2.11 Digital output module

CAUTION

For external cable connectors corresponding to each pin of MIL connector A2, A3, B2 and B3, use pin-less connectors for the digital output module that is required to assure insulation distance.

- **Outline**
  - The number of outputs for ADOT01 and ADOT02 32 points per module, and that of ADOT03 is 64 points.
  - ADOT01, ADOT02 and ADOT03 are open collector outputs for transistors.
  - A DO pulse width/train output function with bit display is available as an option.
  - The modules other than ADOT01 are capable of duplexing.
  - For external cable connection to adot01, dedicated connectors are used. For ADOT02 and ADOT03, MIL 50-pin connectors are used.
  - ADOT01, ADOT02 and ADOT03 require 24V DC field power.

- **Appearance**

  Appearance of the digital output module is shown below.
  For external dimensions, see Chapter 8.

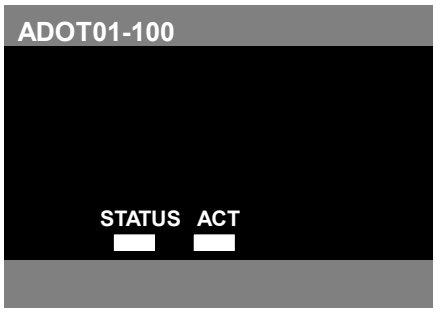


Fig. 2.11.1 LED display

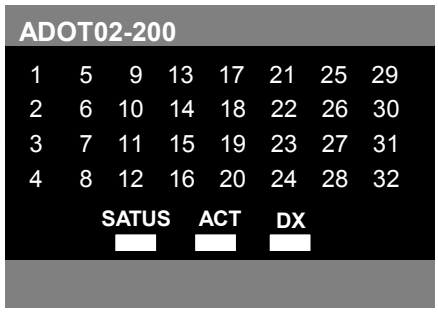


Fig. 2.11.2 LED display

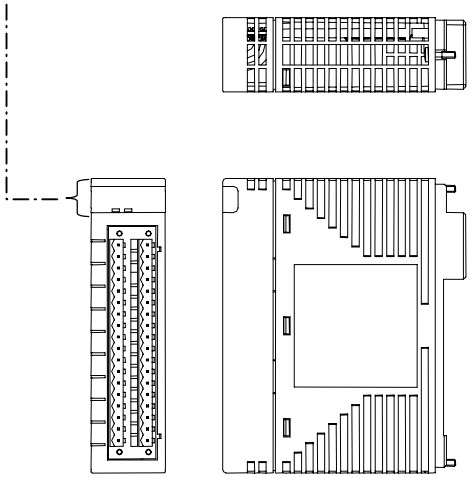


Fig. 2.11.3 Appearance of ADOT01

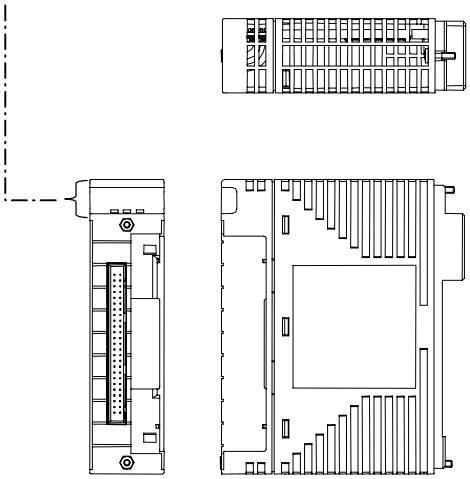


Fig. 2.11.4 Appearance of ADOT02

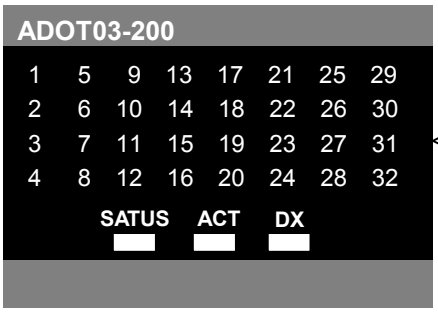


Fig. 2.11.5 LED display

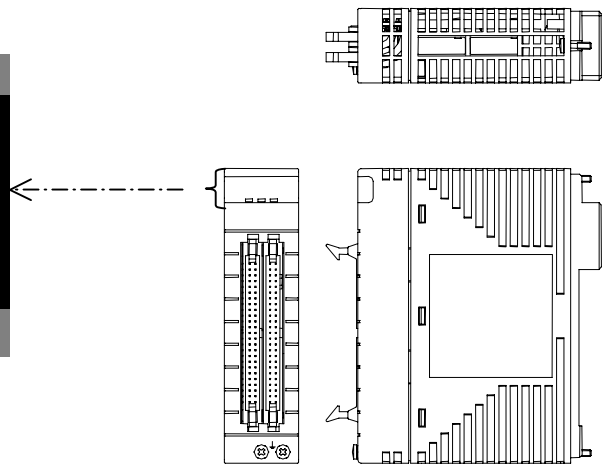


Fig. 2.11.6 Appearance of ADOT03

- **Type name**

Table 2.11.1 Digital output module type

Name of type		Description
Abbreviation	ADOT01	Digital output module outputs: 32 points (24V DC, 100mA), single only
Specification code	-1□□	Basic type
	-□0□	Basic specifications
	-□1□	G3 conformable: Corrosion resistant gas Class G3 (ISA: S71.04) (Note 1)
	-□□X	X is always set to 2.

Note 1) Basic specification is Class G2 (ISA S71.04).

Table 2.11.2 Digital output module type

Name of type		Description
Abbreviation	ADOT02	Digital output module: 32 inputs (24V DC, 100mA)
	ADOT03	Digital output module: 64 inputs (24V DC, 100mA)
Specification code	-1□□	Basic type
	-2□□	With bit display
	-4□□	With DO pulse width/train output function (Not provided for ADOT03)
	-6□□	With bit display and DO pulse width /train output function (Not provided for ADOT03)
	-□0□	Basic specifications
	-□1□	G3 conformable: Corrosion resistant gas Class G3 (ISA: S71.04) (Note 1)
	-□□X	X is always set to 2.

Note 1) Basic specification is Class G2 (ISA S71.04).

- **Specifications**

Table 2.11.3 Specifications for digital output module

Item \ Module name		Digital output module (32 outputs) for single only	Digital output module (32 inputs)	Digital output module (64 points)
Type		ADOT01	ADOT02	ADOT03
Operating ambient temperature		0 to 60°C	-20 to +70°C (Note 1)	0 to 60°C
Number of outputs		32	32	64 (Note 2)
Common		16 points together common (N-common)		
Rated input voltage		24V DC		
Range of operating voltage		20.4 to 26.4V DC		
Maximum load voltage		100 mA/output		
Output ON voltage max. value		2V DC		
Input response time (up date data writing)		3ms or less in status output mode		
Withstand voltage between field – SG, - common		2000V AC 500V AC		
Power consumption		5V DC: 550mA —	5V DC: 550mA 5V DC: 700mA (Note 3)	5V DC: 650mA 5V DC: 780mA (Note 3)
Power consumption (24V DC external cable connection)		24V DC: 60mA		24V DC: 120mA
Mass		0.3 kg		
Duplex		—	Hardware standard conformable	
Option	Pulse output conformable (Pulse accuracy)	— —	Enable (8mS x n±1mS ±0.02%/FS (n: integer, FS: set time	— —
	Environment conformable	G3	G3	G3

Note 1) When using the module beyond the range of 0 to 60°C, refer to 5. Mounting limitations given in Chapter 4.

Note 2) When the ambient temperature is over 50°C, the simultaneous ON rate is limited to 50%.

Note 3) With bit display

- **LED display**

The meaning of LED to be display is given in Table below:

Table 2.11.4 Digital output module LED display

Display LED	Color of display	Meaning
STATUS	Green	ON: Self diagnosis normal end OFF: Fault status (For the cause, see 3. 3. 2)
ACT	Green	ON: Input/Output activating OFF: Input/Output stop status
DX (Except for ADOT01)	Green	ON: Set as duplex module OFF: Set as single module

Table 2.11.5 LED display for each point

Name	Color of display	Contents	Remarks
LED for each point (Except for ADOT01)	Green	ON: Output ON OFF: Output OFF	(Figure)
Display selector switch (ADOT03 only)	—	Left (CN1): 1 to 32 display Right (CN2): 33 to 64 display	

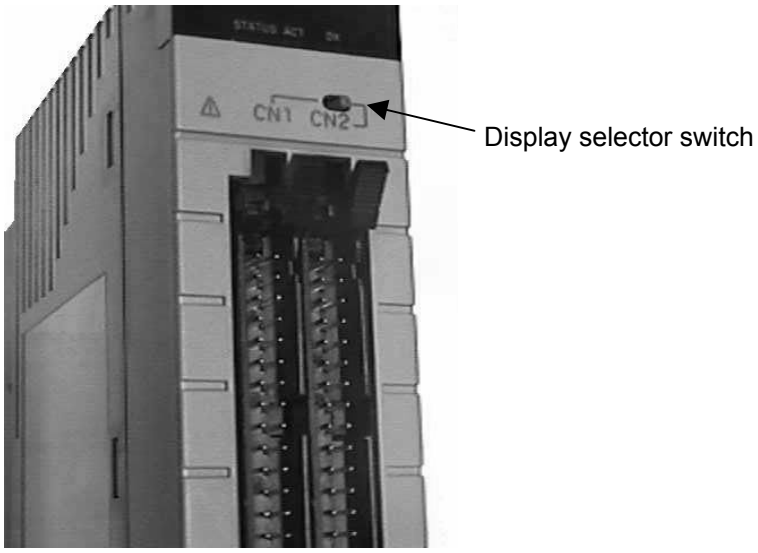


Fig. 2.11. 7 Display selector switch for ADOT03

- **External field power**

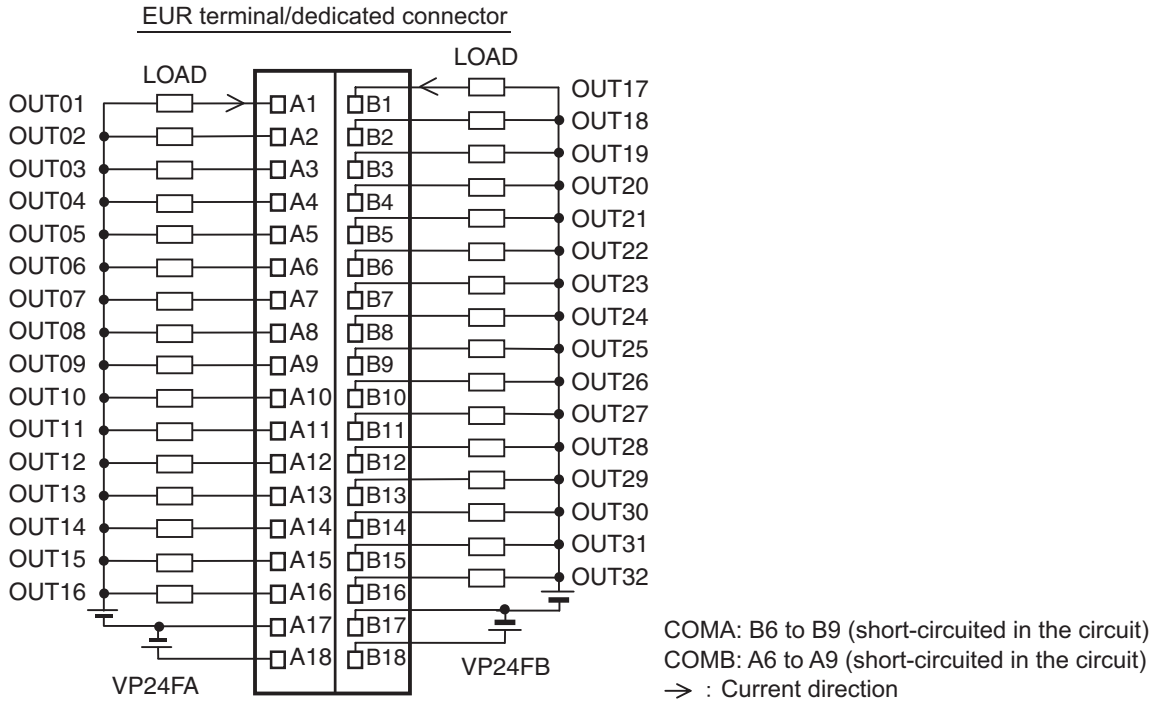
  ADOT01, ADOT02 and ADOT03 require power from the field side to drive loads. Field power specifications are given in Table 2.11.6.

Table 2.11.6 External field power specifications

Item	Specifications
Rated output voltage	24V DC ±10%
Rated output current	Select power suitable for the rated current from current consumption (Table 2.11.3) required for the digital output module.
Standards	Use the power that conforms to CSA22.2 No. 950 or equivalent
Others	Use the power specifications that conform to the environmental conditions.
CAUTION	To the COM terminal, connect a minus (-) of the DC power. To the IN terminals, connect a plus (+) of the DC power. Do not reverse the connection.

- **External cable connection to and terminal assignment for digital output module**

◆ External cable connection to and terminal assignment for digital output module (ADOT01)



Note 1) 24V DC is field power that is provided outside. .

Note 2) When insulation is provided at each point of 16 outputs, each power should be insulated

Fig. 2.11.8 External cable connection to digital output module (ADOT01)

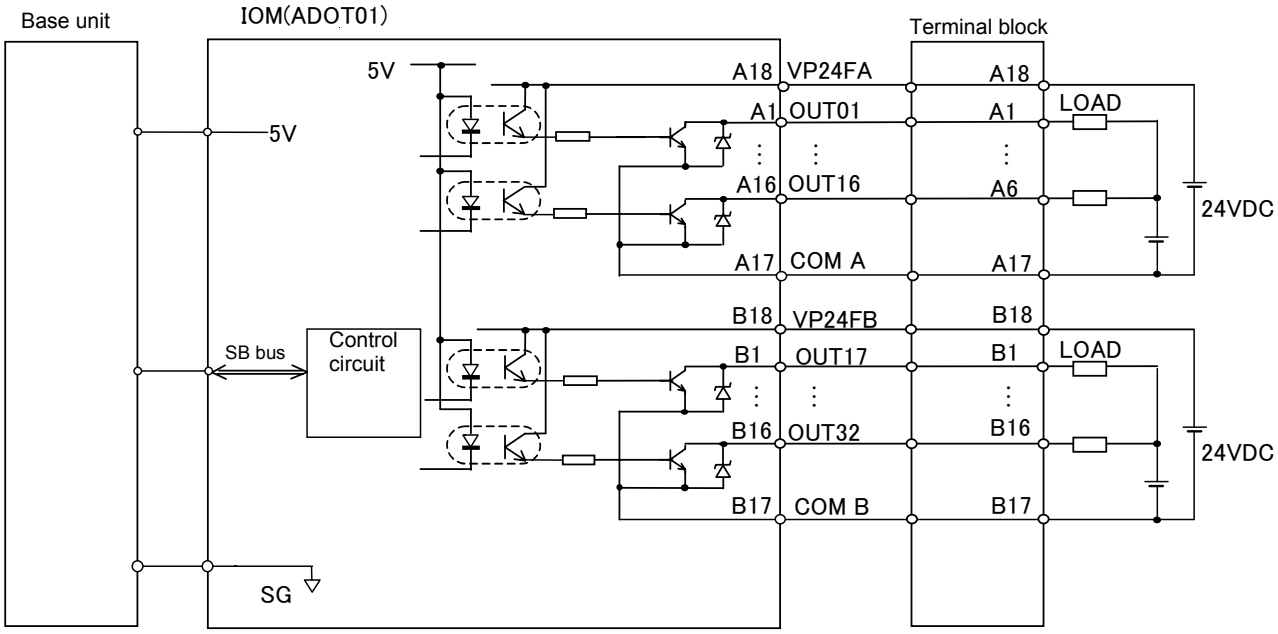


Fig. 2.11.9 External cable connection circuit for digital output module (ADOT01)

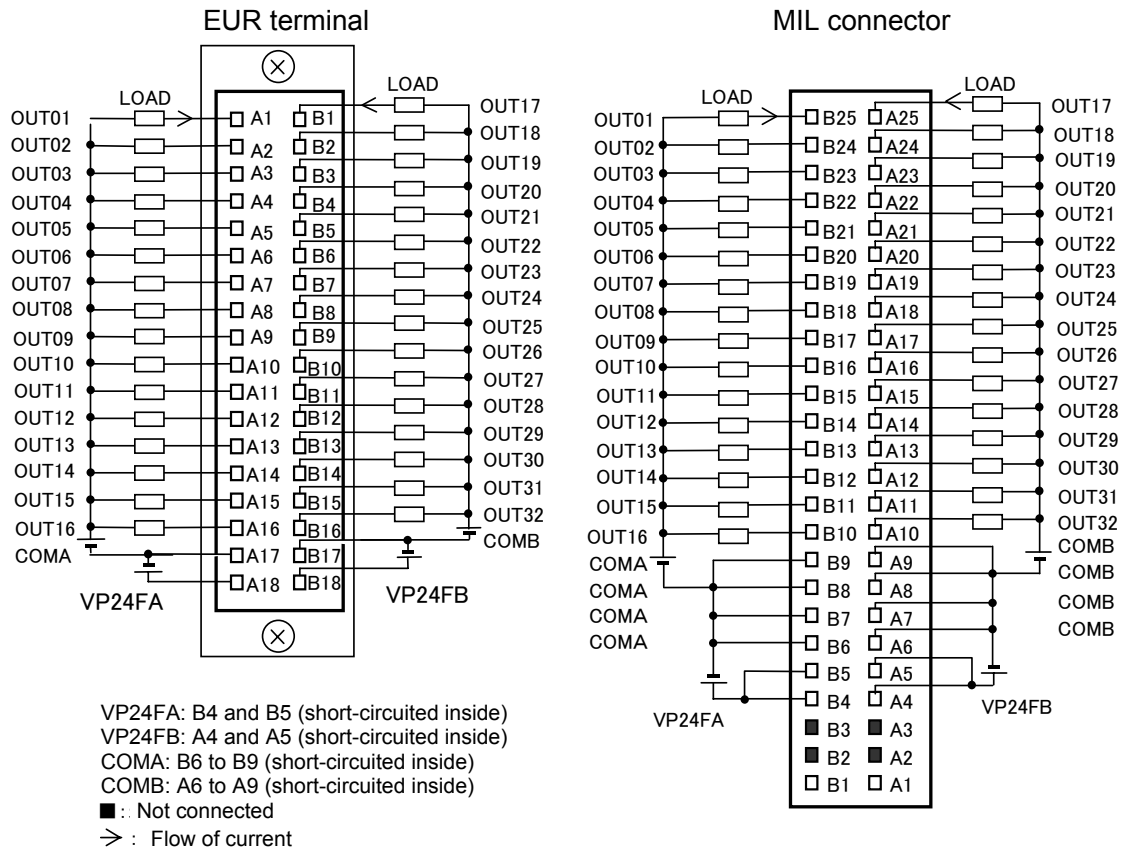
Table 2.11.7 Terminal assignment for digital input module (ADIV05, ADIV06)

Terminal block				ADOT01 connector			
EUR terminal (Note 1)				Dedicated connector			
Pin No.	Name of signal	Pin No.	Name of signal	Pin No.	Name of signal	Pin No.	Name of signal
A1	OUT01	B1	OUT17	A1	OUT01	B1	OUT17
A2	OUT02	B2	OUT18	A2	OUT02	B2	OUT18
A3	OUT03	B3	OUT19	A3	OUT03	B3	OUT19
A4	OUT04	B4	OUT20	A4	OUT04	B4	OUT20
A5	OUT05	B5	OUT21	A5	OUT05	B5	OUT21
A6	OUT06	B6	OUT22	A6	OUT06	B6	OUT22
A7	OUT07	B7	OUT23	A7	OUT07	B7	OUT23
A8	OUT08	B8	OUT24	A8	OUT08	B8	OUT24
A9	OUT09	B9	OUT25	A9	OUT09	B9	OUT25
A10	OUT10	B10	OUT26	A10	OUT10	B10	OUT26
A11	OUT11	B11	OUT27	A11	OUT11	B11	OUT27
A12	OUT12	B12	OUT28	A12	OUT12	B12	OUT28
A13	OUT13	B13	OUT29	A13	OUT13	B13	OUT29
A14	OUT14	B14	OUT30	A14	OUT14	B14	OUT30
A15	OUT15	B15	OUT31	A15	OUT15	B15	OUT31
A16	OUT16	B16	OUT32	A16	OUT16	B16	OUT32
A17	COMA	B17	COMB	A17	COMA	B17	COMB
A18	VP24FA	B18	VP24FB	A18	VP24FA	B18	VP24FB

Note 1) Connect terminal block ATES07 to the dedicated connector.
ATES07 requires both A and B per module.
ATES07 consists of A (A1 to A18) and B (B1 to B18) of the dedicated connector, which are provided with a means of preventing wrong insertion. On the connector “A” dedicated to the IO module, terminal block “A” should be provided.

◆ External cable connection to and terminal assignment for digital output module (ADOT02)

■ In case of EUR terminal and MIL connector



VP24FA: B4 and B5 (short-circuited inside)
VP24FB: A4 and A5 (short-circuited inside)
COMA: B6 to B9 (short-circuited inside)
COMB: A6 to A9 (short-circuited inside)
■ : Not connected
→ : Flow of current

Note 1) 24V DC is field power that is provided outside. The plus (+) side should be connected to 2 points, one point of A4 and A5 and one point of B4 and B5. While the minus (-) side should be connected to each point, one of A6 to A9 and one point of B6 to B9.

Note 2) When insulation is provided at each point of 16 outputs, each power should be insulated.

Fig. 2.11.10 External cable connection to digital output module (ADOT02)

■ In case of screw terminals

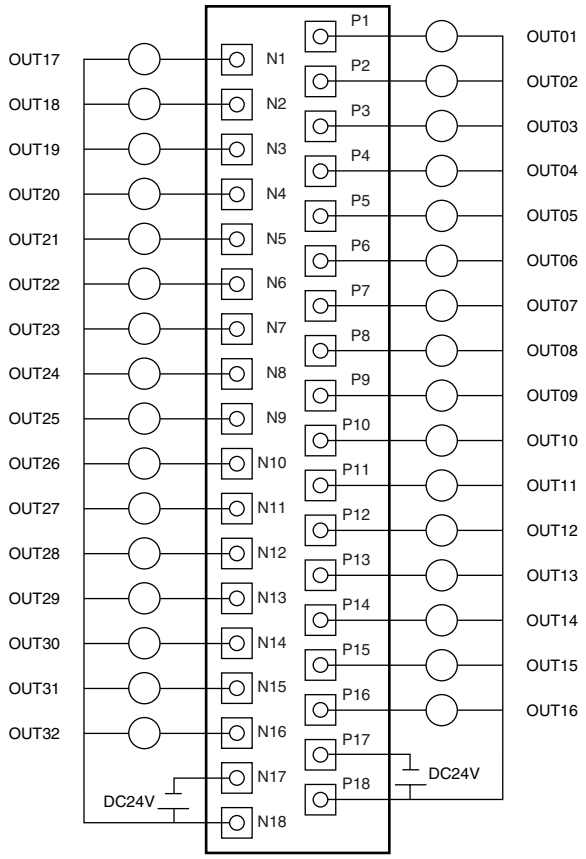
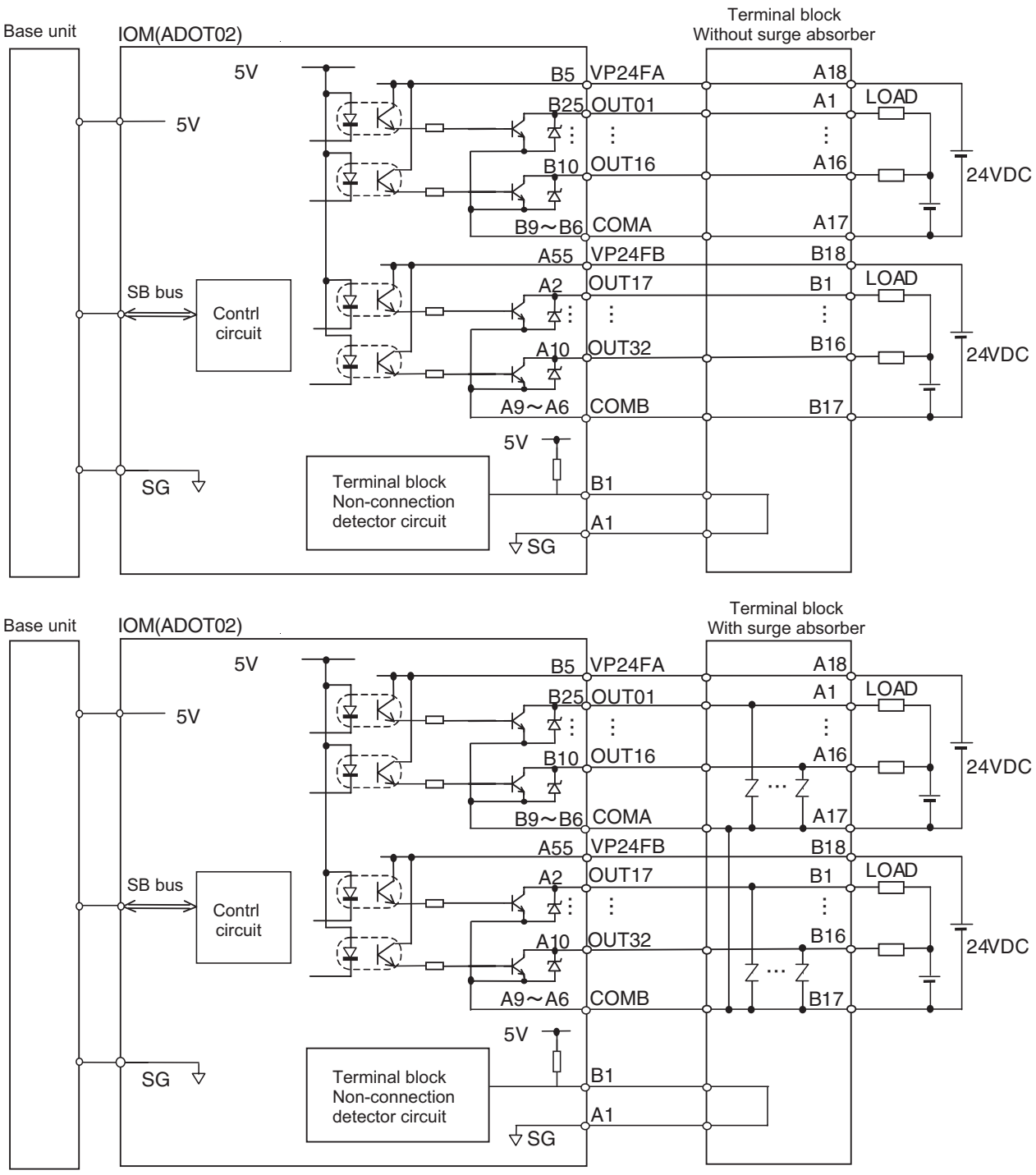


Fig. 2.11.11 External cable connection

Table 2.11.8 Digital output module (ADOT02) terminal assignment

Pin No.	Name of signal	Pin No.	Name of signal
N1	OUT17	P1	OUT01
N2	OUT18	P2	OUT02
N3	OUT19	P3	OUT03
N4	OUT20	P4	OUT04
N5	OUT21	P5	OUT05
N6	OUT22	P6	OUT06
N7	OUT23	P7	OUT07
N8	OUT24	P8	OUT08
N9	OUT25	P9	OUT09
N10	OUT26	P10	OUT10
N11	OUT27	P11	OUT11
N12	OUT28	P12	OUT12
N13	OUT29	P13	OUT13
N14	OUT30	P14	OUT14
N15	OUT31	P15	OUT15
N16	OUT32	P16	OUT16
N17	COMB	P17	COMA
N18	VP24FB	P18	VP24FA



When a terminal block with surge absorbers is used, each common is connected.

Fig. 2.11.12 External cable connection circuit for digital output module (ADOT02)

Table 2.11.9 Terminal assignment for digital output module (ADOT02)

Terminal block				ADOT02 connector			
EUR terminal				MIL connector			
Pin No.	Name of signal	Pin No.	Name of signal	Pin No.	Name of signal	Pin No.	Name of signal
A1	OUT01	B1	OUT17	B25	OUT01	A25	OUT17
A2	OUT02	B2	OUT18	B24	OUT02	A24	OUT18
A3	OUT03	B3	OUT19	B23	OUT03	A23	OUT19
A4	OUT04	B4	OUT20	B22	OUT04	A22	OUT20
A5	OUT05	B5	OUT21	B21	OUT05	A21	OUT21
A6	OUT06	B6	OUT22	B20	OUT06	A20	OUT22
A7	OUT07	B7	OUT23	B19	OUT07	A19	OUT23
A8	OUT08	B8	OUT24	B18	OUT08	A18	OUT24
A9	OUT09	B9	OUT25	B17	OUT09	A17	OUT25
A10	OUT10	B10	OUT26	B16	OUT10	A16	OUT26
A11	OUT11	B11	OUT27	B15	OUT11	A15	OUT27
A12	OUT12	B12	OUT28	B14	OUT12	A14	OUT28
A13	OUT13	B13	OUT29	B13	OUT13	A13	OUT29
A14	OUT14	B14	OUT30	B12	OUT14	A12	OUT30
A15	OUT15	B15	OUT31	B11	OUT15	A11	OUT31
A16	OUT16	B16	OUT32	B10	OUT16	A10	OUT32
A17	COMA	B17	COMB	B9	COMA	A9	COMB
A18	VP24FB	B18	VP24FB	B8	COMA	A8	COMB
				B7	COMA	A7	COMB
				B6	COMA	A6	COMB
				B5	VP24FA	A5	VP24FB
				B4	VP24FA	A4	VP24FB
				B3 (Note 2)	NC	A3 (Note 2)	NC
				B2 (Note 2)	CN	A2 (Note 2)	NC
				B1 (Note 1)	CBSE	A1 (Note 1)	GND

NC: Not connected

CBSE: Signal for detection circuit not connected to terminal block

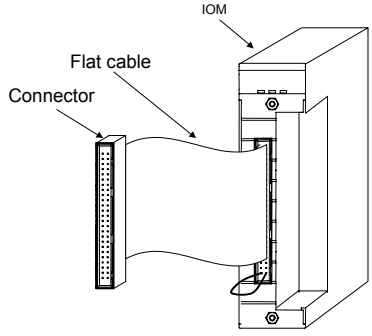
Note 1) To detect any external cable that is not connected to the MIL connector, short-circuit between A1 and B1 at the external side. When using EUR terminal block, A1 and B1 are short-circuited inside.

CAUTION

Note 2) For external cable connectors corresponding to each pin of MIL connector A2, A3, B2 and B3, use pin-less connectors for the digital input module that is required to assure insulation distance.

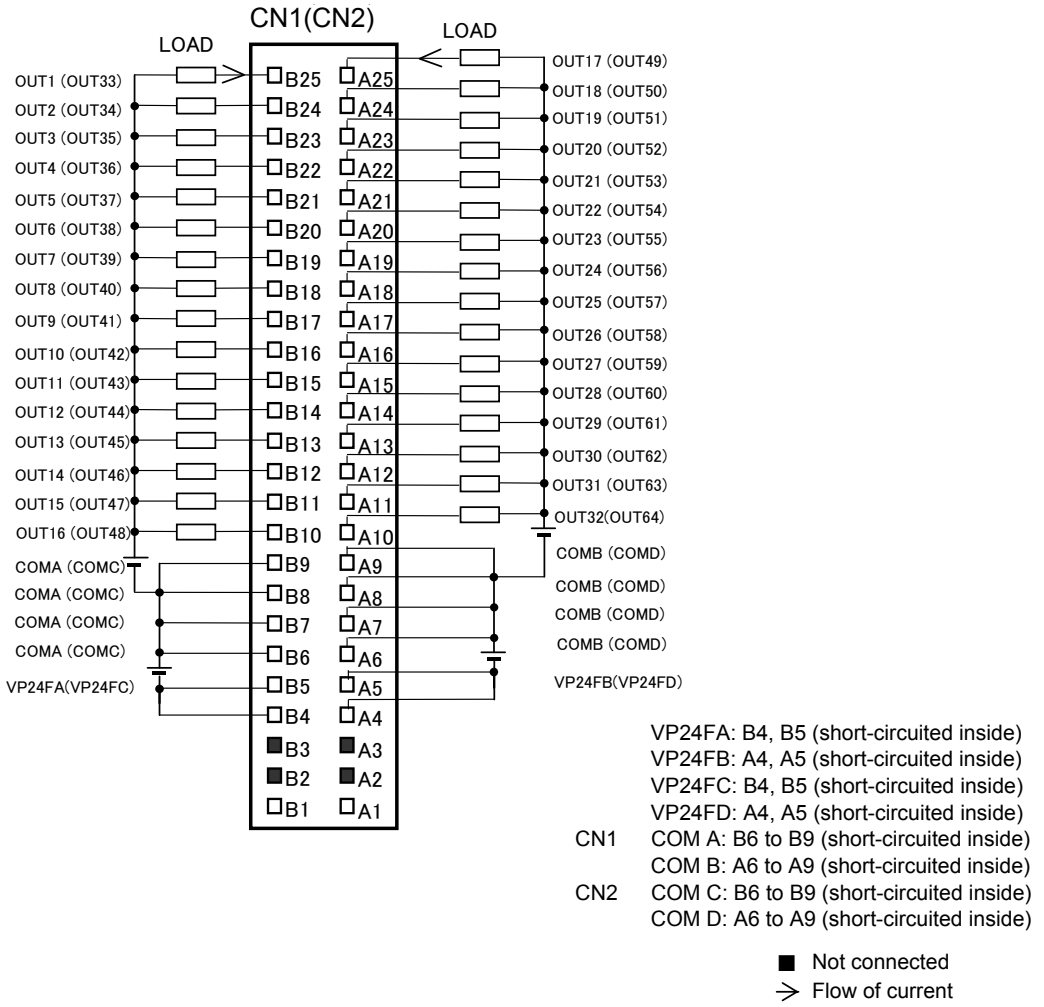
The cable between A1 and B1 is already connected to SG in the internal circuit.

The meter must indicate 2000V AC when measuring withstand voltage between cable and other flat cable for 1 minute.



◆ External cable connection to and terminal assignment for digital output module (ADOT03)

No terminal block that corresponds to ADOT03 is provided.
MIL 50 pin x 2



Note 1) 24V DC is field power that is provided outside.
For CN1 and CN2, the plus (+) side should be connected to 2 points, one point of A4 and A5 and one point of B4 and B5. While the minus (-) side should be connected to each point, one of A6 to A9 and one point of B6 to B9.

Note 2) When insulation is provided at each point of 16 outputs, each power should be insulated.

Fig. 2.11.13 External cable connection of digital output module (ADOT03)

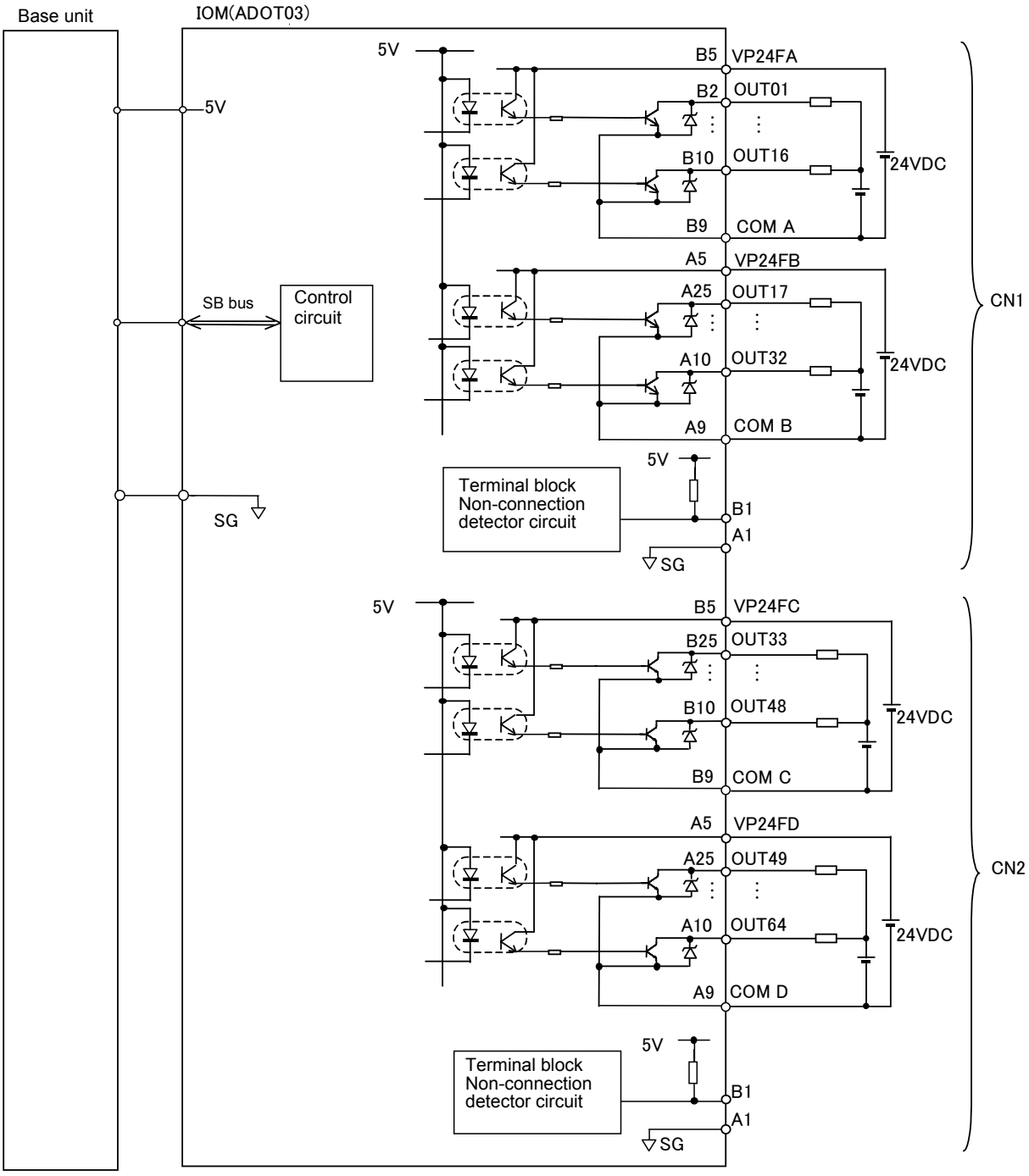


Fig. 2.11.14 External cable connection circuit for digital output module (ADOT03)

Table 2.11.10 Terminal assignment for digital output module (ADOT03)

ADOT03							
MIL connector (CN1)				MIL connector (CN2)			
Pin No.	Name of signal	Pin No.	Name of signal	Pin No.	Name of signal	Pin No.	Name of signal
B25	OUT01	A25	OUT17	B25	OUT33	A25	OUT49
B24	OUT02	A24	OUT18	B24	OUT34	A24	OUT50
B23	OUT03	A23	OUT19	B23	OUT35	A23	OUT51
B22	OUT04	A22	OUT20	B22	OUT36	A22	OUT52
B21	OUT05	A21	OUT21	B21	OUT37	A21	OUT53
B20	OUT06	A20	OUT22	B20	OUT38	A20	OUT54
B19	OUT07	A19	OUT23	B19	OUT39	A19	OUT55
B18	OUT08	A18	OUT24	B18	OUT40	A18	OUT56
B17	OUT09	A17	OUT25	B17	OUT41	A17	OUT57
B16	OUT10	A16	OUT26	B16	OUT42	A16	OUT58
B15	OUT11	A15	OUT27	B15	OUT43	A15	OUT59
B14	OUT12	A14	OUT28	B14	OUT44	A14	OUT60
B13	OUT13	A13	OUT29	B13	OUT45	A13	OUT61
B12	OUT14	A12	OUT30	B12	OUT46	A12	OUT62
B11	OUT15	A11	OUT31	B11	OUT47	A11	OUT63
B10	OUT16	A10	OUT32	B10	OUT48	A10	OUT64
B9	COMA	A9	COMB	B9	COMC	A9	COMD
B8	COMA	A8	COMB	B8	COMC	A8	COMD
B7	COMA	A7	COMB	B7	COMC	A7	COMD
B6	COMA	A6	COMB	B6	COMC	A6	COMD
B5	VP24FA	A5	VP24FB	B5	VP24FC	A5	VP24FD
B4	VP24FA	A4	VP24FB	B4	VP24FC	A4	VP24FD
B3 (Note 2)	NC	A3	NC	B3 (Note 2)	NC	A3	NC
B2 (Note 2)	CN	A2	NC	B2 (Note 2)	CN	A2	NC
B1 (Note 1)	CBSE	A1	GND	B1 (Note 1)	CBSE	A1	GND

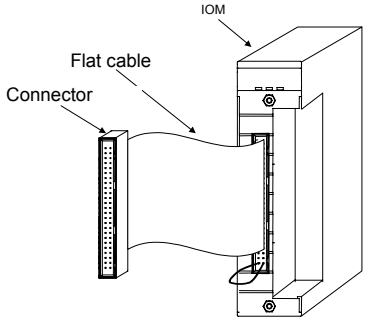
NC: Not connected

CBSE: Detection circuit signal not connected to terminal block

Note 1) To detect any external cable that is not connected, short-circuit between A1 and B1 at the external side.

CAUTION

Note 2) For external cable connectors corresponding to each pin of MIL connector A2, A3, B2 and B3, use pin-less connectors for the digital input module that is required to assure insulation distance.
The cable between A1 and B1 is already connected to SG in the internal circuit.
The meter must indicate 2000V AC for 1 minutes when measuring withstand voltage between cable and other flat cable.



2.12 Relay output module

- **Outline**

  - The number of outputs is 16 points (8 points are common) per module.
  - Voltage of 24 to 110V DC or 100V to 240V AC is applied to the module.
  - DO pulse width/train output function with bit display is available as an option.
  - For external cable connection, dedicated connectors are used.

  (Note) Service life of relays depends on the switching operations. If a high-speed pulse is generated, relay replacement should be performed for a short time. For relation between switching operations and life, refer to 4. Useful life of parts given in Chapter 7.

- **Appearance**

  Appearance of the relay output module is shown below.
  For external dimensions, see Chapter 8.

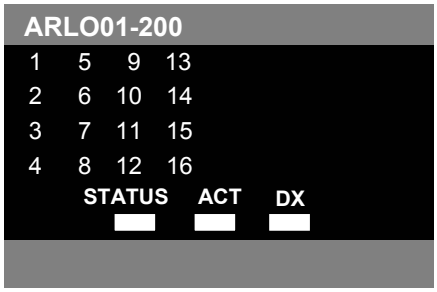


Fig. 2.12.1 LED display

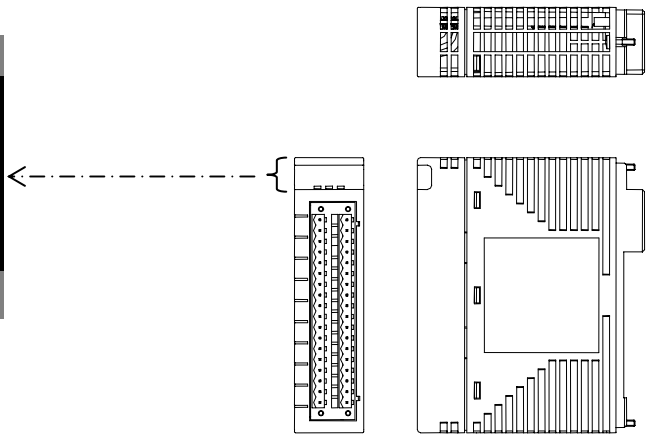


Fig. 2.12.2 Appearance of ARLO01

- **Type name**

Table 2.12.1 Relay output module type

Type name		Description
Abbreviation	ARLO01	Relay output module: 16 points (24V DC/100 to 240V AC)
	ARLO05	Individual contact relay output module: 16 points (24V DC/100 to 240V AC)
Specification code	-1□□	Basic type
	-2□□	With bit display
	-4□□	With DO pulse width/train output function
	-6□□	With bit display and DO pulse width /train output function
	-□0□	Basic specifications
	-□1□	G3 conformable: Corrosion resistant gas Class G3 (ISA: S71.04) (Note 1)
	-□□X	X is always set to 2.

Note 1) Standard specification is Class G2 (ISA S71.04).

- **Specifications**

Table 2.12.2 Specifications for relay output module

Item \ Module name		Relay output module (8 points common)	Relay output module (individual contact)
Type		ARLO01	ARLO05
Operating ambient temperature		-20 to +70°C (Note 1)	
Number of outputs		16 points	
Common		8 points together, common	Every 1 point
Rated voltage		24V to 110V DC 100 to 240V AC (50/60H) (Note 2)	
Maximum load current		Resistive load: 24V DC; 2.0A/point 110V DC; 0.4A/point 100V AC; 2.0A/point 220V AC; 2.0A/point Inductive load: 24V DC; 0.6A/point 110V DC; 0.1A/point 100V AC; 1.0A/point 220V AC; 1.0A/point 8A, max. per common	
Output response time		12ms or less in status output mode	
Withstand voltage between field – SG, - common		2000V AC 1350V AC	
Power consumption		5V: 700mA 5V: 780mA (with bit display)	
Mass		0.3 kg	
Duplex		Hardware standard conformable (external wiring)	
Option	Pulse output conformable (Pulse accuracy)	Enable 8msx n (integer) ±10ms ± 0.02%/FS	
	Environment conformable	G3	

Note 1) When using the module beyond the range of 0 to 60°C, refer to 5. Mounting limitations given in Chapter 4.

Note 2) The AC output signal should be in phase.

- **LED display**

The meaning of LED to be display is given in Table below.

Table 2.12.3 Relay output module LED display

Display LED	Color of display	Meaning
STATUS	Green	ON: Normal or minor fault OFF: Fault status (For the cause, see 3. 3.2.)
ACT	Green	ON: Input/Output activating OFF: Input/Output stop status
DX	Green	ON: Set as duplex module OFF: Set as single module

Table 2.12.4 LED display for each point

Name	Color	Contents	Remarks
LED for each point	Green	ON: Output points with output ON (with relay closed) OFF: Output points with output OFF (with relay open)	(Figure)
Display selector switch	—	For 64-point digital I/O module, every 32 points are displayed.	Left: 1 to 32 lighted Right: 33 to 64 lighted

- **External cable connection to and terminal assignment for relay output (ARLO01)**

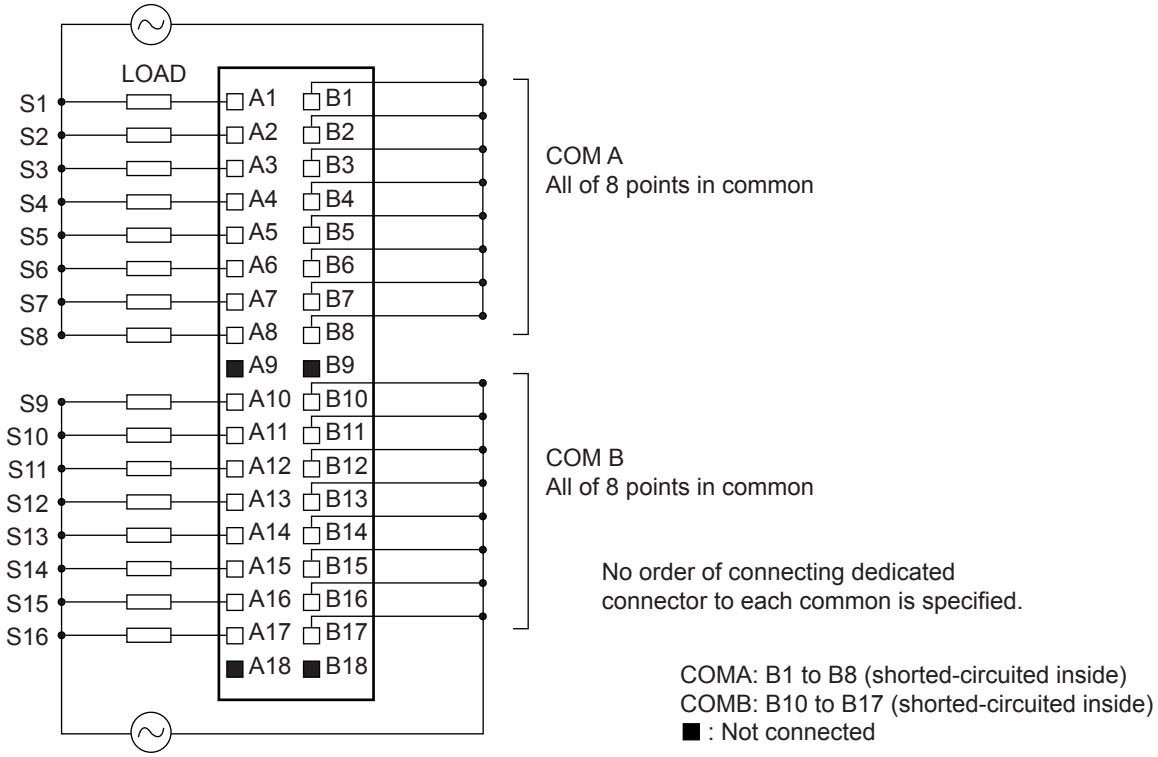


Fig. 2.12.3 External cable connection to relay output module (ARLO01)

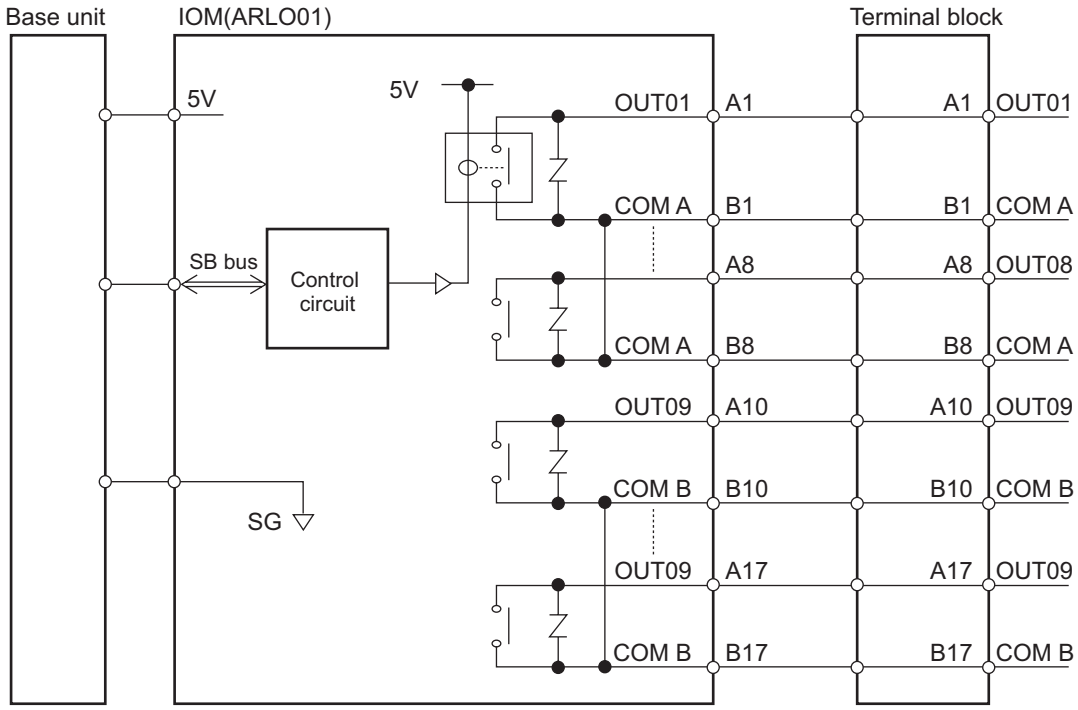


Fig. 2.12.4 External cable connection circuit for relay output module (ARLO01)

Table 2.12.5 Terminal assignment for relay output module (ARLO01)

ARLO01 connector				Terminal block			
Dedicated connector				EUR terminal (Note 3)			
Pin No.	Name of signal	Pin No.	Name of signal	Pin No.	Name of signal	Pin No.	Name of signal
A1	OUT01	B1	COMA	A1	OUT01	B1	COMA
A2	OUT02	B2	COMA	A2	OUT02	B2	COMA
A3	OUT03	B3	COMA	A3	OUT03	B3	COMA
A4	OUT04	B4	COMA	A4	OUT04	B4	COMA
A5	OUT05	B5	COMA	A5	OUT05	B5	COMA
A6	OUT06	B6	COMA	A6	OUT06	B6	COMA
A7	OUT07	B7	COMA	A7	OUT07	B7	COMA
A8	OUT08	B8	COMA	A8	OUT08	B8	COMA
A9	NC	B9	NC	A9	NC	B9	NC
A10	OUT09	B10	COMB	A10	OUT09	B10	COMB
A11	OUT10	B11	COMB	A11	OUT10	B11	COMB
A12	OUT11	B12	COMB	A12	OUT11	B12	COMB
A13	OUT12	B13	COMB	A13	OUT12	B13	COMB
A14	OUT13	B14	COMB	A14	OUT13	B14	COMB
A15	OUT14	B15	COMB	A15	OUT14	B15	COMB
A16	OUT15	B16	COMB	A16	OUT15	B16	COMB
A17	OUT16	B17	COMB	A17	OUT16	B17	COMB
A18	NC	B18	NC	A18	NC	B18	NC

NC: Not connected

Note 1) Connect external cables to all points of common terminal.

Note 2) Limit current to the common terminal to 2A per pin.

Note 3) Connect terminal block ATES06 to the dedicated connector.
ATES06 requires both A and B per module.
ATES06 consists of A side (A1 to A18) and B side (B1 to B18) of the dedicated connector, which are provided with a means of preventing wrong insertion. On the connector “A” dedicated to the I/O module, terminal block “A” should be provided.

- **External cable connection and terminal assignment for relay output (ARLO05)**

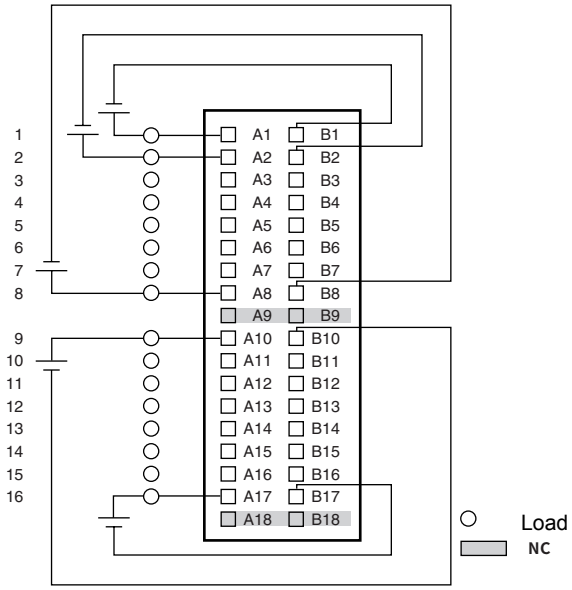


Fig. 2.12.5 External cable connection to relay output module (ARLO05)

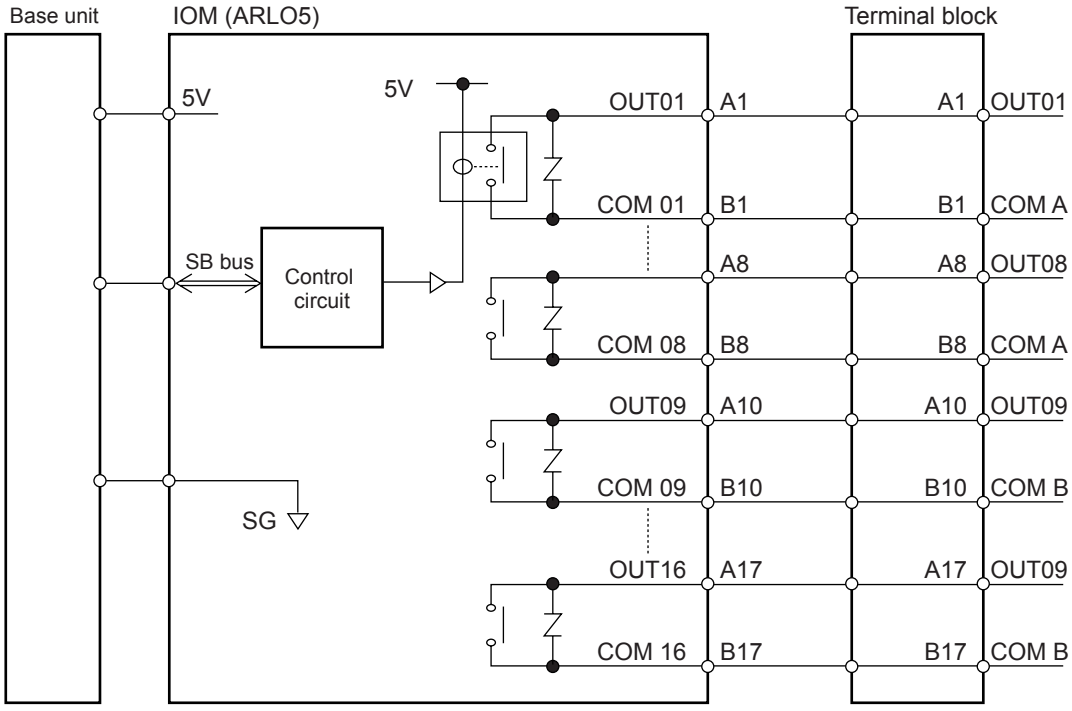


Fig. 2.12.6 External cable connection circuit for relay output module (ARLO05)

Table 2.12.6 Terminal assignment for relay output module (ARLO05)

ARLO05 connector				Terminal block			
Dedicated connector				EUR terminal (Note 3)			
Pin No.	Name of signal	Pin No.	Name of signal	Pin No.	Name of signal	Pin No.	Name of signal
A1	OUT01	B1	COM01	A1	OUT01	B1	COM01
A2	OUT02	B2	COM02	A2	OUT02	B2	COM02
A3	OUT03	B3	COM03	A3	OUT03	B3	COM03
A4	OUT04	B4	COM04	A4	OUT04	B4	COM04
A5	OUT05	B5	COM05	A5	OUT05	B5	COM05
A6	OUT06	B6	COM06	A6	OUT06	B6	COM06
A7	OUT07	B7	COM07	A7	OUT07	B7	COM07
A8	OUT08	B8	COM08	A8	OUT08	B8	COM08
A9	NC	B9	NC	A9	NC	B9	NC
A10	OUT09	B10	COM09	A10	OUT09	B10	COM09
A11	OUT10	B11	COM10	A11	OUT10	B11	COM10
A12	OUT11	B12	COM11	A12	OUT11	B12	COM11
A13	OUT12	B13	COM12	A13	OUT12	B13	COM12
A14	OUT13	B14	COM13	A14	OUT13	B14	COM13
A15	OUT14	B15	COM14	A15	OUT14	B15	COM14
A16	OUT15	B16	COM15	A16	OUT15	B16	COM15
A17	OUT16	B17	COM16	A17	OUT16	B17	COM16
A18	NC	B18	NC	A18	NC	B18	NC

NC: Not connected

Note 1) Limit current to the common terminal to 2A per pin.

Note 2) Connect terminal block ATES06 to the dedicated connector.
ATES06 requires both A and B per module.
ATES06 consists of A side (A1 to A18) and B side (B1 to B18) of the dedicated connector, which are provided with a means of preventing wrong insertion. On the connector “A” dedicated to the I/O module, terminal block “A” should be provided.