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User's Manual
for HCA8C Extension Blocks

This manual gives a detailed introduction of HCA8C extension blocks specification.

This manual should be read and understood before attempting to install or use the unit.

1. Generic specification and safety precaution

1.1 Specification

Items	Specification				
Ambient temperature	0 to 55°C (32 to 131°F) when operating and -25 to 75°C (-13 to 167°F) when stored				
Vibration resistance		Frequency (Hz)	Acceleration ($m/s^{2)}$	Half amplitude (mm)	
	When installed on DIN rail	10 to 57	--	0.035	Sweep Count for X, Y, Z: 10 times (80 min in each direction)
		57 to 150	4.9	--	
	When installed directly	10 to 57	--	0.075	
		57 to 150	9.8	--	
Shock resistance	147 m/s^2 acceleration; Action time: 11ms; 3 times by half-sine pulse in each direction X, Y and Z.				
Noise resistance	By noise simulator at noise voltage of 1,000 Vp-p, noise width of 1 μs, rise time of 1 ns and period of 30 to 100 Hz				
Dielectric withstand voltage	500V AC for one minute				
Insulation resistance	5MΩor more by 500V DC megger				
Grounding	Class D grounding(grounding resistance: 100 Ωor less) <Common grounding with a heavy electrical system is not allowed.>*3				
Working atmosphere	Free from corrosive gas, flammable gas or excessive conductive dusts				
Working altitude	<2000m				

1.2 Safety precaution

Design precaution ⚠DANGER
•Make sure to have the following safety circuits outside of the PLC to ensure safe system operation even during external power supply problems or PLC failure. Otherwise, malfunction may cause series accidents. 1) Most importantly, have the following: an emergency stop circuit, a protection circuit, an interlock circuit for opposite movement(such as normal vs. reverse rotation), and an interlock circuit (to prevent damage to the equipment at the upper or lower positioning limits) 2) Note that when the PLC CPU detects an error, such as a watchdog timer error, during self-diagnosis, all outputs are turned off. Also, when an error that cannot be detected by the PLC CPU occurs in an input/output control block, output control may be disabled. External circuits and mechanisms should be designed to ensure safe machinery operation in such a case. 3) Note that when an error occurs in a relay, triac or transistor output devices, the output could be held either on or off. For output signals that may lead to series accidents, external circuits and mechanisms

should be designed to ensure safe machinery operation in such a case.

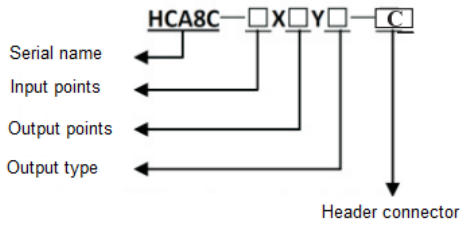
Design Precautions ⚠CAUTION
• Do not bundle the control line together with or lay it close to the main circuit or power line. As a guideline, lay the control line at least 100mm (3.94") or more away from the main circuit or power line. Noise may cause malfunctions. • Install module so that excessive force will not be applied to peripheral device connectors, power connectors or input/output connectors. Failure to do so may result in wire damage/breakage or PLC failure.

Wiring Precautions ⚠DANGER
•Make sure to cut off all phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product. • Make sure to attach the terminal cover, offered as an accessory, before turning on the power or initiating operation after installation or wiring work. Failure to do so may cause electric shock. • Make sure to properly wire theHCA8C Series extension equipment in accordance with the following precautions. Failure to do so may cause electric shock, a short-circuit, wire breakage, or damage to the product. - The disposal size of the cable end should follow the dimensions described in this manual. - Tightening torque should be between 0.5 and 0.8 N•m. • Make sure to properly wire to the European terminal board in accordance with the following precautions. Failure to do so may cause electric shock, a short-circuit, wire breakage, or damage to the product. - The disposal size of the cable end should follow the dimensions described in this manual. - Tightening torque should be between 0.5 and 0.8 N•m. - Twist the end of strand wire and make sure that there are no loose wires. - Do not solder-plate the electric wire ends. - Do not connect more than the specified number of wires or electric wires of unspecified size. - Affix the electric wires so that neither the terminal block nor the connected parts are directly stressed.

2. Product overview

This section gives an overview of HCA8C extension blocks.

2.1 Interpretation of I/O extension blocks model names



Note: *YR indicates relay output, *YT indicates transistor output.

Model name with “-C”: (Header) connector type; Model name without “-C”: Terminal block type

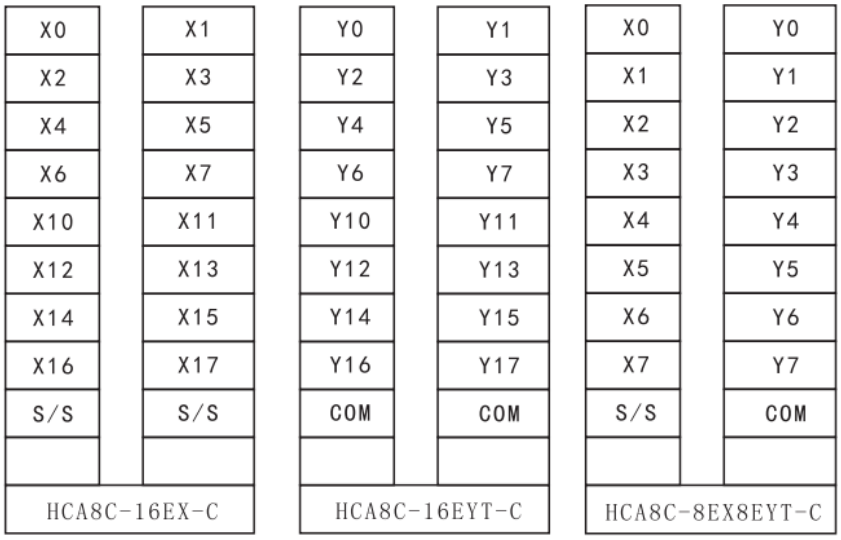
2.2 I/O extension blocks

Model Name	Input		Output		Connection type	I/O occupied points	5V DC power supply capacity(mA)
	Points	Type	Points	Type			
HCA8C-4EX4EYR	4	24VDC	4	Relay	Terminal block	16(Note1)	40
HCA8C-4EX4EYT	4	24VDC	4	Transistor	Terminal block	16(Note1)	40
HCA8C-8EX	8	24VDC	--	--	Terminal block	8	25
HCA8C-8EYR	--	--	8	Relay	Terminal block	8	30
HCA8C-8EYT	--	--	8	Transistor	Terminal block	8	30
HCA8C-8EX8EYR	8	24VDC	8	Relay	Terminal block	16	60
HCA8C-8EX8EYT	8	24VDC	8	Transistor	Terminal block	16	60
HCA8C-16EX	16	24VDC	--	--	Terminal block	16	30
HCA8C-16EYR	--	--	16	Relay	Terminal block	16	50
HCA8C-16EYT	--	--	16	Transistor	Terminal block	16	50
HCA8C-16EX-C	16	24VDC	--	--	Connector	16	30
HCA8C-16EYT-C	--	--	16	Transistor	Connector	16	50
HCA8C-8EX8EYT-C	8	24VDC	8	Transistor	Terminal block	16	

Note1: Even though HCA8C-4EX4EYR &HCA8C-4EX4EYT each have 4 input points and 4 output points, but 8 input points and 8 output points are occupied in PLC main unit. If more extension blocks need to be connected, please take note of the number of I/O points.

2.3 Terminal layout

Extension blocks (Connector):



Extension blocks (8-pin terminal block):

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X0
X1
X2
X3
S/S
Y0
Y1
Y2
Y3
COM

HCA8C-4EX4EYT
HCA8C-4EX4EYR

X0
X1
X2
X3
X4
X5
X6
X7
S/S
S/S

HCA8C-8EX

Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
COM
COM

HCA8C-8EYT
HCA8C-8EYR

Extension blocks (16-pin terminal block):

X0
X1
X2
X3
X4
X5
X6
X7
S/S
S/S

X0
X1
X2
X3
X4
X5
X6
X7
S/S1
S/S1

Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
COM1
COM1

Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
COM
COM

HCA8C-8EX8EYT
HCA8C-8EX8EYR

X10
X11
X12
X13
X14
X15
X16
X17
S/S2
S/S2

HCA8C-16EX

Y10
Y11
Y12
Y13
Y14
Y15
Y16
Y17
COM2
COM2

HCA8C-16EYT
HCA8C-16EYR

3. 24V DC input specification

3.1 Input terminal

There are two optional connection methods (sink input/ source input) between input terminals and S/S terminal.

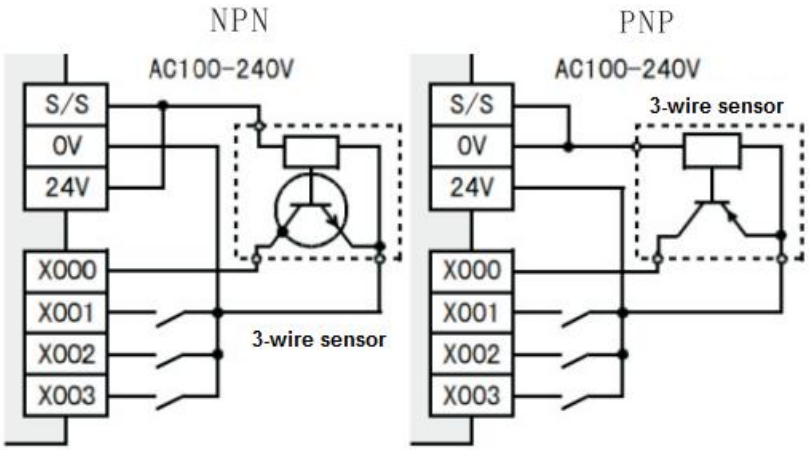
Instructions for connecting input devices:

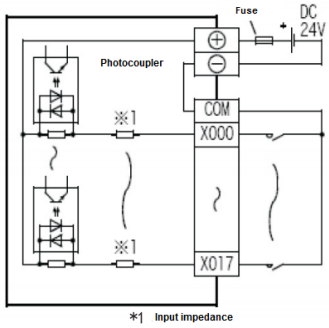
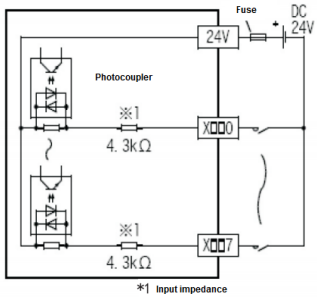
1) In the case of no-voltage contact:

The input current of this PLC is 5 to 7 mA/24V DC. Use input devices applicable to this minute current.

2) In the case of input device with built-in series diode:

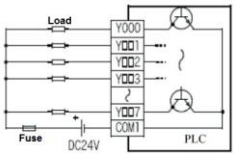
When lead switches with a series LED are used, up to two switches can be connected in series.



Items		24V DC input specification			
		Main unit/ HCA8C input extension blocks			HCA8C input extension blocks
Input circuit configuration					
Input signal voltage		24V DC +20% -15% Ripple Voltage (p-p) 5% or less			
Input impedance		Main unit	X000 ~ X005	3.9kΩ	4.3kΩ
			X006, X007	3.3kΩ	
			X010 ~ X017	4.3kΩ	
		HCA8C extension blocks		4.3kΩ	
Input signal current		Main unit	X000 ~ X005	6mA/24V DC	5mA/24V DC
			X006, X007	7mA/24V DC	
			X010 ~ X017	5mA/24V DC	
		HCA8C extension blocks		5mA/24V DC	
Input sensitivity current	ON	Main unit	X000 ~ X005	3.5mA or more	3.5mA or more
			X006, X007	4.5mA or more	
			X010 ~ X017	3.5mA or more	
		HCA8C extension blocks		3.5mA or more	
	OFF	1.5mA or less			1.5mA or less
Input response time		Approx. 10ms			Approx. 10ms
Input signal form		Sink input: No-voltage contact input/NPN open collector transistor Source input: No-voltage contact input/PNP open collector transistor			
Circuit insulation		Photocoupler insulation			

Input operation display	Main unit	Turning on the input will light the LED indicator lamp
	HCA8C extension blocks	

4. Transistor output specification

Items				Specification	
Output circuit configuration					
External power supply				5 to 30V DC	
Max. load	Resistance load	Main unit	Y000 to Y003	0.3A/1 point	Make sure that the total load current of 16 resistance load points is 1.6A or less
			Y004 to Y017	0.1A/1 point	
		HCA8C-16EYT, HCA8C-32EYT		0.1A/1 point	
		HCA8C-16EYT-C		0.3A/1 point	Make sure that the total load current of 16 resistance load points is 1.6A or less.
		HCA8C-8EYT HCA8C-16EYT HCA8C-16EYR		0.5A/1 point	The total load current of resistance loads per common terminal should be the following value. 4points/common: 0.8A 8points/common: 1.6A
		HCA8C-8EYTR		1A/1 point	Make sure that the total load current of 4 resistance load points is 2A or less.
	Inductive load	Main unit	Y000 to Y003	7.2W/1 point (24V DC)	Make sure that the total load of 16 inductive load points is 38.4W/24V DC or less.
			Y004 to Y017	2.4W/1 point (24V DC)	
		HCA8C-16EYT, HCA8C-32EYT		2.4W/1 point (24V DC)	
		HCA8C-16EYT-C		7.2W/1 point (24V DC)	
		HCA8C-8EYT, HCA8C-16EYT, HCA8C-16EYR		12W/1 point (24V DC)	
		HCA8C-8EYT-H		24W/1 point (24V DC)	
	Lamp load	Main unit	Y000 to Y003	0.9W/1 point (24V DC)	Make sure that the total load of 16 lamp load points is 4.8W/24V DC or less.
			Y004 to Y017	0.3W/1 point (24V DC)	
		HCA8C-16EYT, HCA8C-32EYT		0.3W/1 point (24V DC)	
		HCA8C-16EYT-C		1W/1 point (24V DC)	
		HCA8C-8EYT, HCA8C-16EYT, HCA8C-16EYR		1.5W/1 point (24V DC)	
		HCA8C-8EYTR		3W/1 point (24V DC)	
Open circuit leakage current				0.1mA or less/30V DC	
ON voltage				1.5V	
Response time	OFF→ON	Main unit	Y000 to Y003	5µs or less/10mA or more (5 to 24V DC)	
			Y004 to Y017	0.2ms or less/100mA (24V DC)	
		Extension blocks			
	ON→OFF	Main unit	Y000 to Y003	5µs or less/10mA or more (5 to 24V DC)	
			Y004 to Y017	0.2ms or less/100mA (24V DC)	
		Extension blocks			
Circuit insulation				Photocoupler insulation	
Output operation display		Main unit		Monitored by the display module	
		Extension blocks		LED on panel lights when photocoupler is driven.	

4 or 8 transistor output points are covered by one common terminal. For driving the load, use a smoothing power supply of 5 to 30V DC that can output current two or more times the rated current of the fuse connected to the load circuit.

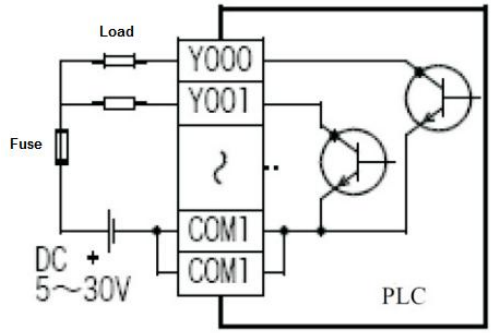
The internal circuit of the PLC and the output transistor are insulated with a photocoupler. The common blocks are separated from one another. Operation indicator LEDs are built into the main unit and output extension blocks, and turn ON when photocouplers are actuated. The response time from when the PLC

drives (or shuts down) the photocoupler until the transistor is turned on (or off) is 5 µs or less.

1) Output terminals

4, 8 or 16 transistor output points are covered by one common terminal.

Two COM terminals connected each other inside the PLC are provided for sink outputs in the HCA8C-8X8YT main unit, transistor output type extension blocks for output. HCA8C. For external wiring, connect two COM terminals outside the PLC so that the load applied on each COM terminal becomes smaller.



2) External power supply

For driving the load, use a smoothing power supply of 5 to30V DC that can output current two or more times the rated current of the fuse connected to the load circuit.

3) Circuit insulation

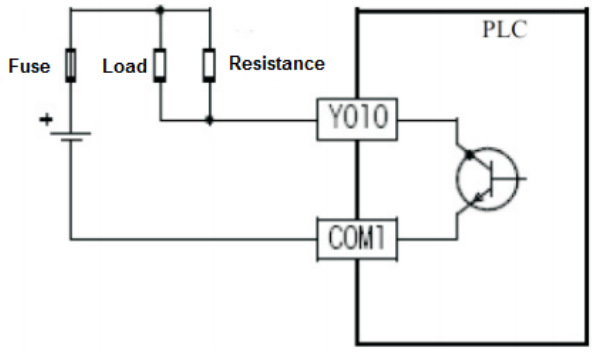
The internal circuit of the PLC and the output transistor are insulated with a photocoupler.

The common blocks are separated from one another.

4) Display of operation

The main unit does not have operation indicator LEDs, but the operation can be monitored with the display module. Operation indicator LEDs are built into the output extension blocks, and turn ON when photocouplers are actuated.

The transistor OFF time is longer under lighter loads. For example, under a load of 24V DC 40mA, the response time is approx. 0.3ms. When response performance is required under light loads, provide a dummy resistor as shown below to increase the load current.



6) Output current

The ON voltage of the output transistor is approx. 1.5V.

When driving a semiconductor element, carefully check the input voltage characteristics of the applied element.

Model		Output current	Limitation
Main unit	Y000 to Y003	0.3A/1 point*1	Make sure that the total load current of resistance loads per common terminal (16points/common) is 1.6A so that temperature rise is restrained
	Y004 to Y017	0.1A/1 point	
Extension blocks	HCA8C-16EYT HCA8C-32EYT	0.1A/1 point	
	HCA8C-16EYT-C	0.3A/1 point	Make sure that the total load current of 16 resistance load points is 1.6A or less
	HCA8C-8EYT HCA8C-16EYT	0.5A/1 point	The total load current of resistance loads per common terminal should be the following value. 4points/common: 0.8A 8points/common: 1.6A
	HCA8C-8EYT-H	1A/1 point	Make sure that the total load current of 4 resistance load points is 2A or less.

*1. When using an instruction related to pulse train output or positioning, make sure to set the load current to 10 to 100mA (5 to 24V DC).

(7) Open circuit leakage current

0.1mA or less

5. Relay output specification

1) Product life of relay contacts

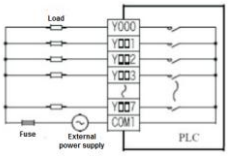
The standard life of contacts used for Inductive loads, such as contactors and solenoid valves, is 500,000 operations at 20VA.

The following table shows the approximate life of a relay based on the results of an operation life test.

Test condition: 1 sec. ON/1 sec. OFF

Load capacity		Contact life
20 VA	0.2A/100V AC	3,000,000 times
	0.1A/200V AC	
35 VA	0.35A/100V AC	1,000,000 times
	0.17A/200V AC	
80 VA	0.8A/100V AC	200,000 times
	0.4A/200V AC	

Relay output specification

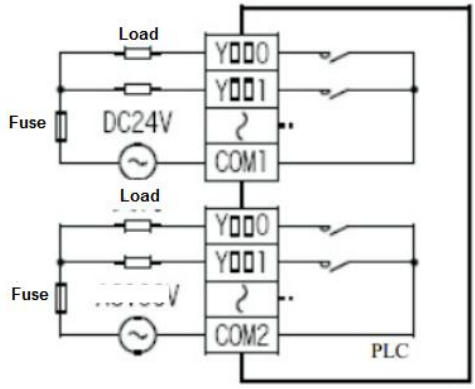
<table>
<tr><th colspan="3">Items</th><th colspan="2">Relay output specification</th></tr>
<tr><td colspan="3">Output circuit diagram</td><td colspan="2"> 
</td></tr>
<tr><td colspan="3">External power supply</td><td colspan="2">30V DC or less or 250V AC or less</td></tr>
<tr><td rowspan="2">Max. load</td><td>Resistance load</td><td>HCA8C-8ER
HCA8C-16EYR</td><td>2A/1 point</td><td>The total resistance load current per common should be as follows:
4 output points/common: 8A or less
8 output points/common: 8A or less</td></tr>
<tr><td>Inductive load</td><td>HCA8C-16EYT
HCA8C-8ER
HCA8C-16EYR</td><td colspan="2">80VA</td></tr>
<tr><td colspan="3">Minimum load</td><td colspan="2">5V DC, 2mA (reference values)</td></tr>
<tr><td colspan="3">Open circuit leakage current</td><td colspan="2">--</td></tr>
<tr><td colspan="2" rowspan="2">Response time</td><td>OFF→ON</td><td colspan="2">Approx. 10 ms</td></tr>
<tr><td>ON→OFF</td><td colspan="2">Approx. 10 ms</td></tr>
<tr><td colspan="3">Circuit insulation</td><td colspan="2">Mechanical insulation</td></tr>
<tr><td colspan="3">Display of output operation</td><td colspan="2">Supplying power to the relay coil will light the LED indicator lamp on panel.</td></tr>
</table>

2) Output terminals

One common terminal is used for 4 or 8 relay output points. The common terminal blocks can drive loads of different circuit voltage systems. Use an external power supply of 30V DC or less or 250VAC or less for loads.

When power is applied to the output relay coil, the LED is lit, and the output contact is turned on. The response time of the output relay from when the power is applied to the coil until the output contact is turned on and from when the coil is shut off until the output contact is turned off is approx. 10ms.

When an inductive load is switched, connect a diode (for commutation) or a surge absorber in parallel with this load.



3) External power supply

Use an external power supply of 30V DC or less or 250VAC or less for loads.

4) Circuit insulation

The PLC internal circuit and external load circuits are electrically insulated between the output relay coil and contact. The common terminal blocks are separated from one another.

5) Display of operation

When power is applied to the output relay coil, the LED is lit, and the output contact is turned on.

6) Response time

The response time of the output relay from when the power is applied to the coil until the output contact is turned on and from when the coil is shut off until the output contact is turned off is approx. 10ms.

7) Output current

At a circuit voltage of 250V AC or less, a resistance load of 2A per point or an inductive load of 80VA or less (100V AC or 200V AC) or the lamp load of 100W or less (100V AC or 200V AC) can be driven.

When an inductive load is switched, connect a diode (for commutation) or a surge absorber in parallel with this load.

DC Circuit	Diode (for commutation)
AC Circuit	Surge absorber

8) Open circuit leakage current

Because there is no leakage current even while output contacts are OFF, the neon ball, etc. can be driven directly.