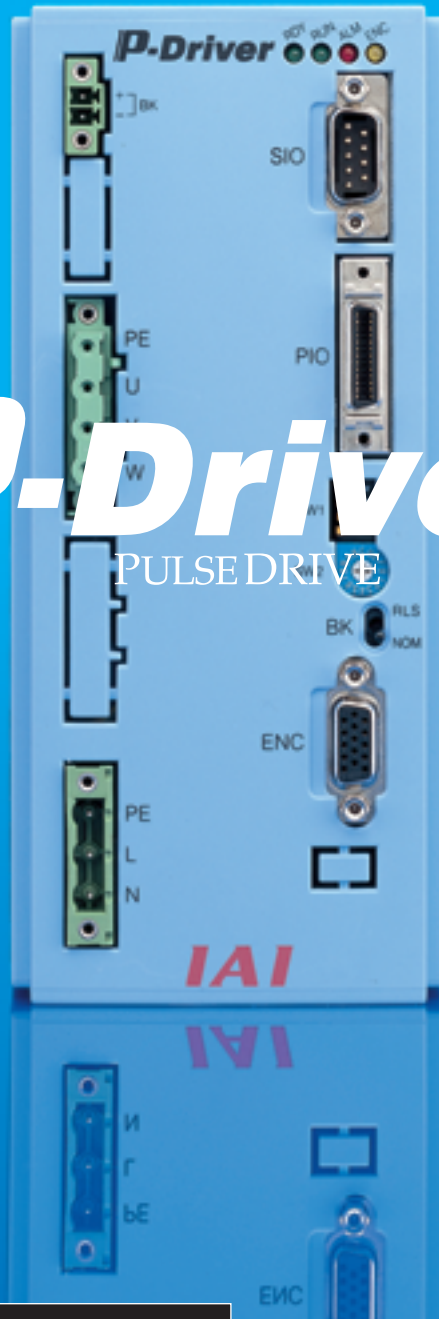# IAI
Quality and Innovation

SECOND EDITION

P-Driver
PULSE DRIVE

AGENT

IAI America, Inc.

Pulse-Train Input Driver for Positioning

P-Driver

P-Driver is a pulse-train input driver that enables flexible operation of IAI's ROBO CYLINDER and single-axis robots. (Note 1)

(Note 1) Certain types of ROBO CYLINDER cannot be operated by P-Driver. See the table below for the compatible actuator types.

Controller	*P-Driver*	*E-Con*	*RCS-C*		*RCP-C*
Positioning command	Pulse train (Sequence control)	PIO (Position number)			
Number of positioning points	No limitation	64 points	16 points		16 points
Input power supply	100VAC 200VAC	100VAC 200VAC	100VAC 200VAC	24VDC	24VDC
RCP					○
RCS-SA4/SA5/SA6				○	
RCS-RA35/RA45				○	
RCS-RB7525				○	
RCS-SS/SM	○	○	○		
RCS-SSR/SMR	○	○	○		
RCS-RA55/F55	○	○	○		
RCS-RB7530 RB7535	○		○		
DS (T1 specification)	○				
SS IS/ISP ISD ISD-CR ISPD-CR IF FS (All T1 specification)	○	○			
12RS (T1 type)	○				
RCS-R10I RCS-R20I RCS-R30I	○	○			
RCS-G20I	○	○			

Compatible actuators

01

Flexible Control of IAI's ROBO CYLINDER and Single-Axis Robots Using Pulse Train

- The P-Driver can control a wide range of ROBO CYLINDERS and single-axis robots in desired manners. (Motor wattage: 20W to 750W, Strokes: 50mm to 3,000mm)
- The P-Driver comes fully assembled and pre-formatted to the specific actuator ordered. Cost, assembly time and design time can be reduced as compared to integrating a system in-house by assembling the ballscrew, motor, linear guides and various other parts.
- Pulse-train control puts no limitation on the number of positioning points.

Pulse generator

Dedicated Homing Signal

The dedicated homing input enables automatic homing without programming a complex sequence.

Torque Limiting Function

Torque can be limited using external signal (via parameter setting). Signal is output when the specified toque is reached. Push operation and press-fitting become possible with the use of this function.

Brake Control Function

- The actuator's brake (optional) is controlled via a dedicated circuit inside the controller. There is no need to program a special sequence.
- With the use of a dedicated power supply (24 VDC), the brake can be forcibly released while the driver's main power is off.

Feedback Function

- Position detection data can be output in pulse trains (differential output). This enables reading of the current position in real time from the host controller.

Feed-Forward Control Function

- Response can be improved under certain conditions when the load inertia ratio is high. Increasing the parameter setting decreases the deviation, thus resulting in improved resonse. (Deviation is the difference between the position command and the position feedback.)

Position-Command Primary Filter Function

- Soft start and stop are possible even with command pulse inputs for which acceleration/deceleration is not specified.
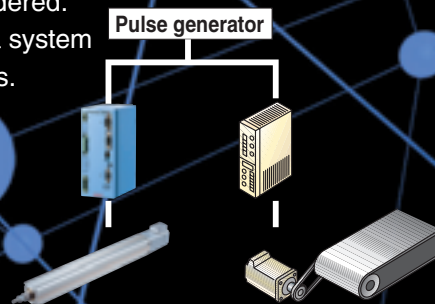
Model

PDR-I-100 B-1-P
   ①   ②   ③   ④   ⑤   ⑥

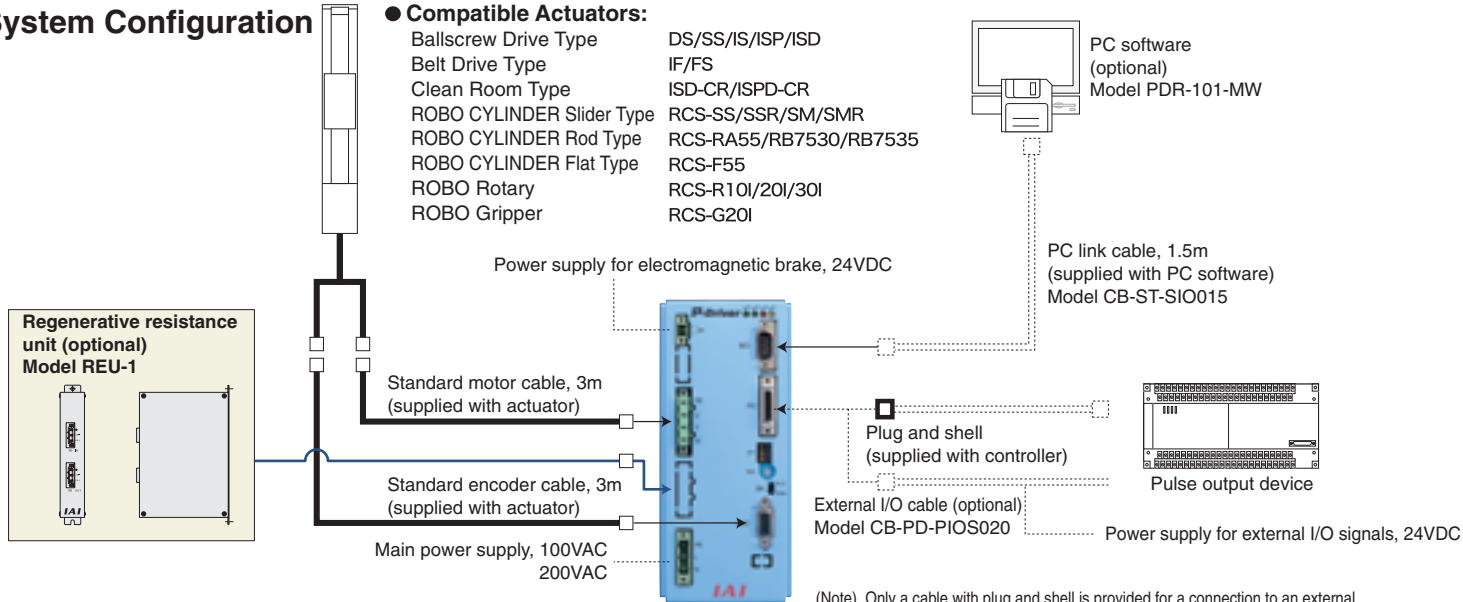|		
① Series	PDR: P-Driver	
② Encoder type	I: Incremental	
③ Motor capacity	20: 20W / 30: 30W / 60: 60W / 100: 100W / 150: 150W	
	200: 200W / 400: 400W / 600: 600W / 750: 750W	
④ Options	(Blank): None / B: Brake / C: Creep sensor / L: Limit switch	
⑤ Power-supply voltage	1: 100V / 2: 200V	
⑥ I/O method	(Blank): NPN specification / P: PNP specification	

System Configuration

● **Compatible Actuators:**

Ballscrew Drive Type	DS/SS/IS/ISP/ISD
Belt Drive Type	IF/FS
Clean Room Type	ISD-CR/ISPD-CR
ROBO CYLINDER Slider Type	RCS-SS/SSR/SM/SMR
ROBO CYLINDER Rod Type	RCS-RA55/RB7530/RB7535
ROBO CYLINDER Flat Type	RCS-F55
ROBO Rotary	RCS-R10I/20I/30I
ROBO Gripper	RCS-G20I

PC software
(optional)
Model PDR-101-MW

Power supply for electromagnetic brake, 24VDC

PC link cable, 1.5m
(supplied with PC software)
Model CB-ST-SIO015

Regenerative resistance unit (optional) Model REU-1

Standard motor cable, 3m
(supplied with actuator)

Plug and shell
(supplied with controller)

Standard encoder cable, 3m
(supplied with actuator)

External I/O cable (optional)
Model CB-PD-PIOS020

Pulse output device

Main power supply, 100VAC
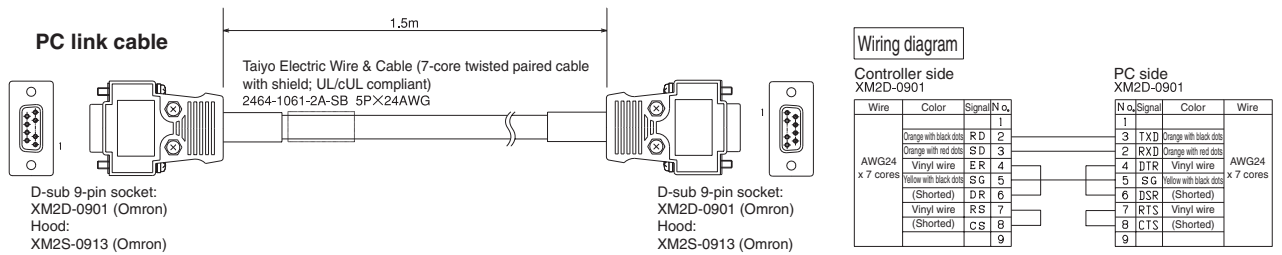200VAC

Power supply for external I/O signals, 24VDC

(Note) Only a cable with plug and shell is provided for a connection to an external device. Solder the cable or use an optional external I/O cable.
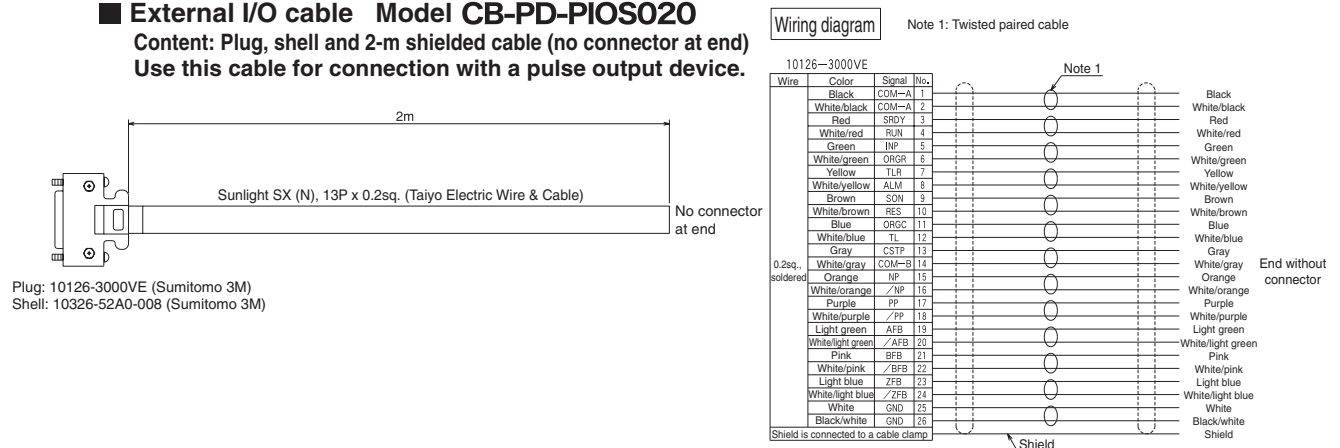
Options

■ PC software   Model PDR-101-MW

Content: Floppy disks, PC link cable 1.5m (Unit model CB-ST-SIO015)
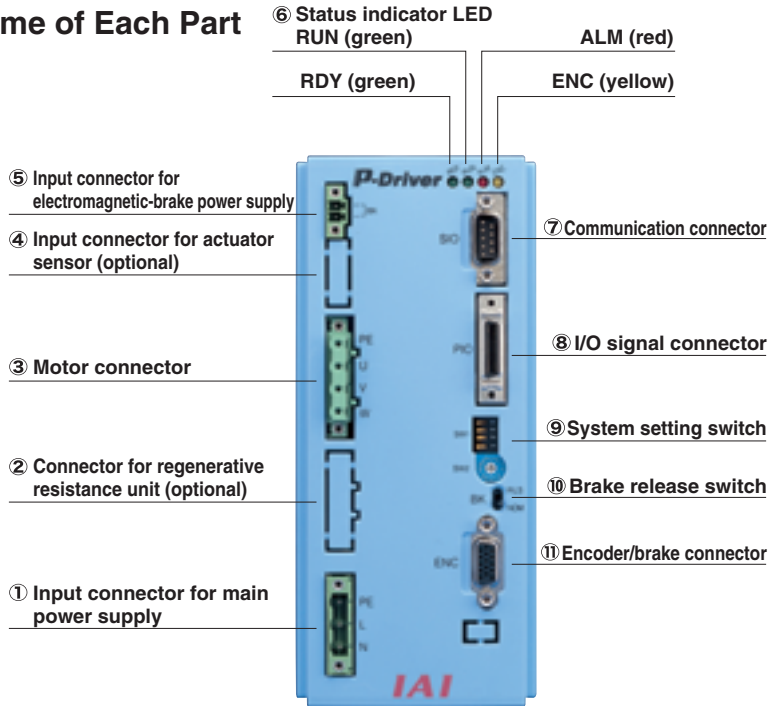**Used to set P-Driver parameters, monitor jogging operation during debugging, check various signals, and so on.**

PC link cable

1.5m

Taiyo Electric Wire & Cable (7-core twisted paired cable with shield; UL/cUL compliant)
2464-1061-2A-SB 5P✕24AWG

D-sub 9-pin socket:
XM2D-0901 (Omron)
Hood:
XM2S-0913 (Omron)

D-sub 9-pin socket:
XM2D-0901 (Omron)
Hood:
XM2S-0913 (Omron)

Wiring diagram

Controller side XM2D-0901

Wire	Color	Signal	No.
			1
	Orange with black dots	RD	2
	Orange with red dots	SD	3
AWG24 x 7 cores	Vinyl wire	ER	4
	Yellow with black dots	SG	5
	(Shorted)	DR	6
	Vinyl wire	RS	7
	(Shorted)	CS	8
			9

PC side XM2D-0901

No.	Signal	Color	Wire
1			
3	TXD	Orange with black dots	
2	RXD	Orange with red dots	
4	DTR	Vinyl wire	AWG24 x 7 cores
5	SG	Yellow with black dots	
6	DSR	(Shorted)	
7	RTS	Vinyl wire	
8	CTS	(Shorted)	
9			

■ External I/O cable   Model CB-PD-PIOS020

Content: Plug, shell and 2-m shielded cable (no connector at end)
Use this cable for connection with a pulse output device.

2m

Sunlight SX (N), 13P x 0.2sq. (Taiyo Electric Wire & Cable)

No connector at end

Plug: 10126-3000VE (Sumitomo 3M)
Shell: 10326-52A0-008 (Sumitomo 3M)

Wiring diagram   Note 1: Twisted paired cable

10126—3000VE

Wire	Color	Signal	No.		
	Black	COM—A	1		Black
	White/black	COM—A	2		White/black
	Red	SRDY	3		Red
	White/red	RUN	4		White/red
	Green	INP	5		Green
	White/green	ORGR	6		White/green
	Yellow	TLR	7		Yellow
	White/yellow	ALM	8		White/yellow
	Brown	SON	9		Brown
	White/brown	RES	10		White/brown
	Blue	ORGC	11		Blue
	White/blue	TL	12		White/blue
	Gray	CSTP	13		Gray
0.2sq., soldered	White/gray	COM—B	14		White/gray
	Orange	NP	15		Orange
	White/orange	／NP	16		White/orange
	Purple	PP	17		Purple
	White/purple	／PP	18		White/purple
	Light green	AFB	19		Light green
	White/light green	／AFB	20		White/light green
	Pink	BFB	21		Pink
	White/pink	／BFB	22		White/pink
	Light blue	ZFB	23		Light blue
	White/light blue	／ZFB	24		White/light blue
	White	GND	25		White
	Black/white	GND	26		Black/white
Shield is connected to a cable clamp					Shield

Note 1

End without connector

Shield

Name of Each Part

⑥ **Status indicator LED**
RUN (green)   ALM (red)

RDY (green)   ENC (yellow)

⑤ **Input connector for electromagnetic-brake power supply**

④ **Input connector for actuator sensor (optional)**

③ **Motor connector**

② **Connector for regenerative resistance unit (optional)**

① **Input connector for main power supply**

⑦ **Communication connector**

⑧ **I/O signal connector**

⑨ **System setting switch**

⑩ **Brake release switch**

⑪ **Encoder/brake connector**

① **Input connector for main power supply** ··· Connects the power supply.

② **Connector for regenerative resistance unit** ··· Connects a regenerative resistance unit (optional).

③ **Motor connector** ··· Connects the actuator's motor cable.

④ **Input connector for actuator sensor** ··· Connects cables from the actuator's sensors such as LS, CREEP and OT (optional).

⑤ **Input connector for electromagnetic-brake power supply** ··· Connects the power supply for electromagnetic brake.
(An electromagnetic brake requires an external power supply.)

⑥ **Status indicator (LED)** ··· Used to monitor the controller's operating condition.

⑦ **Communication connector** ··· Connects the PC software cable.

⑧ **I/O signal connector** ··· Connects the control I/O signals.

⑨ **System setting switch** ··· This switch is used to change the encoder voltage and for remote start operation. (The rotary switch is used for adjustment by the manufacturer.)

⑩ **Brake release switch** ··· This switch is used to forcibly release the brake.

⑪ **Encoder/brake connector** ··· Connects the actuator's encoder/brake cable.

Regenerative Resistance Unit

■ **Model** **REU-1**

■ **Features** ● This unit converts the regenerative current that generates when the motor decelerates into heat. A regenerative resistor is installed in the controller, but its capacity may not be sufficient if a large load is supported on a vertical axis. In this case, a separate regenerative resistance unit is required.
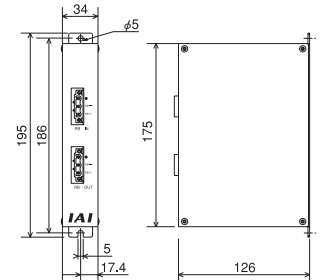
■ **Specifications**

Item	Specification
Unit dimensions	W34㎜×H195㎜×D126㎜
Unit weight	0.9㎏
Ratings of built-in regenerative resistance	220Ω 80W
Accessory	Controller link cable (Model CB-ST-REU010), 1m

■ **Installation Standards**

Motor wattage	Horizontal application	
20~150W	Not required.	
200~600W		
750W		

*The above table shows reference values when the driver is used in the rated conditions (load capacity, speed and acceleration).

■ **Dimensions**

Specification Table

Actuator motor capacity (W)		20	30	60	100	150	200	400	600	750
Power capacity	(W)	34	42	100	150	210	270	520	770	1000
	(VA)	57	70	160	240	350	450	870	1300	1600
Input power supply		100V specification: single-phase, 100 to 115VAC ±10%, 50/60Hz								
		200V specification: single-phase, 200 to 230VAC ±10%, 50/60Hz								
Control method		Sine wave PWM, vector current control								
Position detection method		Incremental encoder								
Braking method		Regenerative resistance								
Function/ performance	Control mode	Position control via pulse-train input								
	Maximum input pulse frequency	Max. 500kpps (differential) / Max. 200kpps (open-collector)								
	Command pulse magnification (electronic gear: A/B)	A, B = 1 to 4096 1/50 < A/B < 50/1 (parameter setting)								
	Positioning completion width	1 to 4096 pulses (parameter setting)								
Power supply for I/O signal I/F		24VDC ±20%, 0.8A (supplied externally)								
Power supply for electromagnetic brake		24VDC ±20%, 1A (peak value) (supplied externally)								
Communication function		RS232C (for dedicated PC software)								
Protection functions		Motor overvoltage, overcurrent, abnormal driver temperature, encoder error, motor overload, etc.								
Environmental conditions	Operating temperature/humidity	0 to 40°C, 85%RH or less (non-condensing)								
	Storage temperature	-20 to 70°C (non-condensing)								
	Operating ambience	Free from corrosive or flammable gases, oil mist or dust.								
	Durability/vibration	4.9m/s²								
Insulation resistance		1500VAC for 1 minute (1000VAC for 1 minute with actuator connected)								
Protection structure		Open, forced air cooling (IP20)								
Weight		1.2kg								

Interface Circuit

Sequence input part

Item	Description
Number of input signal points	5 points
Input voltage	24VDC ±20%
Input current	7mA/point
Operating voltage	ON voltage ··· Min. 16V (4.5mA)
	OFF voltage ··· Max. 6V (1.4mA)
Insulation method	Photo-coupler

NPN specification
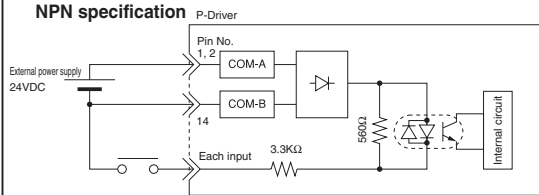
PNP specification
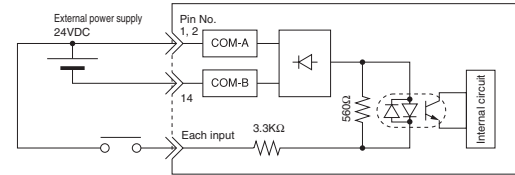
Sequence output part

| Item	Description
Number of output signal points	6 points
Rated load voltage	24/60VDC (peak; without flywheel diode)
Maximum load current	100mA/point
Residual voltage	1.8V/100mA
Insulation method	Photo-coupler
Overcurrent protection	Fuse resistance: 10Ω, 0.1W

NPN specification
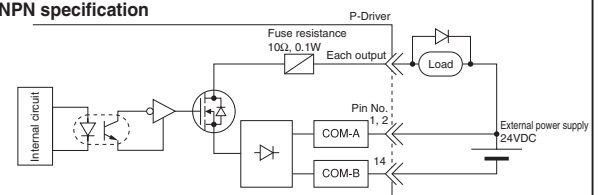
PNP specification
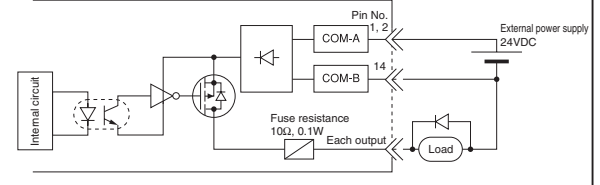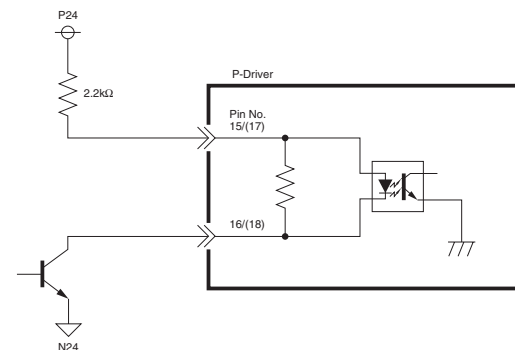
Command Pulse-Train Input Part

Differential line-driver input
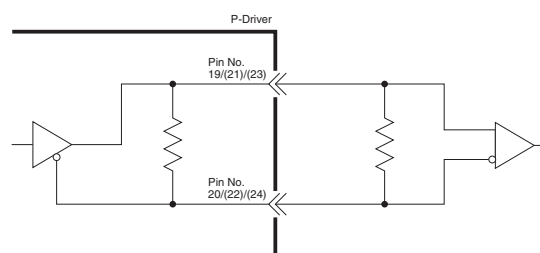**Applicable line driver: 26C31 or equivalent**
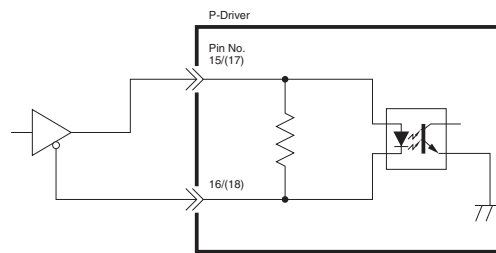
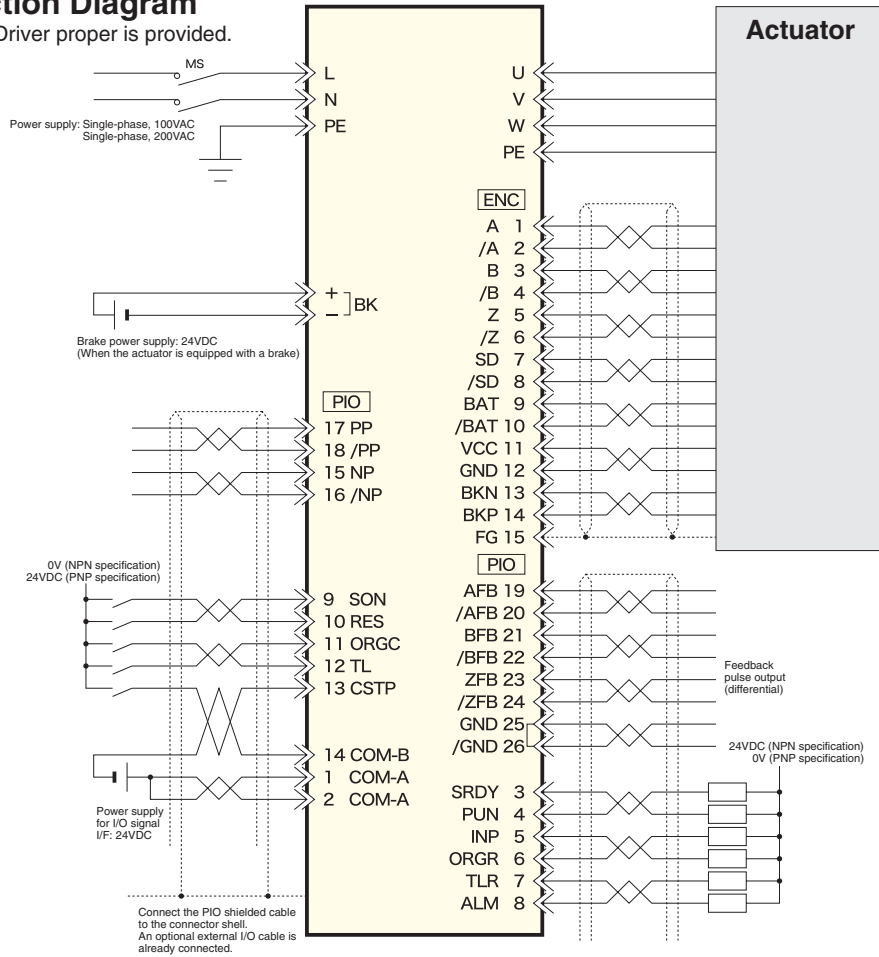### Open-collector input
Pull-up resistance: 2.2kΩ

Feedback pulse output
Applicable line receiver: 26C32 or equivalent

Standard Connection Diagram

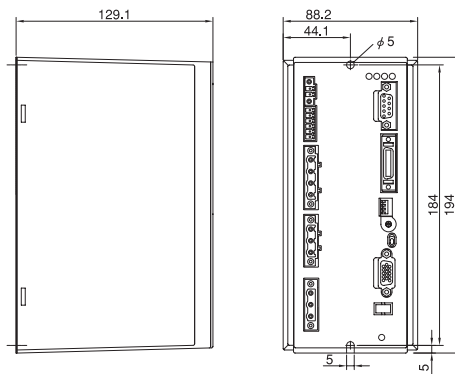A connection diagram of P-Driver proper is provided.

MS

L
N
PE

Power supply: Single-phase, 100VAC
Single-phase, 200VAC

+ − BK

Brake power supply: 24VDC
(When the actuator is equipped with a brake)

PIO
17 PP
18 /PP
15 NP
16 /NP

0V (NPN specification)
24VDC (PNP specification)

9   SON
10 RES
11 ORGC
12 TL
13 CSTP

14 COM-B
1   COM-A
2   COM-A

Power supply
for I/O signal
I/F: 24VDC

Connect the PIO shielded cable
to the connector shell.
An optional external I/O cable is
already connected.

Actuator

U
V
W
PE

ENC
A   1
/A   2
B   3
/B   4
Z   5
/Z   6
SD   7
/SD 8
BAT 9
/BAT 10
VCC 11
GND 12
BKN 13
BKP 14
FG 15

PIO
AFB 19
/AFB 20
BFB 21
/BFB 22
ZFB 23
/ZFB 24
GND 25
/GND 26

Feedback
pulse output
(differential)

24VDC (NPN specification)
0V (PNP specification)

SRDY 3
PUN   4
INP   5
ORGR 6
TLR   7
ALM   8

External I/O Signals

Pin No.	I/O category	Code	Signal name	Function
1	Power supply for I/O	COM-A	Power-supply common (+)	Power-supply common for external I/O signals, 24VDC, connected to the + side
2		COM-A		(Pins 1 and 2 are connected internally.)
3	Sequence signal output	SRDY	System ready	Turns ON when control is enabled following a power input. Synchronized with ON/OFF of the corresponding LED located on the front side of the enclosure.
4		RUN	Operation ready	Turns ON when the servo is turned ON (operation is enabled). Synchronized with ON/OFF of the corresponding LED located on the front side of the enclosure.
5		INP	Positioning completion	Turns ON when the robot enters the in-position range set by parameter.
6		ORGR	Homing completion	Turns ON when homing is complete.
7		TLR	Torque limiting	Turns ON when the actuator output reaches the parameter-set torque limit while TL is ON.
8		ALM	Alarm	Turns OFF when a protection circuit (function) is actuated and the base current is interrupted (this signal is normally ON).
9	Sequence signal input	SON	Servo ON	Motor is turned on when input is on. Required for movement.
10		RES	Alarm reset	Alarm is reset when this signal turns ON.
11		ORGC	Homing command	Homing starts when this signal turns ON.
12		TL	Torque limit selection	Limiting of actuator torque starts when this signal turns ON. (Torque limiting is cancelled when the signal turns OFF.)
13		CSTP	Forced stop	When this signal turns ON, the robot decelerates to a stop at the forced stopping toque and the servo is turned OFF.
14	Power supply for I/O	COM-B	Power-supply common (-)	Power-supply common for external I/O signals, 24VDC, connected to the - side
15	Command pulse input	NP	Pulse-train input	Command pulse-train input: Open-collector method (Max. 200kpps) Differential receiver method (Max. 500kpps) Command pulse mode is specified (from 6 modes) using parameter.
16		/NP		
17		PP		
18		/PP		
19	Feedback pulse differential output	AFB	+A	Position detection data is converted to pulses and output (phases A, B and Z). Pulse output mode is specified (from 6 modes) using parameter.
20		/AFB	−A	
21		BFB	+B	
22		/BFB	−B	
23		ZFB	+Z	
24		/ZFB	−Z	
25	Reference potential	GND	Reference potential	For feedback pulse output
26		GND		Line driver ground line (Pins 25 and 26 are connected internally.)

■ Command Pulse Input Modes

Command pulse-train mode		Input terminal	Forward	Reverse
Negative logic	Forward pulse train	PP・/PP		
	Reverse pulse train	NP・/NP		
	A forward pulse train indicates motor revolutions in the forward direction, while a reverse pulse train indicates motor revolutions in the reverse direction.			
	Pulse train	PP・/PP		
	Sign	NP・/NP	Low	High
	A command pulse indicates motor revolutions and its sign indicates the rotating direction of the motor.			
	Phase A/B pulse train	PP・/PP		
		NP・/NP		
	Motor revolutions and rotating direction are specified by phases A/B (4 multiplications) with a 90-degree phase difference.			
Positive logic	Forward pulse train	PP・/PP		
	Reverse pulse train	NP・/NP		
	Pulse train	PP・/PP		
	Sign	NP・/NP	High	Low
	Phase A/B pulse train	PP・/PP		
		NP・/NP		

* Output modes of feedback pulse follow the same classification.

■ External Dimensions

129.1
88.2
44.1
φ5
184
194
5
5

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