DONG-DO

Color TFT LCD & Column LED bar Display

High Precision Air type Electronic micrometer

ML-1CT

User's Guide (Ver. 5.02)

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.)

LED Column Bar:
It is displayed 'OK(Green color) / NG(Red color) / High & Low tolerance marking'

RS232C communication port

I/O port

Color TFT LCD

Power switch

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

'Air in' nipple

DC 24V power input

'Air out' nipple(it could be at the behind of the ML-1CT.)

2. Measuring screen

Scale for LED column bar

Model number

Part counter

Tol. Hi: (mm)
+40.0100
Tol. Lo: (mm)
+39.9900

Hi/Low tolerances

P1:

Measured data

40.0000

LED[0.4um]   MODEL[1]

Hi Mst | Lo Mst | Start | Menu

Normal Text view

LED[0.4um]   P[02v1] MODEL[1]

T.Histo   L.Histo200 F.Chart200

P1: +39.9900 ~ +40.0100 (mm)

40.0000

Hi Mst | Lo Mst | Start | Menu

Histograms & chart view

Functions

1. Main menu

- Main menu is entered by hitting ■ button(4th button from left) on the measuring screen.
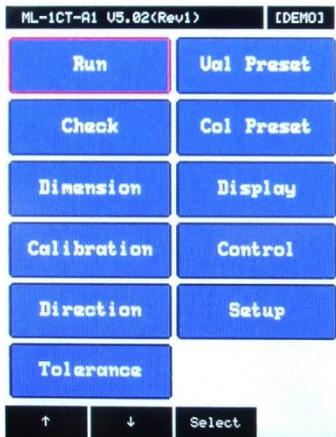
-The main menu is composed as like the picture at the left.
-Each functions can be chosen by ▶ button after cursor is moved by ▲▼buttons.

1. Run: To go to the measuring screen.
2. Check: Checking sensor data.
3. Dimension: Hi/Low masters' dimension setting.
4. Calibration: Calibration sensors by Hi/Low masters.
5. Direction :Sensor direction setting
6. Tolerance: To input the tolerance of the measuring part.
7. Val Preset: Preset(base) value for the measuring data on the LCD display.
8. Col Preset: Preset(base) value for the measuring data on the LED bar display.
9. Display: To set the scale, zoom on/off, and display modes for the LED bar.
10. Control: To set up the input/output methods, serial communication, etc.
11. Setup : To setup the model number, sound, etc.

2. Run
-To enter the measuring screen.

3. Check
-If ▶(SELECT) button is pushed at the "Check" on the main menu, sensor data checking screen is come out. ▲(UP), ▼(DOWN) buttons are used for moving the cursor.
 A row data of the sensor is on the screen in this menu.
The sensor area should be changed when the data is fixed at -204.8 or +204.7 after master or a measured part is set. Because it means the sensor is out of measuring area.
It could be happened, if the difference between air gauge and measuring part is too big or sensor is damaged. (Normally it is shown around -1900~-1800 if there's no air input. But it could be different depended on models.)

* Caution: a wrong data comes out at the wrong measuring area!
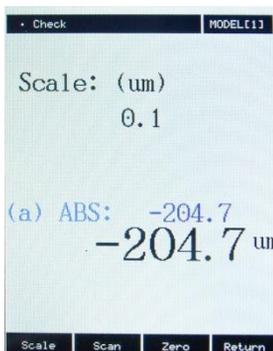
-If ▶(SCAN) button is pushed, a row data is displayed at the screen and ▶(ZERO) is displayed at ▶(SCAN) position.
If ▶(ZERO) button is pushed, a relative value from the value of the moment is displayed. The value of the moment is set to zero. The value is not saved at all. It's just for the checking sensor data.

**Simple setting orders.

* **Dimension → Calibration → Tolerance → Other options**

a. Hi/Lo Master Size input(at **Dimension** menu).
b. Hi/Lo Master Calibration(at **Calibration** menu)
c. Zero Master offset setting(Optional, at **Offset** menu)
d. **Tolerance** setting to make the decision of OK or NG.
e. Other settings as like preset, scale, etc.

4. Dimension

- Hi/Low masters' dimension setting before doing master calibration.
- If ▶(SELECT) button is pushed at the "Dimension" on the main menu, master dimension setting screen is come out. ▲(UP), ▼(DOWN) buttons are used for moving the cursor.

- The unit is [um]. And the master dimension should be under 1[mm].
They are the two kinds of example for the master dimension.

Master Size	10.000 [mm] +0.010 [mm] / −0.010 [mm]	20.500 [mm] +0.050 [mm] / +0.030 [mm]	
Inputting Value	Val Preset: +10.000 HI : +010.0(um) LO : −010.0(um)	Val Preset: +20.500 HI : +50.0(um) LO : +30.0(um)	Val Preset: +20.000 HI : +550.0(um) LO : +530.0(um)
Note	–	Both of the settings are possible.(HI/LO deviation is the same. 'Val preset' is a nominal value but just for display on measuring screen.)	

5. Calibration

- Hi/Low masters setting menu.
If ▶(SELECT) button is pushed at the "Calibration" on the main menu, master setting screen is come out.
▲(UP), ▼(DOWN) buttons are used for moving the cursor.
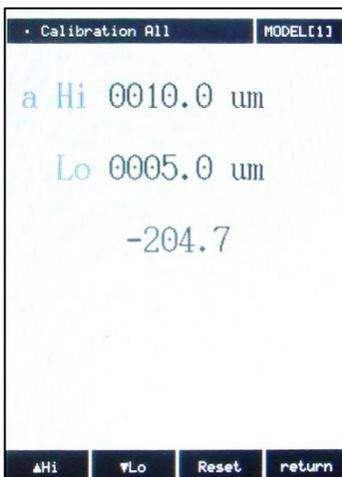
The high master value is set with a buzzer sound if ▲(Hi) button is pushed after high master is set. And the low master value is set with a buzzer sound if ▼(Lo) button is pushed after low master is set. The setting is done if the measured data is all right on the display.
And then, to escape the menu with saving the setting, hit the ■(return) button.
If he master value setting is wrong, there is an alarm. In this case, erase the input master values with ▶(Reset) button.

6. 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.

7. Offset(optional)

- 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.

8. Tolerance

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

9. Val 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.

10. Col preset

- Preset(base) value for the measuring data on the LED column bar display. Preset is useful to display whole of the measuring area of a part.

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

11. Display(for LED bar)

- To set the scale, and display modes for the LED bar.

1) Scale
It is for the setting how length is shown as the length of the LED display increased.
For example, if 0.2um/LED is set, the each LED is 0.2um.
The picture on the right is shown the LED display as the scales are changed at the 2um.
If 'Auto' is set in this menu, the scale is changed automatically as the area of measuring is changed.

* Auto → 0.1 → 0.2 → 0.4 → 0.5 → 1.0 → 2.0 → 4.0 → 5.0 → 10.0 um as the ▶ button is hit.

2) Mode for LED bar display
The LED display start position is set on this screen
CENTER : LED display is started from middle of the bar.
BOTTOM : LED display is started from bottom of the bar.

0.2um   0.4um   1um

End of the view
0.2um SCALE   0.4um SCALE
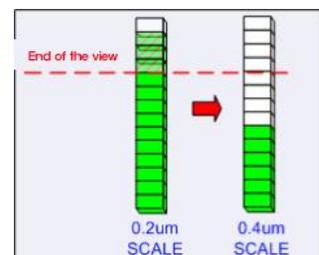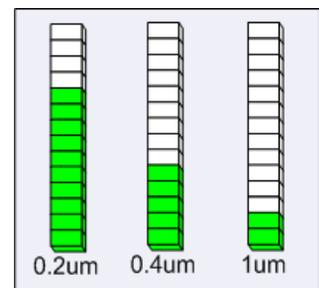
12. Control
- To set up the input/output methods, serial communication, etc.
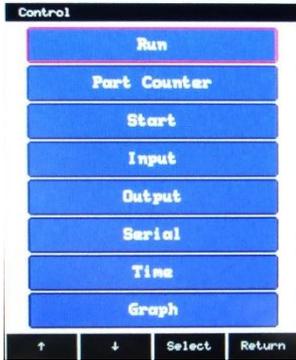
1) Run : to go to the measuring screen.
2) Part Counter: To set the part counter on the measuring screen.
3) Start
   - Auto : Start the measuring continuously.
   - Semi-Auto : Data is updated continuously on the screen.
            But the data is gotten when 'start' signal is inputted.
   - Manual : give the start signal from outside(▶button or from I/O port).
   - 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.
4) Input : To change the use of the input signals on the I/O Port.
            User choose an item and set an input pin number.(Check page 10)
5) Output: : To change the use of the output signals on the I/O Port.
            User choose an item and set an output pin number. (Check page 10)
6) Serial : To set the RS232C data(Check page 9).
7) Time : To set the probe stable time and output signal hold time.
8) 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.
   - Clear Graph Data : To clear the graphs on the measuring screen.
   - Sample Count : This is for 'Latest histogram' & 'Flow chart'.
                  It's about how many latest data is used for them.
   - Selection : To choose which graphs are displayed on the measuring screen.

**There're 5 kinds of display output in the 'Graph' selection menu.
 A. Total histogram(T.Histo) : Histogram by total data but they're not saved in the memory,
                  but only updated from last histogram.
 B. Latest histogram(L.Histo) : Histogram by a number of latest data, 1 to 300, and they're saved
                  in the memory.
 C. Flow chart(F.Chart) : Flow chart by a number of latest data, 1 to 300.
 D. Total CP/CPK(T.Cpk) : CP/CPK by 'Total histogram'.
                  Caution: the total histogram data is saved on 23 sections between
                  (-tolerance value x 2) to (+tolerance value x 2). And if the data is out of the area,
                  +/- tolerance x 2, the data is saved at the last value, at -tolerance x 2 or
                  +tolerance x 2. So, if there're a lot of measuring data that is out of the area,
                  the CP/CPK value could be different. **So, it is a reference value, but not exact value.**
 E. Latest CP/CPK(L.Cpk) : CP/CPK with latest data based.
                  It is the CP/CPK value based on real latest data. So, the value is exact.
                  But there's a data number limits, normally latest 300 data.

13. Setup

- To set up the model number, sound, etc.

Setup
Run
Model = 0
Avg = 7
Sound
LCD = On
Value Conv
I/O test
Demo = Off
↑	↓	select	return

1) Run : To go to the measuring screen
2) Model : Memory space to save the current settings.
       There are 16 spaces, 0 to 15, and external memory selection
       by input signal is possible if the model is set to 99.
3) Avg : To set how many raw data is used to average them
       for one measuring sequence.
4) Sound : To set if a beep is used at the decision of the OK or NG.
5) LCD : 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'.
6) Value Conv : To setup the end figure of the measured value.
       There are the options of 'none' (Don't do anything.),
       'round', 'raise', and 'cut'.
7) I/O test : To verify the external I/O state.
       1 and 0 are repeated to the output port.
8) Demo : To run with a random data for display for a show.

*Serial

1) Items (At the Main menu → Control → Serial)
- Send : To set the use of the RS232C serial output or not.
- Type : ASCII or HEX
- Form : +0 or +0000(Fill 0 at the front).
- Speed : Communication speed from 9600 bps to 115200 bps.
- OK/NG : To set if the result is in the serial data or not.
- Model : To set if the model is in the serial data or not.
- Part No. : To set if the part number(counter) is in the serial data or not.
- Fix Length : If it's 'No', the maximum data length is set(8 data).
***The serial data is sent without decimal point normally, but if user inputs the 'Val preset' data,
    the serial data is output with decimal point.
 Ex) Measured data: +0.0050 → ①If 'Val preset' is +100.0000, the serial data is +100.0050
                     ②If 'Val preset' is +0.0000, the serial data is +0050 (No decimal point).

Serial formant viewer

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

 3). Output types for communication

 - Hex Format

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

 - ASCII Format   (n = Transmit Data Q'ty x 2)

Byte	1	2	1	2	1	5*n+(n-1)	1	1	2	1	1
Char	ENQ (0x05)	Start Point	'	End Point	,	Data	,	ETX (0x03)	@@	CR	LF

 - ASCII Format with Part number.

Byte	1	2	1	2	1	2	1	5*n+(n-1)	1	1	2	1	1
Char	ENQ (0x05)	Part No.	'	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

*I/O port & operating sequence

1) I/O pin description

Pin	Name	In/Out		Description	Circuit
1	NCOMMON		0 V	GROUND	
7	IN2	in	H/L		
8	IN1	in	H/L		
10	OUT4	out	H/L		
12	OUT3	out	H/L		
13	OUT2	out	H/L		
14	OUT1	out	H/L		

INPUT (START)
+24V
2.2k
INPUT CURRENT:MAX 10mA

OUTPUT (OK, NG, READY)
LOAD
com   POWER
VOLTAGE:MAX 30V
CURRENT:MAX 300mA

* User should set how to use the IN/OUT pins.
- Input: Make a selection IN1 or IN2 for Start / Hi / Lo / Model.
- Output: Make a selection OUT1 to OUT4 for None / Ready / Total OK / Total NG / Group OK/NG.

2) Timing diagram

Ready

Start

Stable time
Probe stable time

Measure
Measuring time

Output (OK/NG)
Output hold time
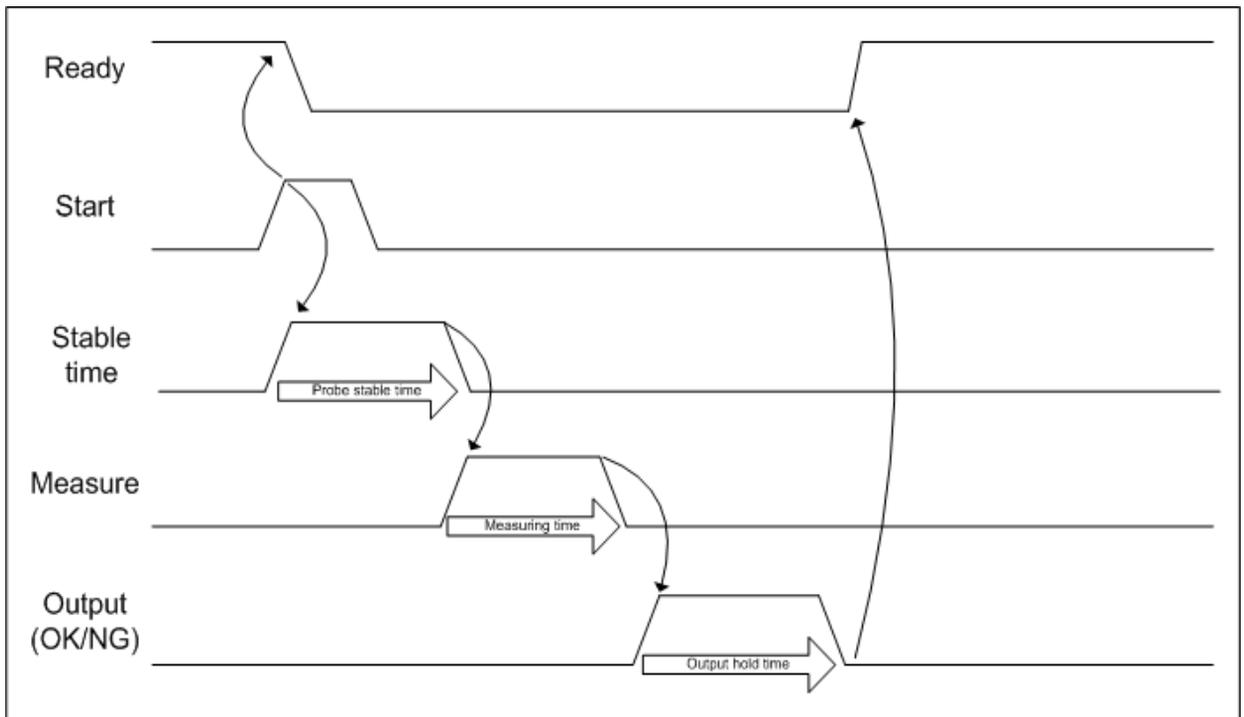
Specifications

1. General Specifications

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

2. Specifications

DIVISION		SPECIFICATION
AIR SENSOR	CHANNELS	1ch
	RESOLUTION	0.1um
DISPLAY	LCD	2.8" TFT COLOR GRAPHIC LCD
DIMENSION		W153×D107.5×H440(㎜)
WEIGHT		1.7kg
OUTER INTERFACE		RS232C, 9600N81
		I/O port (IN:2, OUT:4)

High Precision Air Type Micrometer

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