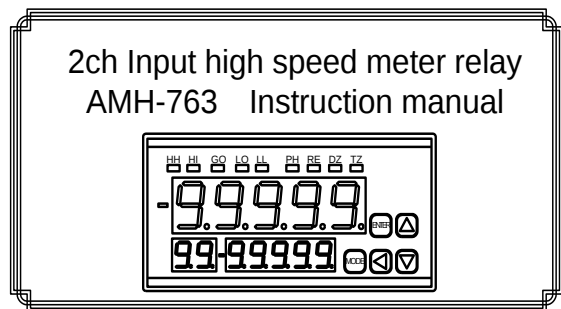




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Warning

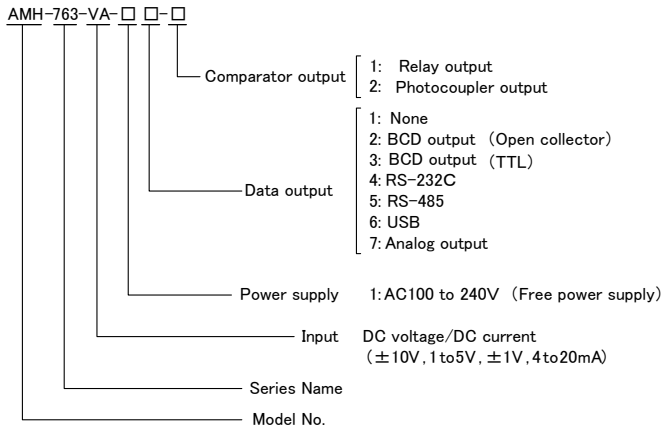
- (1) Putting the voltage or current surpassed maximum allowable value for input which leads to damage of the machinery.
- (2) Please use power supply voltage in the range available. If you use out of range available, that will be cause of fire hazard, electric shock and fault.
- (3) You should be aware that content hereof is subject to change without notice.
- (4) Regarding the contents of this booklet, please kindly contact to our company or distributor, if there is any points to notice, aware and the leakage of writing.
- (5) Please keep this instruction manual in a place where you can watch this anytime.

1. Notes to users

Thank you for using this AMH-763 this time. Please keep this instruction manual at your sight. And, please confirm the damage through transit, if you have any points to notice, please contact directly to our company.

1.1 Model No. configuration

AMH-763 type composition is as follows. Please confirm selected products at your ordered.



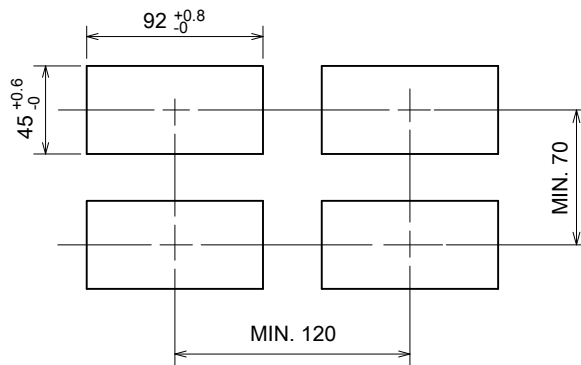
1.2 Confirm the accessories

AMH-763 accessory is this instruction manual and one unit seal. Yet, in the case of BCD output(HIF3BA-34D-2.54R [Hirose Electric CO.,LTD.])socket will be attached.

2. Mounting method

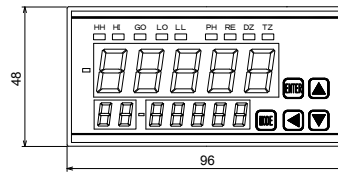
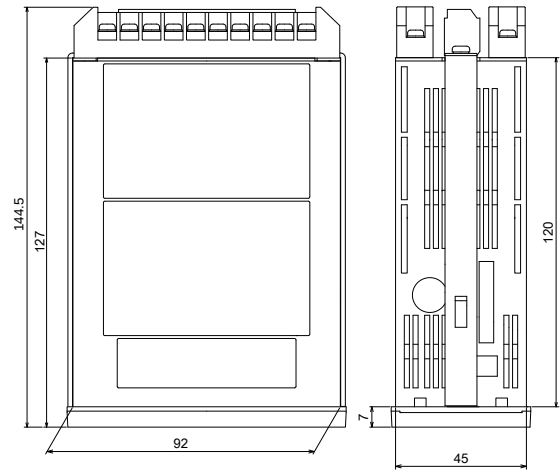
2.1 Panel cut dimension

Panel cut dimension is as following diagram by attaching AMH-763.



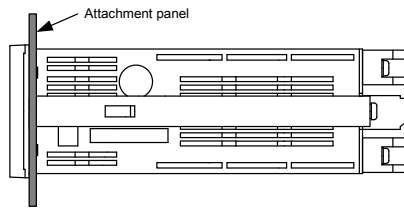
*Recommended Panel thickness 0.8mm to 5mm

2.2 External dimensions



2.3 Installation method on the Panel

Please pick at the attachment band from the panel rear and insert from the panel front in the condition taking of belt of the machine.

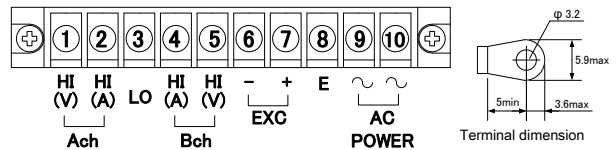


Warning

- (1) Please use this in the place where there are no dust, dirt, toxic chemical to electrical parts and corrosive gas etc.
- (2) In the case of setting this machine in the device, please pay note to the heat liberation not over the 50 celsius in the device.
- (3) Please do not harm the vibration and shock.
- (4) Please mount horizontally.

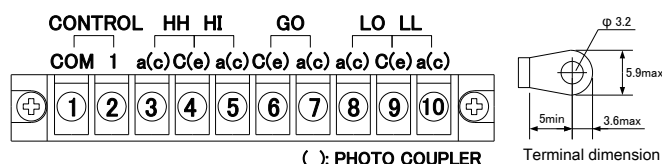
3. Terminals and Connections

3.1 Lower terminals



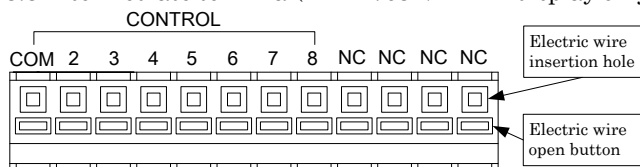
Terminal No.	Name	Contents
1	Ach HI (V)	Ach voltage input terminal +side
2	Ach HI (A)	Ach current input terminal +side
3	LO	Ach, Bch common input terminal -side *In the case of 2ch simultaneous input, please connect wiring divided in two.
4	Bch HI (A)	Bch current input terminal +side
5	Bch HI (V)	Bch voltage input terminal +side
6	EXC -	Sensor output power terminal -side
7	EXC +	Sensor output power terminal +side
8	E	Ground terminal *Please pay note not to contact with the other terminal because that will be charged at neutral point.
9	AC POWER	AC power supply terminal
10	AC POWER	

3.2 Upper terminals



Terminal No.	Name	Content	Relay Output	Photocoupler Output
1	CONTROL COM	Control terminal common terminal	—	—
2	CONTROL 1	Control input No.1 terminal	—	—
3	HH a (c)	HH comparator output terminal	a contact	collector
4	HH,HI C (e)	HH,HI comparator output common terminal	COM	emitter
5	HI a (c)	HI Comparator output terminal	a contact	collector
6	GO C (e)	GO comparator output common terminal	COM	emitter
7	GO a (c)	GO comparator output terminal	a contact	collector
8	LO a (c)	LO comparator output terminal	a contact	collector
9	LO,LL C (e)	LO,LL comparator output common terminal	COM	emitter
10	LL a (c)	LL comparator output terminal	a contact	collector

3.3 Intermediate terminal(AMH-763-VA-11-X display only)

**Screwless terminal** (Available for plug detachment)Rating applicable wire: one wire $\phi 1.0\text{mm}$ (AWG18)Stranded cable 0.75mm^2 (AWG20) More than one wire $\phi 0.18$ Available for use wire range: single line $\phi 0.4\text{mm}$ (AWG26) to $\phi 1.0\text{mm}$ (AWG18)Stranded cable 0.3mm^2 (AWG22) to 0.75mm^2 (AWG20)Wire span more than $\phi 0.18$

Standard strip line length: 9mm

Adjustment tool for button operation: Minus driver (axial $\phi 3$, blade width 2.6)

Wiring method: Keep pushing wire open button by minus driver, insert the wire to the wire insertion hole till it end and, release the wire open button.

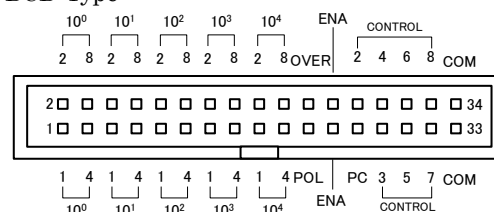
Name	Content
CONTROL COM	Control input common terminal
CONTROL 2	Control input No.2 terminal
CONTROL 3	Control input No.3 terminal
CONTROL 4	Control input No.4 terminal
CONTROL 5	Control input No.5 terminal
CONTROL 6	Control input No.6 terminal
CONTROL 7	Control input No.7 terminal
CONTROL 8	Control input No.8 terminal
NC	Unconnected *Please do not use as relay terminal
NC	
NC	
NC	

3.4 Intermediate terminal(BCD output AMH-763-VA-12,3-X)

Available for select output type (BCD or Binary type) by setup change.

*As an accessory, MIL type connector HIF3BA-34D-2.54R(Hirose Electric Co., Ltd.) will be attached.

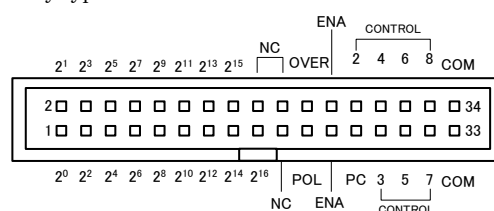
3.4.1 BCD Type



Terminal No.	Name	Contents	Terminal No.	Name	Contents
1	10 ⁰ 1	Data output	18	10 ¹ 2	Data Output
2	10 ⁰ 2		19	10 ¹ 4	
3	10 ⁰ 4		20	10 ¹ 8	
4	10 ⁰ 8		21	POL	Polarity output
5	10 ¹ 1		22	OVER	Over output
6	10 ¹ 2		23	ENA	Output allowable input
7	10 ¹ 4		24		
8	10 ¹ 8		25	PC	Printing command signal
9	10 ² 1		26	CONTROL 2	Control input No.2 terminal
10	10 ² 2		27	CONTROL 3	Control input No.3 terminal
11	10 ² 4		28	CONTROL 4	Control input No.4 terminal
12	10 ² 8		29	CONTROL 5	Control input No.5 terminal
13	10 ³ 1		30	CONTROL 6	Control input No.6 terminal
14	10 ³ 2		31	CONTROL 7	Control input No.7 terminal
15	10 ³ 4		32	CONTROL 8	Control input No.8 terminal
16	10 ³ 8		33	COM	Common Terminal
17	10 ⁴ 1		34		

*COM's of BCD output and control terminal will be common.

3.4.2 Binary type

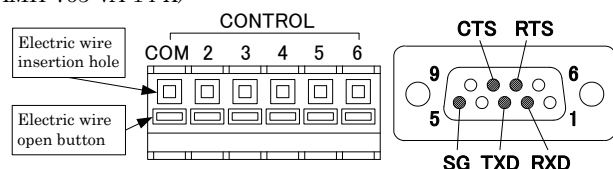


Terminal No.	Name	Contents	Terminal No.	Name	Contents
1	2 ⁰	Data Output	18	NC	Unconnected
2	2 ¹		19	NC	*Don't use as relay terminal
3	2 ²		20	NC	terminal
4	2 ³		21	POL	Polar output
5	2 ⁴		22	OVER	Over output
6	2 ⁵		23	ENA	Output allowance input
7	2 ⁶		24		
8	2 ⁷		25	PC	Printing command signal
9	2 ⁸		26	CONTROL 2	Control input No.2 terminal
10	2 ⁹		27	CONTROL 3	Control input No.3 terminal
11	2 ¹⁰		28	CONTROL 4	Control input No.4 terminal
12	2 ¹¹		29	CONTROL 5	Control input No.5 terminal
13	2 ¹²		30	CONTROL 6	Control input No.6 terminal
14	2 ¹³		31	CONTROL 7	Control input No.7 terminal
15	2 ¹⁴		32	CONTROL 8	Control input No.8 terminal
16	2 ¹⁵		33	COM	Common terminal
17	2 ¹⁶		34		

*BCD outputs COM and control terminals are common.

*Don't use NC terminal as relay terminal.

3.5 Intermediate terminal (RS-232 Communication AMH-763-VA-14-X)



Screwless terminal (Available for plug detachment)

Rating applicable wire: one wire $\phi 1.0\text{mm}$ (AWG18)

Stranded cable 0.75mm^2 (AWG20) More than one wire $\phi 0.18$

Available for use wire range: single line $\phi 0.4\text{mm}$ (AWG26) to $\phi 1.0\text{mm}$ (AWG18)

Stranded cable 0.3mm^2 (AWG22) to 0.75mm^2 (AWG20)

Wire span more than $\phi 0.18$

Standard strip line length: 9mm

Adjustment tool for button operation: Minus driver (axial $\phi 3$, blade width 2.6)

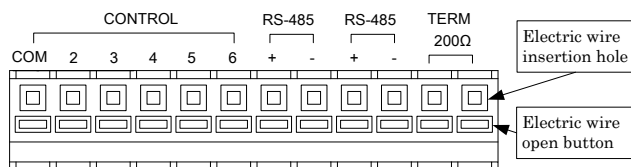
Wiring method: Keep pushing wire open button by minus driver, insert the wire to the wire insertion hole till it end and, release the wire open button.

RS-232C part

Cable: D-SUB 9 pin (female) cross cable (maximum 15m)

Name	Content	Pin No.	Signal name	Content
CONTROL COM	Control input common terminal	1	NC	Unconnected
CONTROL 2	Control input No.2 terminal	2	RXD	Receive data
CONTROL 3	Control input No.3 terminal	3	TXD	Transmit data
CONTROL 4	Control input No.4 terminal	4	NC	Unconnected
CONTROL 5	Control input No.5 terminal	5	SG	Signal grand
CONTROL 6	Control input No.6 terminal	6	NC	unconnected
CONTROL 7	Control input No.7 terminal	7	RTS	Request to send
-	-	8	CTS	Clear to send
-	-	9	NC	Unconnected

3.6 Intermediate terminal(RS-485 communication AMH-763-VA-15-X)



Screwless terminal (Available for plug detachment)

Rating applicable wire: one wire $\phi 1.0\text{mm}$ (AWG18)

Stranded cable 0.75mm^2 (AWG20) More than one wire $\phi 0.18$

Available for use wire range: single line $\phi 0.4\text{mm}$ (AWG26) to $\phi 1.0\text{mm}$ (AWG18)

Stranded cable 0.3mm^2 (AWG22) to 0.75mm^2 (AWG20)

Wire span more than $\phi 0.18$

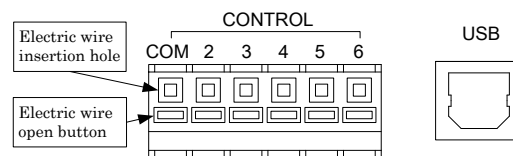
Standard strip line length: 9mm

Adjustment tool for button operation: Minus driver (axial $\phi 3$, blade width 2.6)

Wiring method: Keep pushing wire open button by minus driver, insert the wire to the wire insertion hole till it end and, release the wire open button.

Name	Contents
CONTROL COM	Control input Common terminal
CONTROL 2	Control input No.2 terminal
CONTROL 3	Control input No.3 terminal
CONTROL 4	Control input No.4 terminal
CONTROL 5	Control input No.5 terminal
CONTROL 6	Control input No.6 terminal
RS-485 +	RS-485 non-inversion input & output
RS-485 -	RS-485 inversion input & output
RS-485 +	RS-485 non-inversion input & output
RS-485 -	RS-485 inversion input & output
TERM 200Ω	When short between terminals, resistance 200 Ω connect between non-inversion input & output and inversion input & output.

3.7 Intermediate terminal (USB Communication AMH-763-VA-16-X)



Screwless terminal (Available for plug detachment)

Rating applicable wire: one wire $\phi 1.0\text{mm}$ (AWG18)

Stranded cable 0.75mm^2 (AWG20) More than one wire $\phi 0.18$

Available for use wire range: single line $\phi 0.4\text{mm}$ (AWG26) to $\phi 1.0\text{mm}$ (AWG18)

Stranded cable 0.3mm^2 (AWG22) to 0.75mm^2 (AWG20)

Wire span more than $\phi 0.18$

Standard strip line length: 9mm

Adjustment tool for button operation: Minus driver (axial $\phi 3$, blade width 2.6)

Wiring method: Keep pushing wire open button by minus driver, insert the wire to the wire insertion hole till it end and, release the wire open button.

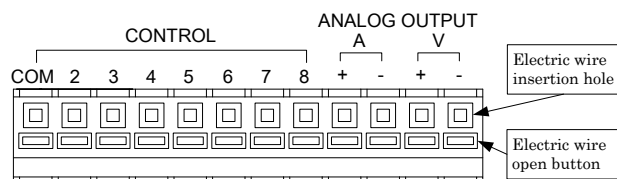
USB part

Connector :USB B type

Please use USB cable in the market.(5m at maximum)

Name	Content
CONTROL COM	Control input Common terminal
CONTROL 2	Control input No.2 terminal
CONTROL 3	Control input No.3 terminal
CONTROL 4	Control input No.4 terminal
CONTROL 5	Control input No.5 terminal
CONTROL 6	Control input No.6 terminal

3.8 Intermediate terminal(Analog output AMH-763-VA-17-X)



Screwless terminal (Available for plug detachment)

Rating applicable wire: one wire $\phi 1.0\text{mm}$ (AWG18)

Stranded cable 0.75mm^2 (AWG20) More than one wire $\phi 0.18$

Available for use wire range: single line $\phi 0.4\text{mm}$ (AWG26) to $\phi 1.0\text{mm}$ (AWG18)

Stranded cable 0.3mm^2 (AWG22) to 0.75mm^2 (AWG20)

Wire span more than $\phi 0.18$

Standard strip line length: 9mm

Adjustment tool for button operation: Minus driver (axial $\phi 3$, blade width 2.6)

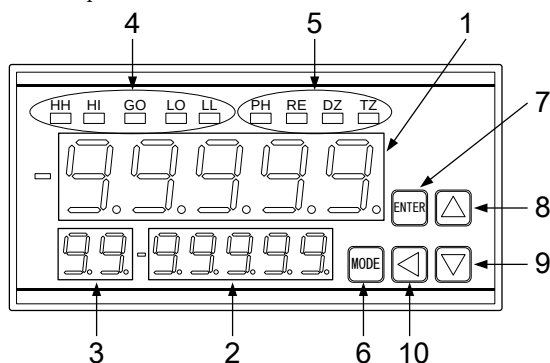
Wiring method: Keep pushing wire open button by minus driver, insert the wire to the wire insertion hole till it end and, release the wire open button.

Name	Contents
CONTROL COM	Control Input Common Terminal
CONTROL 2	Control Input No.2 Terminal
CONTROL 3	Control Input No.3 Terminal
CONTROL 4	Control Input No.4 Terminal
CONTROL 5	Control Input No.5 Terminal
CONTROL 6	Control Input No.6 Terminal
CONTROL 7	Control Input No.7 Terminal
CONTROL 8	Control Input No.8 Terminal
ANALOG A +	Analog current output + side terminal
ANALOG A -	Analog current output - side terminal
ANALOG V +	Analog voltage output + side terminal
ANALOG V -	Analog voltage output - side terminal

*Please do not connect load simultaneously to current output terminal and voltage output terminal.

4. Parameter settings

4.1 Components and functions



No.	Name	Main Function	
		At the measuring mode	At the setup mode
1	Main Display	Operation result display	Group name, display of parameter setup value.
2	Monitor Display	Comparator setup value, Maximum and Minimum value, Ach, Bch measured value, Pattern No. Display	Group selection condition display, parameter display.
3	Sub Display	Display of monitor display item name	Group No. Display, Parameter No. Display.
4	Comparator output display	Display of comparison judgment results.	Lights-off(Comparator output OFF)
5	Function Display	PH	Light at the time of Peak Hold Function Terminal "ON".
		RE	Light at the time of Remote Control Condition by communication function.
		DZ	Lights while digital zero is "ON"
		TZ	Light "Tracking Zero Function" at the time of "ON"
6	MODE KEY	Transit to setup mode by mode and UP key.	Select, Decision
7	ENTER KEY	Measurement pattern mode switching.	Return, Cancel
8	UP KEY	Monitor Display content's change.	Above item moving setup "Plus".
9	DOWN KEY		Below item moving setup value minus.
10	SHIFT KEY	Monitor Display Content's change.	Select, setup digit change.

4.2 Numeric and character display

Indication on the main display and characters correspond to them are as follows:

0 1 2 3 4 5 6 7 8 9 - / + &
 0 1 2 3 4 5 6 7 8 9 - / + &
 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 A b c d e f G H I J K L M n o P q r S t U v u y z

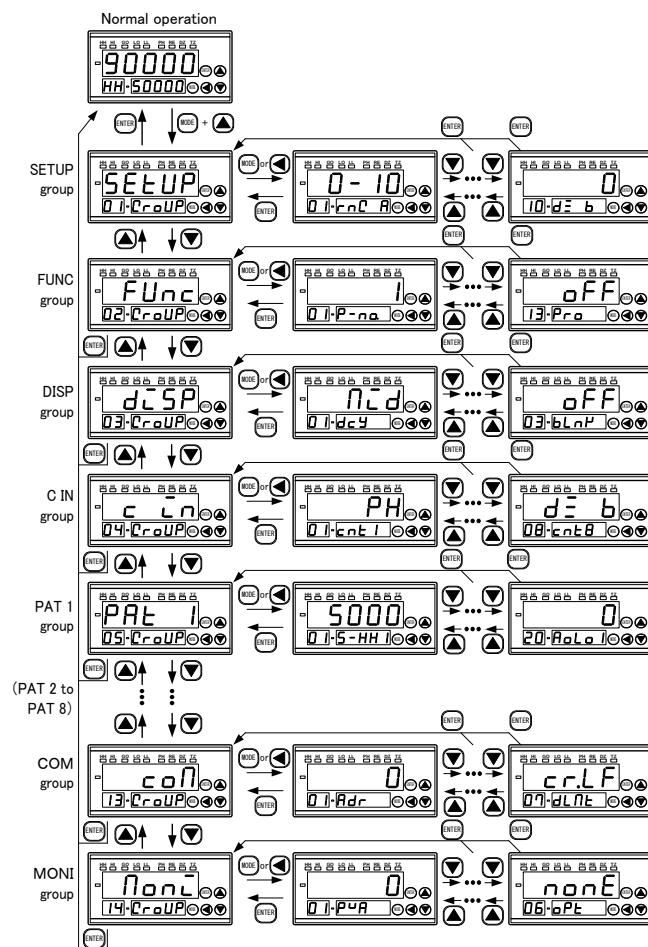
4.3 Group

The parameter will be divided to group with main purpose.
 At the time of changing parameter, please move to the group involved with objective parameter.

No.	Group name	Setup contents	Group category
1	SETUP	Basic	Condition data
2	FUNC	Function	
3	DISP	Display	
4	C IN	Control terminal function	Pattern data
5	PAT 1	Pattern 1	
6	PAT 2	Pattern 2	
7	PAT 3	Pattern 3	
8	PAT 4	Pattern 4	
9	PAT 5	Pattern 5	
10	PAT 6	Pattern 6	
11	PAT 7	Pattern 7	
12	PAT 8	Pattern 8	
13	COM	Communication	Condition data
14	MONI	Condition	—

4.4 Shift to the Parameter setting mode

In the case of each parameter setup, basic operation will be as follows:



5. The list of each parameter and setup method

5.1 SETUP group parameter

5.1.1 The list of SETUP group parameter

No.	Name	Name	Setup range	Initial value
1	rnG A	Input Range Ach	0-10: ±10V 1-5: 1-5V(±5V)	0-10
2	rnG B	Input Range Bch	0-1: ±1V 4-20: 4-20mA	
3	SMP	Sampling speed	4000:4000 times/sec 2000:2000 times/sec 1000:1000 times/sec 500:500 times/sec 200:200 times/sec 100:100 times/sec 50:50 times/sec 20:20 times/sec 10:10 times/sec 5:5 times/sec 2:2 times/sec 1:1 times/sec	50
4	cALc	Switching the calculation	ACH: Ach BCH: Bch K-A: K-A A+B: A+B A-B: A-B K-A+B: K-(A+B) A-B/B: ((A-B)/ B)×1000 B/A: (B/A)×1000 1-B/A: {1-(B/A)}×1000 B/A-1: (B/A-1)×1000 A&B: Ach (AMH-762 for interchangeable)	ACH
5	K	Operation constant	-99999 to 99999	0
6	MAV A	Moving average Ach	OFF: nothing 16:16times 2:2times 32:32times	OFF
7	MAV B	Moving average Bch	4:4times 64:64times 8:8times	
8	dZ.bU	Digital zero backup	OFF: There is no backup. ON: There is backup.	OFF
9	dZ A	Digital zero value Ach	-99999 to 99999	0
10	dZ B	Digital zero value Bch		

No.1,2 Input Range: Setup input range.(Ach, Bch independence)

After full scale input value setup change, offset input value will be re-written and preserve to E2PROM.

Note) After setup change, during E2PROM preservation parameter setup will be unavailable.

No.3 Sampling speed: Setup input sampling speed.

Average 4000 times/ second data by setup speed and always sampling at 4000 times / second.

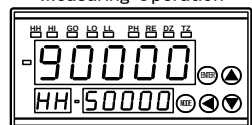
No.4 Switching the calculation: Select calculation type. * At the time of A&B setup, when power supply start-up monitor sub display set Bch. (Prefer the SUB setup value)**No.5 Operation constant:** Setup constant number "K" using computation. (Only calculation formula using "K")**No.6, 7 Moving average:** Setup the times of input moving average transaction.(Ach, Bch independent)**No.8 Digital Zero Backup:** At the time of digital zero "ON" setup whether write in digital zero value to E2PROM or not.**No.9, 10 Digital Zero Value:** Setup digital zero value at the time of digital zero "ON".(Ach, Bch independent)

Note) Setup "ON" at the digital zero time, value will be change.

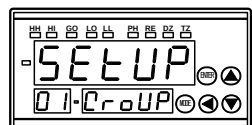
5.1.2 SETUP group parameter setup method.

As a representative example, demonstrate the input range Ach setup operation example.

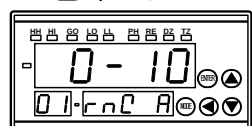
Another parameter will be the same operation method.

Measuring Operation

- (1) Press the mode key and up key during measuring operation.
Shift to SETUP group parameter.



- *Press the enter key at setup display, return to measurement operation.



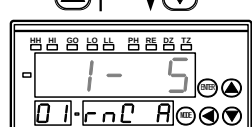
- (2) Press the mode key or shift key.
Shift to input range Ach setup items in the SETUP group parameter

*Return to "SETUP " by pushing enter key.



- (3) Push the mode key or shift key.
Flash Ach's setup range.

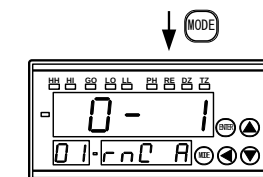
*Return to input range Ach setup item by pushing enter key.



- (4) Select setup range by pushing up key.

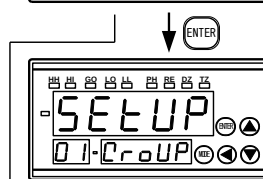
*Press the up key, setup range will be changed in the turns of "1-5" → "0-1" → "4-20".

*On the contrary, press the down key from 4 to 20, setup range will be changed in the turns of "0-1" → "1-5" → "0-10".

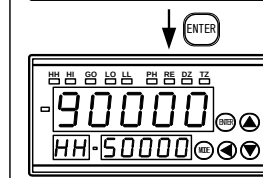


- (5) Press the mode key and fix the setup range.
After fixing, stop the display blinking.

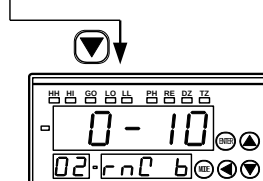
Note: Setup value will be "invalid" after not pressing the mode key and pushing enter key.



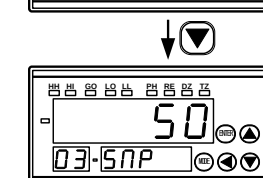
- (6) After pressing the enter key, shift to SETUP.
*In the case of shift to next setup menu, please reference with the (8) section.



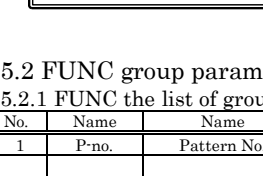
- (7) Press the enter key and return to measurement operation.



- (8) Press the down key, and transit to next setup menu. Input range Bch setup menu will be displayed.



*Input range Bch Setup, and setup the above mentioned same operation.



- (9) Shift to next setup menu by pushing the down key.
Note: In the case of setup digital zero value and calculation constant and transit to setup available digit by shift key.

5.2 FUNC group parameter**5.2.1 FUNC the list of group parameter**

No.	Name	Name	Setup range	Initial Value
1	P-no.	Pattern No.	1 to 8	1
2	PSEL	Pattern select	INT: Front key, Communication EXT: External control terminal	EXT
3	S-H	Start/ Hold type	A: Free run B: One shot	A
4	PVH	Peak Hold type selection	PH: Maximum value hold VH: Minimum value hold PVH:(Maximum value-Minimum value hold)	PH
5	P-H	Peak Hold type	A: present continuous type B: Result type	A
6	Std	Start delay	0 to 10000[sample]	0
7	rLd	Comparator output delay	0 to 1000[msec]	0
8	tr t	Tracking zero correction cycle	0 to 10000[sample]	0
9	tr W	Tracking zero correction width	1 to 99[digit]	1
10	FIX	Fix zero	OFF ON	OFF
11	A.oUt	Analog output type	0-10: 0 to 10V 1-5: 1 to 5V 4-20: 4 to 20mA	0-10
12	bcd.t	BCD output type	BCD: 2digit 10digit BIN: 2digit	BCD
13	Pro	Setup value change protect	OFF: nothing PATN: pattern COND: condition ALL: all	OFF

No.1 Pattern number: Setup using parameter pattern no.

Note) At the time of PSEL=EXT, setup will be unavailable.

No.2 Pattern select: Select the pattern select method.**No.3 Start/ Hold type:** Setup start/hold function's operation type.**No.4 Peak Hold type selection:** Select the Peak Hold function's hold type.**No.5 Peak Hold type:** Setup Peak Hold Function Operating Type.**No.6 Start delay:** At the time of using Start/Hold function setup "delay" from start condition to take in signal.
Delay time=Setup value × sampling time

- No.7 Comparator output delay:** At the time of changing from "ON" to "OFF", comparator judgment's output setup the time until "OFF".
- No.8 Tracking zero correction cycle:** At the time of digital zero function, setup the tracking zero function's correction cycle.
Adjustment time = setup value × sampling time
- No.9 Tracking zero correction width:** At the time of digital zero function using, setup the zero correction display width at the time of tracking zero function.
- No.10 Fix zero:** Fix display 10⁰ digits to "0" by compulsion.
- No.11 Analog output type:** When selecting Analog output, select the output type.
- No.12 BCD output time:** At the time of select BCD output, select output type.
- No.13 Setup value change protect:** Setup approval or amendment of setup value.

5.2.2 FUNC group parameter setup method.

As a representative example, demonstrate the peak hold type setup operational example. The other parameter sets same operational method.

Measuring Operation

(1) Press the mode key and up key during measurement operation. Shift to SETUP group parameter.

*Press the enter key at display setup, return to measurement operation. And, transit to FUNC group parameter by pushing the down key.

(2) Press the down key, and shift to FUNC group parameter.

*Press the enter key and transit to measurement operation.

(3) Press the mode key or shift key. Shift to pattern number setup section in the FUNC group parameter.

*Press the enter key and return to FUNC.

(4) Press the down key several times, and transit to peak hold type setup section.

*Press the up key and return to previous setup section.

(5) Press the shift key or mode key. And blink the "Peak Hold Type".

*Press the enter key and return to peak hold type setup section.

(6) Press the up key or down key, setup the peak hold type.

*Press the up key, A will change to B by pushing the down key.

(7) Press the mode key, specify the peak hold type. After confirmation, display blink will be stopped.

Note: Not push the mode key pushing the enter key setup value will be "invalid".

(8) After pressing the enter key, shift to SETUP.
* Reference with the section (10) in the case of shift to next setup menu.

(9) Press the enter key, return to the measurement operation.

(10) Press the down key when shift to next setup menu. Display the start delay setup menu at the start-up monitor.

(11) Press the down key and shift to next setup menu.
Note: Push the mode key and shift to moving average time setup.

5.3 DISP group parameter

5.3.1 DISP the list of group parameter

No.	Name	Name	Setup range	Initial Value
1	dcY	Main display update cycle	SSLO: 1 time / sec SLO: 2 time / sec MID: 10 times / sec FAST: 20 times / sec	MID
2	SU _b	Monitor display at the start-up	HH: HH comparator output value HT: HI comparator output value LO: LO comparator output value LL: LL comparator output value MAX: Maximum value MIN: Minimum value M-M: Maximum value - Minimum value ACH: Ach Measured value BCH: Bch Measured value BLNK: Extinction	HH
3	bLnK	Display extinction	OFF: Normal display ON: Display extinction	OFF

- No.1 Main display update cycle:** Setup main display update cycle.
- No.2 Monitor display at the start-up:** Setup the sub display, monitor when the power setup time.
- *At the time of start up, CALC setup value will be displayed at A&B.
- No.3 Display extinction:** light the display/setup the extinction.

5.3.2 DISP Group Parameter setup method

As a representative example, demonstrate the setup operation example of main display update.

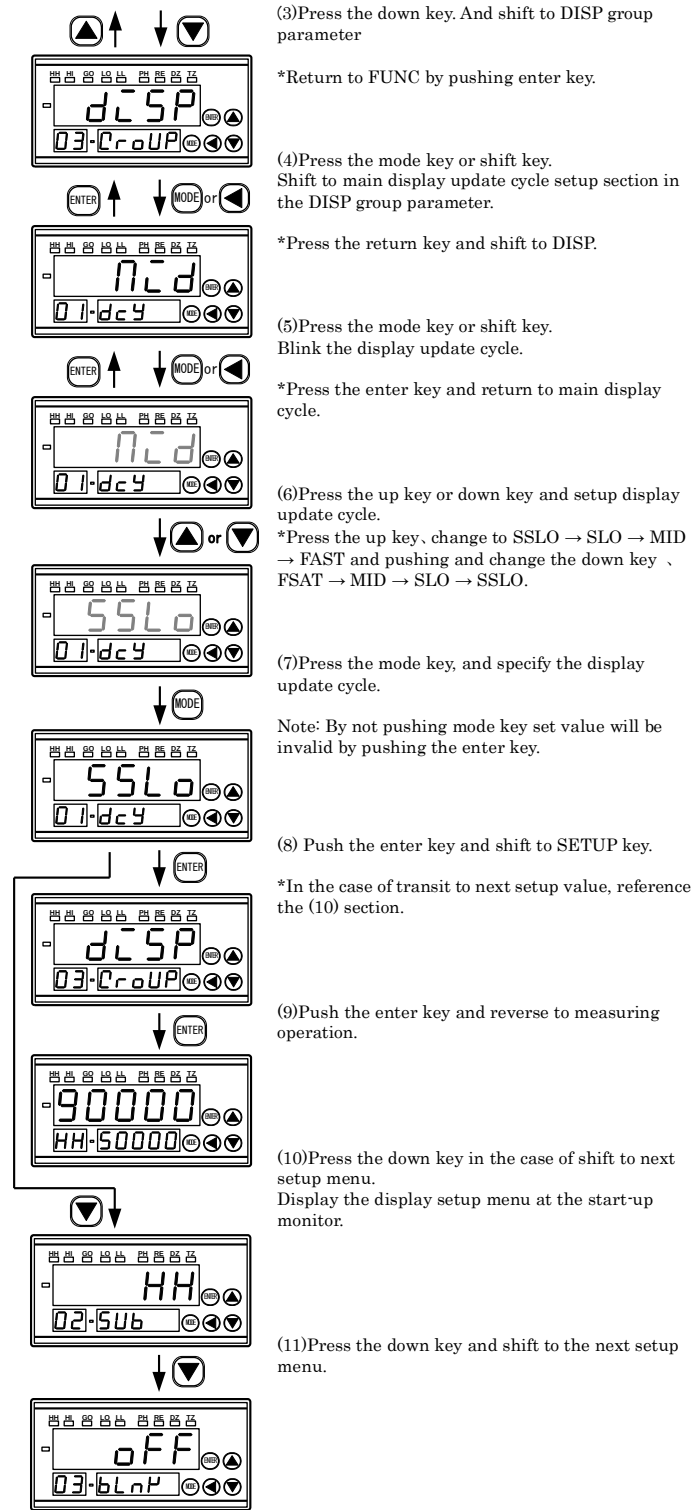
Measuring Operation

(1) Press the mode key and up key during measurement operation. Shift to SETUP group parameter.

*Press the enter key at setup display, return to Measurement operation.

(2) Press the down key. Shift to FUNC group parameter.

*Press the enter key and return to measurement operation.



5.4 CIN group parameter

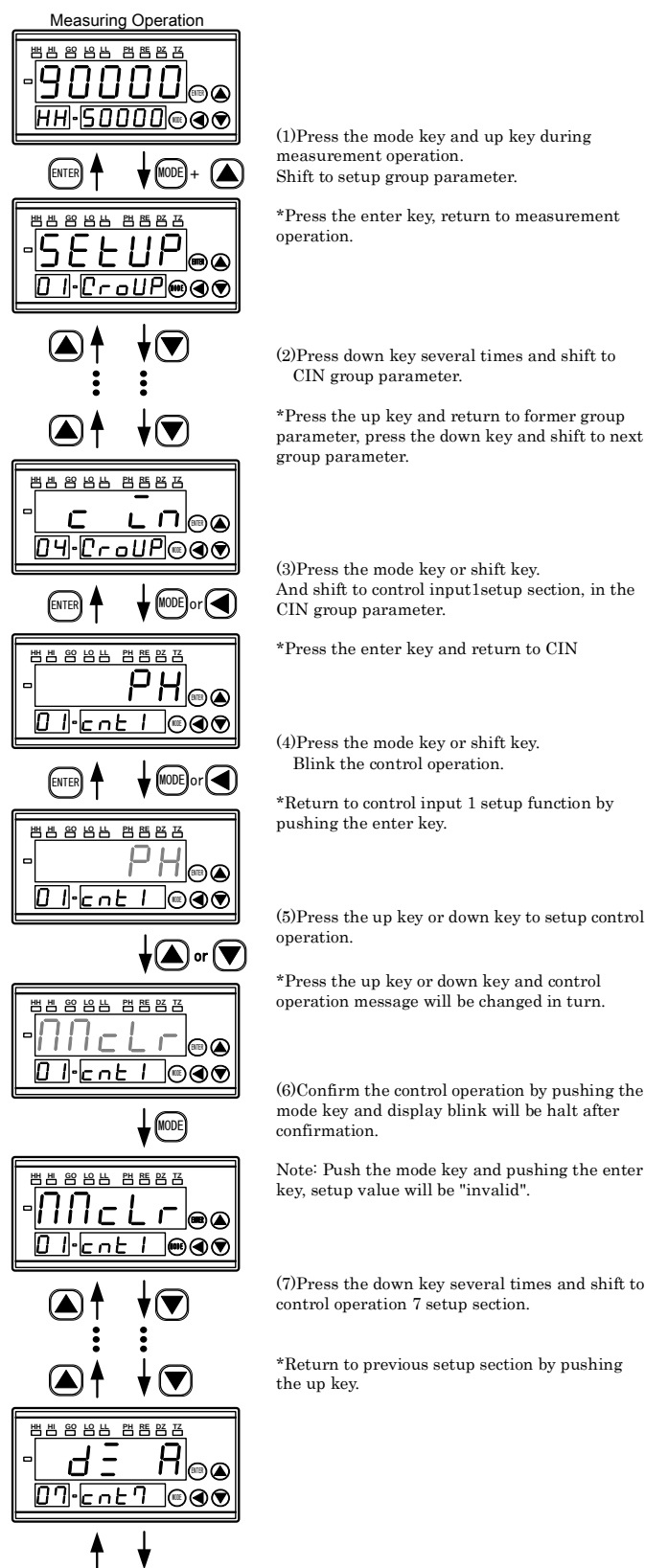
5.4.1 The list of CIN group parameter

No.	Name	Name	Setup range	Initial value
1	cnt 1	Control input No.1 Function	NONE: No function PSEL0: Pattern select 0 PSEL1: Pattern select 1 PSEL2: Pattern select 2 SH A: start /hold Ach SH B: start /hold Bch DZ A: Digital Zero Ach DZ B: Digital Zero Bch PH: Peak Hold RYRES: Comparator output reset MMCLR: Clear the maximum/Minimum value	PH
2	cnt 2	Control input No.2 Function		PSEL0
3	cnt 3	Control input No.3 Function		PSEL1
4	cnt 4	Control input No.4 Function		PSEL2
5	cnt 5	Control input No.5 Function		SH A
6	cnt 6	Control input No.6 Function		SH B
7	cnt 7	Control input No.7 Function		DZ A
8	cnt 8	Control input No.8 Function		DZ B

No.1 to 8 Control input function: Setup each control terminal's function. Note: Allocate the same function with others, switching to rewrite "No function".

5.4.2 CIN group parameter setup method.

As a representative example, clear the maximum and minimum value to control input No.7 Relay reset, demonstrate the setup operation method, making control input 8 to no function.



(8) Press the mode key or shift key. And blink the control operation.

*Press the enter key and return to control input 7 setup section.

(9) Press the up key or down key and setup the control operation.

*Press the up key or down key and control operation will be changed in turn.

(10) Press the mode key, certify the control operation. After fixed, display blink will be suspended.

Note: Not pushing the mode key, after pushing the enter key, setup value will become "invalid".

(11) Press the down key and shift to control input 8 setup sections.

*After pushing the up key, return to previous setup section.

(12) Press the mode key or shift key and blink the control operation.

*Press the enter key and return to control input 8 setup section.

(13) Press the up key or down key and setup control operation.

*Press the up key or down key and control operation message will be changed in turn.

(14) Press the mode key, fix the control operation. After ascertain, display blink will be stopped.

Note: Not pushing the mode key, pushing the enter key will make the setup value "invalid".

(15) Press the enter key and shift to "CIN".

*Reference to (17) section in the case of transit to next setup menu.

(16) Push the enter key, return to the measurement operation.

(17) Press the up key, in the case of transit to previous setup menu. Display the control input 7 setup menu.

(18) Press the up key and shift to previous setup menu.

5.5 PAT 1 to PAT 8 group parameter

5.5.1 PAT1 to PAT8 the list of group parameter

No.	Name	Name	Setup range	Initial Value
1	S-HH1 to S-HH8	HH comparator setup value 1 to 8	-99999 to 99999 Decimal Point: by operation switchover	5000
2	S-Hi1 to S-Hi8	HI comparator setup value 1 to 8	-99999 to 99999 Decimal Point: by operation switchover	1000
3	S-Lo1 to S-Lo8	LO comparator setup value 1 to 8	-99999 to 99999 Decimal Point: by operation switchover	500
4	S-LL1 to S-LL8	LL comparator setup value 1 to 8	-99999 to 99999 Decimal Point: by operation switchover	0
5	H-HH1 to H-HH8	HH Hysteresis 1 to 8	0 to 50000 Decimal Point: by operation switchover	0
6	H-Hi1 to H-Hi8	HI Hysteresis 1 to 8	0 to 50000 Decimal Point: by operation switchover	0
7	H-Lo1 to H-Lo8	LO Hysteresis 1 to 8	0 to 50000 Decimal Point: by operation switchover	0
8	H-LL1 to H-LL8	LL Hysteresis 1 to 8	0 to 50000 Decimal Point: By operation switchover	0
9	FScA1 to FScA8	Full scale display value Ach 1 to 8	-99999 to 99999 Decimal Point: DP A	10000
10	FinA1 to FinA8	Full Scale input value Ach 1 to 8	Ach By input range	10.000
11	oFSA1 to oFSA8	Offset display value Ach 1 to 8	-99999 to 99999 Decimal Point: DP A	0
12	oinA1 to oinA8	Offset input value Ach 1 to 8	Ach By input range	0.000
13	dP A1 to dP A8	Decimal point position Ach 1 to 8	0 to 5	0
14	FScb1 to FScb8	Full scale display value Bch 1 to 8	-99999 to 99999 Decimal Point: DP B	10000
15	FinB1 to Finb8	Full Scale input value Bch 1 to 8	Bch By input range	10.000
16	oFSb1 to oFSb8	Offset display value Bch 1 to 8	-99999 to 99999 Decimal Point: DP B	0
17	oinb1 to oinb8	Offset input value Bch 1 to 8	Bch By input range	0.000
18	dP b1 to dP b8	Decimal point position Bch 1 to 8	0 to 5	0
19	AoHi1 to AoHi8	Analog output HI 1 to 8	-99999 to 99999 Decimal Point: By operation switchover	10000
20	AoLo1 to AoLo8	Analog output LO 1 to 8	-99999 to 99999 Decimal Point: by operation switchover	0

No.1 HH comparator setup value 1 to 8:

Operation result $\geq$ HH setup value $\rightarrow$ HH output ON

No.2 HI comparator setup value 1 to 8:

Operation result $\geq$ HI setup value $\rightarrow$ HI output ON

No.3 LO comparator setup value 1 to 8:

Operation result $\leq$ LO setup value $\rightarrow$ LO output ON

No.4 LL comparator setup value 1 to 8:

Operation result $\leq$ LL setup value $\rightarrow$ LL output ON

No.5 HH hysteresis 1 to 8:

Operation result $<$ (HH setup value $\cdot$ HH Hysteresis) $\rightarrow$ HH output ON

No.6 HI hysteresis 1 to 8:

Operation result $<$ (HI setup value $\cdot$ HI Hysteresis) $\rightarrow$ HI output ON

No.7 LO hysteresis 1 to 8:

Operation result $<$ (LO setup value $+$ LO Hysteresis) $\rightarrow$ LO output ON

No.8 LL hysteresis 1 to 8:

Operation result $>$ (LL setup value $+$ LL Hysteresis) $\rightarrow$ LL output ON

No.9 Full scale display value Ach 1 to 8:

Set up the display value at the time of Ach full scale input value.

No.10 Full scale input value Ach 1 to 8:

Setup the input value at the time of Ach full scale display value.

No.11 Offset display value Ach 1 to 8:

Setup the display value at the time of Ach offset input value.

No.12 Offset input value Ach 1 to 8:

Setup the input value at the time of Ach offset display value.

No.13 Decimal point position Ach 1 to 8:

Setup the Ach decimal point position of display.

No.14 Full scale display value Bch 1 to 8:

Setup the display value at the time of Bch full scale input value.

No.15 Full scale input value Bch 1 to 8:

Setup the input value at the time of Bch full scale display value.

No.16 Offset display value Bch 1 to 8:

Setup the display value at the time of Bch offset input value.

No.17 Offset input value Bch 1 to 8:

Setup the input value at the time of Bch offset display value.

No.18 Decimal point position Bch 1 to 8:

Setup the Bch decimal point position of display.

No.19 Analog output HI 1 to 8:

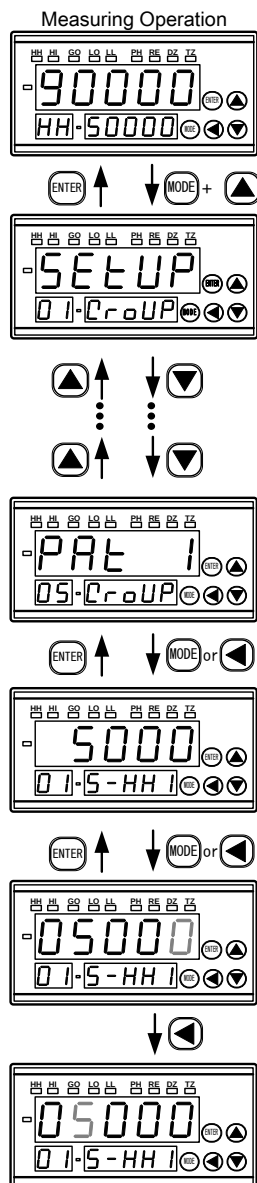
Setup the display value at the time of analog output 100%.

No.20 Analog output LO 1 to 8:

Setup the display value at the time of analog output 0%.

5.5.2 PAT1 to PAT8 group parameter setup method

As a representative example, demonstrate the setup operation method changes from HH "8000" to LL "-9000".



(1) Press the mode key and up key during measurement operation.
Transit to setup group parameter.

*Press the enter key at the setup display, return to measurement operation.

(2) Press the down key several times, transit to PAT1 group parameter.

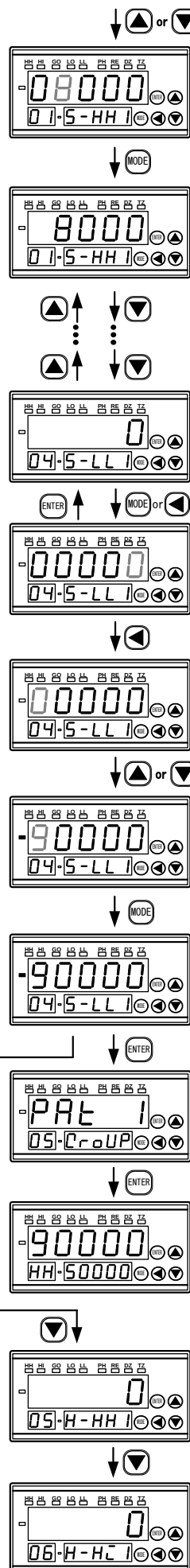
*Press the up key, return to previous group parameter.

(3) Press the mode key or shift key.
Transit to HH comparator output value setup section in the PAT1 group parameter.

*Press the enter key, return to PAT1.

(4) Press the mode key or shift key, the minimum digit will be blinking.
The blinking digit sets as setup digit.
Press the enter key, return to HH comparator output value setup section.

(5) Press the shift key and shift to blinking digit to setup digit.



(6) Press the up key or down key, and setup the HH comparator output value.

*Press the up key, the value will be "increment".
Press the down key, the value will be "decrement".

(7) Press the mode key. And specify the HH comparator output value.
After confirmation, display blinking will be stopped.

Note: Setup value will be "invalid" after pushing the enter key not pushing mode key.

(8) Press the down key several times and shift to LL comparator output value setup section.

*Press the up key and return to previous setup section.

(9) Press the mode key or shift key and blink the minimum digit.

*Press the enter key and return to LL comparator output value.

(10) Press the shift key and move the blinking digit to affordable setup value.

(11) Press the up key or down key and setup the LL comparator output value.

*Press the up key, the value will be "increment".
Press the down key, the value will be "decrement".

(12) Press the mode key, fix the LL comparator value.
After confirmation, stop the display blink.

Note: Not press the mode key. The setup value will be "invalid" after pushing the enter key.

(13) Press the enter key and shift to PA1.

*In the case of transit to next setup value, reference the (15) section.

(14) Press the enter key, return to measurement operation.

(15) Press the down key in the case of transit to next setup menu.
Display the Hysteresis setup menu.

(16) Transit to next setup menu by press the down key.

5.6 COM group parameter

For the reflecting the setup of COM group parameter, it is necessary to turn on the power supply again.

5.6.1 The list of COM group parameter

No.	Name	Name	Setup Range	Initial Value
1	Adr	RS-485 communication address	0 to 99	0
2	bAud	Communication speed	9600:9600bps 19200:19200bps 38400:38400bps	9600
3	dAta	Data bit length	7BIT:7bit 8BIT:8bit	7BIT
4	S.bit	Stop Bit	2BIT:2bit 1BIT:1bit	2BIT
5	Pbit	Parity	EVEN: even number ODD: odd number NONE: nothing	EVEN
6	FLow	Flow control	NONE: No flow control HARD: RTS, CTS control	NONE
7	dLMt	Delimiter	CR:CR LF:LF CR.LF:CR+LF	CR.LF

No.1 RS-485 Communication address: RS-485 communication address.

No.2 Communication speed:

RS-232C, RS-485, USB Communication transmission speed.

No.3 Data bit length:

RS-232C, RS-485, USB communication data bit length.

No.4 Stop bit:

RS-232C, RS-485, USB communication stop bit.

No.5 Parity:

RS-232C, RS-485, USB communication parity.

No.6 Flow control:

RS-232C communication flow control.

No.7 Delimiter:

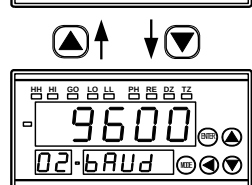
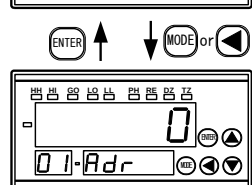
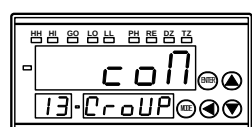
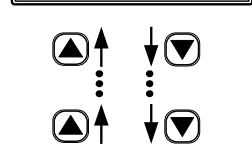
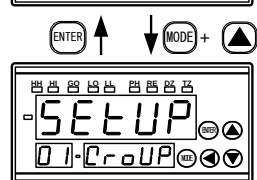
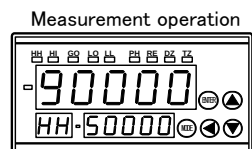
RS-232C, RS-485, USB communication delimiter.

5.6.2 Setup method of COM group parameter

Demonstrate the setup operation method, communication speed

"38400", data bit length "8 bit" as a representative example.

Another parameter is also same operational method.



(1) Press the mode key and up key during measurement operation.
Shift to setup group parameter.

*Revert to measurement operation by pushing the enter key at the setup display.

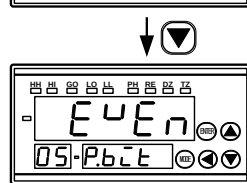
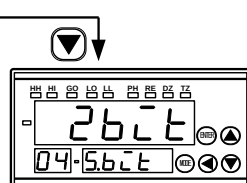
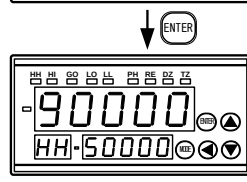
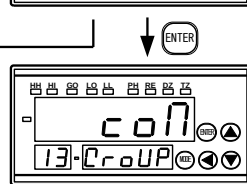
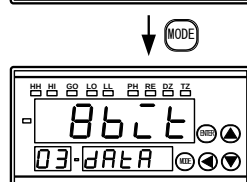
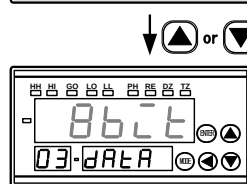
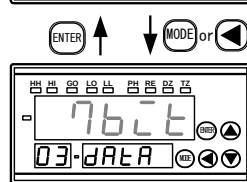
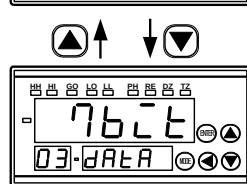
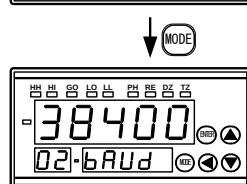
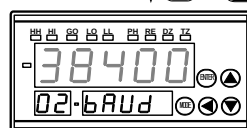
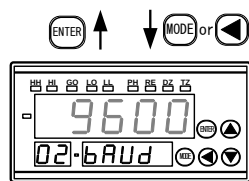
(2) Press the down key several times and shift to COM group parameter.

*Press the up key, return to group parameter.
Press the down key, transit to next group parameter.

(3) Press the shift key or mode key.
Shift to the machine No. setup section in the COM group parameter.

*Press the enter key, return to COM.

(4) Press the down key and shift to communication speed setup section.
*Press the up key and return to previous setup section.



(5) Press the mode key or shift key to blink the communication speed.

*Press the enter key and return to communication speed setup section.

(6) Press the up key or down key and setup the communication speed.

*Press the up key or down key communication speed will be changed in turn.

(7) Press the mode key, communication speed is specified.
After confirmation, display blinking will be stopped.

Note: Not press the mode key and press the enter key, the setup value will be "invalid".

(8) Press the down key and return to "Data Bit Length setup section".

*Press the up key, return to previous setup section.

(9) Press the mode key or shift key and blink the "data bit length".

*Press the enter key, return to "Data Bit Length" setup menu.

(10) Press the up key or down key, setup the "Data Bit Length".

*Press the up key change from 7 bit to 8 bit, and press the down key change from 8 bit to 7 bit.

(11) Press the mode key, the "Data Bit Length" will be specified.
After confirmation, display blinking will be stopped.

Note: Not press the mode key and press the enter key, the setup value will be "invalid".

(12) Press the enter key and shift to COM.

*In the case of shift to next setup menu, reference to (14) section.

(13) Press the enter key and return to the measurement operation.

(14) Press the down key, in the case of transit to next.
Display the setup at start bit menu.

(15) Press the down key and shift to setup menu.

(16) Turn on the power supply again.

5.7 MONI group parameter

5.7.1 The list of COM group parameter

We can not setup MONI group parameter by only using display.

No.	Name	Name	Display range
1	PVA	Ach current value	-99999 to 99999
2	PVB	Bch current value	-99999 to 99999
3	rSLt	Operation result	-99999 to 99999
4	cinL	Control input 1 to 4	0:OFF, 1:ON 10%digit: Control input 4 10%digit: Control input 3 10%digit: Control input 2 10%digit: Control input 1
5	cinH	Control input 5 to 8	0:OFF, 1:ON 10%digit: Control input 8 10%digit: Control input 7 10%digit: Control input 6 10%digit: Control input 5
6	oPt	Data output	NONE: Only for display BCD: BCD output 232: RS-232Ccommunication 485: RS-485 communication USB: USB communication A.O: Analog output

No.1 Ach current value:

After confirmation of PH Ach measurement value (No decimal point).

No.2 Bch current value:

After confirmation of PH Bch measurement value (No decimal point).

No.3 Operation result:

The confirmation of operation result (No decimal point).

No.4 control input 1 to 4:

The confirmation of control input terminal condition (low order).

No.5 control input 5 to 8:

The confirmation of the control Input terminal condition (upper level).

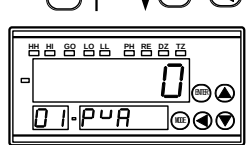
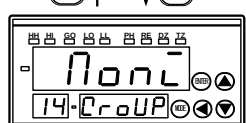
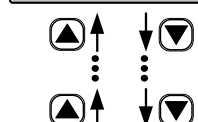
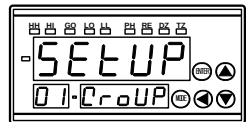
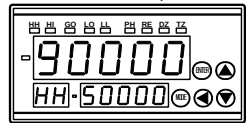
No.6 Data output:

The confirmation of data output.

5.7.2 Confirmation method of MONI group parameter

In here, we present the confirmation method of this machine's conditional.

Measurement operation



(1) Press the mode key and up key during the measurement operation and shift to setup group parameter.

*Press the enter key at the setup display and return to measurement operation.

(2) Press the down key several times and shift to MONI group parameter.

*Press the up key and return to previous group parameter.

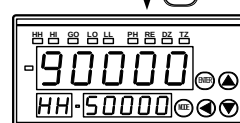
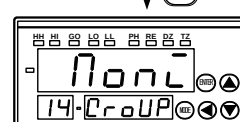
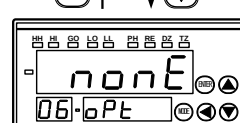
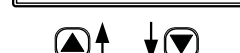
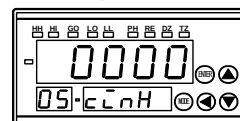
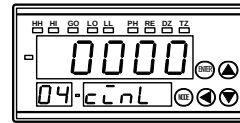
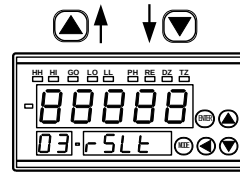
(3) Press the mode key or shift key. Transit to Ach measurement value confirmation section in the MONI group parameter.

*Press the enter key and return to MONI.

(4) Press the down key and shift to Bch measurement confirmation section.

*Press the up key and return to previous confirmation section.

*Press the enter key, return to MONI.



(5) Press the down key and shift to confirmation section.

*Press the up key and return to previous confirmation section.
*Press the enter key and return to MONI.

(6) Press the down key and shift to control input No.1 to 4 confirmation section.

*Press the up key, return to previous confirmation section.
*Press the enter key and return to MONI.

(7) Press the down key and shift to control input 5 to 8 information section.

*Press the up key and return to previous confirmation section.
*Press the enter key and return to MONI.

(8) Press the down key and shift to "Data output confirmation section."

*Press the up key, and return to previous confirmation section.

(9) Press the enter key and shift to MONI.

(10) Press the enter key and return to the measurement operation.

*Press the up key as a replacement for enter key and shift to COM parameter group.

6. The list of function

6.1 Measurement

6.1.1 Input

(1) Input range

Available for switching "input range" by independent from Ach and Bch. Input range setup will be done in the SETUP group parameter.

Range	Resolution	Available range for display	Range Initial Value	Scaling initial value	
				FIN	OIN
±10V	±99999	-10.5 to 10.5V	±10V	10.000	0.000
1~5V (±5V)		-5.2 to 5.2V		5.0000	1.0000
±1V		-1.05 to 1.05V		1.0000	0.0000
4~20mA	99999	-1 to 21mA		20.000	4.000

1~5V Range Resolution will be the range of ±5V.

- The connection of Ach, Bch input to input COM terminal in the different connection wiring.
- Please short the input terminal or setup the unusable input channel from 4 to 20mA.
- Please re-setup the PAT1 to PAT8 group parameter because the scaling input setup value will be the initial value of the variation range.
- The measurement value at the time of input out of the display available range, that must be the scaling value which available for display limit value.
- In the case of measurement value had surpassed the ±99999, the measurement value will limit at ±99999. (Main display part will be OVER or -OVER)

(2) Over Display

At the time of following terminal, main display will be "OVER" or "-OVER".

1. At the time channel for computing out of the display available range

2. At the time of channel for use of computing which had surpassed the measurement value ± 99999 .
3. Operation result had surpassed the ± 99999 .

Operation usage input ch	Operation result	Main display part
Plus OVER condition	Normal value	OVER
Minus OVER condition	Normal value	- OVER
Normal value	Plus OVER condition	OVER
Normal value	Minus OVER condition	- OVER
Minus OVER condition	Plus OVER condition	- OVER
Plus OVER condition	Minus OVER condition	- OVER

6.1.2 Input arithmetic function

By the comparator analog and BCD, at the result of optional constant "K" usage or 2ch input of Ach or Bch.

(1) Operation switch

We can select from the 10 types of calculation formula.

By switching the calculation formula must be done at the SETUP group parameter.

* In the case of selecting the division method, in the case of dividend "0" and operation results "99999" main display will be "OVER".

In the case of divided will "MINUS", at the operation results "-99999", main display will be "-OVER".

(2) Calculation constant K

Available for setup the constant "K", using the computation.

Using only for selecting "K-A" or "K-A+B" by the computation switching of this constant "K".

Regarding the K value setup, please setup the setup group parameter.

(3) Decimal Point

At the time of calculation, calculating the value without decimal point.

The decimal point setup in the PAT1 to PAT8 group parameter which no impact to the calculation result. Operation result's Decimal Point Position vary between the calculation formula.

Setup value	Calculation formula	Decimal Point Position
ACH	Ach	DPA (Ach setup Position)
BCH	Bch	DPB (Bch setup Position)
K-A	K - A	DPA (Ach setup Position)
A+B	A + B	
A-B	A - B	
K-A+B	K - (A + B)	
A+B/B	$\{(A - B) / B \} \times 1000$	
B/A	$(B / A) \times 1000$	
1-B/A	$\{1 - (B / A)\} \times 1000$	
B/A-1	$\{(B / A) - 1\} \times 1000$	

6.1.3 Scaling function

That can be attained by measurement value convert input value changing to optional display value.

*In the case of switching measurement range, scaling input value at the each initial value range.

(1) Calculation formula

Scaling calculation formula is as follows:

$$\text{Measurement value} = \frac{\text{FSC} - \text{FIN}}{\text{OFS} - \text{OIN}} \times \text{Input value} + \left(\text{OFS} - \text{OIN} \times \frac{\text{FSC} - \text{FIN}}{\text{OFS} - \text{OIN}} \right)$$

*Available for scaling setup of minus (Reverse slope).

(2) Scaling setup range

Each scaling setup range will be as follows:

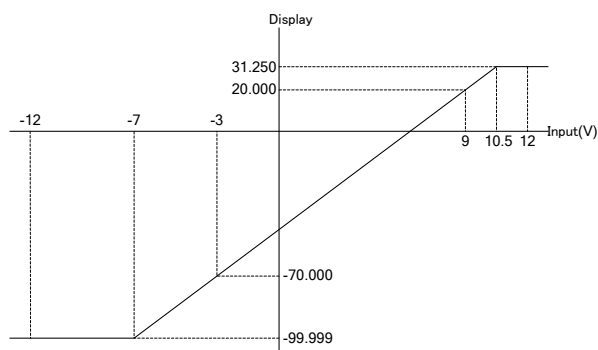
Name	Setup value	Input range			
		0-10	1-5	0-1	4-20
FSC	Initial Value	10000			
	setup range	± 99999			
FIN	Initial Value	10.000	5.0000	1.0000	20.000
	setup range	± 10.000	± 5.0000	± 1.0000	0 to 20.000
OFS	Initial Value	0			
	setup range	-99999 ~ 99999			
OIN	Initial Value	0.000	1.0000	0.0000	4.000
	setup range	± 10.000	± 5.0000	± 1.0000	0 to 20.000
DP	Initial Value	0 (No decimal point)			
	setup range	0(Non), 1(10 ⁰ digit), 2(10 ¹ digit), 3(10 ² digit), 4(10 ³ digit), 5(10 ⁴ digit)			

(3) Scaling example

At the -3V input, display the "-70,000", and at the 9V input, display the "20,000".

*Select the 0-10(± 10 V Input) at the input range.

Name	Setup value
FSC	20000
FIN	9.000
OFS	-70000
OIN	-3.000
DP	4



*Regarding the input range, conduct at the setup group parameter.

*Regarding the scaling setup, conduct at the PAT 1 to PAT 8 group parameter.

6.2 Filter out noise

6.2.1 Sampling average

Equalized the measurement data obtained the 4000 times/sec, setup interval at the sampling speed.

Updating the measurement value, comparator output, analog output, BCD output, will be the each average basis.

Ach and Bch sampling and average timing will be synchronized.

Regarding the sampling speed setup (average number of times), conduct at setup group parameter.

6.2.2 Moving average

Equalize the averaged data at the sampling speed interval by setup numbers of data.

Throw out the most old data at the each sampling spacing, averaging the latest data.

Setup the numbers of moving average with independent by Ach and Bch.

Please setup moving average setup group parameter.

6.3 Zero

6.3.1 Tracking zero function

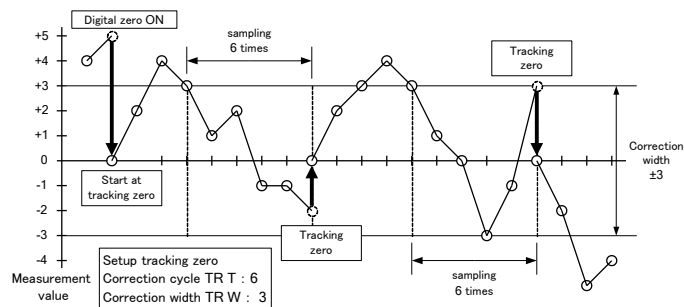
(1) Tracking zero

At the time of measurement value in the setup range at the tracking zero correction width and measure the tracking zero correction cycle setup sampling number.

Latest measurement data sets "zero".

The tracking zero operation doesn't work at the only move to measurement value from correction even the 1 sampling.

Attention) The tracking zero will be "valid the function" at the digital zero "ON", please reference the 6.6 control function 6-6-5 digital zero.



(2) Tracking zero correction cycle

Setup the tracking zero function's correction cycle.

At the tracking zero function "ZERO", setup value setup not less than "1" light out "TZ" at item display section.

Tracking zero correction time = Setup value $\times$ 1 / Sampling speed

Note) Tracking zero correction cycle (TRT) 3000[sample],
At the sampling 20 times,
The tracking correction time: $3000 \times 1 / 20 = 150$ sec
Tracking zero correction cycle's setup must be done at FUNC group parameter.

(3) Tracking zero correction width.

Tracking zero function setup the correction width
- (Tracking zero correction width) $\leq$ Measurement value
Measurement value $\leq$ + (Tracking zero correction width),
Tracking zero function will be operated.
Tracking zero correction width must be done at FUNC group parameter.

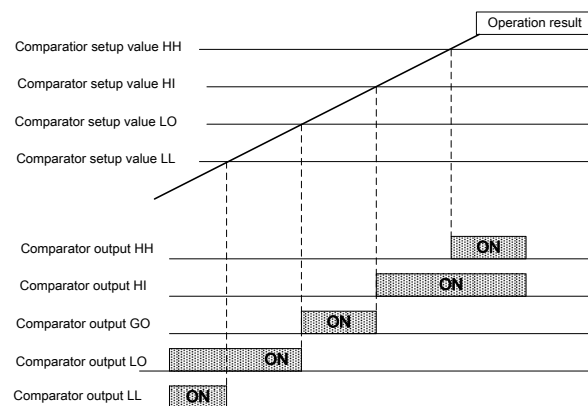
6.3.2 Fix zero function

Compulsory making to "0" only for operation result's minimum digit.
Note) Not fixing to Ach and Bch measurement value, operating the Fix zero only for operation result.
Fix zero setup must be done at FUNC group parameter.

6.4 Comparator output

6.4.1 Comparator output

Comparing with the operation results and comparator setup value and output the comparator output.
Available for output HH, HI, LO, LL simultaneously because no comparator terminal.

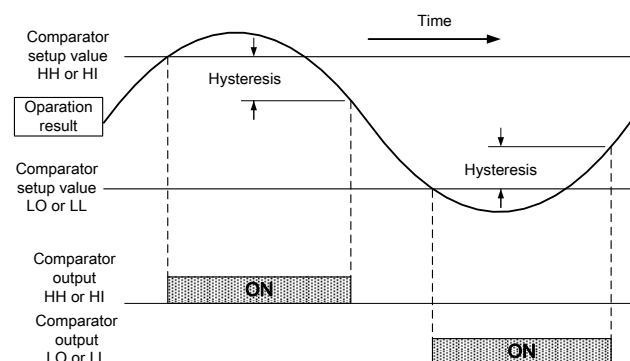


Comparator output	Output OFF → ON terminal
HH	Operation result $\geq$ HH setup value
HI	Operation result $\geq$ HI setup value
GO	All of the HH, HI, LO, LL sets "OFF"
LO	Operation result $\leq$ LO setup value
LL	Operation result $\leq$ LL setup value

Comparator output setup must be done at PAT 1 to PAT 8 group parameter.

6.4.2 Hysteresis

At the changing comparator output from ON to OFF, if there is no operation results changing volume which surpassed setup range at hysteresis, functioning that unavailable output making to "OFF".
Hysteresis is not functioning at comparator output changing from "OFF" to "ON".



Comparator output	Output ON → OFF condition
HH	Operation result $<$ (HH setup value - HH Hysteresis)
HI	Operation result $<$ (HI setup value - HI Hysteresis)
GO	Any of the HH, HI, LO, LL sets "ON" (No hysteresis)
LO	Operation result $>$ (LO setup value + LO Hysteresis)
LL	Operation result $>$ (LL setup value + LL Hysteresis)

Hysteresis setup must be done at PAT 1 to PAT 8 group parameter.

6.4.3 Output off delay function

At the times of comparator results "OFF", after the times of comparator output off delay setup goes to "OFF".
Comparator output off delay setup must be done at FUNC group parameter.

6.5 Display

6.5.1 Main display update cycle

Main display update cycle can be changed.
However, monitor display, sub display, comparator output display update cycle fixed at 20 times / sec. Display update cycle irrelevant to sampling speed. Main display update cycle setup must be at DISP group parameter.

6.5.2 Display lights-out

By the display lights-out "ON", main display, monitor display, sub display can be available for lights-out.
Comparator output display and display function lights-out. Display lights-out setup must be done at DISP group parameter.

6.5.3 Monitor display select

(1) Monitor display change method.

During the measurement, available for changing the monitor display, display contents by front key operation.
The monitor display contents will be changed by up and down key and display section will be changed by shift key.

Monitor display section (Shift Key)	Monitor display contents (UP Key or Down Key)	Sub-Display
Comparator setup value	HH comparator setup value	HH
	HI comparator setup value	HI
	LO comparator setup value	LO
	LL comparator setup value	LL
Maximum and minimum value	Maximum value	MA
	Minimum value	MI
	Maximum - Minimum	MM
Measurement value	Ach measurement value	A HA (hold condition)
	Bch measurement value	B HB (hold condition)
No display	lights-out	lights-out

(2) Monitor display when start up.

Monitor display at the time of power supply start-up and variable for setup sub display's display contents.
Current display contents will not be changed even after setup and reflect at the time of power supply.
Monitor display setup will be done at the time of start up.

6.5.4 Display condition

We can confirm the setup mode of data output, Ach, Bch measurement value, Operation result, control input condition.
Please confirm the MONI group parameter's set condition.

6.6 Control function

6.6.1 Control input switch

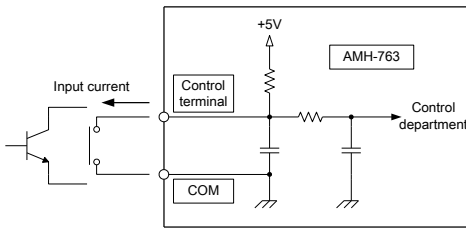
Arbitrarily select from ten sorts in each terminal control input terminal.

(1) Control terminal specification

ON voltage: 0 to 0.8V

OFF voltage: 3 to 5V

Input current: Less or equal to - 0.5mA



- Please supply control terminal's input at the non voltage contact input.
- In the case of input at the transistor, connect with open collector output.
- Because of the less contact electric current, in the case of contact input use the fine current.

(2) Setup the control terminal variation

Setup the control terminal function.

Allocated control input initial value to control input terminal and control terminal is as follows:

Setup value	Control operation input
NONE	No function
PSEL0	Pattern Select0
PSEL1	Pattern Select1
PSEL2	Pattern Select2
SH A	Start/Hold Ach
SH B	Start/Hold Bch
DZ A	Digital zero Ach
DZ B	Digital zero Bch
PH	Peak Hold
RYRES	Reset the comparator output
MMCLR	Clear the maximum and minimum value

Control terminal name	Initial setup value
Control Input 1	PH
Control Input 2	PSEL0
Control Input 3	PSEL1
Control Input 4	PSEL2
Control Input 5	SH A
Control Input 6	SH B
Control Input 7	DZ A
Control Input 8	DZ B

In the case of setup changing the operation function to the control terminal, must be done at CIN group parameter.

Note: In the case of allocating same function with others, write and replace to "NONE". In the case of setup the finished setup function to another control terminal which setup to the other terminal, please setup after the finished setup function sets "NONE".

6.6.2 Peak Hold Function

(1) Peak Hold

Available for retaining the maximum value (PH), minimum value (VH), maximum value-minimum value (PVH) during the each input Ch measurement period.

At the peak hold operation, at the Ach and Bch peak hold value calculation the operation result.

As an input of communication or external control terminal, available for peak hold control simultaneously to Ach and Bch.

Peak hold type change must be done at FUNC group parameter.

In the case of control with external control terminal because the peak hold setup at the control terminal 1, so that in the case of allocation change must be done at CIN group parameter.

(2) Operation type

Regarding the peak hold, A type (present progressive type) and B type (result type) are existed.

A type: Starting the operation at Peak Hold "ON", updating the peak hold value at each sampling speed. Peak hold measurement finish at the peak hold off and return to normal measurement.

B type: In the period of peak hold off updating at the peak hold value keep holding the peak hold value until next updating time.

Operation type setup must be done at FUNC group parameter.

6.6.3 Pattern Select

Available for omnibus switching 8 pattern analog output scaling value, scaling setup value, hysteresis, comparator setup value at the external control terminal, communication or front key.

(1) Pattern Select method

Setup whether pattern select by control terminal, communication or front key.

Setup value	Pattern select method
EXT	Control terminal
INT	Communication, front key

The method of pattern select change must be done at FUNC Group Parameter.

(2) Pattern Select control terminal operation.

In the case of pattern selecting at control terminal, switching the using pattern of pattern select control terminal "ON" and "OFF".

PSEL0 terminal	PSEL1 terminal	PSEL2 terminal	Selected pattern number
OFF	OFF	OFF	1
ON	OFF	OFF	2
OFF	ON	OFF	3
ON	ON	OFF	4
OFF	OFF	ON	5
ON	OFF	ON	6
OFF	ON	ON	7
ON	ON	ON	8

Setup pattern select at control terminal 2 to 4 in the case of changing terminal allocation that must be done at CIN group parameter.

(3) Pattern Select front key operation

In the case of selecting pattern, switching using pattern by front key operation.

1. During the measurement, keep pushing the enter key for more than 2 seconds, blinking the display "PT" at the monitor display part, pattern number and sub display.

2. Switching the usage pattern by the up key or down key.

*Not saving to E²PROM even the switching pattern number.

3. Keep pushing the enter key not lower than 1 second, returning to measurement operation.

(4) Pattern number modification

In the case of setup the pattern select method to the INT (communication, front key), variable for changing pattern number's setup value. At the time of setup value change, pattern number will be saved to E²PROM and operating the setup pattern at the time of next start-up.

6.6.4 Start/Hold function

(1) Start/Hold

Available for Ach, Bch independent, start the measurement and stopping the control by external control terminal communication as an input.

In the case of control the external control terminal setup the start/hold A to the control terminal 5 and start/hold B to the control terminal 6 so that please change the control terminal allocation at the CIN group parameter

(2) Operating type

Regarding the start/hold operation, there are A type (free run) and B type (one shot).

A type: Comparator, analog, BCD output will be retaining the lastly hold value after the hold condition and stop measurement at the start/hold "ON".

B type: Start/Hold OFF → measure at only the time sets "ON" and output at Comparator, Analog, BCD.

Continuing the hold condition except those condition.

In the case of B type, Setting "ON" not lower than 2 times, measurement value updating will be "1 time".

Operating type setup must be done at FUNC group parameter.

(3) Response time

Start/Hold response time will be as follows.

Not more than (500μsec + 1 / Sampling speed)

Example: At sampling 4000times

Response time: 500μsec + 1 / 4000 = not more than 750μsec

(4) Start delay

At the time of start/delay function usage there is a start delay function which defer start the amount of setup time.

Start/delay time = setup value × 1 / sampling speed

Example: Start delay (STD) 100[sample], at the times of sampling 500times

Start/delay time: 100 × 1 / 500 = 0.2sec

Start/delay start up must be done at FUNC group parameter.

6.6.5 Digital zero function

(1) Digital zero

The external control terminal or communication as input by Ach, Bch independent, available setup value shift "0".
Functioning the digital zero "ON", return to normal operation with "OFF".

Lights-out the function display "DZ" even the Ach or Bch digital zero sets "ON".

In the case of control at the external control terminal, setup the digital zero A at control terminal 7 and digital zero B at control terminal 8 so that in the case of changing allocation of control terminal should be done at CIN group parameter.

(2) Response time

Start/hold response time is as follows:

Not more than (500μsec + 1 / sampling speed)

Example: At the time of sampling 4000times

Response time: 500μsec + 1 / 4000 = not more than 750μsec

(3) Digital zero value Ach, Bch

The digital zero value at the digital zero "ON", available for setup given value by isolated Ach and Bch.

The setup value save to E²PROM.

The setup must be done at setup group parameter and the range set from "-99999 to 99999".

(4) Digital zero backup

Available for saving digital zero value to E²PROM at the digital zero "ON".

Note: Also, in the case of digital zero control more frequently at digital zero backup "ON", pay note to E²PROM allowable saving time.

Digital zero setup must be done at setup group parameter.

6.6.6 Comparator output reset function

As an input of external control terminal or communication, all of the comparator output result "OFF".

All of comparator output display LED of display part will be light off and main display color will be "OFF".

Please setup at the CIN group parameter because not allocating comparator output reset function to control input terminal in the case of controlling at the external terminal.

6.6.7 Clear function of maximum and minimum value.

Available for clear the external control terminal or communication as an input by maximum and minimum value.

By the clearing the maximum and minimum value "ON", maximum value, minimum value and minimum-minimum value will be the "WAIT" condition.

At the "ON" to "OFF" start the maximum and minimum value's measurement.

Please setup at the CIN group parameter because not allocating maximum value and minimum value reset function to control input terminal in the case of controlling at the external terminal.

6.7 Another function

6.7.1 Setup value change protect function.

Available for setup modification status of pattern data and condition data.

(1) The various of data.

Each group parameter's data type is as follows:

Group Parameter	Data type
SETUP	Condition data
FUNC	
DISP	
C IN	
COM	
PAT 1 to PAT 8	Pattern data

(2) Setup value change protect

Changing protect field is as follows.

Setup value	Condition data Setup change	Pattern data setup change
OFF	○	○
PATN	○	×
COND	×	○
ALL	×	×

○: available for setup change

×: unavailable for setup change

Setup change protect setup must be done at FUNC group parameter.

6.7.2 Setup value initialization function

By the front operation key, available for initialization of setup value.

Initialization conducted to all setup value.

Keep pushing the enter key and shift key" and startup the power supply, initialization will be started.

• After finishing the initialization, that will convert to measurement mode.

• Initialization needs approximately one minute. Please do not Switch off the power supply during the initialization.

• Unavailable for cancel under the initialization.

• During the initialization, appear in the blinking condition "INIT" at the main display.

• displaying the "EPROM" at the monitor display.

7. Data output

7.1 BCD output

BCD output type	ON or "1"	OFF or "0"
Open collector	Transistor "ON"	Transistor "OFF"
TTL	+5V	0V

Note 1: BCD output's COM and control terminal's com are common.

Note 2: Output at the times of power supply start-up is variable.

Note 3: Open collector output will be the NPN open collector output.

7.1.1 Data out

Output put the operation result at the sampling speed interval.

Available for select output type from BCD type (Binary Coded Decimal) or Binary type (Binary).

(1) BCD output type

Available for select output type from BCD type (Binary Coded Decimal) or Binary type (Binary).

BCD output type change must be done at FUNC Group Parameter.

■ Binary type

Output by the 17 bit's binary number.

The polarity output by POL, in the case of operation result's "minus", not outputting to data output side.

Binary output example

Operation result	POL	2 ¹⁶	2 ¹⁵	2 ¹⁴	2 ¹³	2 ¹²	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸
5000	0	0	0	0	0	1	0	0	1	1
99999	0	1	1	0	0	0	0	1	1	0
-99999	1	1	1	0	0	0	0	1	1	0
		2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	
		1	0	0	0	1	0	0	1	
		1	0	0	1	1	1	1	1	
		1	0	0	1	1	1	1	1	

7.1.2 Over signal (OVER)

At the times of OVER display, output sets "ON".

7.1.3 Polarity signal (POL)

Output will be "ON" at the time of operation result "minus."

7.1.4 Printing command signal (PC)

After completed the measurement and at the time of output data specified changing to "ON". "ON" time will be changed by sampling speed.

Sampling speed (times/sec)	4000	2000	1000	500	200
PC ON time	200μs	450μs	450μs	450μs	2.45ms

Sampling speed (times/sec)	100	50	20	10	5	2	1
PC ON time	4.95ms	10ms	25ms	50ms	100ms		

*When hold by the start/hold function, PC signal goes "OFF".

7.1.5 Output allowable input (ENABLE)

When shorts the Enable terminal and COM, all of the data output, OVER signal, polarity, printing command signal goes "OFF".

(Open collector: transistor OFF, TTL: high impedance)

ON voltage: 0 to 0.8V

OFF voltage: 4 to 5V

Input current: Not more than -0.5mA

7.2 Analog output

Available for the output analog output scaling by the converting voltage and current value.

Note 1: When turning the power on, output approx.-1V at the output terminal.

When turning the power on, output 0mA at the output terminal.

Note2: Please do not connect the output load at the same time electric voltage output and electric current output.

Note 3: Analog output will become 0% output when the setup mode or operation mode sets "WAIT".

7.2.1 Step input corresponding time

Response time: Not more than $(250\mu\text{sec} + (2 / \text{sampling speed}))$

Example: Sampling 4000times

Response time: $250\mu\text{sec} + 2 / 4000 = \text{not more than } 750\mu\text{sec}$

7.2.2 Analog output type

Selecting from analog output 0 to 10V output, 1 to 5V output and 4 to 20mA output.

Analog output type setup must be done at FUNC group parameter.

7.2.3 Analog output range

Analog output type	Analog output range
0 to 10V	-0.5 to 10.5V
1 to 5V	0.8 to 5.2V
4 to 20mA	3.2 to 20.8mA

Note 1: In the case of operation result out range of analog output, limit the analog output range.

Note 2: In the case of OVER display, output the analog output scaling changeable value at the analog output operation result.

7.2.4 Analog output scaling function

Available for output the operation results by operational convert analog output value. Converting the scale by currently selecting pattern's analog output scaling setup.

(1) Calculation formula

Analog output scaling calculation formula is as follows:

$$\text{Analogue output value} = \frac{\text{Output value of 100\%} - \text{Output value of 0\%}}{\text{AOHI} - \text{AOLO}} \times \text{Calculation result} + \left(\text{Output value of 0\%} - \text{AOLO} \times \frac{\text{Output value of 100\%} - \text{Output value of 0\%}}{\text{AOHI} - \text{AOLO}} \right)$$

* Available for minus (reverse slope) scaling setup.

(2) Analog output scaling setup range

Each scaling setup range is as follows:

Name	Name	Setup range	Initial Value
AOHI 1 to 8	Analog output 100% Display value 1 to 8	-99999 to 99999	10000
AOLO 1 to 8	Analog output 0% Display value 1 to 8	-99999 to 99999	0

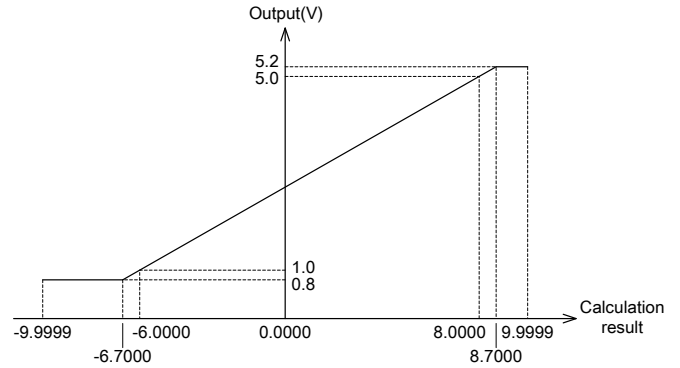
Analog output type	Analog output 100% output value	Analog output 0% output value
0 to 10V	10V	0V
1 to 5V	5V	1V
4 to 20mA	20mA	4mA

(3) Analog output scaling example

I let you output 5V at the time of "8.0000" indication and output 1V at the time of "-6.0000" indication.

*We can select from 1-5(1 to 5V output) at analog output type.

Name	Setup value
AOHI	20000
AOLO	9.000



*Please analog output type change at the FUNC group parameter.

*Please setup the analog output scaling at the PAT1 to PAT8 group parameter.

8. Communication

This machine can be mounted the communication function any of the RS-232C, RS-485, USB.

Acquirement of measurement value, comparator results, remote control of the machine or changing the each setup value by the communication with machine.

The details of each communication function, please reference the "communication machine instruction manual" as additional volume.

9. Specification

■ Input specification

The measurement function: DC voltage / DC current

Range	Measurement Range	Display	Input impedance	Maximum allowable Input value
0-1	±1V	Offset ±99999	1MΩ	±250V
0-10	±10V			
1-5	1 to 5V (±5V)	Full Scale ±99999	50Ω	±70mA
4-20	4 to 20mA			

The mode of operation: $\Delta\Sigma$ conversion method

Input circuit: Single ended type

Resolution: ±99999 (Voltage Input), 99999 (Current Input)

Input numbers: 2ch Input (Ach, Bch)

Non-isolated between of Ach / Bch

Sampling speed: 1 times / sec to 4000times / sec (1ch, 2ch)

Accuracy: ±0.1%FS (23°C±5°C, 35 to 85%RH)

Input calculation formula: Ach, Bch, K·A, A+B, A·B, K·(A+B),
{(A-B)/|B|}×1000, B/A×1000, (1-B/A)×1000, (B/A-1)×1000

*K is the available for setup constant.

■ Display specification

Main Display part: 2 colors (red/green) 7segment LED character height 14.2mm

Sub Display: Green 7segment LED character height 8mm

Display updating cycle: 1, 2, 10, 20 times/sec

■ Comparator part specification

Comparator objective: At the times of 1ch, comparator output to present value.

At the times of 2ch, comparator output to calculation value.

Comparator results: HH, HI, GO, LO, LL (5 points)

Setup method: Upper point 2points(HH, HI), Lower points 2 points(LO, LL) No comparator condition

Hysteresis: 4 points independent

Relay output: Contact volume 1a contact AC250V/DC30V 1A (resistive load)

The electrical life 50 thousand times (The rated load.)

Photocoupler output: Output rating DC30V 20mA (MAX)

Output saturation no more than voltage 1.2V

■ External control terminal specification (Input and Insulation)

The control terminal function available for allocating at it's option.

The numbers of terminal:

8 Input (No data output [Only for display], Analog output, BCD output)

6 Input (RS-232C communication, RS-485 communication, USB communication)

Function: Pattern Select0, 1, 2, Start/Hold (Ach, Bch independent), Peak Hold, Digital zero (Ach, Bch independent), Reset the

Comparator output, clear the maximum/minimum value

Input: Non-voltage contact, NPN open collector Input

When short the control terminal and COM, each function sets "ON".

ON voltage: 0 to 0.8V

OFF voltage: 3 to 5V

Input current: No more than -0.5mA

■ General specification

Power supply: AC100 to 240V±10% (50 / 60Hz)

Consumed electric power: MAX 20VA

Dimension: 96mm(W)×48mm(H)×144.5mm(D) *Except the BCD output
96mm(W)×48mm(H)×147.0mm(D) *At the time of BCD output

Weight: Approx. 400g

Dielectric voltage: Power supply terminal / input terminal, each output terminal, communication, control input terminal
AC 1500V per minute.

E terminal / power supply terminal, input terminal

AC 1500V per minute.

Input terminal / each output terminal, communication, control input AC 500V per minute.

Insulated resistance: No lower than DC500V 100MΩ between of above described terminal.

Pairing vibration: The numbers of vibration 10 to 55Hz half amplitude
0.15mm X, Y, Z 5min × 10 trace in each direction.

Sensor power supply: DC24V±10% 40mA (Ripple no more than 100mVp-p)

Memory backup: E²PROM the numbers of write in: One hundred thousand times.

Attachment: Instruction manual

■ Data output specification

● BCD output (Isolated input)

Connector: MIL type 34 pin connector (Insulation-displacement connector supplied as standard.)

Output format: BCD code, Binary code

Output: BCD signal

Printing command signal (PC)

Polarity signal (POL) output at the time of minus

Over signal (OVER) output at the time of OVER

Control input: Output allowance (ENABLE)

When Enable and COM short, each output will be "OFF".

(Open collector: transistor OFF, TTL: High impedance)

ON electric voltage: 0 to 0.8V

OFF electric voltage: 3 to 5V

Input current: No more than -0.5mA

NPN open collector output: DC30V 10mA (MAX)

Output saturation voltage: No more than 1.2V

TTL output: Positive logic TTL level (CMOS compatible) Fan-out 2

● Analog output (Isolated input)

Output Range: 0 to 10V, 1 to 5V, 4 to 20mA (Unavailable for simultaneous of voltage, current's output)

Accuracy: ±0.5% FS (23°C±5°C)

Temperature coefficient: No more than 0.02% FS/°C

Resolution: 0 to 10V output Approx. 50000 count

1 to 5V output Approx. 20000 count

4 to 20mA output Approx. 40000 count

Allowable load resistance: No lower than 10kΩ (At the 1 to 5V output, 0 to 10V)

No more than 500Ω (At the 4 to 20mA output)

● RS-232C communication (Isolated input)

Connector: D-SUB9 pin

Synchronization method: Start / stop synchronization scheme

Communication speed: 9600, 19200, 38400bps

Data bit Length: 7, 8bit

Stop Bit Length: 1, 2bit

Parity: Even, Odd, Nothing

● RS-485 communication (Isolated input)

Synchronization method: Start / stop synchronization scheme

Communication speed: 9600, 19200, 38400bps

Data Bit Length: 7, 8bit

Stop Bit Length: 1, 2bit

Parity: Even, Odd, Nothing

Error Detection: BCC

Number of connections: 31 machines at maximum

Line length: Maximum 500m at total

● USB COMMUNICATION (Isolated input)

Operating as virtual COM port

USB Interface specification: Rev1.1/2.0 Full speed communication B connector

Correspondence OS: Windows XP SP2, Windows Vista (32bit)

• USB COMMUNICATION Virtual COM port specification

Synchronization method: Start / stop synchronization scheme

Communication speed: 9600, 19200, 38400bps

Data Bit Length: 7, 8bit

Stop Bit Length: 1, 2bit

Parity: Even, Odd, Nothing

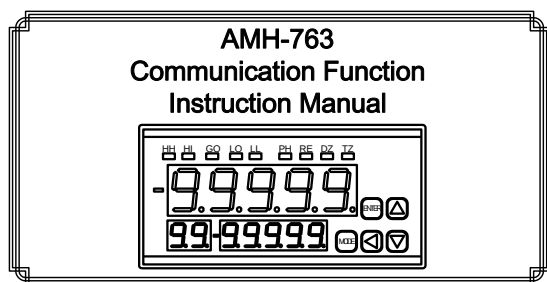
10. Trouble Shooting

10.1 Error messages

Error main display	Error display monitor.	The possible cause	Countermeasure
OVER -OVER	Normal Display	Input range over	The channel input using calculation in the display available range.
		Display range over	The using calculation channel's measurement value should not surpass the ± 99999 for input value.
		Operation result over	Operation result should not surpass the ± 99999 . The calculation formula using division not divide by zero.
WAIT	Normal Display	Start / Hold function will be the "Hold" condition.	Start/Hold function make "start" condition. Start-delay function sets "0".
		Peak Hold type will be the B type so not updating Peak Hold value.	Updating the Peak Hold value. Peak Hold type sets "A type".
		The both of Start/Hold type and Peak Hold type will be the "B" type.	Either Start/Hold type or Peak/Hold type change to "A" type.
ERROR	P ROM	In the cause of cutout the power supply during the setup value write in.	For the recovery, setup value must be initialized when turning on the power supply again and setup value will be initialized. After finishing the initialization to normal display, display the "INIT EPROM" during the initialization. Because the setup value initialized, please change the setup value again. *Doing initializing "setup value" several times, in the case of displaying "ERROR ROM" , that will surpass the conservation available range and unavailable to preserve the setup value. Please contact us directly or distributor.
ERROR	A ROM	The calibration is not right.	Please contact us directly or distributor because not able to rescue by customer.

10.2 Response in times of trouble

Phenomenon	The possible cause	Measure
There is no indication.	Display lights-out function will be "ON".	Display lights-out function will be "OFF".
Unavailable to transit to setup mode.	Keep protect setup will be "ON".	Key protect setup will be "OFF" by communication and initialize the setup value.
We can not change the display value.	Setup value change protect sets "ON".	Setup value change protect will be "OFF".
Sensor power supply terminals' output will not output.	More than allowable output current flows into sensor power supply terminal and output protect circuit will be activated.	Turn on the power supply again by sensor power supply's load below the allowable output current.
Control terminal will not be activated.	Not correctly allocated to control terminal function.	The function allocated to control terminal.
	At the time of patter select function, patter select method will be "EXT".	Pattern Select method sets "INT".
	The communication remote control will set "ON".	The communication remote control will set "OFF".
Unavailable for communication.	Wiring is not normally connected.	Reappraise the "Arrangement of tracks".
	After changing communication setup, not turning on the power supply.	Turning on the power supply again
	Not adjusting to sending and receiving communication setup.	Adjust the communication setup.
	Replicate the RTS, CTS terminal used with cable at the RS-232C communication and setup hardware flow control.	Setup without the hardware flow control, using the RTS, CTS terminal replicate the RTS and CTS terminal.
	At the time of USB communication, start up the communication software before power up to the machine.	After communication software start-up after the turning on the machine's power supply.
	At the time of RS-485 communication, device No. will be the same with the other machine or "0".	We will not use another communication machine except the device No. "0".
	At the times of RS-485, we will not establish the communication.	Establish the communication.
	At the time of RS-485 communication, BCC will not be attached.	Attach BCC to the command.



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1. Notes to users

This instruction manual is for AMH-763's communication function. Besides, please use this handling manual.

2. Specifications

2.1 RS-232C

Connector: D-SUB 9 Pin
Synchronization scheme: Start / stop synchronization scheme
Communication speed: 9600, 19200, 38400bps
Data bit Length: 7, 8bit
Stop bit Length: 1, 2bit
Parity: Even, Odd, Nothing

2.2 RS-485

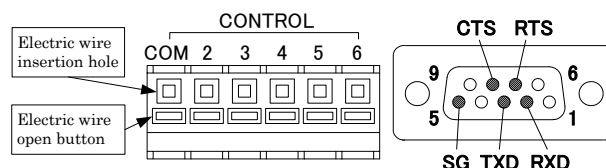
Synchronization scheme: Start / stop synchronization scheme
Communication speed: 9600, 19200, 38400bps
Data bit length: 7, 8bit
Stop bit length: 1, 2bit
Parity: Even, Odd, Nothing
Error Detection: BCC
No. of connections: 31 machines at maximum
Line Length: Maximum 500m at sum total

2.3 USB

Operating as virtual COM port
USB interface specification: Rev1.1/2.0 Full speed communication
B connector
Corresponding OS: Windows XP SP2, Windows Vista (32bit)
●USB communication Virtual COM port specifications
Synchronization method: Start / stop synchronization scheme
Communication speed: 9600, 19200, 38400bps
Data bit length: 7, 8bit
Stop bit length: 1, 2bit
Parity: Even, Odd, Nothing

3. Terminal's explanation and connection method.

3.1 RS-232C



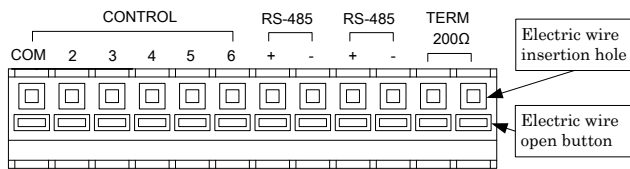
RS-232C Part

Cable: D-SUB 9pin (female) cross cable (15m at maximum)

Name	Contents	Pin No.	Signal name	Contents
CONTROL COM	Control input common terminal	1	NC	Unconnected
CONTROL 2	Control input No.2 terminal	2	RXD	Receive data
CONTROL 3	Control input No.3 terminal	3	TXD	Transmit data
CONTROL 4	Control input No.4 terminal	4	NC	Unconnected
CONTROL 5	Control input No.5 terminal	5	SG	Signal grand
CONTROL 6	Control input No.6 terminal	6	NC	unconnected
-	-	7	RTS	Request to send
-	-	8	CTS	Clear to send
-	-	9	NC	Unconnected

Note) Only setup "flow control" at "HARD", communicate by using RTS and CTS signal.
In the case of using connected cable with RTS and CTS signal, please setup "flow control" at "NONE".
Communication will be suspended by setup "flow control" at "HARD".

3.2 RS-485



Screwless terminal (Available for plug detachment)

Rating applicable wire: one wire $\phi 1.0\text{mm}$ (AWG18)

Stranded cable 0.75mm^2 (AWG20) More than one wire $\phi 0.18$

Available for use wire range: single line $\phi 0.4\text{mm}$ (AWG26) to $\phi 1.0\text{mm}$ (AWG18)

Stranded cable 0.3mm^2 (AWG22) to 0.75mm^2 (AWG20)

Wire span more than $\phi 0.18$

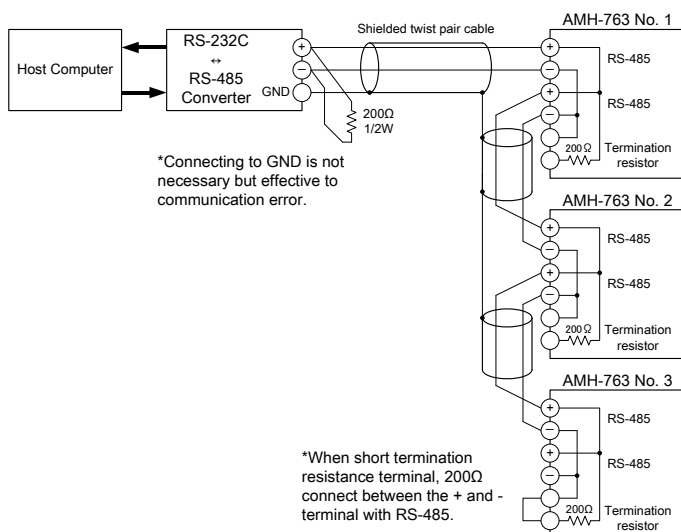
Standard strip line length: 9mm

Adjustment tool for button operation: Minus driver (axial $\phi 3$, blade width 2.6)

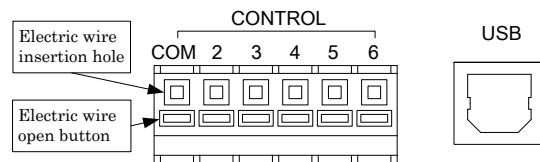
Wiring method: Keep pushing wire open button by minus driver, insert the wire to the wire insertion hole till it end and, release the wire open button.

Name	Contents
CONTROL COM	Control input common terminal
CONTROL 2	Control input No. 2 terminal
CONTROL 3	Control input No. 3 terminal
CONTROL 4	Control input No. 4 terminal
CONTROL 5	Control input No. 5 terminal
CONTROL 6	Control input No. 6 terminal
RS-485 +	RS-485 non-inversion input & output
RS-485 -	RS-485 inversion input & output
RS-485 +	RS-485 non-inversion input & output
RS-485 -	RS-485 inversion input & output
TERM 200Ω	When short between terminals, resistance 200Ω connect between non-inversion input & output and inversion input & output.

- Please use shielded twist pair cable.
- Available for connecting 31 machines at maximum.
- Cable's total prolongation will be 500m at maximum.
- Please connect 200Ω's termination resistor in the line's both end. When you connect this machine's termination resistor terminal to connecting to 200Ω integrated terminating resistor. Please release the termination resistor terminal in case of not to connect to machine's each end of the line.
- RS-232C ↔ RS-485 Converter recommended products: SI-30 (LINE EYE)
- Ethernet ↔ RS-485 Converter recommended products: TF-WS (our product)



3.3 USB



USB part

Connector: USB B type

Please use USB cable in the market. (5m at maximum)

- Detect the PC USB port to virtual COM port (RS-232C) and available for PC communication using RS-232C communication software like "Hyper terminal" which attached windows.

Note 1) Not corresponding to hibernate mode or standby mode.

Note 2) Please pay attention that USB cable is easily plugged out.

Note 3) When cut the machine's power supply and plug out USB cable during COM port "OPEN" which using communication software, restart the communication software to communicate with this machine.

3.3.1 Driver

Driver's installation to PC will be necessary for the first use of USB communication.

Please download the driver from our homepage.

Corresponding OS: Windows XP SP2, Windows VISTA (32bit)

Note) By all means, please install 2 driver "USB Serial Converter" and "USB serial port driver".

• Driver installation method

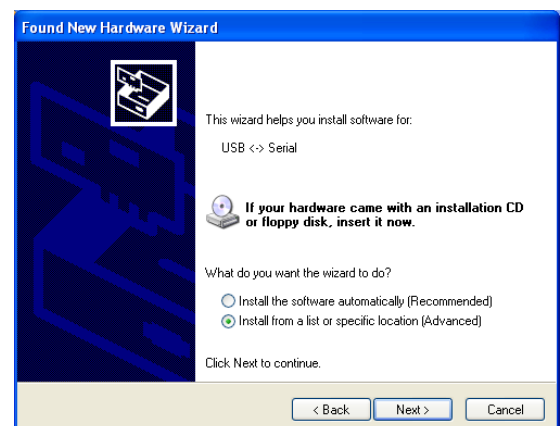
- (1) Power up pc power supply.
- (2) At power up of the machine, connecting to PC and machine by USB connector.

For the time being, the preparation of driver's install will be started. Displaying the "New Hardware Wizard" in the drawing below.

Selecting "No, not this time" and click "Next".

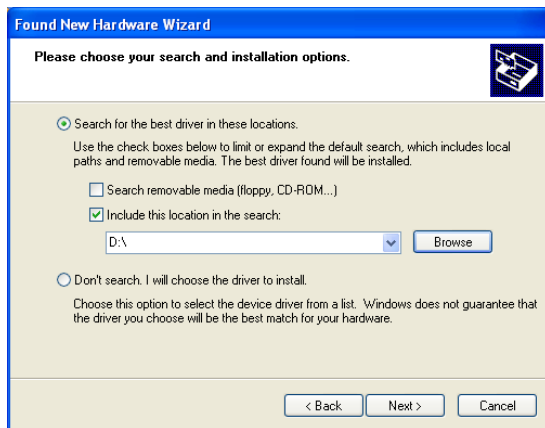


- (3) Select the "Installation from a list or specific location (Advanced)" and click "Next".

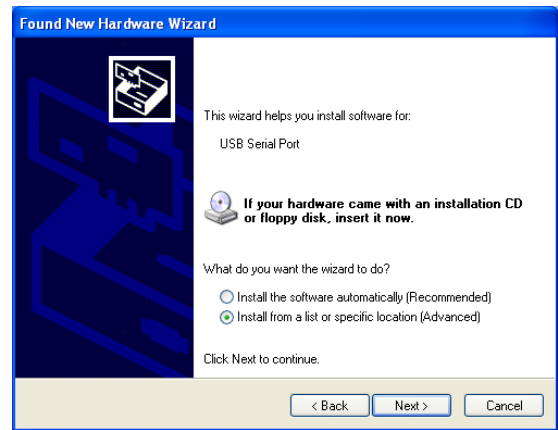


- (4) Selecting "**Search for the best driver in these locations**". Only checking for "**Include this location in the search**", and click "**Browse**" by specifying driver's decompressed folder.

(D:\ in the example below)

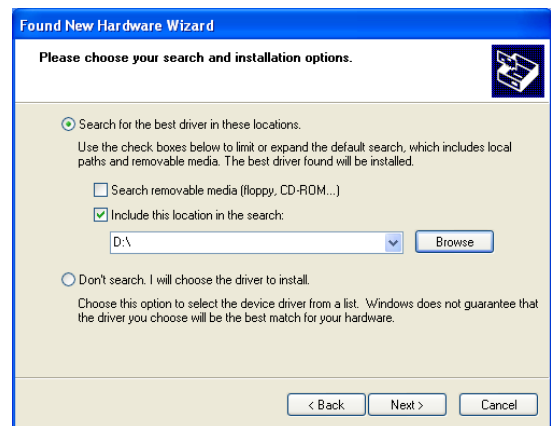


- (7) Selecting "**Install from list or specific location (Advanced)**" and click "**Next**".

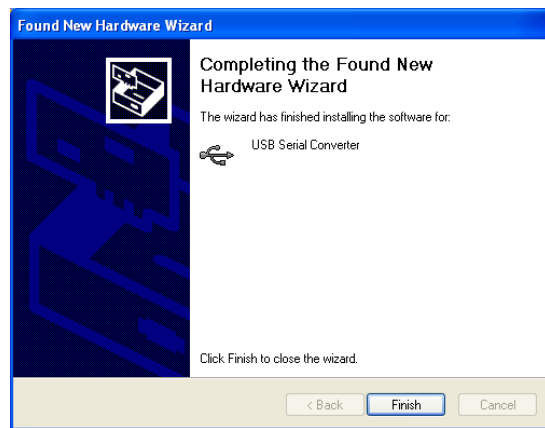


- (8) Selecting "**Search for the best driver in these locations**". Only checking for "**Include this location in the search**", and click "**Browse**" by specifying driver's decompressed folder.

(D:\ in the example below)



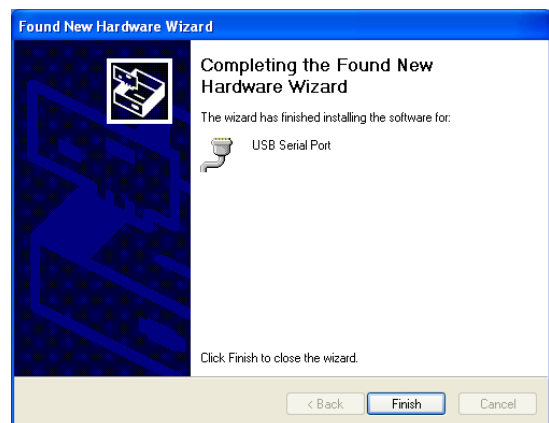
- (5) Because of starting driver's install, please wait until displaying below described screen.
By clicking "**Finish**", first driver's install will be finished.



- (6) Selecting "**No, not this time**" and display the next continuing driver's install window and click "**Next**".



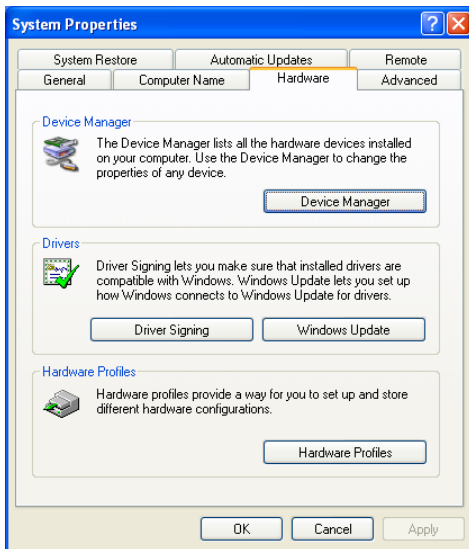
- (9) Because of starting driver's install, please wait until displaying below described screen.
After finishing driver's installation, click "**Finish**" after displaying.



3.3.2 Driver and COM port number confirmation.

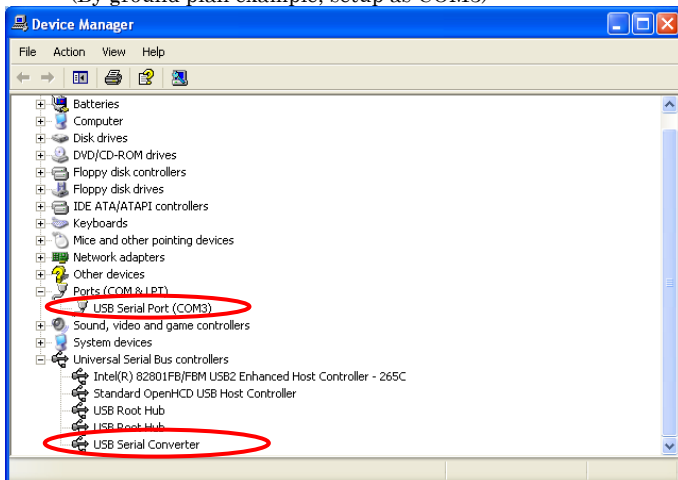
We can confirm the driver's normal install and COM port number as following method.

- (1) Click the [Start] - [Control panel] - [System].
Click [Device Manager] from the [Hardware] tab.



- (2) Please confirm "USB Serial Port" in the "port (COM and LPT)" and "USB Serial Converter" in the "Universal Serial Bus controller".
The number after "USB Serial Port" will be the COM port number using as communication software.
Firstly allocated COM port number will be different from using PC circumstances.

(By ground plan example, setup as COM3)

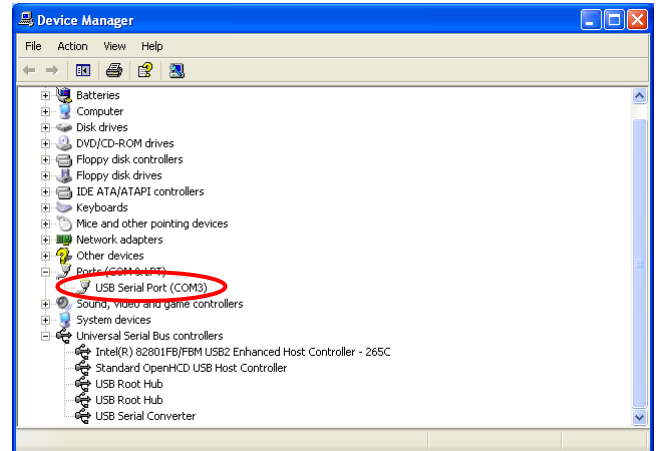


Note) Device will not be displayed at the device manager, in the condition of machine's power supply cut.
By all means, plug in power supply and confirm USB connected condition.

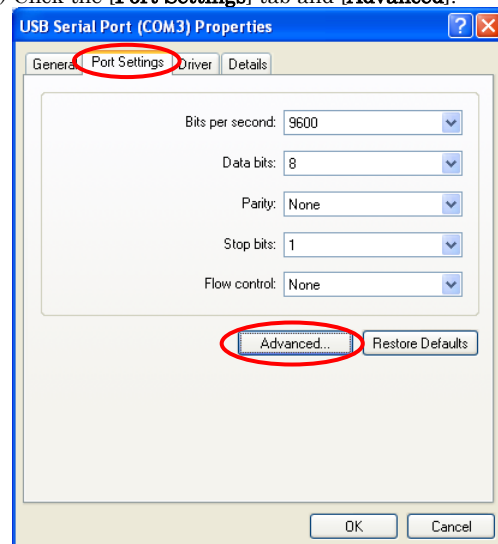
3.3.3 The changing method of COM port number.

Available for changing COM port number as following method.
Please change the COM port number after finishing the communication software.

- (1) Double click the "USB Serial Port" in the device manager's "Port (COM and LPT)".



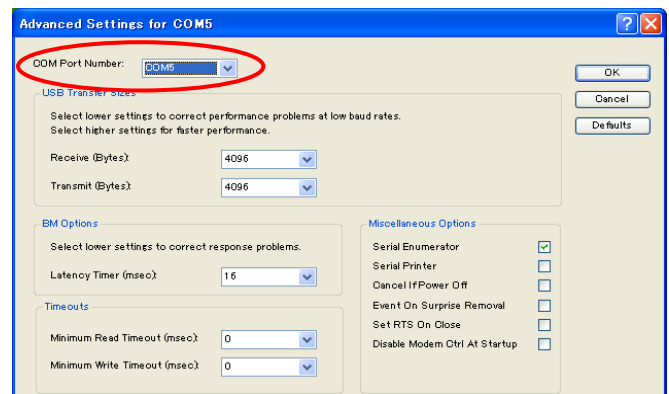
- (2) Click the [Port Settings] tab and [Advanced].



- (3) Select the COM port number from displayed list box, click "COM Port Number" and click "Ok".

Note 1) Please do not use COM port number displayed "(in use)" because the one used before or using.

Note 2) Please do not change the other setup section.



- (4) Click "OK" of the "USB Serial Port's properties", restart the PC or once plug out the USB cable and re-connect.

Note) Until finishing the above operation, please pay Note to that not change the COM port number.

4. Communication setup

Matching to communication device fixing to USB communication setup, RS-485 and RS-232C.

We can not communicate different setting with communication machine.

Note 1) The various type communication setup will not be reflected changed setup value until the machine's power supply re-start up.

Note 2) Various type communication setup will be setup by COM group parameter.

4.1 Communication speed (RS-232C, RS-485, USB)

Setup the communication speed.

Bps is the number of bits that are conveyed per a second.

* It's necessary for power supply's restart up by setup reflection.

Group	No.	Name	Setup value	Communication speed	Initial value
COM	2	BAUD	9600	9600bps	9600
			19200	19200bps	
			38400	38400bps	

4.2 Data bit length (RS-232C, RS-485, USB)

Setup the data bit length.

Data bit length is the one character data length.

* It's necessary for power supply's restart up by setup reflection.

Group	No.	Name	Setup value	Data Length	Initial value
COM	3	DATA	7BIT	7Bit (00H to 7FH)	7BIT
			8BIT	8Bit (00H to FFH)	

4.3 Stop Bit (RS-232C, RS-485, USB)

Setup the stop bit length.

Stop bit is the mark bit for notifying the one character length data finish.

* It's necessary for power supply's restart up by setup reflection.

Group	No.	Name	Setup value	Stop bit	Initial value
COM	4	S.BIT	2BIT	2bit	2BIT
			1BIT	1bit	

4.4 Parity (RS-232C, RS-485, USB)

Setup the parity bit.

Parity bit is the bit for error detection when transmitting the one character data.

* It's necessary for power supply's restart up by setup reflection.

Group	No.	Name	Setup value	Parity	Initial value
COM	5	P.BIT	EVEN	Even	EVEN
			ODD	Odd	
			NONE	Nothing	

4.5 Flow control (RS-232C, USB)

Setup the "Flow Control".

"Flow control" is the controlling to stop and restart receiving and sending.

* It's necessary for power supply's restart up by setup reflection.

* At the time of RS-485 communication, that will not work out.

Group	No.	Name	Setup value	Flow control	Initial value
COM	6	FLOW	NONE	Nothing	NONE
			HARD	Hardware control (RTS, CTS)	

4.6 Delimiter (RS-232C, RS-485, USB)

Setup delimiter

Delimiter is the communication command segment at the sending communication command from PC (host side).

Recognized as communication command segment when receiving delimiter at the machine.

Responding the separated data by delimiter with Replying data from the machine.

* It's necessary for power supply's restart up by setup reflection.

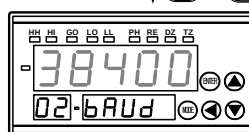
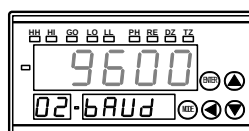
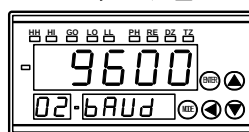
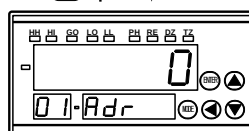
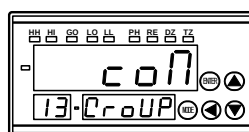
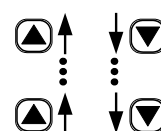
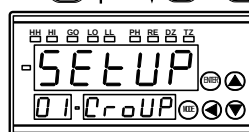
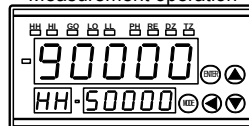
Group	No.	Name	Setup value	Delimiter	Initial value
COM	7	DLMT	CR	CR	CR.LF
			LF	LF	
			CR.LF	CR+LF	

4.7 Communication setup method.

Explaining the concrete communication setup method as a setup example of data bit length "8 bit" as following communication speed "38400 bps".

Setup the same operation with following example in the case of communication setup except the example.

Measurement operation



(1) Shift to setup group parameter by pressing the up key and mode key during the measurement.

* Press the enter key and return to measurement operation at SETUP display.

(2) Press the down key several times and shift to COM group parameter.

* Press the up key and return to group parameter. Press the down key and shift to next group operator.

(3) Press the mode key or the shift key. Shift to setup section in the machine's COM group parameter.

* Press the enter key and return to COM.

(4) Press the down key and shift to communication speed setup section.

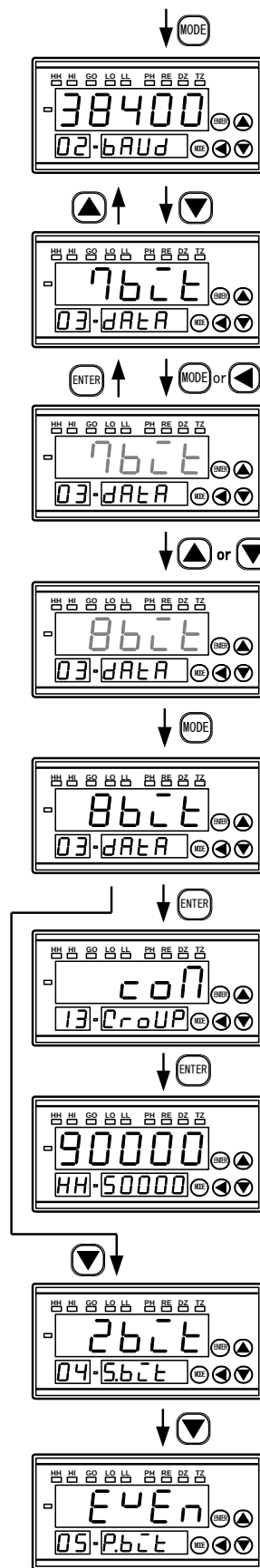
* Return to the previous setup item by pressing the up key.

(5) Press the mode key or the shift key. Blink the communication speed.

* Press the enter key and return to communication speed setup section.

(6) Press the up key and down key, setup the communication speed.

* Press the up key or down key. Communication speed will change by turn.



(7) Press the mode key and specify the communication speed.
Stop the display blinking after confirmation.
Note: Not press the mode key and press the enter key, the setup value will be "invalid".

(8) Press the down key and moving to data bit length setup section.

* Return to the previous setup item by pressing the up key.

(9) Push the mode key or the shift key.
Blink the data bit length.

* Press the data key, return to data bit length setup.

(10) Press the up key or down key, setup the data bit length.
* Press the up key and change from 7 bit to 8 bit.
Press the down key and change from 8 bit to 7 bit.

(11) Press the mode key and specify the data bit length, after confirmation, stop blinking the display.
Note: Not push the mode key and push the enter key, setup value will be "invalid".

(12) Press the enter key and shift to COM.

* Please reference the (14) section, in the case of transit to next setup menu.

(13) Press the enter key and return to measurement operation.

(14) Press the down key and shift to next setup menu.
Display that start bit setup menu.

(15) Press the down key and shift to next setup menu.

5. ASCII code

Communicate with one character using ASCII code in the list below.
We can not use lower case letter at the 485 communication.

Hex	Control character	Hex	Control character	Hex	Control character	Hex	Numeric character
00	NUL	10	DLE	20	SPACE	30	0
01	SOH	11	DC1	21	!	31	1
02	STX	12	DC2	22	"	32	2
03	ETX	13	DC3	23	#	33	3
04	EOT	14	DC4	24	\$	34	4
05	ENQ	15	NAK	25	%	35	5
06	ACK	16	SYN	26	&	36	6
07	BEL	17	ETB	27	'	37	7
08	BS	18	CAN	28	(	38	8
09	HT	19	EM	29	)	39	9
0A	LF	1A	SUB	2A	*	3A	:
0B	VT	1B	ESC	2B	+	3B	;
0C	FF	1C	FS	2C	,	3C	<
0D	CR	1D	GS	2D	-	3D	=
0E	SO	1E	RS	2E	.	3E	>
0F	SI	1F	US	2F	/	3F	?

Hex	Letter, Symbol	Hex	Letter, Symbol	Hex	Letter, Symbol	Hex	Letter, Symbol
40	@	50	P	60	`	70	p
41	A	51	Q	61	a	71	q
42	B	52	R	62	b	72	r
43	C	53	S	63	c	73	s
44	D	54	T	64	d	74	t
45	E	55	U	65	e	75	u
46	F	56	V	66	f	76	v
47	G	57	W	67	g	77	w
48	H	58	X	68	h	78	x
49	I	59	Y	69	i	79	y
4A	J	5A	Z	6A	j	7A	z
4B	K	5B	[	6B	k	7B	{
4C	L	5C	\	6C	l	7C	
4D	M	5D	]	6D	m	7D	}
4E	N	5E	^	6E	n	7E	~
4F	O	5F	_	6F	o	7F	DEL

6. RS-232C, USB communication

6.1 Communication command

By sending the command to the machine from PC, available acquiring the comparator result, setup value change and machine's remote control.

Format will be as follows;

Command + space + Parameter + Delimiter

Command + Delimiter

Example) Start-delay setup command STD command

Sending data	Command			space	Parameter		Delimiter	
Character	S	T	D		1	5	CR	LF
ASCII code	53H	54H	44H	20H	31H	35H	0DH	0AH

Example) Calculation result and acquiring the comparator result DSP command.

Sending data	Command			Delimiter	
Character	D	S	P	CR	LF
ASCII code	44H	53H	50H	0DH	0AH

6.2 Abnormal response

Output the response as follows, at the time of communication failure.

Please send the command again by reviewing the sending and receiving timing, communication setup, wiring and power supply.

Replying data	Response					Delimiter	
Character	N	O		?		CR	LF
ASCII code	4EH	4FH	20H	3FH	20H	0DH	0AH

7. RS-485 communication

7.1 Control character (RS-485)

Use the control character in the following table at the time of RS-485 communication.

Note) There is a thing that the control code cannot be transmitted and displayed by the communication software.

Control code	ASCII code (Hex)	Name
STX	02H	Start of Text
ETX	03H	End of Text
EOT	04H	End of Transmission
ENQ	05H	Enquiry
ACK	06H	Acknowledge

7.2 Establishing and releasing the communication link

In the case of RS-485 communication, because of there is availability to connection with one communication wire for 31 machines so that having necessity to communicate with specified device number and available for communication with which machine will be used.

7.2.1 Device Number

Setup the device number because specifying the machine.

* At the time of RS-232C, USB communication, that will not work out.

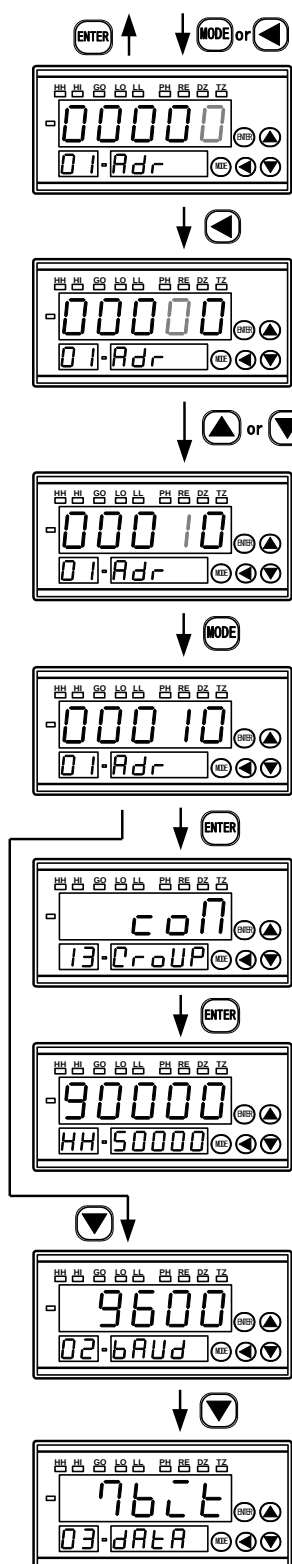
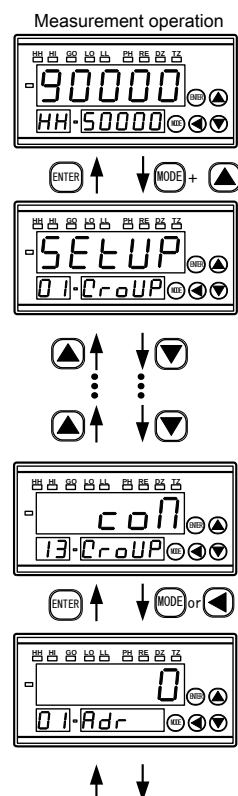
Group	No.	Name	Setup value	Initial value
COM	1	ADR	0 to 99	0

Note 1) In the case of setup value "0", unavailable for communication.

Note 2) Setup the device No. which different form the other communication machine. If setup the same device number, unavailable for communication.

7.2.2 Device number setup method

Explain the concrete communication setup method taking a setup device No. 10 to the following machine as an example.



7.2.3. Establishing the communication link

Firstly, send "ENQ" + device No. + delimiter establishing the communication link, because specifying the machine.

Available for communication with the only specified number device after establishment the communication.

Example) Device No.3 and establishing communication link

Sending data	Enquiry	Device No.		Delimiter	
Character	ENQ	0	3	CR	LF
ASCII code	05H	30H	33H	0DH	0AH

* Certainly setup the device number at the 2 digit.

Normal response

Replying data	Acknowledge	Device No.		Delimiter	
Character	ACK	0	3	CR	LF
ASCII code	06H	30H	33H	0DH	0AH

* In the case of device number is different, receive no response.

* Replying time: Not more than 2msec

7.2.4. Releasing the communication link

In the case of communicate with the machine except the machine currently communicating, necessary to release the communication link.

Send "EOT" + delimiter releasing the communication link.

Releasing the communication link is also possible if established by any other device number.

Sending data	End of transmission	Delimiter	
Character	EOT	CR	LF
ASCII code	04H	0DH	0AH

*Not Replying to this machine regarding the releasing communication link.

7.3 Communication command (RS-485)

Format will be as follows

"STX" + command+ space + parameter + "ETX" + BCC checksum + delimiter

"STX" + command + "ETX" + BCC checksum + delimiter

7.3.1 BCC Checksum

Using the BCC checksum as the error detection at the communication in the RS-485.

BCC is the command, space, parameter, "ETX" transforming to ASCII code and calculating to one character in sum of total lower digit 8 bit.

Communicate with attached BCC with sending and receiving at the RS-485 communication. (Except the ENQ, ACK, and EOT)

Replying "NO ?" at the receiving wrong BCC.

Example) Start-delay setup STD command

Sending data	STX	Command			Space	Parameter		ETX
Character	STX	S	T	D		1	5	ETX
ASCII code	02H	53H	54H	44H	20H	31H	35H	03H
BCC calculation data								
		BCC		L		H		Delimiter
		4		7		CR		LF
		34H		37H		0DH		0AH
		1		2				

BCC checksum calculation

BCC: 53H + 54H + 44H + 20H + 31H + 35H + 03H = **174H**

1. BCC L = 4 (Low order 4bit)

2. BCC H = 7 (High order 4bit)

Normal response

Replying data	STX	Response					ETX	BCC	
Character	STX	Y	E	S			ETX	4	1
ASCII code	02H	59H	45H	53H	20H	03H		34H	31H
BCC calculation data								1	2
Delimiter									
CR LF									
0DH 0AH									

BCC checksum calculation

BCC: 59H + 45H + 53H + 20H + 03H = **114H**

1. BCC L = 4 (Low order 4bit)

2. BCC H = 1 (High order 4bit)

Abnormal response

Replying data	STX	Response					ETX	BCC	
Character	STX	N	O		?		ETX	F	1
ASCII code	02H	4EH	4FH	20H	3FH	20H	03H	46H	31H
BCC calculation data								1	2
Delimiter									
CR LF									
0DH 0AH									

BCC checksum calculation

BCC: 4EH + 4FH + 20H + 3FH + 20H + 03H = **11FH**

1. BCC L = F (Low order 4bit)

2. BCC H = 1 (High order 4bit)

Example) Calculation result and acquiring the comparator result command

Sending data	STX	Command				ETX	BCC		Delimiter
character	STX	D	S	P	ETX	A	E	CR	LF
ASCII code	02H	44H	53H	50H	03H	41H	45H	0DH	0AH
BCC calculation data								1	2

BCC checksum calculation

BCC: 44H + 53H + 50H + 03H = **1EAH**

1. BCC L = A (Low order 4bit)

2. BCC H = E (High order 4bit)

Normal response

Sending data	STX	Response							
Character	STX	P	H	-	4	.	9	7	1
ASCII code	02H	50H	48H	2DH	34H	2EH	39H	37H	31H
	BCC calculation data								
	Response				ETX	BCC		Delimiter	
	2		L	O	ETX	8	B	CR	LF
	32H	20H	4CH	4FH	03H	38H	42H	0DH	0AH
	BCC calculation data					1	2		

BCC checksum calculation

BCC: 50H + 48H + 2DH + 34H + 2EH + 39H + 37H + 31H + 32H

+ 20H + 4CH + 4FH + 03H = **2B8H**

1. BCC L = 8 (Low order 4bit)

2. BCC H = B (High order 4bit)

8. Details of the command

8.1 Acquire the command

Command	Contents	Replying data
DSP	Acquire the calculation result and comparator results	1 to 2 characters: Condition " ": Normal operation (space 2 characters) "<=": At the OVER display "PH": At the peak hold "VH": At the volley hold "PV": At the peak volley hold 3 to 9 characters: Calculation result Output at the right aligned at the time of fewer digits. Example) "-9. 9999" *3 to 8 characters at the no decimal point. Example) "-99999" * At the time of indefinite calculation result, output the "?0. 000". (Decimal point position depends on the setup.) After the 10 characters: comparator result *At the no decimal point, since the nine characters. " HI": HI judgment ON (Space one character at the top) " HH": HH judgment ON (Space one character at the top) " LO": LO judgment ON (Space one character at the top) " LL": LL judgment ON (Space one character at the top) " GO": GO judgment ON (Space one character at the top) * Output the multiple judgment result at the upper described turn in the case of multiple judgment "ON" simultaneously. * Not output the judgment result at the time of no judgment result. Response example) "PH-1. 2345 LO LL" " 123 GO" "<= 999. 99 HH"
MES	Acquire the calculation result	12 characters fixed length. 1 to 2 characters: condition " ": At the normal condition (Space 2 characters) "<=": At the OVER display 3 to 9 characters: calculation result At the times of fewer digit, output at the left aligned In the case of Polarity plus, output the space at the polarity digit. example) "-9. 9999" * At the time of indefinite calculation result, output the "?0. 000". (Decimal point position depends on the setup.) 10 to 12 characters: Space " " Response example) " -1. 2345 " " 123 " "<= 999. 99 "
JGM	Acquire the comparator result	15 characters for fixed length. "HI ": HI judgment ON (Lastly space one character) "HH ": HH judgment ON (Lastly space one character) "LO ": LO judgment ON (Lastly space one character) "LL ": LL judgment ON (Lastly space one character) "GO ": GO judgment ON (Lastly space one character) "OFF": No judgment result * In the case of not fulfill the fifteen characters as output and output the rest of all goes to space. * In the case of multiple judgment "ON" simultaneously, output the multiple judgment result in above described turn. Response example) "HI HH LO LL "

Command	Contents	Replying data
DSA DSB	Acquire the Ach measurement value Acquire the Bch measurement value	1 to 2 characters: condition " ": At the normal time, (space 2 characters) "<=": At the OVER display 3 to 9 characters: calculation results At the few digit time, output by the right aligned. Example) "-9.9999" * At the time of no decimal point, 3 to 8 characters. Example) "-99999" * At the time of indefinite calculation result, output the "?0.000". (Decimal point position depends on the setup.) Response example) " -1.2345" " 123" "<= 999.99"
CIN	Acquire the control input terminal condition.	1 to 4 characters: "CIN " (Lastly space one character) Since the 5 characters: Control input 1 to 8 terminal condition (Output in turn) "ON ": control input "ON" (Lastly space one character) "OFF ": control input "OFF" (Lastly space one character) Response example) "CIN ON OFF ON OFF OFF ON ON OFF "

8.2 Setup value saving

Not save the setup value in the case of changing setup value by communication. After cut out the power supply, return to previous setup value.

Please save the setup value using the following command.

Setup value saving needs approx. 1 minute. Available for confirming the saving condition.

Please save the setup value after confirmation thoroughly because unavailable for stop the setup value saving in on the way.

Note) Don't cut out the power supply in the middle of saving the setup value.

Command	Contents	Parameter	Replying data
WEP	Setup value saving condition confirmation	Nothing	"WEP OFF": Setup value saving "OFF" "WEP ON": In the setup value saving
	Setup value saving	"ON": Setup value saving	"YES ": Successively setting (Lastly space one character)

8.3 Communication setup

Command	Contents	Parameter	Replying data
BPS	Communication speed confirmation	Nothing	"BPS 9600": 9600bps "BPS 19200": 19200bps "BPS 38400": 38400bps
	Communication speed change	"9600": 9600bps "19200": 19200bps "38400": 38400bps	"YES ": Successively setting (Lastly space one character) *Reflect the setup by re-start the power supply after saving the setup value (WEP command) after successive setup.
DLM	Communication delimiter confirmation	Nothing	"DLM 1": CR "DLM 2": LF "DLM 3": CR + LF
	Communication delimiter change	"1": CR "2": LF "3": CR + LF	"YES ": Successively setting (Lastly space one character) *Reflect the setup by re-startup the power supply after saving the setup value (WEP command) after successive setup.

8.4 Input

Command	Contents	Parameter	Replying data
RAN	Input range confirmation	Nothing	1 to 5 characters: "RANG " (Lastly space one character) After the 6 characters: "A=" : Input range setup Ach "B=" : Input range setup Bch "0-10" : $\pm 10V$ input "1-5" : 1 to 5V($\pm 5V$) input (space one character at the top) "0-1" : $\pm 1V$ input (space one character at the top) "4-20" : 4 to 20mA input Response example) "RANG A= 1-5 B=4-20"
	Input range change	Input channel select "A=" : Ach "B=" : Bch Input range "0-10" : $\pm 10V$ "1-5" : 1 to 5V($\pm 5V$) "0-1" : $\pm 1V$ "4-20" : 4 to 20mA Sending example) "RAN B=0-1" *Unavailable for changing 2 channel simultaneously.	"YES " : Successively setting (Lastly space one character)
SEL	Calculation switching confirmation	Nothing	"SEL A" : Ach "SEL B" : Bch "SEL K-A" : $K \cdot A$ "SEL A+B" : $A+B$ "SEL A-B" : $A-B$ "SEL K-A+B" : $K \cdot (A+B)$ "SEL A-BB" : $\{(A \cdot B) / B \} \times 1000$ "SEL B/A" : $(B/A) \times 1000$ "SEL 1-BA" : $\{1 - (B/A)\} \times 1000$ "SEL BA-1" : $\{(B/A) - 1\} \times 1000$ "SEL A&B" : Ach (AMH-762 for convertible)
	Calculation switching change	"A" : Ach "B" : Bch "K-A" : $K \cdot A$ "A+B" : $A+B$ "A-B" : $A-B$ "K-A+B" : $K \cdot (A+B)$ "A-BB" : $\{(A \cdot B) / B \} \times 1000$ "B/A" : $(B/A) \times 1000$ "1-BA" : $\{1 - (B/A)\} \times 1000$ "BA-1" : $\{(B/A) - 1\} \times 1000$ "A&B" : Ach (AMH-762 for convertible)	"YES " : Successively setting (Lastly space one character) * When set "A and B", change sub display and monitor to B channel.

Command	Content	Parameter	Replying data
SMP	Sampling speed confirmation	Nothing	"SMP 4000" : 4000 times / sec "SMP 2000" : 2000 times / sec "SMP 1000" : 1000 times / sec "SMP 500" : 500 times / sec "SMP 200" : 200 times / sec "SMP 100" : 100 times / sec "SMP 50" : 50 times / sec "SMP 20" : 20 times / sec "SMP 10" : 10 times / sec "SMP 5" : 5 times / sec "SMP 2" : 2 times / sec "SMP 1" : 1 times / sec
	Sampling speed change	"4000" : 4000 times / sec "2000" : 2000 times / sec "1000" : 1000 times / sec "500" : 500 times / sec "200" : 200 times / sec "100" : 100 times / sec "50" : 50 times / sec "20" : 20 times / sec "10" : 10 times / sec "5" : 5 times / sec "2" : 2 times / sec "1" : 1 times / sec	"YES " : Successively setting (Lastly space one character)
MAV	Moving average confirmation	Nothing	1 to 4 character: "MAV " (Lastly space one character) After 5 character: "A=" : Moving average setup Ach "B=" : Moving average setup Bch "OFF" : No moving average "2" : Moving average 2 times "4" : Moving average 4 times "8" : Moving average 8 times "16" : Moving average 16 times "32" : Moving average 32 times "64" : Moving average 64 times Response example) "MAV A=8 B=OFF"
	Moving average change	Input channel select "A=" : Ach "B=" : Bch Selecting the moving average "0" : No moving average "2" : Moving average 2 times "4" : Moving average 4 times "8" : Moving average 8 times "16" : Moving average 16 times "32" : Moving average 32 times "64" : Moving average 64 times Sending example) "MAV A=16" *Unavailable for changing 2 channel simultaneously.	"YES " : Successively setting (Lastly space one character)

8.5 Pattern

At the time of only PSEL set "INT".

Command	Contents	Parameter	Replying data
PSL	Pattern confirmation	Nothing	"PSL P-X": Pattern setup value X = 1 to 8 * In the case of PSEL = "EXT", Replying to "NO? ".
	Pattern change	Pattern setup "X" X = 1 to 8 Sending example) "PSL 5"	"YES ": successively setting (Lastly space one character) * In the case of PSEL = "EXT", Replying to "NO? ".

8.6 COM, MET command

• Change the pattern 1 to 8 pattern group setup value using the COM, MET command

• In the case of using COM, MET command, transit to each setup mode.

COM command transit to comparator and hysteresis setup mode.

MET command transit to scaling setup mode.

• Available for using only R command, N command, J command during the COM, MET setup mode.

* At the COM and MET setup mode, we not using besides the above communication command.

* At the COM and MET setup mode, continuously operate the measurement movement and comparator output movement.

Command	Contents	Parameter	Replying data
COM	Comparator and Hysteresis setup mode	Nothing	Transit to comparator setup and hysteresis setup mode. "P- X ": Current setup pattern (Lastly space one character) X = 1 to 8
MET	Scaling setup mode	Nothing	Transit to scaling setup mode. "P- X ": Current setup pattern (Lastly space one character) X = 1 to 8

■ R command (COM, MET setup mode)

Return to normal communication mode by finishing the COM, MET setup mode.

And reflect the changed setup value during the COM, MET setup mode change.

* Until sending R command, setup value change will not be reflected to the operation.

Command	Contents	Parameter	Replying data
R	Normal communication mode	Nothing	Transit to normal communication mode and reflecting the setup value change. "YES ": Successively setting (Lastly space one character)

■ N command (COM, MET setup mode)

Move the setup section to the next setup value returning the setup value and setup section name as Replying data.

Command	Contents	Parameter	Replying data at COM setup mode	Replying data at the MET setup mode
N	Setup section movement	Nothing	At the current setup pattern setup section, moving in the following turn. "P- X ": Current setup pattern ↓ "S-HH XXXXXX": Comparator setup HH ↓ "S-HI XXXXXX": Comparator setup HI ↓ "S-LO XXXXXX": Comparator setup LO ↓ "S-LL XXXXXX": Comparator setup LL ↓ "H-HH XXXXXX": Hysteresis setup HH ↓ "H-HI XXXXXX": Hysteresis setup HI ↓ "H-LO XXXXXX": Hysteresis setup LO ↓ "H-LL XXXXXX": Hysteresis setup LL ↓ "P- X ": Return to current setup pattern X to XXXXXX is the setup value.	At the current setup pattern setup section, moving in the following turn. "P- X ": Current setup pattern ↓ "FSC XXXXXX": Full scale display value Ach ↓ "FIN XXXXXX": Full scale input value Ach ↓ "OFS XXXXXX": Offset display value Ach ↓ "OIN XXXXXX": Offset input value Ach ↓ "FSCB XXXXXX": Full scale display value Bch ↓ "FINB XXXXXX": Full scale input value Bch ↓ "OFSB XXXXXX": Offset display value Bch ↓ "OINB XXXXXX": Offset input value Bch ↓ "DP A X ": Decimal point position Ach ↓ "DP B X ": Decimal point position Bch ↓ "P- X ": Return to current setup pattern X to XXXXXX is the setup value.

■ J command (COM, MET setup mode)

Jump and move at the setup section and returning the setup section name and setup value as a Replying data.

Command	Contents	Parameter	Replying data at the COM setup mode	Replying data at the MET setup mode
J	Setup section movement	Nothing	Jump in the following turn regarding the current setup pattern's setup section. "P- X ": Current setup pattern ↓ "S-HH XXXXXX": Comparator setup HH ↓ "H-HH XXXXXX": Hysteresis setup HH ↓ "P- X ": Current setup pattern	Jump in the following turn regarding the current setup pattern's setup section. "P- X ": Current setup pattern ↓ "FSC XXXXXX": Full scale display value Ach ↓ "FSCB XXXXXX": Full scale display value Bch ↓ "DP A X ": Ach decimal point position ↓ "P- X ": Returning to current setup pattern

■ Setup change (COM, MET setup mode)

Available for change the current setup pattern setup value at the setup section by sending only numeric value with no command.

At the successively setup, returning the setup section name and setup value as a replying data.

* In the case of current setup pattern at the setup section, available for changing the pattern to the setup value.

Not switch the usage pattern at operation.

Command	Contents	Parameter	Replying data
Nothing	Pattern change	Current setup pattern "X" X = 1 to 8	"P- X ": Successively setup current setup pattern "Error": Out of range setup error
Nothing	Comparator and scaling display value setup change	Comparator setup HH Comparator setup HI Comparator setup LO Comparator setup LL Full scale display value Ach Offset display value Ach Full scale display value Bch Offset display value Bch "XXXXXX" XXXXXX = -99999 to 99999 * No decimal point	"S-HH XXXXXXX": Successively setup comparator setup HH "S-HI XXXXXXX": Successively setup comparator setup HI "S-LO XXXXXXX": Successively setup comparator setup LO "S-LL XXXXXXX": Successively setup comparator setup LL "FSC XXXXXXX": Successively setup full scale display value Ach "OFS XXXXXXX": Successively setup offset display value Ach "FSCB XXXXXXX": Successively setup full scale value Bch "OFSB XXXXXXX": Successively setup offset display value Bch * Full decimal point "Error": Out of range setup error
	Hysteresis setup	Hysteresis setup HH Hysteresis setup HI Hysteresis setup LO Hysteresis setup LL "XXXXXX" XXXXXX = 0 to 50000 * No decimal point	"H-HH XXXXXXX": Successively setup hysteresis setup HH "H-HI XXXXXXX": Successively setup hysteresis setup HI "H-LO XXXXXXX": Successively setup hysteresis setup LO "H-LL XXXXXXX": Successively setup hysteresis setup LL * Full decimal point "Error": Out of range setup error
	Scaling input value change	Full scale input value Ach Offset input value Ach Full scale input value Bch Offset input value Bch "XXXXXX" XXXXXX = Please reference the FIN, OIN setup range regarding the setup range for the scaling setup. * No decimal point	"FIN XXXXXXX": Full scale input value Ach "OIN XXXXXXX": Offset input value Ach "FINB XXXXXXX": Full scale input value Bch "OINB XXXXXXX": Offset input value Bch * Full decimal point "Error": Out of range setup error
	Decimal point change	Decimal point position Ach Decimal point position Bch "X" X = 0 to 5	"DP A X ": Decimal point position Ach "DP B X ": Decimal point position Bch "Error": Out of range setup error

Configuration example) Change the pattern 5 hysteresis HI to 100.

Number	Sending	Response	Content of communication
1	"COM"	"P- 3 "	Transit to comparator setup, hysteresis setup mode.
2	"5"	"P- 5 "	Change the setup pattern to 5.
3	"N"	"S-HH 5000 "	Setup section moves to comparator setup HH.
4	"J"	"H-HH 0 "	Setup section jumps to hysteresis setup HH.
5	"N"	"H-HI 0 "	Setup section moves to hysteresis setup HI.
6	"100"	"H-HI 100 "	Setup the hysteresis setup HI to "100".
7	R	"YES "	Update the setup value after finishing the comparator setup and hysteresis setup mode.

8.7 Function

Command	Contents	Parameter	Replying data
FIX	Fix zero confirmation	Nothing	"FIX OFF": OFF "FIX ON": ON
	Fix zero change	"OF": OFF "ON": ON	"YES ": Successively setting (Lastly space one character)
TRK	Tracking zero correction cycle confirmation	Nothing	- At the tracking zero "OFF" "TRK OFF": Tracking zero "OFF" - At the tracking zero "ON" After 1 to 3 characters: "ON " After four characters: "T=XXXX": Tracking zero correction cycle XXXXX = 1 to 10000[sample] (0 is OFF) "W=XX": Tracking zero correction width XX = 1 to 99[digit] Response example) "ON T=10000 W=99"
	Tracking zero correction cycle confirmation	"T=XXXX" XXXXX = 0 to 10000[sample] Sending example) "TRK T=500"	"YES ": Successively setting (Lastly space one character)
	Tracking zero correction width change	"W=XX" XX=1 to 99[digit] Sending example) "TRK W=9" Unavailable to change correction width and correction cycle simultaneously.	"YES ": Successively setting (Lastly space one character)
DCY	Main display update cycle confirmation	Nothing	"DCY SSLO": 1 time / sec "DCY SLO": 2 times / sec "DCY MID": 10 times / sec "DCY FAST": 20 times / sec
	Main display update cycle change	"SSLO": 1 time / sec "SLO": 2 times / sec "MID": 10 times / sec "FAST": 20 times / sec	"YES ": Successively setting (Lastly space one character)
KEY	Key protect confirmation	Nothing	"KEY OFF": OFF "KEY ON": ON Unavailable for transit to setup mode by the key protect "ON". Also unavailable for pattern switching. *Available for setup key protect only by communication. By the parameter initialization, set the key protect "OFF".
	Key protect change	"OF": OFF "ON": ON	"YES ": Successively setting (Lastly space one character)
PRO	Setup value change Protect confirmation	Nothing	"PRO OFF": OFF "PRO CND": Unavailable for setup condition data. "PRO PATN": Unavailable for setup pattern data. "PRO ON": Unavailable for change all setup value.
	Setup value change protect change	"OF": OFF "CND": Unavailable for setup condition data. "PATN": Unavailable for setup pattern data. "ON": Unavailable to change all setup value.	"YES ": Successively setting (Lastly space one character)

8.8 Digital Zero (Remote control)

Command	Contents	Parameter	Replying data
DZA	Digital zero Ach remote control	"OFF": Digital zero Ach terminal OFF "ON": Digital zero Ach terminal ON	"YES ": Successively setting (Lastly space one character)
	Digital zero value Ach change	"XXXXXX" XXXXXX = -99999 to 99999 (No decimal point) Sending example) "DZA -6000"	"YES ": Successively setting (Lastly space one character) Setup the digital zero value at the time of digital zero Ach terminal "ON".
DZB	Digital zero Bch remote control	"OFF": Digital zero Bch terminal OFF "ON": Digital zero Bch terminal ON	"YES ": Successively setting (Lastly space one character)
	Digital zero value Bch Change	"XXXXXX" XXXXXX = -99999 to 99999 (No decimal point) Sending example) "DZB 200"	"YES ": Successively setting (Lastly space one character) Setup the digital zero value at the time of digital zero Bch terminal "ON".
DZC	Digital zero Ach and Bch remote control	Remote control "OFF": Digital zero Ach & Bch(both) terminal OFF "ON": Digital zero Ach & Bch(both) terminal ON	"YES ": Successively setting (Lastly space one character)
	Digital zero value Ach and Bch change	"XXXXXX" XXXXXX = -99999 to 99999 (No decimal point) Sending example) "DZC -99999"	"YES ": Successively setting (Lastly space one character) Setup the 2 channel's same digital zero value at the time of both digital zero Ach and Bch terminal "ON".
EZM	Digital zero Ach & Bch Remote control "OFF"	Nothing	"YES ": Successively setting (Lastly space one character) Finishing the both digital zero Ach and Bch at the remote control simultaneously. *In the case of allocating digital zero function to the control terminal, switching to digital zero control at the control terminal at the time of remote control "OFF". (Remote LED light-off at the time of all remote control "OFF".)

*At the time of remote control, remote control precedence over even allocating to digital zero function to control terminal.

*Remote LED light at the remote control (remote LED light at the time of another remote control use.)

*Even the setup digital zero value setting at the digital zero terminal "OFF", updating the digital zero value at the "ON" time so that not operating at setup value.

8.9 Digital zero

Command	Contents	Parameter	Replying data
DZR	Digital zero Acquiring the condition	Nothing	1 to 4 characters: "DZR " (Lastly space one character) After the 5 characters: Ch "A=": Ach "B=": Bch Condition "OF": Digital Zero "OFF" "XXXXXX": Digital zero value (ON condition) XXXXXX = -9.9999 to 9.9999 * At the time of no decimal point, output at the 6 digits. * Decimal point position depends on the setup. Response example) "DZR A= 0.10 B=OF"

8.10 Peak Hold

Command	Contents	Parameter	Replying data
PVD	Acquiring the peak hold value.	"A": Ach Peak hold value "B": Bch Peak hold value	Output the peak hold, volley hold Peak volley hold value simultaneously "PH XXXXXX": Peak hold value "VH XXXXXX": Volley hold value "PVH XXXXXX": Peak volley hold value XXXXXXX = -9.9999 to 9.9999 * Output the 6 digits at the time of no decimal point. * Decimal point position depends on the setup. * Output the "?0.000" at the time of indefinite peak hold value. (Decimal point position depends on the setup.)
PVH	Peak hold type Confirmation of terminal condition	Nothing	Peak hold type setup value 1 to 6 characters: "PVH PH": Peak hold "PVH VH": Volley hold "PVH PV": Peak volley hold Peak hold terminal condition After the 7 characters " OFF": Peak hold terminal "OFF" condition " ON": Peak hold terminal "ON" condition Response example) "PVH VH OFF"
	Changing the peak hold type	"PH": Peak hold "VH": Volley hold "PV": Peak volley hold	"YES ": Successively setting (Lastly space one character)
PVT	Confirmation of peak hold type	Nothing	"PVH A": A type (Present continuous type) "PVH B": B type (Result type)
	Changing the peak hold type	"A": A type (Present continuous type) "B": B type (Result type)	"YES ": Successively setting (Lastly space one character)
PCL	Clear the peak hold value.	Ch "A": Ach peak hold value "B": Bch peak hold value Peak hold type " PH": Peak hold " VH": Volley hold " PV": Peak volley hold Sending example) "PCL A PH" "PCL B VH"	"YES ": Successively setting (Lastly space one character) Clear the setup channel and peak hold type's peak hold value. In the case of not updating the peak hold value, peak hold value will be the "?0.000" after the clearance. (Decimal point position depends on the setup.)

8.11 Peak Hold (Remote control)

Command	Content	Parameter	Replying data
PHC	Peak hold Remote control	"OFF": Peak hold terminal "OFF" "ON": Peak hold terminal "ON"	"YES ": Successively setting (Lastly space one character) Remote control will be preferred at the control terminal even the peak hold function allocated. Light the remote LED at the remote control. (Light the remote LED at the other remote control using.)
EPM	Peak hold Remote control "OFF"	Nothing	"YES ": Successively setting (Lastly space one character) Finishing the peak hold's remote control. *In the case of allocation the peak hold function, at the remote control "OFF" time, switching the peak hold control at the control terminal. (Remote LED will light off at the all of remote control "OFF".)

8.12 Start / Hold

Command	Contents	Parameter	Replying data
STH	Acquire the Start/Hold condition	Nothing	1 to 4 character: "STH " (Lastly space one character) Since five character: Ch "A=" : Ach "B=" : Bch Condition "H" : Hold condition "S" : Start condition Response example) "STH A=H B=S"
STT	Start/Hold type confirmation	Nothing	"STH A" : A type (Free run type) "STH B" : B type (One shot type)
	Start/Hold type change	"A" : A type (Free run type) "B" : B type (One shot type)	"YES " : Successively setting (Lastly space one character)
STD	Start/delay confirmation	Nothing	"STD OFF" : Start delay OFF "STD XXXXX" : Start delay setup value (ON) XXXXX = 1 to 10000[sample] (0 is OFF)
	Start delay change	"XXXXX" XXXXX = 0 to 10000[sample] Sending example) "STD 500"	"YES " : Successively setting (Lastly space one character)
T	Acquiring the calculation result and comparator result (Only at the Start/Hold)	Nothing	Replying on time at the time of start hold after receiving the command by the sampling timing. Replying date will be the same format with "DSP" command. *At the start/hold starting with no response. *At the 2ch input calculation usage, response only both 2ch goes to hold.

8.13 Start / Hold (Remote control)

Command	Contents	Parameter	Replying data
SHA	Start/Hold Ach remote control	"H" : Start/Hold Ach terminal hold "S" : Start/Hold Start the Ach terminal	"YES " : Successively setting (Lastly space one character)
SHB	Start/Hold Bch remote control	"H" : Start/Hold Bch terminal hold "S" : Start/Hold Start the Bch terminal	"YES " : Successively setting (Lastly space one character)
SHC	Start/Hold Ach and Bch remote control	"H" : Start/Hold Ach and Bch terminal hold "S" : Start / Hold Start the Ach and Bch terminal	"YES " : Successively setting (Lastly space one character)
ESM	Remote control OFF at the Ach and Bch	Nothing	"YES " : Successively setting (Lastly space one character) Simultaneously finish the star/hold remote control both Ach and Bch. *In the case of allocating start/hold function to control terminal, switching to start/hold control to the control terminal at the remote control "OFF" . (The remote Led lights-out when all of the remote control "OFF" .)

* At the time of remote control, remote control precedence over even allocating to start/hold function to control terminal.

8.14 Maximum and minimum value

Command	Contents	Parameter	Replying data
MAX	Acquired the maximum and minimum value	Nothing	Output simultaneously the maximum value, minimum value, and maximum value - minimum value. The number is the right filling. "MAX XXXXXXX" : Maximum value "MIN XXXXXXX" : Minimum value "M-M XXXXXXX" : Maximum value - Minimum value XXXXXXXX = -99999 to 99999 * At the no decimal point character will goes 10 digits. * Maximum value - minimum value should not be more than 99999. * Output the "?.0000" at the times of indefinite maximum and minimum value. (Decimal point position depends on the setup.)
MCL	Clear the maximum and minimum value	"MA" : Maximum value "MI" : Minimum value "MM" : Maximum value - Minimum value	"YES " : Successively setting (Lastly space one character) Clear the established maximum and minimum value. After the clear, in the case of not updating the maximum and minimum value will be the "?.000" . (Decimal point position depends on the setup.)

8.15 Clear the maximum and minimum value (Remote control)

Command	Contents	Parameter	Replying data
CLR	Clear the maximum and minimum value remote control	"OF" : Maximum and minimum value clear terminal "OFF" . "ON" : Maximum and minimum value clear terminal "ON" .	"YES " : Successively setting (Lastly space one character) Remote control is precedence over even the maximum - minimum value clear function allocation to control terminal. At the time of remote control, light the remote LED. (Light the remote LED at the other remote control using.)
ECM	Clear the maximum and minimum value remote control "OFF"	Nothing	"YES " : Successively setting (Lastly space one character) Finishing the remote control of maximum - minimum value. *In the case of allocation the maximum - minimum value clear function to control terminal, at the remote control "OFF" switching the maximum-minimum value clear control at the control terminal. (Lights-off the remote LED at the time of all remote control set "OFF" .)

8.16 Comparator output

Command	Contents	Parameter	Replying data
RLD	Comparator output off delay confirmation	Nothing	"RLD OFF" : Comparator output OFF delay OFF "RLD XXXX" : Comparator output OFF delay setup value (ON) XXXX = 1 to 1000[msec] (0 is OFF)
	Comparator output off delay change	"XXXX" XXXX = 0 to 1000[msec] Sending example) "RLD 20"	"YES " : Successively setting (Lastly space one character)

8.17 Comparator output (Remote control)

Command	Contents	Parameter	Replying data
RES	Reset the comparator output remote control	"OFF" : Comparator output reset terminal OFF "ON" : Comparator output reset terminal ON	"YES " : Successively setting (Lastly space one character) Prefer the remote control to the control terminal even the reset the comparator output function allocated. Lighting the remote LED at the remote control. (When another remote control using, lights the remote LED.)
ERM	Reset the comparator output remote control "OFF"	Nothing	"YES " : Successively setting (Lastly space one character) Finish the comparator output reset remote control *In the case of allocating comparator output reset function to control terminal, at the remote control "OFF" switching comparator output reset to the control terminal. (All of the remote LED, lights-off at the remote control set "OFF" .)
RLY	Comparator output remote output confirmation.	Nothing	"RLY OFF" : Comparator output all sets "OFF" "RLY HH" : Comparator output sets "ON" only for HH "RLY HI" : Comparator output sets "ON" only for HI "RLY GO" : Comparator output sets "ON" only for GO "RLY LO" : Comparator output sets "ON" only for LO "RLY LL" : Comparator output sets "ON" only for LL
	Comparator output remote output change	"OFF" : Comparator output all sets "OFF" "HH" : Comparator output sets "ON" only for HH "HI" : Comparator output sets "ON" only for HI "GO" : Comparator output sets "ON" only for GO "LO" : Comparator output sets "ON" only for LO "LL" : Comparator output sets "ON" only for LL	"YES " : Successively setting (Lastly space one character) Prefer the comparator output remote output to the comparator output reset. At the setup mode, all of comparator output goes "OFF" . Remote LED light at the remote control. (light the remote LED even at the time of use another remote control)
RCM	Comparator output remote control "OFF"	Nothing	"YES " : Successively setting (Lastly space one character) Finishing the comparator output remote output. (Remote LED lights off at the time of all of remote control set "OFF" .)

8.18 Setup value confirmation

Command	Contents	Parameter	Replying data
ALL	Setup value confirmation	Nothing	Available for confirm the setup value at the following section. "PVH XX": Peak hold type setup value "RANG A=XXXX B=XXXX": Input range setup value "SMP XXXX": Sampling speed setup value "SEL XXXX": Calculation switch setup value "DCY XXXX": Main display update cycle setup value "MAV A=XXX B=XXX": Moving average setup value "STH X": Start / hold type setup value "PVH X": Peak hold type setup value "STD XXXX": Start delay setup value "RLD XXXX": Comparator output OFF delay setup value "ON T=XXXXX W=XX": Tracking zero setup value "FIX XXX": Fix zero setup value •Display lights out setup value (communication setting not available) "BLNK OFF": Normal displayed "BLNK OFF": Display lights out •Pattern select method setup value (communication setting not available) "PSEL INS": Front key, communication "PSEL OUT": Control terminal "BPS XXXX": Communication speed setup value "PRO XXXX": Setup value change protect setup value X to XXXXX: Setup value * Please reference the each communication command regarding the setup value detail Response example) "PVH PV" "RANG A=0-10 B= 1-5" "SMP 4000" "SEL K-A+B" "DCY SSLO" "MAV A=16 B=OFF" "STH A" "PVH B" "STD 10000" "RLD 500" "ON T= 100 W=99" "FIX ON" "BLNK ON" "PSEL INS" "BPS 38400" "PRO PATN"

9. Trouble shooting

9.1 Error message

Error main display	Error display monitor.	The possible cause	Countermeasure
OVER -OVER	Normal Display	Input range over	The channel input using calculation in the display available range.
		Display range over	The using calculation channel's measurement value should not surpass the ± 99999 for input value.
		Operation result over	Operation result should not surpass the ± 99999 . The calculation formula using division not divide by zero.
WAIT	Normal Display	Start / Hold function will be the "Hold" condition.	Start/Hold function make "start" condition. Start-delay function sets "0".
		Peak Hold type will be the B type so not updating Peak Hold value.	Updating the Peak Hold value. Peak Hold type sets "A type".
		The both of Start/Hold type and Peak Hold type will be the "B" type.	Either Start/Hold type or Peak/Hold type change to "A" type.
ERROR	P ROM	In the cause of cutout the power supply during the setup value write in.	For the recovery, setup value must be initialized when turning on the power supply again and setup value will be initialized. After finishing the initialization to normal display, display the "INIT EPROM" during the initialization. Because the setup value initialized, please change the setup value again. *Doing initializing "setup value" several times, in the case of displaying "ERROR ROM" , that will surpass the conservation available range and unavailable to preserve the setup value. Please contact us directly or distributor.
ERROR	A ROM	The calibration is not right.	Please contact us directly or distributor because not able to rescue by customer.

9.2 Response in times of trouble

Phenomenon	The possible cause	Measure
There is no indication.	Display lights-out function will be "ON".	Display lights-out function will be "OFF".
Unavailable to transit to setup mode.	Keep protect setup will be "ON".	Key protect setup will be "OFF" by communication and initialize the setup value.
We can not change the display value.	Setup value change protect sets "ON".	Setup value change protect will be "OFF".
Sensor power supply terminals' output will not output.	More than allowable output current flows into sensor power supply terminal and output protect circuit will be activated.	Turn on the power supply again by sensor power supply's load below the allowable output current.
Control terminal will not be activated.	Not correctly allocated to control terminal function.	The function allocated to control terminal.
	At the time of patter select function, patter select method will be "EXT".	Pattern Select method sets "INT".
	The communication remote control will set "ON".	The communication remote control will set "OFF".
Unavailable for communication.	Wiring is not normally connected.	Reappraise the "Arrangement of tracks".
	After changing communication setup, not turning on the power supply.	Turning on the power supply again
	Not adjusting to sending and receiving communication setup.	Adjust the communication setup.
	Replicate the RTS, CTS terminal used with cable at the RS-232C communication and setup hardware flow control.	Setup without the hardware flow control, using the RTS, CTS terminal replicate the RTS and CTS terminal.
	At the time of USB communication, start up the communication software before power up to the machine.	After communication software start-up after the turning on the machine's power supply.
	At the time of RS-485 communication, device No. will be the same with the other machine or "0".	We will not use another communication machine except the device No. "0".
	At the times of RS-485, we will not establish the communication.	Establish the communication.
	At the time of RS-485 communication, BCC will not be attached.	Attach BCC to the command.

watanabe

WATANABE ELECTRIC INDUSTRY CO., LTD.

6-16-19, Jingumae, Shibuya-ku, Tokyo 150-0001, Japan

Phone: (81)3-3400-6141

Homepage <http://www.watanabe-electric.co.jp/en/>