

Transistor I/O Link Modules

B7A/B7AS

Reduce Wiring Back to PLC Rack for
32 I/O Points

- Transmit 16 input signals over just 2 wires (3 wires if only one terminal has a power supply)
- Normal I/O delay (19.2 ms typical) or short I/O delay (3 ms typical) models
- Output models offer Hold or Load Off options for handling transmission errors
- Compact B7AS measures 30% shorter than conventional 16-point blocks
- Printed circuit board models available



Ordering Information

MODEL NUMBER LEGEND

Input Models

B7A□ - T 6 □ □
1 2 3 4 5

1. Series

None: Standard
S: Small

2. Input/Output Classification

T: Input

3. Number of I/O Points

6: 16

4. Input Logic/Internal I/O Common

4	Input logic	Internal I/O common
A	NPN compatible	- common
B	NPN compatible	+/- common
C	PNP compatible	+/- common
D	PNP (TTL) compatible	---

5. I/O Delay Time (Typical)/Appearance

5	I/O delay	Appearance
1	19.2 ms	Screw terminals
2	19.2 ms	Printed circuit board model
6	3 ms	Screw terminals
7	3 ms	Printed circuit board model

Output Models

B7A□ - R 6 □ □ □
1 2 3 4 5 6

1. Series

None: Standard
S: Small

2. Input/Output Classification

R: Output

3. Number of I/O Points

6: 16

4. Output Logic/Output Capacity

3	Output logic	Output capacity
A	NPN open collector	0.05 A/point
B	NPN open collector	0.1 A/point
C	NPN open collector	0.5 A/point
F	PNP open collector	0.1 A/point
G	PNP open collector	0.5 A/point

5. Error Processing

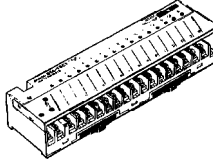
1: HOLD
3: LOAD OFF
5: HOLD/LOAD OFF

6. I/O Delay (Typical)/Appearance

5	I/O delay time	Appearance
1	19.2 ms	Screw terminals
2	19.2 ms	Printed circuit board model
6	3 ms	Screw terminals
7	3 ms	Printed circuit board model

16-POINT LINK MODULES

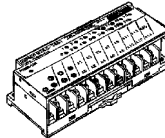
Screw Terminal Models

Appearance	I/O classification	I/O configuration	I/O delay (typical)	Internal I/O common	Error processing (See Note 1)	Part number	
	Input	NPN compatible	Normal speed 19.2 ms	- common	---	B7A-T6A1 (See Note 2)	
				+/- common	---	B7A-T6B1 (See Note 2)	
				+/- common	---	B7A-T6C1	
		PNP compatible	High speed 3 ms	- common	---	B7A-T6A6 (See Note 2)	
				+/- common	---	B7A-T6B6 (See Note 2)	
				+/- common	---	B7A-T6C6	
		Output	NPN open collector 100 mA/point	Normal speed 19.2 ms	+ common	HOLD	B7A-R6B11
						LOAD OFF	B7A-R6B31
			NPN open collector 500 mA/point (See Note 3)		- common	HOLD	B7A-R6C11
	LOAD OFF					B7A-R6C31	
	PNP open collector 100 mA/point		+ common		HOLD	B7A-R6F11	
					LOAD OFF	B7A-R6F31	
	PNP open collector 500 mA/point (See Note 4)		- common		HOLD	B7A-R6G11	
					LOAD OFF	B7A-R6G31	
	High speed 3 ms		NPN open collector 100 mA/point	+ common	HOLD	B7A-R6B16	
		LOAD OFF			B7A-R6B36		
		NPN open collector 500 mA/point (See Note 3)	- common	HOLD	B7A-R6C16		
				LOAD OFF	B7A-R6C36		
PNP open collector 100 mA/point		+ common	HOLD	B7A-R6F16			
			LOAD OFF	B7A-R6F36			
PNP open collector 500 mA/point (See Note 4)		- common	HOLD	B7A-R6G16			
			LOAD OFF	B7A-R6G36			

Note: 1. HOLD: The previous output condition will be on hold when an error occurs.
LOAD OFF: All outputs will be OFF when an error occurs.

2. The 16-point B7A-T6A□ and 16-point B7A-T6B□ are different from each other in terminal configuration.

Small Screw Terminal Models

Appearance	I/O classification	I/O configuration	I/O delay (typical)	Internal I/O common	Error processing (See Note 1)	Part number	
	Input	NPN compatible	Normal speed 19.2 ms	+/- common	---	B7AS-T6B1	
			High speed 3 ms		---	B7AS-T6B6	
	Output	NPN open collector 100 mA/point	Normal speed 19.2 ms		HOLD	B7AS-R6B11	
					LOAD OFF	B7AS-R6B31	
			High speed 3 ms		HOLD	B7AS-R6B16	
					LOAD OFF	B7AS-R6B36	

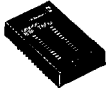
Note: 1. HOLD: The previous output condition will be on hold when an error occurs.
LOAD OFF: All outputs will be OFF when an error occurs.

2. The 16-point B7A-T6A□ and 16-point B7A-T6B□ are different from each other in terminal configuration.

3. N-channel MOS FET open drain output

4. P-channel MOS FET open drain output

Printed Circuit Board Models

Appearance	I/O classification	I/O configuration	I/O delay (typical)	Error processing (See Note)	Part number
	Input	TTL input	Normal speed 19.2 ms	---	B7A-T6D2
			High speed 3 ms	---	B7A-T6D7
	Output	NPN open collector 50 mA/point	Normal speed 19.2 ms	HOLD/LOAD OFF selected by wiring	B7A-R6A52
			High speed 3 ms		B7A-R6A57

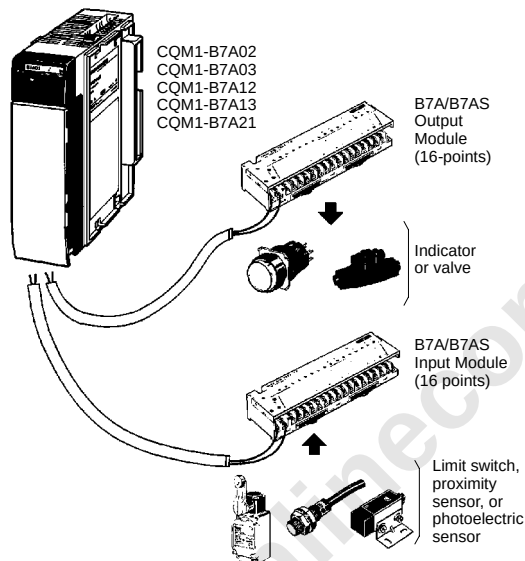
Note: HOLD: The previous output condition will be on hold when an error occurs.
LOAD OFF: All outputs will be OFF when an error occurs.

POWER SUPPLIES

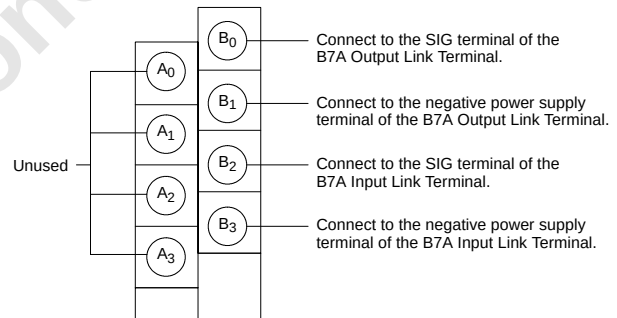
Input voltage	Output rating	Application	Part number
120 to 240 VAC	0.13 A, 24 VDC	Use one to power each input or output block	S82K-00324
	0.3 A, 24 VDC	Use one to power two blocks from a single power supply	S82K-00724
	0.6 A, 24 VDC	Use this to power blocks connected to sensors, relays indicator lights	S82K-01524
	1.3 A, 24 VDC	Use one where excess power is needed	S82K-03024

Application Examples

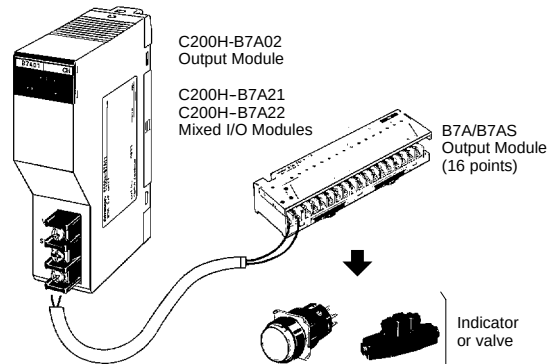
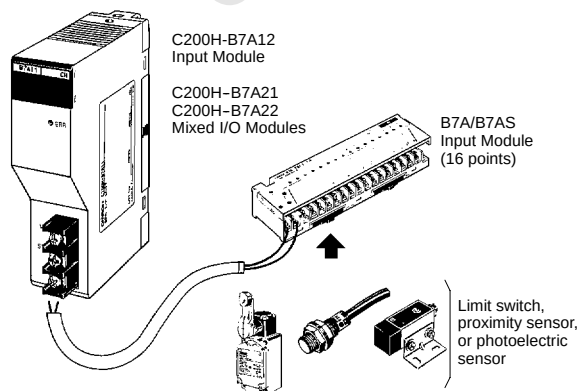
CQM1 B7A Master Link Modules



CQM1 Connecting Terminals



C200H B7A Master Link Modules



Note: B7A-series high-speed models cannot be used with C200H-B7A11 and C200H-B7A01.

Specifications

■ CHARACTERISTICS

General

Item	Normal speed	High speed
Communication method	Unidirectional, time-division multiplex	
Transmission distance (See Note 1)	500 m max.	100 m max. (See Note 2)
I/O delay	Typical: 19.2 ms; 31 ms max.	Typical: 3 ms; 5 ms max.
Minimum input time (See Note 3)	16 ms	2.4 ms
Operating voltage range	12 to 24 VDC (10.8 to 26.4 VDC) (See Note 1)	
Insulation resistance	100 MΩ min. at 500 V between each terminal and external parts	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between each terminal and external parts	
Noise immunity (See Note 4)	Noise level: 1.5 kV; pulse width: 100 ns to 1 μs (on transmission line due to coupling)	
Vibration resistance	10 to 55 Hz, 1.5 mm double amplitude	
Shock resistance	300 m/s ² (approx. 30G)	
Ambient temperature	Operating: -10°C to 55°C (14°F to 131°F) with no icing Storage: -25°C to 65°C (-13°F to 149°F) with no icing	
Ambient humidity	Operating: 35% to 85% with no condensation	

- Note: 1. The transmission distance values stated in this table are based on one power supply attached to each Input or Output Link Terminal. If two Input or Output Link Terminals share one power supply, the transmission distance will be derated, and the voltage must be 24 VDC ±10%. The derated transmission distance for normal-speed models is 100 m maximum and that of a high-speed model is 50 m maximum. Additional information on power supply connections follows in Operation section.
2. A shielded transmission cable or plain twisted pair cable with a thickness of 0.75 mm² minimum must be used for signal transmission. If twisted pair cable is used, however, the transmission distance will be 10 m maximum regardless of whether or not independent power supplies for the Input and the Output Link Terminals are used.
3. The minimum input time is required for the B7A/B7AS to read an input signal.
4. For high-speed models, these values are possible without grounding the shielded line.

Input Models

Item	Screw terminal models		
	B7A-T6A1/-T6A6	B7A-T6B1/-T6B6	B7AS-T6B1/-T6B6
Compatible inputs	Switches, two-wire sensors with DC output, three-wire NPN sensors (See Note 1)		
Input logic	Active low		
I/O delay	B7A□-T6□1: standard (typical 19.2 ms); B7A□-T6□6: high speed (typical 3 ms)		
Current consumption	120 mA max. with all input terminals ON (See Note 2)		
Operating voltage range	12 to 24 VDC		
Input voltage range	0 VDC to supply voltage		
Input current range	-6 to -3 mA/point (current flowing from input terminals)		
Minimum input time	B7A□-T6□1: 16 ms; B7A□-T6□6: 2.4 ms		
ON/OFF threshold	No-contact input: ON voltage: 4 V max. OFF voltage: 6 V min. Contact input: ON discrimination resistance: 660 Ω max. OFF discrimination resistance: 2 kΩ min.		
Mounting strength	No damage when 5 kgf (49 N) pull is applied for 1 min each in all directions (except in direction of DIN rail)		
Terminal strength	No damage when 5 kgf (49 N) pull is applied each in all directions		
Tightening torque	8 to 12 kgf • cm (0.78 to 1.18 N • m)		
Weight	Approx. 160 g		Approx. 130 g

- Note: 1. All B terminals of the B7A-T6A□ are negative terminals; power must be supplied to the three-wire sensor via the positive power supply terminal or from an independent power supply.
Two-wire sensors must satisfy the following requirements:
Residual voltage: 4 V max.
Current leakage: 1.5 mA max.
The lower limit of control output: 3 mA (Use a breeder resistor to eliminate this restriction.)
2. Consumption when all 16 points are ON. Excludes external sensor current for Input Terminals.

Input Models continued

Item	Screw terminal models	Printed circuit board models
	B7A-T6C1/-T6C6	B7A-T6D2/-T6D7
Compatible inputs	Switches, two-wire sensors with DC output, three-wire PNP sensors	TTLs, switches, 3-wire PNP sensors (See Note 2)
Input logic	Active high	
I/O delay	B7A-T6C1: standard (typical 19.2 ms); B7A-T6C6: high speed (typical 3 ms)	B7A-T6D2: standard (typical 19.2 ms); B7A-T6D7: high speed (typical 3 ms)
Current consumption (See Note 3)	120 mA max. with all input terminals ON	60 mA max. with all input terminals ON
Operating voltage range	12 to 24 VDC	
Input voltage range	0 VDC to supply voltage	
Input current range	3 to 6 mA/point	0.2 to 2 mA/point (input voltage: 5 to 24 VDC)
Minimum input time (See Note 4)	B7A-T6C1: 16 ms; B7A-T6C6: 2.4 ms	B7A-T6D2: 16 ms; B7A-T6D7: 2.4 ms
ON/OFF threshold	No-contact input: ON voltage: -4 V max. OFF voltage: -6 V min. Contact input: ON discrimination resistance: 660 Ω max. OFF discrimination resistance: 2 kΩ min.	ON voltage: 2.2 V min. OFF voltage: 0.8 V max.
Mounting strength	No damage when 5 kgf (49 N) pull is applied for 1 min each in all directions (except in direction of DIN track)	---
Terminal strength	No damage when 5 kgf (49 N) pull is applied each in all directions	---
Tightening torque	8 to 12 kgf • cm (0.78 to 1.18 N • m)	---
Weight	Approx. 160 g	Approx. 23 g

- Note: 1. If there is a possibility of noise interference from the power supply, input, and/or output lines, add appropriate noise protection circuits. Refer to *Noise Protection Circuits* in the Technical Reference Section
2. A three-wire NPN sensor with a residual voltage of 0.8 V maximum and a built-in collector load can be used. In this case, however, when the output transistor of the sensor is ON, the B7A will be OFF.
3. Consumption when all 16 points are ON. Excludes external sensor current for Input Terminals.
4. The minimum input time is required for the B7A to read an input signal.

Output Models

Item	Screw terminal models (100 mA/point)		
	B7A-R6B11/-R6B16/ -R6B31/-R6B36	B7AS-R6B11/-R6B16/ -R6B31/-R6B36	B7A-R6F11/-R6F16/ -R6F31/-R6F36
Output configuration	NPN open collector		PNP open collector
I/O delay	B7A□-R6□□1: standard (typical 19.2 ms); B7A□ R6□□6: high speed (typical 3 ms)		
Error processing	B7A□-R6□□1□: HOLD; B7A□ R6□□3□: LOAD OFF		
Current consumption (See Note)	80 mA max. with all output terminals ON	120 mA max. with all output terminals ON	80 mA max. with all output terminals ON
Power supply voltage	12 to 24 VDC		
Rated load voltage	5 to 24 VDC		
Output residual voltage	0.8 V max.		
Output current	Sink current, 100 mA max./point		Source current, 100 mA max./point
Mounting strength	No damage when 5 kgf (49 N) pull is applied for 1 min each in all directions (except in direction of DIN track)		
Terminal strength	No damage when 5 kgf (49 N) pull is applied each in all directions (except in direction of DIN track)		
Tightening torque	8 to 12 kgf • cm (0.78 to 1.18 N • m)		
Weight	Approx. 160 g	Approx. 130 g	Approx. 160 g

Note: Consumption when all 16 points are ON. Excludes external load current and error load current for Output Terminals.

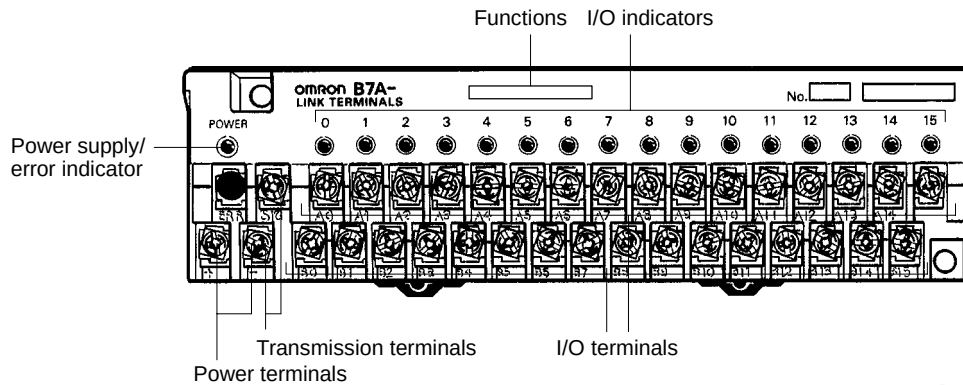
Output Models continued

Item	Screw terminal models (500 mA/point)		Printed circuit board models
	B7A-R6C11/-R6C16/-R6C31/-R6C36	B7A-R6G11/-R6G16/-R6G31/-R6G36	B7A-R6A52/-R6A57
Output configuration	N-channel MOSFET open drain (NPN compatible)	P-channel MOSFET open drain (PNP compatible)	NPN open collector
I/O delay	B7A-R6□□1: standard (typical 19.2 ms); B7A-R6□□6: high speed (typical 3 ms)		B7A-R6A52: standard (typical 19.2 ms) B7A-R6A57: high speed (typical 3 ms)
Error processing	B7A-R6□1□: HOLD; B7A-R6□3□: LOAD OFF		HOLD (H/L terminals open) LOAD OFF (H/L terminals connected to 0 V)
Current consumption (See Note 1)	100 mA max. with all output terminals ON		40 mA max. with all output terminals ON
Power supply voltage	12 to 24 VDC		
Rated load voltage	5 to 24 VDC		
Output residual voltage	0.8 V max.		
Output current	Sink current, 500 mA max./point (See Note 2)	Source current, 500 mA max./point (See Note 2)	Sink current, 50 mA max./point
Mounting strength	No damage when 5 kgf (49 N) pull is applied for 1 min each in all directions (except in direction of DIN track)		---
Terminal strength	No damage when 5 kgf (49 N) pull is applied each in all directions (except in direction of DIN track)		---
Tightening torque	8 to 12 kgf • cm (0.78 to 1.18 N • m)		---
Output logic	---		Active high (N/P terminals open) Active low (N/P terminals connected to 0 V) (See Note 3)
Weight	Approx. 170 g		Approx. 23 g

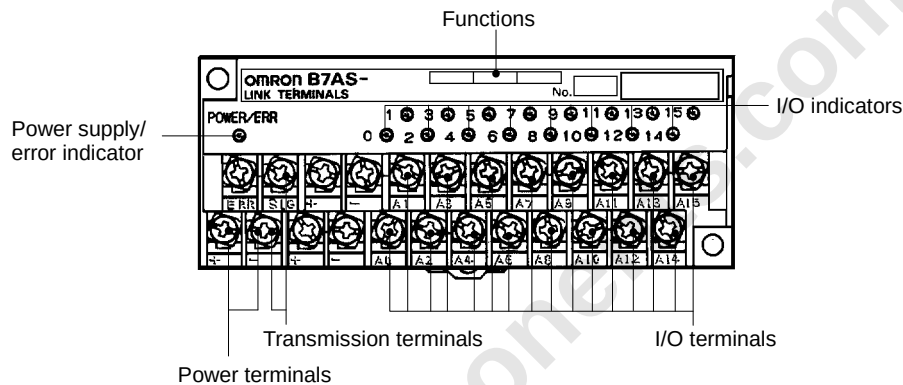
- Note: 1. Consumption when all 16 points are ON. Excludes external load current and error load current for Output Terminals.
2. If a single power supply is connected to the Input or Output Link Terminal via a twisted pair cable with a thickness of 0.75 mm² minimum, the current flow must not exceed 1.8 A.
3. Refer to *B7A Technical Reference* for information regarding the relationship between the output logic and output ON/OFF status of the B7A.

Nomenclature

B7A



B7AS



Indication Operation

Indicator	Function
POWER (Input Terminal)	G Lit when power is supplied and the Terminal is operating.
	N Not lit when power is not supplied.
POWER/ERR (Output Terminal)	G Lit when power is supplied and the Terminal is operating without error.
	R Lit during transmission errors.
	N Not lit when power is not supplied.
I/O	O Lit when the input signals are ON.
	N Not lit when the signals are OFF.

Note: G: Green indicator lit; R: Red indicator lit;
O: Orange indicator lit; N: Not lit

Functions

I/O classification	Display	Description
Input		Input configuration Indicates the compatible transistor type for the input device.
		I/O delay Indicates the typical I/O delay time of the B7A. Use a combination of an Input and an Output Link Terminal with the same I/O delay time.
Output		Output configuration Indicates the compatible transistor type for the output transistor.
		Output current Indicates the rated output current value of the B7A per point.
		I/O delay Indicates the typical I/O delay time of the B7A. Use a combination of an Input and Output Link Terminal with the same I/O delay time.

Recommended Solderless Terminals

Wire	JIS specifications
0.75 mm ² (AWG#18)	RAV 1.25 to 3.5 (vinyl-insulated round wire) or RAP 1.25 to 3.5 (nylon-insulated round wire)
1.25 mm ² (AWG#16)	

Operation

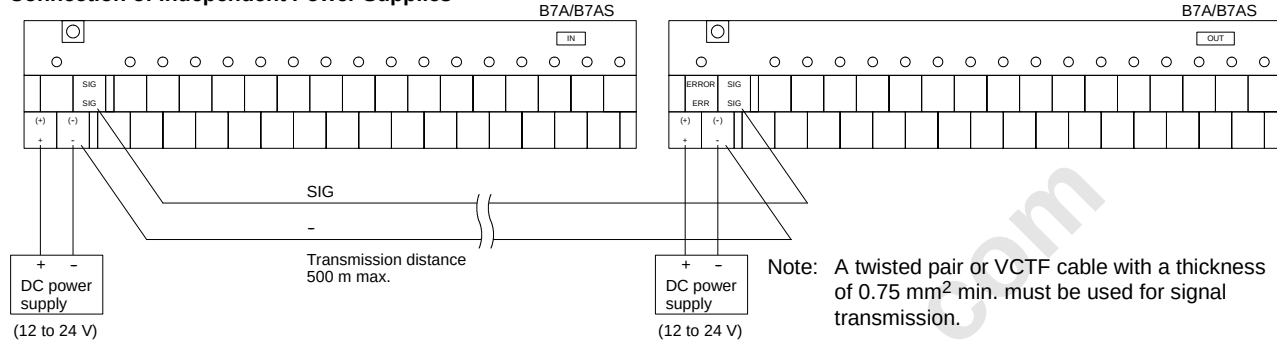
POWER SUPPLY

There are 16-point models with standard and high-speed transmission speeds, which are different in recommended transmission cable and transmission distance. If one power supply is connected to two Input or Output Modules, the current on the power line will be limited.

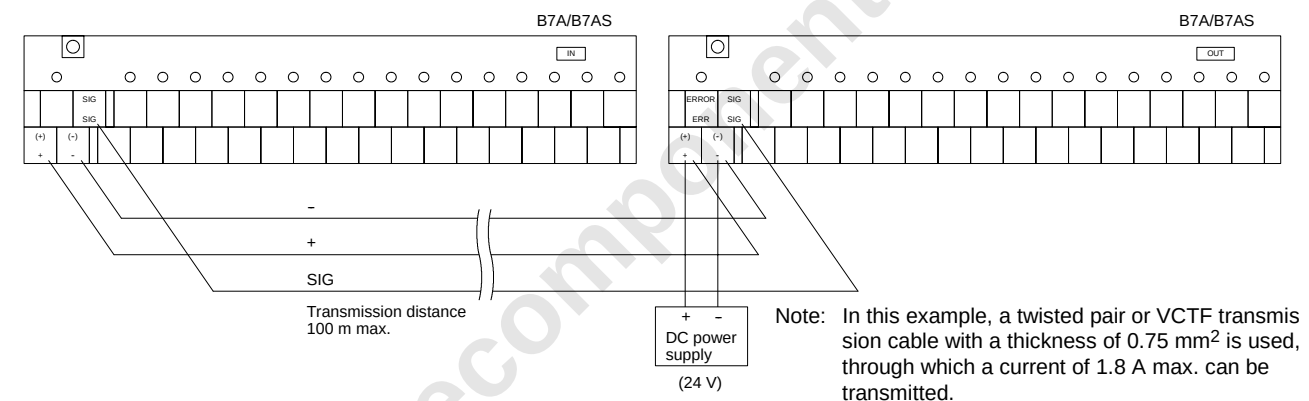
Screw Terminal Models

I/O Delay: Normal Speed

Connection of Independent Power Supplies

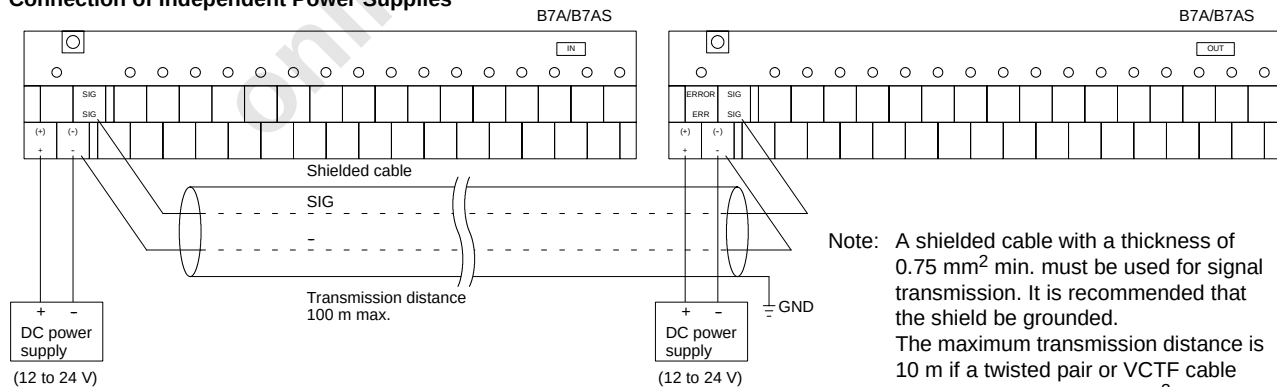


Connection of Single Power Supply to Input or Output Terminal

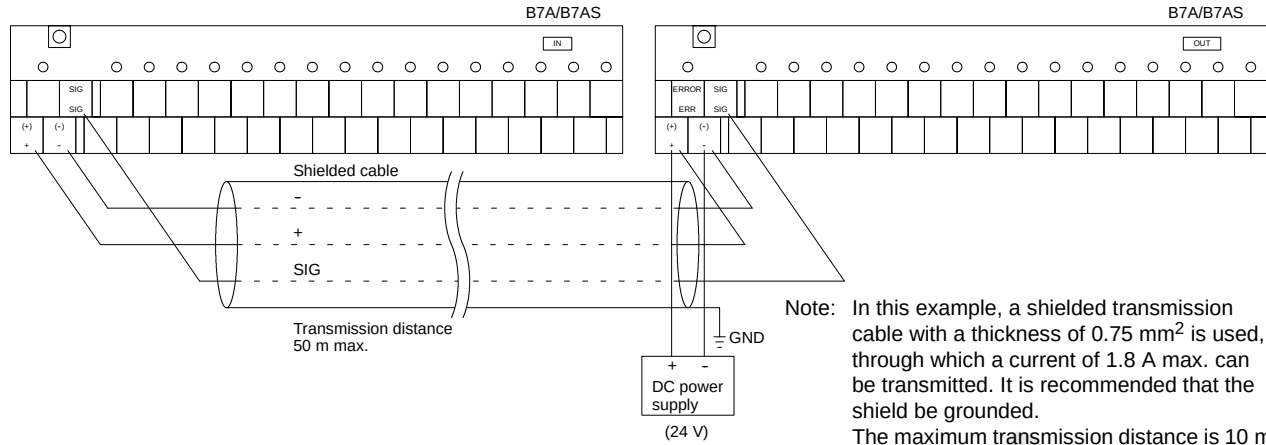


I/O Delay: High Speed

Connection of Independent Power Supplies



Connection of Single Power Supply to Input or Output Terminal

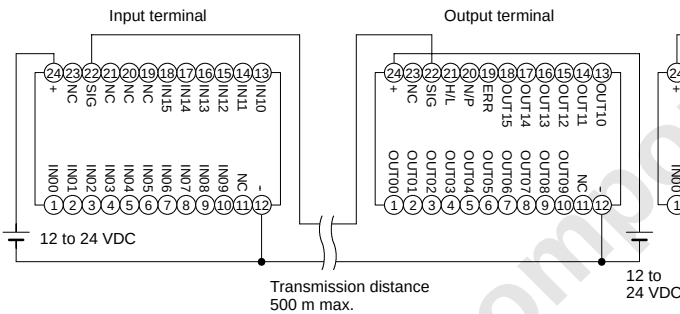


Note: In this example, a shielded transmission cable with a thickness of 0.75 mm^2 is used, through which a current of 1.8 A max. can be transmitted. It is recommended that the shield be grounded.
The maximum transmission distance is 10 m if a twisted pair or VCTF cable with a thickness of 0.75 mm^2 is used instead of a shielded cable for the transmission path.

Printed Circuit Board Models

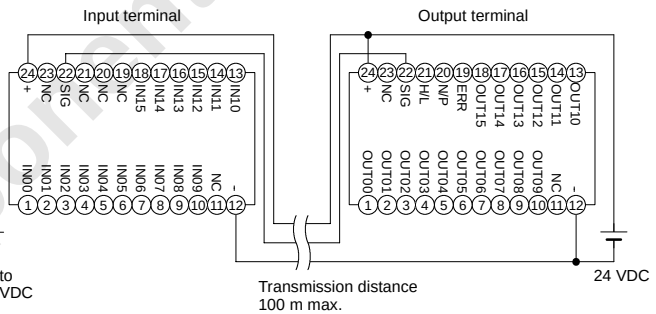
I/O Delay: Normal Speed

Connection of Independent Power Supplies



Note: A twisted pair or VCTF cable with a thickness of 0.75 mm^2 min. must be used for signal transmission.

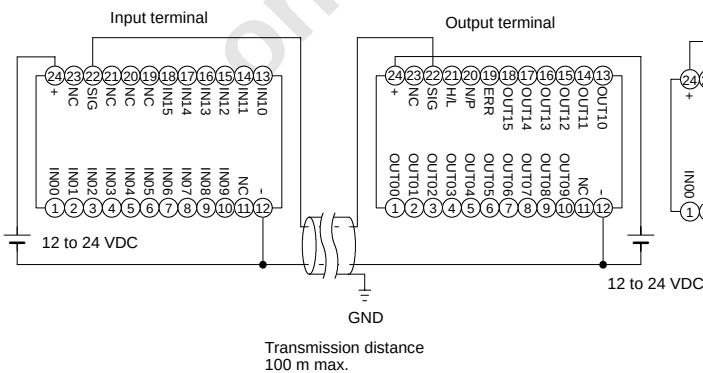
Connection of Single Power Supply to Input or Output Terminal



Note: In this example, a twisted pair or VCTF transmission cable with a thickness of 0.75 mm^2 min. is used, through which a current of 1.8 A max. can be transmitted.

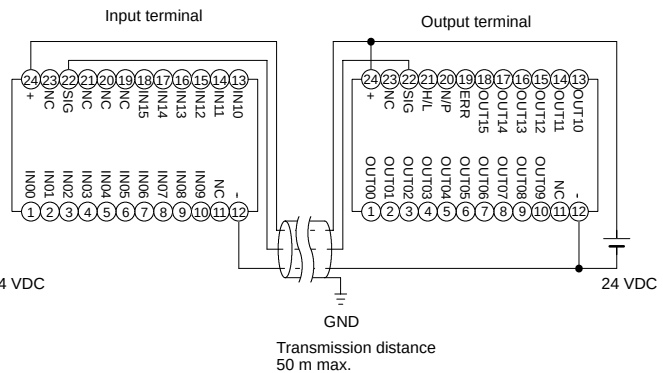
I/O Delay: High Speed

Connection of Independent Power Supplies



Note: A shielded cable with a thickness of 0.75 mm^2 min. must be used for signal transmission. It is recommended that the shield be grounded.
The maximum transmission distance is 10 m if a twisted pair or VCTF cable with a thickness of 0.75 mm^2 is used instead of a shielded cable for the transmission path.

Connection of Single Power Supply to Input or Output Terminal



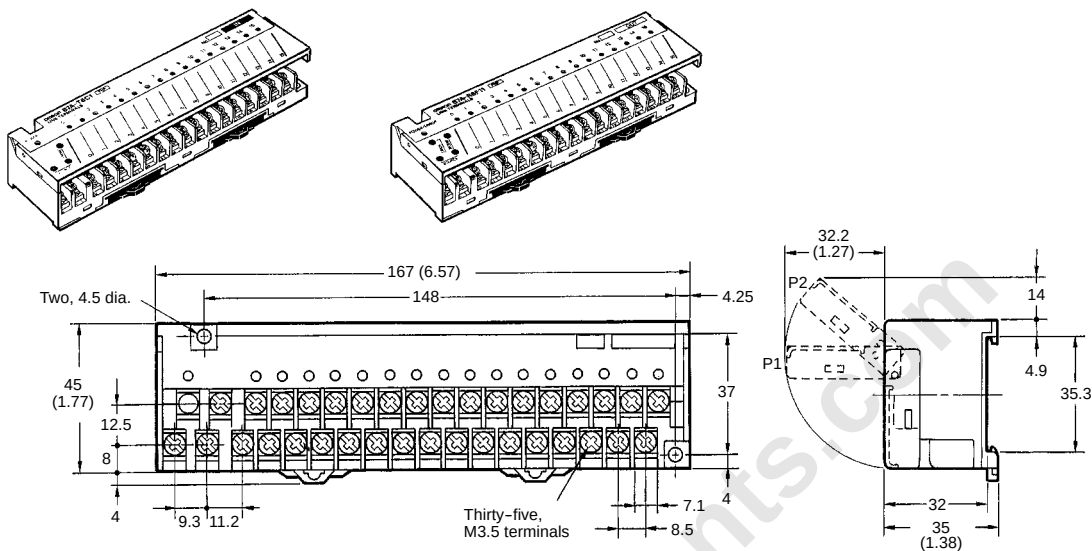
Note: In this example, a shielded transmission cable with a thickness of 0.75 mm^2 min. is used, through which a current of 1.8 A max. can be transmitted. It is recommended that the shield be grounded.
The maximum transmission distance is 10 m if a twisted pair or VCTF cable with a thickness of 0.75 mm^2 is used instead of a shielded cable for the transmission path.

Dimensions

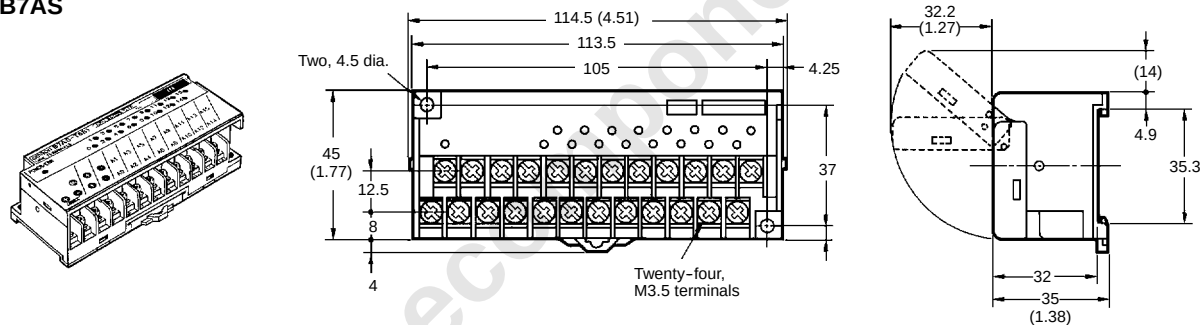
Unit: mm (inch)

SCREW TERMINAL MODELS

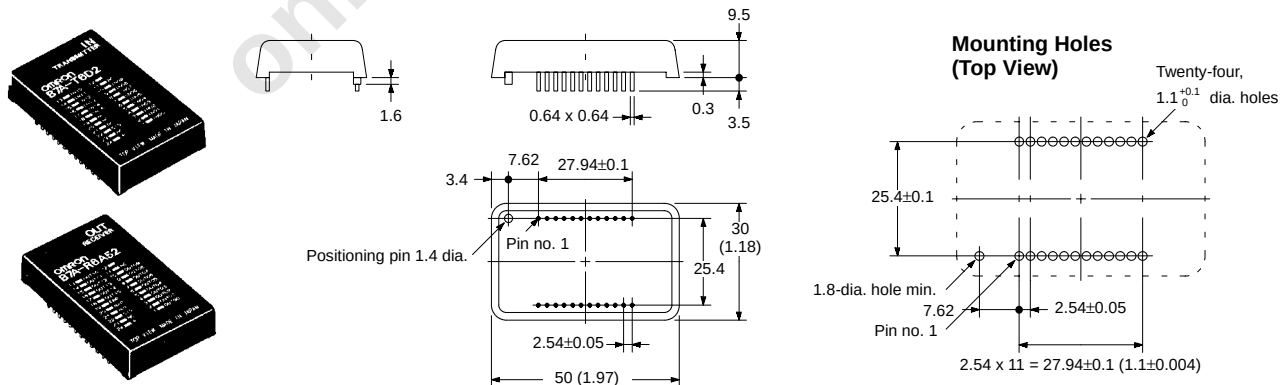
Standard Models B7A



Compact Models B7AS



PRINTED CIRCUIT BOARD MODELS

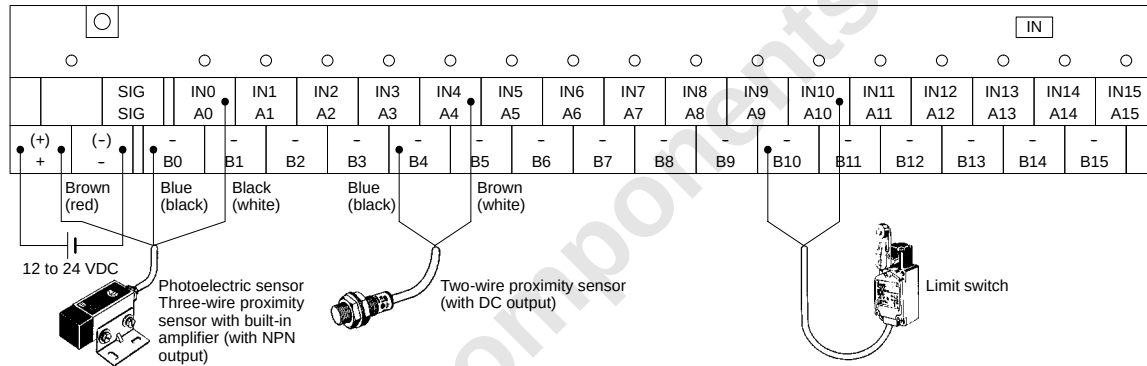
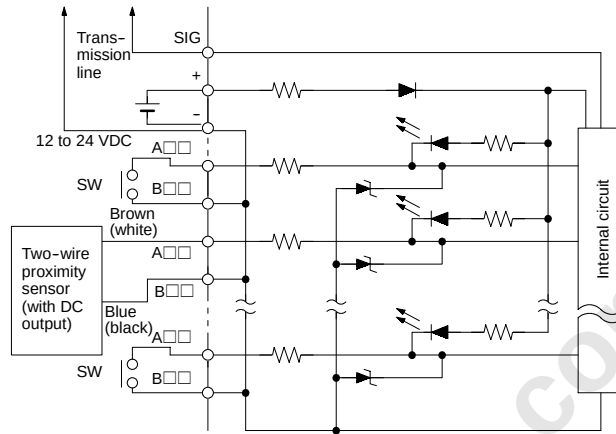


Installation

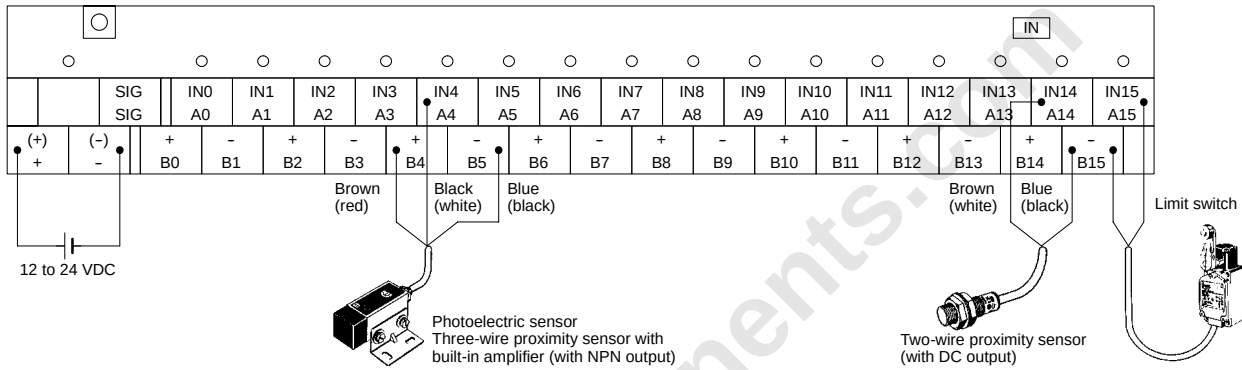
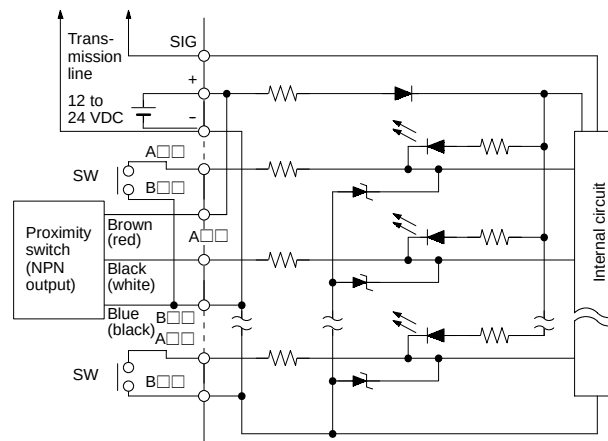
INTERNAL CIRCUITS AND TERMINAL ARRANGEMENT

Screw Terminal Models

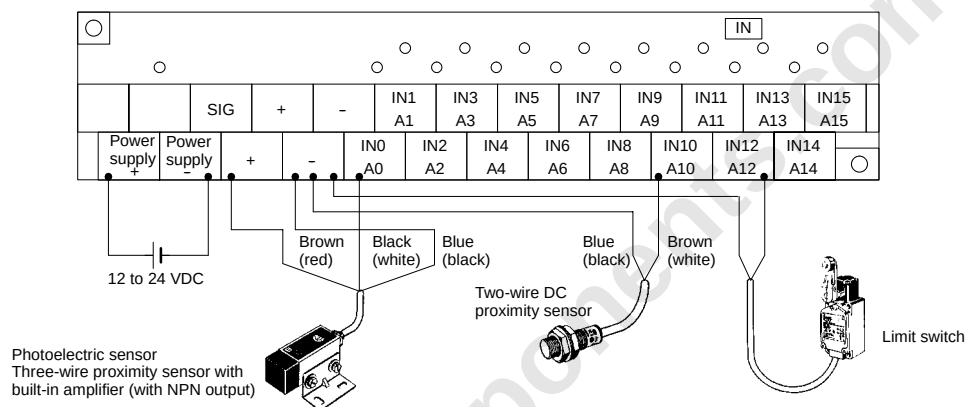
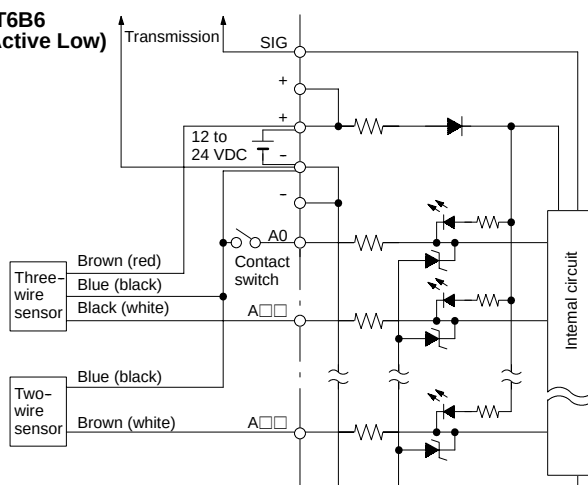
B7A-T6A1/-T6A6
(NPN Input, Active Low)



B7A-T6B1/-T6B6
(NPN Input, Active Low)

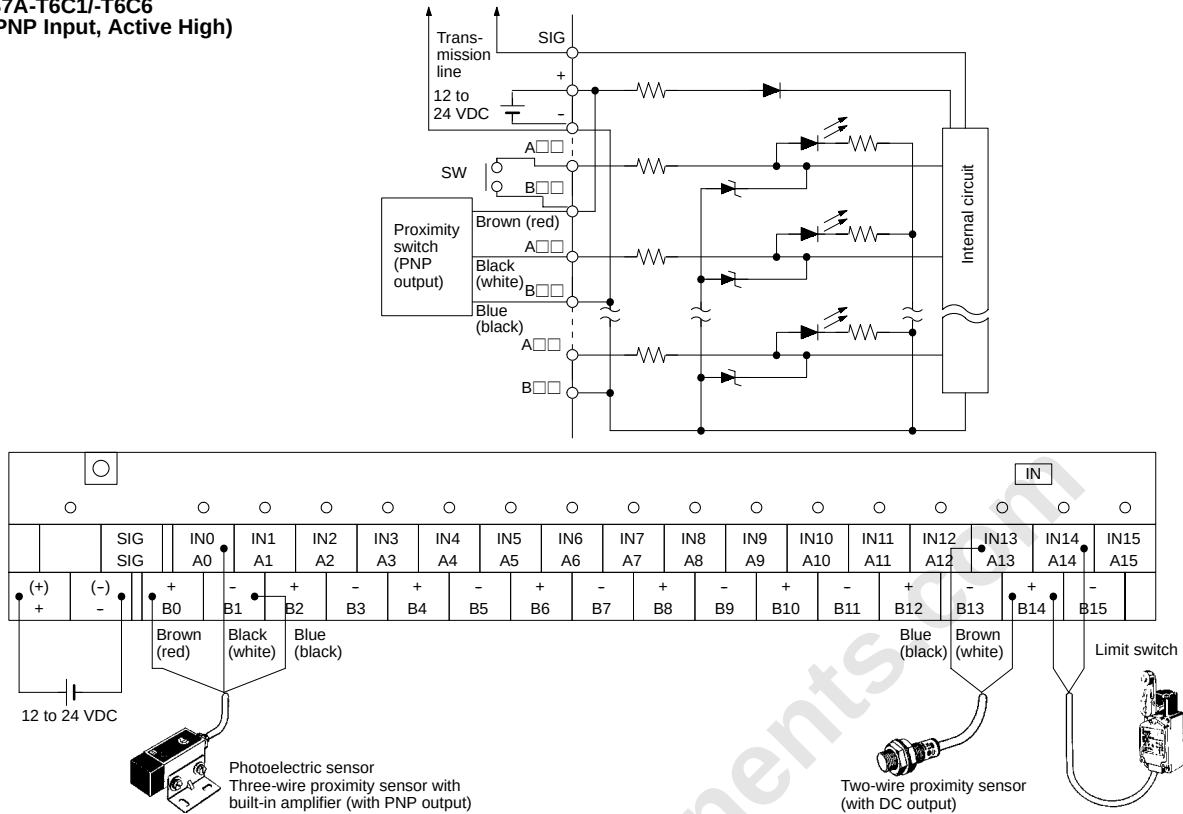


B7AS-T6B1/-T6B6
(NPN Input, Active Low)



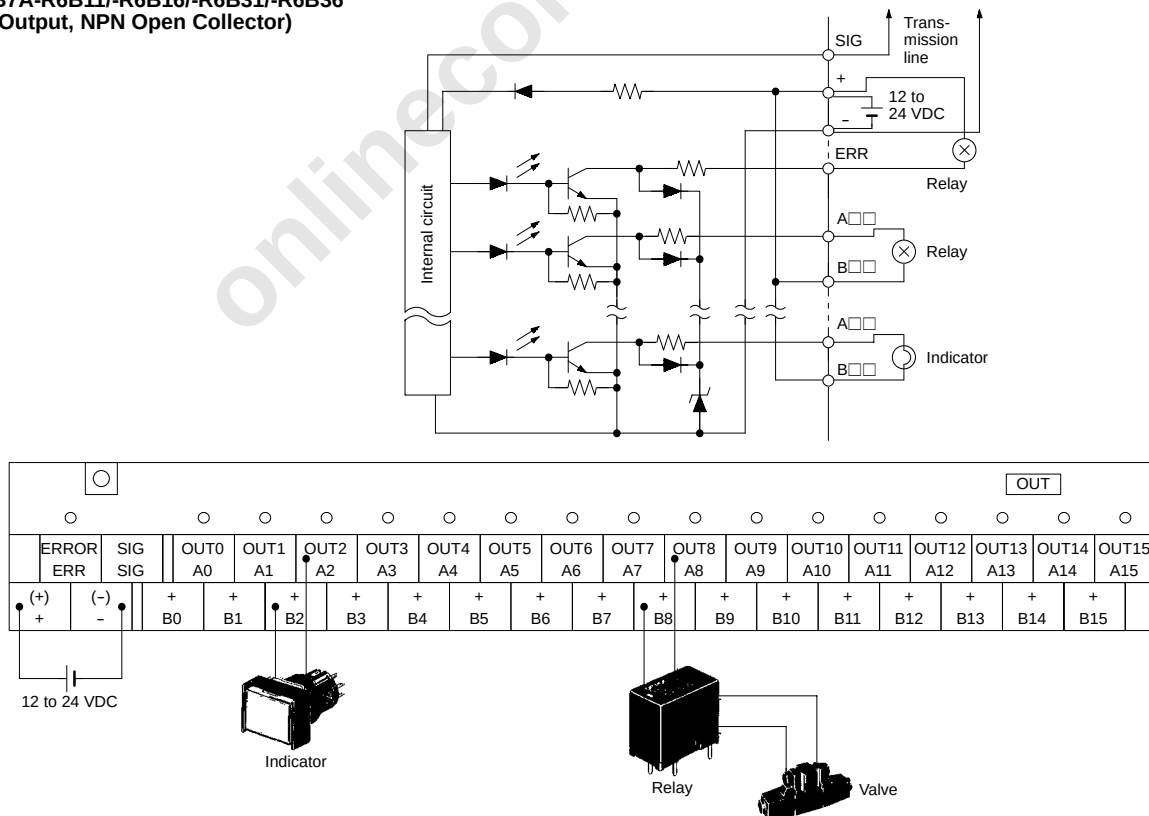
- Note: 1. IEC wire colors for photoelectric sensors and proximity sensors are shown first. The colors in parentheses refer to the old colors.
2. Do not short-circuit the SIG terminal with the positive power supply terminal, negative power supply terminal, or a B□□ terminal, otherwise the internal elements of the B7A will be damaged and no transmission will be possible.

B7A-T6C1/-T6C6
(PNP Input, Active High)

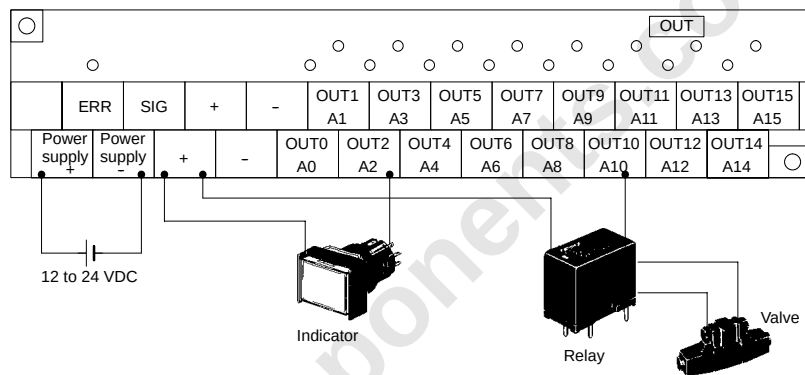
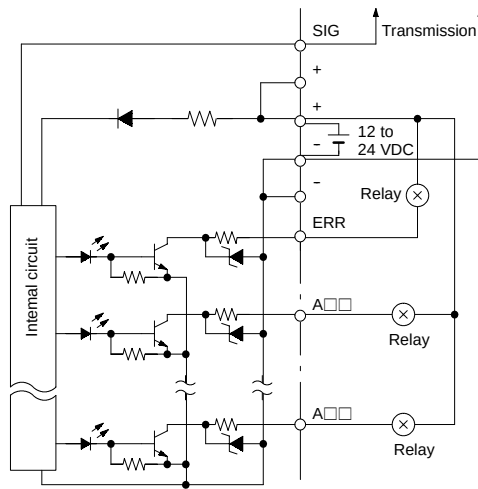


- Note: 1. IEC wire colors for photoelectric sensors and proximity sensors are shown first. The colors in parentheses refer to the old colors.
2. Do not short-circuit the SIG terminal with the positive power supply terminal, negative power supply terminal, or a B□□ terminal, otherwise the internal elements of the B7A will be damaged and no transmission will be possible.

B7A-R6B11/-R6B16/-R6B31/-R6B36
(Output, NPN Open Collector)

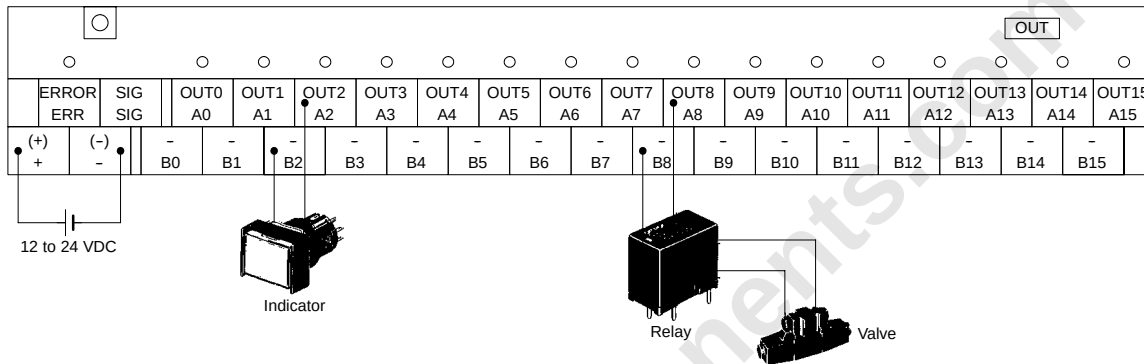
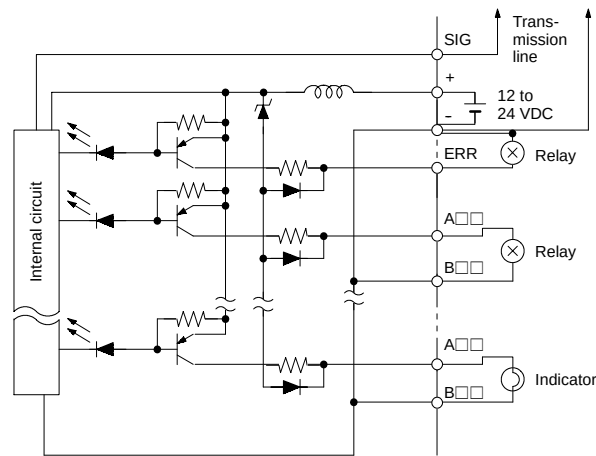


B7AS-R6B11/-R6B16/-R6B31/-R6B36
(Output, NPN Open Collector)

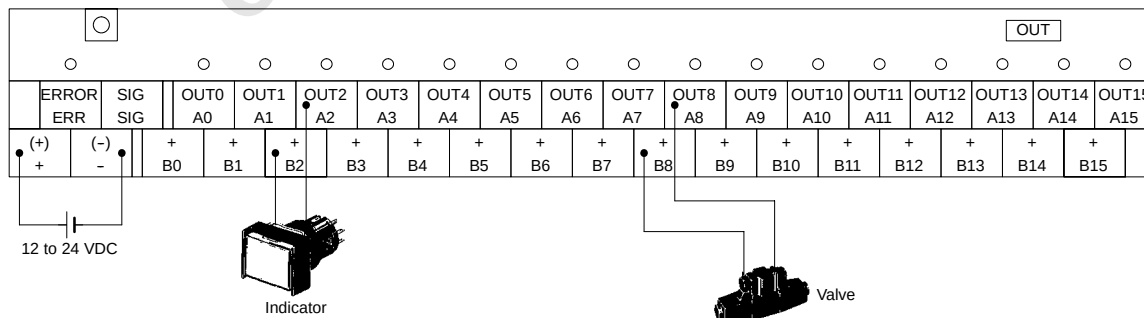
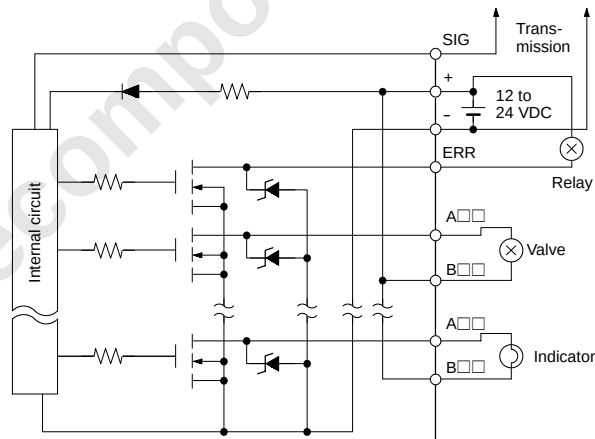


Note: Do not short-circuit terminals A□□ and B□□, otherwise the internal element(s) of the B7A may be damaged.

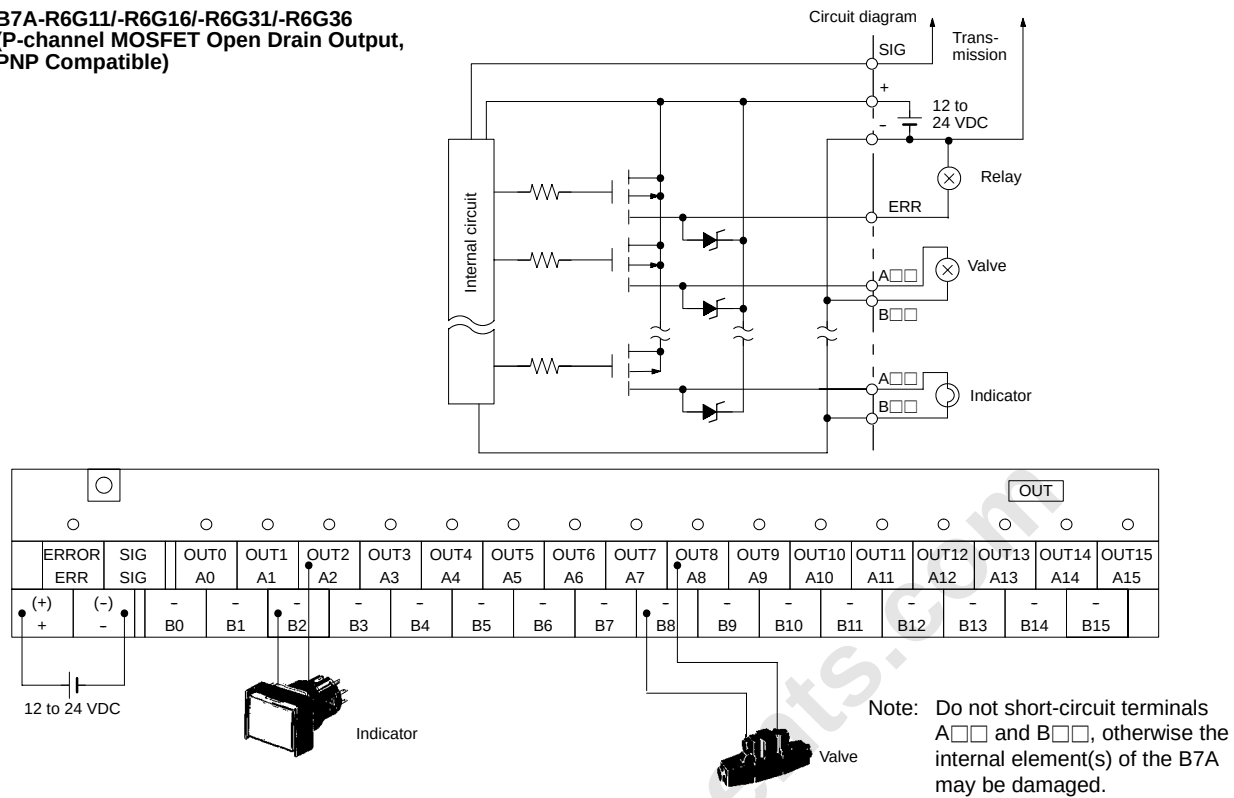
B7A-R6F11/-R6F16/-R6F31/-R6F36
(Output, PNP Open Collector)



B7A-R6C11/-R6C16/-R6C31/-R6C36
(N-channel MOSFET Open Drain Output, NPN Compatible)

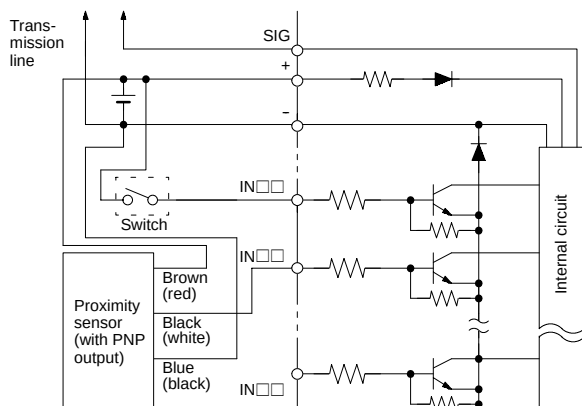


B7A-R6G11/-R6G16/-R6G31/-R6G36
(P-channel MOSFET Open Drain Output,
PNP Compatible)



Printed Circuit Board Models

B7A-T6D2/-T6D7 (PNP Input, Active High)

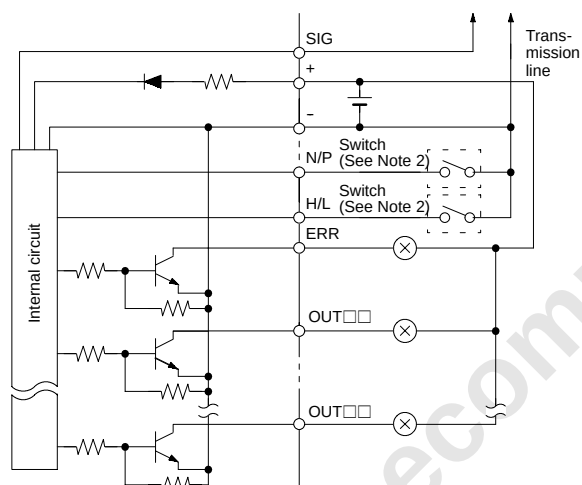


Top View

13 ■ IN10	12 ■ -
14 ■ IN11	11 ■ NC
15 ■ IN12	10 ■ IN09
16 ■ IN13	9 ■ IN08
17 ■ IN14	8 ■ IN07
18 ■ IN15	7 ■ IN06
19 ■ NC	6 ■ IN05
20 ■ NC	5 ■ IN04
21 ■ NC	4 ■ IN03
22 ■ SIG	3 ■ IN02
23 ■ NC	2 ■ IN01
24 ■ +	1 ■ IN00 ○

- Note: 1. IEC wire colors for photoelectric sensors and proximity sensors are shown first. The colors in parentheses refer to the old colors.
2. Do not short-circuit the SIG terminal with a positive or negative power supply terminal, or internal elements of B7A will be damaged and no transmission will occur.

B7A-R6A52/-R6A57 (Output, NPN Open Collector)



Top View

13 ■ OUT10	12 ■ -
14 ■ OUT11	11 ■ NC
15 ■ OUT12	10 ■ OUT09
16 ■ OUT13	9 ■ OUT08
17 ■ OUT14	8 ■ OUT07
18 ■ OUT15	7 ■ OUT06
19 ■ ERR	6 ■ OUT05
20 ■ N/P	5 ■ OUT04
21 ■ H/L	4 ■ OUT03
22 ■ SIG	3 ■ OUT02
23 ■ NC	2 ■ OUT01
24 ■ +	1 ■ OUT00 ○

- Note: 1. Do not short-circuit any output terminal with the positive terminal, or the internal elements of the B7A will be damaged.
2. Logic output processing and error output processing methods can be selected with the selectors. The selectors are not required when the B7A is used with its output fixed to the output logic.

N/P: Negative/Positive		H/L: HOLD/LOAD OFF	
Terminal processing	Function	Terminal processing	Function
Open	Output logic active H	Open	Error output processing: HOLD
Connected to 0 V	Output logic active L	Connected to 0 V	Error output processing: LOAD OFF

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NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.

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