NT10S
Programmable Terminal

OPERATION MANUAL

OMRON

NT10S Programmable Terminal

Operation Manual

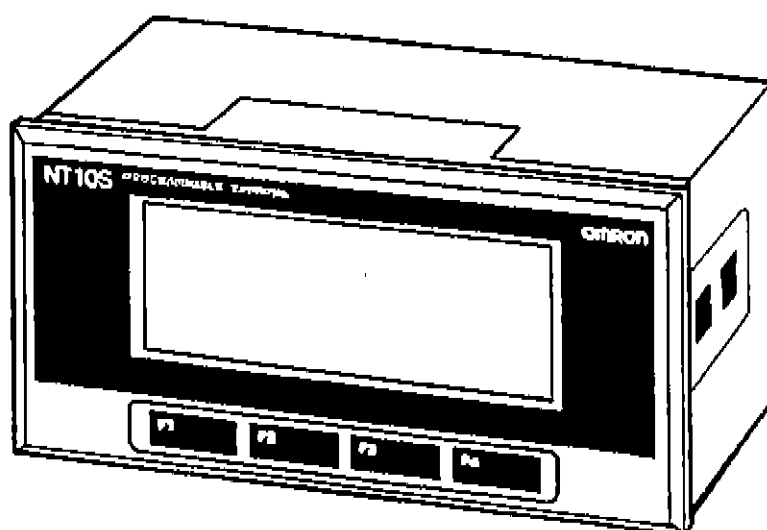*Produced May 1992*

TABLE OF CONTENTS

About this Manual:

This manual describes the installation and operation of the NT10S-SF121 and NT10S-SF122 Programmable Terminals (PTs) and includes the sections described below. The NT10S-SF121 is designed for connection to a SYSMAC Programmable Controller (PC) via a SYSMAC BUS Remote I/O System; the NT10S-SF122, for connection via a SYSMAC WAY Host Link System.

Please read this manual completely and be sure you understand the information provide before attempting to install and operate a NT10S-SF121 or NT10S-SF122 PT.

Section 1 describes the features of the NT10S PTs and the types of system connections that are possible for them. It also provides the names of the parts of the PTs.

Section 2 provides information required to install and start up the PT for the first time. Refer to *Section 6* for the trial operation procedure that should be used the first time a PT is placed into acutal operation.

Section 3 describes the operations that can be performed by transferring data from the PC to the PT to manipulate displays on the PT and the operation of the function keys in transferring data from the PT to the PC via a SYSMAC BUS Remote I/O System using the NT10S-SF121.

Section 4 describes the status data that can be read at the PC and the commands that can be sent from the PC to control PT displays via a SYSMAC WAY Host Link System using the NT10S-SF122 PT.

Section 5 describes the procedure that should be used to begin PT operation the first time the PT is started for actual application and provides basic troubleshooting procedures.

Section 6 describes the periodic inspections and maintenance that must be conducted to ensure proper PT operation.

Appendix A lists the standard products available for use with the PTs.

Appendix B lists the technical specifications of the PTs.

Appendix C provides a sheet than can be used to plan screen layouts.

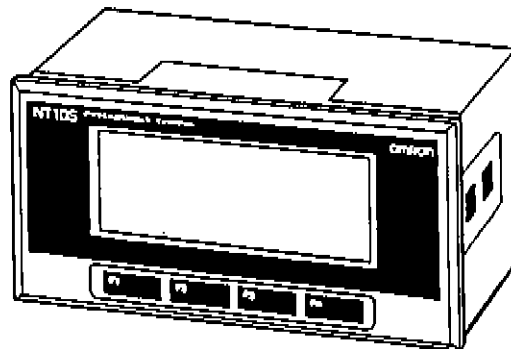# SECTION 1
Features and System Configuration

This section describes the features of the NT10S PTs and the types of system connections that are possible for them. It also provides the names of the parts of the PTs.

1-1   Features

Built-in Communications Interface:
NT10S-SF121 for Wired SYSMAC BUS or NT10S-SF122 for SYSMAC WAY

Input Switches	Four function switches on the front panel allow the PT to be used to input signals to the PC.
Bright Backlight	The backlight uses a bright cold fluorescent lamp, so the screen can be seen clearly even in dark locations.
Easy-to-Read Display	The display uses a blue liquid crystal, giving it a wide angle of visibility: approximately 60 degrees.
Compact Size	With the panel mounted, the depth of the Terminal is no more than 75 mm. (This does not include the cable connectors when peripheral devices are connected.)
No Need for Batteries	The screen memory uses EEPROM or EPROM, thereby permitting screen storage and modifications without batteries.

NT10S-SF121

Reduced Wiring	Wiring is minimized by the use of 2-core cable for communications with SYSMAC BUS Remote I/O Systems running under SYSMAC C-series Programmable Controllers.
	Transmission distance can be extended to as much as 200 meters (combined length).
	As many as 16 Slaves can be connected to one Master for remote operation.

NT10S-SF122

Simple Screen Management	You can control the PT screens simply by controlling Programmable Controller memory, thus greatly reducing the burdens of creating Programmable Controller programs.

1-2 Terminal Configuration Diagrams

NT10S-SF121

Screen creation device ← → RS-232C transceiver

User screen memory (EEPROM/EPROM)

SYSMAC C-series PC → SYSMAC BUS interface (2 words)

Node designation switch (4 bits)

CPU

System ROM

Liquid crystal display (128 x 48 dots)

Backlight (cold fluorescent lamp)

Insulator

24-VDC external power supply — DC/DC convertor (insulation transformer) → 5-VDC power supply for internal control

NT10S-SF122

Screen creation device and PC (Host Link Unit) — RS-232C transceiver

Screen data memory (EEPROM/EPROM)

System ROM

CPU

Liquid crystal display (128 x 48 dots)

Backlight (cold fluorescent lamp)

Insulator

24-VDC external power supply — DC/DC convertor (insulation transformer) → 5-VDC power supply for internal control

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1-3   System Configuration

1-3-1   Creating Screen Data

You can quickly and easily create screen data for the PT by using special support software running on an IBM PC/AT or compatible. It is possible to register an additional 50 symbols for special applications. You can also register various kinds of expansion characters, and blocks for mixed or overlapping displays. For details, refer to the *NT10S Support Tool Operation Manual.*

1-3-2   Using EEPROM Screen Memory

The NT10S-SF121 can receive screen data from a personal computer even while it is engaged in communications with a Programmable Controller. The data from 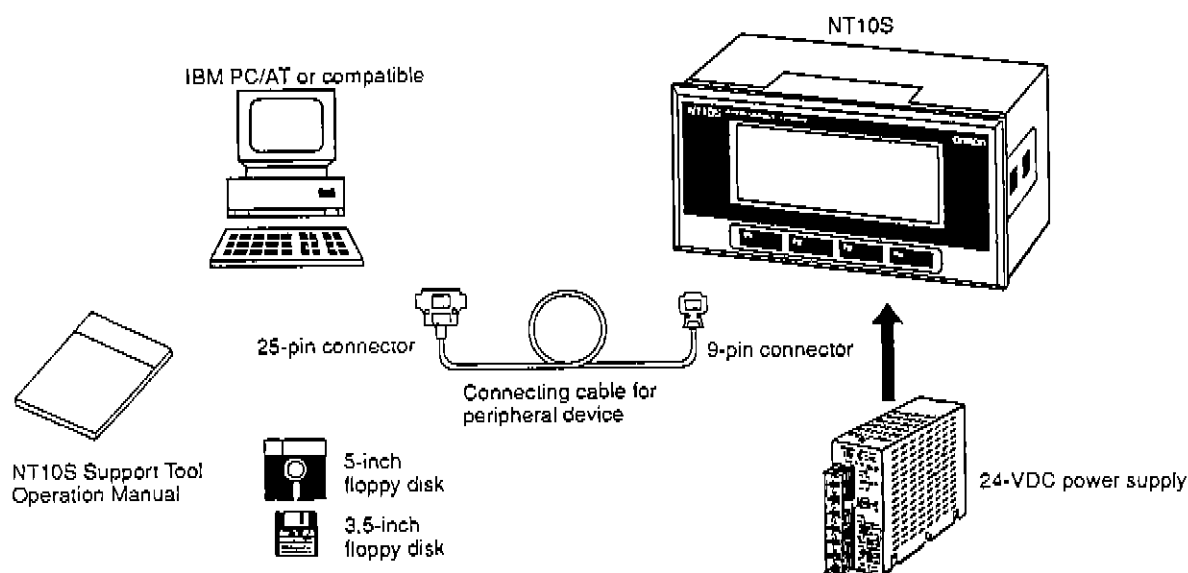the personal computer will be given priority, and communications with the Programmable Controller will halt until the transmission of data is complete.

You can also have the NT10S-SF122 receive data from a personal computer by pressing the F4 Key on the PT while the Initial Screen is being displayed at start-up.

1-3-3   Using EPROM Screen Memory

A personal computer and a commercially-available PROM writer can be connected via RS-232C cable to create screen and write it to ROM.
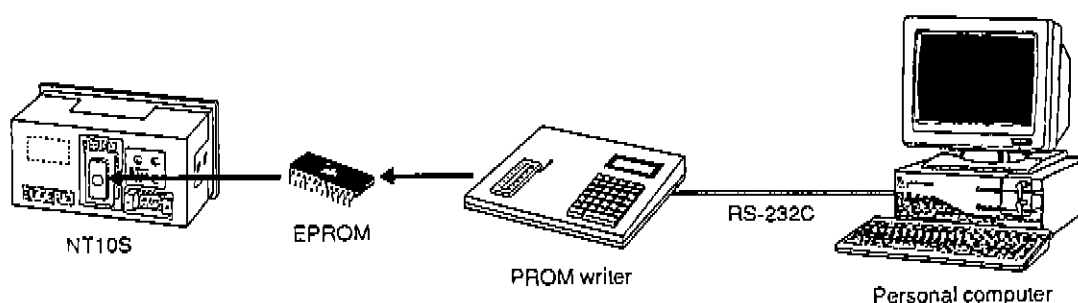
1-3-4 Connecting to PCs via SYSMAC BUS Remote I/O Systems

The NT10S-SF121 can be connected to a SYSMAC C-series SYSMAC BUS Remote I/O System, within which the PT is allocated 16 input points and 16 output points for remote operation.

Wired Remote I/O Master

SYSMAC BUS wired bus line

C200H, C500, C1000H, C2000H, CV500, or CV1000 Programmable Controller

Up to 16 PTs max.

System Connection Example

Master

SYSMAC BUS wired bus line

2-wire cable
VCTF0.75x2C recommended.
Transmission distance: 200 m max. (total distance)
Transmission time: 2 ms x number of Terminals

Valve wiring block

G72C-OD16

G72C-ID16

Output devices

Solenoids etc.

Input devices

Photoelectric switches, etc.

The numbers of points used by the various devices for remote I/O can be mixed as long as the total number stays within the limit of 512 (the number of I/O points per Master).

1-3-5 Connecting to PCs via SYSMAC WAY Host Link System

The NT10S-SF122 can be connected one-to-one to a Host Link Unit mounted to a Programmable Controller via RS-232C cable.

Units Connectable to the NT10S-SF122

When using a CV500-CPU01, CV1000-CPU01, C20H, C28H, or C40H is used, you can connect the NT10S-SF122 to a Host Link System simply by connecting it to the RS-232C connector of the CPU Rack or Programmable 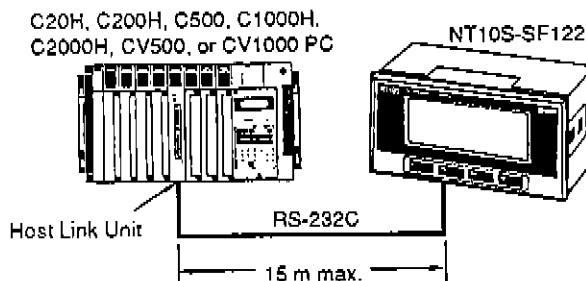Controller. When using a Host Link Unit, connect the Host Link Unit to the Backplane of the Programmable Controller and then connect the NT10S-SF122. For instructions on how to make the connections, refer to the operation manuals for the individual products.

Unit		Model
SYSMAC CV-series CPUs		CV500-CPU01 CV1000-CPU01
SYSMAC C Series	PCs	C20H, C28H, C40H
	Host Link Units	C200H-LK101-P C200H-LK201/202 C500-LK103/103-P C500-LK203

1-4 Nomenclature

Front (NT10S-SF121/122)
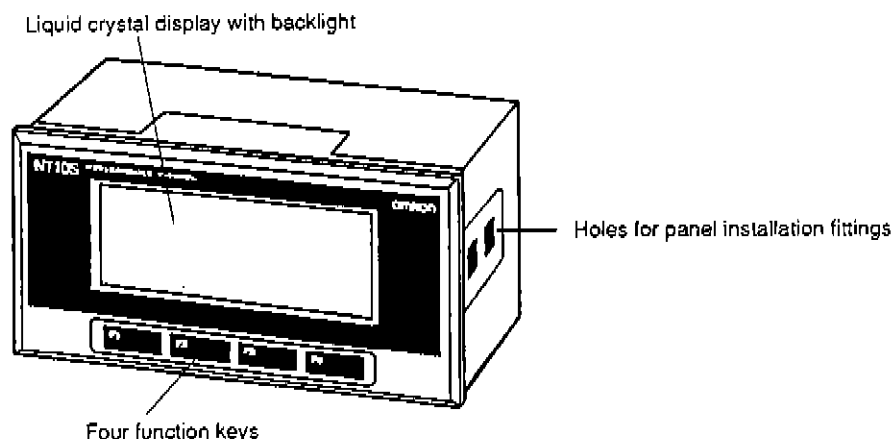
Back of NT10S-SF121

The following diagram shows the back of the PT with the switch cover removed. There are important operating instructions written on the cover, so be sure to read them before operation.

Screen data memory (socket with lever)

SYSMAC BUS terminator switch

Reset switch

Contrast control

Installation holes

Power supply indicator

SYSMAC BUS unit number switch

Nameplate

Frame connection terminal

24-VDC input terminal

SYSMAC BUS 2-wire cable connection terminal

Personal computer connector (RS-232C 9-pin D-SUB)
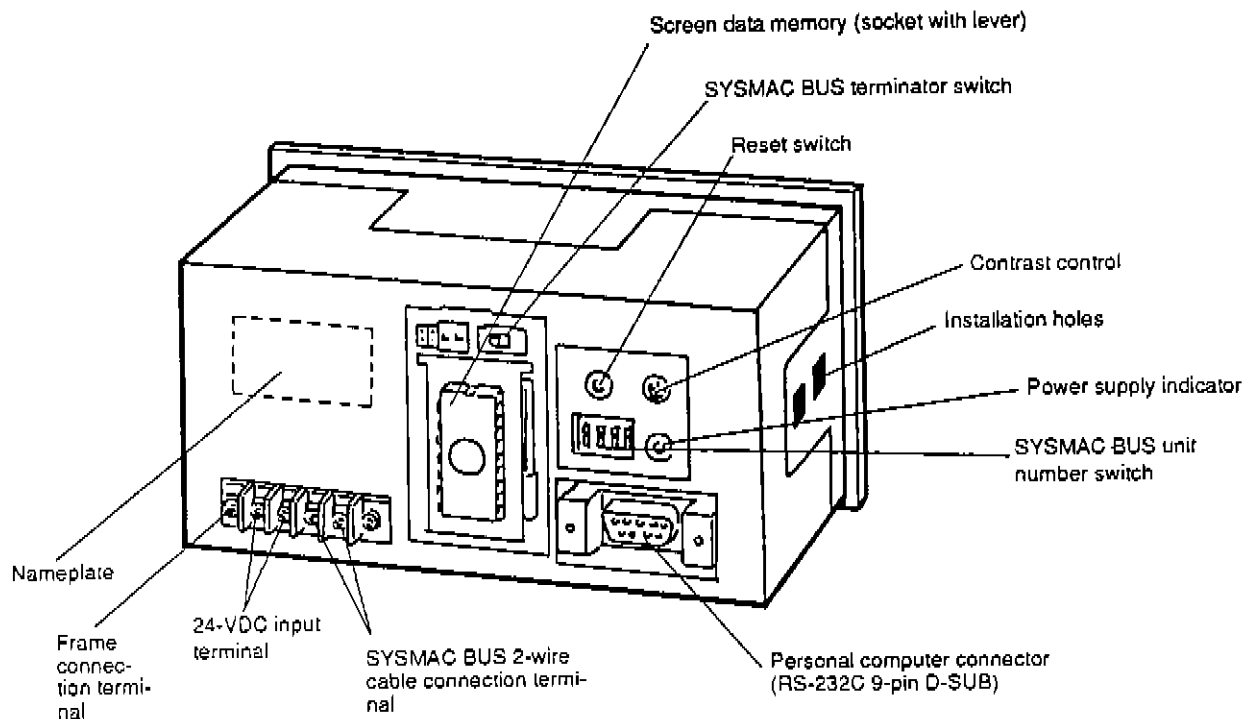
Back of NT10S-SF122

The following diagram shows the back of the PT with the switch cover removed. There are important operating instructions written on the cover, so be sure to read them before operation.

Screen data memory (socket with lever)

Reset switch

Contrast control

Installation holes

Power supply indicator

Host interface switch

Nameplate

Frame connection terminal

24-VDC input terminal

Host interface/personal computer connector (RS-232C 9-pin D-SUB)
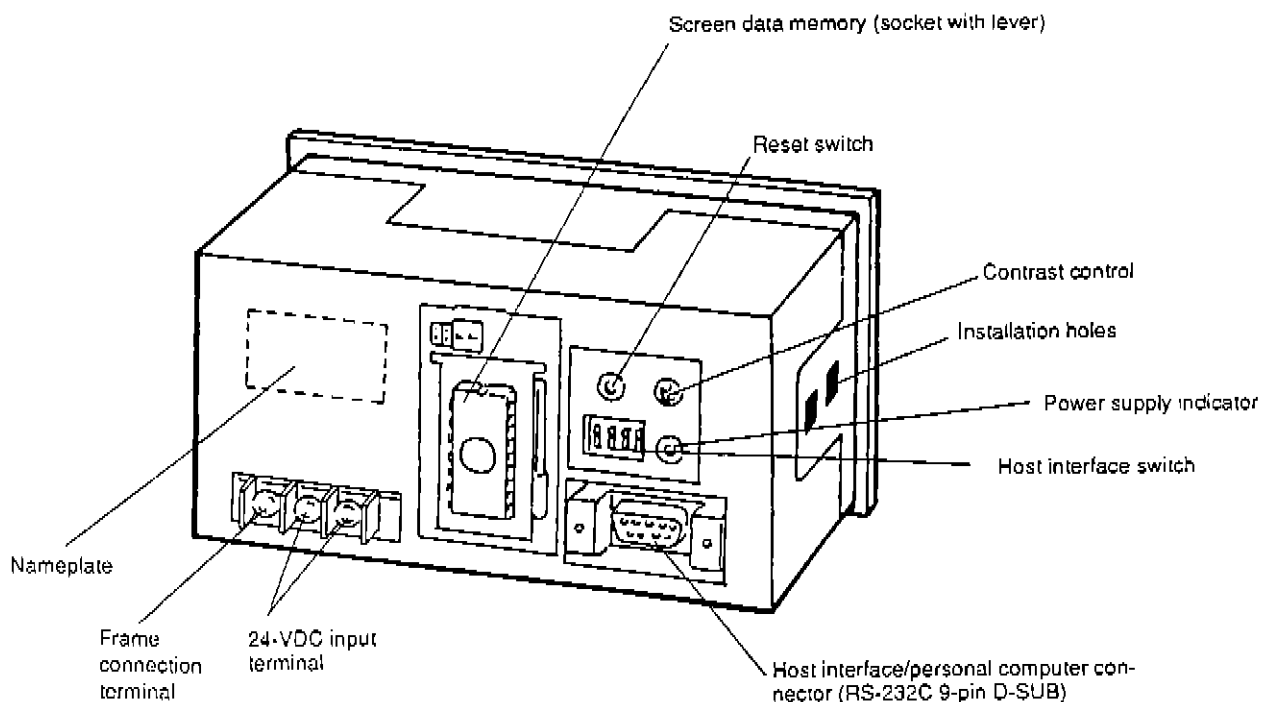
This section provides information required to install and start up the PT for the first time. Refer to *Section 6* for the trial operation procedure that should be used the first time a PT is placed into actual operation.

2-1   Dimensions and Materials

NT10S-SF121

(4)

NT10S-SF122

(4)

Materials
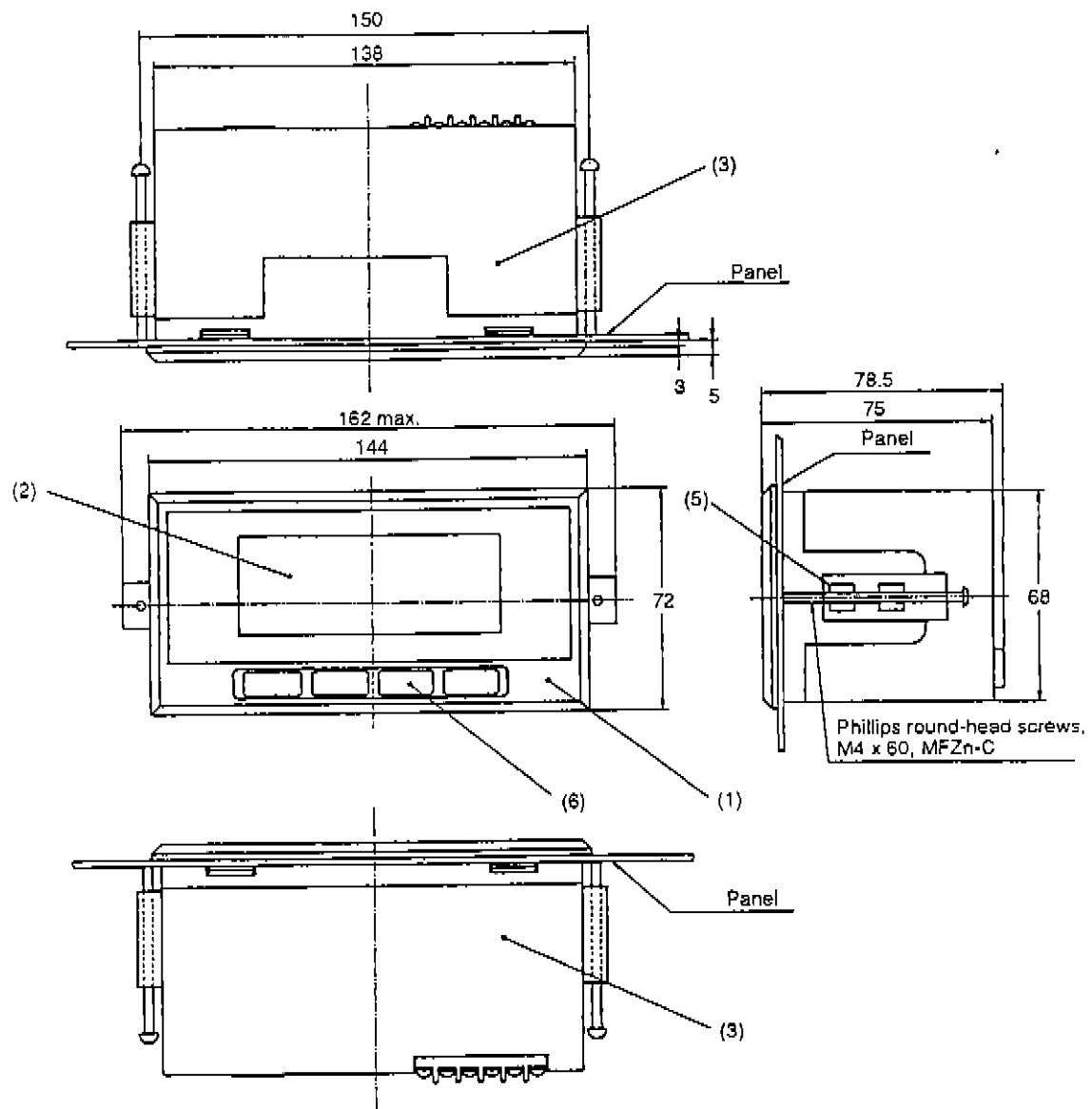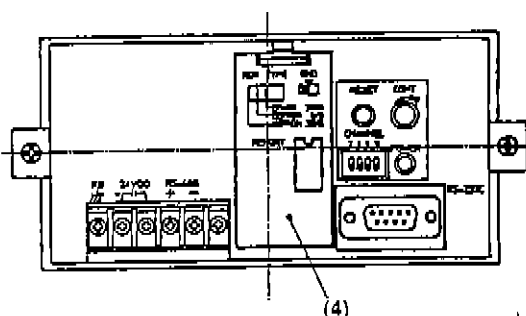
	Part	Qty	Material
1	Front case	1	ABS
2	Resin panel	1	Acryl, t = 2
3	Rear case	1	ABS
4	Cover	1	ABS
5	Installation fittings	2 sets	SPCC, t = 1.6 (Round-head screws, M4 x 60 mm, MFZn-C)
6	Sheet switch	1	Polyester

2-2   System Design Precautions

Abide by the following precautions when designing a system that includes a Programmable Terminal.

Emergency Stop Circuit

Wire the power supply for the PT separately from the main power system. Furthermore, to ensure that an accident or malfunction at the PT will not affect the entire system, connect important inputs (such as the emergency stop) to an external relay circuit (CR1 in the diagram below) in a separate system rather than using the PT's input.
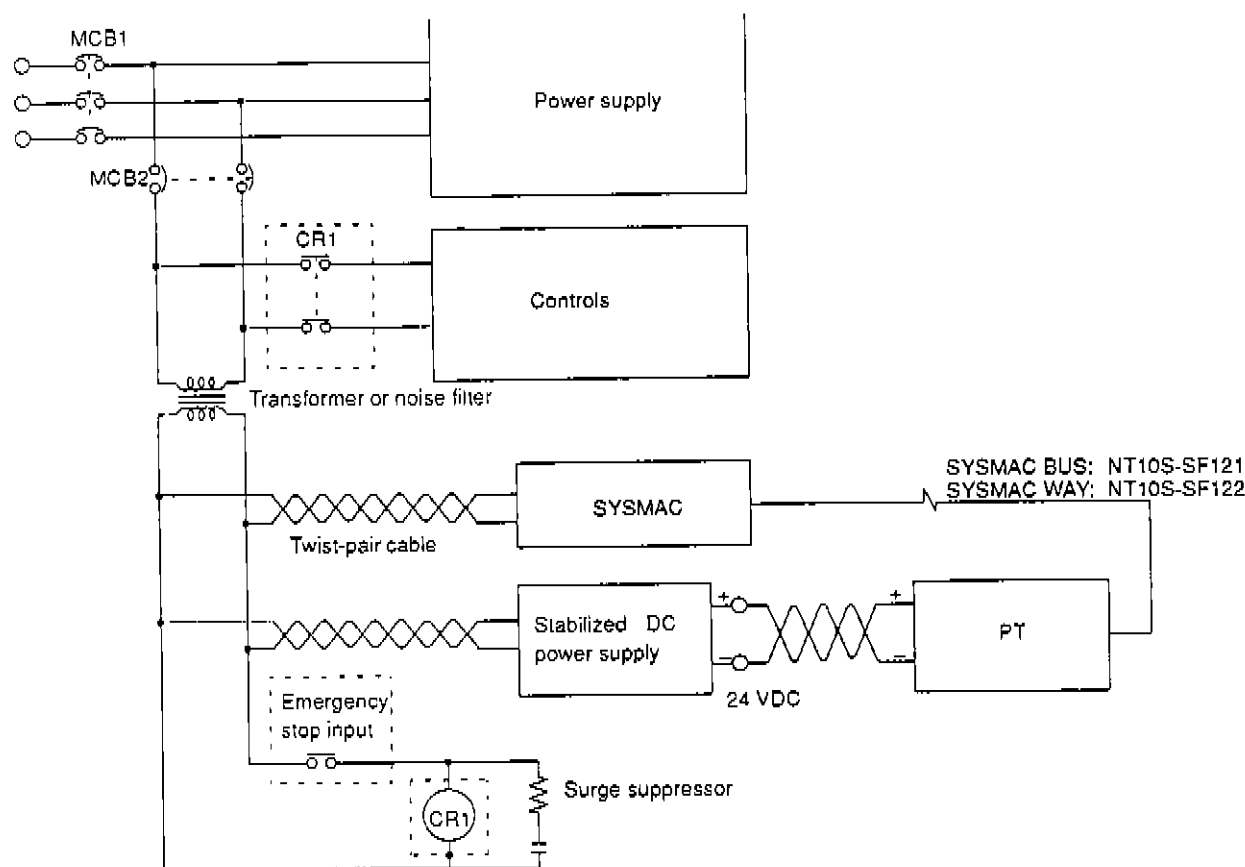
PT Power Interruptions   Continued operation of the PT cannot be ensured if the 24-VDC power supply drops to 20.4 VDC or below. When the power is restored to 24 VDC, the PT will display the Initial Display and communications with the Programmable Controller will begin. The display that was being displayed prior to the power interruption will not be displayed when the power is restored.

2-3   Installation Environment

The NT10S has strong environmental resistance and high reliability, but you can maximize system reliability and make the most of its functions by observing the following guidelines during installation.

2-3-1 Installation Site

Avoid installing the NT10S in a location where any of the following conditions exist.

- Ambient temperature exceeding the ranges shown below:
  NT10S-SF121: 0°C to 40°C
  NT10S-SF122: 0°C 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).

2-3-2 Mounting Location

The NT10S 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 allowable ambient temperature is 0°C to 40°C for the NT10S-SF121, and 0°C to 45°C for the NT10S-SF122. Take into consideration the following points:

- Leave sufficient ventilation space.
- Do not install the PT directly above machinery that radiates a lot of heat (e.g., heaters, transformers, high-capacity resistors).
- If the allowable ambient temperature is exceeded, reduce it by install a strong fan or a cooler.
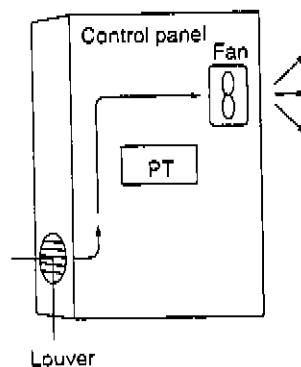
Operation and Maintenance

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 NT10S in a panel with high-voltage devices and install it at least 200 mm from electric power lines.
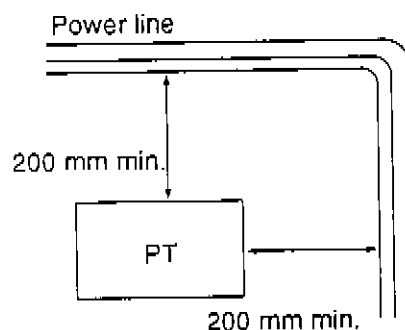
When installing the Terminal near devices with strong electrical or magnetic fields (such as solenoids), allow a distance of at least 40 mm, more if necessary.
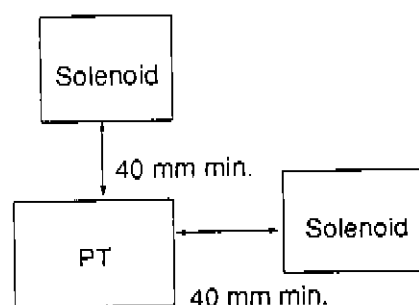
Other Precautions

Make sure that no fluids, such as water or chemicals, and no metal objects, such as copper wire, penetrate the PT. It is extremely dangerous to operate the equipment with foreign matter inside, and it may result in a breakdown or accident.

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The surface of the PT is made of acrylic resin, and may break if struck with a hard object.

Staring at the screen for long periods is not good for the eyes. When using the PT continuously for long periods of time, rest your eyes occasionally.

2-4 Panel Installation

The NT10S is designed to be mounted 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 3.2 mm thick. All dimensions are shown in millimeters.

Unit: mm
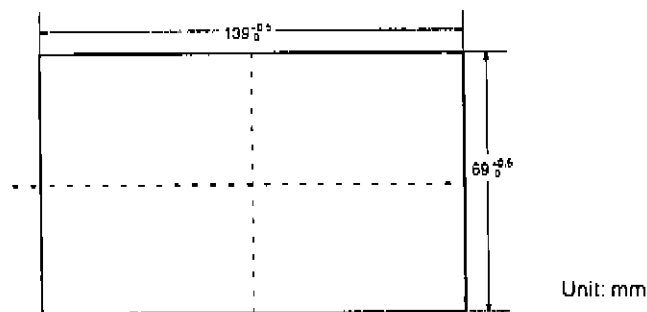
Panel Dimensions

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

3. Fasten the Terminal from the rear of the panel, using the accessory metal fittings.

Mounting surface

Metal fitting

Thickness 1 6 to 3.2 mm

Metal fitting   Metal fitting

Side View   **Top View**

Direction for tightening screws
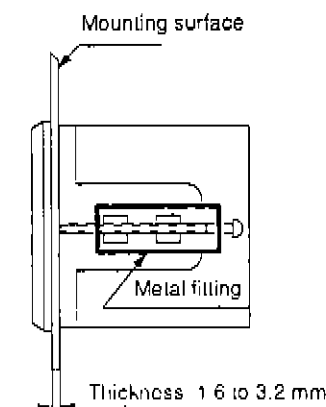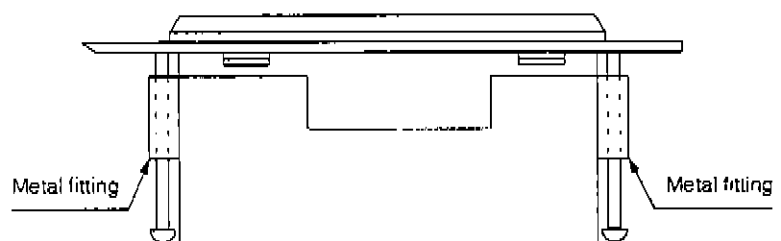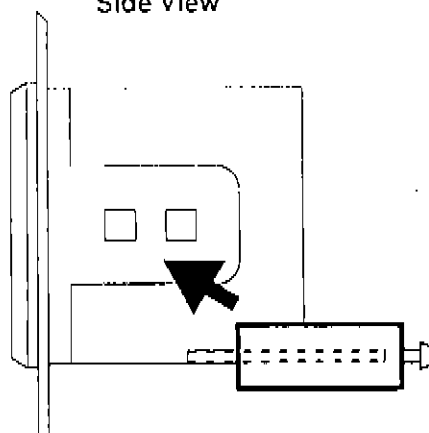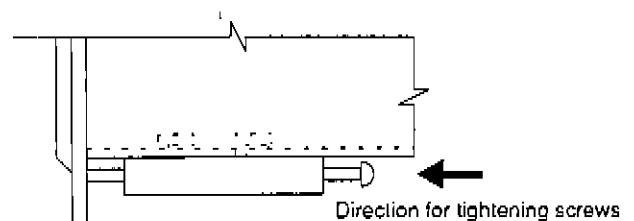
Note Use only the screws (M4 x 60) that are provided to securing the Terminal.

2-5 Terminal Block Wiring

The terminal block on the back of the NT10S is shown in the following illustration.

NT10S-SF121
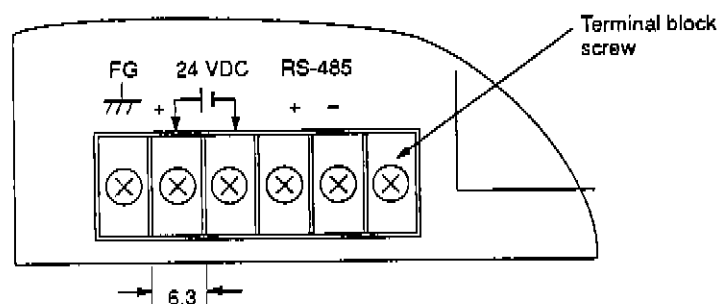
NT10S-SF122
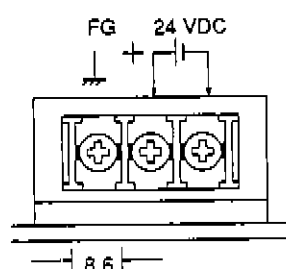
Note The screw on the right side of the terminal block is for securing the block, and should not be loosened.

2-5-1 Terminal Screws and Crimp Terminals

Use M3.0 terminal screws for the SF121, and M3.5 terminal screws for the SF122.

Crimp terminals are recommended for wiring. Use crimp terminals with M3.0 holes for the SF121, and M3.5 holes for the SF122.

Fork-type   Round-type

Dimension	NT10S-SF121	NT10S-SF122
A	6 mm max.	7 mm max.

Applicable Crimp Terminals (Examples)

NT10S-SF121

Maker	Model (forked)	Model (round)	Applicable wire size (stranded wire)
Nippon Crimp-Style Terminals	2-N3A	2-MS3	1.04 to 2.63 mm
Fuji Terminals	2-YAS3	V2-FS3	
Nichifu Terminals	2Y-3	2-3S	

NT10S-SF122

Maker	Model (forked)	Model (round)	Applicable wire size (stranded wire)
Nippon Crimp-Style Terminals	2-YS3A	2-3.5 (M3)	1.04 to 2.63 mm
Nippon Terminals	VD2-3.5-12	---	

2-5-2 Power Supply

NT10S-SF121
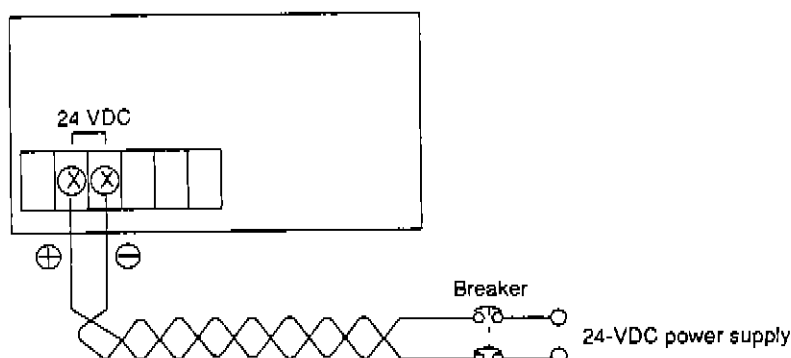
NT10S-SF122
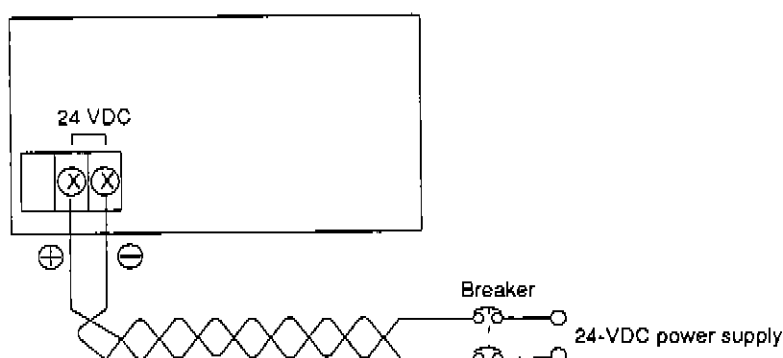
Provide a power supply of 24 VDC that remains within the allowable range of voltage fluctuation.

Power supply	Allowable voltage fluctuation
24 VDC	20.4 to 26.4 VDC

- Use a power supply of at least the rated 24 VDC and 6 watts, and use twisted-pair cable for the power supply line. When a long line must be used, employ cable of at least 2 mm^2 in order to prevent a voltage drop.
- Be careful not to confuse positive and negative wiring.
- Do not place power lines with high voltage or strong current in parallel with, or in close proximity to, the wiring between the 24-VDC power supply and the PT input terminals. If you anticipate noise levels exceeding the specifications, then take appropriate countermeasures at the 24-VDC power supply.

2-5-3 Grounding

Use power lines of at least 2 mm^2.
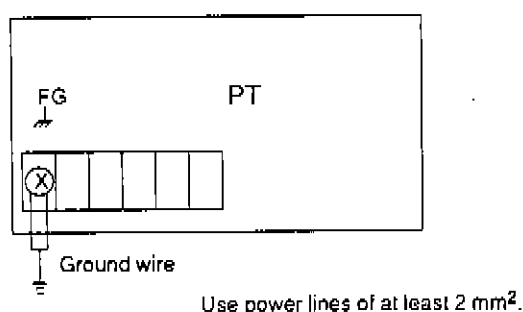
- The FG is the neutral terminal of the noise filter. If malfunctioning results from excessive noise, ground the terminal to 100 Ω or less.

- The ground line should be no longer than 20 meters.

- Sharing a ground line with other machinery or grounding to the girders of a building may be ineffective and even harmful.

OK   NO
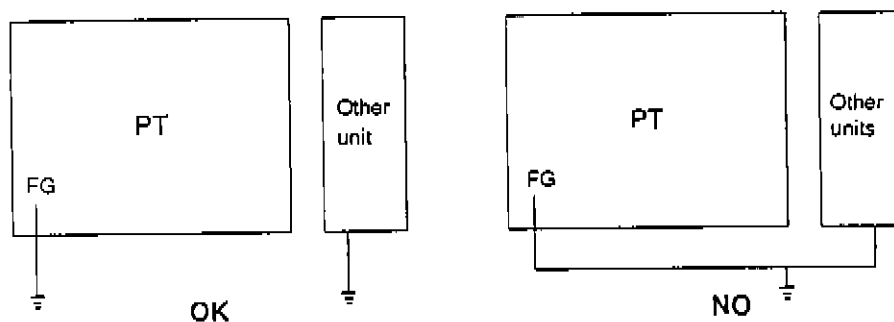
Note When using a 24-VDC power supply with no output short-circuit prevention, provide a breaker.

2-5-4 Communications Path

Connect the PT to the Master with 2-wire cable as shown in the following illustration.

Not terminator (OFF)   Terminator (ON)
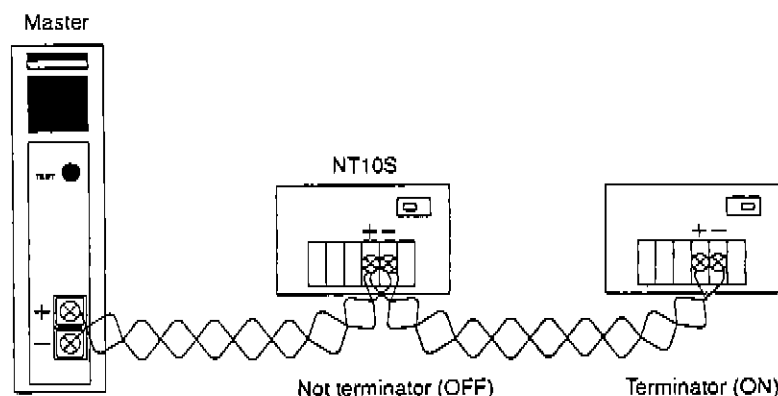
Wiring

1, 2, 3...   1. For the 2-wire cable, use VCTF 0.75 x 2C.
Outer diameter of line: 1.1 mm
Outer diameter including insulation: 2.3 mm

2. Connect the RS-485 positive to positive and negative to negative.

3. Wire the Units in order starting from the Master, and set the last Unit as the terminator (ON).

4. Make sure that the same words are not allocated more then once to the PTs, Remote I/O Units, I/O Terminals, or other Slaves.

5. The combined cable length must be no more than 200 meters.

6. For the communications lines, it is permissible to mix ordinary I/O wiring and ordinary power lines. Do not, however, place power lines with high voltage or strong current in parallel with, or in close proximity to, the communications lines.

Communications Path Interface

Transmission terminal

120Ω   120Ω

Master (RS-485)

Not designated as terminator.

Designated as terminator. (RS-485)

RS-485
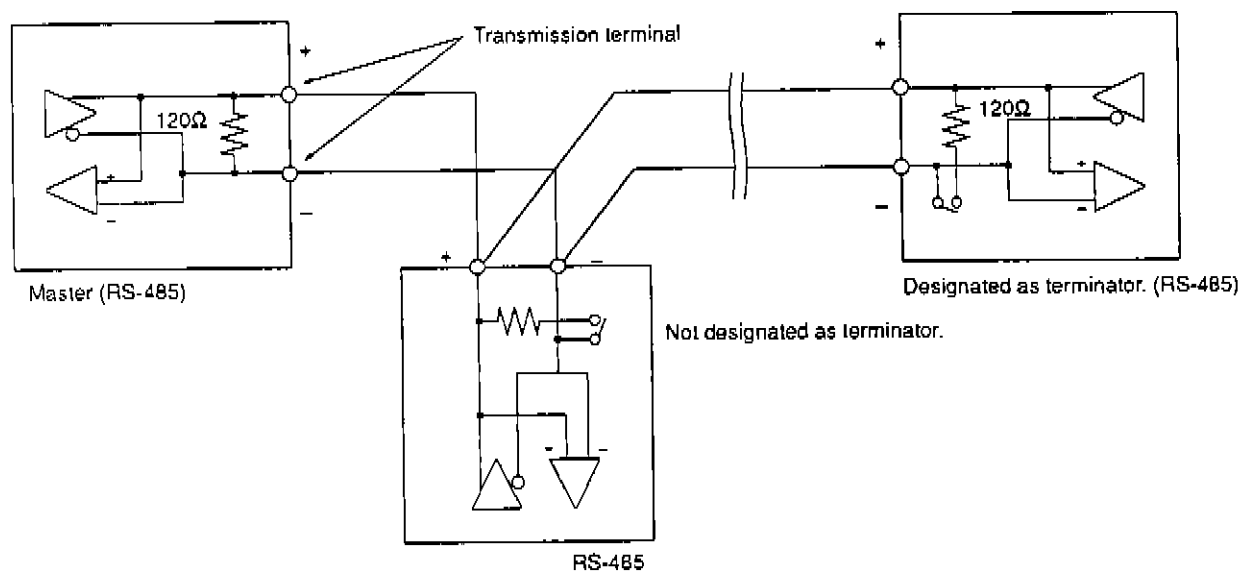
Note The switch for designating the terminator connects the termination resistance.

Slaves Connection Examples (NT10S)

RM   NT10S   NT10S   NT10S

OK

Designated as   Designated as   Designated as
terminator.   terminator.   terminator.
(OFF)   (OFF)   (ON)

Connect the
Units in series
from the Master.

RM   NT10S

NO

Positive and negative
terminals cannot be
crossed.

RT   RM   NT10S

NO

No more than one
Slave can be di-
rectly connected
to a Master.

RM   NT10S   NT10S   NT10S

NO

NT10S

There can be no
branching from any
of the Slaves con-
nected in series
from the Master.

2-6 Connecting the NT10S-SF122 to a Host Link Unit
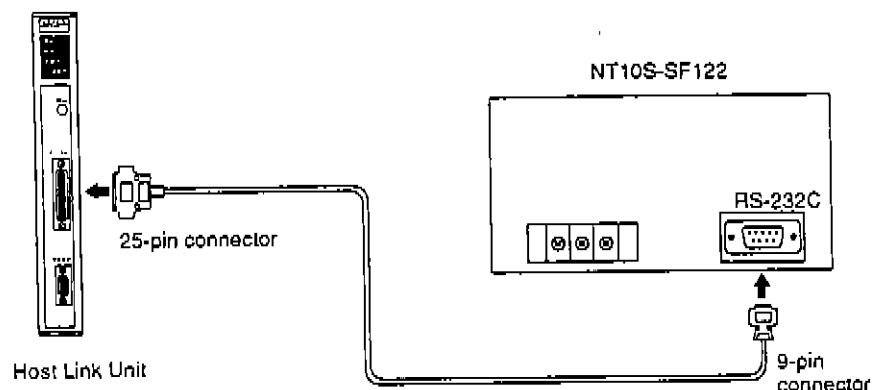
Set the Host Link Unit as shown below.

Item	Switch setting
I/O port	RS-232C
Baud rate	Same as PT
Transmission code	ASCII, 7 bits, 2 stop bits
Parity	Even
1:1/1:N procedure	1:N
Command level	Either level 1, levels 1 and 2, or levels 1, 2, and 3 valid
Unit number	00
CTS switching	0 V
Termination resistance	None

Note 1. Turn off the PT's power when attaching or removing connectors.

2. Short-circuit (close) RS and CS at their respective connectors.

For details, refer to the *SYSMAC WAY Host Link System Manual (W118, W143, W182)* or the *CV500/CV1000 Operation Manual Host Interface (W205)*.

2-6-1 Connector Pin Arrangement
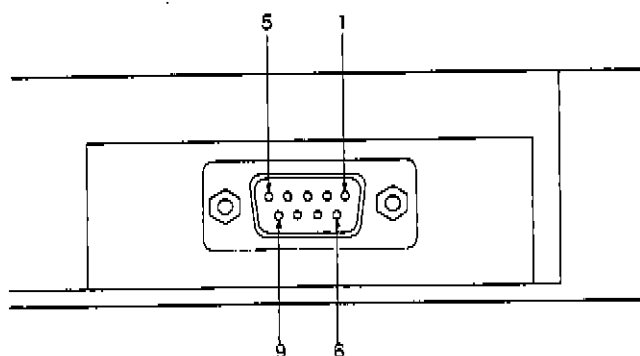
Pin	Symbol	Name
1	FG	Frame Ground (see note)
2	SD	Send Data
3	RD	Receive Data
4	RS	Request to Send
5	CS	Clear to Send
9	SG	Signal Ground

Note The FG line is not connected internally at the NT10S. In locations where static electricity or noise tend to occur, connect the line at the Programmable Controller.

2-6-2 Connections

SYSMAC WAY (25-pin) RS-232C NT10S-SF122 (9-pin)
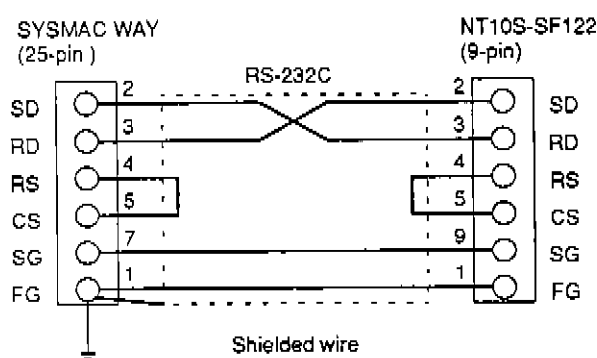
RS (RTS) and CS (CTS) must be short-circuited.

DTR and DSR signal lines are not used, so either one need to be connected.

Optical Fiber Cable
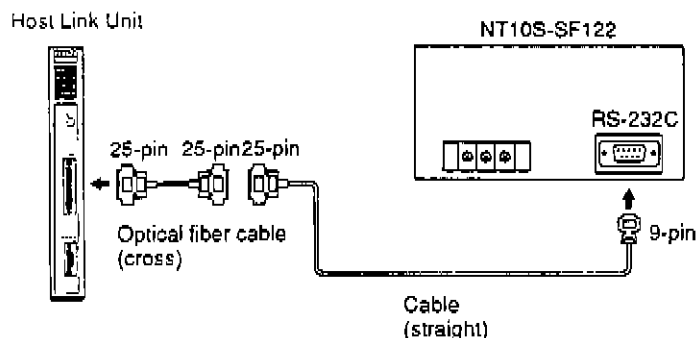
Applicable NT10S Connectors	Plug: XM2A-0901 (OMRON) or equivalent Hood: XM2S-0911 (OMRON)
Applicable SYSMAC WAY Connectors	Plug: XM2A-2501 (OMRON) or equivalent Hood: XM2S-2511 (OMRON) Hood (for optical fiber cable): XM2D-2501 (OMRON) or equivalent
Recommended Cable	AWG28 x 5P IFVV-SB (Fujikura Cable, Ltd.) CO-MA-VV-SB 5P x 28 AWG (Hitachi Cable, Ltd.)
Optical Fiber Cable	Optical module: Z3RN-A (25-pin) (OMRON) or equivalent; (2 required) Optical fiber: Z3F2-4DLM (OMRON); L = 1 to 500 (m) AC adaptor: Z3GP-01 (100 VAC) (OMRON); (2 required)

Note   1. Turn off the PT's power supply when attaching or removing connectors.

2. Short-circuit (close) RS and CS at their respective connectors.

3. When using optical fiber cable, be sure to wire the 25-pin/9-pin cable straight across.

2-7 PT Switch Settings

On the back of the PT are located the switches for making SYSMAC BUS settings (for the SF121), host interface settings (for the SF122), and the memory for screen data (for both models).

NT10S-SF121

User' memory switch
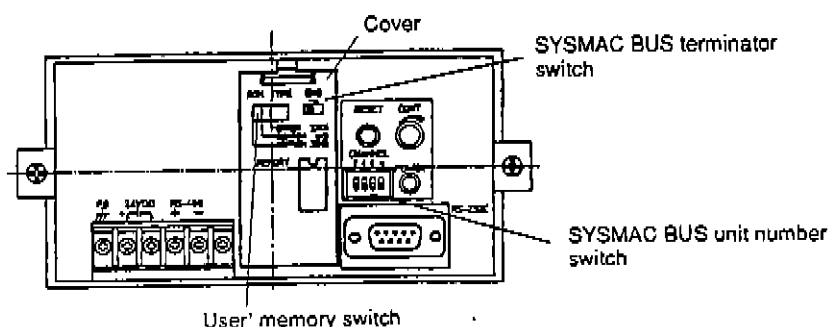
NT10S-SF122
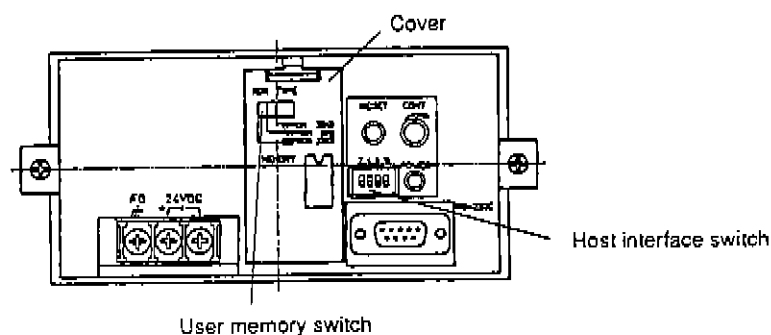
User memory switch

2-7-1 Designating User Memory

The short-circuiting switches shown in the following illustration are located under the cover on the back of the PT. Use the short-circuiting pins that come with the PT to set these switches to match the type of memory which is to be used for screen data.

Memory	Setting at time of shipping
EEPROM, 32 KB	
EEPROM, 8 KB	
EPROM, 32 KB	

Note Always turn off the power supply before setting the switches.

2-7-2 Allocating SYSMAC BUS Words

Terminator switch

Word switch

Terminator Switch

OFF ⬅ ➡ ON
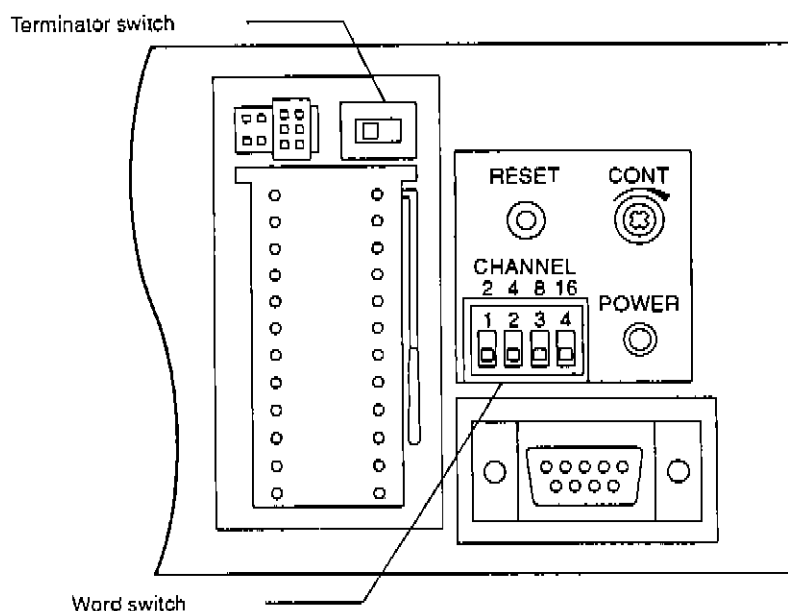
Not terminator ⬅ ➡ Terminator
(termination re-   (termination re-
sistance OFF)   sistance ON)

The switch for designating the terminator connects the termination resistance.
Set as the terminator the Unit connected furthest from the Master. The switch is
factory set to OFF (i.e., not a terminator). To set a Unit as the terminator, turn the
switch ON.

Word Switch

2   4   8   16

OFF
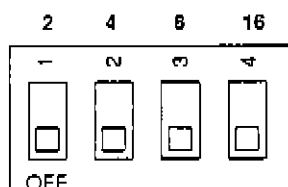
The total value of all of the switches turned ON sets the word address. For exam-
ple, to set word 30, turn ON all of the switches (16 + 8 + 4 + 2 = 30). To set word
14, turn ON switches 1 to 3 and leave switch 4 OFF (8 + 4 + 2 = 14).

Note The factory setting is word 30. The following table shows the words allocated for
each of the Programmable Controller models.

Model	Words allocated	
	Input word	Output word
C500/C2000	Switch setting	Input word + 1
C1000H/C2000H	(32 x word multiplier) + switch setting	Input word + 1
C200H	200 + switch setting	Input word + 1

For details on SYSMAC BUS Wired Remote I/O Systems, refer to the *SYSMAC C-series Wired Remote I/O System Manual.* The NT10S is treated the same as an I/O Terminal.

Note   1. Be sure to turn the power off before making switch settings.

2. When connecting to a C500 Master, set the words in order, from large to small, beginning with word #30. For the C120, however, do the same beginning with word #14.

2-7-3   SYSMAC WAY Communications Settings
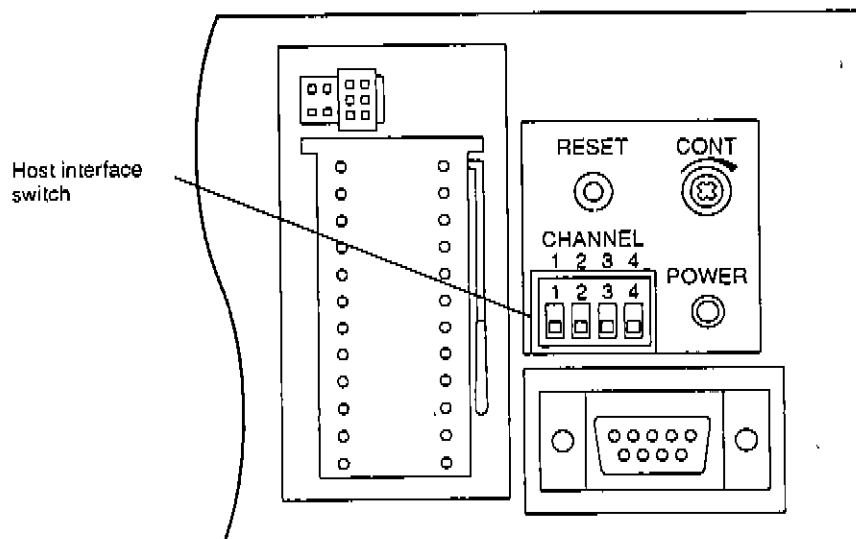
Host Interface Switch
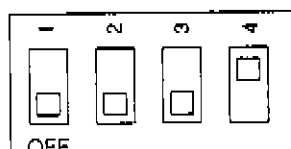
Switch 1	Switch 2	First word
OFF	OFF	DM 0000
OFF	ON	DM 0256
ON	OFF	DM 0512
ON	ON	Not used

Switch 3	Mode setting	Switch 4	Baud rate
ON	Continue Mode	ON	19,200 bps
OFF	Stop Mode	OFF	9,600 bps

Switch	Setting	Content	
SW1, SW2	First word	First word (n) allocated to the PT.	
SW3	Mode setting	Continue Mode (ON)	Communications will continue even if there is an error (such as a Programmable Controller error) during communications with the host.
		Stop Mode (OFF)	If there is an error (such as a Programmable Controller error) during communications with the host, communications will stop after a fixed interval.
SW4	Baud rate	ON: 19,200 bps OFF: 9,600 bps	

Note The baud rate must be set to 9,600 bps to communication with the Support Tool.

2-8 Connecting to the Computer

The computer can be connected to the PT as illustrated below to transfer screen data created at the computer to the EEPROM installed in the PT.

2-8-1 Using OMRON Cable

Connecting cable
CV500-CN228
Cable length: 2 m
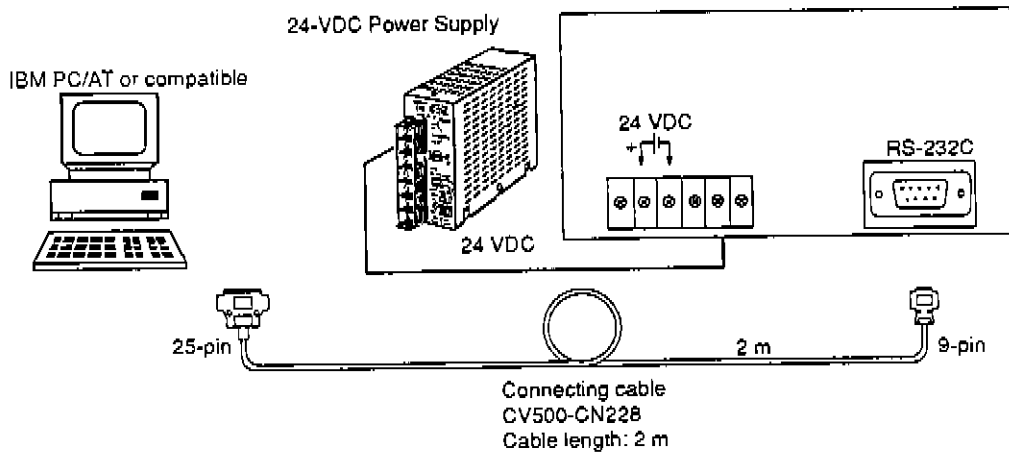
Note When transferring screen data to the NT10S-SF122, follow the procedure outlined in *2-9 Startup Procedure*.

2-8-2 Using General Connecting Cable

Recommended Connection (Example)
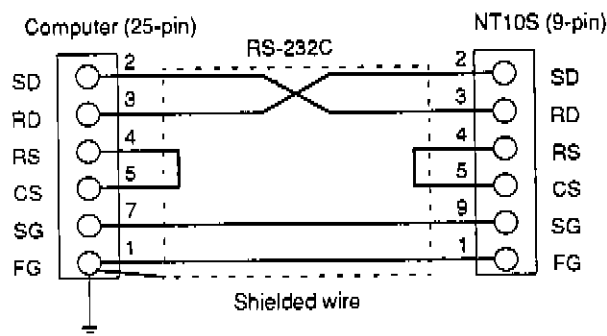
Short-circuit RS (RTS) and CS (CTS). Cross wiring is permissible.

DTR and DTS signal lines are not used, so either one may be connected

Connector Pin Assignments

Pin	Signal	Name
1	FG	Frame Ground (see note)
2	SD	Send Data
3	RD	Receive Data
4	RS	Request to Send
5	CS	Clear to Send
9	SG	Signal Ground

Note The FG line is not connected internally at the NT10S. In locations where static electricity or noise tend to occur, connect the line at the Programmable Controller.

Applicable Cable Connectors   Plug: XM2A-0901 (OMRON) or equivalent
                                   Hood: XM2S-0911 (OMRON)

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

2-9   Startup Procedure

Use the following procedures to start up the PT.

1, 2, 3...   1. Check the installation environment and the wiring before turning on the power supply.

2. Even if the screen data memory is not installed, the version display will be shown on the Initial Display when power is turned on.

NT10S-SF121

1, 2, 3...   1. The Initial Display will be displayed for approximately two seconds after the power is turned on. The screen will then be cleared and nothing will be displayed.

```
OMRON
NT10S
Ver□. □
```

2. The screen data is then transferred from the Support Tool. For details, refer to the *NT10S Support Tool Operation Manual.*

3. Place the Programmable Controller into RUN mode, and check the designated screen displays and the input functions.

NT10S-SF122

1, 2, 3...   1. The Initial Display will be displayed for approximately three seconds after the power is turned on.

```
OMRON Ver□. □
   NT10S-SF122
    TOOL>> F4
```

2. If you press the PT's F4 Key while the Initial Display is being displayed, the next display (Tool Mode) will appear and the PT will be in the mode for communicating with the Support Tool. If the F4 Key is not pressed within the three seconds that the Initial Display is displayed, communications with the host will begin.

```
    TOOL MODE
```

3. The screen data is then transferred from the Support Tool. For details, refer to the *NT10S Support Tool Operation Manual.*

```
    HOST→PT
```

This display will be displayed while data is being received from the Support Tool. When the data has been completely received, the screen will be cleared.

4. Put the Programmable Controller in MONITOR or PROGRAM mode, and check the designated screen displays and the input functions. (MONITOR mode will be used even for RUN mode.)

2-10 Contrast Control

The NT10S is equipped with a contrast control, located on the back of the PT in the upper right-hand corner. In order to be able to read the display screen accurately and reliably, adjust the contrast to accord with the place of installation and the operation settings.
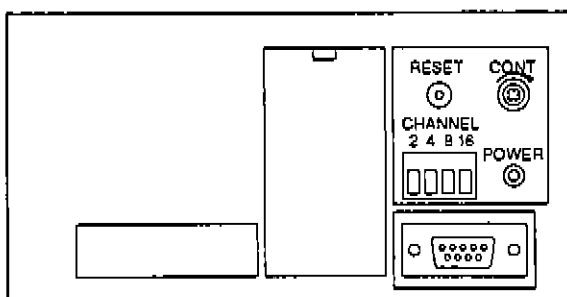
Adjust the contrast using a Phillips screwdriver.

This section describes the operations that can be performed by transferring data from the PC to the PT to manipulate displays on the PT and the operation of the function keys in transferring data from the PT to the PC via a SYSMAC BUS Remote I/O System using the NT10S-SF121.

3-1   I/O Allocation

3-1-1   Outputs

MSB   LSB

Word n+1

Transmission counter
0000 Invalid
0001 1st time
0010 2nd time
0011 3rd time
0100 4th time
0101 5th time
0110 6th time
etc.
Repeats for 15th time onwards.

Screen number (3 digits BCD)

BCD/ASCII/MARK Code

Data classification
00 BCD
01 ASCII
10 MARK (1st byte)
11 MARK (2nd byte)
For mixed display, BCD, ASCII, and MARK cannot be mixed in one output.

Command classification
00 Screen number
01 Mixed display
10 Overlapping display
11 Backlight/ACL control
1100: Backlight ON
1101: Backlight OFF
1110: Screen clear (ACL)

3-1-2   Inputs

MSB   LSB

Word n

Busy

NT RUN

Transmission counter response

Key 1 status
Key 2 status
Key 3 status
Key 4 status

Note x: Not used. Enter 0 or 1.

3-2   Changing Screens

This operation allows screens created with the Support Tool and transferred to the NT10S to be displayed by designating the desired screen number from the Programmable Controller.

By simply outputting the screen numbers in word n+1 from the PC, you can switch among screens 1 to 255.

Data Output from PC

```
            15                                           0
Word (n+1) | 0001 | 00?? | ???? | ???? |
```

Screen number (1 to 255, in 3 digits BCD)
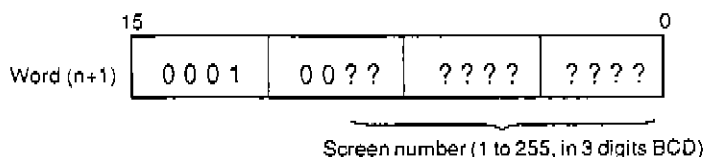
Example: Designating Screen Number 128

Transmission data
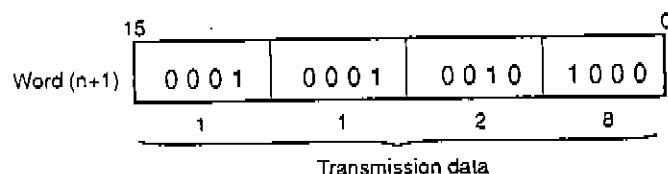
PT Responses
The PT display can be confirmed by checking the data returned from the PT on word n.
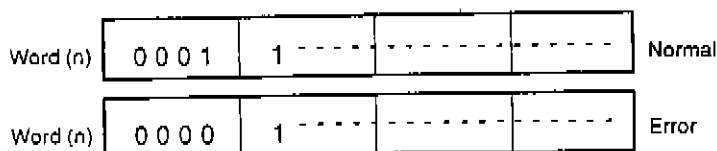
3-3   Mixed Displays

This operation allows you to transmit alphanumerics from a Programmable Controller to the NT10S and to display them in the desired sizes and locations.

Caution When displaying mixed screens or overlapping screens, set the Support Tool's Write Mode to "normal." Messages will not be displayed if the Write Mode is set to "flashing." For instructions on Write Mode settings, refer to the *NT10S Support Tool Operation Manual.*

Example

Registered Screen

Block number

When creating the screen, register the blocks in the places where you want the mixed displays. You can designate up to eight places per screen for block numbers.

Transmitted Screen

TOKYO

The desired blocks and display data can be sent from the PC to create the required display.
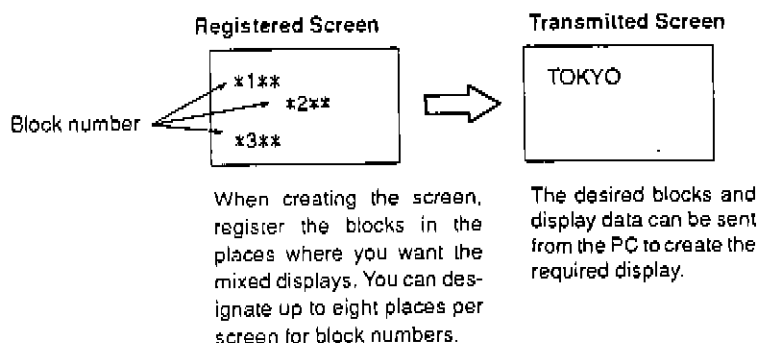
Transmittable Characters
The following table shows the types of characters, symbols, and numerals than can be transmitted.

Mark code (FD11h to FD42h) 50 marks	MARK Code
English letters, numerals, special symbols	ASCII
Numerals	BCD

3-3-1 Mixed Display Transmissions

15   0

| 0 | 0 | 0 | 1 | 0 | 1 | ? | ? | ? | ? | ? | ? | ? | ? | ? | ? | 1st: Screen no. (1 to 255, in 3 digits BCD) |

| 0 | 0 | 1 | 0 | 0 | 1 | X | X | ? | ? | ? | ? | ? | ? | ? | ? | 2nd: Block no. (1 to 8 blocks) |

| 0 | 0 | 1 | 1 | 0 | 1 | X | X | ? | ? | ? | ? | ? | ? | ? | ? | 3rd: Display Mode (See table in *3-3-2 Display Mode*) |

10^1 digit 10^0 digit

Note The data in the areas marked by "X" is ignored by the PT.

| 0 | 1 | 0 | 0 | 0 | 1 | ? | ? | ? | ? | ? | ? | ? | ? | ? | ? | 4th: Screen data (BCD, ASCII, Mark) |

| 1 | 1 | 1 | 1 | 0 | 1 | ? | ? | ? | ? | ? | ? | ? | ? | ? | ? | - - |

Data classification
00: BCD
01: ASCII
10: Mark (1st byte)
11: Mark (2nd byte)

Differing classes of data cannot be mixed within a single transmission series. If the data classification is changed, resend the data from the screen display.

Indicates a mixed display.

Transmission counter
The screen numbers, block numbers, display modes, and display data transmitted at the same time as the transmission counter will be stored in the PT. If the screen numbers are changed, the previously stored data will be cleared.

3-3-2 Display Mode

Code	Display Mode			
	10^1 digit		10^0 digit	
Mark (Wide)	Equivalent	1	Standard	0
	4x	2	Reverse	1
ASCII (Normal)	Equivalent	1	Standard	0
	4x	2	Reverse	1

3-3-3 Display Data Timing

In Mixed Mode, designated characters are displayed as they are transmitted with the transmission counter. Once characters have been displayed in Mixed Mode, only characters in specified positions will changed each time the transmission counter and character code are transmitted.

3-3-4 Display Range

Transmitted characters will be displayed on only one line, beginning from the point of the designated block number. If a character string that is transmitted exceeds the display range, that portion of the string which exceeds the range will not be displayed.

Example: Transmitting "OMRON Corporation"
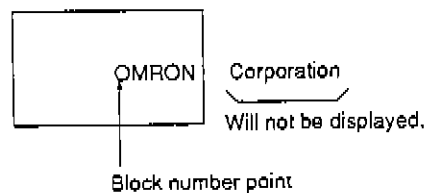
3-3-5 Special Characters

With the mixed display operation, special characters cannot be displayed by means of a transmission data designation from the host. The special characters can be used only when creating screen data.

With the overlapping screen operation, it is possible to use special characters, numerals, and marks.

3-3-6 Display Character Limitations

The transmission counter for showing display data can range from 4 to 16. The number of characters in Mixed Display Mode that can be transmitted in a single line is thus as follows:

Mark equivalent size: 6 max. (Transmission counter limit)
Mark 4x size: 4 max. (Screen size limit)
ASCII equivalent size: 12 (Transmission counter limit)
ASCII 4x size: 8 max. (Screen size limit)

3-3-7 Mixed Display Applications

The screen number, blocks, and display mode are stored in the memory of the PT. You can make use of this stored data to create the following types of displays.

Screen Example
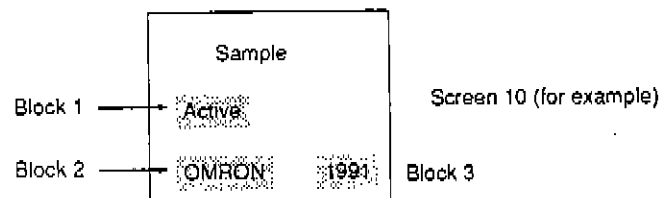
Display Contents

Block 1: "Active" (Normal characters)
Block 2: "OMRON" (Normal characters)
Block 3: "1991" (BCD numeric value)

Transmission Contents

Order	Content	Transmission counter	Transmission data	Remarks
1	Screen no.	1	1410	Mixed display designation
2	Block no.	2	2401	Block 1
3	Display mode	3	3410	Display mode: Wide standard
4	Display data	4	4341	ASCII "A"
5	Display data	5	5363	ASCII "c"
6	Display data	6	6374	ASCII "t"
7	Display data	7	7369	ASCII "i"
8	Display data	8	8376	ASCII "v"
9	Display data	9	9365	ASCII "e"
10	Block no.	2	2402	Block 2
11	Display mode	3	3410	Display mode: Normal standard (ASCII)
12	Display data	4	454F	ASCII "O"
13	Display data	5	554D	ASCII "M"
14	Display data	6	6552	ASCII "R"
15	Display data	7	754F	ASCII "O"
16	Display data	8	854E	ASCII "N"
17	Block no.	2	2403	Block 3
18	Display mode	3	3410	Display mode: Normal standard (ASCII)
19	Display data	4	4419	BCD "19"
20	Display data	5	5491	BCD "91"

Note Overlapping and mixed displays cannot be used on the same screen at the same time.

3-4   Overlapping Displays

This operation allows several messages to be registered in the NT10S in advance, and then to be rapidly switched on the screen by designating the message numbers and screen display positions from a Programmable Controller.

Caution When displaying mixed screens or overlapping screens, set the Support Tool's Write Mode to "normal." The message will not be displayed if the Write Mode is set to "flashing." For instructions on Write Mode settings, refer to the *NT10S Support Tool Operation Manual.*
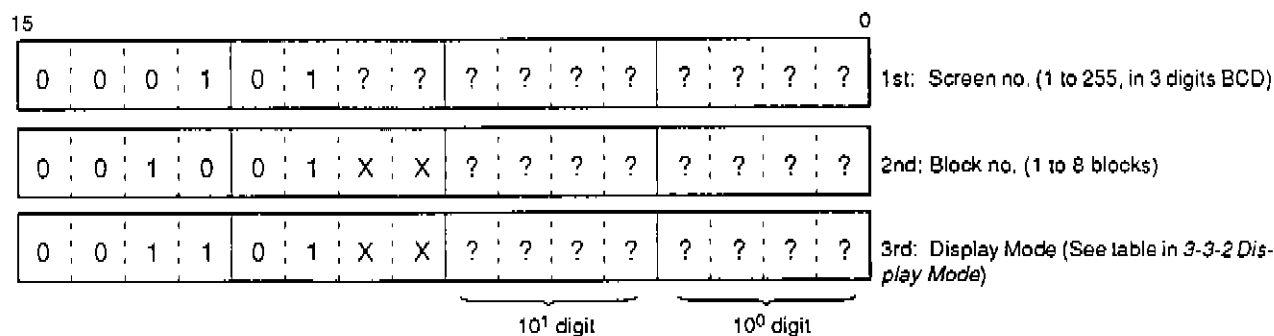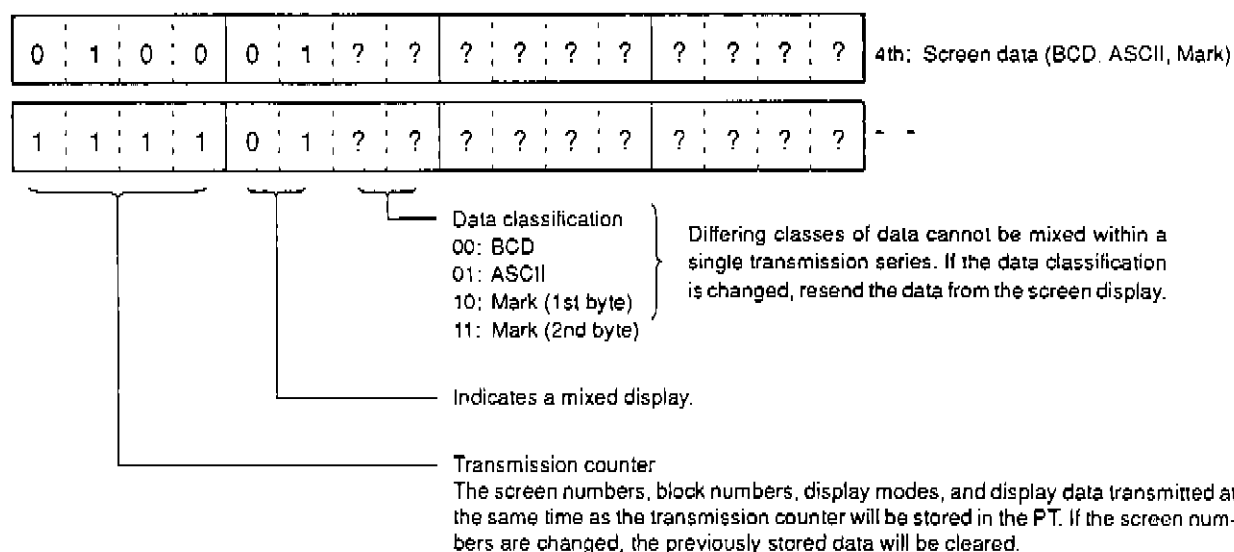
Example

Registered Screen

```
         **2*
**3*
      **1*
```

Displayed Screen

```
   Being inspected
  Move the workpiece
   In production
```

Messages

```
 In production
 Being inspected
 Move the workpiece
```
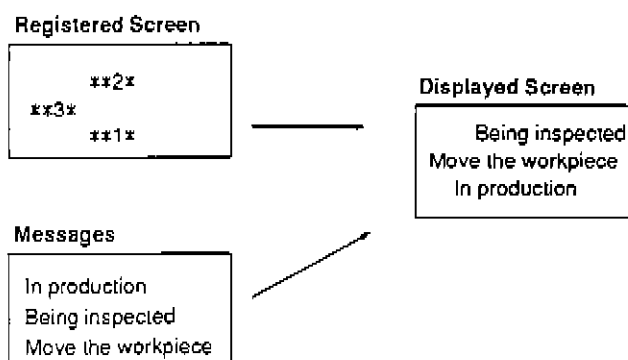
3-4-1 Transmissions for Overlapping Displays

15   0

| 0 0 0 1 | 1 0 ? ? | ? ? ? ? | ? ? ? ? | 1st: Screen (1 to 255) |

| 0 0 1 0 | 1 0 X X | X X X X | ? ? ? ? | 2nd: Block designation (1 to 8) |

| 0 0 1 1 | 1 0 X X | ? ? ? ? | ? ? ? ? | 3rd: Display mode |

10^1 digit 10^0 digit

| 0 1 0 0 | 1 0 ? ? | ? ? ? ? | ? ? ? ? | 4th: Message no. (hexadecimal) |

Note The data in the areas marked by "X" is ignored by the PT. The screen number, block numbers, and display mode are all stored in the memory of the PT, but the message numbers are not.

3-4-2 Display Mode Character Sizes

Display Mode			
Digit 10^1		Digit 10^0	
Equivalent	1	Standard	0
4x	2	Reverse	1

3-4-3 Overlapping Display Applications

The screen number, block number, and display mode are stored in the memory of the PT for the overlapping display function. You can make use of this stored data to create the following types of displays.

Screen Example

```
Line Monitor

Assembly    ON    ─┬─ Block 1

Paint       Red   ─┴─ Block 2
```

Screen 20 (for example)
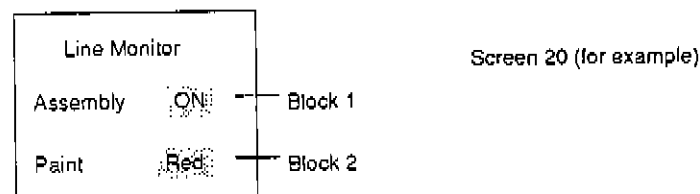
Message 15: "ON"
Message 16: "OFF"
Message 17: "Red"
Message 18: "White"

These messages are to be created in advance, using the Support Tool. For instructions on this procedure, refer to the *NT10S Support Tool Operation Manual*.

Display Contents

The following displays are toggled.

• Block 1: "ON"; block 2: "Red"

• Block 1: "OFF"; block 2: "White"

Transmission Contents

Order	Content	Transmission counter	Transmission data	Remarks
1	Screen no.	1	1820	Overlap designation
2	Block no.	2	2801	Block 1
3	Display mode	3	3810	Display mode: Wide standard
4	Message no.	4	480F	Message 15: "ON"
5	Block no.	2	2802	Block 2
6	Display mode	3	3810	Display mode: Wide standard
7	Message no.	4	4811	Message 17: "Red"
8	Block no.	2	2801	Block 1
9	Display mode	3	3810	Display mode: Wide standard
10	Message no.	4	4810	Message 16: "OFF"
11	Block no.	2	2802	Block 2
12	Display mode	3	3810	Display mode: Wide standard
13	Message no.	4	4812	Message 18: "White"

Note Overlapping and mixed displays cannot be used on the same screen at the same time.

3-5   Special Operations

3-5-1   Backlight On/Off

This operation allows the NT10S backlight to be turned on and off from the Programmable Controller.

Programmable Controller Output Data

15			0	
0 0 0 1	1 1 0 0	X X X X	X X X X	Backlight on
0 0 0 1	1 1 0 1	X X X X	X X X X	Backlight off

Note The data in the areas marked by "X" is ignored by the PT.

3-5-2   Clear Display

This operation clears the NT10S display from the Programmable Controller. The backlight remains lit after the display is cleared.

Programmable Controller Output Data

15			0
0 0 0 1	1 1 1 0	X X X X	X X X X

Note The data in the areas marked by "X" is ignored by the PT.

3-6   Function Key Inputs

The status of the four function keys on the front of the PT, as well as flags indicating PT status, can be read from the Programmable Controller. The available status is shown in the following diagram.

BUSY
0: PT ready to receive data from Programmable Controller.
1: Not ready.

NT RUN
0: PT's RS-232C port connected to personal computer; screen data being transmitted.
1: PT in RUN status.
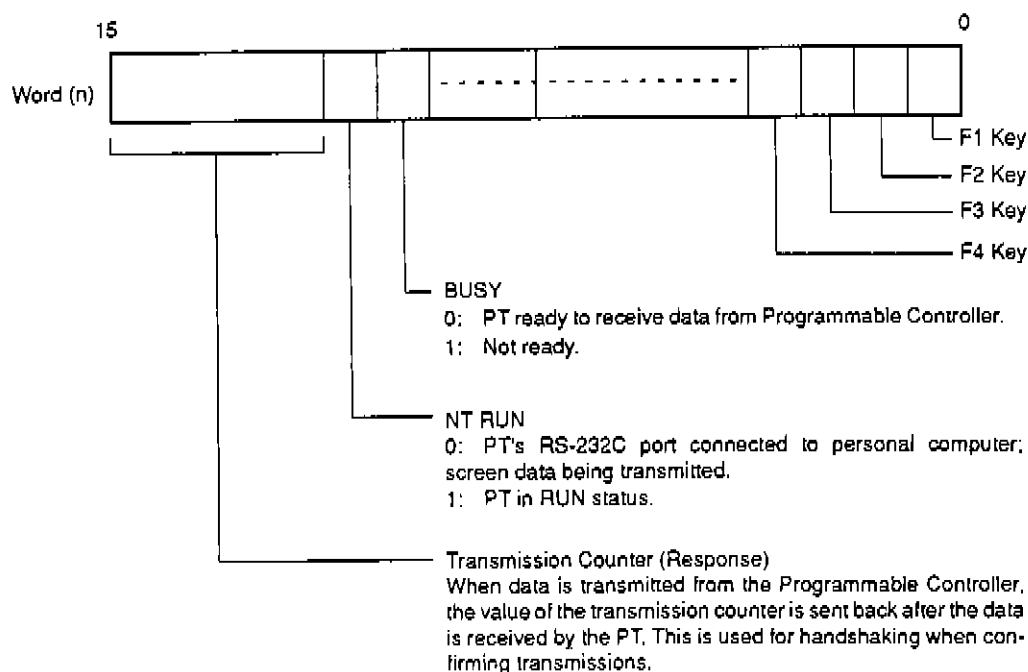
Transmission Counter (Response)
When data is transmitted from the Programmable Controller, the value of the transmission counter is sent back after the data is received by the PT. This is used for handshaking when confirming transmissions.

This section describes the status data that can be read at the PC and the commands that can be sent from the PC to control PT displays via a SYSMAC WAY Host Link System using the NT10S-SF122 PT.

4-1 I/O Allocation

The bits for the PT are automatically allocated to two of the Programmable Controller's DM words, starting with the first word (n), that is set with the first word switch on the PT. For the first word, select DM 0000, DM 0256, or DM 0512. (Refer to 2<#106>7<#106>2 Setting SYSMAC BUS Words.)

Key Input Status (PT to Host) In Word n

Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Contents	Not used				RUN	Not used			Not used				Function key status			
													F4	F3	F2	F1

Screen Changes and Special Operations (Host to PT) In Word n + 1

Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Contents	Command classification				Not used		Screen number (BCD)									

Mixed Displays (Host to PT)

Block	Word	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Block 1	n+2	Display mode								Not used						Data classification	
	n+3 to n+8	Display data								Display data							
Block 2	n+9	Display mode								Not used						Data classification	
	n+10 to n+15	Display data								Display data							
Block 3	n+16	Display mode								Not used						Data classification	
	n+17 to n+22	Display data								Display data							
Block 4	n+23	Display mode								Not used						Data classification	
	n+24 to n+29	Display data								Display data							
Block 5	n+30	Display mode								Not used						Data classification	
	n+31 to n+36	Display data								Display data							

Overlapping Displays (Host to PT)

Block	Word	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Block 1	n+37	Display mode								Message number (hexadecimal)							
Block 2	n+38	Display mode								Message number (hexadecimal)							
Block 3	n+39	Display mode								Message number (hexadecimal)							
Block 4	n+40	Display mode								Message number (hexadecimal)							
Block 5	n+41	Display mode								Message number (hexadecimal)							

4-2　Key Input Status (PT to Host)

Bits 0 to 3 of word n correspond to the function keys on the front of the PT, and the host can read the status of these keys from this word. When a bit is ON, it indicates that the corresponding function key is pushed down.

Word n

Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Transmitted data	Not used								Not used				Function key status			
					RUN	Not used							F4	F3	F2	F1

Example: Status when F2 Key Down

Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Transmitted data	0				8				0				2			

4-3　Commands

4-3-1　Screen Changes and Special Operations (Host to PT)

These operations use command classifications in bits 12 to 15 of word n + 1 to change the screen being display, to turn on and off the backlight, and to clear the screen. The command code is transmitted as 1 digit of hexadecimal data and the screen number as 3 digits of BCD.

Screen Changes (Word n+1)

Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Transmitted data	0				0 to 2				0 to 5				1 to 5			

Backlight On (Word n+1)

Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Transmitted data	C				0				0				0			

Backlight Off (Word n+1)

Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Transmitted data	D				0				0				0			

Clear Display (Word n+1)

Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Transmitted data	E				0				0				0			

4-3-2　Mixed Display

This operation displays character data transmitted from the host in a position (i.e., block) previously set with the Support Tool. The display mode, which is transmitted from the host, can be designated as either equivalent or 4x, and both of these can be designated as either standard or inverse (reverse video).

The block number is determined by the word which is used. To display in block no. 1, set the display mode in word n + 2 and set the character data in words n + 3 to n + 8, as shown in the table below. Likewise, to display in block no. 2, set the display mode in word n + 9 and set the character data in words n + 10 to n + 15.

Word Allocation

Block	Display mode	Character data (MARK or ASCII)	Numeral data (BCD)
Block 1	n+2	n+3 to n+8	n+3 to n+5
Block 2	n+9	n+10 to n+15	n+10 to n+12
Block 3	n+16	n+17 to n+22	n+17 to n+19
Block 4	n+23	n+24 to n+29	n+24 to n+26
Block 5	n+30	n+31 to n+36	n+31 to n+33

Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Transmitted data	Display mode								Not used				Data classification			
Mark	1 (Wide)				0 (Standard)				---				0 (BCD) 1 (ASCII) 2 (Mark)			
	2 (4x)				1 (Reverse)											
ASCII	1 (Normal)				0 (Standard)											
	2 (4x)				1 (Reverse)											

Example: Mixed Display on PT Screen

DM data is displayed in order, beginning with the lowest word address. At the end of the character string for which you want a mixed display, enter "F0." If F0 is not entered, the string will be deleted from the mixed display position to the end of the line. In addition, fill in any unused words with the letter "F."

Registered Screen

A screen such as the following one is created in advance by the Support Tool.

NT10S
XI RX

Example ASCII Data

The following data can be sent to display six ASCII characters.

Word	Data	Content
n+2	1001	Designates normal attribute
n+3	4142	Displays "AB"
n+4	4344	Displays "CD"
n+5	4546	Displays "EF"
n+6	F0FF	Not displayed from here on.
n+7	FFFF	Not used
n+8	FFFF	Not used

PT Screen Display

NT10S
ABCDEF

Example Numeric Data

The following data can be sent to display "123456." The data is placed in BCD in DM words with the rightmost (least significant) portion is the word with the lower address. Fill in unused digits with "F." Each "0" after the "F" will be displayed as a blank space. The actual zeros will be displayed only after confirming other numeric values.

Word	Data	Content
n+2	1000	BCD normal attribute
n+3	3456	"3456" displayed
n+4	0012	"12" displayed
n+5	FFFF	Left alignment
n+6	FFFF	Not used
n+7	FFFF	Not used
n+8	FFFF	Not used

PT Display Screen

```
NT105
123456
```

The following data can be sent to display "123" in reverse video. A blank space is inserted to align the numerals to the left.

Word	Data	Content
n+2	1100	BCD reverse attribute
n+3	FFFF	Not used
n+4	F0FF	Space display
n+5	F123	Left alignment: "123"
n+6	FFFF	Not used
n+7	FFFF	Not used
n+8	FFFF	Not used

PT Display Screen

```
NT10S
123
```

Note Overlapping and mixed displays cannot be used on the same screen at the same time.

4-3-3 Overlapping Displays

This operation allows you to change the PT's display screen by designating from the host the display position (block number) and the message number of character data that has been set in advance with the Support Tool.

The display mode can be designated as either equivalent or 4x, and both of these can be designated as either standard or inverse (reverse video). The block number is determined by the word which is used, as shown in the following table.

Block	Word
Block 1	n+37
Block 2	n+38
Block 3	n+39
Block 4	n+40
Block 5	n+41

Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Transmitted data	Display mode								Message no. (hex.)							
	1: Wide				0: Standard											
	2: 4x				1: Reverse											

Example: Overlapping Displays on PT Screen

In this example, overlapping message 1 ("Stopped") and 5 ("Please wait") are displayed in PT blocks 1 and 2.
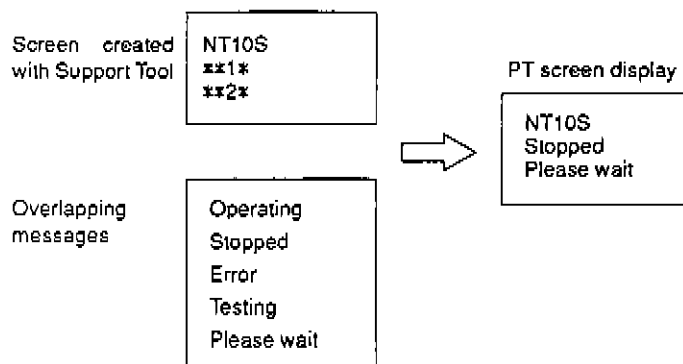
The data transferred to achieve this display is shown in the following table.

Word	Data	Content
n+37	1002	Message 2 displayed
n+38	1005	Message 5 displayed

Note   Overlapping and mixed displays cannot be used on the same screen at the same time.

4-4   PT Processing Flow

When the PT is turned on it initializes itself. If there are no errors, it then read/ writes DM data, function key inputs, screen refreshing, and so on.

1, 2, 3...
1. Power turned on.
2. Reads data from Programmable Controller's DM n + 1 to DM n + 22.
3. Updates function key status.
4. Reads data from Programmable Controller's DM n + 23 to DM n + 41.
5. Updates function key status.

Note
1. When using the NT10S-SF122, set the Programmable Controller mode to MONITOR or PROGRAM.
2. Do not remove connectors while communications are in progress with the Support Tool. Removing the connectors will cause internal processing to stop and a communications error will be displayed. If this occurs, you can restart the processing by transmitting again from the Support Tool.
3. To communication between the NT10S-SF122 and a Programmable Controller, attach the connector to a Host Link Unit and press the hardware reset switch.
4. The PC's DISPLAY MESSAGE instruction (MSG(46) or MSG(195)) cannot be used because message data will be attached to the status when it is read out, changing the length of the response.

SECTION 5
Trial Operation and Troubleshooting

This section describes the procedure that should be used to begin PT operation the first time the PT is started for actual application and provides basic troubleshooting procedures. Refer to *Section 8 Maintenance* for periodic maintenance inspections.

5-1   Trial Operation

Checklist   After the PT has been wired, check the items shown in the following table before conducting the trial operation.

Item	Check	Reference
Power supply and I/O line connections	Has the wiring been done correctly? Are there any loose terminal screws? Are any crimp-style terminals short-circuited? Is the installation environment satisfactory? Is the PT mounted securely?	2-5 2-3 2-4
Connecting cable	Are all of the connecting cables connected correctly and locked?	p. 17
Screen memory	Is the memory designation switch set for the memory that is to be used?	2-7
Word settings	Are the words correctly set? Is the terminator correctly set?	p. 21

Trial Operation Procedure   After the PT has been installed and wired, and the checks outlined above have been completed, follow the procedure described below for the trial operation.

1, 2, 3...   1. Power up
   a) Check power supply voltage and terminal connections.
   b) Check terminal connections, connectors, and setting switches.
   c) Check screen memory installation and setting switches.
   d) Turn on the power, and verify that the power indicator is lit.
2. Initial display check.
   Verify that the version display appears right after the power is turned on.
3. Screen data transfer.
   Connect to the computer if EEPROM is used for screen memory and transfer screen data to PT.
4. Programmable Controller preparation
   a) Put the PC in PROGRAM mode and create an I/O table.
   b) Enter a program in the PC.
   c) Put the PC in MONITOR or RUN mode and check operation.
5. Debugging
   a) Correct the PC program.
   b) Correct the screen data.
6. Program saving
   a) Save the final screen on a diskette.
   b) Save the PC program on a diskette.

5-2   Error Processing

Symptom	Probable cause	Corrective measures
Power indicator does not light.	There is a faulty connection at the power supply terminals.	Check the positive and negative connections.
	The power supply is defective.	Check the 24-VDC voltage. If deficient, replace the Power Supply Unit.
	The PROM is inserted backwards.	Check the memory installation.
Initial display does not appear.	The PT is defective.	Replace the PT.

Power Indicator Troubleshooting Flowchart

```
                   ( Power indicator not lit )
                            │
                            ▼
                                      No
        ◇ Is power being supplied? ──────────────────────►  ┌──────────────┐
                            │                                │ Supply power.│
                           Yes                               └──────────────┘
                            │                                        │
                            │                                        ▼
                            │              No                                        Yes
                            │ ◄───────────────── ◇ Is the power indicator lit? ──────────►
                            │
                            ▼
                                      No
        ◇ Is the voltage within ──────────────────►  ┌────────────────────────┐
          the allowable range?                       │ Place voltage within the pre- │
                            │                         │ scribed range of fluctuation. │
                           Yes                        └────────────────────────┘
                            │                                        │
                            │             No                         ▼               Yes
                            │ ◄──────────────── ◇ Is the power indicator lit? ──────────►
                            │
                            ▼
                                      No
        ◇ Are settings ok for the ─────────────►  ┌──────────────────┐
          voltage terminals?                      │ Set them correctly. │
                            │                      └──────────────────┘
                            │                                │
                            │            No                  ▼              Yes
                            │ ◄────────────── ◇ Is the power indicator lit? ────────►
                            │
                            ▼
                                     Yes
        ◇ Are there loose terminal ─────────────►  ┌──────────────────────┐
          screws or disconnected                   │ Tighten screws; connect or re- │
          power lines?                             │ place power lines.    │
                            │                       └──────────────────────┘
                           No                                │
                            │            No                  ▼              Yes
                            │ ◄────────────── ◇ Is the power indicator lit? ────────►
                            │
                            ▼
                                      No
        ◇ Is the memory inserted ─────────────►  ┌──────────────────┐
          backwards?                             │ Install the screen memory │
                            │                     │ correctly.        │
                           No                     └──────────────────┘
                            │                                │
                            │            No                  ▼              Yes
                            │ ◄────────────── ◇ Is the power indicator lit? ────────►
                            │
                            ▼
                   ┌─────────────────┐                        ( End )
                   │ Replace the PT. │
                   └─────────────────┘
```

This section describes the periodic inspections and maintenance that must be conducted to ensure proper PT operation. Refer to *Section 5 Trial Operation and Troubleshooting* for troubleshooting procedures.

| Spare Terminals | In order to restore operations as quickly as possible in the event of an NT10S breakdown, it is a good idea to always keep a spare PT on hand. |

| Inspection | If the NT10S 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 six to twelve 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.

Item	Inspection	Criterion	Method/tools
Power supply voltage	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?	NT10S-SF121: 0° to 40°C NT10S-SF122: 0° to 45°C	Thermometer
	Is the ambient humidity (the humidity inside of the panel) suitable?	35% to 85%, with no condensation.	Hydroscope
	Is dust collecting?	There should be no dust.	Visual
Installation	Is each PT 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 externally visible abnormalities.	Visual
Replaceable parts	Can you read the characters on the liquid crystal display?	Average life expectancy of liquid crystal: 50,000 hrs	Visual
	Is the backlight illumination as bright as it should be?	Average life expectancy of backlight: 20,000 hrs	

| Precautions for Handling | Turn off the power before replacing a PT. |

When you discover a defective PT and replace it, check again to verify that the problem was actually with the PT.

When returning a defective PT for service, please describe the problem in as much detail as possible. Send the PT to your OMRON representative.

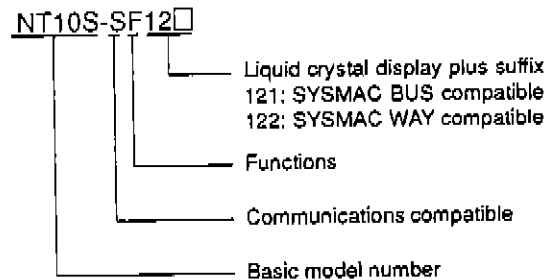| Tools for Inspection | Standard Tools |

- Phillips and flat-blade screwdrivers
- Voltage tester or digital voltmeter
- Industrial alcohol and all-cotton cloth.
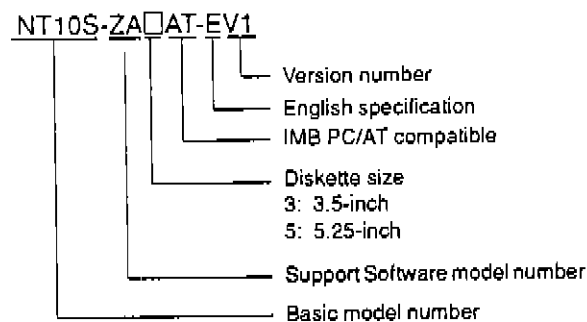
Measuring Instruments (Depending on Case)

- Synchroscope
- Oscilloscope with pen output
- Thermometer
- Hydroscope

Appendix A
Standard Models

NT10S Programmable Terminals

NT10S-SF12□
- Liquid crystal display plus suffix
  - 121: SYSMAC BUS compatible
  - 122: SYSMAC WAY compatible
- Functions
- Communications compatible
- Basic model number

Support Software

NT10S-ZA□AT-EV1
- Version number
- English specification
- IMB PC/AT compatible
- Diskette size
  - 3: 3.5-inch
  - 5: 5.25-inch
- Support Software model number
- Basic model number

User Screen Data Memory

Memory type	Memory capacity	Model	Remarks
EEPROM	8 KB	OMRON EER61-25 (access time: 250 ns)	HN58C65P-25
	32 KB	OMRON EER22-20 (access time: 200 ns)	HN58C256P-20
EPROM	32 KB	OMRON ROM22-20B (access time: 200 ns)	TC57256AD-20

Screen Memory Capacity

Memory size	Number of screens
8 KB	100
32 KB	255

Appendix B
Specifications

General Specifications

Item	Specification
Power supply voltage	24 VDC
Applicable voltage range	20.4 to 26.4 VDC (24 VDC $^{-15\%}/_{+10\%}$)
Power consumption	6 W max.
Noise resistance (at 24 VDC)	Normal mode: 300 Vp-p (pulse width: 100 ns to 1 µs) Common mode: 600 Vp-p (pulse width with 1-ns rising time)
Vibration resistance	Conforms to JIS C 0911 IID4 (2 hrs each in X and Y directions; 4 hrs in Z direction)
Ambient operating temperature	NT10S-SF121: 0° to 40°C NT10S-SF122: 0° to 45°C
Ambient operating humidity	35% to 85% (with no condensation)
Storage temperature	−20° to 60°C (with no freezing)
Enclosure ratings	Front display control area: IP52 (dustproof) Rear case: IP20 Terminals: IP00
Weight	Approx. 550 g
Dimensions	162 x 72 x 79 (W x H x D) For details, refer to 2-1 External Dimensions.

Characteristics

Item	Specifications
Liquid crystal display panel	Blue mode dot matrix LCD panel Number of dots: 128 x 48 Dot dimensions: 0.68 x 0.68 mm Dot pitch: 0.7 mm Effective display area: 86 x 32 mm Liquid crystal life expectancy: Approx. 50,000 hrs.
Backlight	Cold fluorescent lamp (CFL) Life expectancy (lit): Average 20,000 hrs. Backlight can be turned off from the host.
Usable characters	Normal: Alphanumeric and symbols Wide: Alphanumeric and symbols; an addition 50 characters can be registered.
Scale	Scaling can be used with either normal or wide characters. Equivalent (normal), double-width, 4x, 9x (only equivalent and 4x for mixed or overlapping displays)
No. of screens	255 screens with 32 KB of EPROM or EEPROM 100 screens with 8 KB of EEPROM
Special display functions	Flashing, inverse (reverse video), mixed (BCD and ASCII), overlapping
Input switches	4 points (function keys F1 to F4, handled as bit data)
Power supply indicator	Green POWER indicator on back of PT
Screen registration method	Implemented with a PC/AT compatible after the newly-created screen data has been transferred to EEPROM or written to EPROM.
Screen data memory	EEPROM, 8 KB: OMRON EER61-25 (access time: 250 ns) EEPROM, 32 KB: OMRON EER22-20 (access time: 200 ns) EPROM, 32 KB: OMRON ROM22-20B (access time: 200 ns)

Appendix C
Screen Layout Sheet

Make copies of this design sheet when preparing PT screen layouts.

Screen No.: ___ Name: ____ Date: _____

1	2	3	4	5	6	7	8
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

$\frac{1}{2}$ $\frac{3}{}$

Screen No.: ___ Name: ____ Date: _____

1	2	3	4	5	6	7	8
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Screen No.: ___ Name: ____ Date: _____

1	2	3	4	5	6	7	8
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

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