YAMATAKE **Specification**

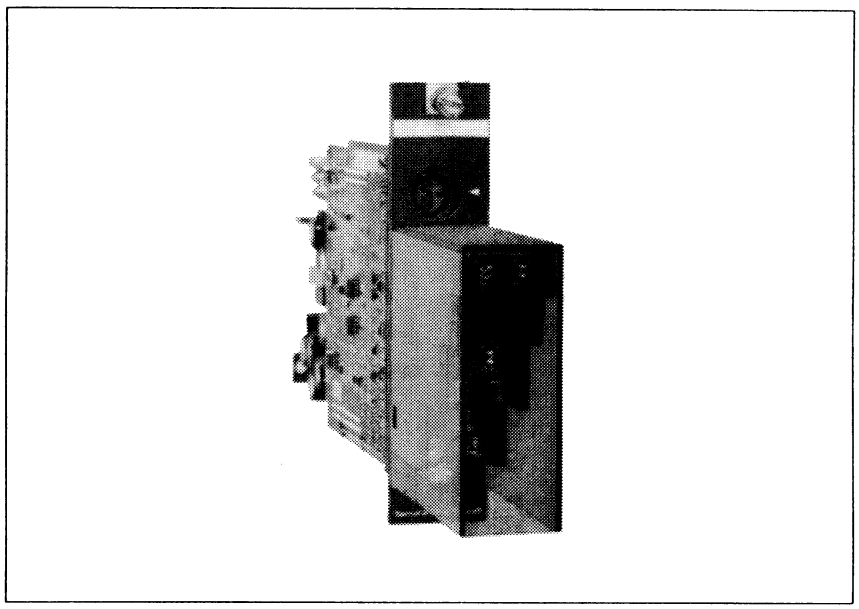
SystempaK (Digital/File Type)
Single Input Arithmetic Relay Module
Model J-SCM 80/85

Introduction

The Singel Input Arithmetic Relay Module (J-SCM 80/85) provides a variety of arithmetic operations which are selected with dedicated Handy Communicator in the field.

- Ratio / bias setting
- Square root extraction
- Signal reversing
- Function generating
- Limiting
- Rate of change limiting
- Lead / lag
- Differentiating operation

The J-SCM 80/85 provides one-input and two-input modules, and the square root operation can be combined to any arithmetic operations.



Functions

Arithmetic operation	Description
Ratio / bias setting	An input signal is ratioed, and addition or subtraction biased for outputting it.
Square root extraction	Square root extraction is performed for an input signal.
Signal reversing	Reversing an input signal for outputting it.
Function generating	Approximating an input signal with 20 linearization point for outputting it.
Limiting	Limits an output signal when an input signal exceeds the upper or lower limit value previously set.
Rate of change limiting	Limits an output signal when rate of input signal change exceeds the upper or lower limit value previously set.
Lead / lag	Activating as lead or lag element for the change of input signal.
Differentiating operation	Differentiating operation is applied to an input signal.

Specification

Items			Ratio / Bias setting	Square root extraction	Signal reversing	Function generating
Input	Input signal		1 to 5V DC or 4 to 20mA DC			
	Input bias current		−1μA or less			
Output	Output signal	No.1 Output	1 to 5V DC or 4 to 20mA DC (No.1 output must be 1 to 5V DC when connecting the signal with the A-MC I/O cable.)			
		No.2 Output	1 to 5V DC (Between No.1 and No.2 output is not isolated.)			
	Output impedance		Voltage output: 250Ω or less, Current output: 250kΩ or more			
	Allowable load resistance		0 to 600Ω (current output)			
Arithmetic equation			$V_O - 1 = K(V_i - 1) + B$ (V_O = Output, V_i = Input, K = Ratio, B = Bias)	$V_O - 1 = 2\sqrt{(V_i - 1)}$ (V_O = Output, V_i = Input)	$V_O = 6 - V_i$ (V_O = Output, V_i = Input)	$V_O = f(V_{in})$ $f(V_{in})$ is a linearization approximation.
Setting range			K: − 6.999 to +7.999 B: − 699.9 to +799.9%	Dropout: 0 to 20%FS of input	——	Linearization point setting range X_n: − 6.9% ≤ X_n ≤ 106.9% Y_n: − 6.9% ≤ Y_n ≤ 106.9%
Number of linearization lines			——	——	——	20 (21 linearization points)
Accuracy	Arithmetic operation	No.1 Output (Note 1)	±0.25%FS (for ratio 1 and bias 0%)	±0.25%FS (10 to 100% input) ±2.0%FS (0 to less than 10% input) 0±0.5%FS (at dropout)	±0.25%FS	±0.25 × G%FS (G: Slope G > Partition of 1.0)
		No.2 Output	±0.5%FS (added to No.1 output accuracy.)			
	Setting		——	Dropout setting accuracy ±0.1%FS	——	——
Common	Current		24V DC $^{+10}_{-15}$%			
	Current consumption		200mA or less (at 24V)			
	Ambient temperature		5 to 45°C			
	Ambient humidity		0 to 90%RH			
	Mounting		File			
	Front mask		Black			
	Weight		300g			
Operating influence			Supply voltage effect: ±0.2%FS/24V DC $^{+10}_{-15}$%			
			Temperature effect: ±0.2%FS/10°C			

Note: 1) For No. 1 current output, adds 0.1% to those indicated above.

<table>
<tr><th colspan="3">Items</th><th>Limiting</th><th>Rate of change limiting</th><th>Lead / Lag</th><th>Differentiating operation</th></tr>
<tr><td rowspan="2">Input</td><td colspan="2">Input signal</td><td colspan="4">1 to 5V DC or 4 to 20mA DC</td></tr>
<tr><td colspan="2">Input bias current</td><td colspan="4">−1μA or less</td></tr>
<tr><td rowspan="4">Output</td><td rowspan="2">Output signal</td><td>No.1 Output</td><td colspan="4">1 to 5V DC or 4 to 20mA DC
(No.1 output must be 1 to 5V DC when connecting the signal with the A-MC I/O cable.)</td></tr>
<tr><td>No.2 Output</td><td colspan="4">1 to 5V DC (Between No.1 and No.2 output is not isolated.)</td></tr>
<tr><td colspan="2">Output impedance</td><td colspan="4">Voltage output: 250Ω or less, Current output: 250kΩ or more</td></tr>
<tr><td colspan="2">Allowable load resistance</td><td colspan="4">0 to 600Ω (current output)</td></tr>
<tr><td colspan="3" rowspan="2">Arithmetic equation</td><td rowspan="2">——</td><td rowspan="2">——</td><td>$V_0-1=\frac{1+T_1S}{1+T_2S}(V_i-1)+B$</td><td>$V_0-1=\frac{T_1S}{1+T_2S}(V_i-1)+B$</td></tr>
<tr><td colspan="2">V_0 = Output, V_i = Input, T_1 = Lead time, T_2 = Lag time, B = Bias</td></tr>
<tr><td colspan="3" rowspan="2">Setting range</td><td rowspan="2">Limit value:
−6.9 to +106.9%FS
(both upper and lower limits)</td><td rowspan="2">Rate of change:
−699.9 to +799.9%FS/min.</td><td colspan="2">Lead time: 0 to 99.99 minutes
Lag time: 0 to 99.99 minutes</td></tr>
<tr><td>Bias
−100.0 to +100.0%</td><td>Bias
0.0 to 100.0%</td></tr>
<tr><td colspan="3">Number of linearization lines</td><td>——</td><td>——</td><td>——</td><td>——</td></tr>
<tr><td rowspan="3">Accuracy</td><td rowspan="2">Arithmetic operation</td><td>No.1 Output (Note 1)</td><td>±0.25%FS
(other than limiting operation range)</td><td>±0.25%FS
(other than limiting operation range)</td><td colspan="2">±0.25%FS</td></tr>
<tr><td>No.2 Output</td><td colspan="4">±0.5%FS (Added to No.1 output accuracy.)</td></tr>
<tr><td colspan="2">Setting</td><td>±0.1%FS</td><td>±0.5%FS/min.</td><td colspan="2">Time constant: ±0.5 minutes (at setting 1 min.),
Bias: ±0.1%FS</td></tr>
<tr><td rowspan="6">Common</td><td colspan="2">Current</td><td colspan="4">24V DC$^{+10}_{-15}$%</td></tr>
<tr><td colspan="2">Current consumption</td><td colspan="4">200mA or less (at 24V)</td></tr>
<tr><td colspan="2">Ambient temperature</td><td colspan="4">5 to 45°C</td></tr>
<tr><td colspan="2">Ambient humidity</td><td colspan="4">0 to 90%RH</td></tr>
<tr><td colspan="2">Mounting</td><td colspan="4">File</td></tr>
<tr><td colspan="2">Front mask</td><td colspan="4">Black</td></tr>
<tr><td colspan="2">Weight</td><td colspan="4">300g</td></tr>
<tr><td colspan="3" rowspan="2">Operating influence</td><td colspan="4">Supply voltage effect: ±0.2%FS/24V DC$^{+10}_{-15}$%</td></tr>
<tr><td colspan="4">Temperature effect: ±0.2%FS/10°C</td></tr>
</table>

Note: 1) For No. 1 current output, adds 0.1% to those indicated above.

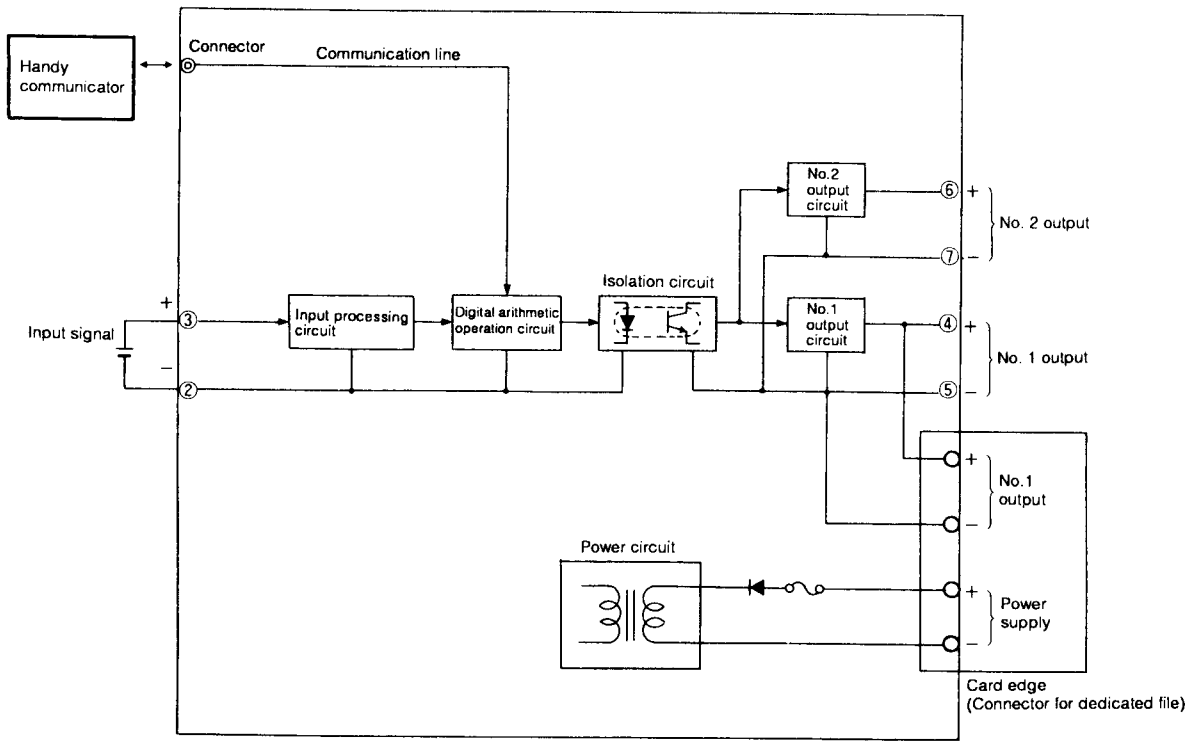


Figure 1. Functional block diagram of single input arithmetic relay module

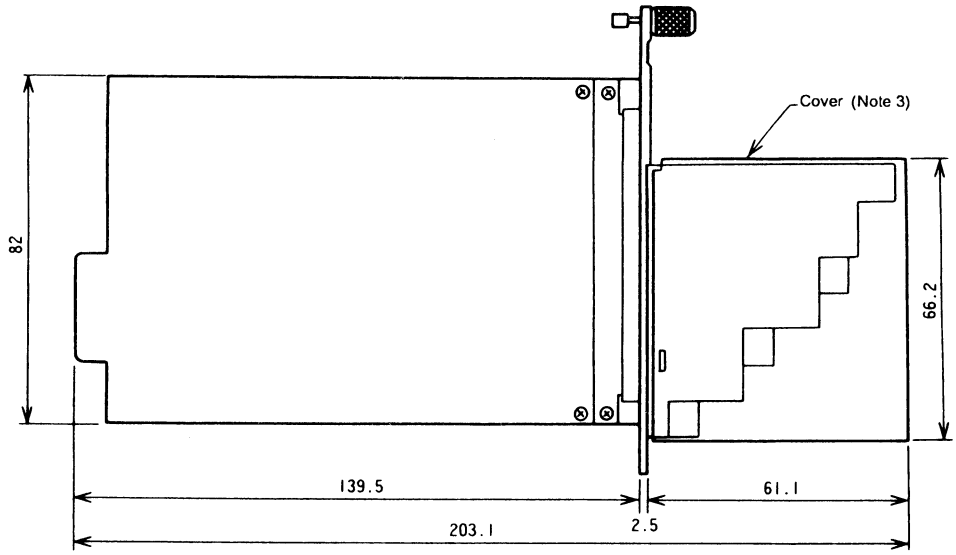
Model Number Table

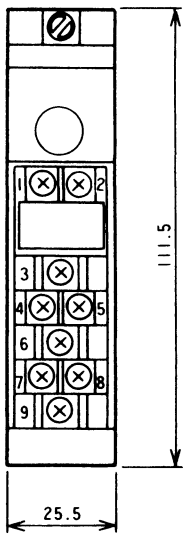
One-output module

Basic model number	Selections I	Selections II	Description
J-SCM 80			Single Input Arithmetic Relay Module (1-output)
	– 1		Input 1 to 5V DC
	– 2		Input 4 to 20mA DC
		1	Output 1 to 5V DC
		2	Output 4 to 20mA DC

Two-output module

Basic model number	Selections I	Selections II	Description
J-SCM 85			Single Input Arithmetic Relay Module (2-output)
	– 1		Input 1 to 5V DC
	– 2		Input 4 to 20mA DC
		1	No.1 output 1 to 5V DC No.2 output 1 to 5V DC
		2	No.1 output 4 to 20mA DC No.2 output 1 to 5V DC





No.	Description
1 (Note 1)	——
2 (Note 1)	Input (–)
3	Input (+)
4	No. 1 Output (+)
5	No. 1 Output (–)
6	No. 2 Output (+) (Note 2)
7	No. 2 Output (–) (Note 2)
8	——
9	GND

Note 1) 250Ω resistor is added for current input.
2) For two-output mode.
3) Operate the Module with a cover.
4) Terminal screws: M3.5
5) Use the pressured terminals with insulation sheath.

Figure 2. Dimensions and wiring diagram

Ordering Information

When ordering, please specify:

1) Tag number
2) Arithmetic functions
   Ratio bias setting, Square root extraction, Signal reversing, Function generating, Limiting, Rate of change limiting, Lead/lag, Differentiating operation
3) Setting data

   For ratio bias setting; Ratio value, Bias value
   For function generating; Linearization point data
   For limiting; Lower limit value, Upper limit value

   For rate of change limiting; Rate of minus change limit value, Rate of plus change limit value
   For lead/lag; Lead time (T1), Lag time (T2), Bias value
   For differentiating operation; Lead time (T1), Lag time (T2), Bias value

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Shanghai Yamatake Jinshan Control Instruments Co., Ltd.	: China	86-21-5793-5334
Yamatake (Thailand) Co., Ltd.	: Thailand	66-2-210-0900~7
Yamatake Philippines, Inc.	: Philippines	63-2-817-6452
PT. Yamatake Berca Indonesia	: Indonesia	62-21-230-5537/5539
Yamatake Controls Singapore Pte. Ltd.	: Singapore	65-778-5966
YCV Corporation	: U.S.A.	1-602-548-1800

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