

**SYSMAC
C20HB**

Board-type PC

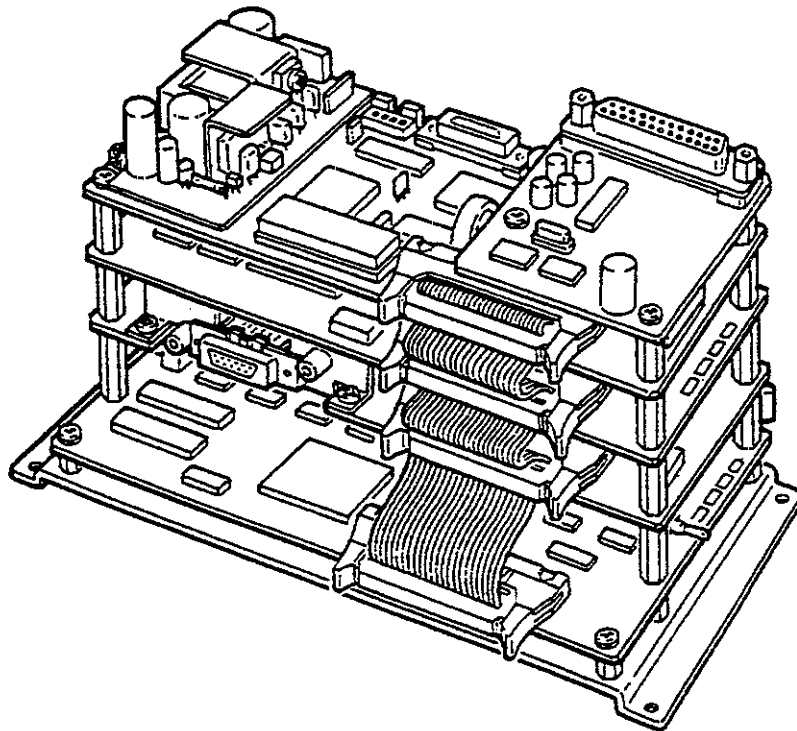
INSTALLATION GUIDE

OMRON

C20HB Board-type Programmable Controller

Installation Guide

Produced June 1994



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.

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About this Manual:

This manual describes the installation of the SYSMAC C20HB Board-type Programmable Controller 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 C20HB Board-type PC.

Note There are C20HB hardware and software models mentioned in this manual which are not sold overseas.

Section 1 introduces the main features and components of the C20HB Board-type PC and shows possible system configurations.

Section 2 explains the entire sequence of procedures involved in setting up, installing, testing, and maintaining a minimum system composed of one CPU Board and one 32-point I/O Board.

Section 3 describes the operation of additional C20HB boards including the 64-point I/O Board, RS-232C/RS-422 Interface Boards, Expansion I/O Board, I/O Link Board and the B7A Link Board.

Section 4 provides specifications and dimensions for the various C20HB Boards.

Section 5 describes the C20HB's self-diagnostic functions and troubleshooting information in the event of an error.

<p>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.</p>

SECTION 1

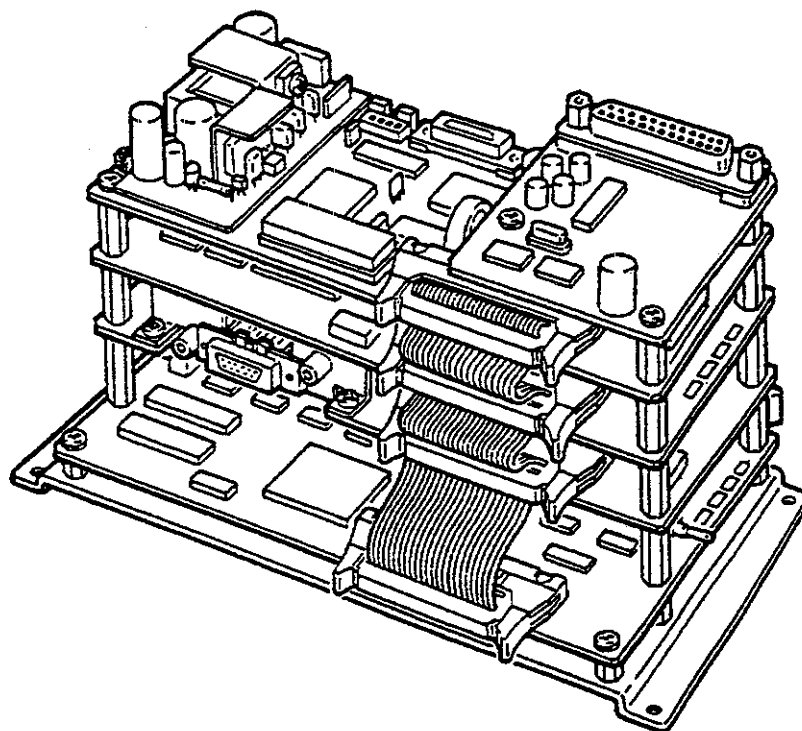
Introduction

This section introduces the main features and components of the C20HB Board-type PC and shows possible system configurations.

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1-3	Expansion Systems	4
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1-1 Main Features

	The C20HB has the following features.
Large Instruction Set	The C20HB is equipped with 137 instructions.
Differentiation Instructions	Many instructions have input differentiation, so the instruction is executed only when the input condition goes from OFF to ON.
Large Capacity	The C20HB can handle up to 192 I/O points.
Compact Size	The C20HB's small size allows it to be incorporated into all kinds of equipment. It is ideal for installation in a control panel.
Optional Interfaces	Optional RS-232C and RS-422 interfaces provide powerful communications capability.
Optional Battery Set	An optional Battery Set can be installed to provide approximately 5 years of memory backup protection.
Analog Timer Capability	An analog timer can be connected and timer settings made on-site. (The user must install potentiometers to adjust timer settings on-site.)
Compatible with OMRON Programming Consoles	Programs can be written and edited using OMRON Programming Consoles.



1-2 System Configuration Basics

Work Flow in Constructing Systems

The following basic procedure can be used for constructing a system using the C20HB.

1, 2, 3...

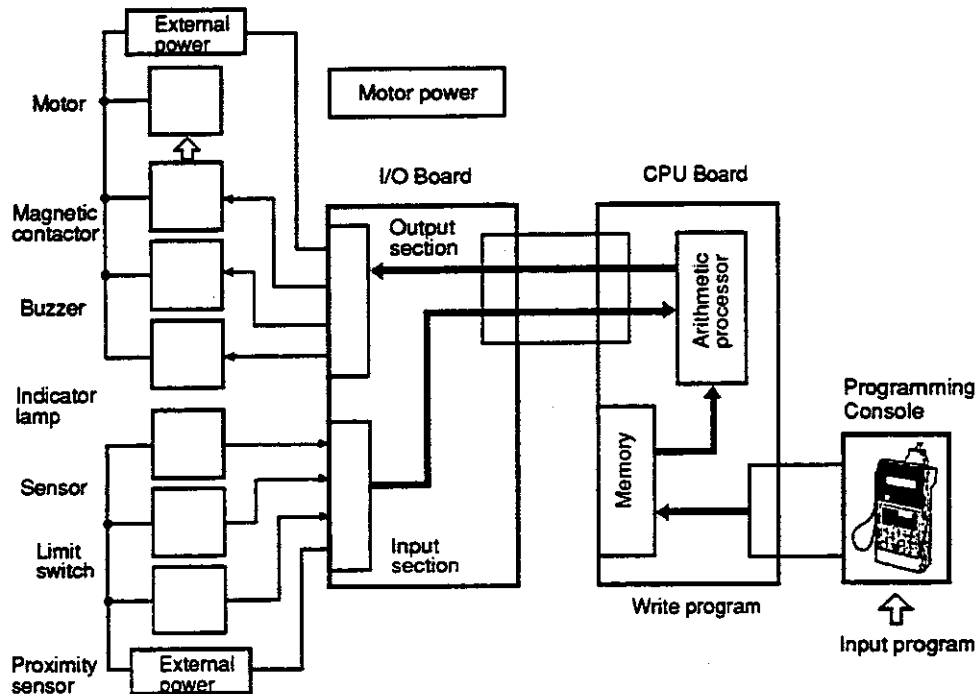
1. Write the Program.

Create a program that will turn ON and OFF output devices based on the ON/OFF status of input devices and write this program into the memory on the CPU Board using the Programming Console.

Note Refer to the *Mini H-type PCs: C20/28/40/60H (W176) Operation Manual* for details on writing the program.

2. Connect I/O Devices.

Connect the switches, sensors, and other input devices to the input side of the I/O Board and the motors, displays, and other output devices to the output sides of the I/O Board.



Note Motors and other devices that consume large quantities of power cannot be driven directly from the C20HB. Control such devices through magnetic contactors.

3. Execute Trial Operation.

Try operating the system without connecting motors.

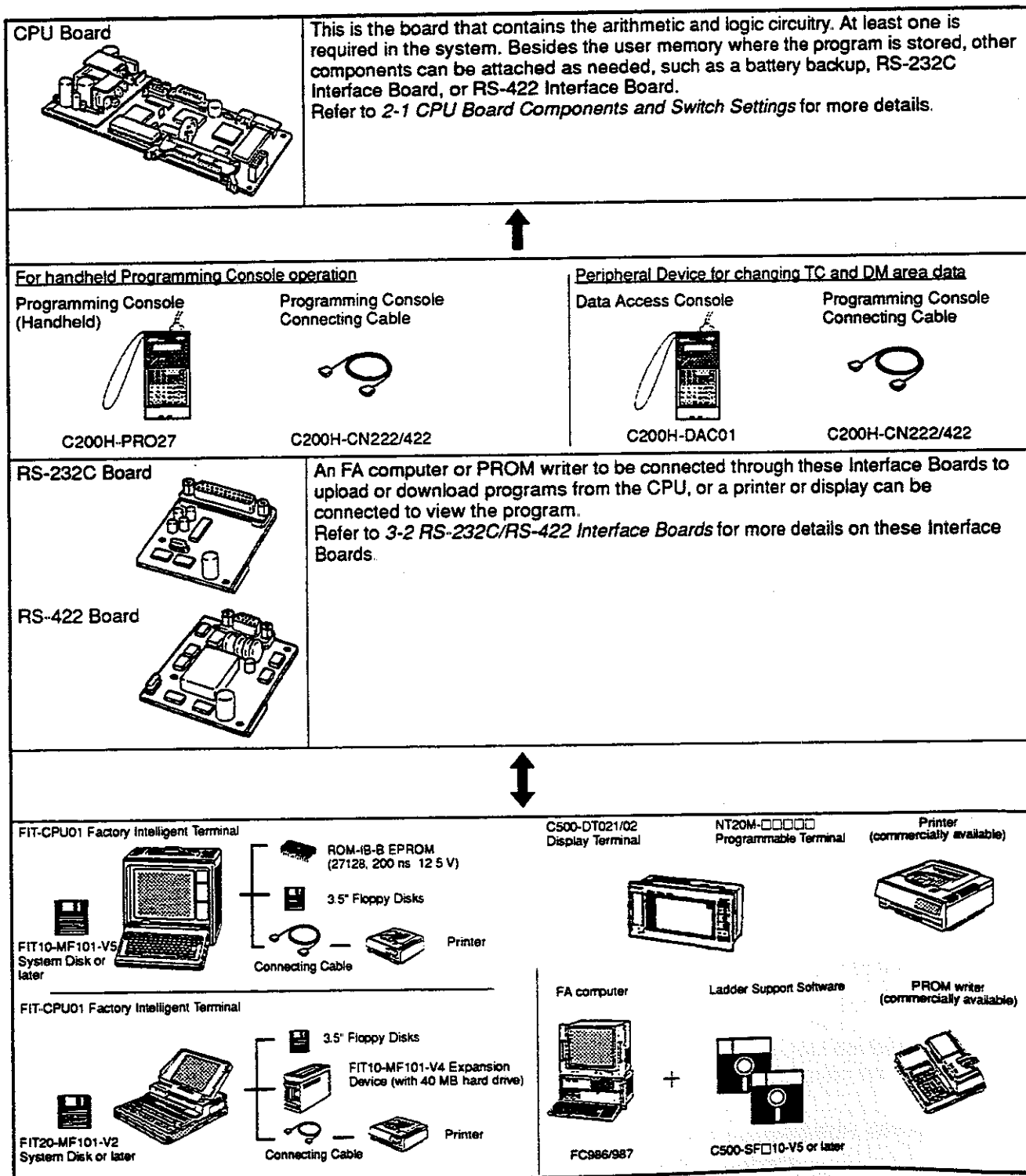
4. Run the System.

Connect the motors and proceed with actual system operation once the correct operation of all devices has been confirmed.

1-3 Expansion Systems

Note There are C20HB hardware and software models mentioned in this manual which are not sold overseas.

A variety of expansion systems can be constructed by installing different kinds of C20HB boards.



32-point I/O Board

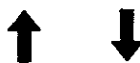


One Board can process a total of 32 I/O points, 16 input points and 16 output points. Refer to 2-2 32-point I/O Board Components and Switch Settings for more details.

64-point I/O Board



One Board can process a total of 64 I/O points, 32 input points and 32 output points. Refer to 3-1 64-point I/O Board for more details



Proximity Switch



Contact



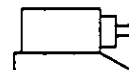
Limit Switch



Buzzer

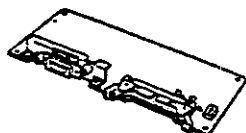


Switch



Motor

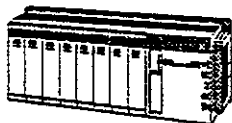
Expansion I/O Board



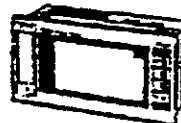
Allows connection of a Programmable Terminal or an OMRON C200H Expansion I/O Rack with its capacity for a variety of I/O Units. Refer to 3-1 64-point I/O Board for more details.



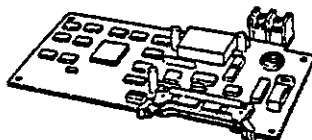
C200H Expansion I/O Rack (1 Rack max)



Programmable Terminal



I/O Link Board



Allows communication between Racks through an OMRON SYSMAC BUS Wired Remote I/O System. Refer to 3-4 I/O Link Board for more details



C200H-RM201 Remote I/O Master Unit

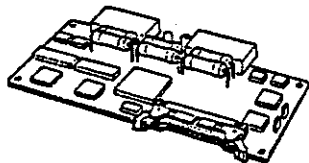


C500 Remote I/O Master Rack



Remote I/O Master Rack

B7A Link Board



Reduces the wiring to B7A Link Terminals by converting serial signals to parallel signals. This is helpful when interfacing with distant I/O (64 points max.). Refer to 3-5 B7A Link Board for more details.



B7A-T6□1 Link Terminal



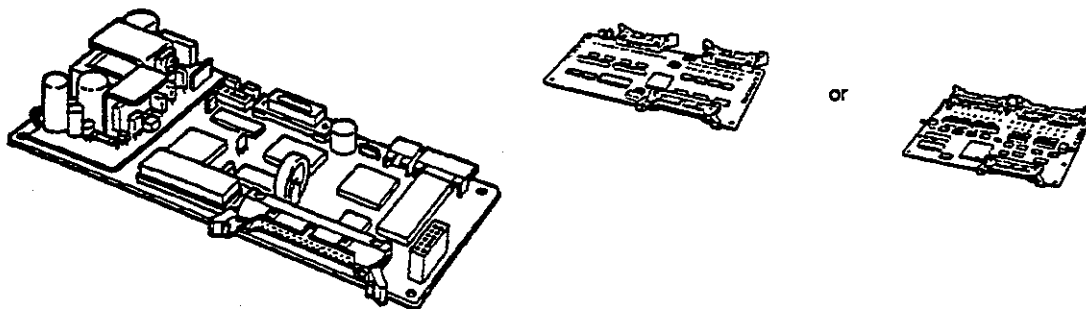
B7A-R6□□1 Link Terminal

1-3-1 System Limitations

A variety of system configurations can be constructed by combining C20HB Boards, but there are some limitations on the combinations.

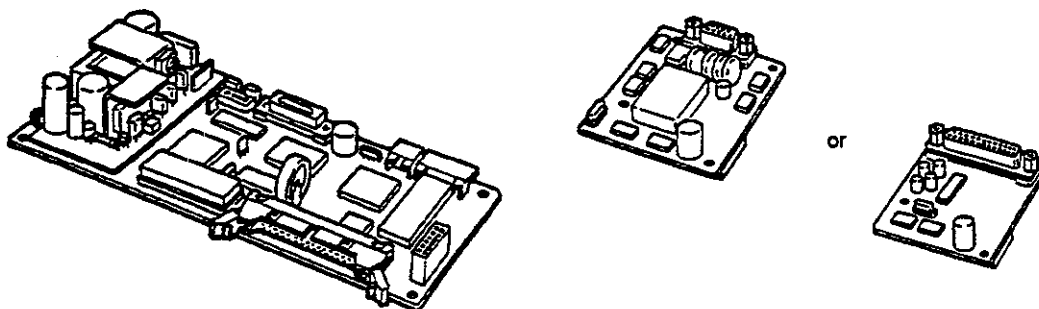
Minimum System Configuration

The minimum C20HB System requires a CPU Board and one I/O Board or Expansion Board.



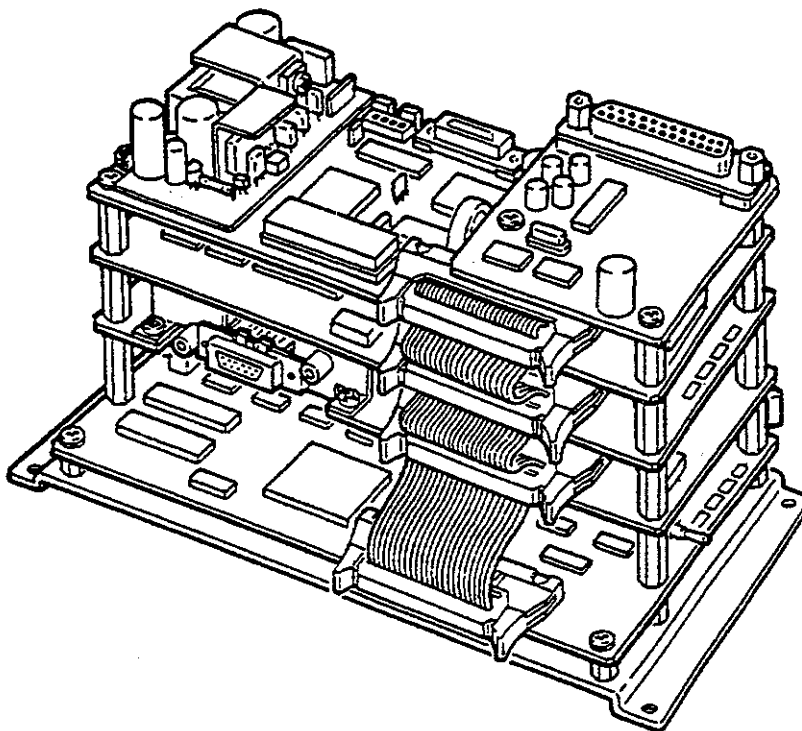
Interface Limitations

There are two kinds of Interface Board available, the RS-232C and the RS-422, but only one Interface Board can be installed per CPU Board.



Maximum System Configuration

A C20HB System can contain a maximum of 4 Boards, including the CPU Board. (A communications board installed on the CPU Board doesn't count as one of the 4 boards.)

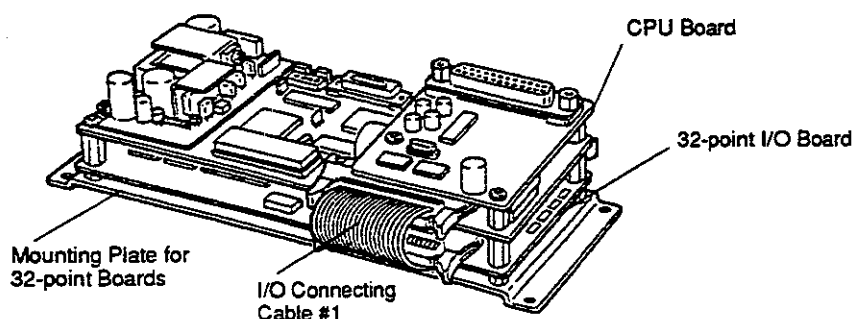


1-3-2 System Configuration Examples

This section shows examples of minimum and maximum board configurations.

Minimum System Configuration

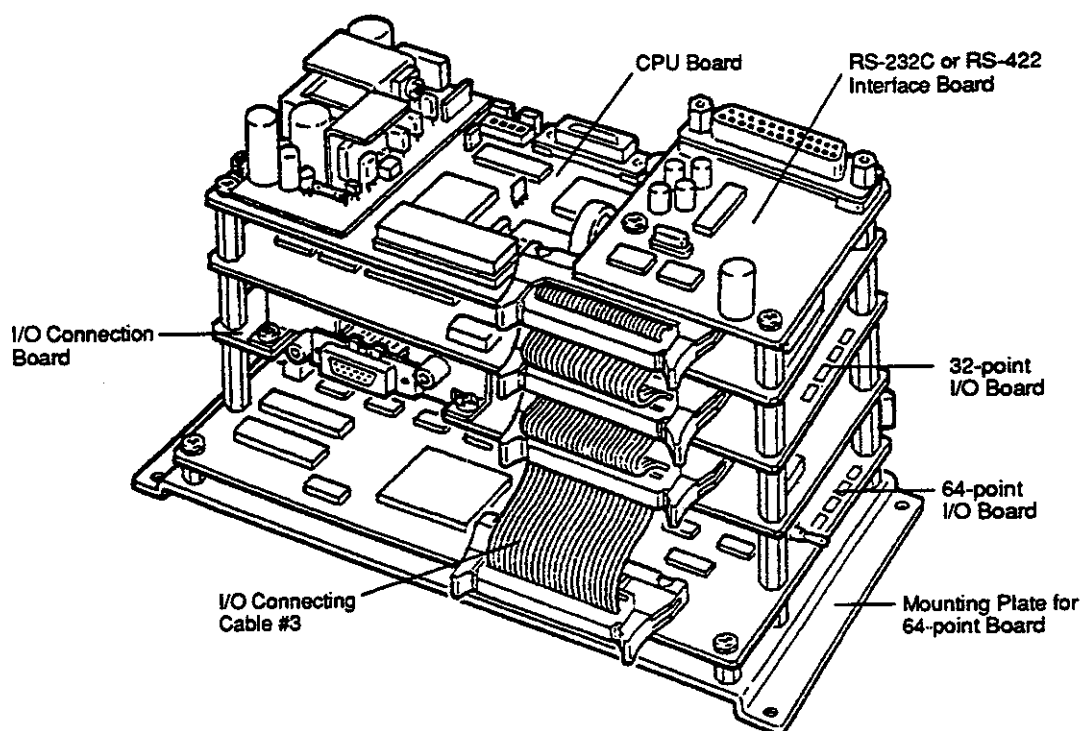
A CPU Board and one 32-point I/O Board are considered a minimum system configuration. This configuration is shown in the following diagram.



Note Refer to *Section 2 Basic Setup and Testing Procedures* for details on all of the procedures involved in setting up and testing a minimum system composed of one CPU Board and one 32-point I/O Board.

Maximum System Configuration

The following diagram shows an example system configuration having the maximum 4 boards. The system includes a CPU Board with a communications board, 32-point I/O Board, Expansion I/O Board, and 64-point I/O Board.



Note The maximum system has 4 Boards, including the CPU Board, but not including the optional Interface Boards.

SECTION 2

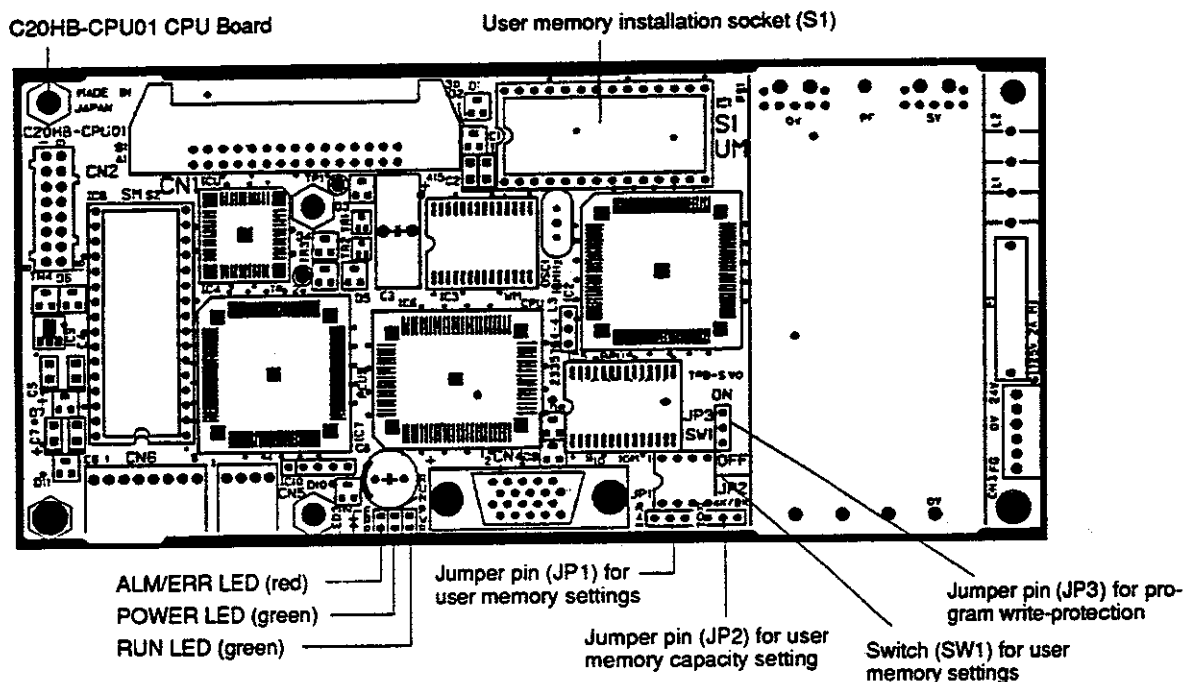
Basic Setup and Testing Procedures

This section explains the entire sequence of procedures involved in setting up, installing, testing, and maintaining a minimum system composed of one CPU Board and one 32-point I/O Board.

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2-1 CPU Board Components and Switch Settings

The following diagram shows the CPU Board components.



2-1-1 LED Indicators

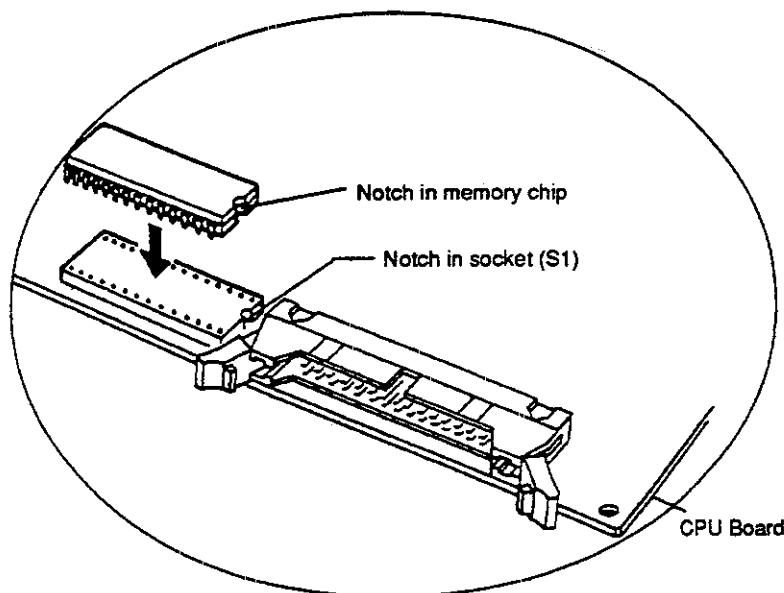
The CPU Board indicators are described in the following table.

Indicator	Function
POWER	Lights when power is supplied to the CPU Board.
RUN	Lights when the PC is operating normally.
ALM/ERR	<p>ALARM: Flashes when a non-fatal error is discovered in error diagnosis operations. PC operation will continue.</p> <p>ERROR: Lights when a fatal error is discovered in error diagnosis operations. When this indicator lights, the RUN indicator will go off, CPU operation will be stopped, and all outputs from the PC will be turned OFF.</p>

2-1-2 Installing User Memory

The CPU Board does not come with User Memory. User Memory must be purchased separately and installed in the CPU Board's User Memory socket.

- 1, 2, 3... 1. Select a memory chip. There are RAM, EEPROM, and EPROM chips available with either 4K words or 8K words of memory.
2. With CPU Board power off, align the memory chip's notch with the socket's notch and insert the chip firmly into the socket.

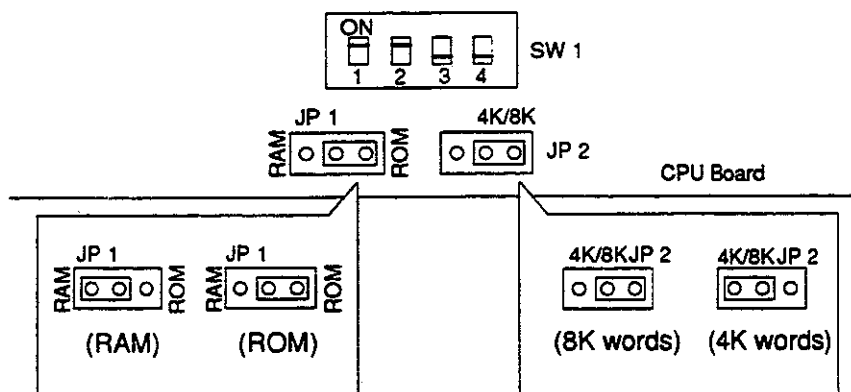


- Note**
1. The RAM contents will be retained for about 20 days after the PC's power supply goes off. Install an optional Battery Set in the CPU Board if the RAM data must be retained longer than 20 days.
 2. Any kind of EPROM (2764, 27128, or 27256) can be used when the program is written to EPROM through a commercially available PROM writer. However, only ROM-III EPROM (27128) is compatible with Ladder Support Software.

Refer to 7-2-12 *PROM Writer Operations* in the *Mini H-type PCs Operation Manual* for details on writing the program to EPROM with a PROM writer.

2-1-3 User Memory Switch Settings

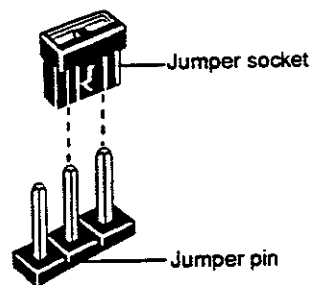
The settings for switch SW1 and jumper pins JP1 and JP2 depend on the type of memory being used. The JP1 setting indicates whether the user memory is RAM or ROM and the JP2 setting indicates whether the user memory is 4K words or 8K words, as shown in the following diagram and table.



		User Memory					
		RAM		EEPROM		EPROM	
		RAM-H (4K-word)	RAM-J (8K-word)	EEPROM-H (4K-word)	EER22-20 (8K-word)	ROM-HD/ ROM-HB-B (4K-word)	ROM-JD-B (8K-word)
JP1	RAM ROM 	RAM ROM 		RAM ROM 		RAM ROM 	
JP2	4K/8K 	4K/8K 	4K/8K 	4K/8K 	4K/8K 	4K/8K 	4K/8K
SW1 	4	OFF		OFF		ON	OFF
	3	ON	OFF	ON	OFF	ON	OFF
	2	ON		ON		OFF	
	1	ON		OFF		OFF	

Changing Jumper Pin Settings

When a jumper socket needs to be moved, remove it with a chip-removing tool and insert it gently into the correct position.



2-1-4 Program Write-protect Setting

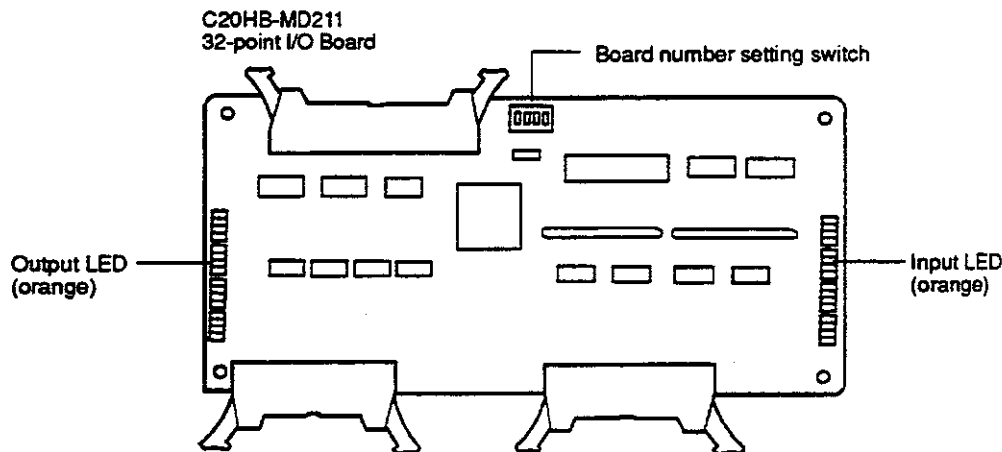
The C20HB is equipped with a jumper pin (JP3) that can be set to write-protect RAM or EEPROM data, as shown in the following diagram.

Not write-protected	Write-protected

The JP3 jumper pin setting is valid only with RAM and EEPROM data. EPROM data cannot be overwritten, so this jumper pin's setting has no effect on EPROM. Move the JP3 jumper socket to the OFF position when writing or editing the program, and move it to the ON position to protect those changes.

2-2 32-point I/O Board Components and Switch Settings

The following diagram shows the 32-point I/O Board components.



2-2-1 LED Indicators

The 32-point I/O Board indicators are described in the following table.

Indicator	Function
OUTPUT	An output LED is lit when its corresponding output (OUT00 to OUT15) is ON.
INPUT	An input LED is lit when its corresponding input (IN00 to IN15) is ON.

2-2-2 Board Number Settings

Set the board number setting switches to indicate the installation position of the 32-point I/O Board relative to the CPU Board, as shown in the following table. The first Board from the CPU Board should be set to "1," the second to "2," etc.

The following table shows the IR words allocated to each Board.

Board number	Switch settings				IR words allocated
	1	2	3	4	
1	ON 				IR 000 to IR 001
2		ON 			IR 010 and IR 011
3			ON 		IR 020 and IR 021

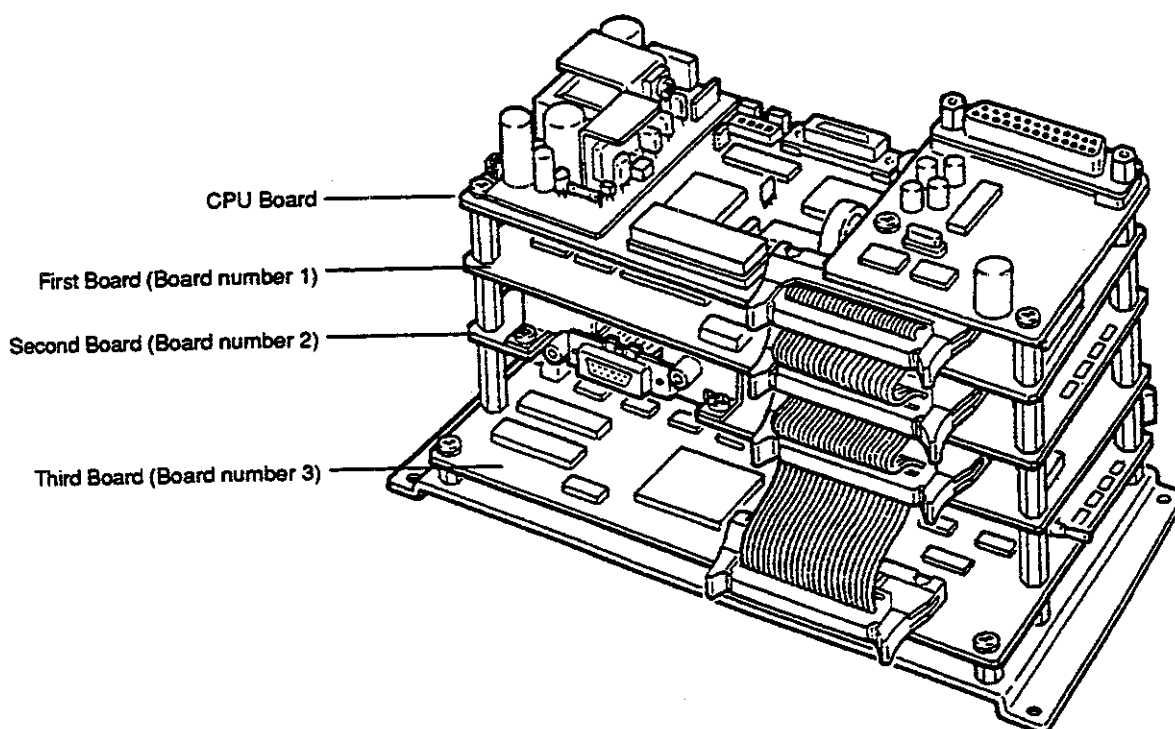
32-point I/O Board Example

Since there is only one Board besides the CPU Board in this case, its board number setting should be "1." The following table shows the IR area words allocated to the 32-point I/O Board for input and output bits.

Input points		Output points	
Wd 0□0		Wd 0□1	
00	08	00	08
01	09	01	09
02	10	02	10
03	11	03	11
04	12	04	12
05	13	05	13
06	14	06	14
07	15	07	15

- Note**
1. The □ digit in the IR word is the board number - 1.
 2. Always set the board number to 1 when only one board is installed. An I/O Bus Error will be generated if the board number is set to 2 or 3.

The following diagram shows the proper board number settings when 3 I/O boards are installed.



- Note** The PC will not operate properly if the same board number is assigned to two Boards or if a board number is skipped.

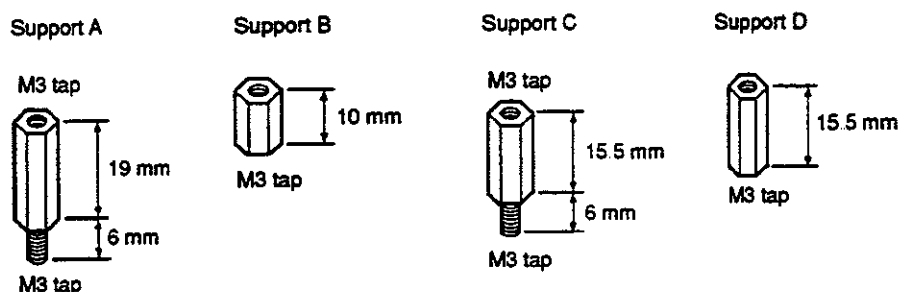
2-3 Board Assembly and Cable Connections

The CPU Board and 32-point I/O Board can be assembled once the required switch settings have been made. The following parts are required for assembly:

- 1, 2, 3...
1. C20HB-CPU01 CPU Board
 2. C20HB-MD211 32-point I/O Board
 3. C20HB-CN401 I/O Connecting Cable #1
 4. C20HB-ATT01 Mounting Plate for 32-point Boards
 5. Support hardware (Included with the I/O Board and Mounting Plate.)

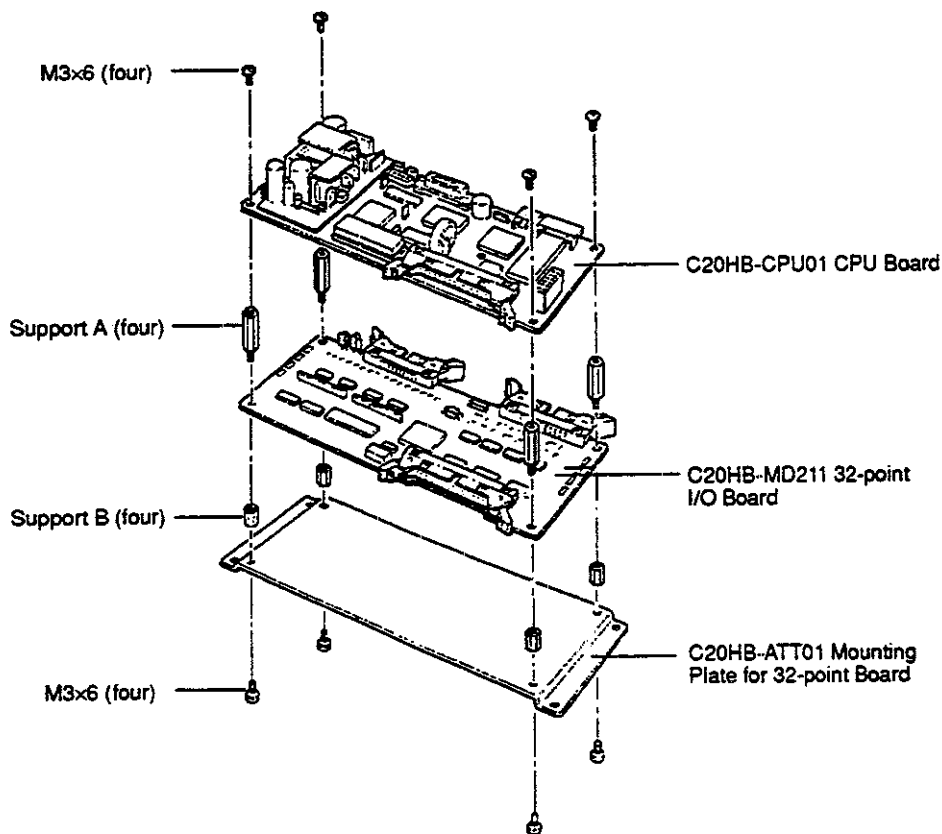
2-3-1 Board Assembly

The following diagram shows the dimensions of the support hardware included with I/O Boards. All of the supports have M3 taps and screw threads.



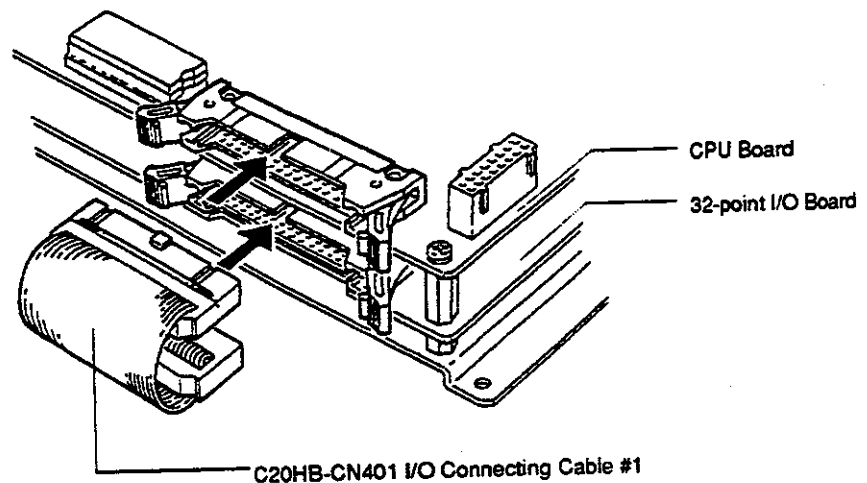
Assembly of the CPU Board, 32-point I/O Board, and Mounting Plate requires four Support As, four Support Bs, and eight M3x6 screws. (The screws are included with the Mounting Plate.)

The following diagram shows the proper assembly of these components. Be sure to tighten the screws and supports securely. The Boards will vibrate if the screws or supports are loose.

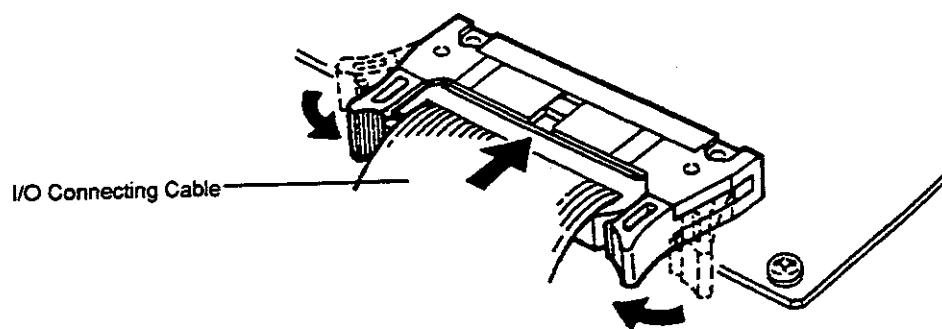


2-3-2 Cable Connections

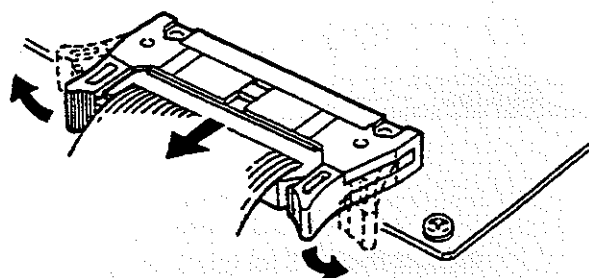
Insert the I/O Connecting Cable #1 into the CN1 connectors on the CPU Board and 32-point I/O Board. (The catches on each side of the CN1 connectors should be open.)



Push the I/O Connecting Cable #1 connectors into the CN1 connectors until the catches lock into place.



To remove the I/O Connecting Cable #1, open the catches and pull out the connector.



2-4 Installation in a Cabinet

This section explains how to install a C20HB PC in a cabinet or piece of equipment.

2-4-1 Installation Locations

Ease of Maintenance

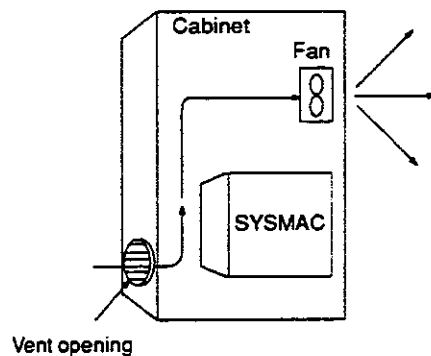
Each Board has LEDs that indicate information such as operating status or the ON/OFF status of I/O points. Install the C20HB in a location where these LEDs are easily visible.

For safety and ease of maintenance, install the C20HB as far as possible from high-voltage and power equipment.

Ambient Temperature

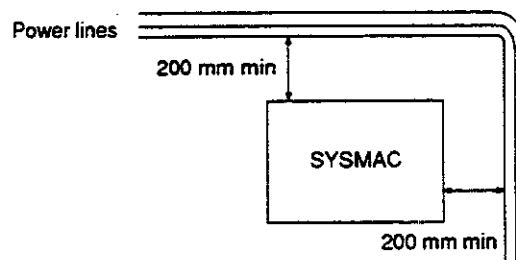
The operating temperature range for the C20HB is 0° to 55°C. Install the C20HB in a location with good airflow and never install the C20HB above equipment that produces a lot of heat (such as heaters, transformers, or large capacitors).

Install a fan or air conditioner in locations that might exceed 55°C, as shown in the following diagram.



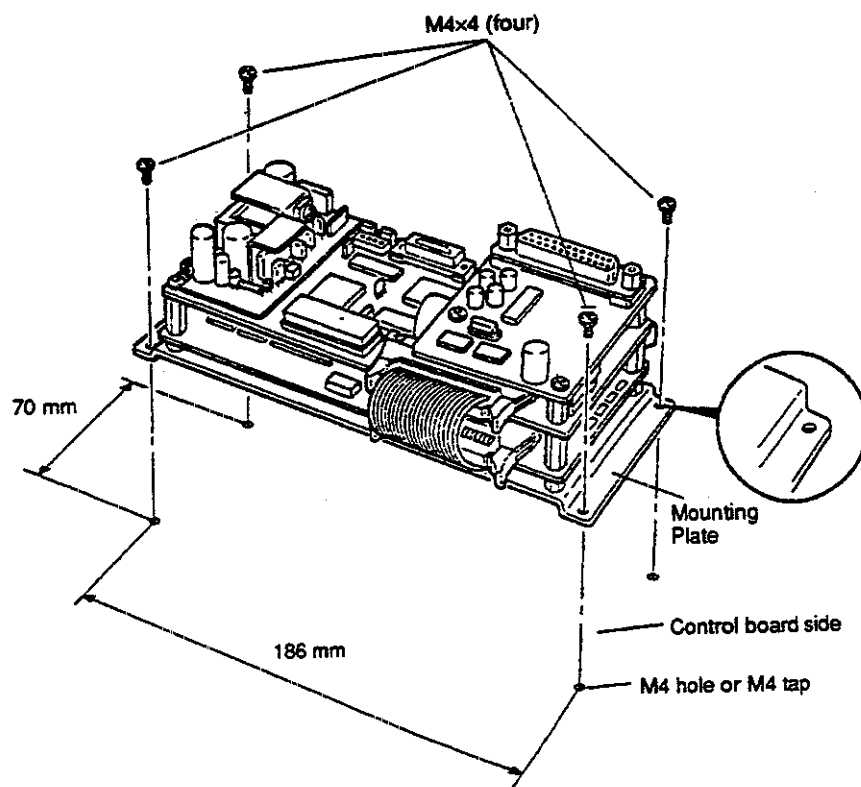
Noise Interference

Install the C20HB in a location that is not subject to noise interference. In particular, do not install the C20HB in cabinets with high-voltage or less than 200 mm from power lines.

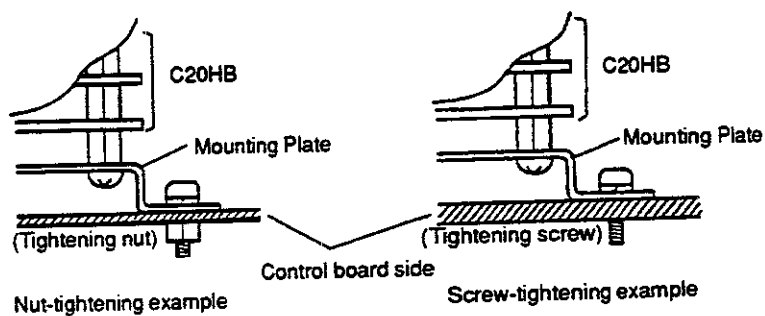


2-4-2 Installation

- 1, 2, 3... 1. Prepare 4 M4 holes or M4 taps in the surface where the C20HB will be installed.

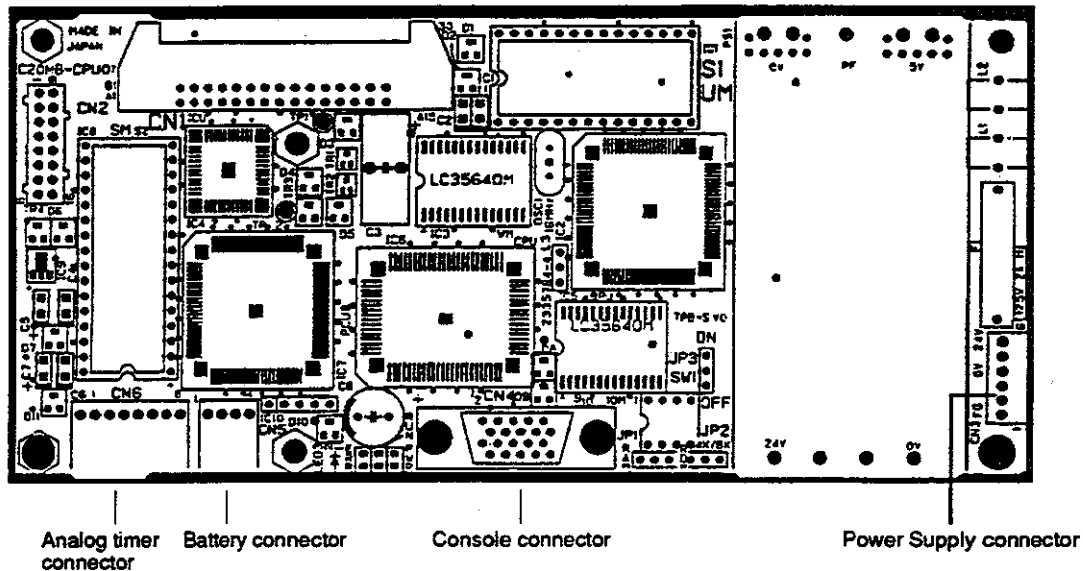


2. Install the C20HB securely to the mounting surface. Make sure that the screws are tight and won't work loose from vibration.



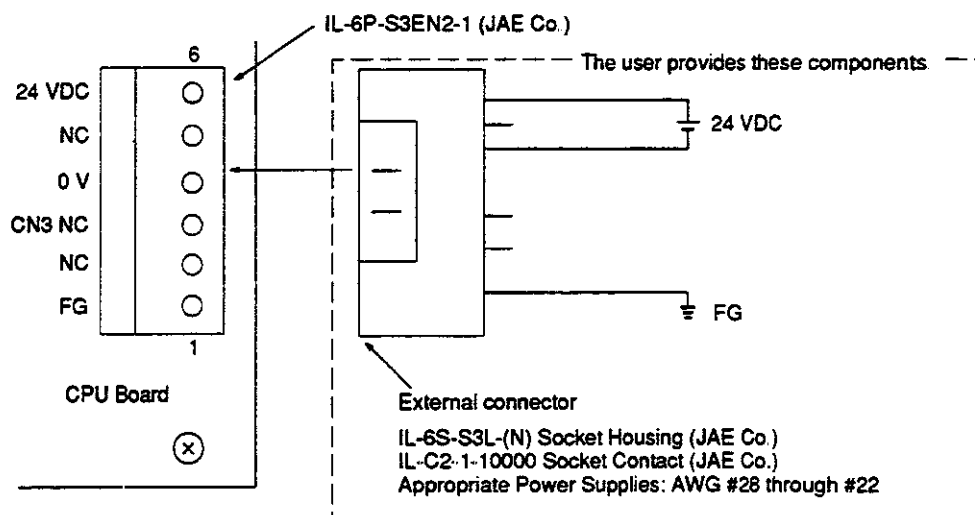
2-5 CPU Board Cable Connections

Once the C20HB has been installed, the various CPU Board cables can be connected. The following diagram shows where these connections are made.



2-5-1 Power Supply Connection

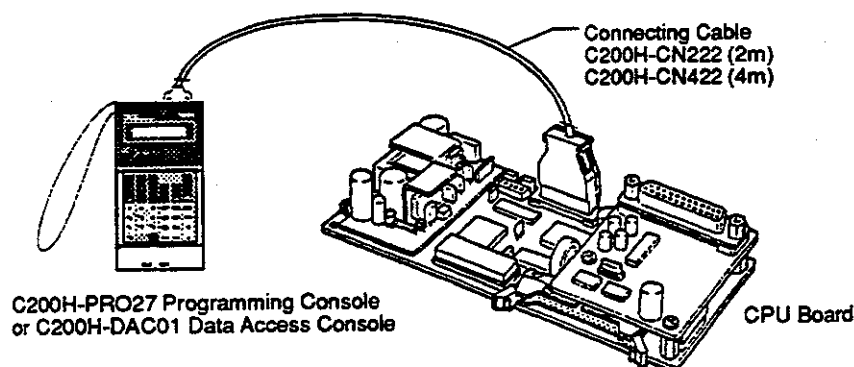
Insert the separately-purchased power cord into the power supply connector.



- Note**
1. A JAE Co. CT150-1□-IL tool is needed to crimp the wires and contacts of the power supply connectors.
 2. Independently ground the frame ground (FG) to 100 Ω or less.

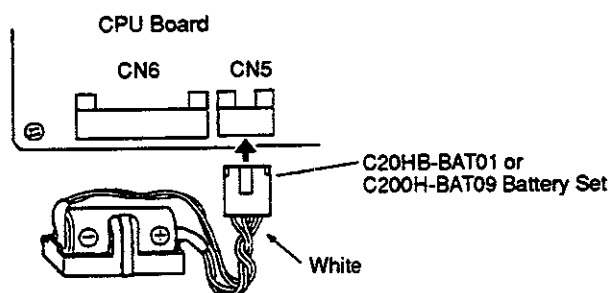
2-5-2 Programming Console Connection

Insert the Programming Console Connecting Cable into the CPU Board's CN4 connector. The Programming Console's operating temperature range is 0°C to 45°C, so the PC system's operating temperature range must be between 0°C and 45°C when the Programming Console is connected.



2-5-3 Battery Set Connection

Insert the optional Battery Set's connector into the CPU Board's CN5 connector.



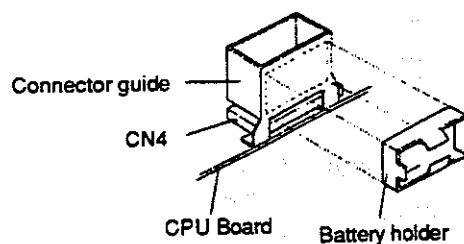
Replace the battery within the battery's effective lifetime (5 years at 25°C). The battery life is shorter at higher temperatures.

The CPU Board's ALM/ERR LED will blink when the battery's voltage drops. Replace the battery within one week after the ALM/ERR LED begins blinking, and connect the new battery within 5 minutes after removing the old one.

Note The C20HB is shipped from the factory without a Battery Set, so the ALM/ERR LED is not set to blink when battery voltage is low. Be sure to change this setting when installing a Battery Set. This setting is made with the SYS(49) instruction; refer to 5-20-5 SET SYSTEM – SYS(49) in the *Mini H-type PCs Operation Manual* for details on this instruction.

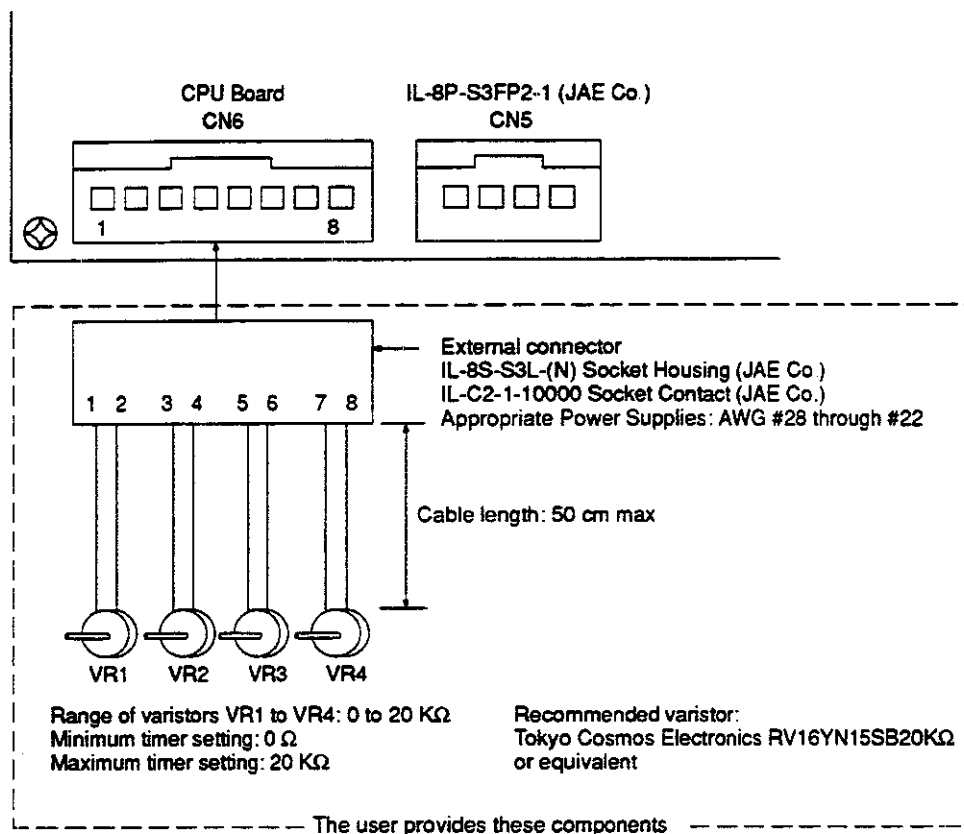
2-5-4 Battery Holder Installation

Attach the battery holder (included with the C20HB-BAT01 Battery Set) to the CPU Board's CN4 connector guide.



2-5-5 Analog Timer Potentiometer Connection

The user can set up to 4 timer SVs on-site with analog timer potentiometers connected to the CPU Board's CN6 connector. Insert the user-provided analog timer connector into CN6, as shown in the following diagram.



- Note**
1. A JAE Co. CT150-1□-IL tool is needed to crimp the connector wires and contacts.
 2. The maximum length of the wires between the CPU Board and potentiometers is 50 cm.

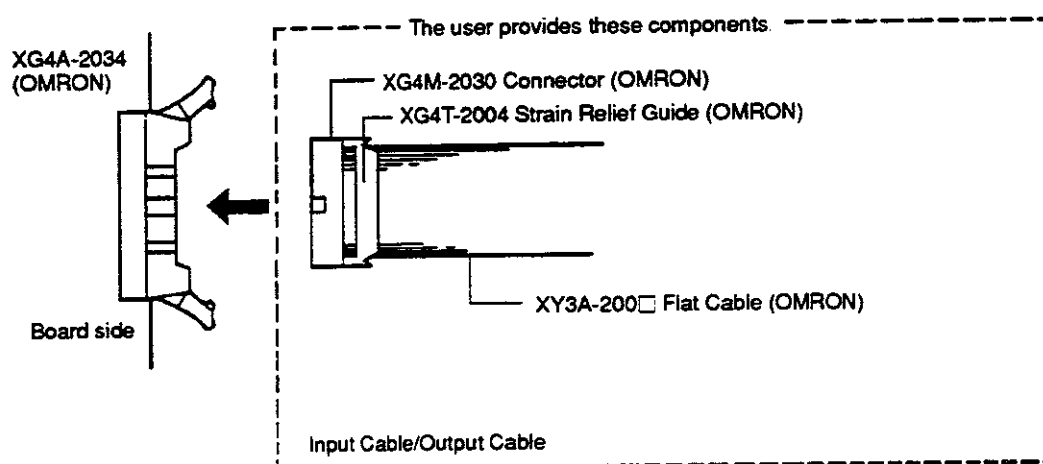
2-6 32-point I/O Board Cable Connections

This section describes how to connect the input and output connectors and how to wire the inputs and outputs.

2-6-1 I/O Cable Connections

Cable Assembly

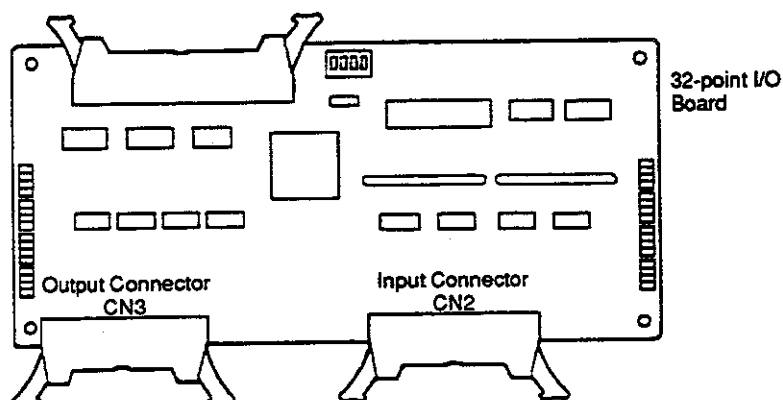
Make one input cable and one output cable from the parts shown in the following diagram.



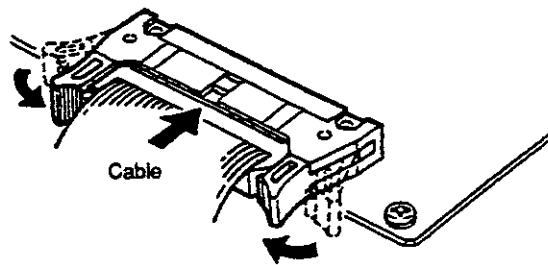
- Note**
1. An OMRON XY2B-0002 Crimping Tool and XY2B-1007 Attachment are needed to install the flat cable in the socket.
 2. The cable assembly procedure can be avoided by purchasing an OMRON Harness Assembly. Refer to the section on XG4/XG2 Connectors in OMRON's *Connector Catalog* for details on purchasing Harness Assemblies.

Cable Connections

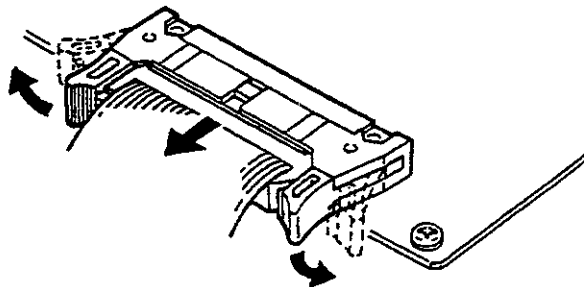
Insert the input cable into the 32-point I/O Board's CN2 connector and insert the output cable into the CN3 connector. (The catches on each side of the connectors should be open.)



Push the connectors until the catches lock into place.

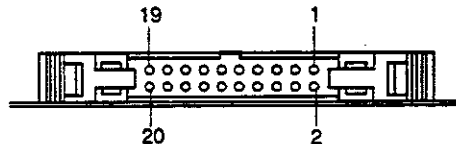


To remove the cables, open the catches and pull out the connector.

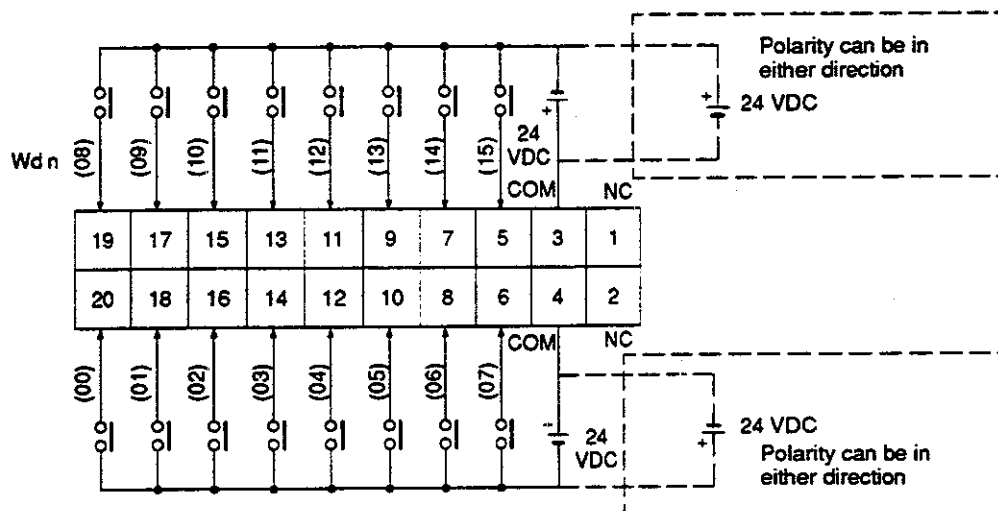


2-6-2 Input Cable Wiring

The following diagram shows the pin allocation of the 32-point I/O Board's input connector.

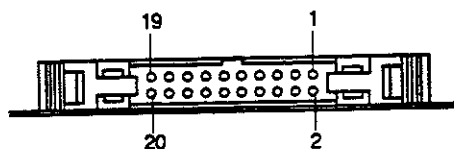


The following diagram shows the input cable wiring. The numbers (00) to (15) indicate input bits 00 to 15, Wd n indicates the IR word in which the bits are located.

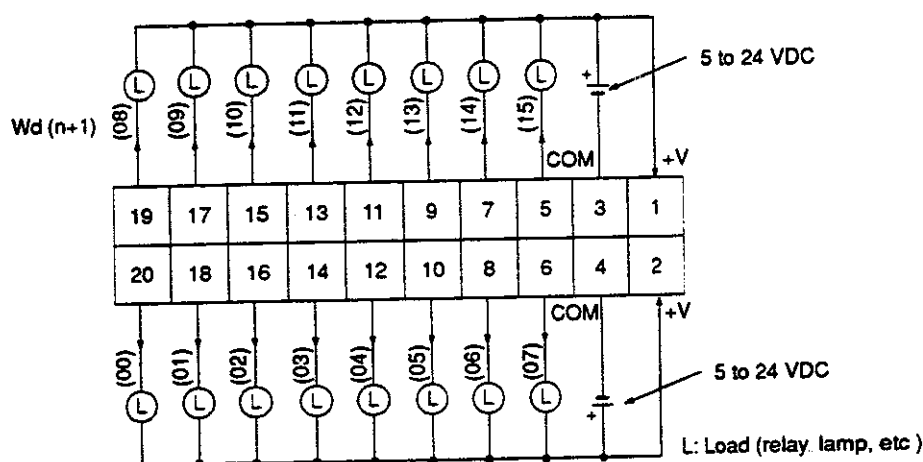


- Note**
1. Prepare a 24 VDC power supply for inputs.
 2. The connection diagrams above show basic connection methods. Refer to 2-7 *Safety Considerations* for system design information.

The following diagram shows the pin allocation of the 32-point I/O Board's output connector.



The following diagram shows the output cable wiring. The numbers (00) to (15) indicate input bits 00 to 15, and n+1 indicates the IR word in which the bits are located.

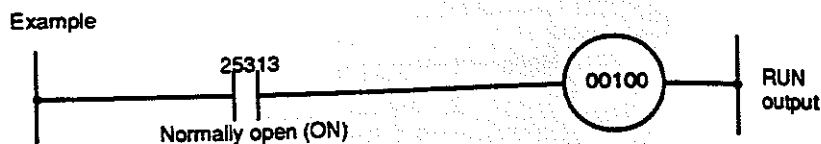


- Note**
1. Prepare a 24 VDC power supply for outputs
 2. The connection diagrams above show basic connection methods. Refer to *2-7 Safety Considerations* for system design information.

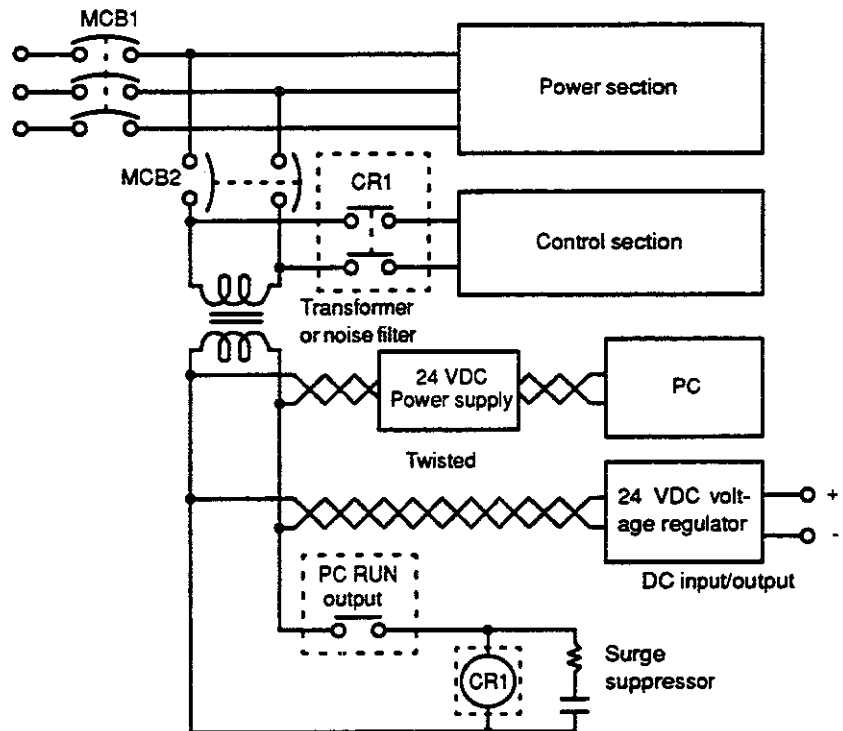
There are certain safety requirements to consider when installing the PC, such as the emergency stop circuit, that are part of the initial wiring. This section provides additional items that should be kept in mind when operating the PC and connecting I/O devices.

Emergency Stop Circuit

The emergency stop circuit is intended to prevent a C20HB breakdown or malfunction from damaging the entire system. Construct an external relay circuit using the Always ON Flag (SR 25313). If the program is set up as shown in the following diagram. Output 00100 will be ON whenever the C20HB is in either RUN or MONITOR mode, so it can be used to monitor whether the C20HB is operating.



The following diagram shows the C20HB RUN Output (IR 00100) used in a power supply system circuit. When the C20HB stops operating, IR 00100 goes OFF and the circuit is opened.

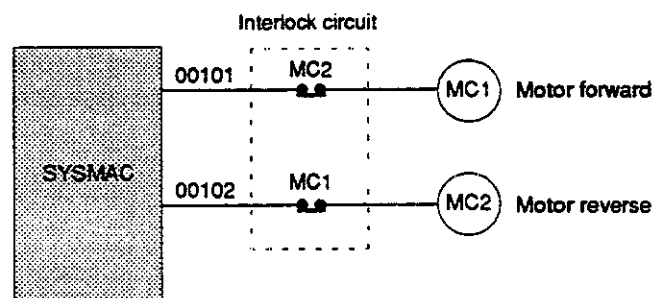


Power System Wiring

The power system, control system, PC power supply system, and power supply systems for I/O should be wired as separate systems. Use the pattern of a power supply system with an emergency stop circuit, as shown above.

Interlock Circuits

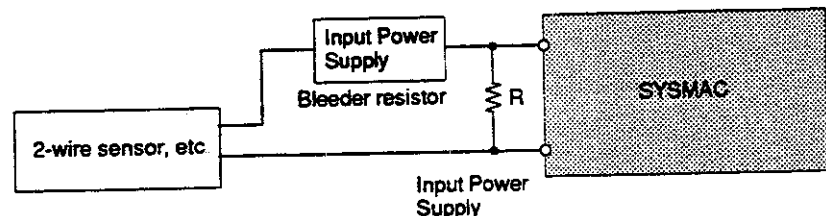
When the PC controls an operation such as the forward and reverse operations of a motor, provide an external interlock such as the one shown below. This circuit prevents the forward and reverse outputs from going ON simultaneously even if IR 00101 and IR 00102 are ON at the same time, and protects the motor from damage even if the PC is programmed improperly or malfunctions.



2-7-2 Input Wiring

Input Leakage Current

When two-wire sensors, such as photoelectric sensors, proximity sensors, or limit switches with LEDs, are connected to the PC as input devices, the input bit may be turned ON erroneously by leakage current. There should be no problem if the leakage current is less than 1.5 mA, but if the leakage current is greater than 1.5 mA, connect a bleeder resistor across the input as shown below.



The required resistance and rating for the bleeder resistor can be determined from the following formulas:

I = leakage current in mA

R = Bleeder resistance in $K\Omega$

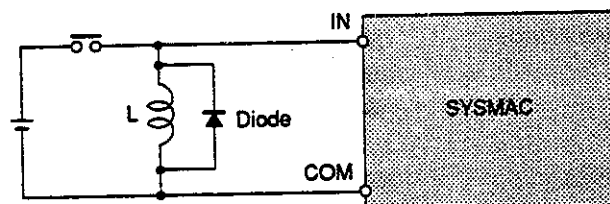
W = Bleeder resistance rating in Watts

$$R = \frac{29.3}{59 \times I - 5} \text{ K}\Omega \text{ max.}$$

$$W = \frac{2.3}{R} \text{ W min.}$$

Inductive Load Surge Suppressors

When an inductive load is connected to an input, it is necessary to connect a surge suppressor or a diode in parallel with the load, as shown below. Be sure to connect the cathode side of the diode to the +polarity side

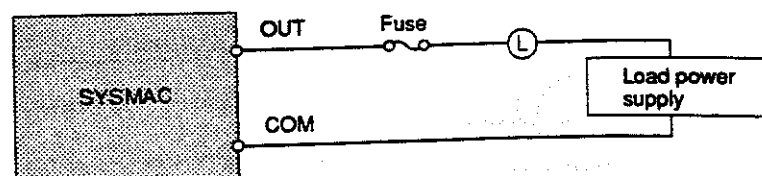


Note The diode's reverse breakdown voltage must be at least three times the load voltage, and the average rectified current is 1 A.

2-7-3 Output Wiring

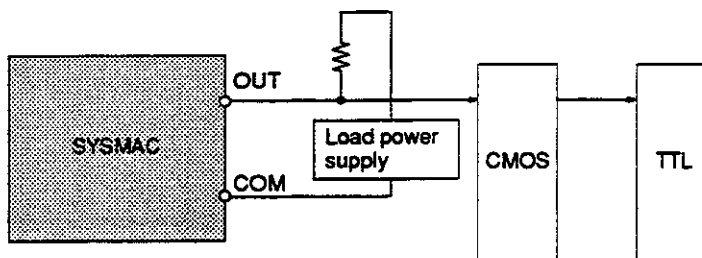
Protection Against Short-circuits

It is recommended to install a fuse in the circuit to prevent damage to the output terminals or printed circuit board in the event of a short circuit over the load.



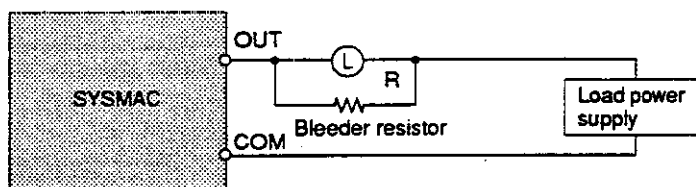
Connection to TTL

It is not possible to connect directly to TTL (transistor-transistor logic) because of the transistor's leakage current. Connect to TTL from a CMOS IC and pull up the transistor output with a resistor, as shown in the following diagram



Output Leakage Current

Leakage current can cause output devices to malfunction. Connect a bleeder resistor across the output as shown below to prevent output operation due to leakage current.



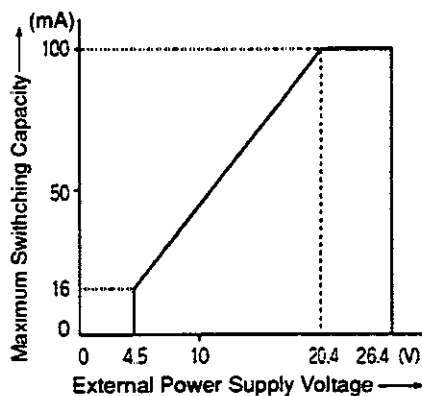
The required resistance for the bleeder resistor can be determined from the following formula:

V_{ON} = ON voltage for load L (V)
 I = Output leakage current (0.1 mA)
 R = Bleeder resistance (K Ω)

$$R < \frac{V_{ON}}{I} \text{ K}\Omega$$

Maximum Load Current

The 32-point I/O Board and 64-point I/O Board have transistor outputs. The acceptable supply voltage range is from 5 VDC ($\pm 10\%$) to 24 VDC ($\pm 10\%$) and the maximum load current depends on the supply voltage, as shown in the following chart. Select an appropriate power supply voltage based on this chart.

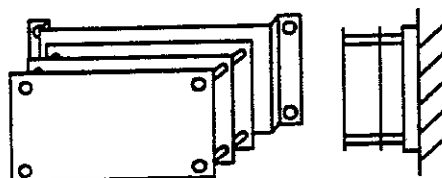
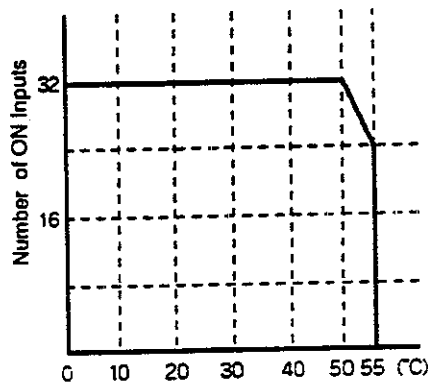


Caution The transistor will be damaged if the switching current exceeds the maximum load current shown in the chart.

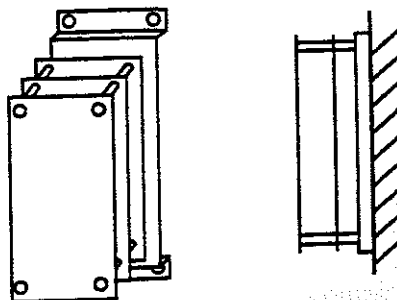
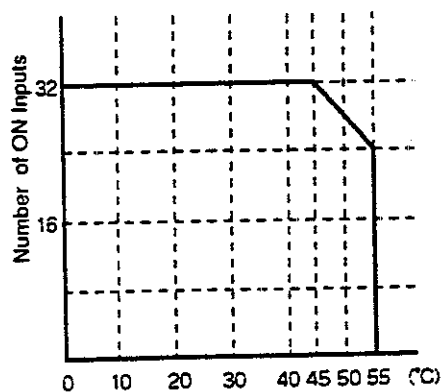
Maximum Number of ON Inputs

When using a 64-point I/O Board, the number of inputs that can be ON at the same time is limited at higher temperatures. The maximum number of ON inputs depends on both the temperature and installation orientation, as shown in the following charts.

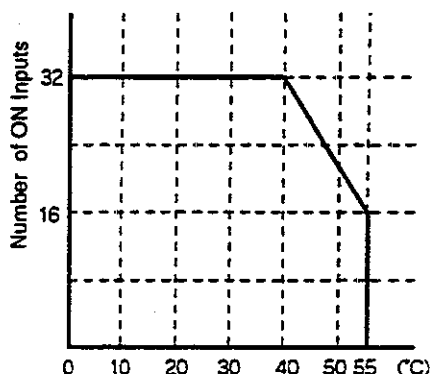
- 1, 2, 3... 1. Installation on a vertical surface with horizontal orientation



2. Installation on a vertical surface with vertical orientation



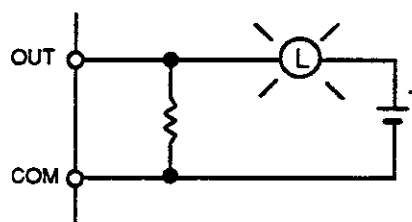
3. Installation on a horizontal surface



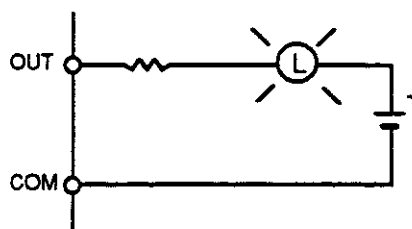
Controlling Surge Current

The output transistor can be damaged when it is connected to a load that has a large surge current, such as an incandescent lamp. The circuits shown below show 2 methods of reducing the inrush current.

This circuit allows a slight current (about 1/3 the rated current) to flow through the load (i.e., the lamp), thus eliminating any initial surge of current.

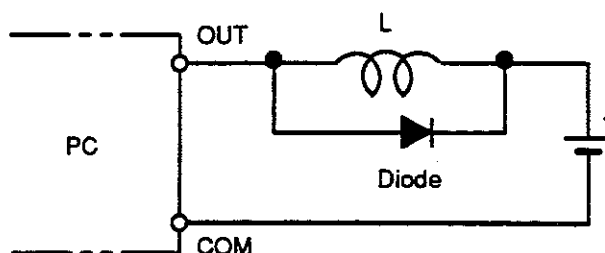


This circuit acts directly on the inrush current to limit it, but also reduces the voltage across the load.



Inductive Load Surge Suppressors

When an inductive load is connected to an output, it is necessary to connect a surge suppressor or a diode in parallel with the load, as shown below. Be sure to connect the cathode side of the diode to the +polarity side.

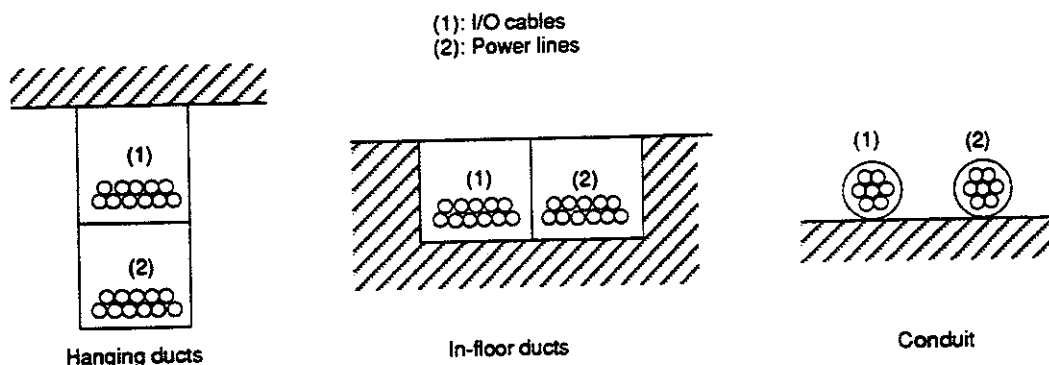


Note The diode's reverse breakdown voltage must be at least three times the load voltage, and the average rectified current is 1 A.

Reducing Electrical Noise

Ground the PC independently to less than 100 Ω .

Isolate the I/O signal lines from power lines by installing the lines in separate ducts or conduit as shown in the following diagrams.



If the I/O signal lines and power lines must be wired through the same duct, use shielded cables to improve noise-resistance. In this case, connect the cable's shield conductor to the PC's FG terminal.

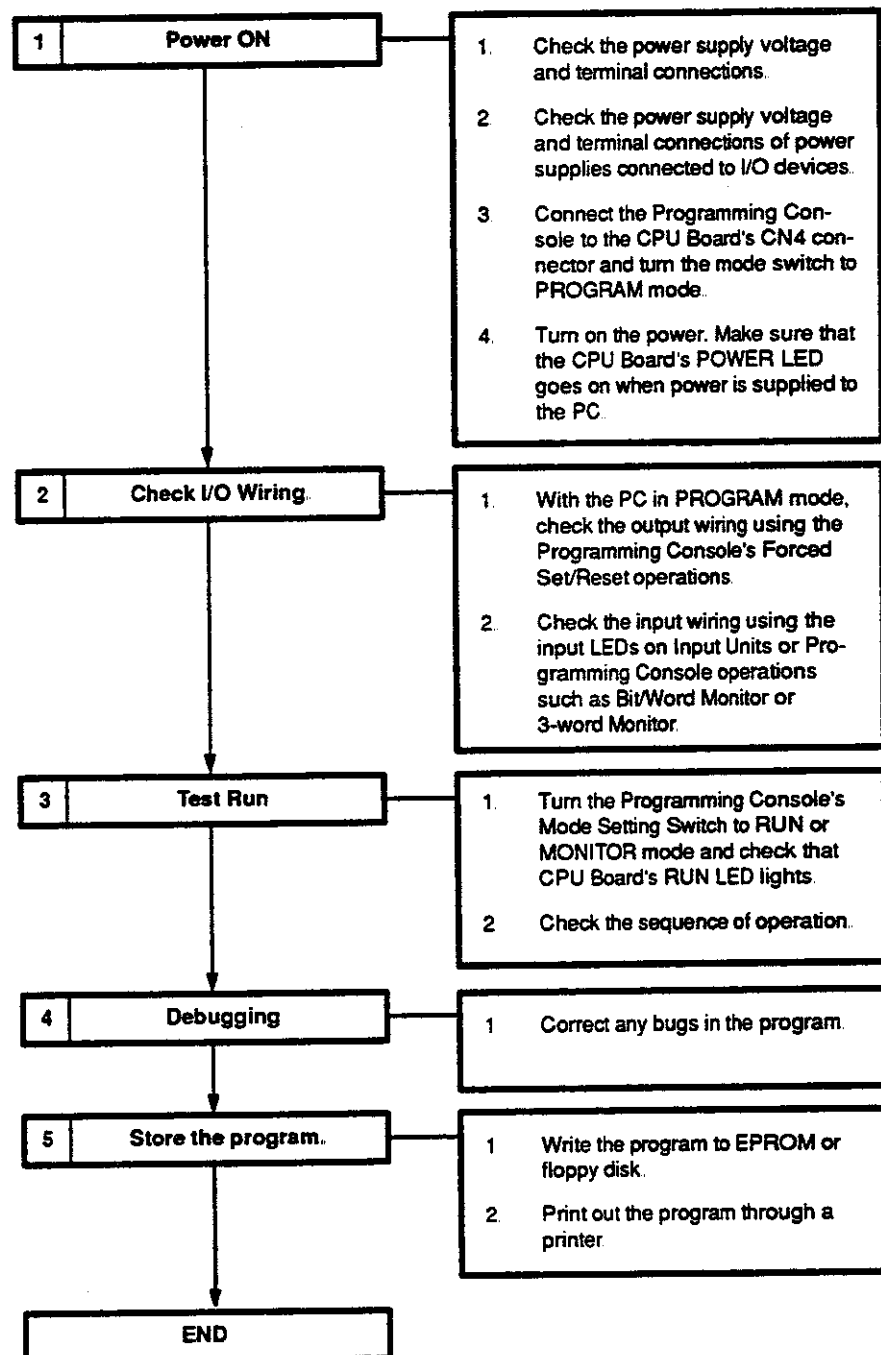
Battery Error Detection

When an optional Battery Set has been installed in the CPU Board, the CPU Board's ALM/ERR LED will blink when battery voltage drops if the PC has been set to detect battery errors.

The C20HB is not set to detect battery errors when it is shipped from the factory. This setting is made with the SYS(49) instruction; refer to *5-20-5 SET SYSTEM - SYS(49)* in the *Mini H-type PCs Operation Manual* for details on this instruction.

2-8 Test Run Procedure

The following flowchart shows the test run procedure to be performed using a Programming Console. Refer to 4-4 *The Programming Console* and Section 7 *Program Debugging and Execution* in the *Mini H-type PCs Operation Manual* for details on Programming Console operation.



Various system diagnostics, such as program syntax checks and C20HB hardware tests, are performed while the PC is in operation. If any errors are detected, the ALM/ERR LED on the CPU Board will blink or go on. Details on these errors can be accessed from the Programming Console.

2-9 Troubleshooting

The following table provides probable causes and possible corrections of errors that can occur in newly installed C20HB systems.

Error symptom	Probable cause	Possible correction
POWER LED does not light.	Faulty internal power supply or blown fuse.	Replace CPU Board.
RUN LED does not light.	(1) Faulty Power Supply	Replace CPU Board.
	(2) Programming error (no END instruction)	Correct the program.
None of the inputs go ON. (Operating LED lit.)	Faulty circuit	Replace Board.
None of the inputs go ON. (Operating LED not lit.)	(1) External Input power supply not supplying power. (Power Supply voltage too low.)	Supply power. (Increase voltage.)
	(2) Faulty wiring connections	Correct wiring connections.
None of the inputs go OFF.	Faulty input circuit	Replace Board.
Input of a particular IR bit does not go ON.	(1) Faulty input circuit	Replace Board.
	(2) Faulty wiring connections	Correct wiring connections.
	(3) External input's ON time is too short.	Adjust the external device.
Input of a particular IR bit does not go OFF.	Faulty input circuit	Replace Board.
Inputs go ON and OFF inconsistently.	(1) External input voltage too low.	Increase voltage.
	(2) Malfunctioning because of noise	Wire using shielded cable, etc.
Input's and Output's operating LEDs do not light. (Operation is otherwise normal.)	LED burned out.	Replace Board.
None of the outputs go ON.	(1) Load power supply not supplying power. (Power supply voltage too low.)	Supply power. (Increase voltage.)
	(2) Faulty wiring connections	Correct wiring connections.
	(3) Faulty circuit	Replace Board.
None of the outputs go OFF.	Faulty output circuit	Replace Board.
Output of a particular IR bit does not go ON. (Operating LED lit.)	(1) Break in external load wiring	Replace external load.
	(2) Faulty wiring connections	Correct wiring connections.
	(3) Faulty circuit	Replace Board.
	(4) Power supply voltage too low	Increase voltage (20.4 to 26.4 VDC)
Output of a particular IR bit does not go ON. (Operating LED not lit.)	(1) Output ON time too short	Correct the program.
	(2) The IR bit is used in more than one OUT instruction in program.	Correct the program.
	(3) Faulty output circuit	Replace Board.
Output of a particular IR bit does not go OFF. (Operating LED not lit.)	Faulty reset because of leakage current or residual voltage.	Replace external load or add dummy resistance.
Output of a particular IR bit does not go OFF. (Operating LED lit.)	(1) The IR bit is used in more than one OUT instruction in program.	Correct the program.
	(2) Faulty output circuit	Replace Board.
Outputs go ON and OFF inconsistently.	(1) Load power supply voltage too low	Increase voltage.
	(2) The IR bit is used in more than one OUT instruction in program.	Correct the program.
	(3) Malfunctioning because of noise	Anti-noise measures: • Connect a surge-killer. • Connect an isolating transformer. • Wire using shielded cable, etc.

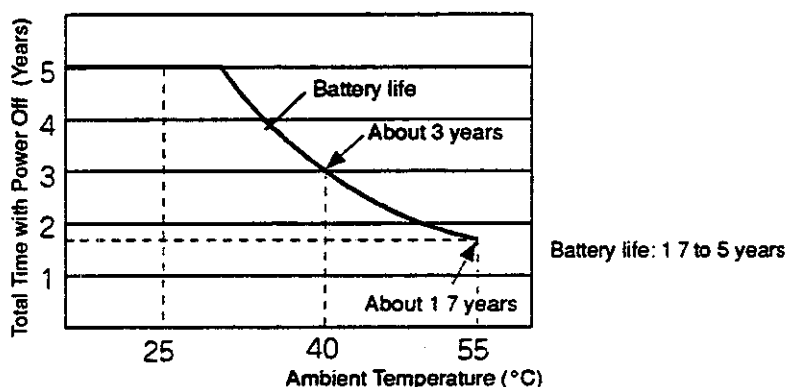
Caution Be sure to turn off the PC's power before disconnecting or connecting any Boards or Connecting Cables.

2-10 Battery Replacement

An optional Battery Set is available to backup RAM data when the PC power is off. Current does not flow from the battery when the PC power is on.

Battery Lifetime

The battery in the optional Battery Set has a life expectancy of 5 years at 25°C, and a reduced lifetime at higher temperatures (1.7 years minimum). The following chart shows the relationship between the ambient temperature and the battery life expectancy (total time with PC power off).



The chart shows the minimum battery lifetime would be 1.7 years if the ambient temperature is a constant 55°C and the PC is not used.

Battery Error Indication

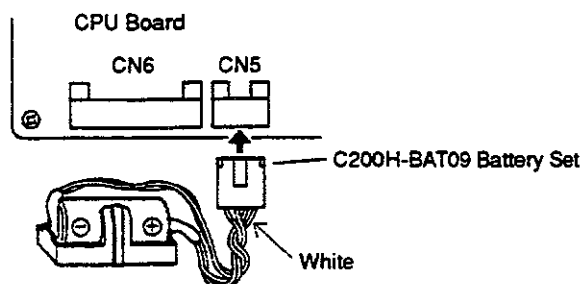
The CPU Board's ALM/ERR LED will blink when the battery voltage drops to the point that it cannot backup the contents of memory. When it is connected to the C20HB, the Programming Console will show "BATT LOW" indicating the battery voltage has dropped. Replace the battery within one week after the battery error occurs.

Note The C20HB is not set to detect battery errors when it is shipped from the factory. This setting is made with the SYS(49) instruction; refer to 5-20-5 SET SYSTEM – SYS(49) in the *Mini H-type PCs Operation Manual* for details on this instruction.

Battery Replacement

The battery-replacement procedure is described below.

- 1, 2, 3... 1. Turn off the PC's power. If the PC's power is already off, turn it on for 1 minute to give the battery some charge and then turn it off again.
2. Remove the old Battery Set from the CPU Board and install the new one within 5 minutes. The RAM data might be lost if the new battery is not installed within 5 minutes.



Note Do not short, recharge, break open, heat, or burn the battery.

2-11 Inspection and Maintenance

It is necessary to perform inspections periodically to keep the C20HB operating at its best.

Inspection Points

Most of the C20HB's components are solid state and never need replacement, but it is possible for their performance to deteriorate due to poor operating conditions. A standard inspection routine is usually carried out every 6 months to 1 year, but more frequent inspections might be needed in more demanding operating conditions.

Inspect the following items and correct any items that do not meet the standards.

Inspection Item	Procedure	Standards	Remarks
Power supply	Measure the voltage fluctuation at the power supply's connector pins and check that it is within standards.	20.4 to 26.4 VDC	Voltage tester
Ambient conditions	Is the ambient temperature OK?	0° to 55°C	Thermometer
	Is the ambient humidity OK?	35% to 85% RH, with no condensation	Hygrometer
	Is there dust/dirt accumulation?	Dust should not accumulate.	Visual inspection.
I/O power supply	Measure the voltage fluctuation at the power supply and check that it is within standards.	Check each I/O device's specifications	Voltage tester
Installation	Is each board securely installed.	No looseness	Phillips-head screwdriver
	Are the connecting cable connectors inserted fully?	No looseness	---
	Are the external wires' screws tight?	No looseness	Phillips-head screwdriver
	Is there any sign of damage to the external cables?	No signs of damage	Visual inspection.
Life expectancy	C200H-BAT09 Battery Set (Optional)	5 years (25°C)	---

Handling Precautions

Observe the following precautions when handling C20HB Boards.

- 1, 2, 3... 1. Turn off the C20HB's power before replacing a Board.
2. If a defective Board is found and replaced, check the new board and make sure it is not defective.
3. When a defective Board is returned for repair, please describe the error in as much detail as possible, attach this description to the Board, and return the Board to the nearest OMRON dealer listed at the end of this manual.
4. If a contact is malfunctioning, try wiping the contact with a clean cotton cloth soaked with some cleaning alcohol. Be sure to remove any lint before re-installing the Board.

Required Tools

The following tools might be needed during inspections:

- 1, 2, 3... 1. Always required:
 - a) Phillips-head and standard screwdrivers
 - b) Multimeter
 - c) Cloth and cleaning alcohol
2. Sometimes required:
 - a) Oscilloscope
 - b) Oscilloscope with pen
 - c) Thermometer and hygrometer

SECTION 3

C20HB Board Installation

This section describes the operation of C20HB Boards other than the CPU Board and 32-point I/O Board. The CPU Board and 32-point I/O Board are described in *Section 2 Basic Setup and Testing Procedures*.

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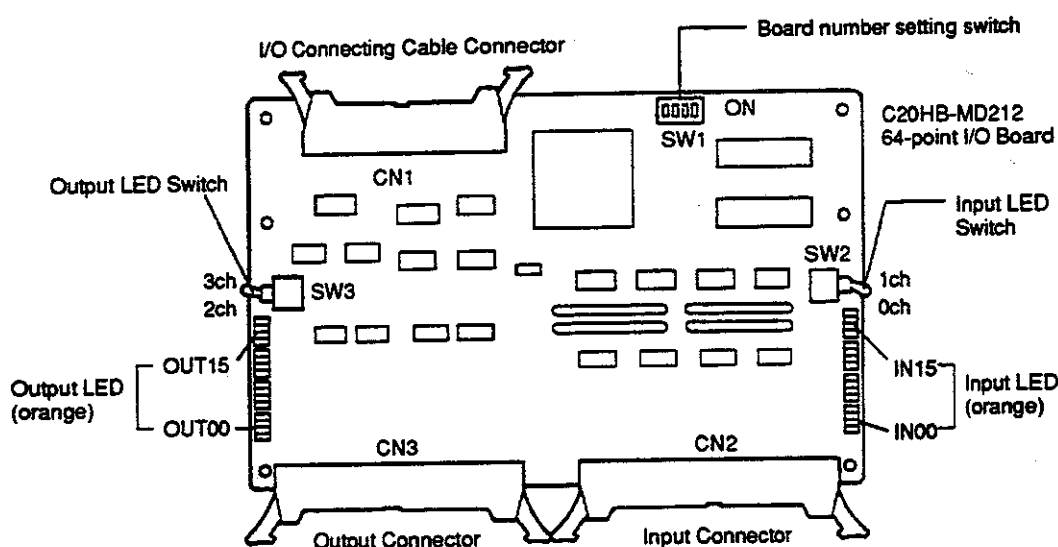
3-1 64-point I/O Board

3-1-1 System Configuration

This section describes a C20HB PC composed of a CPU Board and three 64-point I/O Boards, giving a total of 192 I/O points (96 inputs and 96 outputs). Of course, the 64-point I/O Board can be used in combination with other C20HB Boards, if desired.

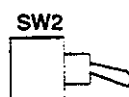
3-1-2 64-point I/O Board Components

The following diagram shows the 64-point I/O Board components.



Input Indicators

The 64-point I/O Board has 32 inputs but only 16 input LED indicators, so the input LED switch is used to determine which 16 input points correspond to input LEDs 00 to 15. The input LEDs indicate the status of the first 16 input points when the input LED switch is set to "1ch," and the status of the second 16 input points when the input LED switch is set to "0ch."

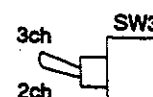


1ch: Input LEDs indicate status of the first 16 input points
0ch: Input LEDs indicate status of the second 16 input points

Output Indicators













The 64-point I/O Board has 32 outputs but only 16 output LED indicators, so the output LED switch is used to determine which 16 output points correspond to output LEDs 00 to 15. The output LEDs indicate the status of the first 16 output points when the output LED switch is set to "3ch," and the status of the second 16 output points when the output LED switch is set to "2ch."

Output LEDs indicate status of the first 16 output points: 3ch
Output LEDs indicate status of the second 16 output points: 2ch



Board Number Settings

Set the board number setting switches to indicate the installation position of the 64-point I/O Board relative to the CPU Board, as shown in the following table. The first Board from the CPU Board should be set to "1," the second to "2," etc. The following table shows board number settings and the corresponding IR words allocated to each Board.

Board number	Switch settings				IR words allocated
	1	2	3	4	
1	ON 				IR 000 to IR 003
2		ON 			IR 010 to IR 013
3			ON 		IR 020 to IR 023

I/O Cable Connector

Insert the I/O Connecting Cable Connector.

3-1-3 I/O Bit Allocation

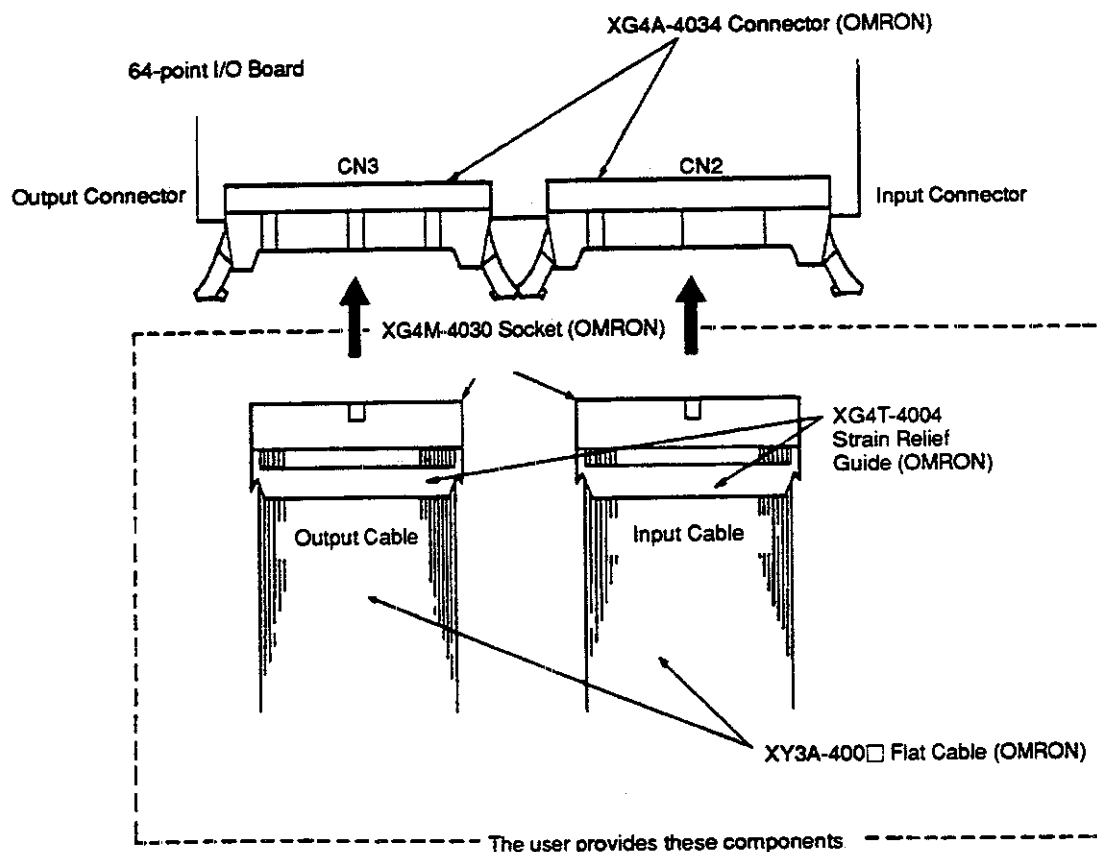
The following table shows the IR area words allocated to the 64-point I/O Board for input and output bits.

Input points				Output points			
Wd 0□0		Wd 0□1		Wd 0□2		Wd 0□3	
00	08	00	08	00	08	00	08
01	09	01	09	01	09	01	09
02	10	02	10	02	10	02	10
03	11	03	11	03	11	03	11
04	12	04	12	04	12	04	12
05	13	05	13	05	13	05	13
06	14	06	14	06	14	06	14
07	15	07	15	07	15	07	15

Note The □ digit in the IR word is the board number - 1.

Cable Assembly

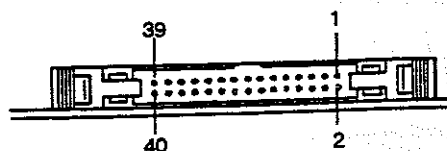
Make one input cable and one output cable from the parts shown in the following diagram and insert them into connectors CN2 and CN3.



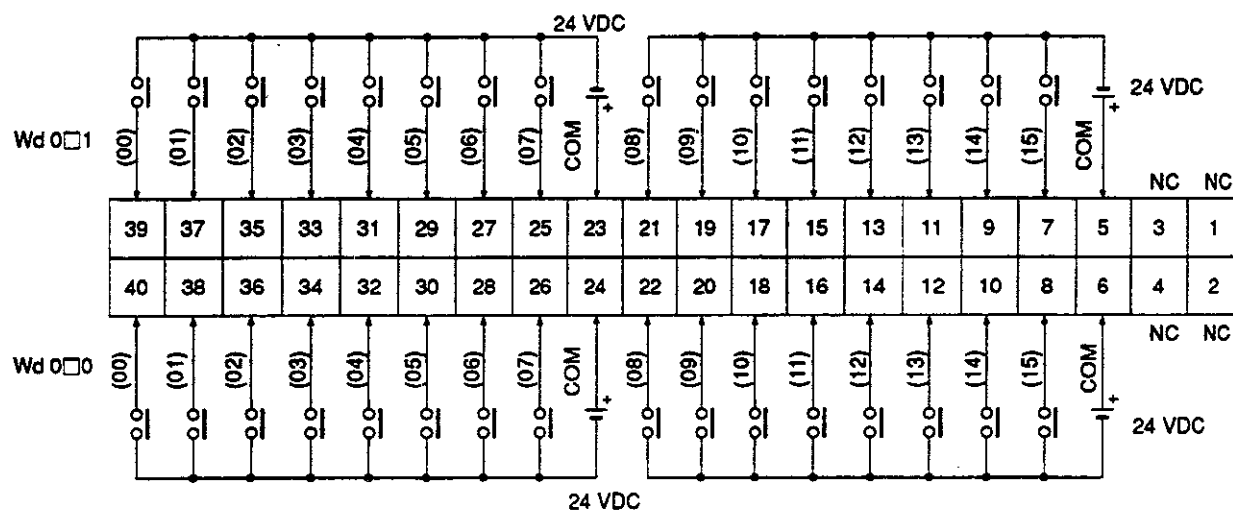
- Note**
1. An OMRON XY2B-0002 Crimping Tool and XY2B-1007 Attachment are needed to install the flat cable in the socket.
 2. The cable assembly procedure can be avoided by purchasing an OMRON Harness Assembly. Refer to the section on XG4/XG2 Connectors in OMRON's *Connector Catalog* for details on purchasing Harness Assemblies.

3-1-4 Input Cable Wiring

The following diagram shows the pin allocation of the 64-point I/O Board's input connector.



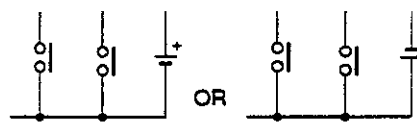
The following diagram shows the input cable wiring. The numbers (00) to (15) indicate input bits 00 to 15, and Wd 0□1 and Wd 0□0 indicate the IR word in which the bits are located.



(□ = the board number - 1)

NC: Do not connect anything to these pins.

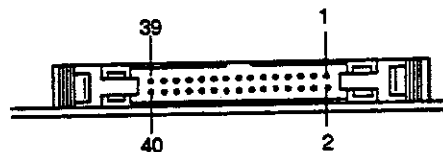
Note 1 Prepare a 24 VDC power supply for inputs. The power supply can be connected with polarity in either direction.



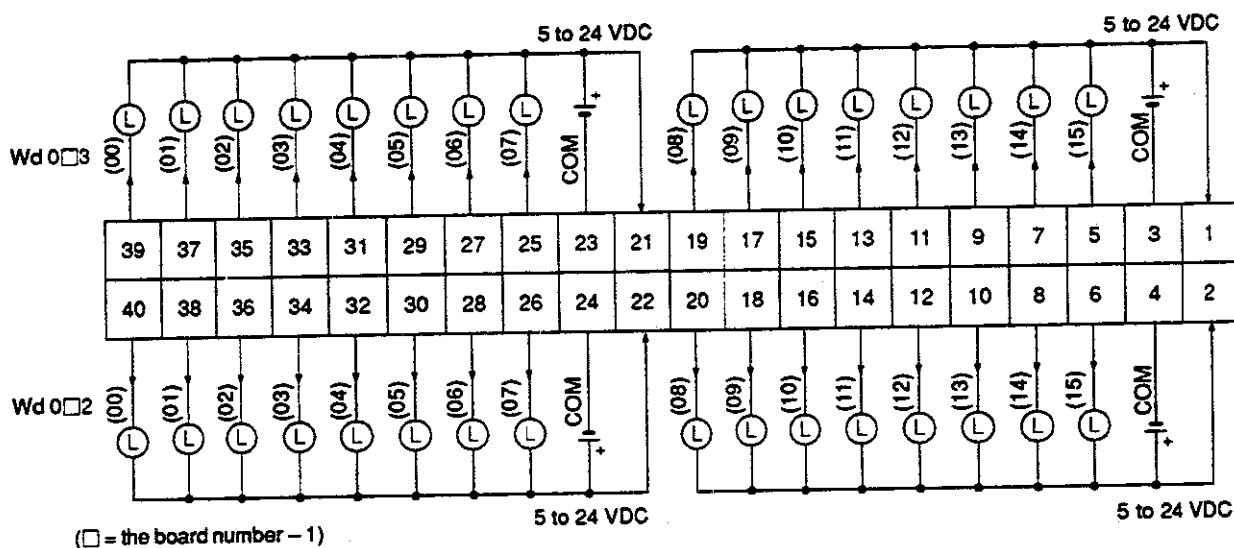
2 The connection diagrams above show basic connection methods. Refer to 2-7 *Safety Considerations* for system design information.

3-1-5 Output Cable Wiring

The following diagram shows the pin allocation of the 64-point I/O Board's output connector.



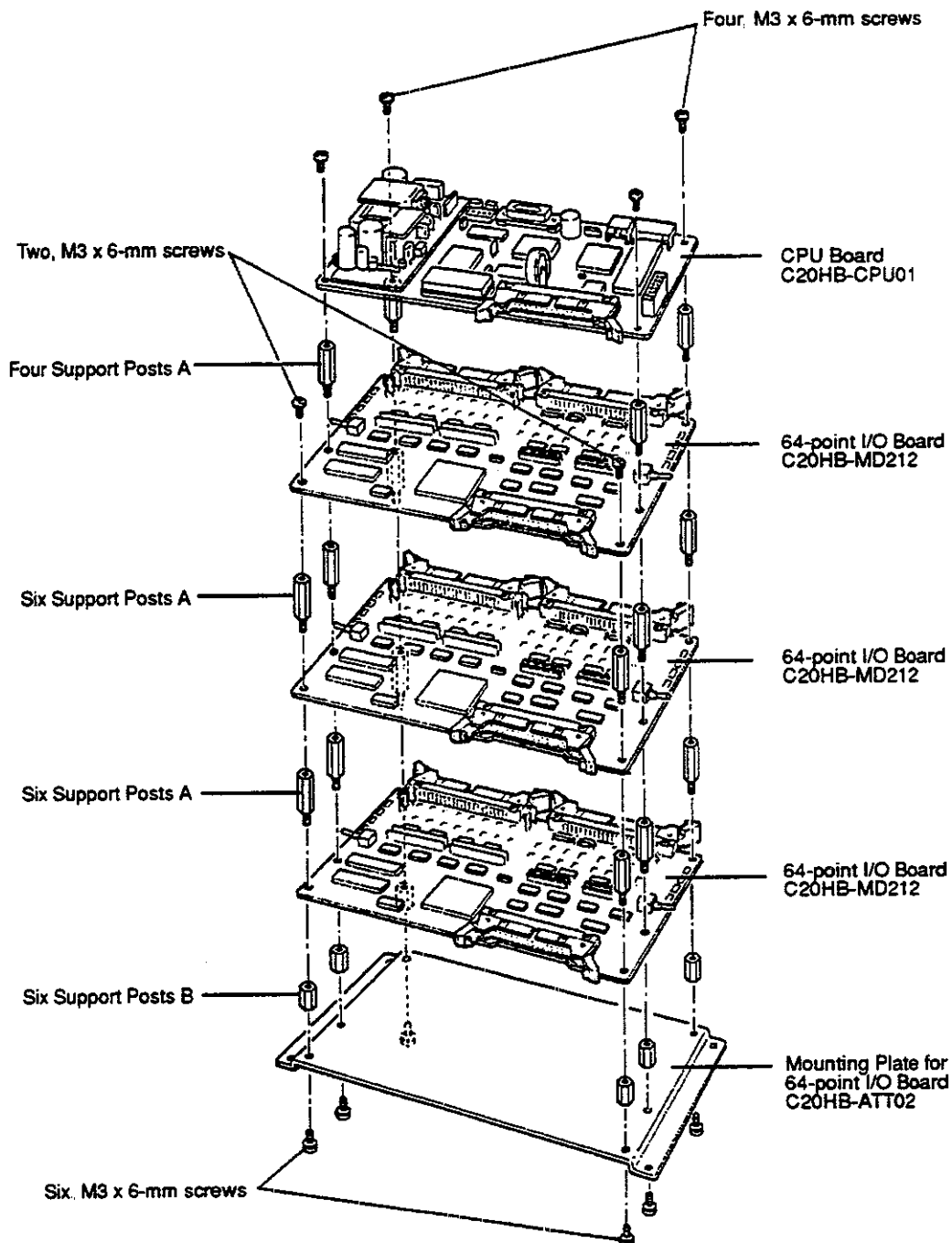
The following diagram shows the output cable wiring. The numbers (00) to (15) indicate input bits 00 to 15, and Wd 0□3 and Wd 0□2 indicate the IR word in which the bits are located.



- Note**
1. Prepare a 5 to 24 VDC power supply for outputs.
 2. The connection diagrams above show basic connection methods. Refer to 2-7 *Safety Considerations* for system design information.

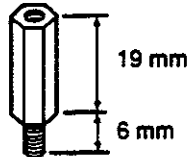

3-1-6 Assembling the Boards

The following examples illustrate assembling a C20HB PC containing one CPU Board and three, 64-point I/O Boards.



Caution Be sure to tighten all screws sufficiently. Loose can result in vibration in the Boards, possibly causing faulty operation or damage.

The following Support Posts and screws are used in this example.

Type	Support Post A	Support Post B
Shape	M3 tap  19 mm 6 mm M3 screw	 10 mm M3 tap
Quantity	16	6
Remarks	Provided with I/O Boards	Provided with Mounting Plate

The following mounting screws are used and are provided with with Mounting Plate:

Twelve, M3 x 6-mm screws

Mounting the PC

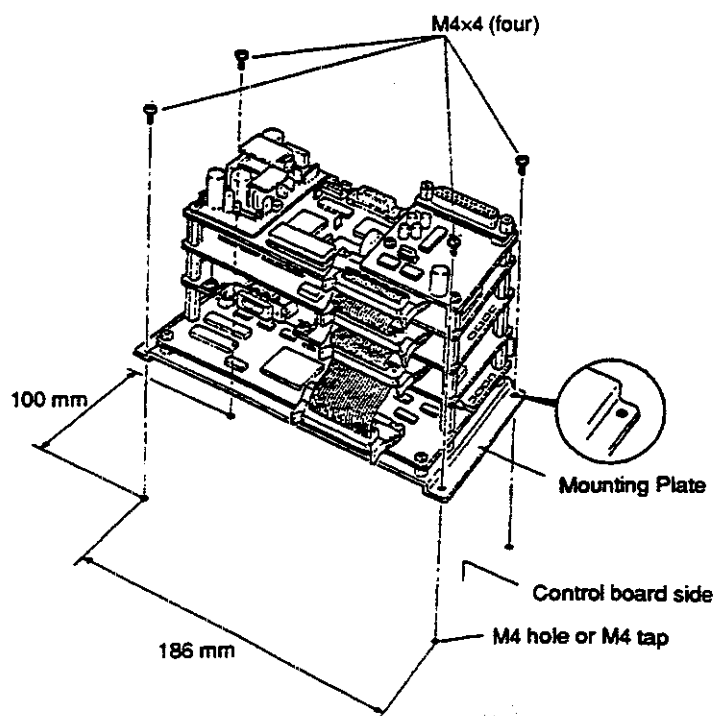
The following example illustrates mounting the assembled PC to a control panel.

3-1-7 PC Installation

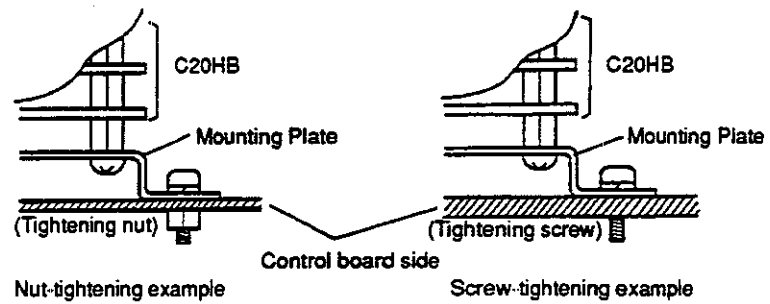
Mounting the PC

The following example illustrates mounting the assembled PC to a control panel.

- 1, 2, 3.... 1. Prepare 4 M3 holes or M3 taps in the surface where the C20HB will be installed.



2. Install the C20HB securely to the mounting surface. Make sure that the screws are tight and won't work loose from vibration.



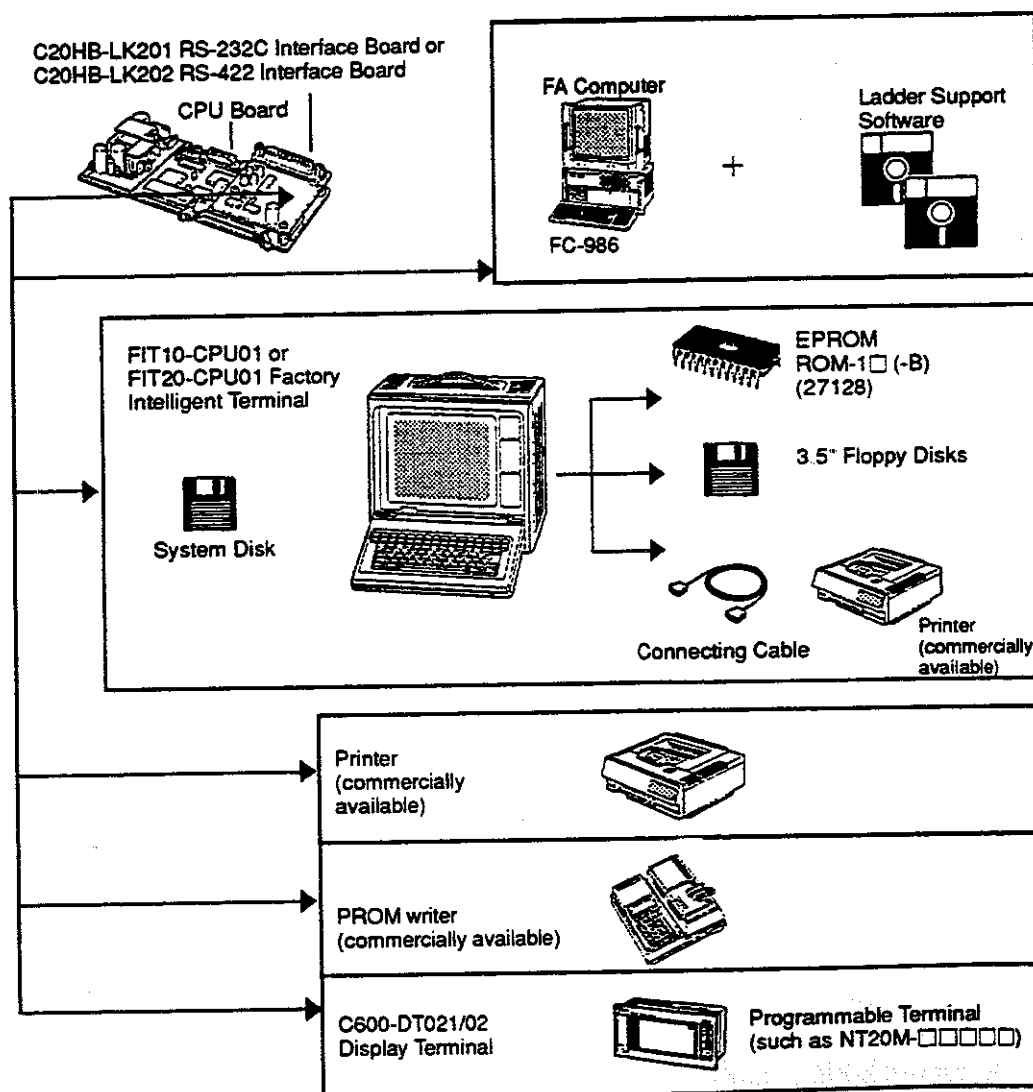
Caution Be sure to tighten all screws sufficiently. Loose can result in vibration in the PC, possibly causing faulty operation or damage.

3-2 RS-232C/RS-422 Interface Boards

3-2-1 System Configuration

An RS-232C or RS-422 Interface Board allows direct communication between the CPU Board and Peripheral Devices. Either Interface Board can be installed. The RS-232C can connect to only one Peripheral Device at a time and has a maximum cable length of 15 m. The RS-422 can connect to several Peripheral Devices and has a maximum cable length of 500 m.

Available Peripheral Devices The following diagram shows the Peripheral Devices that can be connected to the CPU Board through an RS-232C or RS-422 Interface Board.



FA Computer/FIT

An FA computer can be used to write programs, download them to the PC, and then debug the program by monitoring the PC's operating status. (Host Link mode)

PROM Writer

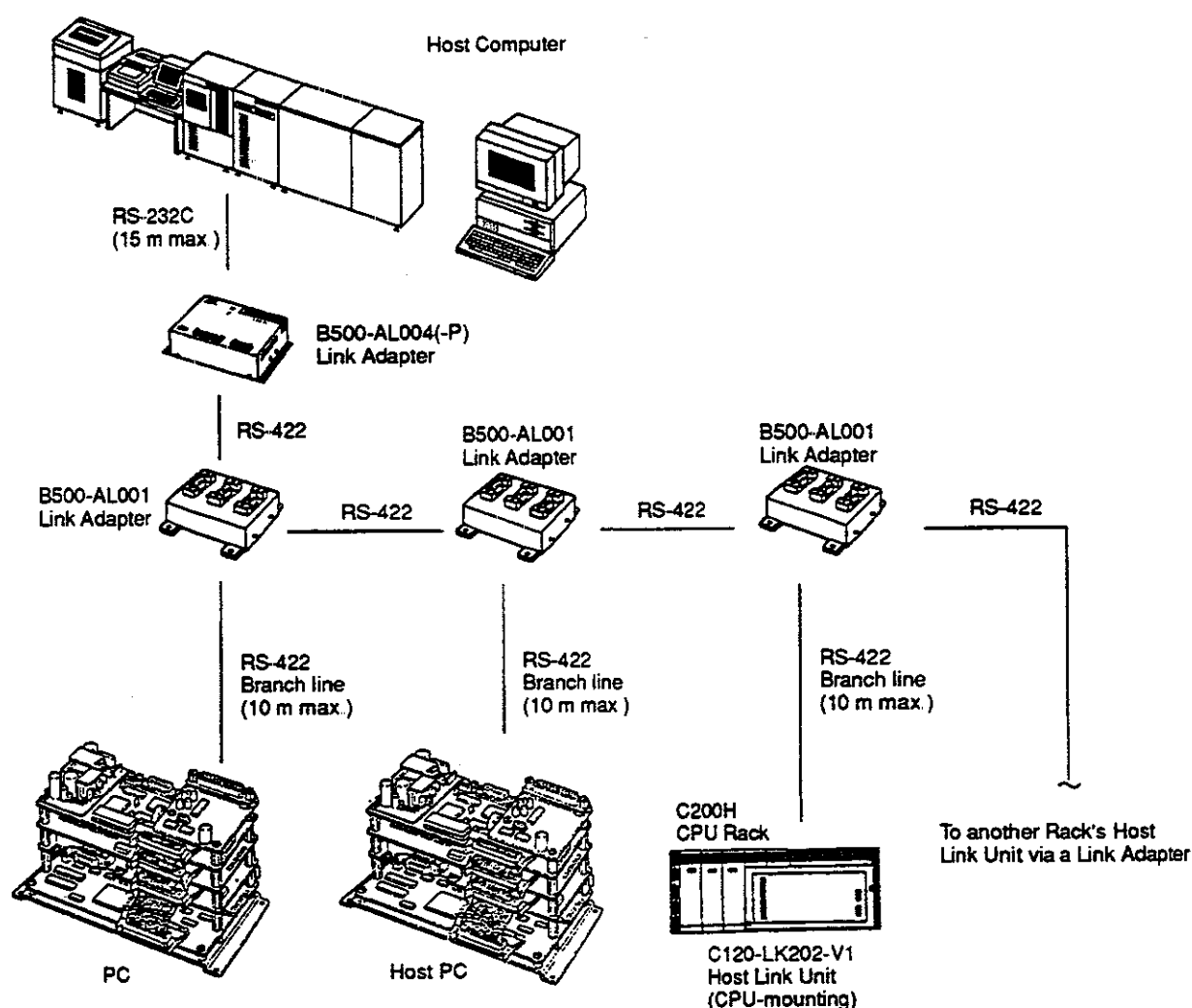
A multi-purpose PROM writer with an RS-232C interface can be used to transfer programs to and from EPROM. (Upload/Download mode)

The AVAL Corporation PKW-1100 and Advantest R4944A PROM Writers are recommended.

Printer	<p>A multi-purpose printer with an RS-232C interface can be used to print out messages, error information, etc. (ASCII I/O mode)</p> <p>The Epson VP-800 and VP-1000 are recommended, although an Epson Interface Board (#8148) is required to connect these printers.</p>
Display Terminal or Programmable Terminal	<p>A Display Terminal or Programmable Terminal can be used to display messages, error information, etc. (ASCII I/O mode)</p>
Other Devices	<p>Devices equipped with RS-232C or RS-422 interfaces can be connected, so a wide variety of devices can be used. (ASCII I/O mode)</p>
Interface Modes/Data Format	<p>There are 3 interface modes, Host Link, Upload/Download, and ASCII I/O. The interface mode is set in System DM. Refer to 8-1 <i>RS-232C Interface Modes</i> and 3-6 <i>DM (Data Memory) Area</i> of the <i>Mini H-type PC Operation Manual</i> for details on setting these modes.</p> <p>The baud rate and data format must match in the PC and connected Peripheral Device. Refer to 3-6 <i>DM (Data Memory) Area</i> of the <i>Mini H-type PC Operation Manual</i> for details on these settings.</p>

3-2-2 Connecting Several Peripheral Devices through RS-422

It is possible to communicate with several Peripheral Devices through the RS-422 Interface. The following diagram shows how to connect several Peripheral Devices using Link Adapters.



The baud rate and data format must match in the PC and connected Peripheral Devices. Refer to 3-6 DM (Data Memory) Area of the *Mini H-type PC Operation Manual* for details on these settings.

A single host computer can be connected to a maximum of 32 PCs and C-series PC Host Link Units.

Cable Length Limitations

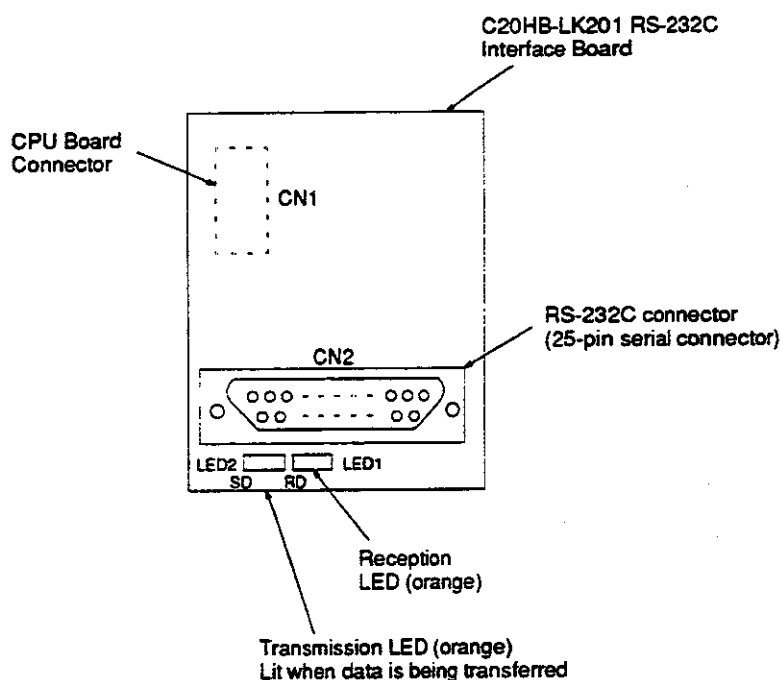
The lengths of RS-422/RS-232C cables are limited as follows:

- 1, 2, 3... 1. The total length of RS-422 cable must be less than 500 m.
2. The length of RS-422 branch cables must be less than 10 m.
3. The length of RS-232C cables must be less than 15 m.

3-2-3 Interface Board Components

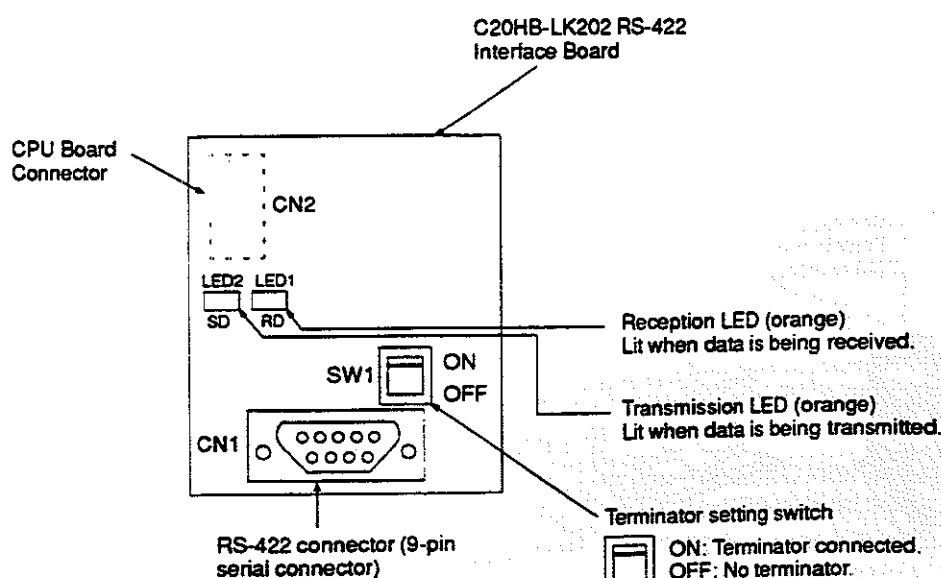
RS-232C Interface Board

The following diagram shows the RS-232C Interface Board components.



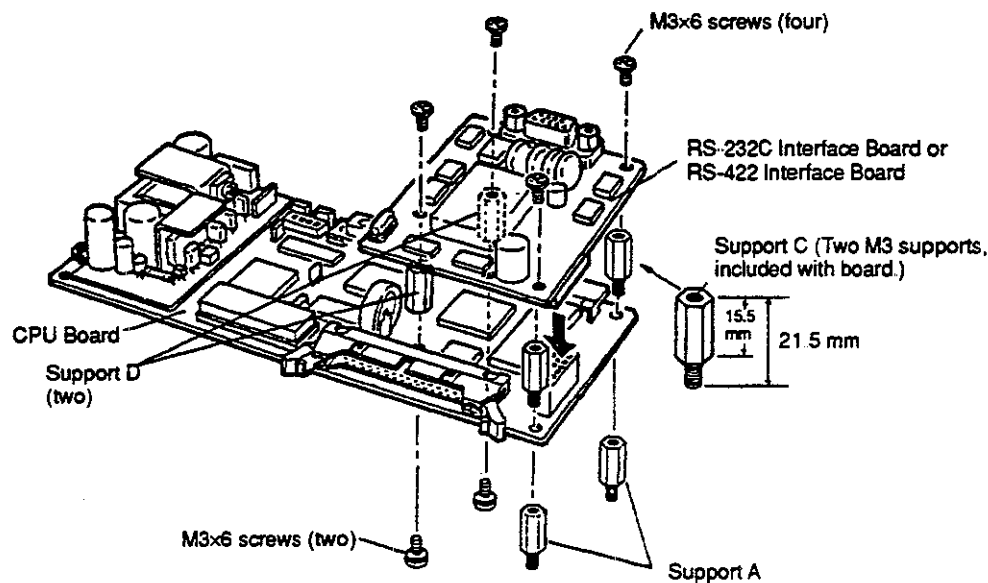
RS-422 Interface Board

The following diagram shows the RS-422 Interface Board components.



3-2-4 Interface Board Installation

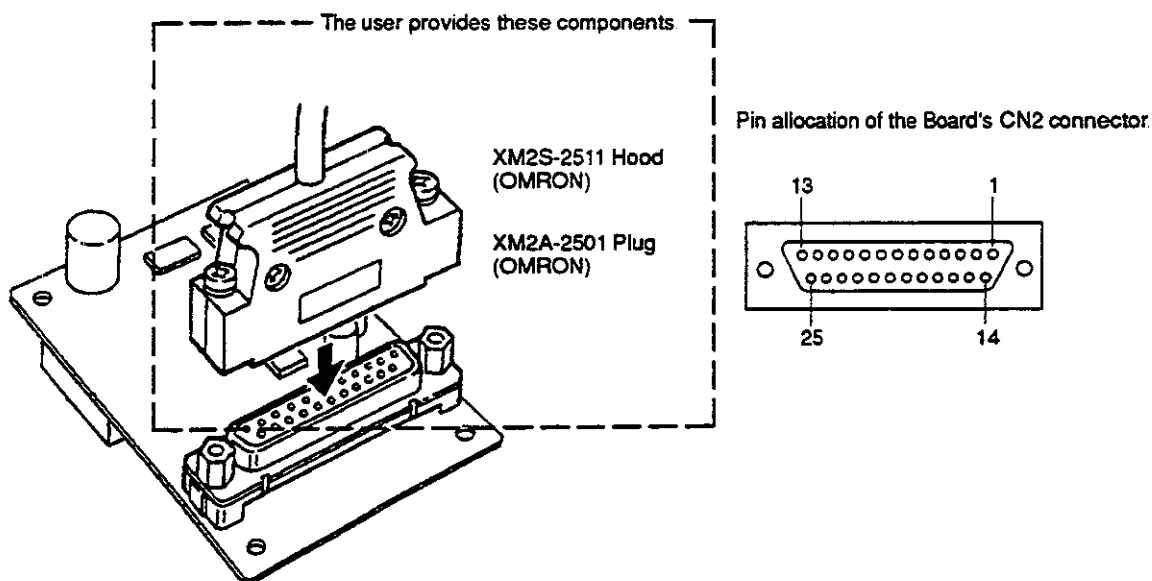
Insert the connector on the soldered side of the Interface Board into the CPU Board and tighten the 4 retaining screws.



3-2-5 Cable Connection

RS-232C Interface Board

The following diagram shows the connecting cable (user-provided) being connected to the RS-232C Interface Board.



Recommended cable: Hitachi Densen
(CO-DS-IREVV-SX-10P × 01.8 mm²)

The following table shows the pin allocation for the RS-232C Interface Board's connector.

Pin	Signal	Signal name	I/O Designation
1	FG	Frame ground	---
2	SD	Sending data	Output
3	RD	Receiving data	Input
4	RS	Request to send	Output
5	CS	Clear to send	Input
6	NC	No contact	---
7	SG	Signal ground	---
8	NC	No contact	---

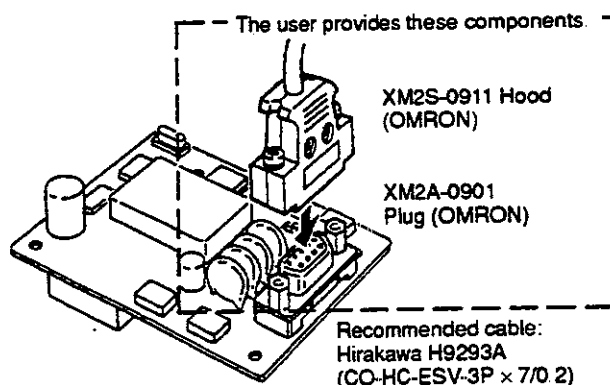
13	NC	No contact	---
14	5 V	5 VDC for optical interface (see note 1)	---
15	NC	No contact	---

25	NC	No contact	---

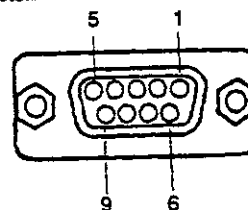
- Note**
1. Do not use the 5V terminal for anything other than an Optical Interface.
 2. The electrical characteristics conform to EIA RS-232C specifications.

RS-422 Interface Board

The following diagram shows the connecting cable (user-provided) being connected to the RS-422 Interface Board.



Pin allocation of the Board's CN2 connector.



The following table shows the pin allocation for the RS-422 Interface Board's connector.

Pin	Signal	Signal name	I/O Designation
1	RDB	Receiving data B	Input
2	NC	No contact	---
3	SG	Signal ground	---
4	NC	No contact	---
5	SDB	Sending data B	Output
6	RDA	Receiving data A	Input
7	FG	Frame ground	---
8	NC	No contact	---
9	SDA	Sending data A	Output

3-2-6 RS-232C Wiring Examples

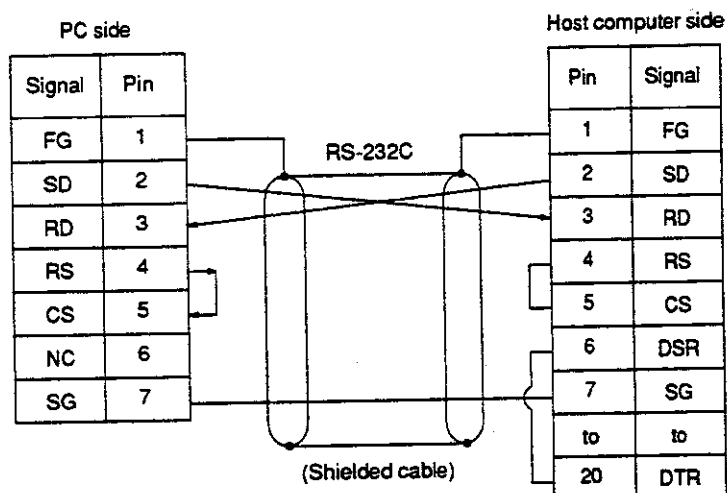
The maximum cable length is 15 m for RS-232C connections. The following cable components are recommended:

- 1, 2, 3... 1. Recommended cable: Hitachi Densen CO-DS-IREVV-SX-10P × 0.18 mm²
2. Recommended connector for the C20HB:
 Plug: OMRON XM2A-2501
 Hood: OMRON XM2S-2511
3. Recommended connector for a host computer or FIT:
 Plug: OMRON XM2A-2501
 Hood: OMRON XM2S-2511

Host Link Mode

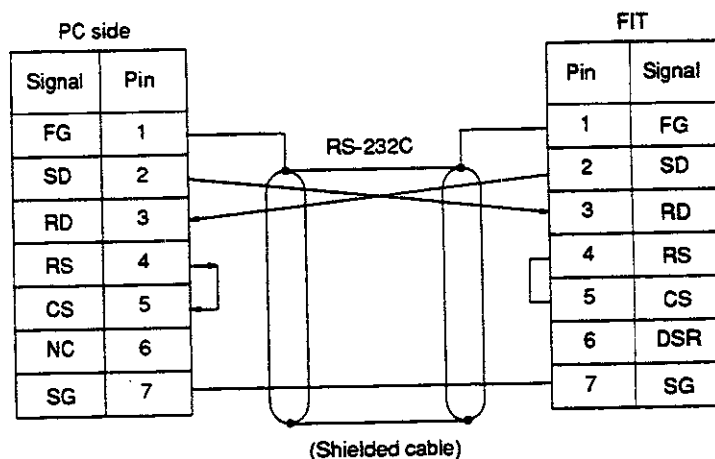
C20HB ↔ Host Computer

The following diagram shows the proper RS-232C wiring for a connection between a C20HB and host computer.



C20HB ↔ FIT

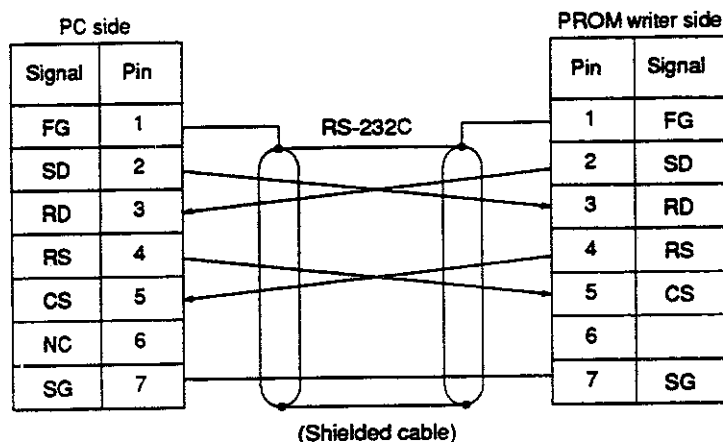
The following diagram shows the proper RS-232C wiring for a connection between a C20HB and FIT.



Upload/Download Mode

C20HB ↔ PROM Writer

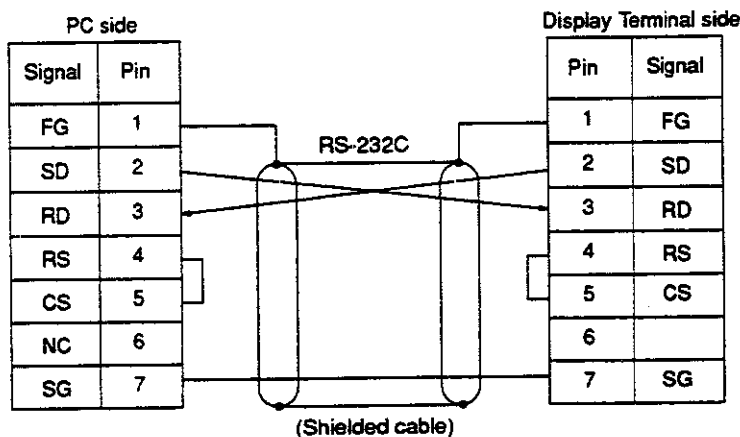
The following diagram shows the proper RS-232C wiring for a connection between a C20HB and PROM Writer.



ASCII I/O Mode

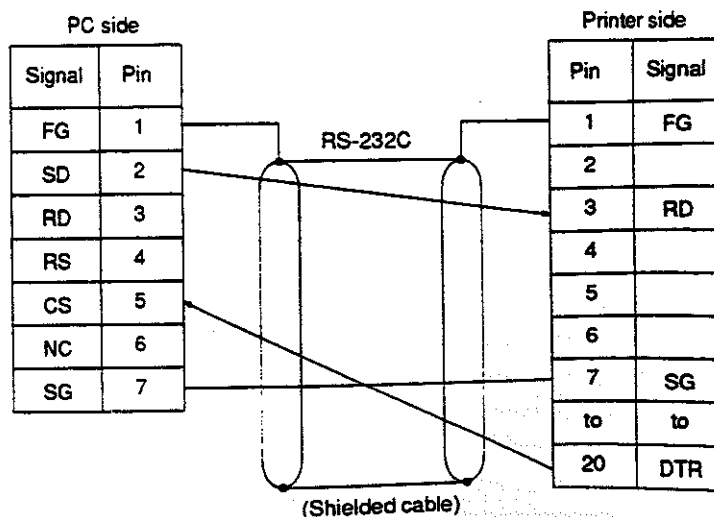
C20HB ↔ Display Terminal

The following diagram shows the proper RS-232C wiring for a connection between a C20HB and C500-DT021/22 Display Terminal



C20HB ↔ Printer

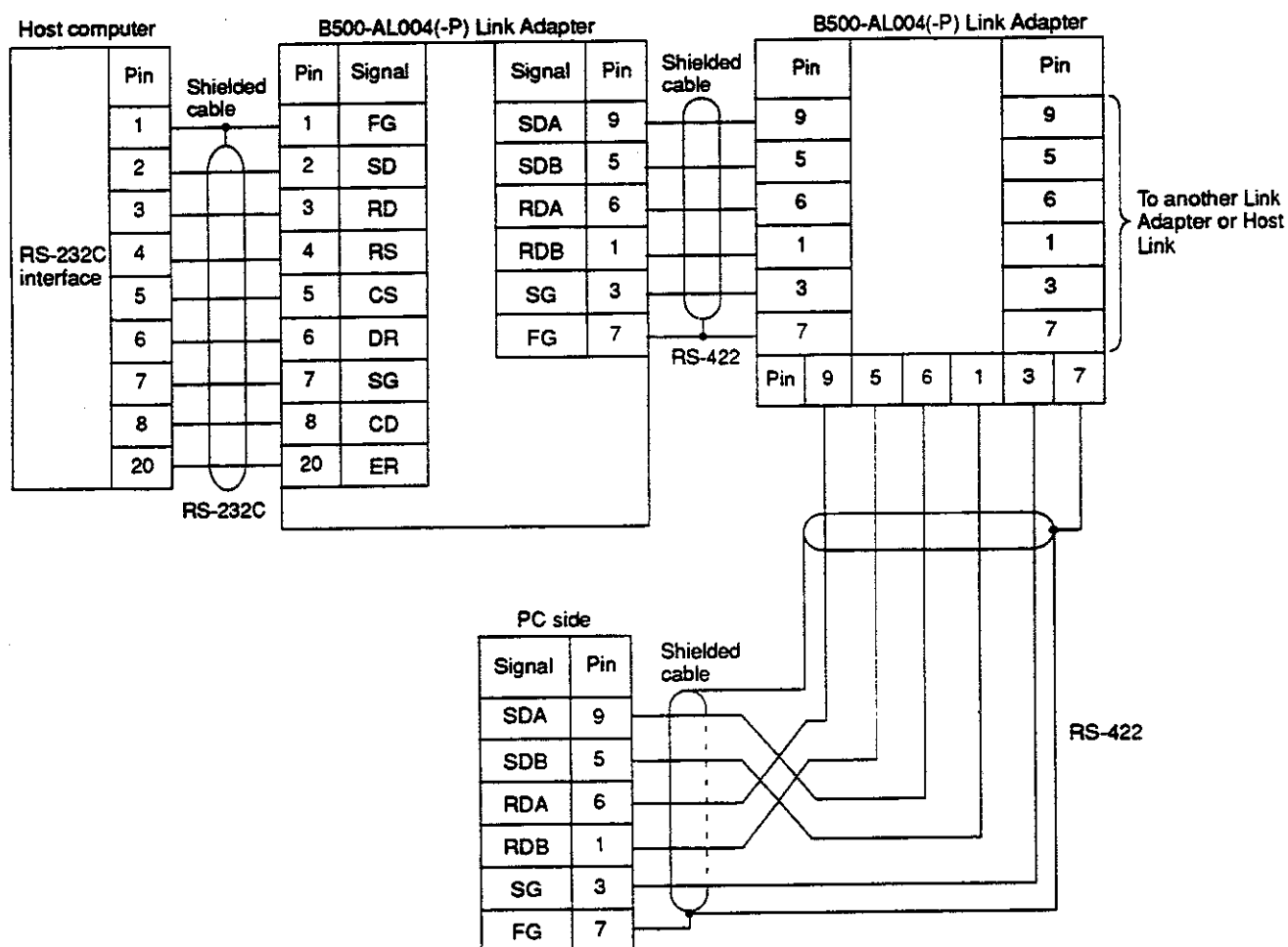
The following diagram shows the proper RS-232C wiring for a connection between a C20HB and commercially available printer.



3-2-7 RS-422 Wiring Example

The maximum cable length is 15 m for RS-232C connections and the maximum total length is 500 m for RS-422 connections. Individual RS-422 branch lines must be less than 10 m.

Refer to the *C-series Link Adapter Manual* for details on the recommended cables and connectors.

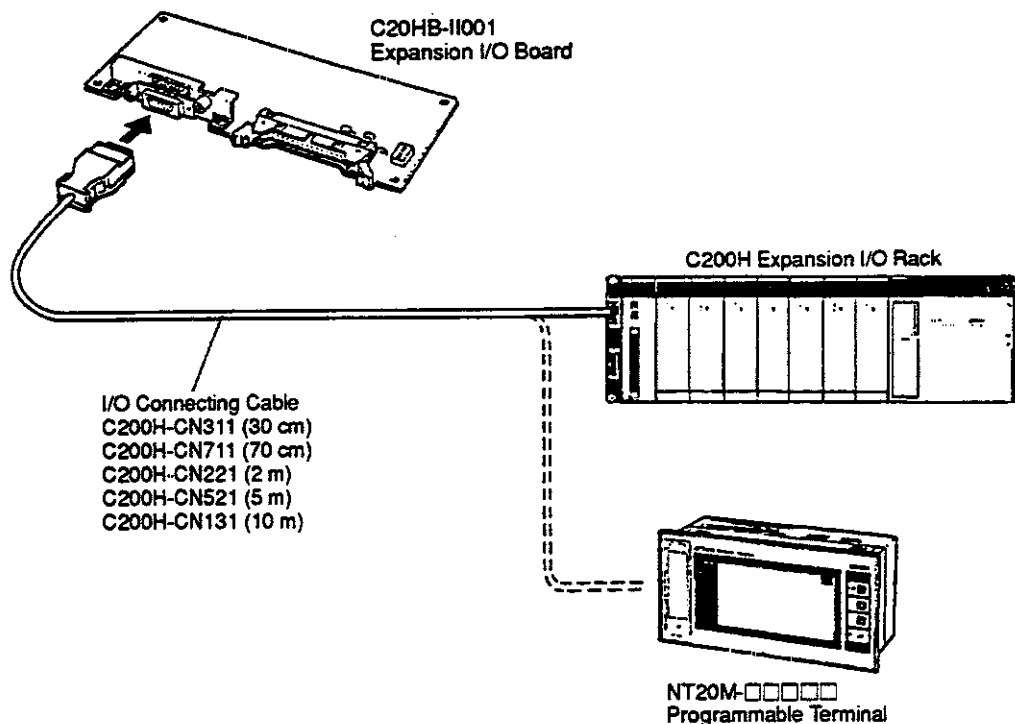


3-3 Expansion I/O Board

3-3-1 System Configuration

An Expansion I/O Board allows direct connection to a single C200H Expansion I/O Rack and access to most of the Units that can be mounted to a C200H Expansion I/O Rack. An NT20M-□□□□□ Programmable Terminal can be connected instead of a C200H Expansion I/O Rack.

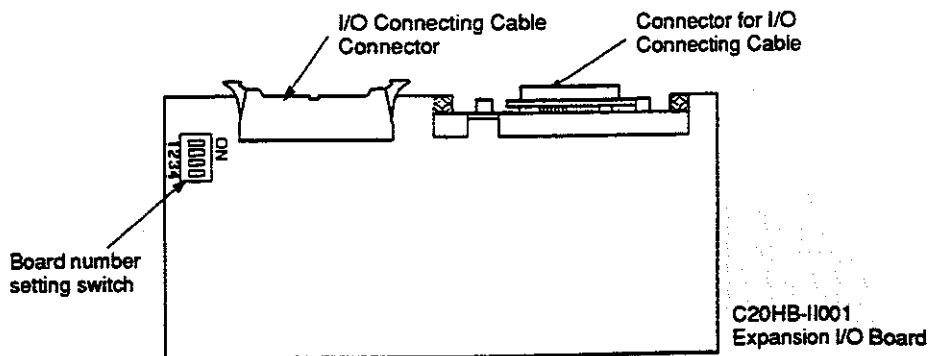
The Expansion I/O Board must be the last Board in the C20HB (furthest from the CPU Board).



- Note**
1. Only one C200H Expansion I/O Rack can be connected to a C20HB.
 2. There are some restrictions on the Units that can be mounted in the C200H Expansion I/O Rack. (For example, a Host Link Unit cannot be mounted.)

3-3-2 Expansion I/O Board Components


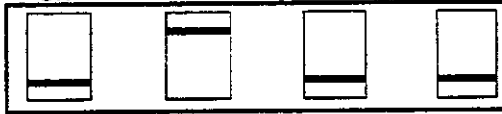

The following diagram shows the Expansion I/O Board components.



Board Number Settings

Set the board number setting switches to indicate the installation position of the Expansion I/O Board relative to the CPU Board, as shown in the following table. The first Board from the CPU Board should be set to "1," the second to "2," etc.

The following table shows board number settings and the corresponding IR words allocated to each Board.

Board number	Switch settings				IR words allocated
	1	2	3	4	
1	ON 				IR 000 to IR 009
2	ON 				IR 010 to IR 019
3	ON 				IR 020 to IR 029

I/O Connecting Cable Connector

Insert the I/O Connecting Cable in this connector.

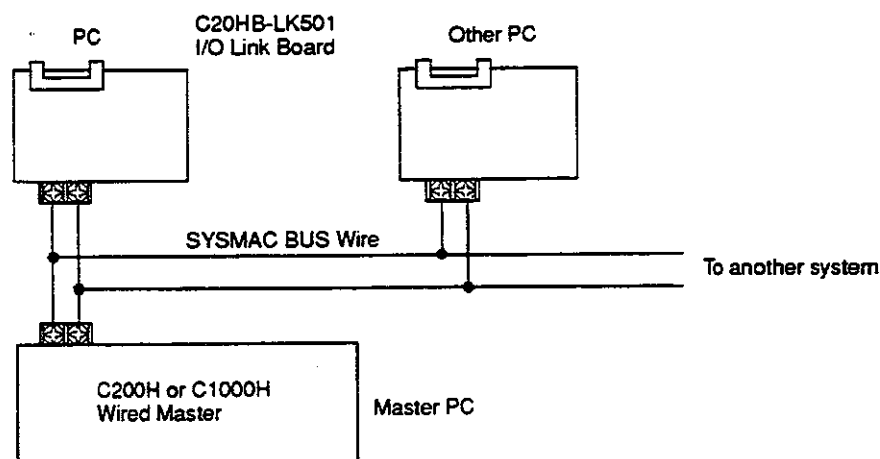
Connector for I/O Connecting Cable

Insert the C200H I/O Connecting Cable in this connector.

3-4 I/O Link Board

3-4-1 System Configuration

An I/O Link Board allows direct connection to a SYSMAC BUS Wired Remote I/O System. The I/O Link Board connects to a Master Unit through a 2-conductor cable and can transfer data on 16 input points and 16 output points.

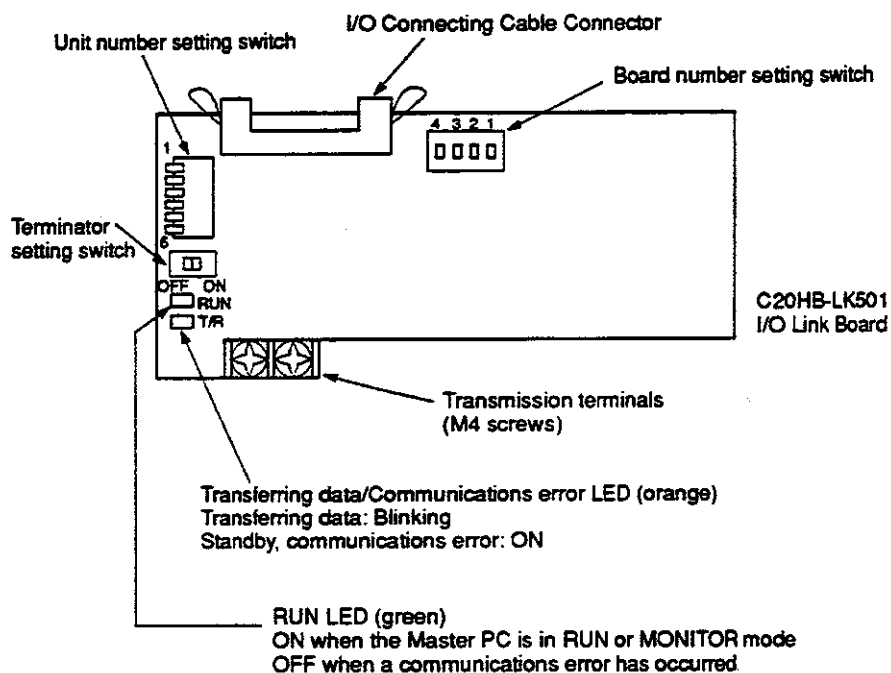


The SYSMAC BUS Wired Remote I/O System transfers through a 2-conductor cable (200 m max.) using the half-duplex, start-stop format and a baud rate of 187.5K baud.

Note Refer to the *Wired Remote I/O System Manual* for more details on Wired Remote I/O Systems.

3-4-2 I/O Link Board Components

The following diagram shows the I/O Link Board components.



Board Number Settings

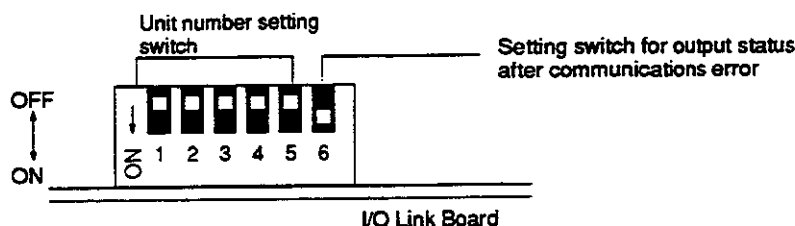
Set the board number setting switches to indicate the installation position of the I/O Link Board relative to the CPU Board, as shown in the following table. The first Board from the CPU Board should be set to "1," the second to "2," etc.

The following table shows board number settings and the corresponding IR words allocated to each Board.

Board number	Switch settings				IR words allocated
	1	2	3	4	
1	ON 				IR 000 to IR 002
2	ON 				IR 010 to IR 012
3	ON 				IR 020 to IR 022

Unit Number and Output Status Settings

The I/O Link Board's unit number is set with the pins 1 to 5 and the output status setting is set with pin 6 of the I/O Link Board's DIP switch, as shown in the following diagram.



Pins 1 to 5 of the DIP switch determine the I/O Link Board's unit number in 5-digit binary, so the possible unit number settings are 0 to 31.

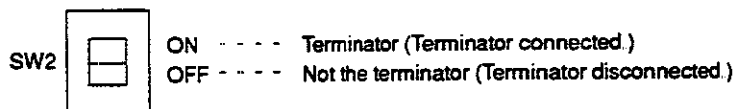
(Pin 1: 2^0 ; Pin 2: 2^1 ; Pin 3: 2^2 ; Pin 4: 2^3 ; Pin 5: 2^4)

Pin 6 of the DIP switch determines the I/O Link Board's output status setting. This setting determines whether output status will be maintained or reset when a communications error occurs.

Pin 6	Setting	Meaning
OFF	Hold outputs	The current output bit status is maintained in the event of a communications error.
ON	Reset outputs	All output bits are turned OFF in the event of a communications error.

Terminator Setting

Turn the terminator switch (SW2) ON if the PC is the terminator of the System. Terminator is connected to the transmission path when the terminator switch is ON.

**3-4-3 Cable Connections****I/O Connecting Cable**

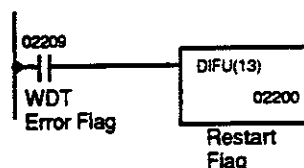
Connect the I/O Link Board's I/O Connecting Cable.

I/O Bit Allocation

The following table shows the usage of IR area words allocated to the I/O Link Board. (\square = board number - 1)

Bit	Word		
	Wd 0□0	Wd 0□1	Wd 0□2
00	Output relays (The status of these bits is transferred to the Remote I/O Master Unit.)	Input relays (The status of these bits is set according to the data transferred from the Remote I/O Master Unit.)	Restart Flag (see note 1)
01			Not used. (Can be used as work bits.)
02			
03			
04			
05			
06			
07			
08			RUN Flag (see note 2)
09			WDT Error Flag (see note 3)
10			Communications Error Flag (see note 4)
11			Not used. (Cannot be used as work bits.)
12			
13			
14			
15			

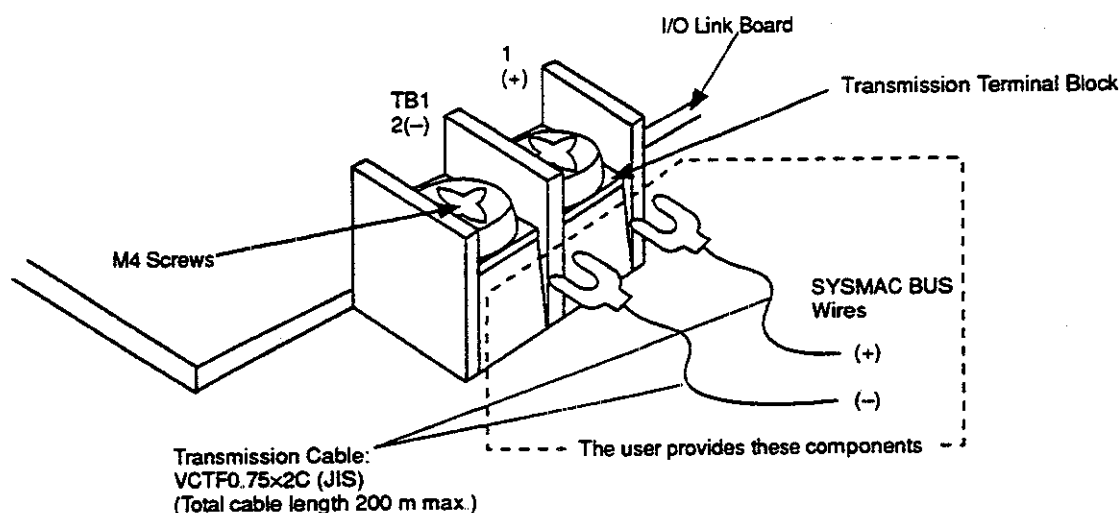
- Note** 1. The Restart Flag is used to restart the Board when it has been shutdown due to a WDT error. This control bit must be turned OFF, ON, and OFF again to restart the Board. The following instruction line will restart Board number 3.



2. The RUN Flag will be ON when the Master PC is in RUN or MONITOR mode and a communications error hasn't occurred. (The RUN Flag and RUN LED indicate the same information.)
3. The WDT Error Flag indicates that the Board has been shutdown due to a WDT error.
4. This flag will be ON when an error has occurred during communications with the Master PC.

Transmission Cable

Connect the 2-conductor transmission cable as shown in the following diagram.



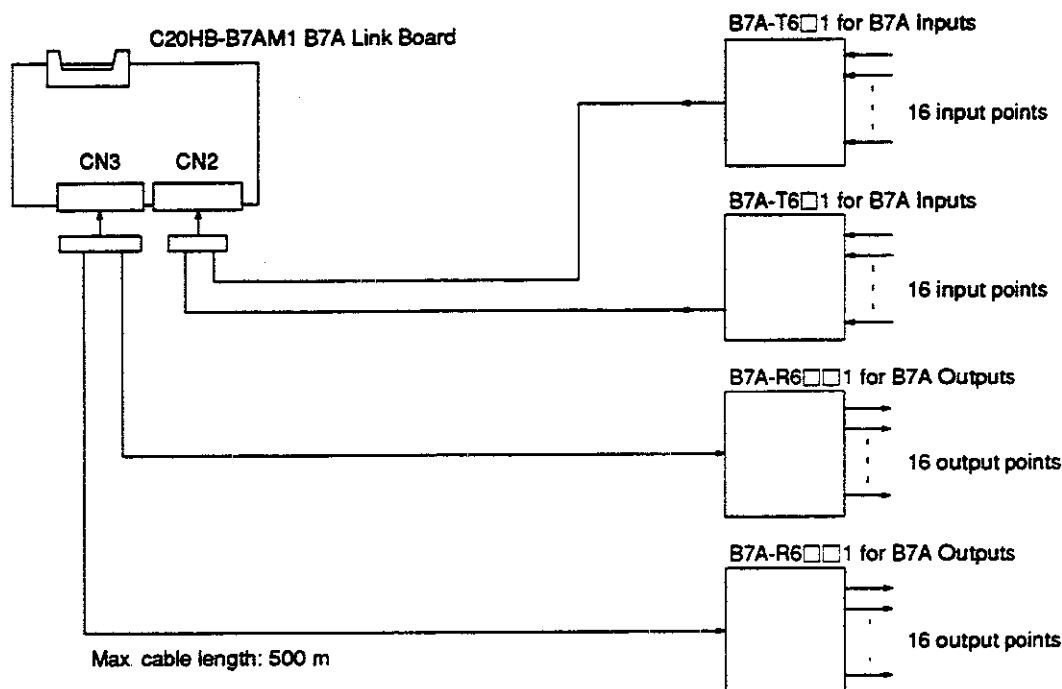
3-4-4 Assembly

The I/O Link Board is the same size as the 32-point I/O Board. Refer to 2-3 Board Assembly and Cable Connections for details on assembly.

3-5 B7A Link Board

3-5-1 System Configuration

A B7A Link Board allows direct connection to distant B7A Link Terminals with several signal wires. This method reduces wire usage.

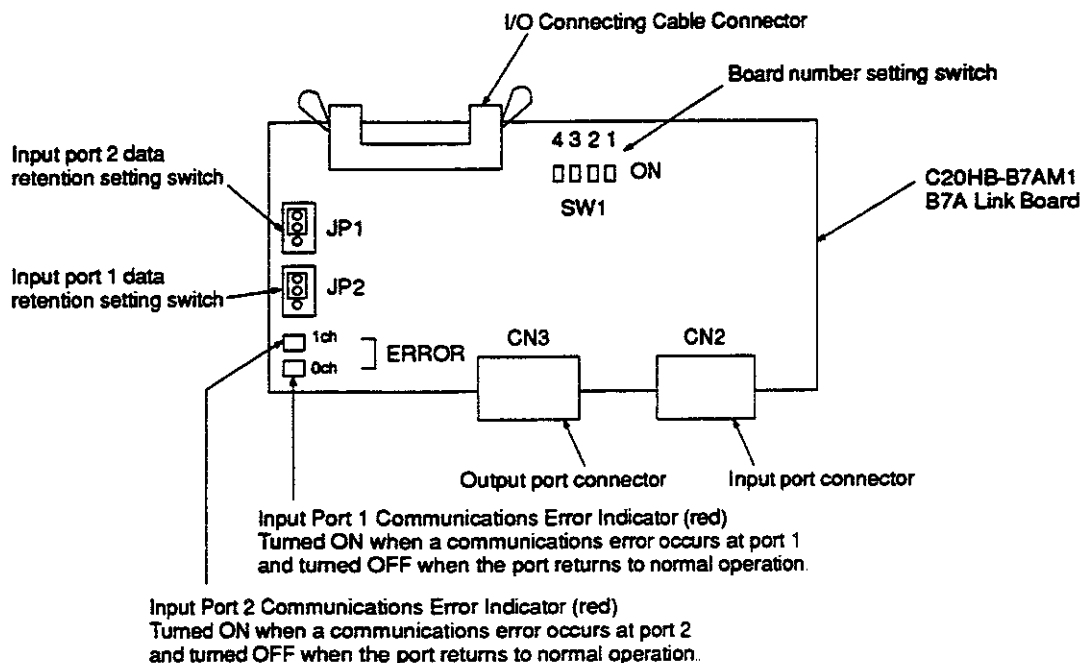


Wiring is reduced between the C20HB and the device to which the B7A Link Terminal is mounted. The B7A Link Terminal (for inputs) receives the input signals from 16 inputs, converts the signal from parallel to series, and transmits the data to the B7A Link Board. The B7A Link Terminal (for outputs) receives a serial signal from the B7A Link Board, converts the signal to parallel, and outputs the data to 16 outputs.

- Note**
1. There is some transmission delay since the B7A Link Terminal converts signals between serial and parallel. The standard response time is 19.2 ms.
 2. The 16-point type B7A Link Terminal with a 19.2 ms response time is the only Link Terminal that can be connected to the C20HB. The high-speed 10-point and 32-point Link Terminals cannot be connected.

3-5-2 B7A Link Board Components

The following diagram shows the B7A Link Board components.



Board Number Settings

Set the board number setting switches to indicate the installation position of the B7A Link Board relative to the CPU Board, as shown in the following table. The first Board from the CPU Board should be set to "1," the second to "2," etc.

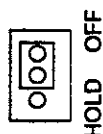
The following table shows board number settings and the corresponding IR words allocated to each Board

Board number	Switch settings				IR words allocated
	1	2	3	4	
1	ON 				IR 000 to IR 004
2	ON 				IR 010 to IR 014
3	ON 				IR 020 to IR 024

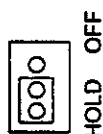
Input Data Retention Settings

The settings on jumper pins JP1 and JP2 determine the B7A Link Board's input data retention settings. These settings determine whether the input status will be retained or discarded when a communications error occurs in port 1 or 2.

When the jumper pin is set to OFF, as shown below, the data will be discarded when a communications error occurs in the corresponding port.



When the jumper pin is set to HOLD, as shown below, the data will be retained when a communications error occurs in the corresponding port.



Note When the error is caused by a power interruption at the B7A Link Terminal, all zeroes will be transmitted on the first transmission cycle after power is restored to the B7A Link Terminal.

3-5-3 Cable Connections

I/O Connecting Cable

Connect the B7A Link Board's I/O Connecting Cable

I/O Bit Allocation

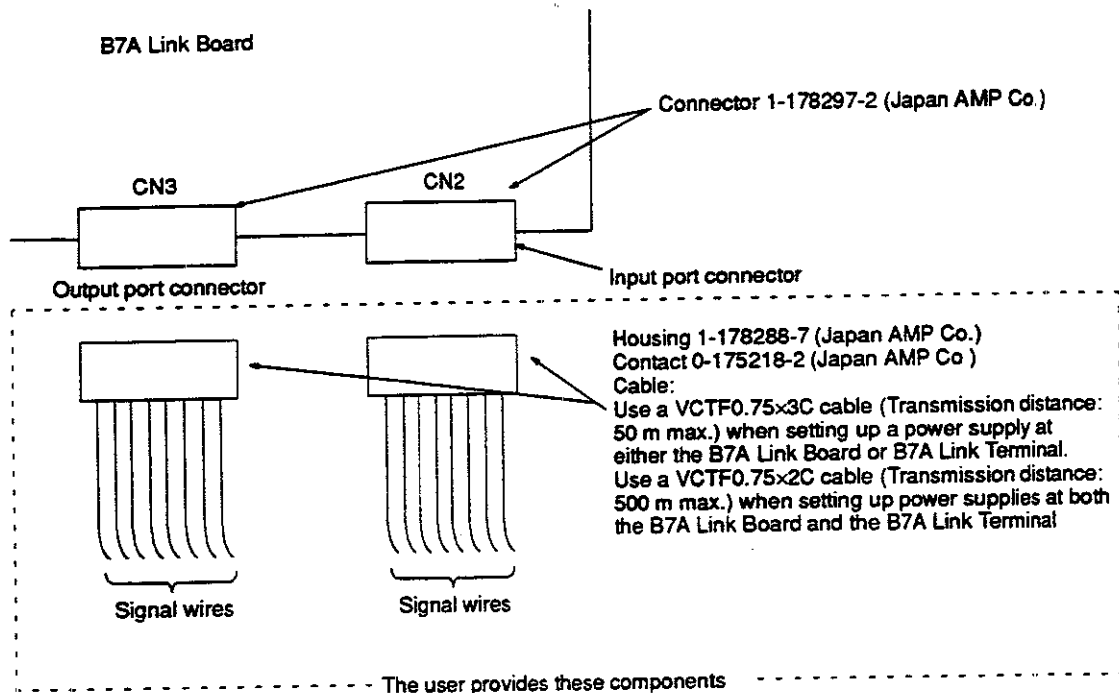
The following table shows the usage of IR area words allocated to the B7A Link Board. (□ = board number - 1)

Bit	Word				
	Wd 0□0	Wd 0□1	Wd 0□2	Wd 0□3	Wd 0□4
00	Input port 1 input bits The status of these bits is set according to the data transferred from the B7A Link Terminal inputs.	Input port 2 input bits The status of these bits is set according to the data transferred from the B7A Link Terminal inputs.	Output port 1 output bits The status of these bits is output to the B7A Link Terminal outputs.	Output port 2 output bits The status of these bits is output to the B7A Link Terminal outputs.	Input port 1 Communications Error Flag (See note)
01					Input port 2 Communications Error Flag (See note)
02					Not used. (Cannot be used as work bits.)
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					

Note A Communications Error Flag is turned ON when a communications error occurs with the corresponding port, and is turned OFF when communications return to normal.

Signal Wires

Connect the signal wires as shown in the following diagram.



Connector Pin Allocation

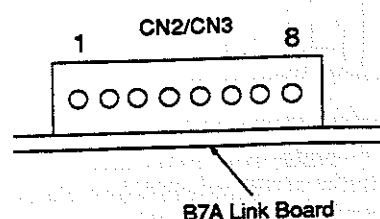
The following tables show the allocation of pins in connectors CN2 and CN3.

CN2

Pin	Signal name	Remarks
8	24 VDC	Power supply for the input port's communications circuit
7	0 V	
6	24 VDC	Power supply for the B7A Link Terminal
5	Input port 1 signal	---
4	0 V	---
3	24 VDC	Power supply for the B7A Link Terminal
2	Input port 2 signal	---
1	0 V	---

CN3

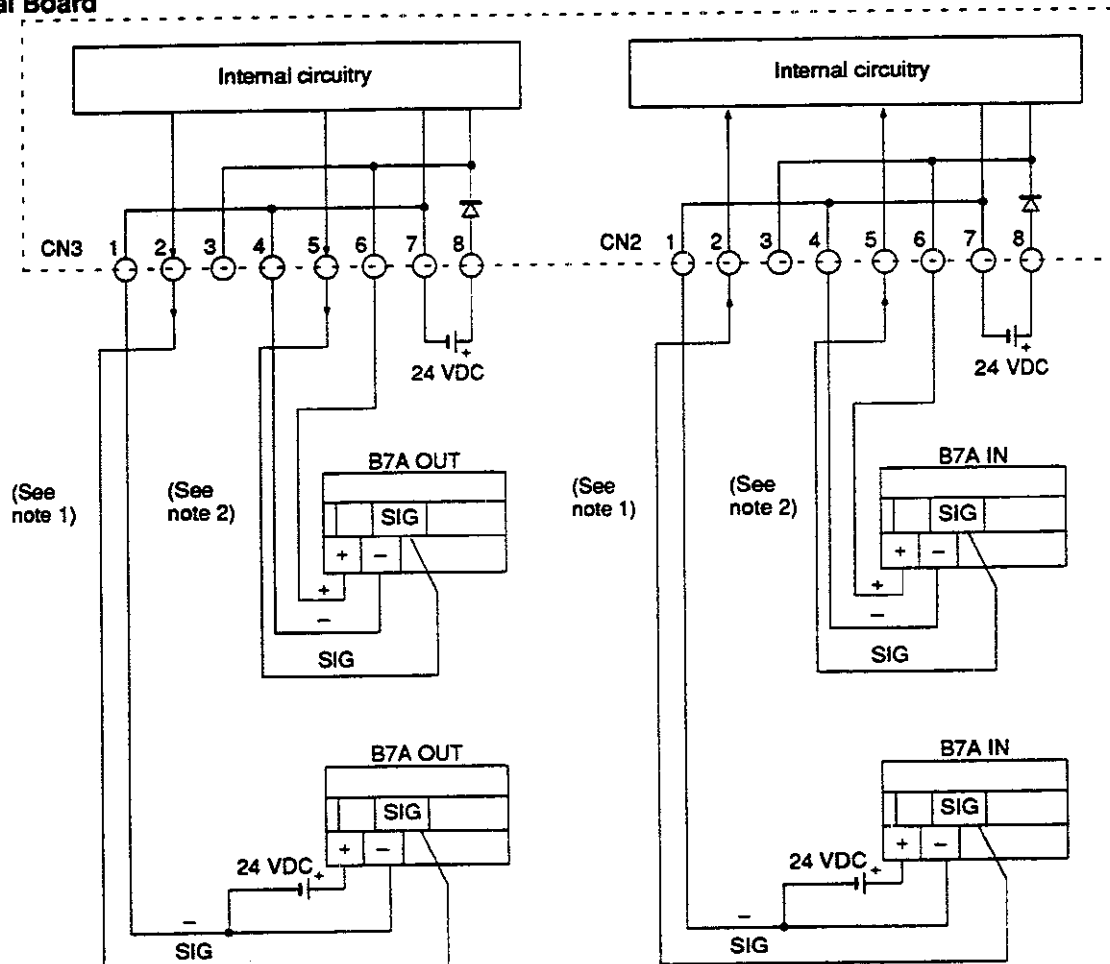
Pin	Signal name	Remarks
8	24 VDC	Power supply for the output port's communications circuit
7	0 V	
6	24 VDC	Power supply for the B7A Link Terminal
5	Output port 1 signal	---
4	0 V	---
3	24 VDC	Power supply for the B7A Link Terminal
2	Output port 2 signal	---
1	0 V	---



- Note**
1. Always use pins 7 (-) and 8 (+) to supply 24 VDC power to the B7A Link Board's I/O port transmission circuit.
 2. Use pins 3 and 6 when supplying 24 VDC power to the B7A Link Terminals. Do not connect a 24 VDC power supply here.

Wiring to the B7A Link Terminal Board

The diagram shows the wiring to the B7A Link Terminal Board.



- Note**
1. The maximum transmission distance is 500 m when separate power supplies are provided for the B7A Link Board and B7A Link Terminal.
 2. The maximum transmission distance is 50 m when a power supply is provided for either the B7A Link Board or the B7A Link Terminal.

SECTION 4

Specifications and Dimensions

This section provides specifications and dimensions for the various C20HB Boards.

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4-1 General Specifications and Dimensions

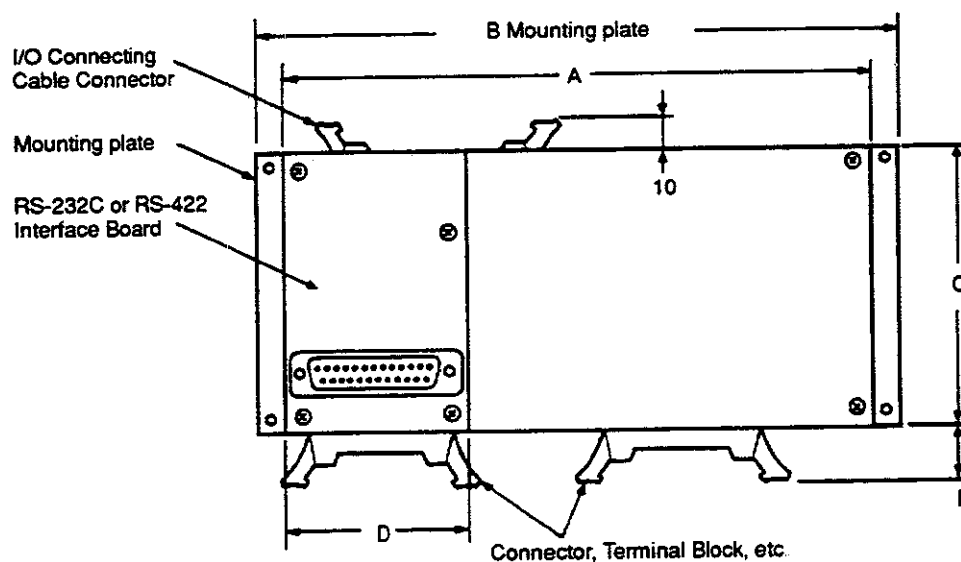
4-1-1 General Specifications

Item	Specifications
Power supply voltage	24 VDC
Power supply voltage range	20.4 to 26.4 VDC
Power consumption	20 W max.
Insulation resistance	20 M Ω between external terminals and FG (at 500 VDC)
Dielectric strength	1,000 VAC 50/60 Hz for 1 minute between external terminals and FG, leakage current 10 mA max.
Noise resistance	1,000 V _{p-p} , pulse width of 100 ns to 1 μ s, 1 ns rise time
Vibration resistance	10 to 35 Hz, 1 mm total amplitude for 2 hours in each direction
Shock resistance	10 G (98 m/s ²) 3 times in each direction
Operating temperature range	0° to 55°C
Operating humidity range	35% to 85% RH (no condensation)
Surrounding air	No corrosive gases
Storage temperature range	-20° to 65°C
Ground	Ground to 100 Ω or less

4-1-2 Dimensions

C20HB Board Dimensions

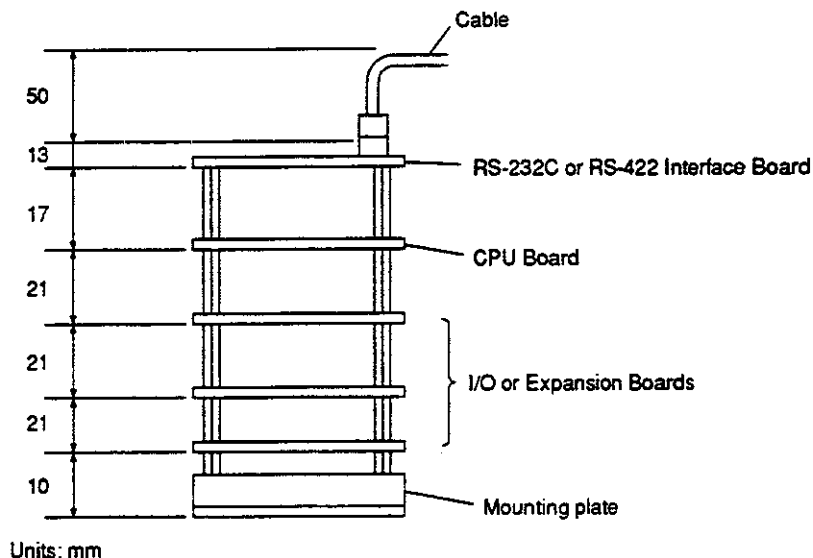
The dimensions of each C20HB Board are different. The following diagram shows the basic dimensional measurements taken for each Board. These dimensions are shown in a table following the diagram.



Board model	A	B	C	D	E
C20HB-CPU01 CPU Board	174 mm	196 mm	80 mm	---	0 mm
C20HB-MD211 32-point I/O Board	174 mm	196 mm	80 mm	---	20 mm
C20HB-MD212 64-point I/O Board	174 mm	196 mm	110 mm	---	20 mm
C20HB-II001 Expansion I/O Board	174 mm	196 mm	80 mm	---	0 mm
C20HB-LK501 I/O Link Board	174 mm	196 mm	80 mm	---	20 mm
C20HB-B7AM1 B7A Interface Board	174 mm	196 mm	80 mm	---	20 mm
C20HB-LK201 RS-232C Interface Board	---	---	80 mm	55 mm	---
C20HB-LD202 RS-422 Interface Board	---	---	80 mm	60 mm	---

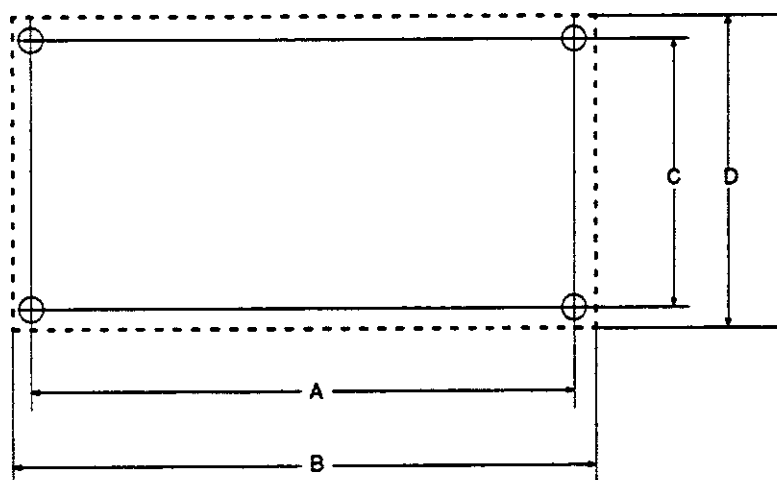
C20HB Board Heights

The following diagram shows the height that each kind of C20HB Board adds to a C20HB PC.



PC Installation Footprint

The following diagram shows the "footprint" measurements taken for each Mounting Plate (for 32-point or 64-point Boards). These dimensions are shown in a table following the diagram.



	A	B	C	D
C20HB-ATT01 Mounting Plate for 32-point Board	186 mm	196 mm	70 mm	80 mm
C20HB-ATT02 Mounting Plate for 64-point Board	186 mm	196 mm	100 mm	110 mm

4-2 Specifications of C20HB Boards

4-2-1 C20HB-CPU01 CPU Board

Item	Specifications
Control method	Stored program method
I/O control method	Both cyclic scan and immediate interrupt processing are available.
Programming method	Ladder chart
Instruction length	1 step/instruction, 1 to 4 words/instruction
Instruction group	137 instructions

Item	Specifications	
Execution time	0.75 to 2.25 μ s for basic instructions	
Program capacity	2,878 words or 6,974 words depending on the kind of memory used. (RAM, EPROM, and EEPROM are available.)	
Internal Relay area (I/O points)	32 to 192 points depending on the board configuration used. (IR 00000 to IR 03915)	
Internal Relay area (work bits)	3,472 points (IR 03000 to IR 24615)	
Special Relay area	SR 24700 to SR 25507 (136 bits) The SR area contains flags, control bits, and clock pulses. For example the SR area contains the Always ON Flag, Always OFF Flag, Battery Error Flag (See note.), and the 0.1 s, 0.2 s, and 1.0 s clock pulses.	
Holding Relay area	1,600 points (HR 0000 to HR 9915)	
Temporary Relay area	8 points (TR 0 to TR 7)	
Auxiliary Relay area	448 points (AR 0000 to AR 2715)	
Link Relay area	1,024 points (LR 0000 to LR 6315)	
Timer/Counter area	TC 000 to TC 511 (512 timers and counters) Timer range: 0 to 999.9 s; High-speed timer range: 0 to 99.99 s; Counter range: 0 to 9,999	
Data Memory area	Read/write	DM 0000 to DM 0999 (1000 words) DM 0900 to DM 0999 is System DM.
	Read	DM 1000 to DM 1999 (1000 words) DM 1900 to DM 1999 is System DM.
Data retention functions	The contents of the HR area, AR area, DM area, and counters are retained during power interruptions. The data will be retained for up to 20 days (at 25°C) after PC power goes off. (When an optional Battery Set has been installed data will be retained until the battery is dead.)	
Battery life (battery optional)	<ul style="list-style-type: none"> The battery life is 5 years at 25°C. The lifetime will be shorter with higher ambient temperatures. Replace the battery within one week after the battery error indicator (ALM LED) begins blinking. To ensure data retention, the new battery must be in place within 5 minutes after removing the old one. 	
Self-diagnosis functions	CPU error (watchdog timer), I/O bus error, Host Link error, memory error, battery error (See note.), etc.	
Program check function	<ul style="list-style-type: none"> Program checks (Items checked when starting program execution.) Check for no end instruction error, instruction error. Check the program using a Programming Console. Three levels of program checking are available. 	
RS-232C interface (optional)	<ul style="list-style-type: none"> Either can be used. Transmission method: half duplex Synchronization method: start-stop Baud rates: 300, 600, 1200, 2400, 4800, 9600 bps Transmission distance: 15 m max. (RS-232C); 500 m max. (RS-422) 	
RS-422 interface (optional)		
Analog timer input (user-provided)	The user can connect up to 4 analog volume inputs	
Current consumption	5 VDC, 150 mA max. 5 VDC, 180 mA max. (when an RS-232C Interface Board is installed) 5 VDC, 350 mA max. (when an RS-422 Interface Board is installed) Note: Add 150 mA when a Programming Console is connected.	
Weight	200 g max. 250 g max. (when an RS-232C Interface Board is installed) 260 g max. (when an RS-422 Interface Board is installed)	

Note The battery error is valid only when an optional Battery Set has been installed.

4-2-2 I/O Boards (C20HB-MD211 and C20HB-MD212)

The following table shows specifications of the C20HB-MD211 32-point I/O Board and the C20HB-MD212 64-point I/O Board.

Item	DC Inputs		Transistor Outputs		
	Input voltage	Input impedance	Maximum switching capacity	C20HB-MD211	C20HB-MD212
Input voltage	24 VDC $\pm 10\%$ / -15%	5.6 k Ω	Leakage current	16 mA/4.5 V min. 100 mA/26.4 V 800 mA/common 1.6 A/board	16 mA/4.5 V min. 100 mA/26.4 V 800 mA/common 3.2 A/board
Input impedance	5.6 k Ω	4.1 mA TYP. (24 VDC)			
Input current	4.1 mA TYP. (24 VDC)	16 VDC min.			
ON voltage	16 VDC min.	5 VDC max.	Residual voltage	0.1 mA max.	0.7 V max.
OFF voltage	5 VDC max.	2.5 ms max.	ON response time	0.2 ms max.	0.6 ms max.
ON response time	2.5 ms max.	2.5 ms max.	OFF response time	0.6 ms max.	
OFF response time	2.5 ms max.				
Number of circuits	C20HB-MD211	C20HB-MD212	Number of circuits	C20HB-MD211	C20HB-MD212
	16 points (2 independent commons with 8 points each)	32 points (4 independent commons with 8 points each)		16 points (2 independent commons with 8 points each)	32 points (4 independent commons with 8 points each)
			Fuse	1 fuse/common	
			External power supply	C20HB-MD211 5 to 24 VDC $\pm 10\%$, 55 mA min. (3.4 mA \times number of ON points)	C20HB-MD212 5 to 24 VDC $\pm 10\%$, 110 mA min. (3.4 mA \times number of ON points)
Internal current consumption	5 VDC 200 mA max. (C20HB-MD211) 5 VDC 370 mA max. (C20HB-MD212)				
Weight	100 g max. (C20HB-MD211) 140 g max. (C20HB-MD212)				
Circuit configuration	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Input</p> </div> <div style="text-align: center;"> <p>Output</p> </div> </div> <p>The polarity of the 24 VDC Power Supply can be connected in either direction, so either PNP (negative common) or NPN (positive common) inputs can be used</p>				

Item	DC Inputs	Transistor Outputs
Terminal connections	C20HB-MD211 Output 	Input
	C20HB-MD212 Output 	Input

4-2-3 C20HB-II001 Expansion I/O Board

Item	Specifications
Current consumption	5 VDC 10 mA max.
Weight	100 g max.

4-2-4 C20HB-LK501 I/O Link Board

Communications method	Two-wire half duplex
Synchronization method	Start-stop
Transmission path	2-conductor cable
Interface	RS-485 (insulated)
Baud rate	187.5K bps
Transmission distance	200 m max.
Transmission points	32 points (16 input points + 16 output points)
Current consumption	5 VDC 210 mA max.
Weight	110 g max.
Diagnostic functions	<ul style="list-style-type: none"> Communications error check CPU error (watchdog timer error)
Error information	Transmitting, polling out, watchdog timer output to CPU board
Indicators	RUN, transmitting/communications error indicated with LEDs.

4-2-5 C20HB-B7AM1 B7A Link Board

Item	Specifications
Transmission method	One-way time-sharing multiplex transmission (insulated)
Transmission distance	500 m max.
Transmission delay	TYP. 19.2 mS 31 mS max.
Number of transmission ports	4 ports (two 16-point input ports and two 16-point output ports)
Current consumption	5 VDC 50 mA max., 24 VDC 50 mA max.
Weight	130 g max.
Error processing	The hold/load off jumper pin setting determines whether output status is maintained or turned off when an input port transmission error occurs.
Indicators	Input port communicating/transmission error indicated by LED.

4-2-6 C20HB-LK201 RS-232C Interface Board

Item	Specifications
Communications method	Half duplex
Synchronization method	Start-stop
Interface	RS-232C (non-insulated)
Baud rate	Select 300, 600, 1200, 2400, 4800, or 9600 bps.
Transmission distance	15 m max.
Current consumption	5 VDC 30 mA max.
Weight	50 g max.
Indicators	Receiving data, sending data indicated by LED.

4-2-7 C20HB-LK202 RS-422 Interface Board

Item	Specifications
Communications method	Half duplex
Synchronization method	Start-stop
Interface	RS-422 (Insulated)
Baud rate	Select 300, 600, 1200, 2400, 4800, or 9600 bps.
Transmission distance	500 m max.
Current consumption	5 VDC 200 mA max.
Weight	60 g max.
Indicators	Receiving data, sending data indicated by LED.

4-3 IR Bit Allocation to C20HB Boards

4-3-1 C20HB-MD211 32-point I/O Board

Bit	Word	
	Wd 0□0	Wd 0□1
00	Input bits	Output bits
01		
02		
03		
...		
15		

- Note**
1. The blank "□" symbol equals the board number – 1.
 2. IR 0□2 through IR 0□9 can be used as work words.

4-3-2 C20HB-MD212 64-point I/O Board

Bit	Word			
	Wd 0□0	Wd 0□1	Wd 0□2	Wd 0□3
00	Input bits			Output bits
01				
...				
...				
15				

- Note**
1. The blank "□" symbol equals the board number – 1.
 2. IR 0□4 through IR 0□9 can be used as work words.

4-3-3 C20HB-LK501 I/O Link Board

Bit	Word		
	Wd 0□0	Wd 0□1	Wd 0□2
00	Output bits	Input bits	Restart Flag
01			Can be used as work bits.
..			
..			
08			RUN Flag
09			WDT Error Flag
10			Communications Error Flag
..			Cannot be used as work bits.
..			
15			

- Note**
1. The blank "□" symbol equals the board number – 1.
 2. IR 0□3 through IR 0□9 can be used as work words.

4-3-4 C20HB-B7AM1 B7A Link Board

Bit	Word				
	Wd 0□0	Wd 0□1	Wd 0□2	Wd 0□3	Wd 0□4
00	Input bits (input port 1)	Input bits (input port 2)	Output bits (output port 1)	Output bits (output port 2)	Input port 1 Communications Error Flag
01					Input port 2 Communications Error Flag
02					Cannot be used as work bits.
..					
..					
15					

- Note**
1. The blank "□" symbol equals the board number – 1.
 2. IR 0□5 through IR 0□9 can be used as work words.

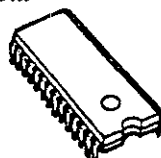
4-4 Standard Models

The following OMRON products are used in constructing C20HB PCs




4-4-1 Boards

Name	Specifications	Model number
CPU Board	Power supply voltage: 24 VDC	C20HB-CPU01
32-point I/O Board	Inputs: 24 VDC, 16 points; Outputs: Transistor relays, 16 points Accessories: Four Support Posts A	C20HB-MD211
64-point I/O Board	Inputs: 24 VDC, 32 points; Outputs: Transistor relays, 32 points Accessories: Six Support Posts A	C20HB-MD212
I/O Expansion Board	Accessories: Four Support Posts A	C20HB-II001
I/O Link Board	Inputs: 16 points (serial signals); Outputs: 16 points (serial signals) Accessories: Four Support Posts A	C20HB-LK501
B7A Interface Board	Inputs: 32 points (serial signals); Outputs: 32 points (serial signals) Accessories: Four Support Posts A	C20HB-B7AM1
RS-232C Interface Board	For RS-232C communications Accessories: Two Support Posts C, two Support Posts D, and four small screws (M3 x 6 mm)	C20HB-LK201
RS-422 Interface Board	For RS-422 communications Accessories: Two Support Posts C, two Support Posts D, and four small screws (M3 x 6 mm)	C20HB-LK202

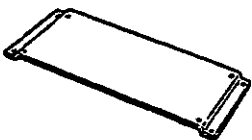
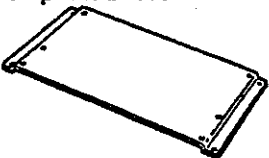
4-4-2 Memory Chips

Name	Type	Access time (ns)	Write voltage	Model number
EPROM 	2764 (4K words)	200	12.5	ROM-HB-B
		150	21	ROM-HD
	27128 (8K words)	200	12.5	ROM-IB-B
		150	12.5	ROM-ID-B
	27256 (8K words)	150	12.5	ROM-JD-B
RAM	6264 (4K words)	150	---	RAM-H
	62256 (8K words)	150	---	RAM-J
EEPROM	28C64 (4K words)	200	---	EEROM-H
	58C256 (8K words)	200	---	EER22-20


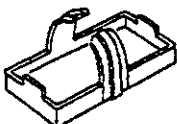
4-4-3 I/O Connecting Cables

Name	Specifications	Model number
I/O Expansion Cable 1 	For one expansion board	C20HB-CN401
I/O Expansion Cable 2 	For two expansion boards	C20HB-CN402
I/O Expansion Cable 3 	For three expansion boards	C20HB-CN403

4-4-4 Mounting Plates

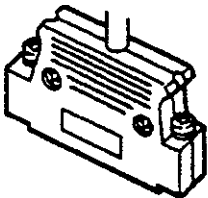
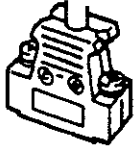
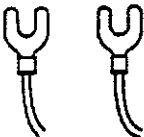
Name	Specifications	Model number
Mounting Plate for 32-point Board 	Mounting Plate for following Boards: 32-point I/O Board, I/O Expansion Board, I/O Link Board, and B7A Interface Board. Accessories: Four Support Posts B and eight small screws (M3 x 6 mm)	C20HB-ATT01
Mounting Plate for 64-point Board 	Mounting Plate for 64-point I/O Board. Accessories: Six Support Posts B and twelve small screws (M3 x 6 mm)	C20HB-ATT02

4-4-5 Battery Sets

Name	Specifications	Model number
Battery Set 	With a holder	C20HB-BAT01
	Without a holder	C200H-BAT09

4-5 User Provided Items

The following items must be provided by the customer and are not provided with the C20HB. Model numbers of recommended products are provided and the names of the manufactures are placed in parentheses following the model numbers.

Item	Specifications	Page	Board name
Power supply cable	<ul style="list-style-type: none"> One socket housing: IL-6S-S3L-(N) (JAE) Three socket connectors: IL-C2-1-10000 (JAE) Note: Crimp tool required 	19	CPU Board C20HB-CPU01
Analog timer variable resistor and cable	<ul style="list-style-type: none"> One socket housing: IL-8S-S3L-(N) (JAE) Eight socket contacts: IL-C2-1-10000 (JAE) Note: Crimp tool required Four variable resistors (20 KΩ): RV16YN15SB20KΩ recommended (Tokyo Cosmos) 	21	
Input cable/Output cable	<ul style="list-style-type: none"> Two connectors: XG4M-2030 (OMRON) Two strain relief guides: XG4T2004 (OMRON) Two flat cables: XY3A-200□ (OMRON) Note: Crimp tool and attachments required Harness assembly (if desired to reduce installation time) 	22	32-point I/O Board C20HB-MD211
	<ul style="list-style-type: none"> Two connectors: XG4M-4030 (OMRON) Two strain relief guides: XG4T4004 (OMRON) Two flat cables: XY3A-400□ (OMRON) Note: Crimp tool and attachments required Harness assembly (if desired to reduce installation time) 	38	64-point I/O Board C20HB-MD212
I/O cable	<ul style="list-style-type: none"> Two housings: 1-178288-7 (Japan AMP) Sixteen contacts: 0-175218-2 (Japan AMP) Note: Crimp tool required 	60	B7A Interface Board C20HB-B7AM1
RS-232C cable 	<ul style="list-style-type: none"> Plug: XM2A-2501 (OMRON) Hood: XM2S-2511 (OMRON) Cable: CO-DS-IREVV-SX-10P (0.18mm²) 	47	RS-232C Interface Board C20HB-LK201
RS-422 cable 	<ul style="list-style-type: none"> Plug: XM2A-0901 (OMRON) Hood: XM2S-0911 (OMRON) Cable: H-9293A (Hirakawa Electric Cable) CO-HC-ESV-3Px7/0.2 	48	RS-422 Interface Board C20HB-LK202
SYSMAC BUS Remote I/O System wire 	<ul style="list-style-type: none"> Two lug terminals for M4 screws Transmission cable: VCTF0.75x2C (JIS) 	56	I/O Link Board C20HB-LK501

Note Inquiries in Japan for the Japan AMP Company can be addressed as follows:
FA Division, Industrial Equipment Department, Japan AMP Company
TEL 044-844-8048

4-6 Reference Manuals

The following manuals are applicable to the C20HB. Please be sure to use these manuals when operating the relevant Units.

Unit	Model number	Manual name	Catalog number
PC	C20H/C28H/C40H/C60H	Installation Guide	W175
		Operation Manual	W176
FIT10	FIT10-MF101-EV6	Operation Manual	W150
LSS	C500-SF312-EV3/ C500-SF711-EV3	Operation Manual	W237
Data Access Console	C200H-DAC01	Operation Manual	W173
B7A Input Link Terminal	B7A-T6□1	Catalog	Q101
B7A Output Link Terminal	B7A-T6□□1		
Link Adapters	3G2A9-AL001/AL004-PE	Operation Manual	W123

The following manuals may be relevant when connecting a C200H Expansion I/O Rack.

Unit	Model number	Manual name	Catalog number
C200H CPU	C200H (CPU01-E/CPU03-E/ CPU11-E)	Installation Guide	W111
		Operation Manual	W130
	C200H (CPU21-E/CPU23-E/ CPU31-E)	Installation Guide	W218
		Operation Manual	W217
PC Link Unit	C200H-LK401	System Manual	W135
High-speed Counter Unit	C200H-CT001-V1/002	Operation Manual	W141
Position Control Unit	C200H-NC111	Operation Manual	W137
	C200H-NC112	Operation Manual	W128
	C200H-NC211	Operation Manual	W166
High-density I/O Unit	C200H-ID215/501 C200H-OD215/501 C200H-MD215/501	C200H Installation Guide (CPU21-E/CPU23-E/ CPU31-E)	W218
Analog I/O Unit	C200H-AD001/DA001	Operation Manual	W127
Temperature Sensor Unit	C200H-TS□01/TS□02	Operation Manual	W124
ASCII Unit	C200H-ASC02	Operation Manual	W165
ID Sensor Unit	C200H-IDS01/21	Operation Manual	W153
Fuzzy Logic Unit	C200H-FZ001	Operation Manual	W208

SECTION 5

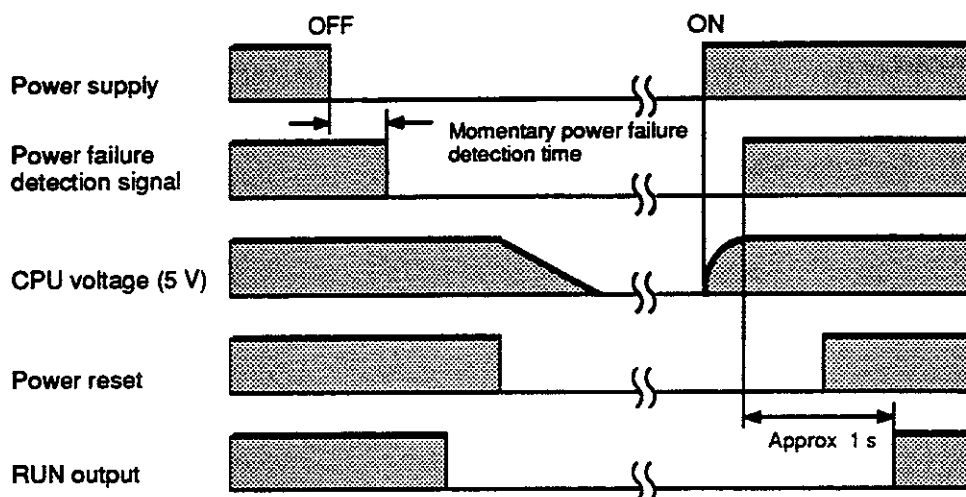
Error Processing

This section describes the C20HB's self-diagnostic functions and troubleshooting information in the event of an error.

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5-1 Power Failure

The C20HB is equipped with a sequential circuit that handles power interruptions. This circuit prevents malfunctions due to momentary power loss or voltage drops. A timing diagram for the operation of this circuit is shown below.



The PC ignores all momentary power failures if the interruption lasts no longer than 0.3 ms. If the interruption is longer than 1 ms, the PC stops operating and the external outputs are automatically turned OFF. (PC operation might continue or stop if the interruption lasts between 0.3 and 1 ms.)

Operation resumes automatically when the voltage is restored to more than 85% of the rated value.

5-2 Error Processing

The C20HB provides self-diagnostic functions to identify many types of abnormal system conditions. These functions minimize downtime and enable quick, smooth error correction.

5-2-1 Error Detection

There are three ways to determine if an error has been detected by the C20HB's self-diagnostic functions:

- 1, 2, 3... 1. Check the status of the CPU Boards POWER, RUN, and ALM/ERR LEDs.
The ALM/ERR LED will be turned ON when a fatal error (i.e., one that will stop PC operation) has occurred; it will blink to indicate non-fatal ones.
2. Use the Programming Console to read any error messages from the CPU.
3. Check specific error flags in the SR area.

The user can install LED indicators controlled by these flags to indicate PC operating status and error conditions.

5-2-2 Error Messages

Non-fatal Operating Errors The following error messages appear for errors that occur after program execution has been started. PC operation and program execution will continue after one or more of these errors have occurred. For each of these errors, the POWER and RUN indicators will be ON and the ALM/ERR indicator will blink.

Error and message	FAL no.	Probable cause	Possible correction
FAL error <div>SYS FAIL FAL</div>	01 to 99	FAL(06) has been executed in program.	Check the program. (The program location is indicated by the FAL number set by the user.)
	9E	Checksum error occurred in Parameter Backup Area. (SR 25208 goes ON.)	Check Parameter and Parameter Backup areas. Set and back up parameters with system command.
Cycle time overrun <div>SCAN TIME OVER</div>	F8	Watchdog timer timeout. (100 to 130 ms) (SR 25309 goes ON.)	Program cycle time is longer than recommended. Reduce cycle time or increase the "scan time limit" registered in DM 0901.
Battery error <div>BATT LOW</div>	F7	Backup battery is missing or its voltage has dropped. (SR 25308 goes ON.)	Check battery and replace if necessary.
RS-232C/RS-422 Interface Error <div>No message</div>	None	Error occurred between host computer and RS-232C/RS-422 Interface (SR 25215 goes ON.)	Check communications with the host computer and the CPU Board's settings.

Fatal Operating Errors

The following error messages appear for errors that occur after program execution has been started. PC operation and program execution will stop and all outputs from the PC will be turned OFF when any of the following errors occur.

All CPU indicators will be OFF for the power interruption error. For all other fatal operating errors, the POWER and ALM/ERR indicators will be ON and the RUN indicator will be OFF.

Error and message	FAL no.	Probable cause	Possible correction
Power interruption <div>No message</div>	None	Power has been interrupted for more than 0.3 ms.	Check power supply voltage and power lines. Try to power-up again.
CPU error <div>No message</div>	None	Watchdog timer timeout (over 130 ms).	Restart system in PROGRAM mode.
Memory error <div>MEMORY ERR</div>	F1	Memory chip is incorrectly mounted or missing, checksum error has occurred, or incorrect instruction exists.	Perform a Program Check Operation to locate cause of error. If error not correctable, try inputting program again. Check Memory chip to make sure it is mounted properly. Check the battery connection. Clear the error after correction.
No END(01) instruction <div>NO END INST</div>	F0	END(01) is not written anywhere in program.	Write END(01) at the last address of the program.
I/O bus error <div>I/O BUS ERR</div> <div>Rack no.</div>	C0 to C3 See note.	Error has occurred in data transfer between the CPU and I/O Board.	Check I/O connecting cable connections to each device. Check the board number settings. Clear the error after correction.
FALS error <div>SYS FAIL FAL**</div>	01 to 99	FALS has been executed by the program.	Check the program. (The program location is indicated by the FAL number set by the user.)
	9F	The cycle time is 120 ms to 130 ms.	The time can be extended by using WDT(94).

Note An FAL number of "C0" indicates the first board, "C1" indicates the second board, and "C2" indicates the third board.

5-2-3 Errors Involving a C200H Expansion I/O Rack

In addition to the errors described in 5-2-2 *Error Messages*, the following errors can occur when a C200H Expansion I/O Rack is being used.

Initialization Error

The following error message appears before program execution has been started. The POWER indicator will be ON, the RUN indicator will OFF, and the ALM/ERR indicator might be ON, OFF, or blinking.

Error and message	FAL no.	Probable cause	Possible remedy
Waiting for Units CPU WAITG	None	CPU waiting for Special I/O Units to start-up.	Check all Special I/O Units and replace all faulty Units.

Non-fatal Operating Errors

The following error message appears after program execution has been started. PC operation and program execution will continue, the POWER and RUN indicators will be ON and the ALM/ERR indicator will blink.

Error and message	FAL no.	Probable cause	Possible correction
Special I/O error SPECIAL UNIT ERR	D0	An error occurred between the CPU and a Special I/O Unit (Special I/O or Host Link) or else a Special I/O Unit's unit number was set to 8 or 9. (SR 25415 goes ON. Check AR 00)	Check AR 00 to determine which Unit is causing the error. After correcting the cause, restart the Unit using the appropriate control bit in AR 01 or SR 25213. Replace the Unit if it cannot be restarted. Be sure to set the unit numbers of Special I/O Units between 0 and 7.

Fatal Operating Errors

The following error message appears after program execution has been started. PC operation and program execution will stop and all outputs from the PC will be turned OFF when this error occurs. The POWER and ALM/ERR indicators will be ON. The RUN indicator will be OFF.

Error and message	FAL no.	Probable cause	Possible correction
I/O Unit over I/O UNIT OVER	E1	There is a duplication in Special I/O Unit unit number settings. (SR 25415 goes ON. Check AR 00)	Check the unit number settings of Special I/O Units and make sure there are no duplications.

Glossary

ASCII code	[A(merican) S(tandard) C(ode for) I(nformation) I(nterchange)] A standard computer code used to facilitate the interchange of information among various types of data-processing equipment.
ASCII Unit	An Intelligent I/O Unit. The ASCII Unit has its own CPU and 16 kilobytes of memory. This Unit enables communication between the PC and any other device which uses ASCII code. The ASCII Unit can be programmed in BASIC.
Backplane	A base to which Units are mounted to form a Rack. Backplanes provide a series of connectors for these Units along with wiring to connect them to the CPU and Power Supply. Backplanes also provide connectors used to connect them to other Backplanes. In some Systems, different Backplanes are used for different Racks; in other Systems, Racks differ only by the Units mounted to them.
back-up	A copy of existing data which is valuable if data is accidentally erased.
baud rate	Transfer speed between two devices in a system measured in bits per second. For example, an optical sensor might be configured to send its information to the FIT at 9600 baud. It is important for both of the devices to be set to the same baud rate.
bit	The smallest piece of information that can be represented on a computer. A bit has the value of either zero or one, corresponding to the electrical signals ON and OFF. A bit is one binary digit.
central processing unit	A device that is capable of storing a program and data, and executing the set of instructions contained in the program. In a PC System, the central processing unit executes the program, processes I/O signals, communicates with external devices, etc.
communication cable	Cable used to transfer data between components of a control system and conforming to the RS-232C or RS-422 standards.
Control System	All of the hardware and software components used to control other devices. A Control System includes the PC System, the PC programs, and all I/O devices that are used to control or obtain feedback from the controlled system.
counter	A PC function that counts the number of occurrences of a certain event.
CPU	An acronym for central processing unit.
data area	An area in the PC's memory that is designed to hold a specific type of data, e.g., the LR area is designed to hold common data in a PC Link System.
data disk	Floppy disk used to store information such as programs or I/O tables. The data disk should be used in drive B of the FIT.
data link	Allows for the connection of up to 32 PCs in a Net Link System where each is contributing information to a common memory area. Data links may be established in the LR and/or DM memory areas.

Glossary

debugging	The process of checking for errors in a program.
default condition	The original condition of a function or system. For example, the FIT's default condition is to start from its hard drive, but this default condition can be changed so that it starts from a floppy disk drive.
distributed control	An automation concept in which control of each portion of an automated system is located near the devices actually being controlled, i.e., control is decentralized and "distributed" over the system. Distributed control is a concept basic to PC Systems.
EEPROM	[E(lectrically) E(rasable) P(rogrammable) R(ead) O(nly) M(emory)] A type of ROM in which stored data can be erased and reprogrammed. This is accomplished using a special control lead connected to the EEPROM chip and can be done without having to remove the EEPROM chip from the device in which it is mounted.
electrical noise	Electric 'static' that can disturb electronic communications. The 'snow' that can appear on a TV screen is an example of the effects of electrical noise.
EPROM	[E(rasable) P(rogrammable) R(ead) O(nly) M(emory)] A type of ROM in which stored data can be erased, by ultraviolet light or other means, and reprogrammed.
Expansion I/O Unit	An I/O Unit for a Package-type PC that provides more I/O points to the PC.
factory computer	A general-purpose computer, usually quite similar to a business computer, that is used in automated factory control.
flag	A bit that is turned ON and OFF automatically by the system in order to provide status information.
High-speed Counter	A Special I/O Unit. A High Speed Counter Unit counts independently of the PC's scan time. This allows counting of very short, fast signals.
host computer	A computer that is used to transfer data to or receive data from a PC in a Host Link system. The host computer is used for data management and overall system control. Host computers are generally small personal or business computers.
IBM PC/XT or AT, or compatibles	A computer that has similar architecture to, and is logically compatible with an IBM PC/XT computer; and that can run software designed for that computer.
Instruction line	A succession of instructions which begins with a load instruction at the left bus bar and ends at a right bus bar.
Interface	An interface is the conceptual boundary between systems or devices and usually involves changes in the way the communicated data is represented. Interface devices such as NSBs perform operations such as changing the coding, format, or speed of data.
I/O devices	The devices which are connected to the terminals on I/O Units, Special I/O Units, or Intelligent I/O Units. I/O devices may be part of the Control System if they function to help control other devices, or they may be part of the controlled system if they interact directly with it.

Glossary

I/O point	The place at which an input signal enters the PC System or an output signal leaves the PC System. In physical terms, an I/O point corresponds to terminals or connector pins on a Unit; in terms of programming, an I/O point corresponds to an I/O bit in the IR area.
I/O table	Diagram written to the IR memory area listing the type of I/O units controlled by a PC. It must be cleared before programming or when I/O units are changed. Tables can be read, verified, or transferred to a EPROM.
I/O Unit	The most basic type of Unit mounted to a Backplane. I/O Units include Input Units and Output Units, each of which is available in a range of specifications. I/O Units do not include Special I/O Units, Link Units, etc.
Limit Switch	A switch that detects when an object has reached the limit of its movement by actually making contact with the object. Limit Switches are fitted to electric elevators, traveling cranes, etc. to indicate when a certain part of the equipment has traveled to the specified limit.
Link Unit	Any of the Units used to connect a PC to a Link System. These are Remote I/O Units, I/O Link Units, PC Link Units, Host Link Units, and Net Link Units.
operating mode	The Display Terminal Unit can operate in five different modes: Page Read, Terminal, Dynamic Scan, Read/Write, and Self-Diagnosis.
page	One complete Display Terminal Unit screen. Two hundred screens can be stored on one RAM card.
parallel interface	The parallel interface uses the RS-232 connector, but is not serial communication. When parallel mode is selected as the communication mode, up to 16 Display Terminal Units can be connected to a PC in parallel.
PC	An acronym for Programmable Controller.
PCB	An acronym for printed circuit board.
PC Link Unit	A Unit used to connect two or more PCs together so that they can exchange data through their LR areas.
Photoelectric Switch	A switch that uses light to detect the presence of an object.
Power Supply	A Unit that mounts to a Backplane in a Rack PC. It provides power at the voltage required by the other Units on the Rack.
printed circuit board	A board onto which electrical circuits are printed for mounting into a computer or electrical device.
Programmable Controller	A small, computer-like device that can control peripheral equipment, such as an electric door or quality control devices, based on programming and peripheral input devices. Any process that can be controlled using electrical signals can be controlled by a PC. PCs can be used independently or networked together into a system to control more complex operations.
programming device	A peripheral device used to write programs and to input a program to a PC or to alter or monitor a program already stored in the PC. There are dedicated programming devices, such as Programming Consoles, and there are non-dedicated programming devices, such as a host computer.

Glossary

PROM	[P(rogrammable) R(ead) O(nly) M(emory)] A type of ROM into which the program or data may be written after manufacture, by a customer, but which is fixed from that time on.
PROM Writer	A PROM Writer is a device used to write data to ROM, PROM, and EPROM storage chips.
Proximity Switch	A switch that uses magnetic induction to measure the distance of a metallic object from the front of the switch.
Rack PC	A PC that is composed of Units mounted to one or more Racks. This configuration is the most flexible, and most large PCs are Rack PCs. A Rack PC is the opposite of a Package-type PC, which has all of the basic I/O, storage, and control functions built into a single package.
RAM	[R(andom) A(ccess) M(emory)] RAM will not retain data when power is disconnected. Therefore data should not be stored in RAM.
register/registered	Storing text and graphics in the RAM/ROM card from a personal computer or the ASCII Unit. Graphics that have been written to the RAM/ROM card are referred to as registered messages.
Remote I/O Unit	A Unit that extends the distance an Expansion I/O Unit can be from the CPU.
ROM	[R(ead) O(nly) M(emory)] A type of digital storage that cannot be written to. A ROM chip is manufactured with its program or data already stored in it, and it can never be changed. However, the program or data can be read as many times as desired.
scan time	The total time it takes the PC to perform internal operations, i.e., reset the watchdog timer, read the program, receive input data, send output data, and execute instructions. Scan time is monitored by the watchdog timer within the PC, and if it takes longer than a certain specified amount of time, an error message may be generated, or the CPU may just stop. Scan times will differ depending on the configuration of the system.
switching capacity	The voltage/current that relay can switch ON and OFF.
stepping motor	An output device that rotates according to signals from the Control System. The rotation is very precise and occurs in pre-defined "steps."
switch	An input device that sends either an ON or OFF signal to the Control System. A switch can be operated either by a person or by the movement of a piece of equipment or material.
system configuration	The arrangement in which Units in a System are connected. This term refers to the conceptual arrangement and wiring together of all the devices needed to comprise the System. In OMRON terminology, system configuration is used to describe the arrangement and connection of the Units comprising a Control System that includes one or more PCs.
Unit	In OMRON PC terminology, the word Unit is capitalized to indicate any product sold for a PC System. Though most of the names of these products end with the word Unit, not all do, e.g., a Remote Terminal is referred to in a collective sense as a Unit. Context generally makes any limitations of this word clear.

Glossary

- watchdog timer** A special timer inside the CPU that monitors the PC's scan time. The watchdog timer sets a flag if the scan time becomes longer than a certain specified value. This is useful if the correct operation of your System depends on a certain maximum scan time.
- word** In digital circuits, a group of bits. Usually a word consists of four, eight, or sixteen bits. In C-series PCs, a word consists of sixteen bits. Words can be used to store data, or they can be used for I/O.
- work bits** Bits in the IR area that are not being used for input or output. These bits can be used in the program in any way desired.

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