

Connection and Operation

Names and Functions of Driver Parts

(Top)



②]Function Switches

① Signal Monitor Displays

◇ LED Indicators

Indication	Color	Function	When Activated
POWER	Green	Power supply indication	Lights when power is on.
ALARM	Red	Alarm indication	Blinks when protective functions are activated.

◇ Alarm

Blink Count	Function	When Activated
2	Overheat	The temperature of the driver's internal heat sink exceeds the specified value.
3	Overvoltage	The primary voltage of the driver's inverter exceeds the permissible value.
5	Overcurrent	An excessive current flows to the driver's inverter.

② Function Switches

Indication	Switch Name	Function
SW1	Third Harmonic Waveform Correction Function Select Switch	A function that provides improved angle accuracy and reduced vibrations by optimizing the motor drive current waveforms. You can set the correction value using the select switch.
SW2-1	Smooth Drive Function Switch	Low vibration and low noise operation are available even in the low speed range without changing the step angle setting. The function can be set and deactivated with this switch.
SW2-2	Vibration Suppression Function Select Switch	A function that provides reduced vibrations at medium speed operation. The function can be set or deactivated with this switch.
SW2-3	Not used.	—
SW2-4	Motor Stop Current Switch	For adjusting the motor current at standstill

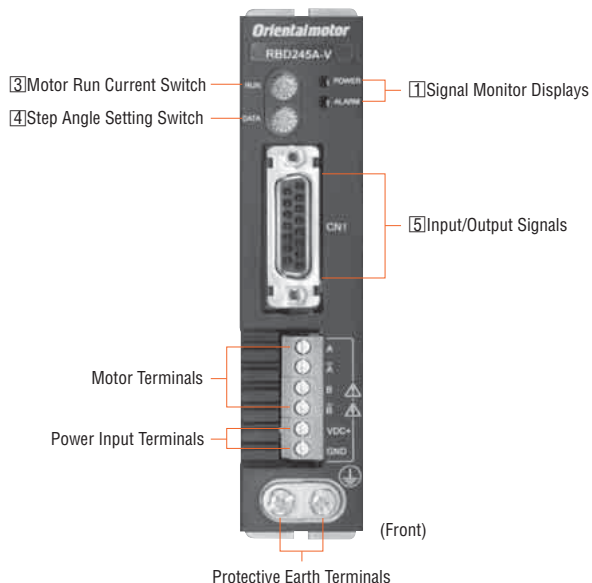
③ Motor Run Current Switch

Indication	Switch Name	Function
RUN	Motor Run Current Switch	For adjusting the motor running current

⑤ Input/Output Signals

Indication	Input/Output	Pin No.	Signal	Signal Name	Function
CN1*	Input	1	PLS+	Pulse Signal	Operation command pulse signal
		2	PLS24+		
		9	PLS-		
		3	DIR+	Rotation Direction Signal	Rotation direction signal Photocoupler ON: CW, Photocoupler OFF: CCW
		10	DIR24+		
		11	DIR-		
		4	AWO	All Windings Off Signal	Cuts the output current to the motor and allows the motor shafts to be rotated manually.
		12	CS	Step Angle Select Signal	The motor will operate at the basic step angle regardless of the settings of the step angle setting switches.
	5	IN-COM	Input Common	Input common for the "All Windings Off" signal and "Step Angle Select" signal.	
	Output	13	CD+	Current Cutback Signal	Outputs a signal when the automatic current cutback function activates.
		6	CD-		
		14	ALM+	Alarm Signal	Turns the output off when one of the driver's protective functions is activated.
		7	ALM-		
		15	TIM+	Excitation Timing Signal	Outputs signals when the excitation sequence is at STEP "0."
		8	TIM-		

* The cable for connecting the terminal box type motor and driver, and the D-Sub (15-pin) connector for connecting to the driver's CN1 connector are not included. They must be supplied separately.
Description of input/output signals → Page C-177



④ Step Angle Setting Switch

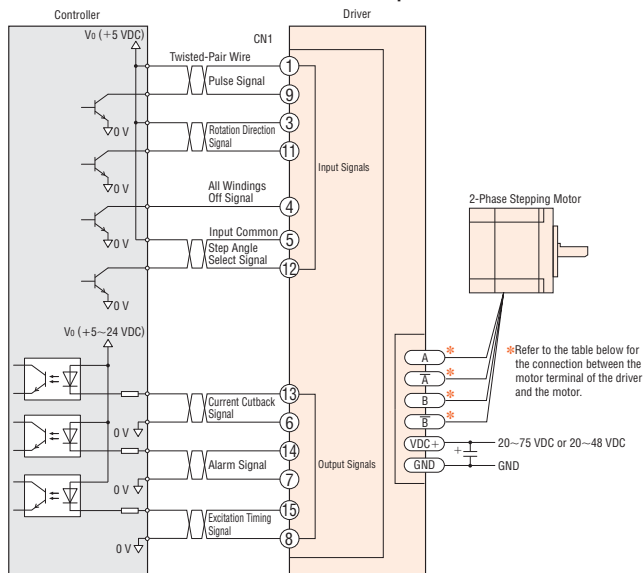
Indication	Switch Name	Function
DATA	Step Angle Setting Switch	The switch can be set to the desired resolution from the 16 resolution levels.

Step Angle Setting Switch	Microsteps/Step	Resolution	Step Angle
0	1	200	1.8°
1	2	400	0.9°
2	4	800	0.45°
3	5	1000	0.36°
4	8	1600	0.225°
5	9	1800	0.2°
6	10	2000	0.18°
7	16	3200	0.1125°
8	18	3600	0.1°
9	20	4000	0.09°
A	32	6400	0.05625°
B	36	7200	0.05°
C	40	8000	0.045°
D	64	12800	0.028125°
E	80	16000	0.0225°
F	128	25600	0.0140625°

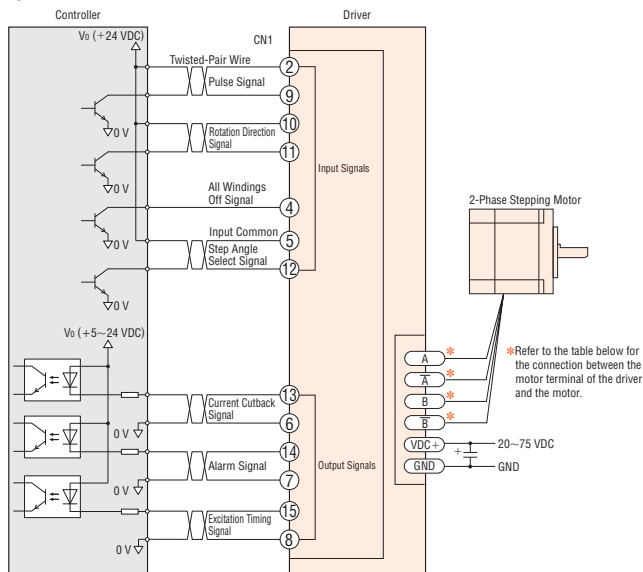
- The step angle set with the step angle setting switch will become effective when the "Step Angle Select" (CS) signal input is OFF.
- Do not change the "Step Angle Select" (CS) signal input or step angle setting switch while the motor is operating. It may cause the motor to misstep and stop. Change the step angle setting switch, when the "Step Angle Select" (CS) signal input is OFF and the "Excitation Timing" (TIM) signal output is ON.

● Connection Diagrams

◇ 5 VDC Connection or Line Driver Input

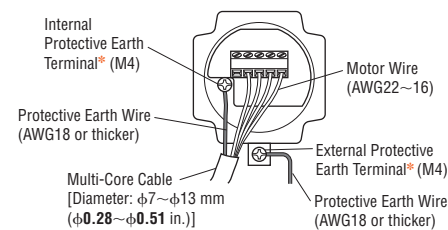


◇ 24 VDC Connection

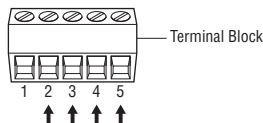


◇ Terminal Box Type Motor Connections

RBK264T, RBK266T, RBK268T

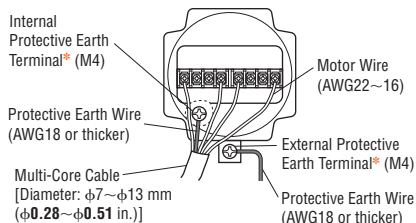


Connect motor lead wires to the terminals 2 to 5.

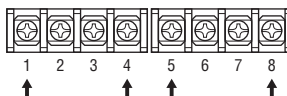


* Connect either the internal protective earth terminal or external protective earth terminal to the ground.

RBK296T, RBK299T, RBK2913T



Terminals 1, 4, 5, and 8 are used. Terminals 2, 3, 6, and 7 are not used. Do not connect anything to them.



* Connect either the internal protective earth terminal or external protective earth terminal to the ground.

◇ Input Signal Connection

- Pulse (PLS) Signal, Rotation Direction (DIR) Signal
You can select either 5 VDC or 24 VDC as the signal voltage. Line driver input is also available. The pin No. to connect differs according to the signal voltage.
- All Windings Off Signal, Step Angle Select Signal
You can select either 5 VDC or 24 VDC as the signal voltage. The pin No. to connect is the same for 5 VDC and 24 VDC.

◇ Output Signal Connection

Keep the output signal voltage and current below 30 VDC and 10 mA respectively.

◇ Power Supply

Use a power supply that can supply sufficient input current. When power supply capacity is insufficient, a decrease in motor output can cause the following malfunctions:

- Motor does not operate properly at high-speed.
- Slow motor startup and stopping.

◇ Notes on Wiring

- Use twisted-pair wires of AWG26 and keep wiring as short as possible [within 2 m (6.6 ft.)].
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases. Technical reference → Page F-54
- Use wires of AWG18 or thicker for motor lines (when extended), power supply lines and protective earth line.
- To ground the driver, lead the ground conductor from the protective earth terminal (M4) and connect the ground conductor to provide a common ground point.
- Signal lines should be kept at least 2 cm (0.79 in.) away from power lines (power supply lines and motor lines). Do not bind the signal lines and power lines together.
- If noise generated by the motor cable or power cable becomes a problem due to the wiring and layout, shield the cables or use ferrite cores.
- Incorrect connection of DC power input will lead to driver damage. Make sure that the polarity is correct before turning power on.
- The cable for connecting the terminal box type motor and driver, and the D-Sub (15-pin) connector for connecting to the driver's CN1 connector are not included. They must be supplied separately.

● Driver Motor Terminals and Motor Leads/Motor Terminal Blocks

Signal Name	Signal	Standard Type Motor	Terminal Box Type Motor	
			Terminal Block No. for RBK26□	Terminal Block No. for RBK29□
A	A-phase output	Black	2	1
\bar{A}	\bar{A} -phase output	Green	3	4
B	B-phase output	Red	4	5
\bar{B}	\bar{B} -phase output	Blue	5	8

● Description of Input/Output Signals

Indication of Input/Output Signal "ON"/"OFF"
 Input (Output) "ON" indicates that the current is sent into the photocoupler (transistor) inside the driver. Input (Output) "OFF" indicates that the current is not sent into the photocoupler (transistor) inside the driver. The input/output remains "OFF" if nothing is connected.

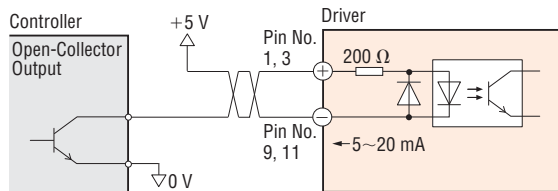
Photocoupler OFF ON

Pulse (PLS), Rotation Direction (DIR) Input Signal

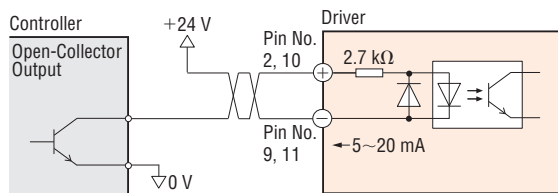
You can select either 5 VDC or 24 VDC as the signal voltage for "Pulse" input and "Rotation Direction" input. Line driver input is also available.

◇ Input Circuit and Sample Connection

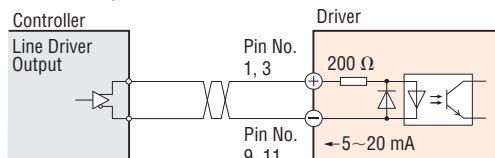
● 5 VDC Connection



● 24 VDC Connection

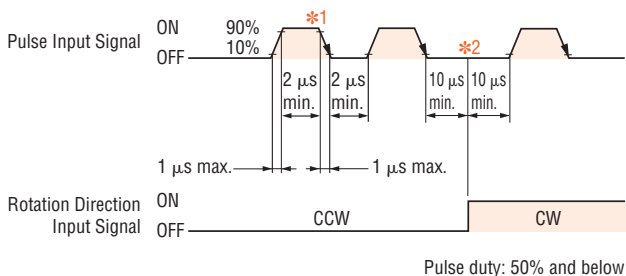


● Line Driver Input

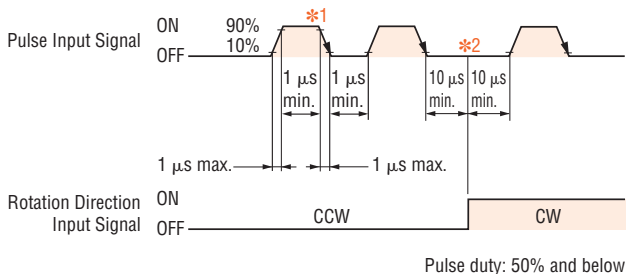


◇ Pulse Waveform Characteristics

● 5 VDC or 24 VDC Connection



● Line Driver Input



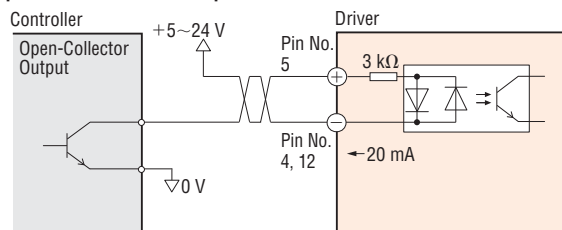
- *1 The shaded area indicates when the photocoupler diode is ON. The motor moves when the photocoupler state changes from ON to OFF.
- *2 The minimum interval time when changing rotation direction is 10 μs. This value varies greatly depending on the motor type, pulse frequency and load inertia.

◇ Pulse Signal Characteristics

- Keep the pulse signal at the "photocoupler OFF" state when no pulses are being input.
- Leave the pulse signal at rest ("photocoupler OFF") when changing rotation directions.

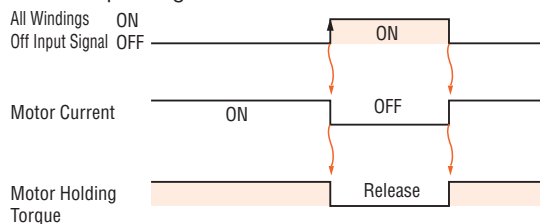
All Windings Off (AWO), Step Angle Select (CS) Input Signal

◇ Input Circuit and Sample Connection



◇ All Windings Off (AWO) Input Signal

- Inputting this signal puts the motor in a non-excitation (free) state.
- This signal is used when turning the motor by external force or manual home position is desired. The photocoupler must be "OFF" when operating the motor.



The shaded area indicates that the motor provides holding torque in proportion to standstill current set by motor stop current switch.

- Switching the "All Windings Off" signal from "photocoupler ON" to "photocoupler OFF" does not alter the excitation sequence. When the motor shaft is manually adjusted with the "All Windings Off" signal input, the shaft will shift up to ±3.6° from the position set after the "All Windings Off" signal is released.

◇ Step Angle Select (CS) Input Signal

- When this signal input is "ON," the motor will operate at the basic step angle regardless of the settings of the step angle setting switches. When the signal input is "OFF," the motor will operate at the step angle set with the step angle setting switch.
- To change the step angle, do so when the "Excitation Timing" signal output is "ON" and the motor is at standstill.

Introduction

AC Input OSTEP AS

DC Input OSTEP ASC

AC Input 5-Phase Microstep RK

AC Input 2-Phase Full/Half UMK

DC Input 5-Phase Microstep CMK

DC Input 2-Phase Microstep RBK

DC Input 2-Phase Microstep CMK

Without Encoder 2-Phase PK/PV

With Encoder 2-Phase PK

Controllers EMP400

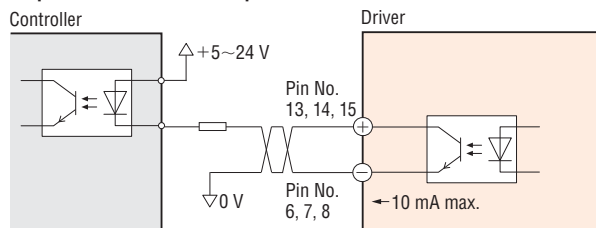
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Accessories

Installation

Current Cutback (CD), Alarm (ALM), Excitation Timing (TIM) Output Signal

◇ Output Circuit and Sample Connection



◇ Current Cutback (CD) Output Signal

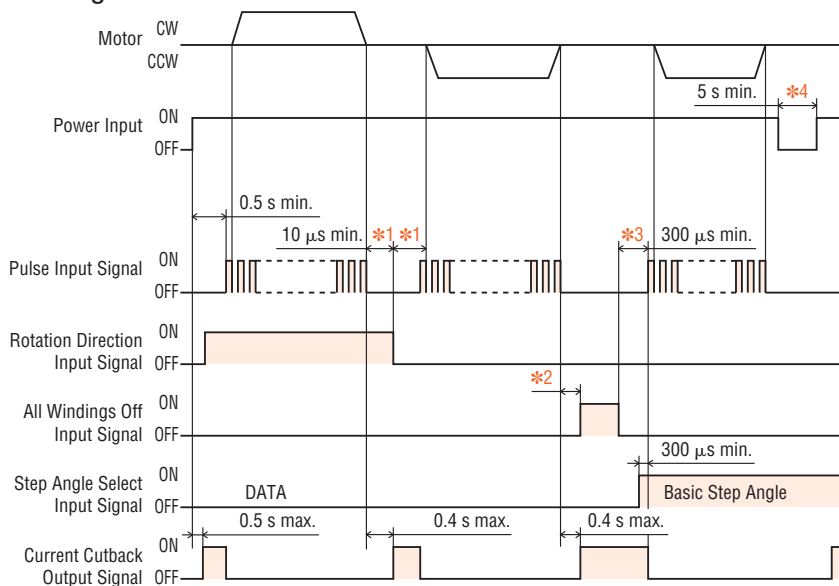
- When the automatic current cutback function is activated, the "Current Cutback" output turns on.

◇ Alarm (ALM) Output Signal

Protective Function	Normal	Fault	Normal
Alarm ON	ON	OFF	ON
Alarm OFF	ON	OFF	ON
ALARM LED		Light	
Motor	Run	Stop	Run

- When the motor is running, if the driver overheat, overvoltage, or overcurrent protective function is detected, the "Alarm" output turns off, and the ALARM LED of the driver flashes. The current to the motor is also cut off to stop the motor.
- You can count the number of times the ALARM LED flashes to confirm which protective function is activated.
- This signal normally stays on, but turns off when a protective function is activated.

● Timing Chart



The shaded section indicates that the photocoupler diode is emitting light.

◇ Excitation Timing (TIM) Output Signal

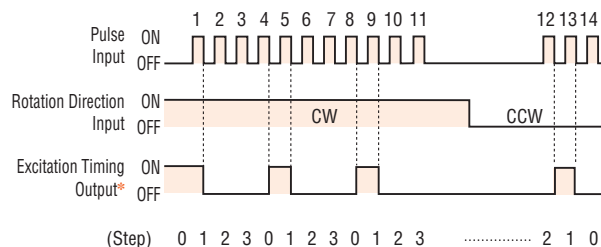
- The "Excitation Timing" signal is output to indicate when the motor excitation is in the initial stage (step "0" at power up).
- The "Excitation Timing" signal is output simultaneously with a pulse input each time the excitation sequence returns to step "0." The excitation sequence will complete one cycle for every 7.2° rotation of the motor output shaft.

Microsteps/step 1: Signal is output once every 4 pulses.

Microsteps/step 4: Signal is output once every 16 pulses.

Timing chart at 1.8/step (Microsteps/step 1)

- * When connected as shown in the sample connection, the signal will be "photocoupler ON" at step "0."



Notes:

- When power is turned ON, the excitation sequence is reset to step "0" and the "Excitation Timing" signal is output.
- When operating the motor using the "Excitation Timing" signal output, make sure the motor output shaft stops at an integral multiple of 7.2°.

- *1 The minimum switching time to change direction 10 μs is shown as the response time of the circuit. The motor may need more time than that.
- *2 Depends on load inertia, load torque, and starting frequency.
- *3 Never input a pulse signal immediately after switching the "All Windings Off" signal to the "photocoupler OFF" state. The motor may not start.
- *4 To cycle the power, turn off the power and then wait for at least five seconds after the POWER LED has turned off.