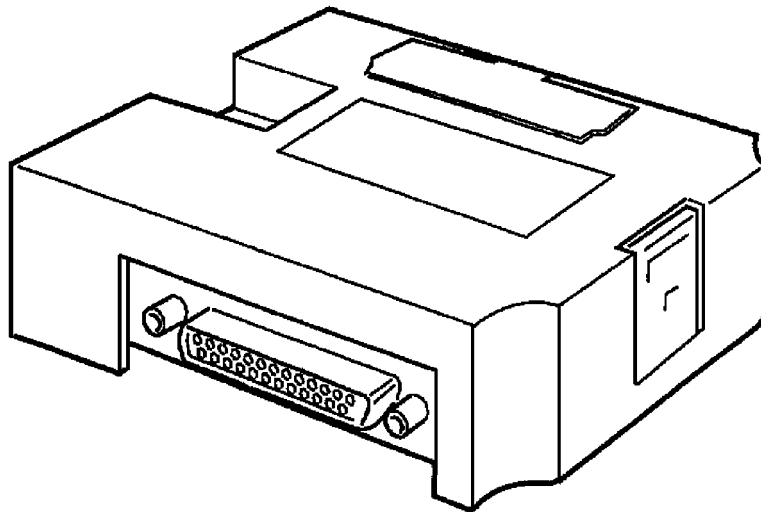


# **NT-series Host Interface Unit Direct Connection**

## **Operation Manual**

*Produced September 1993*



## **Notice:**

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

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

**DANGER!** Indicates information that, if not heeded, is likely to result in loss of life or serious injury.

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

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

## **OMRON Product References**

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

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

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

## **Visual Aids**

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

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

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

## **© OMRON, 1993**

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means, mechanical, electronic, photocopying, recording, or otherwise, without the prior written permission of OMRON.

No patent liability is assumed with respect to the use of the information contained herein. Moreover, because OMRON is constantly striving to improve its high-quality products, the information contained in this manual is subject to change without notice. Every precaution has been taken in the preparation of this manual. Nevertheless, OMRON assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

# TABLE OF CONTENTS

## SECTION 1

<b>Host Interface Unit</b> .....	<b>1</b>
1-1 Getting Starting .....	2
1-2 Programmable Terminal .....	3
1-3 Host Interface Unit .....	5
1-4 System Configuration .....	8
1-5 Before Operating .....	9

## SECTION 2

<b>Installation and Settings</b> .....	<b>11</b>
2-1 Components and Settings .....	12
2-2 Installing the Host Interface .....	13
2-3 Connection to an OMRON PC .....	15

## SECTION 3

<b>Direct Connection Operation</b> .....	<b>25</b>
3-1 The Direct Connection Function .....	26
3-2 Display Element Control and Notification .....	27
3-3 PT Status Control and Notification .....	28
3-4 PT Internal Processing Flow .....	33
3-5 Checking the Host Interface Settings .....	35

## SECTION 4

<b>PT Operation</b> .....	<b>37</b>
4-1 Using the PT .....	38
4-2 Switching Displayed Screens .....	43
4-3 Changing Displayed Numerals or Character Strings .....	45
4-4 Editing Displayed Numerals or Character Strings .....	47
4-5 Upgrading Bar Graphs .....	51
4-6 Controlling the PT Status .....	52
4-7 Turning Lamps and Touch Switches On and Off .....	55
4-8 Determining the Screen Displayed on the PT .....	56
4-9 Determining a Number Input to the PT .....	58
4-10 Determining PT Operating Status .....	61
4-11 Determining Touch Switch Status .....	63

## SECTION 5

<b>Data Conversion</b> .....	<b>67</b>
5-1 Summary of Data Conversion .....	68
5-2 Data Conversion .....	68
5-3 Changing the Allocated Bits and Words for Data Conversion .....	69
5-4 Modifying Programs for Conversion .....	72

## SECTION 6

<b>Troubleshooting</b> .....	<b>79</b>
6-1 Errors Occurring when the Power is Turned ON .....	80
6-2 Errors Occurring During Operation .....	80
6-3 Communication Errors .....	80

# TABLE OF CONTENTS

<b>Appendices</b> .....	<b>83</b>
A Communication Specifications .....	83
B PC Memory Map .....	85
C RS-232C Connections .....	87
D RS-422 Connections .....	97
E Optical Fiber Cable Connections .....	111
F Product Information .....	125
<b>Revision History</b> .....	<b>129</b>

## ***About this Manual:***

This manual describes the installation and operation of the NT-series Host Interface Unit Direct Connection and includes the sections described below.

Please read this manual carefully and be sure you understand the information provided before attempting to install and operate the NT-series Host Interface Unit Direct Connection.

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

**Section 1** describes the role and operation of the Host Interface Unit, and its relationship to the PT features and the new Direct Connection function.

**Section 2** describes how to connect the Host Interface to the PT and the PT to the PC.

**Section 3** describes the basic operation of the new Direct Connection function. Please read this section carefully before using your PT. The Direct Connection function is extremely useful when a PT is used.

**Section 4** describes the actual operation of the PT using Direct Connection. Only the allocated bits and words are described related to the settings with the Support Tool.

**Section 5** describes how to convert existing screen data for use with Direct Connection and how to convert a PC program written for Direct Connection OFF for use with Direct Connection OMRON.

**Section 6** describes the procedures to follow if the PT does not operate correctly.

# SECTION 1

## Host Interface Unit

This section describes the role and operation of the Host Interface Unit, and its relationship to the PT features and the new Direct Connection function.

1-1	Getting Starting .....	2
1-2	Programmable Terminal .....	3
1-2-1	Role and Operation .....	3
1-2-2	Displays .....	5
1-3	Host Interface Unit .....	5
1-3-1	Operation .....	5
1-3-2	Direct Connection Function .....	6
1-4	System Configuration .....	8
1-5	Before Operating .....	9

## **1-1 Getting Starting**

To ensure that the Host Interface Unit works correctly, carefully observe the following when positioning and handling it.

### **Location**

Do not install the Host Interface Unit in a location subject to the following conditions:

- Dust, chemicals, or steam
- Severe temperature fluctuations
- High humidity and condensation
- Direct sunlight
- Strong electrical or magnetic fields
- Poor ventilation
- Severe vibration

### **Handling**

Do not:

- Subject the Unit to strong shocks or vibrations
- Position the Unit's PCB downward
- Touch the Unit's PCB
- Put heavy objects on the unit
- Supply a voltage different from the specified voltage

**System Configuration**

The equipment and parts required to configure the system to use the Direct Connection function are shown below.

Programmable Terminal		Screen-data Memory Board/ Screen Memory	Host I/F Unit	System ROM	Support tools
NT20M	Monochrome LCD: NT20M-DT121-V2 Touch-panel Model	Screen Memory SRAM/32 KB: RAM22-15 SRAM/128 KB: RAM13-10	Host Interface Unit NT600M-LK201	NT20M-SMR31-E	NTM Support Tool NT20M-ZASAT-EV4: 3.5-inch (2DD) and 5.25-inch (2HD) disks
	Backlight replace-able: NT20M-DT131 Touch-panel Model	EPROM/64 KB: ROM-KD-B EPROM/128 KB: ROM-13-12B EEPROM/32 KB: EER22-20			
NT600M	Monochrome LCD: NT600M-DT122 Touch-panel Model	Screen-data Memory Board IC socket type: NT600M-MP251 64-kbyteSRAM: NT600M-MR641 128-kbyteSRAM: NT600M-MR151 256-kbyteSRAM: NT600M-MR251 Screen Memory The screen memory chip must be inserted in the IC socket. screen data is written with a PROM writer.		NT600M-SMR31-E	
	EL display: NT600M-DT211 Touch-panel Model	64-kbyte EPROM: ROM-KD-B 128-kbyte EPROM: ROM 13-12B 256-kbyte EPROM: ROM 23-15B 32-kbyte EEPROM: EER22-20			

## 1-2 Programmable Terminal

The OMRON Programmable Terminal (PT) displays the status and other information about the FA-applied factory. The PT is briefly described below.

### 1-2-1 Role and Operation

The Programmable Terminal (PT) is a FA factory terminal device which communicates with Programmable Controllers (PCs) and displays the operating status of machines and other equipment, work instructions, and operations of the PT.



**Production Line Status Monitoring**

The PT displays real-time information about the system and equipment operating status and manufactured quantity.

Production Control (3)		Date: 27 Jan 93 Time: 14:15:32	
Product	NT20M	NT600M	NT10S
Today's target	560 units	441 units	352 units
Current production	305 units	275 units	213 units
% achieved	54.4 %	60.0 %	60.5 %
Defects	2 units	8 units	1 unit
Repairs	7 units	15 units	5 units

**Messages**

The PT warns of system or equipment errors with a display and buzzer, and prompts the appropriate remedial action.

## Alarm

Assembly line B
-
Positioning pin

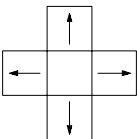
is defective. Line stopped.

Check these points:

1. Pin L3 missing?
2. Position of dog M2.
3. Attachment of photosensor P5.

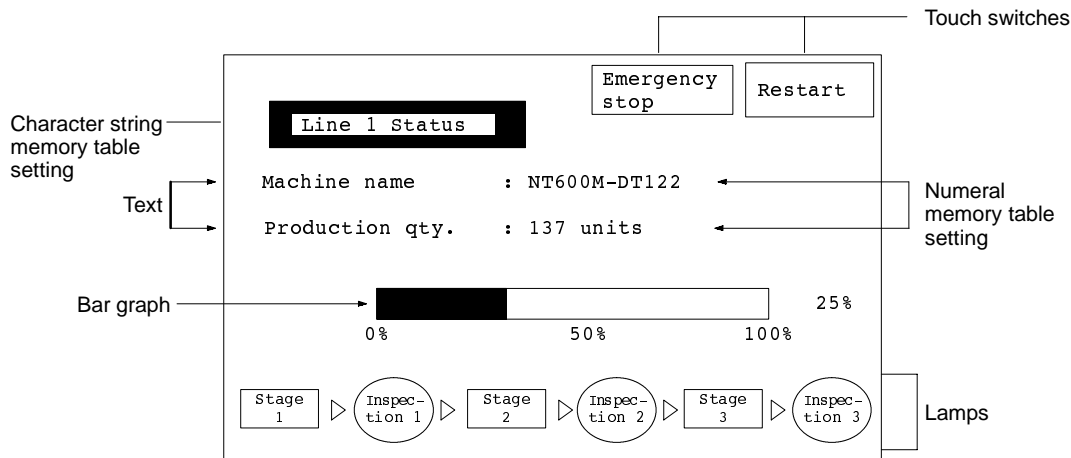
**Panel Switch Functions (Operation from the PT)**

Setting touch switches on the PT allows workers to use the PT as an operating panel. Production targets and other numeric data input to the PT can be transmitted to the PC.

Electroplating Control						
Transport		Electrolyte head	Rinsing head	Rust-proofing head		
		<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Clamp</div> <div style="border: 1px solid black; padding: 5px;">Unclamp</div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">UP</div> <div style="border: 1px solid black; padding: 5px;">DOWN</div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">UP</div> <div style="border: 1px solid black; padding: 5px;">DOWN</div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">UP</div> <div style="border: 1px solid black; padding: 5px;">DOWN</div>	
Halt	Advance Retract	Electrolyte	Rinse	Rust-proofing fluid	Stop buzzer	Alarm

### 1-2-2 Displays

The PT can display the following items to provide the operations mentioned previously. Each of these items is called a “display element.”



- Text** Characters which remain unchanged can be written directly as text.
- Character String Memory Tables** Character strings stored in the character-string memory table are displayed. The display can be changed by changing the data stored in the character-string memory table.
- Numeral Memory Tables** Numbers stored in the numeral memory table are displayed. The display can be changed by changing the data stored in the numeral memory table. The Direct Connection compatible Host Interface Unit also allows the display of hexadecimal values.
- Lamps** Lamps are square or round frames which indicate the operating status. They are controlled by the PC. They can be lit (highlighted) or flashed (intermittent normal and highlighted display).
- Touch Switches** Touch switches can be set anywhere on the screen. Touching the screen at a touch switch location can switch the display (stand-alone function or display-switch function) or notify the PC (notification function). The touch switches can be lit or flashed by the PC in the same way as the lamps.
- Bar Graphs** The bar graph displays a comparison with a value stored in the memory table. A percentage value can be displayed simultaneously.

## 1-3 Host Interface Unit

The Host Interface Unit provides communication between the PT and PC. This sections describes the operation of the Host Interface Unit and the newly added Direct Connection function.

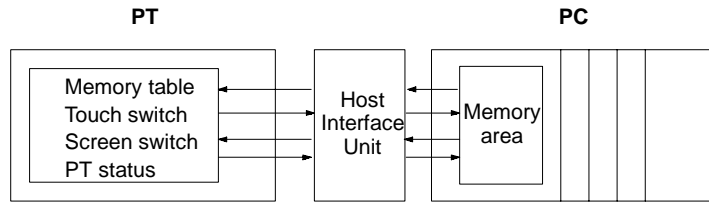
Refer to *Section 3 Direct Connection Operation* and *Section 4 PT Operation* for details on the Direct Connection function.

### 1-3-1 Operation

Many communication units are available to provide communication between the PT and PC for different system configurations. The Host Interface Unit is just one of the communication units which can be mounted on the PT. It can be connected to the Host Link Unit or CPU of a C-series or CV/CVM-series PC.

The Host Interface Unit operates as an intermediary between the PT and PC. It reads information to be displayed on the PT from the PC memory area and writes it to the PT memory table, and writes information to the PC memory area with the PT touch switches.

The Host Interface Unit reads instructions to switch screens from the PC memory area and controls the PT. It reads the status of the PT and writes it to the PC memory area.



### 1-3-2 Direct Connection Function

The new Direct Connection function has been added to the Host Interface Unit to enable the reading and writing of PC bit and word data.

The Direct Connection function is described below.

- The PT is able to directly refer to PC bit and word data so that a PT can be connected to a PC without changing the PC program currently running the production line.
- The bits and words referring to operating status and work instruction information and those storing input data can be freely allocated to almost any part of the PC memory. Bits and words in the PC can be referenced from any memory table.
- The area to control and notify the PT status, including display screens, back-lighting on a flash control, alarms and buzzers, can be freely allocated to any part of the PC memory.

### Setting

The Direct Connection function is set using the NT-series Support Tool, which is the name of the software used to create and maintain the display data for the PT displays, memory table data, and mark data. Refer to the manual listed below for information on the Support Tool and how it is used, as well as for the system configuration:

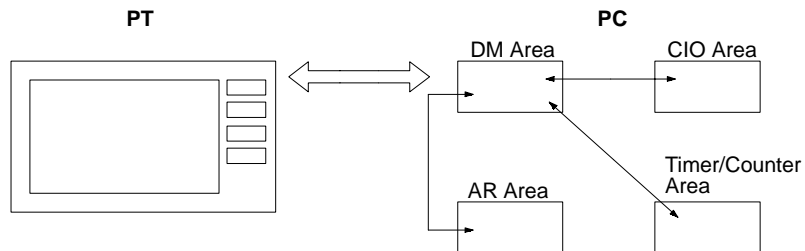
*NT20M/NT2000M/NT600M Support Tool Operation Manual (V004)*

#### Direct Connection is Not Selected

The conventional Host Interface Unit communication protocol is used. De-select the Direct Connection function to use existing programs.

In this case, communication is with the PC's DM area. Data in all other areas is PC program data which must be sent to the DM area in order to be transmitted. In addition, the number of numeral and character-string memory tables which can be communicated with the PC is limited.

This manual describes communications using the Host Interface Unit and Direct Connection. Refer to *NT-series Host Interface Units Operation Manual (V003)* for information on communication without using the Direct Connection function.

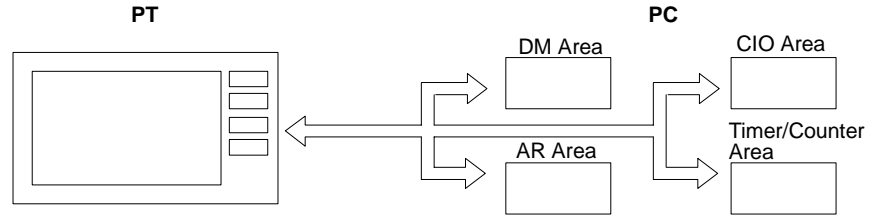


#### Direct Connection is Set

The new Host Interface Unit Direct Connection protocol is used. Direct Connection allows direct reading and writing of most bits and words of the PC memory and allows automatic changing of the display. This new communication format

reduces the load on the PC and increases the efficiency of program development.

Refer to *Section 3 Direct Connection Operation* and *Section 4 PT Operation* for details on the Direct Connection function.

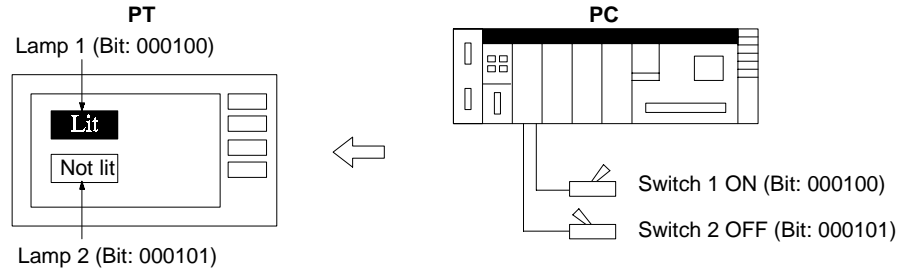


**Direct Connection Examples**

Examples are presented below of PT and PC operation when the Direct Connection function is set.

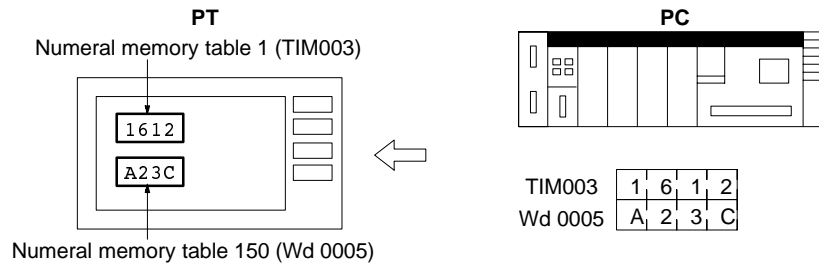
**Example 1**

The status of a PC bit can be directly displayed as a PT lamp without using a PC program.



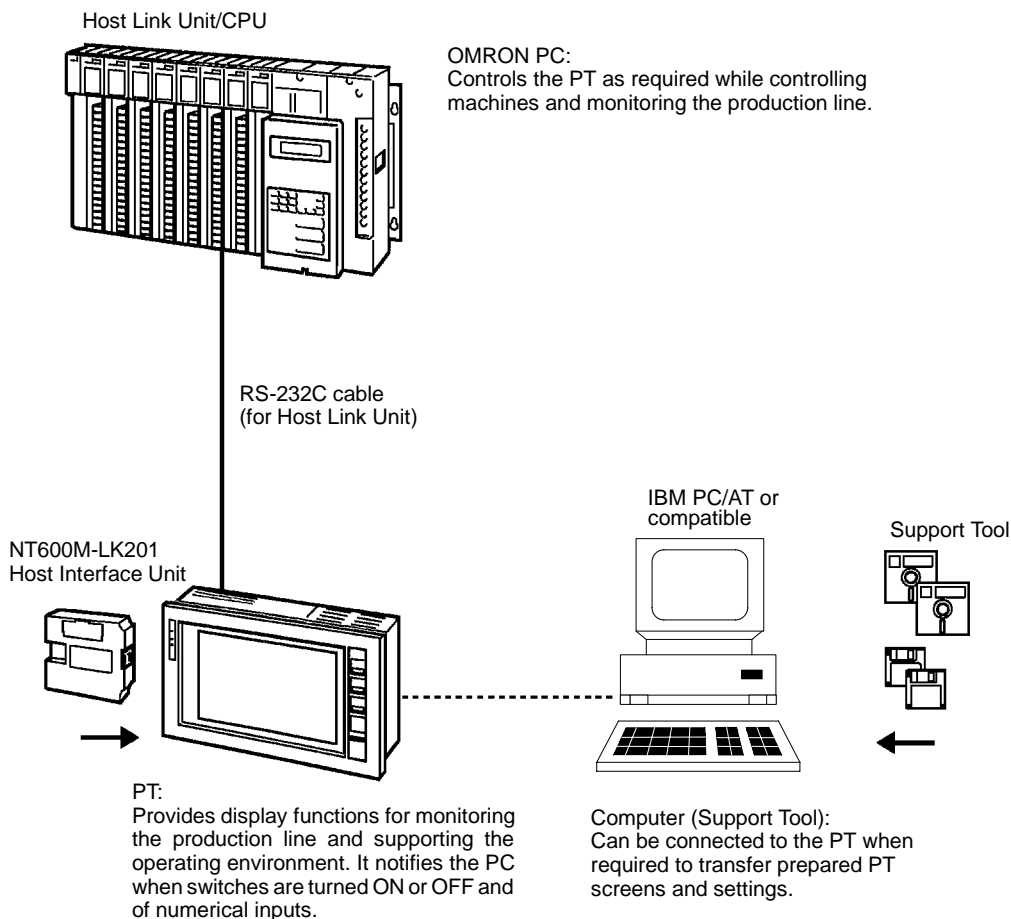
**Example 2**

The displayed word can be freely selected for each memory table. The display as a heraldically value makes it easy to monitor word contents.



# 1-4 System Configuration

This section shows the basic configuration of a system using a Host Interface Unit. Refer to the individual equipment manuals for information on the equipment used in the system.



## System Equipment and Software

<b>OMRON PC</b>	General reference to a C-series or CV/CVM1-series PC. A C□□H-series or CV-series PC can be connected directly to the PT. A Host Link Unit is required to connect a C-series PC.
<b>Programmable Terminals</b>	NT20M, NT2000M, and NT600M.
<b>Computer</b>	IBM PC/AT or compatible.
<b>Support Tool</b>	NT20M/NT2000M/NT600M Support Tool Version 4.0□.

## Connections

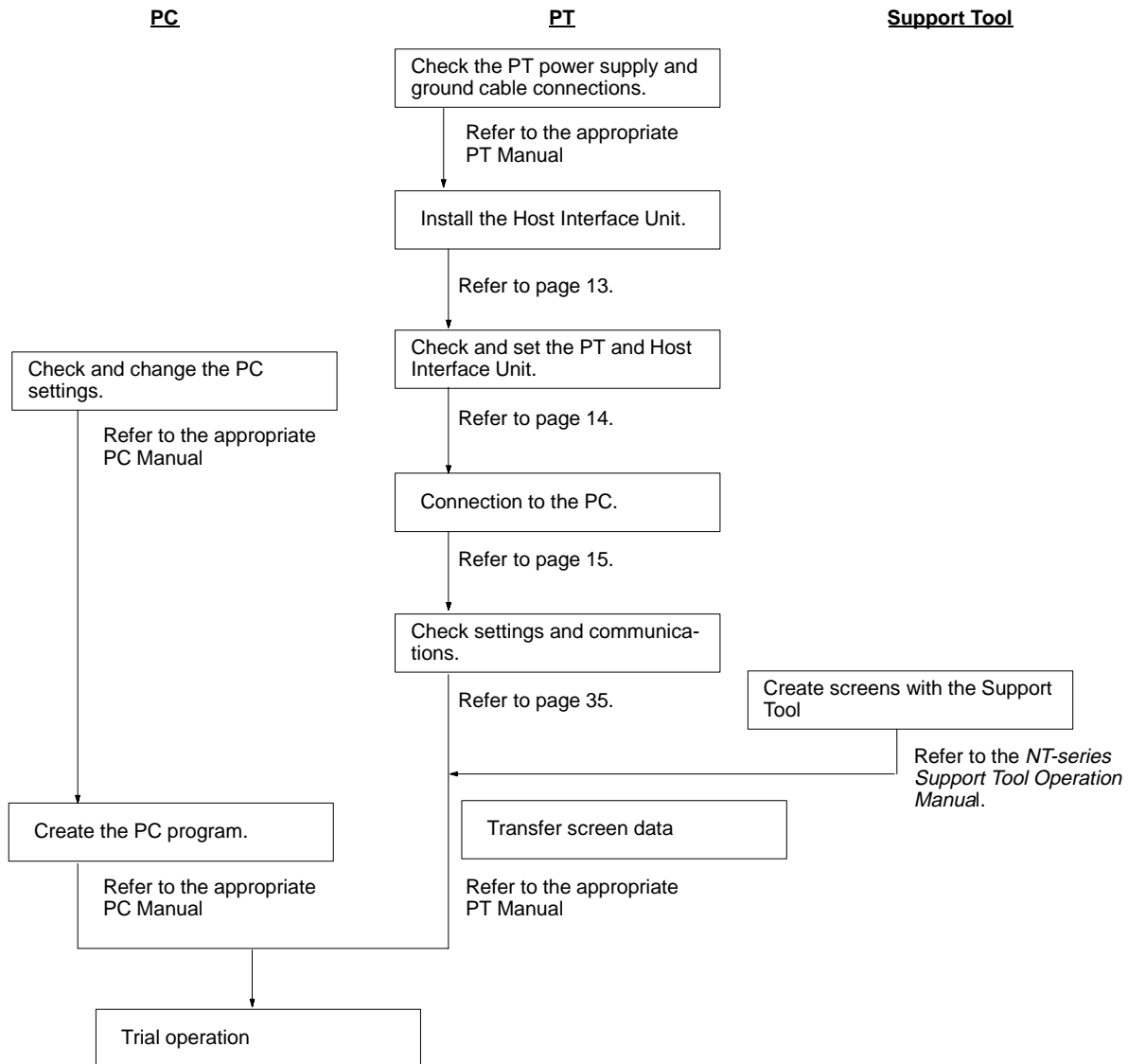
Use an RS-232C cable to connect the PT to the PC. An RS-422 or optical-fiber cable can be used with a Link Adapter.

Refer to the following chapters for details about connecting the PT to the PC.

<b>RS-232C Cable</b>	<i>Section 2 Installation and Settings</i>
<b>RS-422 Cable</b>	<i>Appendix D RS-422 Connections</i>
<b>Optical Fiber Cable</b>	<i>Appendix E Optical Fiber Cable Connections</i>

# 1-5 Before Operating

Follow the procedure indicated below before operating a PT with Host Interface Unit installed.



**Reference Manuals**

The NT20M/NT2000M Series and NT600M Series are covered in the six manuals described below.

Name of Manual	Contents	Manual No.
NT20M/NT2000M Operation Manual	This manual provides specifications, functions, and operating instructions for the NT20M and NT2000M Programmable Terminals.	V001
NT600M Operation Manual	This manual provides specifications, functions, and operating instructions for NT600M Programmable Terminals.	V002
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
NT20M/NT600M Support Tool Operation Manual	This manual covers methods for creating screens, including screen data preparation, switches, lights, and alarms.	V004
NT-series Host Interface Unit Direct Connection Operation Manual	This manual covers the Direct Connection feature which has been added to the Host Interface Unit.	V015
NT-series RS-232C/RS-422 Interface Unit Operation Manual	This manual covers the commands, controls, and communications specifications for operating the NT20M and the NT600M with the RS-232C/RS-422 Interface Unit. Refer to this manual when programming host computer communications.	V016

## **SECTION 2**

# **Installation and Settings**

This section describes how to connect the Host Interface to the PT and the PT to the PC.

2-1	Components and Settings .....	12
2-1-1	Description and Function of Components .....	12
2-1-2	DIP Switch Settings .....	12
2-2	Installing the Host Interface .....	13
2-2-1	Installation .....	13
2-2-2	Setting the PT Switches .....	14
2-3	Connection to an OMRON PC .....	15
2-3-1	Compatible PCs .....	15
2-3-2	Connecting the PT .....	16
2-3-3	PC Switch Settings .....	17



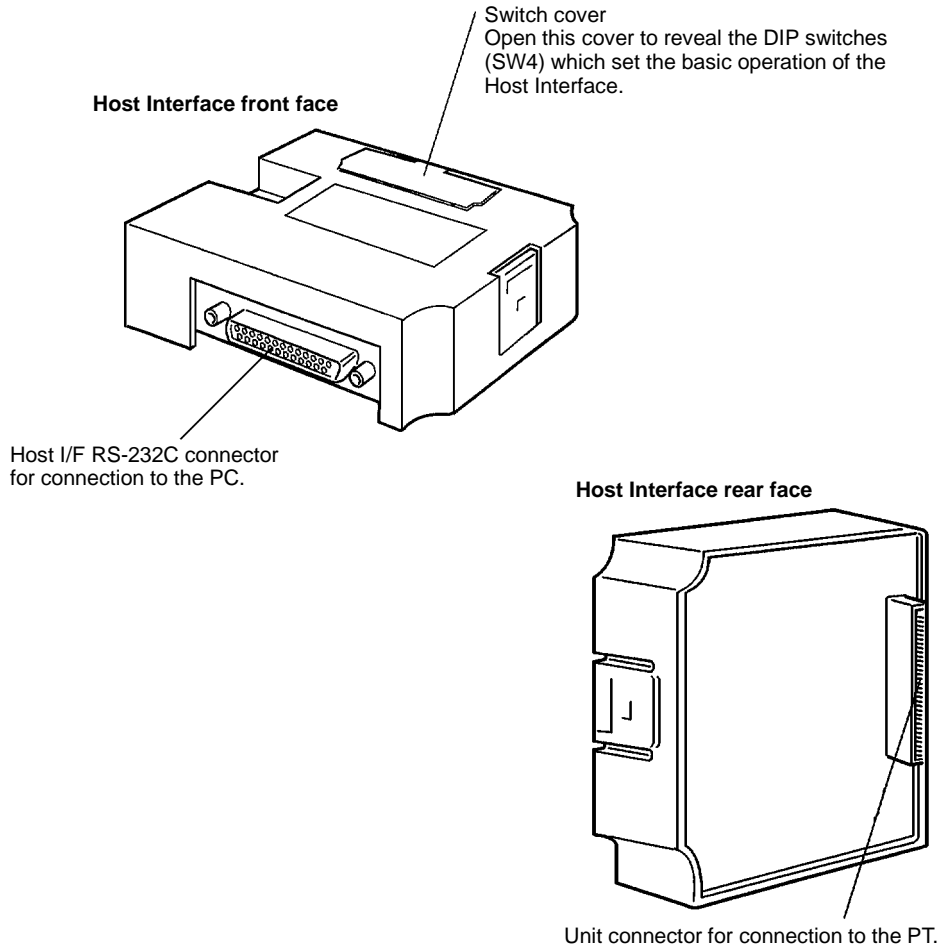
## 2-1 Components and Settings

The parts of the Host Interface and how to set the operating environment are described below.

### 2-1-1 Description and Function of Components

The names and functions of the Host Interface parts are shown in the diagram below.

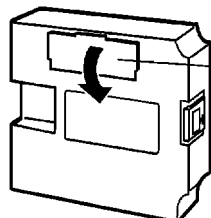
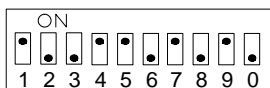
#### NT600M-LK201 Host Interface



### 2-1-2 DIP Switch Settings

Set the operating environment with the Host Interface DIP switches (SW4) before installing the PT.

Set the Host Interface DIP switches in the positions shown below.



Switch cover

The DIP switches are under the switch cover on the front of the I/F Unit.

SW4-3 to 4-6 and 4-0

Not used

**SW4-1**

Initializes the memory table allocating the words.

Setting	Meaning	Description
ON	PT	Initial values set by the Support Tool.
OFF	PC	The contents of the words allocated in the PC memory are used as the memory table initial values.

**SW4-2**

Sets the PT Status Control Area and PT Status Notify Area in the General Memory.

Setting	Meaning	Description
ON	Add	Add PT Status Control Area and PT Status Notify Area to the general memory.
OFF	Don't add	Do not add PT Status Control Area and PT Status Notify Area to the general memory.

**SW4-7, 8, 9**

Sets the PT Baud Rate

Set the Baud Rate to the same value as the PC Host Link function baud rate setting.

Set the Baud Rate to the maximum value that both the PT and PC can handle.

Setting	Baud Rate
SW4-7: ON SW4-8, 9: OFF	4,800 bps
SW4-7, 9: ON SW4-8: OFF	9,600 bps
SW4-7, 8: ON SW4-9: OFF	19,200 bps

- Note**
1. Turn off the power supply before setting the operating environment with the DIP switches.
  2. Be sure to correctly set the communication conditions. Communication is not possible if conditions are not set as shown above.
  3. Use the cables recommended by OMRON to connect the units. Incorrect communication may result if non-recommended cable types are used.

## 2-2 Installing the Host Interface

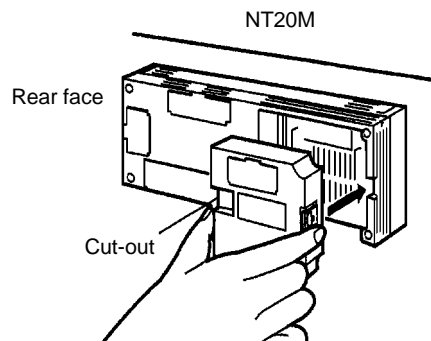
How to install the Host Interface in the PT.

### 2-2-1 Installation

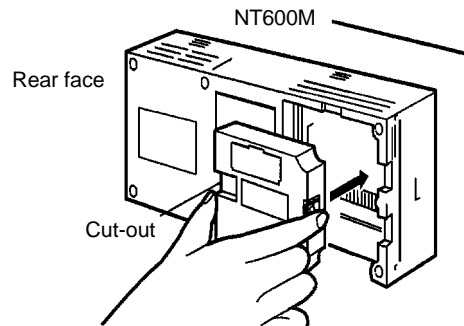
Turn the cut-out in the Host Interface to the left and push the Unit in until a “click” is heard.

In difficult-to-connect situations move the Unit when connecting the Host Interface.

#### Installation in the NT20M



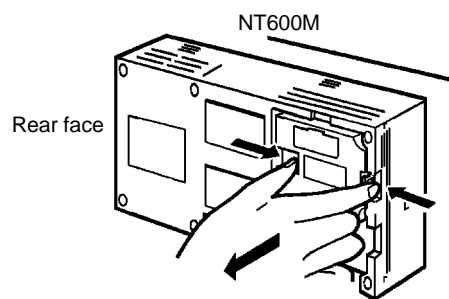
### Installation in the NT600M



#### How to Remove the Unit

Hold the unit by the indentations at each side, press inwards and pull out the unit.

### Removal from the NT600M

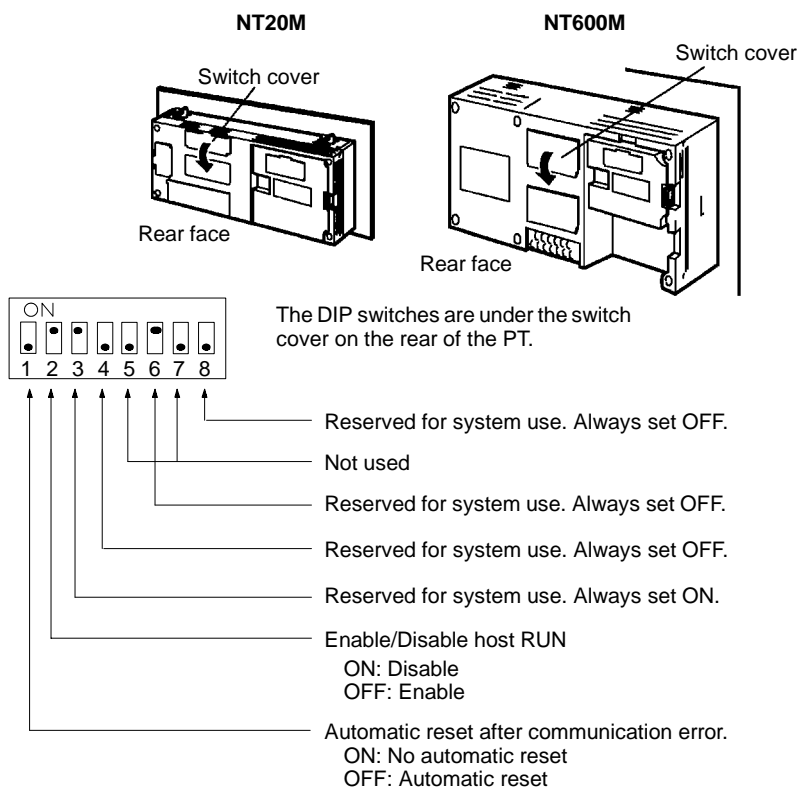


**Note** Turn off the PT power supply when installing or removing the unit.

## 2-2-2 Setting the PT Switches

If Host Interface is installed the communication specifications must be set with DIP switches (SW1) on the PT. These settings are not required if the Direct Connection function is selected. Turn ON DIP-switch SW1-8 when Direct Connection is not selected.

The PT unit DIP switch (SW1) settings are described below. Refer to the appropriate *PT Operation Manual* for more details.



**Note** Turn off the power supply before setting the DIP switches.

## 2-3 Connection to an OMRON PC

Connect the PT fitted with the Host Interface to the OMRON PC with an RS-232C.

### 2-3-1 Compatible PCs

Some models and series of OMRON PCs have the Host Link function built-in. Check the model and series of the PC against the type of Host Link Unit before making the connections.

The compatible PCs are listed in the table below.

PC-series	Units with built-in Host Link function		Connectable to
	Host Link Unit	CPU Unit	
C-series	---	C20H/C28H/C40H/C60H	C__H
	C120-LK201-V1	---	C120, C200H, C500, C1000H
	C200H-LK201	---	C200H
	C500-LK201-V1 C500-LK203	---	C500, C1000H
CV-series	CV500-LK201	CV500-CPU01	CV500
		CV1000-CPU01	CV1000
CVM1-series	CV500-LK201	CVM1-CPU01 CVM1-CPU11	CVM1

### 2-3-2 Connecting the PT

OMRON provides two types of connector cables.

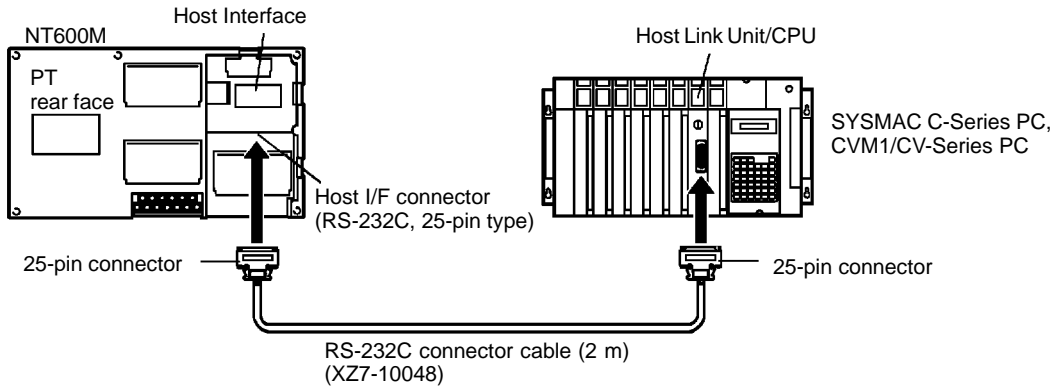
Refer to the diagrams below to select the appropriate cable for the unit connectors. Connect the PT to the PC.

**Note** Turn off the PT and PC power supplies before inserting or removing connectors.

#### Connecting to a PC with 25-pin Connector

Use the following connector cable with a 25-pin connector at each end to connect the PT to a PC with a 25-pin connector:

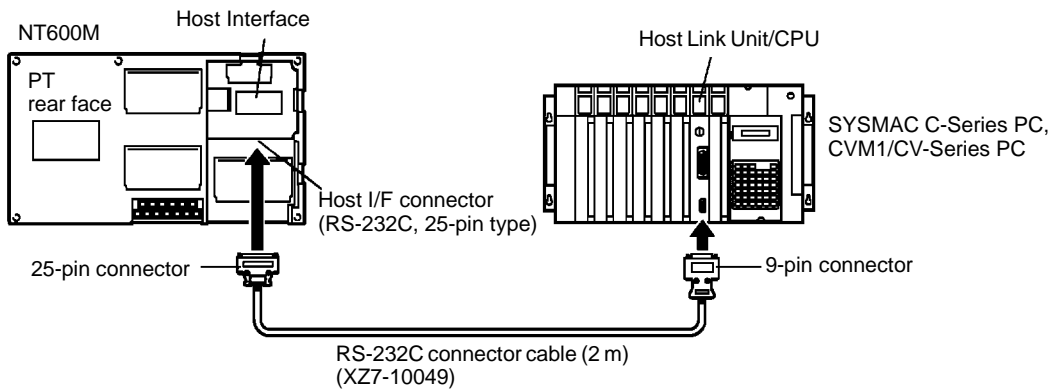
XZ7-10048 (25-pin to 25-pin) Connector Cable



#### Connecting to a PC with 9-pin Connector

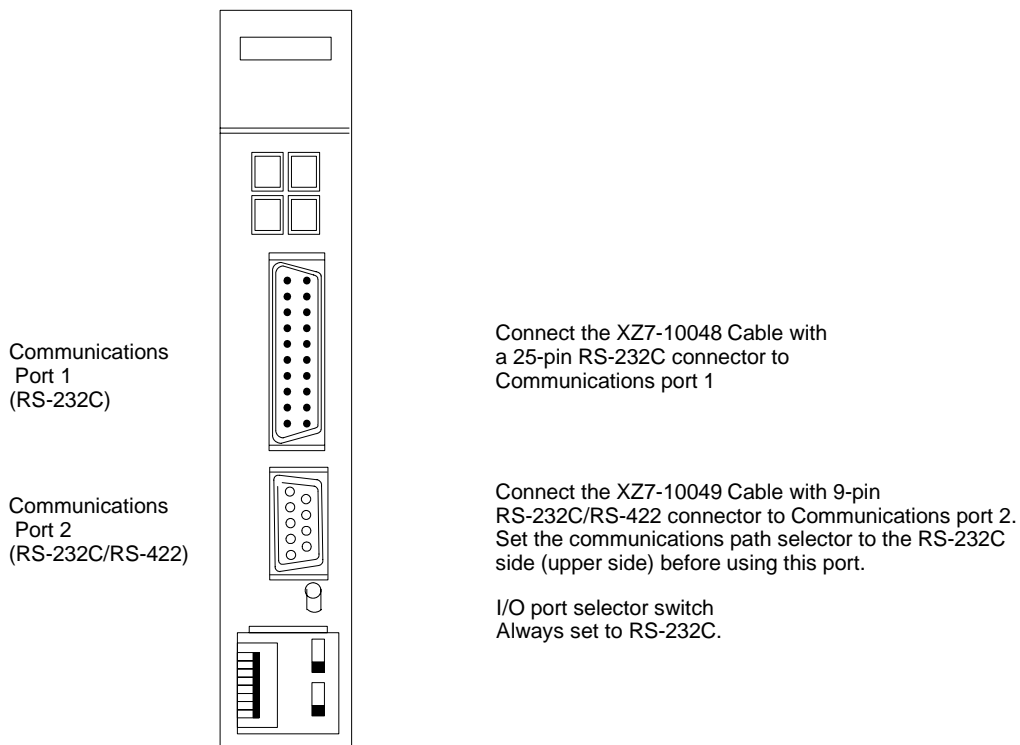
Use the following connector cable with a 25-pin connector at one end and a 9-pin connector the other end to connect the PT to a PC with a 9-pin connector:

XZ7-10049 (9-pin to 25-pin) Connector Cable



**Connecting the PT to a CV or CVM1 Series Host Link Unit**

Two types of connector are found on CV500-LK201 Host Link Units. Both of these connector types can be connected with an RS-232C connector cable. Select the connector cable which matches the connector type.



**If a Cable Longer than 2 m is Required**

If a cable longer than 2 m is required, a longer cable can be fabricated; however the overall length should not exceed 15 m. Refer to *Appendix C RS-232C Connections* for more details.

**Connection with RS-422 or Optical-fiber Cable**

In addition to RS-232C the following two other connection methods are available to connect the PT to PC. Refer to the appropriate appendices for more information on these connection methods.

**RS-422**

Use RS-422 connections if the PT is more than 15 m from the PC. Communication is possible up to 500 m through a multicore shielded cable. However, connection is limited 1-to-1 connection between units. Refer to *Appendix D RS-422 Connections* for more details.

**Optical-fiber**

Optical-fiber cable connections are used in situations where unstable communication occurs because of noise problems. Communication is possible up to 500 m. However, connection is limited 1-to-1 connection between units. Refer to *Appendix E Optical Fiber Cable Connections* for more details.

**2-3-3 PC Switch Settings**

When the PT and PC are connected together, set the conditions at the PC Host Link Unit and the CPU as shown in the table below.

The method of setting the conditions with the switches on each unit is described

on the following pages. Refer to the manual on each unit for more detailed information on making these settings.

Item	Switch setting position
I/O port	RS-232C
Baud rate	Set to the same baud rate as the PT
Transfer code	ASCII, 7 data bits, 2 stop bits
Parity	Even
1-to-1/1-to-N	1-to-N
Instruction level	Level 1
Unit#	00

**Note** The 1-to-N setting enables BCC (Block Check Character). The 1-to-N connection cannot be used to connect a Host Link Unit to a PT.

### Connection to a Host Link Unit

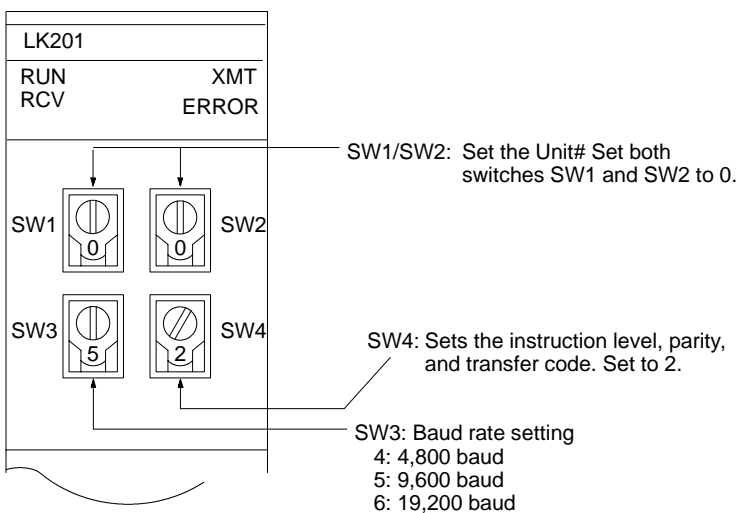
Two types of Host Link Unit are available: a Rack-mounting type and a CPU-mounted type. The switch settings differ according to the type of Host Link Unit. Set the switches according to the unit type.

#### C200H: Rack-mounting Type

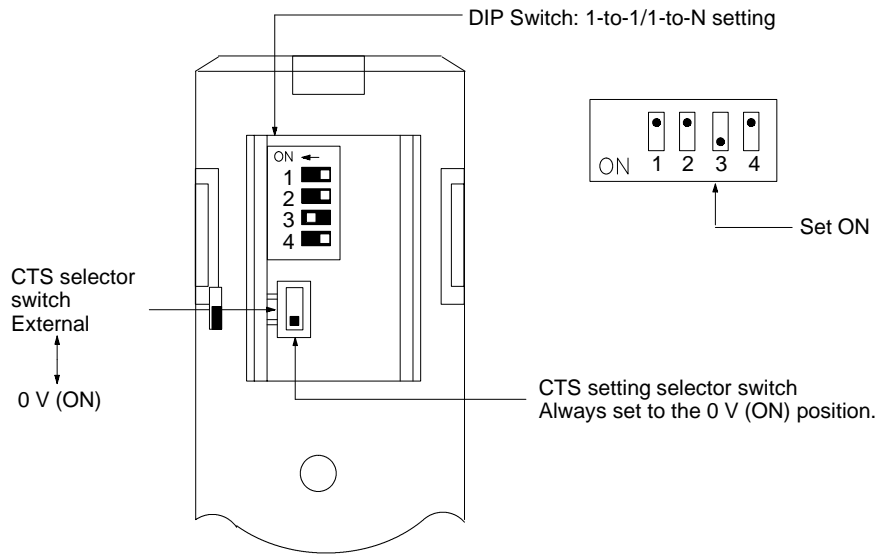
C200H-LK201

#### Setting the Front Switches

Set each switch with a flathead screwdriver until the displayed settings agree with the settings described on the previous page.



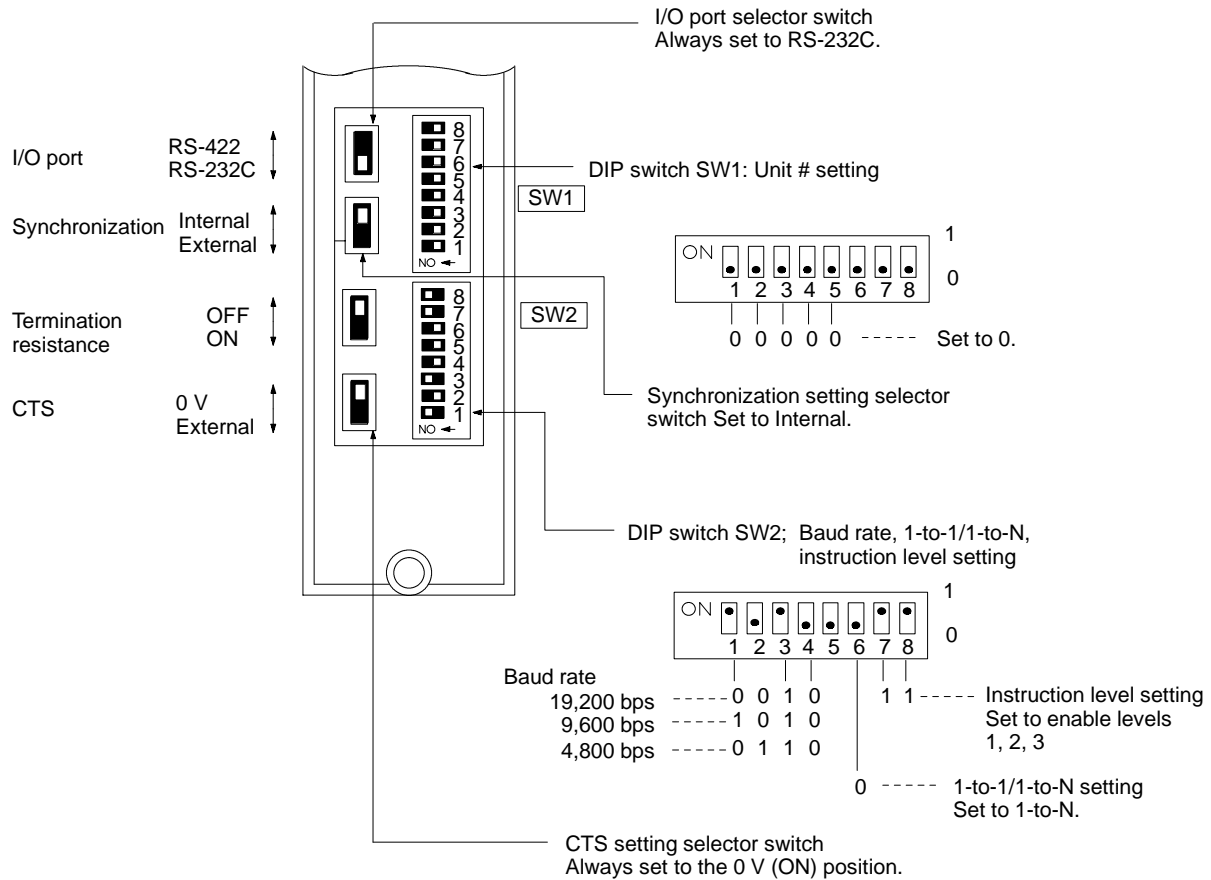
Setting the Rear Switches



C500(F), C1000(F)  
Rack-mounting Types

C500-LK201-V1

Setting the Rear Switches

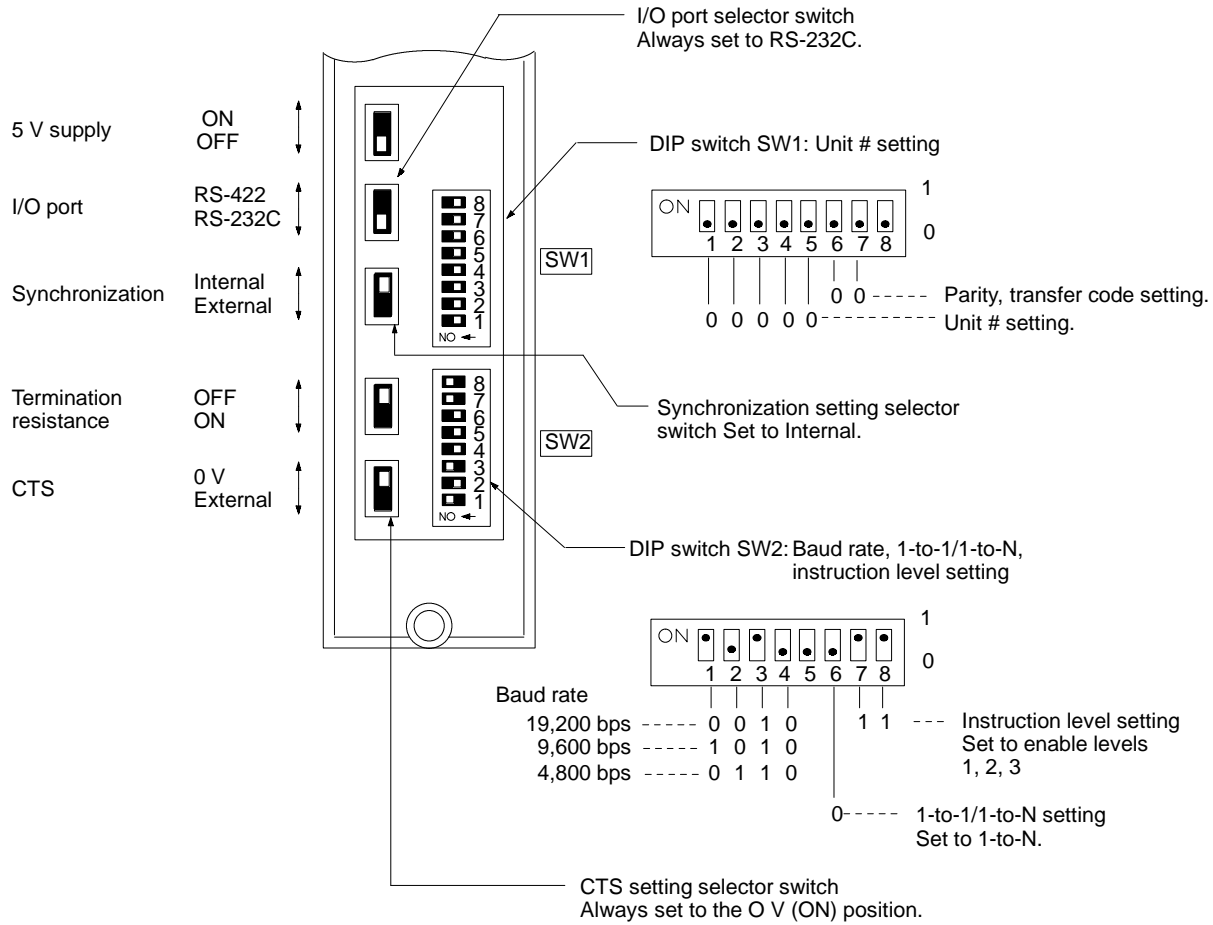




C500(F), C1000(F)  
 Rack-mounting Types

C500-LK203

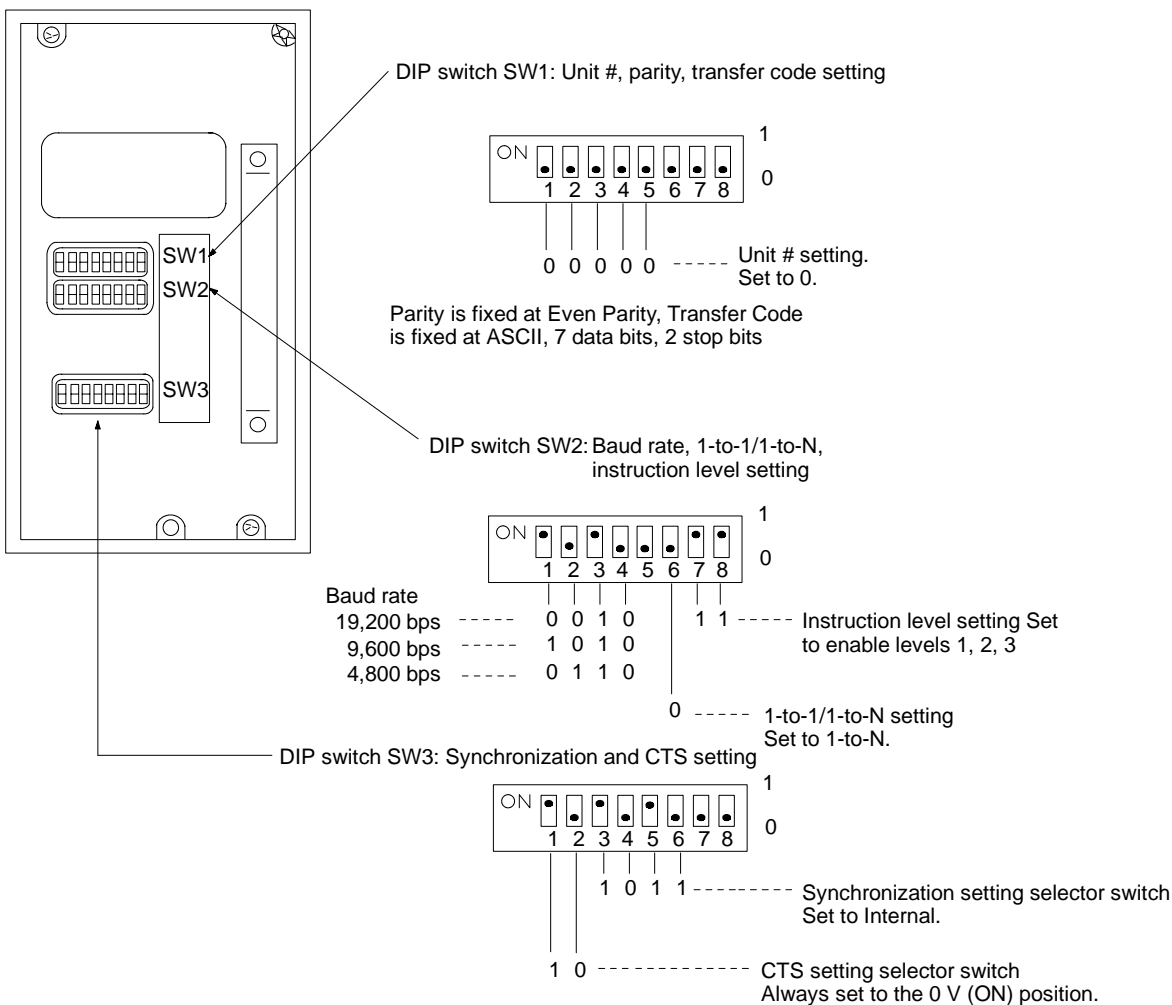
Setting the Rear Switches



CPU-mounted Type

C120-LK201-V1

Setting the Rear Switches



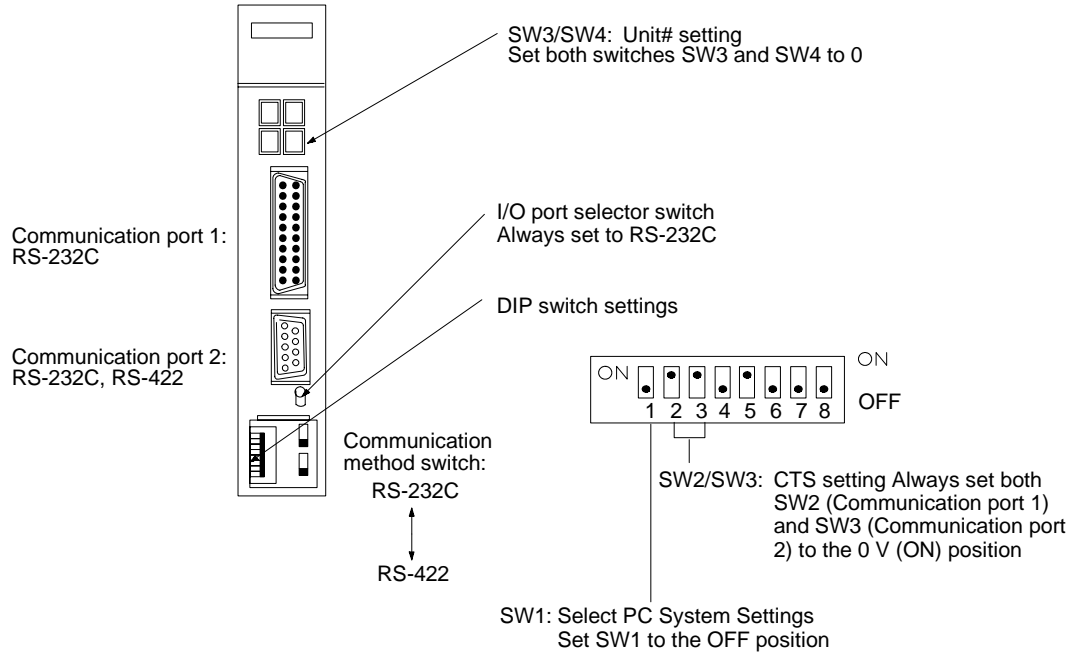
CV Series Backplane Mounted Type

CV500-LK201

Setting the Front Switches

Set the operating conditions with the PC System Setting functions when a CV Series Host Link Unit is connected to a PC. The PC System Settings can be made from the Peripheral Tool (FIT, etc.) or PC system setting information created with a Peripheral Tool can be transferred to the CPU.

Set the DIP switches to enable the system settings to be made.



**Connection to a CPU**

Set the operating conditions with the PC System Setting functions when connecting to a Mini H-type (C□□H) or CV/CVM1 Series CPU. The PC System Settings can be made from the Peripheral Tool (FIT, etc.) or PC system setting information created with a Peripheral Tool can be transferred to the CPU. Refer to the *Mini H-type PCs: C20H, C28H, C40H, C60H Installation Guide* for more details of the system settings.

**Mini H-type PCs (C□□H)**

C20H/C28H/C40H/C60H

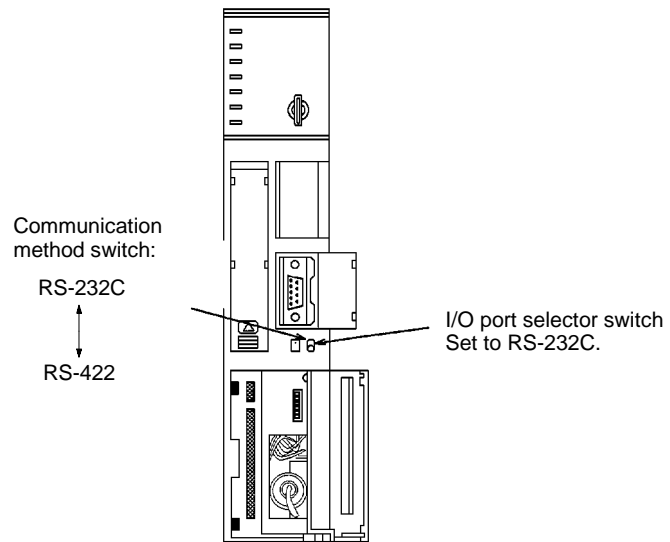
No switch settings required when connecting to a Mini H-type PC.

**CV/CVM1-series**

- CV500-CPU01
- CV1000-CPU01
- CVM1-CPU01
- CVM1-CPU11

**Front Switch Settings**

When connecting to a CV/CVM1 Series CPU, select the RS-232C input port.



# SECTION 3

## Direct Connection Operation

This section describes the basic operation of the new Direct Connection function. Please read this section carefully before using your PT. The Direct Connection function is extremely useful when a PT is used.

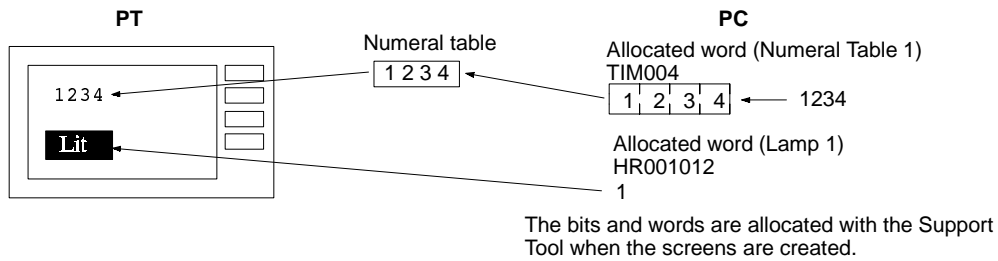
3-1	The Direct Connection Function .....	26
3-2	Display Element Control and Notification .....	27
3-3	PT Status Control and Notification .....	28
3-3-1	PT Status Control Area .....	28
3-3-2	PT Status Notify Area .....	31
3-4	PT Internal Processing Flow .....	33
3-5	Checking the Host Interface Settings .....	35

### 3-1 The Direct Connection Function

Direct Connection is a new function added to the Host Interface Unit. Its features are described below.

#### Direct Connection

When a Host Interface Unit is mounted to a PT, the bits and words of the PC memory area can be freely allocated as reference elements required for the display and to store input data. The PT is then able to directly read and write these allocated bits and words to change the display and to control and notify the PT status. This function is called Direct Connection. The bits and words allocated for use by the Direct Connection function are referred to as “allocated” bits and words.



#### Types and Features of Allocated Data

Using Direct Connection the following items can be allocated to bits and words of the PC memory:

- Display elements: numerals, character strings, lamps, touch switches
- PT status: alarm and buzzer outputs, backlighting lit or flashing, screen selection, currently displayed screen number, operating status, etc.

These allocated bits and words can be used by the PC to control the PT. The items the PC can control are categorized into two groups, as follows:

- Control and notification of display elements
- Control and notification of PT status

The relationship between the allocated memory and the control operation is shown in the table below.

Element, area	Allocated memory	Function	Control or Notification
Lamp	Bit	Control of display elements	Lights (flashes) when the allocated bit is turned ON (1) and goes out when the bit is turned OFF (0).
Touch switch	Bit	Control of display elements	Lights (flashes) when the allocated bit is turned ON (1) and goes out when the bit is turned OFF (0).
		Display element notification	The allocated bit remains ON (1) while the touch switch is pressed.
Numeral table	Word	Display element control and notification	The contents of the allocated word and numeral table are continuously read and written to ensure that their contents are always identical.
Character-string memory table	Word	Display element control and notification	The contents of the allocated word and character-string memory table are continuously read and written to ensure that their contents are always identical.
PT Status Control Area	Word	PT status control	The allocated word is read to control the next PT status, including screen selection, copying a memory table, buzzer, backlighting.
PT status notification	Word	PT status notification	Notifies the allocated word of a change in PT status, including change of selected screen, numeral input to the memory table, operating status.

**Note** To use the Direct Connection function, words must be allocated for the PT Status Control Area and PT Status Notify Area.

**Data Allocated in the PC**      The following bits and words of the PC memory area can be allocated.

Symbol	Area name		Allocate bit	Allocate word	
	C-series PC	CV-series PC		Numeral	Character string
DM	DM Area	DM Area	OK	OK	OK
I/S	IR area	CIO Area	OK	OK	OK
TC or TIM	Timer /Counter Area	Timer Area	NG	1 word only	NG
TC or CNT		Counter Area	NG	1 word only	NG
HR	Holding Area	---	OK	OK	OK
AR	AR Area	Auxiliary Area	OK	OK	OK
LR	Link Area	---	OK	OK	OK

The range of each memory area differs according to the PC type. Refer to *Appendix B PC Memory Map* for more details.

Words allocated as memory tables are limited in length as follows:

Numeral table entries: 2 words max.

Character-string memory tables: 20 consecutive words max.

If the PT Status Control Area and PT Status Notify Area are allocated to general memory, up to 10 consecutive words can be allocated. If the general memory is not used, 4 words are used for the PT Status Control Area and 3 words for the PT Status Notify Area.

- Note**
1. Do not exceed the memory area when allocating words.
  2. When a bit is allocated, all other bits in the word containing the allocated bit are set OFF (0).

## 3-2 Display Element Control and Notification

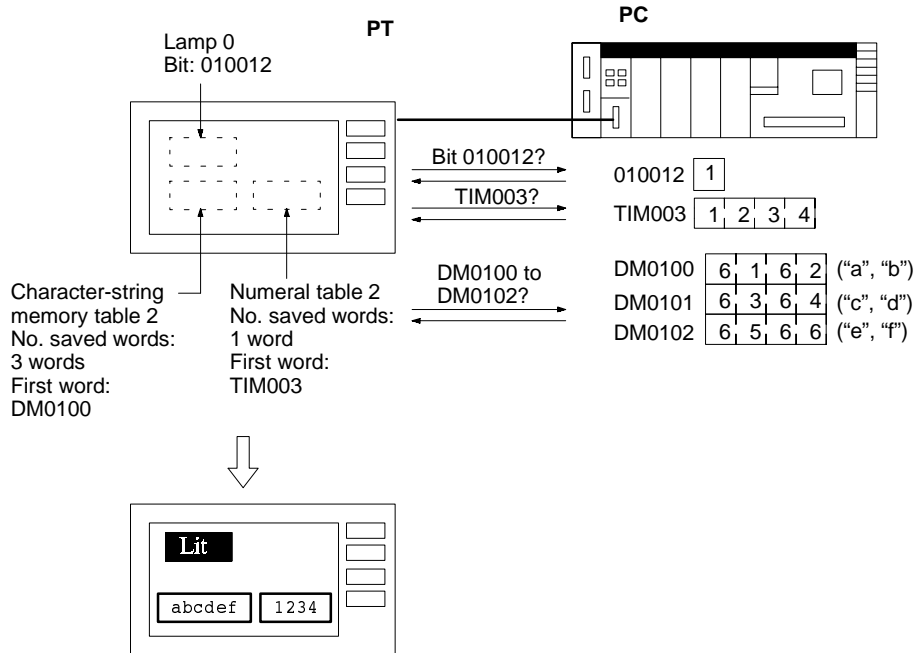
The control and notification of display elements using allocated bits and words is described below.

### Controlling Display Elements

The PT and PC operate as described below to display element control.

- 1, 2, 3...**
1. The PT asks the PC the status of the bits and words allocated to the elements displayed on the screen.
  2. The PC responds with bit and word data.
  3. The PT changes the display in response to the bit and channel data received.

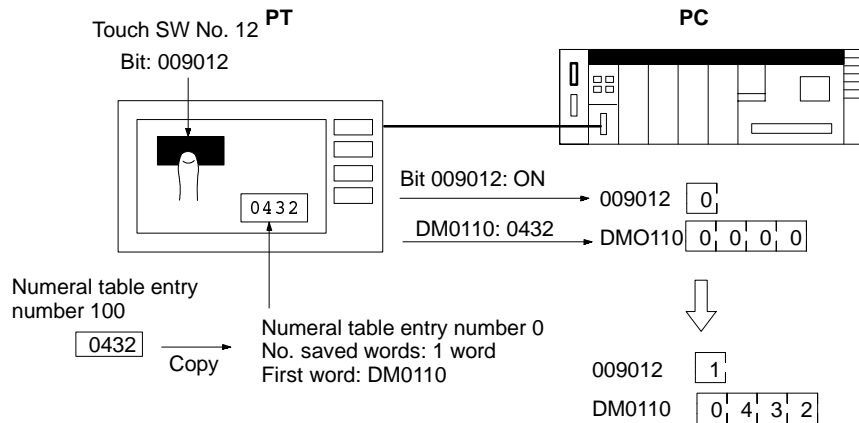
Example:



**Notification of Display Elements**

When the contents of a currently displayed numeral or character-string memory table is changed or a touch switch is pressed, the information is written to the bits and words in the PC memory.

Example:



**3-3 PT Status Control and Notification**

The PT Status Control Area and PT Status Notify Area are described below. Refer to 4-1 Using the PT for details.

**3-3-1 PT Status Control Area**

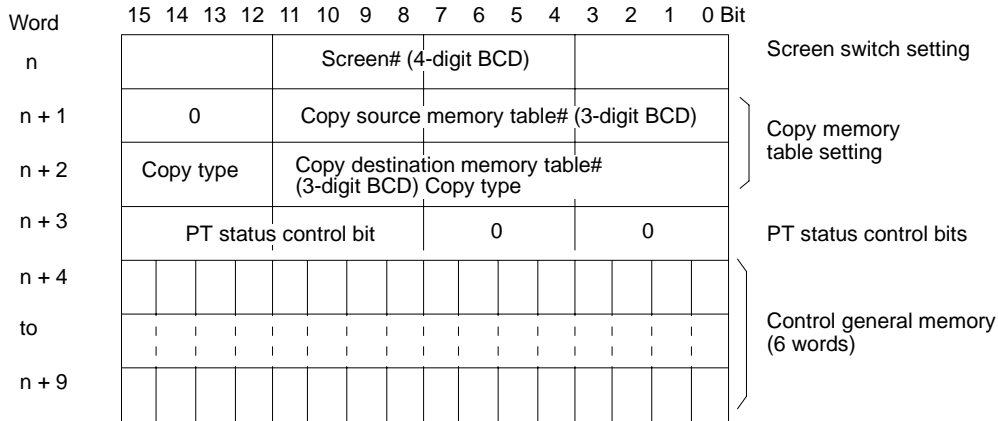
The PT Status Control Area is set by choosing Direct or Direct Specify Information under the Expansion Function from the Screen List on the Support Tool.

Any data written to this specified area is read by the PT.

The PT Status Control Area is configured as ten consecutive words, as shown in the diagram below.



First word (Word n): Set with the Support Tool when the screen is created.



**Screen Switch Settings**

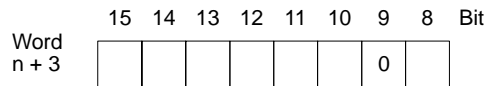
Specify the screen# to switch the screen displayed on the PT.

**Copy Memory Table Settings**

Specify to copy the contents of a memory table internally in the PT.  
 Set the copy type to match the type of memory table to be copied, as follows:  
 0: Character-string memory table  
 1: Numeral table

**Pt Status Control Bits**

Set the bits ON or OFF according to the following table to control the backlighting and buzzer.



Bit no.	Controlled item	1 (ON)	0 (OFF)
15	Screen display (see note)	ON	OFF
14	Alarm output	ON	OFF
13	Continuous buzzer	ON	OFF
12	Intermittent buzzer	ON	OFF
11	Initialize display history	ON	OFF
10	Backlight color	Red	White
8	Backlight mode	Continuous light	Flash

**Note** Backlighting turns on if the Screen Display bit is set ON and turns off if the Screen Display bit is set OFF.

**Control General Memory**

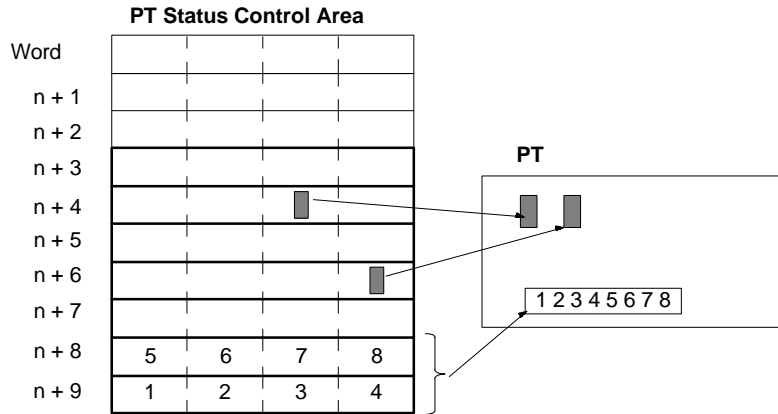
The following bits and words can be allocated to the control general memory:  
 lamp and touch switch control bits  
 numeral table

Using this memory has the following effects.

The control general memory is read frequently at the same time as the PT Status Control Area. Allocating bits and words to the control general memory achieves faster screen refresh than allocating the bits and words to other areas of the memory.

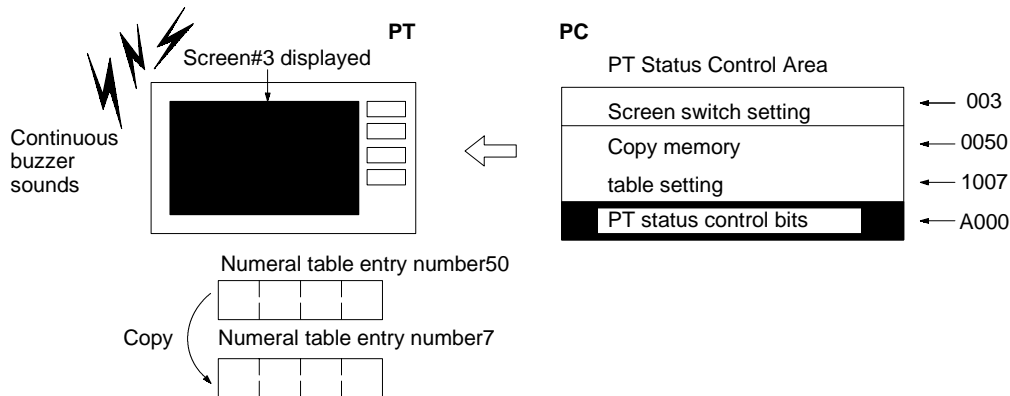
Up to 96 bits (6 words) can be allocated. The operation is identical to when the bits and words are allocated elsewhere in memory. Refer to 4-7 Turning Lamps

and Touch Switches On and Off and 4-4 Editing Displayed Numerals and Character Strings.



**Using the PT Status Control Area**

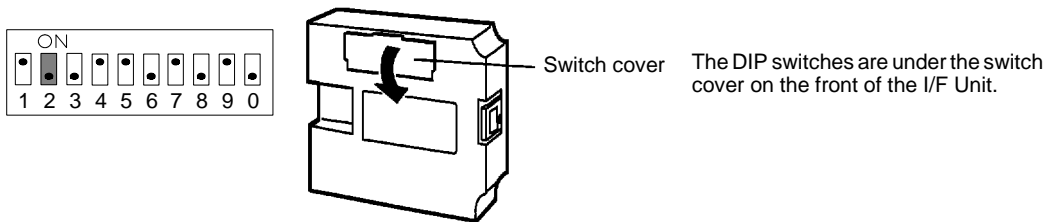
When control data is written to the PT Status Control Area, the PT responds as shown in the diagram below.



**Without Control General Memory**

Turn OFF the Host Interface Unit DIP Switch (SW4-2) if the control general memory is not used. The PT Status Control Area is configured as only four words, n to (n+3). The function of these words is the same as when the control general memory is used.

**DIP Switch Setting**

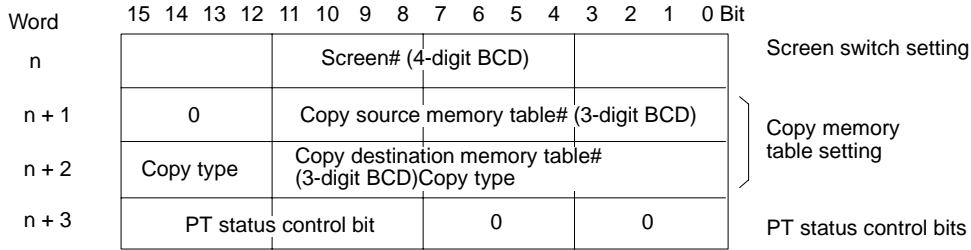


SW4-2 sets the PT Status Control Area and PT Status Notify Area in the general memory.

Setting	Meaning	Function
ON	yes	Add the general memory value to the PT Status Control Area and PT Status Notify Area.
OFF	no	Do not add the general memory value the PT Status Control Area and PT Status Notify Area.

**PT Status Control Area without General Memory**

First word (Word n): Set with the Support Tool when the screen is created.



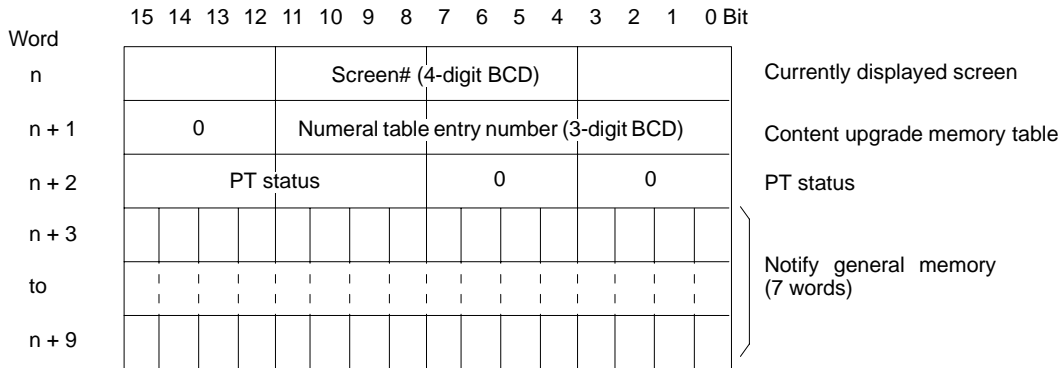
**3-3-2 PT Status Notify Area**

The PT Status Status Notify Area is set by choosing Direct or Direct Specify Information under the Expansion Function from the Screen List on the Support Tool.

Any changes in PT status are written to the PC PT Status Notify Area.

The PT Status Notify Area is configured as ten consecutive words, as shown in the diagram below.

First word (Word n): Set with the Support Tool when the screen is created.



**Currently Displayed Screen**

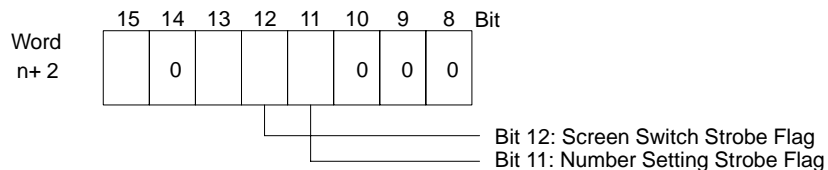
The screen number of the screen displayed on the PT is written to this word. Simultaneously, the PT Status Screen Switch Strobe Flag is set ON (1). After the PC is notified, this flag reverts to OFF (0). Checking the status of this flag provides a simple method of checking if the PT display has switched.

**Content Upgrade Memory Table**

The number of the numeral table is written to this word when the numeral table contents change due to PT switch operation. The input value appears in the word allocated for the appropriate numeral table. As the number of the numeral table is written, the PT Status Number Setting Strobe Flag is simultaneously set ON (1). After the PC is notified, this flag reverts to OFF (0). Checking the status of this flag provides a simple method of checking if a number has been input from the PT.

**PT Status**

The bits shown in the following table are turned ON or OFF in response to the PT operating status and battery level.



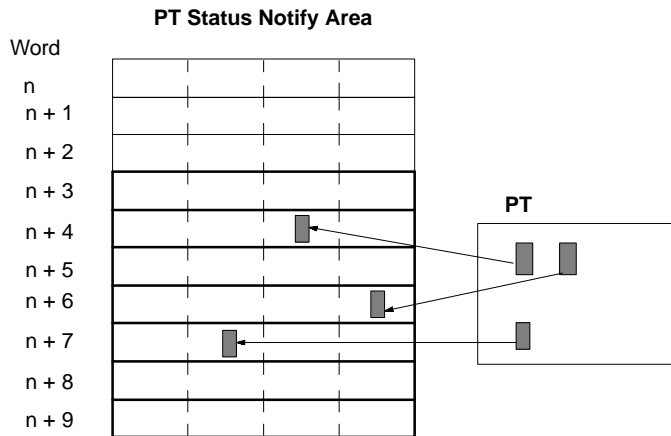
Bit	Notified item	1 (ON)	0 (OFF)
15	PT operating status	Run	Stop
13	Battery	Low	Normal

**Notify General Memory**

The touch switch notify bits can be allocated to the control general memory. Using this memory has the following effects.

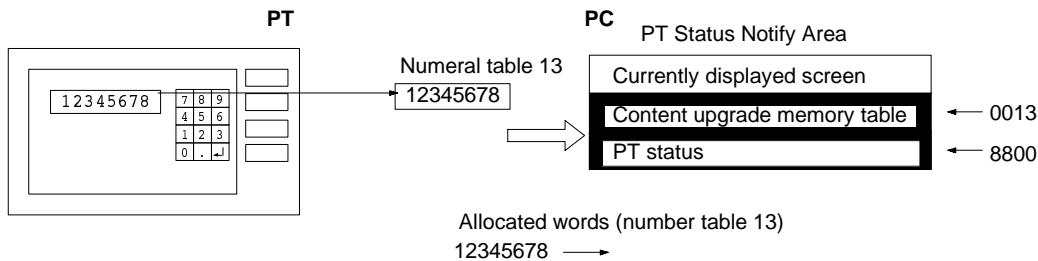
The notify general memory is written to the PC simultaneously with the PT Status Notify area, which has a high notification priority. Allocating bits to the notify general memory achieves faster touch switch notification than allocating the bits to other areas of the memory.

Up to 112 bits (7 words) can be allocated. The operation is identical to when the bits are allocated elsewhere in memory. Refer to 4-11 *Determining Touch Switch Status*.



**Using the PT Status Notify Area**

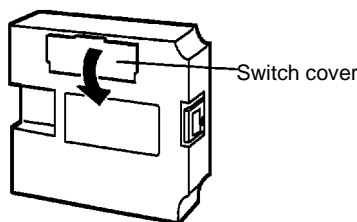
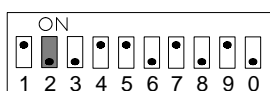
The PT Status Notify area is notified as follows when the PT status changes.



**Without Notify General Memory**

Turn OFF the Host Interface Unit DIP Switch (SW4-2) if the notify general memory is not used. The PT Status Notify Area is configured as only three words, n to (n+2). The function of these words is the same as when the notify general memory is used.

**DIP Switch Setting**



The DIP switches are under the switch cover on the front of the I/F Unit.

SW4-2 sets the PT Status Control Area and PT Status Notify Area in the general memory.

Setting	Meaning	Function
ON	yes	Add the general memory to the PT Status Control Area and PT Status Notify Area.
OFF	no	Do not add the general memory to the PT Status Control Area and PT Status Notify Area.

**PT Status Control Area when General Memory Not Used**

First word (Word n): Set with the Support Tool when the screen is created.

Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit			
n	Screen# (4-digit BCD)																Currently displayed screen			
n + 1	0			Numeral table entry number (3-digit BCD)																Content upgrade memory table
n + 2	PT status											0			0			PT status		

### 3-4 PT Internal Processing Flow

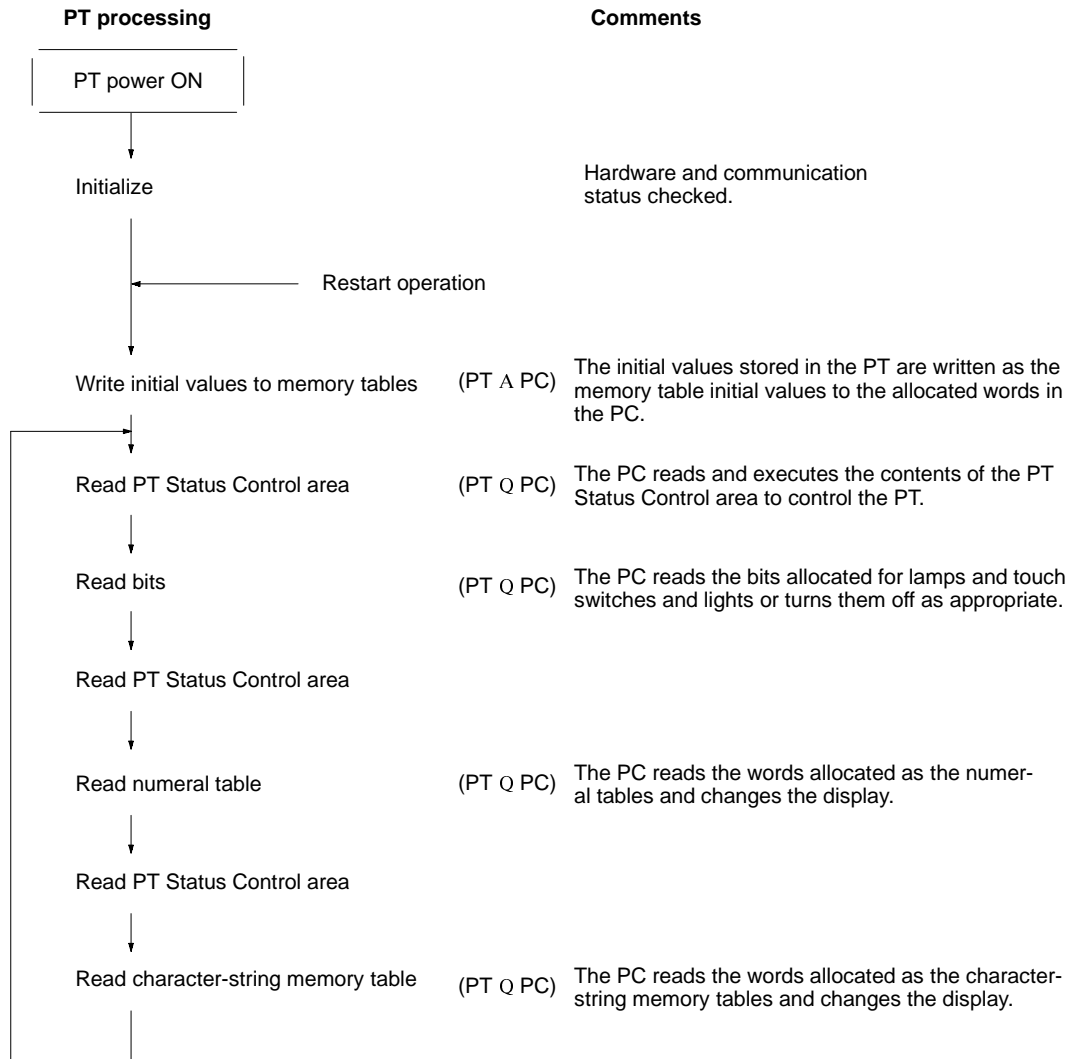
The processing carried out inside a PT mounted to a Host Interface Unit is described below. Processing is divided into two types: periodic processing, event processing. Refer to the appropriate *PT Operation Manual* for more details.

**Periodic Processing**

To allow high-speed control by the PC, the PT Status Control are is executed three times per loop.

If the control general memory is specified for PT processing, the control general memory is read simultaneously with the PT Status area. The control bits and

words allocated in the control general memory for lamps and touch switches are processed more rapidly than those allocated to other areas of memory.



**Note** Only data for the currently displayed screens is read from the PC. Even if a memory table allocated to the PC memory is changed, the PT data contents remain unchanged until the memory table is used for a display screen.

**Event processing**

When the PT status changes during PT operation, data is written to the appropriate area of the PC memory. These writing processes occur only when the PT status changes. If more than one change occurs simultaneously data is written to the PC according to the highest order of preference.

During PT processing, the control general memory and PT Status area are read simultaneously. The lamp and touch switch control bits and the numeral table

allocated to the control general memory are processed faster than those allocated to other areas of the memory.

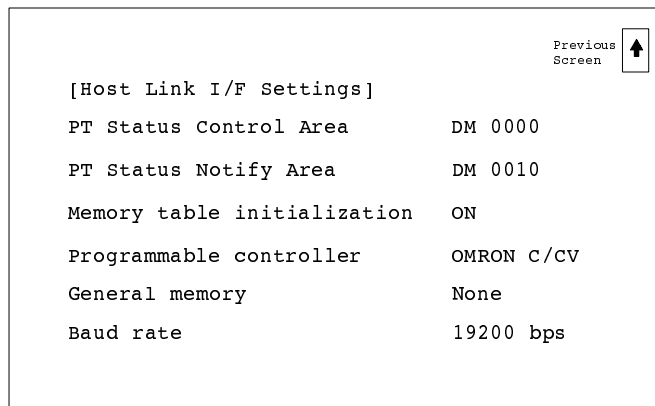
	PT processing		Comments
High	Write to PT Status Notify Area	(PT ^ PC)	The PT Status Notify Area is written to notify the PC of a change in the PT operating status.
↑			
Order of priority	Write bits	(PT ^ PC)	The bit data is written to notify the PC that a touch switch was pressed.
↓			
Low	Write Numeral table entry	(PT ^ PC)	The allocated word data is written to notify the PC that values in a numeral table were changed.
	Write character-string memory table	(PT ^ PC)	The allocated word data is written to notify the PC that the contents of a character-string memory table were changed.

**Note** Only bit, numeral and character-string memory table data for the currently displayed screens is written to the PC. Changes are not written to the PC if the contents of an undisplayed memory table are changed.

### 3-5 Checking the Host Interface Settings

Use the PT Status Area check function to check the Host Interface Unit settings. Follow the procedure below to check the settings.

- 1, 2, 3...
1. Display the PT System Menu.
  2. Select the Maintain Mode item. The Maintain Mode menu is displayed.
  3. Select the PT Setting item. The PT Settings are displayed.
  4. Display the Host Link I/F Settings screen.



The PT Status Control Area, PT Status Notify Area, and Programmable controller settings are not displayed in the initialized status (i.e., before data transfer).

5. Check that the PT settings are the same as the Host Interface Unit DIP switch (SW4) settings.

The menu selection differs according to the model and type of PT. Refer to the appropriate *PT Operation Manual* for details of menu operation.

# SECTION 4

## PT Operation

This section describes the actual operation of the PT using Direct Connection. Only the allocated bits and words are described related to the settings with the Support Tool. Refer to the *Support Tool and PT Operation Manuals* for details of other settings.

4-1	Using the PT .....	38
4-1-1	Before Using the PT .....	38
4-1-2	Creating Screen Data .....	39
4-1-3	Setting Direct Connection .....	41
4-2	Switching Displayed Screens .....	43
4-3	Changing Displayed Numerals or Character Strings .....	45
4-4	Editing Displayed Numerals or Character Strings .....	47
4-5	Upgrading Bar Graphs .....	51
4-6	Controlling the PT Status .....	52
4-7	Turning Lamps and Touch Switches On and Off .....	55
4-8	Determining the Screen Displayed on the PT .....	56
4-9	Determining a Number Input to the PT .....	58
4-10	Determining PT Operating Status .....	61
4-11	Determining Touch Switch Status .....	63



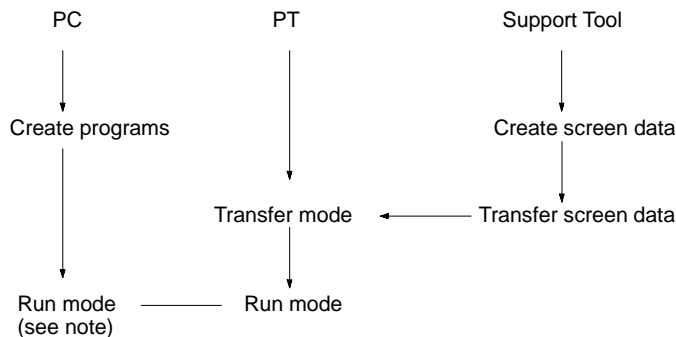
## 4-1 Using the PT

How to create screen data, Direct Connection, and connecting the Support Tool are described below before the use of the PT is explained.

### 4-1-1 Before Using the PT

This section describes PC program creation and Support Tool screen data creation only as it relates to using the PT. For details of other procedures, refer to *1-4 System Configuration*.

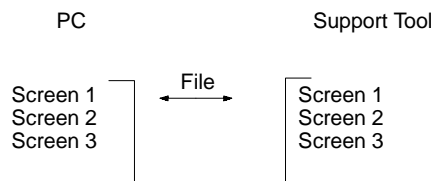
**Preparing to Operate the PT** The relationship between PT, PC and Support Tool operations is shown below.



**Note** The PT reads and writes data to allocated bits and words in the PC even if the PC is not set to Run mode. Control of the PT and reading the status with the Peripheral Tool monitoring functions are also enabled.

### Creating Screen Data

The PT switches the display between multiple screens. All screen data for a single PT corresponds to a single file.



Screen data can be created by one of the following three methods:

- creating a new file;
- editing an existing file;
- reading and editing selected screens from an existing file.

### Equipment

The following equipment and settings are used in the examples in this section:  
General memory:

**PT:**

NT600M-DT211 (EL display, touch panel version NT600M)

**PC:**

OMRON C200H

The memory area used depends on the PC type. Refer to *Appendix B PC Memory Map* for details.

**Support Tool**

NT20M/NT2000M/NT600M Support Tool Version 4.0\_

**Direction Connection**

OMRON

Set with the Tool Setting screen on the Support Tool. Refer to *4-1-3 Setting Direct Connection* for details.

**General Memory**

Do not use

Set the Host Interface Unit DIP switch SW4-2 to the OFF position. The general memory is used if this switch is turned ON. For details, refer to 2-1-2 *DIP Switch Settings*.

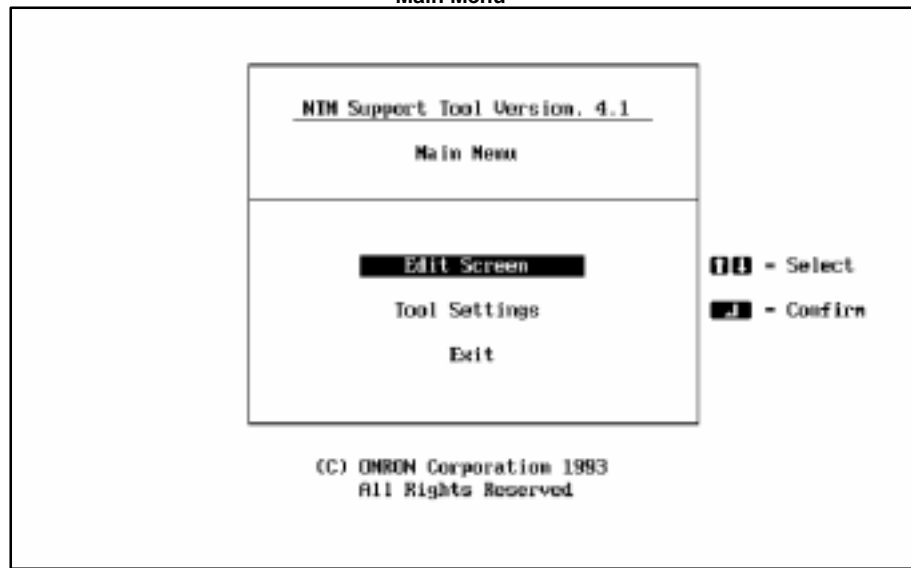
**4-1-2 Creating Screen Data**

Screen data is created with the Support Tool. The basic procedure to create these screens is outlined below along with the relevant page number. The example describes the procedure for creating a new file using Support Tool version NT20M, NT2000M, or NT600M.

**Tool Settings**

NTM model setting (PT model)  
 Memory capacity setting (screen memory)  
 Direct Connection (OFF, OMRON)

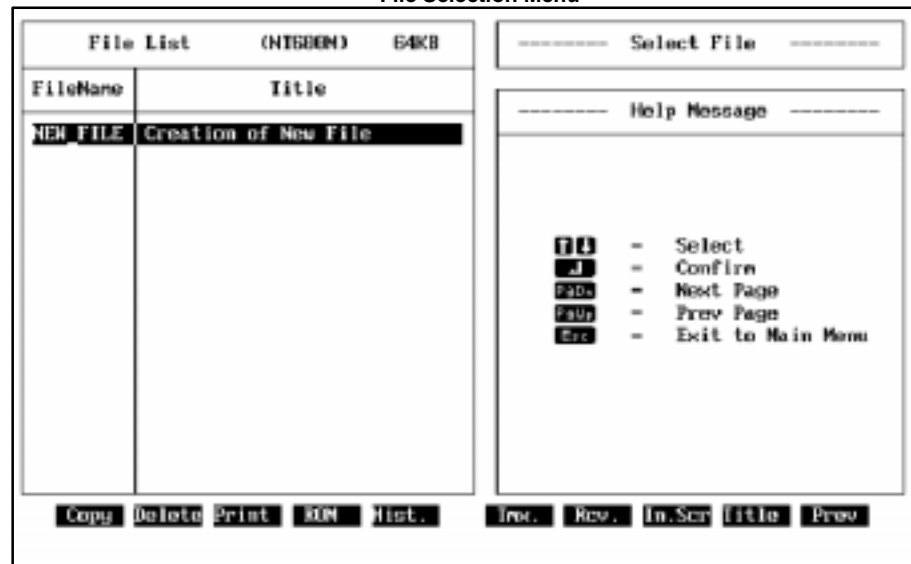
Main Menu



**Create Screen**

Create new file: select New File  
 Edit existing file: select file to edit

File Selection Menu



**Create New File**

Enter filename on completion.

**Setting Direct Connection Information**

Press the function key `Next Page` followed by function key `Direct` to set the following data.

PT Status Control Area (word allocation)

PT Status Notify Area (word allocation)

Numeral table (word allocation)

Character-string memory table (word allocation)

Reuse existing file: select Read

Screen Selection Display

**Select Screen**

**Creating Screen**

The following screen will be displayed. Set the following data from this screen.

Numeral display (numeral table selection)

Character-string display (character-string memory table selection)

Lamp (bit allocation)

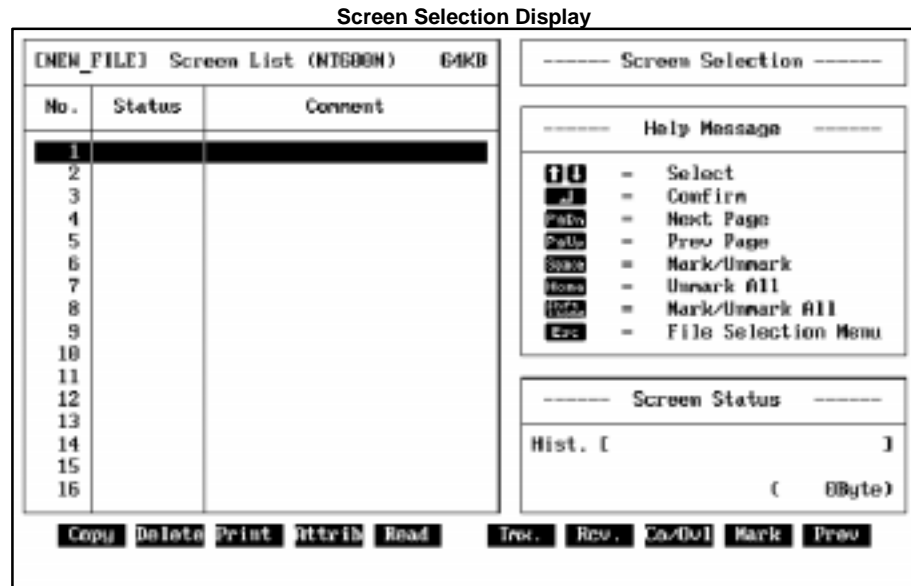
Touch switch (bit allocation for control and notification)

Bar graph (numeral table selection)

Set numbers (numeral table selection)

Initial Edit Display

Complete Create Screen



Complete Create File

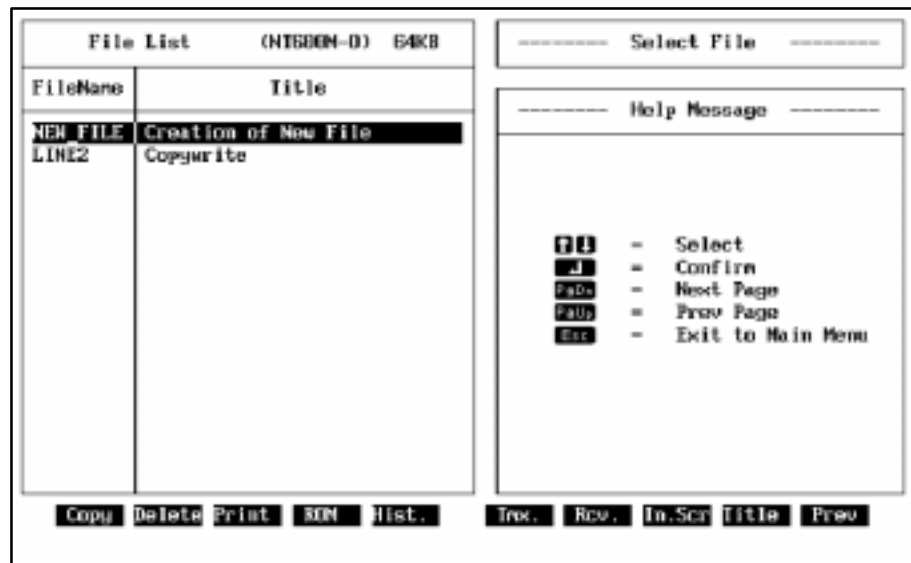
Specify the filename for the newly created screen.

Set Start-up Screen Number

Press the function key F8: Start-up Screen. The following screen is displayed when the PT is booted up.

Transfer

Press the function key F6: Transfer. Transfer the created screen data to the PT.



Transferring Data to the PT

To transfer the screen data to the PT, connect the PT and Support Tool together and set the PT in Transfer Mode.

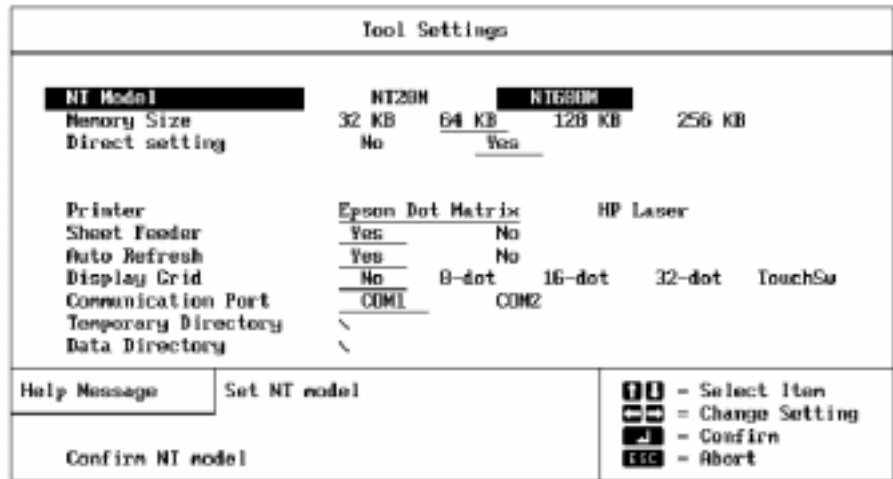
When reusing existing file data with a different Direct Connection setting, change the settings as described in *Section 5 Converting Data*.

### 4-1-3 Setting Direct Connection

Set Direct Connection with the Support Tool before selecting a file. It is set from the Main Menu of the Tool Setting screen.

To select Direct Connection, set the Direct Connection item to either OMRON or ON (depending on the Support Tool version).

NT20M/NT2000M/NT600M Support Tool Version 4.0\_



**Connecting to the Support Tool**

The following equipment and software is required to create screens with the Support Tool:

Computer: PC/AT compatible computer.

Software:

NT20M/NT2000M/NT600M Support Tool Version 4.0\_

NT20M-ZA3PC-V4: 3.5-inch floppy disk

NT20M-ZA5PC-V4: 5-inch floppy disk

NT610G/NT610C Support Tool Version 1.0\_

NT610G-ZASPC; 3.5-inch and 5-inch floppy disks packaged together

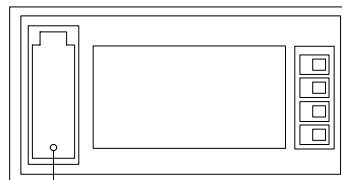
Connecting cable: CV500-CN228, 2 m cable

Refer to the *NT-series Support Tool Operation Manual* for details on the Support Tool software and connecting cables.

**Connections**

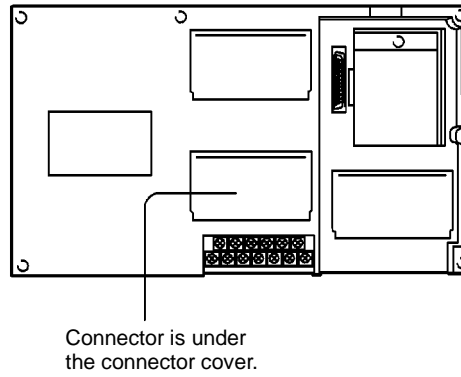
Connect the computer RS-232C connector to the PT connector with the connecting cable as shown in the diagrams below.

**NT20M**



Connector is under the connector cover.

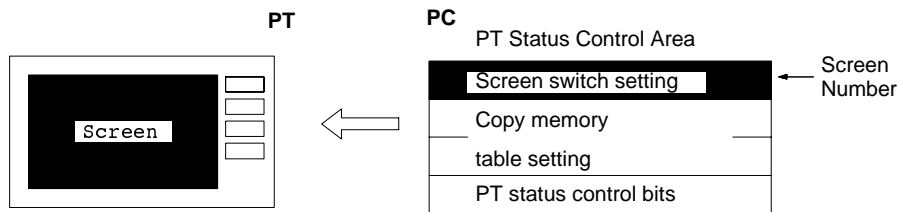
NT600M



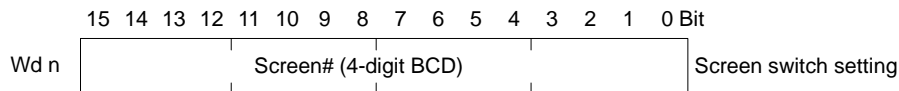
## 4-2 Switching Displayed Screens

### Description

Write the screen number to the Screen Switch setting in the PT Status Control Area to switch the screen displayed on the PT.



Allocated start address: Word n (set with the Support Tool)



Screen#: 0000 (Screen clear — no display)  
 0001 to 0250 (NT20M)  
 0001 to 0250 (NT600M)

### Restrictions

#### Allocated Words

The PT Status Control Area can be allocated to the areas listed in the following table.

Symbol	C-series PC	CV-series PC	Allocation OK?
DM	DM Area	DM Area	OK
I/S	IR Area	CIO Area	OK
TC or TIM	Timer /Counter Area	Timer Area	NG
TC or CNT		Counter Area	NG
HR	Holding Area	---	OK
AR	AR Area	Auxiliary Area	OK
LR	Link Area	---	OK

The range of each memory area differs according to the PC type. Refer to *Appendix B PC Memory Map* for more details.

### Procedure

- 1, 2, 3... 1. Use the Support Tool to allocate the PT Status Control Area to the PC memory.

2. Create a PC program to write the number of the displayed screen to the Screen Switch setting word in the PT Status Control Area as a 4-digit BCD (binary coded decimal) value.

**Important Points**

The displayed screen switches when the contents of the allocated word are changed. To re-specify the number of the currently specified screen, first write the value 0000 to clear the screen before writing the appropriate screen number. As shown in the example, it is also possible to use the function to notify which screen is currently displayed.

**Reference**

When the displayed screen is switched due to PT Status Control Area operation, the screen number is written to the Currently Displayed Screen word in PT Status Notify Area. Refer to *4-8 Determining the Screen Displayed on the PT* for details.

Continuous or superimposed screens can be displayed by specifying the parent screen. If a child screen is specified, only the child screen is displayed.

Refer to the appropriate *PT Operation Manual* and *NT-series Support Tool Operation Manual* for information about displaying continuous and superimposed screens.

One way to switch screens is to set the screen number to a touch switch with the Support Tool. Refer to the Stand-alone functions (screen switch function) in the appropriate *PT Operation Manual* and *NT-series Support Tool Operation Manual* for details.

**Application Example**

This example operates the PC switch (bit) to change the PT display screen.

**Allocation**

Allocate the memory as follows using the Support Tool:

PT Status Control Area: 0100

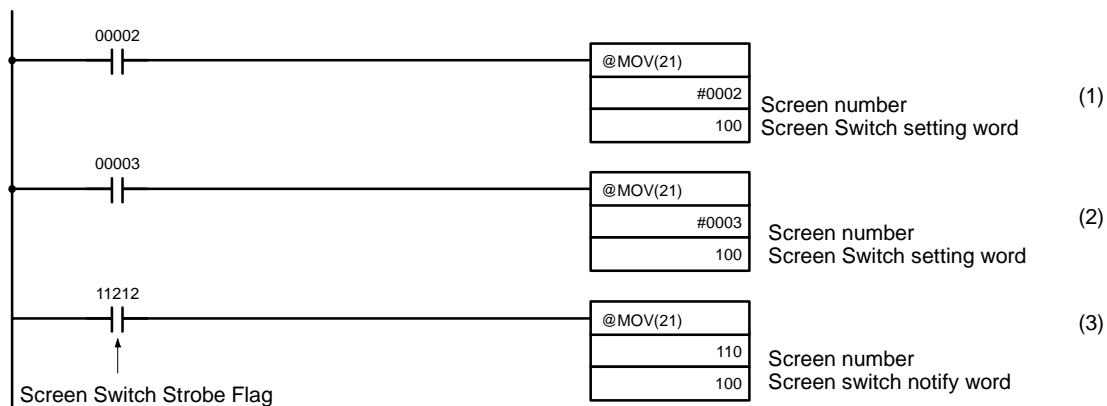
PT Status Notify Area: 0110

**Screens**

Create screens numbers 2 and 3 with the Support Tool and transfer them to the PT.

**PC Program**

Create a PC ladder program, as follows:



**Operation**

PT operation when the program is run is described below.

- 1, 2, 3... 1. Screen number 2 is displayed on the PT when bit 00002 turns ON.
2. Screen number 3 is displayed on the PT when bit 00003 turns ON.
3. When the Screen Switch Strobe Flag turns ON the number of the currently displayed screen is read and written to the Currently Displayed Screen word

in PT Status Notify Area. In this case, the same screen need not be written twice.

When a program is created as in (3) above, the screen can also be switched from the PT using the Stand-alone functions (screen switch function) and it is not necessary to input the same screen number twice. The step in (3) is not necessary if the Stand-alone functions are not used.

Refer to 4-8 Determining the Screen Displayed on the PT for more information on the Screen Switch Strobe Flag and notification of the currently displayed screen.

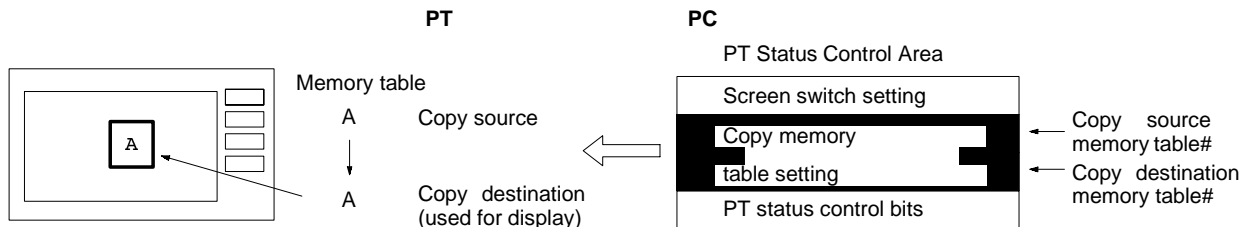
### 4-3 Changing Displayed Numerals or Character Strings

#### Description

The PT display can be changed by editing the contents of the numeral or character-string memory table used for the display.

The method described below for changing the display involves copying the contents of one memory table to another. Writing the source and destination memory table numbers to the Copy Memory Table Setting words of the PT Status Control Area allocated to the PC copies the contents of one memory table to another in the PT, which changes the display.

This is a convenient method to display predetermined numbers of character strings to suit the operating status. The changes are processed extremely rapidly as the PT Status Control Area is used.



Allocated start address: Word n (set with the Support Tool)

Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit
n + 1	0		Copy source memory table# (3-digit BCD)														
n + 2	Copy type		Copy destination memory table# (3-digit BCD)														

} Copy memory table setting

**Copy Type**  
 0: Copy character-string memory table  
 1: Copy numeral table

**Character-string Memory Table Numbers**  
 000 to 127 (NT20M)  
 000 to 255 (NT600M)

**Numeral Table Numbers**  
 000 to 127 (NT20M)  
 000 to 511 (NT600M)

#### Restrictions

**Allocated Words**  
 The PT Status Control Area can be allocated to the areas listed in the following table.



Symbol	C-series PC	CV-series PC	Allocation OK?
DM	DM Area	DM Area	OK
I/S	IR Area	CIO Area	OK
TC or TIM	Timer/Counter Area	Timer Area	NG
TC or CNT		Counter Area	NG
HR	Holding Area	---	OK
AR	AR Area	Auxiliary Area	OK
LR	Link Area	---	OK

The range of each memory area differs according to the PC type. Refer to *Appendix B PC Memory Map* for more details.

**Procedure**

- 1, 2, 3...
1. Use the Support Tool to allocate the PT Status Control Area to the PC memory.
  2. Specify the memory table to be displayed with the Screen Create functions of the Support Tool.  
Specify a numeral table for a numeral display.  
Specify a character-string memory table for a text display.
  3. Use the Table Edit functions to write the contents of the copy source memory table.
  4. Create a PC program to write the data described in (2) and (3) above to the Copy Memory Table setting words in the PT Status Control Area.

**Important Points**

In some cases the PT will read the specified area while the instructions are being written to the PT Status Control Area.

Therefore when using this method, be sure to write the copy destination memory table number word n+2 before writing the copy source memory table number Word n+1. The data may be written to an incorrect memory table if the copy source memory table number is specified first.

The PT reads only the words allocated to the memory tables displayed on the screen. If words are allocated to the copy source memory table, they are used during initialization only.

The display may be incorrect when a numeral table is copied if the display method or number of stored addresses differ.

The copy is not executed if the Copy Type is set to a value other than 0 or 1. The memory table is copied only when the contents change. To make repeated copies between the same source to destination memory table, set the Copy Type to a value other than 0 or 1 then reset it to the correct value.

**Reference**

Prepare a number of copy source memory tables in advance and use them to switch the display to suit the operating status.

**Application Example**

This example switches the displayed screen by copying the character-string memory table.

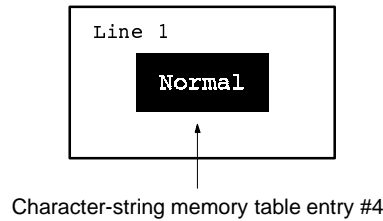
**Allocation**

Allocate the memory as follows using the Support Tool:  
PT Status Control Area: 0100

**Screens**

Use the Support Tool to create a screen which displays character-string memory table entry #4 and transfer it to the PT.

Set the initial values of the character-string memory table as shown below. It is not necessary to allocate addresses.

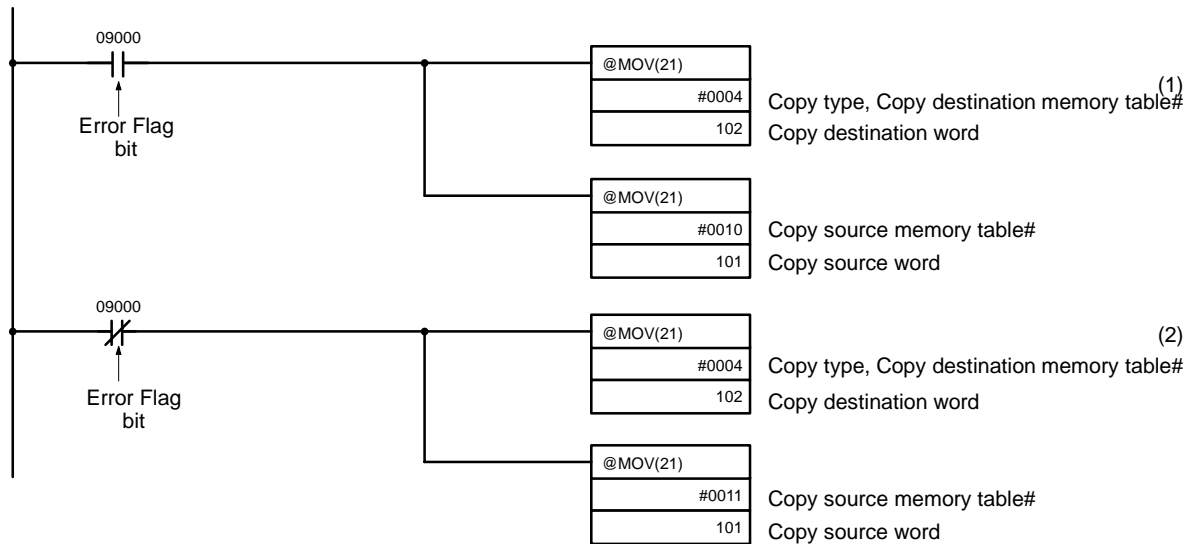


**Character-string memory table**

#	Contents	Qty characters
4	Normal	6 chars
10	Error	6 chars
11	Normal	6 chars

**PC Program**

Create a PC ladder program, as follows:



**Operation**

PT operation when the created screen is displayed and the program is run is described below.

- 1, 2, 3... 1. The Error Flag (bit 09000) turns ON and the PT displays the message “Error” when an error occurs.
- 2. The Error Flag (bit 09000) turns OFF and the PT display reverts to “Normal” when the error is cleared.

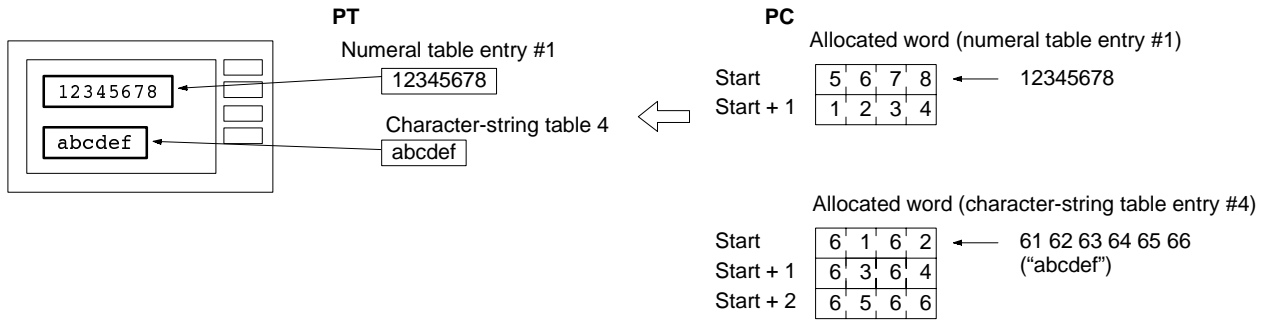
**Note** Specify the copy destination memory table before the copy source memory table.

## 4-4 Editing Displayed Numerals or Character Strings

**Description**

The PT display can be changed by editing the contents of the numeral or character-string memory table used for the display. The method described below for changing the display involves editing the contents of the PC memory allocated to the memory table.

This is a convenient method to display changes in memory contents when monitoring the PC memory.



Allocate the words using the Support Tool.

**Restrictions**

**Allocated Words**

The number of words which can be allocated is shown in the table below.

Memory table	Words
Numeral	1 or 2 words
Character-string	NT20M: 1 to 16 words (2 to 32 characters) NT600M: 1 to 20 words (2 to 40 characters)

The memory table can be allocated to the areas listed in the following table.

Symbol	C-series PC	CV-series PC	Numeral	Character-string
DM	DM Area	DM Area	OK (1 or 2 words for numeral tables)	OK (1 or 2 words for numeral tables)
I/S	IR Area	CIO Area	OK (1 or 2 words for numeral tables)	OK (1 or 2 words for numeral tables)
TC or TIM	Timer/Counter Area	Timer Area	1 word only	NG
TC or CNT		Counter Area	1 word only	NG
HR	Holding Area	---	OK (1 or 2 words for numeral tables)	OK (1 or 2 words for numeral tables)
AR	AR Area	Auxiliary Area	OK (1 or 2 words for numeral tables)	OK (1 or 2 words for numeral tables)
LR	Link Area	---	OK (1 or 2 words for numeral tables)	OK (1 or 2 words for numeral tables)

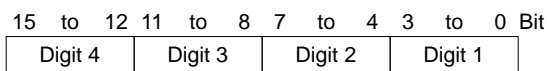
The range of each memory area differs according to the PC type. Refer to *Appendix B PC Memory Map* for more details.

**Contents and Display of Allocated Words**

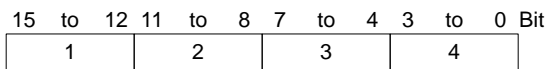
Numerals

Numbers are stored in the allocated words as shown below.

Stored as a single word



Example: 1234



Stored as a double words

Word	15 to 12	11 to 8	7 to 4	3 to 0	Bit
Start	Digit 4	Digit 3	Digit 2	Digit 1	
Start + 1	Digit 8	Digit 7	Digit 6	Digit 5	

Example: 12345678

Word	15 to 12	11 to 8	7 to 4	3 to 0	Bit
Start	5	6	7	8	
Start + 1	1	2	3	4	

Numbers can be handled in three different ways. The most-significant digit is processed differently according to the type of numeral display, as follows:

Hexadecimal display: display of all digits identical to the contents of the allocated words;

Decimal, no sign: an “F” as the most-significant digit is displayed as “0,” any other value as the most-significant digit and all other digits are displayed identical to the contents of the allocated words;

Decimal, with sign: an “F” as the most-significant digit is displayed as a minus sign (–), any other value as the most-significant digit and all other digits are displayed identical to the contents of the allocated words;

Display Example

Data contains numbers 0 to 9 only

Word					
Start	3	4	5	6	
Start + 1	F	0	1	2	

→

Decimal, no sign	123456
Decimal, with sign	–123456
Hexadecimal	F0123456

Data includes letters A to F

Word					
Start	3	B	5	6	
Start + 1	F	0	1	2	

→

Decimal, no sign	123B56
Decimal, with sign	–123B56
Hexadecimal	F0123B56

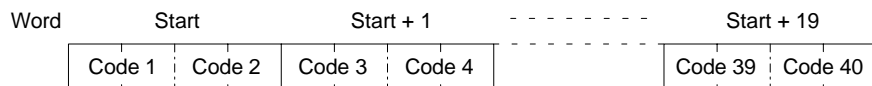
If hexadecimal data (A to F) is transmitted when a decimal display is selected, the letters are displayed unchanged.

- Note**
1. If the number of display digits is less than the number of digits to display (4 digits for a single word, 8 digits for two words) the contents of the allocated word are not displayed and all digits are displayed as asterisks (\*).
  2. If the display is selected as a decimal display with sign, an “F” as the most-significant digit represents the minus sign. Consequently, the number of digits in a negative number is reduced by one

The actual display is also affected by the zero-suppression and decimal-point display settings. Refer to the *NT-series Support Tool Operation Manual* for details.

**Character Strings**

Character strings are stored in sequential words from the start address as Special English 8-bit code (normal characters) . Two normal characters or one wide character is allocated to each word of memory. A maximum of 20 words (40 characters) can be allocated in the NT600M, or 16 words (32 characters) in the NT20M.



Character codes 00 to 1FH are displayed as a normal space character. 00H is converted to 20H.

**Procedure**

- 1, 2, 3...
1. Use the Support Tool to allocate the numeral and character-string memory table to the PC memory.
  2. Create a PC program to write the display numerals and character strings to the allocated words.

**Important Points**

To use a single numeral table to display multiple screens, standardize the display method. Incorrect display may result if the display method is changed.

If the number of characters written is less than the number of characters in the allocated words, fill the remaining character spaces with normal characters (character code: 20H). The display may be incorrect if other unwanted character codes remain.

**Reference**

The display switches very rapidly if the numeral table is allocated to the general memory words of the PT Status Control Area. However, it is not possible to allocate a character-string memory table to the general memory.

**Application**

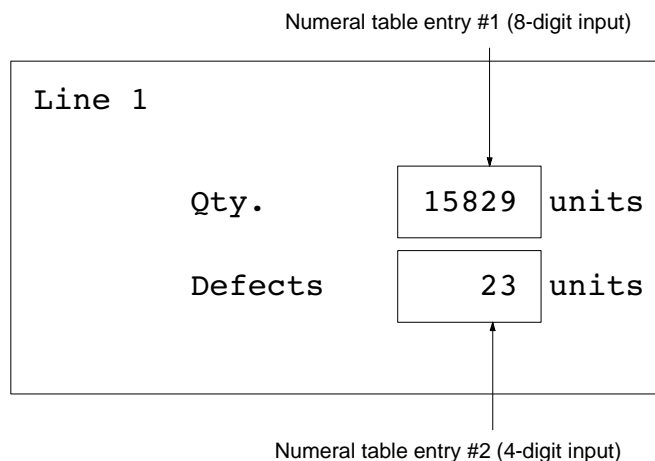
This example directly displays the contents of the words allocated as the numeral table in the PC memory.

**Allocation**

Allocate the memory as follows using the Support Tool:  
 numeral table entry #1: 0000 (number words: 2)  
 numeral table entry #2: 0002 (number words: 1)

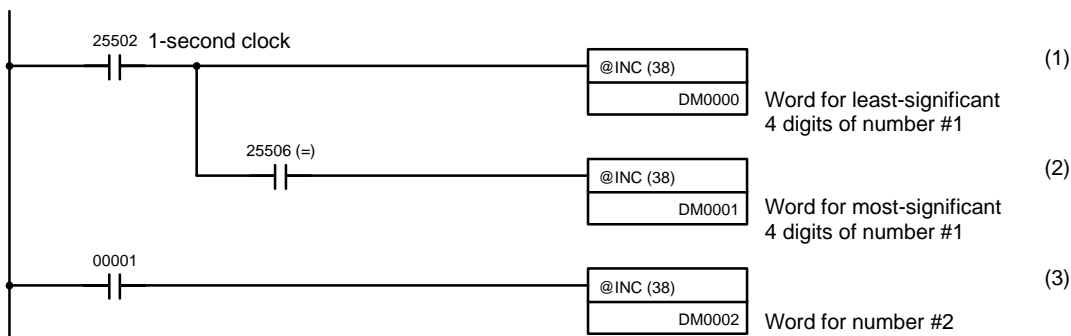
**Screens**

Use the Support Tool to create a screen which displays numeral table numbers 1 and 2 and transfer it to the PT.



**PC Program**

Create a PC ladder program, as follows:



**Operation**

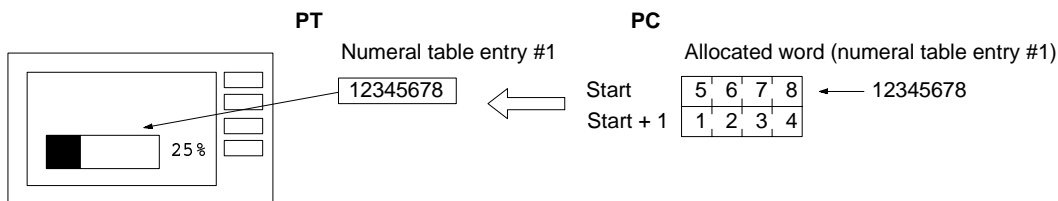
PT operation when the created screen is displayed and the program is run is described below.

- 1, 2, 3...**
1. The contents of word 0000 are incremented by 1 each second. The displayed value in the numeral table entry entry number1 is increased by 1 each second.
  2. When the counter in (1) causes an increase in the most-significant digits, the contents of word 0001 are incremented by 1. The displayed value in the PT numeral table entry number1 most significant digits is increased by 1.
  3. When bit 00001 turns ON the contents of 0002 are incremented by 1. The displayed value in the PT numeral table entry number 2 is increased by 1.

## 4-5 Upgrading Bar Graphs

**Description**

The bar graph can be upgraded by editing the contents of the memory table used for the bar graph.



Allocate the words using the Support Tool.

**Restrictions**

**Allocated Words**

The number of words which can be allocated is shown in the table below.

Memory table	Words
Numeral	1 or 2 words

The memory table can be allocated to the areas listed in the following table.

Symbol	C-series PC	CV-series PC	Allocation OK?
DM	DM Area	DM Area	OK (1 or 2 words for numeral tables)
I/S	IR Area	CIO Area	OK (1 or 2 words for numeral tables)
TC or TIM	Timer /Counter Area	Timer Area	1 word only
TC or CNT		Counter Area	1 word only
HR	Holding Area	---	OK (1 or 2 words for numeral tables)
AR	AR Area	Auxiliary Area	OK (1 or 2 words for numeral tables)
LR	Link Area	---	OK (1 or 2 words for numeral tables)

The range of each memory area differs according to the PC type. Refer to *Appendix B PC Memory Map* for more details.

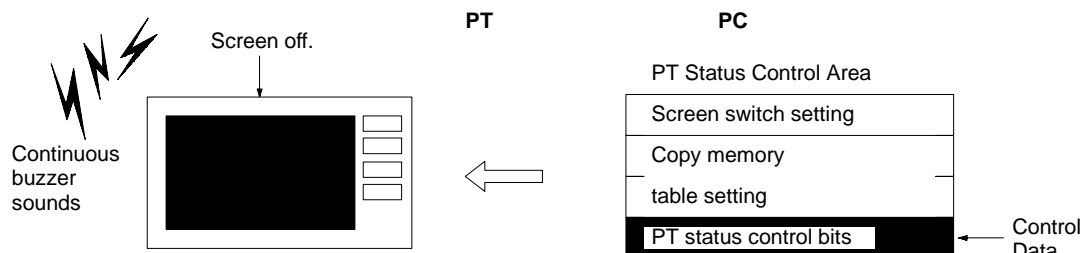
Refer to *4-4 Editing Displayed Numerals and Character Strings* for information on saving numbers to allocated words.

- Note**
1. A bar graph cannot be used to display hexadecimal values.
  2. If a decimal, no sign display is selected and an “F” written to the most-significant digit in the word allocated to the bar graph (which represents a minus sign), the bar graph displays zero and the percent display indicates “\*\*\*\*”.

## 4-6 Controlling the PT Status

### Description

Write the control data to the PT Status Control bits in the PT Status Control Area allocated in PC memory to control the backlighting and buzzer.



Allocated start address: Word n (set with the Support Tool)

Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit
n + 3	PT status control bit						0							0	PT status control bits		

PT Status Control bits:

Word	15	14	13	12	11	10	9	8	Bit
n + 3							0		

Turn bits 7 to 0 OFF.

Bit	Controlled item	1 (ON)	0 (OFF)
15	Screen display	ON	OFF
14	Alarm output	ON	OFF
13	Continuous buzzer	ON	OFF
12	Intermittent buzzer	ON	OFF
11	Initialize display history	ON	OFF
10	Backlight color	Red	White
8	Backlight mode	Continuous light	Flash

- Note**
- Bit 10 (Backlight color) is valid for the NT20M.
  - Bit 8 (Backlight mode) is valid for the NT20M.
  - Bit 15 (Screen display) when used for a LCD (liquid-crystal display) backlighting turns on if the Screen Display bit is set to ON and turns off if the Screen Display bit is set to OFF. For EL operation, screen display operation is controlled.

### Screen Display (Bit 15)

The Screen Display bit is used to display and clear the screen to prevent “burn in” on the CRT.

Set Bit 15 to 0 (OFF) to clear the screen. To restore the screen display, set Bit 15 to 1 (ON), or press the System key or touch switch. On the LCD display version PT, the bit acts to turn the backlight on and off.

Another method of restoring the screen is to display a screen using the Screen Switch setting bit.

**Alarm Output (Bit 14)**

The Alarm Output bit turns on and off the ALM OUTPUT terminals at the rear of the PT.

Alarm Output control with Bit 14 is enabled only when the alarm output is turned on with the PT memory switches.

Refer to the appropriate *PT Operation Manual* and the *NT-series Support Tool Operation Manual* for more details.

**Continuous (Bit 13) and Intermittent (Bit 12) Buzzers**

The continuous buzzer sounds continually without interruption.

The intermittent sounds for 0.5 s at 0.5 s intervals.

If both Bit 13 and Bit 12 are turned ON simultaneously, Bit 13 takes priority and the continuous buzzer is selected.

Buzzer control with these bits is enabled only when the buzzer is turned on with the PT memory switches.

Refer to the appropriate *PT Operation Manual* and the *NT-series Support Tool Operation Manual* for more details.

**Initialize Display History (Bit 11)**

The Initialize Display History initializes the display history stored in the PT.

The display history is initialized when Bit 11 is set from 0 (OFF) to 1 (ON). Bit 11 reverts to 0 (OFF) after the display history is initialized.

**Backlight Color (Bit 10) and Mode (Bit 8)**

The NT20M allows backlighting to be controlled as follows using combinations of Bit 10 and Bit 8.

Bit		Backlight status when Bit 15 set 1 (ON)
10	8	
0	0	White flash (white on – off)
0	1	White on
1	0	Red flash (white on – off)
1	1	Red on

When backlighting is turned OFF (Bit 15 is set to 0 (OFF)), the backlight color (red or white) and backlight mode (continuous or flashing) are invalid.

In addition to the PT Status Control Area, the PT status can be controlled by setting the screen attributes with the Support Tool, as follows:

Alarm: Alarm output ON/OFF

Buzzer attribute: Continuous, Intermittent, Off

Backcolor: White backlighting, Red backlighting

Backlighting: Backlighting On/Off

In addition, the display (or backlighting) is turned off if the PT is unused for a certain time if the PT memory switches are set to enable the burn-in prevention feature (EL display version) or the backlight control feature (LCD display version).

Refer to the appropriate *PT Operation Manual* and the *NT-series Support Tool Operation Manual* for more details.

**Note** The PT Status Control bits remain unchanged if the PT status is changed with the screen attributes or memory switches, so that the status of the PT Status Control bits do not match the actual PT status.

Example: The continuous buzzer may sound if the status of Continuous Buzzer bit 13 is 0 (OFF).

**Restrictions**

**Allocated Words**

The PT Status Control Area can be allocated to the areas listed in the following table.



Symbol	C-series PC	CV-series PC	Allocation OK?
DM	DM Area	DM Area	OK
I/S	IR Area	CIO Area	OK
TC or TIM	Timer/Counter Area	Timer Area	NG
TC or CNT		Counter Area	
HR	Holding Area	---	OK
AR	AR Area	Auxiliary Area	OK
LR	Link Area	---	OK

The range of each memory area differs according to the PC type. Refer to *Appendix B PC Memory Map* for more details.

**Procedure**

- 1, 2, 3...**
1. Use the Support Tool to allocate the PT Status Control Area to the PC memory.
  2. Create a PC program to write the control status to the PT Status Control bits in the PT Status Control Area.

- Note**
1. The PT Status Control Area is not read immediately after the PT is booted up. The PT Status Control Area is read and control executed when the control status is changed.
  2. The control of PT status is executed when the status of a bit is changed. To revert to the control status before the change, set all bits from Bit 8 to Bit 15 back to the status it had before the change.

**Application**

This example controls the PT status to use the PT as a warning lamp.

**Allocation**

Allocate the memory as follows using the Support Tool:

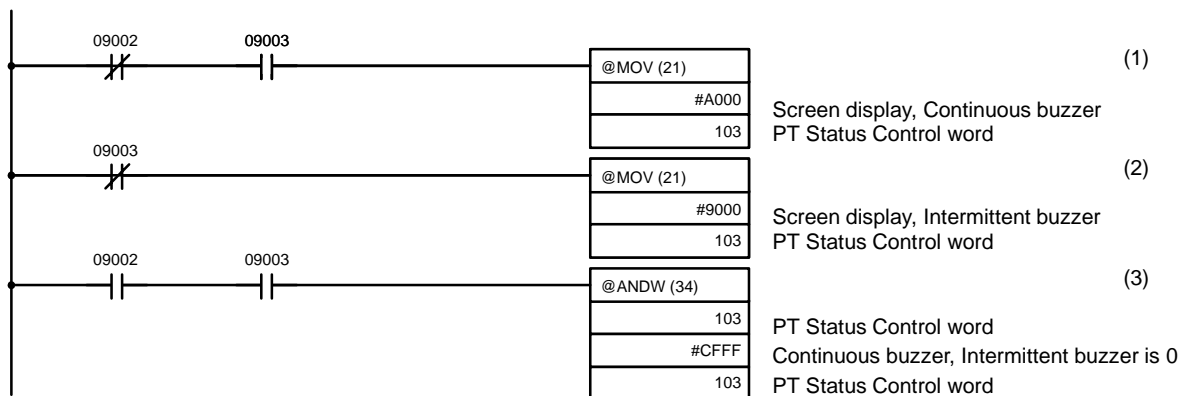
PT Status Control Area: 0100

**Screens**

Not required.

**PC Program**

Create a PC ladder program, as follows:



**Operation**

PT operation when the program is run is described below.

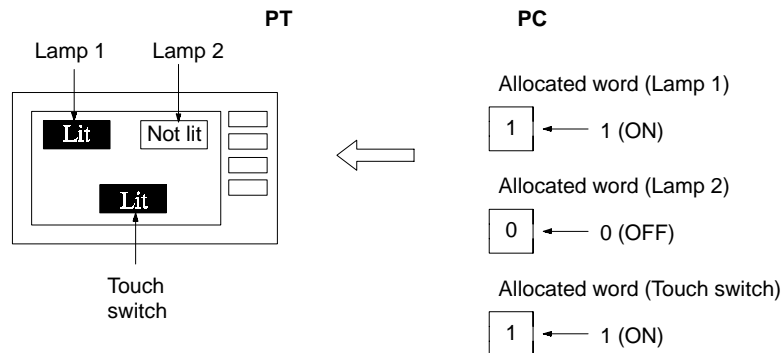
- 1, 2, 3...**
1. PT Status Control bits are set as shown below when bit 09002 turns OFF. This command block not executed when bit 09003 is OFF.
    - Screen display (Bit 15): 1 (ON)
    - Continuous buzzer (Bit 13): 1 (ON)
 The PT continuous buzzer sounds.

2. PT Status Control bits are set as shown below when bit 09003 turns OFF.
  - Screen display (Bit 15): 1 (ON)
  - Intermittent buzzer (Bit 12): 1 (ON)
 The PT intermittent buzzer sounds.
3. PT Status Control bits are set as shown below when both bits 09002 and 09003 turn ON.
  - Continuous buzzer (Bit 13): 0 (OFF)
  - Intermittent buzzer (Bit 12): 0 (OFF)
 The PT buzzer stops.

## 4-7 Turning Lamps and Touch Switches On and Off

### Description

The lamps and touch switches are lit (flashed) and extinguished by setting bits allocated in the PC memory as the lamp and touch switch control bits ON (1) or OFF (0).



Allocate the control bits with the Support Tool. The control bits control the status of lamps and touch switches as follows:

- 0 (OFF): Not lit
- 1 (ON): Lit or flashing

The lamp and touch switch display attributes are set with the Support Tool to determine if the lamp or touch switch lights continuously or flashes. Refer to the *NT-series Support Tool Operation Manual* for details.

### Restrictions

#### Allocated Bits

The lamp and touch-switch control bits can be allocated to the areas listed in the following table.

Symbol	C-series PC	CV-series PC	Allocation OK?
DM	DM Area	DM Area	OK
I/S	IR Area	CIO Area	OK
TC or TIM	Timer/Counter Area	Timer Area	NG
TC or CNT		Counter Area	NG
HR	Holding Area	---	OK
AR	AR Area	Auxiliary Area	OK
LR	Link Area	---	OK

The range of each memory area differs according to the PC type. Refer to *Appendix B PC Memory Map* for more details.

**Procedure**

- 1, 2, 3... 1. Use the Support Tool to allocate the lamp and touch switch Control Bits to the PC memory. Use the display attributes to set if each lamp and touch switch flashes or lights continuously.
2. Create a PC program to set the Control Bits on or off to light (flash) or extinguish each lamp and touch switch.

**Reference**

The lamp and touch switch displays are processed more rapidly if the PT Status Control Area is allocated to the general memory. Refer to *3-3 PT Status Control and Notification* for more details. These bits are used in the same way as the allocated control bits.

Notify bits can be allocated to lamps and touch switches in addition to the control bits. The notify bits inform the PC whether a touch switch has been pressed. Refer to *4-11 Determining Touch Switch Status*.

A touch switch is "lit" by highlighting the displayed touch switch.

**Application Example**

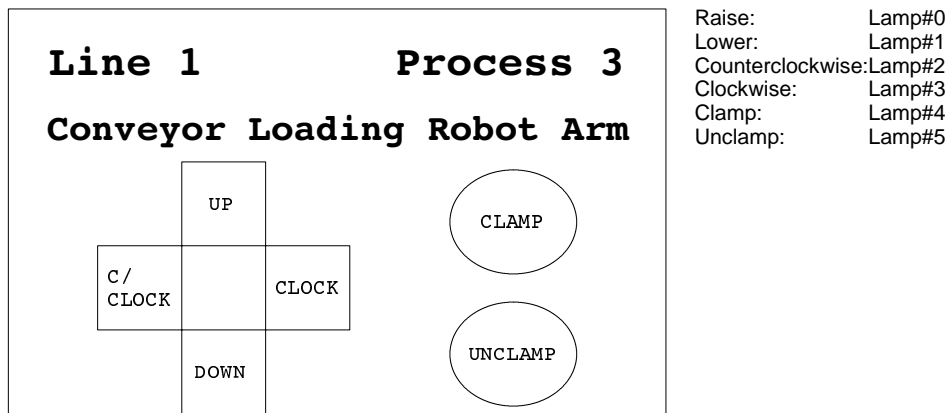
This example controls the bits to move a robot arm and turning the lamps on and off.

**Allocation**

Allocate the memory as follows using the Support Tool:  
 Lamp #0: 00200 (output bit to raise robot arm)  
 Lamp #1: 002001 (output bit to lower robot arm)  
 Lamp #2: 00202 (output bit to rotate robot arm counterclockwise)  
 Lamp #3: 00203 (output bit to rotate robot arm clockwise)  
 Lamp #4: 00204 (output bit to clamp rotate robot arm)  
 Lamp #5: 00205 (output bit to unclamp rotate robot arm)

**Screens**

Create a screen as shown below to display Lamps #0 to #5 with the Support Tool and transfer it to the PT. Set the display attribute to "Light".



**PC Program**

No PC ladder program is required to control the PT. Only a program to control the robot arm movement is required.

**Operation**

When the ladder program is executed to control the robot arm, the PT lamps turn on and off in synchronization with the arm movement. For example, Lamp#0 lights when the robot arm ascends and goes out when it stops ascending.

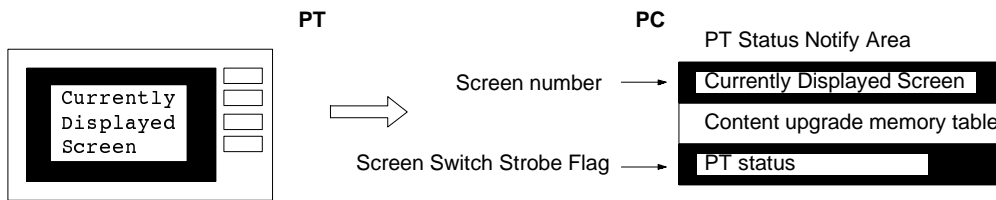
**4-8 Determining the Screen Displayed on the PT**

**Description**

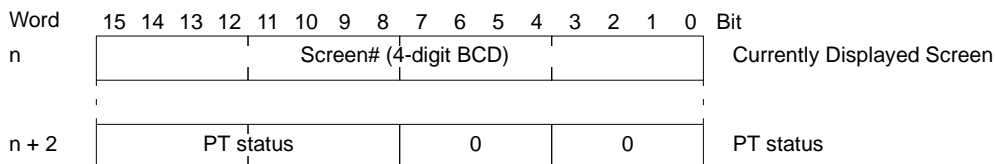
The screen displayed on the PT can be determined by reading the Currently Displayed Screen from the the PT Status Notify Area allocated in the PC memory. When the screen is switched, the PT Status Notify Area is notified as follows:

Switch notification: PT Status Display Switch Flag

New Screen number: Currently Displayed Screen



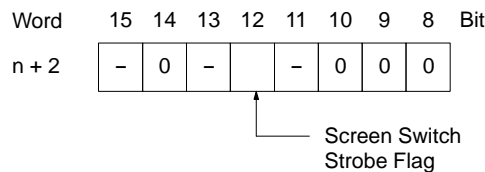
Allocated start address: Word n (set with the Support Tool)



Screen#: 0000 to 0250 (NT20M)

0000 to 1000 (NT600M)

Screen Switch Strobe Flag



**Restrictions**

**Allocated Words**

The PT Status Notify Area can be allocated to the areas listed in the following table.

Symbol	C-series PC	CV-series PC	Allocation OK?
DM	DM Area	DM Area	OK
I/S	IR Area	CIO Area	OK
TC or TIM	Timer/Counter Area	Timer Area	NG
TC or CNT		Counter Area	NG
HR	Holding Area	---	OK
AR	AR Area	Auxiliary Area	OK
LR	Link Area	---	OK

The range of each memory area differs according to the PC type. Refer to Appendix B PC Memory Map for more details.

**Procedure**

- 1, 2, 3...
1. Use the Support Tool to allocate the PT Status Notify Area to the PC memory.
  2. Create a PC program to read the Currently Displayed Screen from PT Status Notify Area.  
The screen# is handled as a 4-digit BCD (binary coded decimal) value.

**Reference**

The Currently Displayed Screen is upgraded when the screen is switched with the stand-alone function. Refer to the Stand-alone functions (screen switch function) in the PT User's Manuals for details.

The PT Status Display Switch bit turns ON (1) in the PT Status Control Area when the screen display switches. It reverts to OFF (0) when the PC is notified of the screen switch. The current screen# can be read by reading the Currently Displayed Screen when the PT Status Display Switch bit turns ON (1).

The number of the parent screen is notified if continuous screens or superimposed screens are displayed.

**Application Example**

This example reads the screen# each time the PT screen display switches.

**Allocation**

Allocate the memory as follows using the Support Tool:

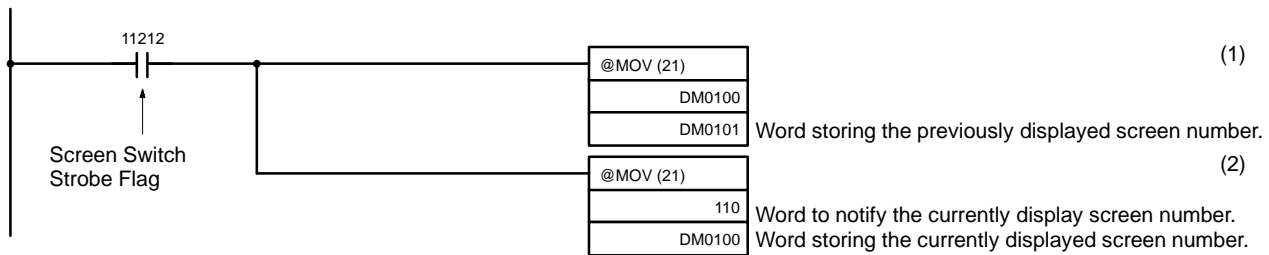
PT Status Control Area: 0100

**Screens**

Create several screens which can be switched with the Support Tool and transfer them to the PT.

**PC Program**

Create a PC ladder program, as follows:



**Operation**

PT operation when the program is run is described below.

- 1, 2, 3... 1. When the PT screen display switches and the Screen Switch Strobe Flag (Bit: 11212) turns ON, the contents of 0100 are transferred to 0101. The number of the previously displayed screen is stored in word 0101.
2. The new screen number notified by the PT is read and transferred to 0100. The number of the currently displayed screen is stored in word 0101.

**4-9 Determining a Number Input to the PT**

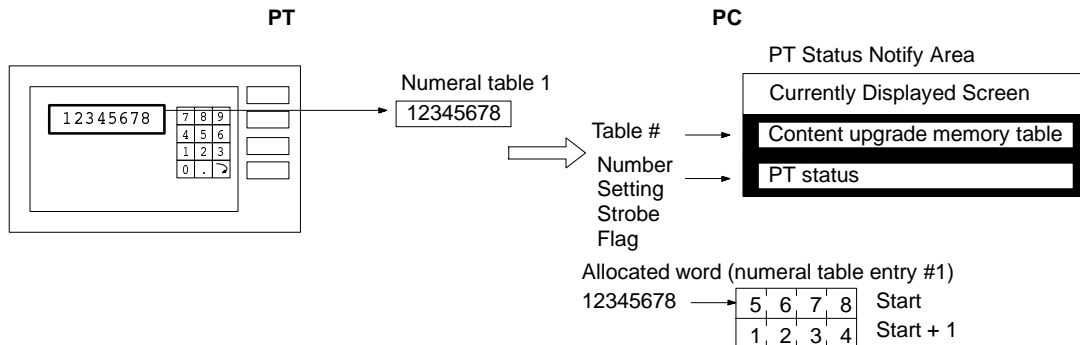
**Description**

The PT can be used as a numeric keypad to write numbers to a numeral table. When a number is written to a numeral table with this so-called “number setting function” an area allocated in PC memory is notified as follows:

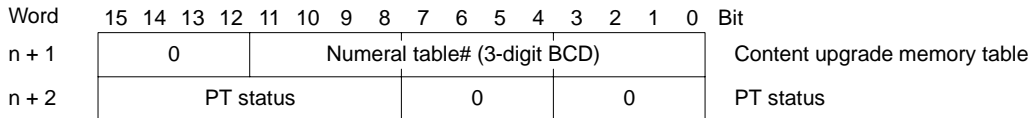
Upgrade notify: PT Status Number Setting Strobe Flag

Upgraded table entry number: Upgraded memory table

Upgrade details: numeral table allocated word

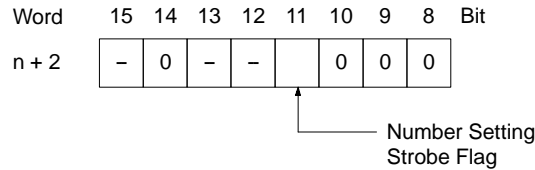


Allocated start address: Word n (set with the Support Tool)



Screen#: 000 to 127 (NT20M)  
000 to 511 (NT600M)

Number Setting Strobe Flag



**Restrictions**

**Allocated Words**

The PT Status Notify Area can be allocated to the areas listed in the following table.

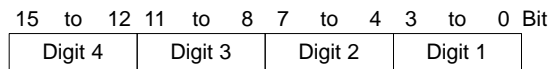
Symbol	C-series PC	CV-series PC	Allocation OK?
DM	DM Area	DM Area	OK
I/S	IR Area	CIO Area	OK
TC or TIM	Timer/Counter Area	Timer Area	NG
TC or CNT		Counter Area	NG
HR	Holding Area	---	OK
AR	AR Area	Auxiliary Area	OK
LR	Link Area	---	OK

The range of each memory area differs according to the PC type. Refer to *Appendix B PC Memory Map* for more details.

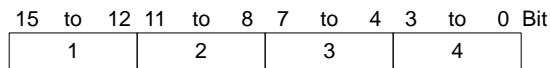
**Contents and Display of Allocated Words**

Numbers are stored in the allocated words as shown below.

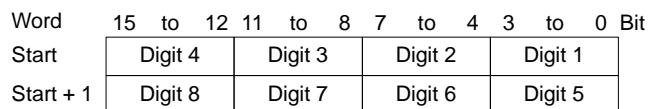
Stored as a single word



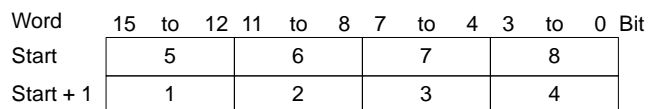
Example: 1234



Stored as a double words



Example: 12345678



**Note** The order in which the numbers are stored in the allocated words depends on the original specification of the Host Interface Unit NT20M-SMR01 or NT600M-SMR01-V\_. Refer to *5-4 Modifying Programs for Conversion*.

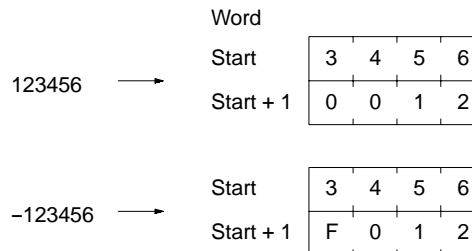
Numbers can be handled in the following three different ways:

Hexadecimal: Cannot be input with the number setting function.

Decimal, no sign: Stored as entered.

Decimal, with sign: For a negative number, an “F” is stored as the most-significant digit, all other digits stored as entered. A positive number is stored as entered.

Examples:



- Note**
1. If a negative values is written when the value is handled as a decimal display with sign, an “F” as the most-significant digit represents the minus sign. Consequently, the number of digits in a negative number is one less than for a positive number.
  2. All numbers are stored as integers. If a decimal point is input, the position of the decimal point is determined by the display method setting. The input number cannot therefore be determined from the contents of the memory word.

**Procedure**

- 1, 2, 3...**
1. Use the Support Tool to allocate the PT Status Notify Area to the PC memory.
  2. Use the Support Tool to create a number setting screen and allocate a numeral table to the PC memory area.
  3. Create a PC program to read the PT content upgrade memory table when the PT Status Number Setting Strobe Flag in the PT Status Notify Area turns ON (1). The contents of the PT content upgrade memory table are handled as 3-digit BCD (binary coded decimal) values.
  4. Read the words allocated to the numeral table allocated at step (3).

**Important Points**

The Number Setting Strobe Flag turns OFF (0) when the PC has been notified. Therefore, always read the PT content upgrade memory table when this flag turns ON (1).

Numbers input to the PT are stored in the words allocated to the numeral table as BCD (binary coded decimal) values. The most-significant digit is treated differently for positive and negative values. Consider these restrictions when creating the PC program to read the contents of the allocated words.

**Application Example**

This example reads the contents of the numeral table input from the PT

**Allocation**

Allocate the memory as follows using the Support Tool:

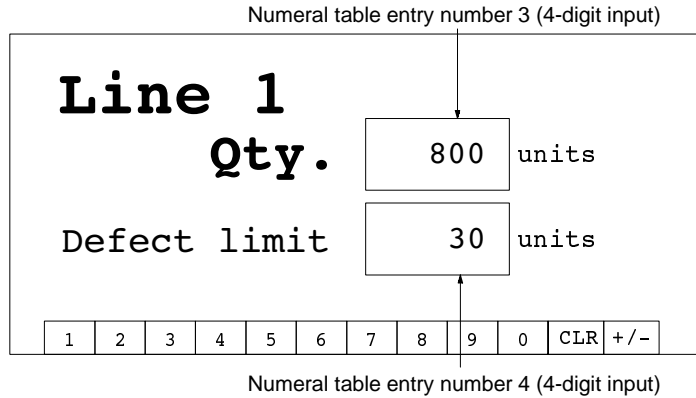
PT Status Control Area: 0110

Numeral table entry number 3: 0003 (words: 1)

Numeral table entry number 4: 0004 (words: 1)

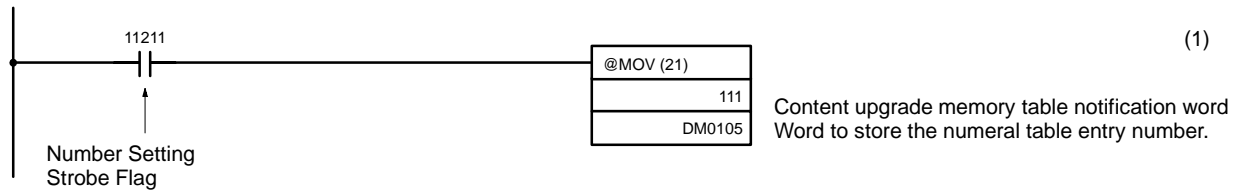
**Screens**

Create a number setting screen with the Support Tool to input values into memory tables numbers 3 and 4 and transfer it to the PT. Numbers should be input as 4 digits.



**PC Program**

Create a PC ladder program, as follows:



**Operation**

PT operation when the number setting screen is displayed and the program is run as described below.

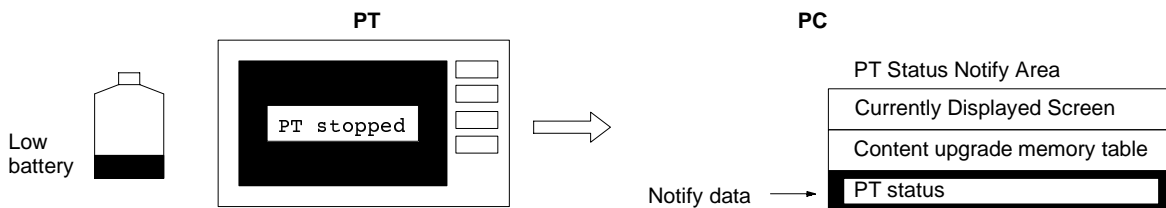
When the Number Setting Strobe Flag (Bit: 11211) turns ON (1) the contents of word 111 are transferred to 0105. The number of the numeral table with upgraded contents is stored in word 0105.

The value input to the numeral table is stored in the word allocated to the numeral table. Numerical table entry number 3 is allocated to word 0003 and numeral table entry number 4 is allocated to word 0004.

## 4-10 Determining PT Operating Status

**Description**

The PT operating status and the battery level can be determined by reading the PT Status word in the PT Status Notify Area allocated to the PC memory.



Allocated start address: Word n (set with the Support Tool)

Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit
n + 2	PT status											0	0	PT status			

PT Status Notify Bits:

Word	15	14	13	12	11	10	9	8	Bit
n + 2	0				0	0	0		



Bit	Notified item	1 (ON)	0 (OFF)
15	PT operating status	Run	Stop
13	Battery	Low	Normal

Bit 12: Screen Switch Strobe Flag  
 Bit 11: Number Setting Strobe Flag

**PT Operating Status (Bit 15)** This bit is ON (1) when the PT is in Run mode. It is OFF when the PT is not in Run mode and while the System Menu is displayed. Reading and writing the allocated bits and words is disabled when this bit is OFF (0).

**Battery (Bit 13)** This bit turns ON (1) when the PT internal memory back-up battery is low.

**Screen Switch Strobe Flag (Bit 12)** This bit turns ON (1) when the PT screen display switches due to an instruction from the PC or due to the stand-alone functions. It reverts to OFF (0) when the PC is notified of the screen switch. Refer to 4-8 *Determining the Screen Displayed on the PT* for more details.

**Number Setting Strobe Flag** This bit turns ON (1) when a value is written to a numeral table by the PT number setting function. It reverts to OFF (0) when the PC is notified of the number input. Refer to 4-9 *Determining a Number Input to the PT* for more details.

**Restrictions**

**Allocated Words**

The PT Status Notify Area can be allocated to the areas listed in the following table.

Symbol	C-series PC	CV-series PC	Allocation OK?
DM	DM Area	DM Area	OK
I/S	IR Area	CIO Area	OK
TC or TIM	Timer/Counter Area	Timer Area	NG
TC or CNT		Counter Area	NG
HR	Holding Area	---	OK
AR	AR Area	Auxiliary Area	OK
LR	Link Area	---	OK

The range of each memory area differs according to the PC type. Refer to *Appendix B PC Memory Map* for more details.

**Procedure**

- 1, 2, 3... 1. Use the Support Tool to allocate the PT Status Notify Area to the PC memory.
2. Write a PC program to read the PT Status word from the PT Status Notify Area and check the status of the bits described above.

**Important Points**

All screen data and other data in the PT is lost when the PT battery becomes flat. Replace the battery with a new one as soon as possible after a low battery voltage is detected. Refer to the appropriate *PT Operation Manual* for details of the battery replacement procedure.

**Application Example**

This example reads the PT operation status then sounds the buzzer and outputs an alarm if the battery voltage is low.

**Allocation**

Allocate the memory as follows using the Support Tool:  
 PT Status Control Area: 0100

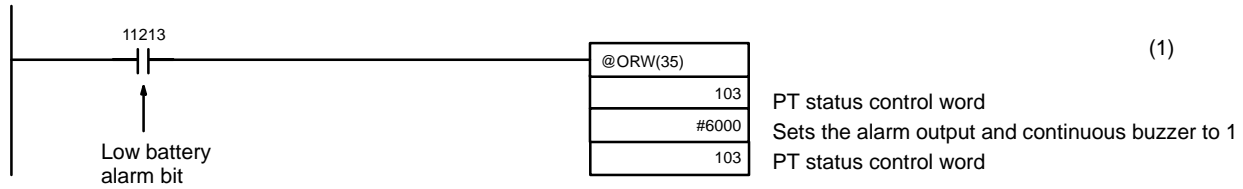
PT Status Notify Area: 0110

Screens

Not required.

PC Program

Create a PC ladder program, as follows:



Operation

PT operation when the program is run is described below.

If the low-batter notify bit (11213) is ON the following bits in the PT Status Control Area are controlled:

- Alarm output (bit 14): 1 (ON)
- Continuous buzzer (bit 13): ON

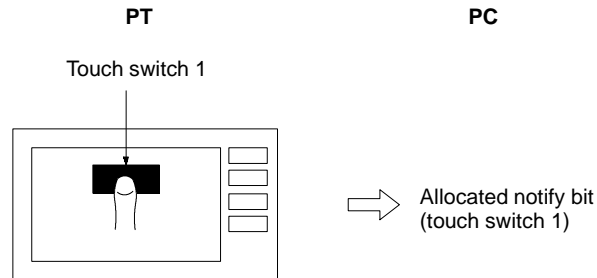
The PT continuous buzzer sounds and the alarm output turns ON.

Refer to 4-6 Controlling the PT Status.

## 4-11 Determining Touch Switch Status

### Description

A touch switch status (pressed or not) can be determined by checking the ON/OFF status of the notify bit allocated in the PC to the touch switch.



Allocate the notify bits with the Support Tool.

The status of the bit reflects the touch switch status, as follows:

- 0 (OFF): not pressed
- 1 (ON): pressed

### Restrictions

#### Allocated Bits

The PT Status Notify Area can be allocated to the areas listed in the following table.

Symbol	C-series PC	CV-series PC	Allocation OK?
DM	DM Area	DM Area	OK
I/S	IR Area	CIO Area	OK
TC or TIM	Timer/Counter Area	Timer Area	NG
TC or CNT		Counter Area	NG
HR	Holding Area	---	OK
AR	AR Area	Auxiliary Area	OK
LR	Link Area	---	OK

The range of each memory area differs according to the PC type. Refer to *Appendix B PC Memory Map* for more details.

**Procedure**

- 1, 2, 3... 1. Use the Support Tool to allocate the touch switch notify bits to the PC memory.
- 2. Write a PC program to read and check the allocated notify bits.

**Important Points**

All unallocated bits are 0 (OFF) in the word to which the touch switch notify bits are allocated. Do not use this word for any other purpose other than allocation of touch switches.

Be sure to allocate each touch switch on a single screen to different bits.

**Reference**

Allocating the bits to the PT Status Notify Area general memory achieves faster touch switch notification than allocating the bits to other areas of the memory. Refer to *3-3 PT Status Control and Notification* for details. These bits are used in the same way as notify bits allocated to other parts of memory.

The screen attributes are ignored when Direct Connection is used. The attributes are permanently set as a Touch Switch.

In addition to the notification function, the following two other functions can be allocated to touch switches with the Support Tool. When one of these functions is specified, the allocated bits are not notified of the touch switch status.

- a. Screen switch function (stand-alone or screen switch function)
- b. Use as a keypad for number input (number setting function)

Refer to the appropriate *PT Operation Manuals* for details about these functions.

**Application**

This example uses the touch switches as normal switches for use as a PT operating panel.

**Allocation**

Allocate the touch switches as follows using the Support Tool:

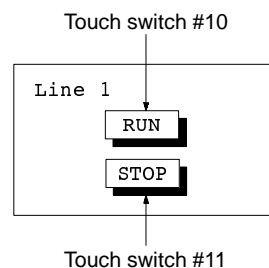
Touch switch number 10: control bit 05000 (Run lamp)  
notify bit: 06000

Touch switch number 11: control bit 05001 (Stop lamp)  
notify bit: 06001

Set the touch switch function to Notify Bit.

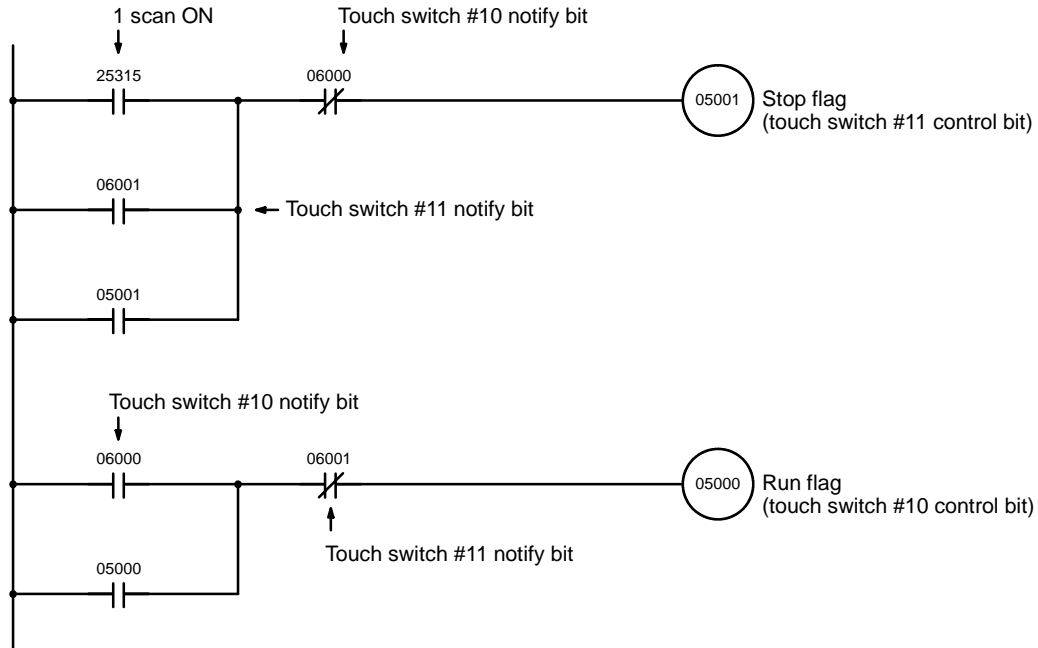
**Screens**

Create a screen which displays touch switches numbers 10 and 11 as shown below and transfer it to the PT. Set the display attribute to "Light".



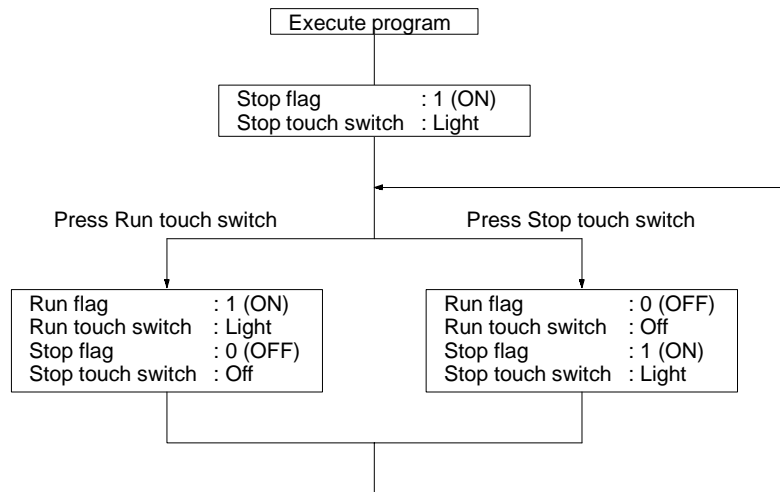
PC Program

Create the following ladder program.



Operation

PT operation when the created screen is displayed and the program is run is described below.



Refer to 4-7 Turning Lamps and Touch Switches On and Off for the method of lighting and turning off touch switches.

## **SECTION 5**

### **Data Conversion**

This section describes how to convert existing screen data for use with Direct Connection and how to convert a PC program written for Direct Connection OFF for use with Direct Connection OMRON.

5-1	Summary of Data Conversion .....	68
5-1-1	Direct Connection Formats .....	68
5-1-2	Data Conversion Procedure .....	68
5-2	Data Conversion .....	68
5-3	Changing the Allocated Bits and Words for Data Conversion.....	69
5-4	Modifying Programs for Conversion .....	72
5-4-1	Comparing Conventional and Direct Connection Formats .....	72
5-4-2	Program Modifications and Setting Areas.....	74

## 5-1 Summary of Data Conversion

The new Host Interface Units can handle Direct Connection and conventional Host Interface Unit specification screen data. This section describes the types of Direct Connection format and the procedure to convert existing screen data for use with Direct Connection.

### 5-1-1 Direct Connection Formats

Direct Connection format is set from the Tool Setting screen on the Support Tool. It can be set in two ways, as follows:

**OFF:** Direct Connection not used. Conventional Host Interface Unit specification is used. Use this setting to give compatibility between the Host Interface Unit specification and the screen data and PC programs.

**OMRON or ON:** Enables Direct Connection for the OMRON C Series and CV/CVM Series PCs.

**Note** "OMRON" is displayed by the NT20M/NT2000M/NT600M Support Tool Version 4.0\_ and "ON" is displayed by the NT610G/NT610C Support Tool Version 1.0 \_.

Refer to *2-3 Connection to an OMRON PC* for information on compatible PCs. The "conventional" Host Interface Unit specification refers to a Host Interface Unit using one of the following System ROMs:

NT20M: NT20M-SMR01

NT600M: NT600M-SMR01-V\_

#### Compatibility of Existing Screen Data

Data created with the NT20M/NT600M Support Tool Ver. 3 is compatible with data created with NT20M/NT600M Support Tool Ver. 4.0\_ with Direct Connection set OFF.

### 5-1-2 Data Conversion Procedure

The data conversion procedure is shown below:

1, 2, 3...

#### 1. Convert Data

Read the existing file or screen data and convert to the Direct Connection format set with the Support Tool.

#### 2. Convert Allocated Bits and Words

Convert the allocated bits and words to match the Direct Connection format.

#### 3. Modify Programs (Direct Connection OFF to ON or OMRON)

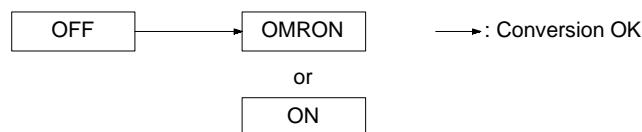
When converting data from Direct Connection OFF to either ON or OMRON, the conventional Host Interface Unit programs can be modified for re-use.

## 5-2 Data Conversion

The method for converting data between different Direct Connection formats is described below.

### Convertible Data

The following data can be converted:



It is not possible to convert data to the Direct Connection OFF format.

### How to Convert Data

Data of different Direct Connection formats is converted using the Support Tool. All data in the file is converted.

- 1, 2, 3...
1. Set the Direct Connection format of the data after conversion using "Direct Connection" on the Tool Setting screen of the Support Tool.
  2. Select the file to be converted from the File Directory.

**Note** The contents of the selected file are overwritten. If the contents of the file are needed, use the Copy function to copy the file before converting it.

3. The following prompt is displayed:



4. Press the RETURN KEY to run the data conversion.

**Data Communication between the PT and Support Tool**

**PT to Support Tool** (receiving data)

Regardless of the Support Tool settings, data is read from the PT and a file is created in the Direct Connection format set at the PT.

**Support Tool to PT** (sending data)

Data transmission is not possible if the PT contains data of a different Direct Connection format from the transmitted file. In this case, either transmit data with the same format as the data in the PT or initialize all data in the PT.

## 5-3 Changing the Allocated Bits and Words for Data Conversion

After data is converted from one Direct Connection format to another, the allocated bits and words are changed as follows:

**Items Changed**

When data is converted from Direct Connection OFF to Direct Connection OMRON or ON format, all allocated bits and words revert to an "unallocated" status. Reset the items listed below to match the system and PLC program.

**PT Status Control Area**

Allocated words:

Set the start addresses for the words allocated in the PT Status Control Area.

**PT Status Notify Area**

Allocated words:

Set the start addresses for the words allocated in the PT Status Notify Area.

**Character Strings**

Allocated words:

Set the number of words allocated to the character-string memory table (NT20M: 1 to 16 words or NT600M: 1 to 20 words), the start address, initialize/not initialize.

Other character-display-related settings remain unchanged after the conversion.

**Numerals**

Allocated words:

Set the number of words allocated to the numeral table (1 or 2 words), the start address, initialize/not initialize.

Display method:

Set if the numbers are displayed as a decimal or hexadecimal value.

Other number-related settings remain unchanged after the conversion.

**Lamps**

Allocated control bits:

Set the bit addresses to control the lighting (flashing) of the lamps.

Other settings remain unchanged after the conversion.

**Touch Switches**

Allocated control bits:

Set the bit addresses to control the lighting (flashing) of the touch switches.

Display attributes:

Set if the touch switch lights continuously or flashes when the control bit turns ON (1).

Notify function:

Set the operation when the touch switch is pressed. If screens are switched using the Stand-alone functions (screen switch function), the setting remains unchanged after conversion.

If the number setting function is used to input numbers from a displayed keypad, the keypad settings must be repeated after data conversion. Set the touch key numbers again.

Allocated notify bits:

Set the bit addresses to notify the PC when each touch switch is pressed.

Other settings remain unchanged after the conversion.

In addition to the items listed above, the words for the numeral table used for bar graph and number settings must be re-allocated.

**Allocatable Bits and Words**

The following bits and words of the PC memory area can be allocated for OM-  
RON PC Direct Connection.

Symbol	Area name		Allocate bit	Allocate word	
	C-series PC	CV-series PC		Numeral	Character string
DM	DM Area	DM Area	OK	OK	OK
I/S	IR Area	CIO Area	OK	OK	OK
TC or TIM	Timer/Counter Area	Timer Area	NG	1 word only	NG
TC or CNT		Counter Area	NG	1 word only	NG
HR	Holding Area	---	OK	OK	OK
AR	AR Area	Auxiliary Area	OK	OK	OK
LR	Link Area	---	OK	OK	OK

The range of each memory area differs according to the PC type. Refer to *Appendix B PC Memory Map* for more details.

**Setting Programs for Reuse**

The method described below allows a Direct Connection OFF format PC program to be reused with only minor modifications.

The method involves setting up the DM area as shown in the diagram below to match the Direct Connection OFF format bit and word allocation as closely as



possible. The setting to initialize the memory table or not should remain unchanged.

Start address (Word n): Set to DM0000, DM0256, DM1024, or DM2048.

Word n															PT Status Control Area (4 words) (see note 1)		
to																	
n + 3																	
n + 4	15	14	13	12	11	10	9	8	7	6	5	4	3	2		1	0
n + 5	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	
n + 6	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	
n + 7	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	
n + 8															PT Status Notify Area (3 words) (see note 1)		
to																	
n + 10																	
n + 11															Not used (1 word)		
n + 12	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Touch switch notify bits (allocate lamps and touch switch numbers to bits with the same number).
n + 13	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	
n + 14	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	
n + 15	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	
n + 16															Numeral table entry number 1 (2 words)		
n + 17																	
n + 18															Numeral memory table entry number 2 (2 words)		
n + 19																	
to															to		
n + 272															Character-string memory table entry number 1 (20 words) (see note 2)		
to																	
n + 291															Character-string memory table entry number 2 (20 words) (see note 2)		
n + 292																	
to																	
n + 311																	
to															to		

- Note**
1. Set the DIP switches such that the general memory is not used.
  2. The diagram refers to the NT600M. For the NT20M, reserve 16 words for each character-string memory table.

The “conventional” Host Interface Unit specification refers to a Host Interface Unit using one of the following System ROMs:

- NT20M: NT20M-SMR01
- NT600M: NT600M-SMR01-V\_

## 5-4 Modifying Programs for Conversion

This section describes the method to modify a program created for a conventional Host Interface Unit (Direct Connection OFF) to use it for Direct Connection.

It is important to understand the differences between the conventional format and Direct Connection format before modifying a program.

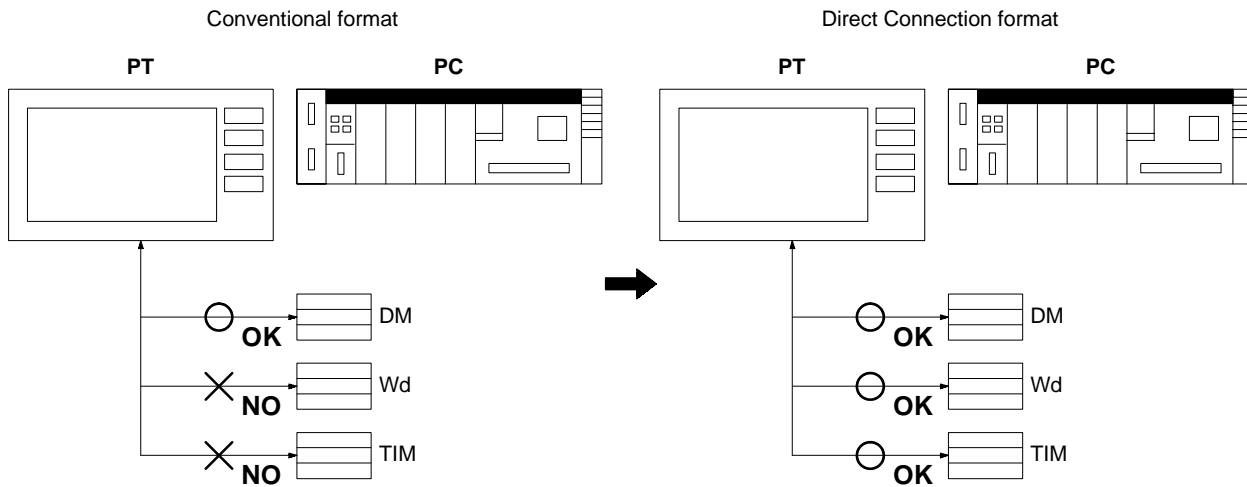
The modifications to the program described here are the minimum modifications required. To use the Direct Connection format to most effectively control the PT the programs should be entirely rewritten.

### 5-4-1 Comparing Conventional and Direct Connection Formats

The differences between the conventional format and Direct Connection format are described below.

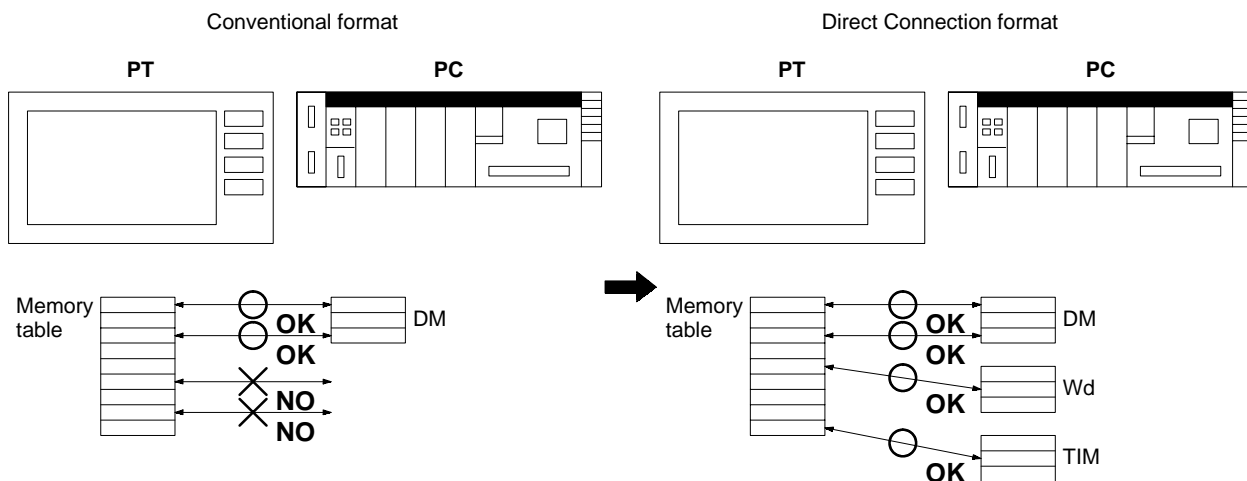
#### Example 1

The memory tables and the bits and words to control and notify the lamp and touch switch status can be allocated almost anywhere in the PC memory. The number of words allocated to a memory table can also be freely allocated (see *Modification and Settings 1*, page 74).



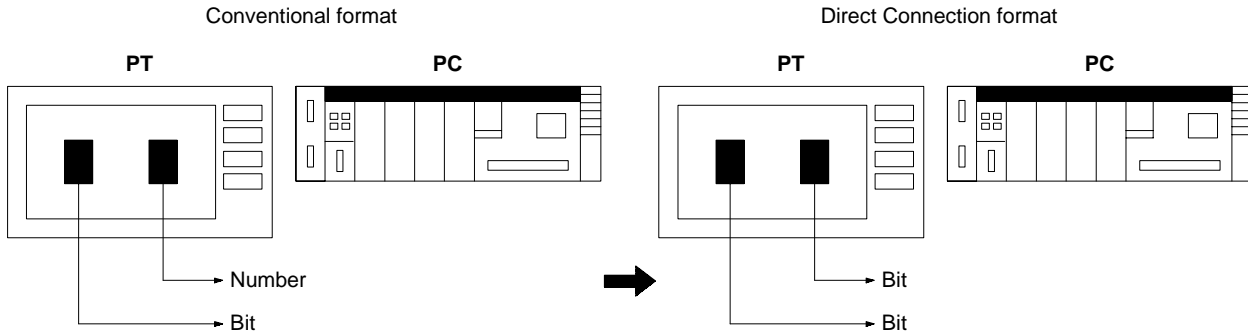
#### Example 2

No limit on the number of memory tables in the PC memory as memory tables, lamps and touch switches can be independently read or written to the PC memory (see *Modification and Settings 2*, page 74).



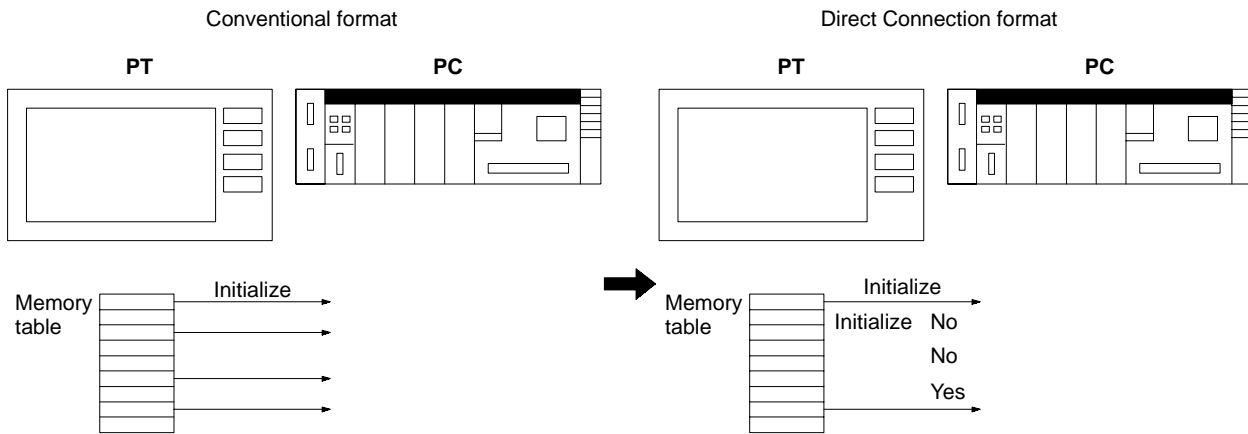
**Example 3**

All control and notification uses bits instead of lamp and touch switch numbers, so that lamps and touch switches can all be handled by a single process and it is not necessary to change the processing to suit the number (see *Modification and Settings 3*, page 74).



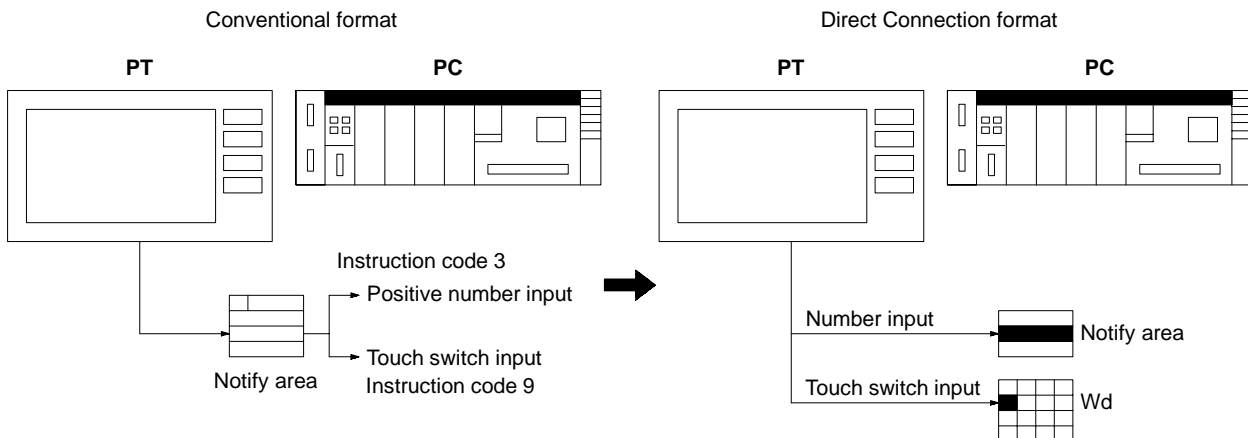
**Example 4**

The memory table initial values when the PT is booted up can be selected between the values set with the Support Tool and the values in the PC (see *Modification and Settings 4*, page 75).



**Example 5**

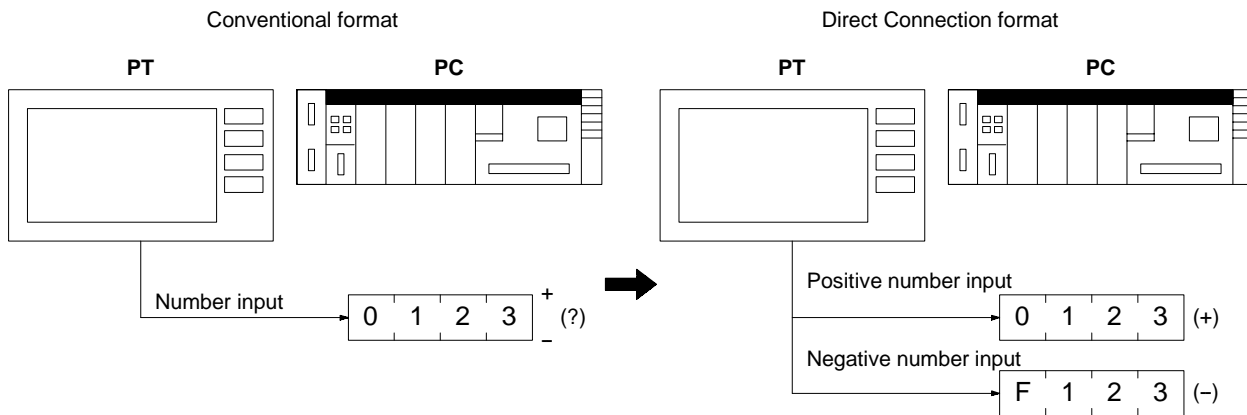
The PT control and notification functions have been simplified to use a fixed memory area for each function, thereby eliminating the need for instruction codes and simplifying data preparation and analysis (see *Modification and Settings 5*, page 75).



**Example 6**

Hexadecimal display of number data is possible. The handling of number data has changed such that negative numbers can be expressed as number data. In conventional format, instruction codes were used to differentiate between posi-

tive and negative values and this could not be determined from the number data alone (see *Modification and Settings 6*, page 76).



### 5-4-2 Program Modifications and Setting Areas

If existing programs are re-used, refer to *5-4-1 Comparing Conventional and Direct Connection Formats* for information on program modification and setting memory areas.

This section described how to modify programs. Refer to the following manuals for more information on programs.

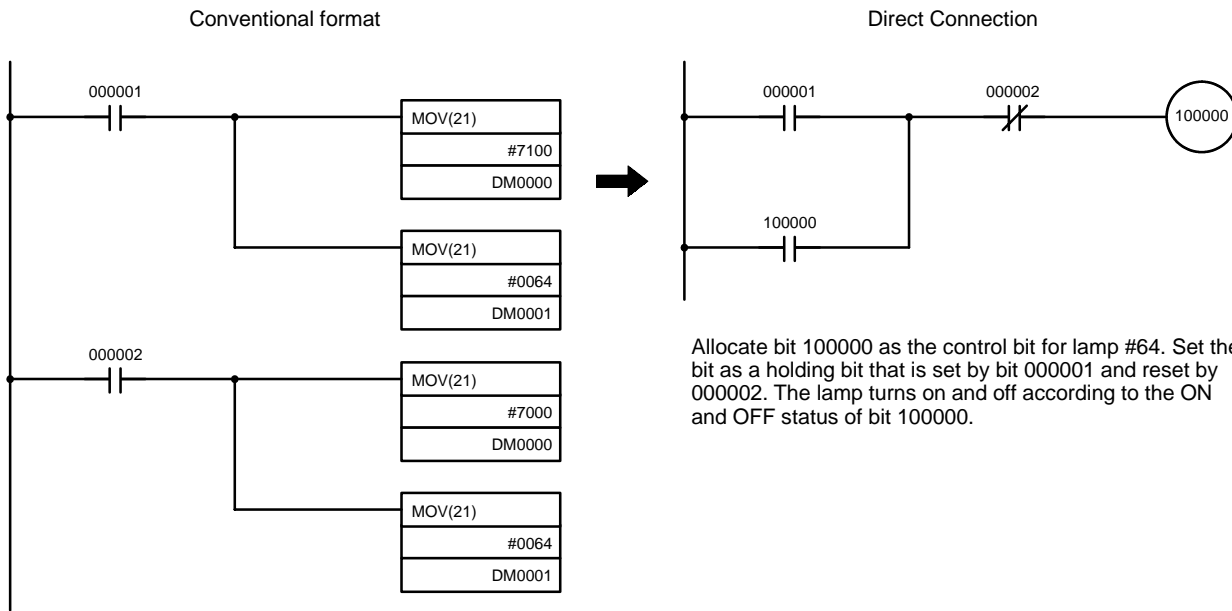
- Conventional format programs:  
*NT-series Host Interface Units Operation Manual*
- Direct Connection format programs:  
Refer to *Section 3 Direct Connection Operation* and *4 PT Operation*.

**Modification and Settings-1** Allocate the bits and words in the same way as for the conventional format.

**Modification and Settings-2** The number of memory tables allocated to the PC memory should match the Host Interface Unit CIP switch settings in the conventional format.

**Modification and Settings-3** Allocate the same control and notify bits to lamps and touch switches 0 to 63 (or 0 to 111) as were allocated in the conventional format. For lamps and touch switches numbered 64 (or 112) and above, modify the program to allow bit control and notification. Allocate bits for easy handling by the program.

Example: Allocation of lamp #64 to turn the lamp on when bit 000001 turns ON and to turn it off when bit 000002 turns ON.

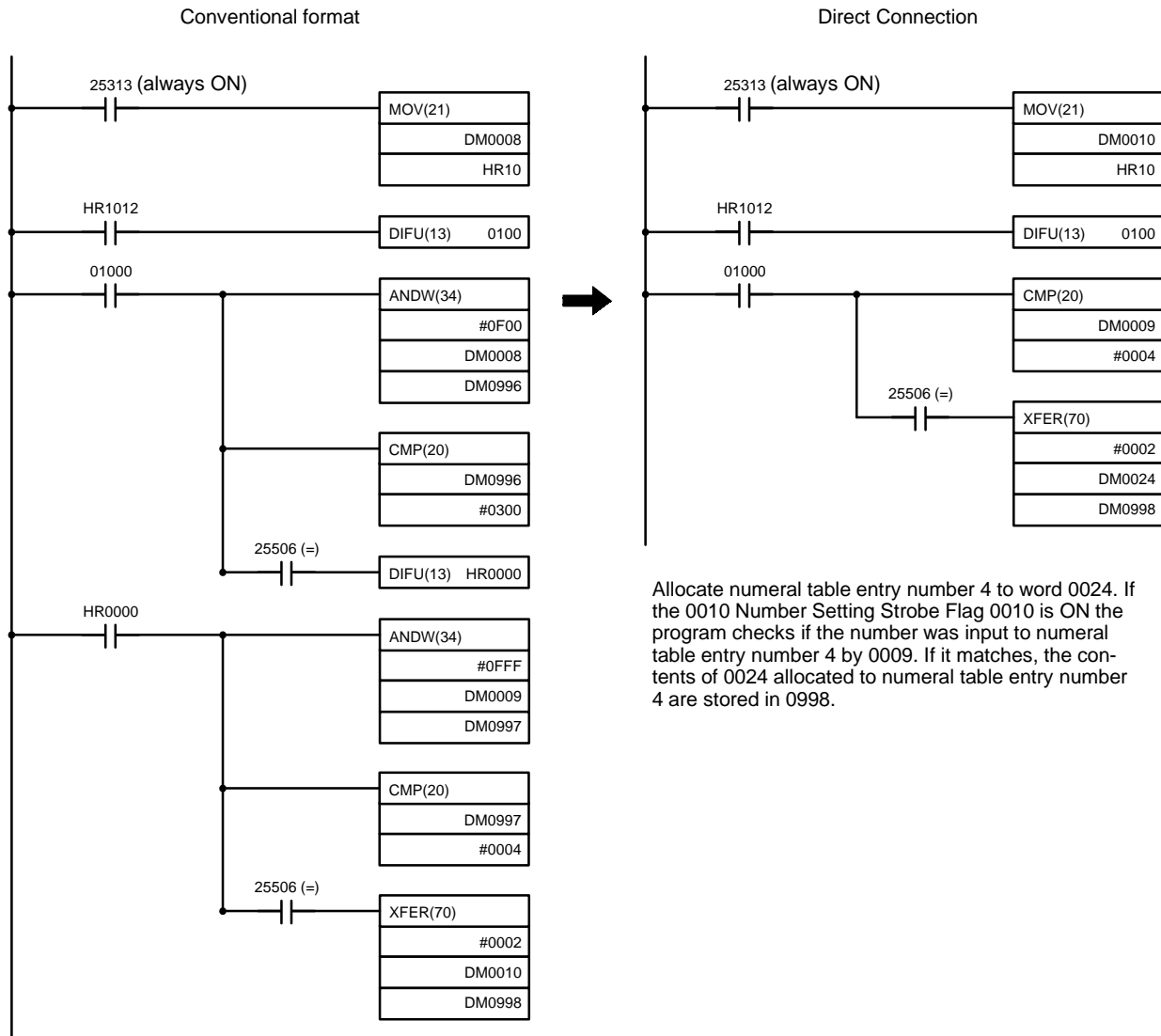


Allocate bit 100000 as the control bit for lamp #64. Set the bit as a holding bit that is set by bit 000001 and reset by 000002. The lamp turns on and off according to the ON and OFF status of bit 100000.

When bit 000001 turns ON an instruction lights lamp #64. The lamp turns off when bit 000002 turns ON.

- Modification and Settings-4** Set with the DIP switches or Support Tool whether or not the PC memory is initialized with the values set by the Support Tool. This setting must match the Host Interface Unit DIP switch settings in the conventional format. Refer to *2-1 Components and Settings* for information on the DIP switch settings.
- Modification and Settings-5** Modify parts of the program using instruction codes to conduct the same processing with no instruction codes.

Example: To read numbers input with the PT number setting function to numeral table entry number 4.



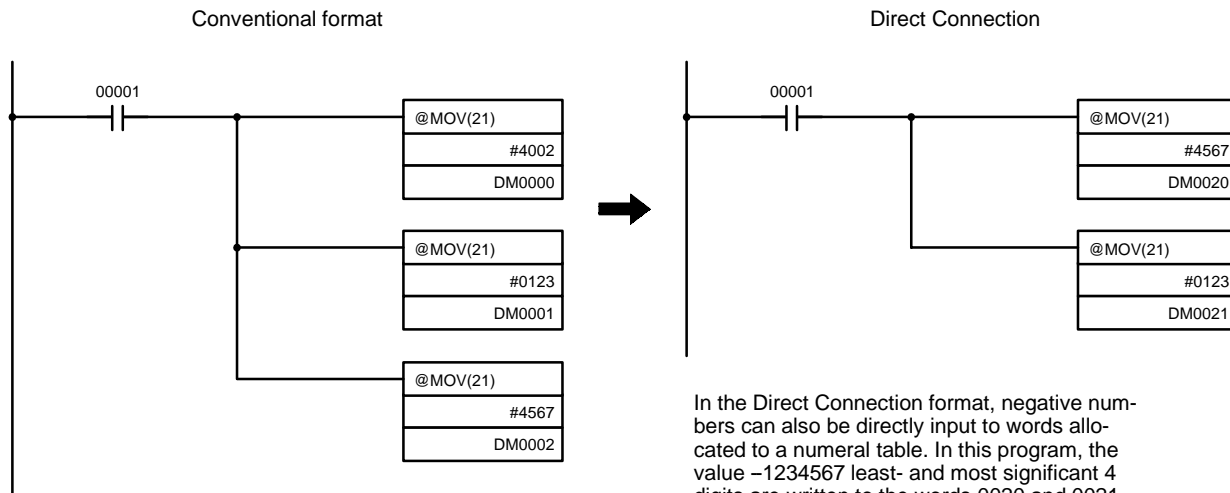
Allocate numeral table entry number 4 to word 0024. If the 0010 Number Setting Strobe Flag 0010 is ON the program checks if the number was input to numeral table entry number 4 by 0009. If it matches, the contents of 0024 allocated to numeral table entry number 4 are stored in 0998.

Bit 12 of DM0008 is the flag for data written from the PT. When this flag bit turns ON the program checks if the DM0008 instruction code is code 3 (positive number input). If a positive number is input the program verifies it against DM0009 to determine if it is numeral table entry number 4. If it matches the notified number is stored in word 0010 and 0011.

In this example, the PT Status Notify Area is allocated to the DM Area and the status of the Number Setting Strobe Flags is checked using HR bits and work bits. When writing a program for Direct Connection use, initially allocating the PT Status Notify Area to work bits allows the Number Setting Strobe Flag bits to be used directly as the input bits.

**Modification and Settings-6** Modify the program such that number representation matches the number representation of the Direct Connection format. Refer to *4-4 Editing Displayed Numerals and Character Strings*.

Example: Writing the value -1234567 to numeral table entry number 2 when bit 00001 turns ON.



In the Direct Connection format, negative numbers can also be directly input to words allocated to a numeral table. In this program, the value -1234567 least- and most significant 4 digits are written to the words 0020 and 0021 allocated numeral table entry number 2.

If numeral table is allocated to memory, a negative number cannot be directly written to it in the conventional format. Instruction code 4 (negative number input) is used to write -1234567 as the most- and least-significant 4 digits to numeral table entry number 2.

**Note** The order of the words storing the most-significant 4 digits and least-significant 4 digits is opposite in the conventional format to the Direct Connection format.

# SECTION 6

## Troubleshooting

This section describes the procedures to follow if the PT does not operate correctly.

6-1	Errors Occurring when the Power is Turned ON .....	80
6-2	Errors Occurring During Operation .....	80
6-3	Communication Errors .....	80



## 6-1 Errors Occurring when the Power is Turned ON

Refer to the table below for the causes and remedies for errors occurring when the PT power is turned on.

General source of error	Cause	Remedy
No Host Interface Unit	Host Interface Unit not installed. The System ROM is not compatible with the Host Interface Unit.	Install the Host Interface Unit. Determine the System ROM compatible with the Host Interface Unit and mount the correct type of ROM.
Memory not formatted	Screen data memory board not installed. EEPROM or EPROM not mounted correctly on the the screen data memory board. The screen memory board DIP switch settings do not match the specifications of the memory chip.	Correctly install the screen data memory board. Correctly mount the memory chip on the screen memory board. Correctly set the screen memory board DIP switches.
Screen data corrupted	The screen data is not compatible with the System ROM. The power supply was turned off during transmission of the screen data.	Create the correct screen data with the Support Tool. Transfer the screen data once more with the Support Tool.
Mark data corrupted	The power supply was turned off during transmission of the screen data. Transmission of the screen data was interrupted.	Transfer the screen data once more with the Support Tool.
Host error	If the PT DIP switches are set to enable Host RUN input: The PC power supply is not turned on. The Host RUN input signal voltage is low.	Turn on the PC power supply. Apply the voltage to the Host RUN input.
No Direct information set Set the PT Status Control Area and PT Status Notify Area with the Support Tool.	The PT Status Control Area and PT Status Notify Area are not allocated to memory.	Allocate the PT Status Control Area and PT Status Notify Area to memory with the Support Tool.

## 6-2 Errors Occurring During Operation

Refer to the table below for the causes and remedies for errors occurring during PT operation.

General source of error	Cause	Remedy
Host error	If the PT DIP switches are set to enable Host RUN input: The PC power supply is not turned on. The Host RUN input signal voltage is low.	Check the PC power supply and operating status.
Setting error Simultaneous display of memory type and address.	Bits or words allocated with the Support Tool in the PC memory not found.	Check the memory in the PC used and correct the bit and word allocation.

## 6-3 Communication Errors

The remedies for communication errors occurring during operation are described below.

### Communication Error Message

A message is displayed on the PT and a buzzer sounds when a communication error occurs. Error messages are displayed if automatic reset after communication error is disabled with the DIP switches.

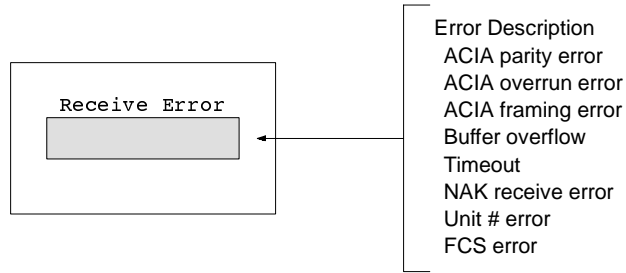
### Procedure

When the buzzer sounds, press the BUZZER or RETURN key to revert the screen display to the operation display.

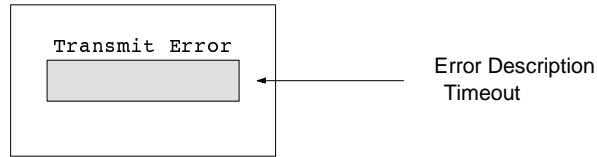
**Error Display**

Communication errors are displayed as follows:

**Error on Receive**



**Error on Transmit**



General source of error	Cause	Remedy
Parity error Overrun error Framing error Buffer overflow	Communication parameters set incorrectly.  Noise caused data corruption during communication.	Make sure the PT parity bit, frame length, baud rate, stop bits, and flow control settings match the PC settings. Use a noise-resistant cable if communication occurs in an environment with high levels of noise.
Timeout	Cable connector is disconnected. PC is halted.	Reconnect the cable. Make sure the PC is able to communicate with the PT.
NAK error (End code simultaneously displayed)	An error existed in the communication data from the PT. Noise caused data corruption during communication.	Possible PT defect. Check PT operation.  Use a noise-resistant cable if communication occurs in an environment with high levels of noise. Refer to the <i>SYSMAC C-series Rack PCs SYSMAC WAY - Host Link Units System Manual</i> . Check the End code.
Unit # error	The PC unit # was changed. The PC is transmitting incorrect data. Noise caused data corruption during communication.	Set the PC unit # to 0. Check PC operation. Use a noise-resistant cable if communication occurs in an environment with high levels of noise.
FCS error	The PC is transmitting incorrect data. Noise caused data corruption during communication.	Check PC operation. Use a noise-resistant cable if communication occurs in an environment with high levels of noise.

# Appendix A

## Communication Specifications

Item	Specification
Communication standard	EIA RS-232C
Communication settings	Start-stop synchronization Baud rate: 4800, 9600, 19200 bps Data bits: 7 Stop bits: 2 Parity: even
Connectors	25-pin D-sub connector (female), Optical Fiber Cable compatible
No. of units	1-to-1
Transmission distance	Max. 15 m (up to 500 m using optical-fiber cable)
Protocol	C Series SYSWAY (1: N)

## Appendix B PC Memory Map

### OMRON C Series Memory Map

PC		IR Area	HR Area	AR Area	Link Relay Area	Timer/Counter Area	DM Area
Ladder type	C20H	0000 to 0255	0000 to 0099	0000 to 0027	0000 to 0063	0000 to 0511	0000 to 1999
	C28H						
	C40H						
	C60H						
	C120	0000 to 0063	0000 to 0031	---	---	0000 to 0127	0000 to 0051
	C200H	0000 to 0255	0000 to 0099	0000 to 0027	0000 to 0063	0000 to 0511	0000 to 1999
	C500	0000 to 0063	0000 to 0031	---	0000 to 0031	0000 to 0127	0000 to 0511
	C1000H	0000 to 0255	0000 to 0099	0000 to 0027	0000 to 0063	0000 to 0511	0000 to 4095
	C2000(H)						0000 to 6655

### OMRON CV/CVM1 Series Memory Map

PC	CIO Area	HR Area	AR Area	Link Area	Timer Area	Counter Area	DM Area
CV500	0000 to 2555	---	0000 to 0511	---	0000 to 0511	0000 to 0511	0000 to 8191
CVM1-CPU01-E							
CV1000	0000 to 2555	---	0000 to 0511	---	0000 to 1023	0000 to 1023	0000 to 9999 (see note)
CVM1-CPU11-E							

**Note** Range applicable to PT operation.

# Appendix C

## RS-232C Connections

Prepare a connector cable to connect a PT to an OMRON PC separated by more than 2 m when the supplied connector cable cannot be used.

Connect the wires to the connectors in accordance with the connector specification for each unit.

### Parts Required

Two connectors, two connector covers and one cable are required to make up a connecting cable. One connector and connector cover is supplied with each PT and PC unit. The cable is not supplied. Purchase the appropriate length of OMRON-recommended cable.

The connector type supplied with each unit and the recommended cable type are shown in the table below.

Name	Model	Comments
Connector	XM2A-2501	25-pin, manufactured by OMRON Supplied with NT600M-LK201 I/F Unit. Supplied with the following Host Link Units: C500-LK203, CV500-LK201, C200H-LK201
	DB-25P	25-pin, manufactured by JAE Supplied with the following Host Link Units: C500-LK201-V1, C120-LK201-V1
	XM2A-0901	9-pin, manufactured by OMRON Supplied with CV-series CPU Units. Supplied with the following Host Link Unit: CV500-LK201
Connector cover	XM2S-2511	25-pin, manufactured by OMRON Supplied with NT600M-LK201 I/F Unit. Supplied with the following Host Link Units: C500-LK203, CV500-LK201, C200H-LK201
	DB-C2-J9	25-pin, manufactured by JAE Supplied with the following Host Link Units: C500-LK201-V1, C120-LK201-V1
	XM2S-0901	9-pin, manufactured by OMRON Supplied with CV-series CPU Units. Supplied with the following Host Link Unit: CV500-LK201
Cable	AWG28 * 5P IFVV-SB	Multicore cable, manufactured by Fujikura Densen.
	CO-MA-VV-SB 5P * 28AWG	Multicore cable, manufactured by Hitachi Densen.

- Note**
1. The necessary connector and connector cover to connect an OMRON C\_\_H to a PT are not supplied and must be purchased separately.
  2. The connector on a C\_\_H CPU is a 9-pin connector. Purchase the following connector and connector cover to make a connection to a C\_\_H:
  3. Connector: XM2A-0901 (9-pin, manufactured by OMRON)
  4. Connector cover: XM2S-0911 (9-pin, manufactured by OMRON)

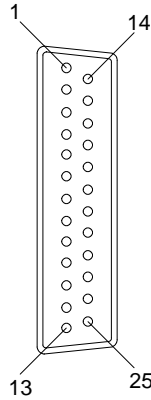
### OMRON Unit Connector Specifications and Wiring

The combination of pin numbers to be connected when wiring a cable differs according to the unit connector specification. First check the connector specifications of the unit then connect the wires to the pins as described in the following pages for the relevant connecting cable.

#### Host Interface Unit 25-pin Connector Specifications

Electrical characteristics: Complies with EIA RS-232C

Signal direction: Signal input and output is relative to the PC.



Connector pin #	Signal name	Abbreviation	Signal direction	
			Input	Output
1	Frame ground	FG	---	---
2	Send data	SD (TXD)		Yes
3	Receive data	RD (RXD)	Yes	
4	Request to send	RS (RTS)		Yes
5	Clear to send	CS (CTS)	Yes	
7	Signal ground	SG (GND)	---	---
14	Optical connector +5V (see note 1)	+ 5V	---	---

- Note**
1. C500-LK203 and C200H-LK201 only.
  2. Ground the PC unit FG terminal to Class 3 ground. Refer to the appropriate *PC Installation Guide* for details.

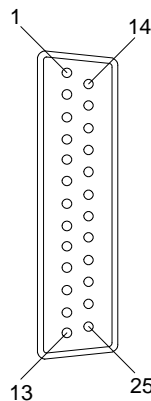
**Connecting a PT to a C Series Host Link Unit**

**C Series Host Link Unit 25-pin Connector Specifications**

Applicable Host Link Unit: C200H-LK201  
 C500-LK201-V1  
 C500-LK203  
 C120-LK201-V1

Electrical characteristics: Complies with EIA RS-232C

Signal direction: Signal input and output is relative to the PC.

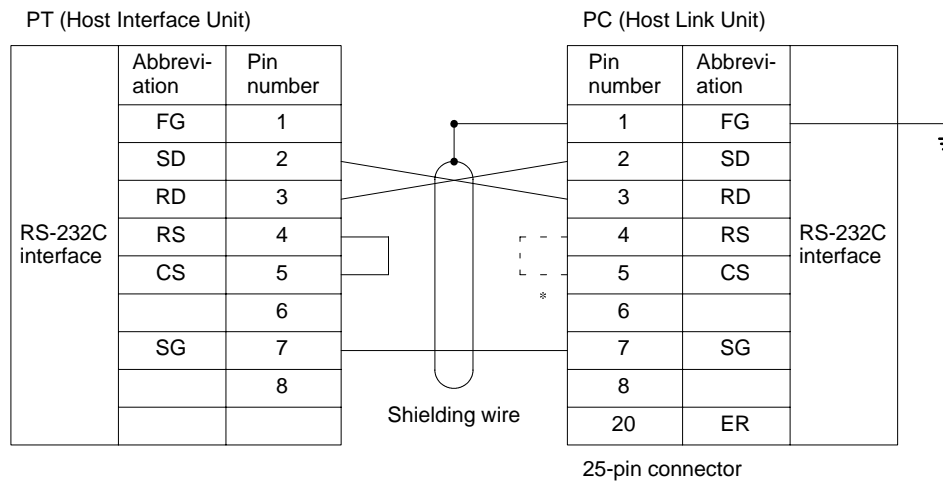


Connector pin #	Signal name	Abbreviation	Signal direction	
			Input	Output
1	Frame ground	FG	---	---
2	Send data	SD (TXD)		Yes
3	Receive data	RD (RXD)	Yes	
4	Request send	RS (RTS)		Yes
5	Clear to send	CS (CTS)	Yes	
7	Signal ground	SG (GND)	---	---
14	Optical connector +5V (see note 2)	+ 5V	---	---
15	Send signal element timing 2 (see note 1)	ST2	Yes	
17	Receive signal element timing (see note 1)	RT	Yes	
20	Data terminal ready	ER (DTR)		Yes
24	Send signal element timing 1 (see note 1)	ST1		Yes

**Note** 1. No element timing signals on C200H-LK201.  
 2. C500-LK203 and C200H-LK201 only.

**Wiring Connections**

Short PC (Host Link Unit) Pin 4 (RS) and Pin 5 (CS) together on the connector. However, it is not necessary to short RS to CS together if the CTS selector switch on the rear of the PC is set to the 0 V position\*. Connect the cable shielding wire to the connector cover and Pin 1 at the Host Link Unit end of the cable only.



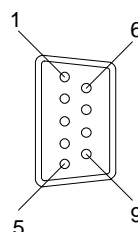
**Connecting a PT to a C Series CPU**

**C Series CPU Unit 9-pin Connector Specifications**

Applicable CPU: C20H/C28H/C40H/C60H

Electrical characteristics: Complies with EIA RS-232C

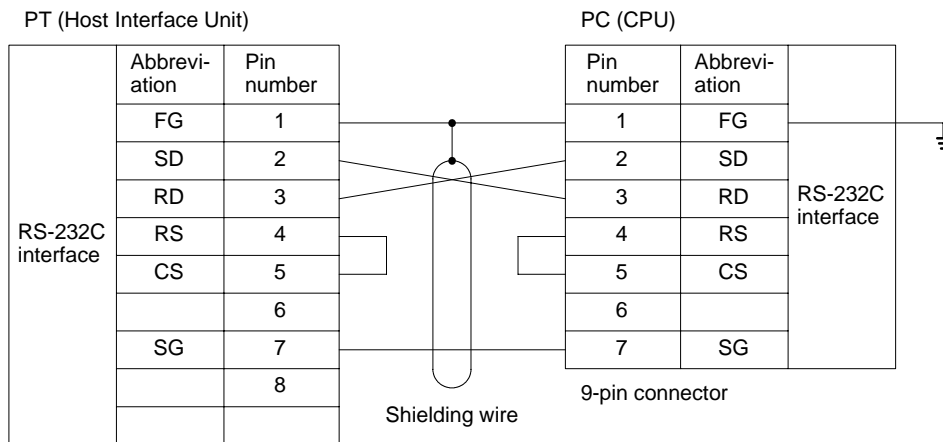
Signal direction: Signal input and output is relative to the PC.



Connector pin #	Signal name	Abbreviation	Signal direction	
			Input	Output
1	Frame ground	FG	---	---
2	Send data	SD (TXD)		Yes
3	Receive data	RD (RXD)	Yes	
4	Request to send	RS (RTS)		Yes
5	Clear to send	CS (CTS)	Yes	
7	Signal ground	SG (GND)	---	---

**Wiring Connections**

Connect the cable shielding wire to the connector cover and Pin 1 at both the PT and CPU ends of the cable.



**Connecting a PT to a CV-Series Host Link Unit**

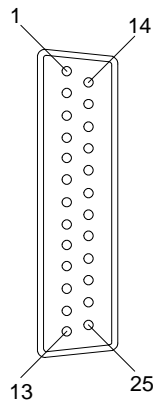
**CV-Series Host Link Unit 25-pin Connector Specifications**

Applicable Host Link Unit: CV500-LK201

Electrical characteristics: Complies with EIA RS-232C

Signal direction: Signal input and output is relative to the PC.

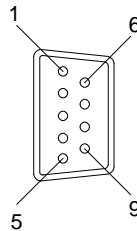
Communication port #1: 25-pin connector





Connector pin #	Signal name	Abbreviation	Signal direction	
			Input	Output
Connector cover	Frame ground	FG	---	---
1	Frame ground	FG	---	---
2	Send data	SD (TXD)		Yes
3	Receive data	RD (RXD)	Yes	
4	Request to send	RS (RTS)		Yes
5	Clear to send	CS (CTS)	Yes	
7	Signal ground	SG (GND)	---	---
8	Carrier detected	CD (DCD)	Yes	
14	Optical connector +5V	+ 5V		Yes
20	Data terminal ready	ER (DTR)		Yes

Communication port #2: 9-pin connector



Connector pin #	Signal name	Abbreviation	Signal direction	
			Input	Output
Connector cover	Frame ground	FG	---	---
2	Send data	SD (TXD)		Yes
3	Receive data	RD (RXD)	Yes	
4	Request send	RS (RTS)		Yes
5	Clear to send	CS (CTS)	Yes	
7	Carrier detected	CD (DCD)	Yes	
9	Signal ground	SG (GND)	---	---

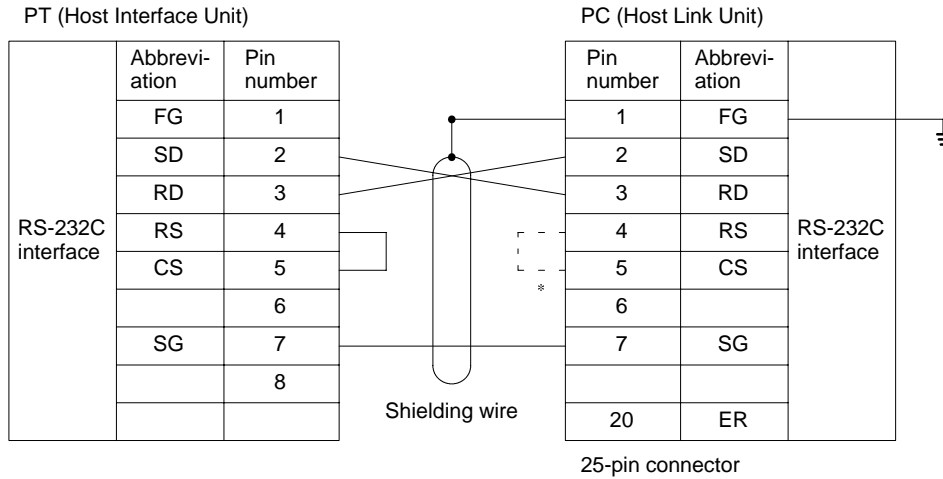
### Wiring Connections

A CV-Series Host Link Unit has two types of connector, which must each be wired differently.

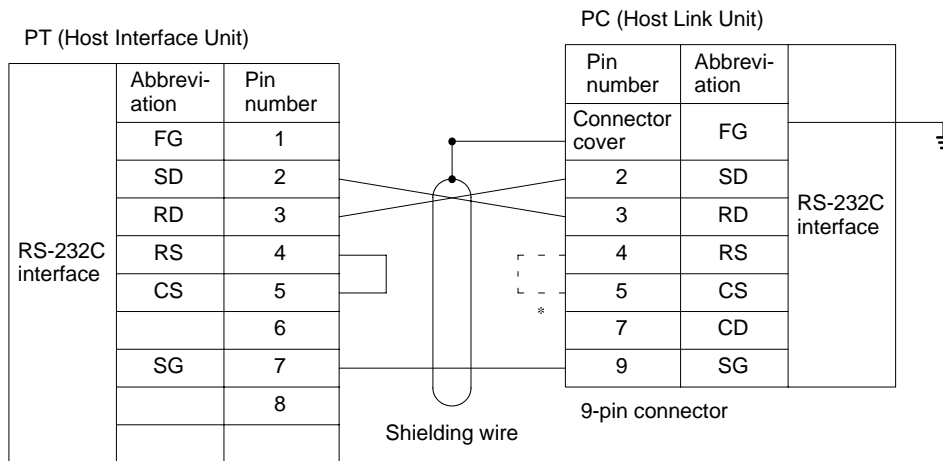
Connect the cable shielding wire to the connector cover and Pin 1 at the Host Link Unit end of the cable only.

Short Pin 4 (RS) and Pin 5 (CS) together on the connector. However, it is not necessary to short RS to CS together if the CTS selector switch on the rear of the PC is set to the 0 V position\*.

Communication port #1: 25-pin connector



Communication port #2: 9-pin connector



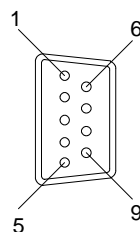
**Connecting a PT to a C-Series CPU**

**CV-Series CPU 9-pin Connector Specifications**

- Applicable CPU: CV500-CPU01
- CV1000-CPU01
- CVM1-CPU01
- CVM1-CPU11

Electrical characteristics: Complies with EIA RS-232C

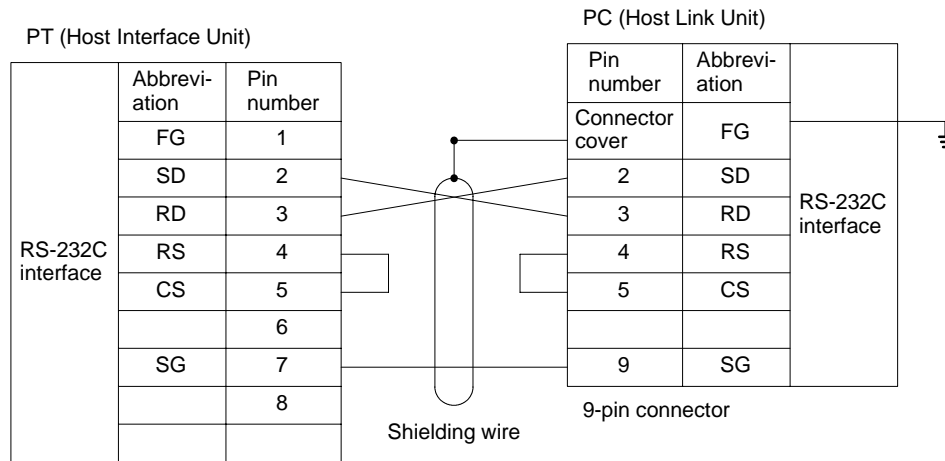
Signal direction: Signal input and output is relative to the PC.



Connector pin #	Signal name	Abbreviation	Signal direction	
			Input	Output
Connector cover	Frame ground	FG	---	---
2	Send data	SD (TXD)		Yes
3	Receive data	RD (RXD)	Yes	
4	Request to send	RS (RTS)		Yes
5	Clear to send	CS (CTS)	Yes	
9	Signal ground	SG (GND)	---	---

**Wiring Connections**

Connect the cable shielding wire to the connector cover and Pin 1 at the CPU end of the cable only.



**Making the Cable**

The procedure to make up a cable is described below. This procedure also applies to fabrication of an RS-422 cable.

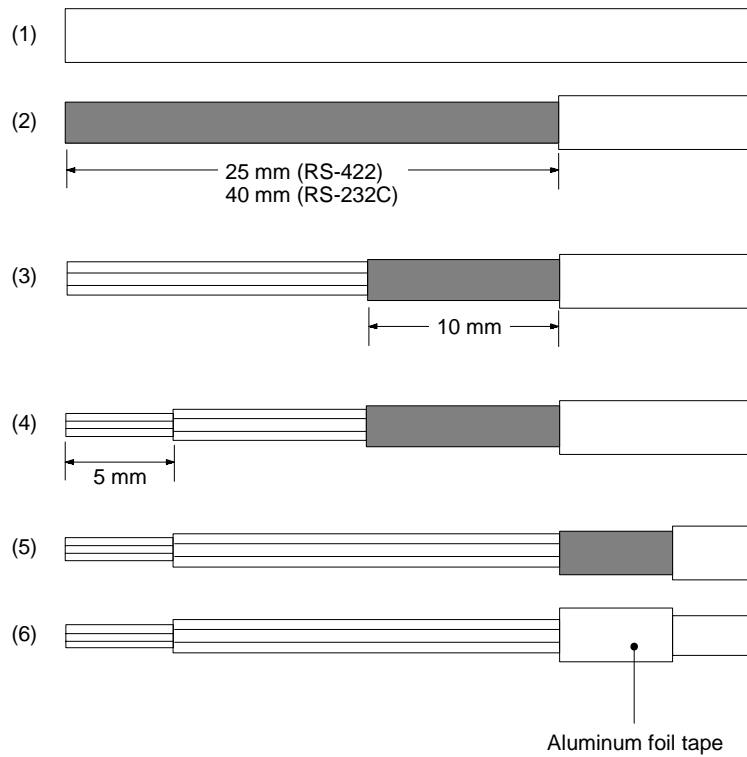
**Cable Preparation**

The preparation of the cable differs according to whether or not the shielding wire is to be connected to the FG.

**Cable with Shielding Wire Connected to FG**

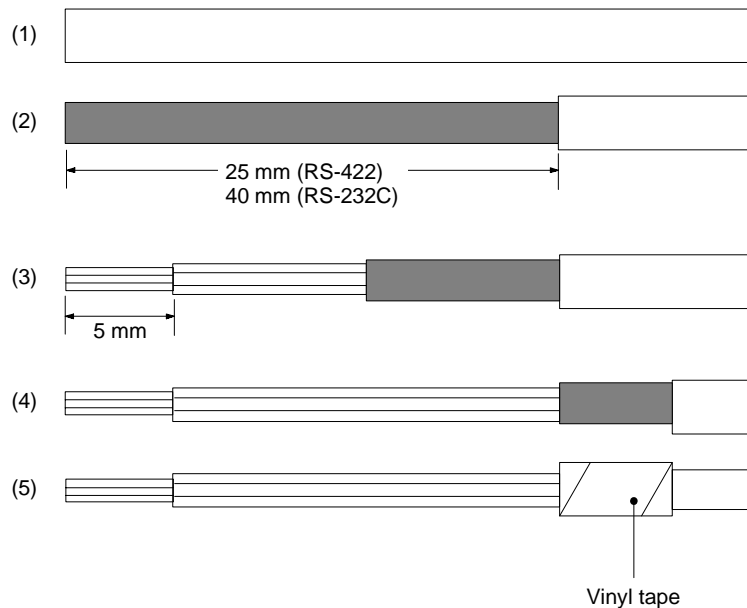
- 1, 2, 3...
1. Cut the cable to the required length.
  2. Remove the external vinyl insulation from the cable with a razor blade. Take care not to damage the shielding underneath.
  3. Cut back the shielding wire with scissors.
  4. Use wire strippers to strip the insulation from each core wire.
  5. Fold back the insulation.

6. Wrap aluminum foil tape around the folded-back shielding wire.



**Cable with Shielding Wire Not Connected to FG**

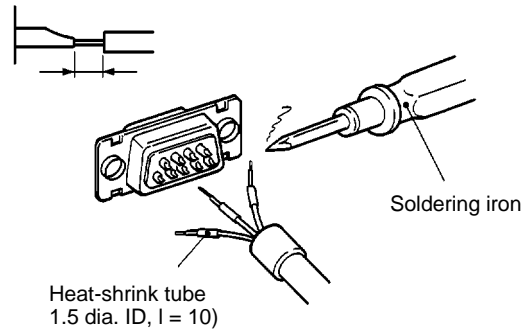
- 1, 2, 3... 1. Cut the cable to the required length.  
 2. Remove the external vinyl insulation from the cable with a razor blade. Take care not to damage the shielding underneath.  
 3. Cut back the shielding wire with scissors.  
 4. Use wire strippers to strip the insulation from each core wire.  
 5. Wrap vinyl tape over the cut-off end of the shielding wire.



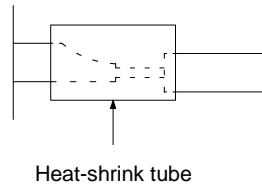
**Soldering**

- 1, 2, 3... 1. Slide heat-shrink tube over each wire.

2. Pre-solder each wire and connector terminal.
3. Solder each wire to the connector terminal.

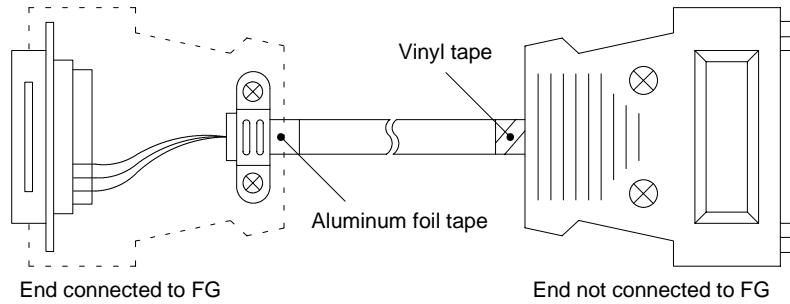


4. Push the heat-shrink tube over the soldered joint and heat the tube to shrink it in place.



### **Connector Cover Assembly**

Assemble the connector covers as shown in the diagram below.



## Appendix D

### RS-422 Connections

A PT with a Host Interface Unit installed and an OMRON PC are connected with an RS-422 cable. RS-422 cables can connect a PT to a PC between 15 m and 500 m apart.

RS-422 connection permits a 1-to-N connection between the host computer and PC (that is, multiple PCs can be connected to a single computer). However PT-to-PC connection is on a 1-to-1 basis only.

### Compatible PCs

Some models and series of OMRON PCs have the Host Link function built-in.

Check the model and series of the PC against the type of Host Link Unit before making the connections.

The compatible PCs are listed in the table below.

PC series	Units with built-in Host Link function		Connectable
	Host Link Unit	CPU Unit	
C-series	---	C20H/C28H/C40H/ C60H	C__H
	C120-LK201-V1 C120-LK202-V1	---	C120, C200H, C500 C1000H
	C200H-LK201 C200H-LK202	---	C200H
	C500-LK201-V1 C500-LK203	---	C500, C1000
CV-series	CV500-LK201	CV500-CPU01	CV500
		CV1000-CPU01	CV1000
CVM1-series	CV500-LK201	CVM1-CPU01 CVM1-CPU11	CVM1

### Parts Required to Prepare an RS-422 Cable

OMRON does not provide RS-422 cables. Prepare a connecting cable if required by the operating environment (long distance between the PC and PT, for example).

Two connectors, two connector covers and one cable are required to make up a connecting cable. One connector and connector cover is supplied with each PT and PC unit. The cable is not supplied. Purchase the appropriate length of the OMRON-recommended cable.

The connector type supplied with each unit and the recommended cable type are shown in the list below.

Name	Model	Comments
Connector	XM2A-0901	9-pin, manufactured by OMRON Supplied with CV Series CPUs. Supplied with the following Host Link Units: C200H-LK202, C500-LK203, CV500-LK201
	DE-9P	9-pin, manufactured by JAE Supplied with the following Host Link Units: C200H-LK202, C500-LK201-V1
Connector cover	XM2S-0901	9-pin, manufactured by OMRON Supplied with CV Series CPUs. Supplied with the following Host Link Units: C200H-LK202, C500-LK203, CV500-LK201
	DE-CI-J6	9-pin, manufactured by JAE Supplied with the following Host Link Units: C200H-LK202, C500-LK201-V1
Cable	H-9293A (CO-HC-ESV-3P * 7/0.2)	RS-422 cable manufactured by Hirakawa Cables.

## Connecting the Cables

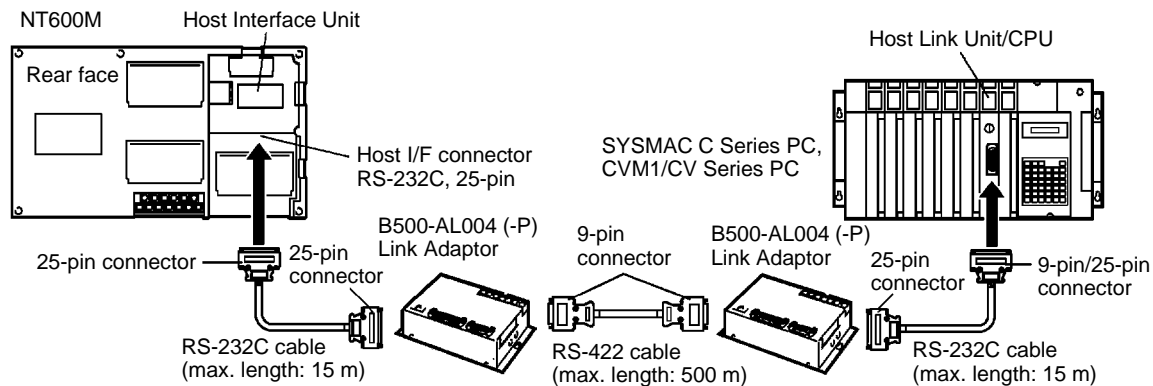
RS-422 communication allows connection between a PT and PC via a Link Adaptor using RS-232C and RS-422 cables.

The method of connection differs depending on whether the unit has an RS-232C connector or RS-422 connector

- Note**
1. Ground the PC unit FG terminal to Class 3 ground. Refer to the appropriate *PC Installation Guide* for details.
  2. Turn off both the PT and PC power supplies before connecting or disconnecting connectors.

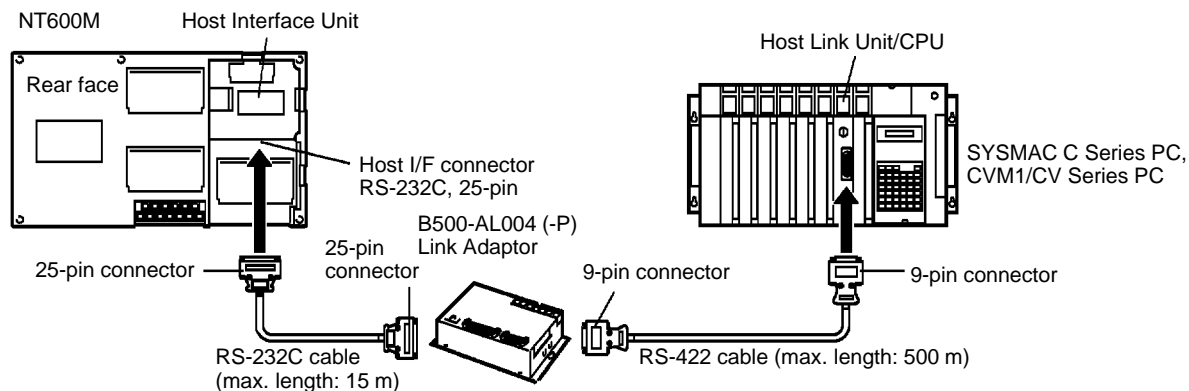
### Connecting Units with an RS-232C Connector

The diagram below shows the connection of a PC and PT using an RS-422 cable and two Link Adaptors. The connection from the PT and PC to the Link Adaptor is by means of an RS-232C cable.



### Connecting Units with an RS-422 Connector

Some types of PC unit have an RS-422 connector. An RS-422 cable can be connected directly to this connector.



## About the Cables

### RS-232C Cable

Versions of RS-232C cable are available with the following connector combinations:

- XZ7-10048 (25-pin to 25-pin)
- XZ7-10049 (25-pin to 9-pin)

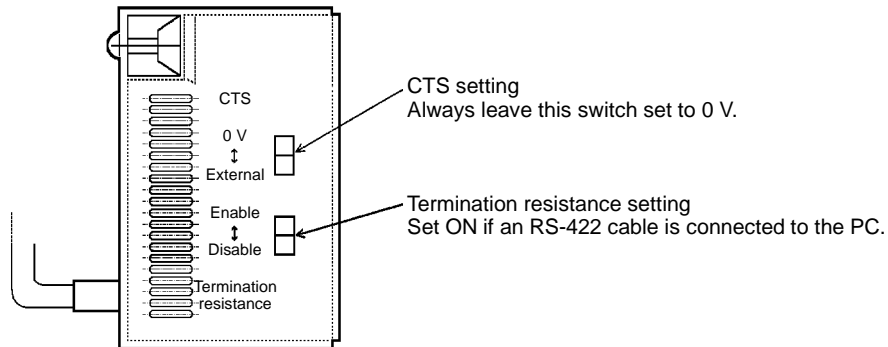
If a cable more than 2 m long is required, refer to *Appendix 3C RS-232C Connections* for details on how to make one.

### RS-422 Cable

OMRON does not provide RS-422 cables. Refer to this *Appendix* if an RS-422 cable is required.

### Link Adaptors

The Link Adaptor is a converter to connect different types of communication cables together. Set the switches as shown below when a Link Adaptor is used. Refer to the *SYSMAC C-series Rack PCs SYSMAC WAY - Host Link Units System Manual (W143)* for details.



### Connecting Units with an RS-232C Connector

The PT to PC connection method below uses two Link Adaptors.

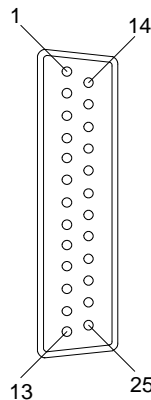
#### Wiring an RS-232C Cable

##### Connector Specifications for a B500-AL004 (-P) Link Adaptor

Connector: RS-232C

Electrical characteristics: Complies with EIA RS-232C

Signal direction: Signal input and output is relative to the PT.

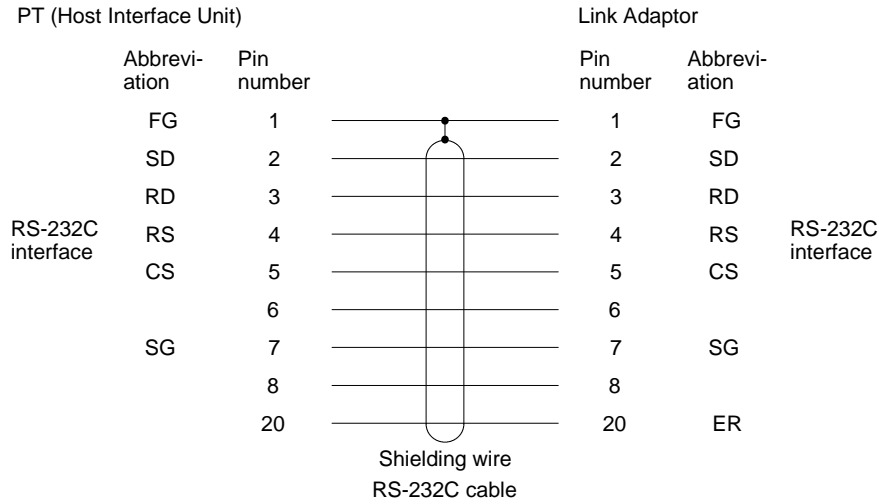


Connector pin #	Signal name	Abbreviation	Signal direction	
			Input	Output
1	Frame ground	FG	---	---
2	Send data	SD (TXD)		Yes
3	Receive data	RD (RXD)	Yes	
4	Request send	RS (RTS)		Yes
5	Clear to send	CS (CTS)	Yes	
6		DR	---	---
7	Signal ground	SG (GND)	---	---
8		CD		
20	Data terminal ready	ER (DTR)		Yes



**Wiring Connections**

The wiring of the RS-232C cables to connect the PT to the Link Adaptor and the PC to the Link Adaptor is described below. However, the PC connector specification depends on the type of PC. Refer to *Appendix C RS-232C Connections* for details about the PC connector specifications.



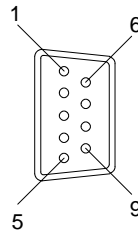
**Wiring an RS-422 Cable**

**Connector Specifications for a B500-AL004 (-P) Link Adaptor**

Connector: RS-422

Electrical characteristics: Complies with EIA RS-422

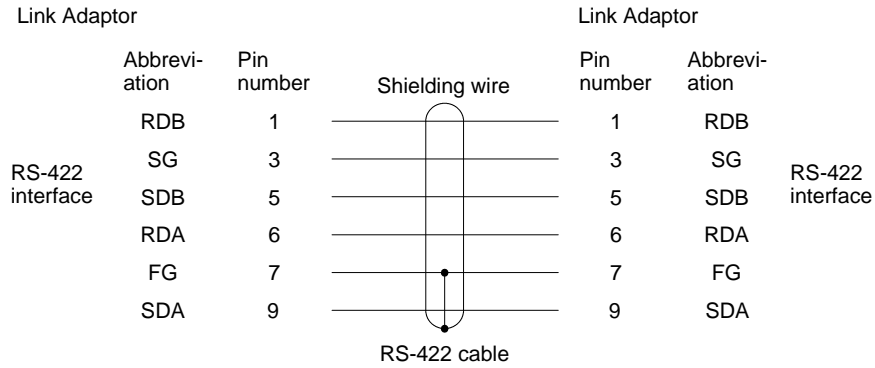
Signal direction: Signal input and output is relative to the PT or PC.



Connector pin #	Signal name	Abbreviation	Signal direction	
			Input	Output
1	Receive data B	RDB	Yes	
3	Signal ground	SG	---	---
5	Send data B	SDB		Yes
6	Receive data A	RDA	Yes	
7	Frame ground	FG (GND)	---	---
9	Send data A	SDA		Yes

**Wiring Connections**

The connection of two Link Adaptors with an RS-422 cable is shown below.



**Connecting Units with an RS-422 Connector**

The connector specifications and wiring connections for a unit with an RS-422 connector is described below. Refer to this *Appendix* for details about the PC connector specifications.

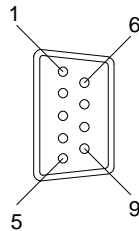
**Connecting to a C Series Host Link Unit**

**C Series Host Link Unit 25-pin Connector Specifications**

Applicable Host Link Unit: C200H-LK202  
 C500-LK201-V1  
 C120-LK202-V1

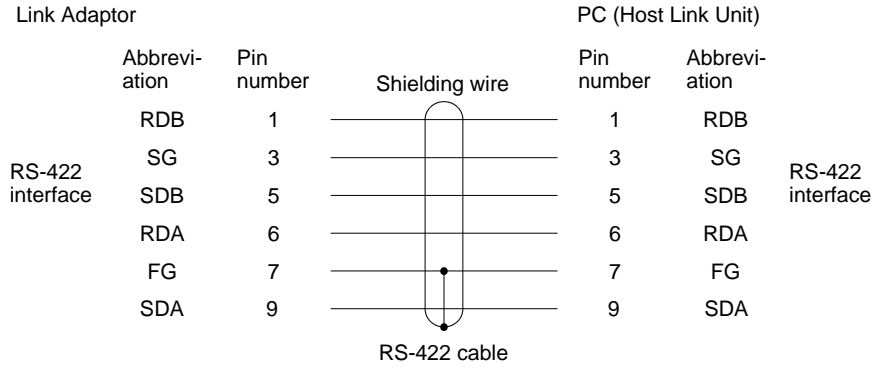
Electrical characteristics: Complies with EIA RS-422

Signal direction: Signal input and output is relative to the Host Link Unit.



Connector pin #	Signal name	Abbreviation	Signal direction	
			Input	Output
1	Receive data B	RDB	Yes	
3	Signal ground	SG	---	---
5	Send data B	SDB		Yes
6	Receive data A	RDA	Yes	
7	Frame ground	FG (GND)	---	---
9	Send data A	SDA		Yes

**Wiring Connections**



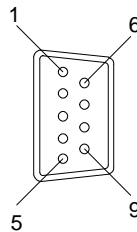
**Connecting to a C Series Host Link Unit (Insulated)**

**C Series Host Link Unit 25-pin Connector Specifications**

Applicable Host Link Unit: C500-LK201-V1  
C120-LK202-V1

Electrical characteristics: Complies with EIA RS-422

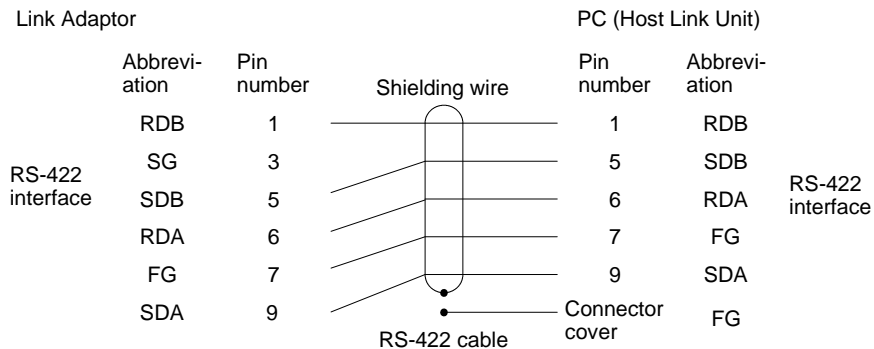
Signal direction: Signal input and output is relative to the Host Link Unit.



Connector pin #	Signal name	Abbreviation	Signal direction	
			Input	Output
Connector cover	Frame ground	FG		
1	Receive data B	RDB	Yes	
5	Send data B	SDB		Yes
6	Receive data A	RDA	Yes	
7	Frame ground	FG	---	---
9	Send data A	SDA		Yes

**Wiring Connections**

Connect the cable shielding wire to the connector cover and Pin 7 at the Host Link Unit end of the cable only.



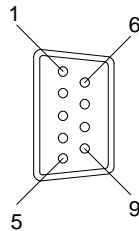
### Connecting to a CV Series Host Link Unit

#### CV Series Host Link Unit Connector Specifications

Applicable Host Link Unit: CV500-LK201 (communication port #2)

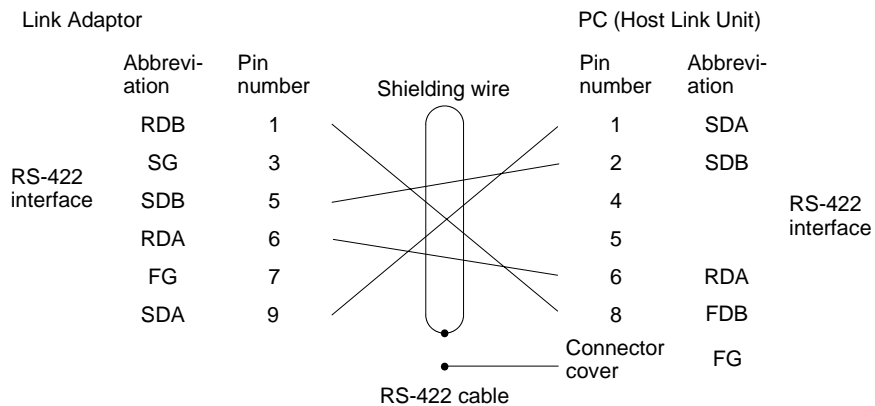
Electrical characteristics: Complies with EIA RS-422

Signal direction: Signal input and output is relative to the Host Link Unit.



Connector pin #	Signal name	Abbreviation	Signal direction	
			Input	Output
Connector cover	Frame ground	FG		
1	Send data A	SDA (SD -)		Yes
2	Send data B	SDB (SD +)		Yes
6	Receive data A	RDA (RD -)	Yes	
8	Receive data B	RDB (RD +)	Yes	

#### Wiring Connections



### Connecting to a CV Series CPU

#### CV Series CPU Connector Specifications

Applicable CPU: CV500-CPU-1

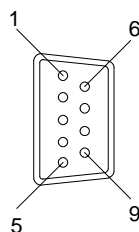
CV1000-CPU01

CVM1-CPU01

CVM1-CPU11

Electrical characteristics: Complies with EIA RS-422

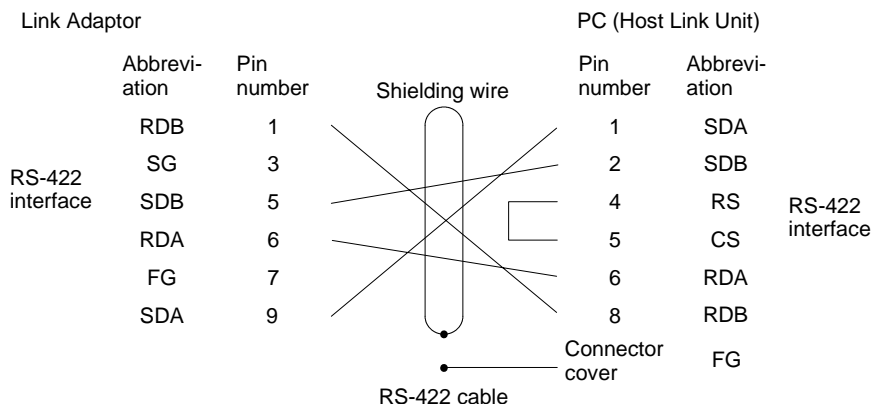
Signal direction: Signal input and output is relative to the PC.



Connector pin #	Signal name	Abbreviation	Signal direction	
			Input	Output
Connector cover	Frame ground	FG		
1	Send data A	SDA (SD -)		Yes
2	Send data B	SDB (SD +)		Yes
4	Request send	RS		Yes
5	Clear to send	CS	Yes	
6	Receive data A	RDA (RD -)	Yes	
8	Receive data B	RDB (RD +)	Yes	

**Wiring Connections**

Short Pin 4 (RS) and Pin 5 (CS) together on the connector at the PC end of the cable.



**PC Switch Settings**

When the PT and PC are connected together, set the conditions at the PC Host Link Unit and the CPU as shown in the table below.

The method of setting the conditions with the switches on each unit is described on the following pages. Refer to the manual on each unit for more detailed information on making these settings.

Item	Switch setting position
I/O port	RS-232C
Baud rate	Set to the same baud rate as the PT
Transfer code	ASCII, 7 data bits, 2 stop bits
Parity	Even
1-to-1/1-to-N	1-to-N
Instruction level	Level 1
Unit#	00

**Note** The 1-to-N setting enables BCC (Block Check Character). The 1-to-N connection between Host Link Units and PTs is not possible.

**Connection to a Host Link Unit**

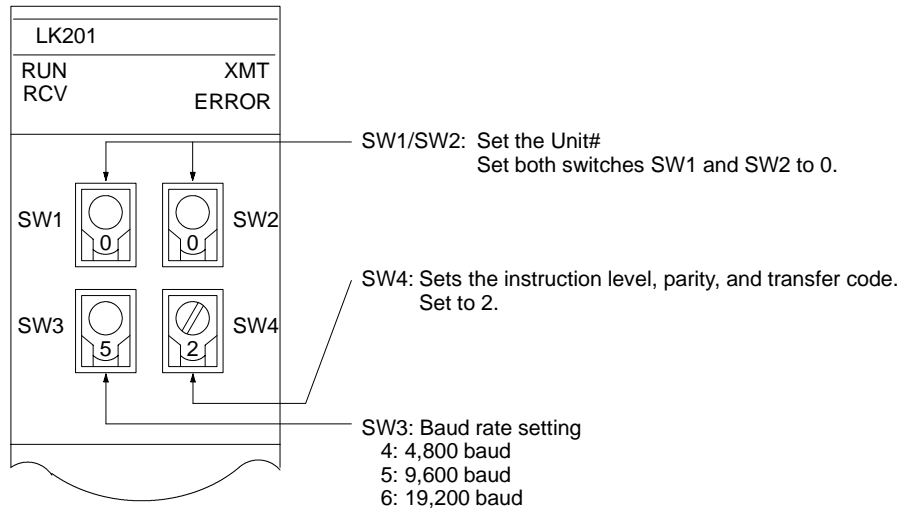
Two types of Host Link Unit are available: a Rack-mounting Unit and a CPU-mounted Unit. The switch settings differ according to the type of Host Link Unit. Set the switches according to the unit type.

**C200H: Rack-mounting Unit**

- C200H-LK201
- C200H-LK202

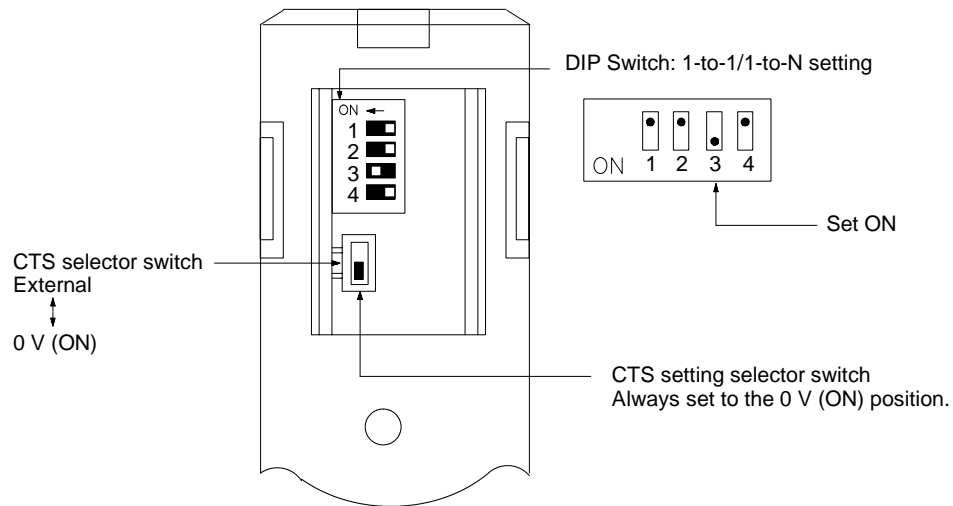
### Setting the Front Switches

Set each switch with a flathead screwdriver until the displayed settings agree with the settings described on the previous page.



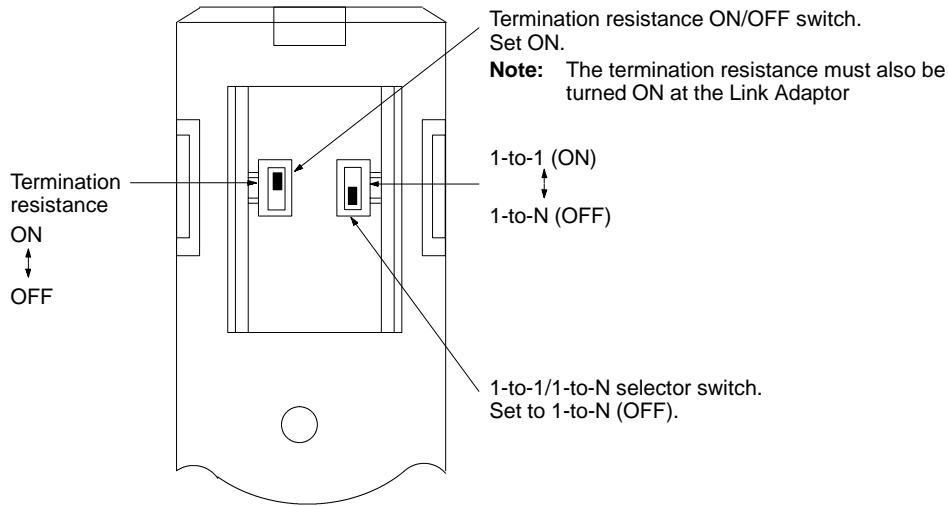
### Setting the Rear Switches

C200H-LK201



C200H-LK202

For types with an RS-422 connector.



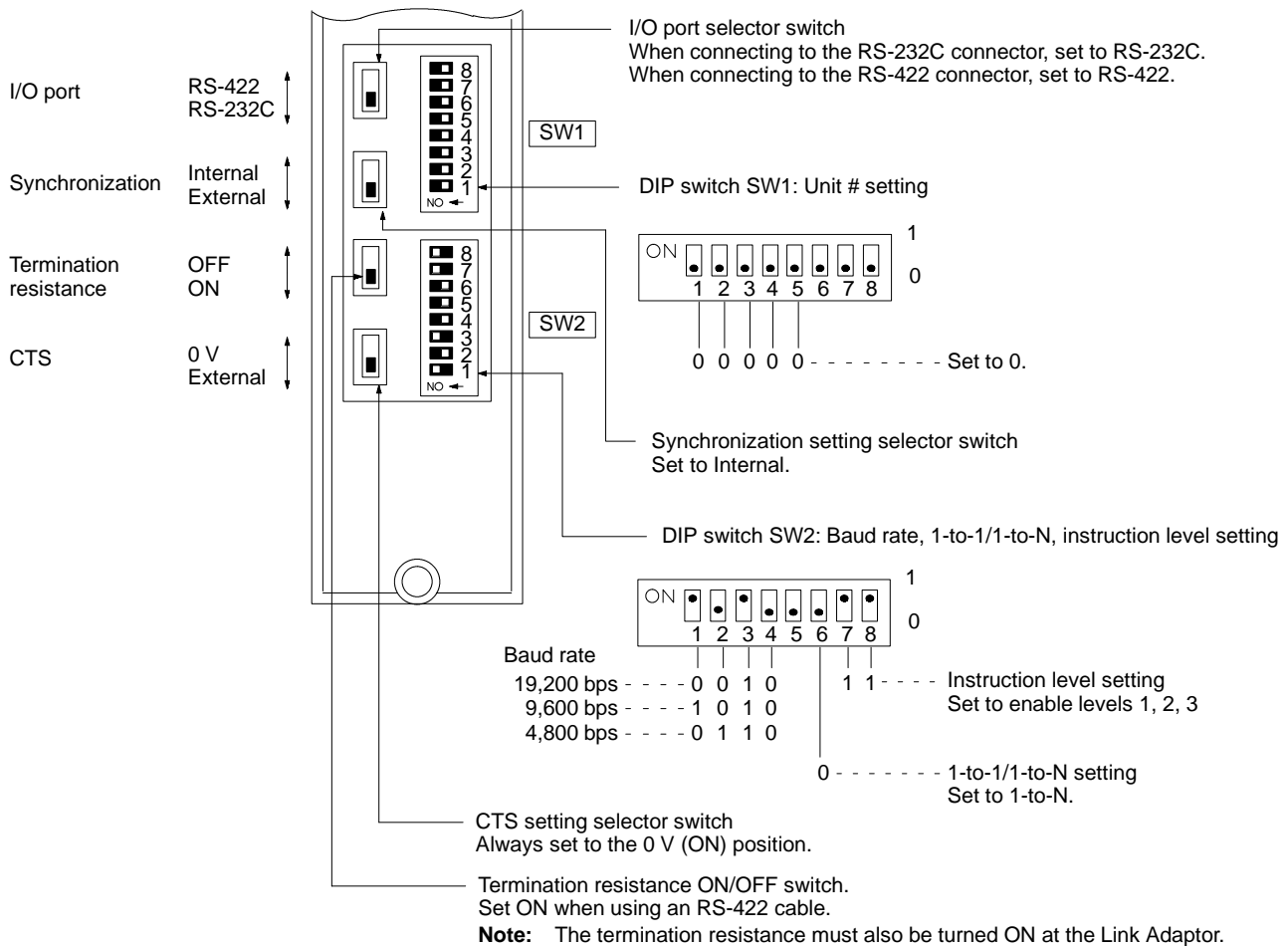
**C500(F), C1000(F) Rack-mounting Units**

C500-LK201-V1

C500-LK203

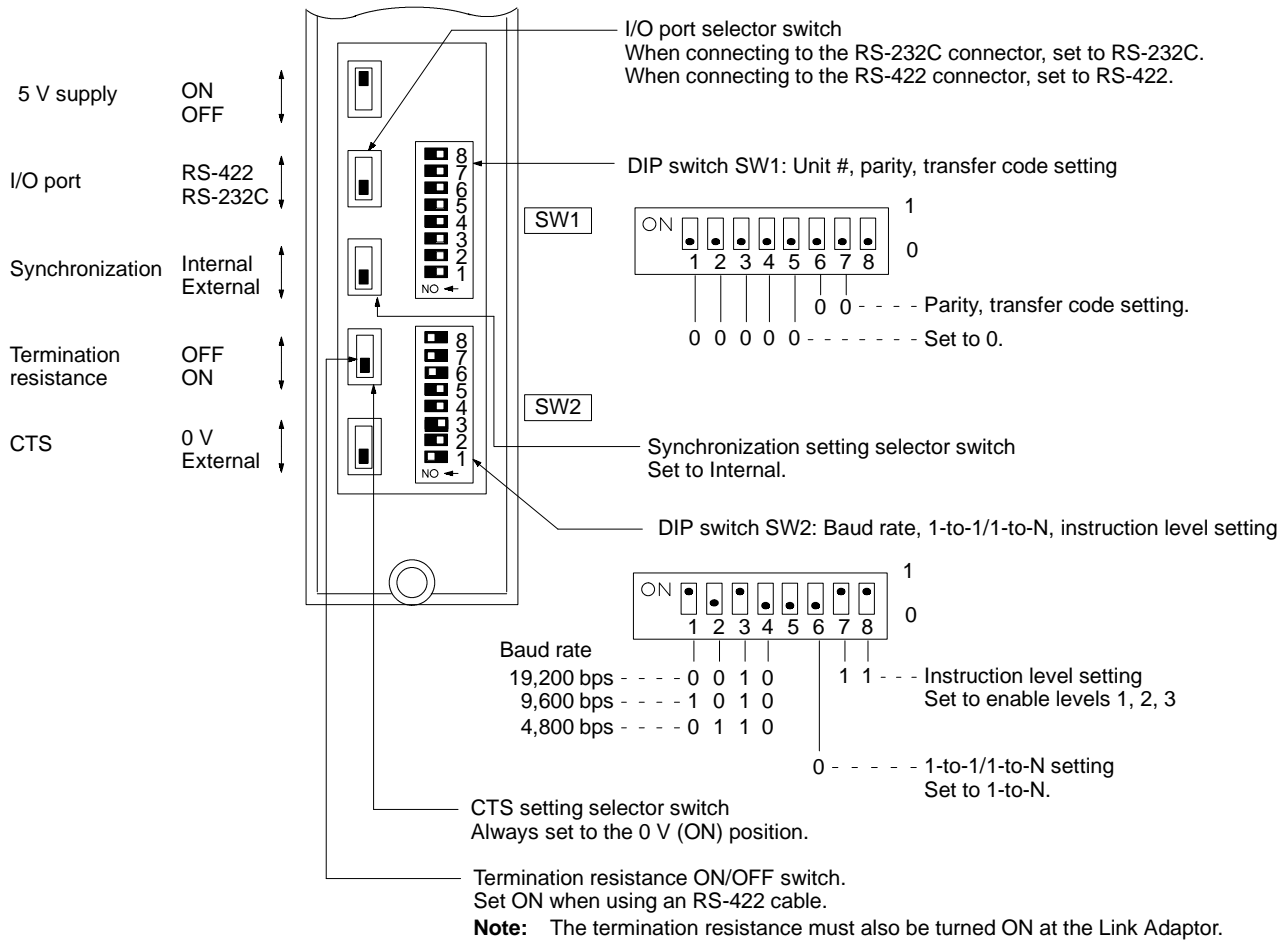
**Setting the Rear Switches**

C500-LK201-V1



Setting the Rear Switches

C500-LK203

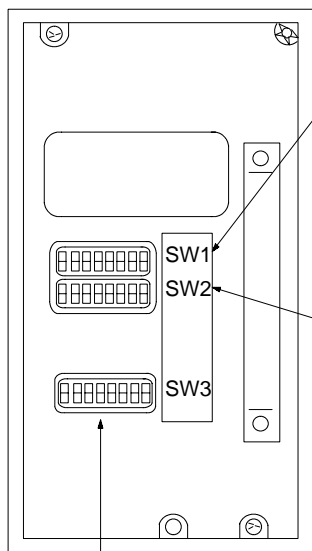




### CPU-mounted Units

C120-LK201-V1  
 C120-LK202-V1

#### Setting the Rear Switches



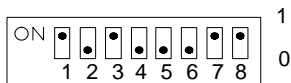
DIP switch SW1: Unit #, parity, transfer code setting



0 0 0 0 0 - - - - - Unit # setting.  
 Set to 0.

Parity is fixed at Even Parity, Transfer Code is fixed at ASCII, 7 data bits, 2 stop bits

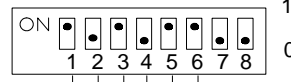
DIP switch SW2: Baud rate, 1-to-1/1-to-N, instruction level setting



Baud rate  
 19,200 bps - - - - - 0 0 1 0 | 1 1  
 9,600 bps - - - - - 1 0 1 0 |  
 4,800 bps - - - - - 0 1 1 0 |  
 0 - - - - - 1-to-1/1-to-N setting  
 Set to 1-to-N.

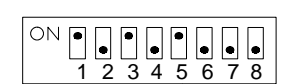
Instruction level setting  
 Set to enable levels 1, 2, 3

DIP switch SW3: Synchronization and CTS setting



1 0 1 1 - - - - - Synchronization setting selector switch  
 Set to Internal.  
 1 0 - - - - - CTS setting selector switch  
 Always set to the 0 V (ON) position.

DIP SW3 on C120-LK202-V1 Termination resistance



1 0 1 0 1 0 - - - - - Termination resistance setting  
 Set ON when using an RS-422 cable.

**Note:** The termination resistance must also be turned ON at the Link Adaptor.

## CV Series Rack-Mounting Units

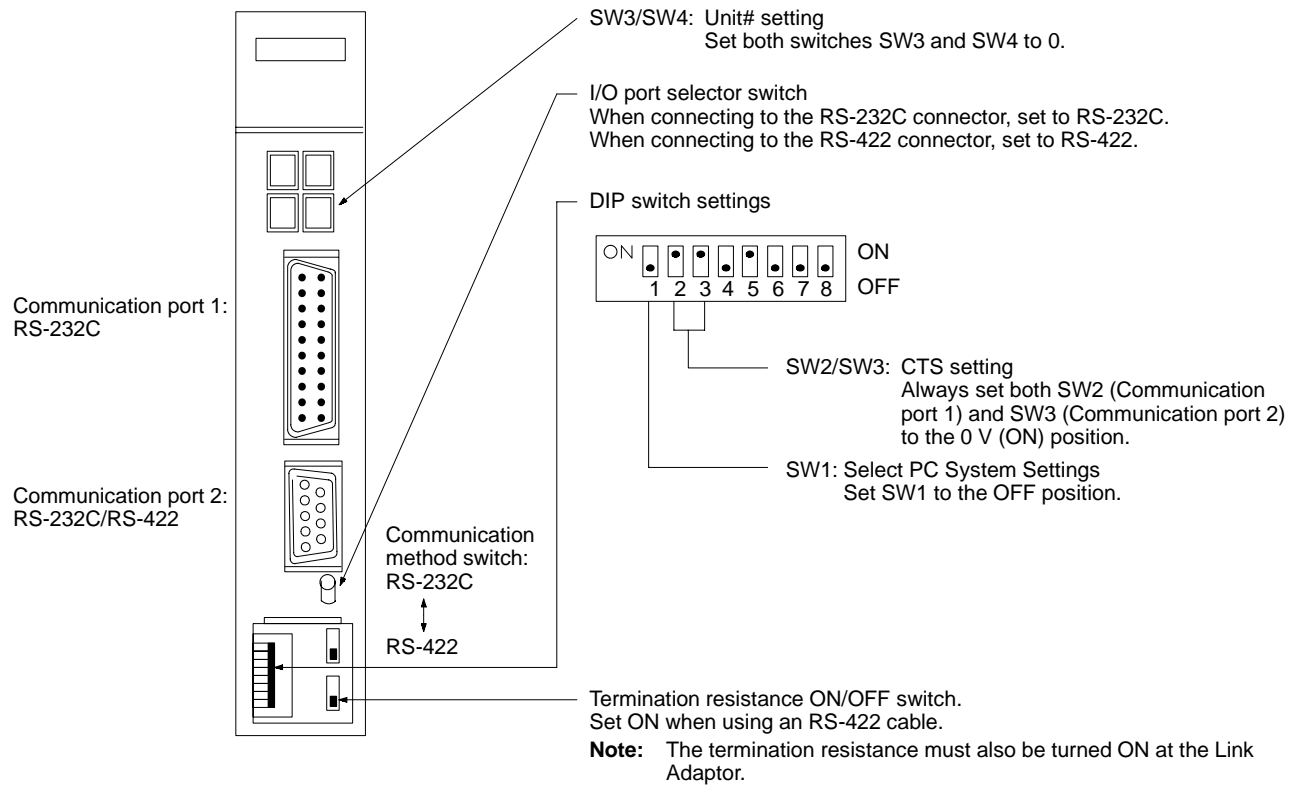
CV500-LK201

### Setting the Front Switches

Set the operating conditions with the PC System Setting functions when a CV Series Host Link Unit is connected to a PC. The PC System Settings can be made from the Peripheral Tool (FIT, etc.) or PC system setting information created with a Peripheral Tool can be transferred to the CPU.

Set the DIP switches to enable the system settings to be made.

Refer to the *CV Support Software Operation Manuals* for more details of the system settings.



### Connection to a CPU

Set the operating conditions with the PC System Setting functions when connecting to a Mini H-type (C□□H) or CV/CVM1 Series CPU. The PC System Settings can be made from the Peripheral Tool (FIT, etc.) or PC system setting information created with a Peripheral Tool can be transferred to the CPU. Refer to the *Mini H-type PCs: C20H, C28H, C40H, C60H Installation Guide* for more details of the system settings.

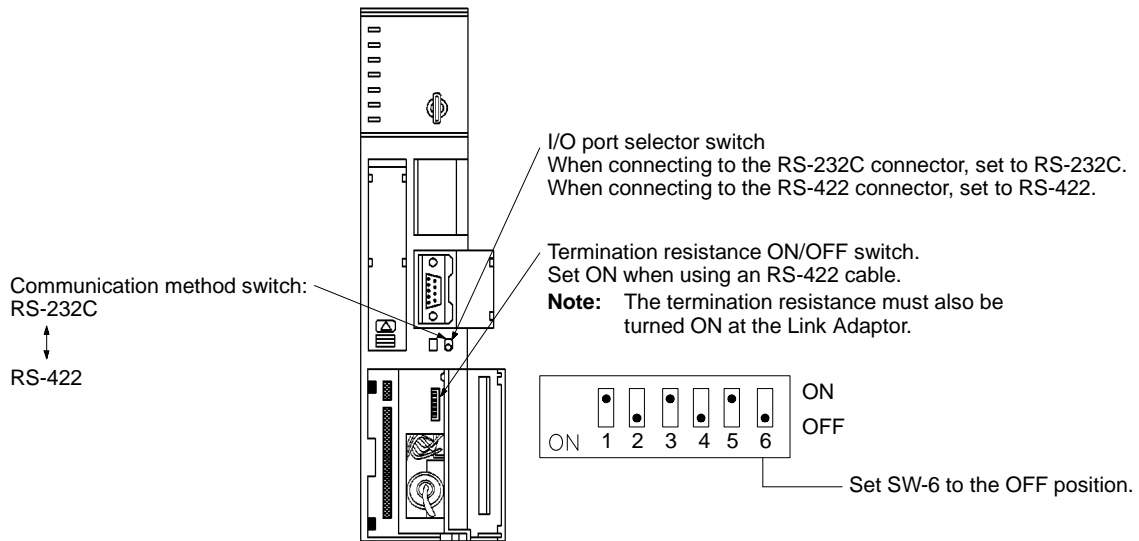
Mini H-type PCs: C20H/C28H/C40H/C60H

No switch settings required when connecting to a Mini H-type PC (C□□H).

The connector is an RS-232C-dedicated port. It cannot be set to RS-422.

- CV-/CVM1-series: CV500-CPU01  
 CV1000-CPU01  
 CVM1-CPU01  
 CVM1-CPU11

### Front Switch Settings



# Appendix E

## Optical Fiber Cable Connections

A PT with a Host Interface Unit installed and an OMRON PC are connected with a optical-fiber cable. The optical-fiber connection method is used in environments with a high level of noise and when the PT and PC are more than 15 m apart. Connection up to 500 m is possible but system configuration is restricted to 1-to-1 connections. Optical-fiber cable connections can be made by the following two methods: Optical Interface or Link Adaptor.

### Applicable PCs

Some models and series of OMRON PCs have the Host Link function built-in. Check the model and series of the PC against the type of Host Link Unit before making the connections. The compatible PCs are listed in the table below.

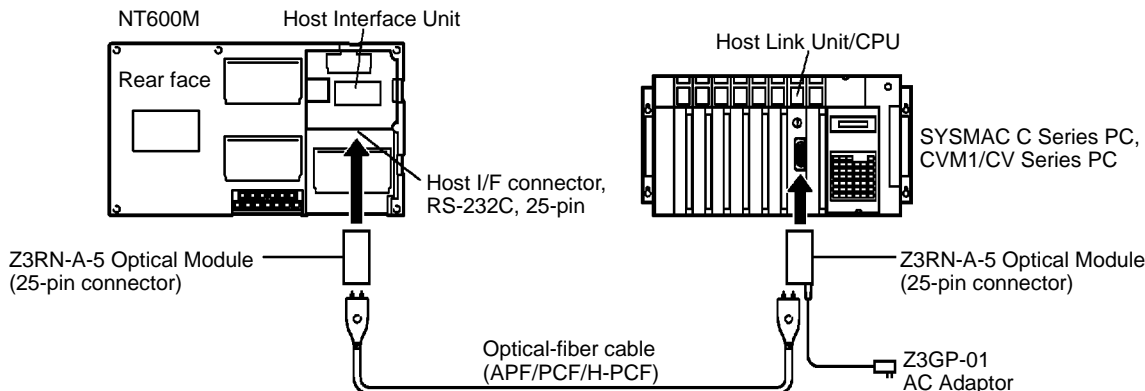
PC series	Units with built-in Host Link function		Connectable to
	Host Link Unit	CPU	
C-series	---	C20H/C28H/C40H/C60H	C_H
	C120-LK101-(P)V1 C120-LK201-V1 C120-LK202-V1	---	C120, C200H, C500, C1000H
	C200H-LK101-P C200H-LK201 C200H-LK202	---	C200H
	C500-LK101-(P)V1 C500-LK103(-P) C500-LK201-V1 C500-LK203	---	C500, C1000H
CV-series	CV500-LK201	CV500-CPU01	CV500
		CV1000-CPU01	CV1000
CVM1-series	CV500-LK201	CVM1-CPU01 CVM1-CPU11	CVM1

### Connection with the Optical Interface

The Optical Interface is used to make an optical-fiber connection between two units with RS-232C connectors. The connection is made with optical modules and an optical-fiber cable, as shown in the diagram below. The optical module is a converter to convert between RS-232C and optical communication.

Connection can be made to the following PCs: C120-LK201-V1  
C200H-LK201  
C500-LK201-V1  
C500-LK203  
CV500-LK201

### Making the Connection



- Note**
1. Ground the PC unit FG terminal to Class 3 ground. Refer to the appropriate *PC Installation Guide* for details.
  2. Turn off both the PT and PC power supplies before connecting or disconnecting connectors.

### Parts Required in an Optical Interface

The parts used in each optical interface for each type of connection are shown in the table below. Order the appropriate parts for the type of connection required.

Name	Model	Comments
Optical Module	Z3RN-A-5	RS-232C-to-optical 25-pin converter, manufactured by OMRON
Optical fiber cable	Z3F2-4D_M	PCF type, manufactured by OMRON When ordering, specify the cable length in the blank in the model number ( _ ). The following cable lengths are available: 1, 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 250, 300, 350, 400, 450, and 500.
AC adaptor	Z3GP-01	100 VAC, manufactured by OMRON

### Optical-fiber Cables

A plastic-clad optical-fiber cable (PCF) is used which allows communication up to 500 m.

### Optical Modules

A 5 V power supply is required to use the Optical Modules. This power supply can be taken from the Host Interface Unit installed on the PT or from some types of unit installed in a PC. Other types of unit do not allow 5 V power supply, and the AC Adaptor is required for use with these units.

If the power can be supplied from the unit, set the Optical Module power switch to the P position.

The types of unit requiring and not requiring an AC Adaptor are shown in the table below.

AC Adaptor not required	AC Adaptor required
C200H-LK201 C500-LK203 CV500-LK201	C120-LK201-V1 C500-LK201-V1

### Connection with Link Adaptors

A PT and PC can be connected with an optical-fiber cable and Link Adaptors.

Two methods are connection are used:

- connection to a unit with an RS-232C or RS-422 connector
- connection to a unit with an optical-fiber connector

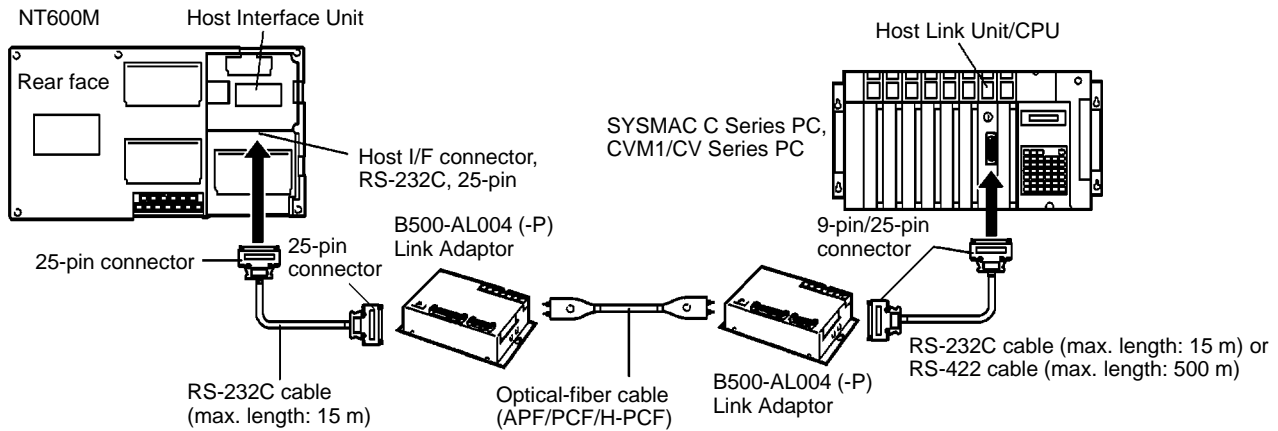
- Note**
1. Ground the PC unit FG terminal to Class 3 ground. Refer to the appropriate *PC Installation Guide* for details.

- Turn off both the PT and PC power supplies before connecting or disconnecting connectors.

**Connection to a Unit with an RS-232C or RS-422 connector**

The PT and PC are connected via Link Adaptors as shown in the diagram below. The connection from the PT to the Link Adaptor is by means of an RS-232C cable and the connection from the Link Adaptor to the PC is by means of an RS-232C or RS-422 cable.

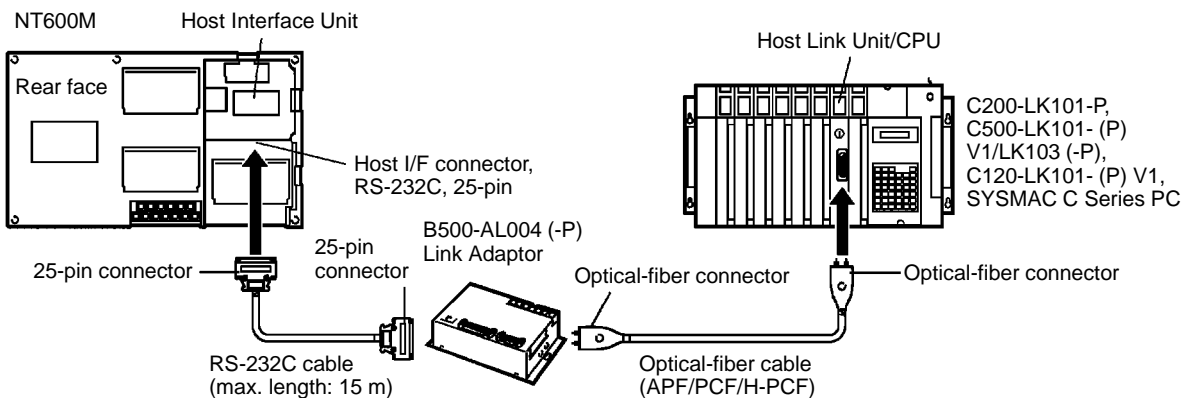
Connection can be made to the following PCs: C20H/C28H/C40H/C60H  
 C120-LK201-V1  
 C200H-LK201  
 C200H-LK202  
 C500-LK201-V1  
 C500-LK203  
 CV500-LK201  
 CV500-CPU01  
 CV1000-CPU01  
 CVM1-CPU01  
 CVM1-CPU11



**Connection to a Unit with an Optical-fiber Connector**

Some models of Host Link Unit for C Series PCs have a connection for optic-fiber connection. An optic-fiber cable can be directly connected to this type of unit as shown in the diagram below.

Connection can be made to the following PCs: C120-LK101-(P)V1  
 C200H-LK101-P  
 C500-LK101-(P)V1  
 C500-LK103(-P)



**Note** The cap must always be fitted over an optical-fiber connector when it is not used to prevent errors due to external light.

**Parts Required for Connection with a Link Adaptor**

The parts used for connection with a Link Adaptor are shown in the table below. Order the appropriate parts for the type of connection required.

Name	Model	Comments
With RS-232C connector	XZ7-10048	2 m 25-pin-to-25-pin type, manufactured by OMRON
	XZ7-10049	2 m 25-pin-to-9-pin type, manufactured by OMRON
Optical-fiber cable		3 types of optical-fiber cable can be used: APF (plastic optical-fiber cable) PCF (plastic-clad optical-fiber cable) H-PCF (hard plastic-clad quartz optical-fiber cable)
Link Adaptor	B500-AL004(-P)	100/200 VAC, manufactured by OMRON

**About the Cables**

**RS-232C Cable**

RS-232C cables with the following connectors can be used:

- XZ7-10048 (25-pin to 25-pin) Connector Cable
- XZ7-10049 (9-pin to 25-pin) Connector Cable

If a cable longer than 2 m is required, refer to *Appendix C RS-232C Connections* for information on making up cable.

**RS-422 Cable**

OMRON does not provide RS-422 cables. Prepare a connecting cable as described in *Appendix D RS-422 Connections* if required.

**Optical-fiber Cable**

The length of optical-fiber cable differs according to the type of cable and Link Amplifier, as shown in the following table:

Optical-fiber cable	B500-AL004-P	B500-AL004
APF	20 m	no connection possible
H-PCF	100 m	200 m
PCF	200 m	800 m

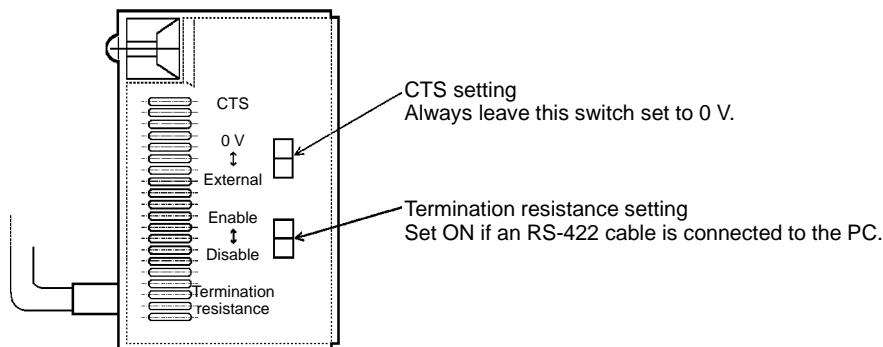
Refer *SYSMAC C-series Rack PCs SYSMAC WAY - Host Link Unit System Manual (W143)* and the *Link Adaptor Instruction Manual* for information on optical-fiber cable specifications and handling procedures.

**Link Adaptors**

The Link Adaptor is a converter to connect different types of communication cables together. Set the switches as shown below when a Link Adaptor is used.

Refer to *Appendix D RS-422 Connections* for the wiring connections if an RS-232C or RS-422 cable is connected to a Link Adaptor.

The B500-AL004 (-P) Link Adaptor is used.



## PC Switch Settings

When the PT and PC are connected together, set the conditions at the PC Host Link Unit and the CPU as shown in the table below.

The method of setting the conditions with the switches on each unit is described on the following pages. Refer to the manual on each unit for more detailed information on making these settings.

Item	Switch setting position
I/O port	RS-232C
Baud rate	Set to the same baud rate as the PT
Transfer code	ASCII, 7 data bits, 2 stop bits
Parity	Even
1-to-1/1-to-N	1-to-N (see note)
Instruction level	Level 1
Unit#	00

**Note** The 1-to-N setting enables BCC (Block Check Character). The 1-to-N connection cannot be used to connect a Host Link Unit to a PT.

## Connection to a Host Link Unit

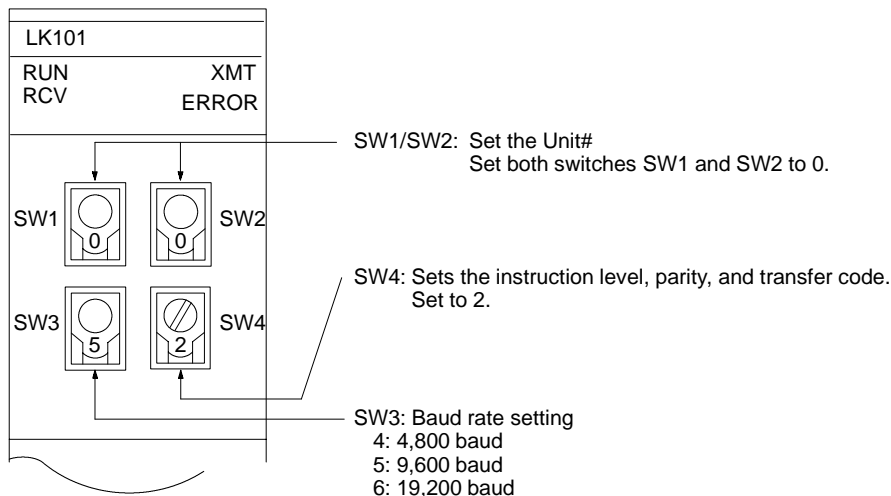
Two types of Host Link Unit are available: a Rack-mounting type and a CPU-mounted type. The switch settings differ according to the type of Host Link Unit. Set the switches according to the unit type.

### C200H: Rack-mounting Type

- C200H-LK201
- C200H-LK202
- C200H-LK101-P

#### Setting the Front Switches

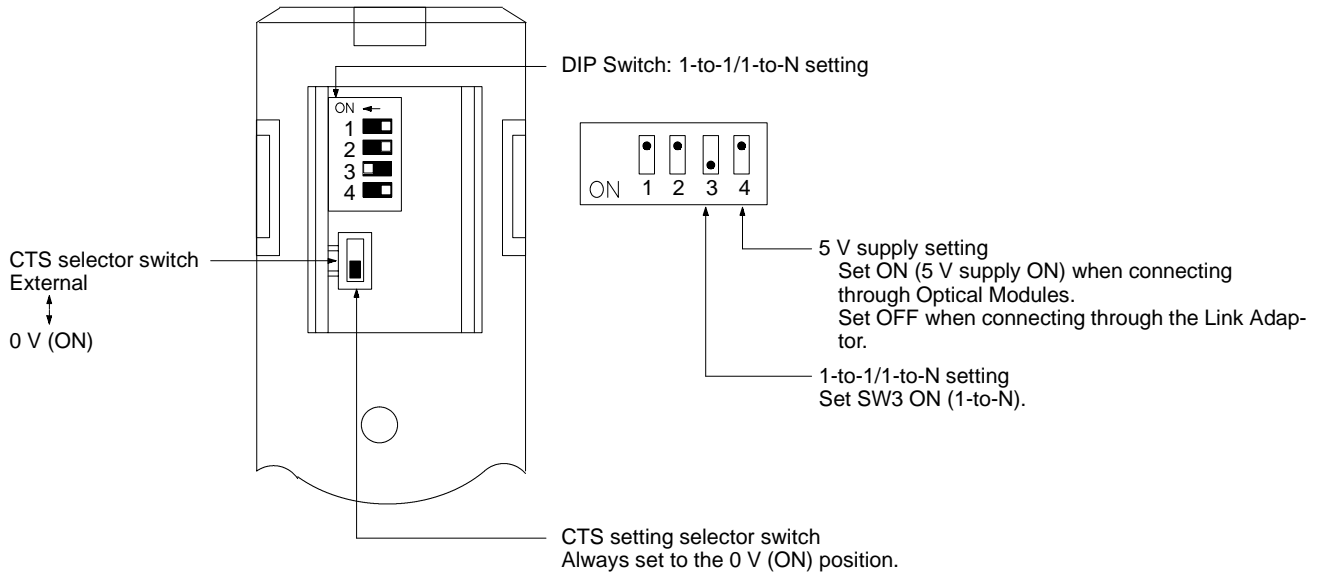
Set each switch with a flathead screwdriver until the displayed settings agree with the settings described on the previous page.





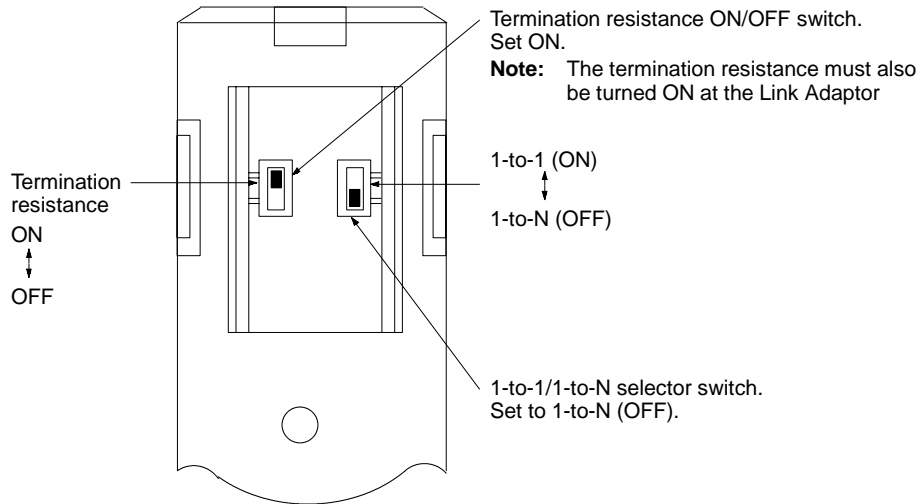
Setting the Rear Switches

C200H-LK201



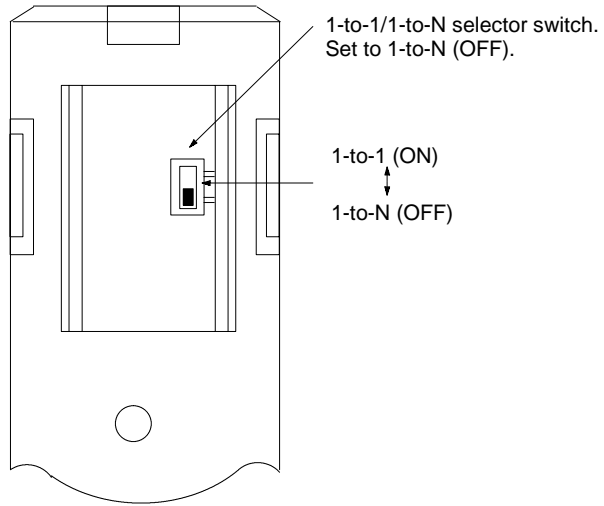
C200H-LK-202

For types with an RS-422 connector.



C200H-LK-101-P

For types with an optical-fiber connector.

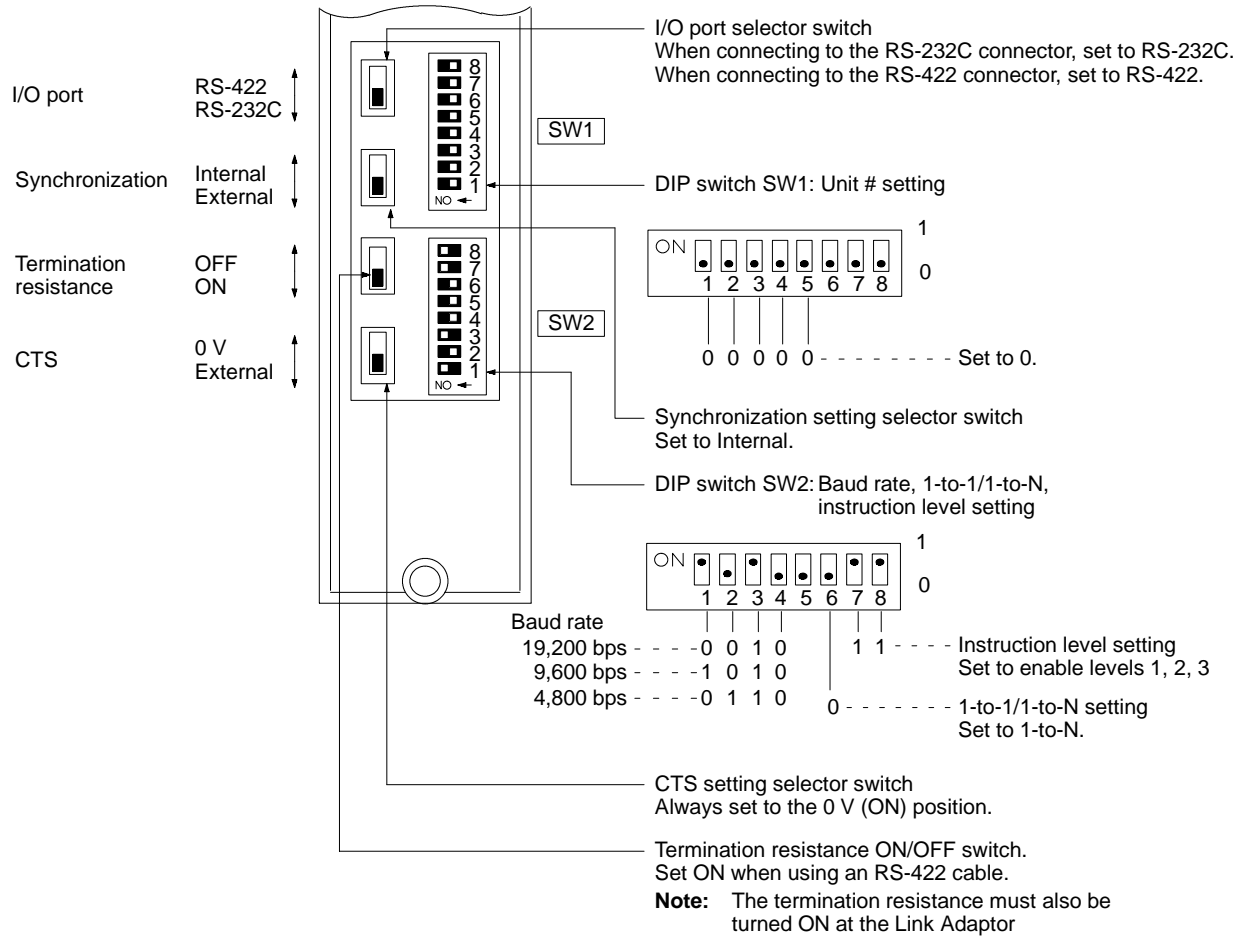


**C500(F), C1000(F), Rack-mounting Types**

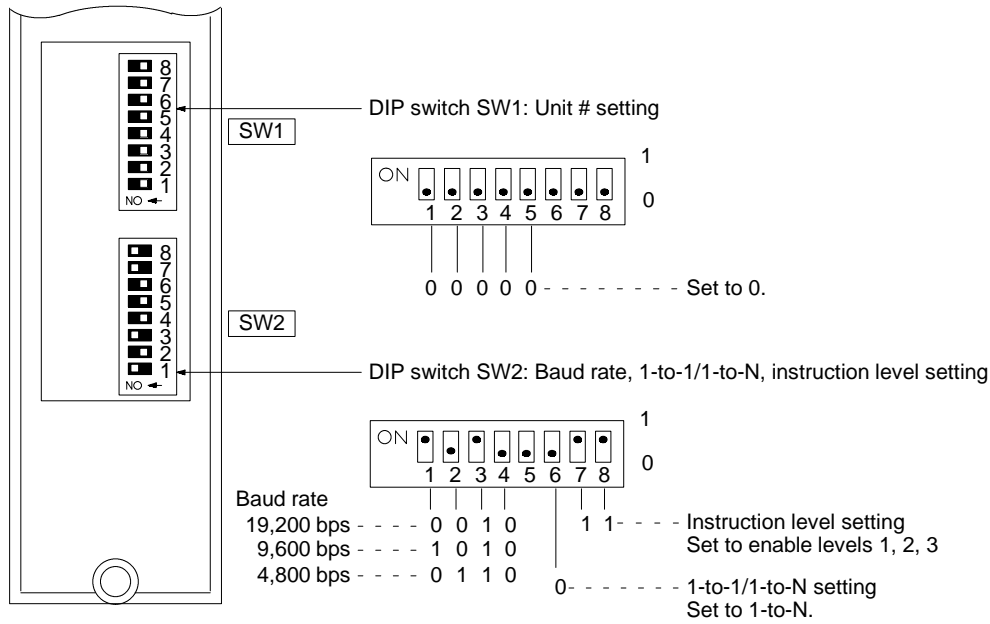
- C500-LK201-V1
- C500-LK101-(P)V1
- C500-LK203
- C500-LK103-(P)

**Setting the Rear Switches**

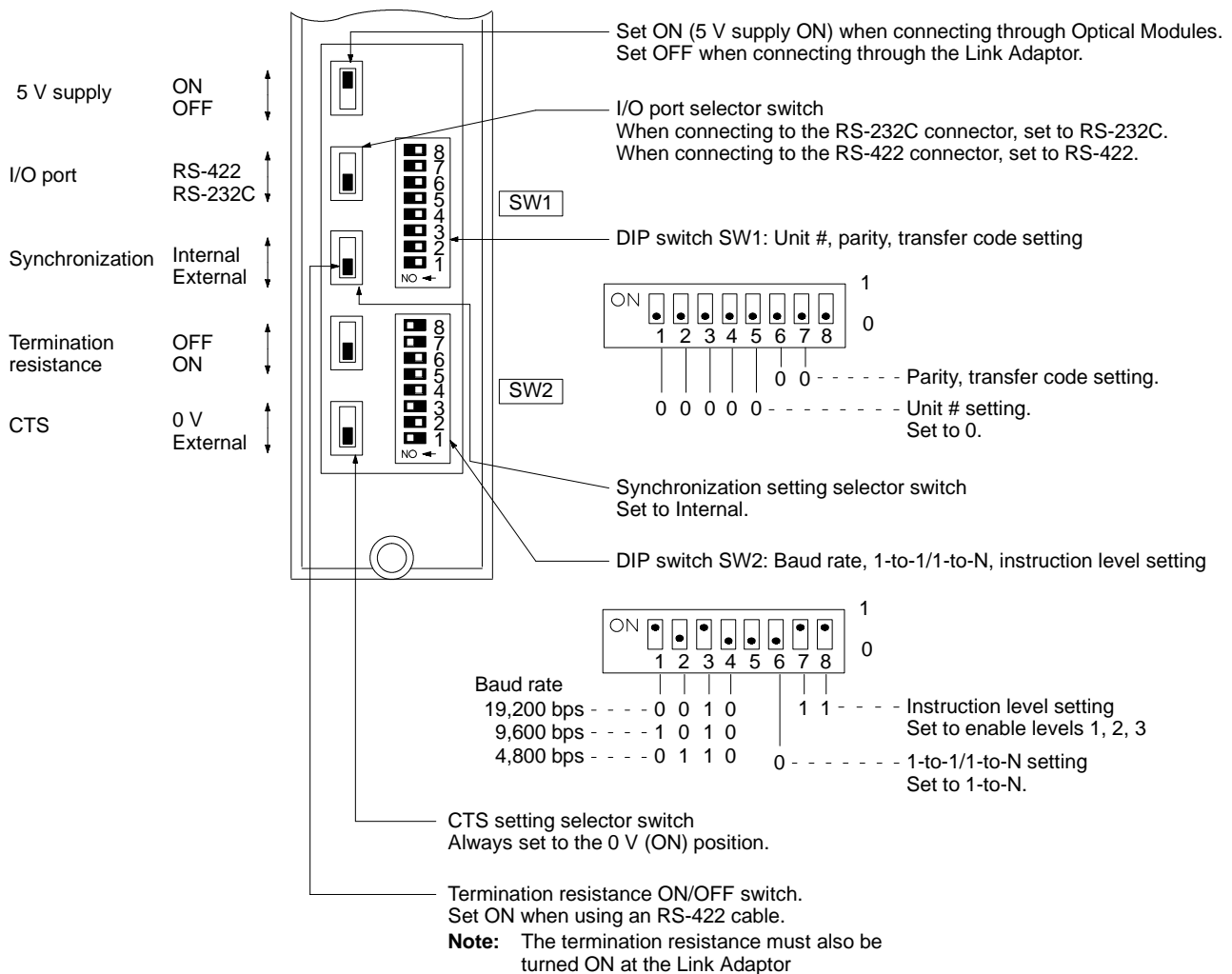
C500-LK201-V1



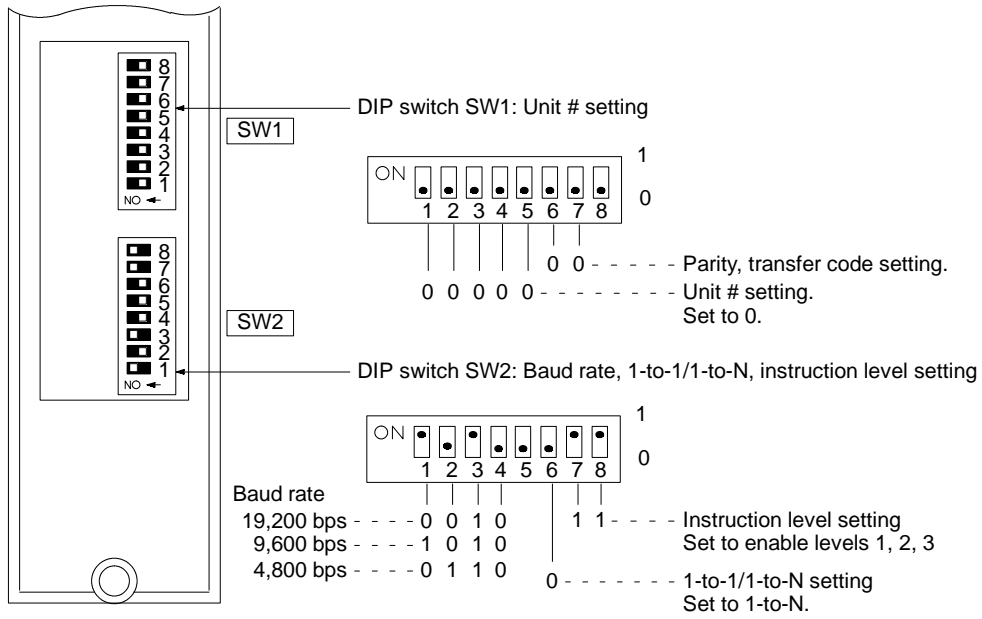
C500-LK101-(P)V1



C500-LK203



C500-LK103(-P)

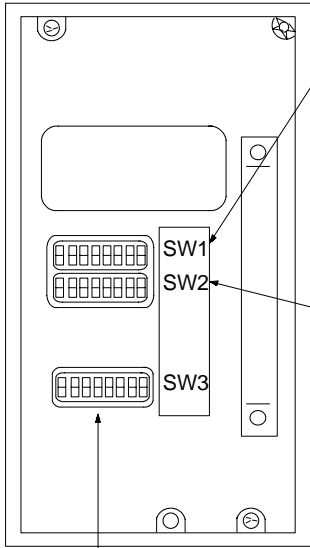


### CPU-mounted Type

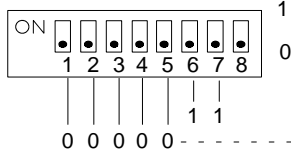
- C120-LK201-V1
- C120-LK202-V1
- C120-LK101-(P)V1

### Setting the Rear Switches

C120-LK201-V1, C120-LK202-V1



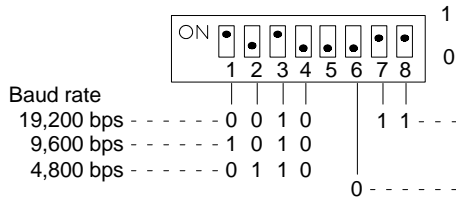
DIP switch SW1: Unit #, parity, transfer code setting



Unit # setting.  
Set to 0.

Parity is fixed at Even Parity, Transfer Code is fixed at ASCII, 7 data bits, 2 stop bits

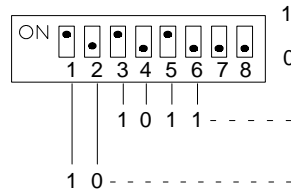
DIP switch SW2: Baud rate, 1-to-1/1-to-N, instruction level setting



Baud rate

19,200 bps ----- 0 0 1 0 1 1 ----- Instruction level setting  
 9,600 bps ----- 1 0 1 0 0 ----- Set to enable levels 1, 2, 3  
 4,800 bps ----- 0 1 1 0 0 ----- 1-to-1/1-to-N setting  
 Set to 1-to-N.

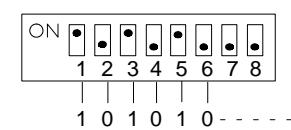
DIP switch SW3: Synchronization and CTS setting



Synchronization setting selector switch  
Set to Internal.

CTS setting selector switch  
Always set to the 0 V (ON) position.

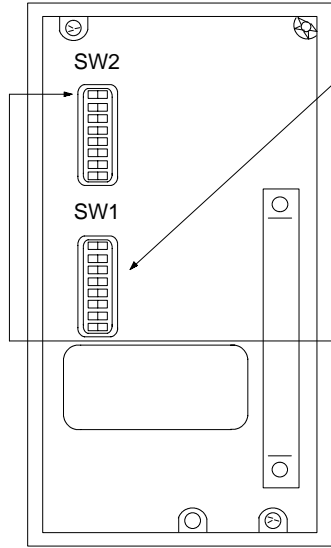
DIP SW3 on C120-LK202-V1 Termination resistance



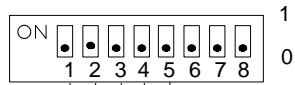
Termination resistance setting  
Set ON when using an RS-422 cable.

**Note:** The termination resistance must also be turned ON at the Link Adaptor.

C120-LK101-(P)V1



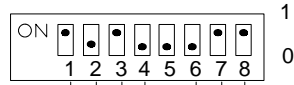
DIP switch SW1: Unit #, parity, transfer code setting



0 0 0 0 0 - - - - - Unit # setting.  
Set to 0.

Parity is fixed at Even Parity, Transfer Code is fixed at ASCII, 7 data bits, 2 stop bits

DIP switch SW2 Baud rate, 1-to-1/1-to-N, instruction level setting



Baud rate  
 19,200 bps - - - - - 0 0 1 0      1 1 - - - - - Instruction level setting  
 9,600 bps - - - - - 1 0 1 0      Set to enable levels 1, 2, 3  
 4,800 bps - - - - - 0 1 1 0  
 0 - - - - - 1-to-1/1-to-N setting  
 Set to 1-to-N.

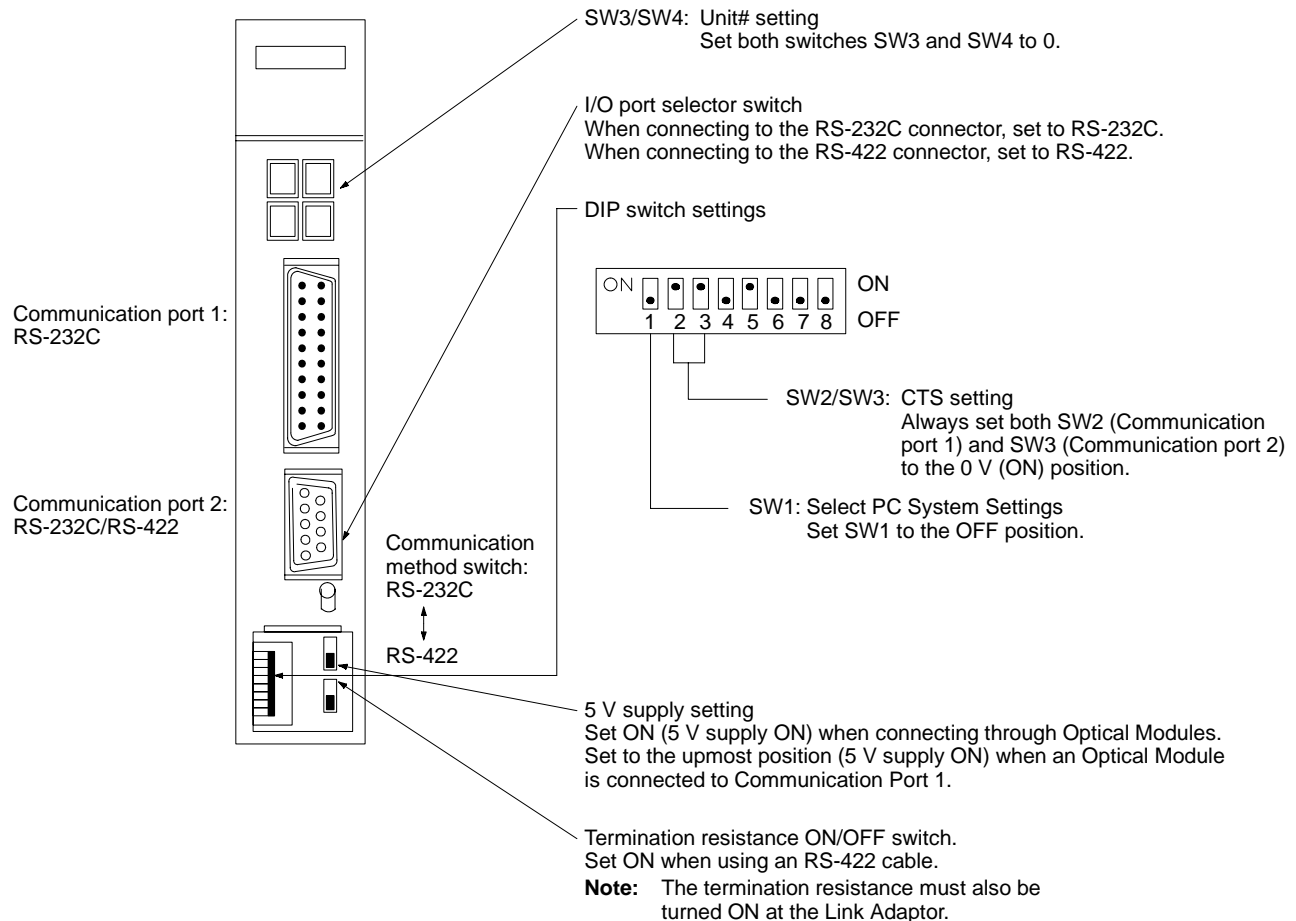
### CV Series Backplane Mounted Type

CV500-LK201

#### Setting the Front Switches

Set the operating conditions with the PC System Setting functions when a CV Series Host Link Unit is connected to a PC. The PC System Settings can be made from the Peripheral Tool (FIT, etc.) or PC system setting information created with a Peripheral Tool can be transferred to the CPU.

Set the DIP switches to enable the system settings to be made.





## Connection to a CPU

Set the operating conditions with the PC System Setting functions when connecting to a Mini H-type (C□□H) or CV/CVM1 Series CPU. The PC System Settings can be made from the Peripheral Tool (FIT, etc.) or PC system setting information created with a Peripheral Tool can be transferred to the CPU. Refer to the *Mini H-type PCs: C20H, C28H, C40H, C60H Installation Guide* for more details of the system settings.

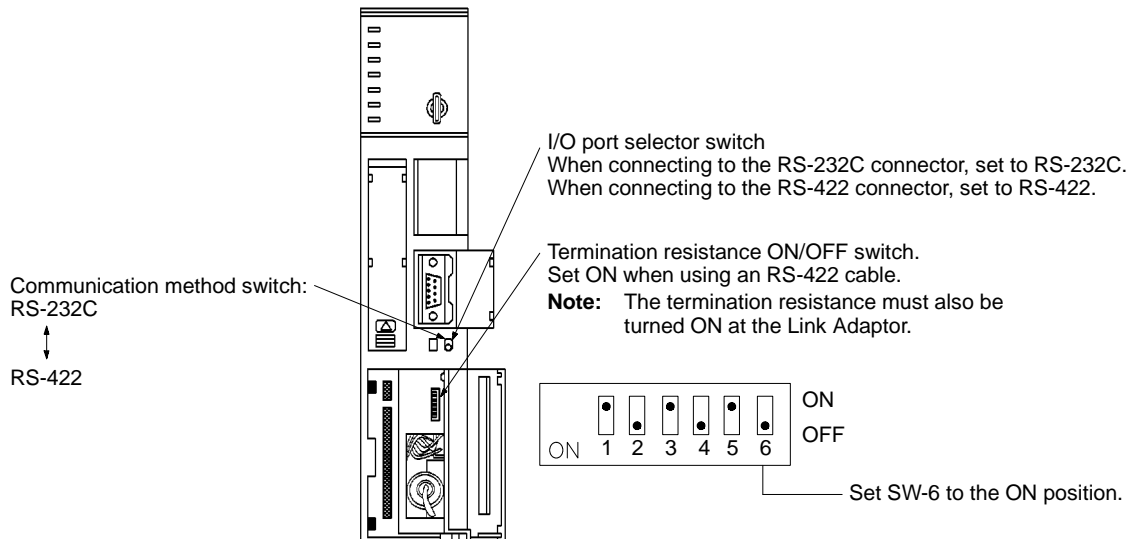
Mini H-type PCs: C20H/C28H/C40H/C60H

No switch settings required when connecting to a Mini H-type PC (C□□H).

The connector is an RS-232C-dedicated port. It cannot be set to RS-422.

CV-/CVM1-series: CV500-CPU01  
 CV1000-CPU01  
 CVM1-CPU01  
 CVM1-CPU11

## Front Switch Settings



# Appendix F

## Product Information

### Host Interface Unit

Name	Model
Host Interface Unit	NT600M-LK201

### PT

Name	Model	Programmable Terminal
Specifications	NT20M-DT131	Touch-panel version (replaceable backlight model)
	NT20M-DT121-V2	Touch-panel version (monochrome LCD model)
	NT600M-DT122	Touch-panel version (monochrome LCD model)
	NT600M-DT211	Touch-panel version (EL display model)

### Host Link Unit

Model	Specification	Applicable PC
C120-LK101-(P)V1	CPU-mounted type with optical-fiber cable connector	C-series C120, C200H, C500, C1000H
C120-LK201-V1	CPU-mounted type with RS-232C connector	
C2120-LK202-V1	CPU-mounted type with RS-422 connector	
C200H-LK101-P	Rack-mounting Unit with optical-fiber cable connector for C200H	C-series C200H
C200H-LK201	Rack-mounting Unit with RS-232C connector for C200H	
C200H-LK202	Rack-mounting Unit with RS-422 connector for C200H	
C500-LK101-(P)V1 C500-LK103(-P)	Rack-mounting Unit with optical-fiber cable connector for C500	C-series C500, C1000H
C500-LK201-V1 C500-LK203	Rack-mounting Unit with selectable RS-232C/RS-422 connector for C500	
CV500-LK201	Rack-mounting Unit with RS-232C connector and selectable RS-232C/RS-422 connector for CV/CVM1	CV-/CVM1-series CV500, CV1000, CVM1

### CPU

Model	Specification	Applicable PC
C20H/C28H/C40H/C60H	9-pin type for RS-232C connector	C-series C20H, C28H, C40H, C60H
CV500-CPU01 CV1000-CPU01 CVM1-CPU01 CVM1-CPU11	9-pin type for selectable RS-232C/RS-422 connector	CV-/CVM1-series CV500, CV1000, CVM1

## Related Parts and Equipment for PT

Name		Model	Comments
System ROM		NT20M-SMR31 NT600M-SMR31	NT20M, NT600M
Screen memory board	IC socket type S-RAM 64KB S-RAM 128KB S-RAM 256KB	NT600M-MP251 NT600M-MR641 NT600M-MR151 NT600M-MR251	NT600M
Screen memory	S-RAM 64KB S-RAM 128KB EPROM 64KB EPROM 128KB EEPROM 32KB	RAM22-15 RAM13-10 ROM-KD-B ROM13-12B EER22-20	NT20M
	EPROM 64KB EPROM 128KB EPROM 256KB EEPROM 32KB	ROM-KD-B ROM13-12B ROM23-15B EER22-20	for NT600M IC socket type
Support Tool		NT20M-ZA5AT-EV4	3.5-inch (2DD) and 5.25-inch (2HD) disks

## Parts and Equipment for Connections

### Connector Cables

Model	Specification	Applicable Host Link Unit/CPU
XZ7-10048	XZ7-10048 (25-pin to 25-pin) connector cable	C120-LK201-V1 C200H-LK201 C500-LK201-V1 CV500-LK201
XZ7-10049	XZ7-10049 (9-pin to 25-pin) connector cable	C20H/C28H/C40H/C60H CV500-LK201 CV500-CPU01 CV1000-CPU01 CVM1-CPU01 CVM1-CPU11

### Cable

Interface	Model	Specification
RS-232C	AWG28 * 5P IFVV-SB	Multicore shielded cable, manufactured by Fujikura Densen
	CO-MA-VV-SB 5P * 28AWG	Multicore shielded cable, manufactured by Hitachi Densen
RS-422	H-9293A (CO-HC-ESV-3P * 7/0.2)	Multicore shielded cable, manufactured by Hirakawa Densen

### Connectors

#### RS-232C

Name	Model	Specification
Connector	XM2A-2501	25-pin, manufactured by OMRON
	XM2A-0901	9-pin, manufactured by OMRON
	DB-25P	25-pin, manufactured by JAE
Connector cover	XM2S-2511	25-pin, manufactured by OMRON
	XM2S-0901	9-pin, manufactured by OMRON
	DB-C2-J9	25-pin, manufactured by JAE

## RS-422

Name	Model	Specification
Connector	XM2A-0901	9-pin, manufactured by OMRON
	DE-9P	9-pin, manufactured by JAE
Connector cover	XM2S-0901	9-pin, manufactured by OMRON
	DE-C1-J6	9-pin, manufactured by JAE

**Optical Interface**

Name	Model	Specification
Optical Module	Z3RN-A-5	RS-232C-to-optical 25-pin converter, manufactured by OMRON
Optical fiber cable	Z3F2-4D_M	PCF type, manufactured by OMRON When ordering, specify the cable length in the blank in the model number ( ). The following cable lengths are available: 1, 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 250, 300, 350, 400, 450, and 500.
AC adaptor	Z3GP-01	100 VAC, manufactured by OMRON

**Link Adaptor**

Name	Model	Specification
Link Adaptor	B500-AL004(-P)	100/200 VAC, manufactured by OMRON

**Optical Fiber Cable**

Refer to the appropriate optical-fiber cable manuals for information on the specifications and handling procedures for the optical-fiber cables used for connection through a Link Adaptor.

## Revision History

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

Cat. No. V015-E1-1  
                                  ↑  
                                  |  
                                  └── Revision code

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	September 1993	Original production