Digital Flow meter ・Speed meter
AC-911 Instruction Manual

⚠Warning

Please do not use this product for the purpose to ensure safety whether directly or indirectly.
Please combine conservation measure by technical measure in case there is possibility of secondary disaster accrual due to product's malfunction or machine itself.
Our company doesn't assume any responsibility to special damage, indirect damage, and the depolarization damage that originates in this product and is caused.

⚠Attentions

(1) Impress the electric current or voltage that cause damage of the machine.
(2) Please use power supply voltage in the range available. If you use out of the range available. That will be the cause of fire, electrification and failure.
(3) The contents of this instructions are subject to change without notice, your understanding of this matter is greatly appreciated.
(4) Regarding this, we made this as possible effort as we can, in case there is notice points, error or if you have any questions, please contact dealer directly or indirectly to our company.
(5) After reading this manual, please save this where you can see this any time.

1. Notes to users

Thank you for purchasing this AC-911 this time.
Please save this manual at your sight. If you have any points to notice about the damage through transit, please contact us or dealer directly.

1.1. Type Identification

Each model number of the AC-911 has its general specifications, and the following describes each note and the meaning. Before using the unit, check that the model number and specifications of the delivered unit match those of the product you ordered.

AC−911−□□−□

Option choice1
- 0 Nothing
- 1 Comparative output(relay)
- 2 Comparative output(photo coupler)
- A BCD output(TTL)*Attention
- B BCD output(open collector)*Attention

*Attention: Available to choose in case option choice 2 sets 5 to 8

Option choice 2
- 0 Nothing
- 5 RS-232C output
- 6 RS-485 output
- 7 RS-232C+analogue output
- 8 RS-485+analogue output
- A BCD output(TTL)
- B BCD output(open collector)

Power supply choice
- 1 AC100 to 240V±10%(50/60Hz)
- 2 DC12 to 48±10%

1.2. Confirmation about the accessory

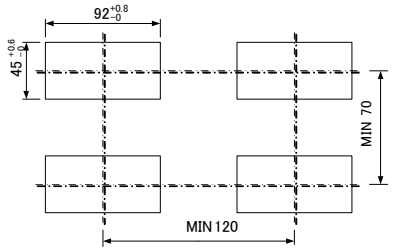
Attachment of AC-911 is the one set of instruction manual and unit seal.
(If choice BCD output, addition at one socket connector.)

Cable with BCD output connector (Separate sale)
A6BCDCN-2M

2. Attachment method

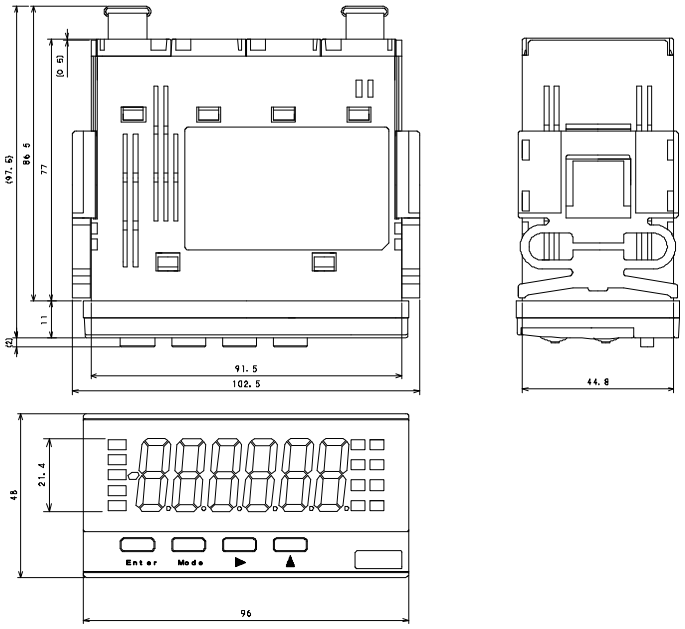
2.1 Panel cut dimension

Please reference the below diagram regarding the panel cut dimension in case attaching the AC-911.



*Recommended panel thickness : 0.8 to 5mm

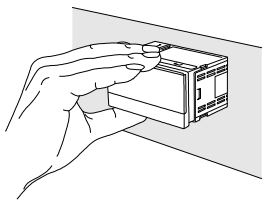
2.2 External dimension



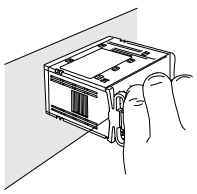
2.3 Panel attachment method

Please fix the attachment band from the panel backward, insert from the panel front in the condition of detach the attachment band from the body of the machine.

①Insert the body of the machine detach the attachment band from the panel front.



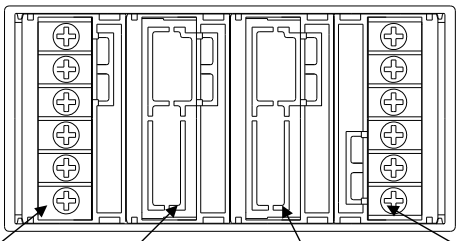
②Fix with the right or left mounting band from the rear of the panel.



⚠ Attention

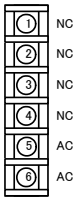
① Please do not use in the place where there is no dust, garbage, electrical parts and chemical agent or corrosive gas.
② In case setting machine in the internal part of the instrument, please pay attention to the radiation not making the instrument temperature more than 50 Celsius.
③ Neither vibration nor the impact must hang.

3. Terminal instruction and connection method



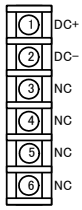
Input unit Option unit ① Option unit ② Power supply unit

AC power supply



Terminal	Terminal name	Remarks
1	NC	
2	NC	
3	NC	
4	NC	
5	AC	AC100 to 240V ±10% (50/60Hz)
6	AC	

DC power supply



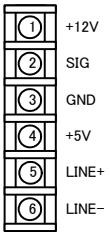
Terminal	Terminal name	Remarks
1	DC+	DC12 to 48V ±10%
2	DC−	
3	NC	
4	NC	
5	NC	
6	NC	

Be careful connection polarity at choice DC power.

⚠ Attention

There is no power supply switch to the machine so that goes operating condition soon after connecting to the power supply.

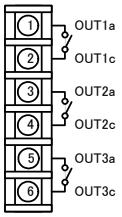
Input



Terminal	Terminal name	Remarks
1	+12V	Sensor power(+12V)
2	SIG	General purpose INPUT
3	GND	INPUT GND
4	+5V	Sensor power(+5V)
5	LINE+	Line driver(+)
6	LINE−	Line driver(−)

Don't used same time at sensor power "+12V"and"+5V".

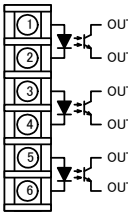
Comparative output (Relay) (option①)



Terminal	Terminal name	Remarks
1	OUT1a	Output relay 1 a contact
2	OUT1c	Output relay 1 COM
3	OUT2a	Output relay 2 a contact
4	OUT2c	Output relay 2 COM
5	OUT3a	Output relay 3 a contact
6	OUT3c	Output relay 3 COM

Please use comparative output choosing 1 type from 3 out of HI-GO-LO, HH-HI-GO and GO-LO-LL through comparative output.
Please refer to clause 5.5 for the setting and the connection.

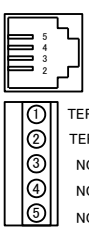
Comparative output (Photo coupler) (option①)



Terminal	Terminal name	Remarks
1	OUT1c	Output photo coupler 1 c
2	OUT1e	Output photo coupler 1 e
3	OUT2c	Output photo coupler 2 c
4	OUT2e	Output photo coupler 2 e
5	OUT3c	Output photo coupler 3 c
6	OUT3e	Output photo coupler 3 e

Please use comparative output choosing 1 type from 3 out of HI-GO-LO, HH-HI-GO and GO-LO-LL through comparative output.
Please refer to clause 5.5 for the setting and the connection.

RS−485 Output(Option②)

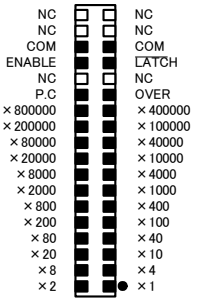


RS-485(RJ-14 (6P4C))		
Terminal	Terminal name	Remarks
5	S.GND	Signal ground
4	NC	
3	−	Data input and output
2	+	

RS-485 (terminal platform)		
Terminal	Terminal name	Remarks
1	TERM	Setup both end resistance
2	TERM	Setup both end resistance
3	NC	
4	NC	
5	NC	

In case insulated resistance "valid", please short the terminal platform ①-②.
Internal both end resistance is 200Ω.
Unable to use NC terminal as relay terminal.

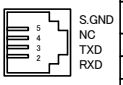
BCD output(TTL, open collector)(option①、②)



Spare(Please do not be connected.)	NC	36	35	NC	Spare(Please do not be connected.)
	NC	34	33	NC	
Common	COM	32	31	COM	Common
BCD enable control	ENABLE	30	29	LATCH	Data latch signal input
Spare(Please do not be connected.)	NC	28	27	NC	Spare(Please do not be connected.)
BCD printing command output	P.C	26	25	OVER	Overflow output
BCD data output	×800000	24	23	×400000	BCD data output
	×200000	22	21	×100000	
	×80000	20	19	×40000	
	×20000	18	17	×10000	
	×8000	16	15	×4000	
	×2000	14	13	×1000	
	×800	12	11	×400	
	×200	10	9	×100	
	×80	8	7	×40	
	×20	6	5	×10	
	×8	4	3	×4	
	×2	2	1	×1	

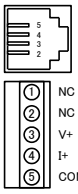
Is the BCD output optional②,do it make to basic, and is only the combination of RS-232C, RS-485, and the analog output optional① is connected.

RS-232C Output(Option②)



RS-232C(RJ-14 (6P4C))		
Terminal	Terminal name	Remarks
4	S.GND	Signal gurund
3	NC	
3	TXD	Output sending data
2	RXD	Input receiving data

RS-232C+Analogue output(Option ②)

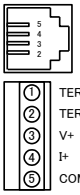


RS-232C(RJ-14 (6P4C))		
Terminal	Terminal name	Remarks
5	S.GND	Signal ground
4	NC	
3	TXD	Output sending data
2	RXD	Input receiving data

Analogue output(terminal platform)		
Terminal	Terminal name	Remarks
1	NC	
2	NC	
3	V+	Voltage output +
4	I+	Current output +
5	COM	Voltage and current output −

Unable to use voltage and current output simultaneously.
Please connect only one side.
In case only output RS-232C, analogue output terminal all become "NC".
Unable to use NC terminal as relay terminal.

RS−485＋Analogue output(Option②)



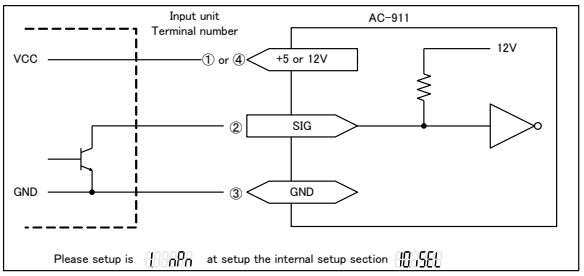
RS-485(RJ-14 (6P4C))		
Terminal	Terminal name	Remarks
5	S.GND	Signal ground
4	NC	
3	−	Data input and output
2	+	

RS-485＋Analogue output(terminal platform)		
terminal	Terminal name	Remarks
1	TERM	Setup both end resistanse
2	TERM	Setup both end resistanse
3	V+	Voltage output +
4	I+	Current output +
5	COM	Voltage and current output −

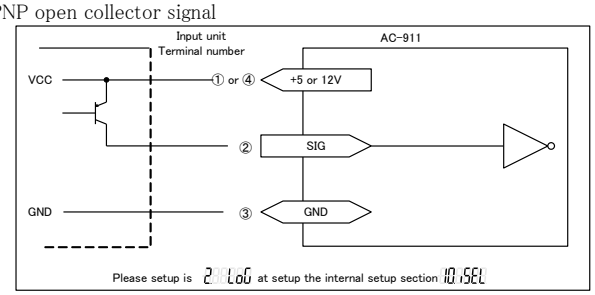
Please short-circuited ①-② of the terminal stand, when it does as the setting of the terminator is effective.
Unable to use voltage and current output simultaneously. Please connect only one side.
In case only output RS-485 analogue output terminal all become "NC".
Unable to use NC terminal as relay terminal.

Each input type connection method connection method

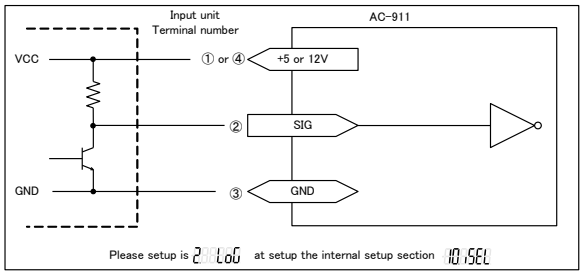
NPN open collector signal



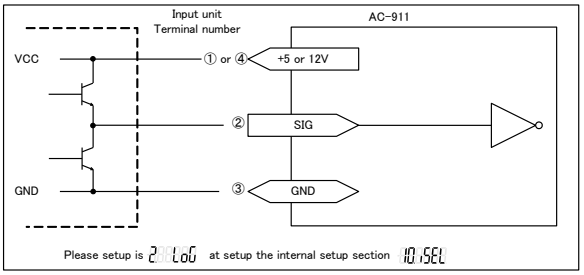
PNP open collector signal



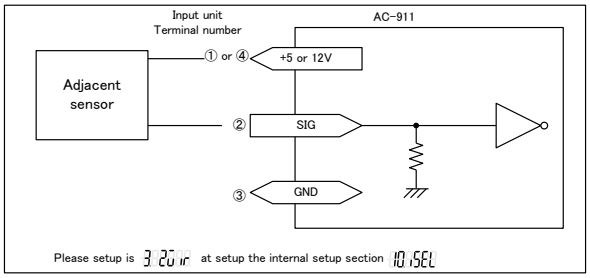
Voltage pulse (NPN transistor output) signal.



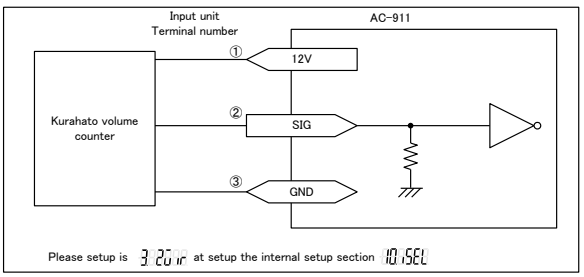
Voltage pulse (logic IC output) signal



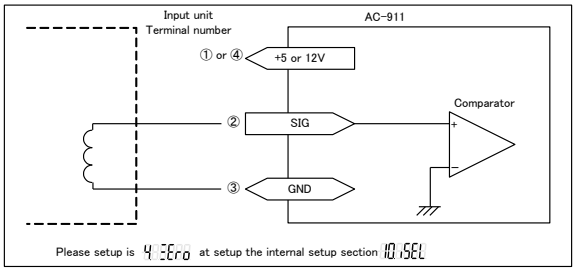
Direct current 2 wires type sensor



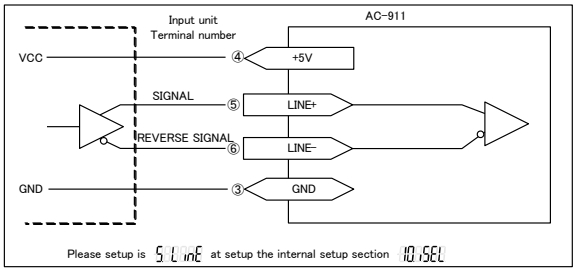
Kurahato volume counter



Zero cross signal

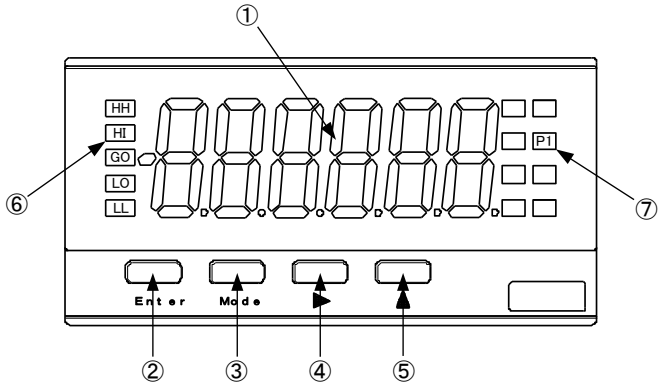


Line driver signal



4. Operating instruction

4.1 Each part name and function



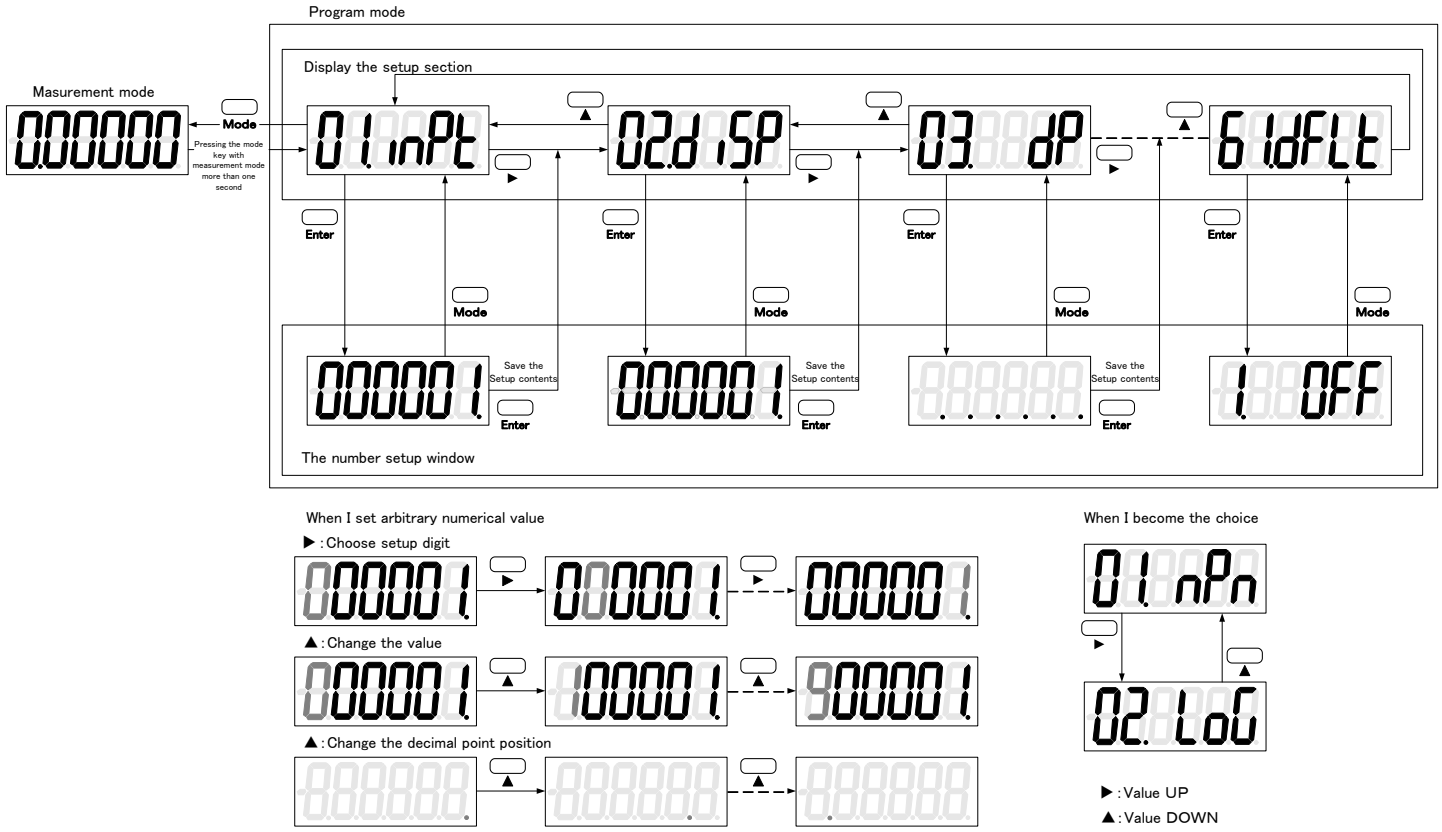
①Display part	・ 6 digits number display LED Available to change the display colors of Red/Green with the setup.
②Enter key	・ Use as the decision key in the program mode.
③Mode key	・ Measure with long pressing with more than one second. ・ Please use as “delete key” in the program mode.
④Shift key	・ Setup section choice with program mode (Setup section number up)
⑤Increment key	・ Choose the setup section with program mode. (Setup section number down) Use for choosing the value.
⑥Comparative operation display part.	・ Display the comparative movement condition HH,HI,LO,LL : Red color fix GO :Green color fix
⑦Trigger display part	・ Blink at the pulse input. Continuous display with high speed pulse. Red color fix

4.2 Display and character display.

Display part’s display and corresponding character is as follows.

4.3 Program mode

Various type parameter setup will be done with program mode.



(1) Please start up the program mode keep pressing the mode key with measurement mode more than one second.
(2) With pressing the shift key or increment key, possible to change the section number.
(3) Press the enter key in the condition of display the setup section, switch with the number setup window.
(4) Blinking digit is the configurable digit.
Blinking digit will move with each pressing the shift key.
(5) The number will increase with each pressing the increment key. The blinking digit will move with each pressing the shift key.
(6) Press the enter key after finishing the value setup.
Setup contents will be memorized so that switching to the next setup section.

⚠ Alarm

At the time of program mode start up, the measurement and each output will be suspended.
In case of using output to the control etc. please change the setup after stopping the control by this machine.

⚠ Attention

Pressing the mode key with value setup window, return to the previous section setup without saving the setup contents.
Please save the setup contents with pressing the mode key in case changing the setup.

(7) Please return to measurement mode with keep pressing the mode key more than one second after complete the all setup.

4.4 Setup section

No.	Display	Name	Setting range	Factory shipping setup
Display setup				
01	inPt	Input number of frequency rate	0.00001 to 999999	1
02	diSP	Display rate	0.00001 to 999999	1
03	dP	Displayed decimal point position	0: Auto range, 1 to 6: Fixed range	0
04	dUPd	Display update time	0.1 to 19.9 seconds	0.3
05	CoLr	Display color(Main)	1: Red, 2: Green	1
06	ZLin	Zero detection	0(Nothing), 0.00001 to 999999(Hz)	0
07	dnAb	The number of display moving	1 to 8	1
Setup the input and output				
10	iSEL	Input switching	1: NPN open collector contact signal 2: PNP open collector NPN/PNP voltage output Logic IC(Voltage pulse) 3: Two wire type sensor 4: Zero cross 5: Line driver	2
11	LPF	Low pass filter	1: OFF, 2: 15kHz, 3: 1.5kHz	1
12	diUP	Dividing ration(Pulse average)	1 to 999	1
13	CrES	Chatter suppress function	1: OFF, 2: ON	1
Analogue output setup (Display at the analogue output mounting)				
20	ASEL	Analogue output choice	1: 0 to 1V, 2: 0 to 10V, 3: 1 to 5V, 4: 4 to 20mA	2
21	AFUL	Analogue output full-scale	0.00001 to 999999	1000
Comparative output setup (Display at the comparative output mounting)				
30	CSEL	Output setup	1: HI-GO-LO 2: HH-HI-GO 3: GO-LO-LL	1
31	CHH	Comparative setup HH value	0.00001 to 999999	60000
32	CHi	Comparative setup HI value	0.00001 to 999999	50000
33	CLo	Comparative setup LO value	0.00001 to 999999	20000
34	CLL	Comparative setup LL value	0.00001 to 999999	10000
35	HYS	Hysteresis	0.00000 to 999999	0
36	o1L	Output logic(OUT1)	1: POSI, 2: NEGA	1
37	o2L	Output logic(OUT2)	1: POSI, 2: NEGA	1
38	o3L	Output logic(OUT3)	1: POSI, 2: NEGA	1
Communication setup (Display at the RS-232C/RS-485 mounting 40-43: RS-485 common, 44-46: RS-485 only)				
40	bAUd	Baud rate	1: 4.8k, 2: 9.6k, 3: 19.2k, 4: 38.4k	3/2
41	dAtA	Data length	1: 7bit, 2: 8bit	2/1
42	Pbit	Parity	1: NO, 2: ODD, 3: EVEN	1/3
43	StPb	Stop bit	1: 1bit, 2: 2bit	1/2
44	CSUn	Check sum	1: OFF, 2: ON	2
45	Wait	Waiting time	1 to 99ms	9
46	id	ID number	1 to 99	1
BCD setup (Display at the BCD mounting)				
50	bCdL	Output logic	1: POSI, 2: NEGA	1
Another setup				
60	Prot	Protect	1: OFF, 2: ON	1
61	dFLt	Factory shipping setup	1: OFF, 2: ON	1

5. Various type parameter setup

5.1 Setup the display rate and number of input frequency rate.

This machine matching to the input and display value ration, available to use various usage like frequency number meter, speed meter and tachometer.

01.INPT : Input number of frequency rate

02.DISP : Display rate

Setup range :000001 to 999999

Factory shipping condition :1

Calculation formula

$$\text{Display value} = \text{Input number of frequency} \times \frac{\text{Display rate}}{\text{Input number of frequency rate}}$$

Ex.1) Use as number of frequency meter.
Setting display unit "Hz". (Input pulse =Display)
01.INPT : 1
02.DISP : 1

Ex.2)Use 100 cycle pulse rotary encoder.
Setting display unit rpm.
01.INPT : 100 In case one cycle per minute setting 100Hz.
02.DISP : 60 one cycle/sec=60 cycles/min

Ex.3) Use 0.12mL/P flow sensor setting.
Display unit setting "L/min".
In this case, it's necessary for calculation to setup.
Calculate the flow volume (L/min) per minute.
In case setting input 1Hz, flow volume will be 0.12mL/sec.
↓ The unit conversed to "L/min".
0.12mL/sec ×1000 =0.00012L/sec
↓ The unit conversed to "L/min".
0.00012L/sec×60 sec=0.0072L/min

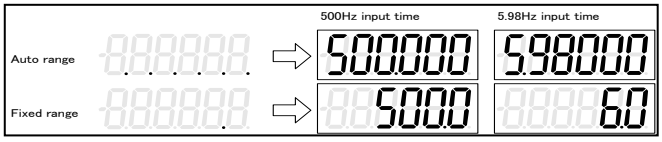
Setup the rate based of the calculation result.

01.INPT : 1 Input 1Hz
02.DISP : 0.0072 0.0072L/min

5.2 Setup about the display

03. DP : Displayed decimal point position

Setup the decimal point position. Always display 6 digits at auto range choice.
Rounding off less than possibly displayed range.



Setup range :0:Auto range, 1 to 6:Fixed range
Factory shipping condition :0:Auto range

04.DUPD : Display update time

AC-911 aggregate the number of pulse in each update time and divided by each cycle this enable enable us to smooth display and fast response.
In case of setting "01", update and equalize the cycle with input number of pulse.
Various type option output synchronized with display, so that setup the various type option output update time indirectly.
Setup range :0.1 to 19.9 seconds
Factory shipping condition :0.3

05.COLR : Display color (Main)

Change the display color at the display part.
The display color at the triggered display part and the comparative operating display part will not be changed.
Setting range : 1 : Red , 2 : Green
Factory shipping condition : 1 : Red

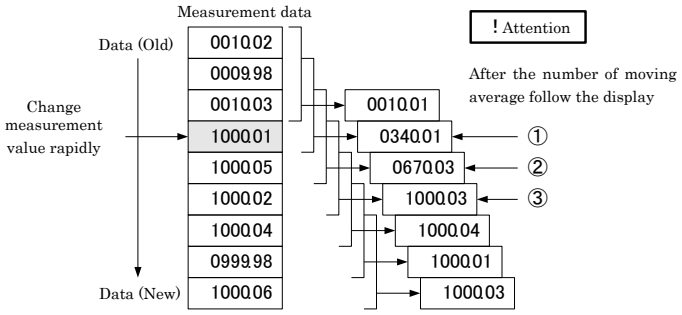
06.ZLIM : Zero detection

Setting display "zero" with less than the number of setup frequency.
As the number of measurement frequency approaches to 0Hz, pulse period will be longer and the display will not update with keeping the condition of pulse input waiting.
In case not detecting pulse in the period of setting number of frequency, update the display "zero" judging with no input pulse.
!! Attention!!
Setup with regard to the input number of frequency with input terminal not display the value setup with display.
Setup range : 0 (Nothing), 0.00001 to 999999Hz
Factory shipping condition : 0 (Nothing)

07.DMAV : The display moving average number

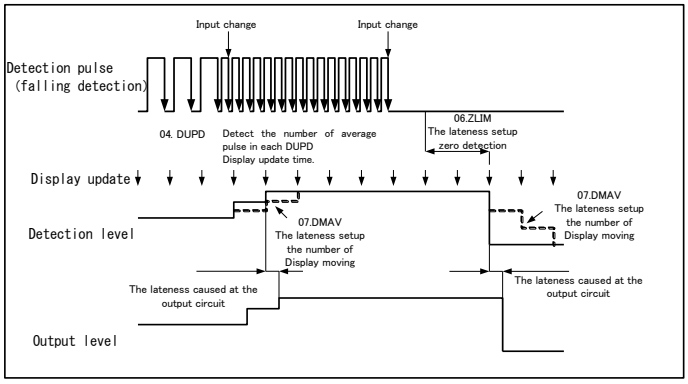
Point out the number of data sampling use for display moving average.
The moving average function totalize the measurement value in each times of display update, dividing the number of sample and equalize so that available for keeping the display update speed with smooth display.
Moving average will be done with each update time, equalize by capture new measurement value and abandon one of the oldest measurement value.

Ex) The number of moving average : Setup "3".



Setup range :1 to 8 time
Factory shipping condition :1 time

!! Attention!!
"04.DUPD, 06.ZLIM,07DMAV"s setup value will be influenced with all output response speed.



Please reference page 12 "6.Specification" regarding late response due to each output.

5.3 Setup about the input and output

10.ISEL : Input switch

Setup range :1:NPN open collector signal contact
2:NPN open collector NPN/PNP voltage output Logic IC (Voltage pulse)
3: 2 wire type sensor
4: Zero cross
5: Line driver

Factory shipping condition:2:PNP open collector NPN/PNP voltage output Logic IC (Voltage pulse)

Please reference 3 page "Each input type connection method" regarding various type sensor connection method and input switch setup.

11. LPF : Low-pass filter

Low pass filter for input signal eliminating the influence of high frequency noise etc.
Low pass filter enable to setup three different ranges.
Please set it according to the environment.
Low pass filter setup valid at setup except setup section 10.SEL "5: Line driver".

!! Attention!!
Low pass filter is the function for high frequency noise countermeasure.
Setup low number of frequency low pass filter more than the measured number of frequency damping input signal as noise.
Setup the number of frequency as measured quantity after checking on.
Setup range :1:OFF, 2:15kHz, 3:1.5kHz
Factory shipping condition :1:OFF

12.DIVP : Dividing ratio (Pulse average)

Use in case there is variation with input pulse. (In case connecting especially with flow sensor). Regardless of input number of frequency and display value, unable to setup dividing ratio. It's not necessary to change rate setup because automatically adjust rate internally by dividing ratio.
Setup range :1 to 999
Factory shipping condition :1

13.CRES : Chatter suppress function

The chatter suppress function is the software filter using eliminating chattering generated at the lead switch etc contact sensor.
Setting this chatter suppress function "ON" eliminate from the calculating as chattering the pulse less than 1ms with input signal's HI level, LO level' s range.
In case pulse setting duty 50% the upper limit of input allowable number of frequency will be approx. 480Hz.
Setup range :1:Chatter suppress function "OFF"
2:Chatter suppress function "ON"
Factory shipping condition :1:Chatter suppress function "OFF"

5.4 Setup the analogue output

- ・Setup section 20 ASEL, 21AFUL display only at analogue output option choice.
- ・After plug in power supply analog outputs the unsecured value in case using analog output for control, please carry out like stopping the control at machine's power supply at the time of machine's power up.
- ・Unable to output analogue's voltage and current output simultaneously.
- ・Connecting one of these output terminal matching to setup in case wiring.
- ・In case of choosing current output, please pay attention to the accrual approx.13V betweens of voltage output terminals.

20.ASEL : Analogue output choice

Possible to choose 0－1V,0-10V,1-5V,4-20mA analogue output with setup.
Please reference the "Terminal instruction and connecting method" on page 2 regarding connection terminal.
Setup range :1:0-1V, 2:0-10V, 3:1-5V, 4:4-20mA
Factory shipping condition :2:0-10V

21.AFUL : Analog output full-scale

Setup display value will be equal to the analog output maximum value (0-1V, 0-10V, 1-5V, 4-20mA with setup section 20.ASEL).
Ex) Setup with ASEL: 2:0-10V, 21AFUL:100
Setup range :0.00001 to 999999
Factory shipping condition:1000

5.5 Setup the comparative output

- ・Setup section 30.CSEL to 38.03L display only at comparative output selection.
- ・Comparative output 's setup method is common with relay or photocoupler's opening and closing output.
- ・The terminal platform's output will be changed with setup section 30.CSEL setup.

		Terminal platform		
		1-2	3-4	5-6
		OUT1	OUT2	OUT3
Setup section30	1H-G-L	HI	GO	LO
	2H-H-G	HH	HI	GO
	3G-L-L	GO	LO	LL

- ・ In case of either setup section 30.CSEL setup, please setup 2 points of comparative value. (Setup output section except GO)
- ・ Each output condition monitor the comparative operation display part at the front.
- ・ Each output status can be monitored in a front comparison operation display part.
- ・ The comparative output operates independently, if the setup value is same with 31.CHH to 34.CLL or if LO setup value is more than HI setup value, there is no problem.

30.CSEL : Output setup

Setup the terminal platform's output function.
Setup range :1:HI-GO-LO, 2:HH-HI-GO, 3:GO-LO-LL
Factory shipping condition:1:HI-GO-LO

31. CHH : Comparative setup HHvalue

Setup the HH comparative value.
The decimal point position includes the decimal point position.
Setup value is the number with regard to the display value.
Setup range :0.00001 to 999999
Factory shipping condition :60000

32. CHI : Comparative setup HI value

Setup the HI comparative value.
The decimal point position includes the comparative value.
The setup value is the number with regard to the display value.
Setup range :0.00001 to 999999
Factory shipping condition :50000

33. CLO : Comparative setup LO value

Setup the LO comparative value.
The decimal point position includes the comparative value.
The setup value is the number with regard to the display value.
Setup range :0.00001 to 999999
Factory shipping condition :20000

34. CLL : Comparative setup LL value

Setup the LL comparative value.
The decimal point position includes the comparative value.
The setup value is the number with regard to the display value.
Setup range :0.00001 to 999999
Factory shipping condition :10000

35. HYS : Hysteresis

Setup the Hysteresis value.
The input value will fluctuate in penny, in case repeating the comparative output ON/OFF, improve hysteresis value by setup enlarge establishment.
Setup range :0.00001 to 999999
Factory shipping condition :0

36. O1L : Output logic (OUT1)
37. O2L : Output logic (OUT2)
38. O3L : Output logic (OUT3)

Setup the comparative output's output logic.
Setup range :1:POSI, 2:NEGA
Factory shipping condition :1:POSI
POSI: Positive logic: Output "ON" at the detection.(MAKE)
NEGA: Negative logic : Output "OFF" at the detection.(BRAKE)

!!Attention!!
The comparison output logic switch of this container reverses logic with software, and the output logic as hardware is a positive logic (turn on when detecting it).
As for the operation when the power supply turning on is intercepted, the positive logic is basic.

5.6 Setup the communication function (RS-232C)

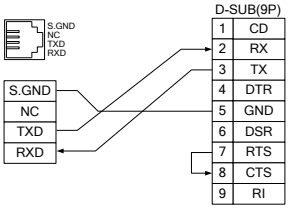
・The setup section 40.BAUD to 43.STPB display only at the RS-232C output option select.
・Using RS-232C communication designer who construct the system is necessary for data communication knowledge.

Communication specification

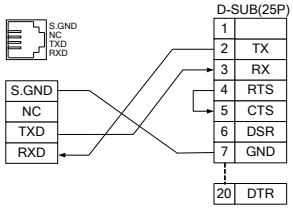
Communication method		Saturated synchronization method
Communication level		Serial communication with RS-232C
Communication code		ASCII
Communication parameter	Baud rate	4.8k/9.6k/19.2k/38.4k
	Start bit	1 bit (fixed)
	Stop bit	1 bit / 2 bit
	Data length	7bit / 8 bit
	Parity bit	Nothing /Odd number / Even number
Using character		0 to 9 A to Z +-.. ?
		C/R 0D(HEX) Carriage return
		L/F 0A(HEX) Line Feed

Cable connection

D-SUB 9 pin (EIA-232)



D-SUB 25 pin (EIA-574)



40.BAUD : Baud rate

Setup range :1:4.8k, 2:9.6k, 3:19.2k, 4:38.4k
Factory shipping condition :3:19.2k

41.DATA : Data length

Setup range :1:7bit, 2:8bit
Factory shipping condition :2:8bit

42.PBIT : Parity

Setup range :1:NO, 2:ODD, 3:EVEN
Factory shipping condition :1:NO

43.STPB : Stop bit

Setup range :1:1bit, 2:2bit
Factory shipping condition :1:1bit

Communication command(Measurement mode)

Measurement mode																	
Contents	Host Command				Direction	AC-911 Response											
Reading the measurement value	M	E	S	CR	→												
					←	D	D	D	D	D	D	D	CR	LF			
Reading the comparativ operating condition	R	J	CR		→	①	②	③	④	⑤							
					←	B	B	B	B	B	CR	LF					
Start of mode program mode	P	CR			→												
					←	O	CR	LF									

O:Affirmative acknowledge
D:Decimal number
B:Binary number
①Comparative HH operating condition
②Comparative HI operating condition
③Comparative GO operating condition
④Comparative LO operating condition
⑤Comparative LL operating condition

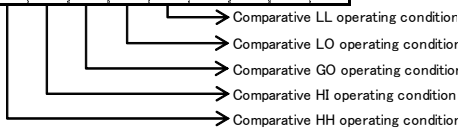
MES command
During the measurement operation after sending MES command from host, this machine reply the measurement data.
Ex) At the time of measurement value setting "1000.0"

Host				Direction	AC-911								
M	E	S	CR	→									
				←	1	0	0	0	.	0	0	CR	LF

!!Attention!!
The display data is the response data with regard to the MES command, decimal point position, rate setup etc, output the displayed data with right aligned 7 character fixind data type.

RJ command
This machine response in the comparative operation condition with sending RJ command from host during measurement operation.
Ex) The comparative GO is in the operating condition.

Host			Direction	AC-911						
R	J	CR	→							
			←	0	0	1	0	0	CR	LF



In the condition of comparative value detecting condition in the display part setting each bit "1".
Output logic setup section 36.O1L to 38.O3L, if setup negative logic but the relationship between "0" and "1" will not be changed.
When a comparison optional output has not been selected, the reply data becomes "00000".

P command
During the measurement operation sending P command from host, entering into program mode and available for program setup value's reading and writing.

Host				Direction	AC-911								
P	CR			→									
				←	O	CR	LF						

In the program mode, display "PROGRM" at the display part.
I send E command from host to return to measurement mode from program mode.

> ⚠ Alarm
>
> At the program start up, measurement and each output etc. will be suspended.
> In case of using output as control etc., please change the setup stopping the control by machine.

Communication command (Program mode)

Program mode																							
Contents	Host													Direction	AC-911								
	Command														Response								
Reading version	R	V	CR											→									
														←	D	D	D	D	CR	LF			
Reading the serial number	R	S	CR											→									
														←	D	D	D	D	D	D	CR	LF	
Reading the setup value	R	P	D	D	CR									→									
														←	D	D	D	D	D	D	D	CR	LF
Writing setup value	W	P	D	D		D	D	D	D	D	D	D	CR	→									
														←	O	CR	LF						
Finish the program mode	E	CR												→									
														←	O	CR	LF						

O:Affirmative acknowledge
D:Decimal number data

RV command

During the program mode start up, with sending RV command, reply the machine itself program version information.

Host			Direction	AC-911					
R	V	CR	→						
			←	1	.	0	1	CR	LF

"1.01" is the machine's program version information.

!! Attention!!

For enhance the function, program sometimes update without prior notice.

RS command

During the program mode start up, after sending RS command from host, possible to confirm the machine's internal setup value.

Ex)At the time of setting serial number "123456".

Host			Direction	AC-911							
R	S	CR	→								
			←	1	2	3	4	5	6	CR	LF

"123456" is the machine's serial number information.

RP command

Possible to confirm machine's internal setup value after sending RP command from host during program start up.

Ex)In case of confirming the setup section 0.1INPT (Input number of frequency rate).

Host					Direction	AC-911								
R	P	0	1	CR	→									
					←	1	0	0	.	0	0	0	CR	LF

Setup sections number

Response the current setup value from the machine.

Data is the maximum 7 characters.

WP command

Possible to confirm machine's internal setup value after sending WP command from host during program mode start up.

Ex)In case of setup 3600 regarding setup section 01.INPT(Input number of frequency rate)

Put the space or comma

Host										Direction	AC-911		
W	P	0	1		3	6	0	0	CR	→			
										←	O	CR	LF

Setup section number　Input the setup configurable value

After setup change has completion, response (affirmative response)O from the machine.

Direction	AC-911		
←	?	CR	LF

Response "?" from machine in case fail the setup change because of invalid number input etc.

E command

After sending E command from host during program start up, return to measurement operation after machine's program mode finish.

Host		Direction	AC-911		
E	CR	→			
		←	O	CR	LF

After finishing the program mode, return to measurement operation with vanishing the PROGRM display.

5.7 Communication function(RS-485) setup.

- Setup section 40.BAUD to 46, display the ID only at selecting RS-485 output option.
- Using RS-485 communication, designer who construct the system is necessary for data communication and computer programming knowledge.

!! Attention!!

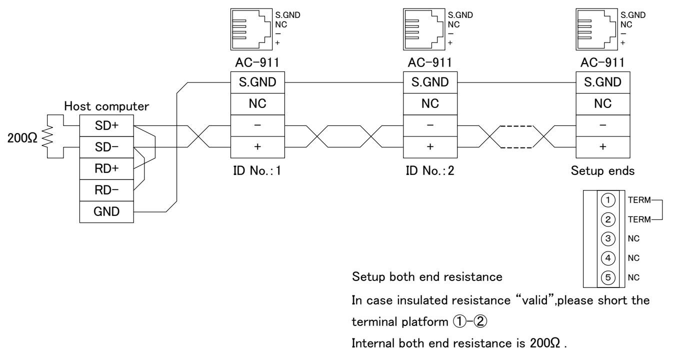
In case of communicate with machine using RS-485, please connect with multi-drop method.

Regarding other company's products like RS-232C converter and RS-485 converter or RS-485 PC card, these are out of support so that please confirm operation by customer.

Communication specification

Communication method	Saturated synchronization method
Communication level	Multi-drop serial communication by RS-485
The number of connections	Maximum 31 machines.
Communication code	ASCII
Communication parameter	Baud rate 4.8k/9.6k/19.2k/38.4k
	Start bit 1bit (fixed)
	Stop bit 1bit/2bit
	Data length 7bit/8bit
	Parity bit Nothing/ Even number / Odd number
Error detection	Checksum (Possible to choose whether with or without at internal setup
Line length	Maximum 500m
Characters possible to use	0 to 9 A to Z + -. . ?
	STX 02(HEX) Start of Text
	ETX 03(HEX) End of Text
	EDT 04(HEX) End of Transmission
	ENQ 05(HEX) ENQuiry
	ACK 06(HEX) ACKnowledge
	CR 0D(HEX) Carriage return
	LF 0A(HEX) Line Feed

Cable connection



Possible to connect between host computer and machine having RS-485 interface maximum 31 machines include this.

!! Attention!!

Please setup terminal resistance regarding connection machine at 2 points both ends.

40.BAUD : Baud Rate

Setup range :1:4.8k, 2:9.6k, 3:19.2k, 4:38.4k

Factory shipping condition :2:9.6k

41.DATA : Data length
Setup range :1:7bit, 2:8bit
Factory shipping condition :1:7bit

42.PBIT : Parity
Setup range :1:NO, 2:ODD, 3:EVEN
Factory shipping condition :3:EVEN

43.STPB : Stop bit
Setup range :1:1bit, 2:2bit
Factory shipping condition :2:2bit

44.CSUM : Check sum
Selecting whether with checksum or not.
Machine response "2" in case of setting 2 (with) and receiving data setting "checksum error".
Setup range :1:OFF, 2:ON
Factory shipping condition :2:ON

45.WAIT : Waiting time
After receiving LF from machine, setup time until start the sending.
The time averting the wiring collapsion.
Setup range :1 to 99ms
Factory shipping condition :9ms

46. ID : ID number
Assing the machine's ID number
In case of connection plural, setup with no same ID number.
Setup range :1 to 99
Factory shipping condition :1

Establishment of communication

Host					Direction	AC-911				
ENQ	0	1	CR	LF	→					
05H	30H	31H	0DH	0AH						
					←	ACK	0	1	CR	LF
						06H	30H	31H	0DH	0AH

ID number (Assign with 2 digits)
Response with corresponding ID number from machine.

There is no response in case not existing the machine with assigned ID number.

Open the communication

Host			Direction	AC-911				
EOT	CR	LF	→					
04H	0DH	0AH						
			←					

There is no response with regard to the open.

Not open the communication with regard to other ID number after establishing the communication, current communicating ID number open communication assigning ID number with established communication.

Communication format
Receiving (host →AC-911)

Host						Direction	AC-911				
STX		ETX		CR	LF	→					
02H		03H		0DH	0AH						

Command Check sum
In case of setting setup section 44 C.SUM"2:with",doing checksum error detection with regard to sending and receiving data.

Communication command is same with the RS-232C.
Please reference the page 9 communication function setup (RS-232C) regarding command.

Ex)Receiving host with regard to the MES command

Host								Direction
STX	M	E	S	ETX	E	8	CR	LF	→
02H	4DH	45H	53H	03H	3EH	38H	0DH	0AH	

Check sum
In case of setting setup section 44 C.SUM"2:with",doing checksum error detection with regard to sending and receiving data.

Sending (AC-911→Host)
Acceptance the reply

Host			Direction	AC-911						
			←	STX	O	ETX	8	2	CR	LF
				02H	7FH	03H	38H	32H	0DH	0AH

Check sum
In case of setting setup section 44 C.SUM"2:with",doing checksum error detection with regard to sending and receiving data.

Response at normal corresponding with regard to setup change etc.

Data response
Response data with regard to reading internal data.

Ex) Response with regard to the MES command at measure the 100KHz.

Direction	AC-911																
←	STX						1	0	0	0	0	0	.	ETX	F	2	CR	LF
	02H	20H	20H	20H	20H	20H	31H	30H	30H	30H	30H	30H	2EH	03H	3FH	32H	0DH	0AH

Check sum
In case of setting setup section 44 C.SUM"2:with",doing checksum error detection with regard to sending and receiving data.

!! Attention!!
Response data with regard to MES command is displayed data and output with right aligned 12 characters fixed data type display rate setup and decimal point etc.

Ex)Response with regard to the RJ command in the condition of comparative GO operation.

Direction	AC-911										
←	STX	0	0	1	0	0	ETX	F	4	CR	LF
	02H	30H	30H	31H	30H	2EH	03H	3FH	34H	0DH	0AH

Check sum
In case of setting setup section 44 C.SUM"2:with",doing checksum error detection with regard to sending and receiving data.

Output the response data in left aligned type with regard to except MES command.

Host			Direction	AC-911						
			←	STX				ETX	8	2	CR	LF
				02H				03H	38H	32H	0DH	0AH

Response data Check sum
In case of setting setup section 44 C.SUM"2:with",doing checksum error detection with regard to sending and receiving data.

Received response

Host			Direction	AC-911						
			←	STX	?	ETX	4	2	CR	LF
				02H	3FH	03H	34H	32H	0DH	0AH

Check sum
In case of setting setup section 44 C.SUM"2:with",doing checksum error detection with regard to sending and receiving data.

Response in case not possible to response normally like input invalid value etc.

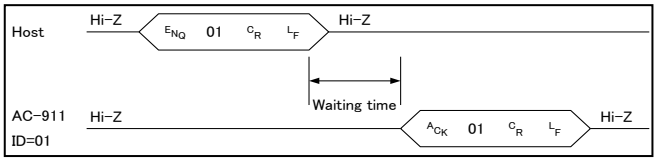
Check-sum
In case of setting setup section 44 C.SUM "2: with", doing checksum error detection with regard to sending and receiving data.

STX	20H	20H	20H	20H	20H	31H	30H	30H	30H	30H	30H	.	ETX	F	2	CR	LF
02H	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	03H	⑬			0DH	0AH

Check-sum H=Total ① to ⑬ Low rank 8bit at high rank 4bit
20H+20H+20H+20H+20H+31H+30H+30H+30H+30H+30H+2EH+03H=1**F**2H

Check-sum L=Total ① to ⑬ Low rank 8bit at high rank 4bit
20H+20H+20H+20H+20H+31H+30H+30H+30H+30H+30H+2EH+03H=1F**2H**

!! Attention!!
The character length will different from each sending and receiving data.



Communication timing

Waiting time is changeable with setup section 45.WAIT.

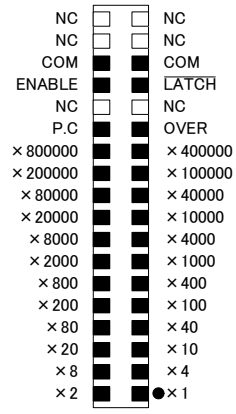
5.8 Setup the BCD output function

・Display only at BCD output option choice regarding setup section 50. BCDL.

・For designer who construct the system needs digital signal interface knowledge use BCD output.

・After input the power supply, BCD output outputs the involtantile number so that in case of using BCD output for control, please process like stopping control at machine's power supply input etc.

Connection method



NC	36	35	NC
NC	34	33	NC
COM	32	31	COM
ENABLE	30	29	LATCH
NC	28	27	NC
P.C	26	25	OVER
×800000	24	23	×400000
×200000	22	21	×100000
×80000	20	19	×40000
×20000	18	17	×10000
×8000	16	15	×4000
×2000	14	13	×1000
×800	12	11	×400
×200	10	9	×100
×80	8	7	×40
×20	6	5	×10
×8	4	3	×4
×2	2	1	×1

Pin number	Signal name	Logic	
		NPN open collector output	CMOS,TTL output
1to24	×1to×800000	0: OFF 1:ON	0: LOW 1:HIGH
25	OVER	Setting "ON" at the overflow	HI level at overflow
26	P.C.	＊Setting ON after the output update	＊ Setting HIGH after output update
29	LATCH	Keep the output data with short the COM terminal BCD input specification	
30	ENABLE	Setting "OFF" with COM terminal.	Setting "HI-z" with COM terminal
31,32	COM	COMMON	

The chart is in the case of positive logic regarding the setup section 50 BCDL setup.
＊The P.C. signal logic is fixed regardless of setup section 50 BCDL setup.

In case display over the 6 digits, BCD data will be "999999" and change No.25 over pin logic.

BCD input specifications

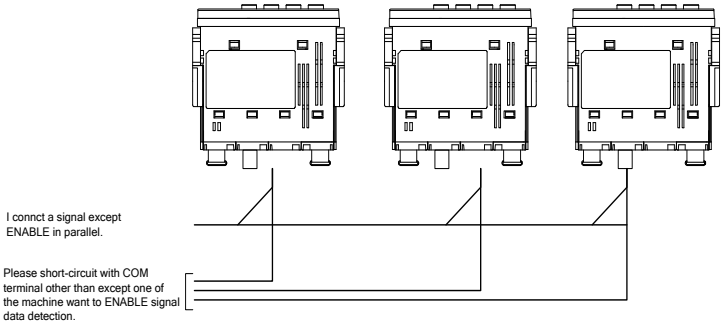
LATCH(29)

Keep the output data after short the COM terminal.
The data hold will continue during continuing "short".

ENABLE(30)

After short the COM terminal will be transistor "OFF" (NPN open collector specification) or high impedance (TTL specification). In case of connecting daisy chain, please short all enable and COM terminal except one of the machine want to output.

Connection example



By connecting in daisy chain method, possible to stop output update with regard to the all connected machines setting LATCH signal "LOW".

BCD output specification

NPN open collector specification

Rating Output applied voltage:30V(max)
Output electric current :10mA(max)

Character Output saturated voltage :Less than 1.2V

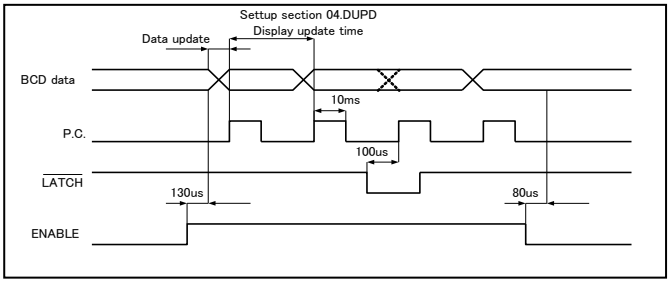
●Conforming to the photocoupler input like sequencer.

TTL specification

Rating Fan-out 2

●Conforming to CMOS/TTL level signal input circuit like computers.

Output timing chart



50.BCDL : Output logic

Setting range : 1 : positive logic, 2: negative logic

Factory shipping condition : 1 : Positive logic

POSI: positive logic

NEGA: negative logic

!! Attention!!

BCD output logic based on the TTL specification.

In case of NPN open collector specification, please pay attention because the logic is reversed.

Please use and setup except auto range about setup section 03 DP display because BCD output not include decimal point information.

About the data update

After data update had completed, design the PC signal setting ON "HIGH". Please be sure to consult at system construct for reading BCD output data during PC signal setting ON "HIGH".

60.PROT : Protect

I can prevent false setting by the operation that I do not aim at, setting item displayed with a program made become only 60.PROT when I set 60.PROT in 2:ON.

Setting range :1:OFF, 2:ON

Factory shipping condition :1:OFF

61.DFLT : Factory shipping setup

All set points are reset by a factory shipment state when I set 61.DFLT in 2:ON

Setting range :1:OFF, 2:ON

Factory shipping condition :1:OFF

!! Attention!!

Because I cannot restore the set point which I reset, please be careful not to set it by mistake.

6. Specification

■ Input specification

Input number of frequency range	10 mHz to 50kHz
Input signal	① Single end input (NPN open collector, logic, zero cross, 2 wire type sensor) ② Differential input (Line driver)
Input method	A single-phase alternating current pulse
Input level and sensitivity	① Logic signal (NPN open collector, logic, 2 wire type sensor) H level : More than 3.9V L level : Less than 1V ② Zero cross signal AC signal passing through 0V with more than 60mV ③ Line driver signal More then ±1V (differential voltage)
Input resistance	① NPN open collector Pull up to ±12V with approx. 15kΩ Pull down to GND with approx.10kΩ ② Logic Pull down to GND with approx.10kΩ ③Zero cross Pull down to GND with approx.10kΩ ④2 wire type sensor Pull down to GND with approx. 900Ω ⑤Line driver Input resistance 330 Ω
Input allowable voltage	① NPN open collector logic ±50V ② Zero cross ±70V ③ 2 wire type sensor ±30V ④ Line driver ±25V (differential voltage)
Input pulse range	More than 9μs (together with L and H level)
Triggered edge	Falling edge

■Measurement system and calculation part specification

Measurement system	Frequency calculation ratio
Measurement mode	Frequency meter
Scaling	Display automatic conversion
Calculation rate	Setup the display value with regard to the number of input frequency Input number of frequency rate : 0.00001 to 999999 [Hz] Display rate : 0.00001 to 999999
Ratio of dividing frequency (Pulse average)	1 to 999
Moving average	1 to 8
Zero detection	Clipping less than setting number of frequency
Chatter suppress function	Upper limit of input number of frequency:480Hz HI level and LO level is removal 1 ms max. pulse width at chattering.
Setup value memory	Writing one million times with nonvolatile memory (EEPROM)

■External power supply specifications

Power supply for sensor(+12V)	DC12 V±10 %
Maximum load	100 mA
Power supply for sensor(+5V)	DC5 V±10%
Maximum load	150 mA

■Display part specifications

Display element	Red/Greeen lighting 7 segment LED (character height approx.20mm)
Display digit/ display lamp	6 digits(measurement value and parameter) HH/HI/GO/LO(judgment result),PI(triggered)
Display range	0.00001 to 999999
Range switching	Auto range, Fixed range
Zero display	Leading zero suppress
Decimal point position	□□□□□□. to □.□□□□□
Over display	OL display
Display update	0.1 to 19.9 second
Display accuracy	±(20 ppm+1 digit) at 23℃

■Power supply specifications

Power supply voltage	Select from following by power supply unit AC 100 to 240 V±10%(50Hz/60Hz) DC 12 to 48 V±10%
Consuming power	AC power supply specification 100V : Less than 17VA 200V : Less than 21VA 240V : Less than 23VA DC power supply specification Less than 11W

■Common specifications

Using temperature and humidity range	0 to 50℃ 35 to 85%RH (non condensing)
Preserving temperature and humidity range	-10 to +70℃ Less than 60% RH (non condensing)
External dimension	48 mm(H)×96 mm(W)×97.5 mm(D) At the time of option unit Non provision
Weight	Approx. 500g
Dielectric voltage	AC power supply type Power supply-input/ Comparative output/ Betweens of all option AC1500V per minute Input-comparative output /Betweens of all option AC1500V per minute Power supply-input/ Betweens of all option DC 500V per minute Case –power supply/ input/comparative output/Betweens of dielectric voltage test terminal AC1500V per minute DC power supply type Power supply-input/Comparative output /Betweens of all option output DC 500V per minute Input-comparative output / Betweens of all option output DC 500V per minute Comparative output/Betweens of all option output / DC 500 V per minute Case –power supply/ input/comparative output/Betweens of dielectric voltage test terminal AC1500V per minute
Insulating resistance	Withstand voltage examination across the terminals DC500V more than 100MΩ
Front protection standard	No standard

■Option specifications

● Comparative output specifications

Setup method	Internally memorize by program mode	
Setup points	2 points	
Output points	3 points	
Judgment operation mode	Selecting by HH/HI/GO,HI/GO/LO,GO/LO/LL	
Output type	Relay output	Photocoupler output
Output rating	DC30V 2A (Insulated load) AC250V 2A(Insulated load)	DC30V 20mA (Insulated load)
Output logic	Possible to switch positice/negative logic	
Output update cycle	display synchronization	
Output response time	2ms (max) (only for output circuit)	

●Analogue output specifications

Output signal	DC0-1V,0-10V,1-5V,4-20mA
Resolution	16bit (mode than 50,000 at each range)
Load resistance	Voltage output: More than 4.7kΩ Current output Less than 510Ω
Output rate	Setup arbitrarily full scale by display value
Moving range	1 to 8
D/A conversion method	PWM conversion method
Update cycle	Display synchronization
Output response time	350ms(max) (only for output circuit)
Accuracy	voltage output :±(0.1% of FS)@23℃ Current output :±(0.2% of FS)@23℃
Temperature fluctuation	Less than ±200ppm/℃
Linearity	±0.1%Max.

● BCD output specifications

Output method	Parallel BCD Output (Open collector or TTL level)
Output signal	6 digit BCD code , OVER, P.C
Control signal	LATCH input ,ENABLE input,P.C
Output rating	Open collector:DC30V 10mA (Output saturation voltage 1.2V max.) (TTL level:fan-out 2)
Output cycle	display synchronization
Output response time	2ms (max) (only for output circuit)
Output logic	Possible to switch positice／negative logic by parameter

● RS-232C specifications

Baud rate	38.4k/19.2k/9.6k/4.8k bps
Start bit	1bit
Data length	7bit/8bit
Parity	Even number /Odd number /Nothing
Stop bit	1bit/2bit
Character code	ASCII code

● RS-485 specifications

Baud rate	38.4k/19.2k/9.6k/4.8k bps
Start bit	1bit
Data length	7bit/8bit
Parity	Even number /Odd number /Nothing
Stop bit	1bit/2bit
Error detection	With BCC check sum/ without BCC check sum
Waiting time	0 to 99ms
Character code	ASCII code
Number of connections	31 machines
Line length	500m at maximum

7. Warranty and after sales service

7.1 Warranty

The period of product warranty is the 1 year from delivery date. The accident accrued during the period in case clearly judged because our company, repair with free or exchange with new product.

7.2 After sales service

Under strict quality control measures, this product was manufactured, tested, inspected and shipped. Should a defect in manufacture or Workmanship be identified, please return the product to our distributor or directly to us. It would be highly appreciated if you could give a detailed account of the fault and enclose it with the product.

watanabe
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