YAMATAKE

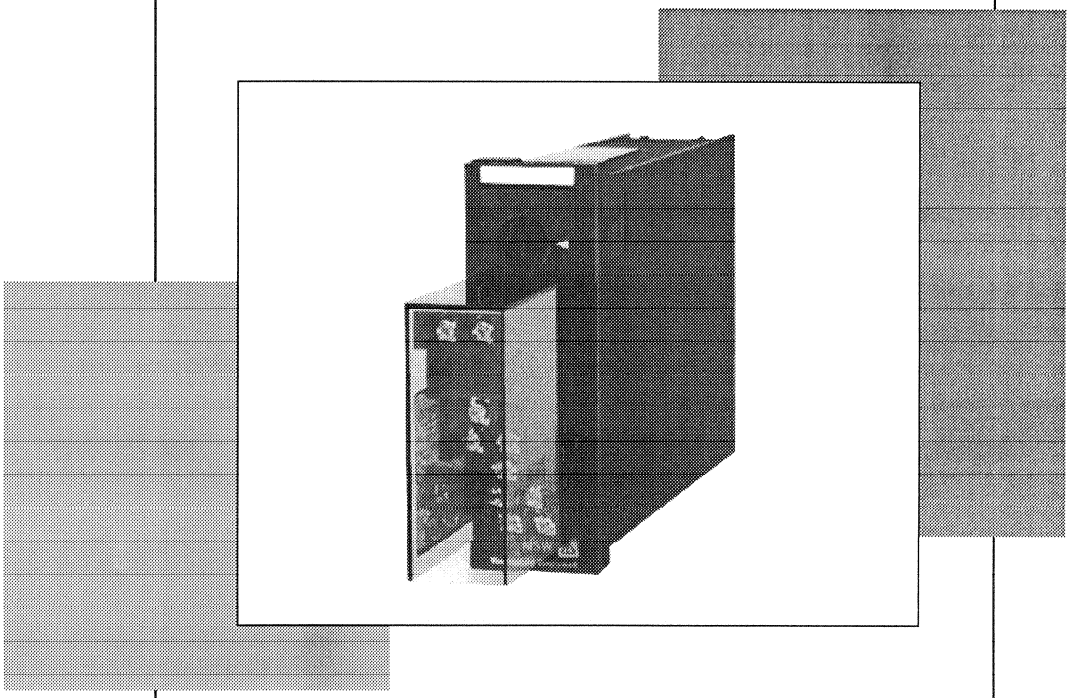
OM2-2330-0100

SystempaK (Digital,Single Case Type)

Millivolt Conversion Module

Model J-SMP80/85

Operator's Manual



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1. OUTLINE

The Millivolt Conversion Module is housed in a single case and, J-SMV80/85, converts the DC millivolt input into a 1 to 5V DC or 4 to 20mA DC signal. This module, which is available in either a one-output or two-output type, is equipped with a linearization function as a standard feature.

The linearization function allows up to 21 break points to be established to linearize a non-linear input into a linear output.

The input specifications (input range, burnout function, and linearization function) may be freely set by the user with the dedicated Handy Communicator.

Note: The description of the Handy Communicator in this manual is limited to the function setting procedure and the output adjusting procedure. Refer to the following document for details.

Handy Communicator Operators Manual: [Document No. OM2-2320-1900]

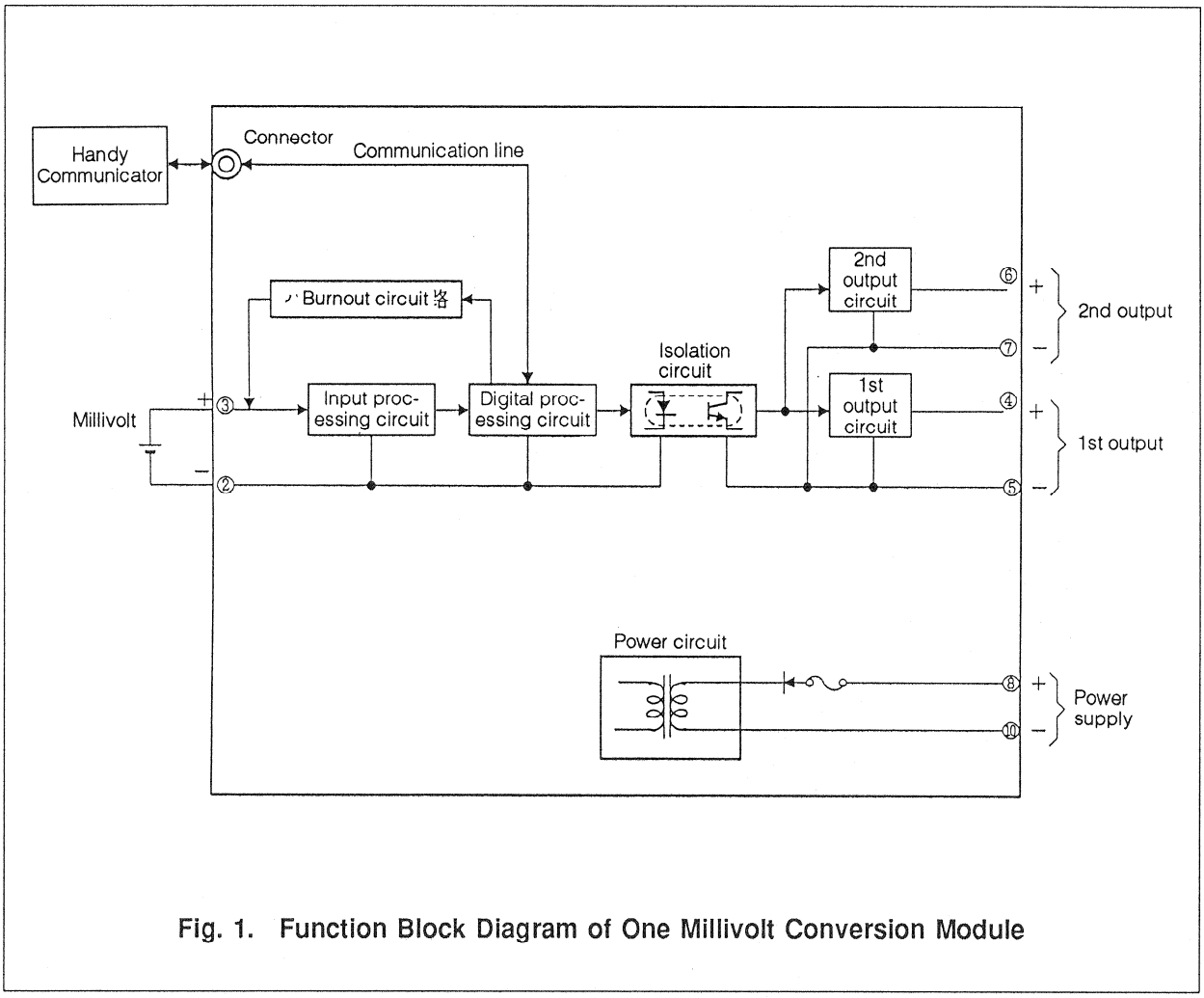


Fig. 1. Function Block Diagram of One Millivolt Conversion Module

2. STANDARD SPECIFICATIONS

Input signal: DC voltage (in mV DC)

Span: 2 to 100mV DC

Suppression: –10 to 35mV DC or 3 times the span, whichever value is smaller

Input bias current: –100nA or less (during upward burnout)
+100nA or less (during downward burnout)

Burnout: Up/down scaling and off setting are possible; at 1 min/FS in speed or less

Output signal:

First output: 1 to 5V DC or 4 to 20mA DC

Second output: 1 to 5V DC (The first output and second output are not isolated and are minus-common.)

Output impedance: 250Ω or less in voltage output; 250KΩ or more in current output

Allowable load resistance: 0 to 600Ω (current output)

Accuracy:

Input span	First output	Second output
At least 4mV	±0.25% FS	±0.75% FS
Less than 4mV	±10μV or less (in terms of input)	± [0.5% FS + 10μV (in terms of input)]

Note: If the first output is a current output, 0.5% FS is added.

Common mode rejection ratio: 120db (at 50Hz)

Supply voltage: 24V DC $^{+10\%}_{-15\%}$

Current consumption: 200mA or less (at 24V)

Ambient temperature range: 5 to 45°C

Ambient humidity range: 0 to 90% RH

Mounting: Panel, Wall, DIN rail

Front mask: Black

Weight: 450g

Additional accuracy:

Influence of supply voltage fluctuations: ±0.2% FS/24V DC $^{+10\%}_{-15\%}$

Influence of ambient temperature fluctuations:

Span of 10mV or more ... ± 0.3% FS/10°C

Span of less than 10mV ... $\pm \frac{3}{\text{Span (mV)}}$ % FS/10°C

3. MODEL NO. STRUCTURE

[1-output type]

Basic model No.	Optional specifications		Content
	I	II	
J-SMP80			One Millivolt Conversion Module
	– 0		Input signal: 2 to 100mV span
		1	Output signal: 1 – 5V DC
		2	Output signal: 4 – 20mA DC

[2-output type]

Basic model No.	Optional specifications		Content
	I	II	
J-SMP85			One Millivolt Conversion Module
	– 0		Input signal: 2 to 100mV span
		1	1st output signal: 1 – 5V DC, 2nd output signal: 1 – 5V DC
		2	1st output signal: 4 – 20mA DC, 2nd output signal: 1 – 5V DC

4. MOUNTING

4.1 Mounting Locations

For the place of installation of the module, select a place which meets the following requirements:

(1) Ambient temperature is normal and does not change sharply.

(2) Ambient humidity is normal and does not become abnormally high.

(3) Atmosphere does not contain corrosive gas.

(4) Atmosphere does not contain dust, oil fumes, or other undesirable substances.

(5) The place is less affected by electrical noise.

4.2 Mounting Method

The module can be installed in one of the following three methods:

(1) Panel mount (flush mount)

(2) Wall mount (protruding mount)

(3) DIN rail mount

■ Panel Mount and Wall Mount

Fix the L-shape mounting brackets on top and bottom of the casing by means of the fixing grooves as shown in Figs. 2 and 3. For panel mount, fix the brackets at the front end positions; for wall mount, fix them at rear end positions. Fix the casing on a panel or a wall by fixing the brackets to the panel or the wall.

For the panel cutout dimensions and the locating pitch (the interval between two adjoining modules when a number of modules are installed side by side), see Fig. 4.

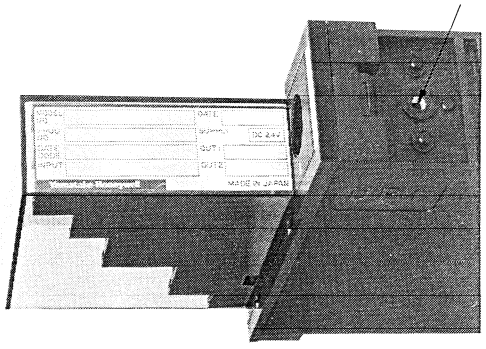


Fig. 2

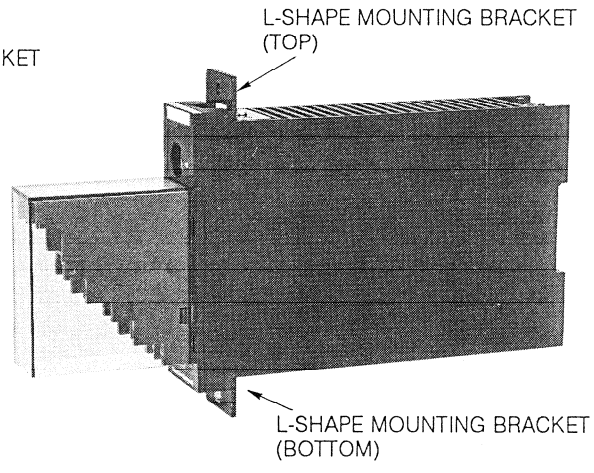
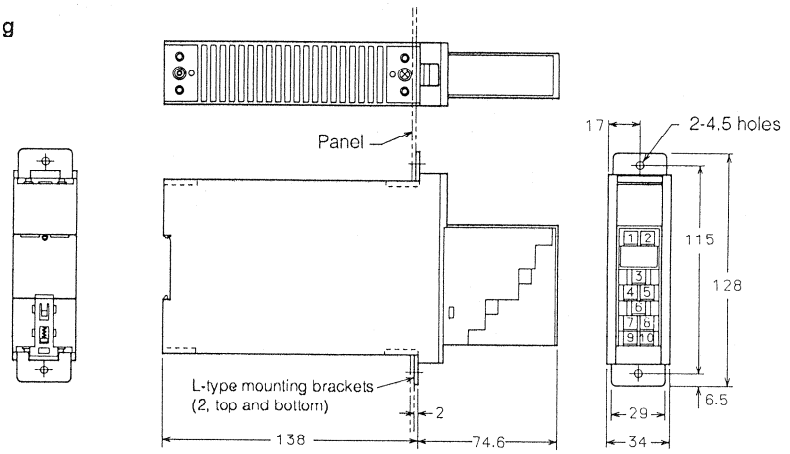
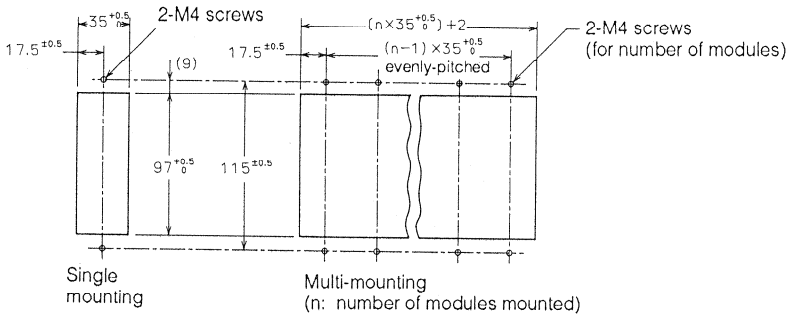


Fig. 3

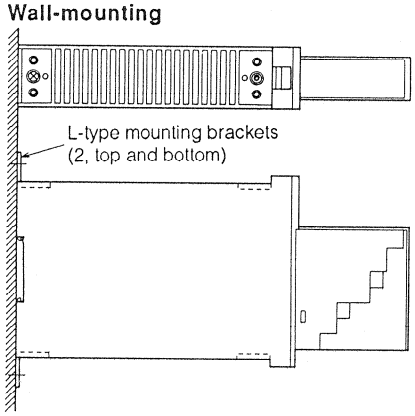
Panel-mounting



Panel-cutout



Wall-mounting



Wall-mounting
(n: number of modules mounted)

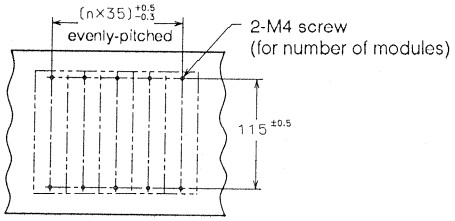


Fig. 4. Dimensions for Panel Mount and Wall Mount

■ Mounting/Dismounting with DIN Rail

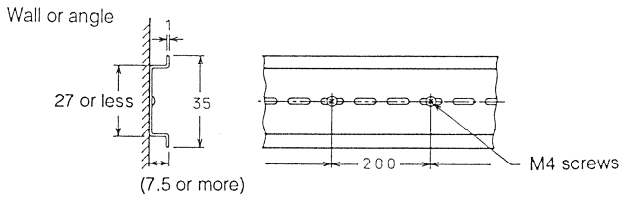
Notes 1. The following models of DIN rails and side clamps are recommended.

Rails: Model DAS-4 (Toyo Giken Co., Ltd.)*

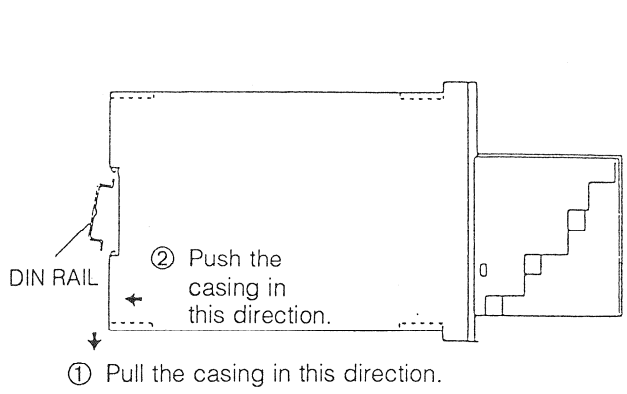
Side clamps: ATO-19 (Toyo Giken Co., Ltd.)*

2. Fix the rail with M4 screws at 200-mm intervals. Put the side clamps on both ends of the rail before fixing the rail.

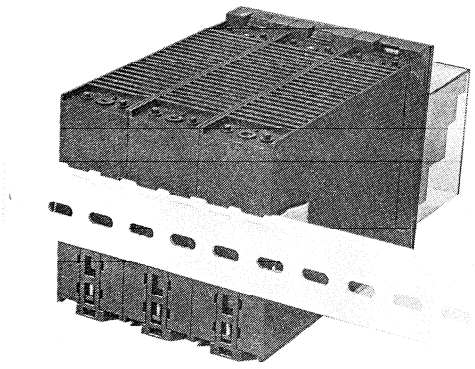
* Or equivalent



(1) Install the module by engaging the top of the DIN rail mount indent of the rear panel of the module with the DIN rail as shown in Fig. 5.



Installing the Module



Installed Module

Fig. 5

NOTE

When installing two or more modules, install them being closely contacted side by side.

(2) After installing the modules, fix the side clamps supporting the right or left ends of the outermost modules as shown in Fig. 6.

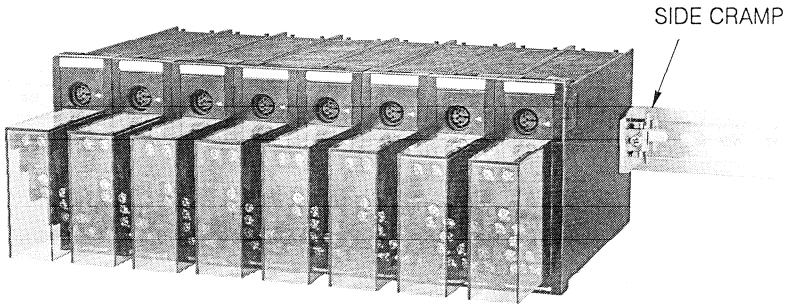


Fig. 6

(3) To remove the module, observe the instructions given in Fig. 7.

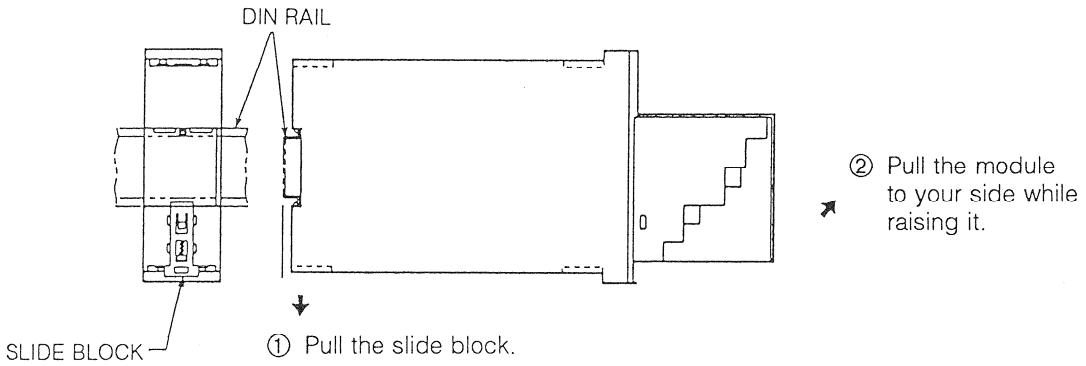


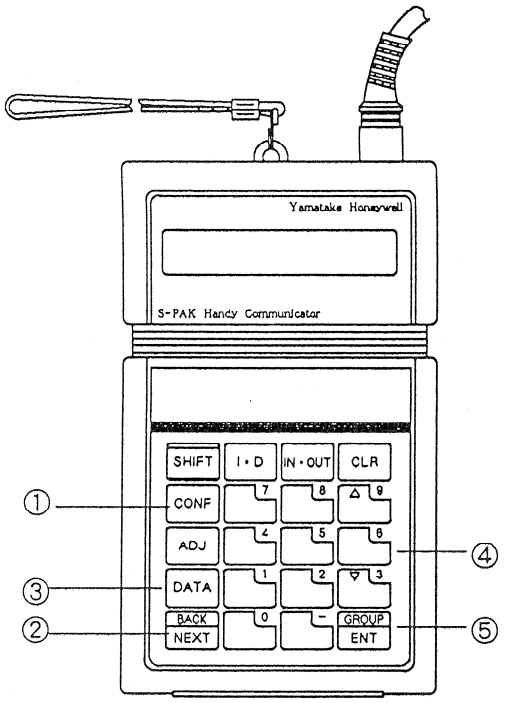
Fig. 7

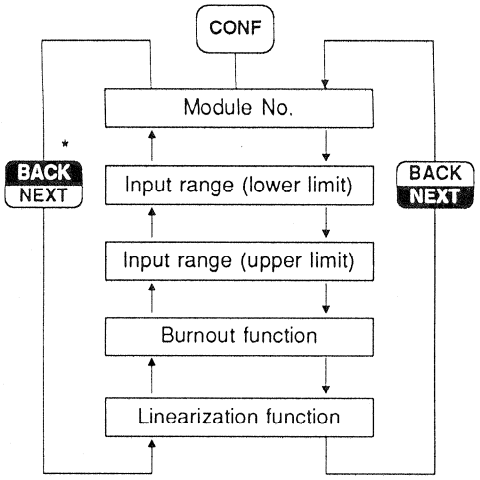
5. FUNCTION SETTING

5.1 Functions of Keys on Handy Communicator

Table 2 describes the functions of the keys which are used for setting functions.

Table 1. Handy Communicator Key Functions used for Function Setting



	Key	Function
①	I·D	Calls Select Processing Function. (Connect the cable to the module while pressing I·D key.)
②	CONF	**MOVES TO THE DATA SETTING FUNCTION.**
③	BACK NEXT	Data setting item selection keys: The key operations are as follows:  * Press BACK NEXT key after pressing SHIFT key.
④	DATA	Enables data setting.
⑤	0 – 9	0 to 9, and – : Keys Used for setting data.
⑥	GROUP ENT	GROUP ENT key: Registers setting data. GROUP ENT key: Used for confirmation registration. Use the GROUP ENT key after pressing the SHIFT key.

5.2 Function Setting Procedure

Function setting on the Millivolt Conversion Module is effected by application of the setting methods shown in Step 1 to Step 10 below, with the aid of the SystempaK-dedicated Handy Comunicator. Table 2 lists the required setting items and gives corresponding example set values for procedures Step 2 to Step 9 .

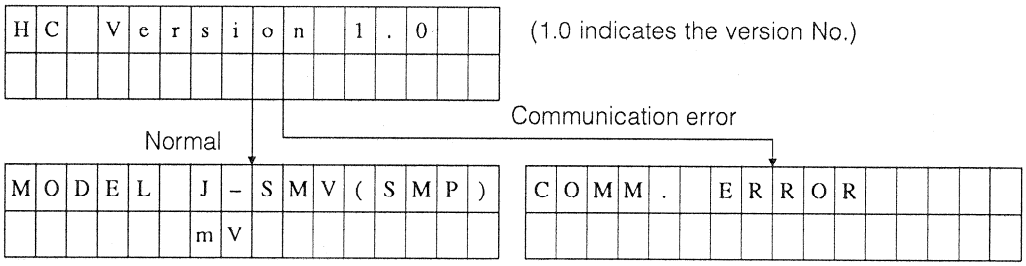
Table 2. Setting Items of Millivolt Conversion Function

Operation step	Setting item	Display on Handy Communicator	Values which are set in examples
2	Module No.	MODULE NO.	2
3	Low limit of input	INPUT RANGE LO	2 . 0 mV
4	High limit of input	INPUT RANGE HI	80 . 0 mV
6	Burnout function	BURN OUT	2 UP (Burnout up)
7	Linearizer function	LINEARIZE TABLE	2 USED (With Linearize function)
8	Linearize table	BREAK POINT X1 BREAK POINT Y1	0 . 0 0 . 0

Step 1 : Initial data display

① Connect the Handy Communicator while power is being supplied to the Millivolt Conversion Module.

➪ The following display will appear on the display unit of the Handy Communicator:



Note: In the case of a communication error, connect Handy Communicator again.

② Make sure that the selected function is being displayed. Set various items using Step 2 .

Step 2 : Setting a module No.

> Note: A module No. is used for management. It has nothing to do with the function of this conversion module. If it is unnecessary to set a module No, go to Step 3 (Setting a decimal point position) by pressing BACK NEXT key.

① Press CONF key, and the following display will appear. A module No. can be registered.

➪ The setting item name and the module No. which is already registered will be displayed in the upper line and the lower line, respectively.

(Example: 0)

M	O	D	U	L	E		N	O	.					
								0						

② Press DATA key.

➪ An underline will be displayed in the data field and "**" is appended indicating that the data being changed will be displayed in the right bottom columns.

M	O	D	U	L	E		N	O	.					
					_	_	_	_					*	*

③ Set a module No. by pressing 0 – 9 keys (max. 4 digits).

(Example: 1)

M	O	D	U	L	E		N	O	.					
					_	_	_	2					*	*

④ Register the module No. by pressing GROUP ENT key.

➪ "**" mark indicating the progress of data change will disappear and the module No. will be registered.

(Example: 1)

M	O	D	U	L	E		N	O	.					
								1						

⑤ If you made a setting mistake or want to change data again, repeat from ② .

Step 3 : Setting a low limit of input.

Set a range (low limit) of input values.

① Press the BACK NEXT key, and the following display will appear.
The upper line shows the setting item name, while the lower line shows the low limit of the input range already registered.

(Example: 0.0mV)

I	N	P	U	T		R	A	N	G	E		L	O		
						0	.	0	m	V					

② Press DATA key.

➪ An underline will be displayed in the data field and "**" is appended indicating the progress of data change will be displayed in the right bottom columns.

I	N	P	U	T		R	A	N	G	E		L	O		
				_	_	_	.	_	m	V				*	*

③ Set a low limit in the engineering unit by pressing keys 0 – 9 and – key. It should be within the following range.

Input signal: 2 to 100mV DC span

Suppression: –10 to 35mV DC or 3 times the span, whichever value is smaller

(Example: 2.0mV)

I	N	P	U	T		R	A	N	G	E		L	O		
				_	_	2	.	0	m	V				*	*

④ Press GROUP ENT key.

➪ "**" is appended indicating the progress of data change will disappear and the low limit of input will be registered.

(Example: 2.0mV)

I	N	P	U	T		R	A	N	G	E		L	O		
						2	.	0	m	V					*

⑤ If you made a setting error or want to change data again, repeat from ② .

⑥ To change only the input range (low limit), perform the group entry operation (final registration), Step 5 .

Step 4 : Setting a high limit of input.

Set a range (high limit) of input values.

① Press the BACK NEXT key, and the following display will appear.

The upper line shows the setting item name, while the lower line shows the high limit of the input range already registered.

(Example: 40.0mV)

I	N	P	U	T		R	A	N	G	E		H	I		
					4	0	.	0	m	V					

② Press DATA key.

➪ An underline will be displayed in the data field and "**" is appended indicating the progress of data change will be displayed in the right bottom columns.

I	N	P	U	T		R	A	N	G	E		H	I		
				_	_	_	.	_	m	V				*	*

③ Set a high limit in the engineering unit by pressing keys 0 – 9 and – key. It should be within the following range.

Input signal: 2 to 100mV DC span

Suppression: –10 to 35mV DC or 3 times the span, whichever value is smaller

(Example: 80.0mV)

I	N	P	U	T		R	A	N	G	E		H	I		
				_	8	0	.	0	m	V				*	*

④ Press GROUP ENT key.

➪ "**" is appended indicating the progress of data change will disappear and the high limit of the engineering unit will be registered.

(Example: 80.0mV)

I	N	P	U	T		R	A	N	G	E		H	I		
					8	0	.	0	m	V					*

⑤ If you made a setting error or want to change data again, repeat from ② .

⑥ To change only the input range (high limit), perform the group entry operation (final registration), Step 5 .

Step 5 : Group entry

This operation step is provided for final registration of the high and low limits of the input range set by Step 3 and Step 4 .

① Press the SHIFT key, and then the GROUP ENT key.

⇨ The "*" mark for final registration disappears, and the high and low limits of the input range are registered at the same time.

(Example: Display after setting the high limit of the input range)

I	N	P	U	T		R	∧	N	G	E		II	I	
					8	0	.	0	m	V				

② If the burnout function or the linearization function is needed, proceed to the next operation.

Otherwise, disconnect the cable from the SystempaK and terminal operation.

Step 6 : Selecting the burnout function

① Press BACK NEXT key, and the burnout function selection specification which is already registered will be displayed.

(Example: OFF)

B	U	R	N		O	U	T								
1	:		O	F	F										

└── Code indicating "burnout function: N" (See ③ .)

② Press DATA key.

⇨ An underline will be displayed in the data field and "**" is appended indicating the progress of data change will be displayed in the right bottom columns.

B	U	R	N		O	U	T								
_	:													*	*

③ Register whether to select or not to select the burnout function by pressing a key 1 to 3.

1 : OFF (Burnout function: Not)

2 : UP (Burnout function: Up)

3 : DOWN (Burnout function: Down)

(Example: UP)

B	U	R	N		O	U	T								
2	:		U	P										*	*

④ Press GROUP ENT key.

⇨ "**" is appended indicating the progress of data change will disappear and the specification will be registered.

(Example: UP)

B	U	R	N		O	U	T								
2	:		U	P											

⑤ If you made a setting error or want to change data again, repeat from ② .

Step 7 : Selecting the linearizer function

Select whether or not to perform linearizer operation on input signals.

① Press BACK NEXT key, and the linearizer function selection specification which is already registered will be displayed.

L	I	N	E	A	R	I	Z	E		T	A	B	L	E	
1	:		U	N	U	S	E	D							

└── Code indicating "linearizer function: N" (See ③ .)

② Press DATA key.

⇨ An underline will be displayed in the data field and "**" is appended indicating the progress of data change will be displayed in the right bottom columns.

L	I	N	E	A	R	I	Z	E		T	A	B	L	E	
_	:													*	*

③ Register whether to select or not to select the linearizer function by pressing a key 1 or 2 .

1 : UNUSED (Linearizer function: N)

2 : USED (Linearizer function: Y)

(Example: USED)

L	I	N	E	A	R	I	Z	E		T	A	B	L	E	
2	:		U	S	E	D								*	*

④ Press GROUP ENT key. The linearizer function is entered.

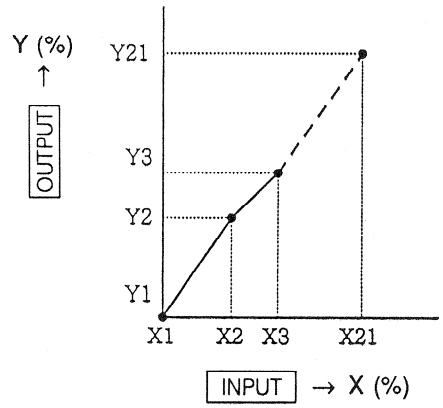
⇨ "**" is appended indicating the progress of data change will disappear and the specification will be registered.

(Example: USED)

L	I	N	E	A	R	I	Z	E		T	A	B	L	E	
2	:		U	S	E	D									

⑤ If you made a setting error or want to change data again, repeat from ② .

Step 8 : Register of Linearize Table



Twenty one break points can be set for a broken line table. Set them as X1, Y1 → X2, Y2 → .

If not setting all of the 21 break points, set 106.9% as the largest break point X_n ($n \leq 21$).

① Press BACK NEXT key, and the break point (%) of X_1 which is already registered will be displayed.

(Example: –6.9%)

B	R	E	A	K		P	O	I	N	T		X	1		
		–				6	.	9	%						

② Press DATA key.

➪ An underline will be displayed in the data field and "**" is appended indicating the progress of data change will be displayed in the right bottom columns.

B	R	E	A	K		P	O	I	N	T		X	1		
				_	_	_	.	_	%					*	*

③ Set a break point of X_1 by pressing keys 0 – 9 key. It should be within the following range.

Range: $-6.9\% \leqq Xn \leqq 106.9\%$
($n = 1$ to 21)

(Example: 0.0%)

B	R	E	A	K		P	O	I	N	T		X	1		
				_	_	0	.	0	%					*	*

④ Press GROUP ENT key.

➪ "**" is appended indicating the progress of data change will disappear and the ratio value will be registered.

(Example: 0.0%)

B	R	E	A	K		P	O	I	N	T		X	1		
						0	.	0	%						

⑤ If you made a setting error or want to change data again, repeat from ② .

⑥ Press [BACK NEXT] key, and the break point (%) of Y_1 which is already registered will be displayed.

Set break point Y1 by employing the procedure of setting break point X1.

(Example: –6.9%)

B	R	E	A	K		P	O	I	N	T		Y	1		
		–				6	.	9	%						

⑦ Press [DATA] key.

➪ An underline will be displayed in the data field and "**" is appended indicating the progress of data change will be displayed in the right bottom columns.

B	R	E	A	K		P	O	I	N	T		Y	1		
				_	_	_	.	_	%					*	*

⑧ Set a break point of Y_1 by pressing keys [0] – [9] and [–] key. It should be within the following range.

Range: $-6.9\% \leqq Yn \leqq 106.9\%$
$(n = 1 \text{ to } 21)$

(Example: 0.0%)

B	R	E	A	K		P	O	I	N	T		Y	1		
				_	_	0	.	0	%					*	*

⑨ Press [GROUP ENT] key.

➪ "**" is appended indicating the progress of data change will disappear and the bias value will be registered.

(Example: 0.0%)

B	R	E	A	K		P	O	I	N	T		Y	1		
						0	.	0	%						

⑩ If you made a setting error or want to change data again, repeat from ⑦.

Set the next break point (X_{1+n}, Y_{1+n}).

⑪ ➪ Set break point X2, Y2 by employing the procedure of setting break point X1, Y1.

➪ If not setting all of the 21 break points, set "106.9%" as the largest break point.

Step 9 : Group Entry

① Press the SHIFT key and then the GROUP ENT key, and the following display will appear after final registration:

L	I	N	E	A	R	I	Z	E		T	A	B	L	E	
2	:		U	S	E	D									

Step 10 : End

Disconnect the cable from the SystempaK.

6. ADJUSTING OUTPUT

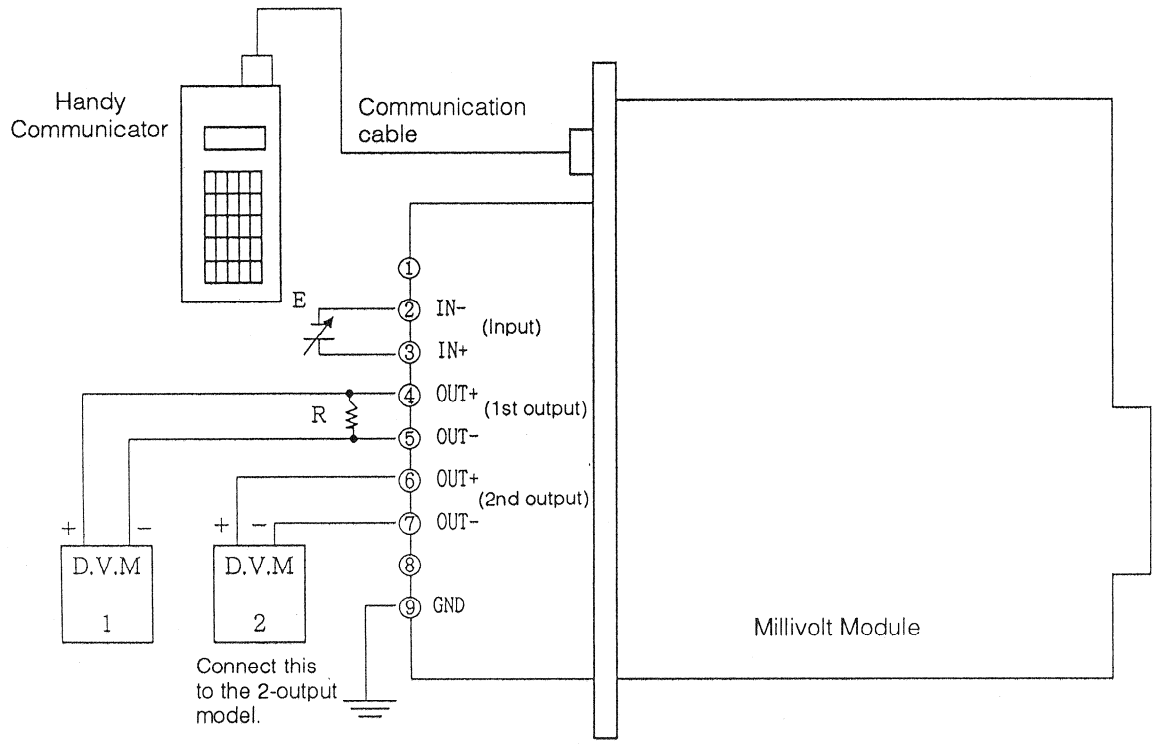
Use Handy Communicator provided exclusively for the SystempaK for adjusting the output. Adjust the 1st output. Make sure that the 2nd output satisfies the specified output accuracy.

Check the output with each of the functions in advance. Then, adjust the output for all the functions comprehensively.

6.1 Preparation

(1) Connect measuring instruments as illustrated in Fig. 8.

(2) Warm up the system for at least 15 minutes in order to stabilize the operation.



D.V.M 1/D.V.M 2:
Digital voltmeter
Measurement range: 1 – 5V
Accuracy: ± 1mV
Impedance: 500KΩ or more

E: Reference voltage generator
(for 1 – 5V)

R: 250Ω ± 0.05%
(Connect it when the output is
4 – 20mA.)

Fig. 8. Calibration and Adjustment

6.2 Confirmation Prior to Adjustment

[Without linearization]

Set the input range from the reference voltage generator at 0% and 100% and make sure that the digital voltmeter (D.V.M1) indicates 1V± the output conversion accuracy and 5V± the output conversion accuracy respectively.

If these values do not fall within the output accuracy, make an adjustment in the zero and span of the output with the Handy Communicator.

[With linearization]

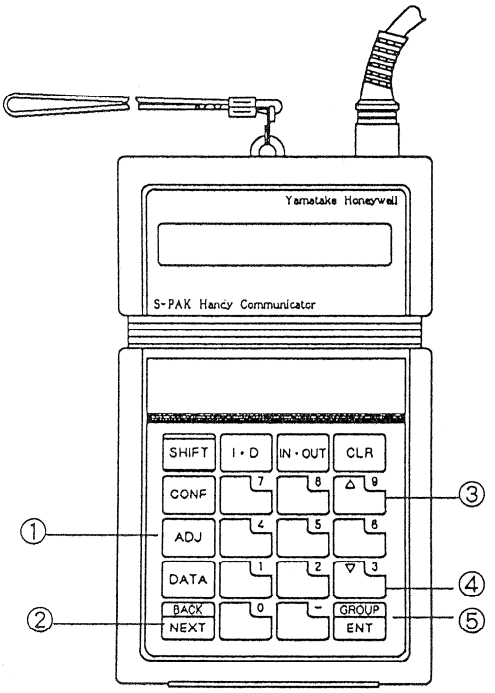
If the Millivolt Conversion Module has the linearization function, reset the module to the "Without linearization function" state, referring to " Step 7 : Linearization function setting" in Chapter 4 and adjust the output.

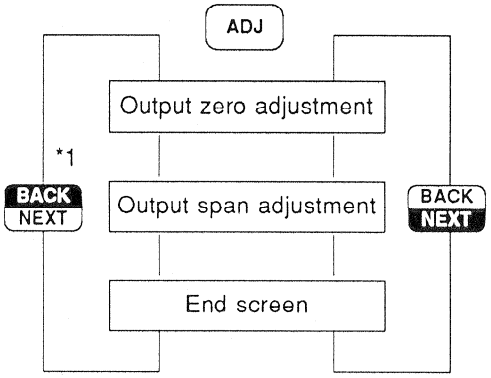
After the adjustment, return to the "With linearization function".

6.3 Adjusting Method

After completing the preparation explained in Chapter 6.1, adjust the zero and span of the output using a Handy Communicator. Table 3 describes the functions of the keys on the Handy Communicator which are used for the adjustment. Adjust No. 1 output only and make sure that No. 2 output meets the specified accuracy.

Table 3. Functions of the Handy Communicator Keys Used for Adjustment



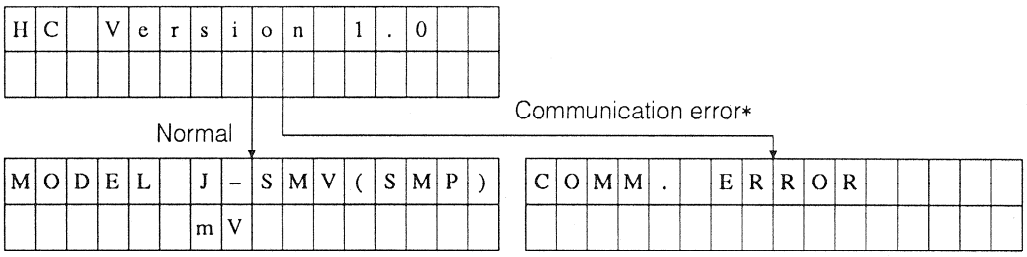
	Key	Function
①	ADJ	Output adjustment select key: When this key is pressed, Handy Communicator becomes ready for adjusting the output zero and span.
②	BACK NEXT	Adjusting item select key: This key operates as shown below.  *1 Press BACK NEXT key after pressing SHIFT key.
③	9	Increases setting data.
④	3	Decreases setting data.

6.3.1 Adjusting Procedure of Handy Communicator

Step 1 : Initial data display

① When Millivolt Conversion Module is ON, connect Handy Communicator to it.

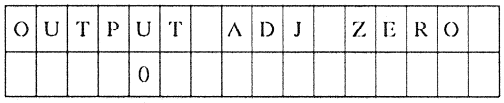
➪ The following information will be displayed automatically on the display area of the Handy Communicator.



* In the case of a communication error, connect Handy Communicator again.

Step 2 : Output zero adjustment

① Press [ADJ] key, and the Handy Communicator will be ready for output zero adjustment. If adjusting the output span only, go to Step 3 by pressing [BACK NEXT] key.

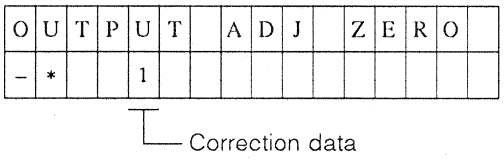


② Set the reference voltage generator to the voltage corresponding to range 0% and measure the output of the SystempaK with the digital voltmeter (D.V.M 1).

③ Increase or decrease the output value by pressing [△ 9] or [▽ 3] key of the Handy Communicator so that the reading of the digital voltmeter (D.V.M 1) may satisfy 1V ± output conversion accuracy.

(Note: The adjusting range of output zero is −1% to +1%.)

➪ The correction data of zero adjustment which was set by [△ 9] and [▽ 3] keys will be displayed on the Handy Communicator.



④ If not adjusting the output span, go to Step 4 by pressing twice [BACK NEXT] key.

Step 3 : Output span adjustment

① Press BACK NEXT key, and the Handy Communicator will be ready for output span adjustment.

O	U	T	P	U	T		A	D	J		S	P	A	N	

② Set the reference voltage generator to the voltage corresponding to range 100%* and measure the output of the SystempaK with the digital voltmeter (D.V.M 1).

* When the reverser function is selected, set it to the voltage corresponding to 0%.

③ Increase or decrease the output value by pressing △ 9 or ▽ 3 key of the Handy Communicator so that the reading of the digital voltmeter (D.V.M 1) may satisfy 5V ± output conversion accuracy.

(Note: The adjusting range of the maximum value is 99% to 101%.)

➪ The correction data of span adjustment which was set by △ 9 and ▽ 3 keys will be displayed on the Handy Communicator.

O	U	T	P	U	T		A	D	J		S	P	A	N	
				1											

Correction data

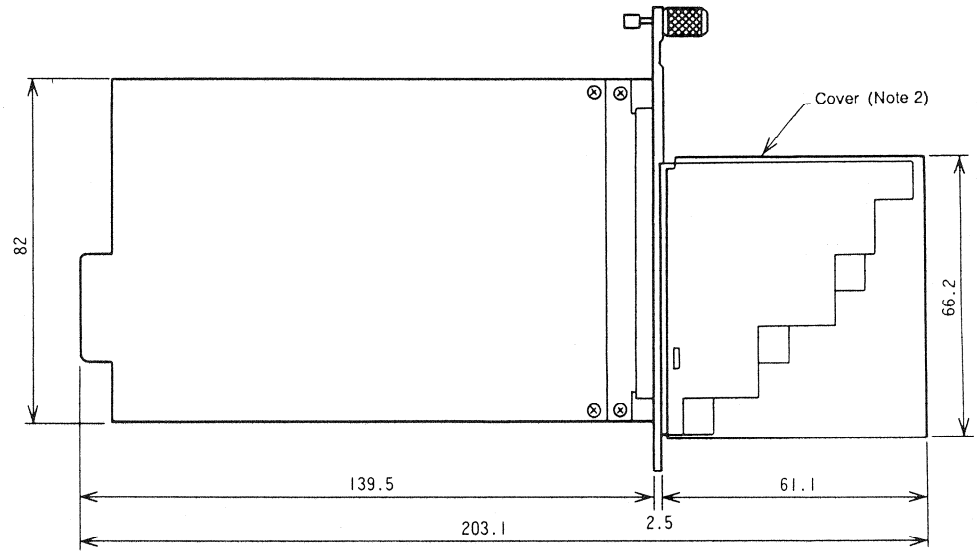
Step 4 : Ending procedure

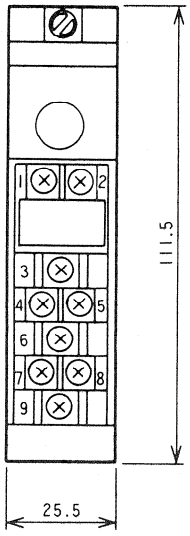
① Press BACK NEXT key, and the end screen of the output adjustment function will be displayed.

O	U	T	P	U	T		A	D	J		E	N	D		
				1											

② If press BACK ENT key, returns to Step 2 .

7. EXTERNAL DIMENSION DRAWING AND TERMINAL CONNECTION DIAGRAM





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

Notes: 1) For two-output model.
2) Operate the Module with a cover.
3) Terminal screws: M3.5
4) Use the pressured terminals with insulation sheath.

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