INSTRUCTION MANUAL

PULSE ACCUMULATOR
(field-programmable; built-in excitation)

MODEL **JPQ2**

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.

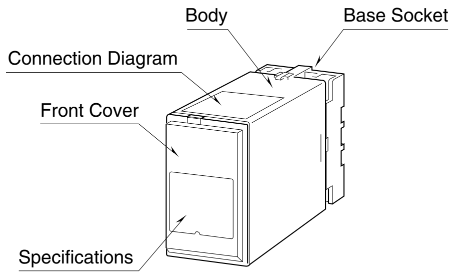
■ WIRING

- 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 ....

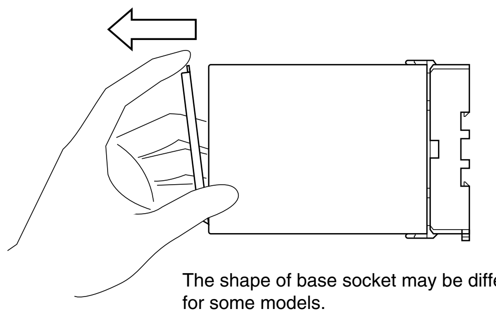
- The unit is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.

COMPONENT IDENTIFICATION



■ HOW TO OPEN THE FRONT COVER:

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



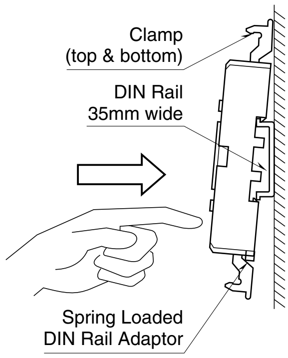
The shape of base socket may be different for some models.

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.



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

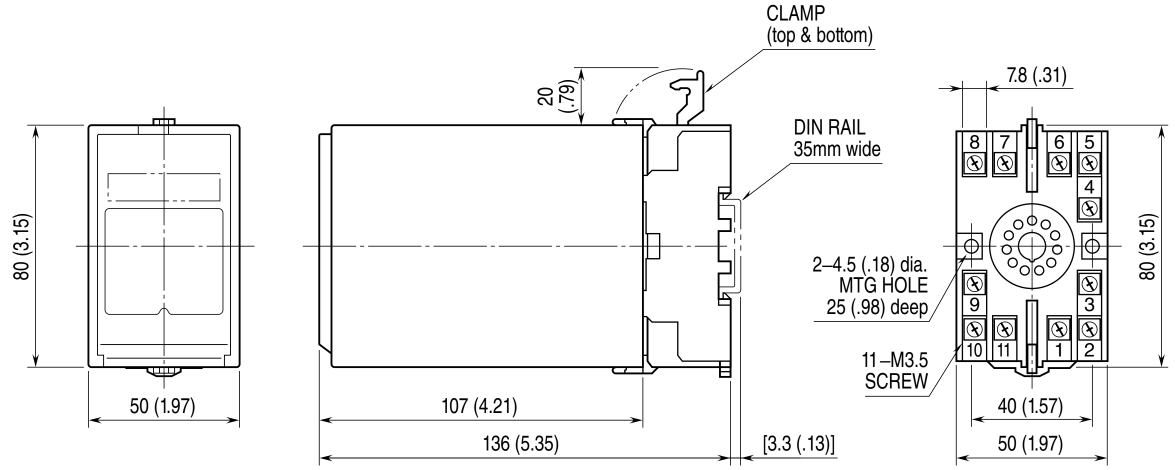
■ WALL MOUNTING

Refer to "EXTERNAL DIMENSIONS."

TERMINAL CONNECTIONS

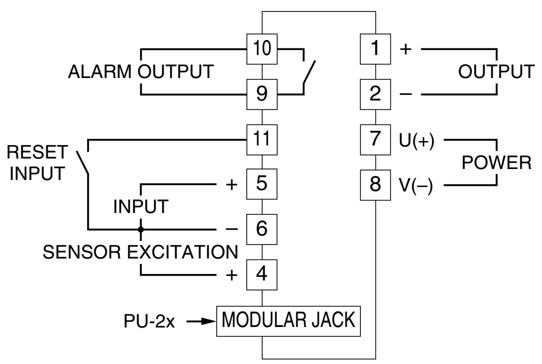
Connect the unit as in the diagram below or refer to the connection diagram on the top of the unit.

■ EXTERNAL DIMENSIONS unit: mm (inch)

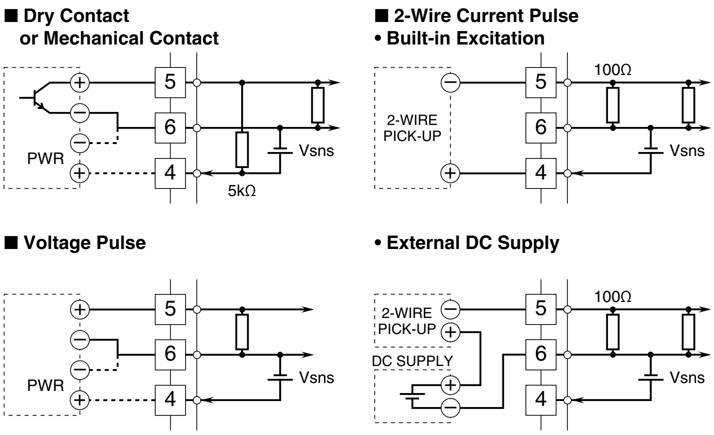


• When mounting, no extra space is needed between units.

■ CONNECTION DIAGRAM



Input Connection Examples



EXPLANATIONS OF TERMS & FUNCTIONS

■ COUNT OVERFLOW

Three overflow modes are selectable with the Programming Unit: Reset, Hold at 100% or Hold at 115%.

In Reset mode, the JPQ2 resets pulse count to zero as soon as the input reaches the span count value. The span count is equal to the zero count, thus the JPQ2 never outputs 100% in this sense.

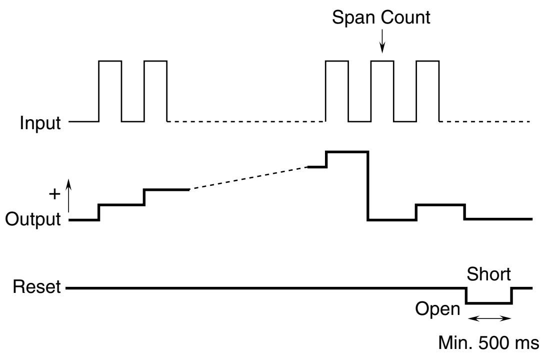
In Hold at 100% mode, the JPQ2 stops counting at 100% input. The count is held at the span count value, and the DC output is held at 100%.

In Hold at 115% mode, the JPQ2 continues counting until 115% before holding the count and DC output.

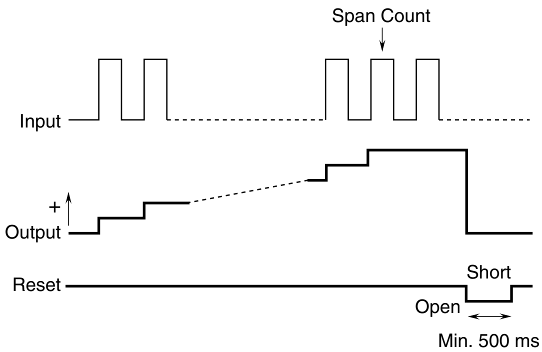
In both modes, the Reset command input resets the count to zero and the JPQ2 returns to the output equivalent to zero count.

Input frequency does not affect the pulse counting of this unit, however, the minimum of 5-microsecond pulse width (50 msec. for mechanical contact input) is required to accurately count the input pulses.

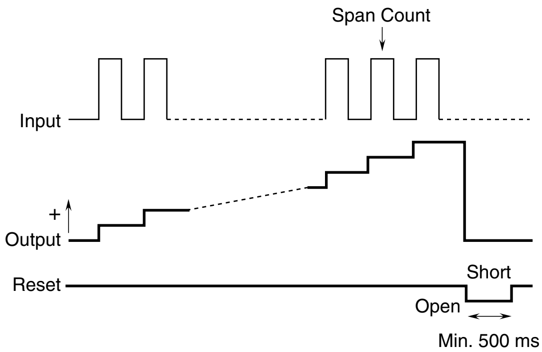
• Reset Mode



• Hold at 100% Mode



• Hold at 115% Mode



■ ALARM OUTPUT

Either Hi or Lo alarm output is supplied by a relay contact. The alarm setpoint and the deadband (hysteresis) are adjustable with the Programming Unit in percentage of the input range. The alarm setpoint is selectable from -15 to +115%, while the deadband is from 0 to 20%.

Once the relay contact trips, it is reset to the normal position when the counter is reset by the external reset command.

■ RESET INPUT

When a reset input is turned on, the accumulated count in the internal counter goes back to zero. The JPQ2 compares the input to this internal count for the alarm function, therefore is affected by reset operations.

The reset input negative is connected to the input common. Short across the terminals 6 and 11 for the minimum of 500 msec.

■ ZERO COUNT, SPAN COUNT

The count value equivalent to 0% output is called 'Zero Count,' while that equivalent to 100% is called 'Span Count.' The zero count is usually set to 0, and selectable up to one count below the span count. The span count is selectable from one count above the zero count up to 99999999.

When a reset input is turned on, the output goes to 0% according to the reset count.

With the 'Hold at 115%' overflow mode, the maximum count range is from 0 to 99999999, and the maximum effective count is 114999998.

■ DETECTING PULSE EDGE

• Open Collector & Mechanical Contact:

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

• Voltage Pulse

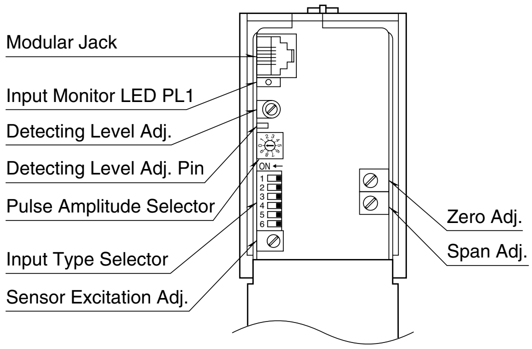
A pulse rise detected when the input voltage goes above the detecting level (input monitor LED ON); a pulse sink detected when it goes below the level (input monitor LED OFF).

• 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).

HARDWARE SETTING & CALIBRATION

■ FRONT PANEL CONFIGURATION



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

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*1	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 to 50 kHz.

■ DIP SWITCH SETTING (*) Factory setting

SW6 is not used. The power supply to the unit must be turned off when changing the setting.

• Input Type

INPUT TYPE	SW1	SW2	SW3
Open collector (*) Mechanical contact	ON	OFF	ON
Voltage pulse	OFF	OFF	ON
Two-wire current pulse	OFF	ON	ON

• Noise Filter

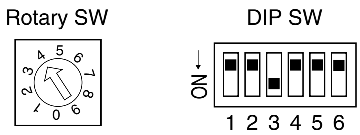
NOISE FILTER	SW4	SW5
High	ON	OFF
Low (*)	OFF	ON
None	OFF	OFF

'High' noise filter is usable for the input frequency 10 Hz or lower range, and 'Low' filter is usable for 500 Hz or lower. For a mechanical contact input, 'High' setting is recommended in order to eliminate unwanted counts caused by chattering.

■ EXAMPLE 1: VOLTAGE PULSE with Amplitude 5V p-p, DC Offset 2.5V, Count Range 0 – 1000

Input type: Voltage Pulse
Input count: Zero count set to 0, Span count set to 1000
(Set 0% and 100% range values with the Programming Unit.)
Input amplitude: 1 – 5V p-p
Detecting level: 2.5V (Set to the offset value after it is scaled by the sensitivity scale.)
Noise filter: None (Choose according to the frequency.)

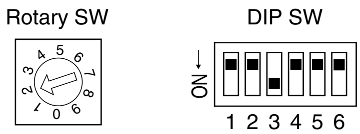
The rotary switch and DIP switch are configured as shown to the right.



■ EXAMPLE 2: VOLTAGE PULSE with Amplitude 24V p-p, DC Offset 12V, Count Range 100 – 10000

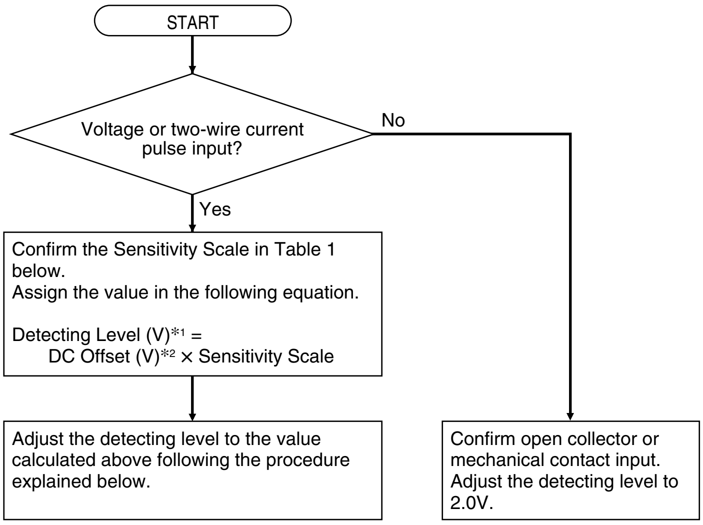
Input type: Voltage Pulse
Input count: Zero count set to 100, Span count set to 10000
(Set 0% and 100% range values with the Programming Unit.)
Input amplitude: 10 – 25V p-p
Detecting level: 1.2V (Set to the offset value after it is scaled by the sensitivity scale.)
Noise filter: None (Choose according to the frequency.)

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



■ DETECTING LEVEL (voltage pulse and two-wire current pulse)

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



*1. Divide a two-wire current pulse input (mA) by 10 and convert it into voltage (V).
*2. Rounded off to one decimal place.

Table 1

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 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 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.

• Setting Examples

Voltage Pulse (DC Offset = Pulse Amplitude / 2)

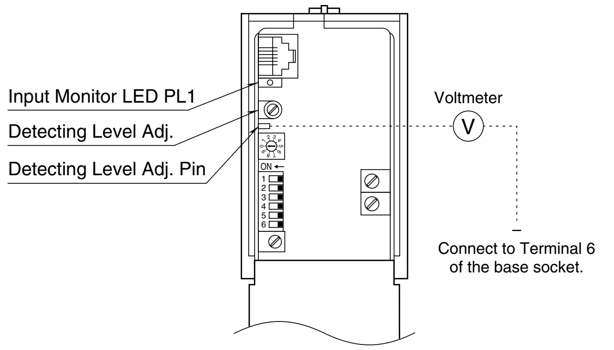
PULSE AMPLITUDE (Vp-p)	AMPLITUDE RANGE (Vp-p)	DETECTING LEVEL (V)
50	50 – 100	1.3
50	25 – 50	2.5
30	25 – 50	1.5
25	10 – 25	2.5
15	10 – 25	1.5
10	5 – 10	2.5
7.5	5 – 10	1.9
5	1 – 5	2.5
3.5	1 – 5	1.8
2	1 – 5	1
1	0.5 – 1	2.5
0.5	0.1 – 0.5	2.5

Two-wire Current Pulse (DC Offset = Pulse Amplitude / 2)

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

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

• How to Change the Detecting Level



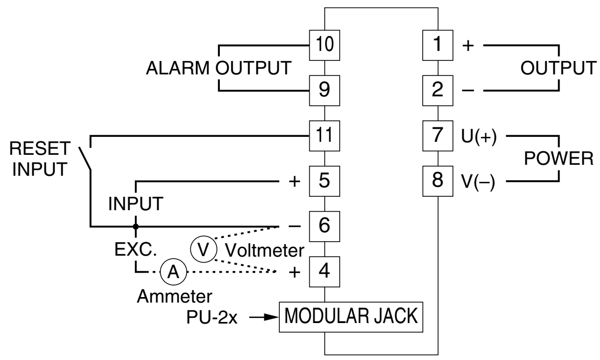
A voltmeter of class 0.5 or better accuracy with pointed probes is required.

1) Connect the negative probe of voltmeter to the terminal 6 of base socket.
2) If you need a noise filter, set the SW4 and SW5 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.

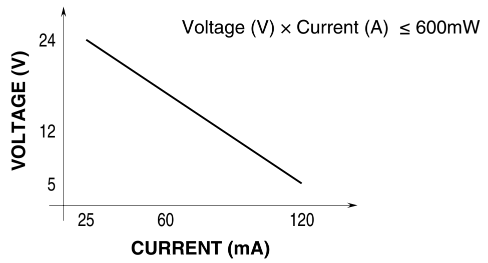


• How to Change the Excitation

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

1) Connect the voltmeter across the terminals 4 – 6.
2) Connect the ammeter to terminal 4.
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.



■ ANALOG OUTPUT ADJUSTMENT

This unit is calibrated at the factory to meet the ordered specifications, therefore you usually do not need any calibration.

For matching the signal to a receiving instrument or in case of regular calibration, adjust the output as explained in the following.

• How to Calibrate The Output Signal

Use a signal source and measuring instruments of sufficient accuracy level. Turn the power supply on and warm up for more than 10 minutes.

1) ZERO: Apply the number of pulses equivalent to zero count (or set the input count to zero count using the Programming Unit) and adjust output to 0%.
2) SPAN: Apply the number of pulses equivalent to span count (or set the input count to span count using the Programming Unit) and adjust output to 100%.
3) Check ZERO adjustment again with zero count.
4) When ZERO value is changed, repeat the above procedure 1) – 3).

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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 : XXXXXXXXXX	N/A	Tag name entry (10 characters max.)
03	P	Percentage	OUTPER XXX.XX	N/A	Output monitor (%) & simulation output
05	D	No input	INPPER XXX.XX	N/A	Input monitor (%)
06	P	No input	CNT XXXXXXXXX	N/A	Input count monitor; or setting to a specific count value
07	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)
08	P			0	Input count at power off
		0	COUNT UNKEEP		Not held (Cold Start)
		1	COUNT KEEP		Held (Hot Start)
10	P			0	Linearization
		0	STRAIGHT		Without
		1	CURVED		With (ITEM 60 to 91 for segment data input)
11	P			0	Count mode
		0	UP_EDGE		Count at pulse rise
		1	DOWN_EDGE		Count at pulse sink
		2	UPDOWN_EDGE		Count at both pulse rise and sink
12	P			0	Count overflow mode
		0	115%_HOLD		Hold at 115%
		1	100%_HOLD		Hold at 100%
		2	100%_RESET		Reset at 100%
14	P	Numeric	LO XXXXXXXXX	0	Input zero count (0% input) (0 to 99999999)
15	P	Numeric	HI XXXXXXXXX	1000	Input span count (100% input) (0 to 99999999)
19	P	Percentage	FINZER XXX.XX OUTPER XXX.XX	0.00	Fine zero adjustment When data is entered, output (%) is shown.
20	P	Percentage	FINSPN XXX.XX OUTPER XXX.XX	100.00	Fine span adjustment When data is entered, output (%) is shown.
21	P			1	Alarm mode
		0	NO ALARM		No alarm trip
		1	UPPER ALARM		High alarm trip
22	P	Percentage	ALARM XXX.XX	100.00	Alarm setpoint (-15.00 to +115.00%)
24	P	Seconds	ALTIME XXXX.X	3.0	Alarm delay at the startup (2.0 to 1000.0 seconds)
60	P	Percentage	X (01) : XXX.XX	0.00	Linearization table (16 points)
61	P	Percentage	Y (01) : XXX.XX	0.00	Set at the maximum of 16 pairs of input (X) and output (Y)
:	:	:	:		calibration points in %. Fill data from the lowest ITEM
:	:	:	:		No. from the lowest calibration point and add as many as
:	:	:	:		required. The output in the undefined range is maintained
90	P	Percentage	X (16) : XXX.XX	0.00	at the value of the first and the last calibration points.
91	P	Percentage	Y (16) : XXX.XX	0.00	

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.

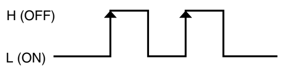
ROM Version Indication

[GROUP 00] [ITEM 99]

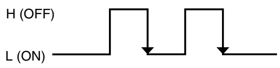
■ COUNT MODE

ITEM 11 specifies at which point of the pulse waveforms the count should be added.

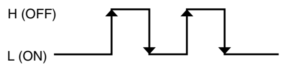
• Count at pulse rise



• Count at pulse sink



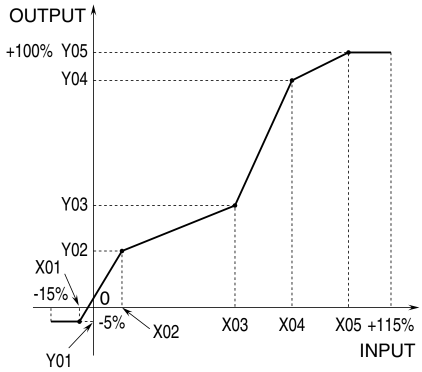
• Count at both edges



■ LINEARIZATION TABLE

The I/O curve is approximated at 16-point segments. Set only the required pairs of I/O points. Refer to the figure below.

X (nn) : Input %
Y (nn) : Output %
Range : -15.00 to +115.00%



[GROUP 01]

ITEM	MDFY.	DATA EXAMPLE
60	P	X (01) : XXX.XX
61	P	Y (01) : XXX.XX
62	P	X (02) : XXX.XX
63	P	Y (02) : XXX.XX
64	P	X (03) : XXX.XX
65	P	Y (03) : XXX.XX
66	P	X (04) : XXX.XX
67	P	Y (04) : XXX.XX
68	P	X (05) : XXX.XX
69	P	Y (05) : XXX.XX
70	P	X (06) : XXX.XX
71	P	Y (06) : XXX.XX
72	P	X (07) : XXX.XX
73	P	Y (07) : XXX.XX
74	P	X (08) : XXX.XX
75	P	Y (08) : XXX.XX
76	P	X (09) : XXX.XX
77	P	Y (09) : XXX.XX
78	P	X (10) : XXX.XX
79	P	Y (10) : XXX.XX
80	P	X (11) : XXX.XX
81	P	Y (11) : XXX.XX
82	P	X (12) : XXX.XX
83	P	Y (12) : XXX.XX
84	P	X (13) : XXX.XX
85	P	Y (13) : XXX.XX
86	P	X (14) : XXX.XX
87	P	Y (14) : XXX.XX
88	P	X (15) : XXX.XX
89	P	Y (15) : XXX.XX
90	P	X (16) : XXX.XX
91	P	Y (16) : XXX.XX

Modification Code

S: Modifiable at any time.
P: Modifiable only when the MAINTENANCE SWITCH is in the “PRG” mode.

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) Input: Check that the input signal is within 0 – 100% of the full-scale.
4) Output: Check that the load resistance meets the described specifications.

MAINTENANCE

Regular calibration procedure is explained below:

■ CALIBRATION

Warm up the unit for at least 10 minutes. Apply 0%, 25%, 50%, 75% and 100% input signal. Check that the output signal for the respective input signal remains within accuracy described in the data sheet. When the output is out of tolerance, recalibrate the unit according to the “ANALOG OUTPUT ADJUSTMENT” procedure.

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.