

<p><b>PULSE SCALER</b> (field-programmable; built-in excitation)</p>	<p>MODEL <b>JPR2</b></p>
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**BEFORE USE ....**

Thank you for choosing M-System. Before use, please check contents of the package you received as outlined below. If you have any problems or questions with the product, please contact M-System's Sales Office or representatives.

**■ PACKAGE INCLUDES:**

Signal conditioner (body + base socket).....(1)

**■ MODEL NO.**

Confirm Model No. marking on the product to be exactly what you ordered.

**■ INSTRUCTION MANUAL**

This manual describes necessary points of caution when you use this product, including installation, connection, hardware setting, operation of the Programming Unit (model: PU-2x)\* specific to this model and basic maintenance procedures.

This unit is factory adjusted and calibrated according to the Ordering Information included in the product package. If you don't need to change the pre-adjusted setting, you can skip the sections on hardware setting and calibration and Software Setting in this manual.

\*When you need to change software settings, please refer to the Operation Manual for Model PU-2x (EM-9255), Section B: (B-1) Introduction, (B-2) General Operation Description, (B-3) Operation Flow chart for general information.

**POINTS OF CAUTION**

**■ POWER INPUT RATING & OPERATIONAL RANGE**

- Locate the power input rating marked on the product and confirm its operational range as indicated below:  
 85 – 132V AC rating: 85 – 132V, 47 – 66 Hz, approx. 6VA  
 12, 24 and 48V DC ratings: Rating ±10%, approx. 3.3W  
 110V DC rating: 85 – 150V DC, approx. 3.3W

**■ GENERAL PRECAUTIONS**

- Before you remove the unit from its base socket or mount it, turn off the power supply and input signal for safety.

**■ ENVIRONMENT**

- Indoor use.
- When heavy dust or metal particles are present in the air, install the unit inside proper housing with sufficient ventilation.
- Do not install the unit where it is subjected to continuous vibration. Do not subject the unit to physical impact.
- Environmental temperature must be within -5 to +60°C (23 to 140°F) with relative humidity within 30 to 90% RH in order to ensure adequate life span and operation.

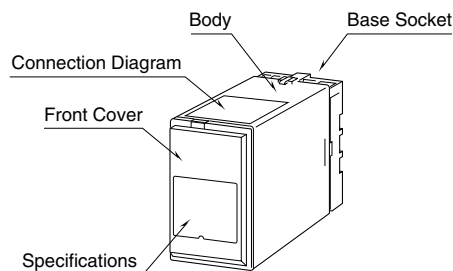
**■ WIRING**

- Do not install cables close to noise sources (relay drive cable, high frequency line, etc.).
- Do not bind these cables together with those in which noises are present. Do not install them in the same duct.

**■ AND ....**

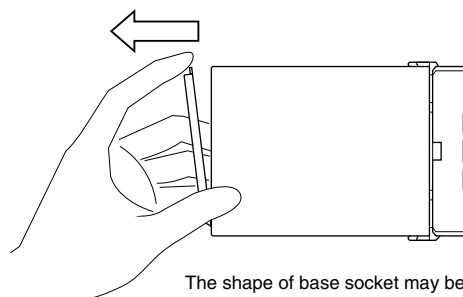
- The unit is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.

**COMPONENT IDENTIFICATION**



**■ HOW TO OPEN THE FRONT COVER:**

Hang your finger on the hook at the top of the front cover and pull.

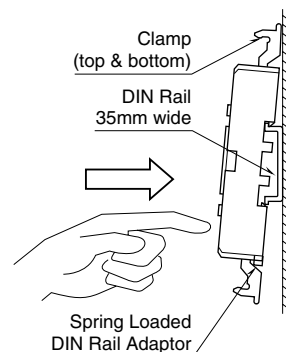


**INSTALLATION**

Detach the yellow clamps located at the top and bottom of the unit for separate the body from the base socket.

**■ DIN RAIL MOUNTING**

Set the base socket so that its DIN rail adaptor is at the bottom. Hang the upper hook at the rear side of base socket on the DIN rail and push in the lower. When removing the socket, push down the DIN rail adaptor utilizing a minus screwdriver and pull.



**■ WALL MOUNTING**

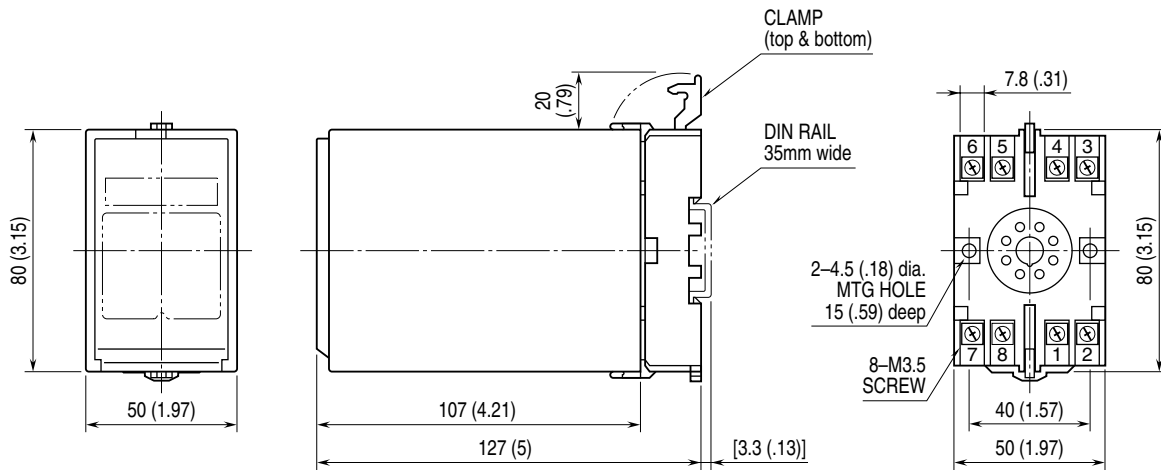
Refer to "EXTERNAL DIMENSIONS."

Shape and size of the base socket are slightly different with various socket types.

# TERMINAL CONNECTIONS

Connect the unit as in the diagram below or refer to the connection diagram on the top of the unit.

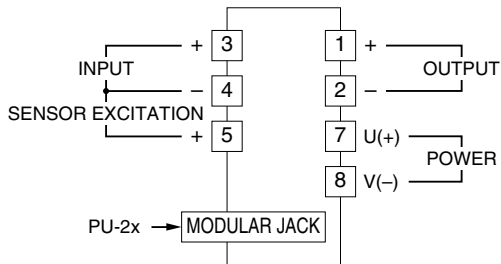
## EXTERNAL DIMENSIONS unit: mm (inch)



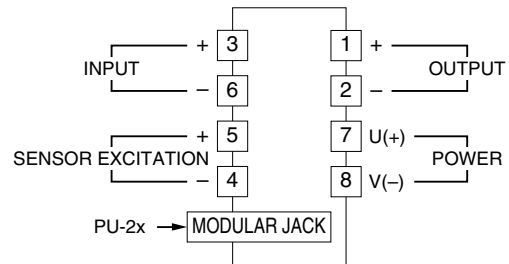
• When mounting, no extra space is needed between units.

## CONNECTION DIAGRAM

### OPEN COLLECTOR, MECHANICAL CONTACT, VOLTAGE PULSE or 2-WIRE CURRENT PULSE INPUT



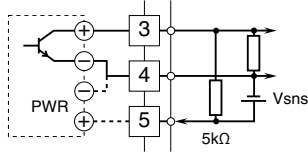
### RS-422 LINE DRIVER PULSE INPUT



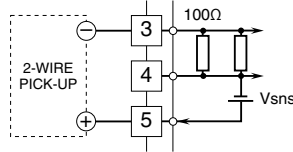
With 24V excitation and open collector/mechanical contact input, the voltage across the terminals 3 – 4, divided in the waveform shaper, is of approx. 16V.

### Input Connection Examples

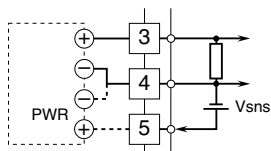
#### Open Collector or Mechanical Contact



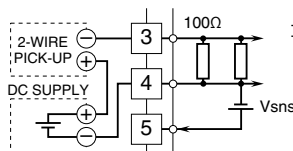
#### 2-Wire Current Pulse • Built-in Excitation



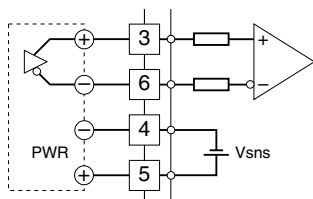
#### Voltage Pulse



#### External DC Supply

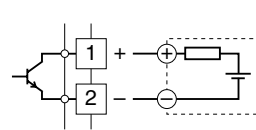


#### RS-422 Line Driver Pulse

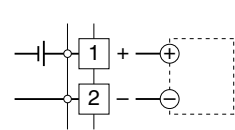


### Output Connection Examples

#### Open Collector

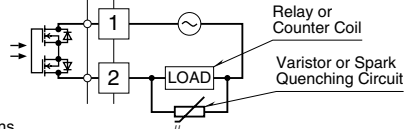


#### Voltage Pulse

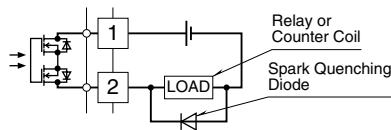


#### Noncontact AC/DC Switch

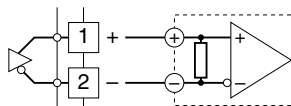
##### AC Powered



##### DC Powered



#### RS-422 Line Driver Pulse



## EXPLANATIONS OF TERMS & FUNCTIONS

### ■ SCALING FACTOR, INPUT PULSE SET COUNT & OUTPUT PULSE SET COUNT

The scaling factor, rate of number of output pulses divided by number of input pulses, is determined by two parameters: input pulse set count and output pulse set count.

The JPR2 output is designed to be proportional in number of pulses relative to the input. For example, when the pulse rate is set to 0.0583, the JPR2, provided with 10000 input pulses, outputs 583 pulses. However, the output is not supplied in a constant frequency. The JPR2 counts the number of input pulses during the sampling time (period) and stores it in the internal buffer counter, and provides the number of output pulses multiplied by the scaling factor for the number of input pulses, by the end of next sampling cycle. With the maximum output frequency limit, those pulses exceeding the limit are still in the buffer and output only in the following cycle.

### ■ SAMPLING TIME

The sampling time is defined as a time period required by the JPR2 to count the input signals for one cycle. With its factory default setting (0.1 sec.), the output is refreshed every 100 milliseconds.

This setting is not usually be changed unless for a specific purpose.

### ■ MAXIMUM OUTPUT FREQUENCY LIMIT

You can limit the maximum output frequency from the JPR2.

The JPR2 multiplies the number of input pulses by the scaling factor. However when the output pulses are supplied to a low-speed response counter, the number of output pulses (output frequency of the JPR2) may have to be limited within a certain level.

Those surplus pulses remains in the buffer and are output in the following sampling cycles within the limit.

### ■ OPERATION

#### [Example]

Input frequency: 2 Hz

Sampling time: 0.5 sec.

Pulse rate: 3/2

Output pulse width: Duty ratio approx. 50%

Max. output frequency: 1 kHz

- 1) The JPR2 counts the number of pulses during the sampling time (period). In the example, 1 count in 0.5 sec. time.
- 2) Converts the number in the preset rate. In the example, 1 pulse  $\times$  3/2 = 1.5 pulses
- 3) Outputs the converted pulses in the next sampling period. If certain pulses are not output within the time due to a fraction or the max. output frequency limit, they are output in the following sampling period. In the example, 1 pulse is output in the second period, two pulses are output in the third to adjust the fraction.

### ■ DETECTING PULSE EDGE

#### • Open Collector & Mechanical Contact:

OFF (input monitor LED ON) to ON (input monitor LED OFF) or ON to OFF

#### • Voltage Pulse

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

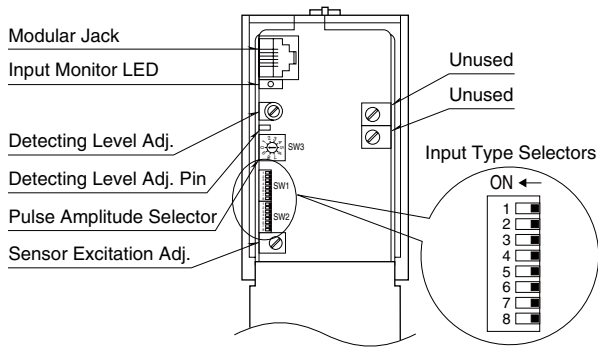
The input resistor (100Ω) converts the current signal (0 – 25mA) into 0 – 2.5V. A pulse rise detected when the voltage goes above the detecting level (input monitor LED ON); a pulse sink detected when it goes below the level (input monitor LED OFF).

# OUTPUT LOGIC

OUTPUT WAVEFORM		INPUT WAVEFORM	Voltage Pulse 2-wire Current Pulse RS-422 Line Driver Pulse	Open Collector or Mechanical Contact
			H L	OFF ON
Voltage Pulse or RS-422 Line Driver Pulse	Non Inverted	No conversion to one-shot		
		One-shot, detecting input pulse rise 		
		One-shot, detecting input pulse drop 		
	Inverted	No conversion to one-shot		
		One-shot, detecting input pulse rise 		
		One-shot, detecting input pulse drop 		
Open collector or Noncontact AC/DC Switch	Non Inverted	No conversion to one-shot		
		One-shot, detecting input pulse rise 		
		One-shot, detecting input pulse drop 		
	Inverted	No conversion to one-shot		
		One-shot, detecting input pulse rise 		
		One-shot, detecting input pulse drop 		

The pulse width in one-shot means the bold lined section of a pulse waveform.

# HARDWARE SETTING & CALIBRATION



**■ PULSE AMPLITUDE (rotary switch) (\*)** Factory setting  
 For RS-422 line driver pulse, this setting is invalid.  
 For voltage pulse input, select the pulse amplitude (V p-p) among the switch positions 0 through 6. For open collector, mechanical contact or two-wire current pulse input, 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 – 5V p-p	5V
5	0.5 – 1V p-p	1V
6*1	0.1 – 0.5V p-p	0.5V
7 (*)	Open collector, mechanical contact or two-wire current pulse	

\*1. Maximum frequency limited 50 kHz.

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

Input type: Voltage Pulse  
 Input amplitude: 1 – 5V p-p  
 Detecting level:  
 $2.5V$  (DC Offset  $\times$  Sensitivity Scale =  $2.5 \times 1/1 = 2.5V$ )  
 (Set to the offset value after it is scaled by the sensitivity scale.)

Noise filter: None

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



**■ EXAMPLE 2: VOLTAGE PULSE with Amplitude 30V p-p, DC Offset 15V, Input Frequency 50 Hz**

Input type: Voltage Pulse  
 Input amplitude: 25 – 50V p-p  
 Detecting level:  
 $1.5V$  (DC Offset  $\times$  Sensitivity Scale =  $15 \times 1/10 = 1.5V$ )  
 (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.



**■ DIP SWITCH SETTING (\*)** Factory setting

For RS-422 line driver pulse, the noise filter setting is invalid.

SW2 is not used. Turn all switches to OFF.

The power supply to the unit must be turned off when changing the setting.

**• Input Type**

INPUT TYPE	SW1					
	1	2	3	4	5	6
Open collector (*)	ON	OFF	ON	OFF	OFF	ON
Mechanical contact	ON	OFF	ON	OFF	OFF	ON
Voltage pulse	OFF	OFF	ON	OFF	OFF	OFF
Two-wire current pulse	OFF	ON	ON	OFF	OFF	ON
RS-422 line driver pulse	OFF	OFF	OFF	ON	ON	OFF

**• Noise Filter**

'High' setting is used for the input frequency  $\leq 10$  Hz.

'Low' setting is used for the input frequency  $\leq 500$  Hz.

For mechanical contact input, 'High' setting is recommended to prevent typical chattering from counting.

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

**■ CAUTION FOR RS-422 LINE DRIVER PULSE**

For RS-422 line driver pulse, the input amplitude, detecting level and noise filter settings are all invalid. However, in order to prevent errors in setting, set these switches as follows:

Input amplitude = 50 – 100V p-p (SW=0)

Detecting level = 0V

Noise filter = None

■ DETECTING LEVEL

Determine the appropriate detecting level referring to the flow chart below.

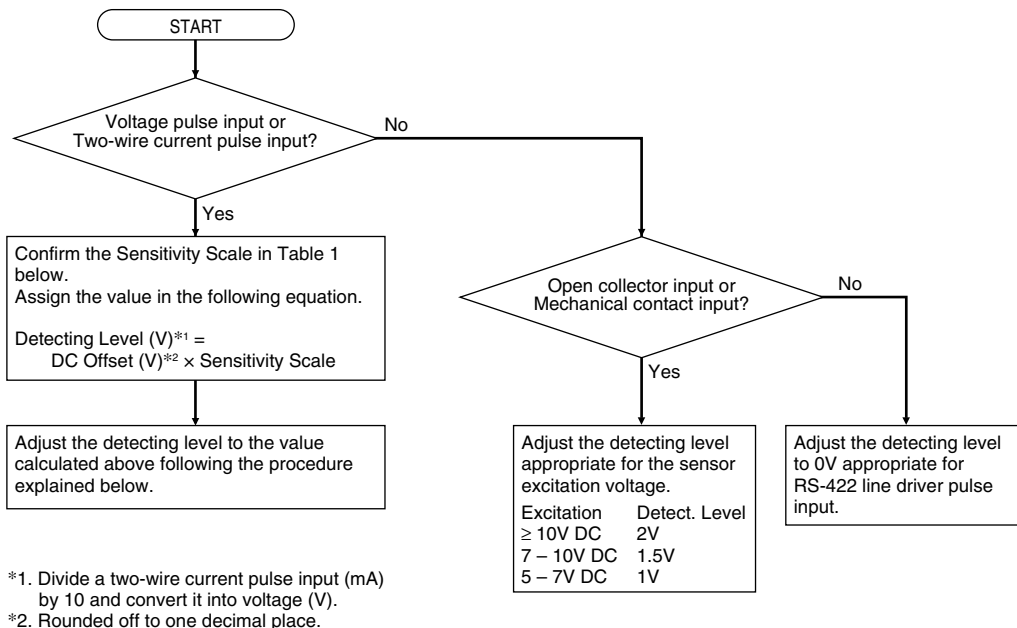


Table 1

SW	PULSE AMPLITUDE	SENSITIVITY SCALE
0	50 – 100 Vp-p	1/20
1	25 – 50 Vp-p	1/10
2	10 – 25 Vp-p	1/5
3	5 – 10 Vp-p	1/2
4	1 – 5 Vp-p	1
5	0.5 – 1 Vp-p	5
6	0.1 – 0.5 Vp-p	10
7	Open collector Mechanical contact Two-wire current pulse	1

A specific sensitivity scale is applied according to the pulse amplitude setting. The scaled input voltage is then compared to the detecting voltage level (0 – 5V). The scaled H level voltage must be equal to or 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).

• Setting Examples

**Voltage pulse (DC Offset = Pulse Amplitude / 2)**

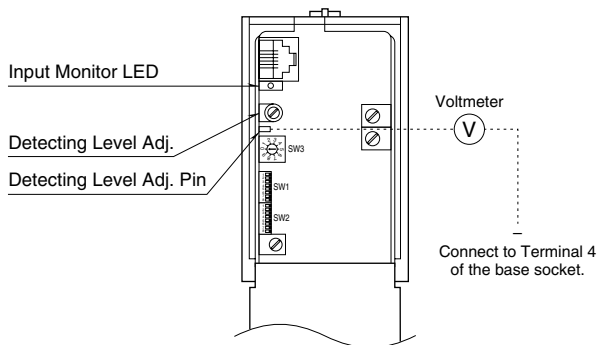
PULSE AMPLITUDE (Vp-p)	AMPLITUDE RANGE (Vp-p)	DETECTING LEVEL (V)
50	50 – 100	1.3
50	25 – 50	2.5
30	25 – 50	1.5
25	10 – 25	2.5
15	10 – 25	1.5
10	5 – 10	2.5
7.5	5 – 10	1.9
5	1 – 5	2.5
3.5	1 – 5	1.8
2	1 – 5	1
1	0.5 – 1	2.5
0.5	0.1 – 0.5	2.5

**Two-wire current pulse (DC Offset = Pulse Amplitude / 2)**

PULSE AMPLITUDE (mA p-p)	AMPLITUDE RANGE	DETECTING LEVEL (V)
15 (1.5 Vp-p)	Set to open collector, mechanical contact or two-wire current pulse	0.8
25 (2.5 Vp-p)		1.3

Set DC offset to 0V for 100 Vp-p pulse input.

• How to Change the Detecting Level



A voltmeter of class 0.5 or better accuracy with pointed probes is required.

- 1) Connect the negative probe of voltmeter to the terminal 4 of base socket.
- 2) If you need a noise filter, set the SW1-7 and SW1-8 in advance.
- 3) Connect the positive probe to the test pin and turn the Detecting Level Adjustment until the meter shows desired value.
- 4) Apply input signals and check that input monitor LED (PL1) blinks according to the input signal.

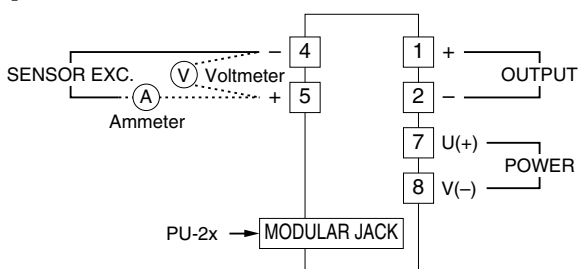
If the LED does not blink, the detecting level may be out of pulse amplitude range. Check the pulse amplitude and the DC offset again and readjust the detecting level.

■ SENSOR EXCITATION ADJUSTMENT

You can change the sensor excitation voltage with the sensor excitation adj. located behind the front cover. If you need to change it, check that the required current is within the specification.

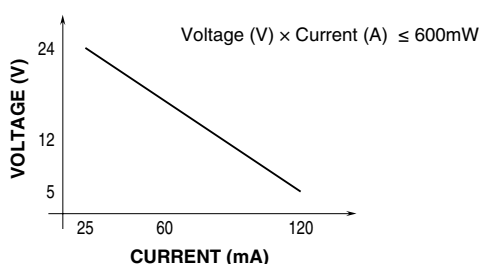
• How to Change the Excitation

A voltmeter and ammeter of class 0.5 or better accuracy are required.



- 1) Connect the voltmeter across the terminals 5 – 4.
- 2) Connect the ammeter to terminal 5.
- 3) Turn the potentiometer until the meter shows the desired value.

Check that the current value indicated on the ammeter is within the allowable limit. If the value is greater than the limit, lower the voltage value or connect a separate power source. Otherwise, the transmitter may fail.



## SOFTWARE SETTING

Please refer to the Operation Manual for Model PU-2x (EM-9255), Section B: (B-1) Introduction, (B-2) General Operation Description, (B-3) Operation Flowchart for general information.

### [GROUP 01]

ITEM	MDFY.	DATA INPUT	DISPLAY	DEFAULT	CONTENTS
01	S			N/A	MAINTENANCE SWITCH
		0	MTSW : MON.MODE		0 : Data indication only.
		1	MTSW : PRG.MODE		1 : All 'P' marked parameters are modifiable.
02	P	Alphabets & No	TG : XXXXXXXXXXX	N/A	Tag name entry (10 characters max.)
03	P	Numeric	CNT : XXXXXX	0	Total input pulses (any count selectable)
04	P	Numeric	IN : XXXXXX	1	Input pulse set count (1 to 1 000 000)
05	P	Numeric	OUT : XXXXXX	1	Output pulse set count (1 to 1 000 000)
06	P	Numeric (Hz)	FRQ : XXXX.XHz	10.0	Max. output frequency limit (0.5 to 100000.0 Hz)
07	P	Numeric (s)	SMP : X.XXs	0.10	Sampling time (0.01 to 100.00 s)
08	D	No input		N/A	Input specification selected with the front rotary switch
			SW : IN_V 1/20		SW = 0, Voltage pulse input, Sensitivity scale = 1/20
			SW : IN_V 1/10		SW = 1, Voltage pulse input, Sensitivity scale = 1/10
			SW : IN_V 1/5		SW = 2, Voltage pulse input, Sensitivity scale = 1/5
			SW : IN_V 1/2		SW = 3, Voltage pulse input, Sensitivity scale = 1/2
			SW : IN_V 1/1		SW = 4, Voltage pulse input, Sensitivity scale = 1/1
			SW : IN_V 5/1		SW = 5, Voltage pulse input, Sensitivity scale = 5/1
			SW : IN_V 10/1		SW = 6, Voltage pulse input, Sensitivity scale = 10/1
			SW : IN_OC, mA		SW = 7, Open collector, mechanical contact or two-wire current pulse input
			SW : no use		SW = 8, (not used)
	SW : no use	SW = 9, (not used)			
	SW : IN_RS422	DIP switch set to RS-422 line driver pulse			
09	P			*	Count mode
		0	IN_EDGE : 0		*Factory default depends upon other specifications.
		1	IN_EDGE : 1		Count at pulse rise
					Count at pulse sink

### Modification Code

D: No modification (writing) possible. Used only for monitoring (reading).

S: Modifiable at any time.

P: Modifiable only when the MAINTENANCE SWITCH is in the "PRG" mode.

### ROM Version Indication

[GROUP 00] [ITEM 99]

## CHECKING

- 1) Terminal wiring: Check that all cables are correctly connected according to the connection diagram.
- 2) Power input voltage: Check voltage across the terminal 7 – 8 with a multimeter.
- 3) Check the input signal.
- 4) Check the output signal.

## LIGHTNING SURGE PROTECTION

M-System offers a series of lightning surge protector for protection against induced lightning surges. Please contact M-System to choose appropriate models.