

Plug-in Signal Conditioners M-UNIT

ENCODER SPEED TRANSMITTER
(field-programmable; built-in excitation)

MODEL **JRP2**

MODEL & SUFFIX CODE SELECTION

JRP2-□□-□

MODEL _____

INPUT SELECTION

- Open collector
- Voltage pulse
- RS-422 line driver

Two inputs (phase A and B) are required for adequate operation of the JRP2.

EXCITATION _____

- 1 : 5V DC @120mA
- 4 : 12V DC @60mA
- 7 : 24V DC @25mA

OUTPUT _____

Current

- A : 4 – 20mA DC
- B : 2 – 10mA DC
- C : 1 – 5mA DC
- D : 0 – 20mA DC
- E : 0 – 16mA DC
- F : 0 – 10mA DC
- G : 0 – 1mA DC
- Z : Specify current

Voltage

- 1 : 0 – 10mV DC
- 2 : 0 – 100mV DC
- 3 : 0 – 1V DC
- 4 : 0 – 10V DC
- 5 : 0 – 5V DC
- 6 : 1 – 5V DC
- 4W : -10 – +10V DC
- 5W : -5 – +5V DC
- 0 : Specify voltage

POWER INPUT _____

AC Power

- K : 85 – 132V AC

DC Power

- S : 12V DC
- R : 24V DC
- V : 48V DC
- P : 110V DC

ORDERING INFORMATION

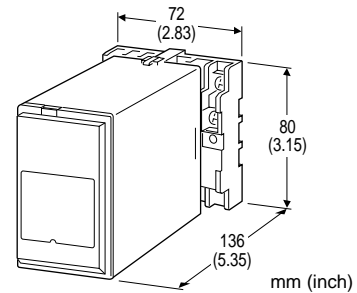
Specify code number and variables. Use Ordering Information Sheet (No. ESU-1577). Factory setting (table below) will be used if not otherwise specified.

- **Code number** (e.g. JRP2-76-K)
- **Special output range** (For codes Z & 0)

Factory Setting

Input type	Open collector
Pulse amplitude	----
Pulse sensing	DC coupled
Noise filter	Low
Detecting level	1V *1 (5V excitation) 2V *1 (12/24V excitation)
Frequency range	0 – 1 kHz
Input zero frequency	0 Hz
Input span frequency	1 kHz
Low-end cutout	0 Hz
Alarm setpoint	100%
Alarm deadband	1.00%
Alarm mode	High alarm
Linearization	Without

*1. Detecting voltage in the internal circuit



Functions & Features

- Converts a two-phase forward and reverse rotation pulse signal with 90 degree phase difference into a forward and reverse speed signal
 - Built-in excitation
 - Field-selectable input type and range
 - Isolation up to 2000V AC
 - High-density mounting
- Typical Applications**
- Measuring moving speed of a machine with a rotary encoder

RELATED PRODUCTS

- **Programming unit** (model: PU-2x)

GENERAL SPECIFICATIONS

Construction: Plug-in

Connection: M3.5 screw terminals

Housing material: Flame-resistant resin (black)

Isolation: Input to output to power

Pulse sensing: DC coupled or capacitor coupled selectable with DIP SW

Overrange output: Approx. -15 – +115% at 1 – 5V

Low-end cutout: Specify frequency; deadband fixed to 1% (factory setting: 0 Hz) *

Alarm mode: High or Low

Alarm setpoint: -15 – +115%

Alarm deadband: 0 – 20%

Input monitor LED (PL1): Red LED flashes according to the input phase A.

Input monitor LED (PL2): Red LED flashes according to the input phase B.

Excitation adjustment: 5 – 24V DC

DIP/rotary switches: For selecting input specifications

Detecting level adjustments: Used to adjust the threshold to determine the pulse state.

Zero and span adjustments: ±5% (front)

Linearization: Max. 16 points

Modular jack: Connecting the PU-2x

Software programming: Programming unit (model: PU-2x) used to set the input frequency range, zero and span, low-end cutout, alarm, fine output adj., linearization, etc.

*When the low-end cutout is set to 0 Hz, the deadband is not valid.

INPUT & OUTPUT**INPUT****Maximum frequency:** 200 kHz****Frequency ranges:** 0 – 0.01 Hz through 100 kHz**

**Choose 100 kHz range to set the zero/span frequencies greater than 100 kHz.

Excitation: Shortcircuit protection; 440mA max. at shortcircuit**Minimum pulse width time requirement:** 2.5 μ sec. for both ON and OFF**Minimum span:** 10% of the selected frequency range**•Open Collector****Input requirements**

EXCITATION	SENSING	OFF	ON
5V	Approx. 4V / 1.5mA	$\geq 200k\Omega$	$\leq 200\Omega$
12V	Approx. 9V / 2.3mA	$\geq 200k\Omega$	$\leq 200\Omega$
24V	Approx. 16V / 4.7mA	$\geq 200k\Omega$	$\leq 200\Omega$

Detecting level: 1V (5V excitation) ***
2V (12/24V excitation) *****Detecting pulse edge:** OFF to ON**•Voltage Pulse****Waveform:** Square or sine**Input impedance:** 10k Ω minimum**Pulse amplitude:** 0.1 – 100V p-p**Max. voltage between input terminals:** 50V**Detecting level:** 0 – 5V*** (factory setting: 2V)**Detecting pulse state:** A pulse rise detected when the input voltage goes above the detecting level; a pulse sink detected when it goes below the level.

***Detecting voltage in the internal circuit.

For open collector input, be sure to re-adjust the voltage back to 1V (5V excitation) or 2V (12/24V excitation) if it has been changed for other input types.

•RS-422 Line Driver**Receiver:** Conforms to RS-422**OUTPUT****•DC Current:** 0 – 20mA DC**Minimum span:** 1mA**Zero suppression/elevation:** Max. 1.5 times span**Load resistance:** Output drive 15V maximum

Output	Load Resistance
4 – 20mA	: 750 (Ω maximum)
2 – 10mA	: 1500
1 – 5mA	: 3000
0 – 20mA	: 750
0 – 16mA	: 900
0 – 10mA	: 1500
0 – 1mA	: 15k

•DC Voltage: -10 – +12V DC**Minimum span:** 5mV**Zero suppression/elevation:** Max. 1.5 times span**Load resistance:** Output drive 10mA maximum; 5mA for negative voltage output; at $\geq 0.5V$

Output	Load Resistance
0 – 10mV	: 10k (Ω minimum)
0 – 100mV	: 100k
0 – 1V	: 100
0 – 10V	: 1000
0 – 5V	: 500
1 – 5V	: 500
-10 – +10V	: 2000
-5 – +5V	: 1000

■ALARM OUTPUT: Relay contact**Rated load:** 125V AC @0.5A ($\cos\phi=1$)

30V DC @0.5A (resistive load)

Electrical life 10^5 cycles (resistive load)**Maximum switching voltage:** 250V AC or 125V DC**Maximum switching power:** 62.5VA or 60W**Minimum load:** 10mV DC @1mA**Mechanical life:** 5×10^7 cycles (300 cycles/minute)

For maximum relay life with inductive loads, external protection is recommended.

INSTALLATION**Power input****AC:** Operational voltage range 85 – 132V, 47 – 66 Hz, approx. 7VA**DC:** Operational voltage range: Rating $\pm 10\%$, or 85 – 150V for 110V rating; ripple 10% p-p max.; Approx. 4W (140mA at 24V)**Operating temperature:** -5 to +60°C (23 to 140°F)**Operating humidity:** 30 to 90% RH (non-condensing)**Mounting:** Surface or DIN rail**Dimensions:** W72xH80xD136 mm (2.83"x3.15"x5.35")**Weight:** 350 g (0.77 lbs)**PERFORMANCE in percentage of span****Accuracy:** Input accuracy + output accuracy**Input accuracy:** $\pm 0.05\%$ of the selected freq. range***1***Output accuracy:** $\pm 0.05\%$ of the output range***Inversely proportional to the input span, except fixed to $\pm 0.05\%$ with [Freq. Range / Span] ≤ 1 .

[Example] Open collector input, 0 – 50 kHz

$$\frac{\text{Selected Freq. Range } 100 \text{ kHz}}{\text{Input Span } 50 \text{ kHz}} \times \text{Accuracy } 0.05\%$$

$$+ \text{Output Accuracy } 0.05\% = \pm 0.15\%$$

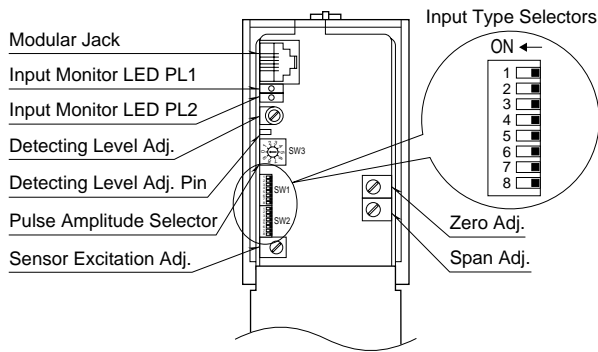
Alarm setpoint accuracy: $\pm 0.1\%$ **Temp. coefficient:** $\pm 0.015\%/^{\circ}\text{C}$ ($\pm 0.008\%/^{\circ}\text{F}$)**Response time (0 – 90%)** **≤ 1 Hz range:** two pulse cycles **≥ 10 Hz range:** 0.5 seconds + one pulse cycle**Line voltage effect:** $\pm 0.1\%$ over voltage range**Insulation resistance:** $\geq 100M\Omega$ with 500V DC**Dielectric strength:** 2000V AC @1 minute

(input to output to power)

1500V AC @1 minute (input or output or power to alarm output)

2000V AC @1 minute (circuit to ground)

FRONT PANEL CONFIGURATION & SWITCH SETTING



■ PULSE AMPLITUDE (rotary switch) (*) Factory setting

This setting is invalid for RS-422 line driver input.

For voltage pulse input, select the pulse amplitude (V p-p) among the switch positions 0 through 6. For open collector, set the switch to 7. DO NOT SET to 8 or 9. The power supply to the unit must be turned off when changing the setting.

SW	PULSE AMPLITUDE	MAX. INPUT VOLTAGE
0	50 – 100V p-p	50V
1	25 – 50V p-p	50V
2	10 – 25V p-p	25V
3	5 – 10V p-p	10V
4*1	1 – 5V p-p	5V
5	0.5 – 1V p-p	1V
6*2	0.1 – 0.5V p-p	0.5V
7(*)	Open collector	

*1. With a sinusoidal waveform input with the capacitor coupling, the JRP2 is not able to detect 150 kHz or higher, -150 kHz or lower frequencies if the pulse amplitude is used within 1 – 1.5 Vp-p.

*2. Maximum frequency limited to ± 50 kHz.

■ DETECTING LEVEL

A specific sensitivity scale is applied according to the pulse amplitude setting. The scaled input voltage is then compared to the preset detecting level.

With DC coupling, the scaled H level voltage must be higher than the detecting level so that the pulse state is accurately detected. (Refer to the instruction manual for detailed information about adjusting the detecting level.)

SW	PULSE AMPLITUDE	SENSITIVITY SCALE
0	50 – 100V p-p	1/20
1	25 – 50V p-p	1/10
2	10 – 25V p-p	1/5
3	5 – 10V p-p	1/2
4	1 – 5V p-p	1
5	0.5 – 1V p-p	5
6	0.1 – 0.5V p-p	10
7	Open collector	1

■ DIP SWITCH SETTING (*) Factory setting

Pulse sensing, noise filter and frequency range setting are invalid for RS-422 line driver input. The power supply to the unit must be turned off when changing the setting.

•Input Type

INPUT TYPE	SW1 & SW2				
	1	2	3	4	5
Open collector (*)	ON	OFF	ON	OFF	OFF
Voltage pulse	OFF	OFF	ON	OFF	OFF
RS-422 line driver*3	OFF	OFF	OFF	ON	ON

*3. Pulse amplitude, detecting level and noise filter settings are invalid, however, in order to prevent wrong setting, we recommend to set the amplitude to 50 – 100V p-p (SW = 0), the detecting level to 0V, and no noise filter.

•Pulse Sensing

PULSE SENSING	SW1-6 & SW2-6
Capacitor coupled *4	OFF
DC coupled (*) *5	ON

*4. Frequency range must be 0 – 100 Hz or higher. 0 – 1 kHz or higher for sinusoidal waveform input. Frequencies lower than ± 10 Hz may be out of accuracy conformance.

*5. For sinusoidal waveform input with the pulse amplitude smaller than 2V p-p, the frequency range must be 0 – 1 kHz or higher.

•Noise Filter

NOISE FILTER	SW1-7 & SW2-7	SW1-8 & SW2-8
High	ON	OFF
Low (*)	OFF	ON
None	OFF	OFF

Be sure to apply the noise filter appropriate for the selected frequency range as shown in the table below. The accuracy may not be assured if no filter is applied.

FREQUENCY RANGE	NOISE FILTER TYPE
0 – 10 mHz	High
0 – 100 mHz	High
0 – 1 Hz	High
0 – 10 Hz	Low
0 – 100 Hz	Low
0 – 1 kHz	Low
0 – 10 kHz	None
0 – 100 kHz	None

RANGE CONFIGURATION

■ **EXAMPLE 1: VOLTAGE PULSE with Amplitude 5V p-p, DC Offset 2.5V, Frequency Range 0 – 1 kHz**

- Input type: Voltage
- Frequency range selected: 0 – 1 kHz
(Select the frequency range and set 0% and 100% range values with the Programming Unit.)
- Input amplitude: 1 – 5V p-p
- Pulse sensing: DC coupled
(Choose Capacitor coupling if necessary.)
- Detecting level: 2.5V (Set to the offset value after it is scaled by the sensitivity scale.)
- Noise filter: Low

The rotary switch and DIP switch are configured as shown to the right.



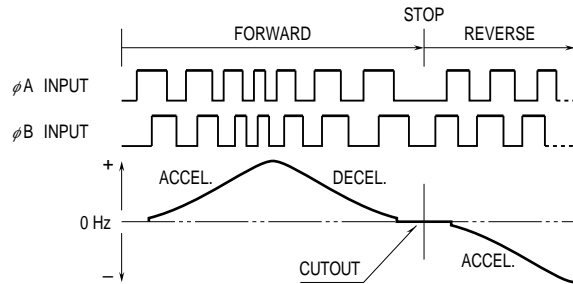
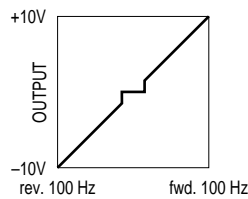
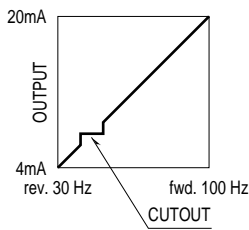
■ **EXAMPLE 2: VOLTAGE PULSE with Amplitude 35V p-p, DC Offset 16V, Frequency Range 10 – 50 kHz**

- Input type: Voltage
- Frequency range selected: 0 – 100 kHz
(Select the frequency range and set 0% and 100% range values with the Programming Unit.)
- Input amplitude: 25 – 50V p-p
- Pulse sensing: Capacitor coupled
(Choose DC coupling if necessary.)
- Detecting level: Turn the adjustment fully counterclockwise.
(Set to 0V)
- Noise filter: None

The rotary switch and DIP switch are configured as shown to the right.



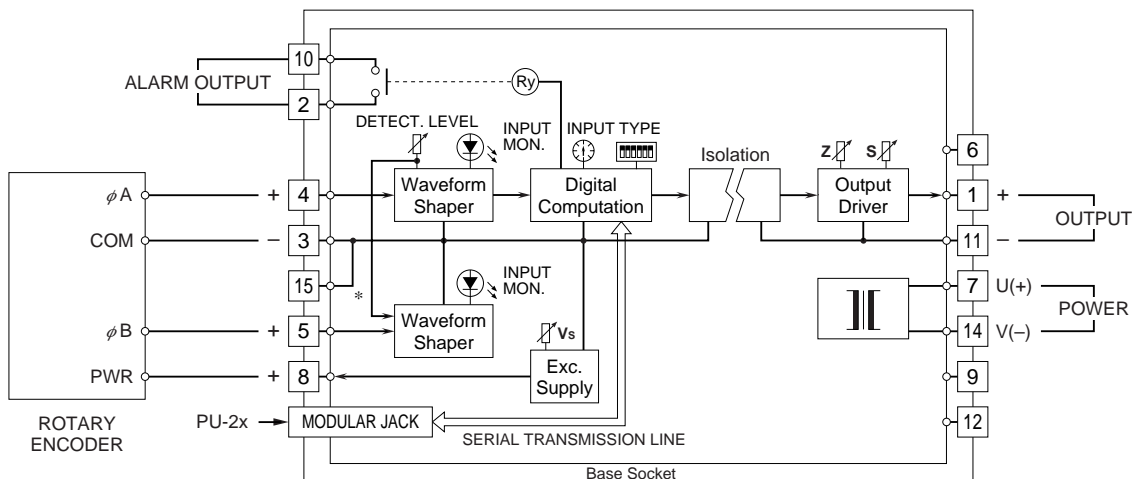
OPERATIONS



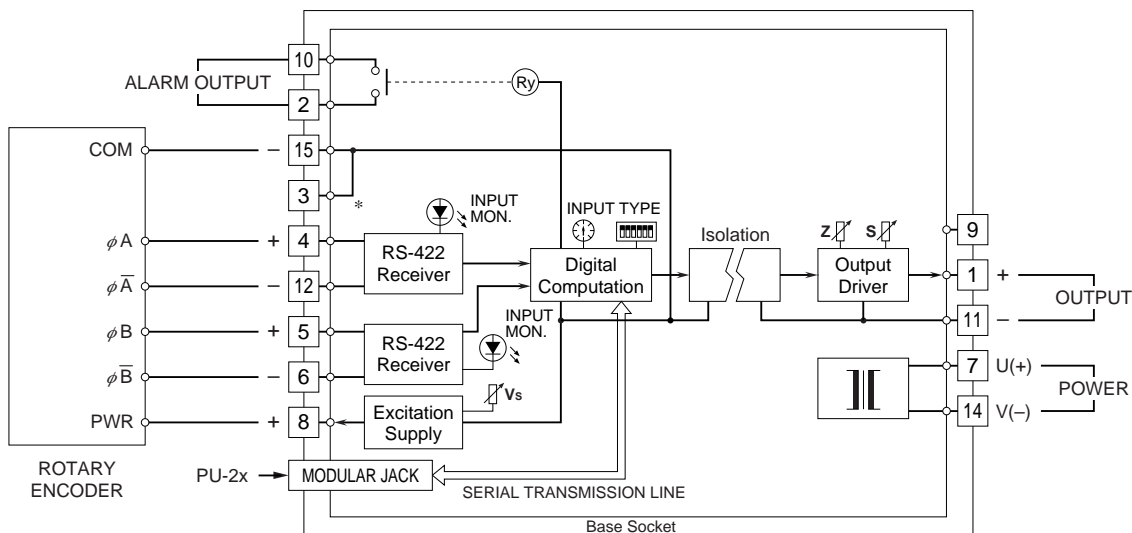
Forward Rotation: Phase A leads the Phase B by 90 degrees.
Reverse Rotation: Phase A lags behind Phase B by 90 degrees.

SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

■ OPEN COLLECTOR or VOLTAGE PULSE INPUT

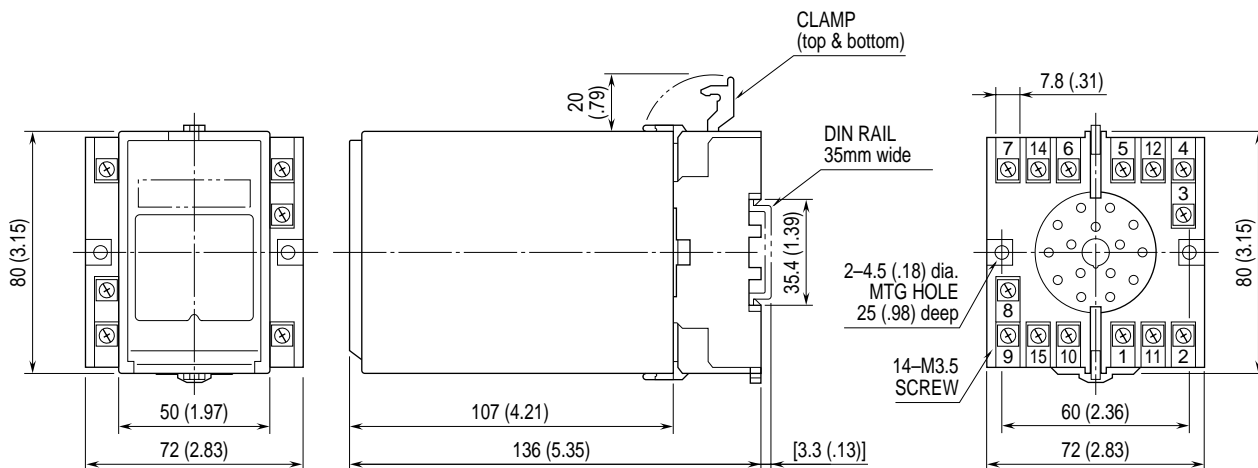


■ RS-422 LINE DRIVER INPUT



*Terminals 3 and 15 are internally connected.
The rotary encoder's COM terminal can be connected to either one.

EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENT mm (inch)



•When mounting, no extra space is needed between units.