the Lithium Backup Battery

A lithium battery is used in the NT20M. If the BAT LOW indicator on the front panel lights, replace the battery within ten days.

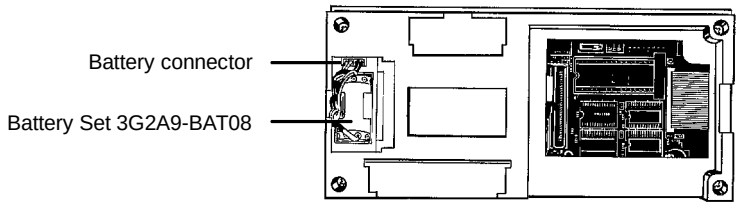
Battery model	3G2A9-BAT08
Battery backup time	5 years at 25%C.
Replacement time	Within 5 minutes from the time power is turned off.

Note The battery can also be replaced while the power is on. If you do it that way, then there is no need to replace the battery within five minutes, but you must exercise care in handling.

Replacing the Battery

1, 2, 3...

1. Turn the power off. If the power has not been on, turn it on for at least one minute and then turn it off again before replacing the battery.
2. Take off the switch cover on the back of the Terminal.
3. Remove the battery from the connector and put in a new battery. Be sure that the connector is straight when inserted.



4. Replace the cover.

Caution The lithium battery can explode if placed into a fire, or it can explode, burn, or leak if the + and – terminals are short-circuited or if the battery is recharged or dismantled. Handle the battery with care.

8-3 Maintenance and Inspection

8-3-1 Spare Terminals

In order to restore operations as quickly as possible in the event of a NT20M breakdown, it is a good idea to always keep a spare Terminal on hand.

8-3-2 Inspection

If the NT20M screen gets dirty, it will become hard to read. Be careful of the following points when cleaning it.

- When cleaning, wipe with a dry, soft cloth. If the dirt does not come off, then moisten the rag with water and rub hard.
- Wiping with a chemical cloth or with volatile solutions such as benzine or thinner may cause degeneration. A little alcohol may be used if necessary.
- Prolonged contact with rubber, vinyl products, or tape may leave marks.
- The PT's liquid crystal display and backlight can wear out. If they become hard to see, replace the Terminal.
- The standard inspection period is once every 6 to 12 months, but it should be moved up if the operating environment is harsh. If there is any deviation from the criterion, then it should be corrected.

Inspection item	Inspection content	Criterion	Method/tools
Power supply	Measure at the power supply terminal block. Are voltage fluctuations within the criterion?	Voltage fluctuation range: 20.4 to 26.4 VDC	Tester
Operating environment	Is the ambient temperature (the temperature inside of the panel) suitable?	0% to 45%C	Thermometer
	Is the ambient humidity (the humidity inside of the panel) suitable?	35% to 85% There should be no condensation.	Hydroscope
	Is dust collecting?	There should be no dust.	Visual
Installation	Is each Terminal firmly secured?	There should be no loose screws.	Phillips screwdriver
	Are the connectors for the connecting cable inserted perfectly and locked?	There should be no loose screws.	---
	Are any screws for the external wiring coming loose?	There should be no loose screws.	Phillips screwdriver
	Is any external wiring loose or disconnected?	There should be no external abnormalities.	Visual
Replaceable parts	Can you read the characters on the liquid crystal display? Is the backlight illumination as bright as it should be?	Average life expectancy of liquid crystal: 50,000 hrs Average life expectancy of backlight: 20,000 hrs	Visual

Precautions for Handling

- Turn off the power before replacing Terminals.
- When you discover a defective Terminal and replace it, check again to be sure that the problem was actually with the Terminal.
- When returning a defective Terminal for service, please describe the problem in as much detail as possible. Send the Terminal to the OMRON office closest to you.

Tools for Inspection

- Phillips and flat-blade screwdrivers
- Voltage tester or digital voltmeter
- Industrial alcohol and all-cotton cloth

Measuring Instruments (Depending on Case)

- Synchroscope
- Oscilloscope with pen output
- Thermometer
- Hydroscope

Appendix A
Standard Models

Host Interface Units

Select Host Interface Units from the table below according to the communications specifications of the host.

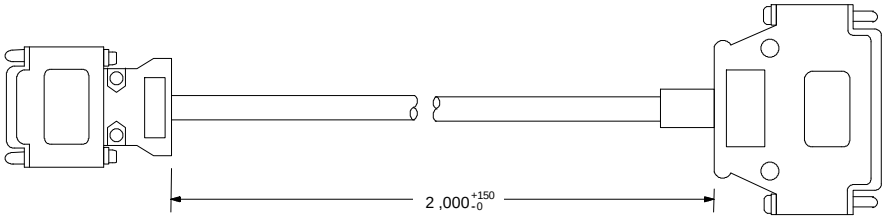
Name of Unit	Model	Remarks
RS-232C Host Interface Unit	NT20M-LK201-EV1	For RS-232C communications
RS-422 Host Interface Unit	NT20M-LK202-EV1	For RS-422 communications
SYSMAC WAY Host Interface Unit	NT20M-LK203-EV1	For Host Link Units
SYSMAC BUS Host Interface Unit	NT20M-RT121-EV1	For SYSMAC BUS Remote I/O Systems

Memory Chips

The memory chips that can be Installed in the socket are shown in the table below.

Type	Memory capacity	Model
SRAM	32K	HM62256ALP-15 (Hitachi) or equivalent.
	128K	HM628128LP-10 (Hitachi) or equivalent.
EPROM	64K	HN27C512G-20 (Hitachi) or equivalent.
	128K	HN27C101AG-12 (Hitachi) or equivalent.

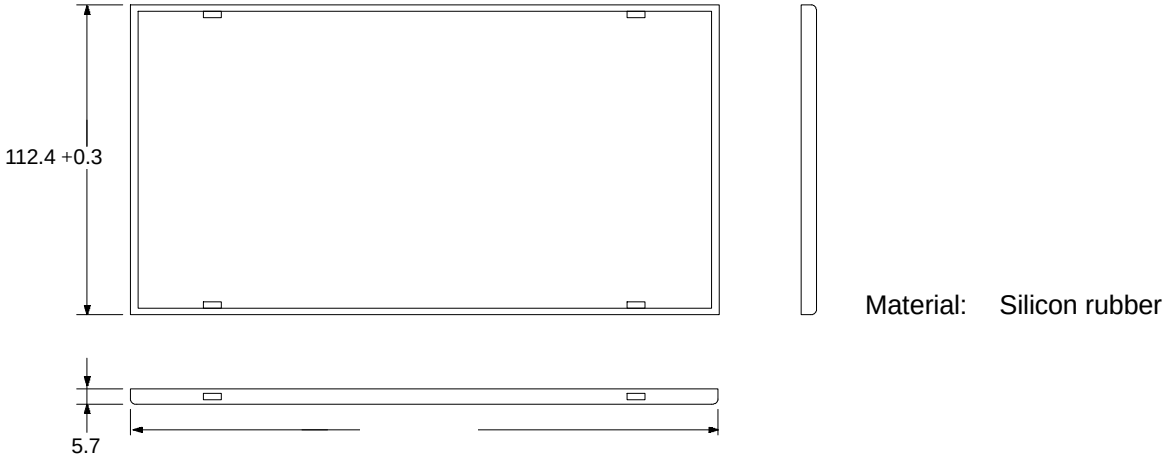
RS-232C Connecting Cable for Connecting Devices (CV500-CN228)



Note The personal computer end of the CV500-CN228 Connecting Cable is a 25-pin D-sub male connector. To connect to an IBM PC/AT or compatibles, a 9-pin or 25-pin D-sub female adapter is required.

Dustproof Cover

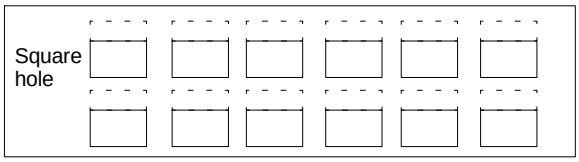
NT20M-KBA01 (for NT20M-DT12_-V1)
NT20M-KBA02 (for NT20M-DF12_-V1)
Under severe conditions, this cover can be used to protect the display area and controls from oil and dust.



NT20M-KBA01 dimensions (mm)

NT20M-DF121-V1 Key Sheets (Five Sheets)

Use these sheets for NT20M-DF12_-V1 function keys. By simply peeling them off of the paper, you can easily write on them and attach them. You can also rub off anything written with oil-base ink. If they get dirty, you can easily remove and replace them.



Appendix B
Specifications

General Specifications

Item	Specifications
Power supply voltage	24 VDC
Allowable power supply voltage range	20.4 to 26.4 VDC, (24 VDC $^{-15\%}/_{+10\%}$)
Power consumption	15 W max.
Noise resistance (24 VDC)	Common (between power supply and panel): 1,000 V_{P-P} Normal: 300 V_{P-P} Pulse width: 100 ns to 1 ms Pulse rise time: 1 ns
Vibration resistance	10 Hz to 20 Hz with 1.5-mm double amplitude in X, Y, and Z directions 22 Hz to 500 Hz (1.5 G) in X, Y, and Z directions for 30 min total
Shock resistance	20G 3 times each in X, Y, and Z directions
Ambient operating temperature	0% to 45%C (with no freezing)
Ambient operating humidity	35% to 85% (with no condensation.)
Operating environment	No corrosive gas
Storage temperature	–20% to 70%C (with no freezing)
Enclosure ratings	Front control panel IP52F (Drip-proof when dust cover is installed.) Rear case IP20 Terminal section IP00
Weight	NT20M-DT12_-V1: 1.2 kg NT20M-DF12_-V1:1.4 kg
Dimensions	NT20M-DT12_-V1: 220 x 110 x 82 (WxHxD) NT20M-DF12_-V1: 220 x 164 x 82 (WxHxD)

Characteristics

Display Specifications

Item	Specifications
Display screen	Dot matrix STN liquid crystal display panel No. of dots: 256 x 128 Effective display area: 112 mm x 56 mm Life expectancy: 50,000 hrs min. Backlight Cold-cathode tube Life expectancy: 10,000 hrs min. (20,000 hrs average) Automatic turn-off: Can be set to not turn off, or to turn off in 10 min or 1 hr
Indicators	Three indicators: POWER indicator (Green LED): Lit when power is being supplied. RUN indicator (Green LED): Lit during operation. BAT LOW indicator (Red LED): Lit when battery level drops.

Control Panel Specifications

Item	Specifications	
System keys	Four keys: buzzer-stop, up-scroll, down-scroll, execute (enter) Functions: System Menu selection, buzzer off, bar cursor movement, up/down scroll for continuous screens, execution of numeric settings	
Function keys (NT20M-DF12_-V1)	No. of keys: 12 Switch type Pressure-sensitive Key sheets are replaceable.	Input capacity: 64 points max. (special interface board required)
Touch panel (NT20M-DT12_-V1)	Maximum: 32 touch switches per screen Pressure-sensitive Operating force: 100 g max. Life expectancy: 1,000,000 operations min.	

Display Capacity

Item	Specifications
Display characters	Half-size characters (8 x 8 dots): Alphanumerics and symbols Normal characters (8 x 16 dots): Alphanumerics and symbols Marks (16 x 16 dots): User defined, 64 max.
Character size	Half-size characters: Approx. 3.5 x 3.5 mm Normal characters: Approx. 3.5 x 7 mm Marks: Approx. 7 x 7 mm
Number of characters displayed	Standard-size characters: Max. 32 characters horizontal x 8 vertical Wide characters: Max. 16 characters horizontal x 8 vertical
Enlargement function	Horizontal, vertical, 4 times, 9 times, 16 times
Display attributes	Inverse, blinking, inverse blinking
Character displays	Displays any characters (screen number designation).
Graphics	Polylines (broken continuous line) and circles
Terminal mode	Characters, numeric values, and graphic designated by the host are displayed (RS-232C or RS-422 interface required).
String displays	Maximum 32 total, 8 per screen and 32 bytes per string
Numeral displays	Maximum 128 total, 8 per screen
Bar graph display	8 or 16 dots at 8 places per screen % display capability
Overlapping screens	Overlapping of a maximum of 8 registered screens is possible.
Continuous screens	Scrolling the display for a maximum of 8 registered screens is possible.
No. of registered screens	250 max.
Screen registration method	Transfer to the PT data created at IBM PC/AT compatible, or mount EPROM chip containing data.
Screen saving method	Can be saved to SRAM (with backup battery) or EPROM.

Data Quantities

Item	Specifications
Mark data	64 max.
String data	32 characters (standard size characters) x 32 strings max.
Numeral data	8 digits x 128 values max.
Switches	Switches and lamps combined: 256 max.
Lamps	

Special Features

Item	Specifications
Alarm output	Relay output on rear terminal block. Rating: 1 A at 24 VDC Output condition: NO contact (Closes when there is a PT error or when there is a screen called with an alarm-ON specification.)
Host RUN input	Photocoupler input on rear terminal block. Rating 24 VDC $^{+10\%}/_{-15\%}$ When this input goes OFF, the PT will display “host error” regardless of other conditions.
Buzzers	Two types: Continuous sound and intermittent sound. ON: The buzzer will sound when a key input is made, when a command is received from the host, or when a screen with a buzzer-ON specification is called. OFF: The buzzer is turned OFF when the Buzzer Key is pressed, when a command is received from the host, or when a screen without a buzzer-ON specification is displayed.
Maintenance functions	Self-test for memory, switches, etc. Status setting confirmation for communications and other conditions. Simple communications confirmation.
Battery backup	Data backed up by lithium battery when screen data memory is SRAM. Data backup time: 5 years (at 25%C) If there is a voltage drop, the BAT LOW indicator on the front panel will light and the Battery Low Flag to the host will turn ON. The battery can be replaced from the rear of the Terminal while power is on.

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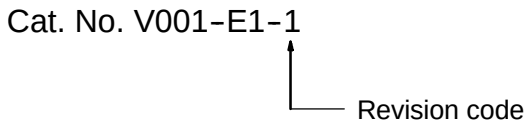
Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
1	November 1991	Original production