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Cat.No. W133-E1-3A

SYSMAC

Special I/O Units: High-Density and Multiplex I/O

C200H-ID501/ID215
C200H-OD501/OD215
C200H-MD501/MD115/MD215

OPERATION MANUAL

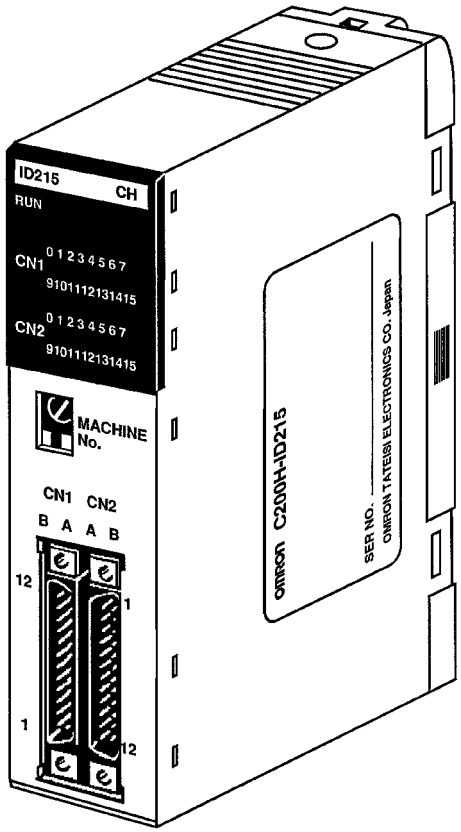
OMRON

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C200H-ID501/ID215
C200H-OD501/OD215
C200H-MD501/MD115/MD215
Special I/O Units:
High-Density and Multiplex I/O

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Revised January 1996



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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 relatively 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 explains operations of the High-Density and Multiplex Units, peripheral devices for OMRON C-series Programmable Controllers that are used to interface the PC to input devices and I/O sources.

Section 1 provides an introduction to the switches and indicators found on the High-Density and Multiplex Units and describes possible system configurations.

Section 2 describes the functions and operations of the Units.

Section 3 explains the relation between the scan time and I/O refresh.

Section 4 shows an application example.

Appendices, a ***Glossary***, and an ***Index*** are also included.

⚠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.

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SECTION 1
Hardware Description

The C200H High-Density and Multiplex I/O Units are Special I/O Units. This section describes the physical layout, system connections, and bit allocations of the Units.

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1-2 Nomenclature 4
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1-1 Introduction

The term multiplex means to use one path for several signals. A multiplexer is an I/O device that routes data from several sources to a common path and then to several destinations. This is the main function of the C200H High-Density and Multiplex I/O Units. The Units also can receive very short input signal. A special high-speed buffer is used to hold short input signals until the next refresh cycle. This function is called a quick-response input.

Seven versions of the C200H exist and are chosen depending on the number of I/O points needed and the rated supply voltage.

C200H Units

Unit	Model No.	Input	Output	Supply Voltage	Description
TTL Input Unit	C200H-ID501	32 pts.	---	5 VDC	32-point input
24-VDC Input Unit	C200H-ID215	32 pts.	---	24 VDC	8 points available as quick-response inputs
TTL Output Unit	C200H-OD501	---	32 pts.	5 VDC	Selectable between 32-point output or dynamic output mode
Transistor Output Unit	C200H-OD215	---	32 pts.	24 VDC	
TTL I/O Unit	C200H-MD501	16 pts.	16 pts.	5 VDC	Selectable between 16-point I/O or dynamic input mode 8 points available as quick-response inputs
12-VDC Input/Transistor Output	C200H-MD115	16 pts.	16 pts.	12 VDC	
24-VDC Input/Transistor Output	C200H-MD215	16 pts.	16 pts.	24 VDC	

System Configuration

The C200H Units operate as Special I/O Units. Up to 10 C200H special I/O Units, including PC Link Units, can be mounted on the CPU, I/O Expansion, or Remote I/O Slave Racks.

The following table lists all of the available peripheral Units in the C-series.

Unit	Model No.
High-Density and Multiplex I/O Units	C200H-ID501
	C200H-ID215
	C200H-OD501
	C200H-OD215
	C200H-MD501
	C200H-MD115
	C200H-MD215
High-Speed Counter	C200H-CT001-V1
	C200H-CT002
A/D Unit	C200H-AD001
D/A Unit	C200H-DA001
Position Control Unit	C200H-NC111
	C200H-NC112
	C200H-NC211
Temperature Sensor Unit	C200H-TS001
	C200H-TS002
	C200H-TS101
	C200H-TS102
ID Sensor Unit	C200H-IDS01
Voice Unit	C200H-OV001

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Unit	Model No.
ASCII Unit	C200H-ASC02
PC Link Unit	C200H-LK401

Mounting to a Remote I/O Slave Rack

The maximum number of Special I/O Units that can be mounted to a Remote Slave Rack differs depending on the group (A, B, C, or D, as shown in the following table) to which they belong.

An maximum of ten Units can be mounted to one Remote I/O Slave Rack. The NC211 Position Control Unit is counted as two Units and, if a PC Link Unit is used, it is counted as one Unit.

This information in this table applies when no other Special I/O Units are mounted to other Racks (PC or Expansion I/O Racks) and the Units in this table are mounted only to a Remote I/O Slave Rack.

A	B	C	D
High-Speed Counter, Position Control Unit (NC111/NC112), ASCII Unit, Analog I/O Unit, ID Sensor Unit	High-Density and Multiplex I/O Unit	Temperature Sensor Unit	Position Control Unit (NC211)
4 Units max.	---	---	---
---	8 Units max.	---	---
---	---	6 Units max.	---
---	---	---	2 Units max.

When combining Units from groups A, B, C, and D, use the following formula:

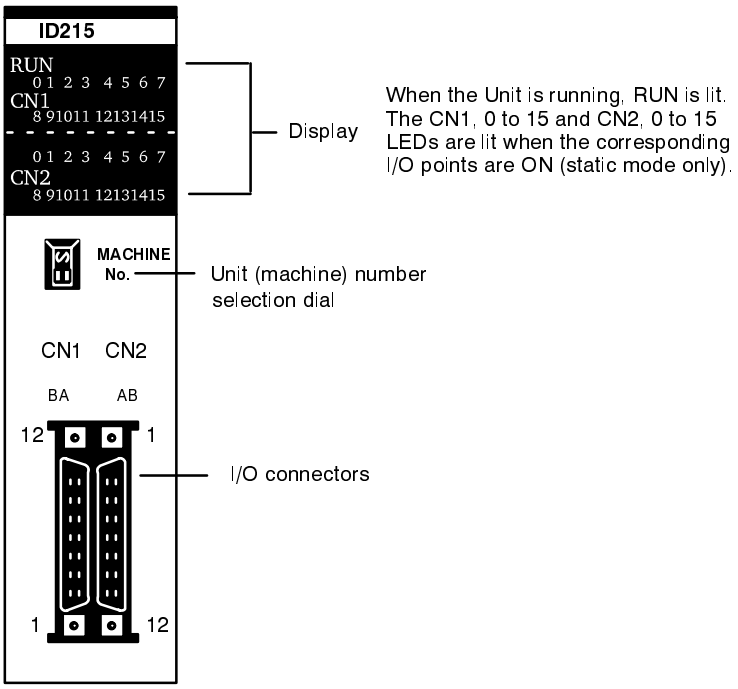
$$3A + B + 2C + 6D \leq 12$$
$$A + B + C + D \leq 8$$

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1-2 Nomenclature

The front panel has the 2 I/O connectors (CN1, CN2), the unit (machine) number selection dial, and the active bit display. The rear panel has the PC Backplane connector and the word selection DIP switch.

The following diagram shows the front panel.

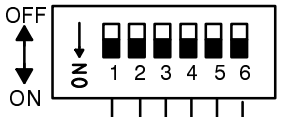


Note The display LEDs are lit during normal operating periods. When an error occurs, they are unlit. When RUN is unlit, I/O refresh is not performed. When the dynamic I/O is used, the display operates differently from the static mode. Refer to *2-2 Dynamic Input* and *2-3 Dynamic Output* for details. When setting the Unit numbers, take care not to use the same number for more than one unit on the same PC. An error will result if the same number is used.

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Back Panel DIP Switch

The back panel DIP switch controls the configuration for I/O timing, I/O modes, and the quick-response input.



Not used

Dynamic data output logic
(C200H-OD501/215 dynamic mode only)

OFF	Negative logic output
ON	Positive logic output

Input response time (for normal input)
(C200H-ID501/215, C200H-MD501/215/115 only)

OFF	2.5 ms max.
ON	15 ms max.

Quick-response input Minimum pulse width
(C200H-ID501/215, C200H-MD501/215/115
quick-response mode only)

OFF	1 ms
ON	4 ms

Quick-response input
(C200H-ID501/215, C200H-MD501/215/115 static
mode only)

OFF	Normal input
ON	Quick-response input

mode control
(not used for C200H-ID501/215)

SW1	C200H-OD501/215	C200H-MD501/215/115
OFF	32-point Static-Output	16-point Static I/O
ON	128-point Dynamic-Input	128-point Dynamic-Output

Note When quick-response mode is used, the I/O connector CN2 pins 08 through 15 are used as the quick-response inputs. The other inputs response time is determined by the SW4 setting.

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The following table shows the switch settings for each individual Unit.

Model	SW1	SW2	SW3	SW4	SW5	SW6
C200H-ID501/215	–	•	Δ	•	–	–
C200H-OD501/215	OFF	–	–	–	–	–
	ON	–	–	–	•	–
C200H-MD501/215/115	OFF	•	Δ	•	–	–
	ON	–	–	–	–	–

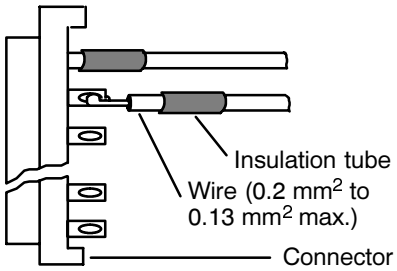
Note 1. – signifies that the switch setting is irrelevant.
2. Δ signifies that the switch must be set when the quick-response mode is used.
3. • signifies that the switch setting is mandatory.

Set the switches as shown in the table and in the explanatory diagram.

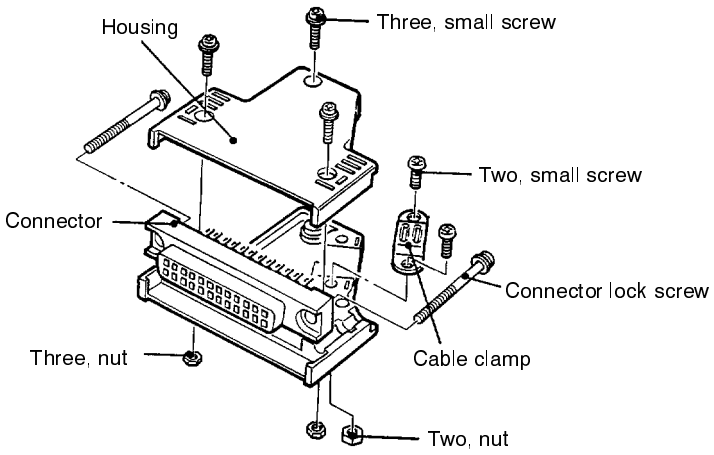
1-3 Connector Assembly

Prior to use, assemble the I/O connector supplied with the Unit. Wire and assemble the connector as shown in the figures. The recommended wire size is from AWG24 to AWG26 (0.2 mm^2 to 0.13 mm^2). The current capacity differs depending on the ambient temperature of the installation area and the thickness of the wire. Keep this in mind when deciding on the wire.

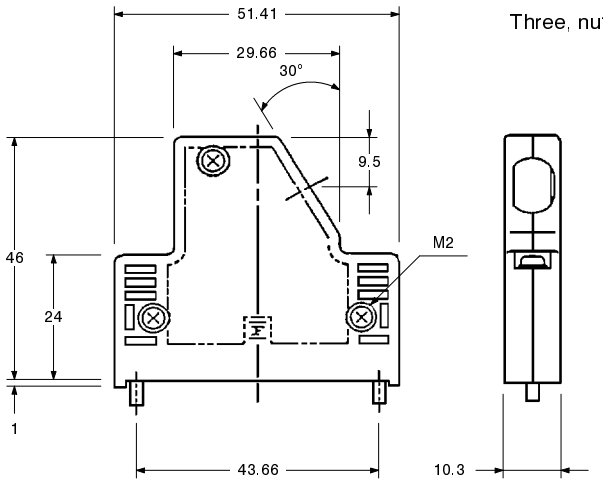
Connector Wiring



Connector Assembly



Connector Assembly



Note: The dimensions of the press-fit connector differ from the above.

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Be careful not to short terminals together. After soldering put insulation tubing over each terminal to protect them from shorts. Before soldering the wire to the terminal, verify the pin and signal names match.

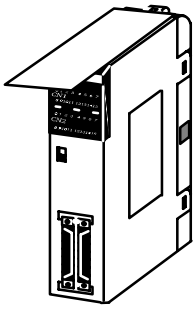
If the polarity of the output power supply is incorrect, the internal fuse will blow. The internal fuse is designed to protect the internal circuitry from damage by incorrect voltage polarity applied to the connector.

The internal fuse is **not** user-replaceable.

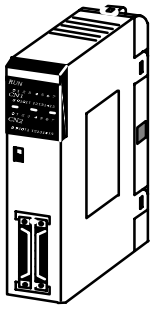
Do not remove the shipping label from the Unit until the wiring is finished. If the label is removed, wire fragments may fall into the Unit. Be sure to remove the label after wiring. The Unit generates heat when operating and may melt the label.

The following diagram shows the Unit with the shipping label attached and removed.

During wiring



After wiring



1-4 System Connections

1-4-1 Bit Allocations

The unit number setting switch located on the front panel is used to set a unique number for each Unit so that the proper words will be allocated to each respective Unit. The following table shows the Unit numbers and corresponding word numbers.

Unit Number Settings and Corresponding Word Allocations

Unit No.	Word
0	100 to 109
1	110 to 119
2	120 to 129
3	130 to 139
4	140 to 149
5	150 to 159
6	160 to 169
7	170 to 179
8	180 to 189
9	190 to 199

The data is refreshed every cycle regardless of the Unit number selected. The data is refreshed when it is sent from the PC to the I/O Unit, and again when it is received by the PC.

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32 Point Static I/O Points

For all models except the C200H-ID501/215, setting SW1 to OFF sets the Unit to the static I/O mode. The following table shows the I/O configuration when set for static mode.

Word n	CN1
Word n+1	CN2
Word n+2 to n+9	These words are not used when set for static I/O. They can be used as auxiliary inputs.

Note (n = 100 + 10 x unit number)

Dynamic I/O Points

For models C200H-OD501/215 and C200H-MD501/215/115, setting SW1 to ON sets the Unit to the dynamic I/O mode. The following table shows the I/O configuration when set for dynamic mode.

Bit		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Data number		7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Word number	Word n	Strobe 1								Strobe 0							
	Word n + 1	Strobe 3								Strobe 2							
	Word n + 2	Strobe 5								Strobe 4							
	Word n + 3	Strobe 7								Strobe 6							

Bit		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Data number		15	14	13	12	11	10	9	8	15	14	13	12	11	10	9	8
Word number	Word n + 4	Strobe 9								Strobe 8							
	Word n + 5	Strobe 11								Strobe 10							
	Word n + 6	Strobe 13								Strobe 12							
	Word n + 7	Strobe 15								Strobe 14							

The unused words (n+8 and n+9) can be used as auxiliary inputs.

Depending on the Unit, the terminal connector that corresponds to the data and strobe numbers differs. The table below shows the differences.

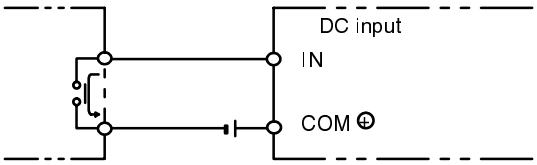
Model No.	**CN1**		**CN2**	
	B	**A**	**A**	**B**
C200H-OD501/215	Strobe 0 to 7	Data 0 to 7	Data 8 to 15	Strobe 8 to 15
C200H-MD501/215/115	Strobe 8 to 15	Strobe 0 to 7	Data 0 to 7	Data 8 to 15

1-4-2 Unit Connections

This section illustrates the input connections from external devices to the I/O Unit are illustrated here. The following diagrams show examples of wiring conventions used to connect the Units. Be sure to follow the specifications of the Unit to avoid damage or operational problems.

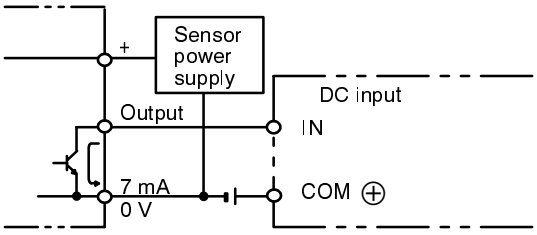
DC I/O Connections

Contact Point Connection

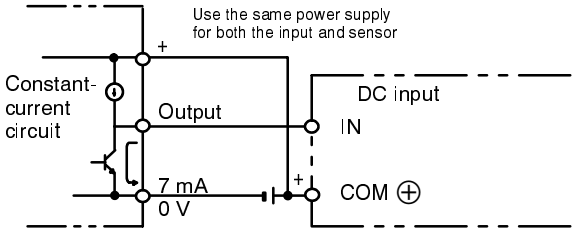


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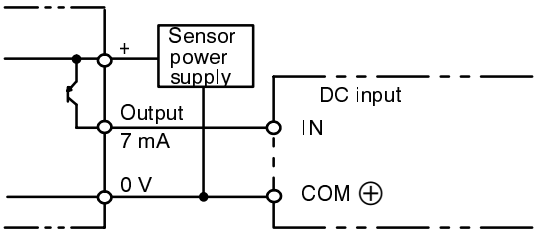
NPN Open Collector Output



NPN Current Output



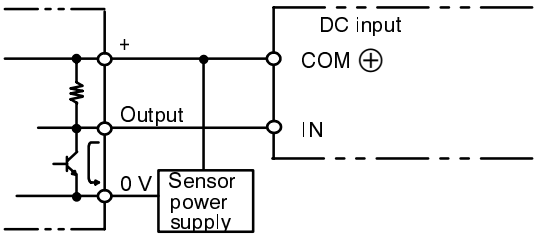
PNP Current Output



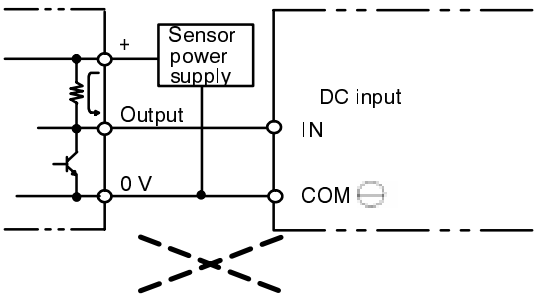
Voltage Output Connection

The following diagram shows how to connect a Unit in a voltage output configuration.

Correct Connection



Incorrect Connection



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TTL Connection

Only the following models can be used with TTL connections.

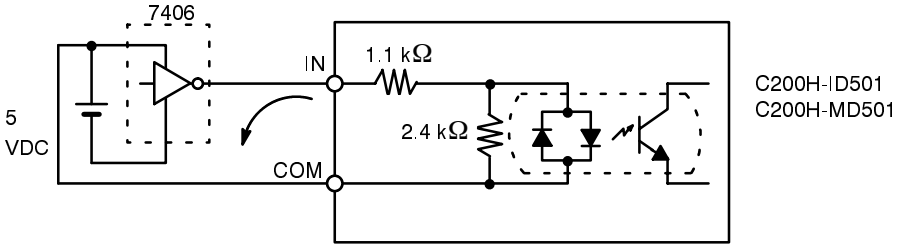
1, 2, 3...

1. C200H-ID501 (32-point input)
2. C200H-OD501(32-point output)
3. C200H-MD501 (16-point input / 16-point output)

The following diagrams show examples of TTL connections.

TTL Input

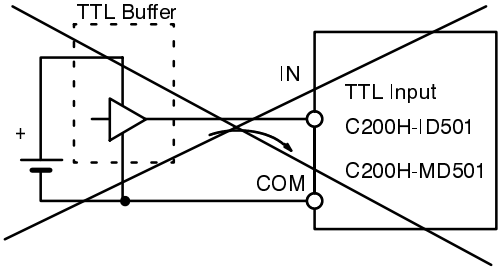
In the example below, negative logic input is used. When a LOW (0) is received, the logic level will be HIGH (1). The TTL buffer used should be a current sink.



If the TTL buffer is a current source, the connection will not work. Because the buffer's HIGH output voltage level is lower than the TTL input Unit's LOW level (3.0 V), the input will not be recognized.

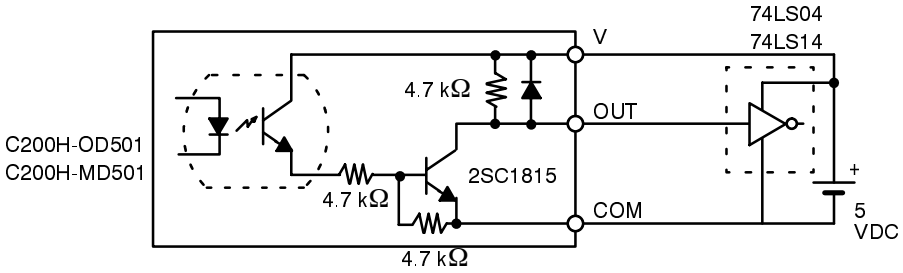
The following diagram shows an example of a connection using a current source buffer.

Current Source Buffer Connection (incorrect)



TTL Output

In the example, negative logic output is used. When a HIGH (1) is sent, the logic level at the output terminal will be LOW (0).



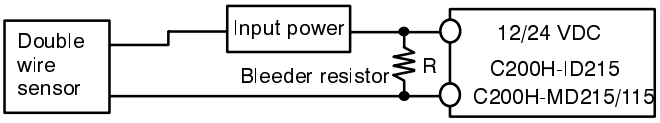
The C200H-OD215 and MD215/115 transistor output Units cannot be connected directly to TTL logic because of the residual voltage of the transistors. In order to connect to TTL, use a CMOS-IC to receive the transistor outputs. If a CMOS-IC is used, the transistor outputs will need pulldown resistors.

12-/24-VDC Input Leakage Current

When a double-wire sensor such as a proximity switch, photo-electric switch or an LED limit switch is used, input errors will occur because of leakage current. When the sensor switches are turned OFF, the leakage current flows and the voltage between the common and input terminals becomes higher than the specified input OFF voltage.

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If the leakage current is less than 1.3 mA, no errors will occur. If the leakage current is more than 1.3 mA, connect a bleeder resistor as explained in the following diagram to lower the input impedance and bring the voltage between the common and input terminals to the OFF condition.



$$R = \frac{29.3}{5.9 \times I - 5.0}\ (k\Omega)\ \text{max.}$$

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

I: Leakage Current (mA)
R: Bleeder Resistor Value (kΩ)
W: Bleeder Resistor Watt Rating (W)

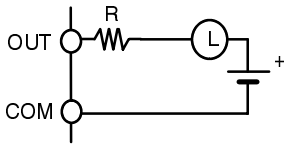
The above equations are derived from the specification tables of each Unit

$$I \times \frac{R \times \frac{\text{Input Voltage 12/24 V}}{\text{Input Current 4.1 mA}}}{R + \frac{\text{Input Voltage 12/24 V}}{\text{Input Current 4.1 mA}}} \leq \text{OFF (5.0 V)}$$

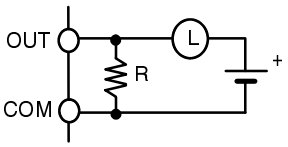
$$W \geq \frac{\text{Input Voltage 12/24 V}}{R} \times \text{Input Voltage 12/24 V} \times 4$$

Surge Current

When using a transistor or TTL output, do not connect loads that have a large amount of surge current. If the output is connected to this type of a device (incandescent light, etc.), the output transistor will be destroyed. In order to lessen the amount of surge current refer to the following diagrams.



Connect a series current limiting resistor



Allowing 1/3 of the rated dark current (residual voltage in bulb) to flow to the incandescent bulb

Output Short-Circuits

If a load connected to the output terminal short-circuits, the output component and the printed circuit board will be damaged. Connect a fuse between the external load and the output terminal to guard against short circuits.

An external fuse is necessary because the internal fuse is only used to protect the Unit from changes in power supply polarity; it does not protect against short circuits.

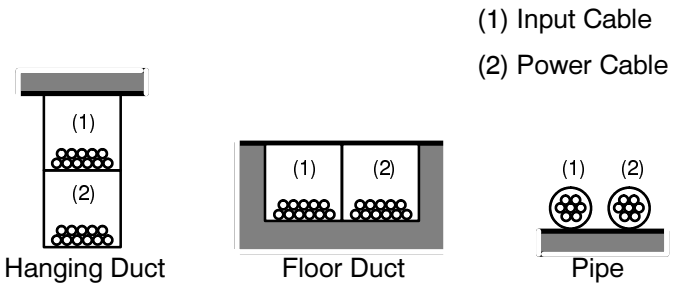
I/O Noise Prevention

Laying I/O Signal Lines

The signal lines should not be laid next to power supply or high voltage lines. Provide separate ducts for each both inside and outside the control panel. If using the same duct is unavoidable, shielded twisted-pair wire should be used with the shield connected to the power supply's ground terminal.

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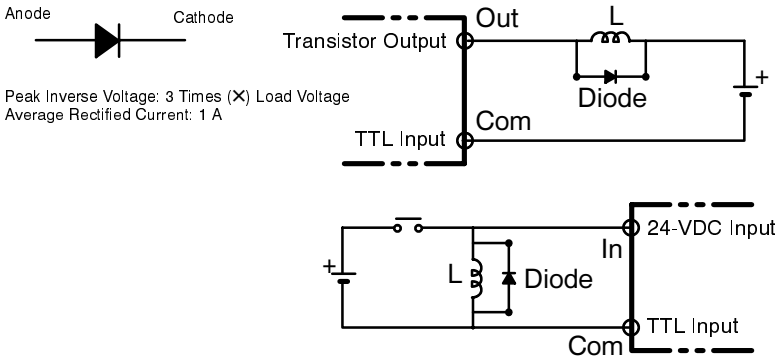
The following diagrams show examples of different schemes for laying the signal lines.



Inductive Loads

When an inductive load is connected to the I/O Unit, connect a diode parallel to the load as shown in the following diagram.

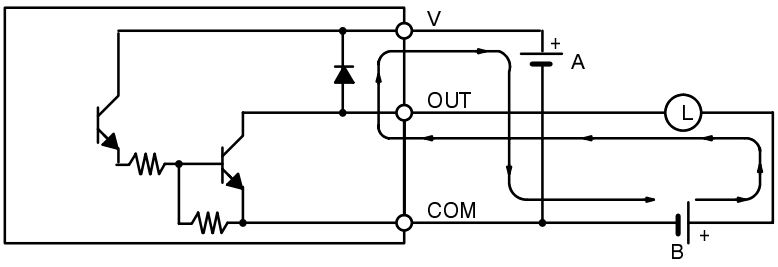
Connect the cathode side of the diode to the positive side of the power supply.



Using Two Power Supplies For Transistor/TTL Output

When using two power supplies as in the following diagram, when the B supply is initially turned ON and the A supply is OFF, current will flow through the circuit as shown by the arrows and turn the load ON. Even if the supply voltage of B is higher than the supply voltage of A, the possibility exists that current will flow and turn ON the load.

If using two supplies is unavoidable, keep the supply voltage of A above the supply voltage of B, and always turn A ON before B and turn B OFF before A.



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SECTION 2
Functional Description

Some of the Units operate in high-speed quick-response mode and some operate in dynamic mode. This section describes these modes.

2-1 Quick-Response Input 14
2-2 Dynamic Input 16
2-3 Dynamic Output 20

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2-1 Quick-Response Input

Quick-Response Input

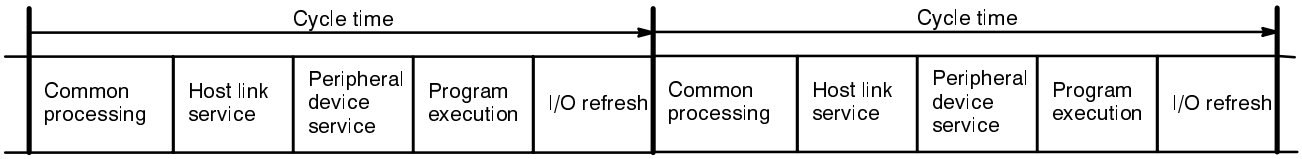
The quick-response input allows the CPU to receive signals shorter than the cycle time. Quick-response input is available on the C200H-ID501/215 and C200H-MD501/215/115 models only.

I/O connector CN2 word n+1 bits 08 through 15 are used as the quick-response inputs. The other data bits function as standard I/O inputs with their input response time set by DIP switch SW4.

The quick-response input function cannot be used in the dynamic I/O mode.

Quick-Response Input Processing

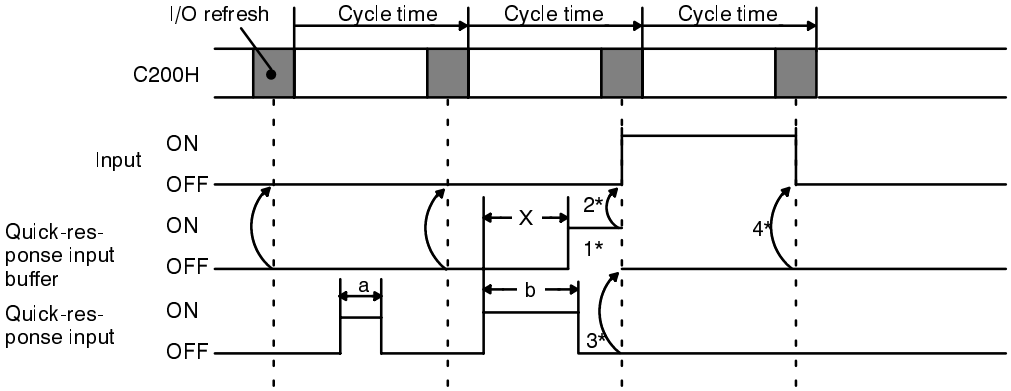
The data processing flow is diagrammed in the following chart.



During I/O refresh, the C200H reads the input signals into the input bits.

Quick-Response Input Recognition

The following diagram shows the data interaction when quick-response mode is turned ON and OFF during an I/O refresh period.



a < X ≤ b

X = Minimum recognizable pulse width.

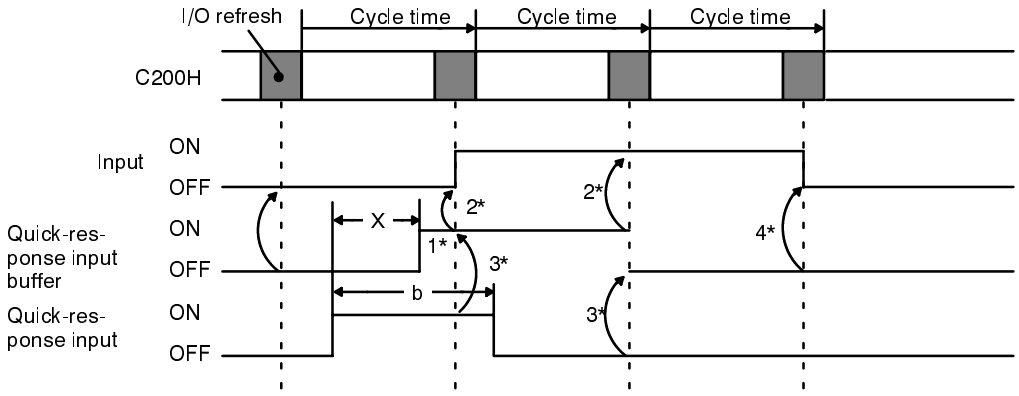
b = Quick-response input pulse widths of a and b.

If a is smaller than X the input is not recognizable.

*See following side heading *Diagram Explanation*

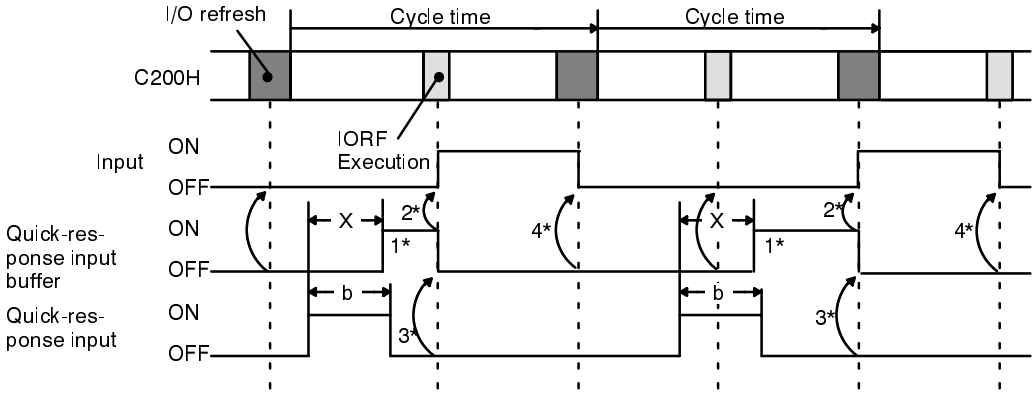
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The following diagram shows the data interaction when quick-response mode is continued after an I/O refresh.



*See following side heading *Diagram Explanation*

The following diagram shows the data interaction when the IORF 97 instruction is used.



$X \leq b$

X = Minimum recognizable pulse width.

b = Quick-response input pulse width of b.

*See following side heading *Diagram Explanation*

Diagram Explanation

1, 2, 3...

1. The quick-response input's pulse width becomes larger than the minimum recognizable width. The input buffer turns ON and retains data until the next I/O refresh.
2. C200H I/O refresh occurs. The quick-response buffer's data is read by the input bits.
3. When the quick-response input turns OFF, the input buffer also turns OFF. While the quick-response input is ON, the input buffer is continuously ON.
4. At the next I/O refresh, when the input buffer turns OFF, the input bits also turn OFF.

IORF 97 Instruction

When the IORF 97 instruction is used, during the execution cycle, I/O refresh occurs. When the quick-response input buffer turns ON, at the next IORF 97 or standard I/O refresh the input bits will turn ON. If the quick-response input turns OFF, at the next I/O refresh (IORF or standard), the input buffer will turn OFF. The second consecutive I/O refresh (IORF or standard) occurrence will turn the input bits.

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Usually, when the quick-response input is used, IORF 97 is not necessary for recognizing short input signals.

2-2 Dynamic Input

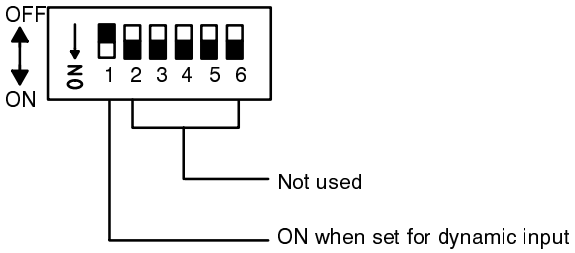
The dynamic input combines data and strobe signals so that many signals are available with a minimum amount of wiring. Input from keyboards and rotary thumb switches is possible because of the simplified wiring configuration.

The dynamic input configuration consists of 2 circuits, each providing 64 points (8 data and 8 strobe signals).

Dynamic input is available on the C200H-MD501/215/115 models only.

Dynamic Input Mode DIP Switch Setup

Set the rear DIP switch as shown for the dynamic input mode.



Input Bit Allocation Table

The following table shows the allocation of the I/O terminal data points.

Bit		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Data number		7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Word number	Word n	Strobe 1								Strobe 0							
	Word n+1	Strobe 3								Strobe 2							
	Word n+2	Strobe 5								Strobe 4							
	Word n+3	Strobe 7								Strobe 6							
Bit		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Data number		15	14	13	12	11	10	9	8	15	14	13	12	11	10	9	8
Word number	Word n+4	Strobe 9								Strobe 8							
	Word n+5	Strobe 11								Strobe 10							
	Word n+6	Strobe 13								Strobe 12							
	Word n+7	Strobe 15								Strobe 14							

CN2 row A

CN1 row A

CN2 row B

CN1 row B

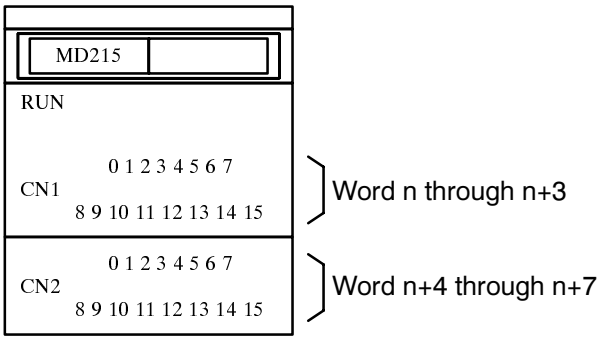
The unused words (n+8 and n+9) can be used as auxiliary inputs.
n = 100 + 10 x unit number

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Display Information

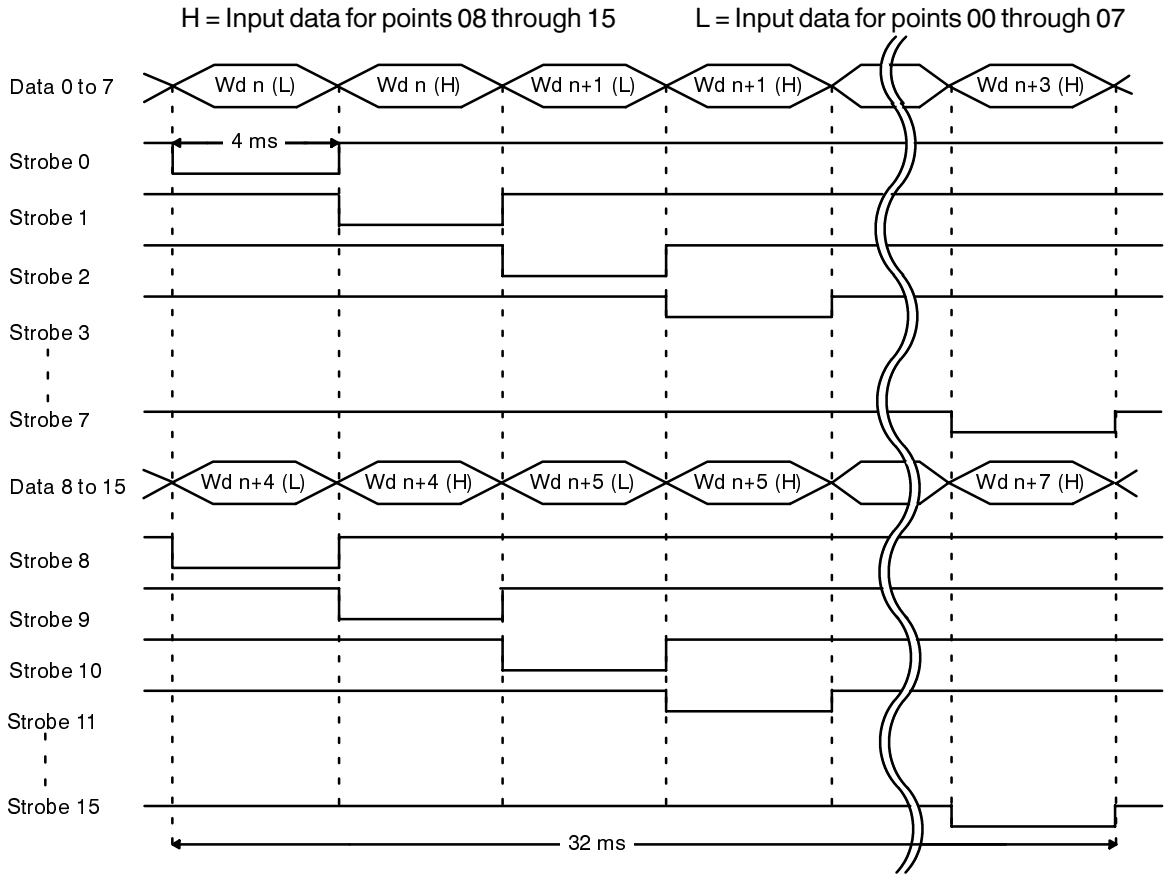
The front panel display shows the state of all the points of a 4-word section. The I/O points and the corresponding display bits operate from the logical OR principle. If the corresponding I/O point of a display bit is ON, the display bit will be lit.

Use this function when checking the wiring connections.

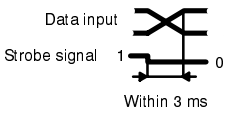


Input Timing

When a strobe signal is ON, the data inputs for that strobe are valid. The following diagram shows the timing for the strobe and data.



The data must be input within 3 ms from the falling edge of the the strobe as shown in the diagram.



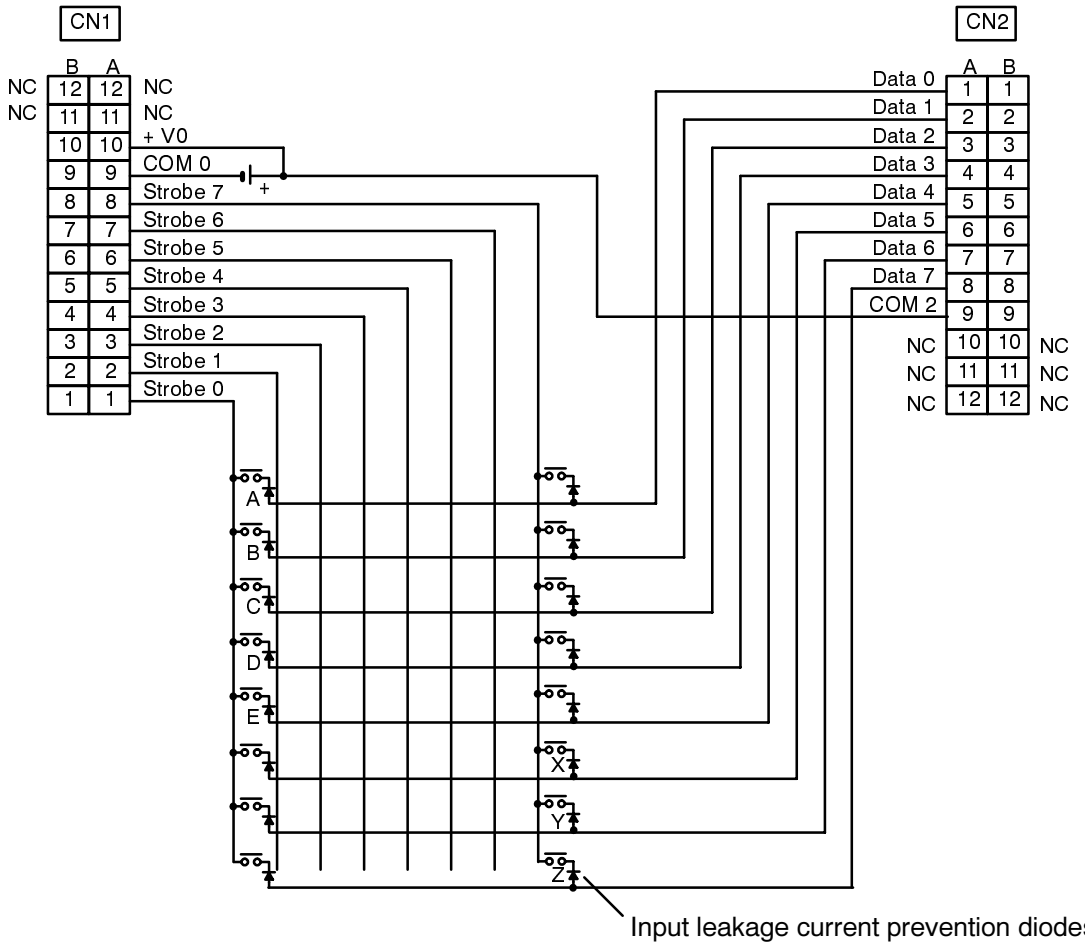
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Dynamic Input Connection Examples

The dynamic input allows the use of different types of input devices; two examples are shown here.

Connection Example #1 (Keyboard)

The following diagram shows how to use a keyboard as an input device.



Example #1 Data Configuration Table

The following table shows the input signal processing when a keyboard is connected as an input device.

When the “A” key is pressed word n, bit 00 turns ON. The remainder of the keys function as shown in the table.

Input points

15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00

Word n		. . . E D C B A
Word n+1		
Word n+2		
Word n+3	Z Y X . . .	

- - - Pressing the “A” key turns ON Word n bit 00.

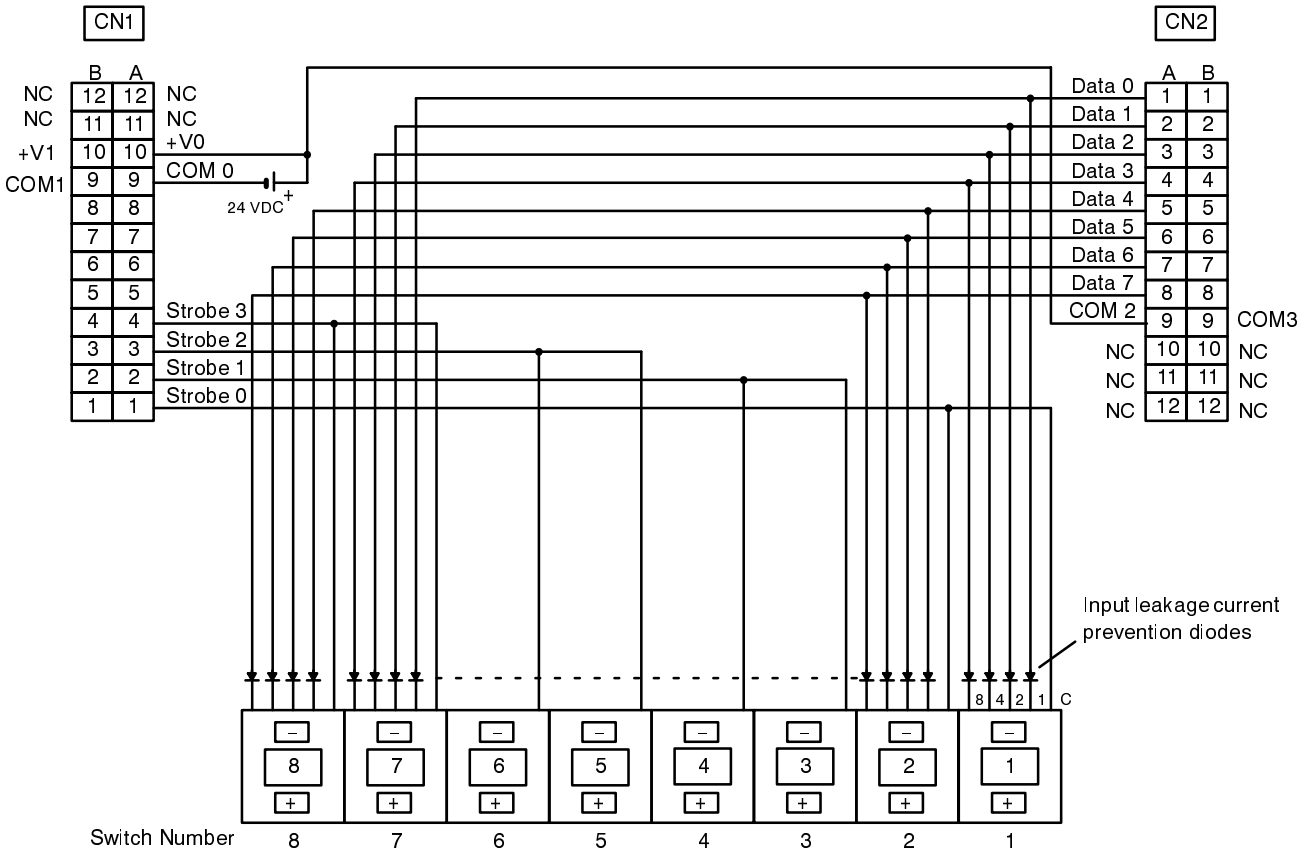
n = 100 + 10 x unit number

Because a small current moves through the connecting wires, shield all connecting wires and keep them separate from power lines. Keep the wire length to less than 10 meters.

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Connection Example #2 (rotary switch)

The following diagram shows how to use a rotary thumb switch as an input device.



Example #2 Data Configuration

The following table shows the input signal processing when a rotary thumb switch is connected as an input device.

Wd n+1				Wd n			
15 ↔ 08		07 ↔ 00		15 ↔ 08		07 ↔ 00	
Digit 8	Digit 7	Digit 6	Digit 5	Digit 4	Digit 3	Digit 2	Digit 1
1000	0111	0110	0101	0100	0011	0010	0001
Strobe 3		Strobe 2		Strobe 1		Strobe 0	

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2-3 Dynamic Output

Dynamic output consists of a data and strobe signal combination. The output configuration consists of 2 circuits, each allowing a total of 64 points (8 data signals and 8 strobe signals).

Setting pin 1 of the DIP switch ON enables the dynamic output.

Dynamic output can be set to operate with the C200H-OD501/215 models.

Data output is set for either positive or negative logic using pin 5 of the DIP switch. Positive logic will turn the output terminal ON when the output bit is ON. Negative logic will turn the output terminal OFF when the output bit is ON.

Strobe signals STB0 through STB15 are negative logic. When an “output” is present, the output terminal turns OFF. The outputs are cyclic and operate automatically.

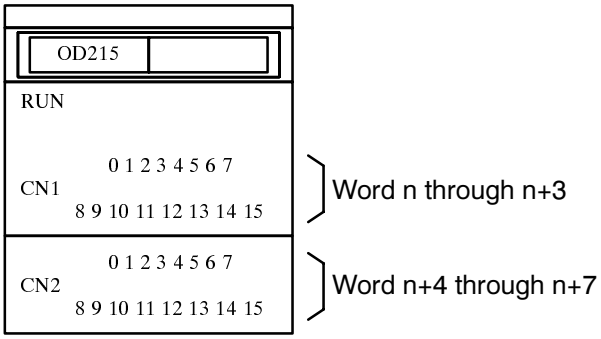
The C200H-OD501 has built-in pull-up resistors. The Unit can be used as is when connected to external devices.

The C200H-OD215 does not have built-in pull-up resistors. If the external device being connected to the Unit is also not equipped with pull-up resistors, a 4.7 kΩ, 1 watt resistor must be connected between the +DC and the DATA 0 through 15 and STB 0 through 15 terminals.

Display Information

The front panel display shows the state of all the points of a 4 word section. The I/O points and the corresponding display bits operate from the logical OR principle. If the corresponding I/O point of a display bit is ON, the display bit will be lit.

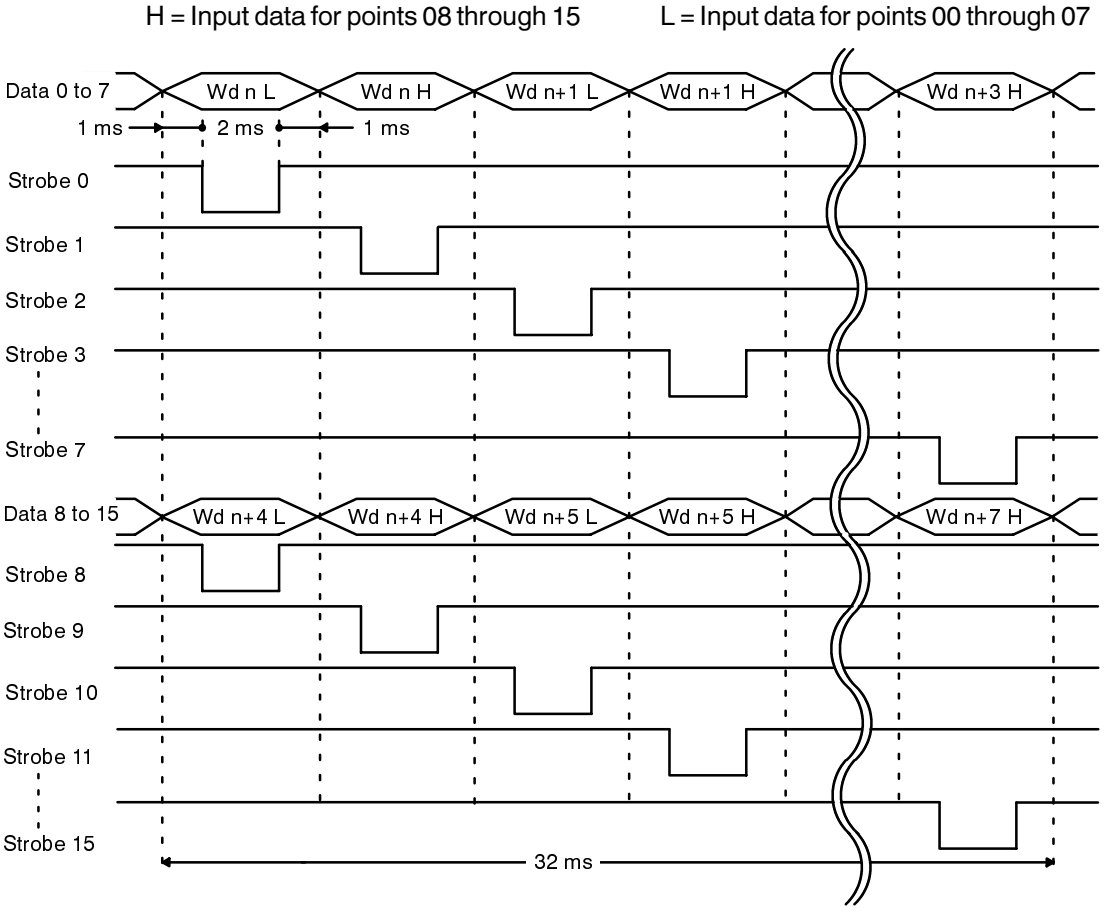
Use this function when checking the wiring connections.



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Timing

When a strobe signal is ON, the data inputs for that strobe are valid. The following diagram shows the timing for the strobe and data.

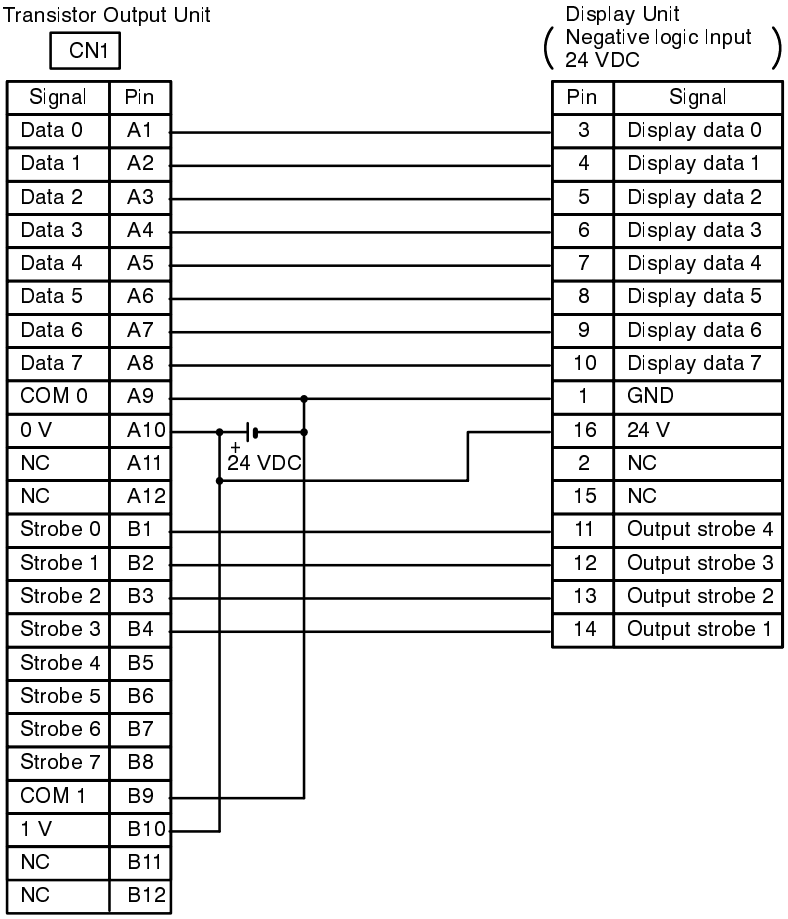


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Dynamic Output Connection Examples

Connection Example #1(Display Unit)

The first example shows the C200H-OD215 connected to a display unit. The display unit requires a negative logic input therefore; SW5 of the DIP switch is set to OFF. The display unit has internal pull-up resistors; no external pull-up resistors need to be connected.



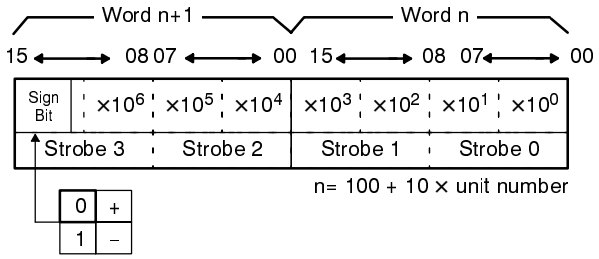
Set the rear panel DIP switch SW1 to ON and SW5 to OFF. For this connection example SW 2, 4, and 6 are not used.

Because a small current moves through the connecting wires, shield all connecting wires and keep them separate from power lines. Keep the wire length to less than 10 meters.

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Example #1 Data Configuration

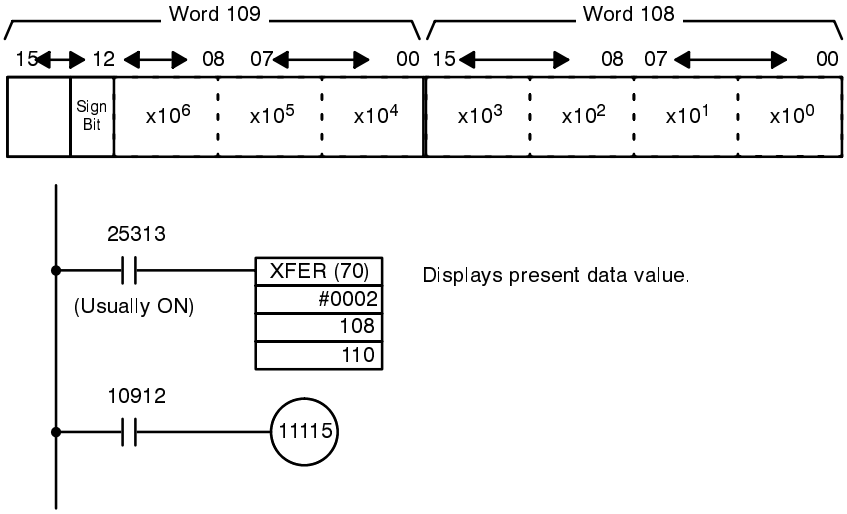
The following table shows the input signal processing.



The display unit accepts BCD format data only. If a different data format is used the display is blank. The numeric range of the display unit is –9,999,999 through 9,999,999.

When displaying the current data value of the C200H-NC111/NC112 Position Control Unit or the C200H-CT001-V1/CT002 High-Speed Counter Unit, the sign bit is located at bit 12 of the highest word of the current data value.

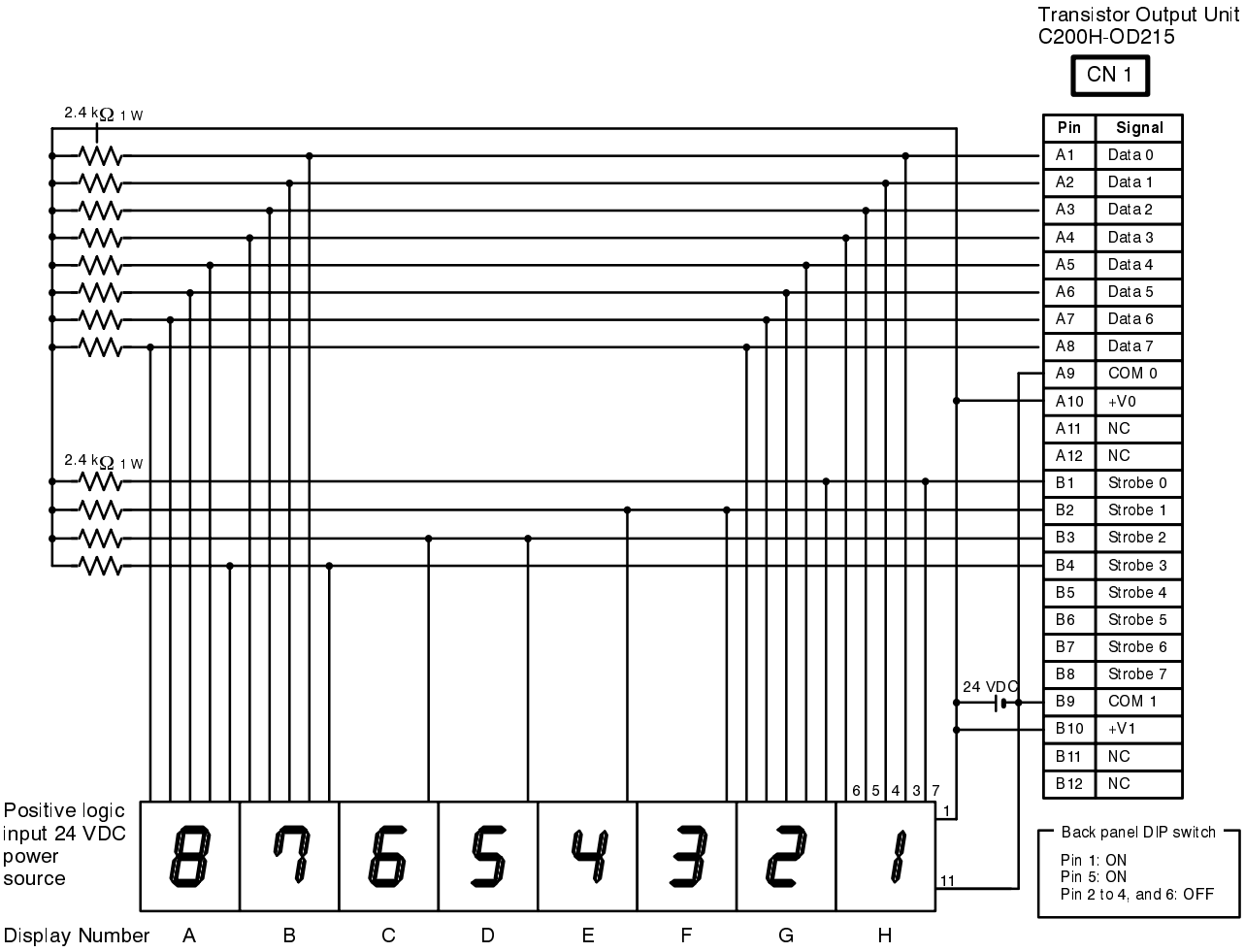
The following diagram shows the data format and an example of a small ladder diagram when the Position Control Unit is set as Unit 0 and the Transistor Output Unit is set as Unit 1.



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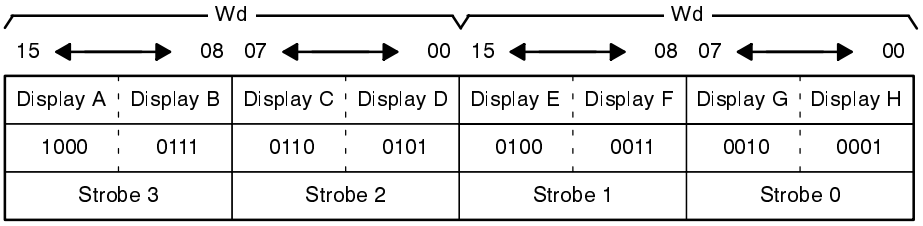
Connection Example #2 (Display Unit)

The second example shows the C200H-OD215 connected to a display unit. The display unit requires a positive logic input; therefore, SW5 of the DIP switch is set to ON. The display unit does not have internal pull-up resistors present therefore, external pull-up resistors need to be connected.



Example #2 Data Configuration

The following table shows the input signal processing.



n = 100 + 10 x unit number

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SECTION 3
I/O Refresh

This section describes the different types of processing involved during each cycle time.

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I/O Refresh Time

C200H Cycle Time

The I/O is refreshed once during each cycle time. The following paragraphs describe the 5 processes, including I/O refresh, and the order in which they occur every cycle time.

1. Common Processing

The common processing does a watchdog timer reset, I/O bus check, cycle time check, and a user program memory check. The processing time is 2.6 ms.

2. Host Link Service

The host link service processes commands sent from a host computer to a rack-mounted Host Link Unit. The maximum processing time is 8 ms.

3. Peripheral Unit Service

The peripheral unit service processes commands sent from programming consoles, and graphic programming consoles.

T = 1 + 2 + 4 + 5

When T ≤ 13 ms the processing time is 0.8 ms.

When T > 13 ms the processing time is T × 0.06 ms.

When a peripheral device is not connected the processing time is 0 ms.

4. Program Processing

The program processing processes the user program instructions. The processing time differs depending on the size of the program and the type of instructions used. Refer to an instruction set table to determine the processing time for the instructions.

5. I/O Refresh

The I/O refresh writes output data to the IR area, and reads input data to the IR area. Remote I/O Unit and Special I/O Unit I/O is also processed.

The I/O refresh processing time is as follows:

PC: 8 input points = 0.07 ms
8 output points = 0.04 ms
(calculate 12 point outputs as 16 points)

Remote Slave
Rack refresh: 1.3 ms × number of slave racks + 0.2 ms × N
(N = number or words used by the remote slave rack)

Special I/O
Unit refresh: Each cycle time × number of Units

Total cycle time = 1 + 2 + 3 + 4 + 5

High-Density and Multiplex I/O Unit Refresh Processing Time

The PC and high density and multiplex I/O Unit exchange data during I/O refresh. When the Unit is connected to a CPU rack or an expansion I/O rack the processing time is as follows:

Set for 32 point I/O: 0.8 ms
Set for dynamic I/O: 1.8 ms

When the Unit is connected to a slave rack, use the formula given in the previous C200H cycle time explanation.

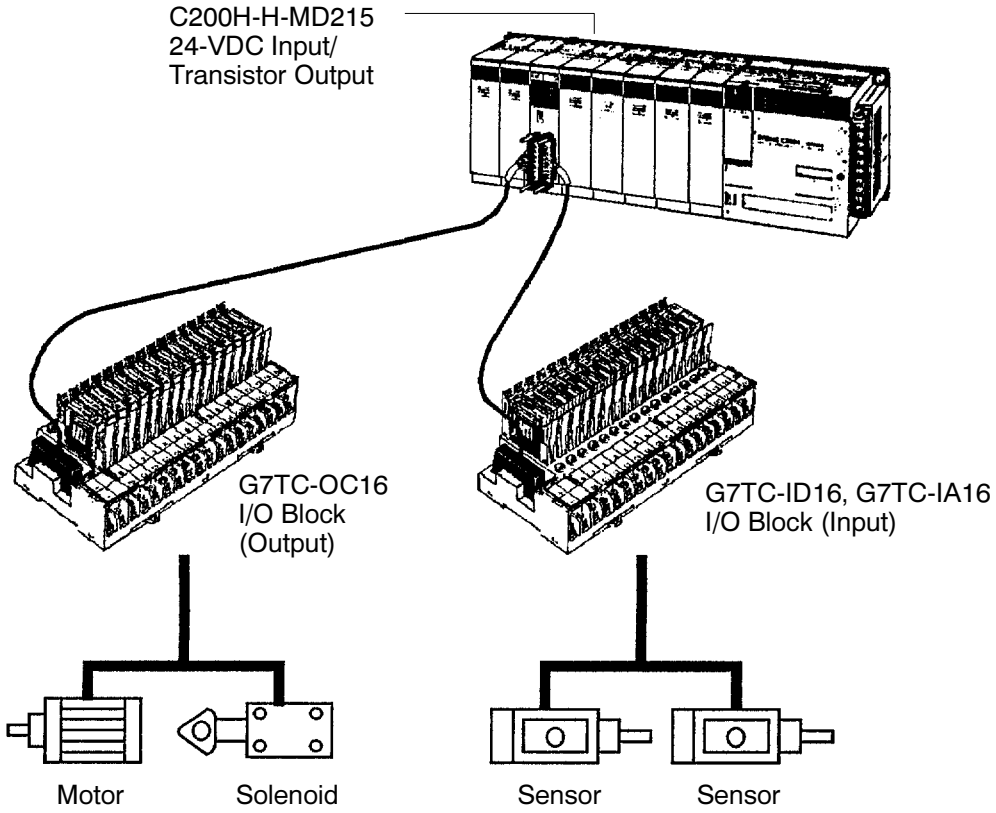
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SECTION 4
Application Example

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Application Example

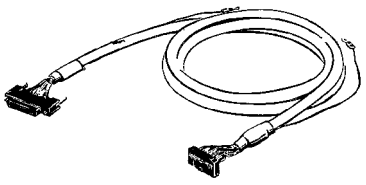
In this example the High-Density and Multiplex Unit 24-VDC model is connected to a G7TC I/O terminal block. Connecting the Unit to terminal blocks reduces the amount of space needed for wiring and system mounting space.



The following tables shows the connections between the High-Density and Multiplex Units and the terminal blocks.

High-Density and Multiplex Unit		Terminal Block	
24-VDC Input	C200H-ID215	G7TC-ID16 G7TC-IA16	Input
Transistor Output	C200H-OD215		
24-VDC Input/Transistor Output	C200H-MD215	G7TC-OC16	Output
12-VDC Input/Transistor Output	C200H-MD115		

I/O Connecting Cables



Model	Length
G79-50C	50 cm
G79-100C	1 m
G79-150C	1.5 m
G79-200C	2 m

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Appendix A
Standard Models

Connecting Cables

Model	Length
G79-50C	50 cm
G79-100C	1 m
G79-150C	1.5 m
G79-200C	2 m

Units Covered In This Manual And Related Units

Unit	Model No.
High-Density and Multiplex I/O Units	C200H-ID501
	C200H-ID215
	C200H-OD501
	C200H-OD215
	C200H-MD501
	C200H-MD115
	C200H-MD215
High-Speed Counter	C200H-CT001-V1
	C200H-CT002
A/D Unit	C200H-AD001
D/A Unit	C200H-DA001
Position Control Unit	C200H-NC111
	C200H-NC112
	C200H-NC211
Temperature Sensor Unit	C200H-TS001
	C200H-TS002
	C200H-TS101
	C200H-TS102
ID Sensor Unit	C200H-IDS01
Voice Unit	C200H-OV001
ASCII Unit	C200H-ASC02
PC Link Unit	C200H-LK401

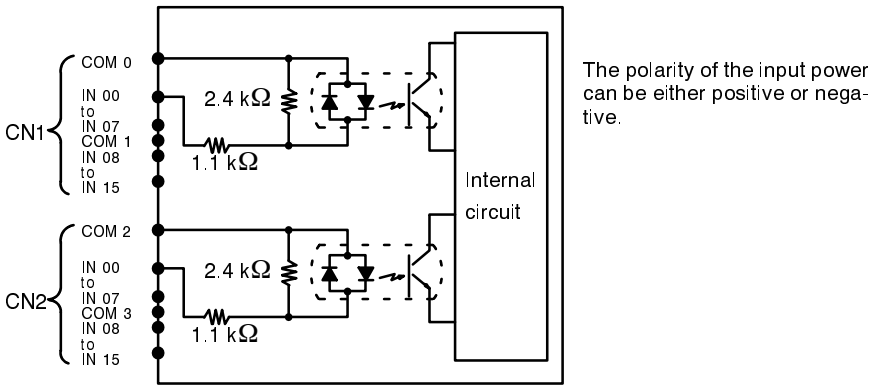
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Appendix B
Specifications

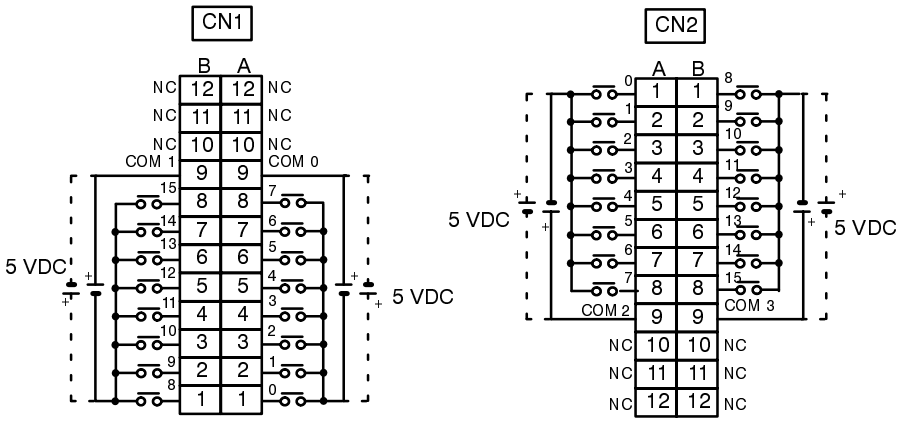
TTL Input Unit

32-Point TTL Input Unit	
Model no.	C200H-ID501
Rated input voltage	5 VDC ±10%
Input impedance	1.1 kΩ
Input current	3.5 mA (5 VDC) This represents an average value.
ON voltage	3.0 VDC min.
OFF voltage	1.0 VDC max.
ON response time	2.5 ms max./15 ms max. (selectable)
OFF response time	2.5 ms max./15 ms max. (selectable)
Number of Points	32 points (8 points/common 4 circuits (Isolated common))
Quick-response inputs	8 points (CN2 08 to 15, pin 2: ON), min. input pulse Width range selectable between 1 ms and 4 ms
Internal current consumption	5 VDC, 130 mA max.
Weight	300 grams max.

Circuit Configuration



External Connection Diagram



When the input is set to quick-response (pin 2: ON), inputs 08 to 15 are used for quick-response.

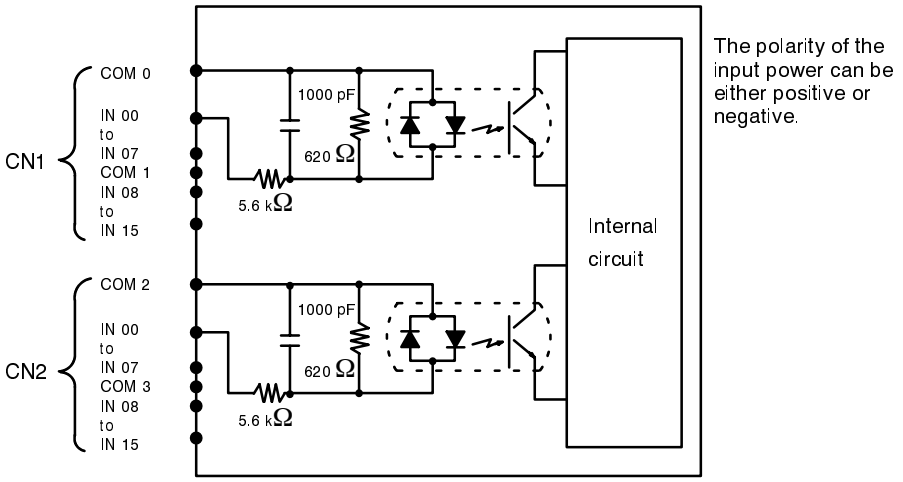
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24-VDC Input Unit

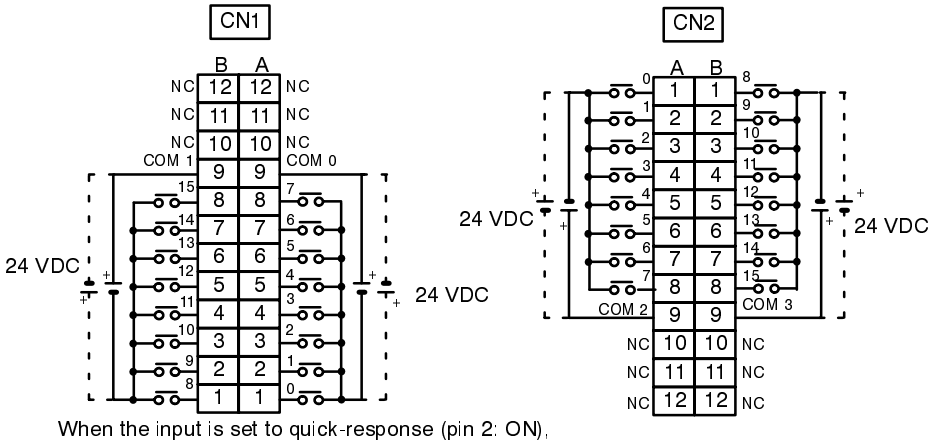
32-Point DC Input Unit	
Model no.	C200H-ID215
Rated input voltage	24 VDC +10%/-15%
Input impedance	5.6 kΩ
Input current	4.1 mA (24 VDC) (typical value)
ON voltage	14.4 VDC min.
OFF voltage	5.0 VDC max.
ON response time	2.5 ms max./15 ms max. (selectable)
OFF response time	2.5 ms max./15 ms max. (selectable)
Number of Circuits	32 points (8 points/common 4 circuits (Isolated common)) (See note)
Quick-response inputs	8 points (CN2 08 to 15, pin 2: ON), min. input pulse Width range selectable between 1 ms and 4 ms
Internal current consumption	5 VDC, 130 mA max.
Weight	300 grams max.

Note Depending on the ambient temperature, the eligible number of points for simultaneous input is restricted. Refer to page 48.

Circuit Configuration



External Connection Diagram



When the input is set to quick-response (pin 2: ON), inputs 08 to 15 are used for quick-response.

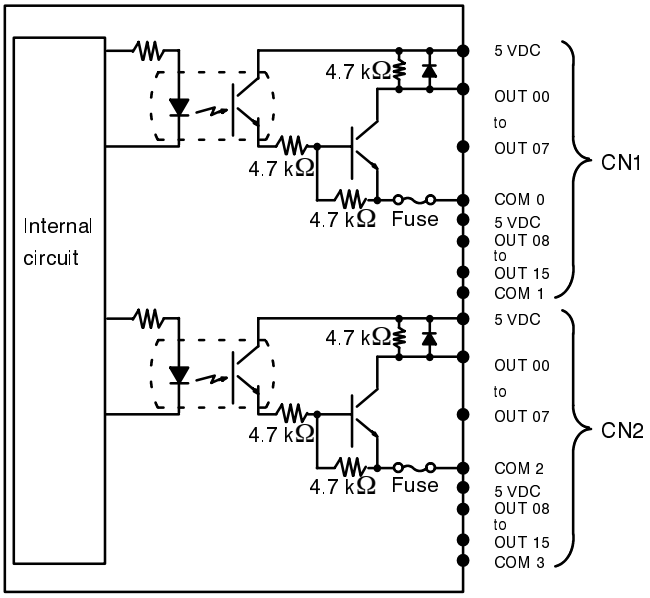
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32-Point TTL Output Unit

32-Point TTL Output Unit (Pin 1: OFF)	
Model no.	C200H-OD501
Maximum switching capacity	5 VDC ±10% 35mA, 280 mA/common, 1.12 A/Unit, output resistance 4.7 kΩ
Leakage current	0.1 mA max.
Residual voltage	0.4 V max.
ON response time	0.2 ms max.
OFF response time	0.3 ms max.
Number of Points	32 points (8 points/common 4 circuits (Isolated common))
Internal current consumption	5 VDC, 220 mA max.
Fuse	1 fuse/circuit, 4 (circuits) (Not user-replaceable)
External power supply	5 VDC ±10%, 39 mA min. (1.2 mA x number of ON points)
Weight	300 grams max.

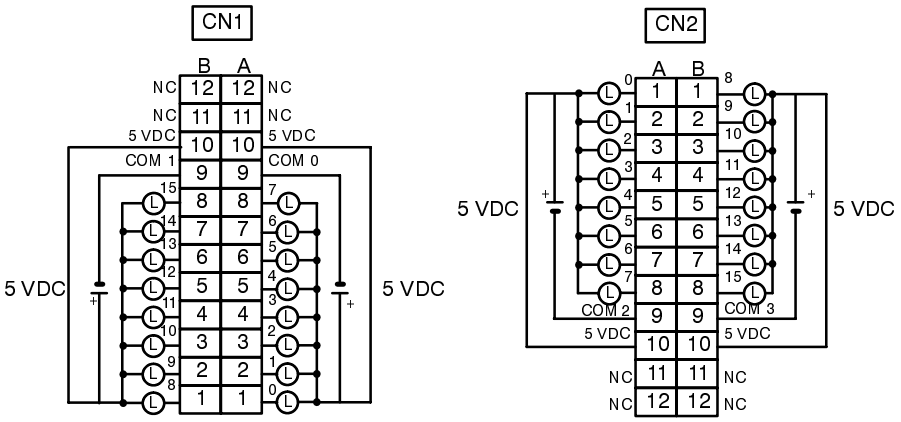
Note
1. To operate the Unit in the 32-point Static-output mode, set pin 1 of the DIP switch to OFF.
2. The output mode is negative logic. The Unit output is OFF when the PC output is ON.
3. The output resistance on each of the output terminals is 4.7 kΩ.

Circuit Configuration



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External Connection Diagram



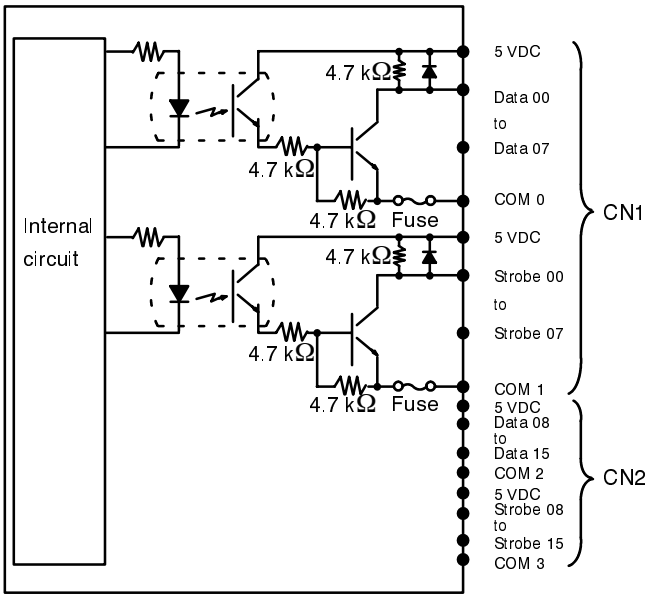
128-Point Dynamic Output TTL Output Unit

128-Point Dynamic Output TTL Output Unit (Pin 1: ON)	
Model no.	C200H-OD501
Maximum switching capacity	5 VDC ±10% 35mA, 280 mA/common, 1.12 A/Unit, output resistance 4.7 kΩ
Leakage current	0.1 mA max.
Residual voltage	0.4 V max.
ON response time	0.2 ms max.
OFF response time	0.3 ms max.
Number of Points	128-point dynamic (64 points dynamic 2 circuits (Isolated common)
Internal current consumption	5 VDC, 220 mA max.
Fuse	1 fuse/circuit, 4 (circuits) Fuses are not user-replaceable.
External power supply	5 VDC ±10%, 39 mA min. (1.2 mA x number of points)
Weight	300 grams max.

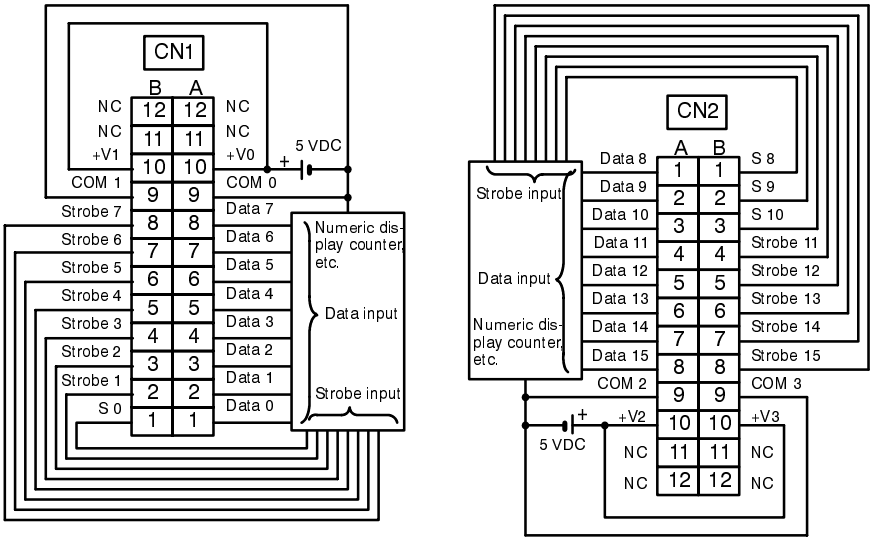
Note
1. To operate the Unit in the 128-point Dynamic-output mode, set pin 1 to ON. Set the output logic with pin 5 of the DIP switch.
2. Negative logic means that the Unit output is OFF when the PC output is ON.
3. Positive logic means that the Unit output is ON when the PC output is ON.
4. Strobe signals become negative logic output regardless of the above settings.
5. The output resistance on each of the output terminals is 4.7 kΩ.

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Circuit Configuration



External Connection Diagram



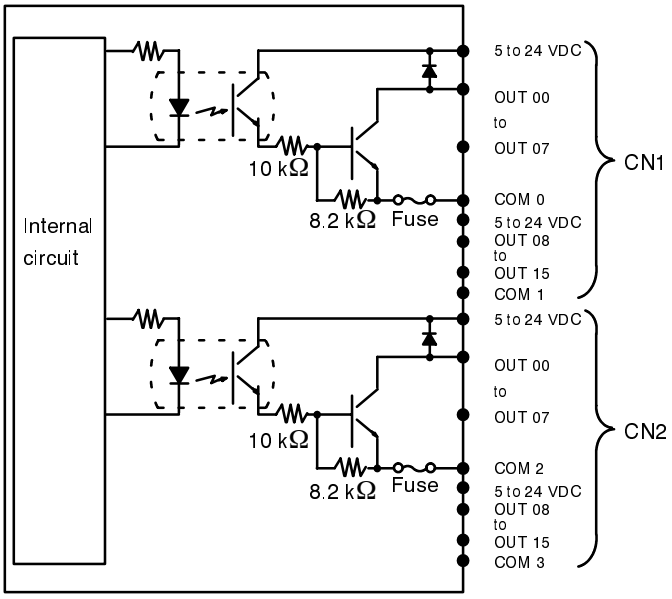
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32-Point Transistor Output Unit

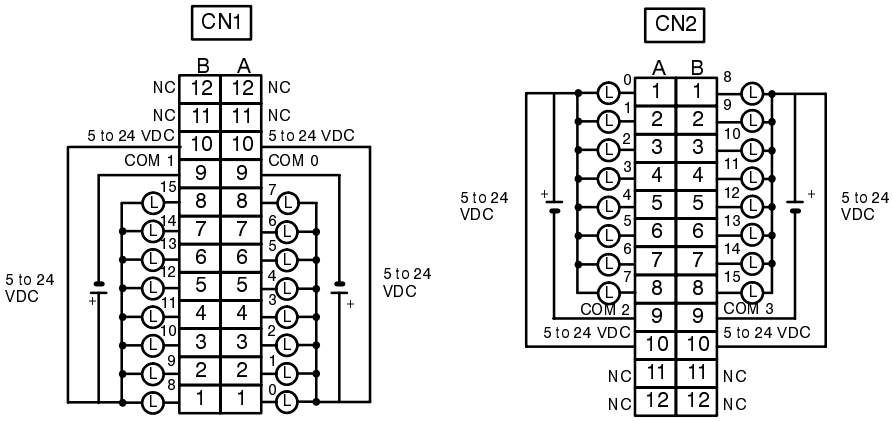
	32-Point Transistor Output Unit (Pin 1: OFF)
Model no.	C200H-OD215
Maximum switching capacity	16 mA/4.5 V to 100 mA/26.4 V 800 mA/common 3.2 A max. Refer to page 48.
Leakage current	0.1 mA max.
Residual voltage	0.7 V max.
ON response time	0.2 ms max.
OFF response time	0.6 ms max.
Number of Points	32-point (8 points/common 4 circuits (Isolated common))
Internal current consumption	5 VDC, 220 mA max.
Fuse	1 fuse/circuit, 4 (circuits) Fuses are not user-replaceable.
External power supply	5 to 24 VDC ±10%, 90 mA min. (2.8 mA x number of ON points)
Weight	300 grams max.

Note To operate the Unit in the 32-point Static-output mode, set pin 1 of the DIP switch to OFF.

Circuit Configuration



External Connection Diagram



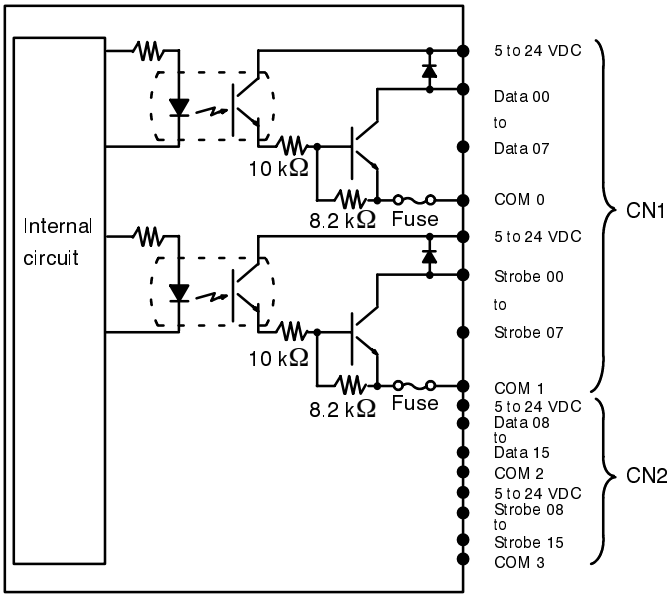
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128-Point Dynamic Output Transistor Output Unit

128-Point Dynamic Output Transistor Output Unit (Pin 1: ON)	
Model no.	C200H-OD215
Maximum switching capacity	16 mA/4.5 V to 100 mA/26.4 V 800 mA/common 3.2 A/Unit
Leakage current	0.1 mA max.
Residual voltage	0.7 V max.
ON response time	0.2 ms max.
OFF response time	0.6 ms max.
Number of Points	128-point dynamic (64 points dynamic 2 circuits (Isolated common))
Internal current consumption	5 VDC, 220 mA max.
Fuse	1 fuse/circuit, 4 (circuits) Fuses are not user-replaceable.
External power supply	5 to 24 VDC ±10%, 90 mA min. (2.8 mA x number of ON points)
Weight	300 grams max.

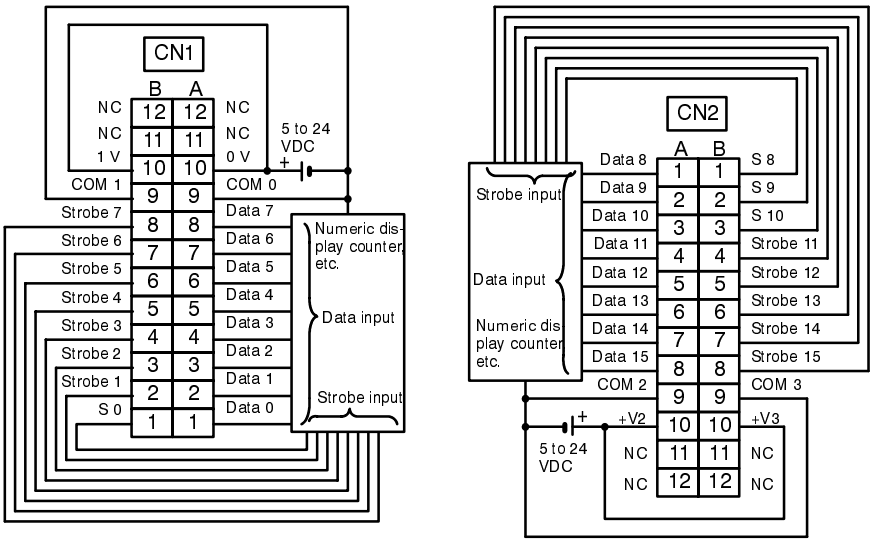
Note
1. To operate the Unit in the 128-point Dynamic-output mode, set pin 1 to ON. Set the output logic with pin 5 of the DIP switch.
2. Negative logic means that the Unit output is OFF when the PC output is ON.
3. Positive logic means that the Unit output is ON when the PC output is ON.
4. Strobe signals become negative logic output regardless of the above settings.

Circuit Configuration



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External Connection Diagram



If there is no pull-up resistance on the output device, a resistor is needed between the DC power supply and each data (0 to 15) or strobe (0 to 15) terminal.

16-Point I/O TTL Unit

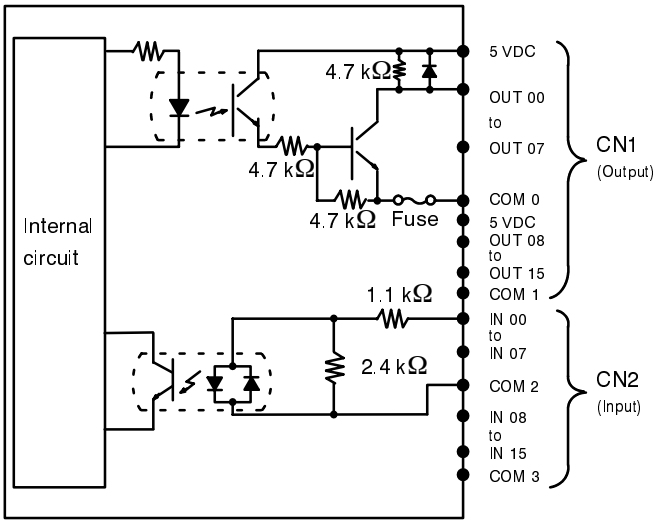
16-Point I/O TTL Unit (Pin 1: OFF)	
Model no.	C200H-MD501
Output section (CN1)	
Maximum switching capacity	5 VDC ±10% 35mA output resistance 4.7 KΩ 280 mA/common 560 mA/Unit
Leakage current	0.1 mA max.
Residual voltage	0.4 V max.
ON response time	0.2 ms max.
OFF response time	0.3 ms max.
Number of Points	16 points (8 points/common 2 circuits (Isolated common))
Internal current consumption	5 VDC, 180 mA max.
Fuse	1 fuse/circuit, (2 circuits) Fuse are not user-replaceable.
External power supply	5 VDC ±10%, 20 mA min. (1.2 mA x number of ON points)
Weight	300 grams max.

16-Point I/O TTL Unit (Pin 1: OFF)	
Model no.	C200H-MD501
Input section (CN2)	
Rated input voltage	5 VDC ±10%
Input impedance	1.1 kΩ
Input current	3.5 mA (5 VDC) (typical value)
ON voltage	3.0 VDC min.
OFF voltage	1.0 VDC max.
ON response time	2.5 ms max./15 ms max. (selectable)
OFF response time	2.5 ms max./15 ms max. (selectable)
Number of Points	16 points (8 points/common 2 circuits (Isolated common))
Quick-response input	8 points (CN2-08 to 15, pin 2 set to ON) Minimum response input pulse range (selectable) 1 ms/4 ms
Internal current consumption	5 VDC, 180 mA max.
Weight	300 grams max.

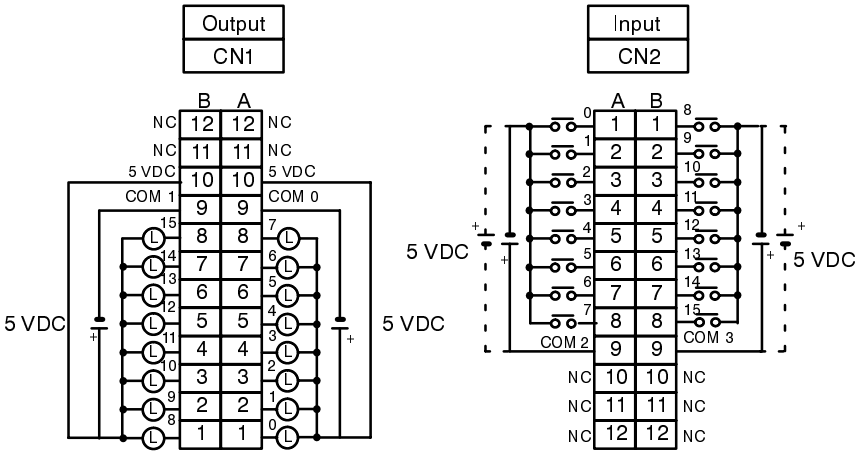
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Note
1. To operate the Unit in the 16-point/16-point Static mode, set pin 1 of the DIP switch to OFF.
2. The Polarity of the input power for the input section can be either positive or negative.
3. The output mode is OFF when the PC output is ON.
4. The output resistance on each of the output terminals is 4.7 kΩ.

Circuit Configuration



External Connection Diagram



When the input is set to quick-response (pin 2: ON), inputs 08 to 15 of CN2 are used for quick-response.

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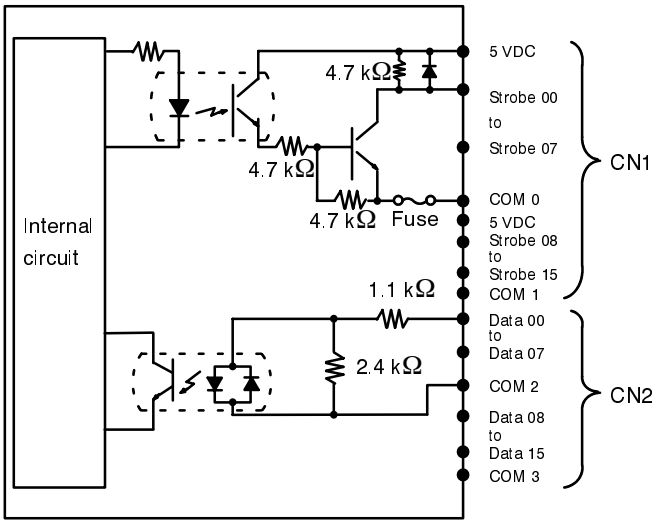
128-Point Dynamic Input TTL I/O Unit

128-Point Dynamic Input TTL I/O Unit (Pin 1: ON)	
Model no.	C200H-MD501
Output section (CN1)	
Maximum switching capacity	5 VDC ±10% 35mA output resistance 4.7 kΩ 280 mA/common 560 mA/Unit
Leakage current	0.1 mA max.
Residual voltage	0.4 V max.
ON response time	0.2 ms max.
OFF response time	0.3 ms max.
Number of Points	128-point dynamic (64 points dynamic 2 circuits (Isolated common))
Internal current consumption	5 VDC, 180 mA max.
Fuse	1 fuse/circuit, (2 circuits) Not user-replaceable
External power supply	5 VDC ±10%, 20 mA min. (1.2 mA x number of ON points)
Weight	300 grams max.

128-points Dynamic Input TTL I/O Unit (Pin 1: ON)	
Model no.	C200H-MD501
Input section (CN2)	
Rated input voltage	5 VDC ±10%
Input impedance	1.1 kΩ
Input current	3.5 mA (5 VDC) Typical value
ON voltage	3.0 VDC min.
OFF voltage	1.0 VDC max.

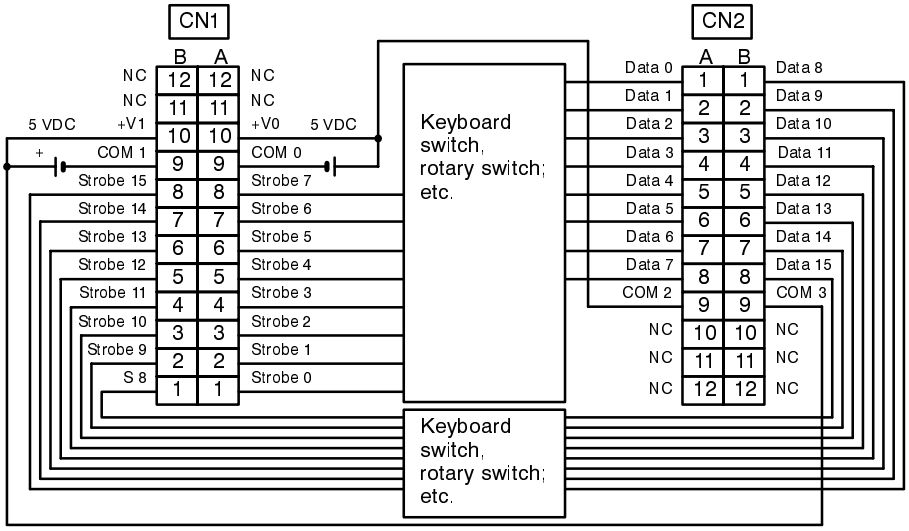
Note 1. To operate the Unit in 128-point dynamic output mode, set pin 1 to ON.
2. The output resistance on each of the output terminals is 4.7 kΩ.

Circuit Configuration



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External Connection Diagram



12-VDC Input/Transistor Output Unit

16-Point DC Input/Transistor Output Unit (Pin 1: OFF)	
Model no.	C200H-MD115
Output section (CN1)	
Maximum switching capacity	16 mA/4.5 V to 100 mA/26.4 V 800 mA/common, 1.6 A/Unit
Leakage current	0.1 mA max.
Residual voltage	0.7 V max.
ON response time	0.2 ms max.
OFF response time	0.6 ms max.
Number of Points	16 points (8 points/common 2 circuits (Isolated common))
Internal current consumption	5 VDC, 180 mA max.
Fuse	1 fuse/circuit, (2 circuits) Fuse are not user-replaceable
External power supply	5 to 24 VDC ±10%, 45 mA min. (2.8 mA x number of points)
Weight	300 grams max.

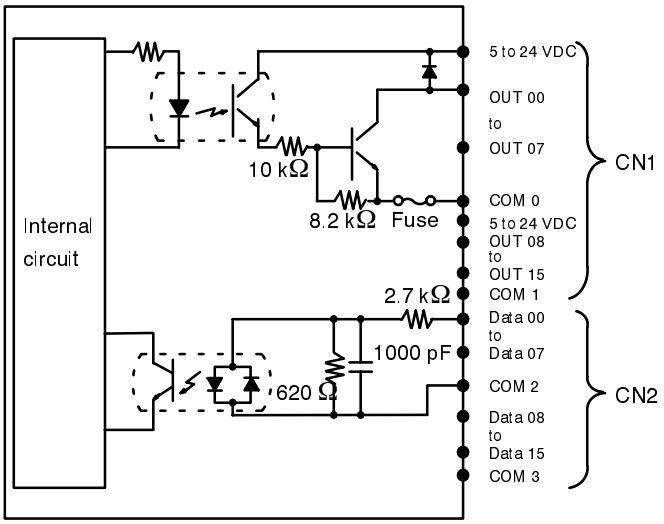
16-Point DC Input/Transistor Output Unit (Pin 1: OFF)	
Model no.	C200H-MD115
Input section (CN2)	
Rated input voltage	12 VDC +10% -15%
Input impedance	2.7 kΩ
Input current	4.1 mA (12 VDC) This represents a average value
ON voltage	8.0 VDC min.
OFF voltage	3.0 VDC max.
ON response time	2.5 ms max./15 ms max. (selectable)
OFF response time	2.5 ms max./15 ms max. (selectable)
Number of Points	16 points (8 points/common 2 circuits (Isolated common))
Quick-response input	8 points (CN2-08 to 15, pin 2 set to ON) Minimum response input pulse range (selectable) 1 ms/4 ms
Internal current consumption	5 VDC, 180 mA max.
Weight	300 grams max.

Note 1. To operate the Unit in the 16-point/16-point Static mode, set pin 1 of the DIP switch to OFF.

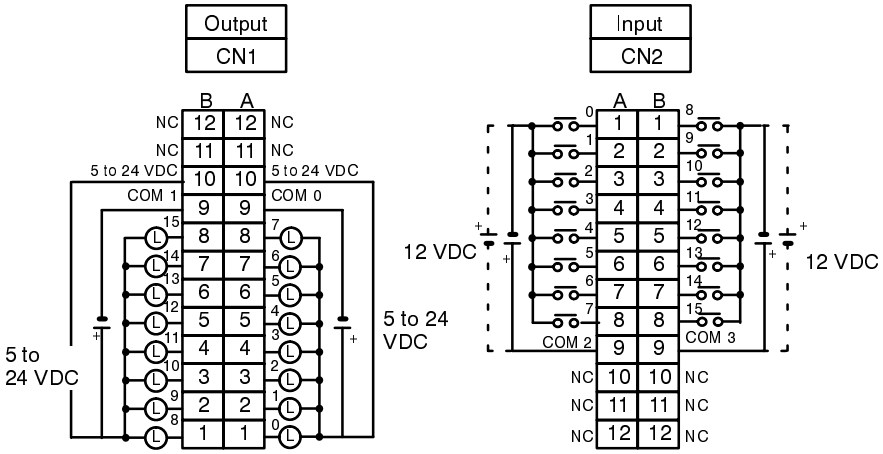
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2. The polarity of the input power for the input section can be either positive or negative.

Circuit Configuration



External Connection Diagram



When the input is set to quick-response (pin 2: ON), inputs 08 to 15 are used for quick-response.

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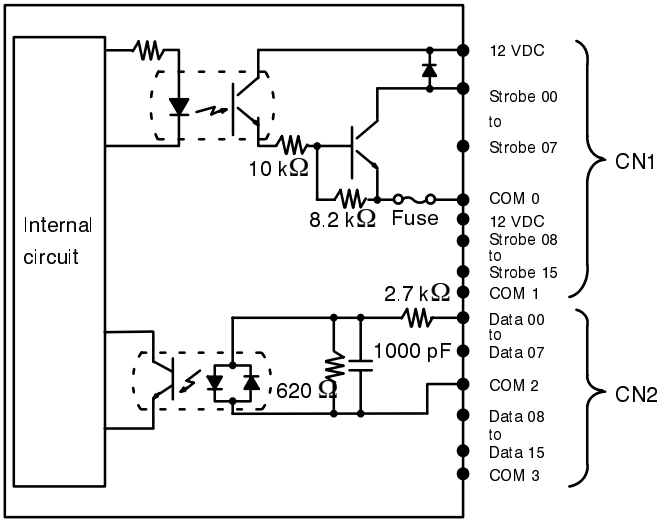
12-VDC Input/Transistor Output

128-Points Dynamic Input DC Input/Transistor Output (Pin 1: ON)	
Model no.	C200H-MD115
Output section (CN1)	
Maximum switching capacity	12 VDC +10% -15% 50mA 400 mA/common, 0.8A/Unit
Leakage current	0.1 mA max.
Residual voltage	0.7 V max.
ON response time	0.2 ms max.
OFF response time	0.6 ms max.
Number of Points	128-point dynamic (64-point dynamic 2 circuits (Isolated common))
Internal current consumption	5 VDC, 180 mA max.
Fuse	1 fuse/circuit, (2 circuits) (Not user-replaceable)
External power supply	12 VDC ±10%, 45 mA min. (2.8 mA x number of ON points)
Weight	300 grams max.

128-Points Dynamic Input DC Input/Transistor Output (Pin 1: ON)	
Model no.	C200H-MD115
Input section (CN2)	
Rated input voltage	12 VDC +10% -15%
Input impedance	2.7 kΩ
Input current	4.1 mA (12 VDC) (typical value)
ON voltage	8.0 VDC min.
OFF voltage	3.0 VDC max.
Number of Points	128-point dynamic (64 points/circuit)
Internal current consumption	5 VDC, 180 mA max.
Weight	300 grams max.

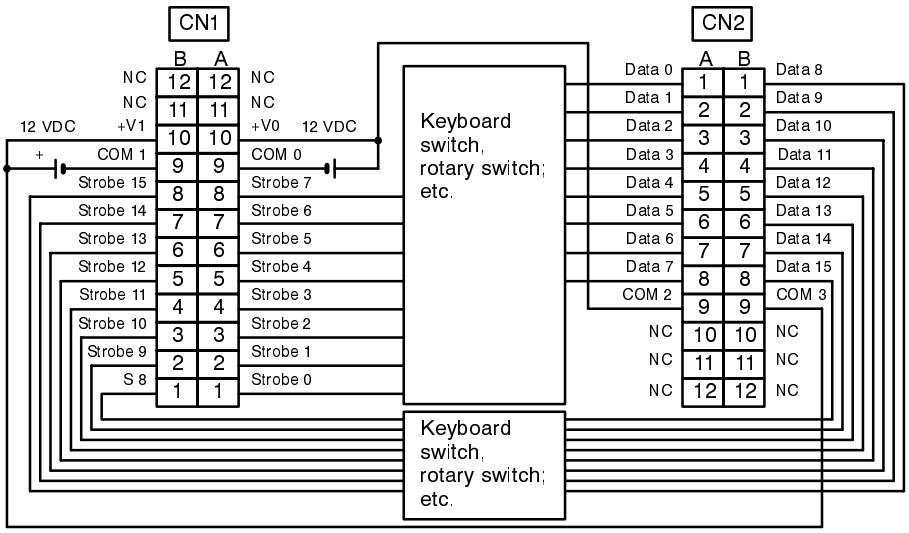
Note To operate the Unit in 128-point Dynamic-input mode, set pin 1 to ON.

Circuit Configuration



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External Connection Diagram



24-VDC Input/Transistor Output Unit

16-Point DC Input/Transistor Output Unit (Pin 1: OFF)	
Model no.	C200H-MD215
Output section (CN1)	
Maximum switching capacity	16 mA/4.5 V to 100 mA/26.4 V 800 mA/common, 1.6 A/Unit
Leakage current	0.1 mA max.
Residual voltage	0.7 V max.
ON response time	0.2 ms max.
OFF response time	0.6 ms max.
Number of Points	16 points (8 points/common) (See note)
Internal current consumption	5 VDC, 180 mA max.
Fuse	1 fuse/circuit, (2 circuits) (Not user-replaceable)
External power supply	5 to 24 VDC ±10%, 45 mA min. (2.8 mA x number of ON points)
Weight	300 grams max.

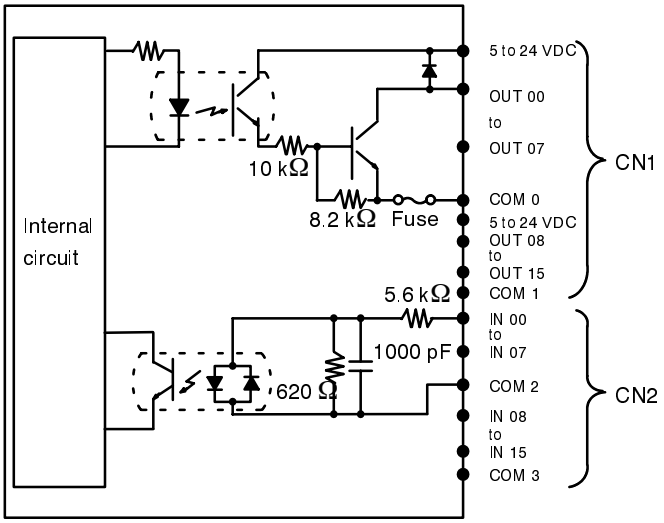
16-point DC Input/Transistor Output Unit (Pin 1: OFF)	
Model no.	C200H-MD215
Input section (CN2)	
Rated input voltage	24 VDC +10% -15%
Input impedance	5.6 kΩ
Input current	4.1 mA (24 VDC) (typical value)
ON voltage	14.4 VDC min.
OFF voltage	5.0 VDC max.
ON response time	2.5 ms max./15 ms max. (selectable)
OFF response time	2.5 ms max./15 ms max. (selectable)
Number of Points	16 points (8 points/common 2 circuits (Isolated common))
Quick-response input	8 points (CN2-08 to 15, pin 2 set to ON) Minimum response input pulse range (selectable) 1 ms/4 ms
Internal current consumption	5 VDC, 180 mA max.
Weight	300 grams max.

Note 1. Depending on surrounding temperature, the number of bits that can simultaneously be input is restricted. Refer to *Simultaneous Input* in this appendix.

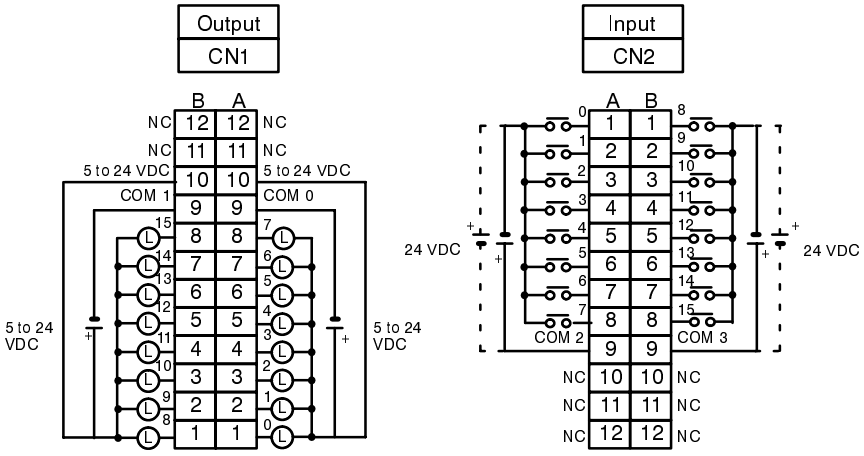
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2. To operate the Unit in the 16-point/16-point Static mode, set pin 1 of the DIP switch to OFF.
3. The polarity of the input power for the input section can be either positive or negative.

Circuit Configuration



External Connection Diagram



When the input is set to quick-response (pin 2: ON), inputs 08 to 15 are used for quick-response.

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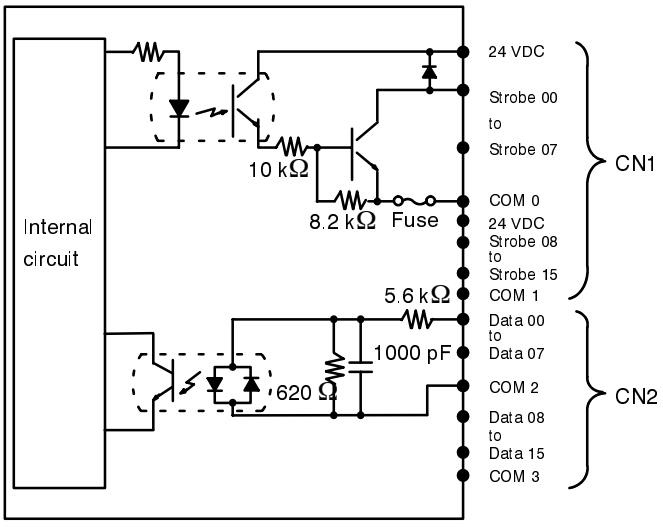
24-VDC Input/Transistor Output

128-Points Dynamic Input DC Input/Transistor Output (Pin 1: ON)	
Model no.	C200H-MD215
Output section (CN1)	
Maximum switching capacity	24 VDC +10% -15% 100mA 800mA/common, 1.6 A/Unit
Leakage current	0.1 mA max.
Residual voltage	0.7 V max.
ON response time	0.2 ms max.
OFF response time	0.6 ms max.
Number of Points	128-point dynamic (64 points dynamic 2 circuits (Isolated common)) (See note)
Internal current consumption	5 VDC, 180 mA max.
Fuse	1 fuse/circuit, (2 circuits) (Not user-replaceable)
External power supply	24 VDC ±10%, 45 mA min. (2.8 mA x number of ON points)
Weight	300 grams max.

128-Points Dynamic Input DC Input/Transistor Output (Pin 1: ON)	
Model no.	C200H-MD215
Input section (CN2)	
Rated input voltage	24 VDC +10% -15%
Input impedance	5.6 kΩ
Input current	4.1 mA (24 VDC) (typical value)
ON voltage	14.4 VDC min.
OFF voltage	5.0 VDC max.
Number of Points	128-point dynamic (64 points dynamic 2 circuits (Isolated common))
Internal current consumption	5 VDC, 180 mA max.
Weight	300 grams max.

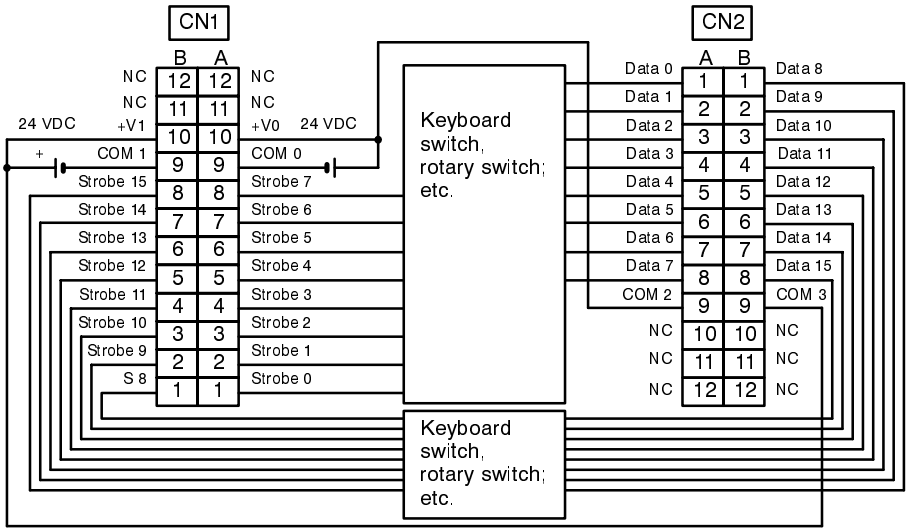
Note Depending on surrounding temperature, the number of bits that can simultaneously be input is restricted. Refer to *Simultaneous Input* in this appendix. To operate the Unit in 128-point Dynamic-output mode, set pin 1 to ON.

Circuit Configuration



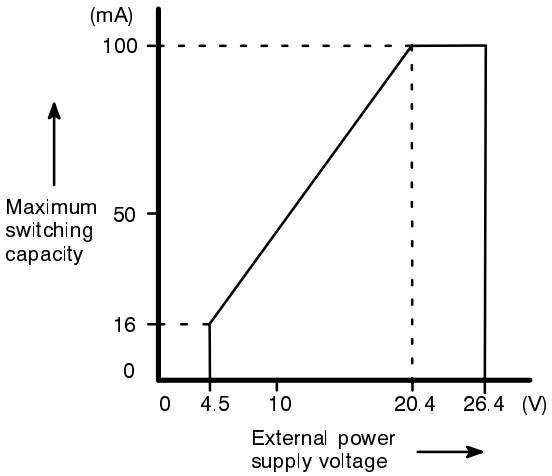
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External Connection Diagram



Transistor Output Maximum Switching Capacity

The following diagram shows the maximum switching capacity of C200H-OD215/MD215, 115 transistor output in ratio to the external power supply.

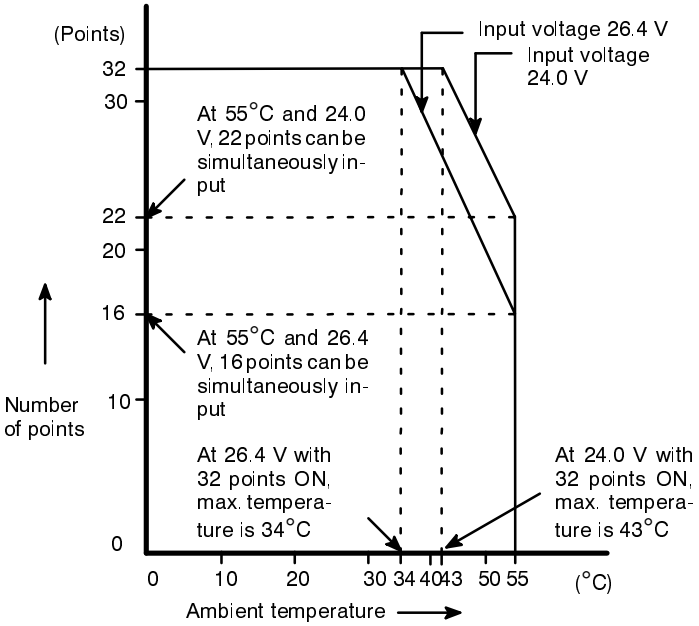


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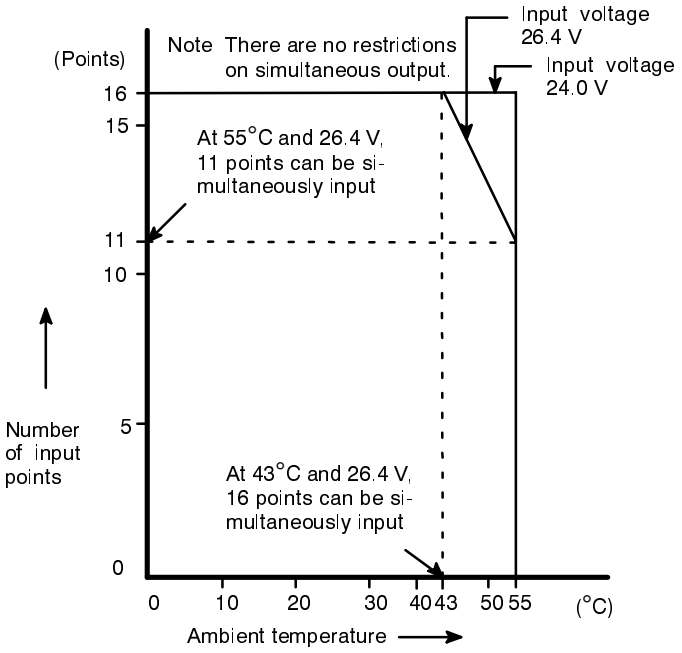
Simultaneous Input

The following diagrams show the number of points that can be simultaneously input to the C200H-ID215 and C200H-MD215, depending on the surrounding temperatures.

C200H-ID215



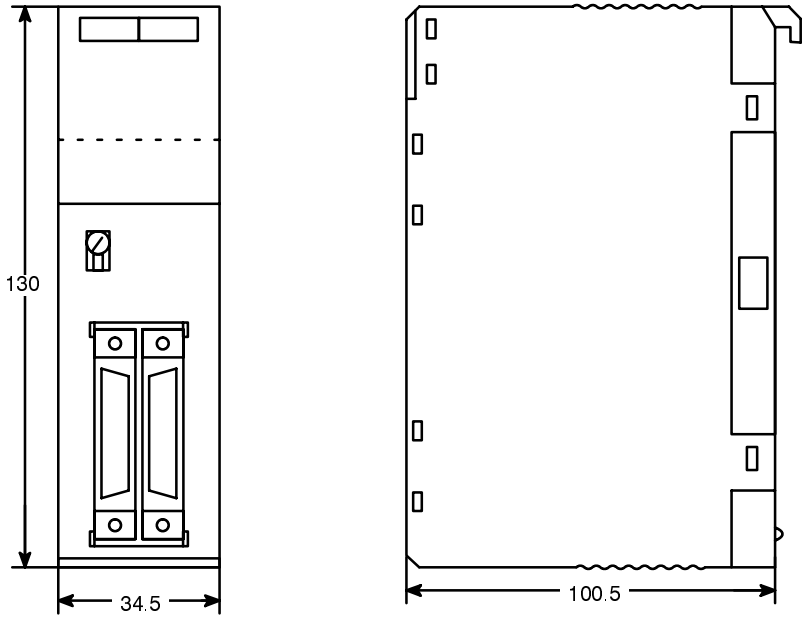
C200H-MD215



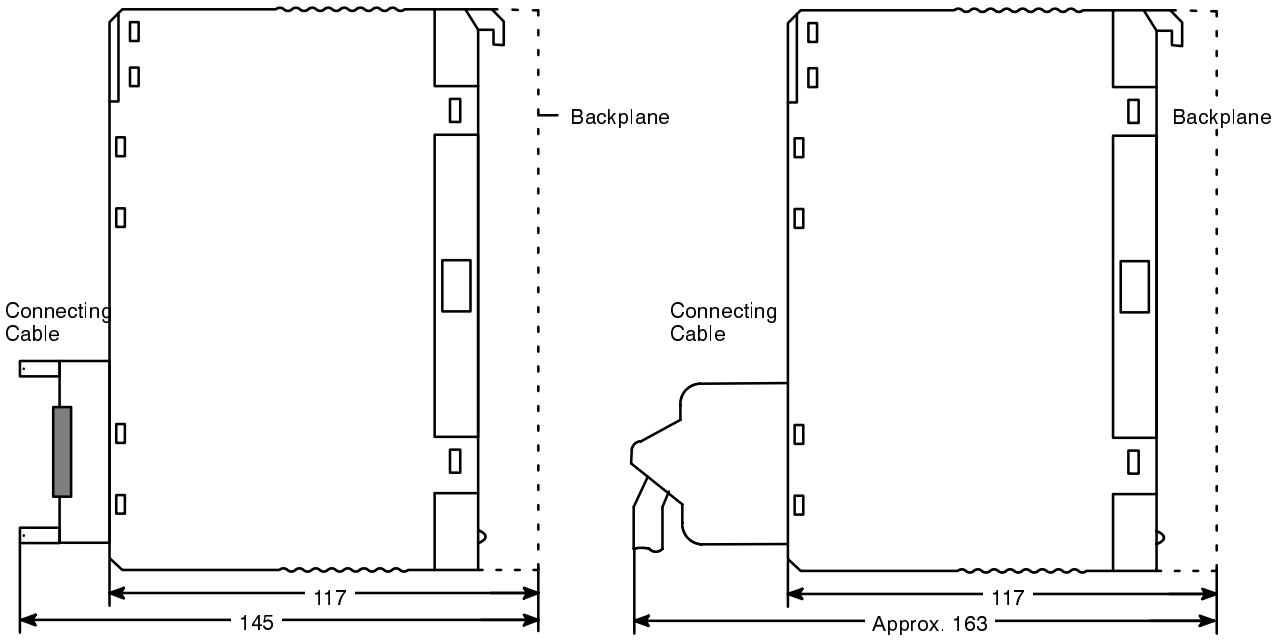
When too many C200H-ID215/MD215 inputs are simultaneously ON, the electronic part inside the Unit becomes too hot. This deteriorates the circuitry as well as the parts, and shortens the life of the Unit, However it does take some degree of time for the parts to get hot. For example, if all the inputs have been OFF long enough to be cooled completely, even inputting signals to all the points simultaneously may be safe for up to 10 minutes. All dimensions are in millimeters.

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External Dimensions



Mounted Dimensions



Note: A length of approximately 200 mm is required when a press-fit connector is used.

Use the G79 Connecting Cable to connect G7TC I/O Block.

When using the G79 Connecting Cable and C200H-BP001 Programming Console Adaptor, it is possible to mount peripheral units directly to the CPU with this Unit mounted to one of the two rightmost slots of CPU Rack.

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Appendix C
Troubleshooting

This appendix covers common problems encountered with the Units and various ways of determining and correcting them.

All Units

No.	Error	Possible cause	Corrective action
1	“RUN” LED is unlit	I/O unit number is duplicated	Correct the I/O unit number
		Malfunction due to noise	Noise prevention • Install surge suppressor • Install insulation former • Use shielded cable
		Defective Unit	Replace Unit
		Defective CPU	Replace CPU
		Defective I/O cable	Check I/O cables
		Defective Power Supply	Replace I/O Power Supply
		Defective Remote I/O Unit	Replace Remote I/O Unit

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Input Unit

No.	Error	Possible cause	Corrective action
1	Inputs do not turn ON (Function LEDs unlit)	No external input voltage supply	Supply power
		Low external input voltage	Supply voltage up to rated voltage
		Bad connection to terminal block	Insert terminal block securely and tighten screws
		Bad circuit	Replace Unit
2	Inputs do not turn ON (Function LEDs lit)	Bad circuit	Replace Unit
3	Inputs do not turn OFF	Bad circuit	Replace Unit
4	Specific bit number input does not turn ON	Bad input device	Replace input device
		Disconnected input wiring	Check input wiring
		Bad connection between terminal block and input wiring	Check wiring of terminal block
		Bad connection to terminal block	Insert terminal block securely and tighten screws
		External input ON time too short	Adjust input device
		Bad input circuit	Replace Unit
		Programmed to use an input bit number as an OUT instruction	Correct the program
5	Specific bit number input does not turn OFF	Bad input circuit	Replace Unit
		Programmed to use an input bit number as an OUT instruction	Correct the program
6	Inputs turn ON/OFF irregularly	External input voltage low	Increase external voltage to the rated voltage
		Malfunction due to noise	Noise prevention • Install surge suppressor • Install insulation transformer • Use shielded cable
		Bad connection between terminal block and input wiring	Check wiring of terminal block
		Bad connection to terminal block	Insert terminal block securely and tighten screws
7	Errors occur in multiples of 8 bits	Common wire poorly connected	Check wiring of terminal block
		Bad connection to terminal block	Insert terminal block securely and tighten screws
		Bad CPU	Replace CPU
8	Input LED unlit (normal operation)	Bad LED indicator	Replace Unit

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Output Unit

No.	Error	Possible cause	Corrective action
1	Outputs do not turn ON	No power supply for load	Supply power
		Low Voltage for load	Increase supply voltage to the rated voltage
		Bad connection to terminal block connector	Insert terminal block securely and tighten screws
		Fuse is blown	Replace Unit
		Bad connection to I/O bus connector	Replace Unit
		Bad circuit	Replace Unit
2	Outputs do not turn OFF	Bad circuit	Replace Unit
3	Specific bit number input does not turn ON (LED unlit)	Output on-time too short	Correct the program
		Bit number involved is programmed in duplicate	Correct the program
		Bad circuit	Replace Unit
4	Specific bit number input does not turn ON (LED lit)	Bad output device	Replace output device
		Disconnected output wiring	Check output wiring
		Bad connection between output wiring and terminal block	Check wiring of terminal block
		Bad connection to terminal block	Insert terminal block securely and tighten screws
		Bad output circuit	Replace Unit
5	Specific bit number output does not turn OFF (LED unlit)	Not reset due to leakage current or residual voltage	Replace external load or add dummy resistor
		Bad output circuit	Replace Unit
6	Specific bit number output does not turn OFF (LED lit)	Bit number involved is programmed in duplicate	Correct the program
		Bad circuit	Replace Unit
7	Outputs turn ON/OFF irregularly	Supply voltage for external load low	Raise external supply voltage
		Bit number involved is programmed in duplicate	Correct the program
		Malfunction due to noise	Noise prevention • Install surge suppressor • Install insulation transformer • Use shielded cable
		Bad connection between output wiring and terminal block	Check wiring of terminal block
		Bad connection to terminal block	Insert terminal block securely and tighten screws
8	Errors occur in multiples of 8 bits	Bad connection between output wiring and terminal block	Check wiring of terminal block
		Bad connection to terminal block	Insert terminal block securely and tighten screws
		Fuse is blown	Replace Unit
		Bad CPU	Replace CPU
9	Output LED unlit (Normal operation)	Bad LED indicator	Replace Unit

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Glossary

allocation — The process by which the PC assigns certain bits or words in memory for various functions. This includes pairing I/O bits to I/O points on Units.

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.

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.

BCD calculation — An arithmetic calculation that uses numbers expressed in binary-coded decimal.

binary — A number system where all numbers are expressed to the base 2, i.e., any number can be written using only 1's or 2's. Each group of four binary bits is equivalent to one hexadecimal digit.

binary calculation — An arithmetic calculation that uses numbers expressed in binary.

binary-coded decimal — A system used to represent numbers so that each four binary bits is numerically equivalent to one decimal digit.

bit — A binary digit; hence a unit of data in binary notation. The smallest unit of information that can be electronically stored in a PC. The status of a bit is either ON or OFF. Different bits at particular addresses are allocated to special purposes, such as holding the status input from external devices, while other bits are available for general use in programming.

bit address — The location in memory where a bit of data is stored. A bit address must specify (sometimes by default) the data area and word that is being addressed as well as the number of the bit.

bit designator — An operand that is used to designate the bit or bits of a word to be used by an instruction.

bit number — A number that indicates the location of a bit within a word. Bit 00 is the rightmost (least-significant) bit; bit 15 is the leftmost (most-significant) bit.

bit number — A number that indicates the location of a bit within a word. Bit 00 is the rightmost (least-significant) bit; bit 15 is the leftmost (most-significant) bit.

BCD — Abbreviation for Binary Coded Decimal. A binary numbering system in which any decimal digit is represented by a group of 4 bits.

communication cable — Cable used to transfer data between components of a control system and conforming to the RS-232C or RS-422 standards.

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CPU	An acronym for central processing unit.
CPU Backplane	A Backplane used to create a CPU Rack.
CPU Rack	Part of a Rack PC, the CPU Rack contains the CPU, a Power Supply, and other Units.
cycle 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. Cycle 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. Cycle times will differ depending on the configuration of the system.
DIP switch	An acronym for dual in-line package switch. A set of four to eight miniature switches fabricated in a dual in-line arrangement.
Expansion I/O Backplane	A Backplane used to create an Expansion I/O Rack.
Expansion I/O Rack	Part of a Rack PC, an Expansion I/O Rack is connected to a CPU Rack to increase the number of slots available for mounting Units.
falling edge	Denotes the side of a signal that is “falling” (decreasing to a level lower than it previous was at).
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.
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.
LAN	An acronym for local area network.
leakage current	A faulty current occurring in any electronic device, circuit, etc., due to leakage.
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.
local area network	A network consisting of nodes or positions in a loop arrangement. Each node can be any one of a number of devices. This kind of network usually operates over a small area such as a group of offices or a factory floor.
multiplex	To use one channel for many signals.
PC	An acronym for Programmable Controller.
photoelectric switch	A switch that uses light to detect the presence of an object.

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PLC	See PC.
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.
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.
proximity switch	A switch that uses magnetic induction to measure the distance of a metallic object from the front of the switch.
pull-up resistor	A resistor connected to a voltage source which is equal to the high (1) level of the logic family that is used.
Rack	An assembly that forms a functional unit in a Rack PC System. A Rack consists of a Backplane and the Units mounted to it. These Units include the Power Supply, CPU, and I/O Units. Racks include CPU Racks, Expansion I/O Racks, and I/O Racks. The CPU Rack is the Rack with the CPU mounted to it. An Expansion I/O Rack is an additional Rack that holds extra I/O Units. An I/O Rack is used in the C2000H Duplex System, because there is no room for any I/O Units on the CPU Rack in this System.
Remote I/O Unit	A Unit that extends the distance an Expansion I/O Rack can be from the CPU.
response time	The elapsed time between an action by a peripheral device and the feedback from the main system.
sensor	An input device that “senses” a property of the real world and relays it to the Control System. The property can be a measurement of an object, or simply a signal indicating the presence of the object.
strobe	A regularly recurring waveform or signal used in timing applications.
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.
terminal block	An I/O device used to communicate with the Unit from a remote site.
TTL	Abbreviation for Transistor -Transistor Logic.
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.

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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.

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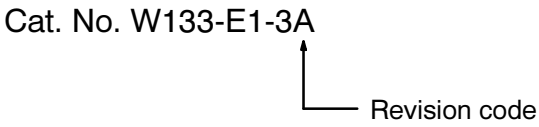
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Revision History

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



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

Revision code	Date	Revised content
1	August 1988	Original production
2	June 1989	Revision of text and graphics.
3	October 1990	Revision of text and graphics.
3A	January 1996	Changed manual format. Scan time changed to cycle time throughout the manual. **Page 6:** Connector dimensions diagram added and connector assembly diagram corrected. Note added. **Page 60:** Mounted dimensions corrected. Note added.

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