DONG-DO

Color TFT LCD display

High Precision Air type Electronic micrometer

ML-CP-Ax

User's Guide

The contents of this manual could be different according to the software version and it can be changed without notice.
Please use this good after reading the manual thoroughly.

Table of Contents

Product features & composition

1. Features(features could be different from pictures without notice.)

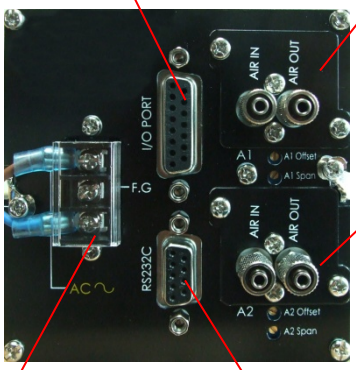
Color TFT LCD & Touch pad

Setup buttons
(up▲, down▼, select▶, mode■ buttons in a row)

Menu

I/O port

Air1 in/out



Air2 in/out

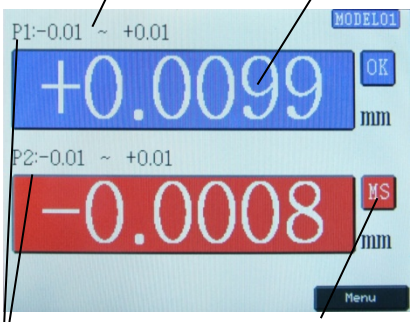
AC power input
(100-220V,50/60Hz)

RS232C communication port

2. Measuring screen

Tolerance

Measured data



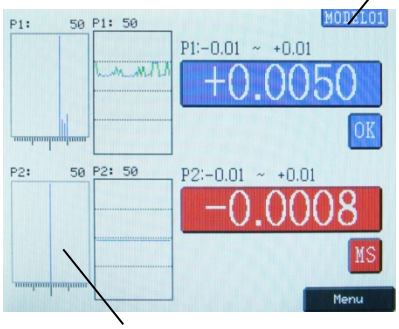
Result

Measured groups(or points)

〈Normal Text view〉

*A wide digital data is shown in this mode. Blue & red color make easy to realize the result.

Model number



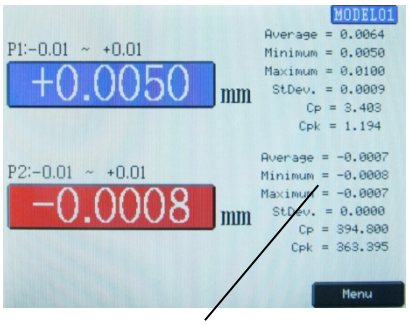
Histogram & Flow chart

〈Histograms & chart view〉

*There're number limitations of displaying histograms and flow charts.

By 4 groups :
Max. 9 histograms & charts.

From 5 to 8 groups:
Max. 3 histograms & charts.



CP/CPK

〈Statistics data view〉

*If the statistics data view is on, the histogram view is off automatically. And only 2 groups' statistics data are shown max.

Statistics data is disappeared from 3 groups.

**Simple setting orders.

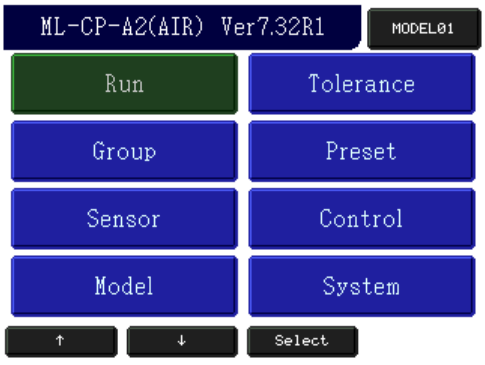
***Air input(2bar) → Dimension → Calibration → Group → Tolerance → Other options**

a. Hi/Lo Master Size input(at **Sensor → Dimension** menu).
b. Hi/Lo Master Calibration(at **Sensor → Calibration** menu)
c. Zero Master offset setting(Optional, at **Sensor → Offset** menu)
d. **Group** setting to display on the measuring screen. (Doesn't need on the 1ch unit.)
e. **Tolerance** setting to make the decision of OK or NG.
f. Other settings as like Preset, Display, etc.

Master Size	10.000 [mm] +0.010 [mm] -0.010 [mm]	20.500 [mm] +0.050 [mm] +0.030 [mm]	
Inputting Dimension Value	Preset: +10.000 **HI : +10.0(um)** **LO : -10.0(um)**	Preset: +20.500 **HI : +50.0(um)** **LO : +30.0(um)**	Preset: +20.530 **HI : +20.0(um)** **LO : +0.0(um)**
Note	-	Both of the settings are possible.(HI/LO deviation is the same. 'Preset' is a nominal value but just for display on measuring screen.)	

1. Main menu

- Main menu is entered by hitting the Mode ■ button(4th button from left) or touching 'menu' on the measuring screen.



〈Main Menu〉

-The main menu is composed as like the picture at the left.
-Each functions can be chosen by touching screen or ▶ button after cursor is moved by ▲▼buttons.

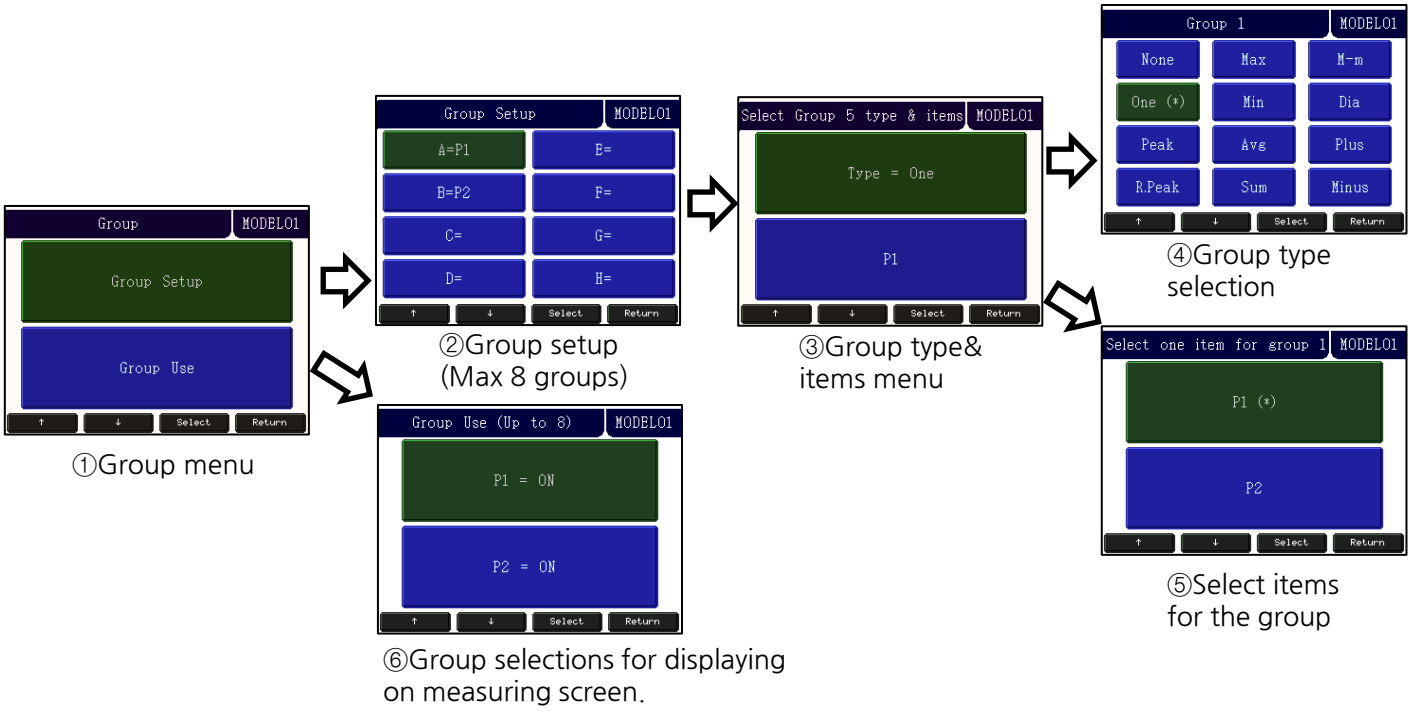
1. Run: To go to the measuring screen.
2. Group: To set the items to display on the measuring screen.
3. Sensor: Calibration sensors by Hi/Low masters.
4. Model :Memory space to save the current settings.
   There are 16 spaces, 1 to 16, and external memory selection by input signal is possible if the model is set to 99.
5. Tolerance: To input the tolerance of the measuring part.
6. Preset: Preset(nominal) value for the measuring data on the LCD display.
7. Control: To set up the display, input/output, serial communication, etc.
8. System : To setup the unit, language, password, etc.

2. Run

-To enter the measuring screen.

3. Group

- To set the items to display on the measuring screen. Various functions can be set in this menu.
- Maximum 8 groups are possible to display on the screen.
- If “Group" is selected on the main menu, the Group setup screen is come out.



①Group menu

②Group setup
(Max 8 groups)

③Group type&
items menu

④Group type
selection

⑤Select items
for the group

⑥Group selections for displaying
on measuring screen.

-There are the types of the group: None, One, Peak, R.Peak, Max, Min, Avg, Sum, M-m, Plus, Minus.

1)None: No used
2)One: 1 point
3)Peak: High peak data hold.
To clear the peak data, press ▲up button or give clear signal to I/O port.
4)R.Peak: Low peak data hold.
To clear the peak data, press ▲up button or give clear signal to I/O port.
5) Max: Maximum value in the selected points or groups.
6) Min: Minimum value in the selected points or groups.
7) Avg: Average value in the selected points or groups.
8) Sum: Addition value of the selected points or groups.
9) M-m: (Maximum value - minimum value) in the selected points or groups.
10) Plus: Addition between two values.
11) Minus: Subtraction between two values.

4. Sensor

- Calibration sensors by Hi/Low masters and sensor's direction setting.

1) Direction:

- Sensor direction setting menu. IN-DIA ←→ OUT-DIA
- IN DIA : to measure inner diameter. So, the value is increased as the hole size is bigger.
- OUT DIA : to measure outer diameter. So, the value is increased as the part size is bigger.

2) Offset:

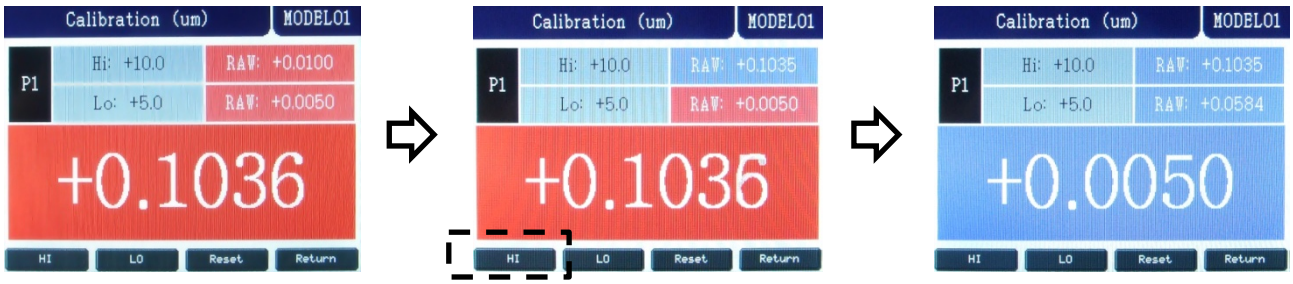
- A offset value is set on this menu. The offset value would be added on the real measured data. For example, 110um would be displayed if the real measured data is 100um and the offset value is 10um.
- Usually set up to 0.
- Measured(displayed) data = Real measured data + Offset value.

3) Dimension:

- Hi/Low masters' dimension setting before doing master calibration.

4) Calibration:

- Hi/Low masters setting menu.

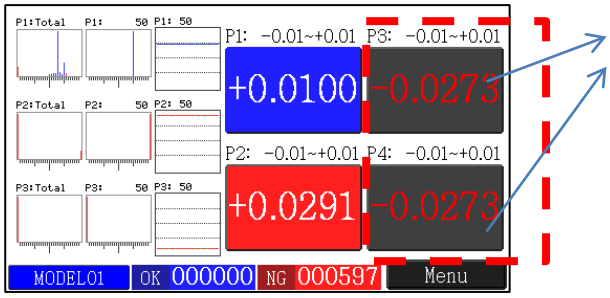


①Red color is shown without Master setting

②Blue color is shown at the High value with Hi master setting.

③All blue color is shown if the master setting is done well.

Master calibration for both side together if necessary at the 'Calibration All' menu.

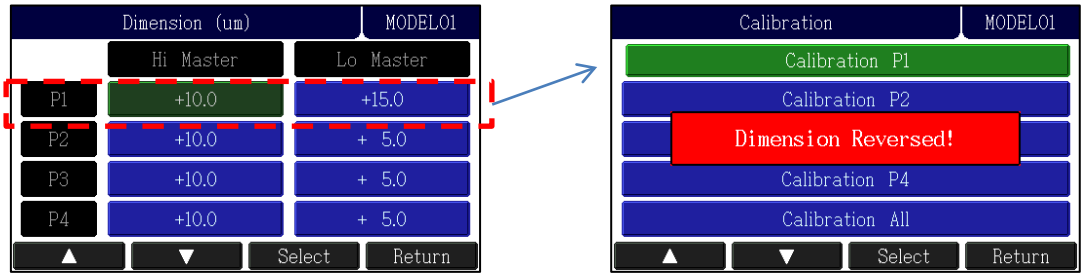


A grey box and red numbers are shown for the wrong master set channels.

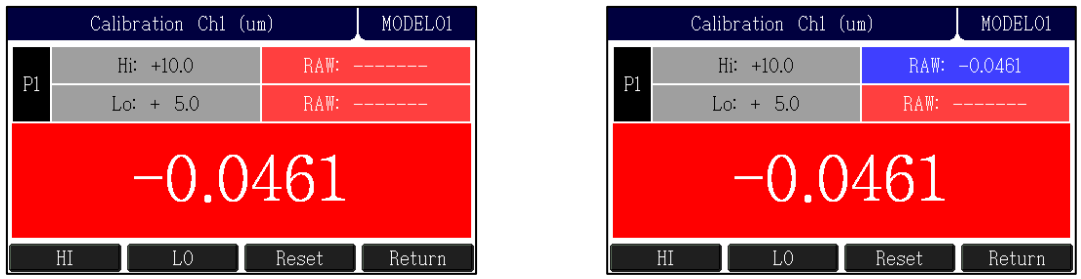
Functions

5) Master setting error view:
- There're Master setting error view to prevent user's mistakes.

A. Dimension setting error:
- If user put in the dimension opposite size, it shows 'Dimension Reversed' on the calibration menu.

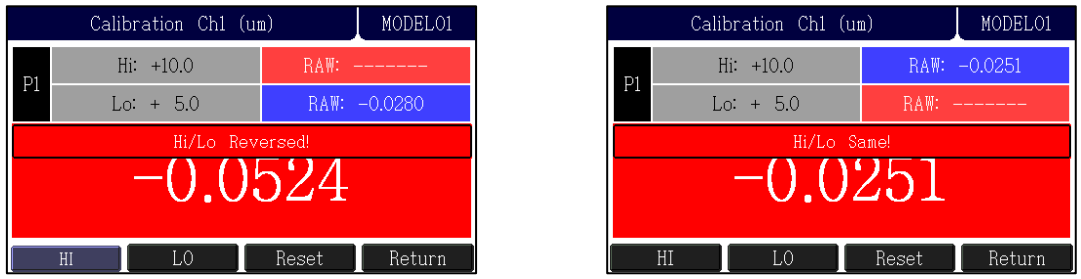


B. No high or low master setting:
- If user doesn't set the masters. It shows a red cautions for it.

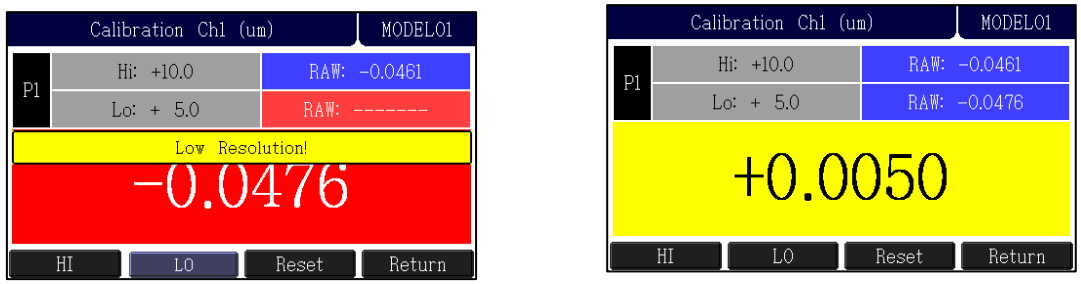


C. high and low master reverse setting:
-If user set the masters reversed.
-It shows a red cautions for it.

D. high and low master value is the same:
- If the value is the same,



E. high and low master value is similar(low resolution):
-If the resolution is low(Over 0.1um), it shows a yellow caution for it. But it is working in low resolution. So, user should decide if it is used in low resolution or find other way.

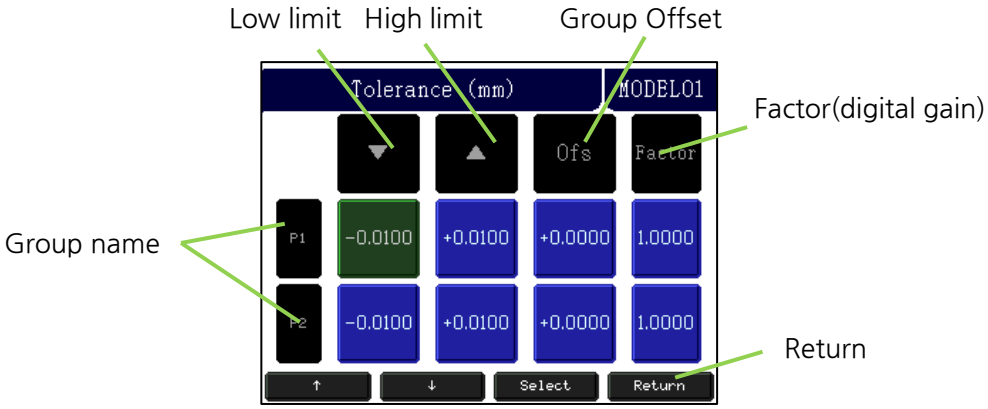


5. Model

- Memory space to save the current settings. And the setting can be recalled. There're 16 memory spaces in ML-CP. If the model is set by 99 or External, the model can be changed by external I/O input.

6. Tolerance

- Tolerance to make the decision of OK/NG is put in this menu.



①Group name: No changeable.
②Hi/Low tolerance: Hi and Low tolerance to make the OK/NG decision. If the tolerance to change is selected, the number entering menu is come out.
③Offset: Offset values for groups. Normally set by 0.000.
④Factor: Digital gain for groups. Normally set by 1.000.
Final value = raw value * Factor(at 'Tolerance' menu).
⑥Return: To return to the main menu with saving the setting.

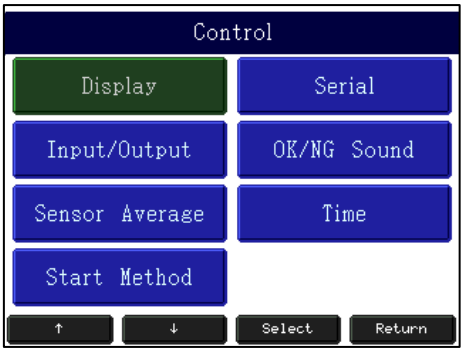
7. Preset

- Preset(nominal) value for the measuring data on the LCD display. Preset is useful to display the real dimension number.

※ The value on the Preset does not effect to the result of the decision. It is just added when the measuring data is displayed.

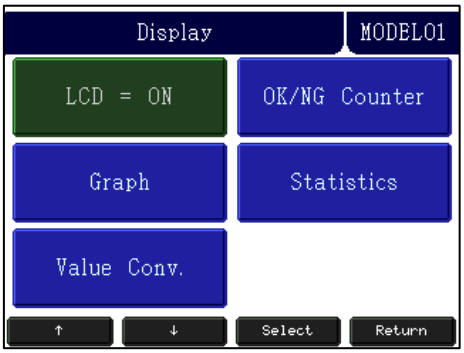
8. Control

- To set up the input/output methods, serial communication, etc.



1) Display:

- To set up display items on the measuring screen .



a. LCD on/off:

To set if the LCD display is used during running or not. If the LCD does not used, other processes are faster. The text of <<LCD DISPLAY IS OFF>> is displayed on the screen if it is set 'Off'.

b. Graph:

To set which the histograms & charts are on the measuring screen.

- Graph On/Off : To select if the graph function is used or not.
- Sample Count : This is for 'Latest histogram' & 'Flow chart'.
  It's about how many latest data is used for them.
- Clear Data : To clear the graphs on the measuring screen.
- Selection : To choose which graphs are displayed on the measuring screen.

* There're number limitations of displaying histograms and flow charts.
- By 4 groups : Max. 9 histograms & charts.
- From 5 to 8 groups: Max. 3 histograms & charts.

**There're 3 kinds of display output in the 'Graph' selection menu.
- Total histogram(T.Histo) : Histogram by total data but they're not saved in the memory, but only updated from last histogram.
- Latest histogram(L.Histo) : Histogram by a number of latest data, 1 to 50, and they're saved in the memory.
- Flow chart(F.Chart) : Flow chart by a number of latest data, 1 to 50.

c. Value conversion:
To setup the end figure of the measured value. There are the options of 'none' (Don't do anything.), 'round', 'raise', and 'cut'.

d. OK/NG counter:
To choose the ok/ng counter on the measuring screen or not.

e. Statistics:
To display statistics data on the measuring screen. Average/Min/Max/Standard Deviation/Cp/Cpk are shown.
*If the statistics data view is on, the histogram view is off automatically. And only 2 groups' statistics data are shown max. Statistics data is disappeared from 3 groups.

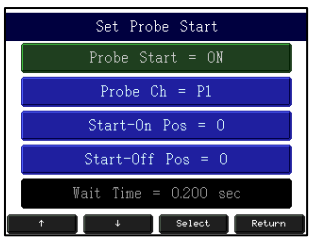
2) Zero Key:
- To do the master zero on the measuring screen by DOWN button(▼). The master zero is saved automatically.

3) Input/output:
- To set input / output pins' purpose. (Check page 14, 15, 16).
- Filter Time : To prevent a noise input from outside, if an input signal is shorter than the setting time, our unit thinks it's a noise.

4) Sensor Average:
-To set how many raw data is used to average them for one measuring sequence.
- The one measuring sequence time could be different by this setting.

5) Start Method:
a. Start:
- Auto : Start the measuring continuously.
- Semi-Auto : Data is updated continuously on the screen.
But the measured data is gotten when 'start' signal is inputted.
- Manual : give the start signal from outside(▶button or from I/O port).

b. Wait Start Off :
If this is 'ON', starting the measuring sequence is waited until the 'Start' signal is off.
If this is 'Off', the measuring sequence is continued until the 'Start' signal is on.
Work with the 'Start Method' is 'Manual' or 'Semi-auto'.



c. Set Probe Start :
If 'On', user can give the start signal by Probes. The measuring sequence is started once when the probe value is bigger than 'Start-On Pos'.
And the sequence is reset if the probe is lower than 'Start Off Pos'
The ABS value of the probe is used on it.(Not from master zero.)

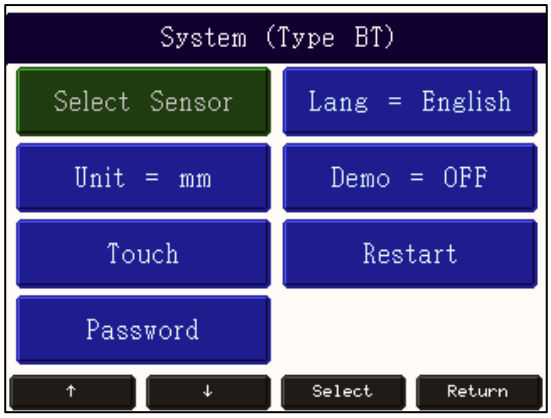
6) Serial:
-To set the RS232C data(Check page 12).

7) OK/NG sound:
-To set if a beep is used at the decision of the OK or NG.

8) Time:
- To set the probe stable time and output signal hold time.

9. System

- To setup the unit, language, password, etc.



1) Select Sensor : Only Air type fixed. (Doesn't work on ML-CP-Ax model.)

2) Unit: To setup unit of the system.
   mm → min→ inch

3) Touch :
   a. Touch Calibration: To check or calibrate the touch pad. To calibrate it, just follow the 5 cross in order. You should press it until a beep is on.
   b. Touch on Run: if 'Off', no touch is worked on the measuring screen. Use mode(■) button to enter the main menu.
   c. Test touch: To check the touch pad is working well. A blue cross will be marked at the touched point. To end of it, press the mode(■) button.

4) Password : To set the password to enter main menu. At the first, password is null, no set.

5) Lang : Menu language selection. English / Korean / Chinese.

6) Demo : To make a random data for a show.

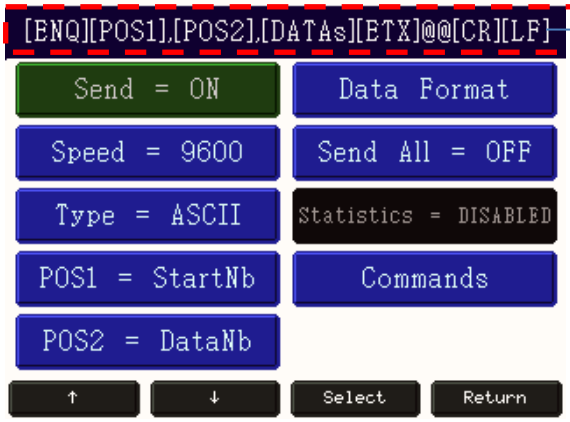
7) Restart : To restart the system(Turn off the power and on again).

10. Initializing

- To initialize all of the setting to the factory set.
- Power on with pressing the mode(■) button. Then a warning message about initializing should be shown. The user setting values are initialized if the select(▶) button is pushed.

※ Every values are initialized to the factory setting. So, write down the values before initializing to save them.

Serial communications



Serial format viewer :
Whenever the settings are changed, the serial format is shown on this viewer.

① Items (At the Main menu → Control → Serial)
- **Send** : To set the use of the RS232C serial output or not.
- **Speed** : Communication speed from 9600 bps to 115200 bps.
- **Type** : ASCII or HEX
- **POS1, POS2** : User can choose one.
  a start number(StartNb), result(OK/NG), a number of data(DataNb), model number(Mdl.Nb), or model name(Mdl.name).
- **Data Format** :
  1)Point On/Off : To put the decimal point on the data or not.
  2)Preset On/Off : To add the 'preset' values for the serial data or not.
  3)Int.Length : To set how many digits are at the front of the decimal point.
  (Only used if 'Point' = ON) ex) In.Length = 4 & Point On/Off = On → +0000.000
  4)Group OK/NG : To send individual 'Group' OK/NG result on each data.
- **Send All** : To send all groups' data even if user doesn't set some groups. i.e. max data output.
- **Statistics On/Off** : If this is on, the statisitics data, Average/Minimum/Maximum/Standard Deviation/ Cp/Cpk, are out with other data. Only worked if user set statistics view is on.
- **Commands** : To give several commands by RS232C.
  1) Commands On/Off: To use the serial commands or not(**Default : Off**).
  2) Use Device ID On/Off: To use the serial command ID when several units connected the line together.
  3) Device ID : The device ID for serial communication. (01 ~ 99, '00' for all unit).

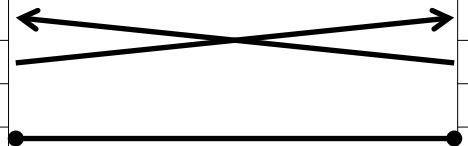
***Serial Commands :**
-START : Starts the measurement once & return the measured data.
-MZERO : No use for Air type.
-MCLEAR : No use for Air type.
-RESET : Initialize the measuring screen (Clear OK/NG counter, Clear graph, ..etc.
-RECALL: Return the current data once without new measurement.

***Serial Commands Format:**
-If no use ID:
[COMMAND] [CR] [LF] → [ACK] returns after 5msec
([ACK] returns only for MZERO, MCLEAR, RESET. For START, RECALL, it gives the data return.)
-If use ID:
[ID] [,] [COMMAND] [CR] [LF] → [ACK] return after 5msec
-[CR] : 0x0D, [LF]: 0x0A, [ACK] : A [CR] [LF] (= A₩r₩n)

Serial communications

② Cable setting

Elec' micrometer		Direction of signal	Computer	
Signal	Pin No.		Pin No.	Signal
N.C	1		1	DC
RD	2		2	RD
TD	3		3	TD
N.C	4		4	DTR
SG	5		5	SG
N.C	6		6	DSR
N.C	7		7	RTS
N.C	8		8	CTS
N.C	9		9	RI



- Cable of computer serial working terminal - Connect 4Pin and 6Pin / Connect 7Pin and 8Pin

Serial communications

③ Examples of the serial communication

- Hex Format

STX (1 Byte)	STATUS (1 Byte)	MEASURING DATA (n Byte)	ETX (1 Byte)

(n = Transmit Data Q'ty x 2)

- ASCII Format

Byte	1	2	1	2	1	-	1	1	2	1	1
Char	ENQ (0x05)	Start Point	,	End Point	,	Data	,	ETX (0x03)	@@	CR	LF

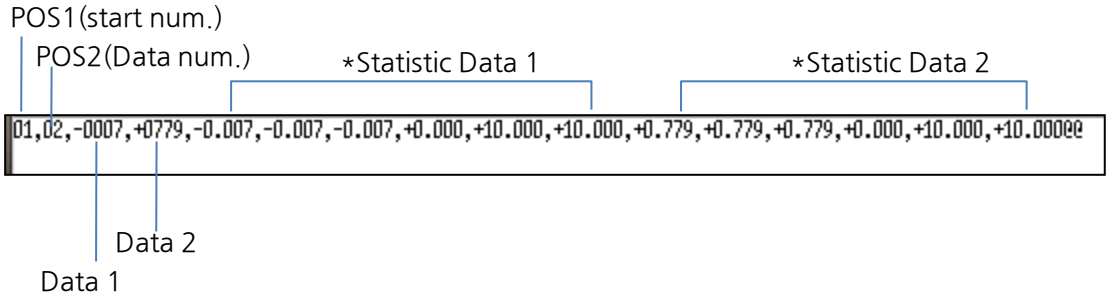
Ex) In case of No. of Data is 2.

1	2	1	2	1	5	1	5	1	1	2	1	1
ENQ	01	,	02	,	+0043	,	-0025	,	ETX	@@	CR	LF

- ASCII Format with Statistic

Byte	1	2	1	2	1	-	-	1	1	2	1	1
Char	ENQ (0x0 5)	Start Point	,	End Point	,	Data	Statistic Data	,	ETX (0x03)	@@	CR	LF

Ex) In case of No. of Data is 2 / Statistics data is 2.



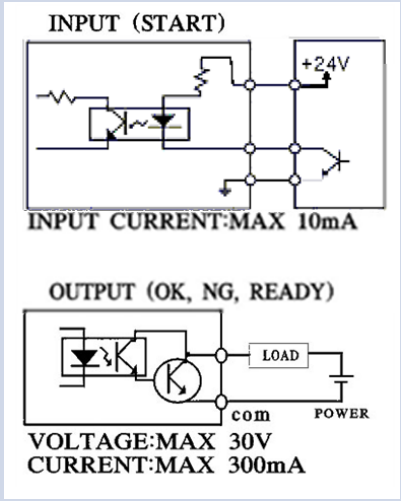
* Statistic data order :

1. Average
2. Min
3. Max
4. St. Dev.
5. Cp
6. Cpk

I/O port & operating sequence

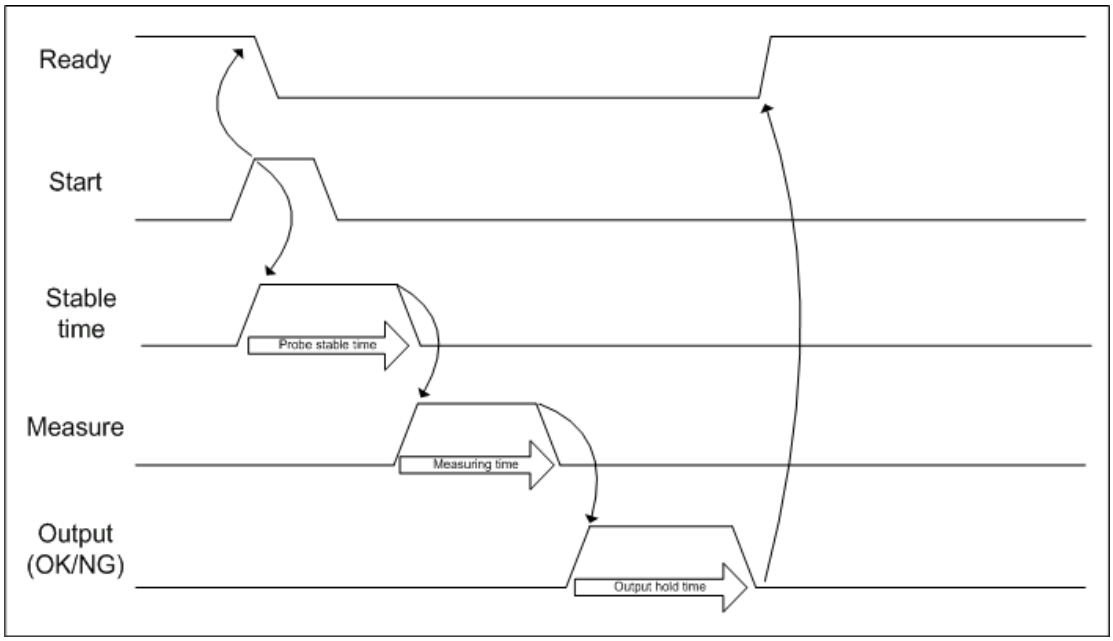
1) I/O pin description

Pin	Name	In/Out		Description	Circuit
1	NCOMMON		0 V	GROUND	
2	PCOMMON		+24V		
3	IN6	in	H/L		
4	IN5	in	H/L		
5	IN4	in	H/L		
6	IN3	in	H/L		
7	IN2	in	H/L		
8	IN1	in	H/L		
9	OUT6	out	H/L		
10	OUT5	out	H/L		
11	OUT4	out	H/L		
12	OUT3	out	H/L		
13	OUT2	out	H/L		
14	OUT1	out	H/L		



* User should set how to use the IN/OUT pins at the 'Setup' → 'Input/output'.

2) Timing diagram

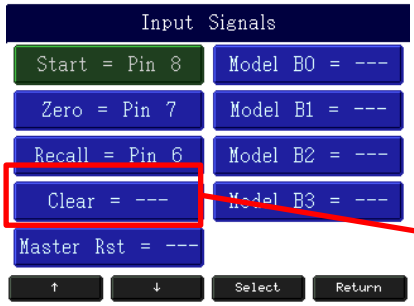


I/O port & operating sequence

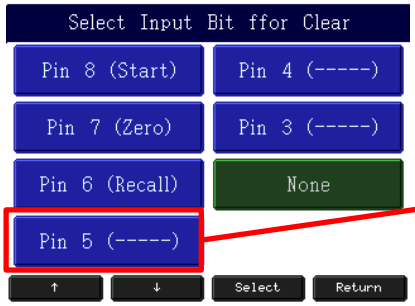
3) How to set the IO port

-Path: Main Menu → Control → Input/Output → Input or Output

Input



To setup a pin to 'Clear' function



Select a pin

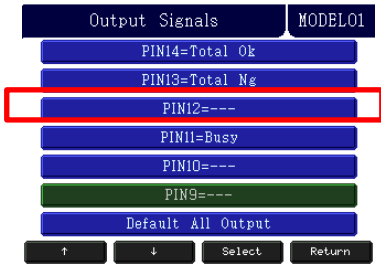
Pin number 5 is set to 'Clear'.

Input - External keys

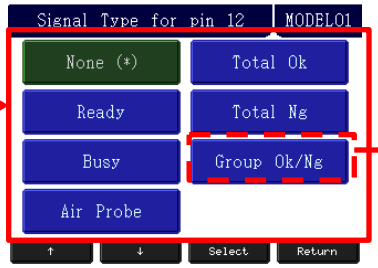
To setup pins Up / Down / Select / Mode buttons.
*After firmware ver. 7.62.

I/O port & operating sequence

Output

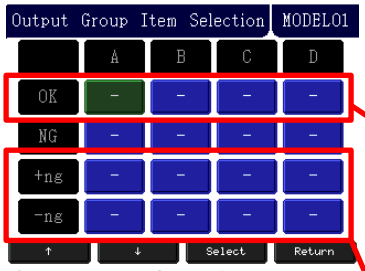


To setup a pin a function

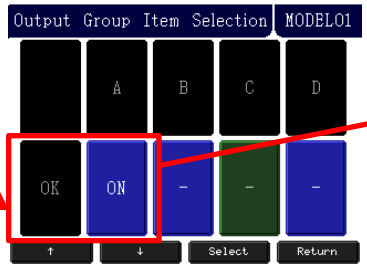


Select one function. → DONE.
*For -NG/OK/+NG, select 'Group OK/NG'

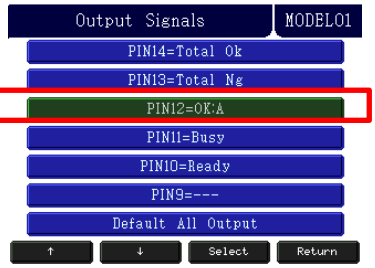
Then press 'Set Group'



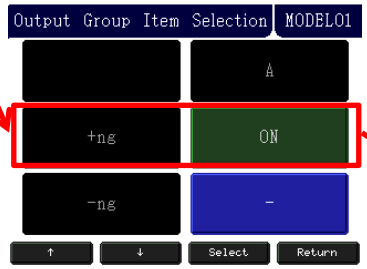
Choose one from '-NG/OK/+NG'



If press 'OK' tap.



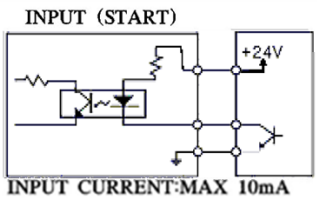
The pin2 is set to OK(for A group)

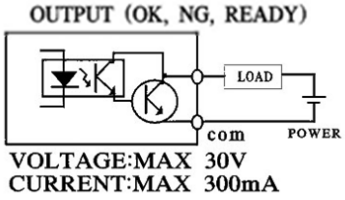


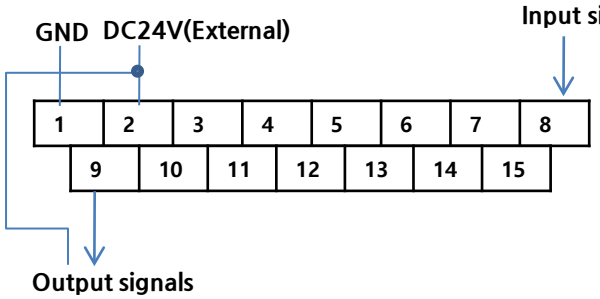
If press '+NG' tap.

The pin9 is set to +NG(for A group)

I/O Pin features - ML-CP/MP/LP







Pin 1: GND
Pin 2: DC24V (Just for ML-CP/MP/LP)
Pin 3~8: Input port
Pin 9~14: Output port

Specifications

1. General Specifications

DIVISION	GENERAL
MAIN SUPPLY	AC100-220V~ 50/60Hz
OPERATING TEMPERATURE	5 ~ 40℃
RELATIVE HUMIDITY	Up To 70%
INPUT AIR PRESSURE	2 BAR
OPERATING CONDITION	NO CORROSIVE GAS AND DUST
SUPPORTING OUTAGE	DATA BACK UP BY INNER FLASH MEMORY

2. Specifications

DIVISION		SPECIFICATION
AIR SENSOR	CHANNELS	1~2ch
	RESOLUTION	0.1um
DISPLAY	LCD	3.5” TFT COLOR GRAPHIC LCD
DIMENSION		W100×H100×D160(㎜)
WEIGHT		1.0㎏
OUTER INTERFACE		RS232C, 9600N81
		I/O port (IN:6, OUT:6)

High Precision Air Type Micrometer

DONG-DO