

## Plug-in Signal Conditioners M-UNIT

### FREQUENCY SCALER

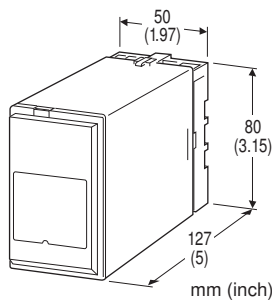
(field-programmable; built-in excitation)

#### Functions & Features

- Scales input frequency
- Various outputs (open collector, voltage pulse, Noncontact AC/DC switch, RS-422 line driver)
- Built-in excitation
- Scaling factor is user-programmable by simply setting input and output frequencies via handheld programmer PU-2x
- Isolation up to 2000 V AC

#### Typical Applications

- Scaling frequency signals from a rotary encoder



## MODEL: JFR2-[1][2][3]-[4][5]

### ORDERING INFORMATION

- Code number: JFR2-[1][2][3]-[4][5]
  - Specify a code from below for each of [1] through [5].  
(e.g. JFR2-4P1-K/Q)
  - Use Ordering Information Sheet (No. ESU-1581). Default setting (table below) will be used if not otherwise specified.
  - Specify the specification for option code /Q  
(e.g. /C01/S01)
- Factory default setting

PARAMETER	DEFAULT
Input	Open collector
Input pulse amplitude	---
Noise filter	Low
Detecting level *1	1V (5V excitation) 2V (12V/24V excitation)
Input span frequency	1000 Hz
Output span frequency	20 Hz (output code R) 1000 Hz (all other codes)
Low-end cutout	3 Hz
Non-uniform wave averaging	1 (No averaging)
One-shot pulse width	400 μsec. (20ms for output signal R)
One-shot pulse logic	H, OFF

\*1. Internal voltage

### INPUT - Field-selectable

- Open collector
- Mechanical contact
- Voltage pulse
- Two-wire current pulse
- RS-422 line driver pulse

### [1] EXCITATION

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

### [2] OUTPUT

- A: Open collector (max. 10 kHz)
- M: 5V pulse (max. 10 kHz)
- N: 12 V pulse (max. 10 kHz)
- P: 24 V pulse (max. 10 kHz)
- J: RS-422 line driver pulse (max. 10 kHz)
- R: Noncontact AC/DC switch (max. 20 Hz)
- ( ) = Max. frequency

### [3] OUTPUT PULSE WIDTH

- 1: No conversion to one-shot
- 3: One-shot output (std. pulse width 400 μsec. (20 msec. for output signal R))  
(Specify when optional pulse width is required.)

### [4] POWER INPUT

- AC Power**
- K: 85 - 132 V AC
- DC Power**
- S: 12 V DC
- R: 24 V DC
- V: 48 V DC
- P: 110 V DC

### [5] OPTIONS

- blank: none
- /Q: With options (specify the specification)

### SPECIFICATIONS OF OPTION: Q (multiple selections)

#### COATING (For the detail, refer to M-System's web site.)

- /C01: Silicone coating
- /C02: Polyurethane coating
- /C03: Rubber coating

#### TERMINAL SCREW MATERIAL

- /S01: Stainless steel

## RELATED PRODUCTS

- Programming Unit (model: PU-2x)
- PC configurator software (model: JXCON)

Downloadable at M-System's web site.

A dedicated cable is required to connect the module to the PC. Please refer to the internet software download site or the users manual for the PC configurator for applicable cable types.

## GENERAL SPECIFICATIONS

**Construction:** Plug-in

**Connection:** M3.5 screw terminals

**Screw terminal:** Chromated steel (standard) or stainless steel

**Housing material:** Flame-resistant resin (black)

**Isolation:** Input or sensor exc. to output to power

**Input monitor LED:** Red LED blinks according to the input.

**Excitation adjustment:** 5 - 24 V DC

**Software programming:** Programming Unit (model: PU-2x); (Refer to the users manual of JXCON for the adjustments configurable with JXCON)

- Input range frequency
- Output range frequency
- Input span frequency
- Output span frequency
- Low-end cutout
- Non-uniform wave averaging
- Others

**Adjustments:** With DIP and Rotary switches.

- Pulse amplitude
- Input type
- Noise filter

(Refer to the instruction manual for details)

**Input pulse sensing:** DC coupled

**Averaging non-uniform input waveforms:** Input pulses are divided and then multiplied so that the output pulses are averaged.

**Low-end cutout:** No pulse output for certain low level of input frequency; 0.3 - 100 % adjustable; deadband 1 %

## INPUT SPECIFICATIONS

**Excitation:** Shortcircuit protection; approx. 440 mA (max.) at shortcircuit

**Minimum pulse width time requirement:** 5  $\mu$ sec.; 50 msec. for mechanical contact (for both ON and OFF)

**Minimum frequency span requirement:** 20 % of the selected input frequency range

### ■ Open Collector & Mechanical Contact

**Input requirements** (Excitation: Sensing)

5 V: Approx. 4 V / 1.0 mA

12 V: Approx. 9 V / 2.3 mA

24 V: Approx. 16 V / 4.7 mA

**Resistance at ON :**  $\leq 200 \Omega$

**Resistance at OFF :**  $\geq 200 \text{ k}\Omega$

**Detecting level:** 1 V with 5 V excitation

2 V with 12 V/24 V excitation.

(Detecting voltage in the internal circuit)

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

**Detecting pulse edge:** OFF (input monitor LED ON) to ON (input monitor LED OFF)

### ■ Voltage Pulse

**Waveform:** Square or sine

**Input impedance:**  $\geq 10 \text{ k}\Omega$

**Pulse amplitude:** 0.1 - 100 Vp-p (square)

1 - 100 Vp-p (sine or similar)

**Max. voltage between input terminals:** 50 V

**Detecting level:** 0 - 5 V (Detecting voltage in the internal circuit.)

**Detecting pulse state:** A pulse rise detected when the input voltage goes above the detecting level (input monitor LED ON); a pulse sink detected when it goes below the level (input monitor LED OFF).

### ■ Two-wire Current Pulse

**Input resistance:** Receiving resistor 100  $\Omega$

**Input range:** 0 - 25 mA

**Minimum pulse amplitude:** 10 mA

**Detecting level:** 0 - 5 V

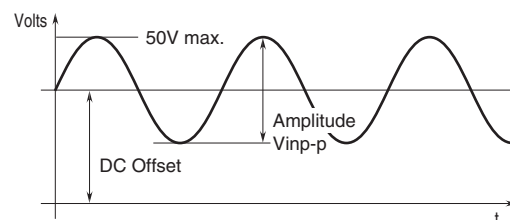
(Detecting voltage in the internal circuit.)

**Detecting pulse state:** The input resistor (100  $\Omega$ ) converts the current signal (0 - 25 mA) into 0 - 2.5 V. A pulse rise detected when the voltage goes above the detecting level (input monitor LED ON); a pulse sink detected when it goes below the level (input monitor LED OFF).

### ■ RS-422 Line Driver Pulse

**Receiver:** Conforms to RS-422

### ■ Voltage pulse waveform



## OUTPUT SPECIFICATIONS

**Output frequency:** Input frequency × scaling factor (scaling factor = output span frequency / input span frequency)

**Minimum frequency span requirement:** 20 % of the selected output frequency range

■ **Open Collector:** 50 V DC @ 50 mA (resistive load)

**Saturation voltage:** 0.6 V DC

**Maximum frequency:** 10kHz

■ **Voltage Pulse**

**H level:** Rating (5, 12 or 24 V) ±10 %

**L level:** ≤ 0.5 V

**Load resistance:** ≥ 1 kΩ (5V), ≥ 2.4 kΩ (12 V), ≥ 4.8 kΩ (24 V)

**Maximum frequency:** 10 kHz

■ **Noncontact AC/DC Switch:** 120 V AC or 120 V DC @200 mA (resistive load)

**ON resistance:** 3 Ω

**Maximum frequency:** 20 Hz

**Rise time:** 5 msec.

**Sink time:** 3 msec.

■ **RS-422 Line Driver Pulse**

**Transmitter:** Conforms to RS-422

**Maximum frequency:** 10 kHz

**Insulation resistance:** ≥ 100 MΩ with 500 V DC

**Dielectric strength:** 2000 V AC @ 1 minute (input or sensor excitation to output to power to ground)

### ■ INPUT FREQUENCY RANGE

INPUT FREQUENCY RANGE	INPUT SPAN FREQUENCY
100 kHz	20 – 100 kHz
10 kHz	2 – 19.999 kHz
1 kHz	0.2 – 1.9999 kHz
100 Hz	20 – 199.99 Hz
10 Hz	2 – 19.999 Hz (2 – 10 Hz for Mechanical Contact)
1 Hz	0.2 – 1.9999 Hz
100 mHz	20 – 199.99 mHz
10 mHz	2 – 19.999 mHz

### ■ OUTPUT FREQUENCY RANGE

OUTPUT FREQUENCY RANGE	OUTPUT SPAN FREQUENCY
10 kHz	2 – 10 kHz
1 kHz	0.2 – 1.9999 kHz
100 Hz	20 – 199.99 Hz
10 Hz	2 – 19.999 Hz
1 Hz	0.2 – 1.9999 Hz
100 mHz	20 – 199.99 mHz
10 mHz	2 – 19.999 mHz
1 mHz	0.2 – 1.9999 mHz

## OUTPUT PULSE WIDTH

• **No conversion to one-shot:** Duty ratio approx. 50 % (Fixed duty ratio even when the output frequency changes.)

• **One-shot Output:** Preset pulse width ±20 %

**Optional pulse width:** 30 μsec. – 300 msec.

## INSTALLATION

**Power input**

• **AC:** Operational voltage range 85 – 132 V, 47 – 66 Hz, approx. 6 VA

• **DC:** Operational voltage range: Rating ±10 %, or 85 – 150 V for 110 V rating; ripple 10 %p-p max.; Approx. 3.3 W (140 mA at 24 V)

**Operating temperature:** -5 to +60°C (23 to 140°F)

**Operating humidity:** 30 to 90 %RH (non-condensing)

**Mounting:** Surface or DIN rail

**Weight:** 400 g (0.88 lb)

## PERFORMANCE in percentage of span

**Accuracy**

**Output 10 kHz range:** ±0.2 %

**Output ≤ 1 kHz range:** ±0.1 %

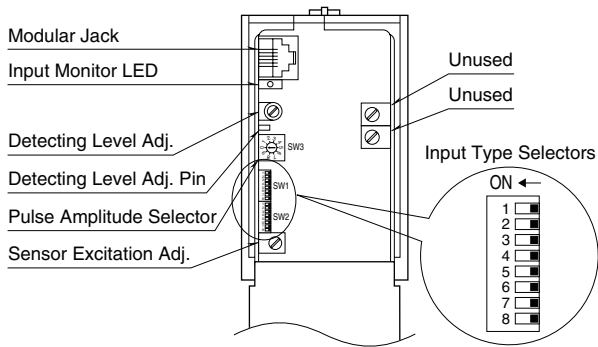
**Response time**

**Input ≥ 10 Hz range:** 0.3 sec. + input cycle + output cycle

**Input ≤ 1 Hz range:** Two (2) input cycles + output cycle

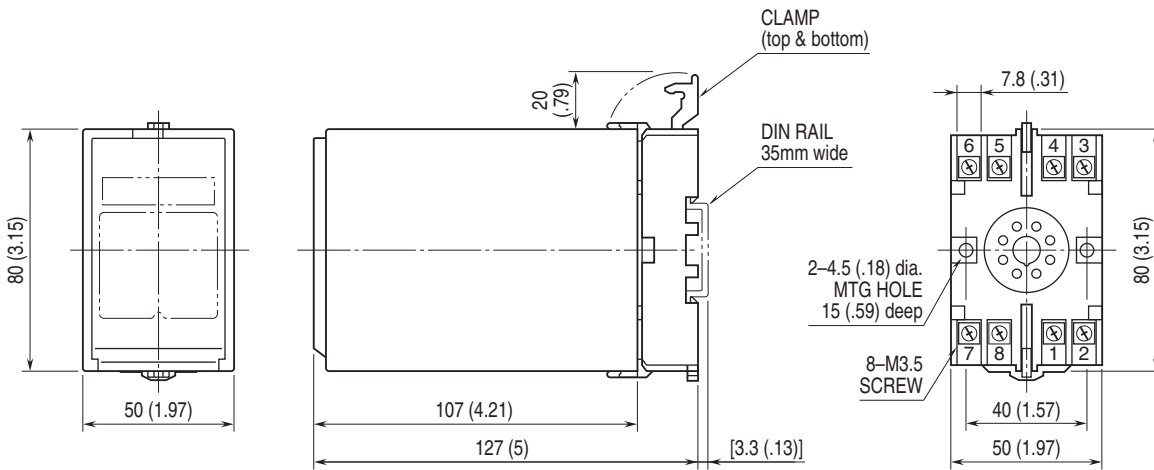
Response time is defined as time required for the first output pulse to be provided for a step input (0 – 100 %).

## EXTERNAL VIEW



Refer to the instruction manual for detailed procedures.

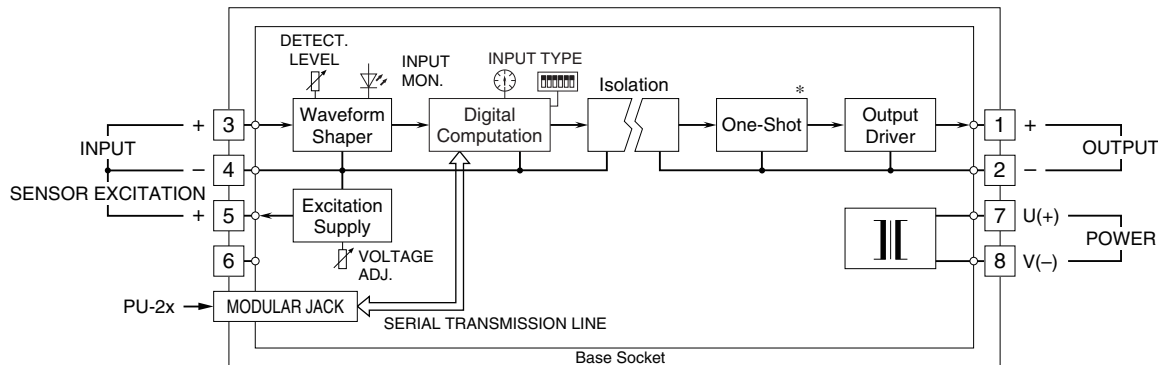
## EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm (inch)



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

## SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

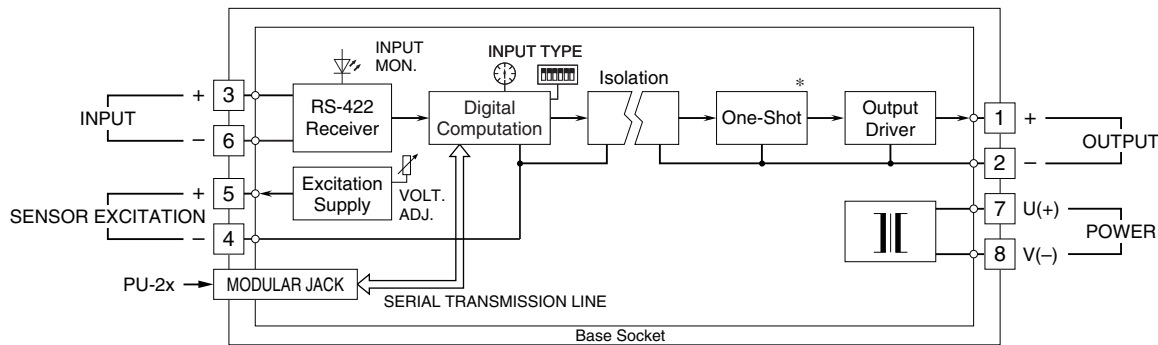
### ■ OPEN COLLECTOR, MECHANICAL SWITCH, VOLTAGE PULSE, 2-WIRE CURRENT PULSE INPUT



\* Deleted with no conversion to one-shot type.

Note: With 24V excitation and open collector/mechanical contact input, the voltage across the terminals 3 – 4, divided in the waveform shaper, is of approx. 16V.

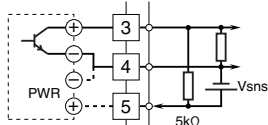
### ■ RS-422 LINE DRIVER PULSE INPUT



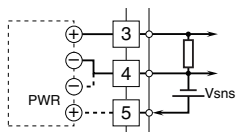
\* Deleted with no conversion to one-shot type.

#### Input Connection Examples

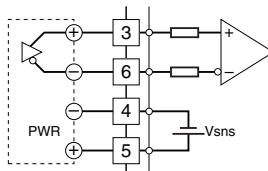
##### ■ Open Collector or Mechanical Contact



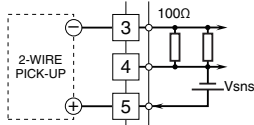
##### ■ Voltage Pulse



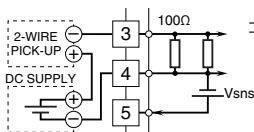
##### ■ RS-422 Line Driver Pulse



##### ■ 2-Wire Current Pulse • Built-in Excitation

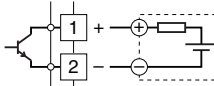


##### • External DC Supply

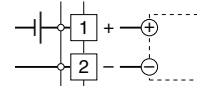


#### Output Connection Examples

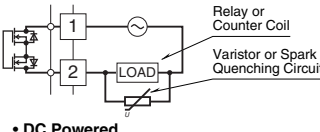
##### ■ Open Collector



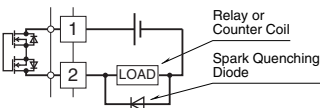
##### ■ Voltage Pulse



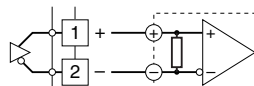
##### ■ Noncontact AC/DC Switch • AC Powered



##### • DC Powered



##### ■ RS-422 Line Driver Pulse



Specifications are subject to change without notice.