# Processing Unit

## HIP - 550

User's Manual

- 10th edition -

Suruga Seiki Co., Ltd.

Thank you for choosing Suruga Seiki's product. This manual has been written for the operation of Processing Unit PRO HIP-550. For proper use, please read this user's manual thoroughly prior to using this product and keep it for future reference.

●Cautions for Your Safety

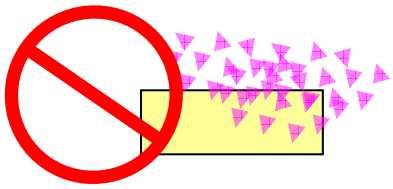
For proper and effective use, please read this manual thoroughly prior to using this product.
Failure to use the product properly as explained in the manual may cause damage or injury. The sign ⃠ indicates prohibited actions.

## ⚠ Cautions

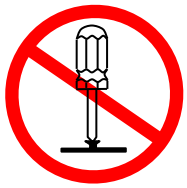
• Safety & Proper Operation
  • This product is connected to Laser Auto Collimator. Therefore, an operator of this product should have knowledge of handling laser equipment safety.

• Wiring
  ・ When connecting or disconnecting a cable, turn off the power of this product and any instrument connected to the product. Otherwise, it may cause damage to the product.
  ・ Make sure to arrange wiring of I/O connector correctly. Otherwise, it may cause damage to the product.

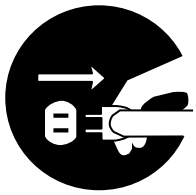
• Operating Environment
  Do not use the product in the following environments:
  —Directly under sunlight
  —Areas that have much dust or metallic particles
  —Near fire
  —Much noise, much vibration
  —Areas that may have water or oil spill
  —Not flat surface
  —Corrosive gas and/or flammable gas environment



• Disassembling/Alteration
  DO NOT disassemble, alter, or perform any improper repair of this product.
  It may cause electric shock. If you have any question trouble, please contact us.



• Repair Request
  In case of the following conditions, please unplug a power cable immediately and contact us for repair request. If the product is continuously used, it may cause fire, electric shock or injury.
  —Strange sound or smell or smoke coming out of the product
  —Power cable is damaged
  —Water is spilled over or foreign particle got inside the product
  —Product was dropped or cabinet was damaged



# INDEX

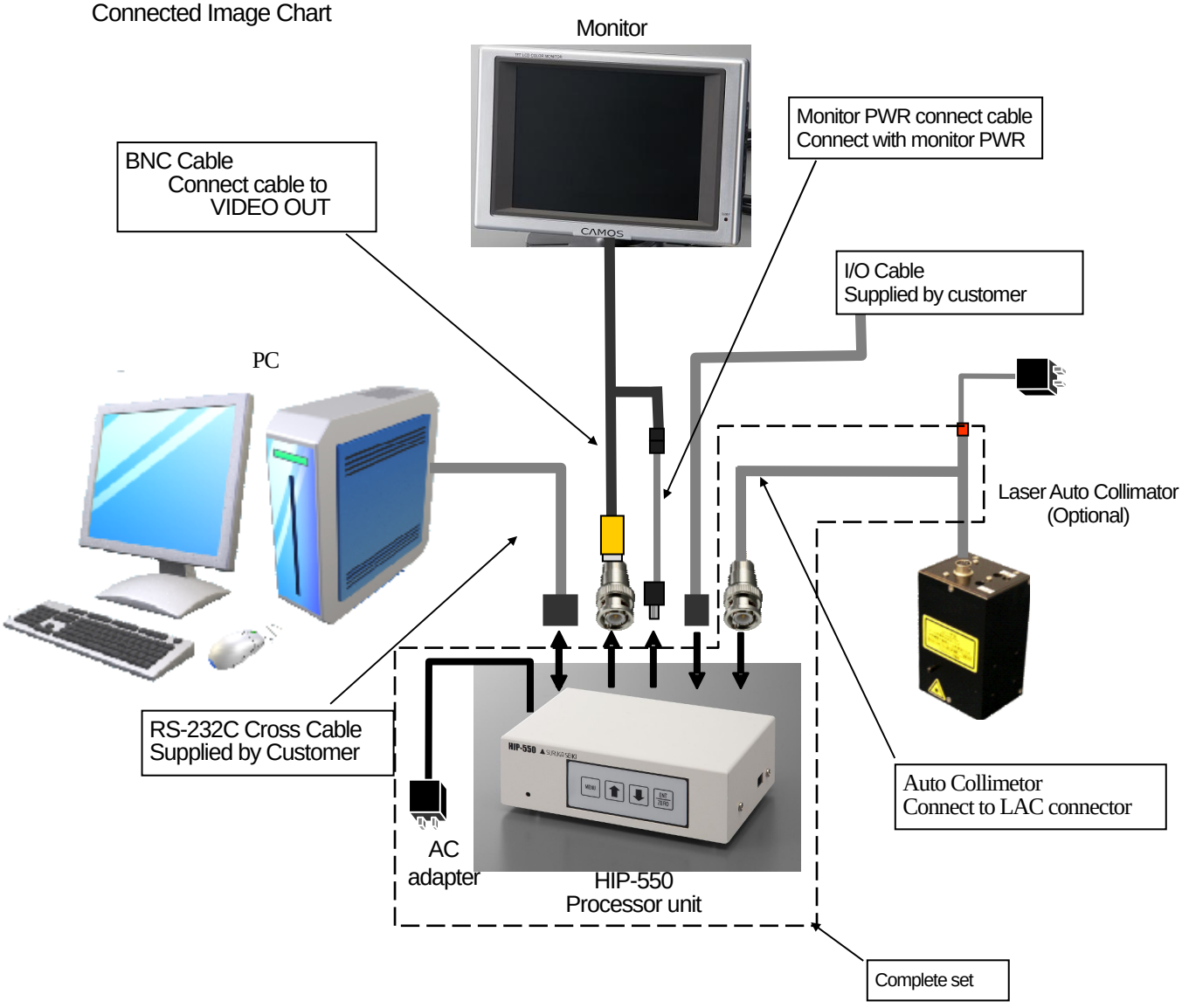
# 1. INTRODUCTION

## 1.1. Processing Function

The HIP-550 Processing Unit receives and digitally processes the signals from Suruga Seiki's Auto Collimator, and displays the detected angles and the result of acceptance range on an external monitor screen.

This HIP-550 is the succession model to former HIP-500.

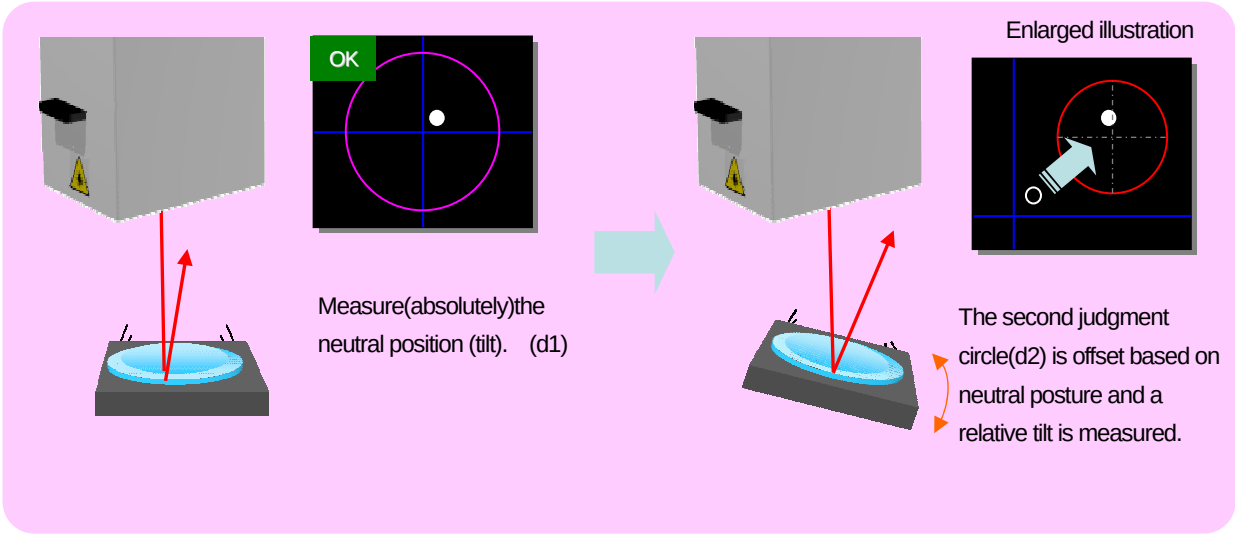
Connected Image Chart




*Attached cable can vary from the models.

Feature

- Two kinds of centroid analysis mode.（Center of area・Luminance centroid）
- Image rotation and mirroring
- Offset judgment range
- Luminance judgment function
- ZOOM function
- Offset tilt measurement function（see below）




Old model compatibility

| Function | | HIP-550 | HIP-500(Old model) |
|---|---|---|---|
| Angle Measurement | Single Spot | ○ | ○ |
| Angle Analysis | Center of area | ○ | ○ |
| | Luminance centroid | ○ | ○ |
| User-Friendly Function | Display the luminance value | ○ | × |
| | Zoom function(choice of magnification） | ○ | × |
| | Image rotation（Switch XY axis） | ○ | × |
| | Inverting image（Axis sign inversion） | ○ | × |
| | Offset Judgment | ○ | × |
| Judgment of Acceptance Range of Acceptance | Circle (d1) | ○ | ○ |
| | Circle2 (d2) | ○ | × |
| | Square (XY) | ○ | ○ |
| Parallel I/O | I／O Points | 2/1 | 2/1 |
| | Input Function1 Zero Set | ○ | ○ |
| | Input Function2 Data Output | ○ | ○ |
| | Output Function | Judgment of Acceptance | Judgment of Acceptance |
| Serial Communication | Interface | RS-232C | RS-232C |
| | Command Control | ○ | ○ |
| | Data Output | CSV Style | CSV Style |

Specification

| Item | Specification |
|---|---|
| Image output signal | NTSC color image signal (BNC) |
| Operation environment | 0～40°C,　20～80%RH (no condensation) |
| Power consumption | AC adapter (AC100~240V±10%　50/60Hz)/DC12V 1A 以下 |
| Parallel I/O | Insulated type I/O,　in:2port, out:1port |
| Communication port | RS-232C (D-SUB 9-pin) |
| Size | W160×H50×D105mm(including the rubber legs of 9mm) |
| Weight | 390g |

*Appearance and specifications of this product are subject to change for upgrade without advance notice.

## ·Accessories & Options

This Product comes with the following accessories. Please check if everything is included.

- AC adapter　1
- Laser Auto Collimator - HIP-550 Video Cable　1
- User's Manual　1

Accessory detailed

1)AC adapter

Size　: W44×L60×H26

Weight : 120g

Rating : AC100～240V

DC12V　1A or more

2) Video cable for H400/H4500/H600

Model　: HBNC-2

Size　: 1.5m

Weight　: 80g

Unattached with HIP-550/***-P.

Can connected with HBNC-1 or HBNC-3 that is attached to the H350.

3)User's Manual

Size　: A4

Weight : 240g

The following option items are available to meet your needs. Please contact us for purchasing option items.

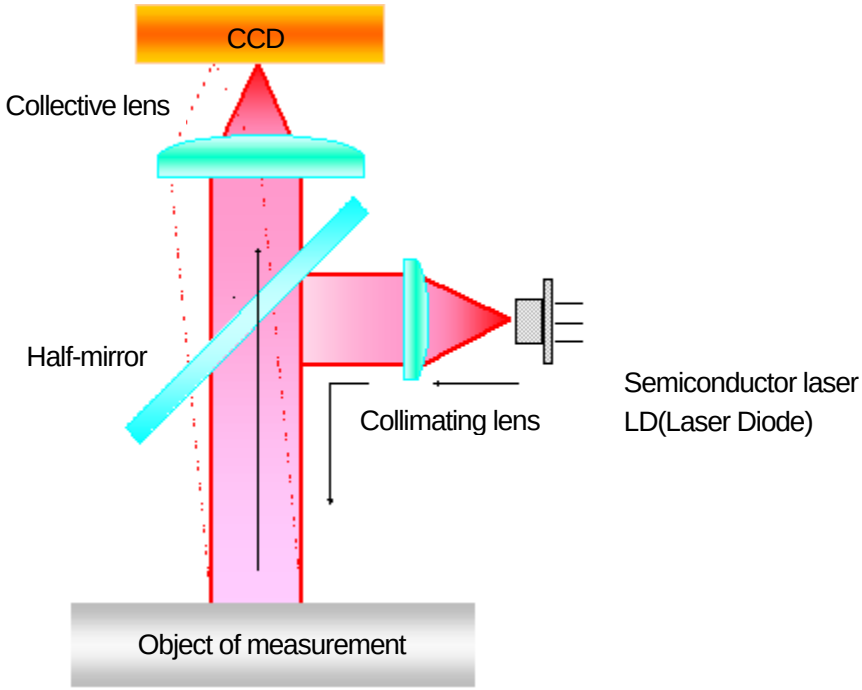
| Product | | Model | Note |
|---|---|---|---|
| Laser Auto Collimator | Small type with red LD<br>Small type with blue LD | H350R-C□□□ | Measuring Range ±0.5°~ ±1.75° |
| | | H350B-C□□□ | Measuring Range ±0.5°~ ±1.0° |
| | With red LD | H400-C□□□ | Measuring Range ±0.5°~ ±2.0° |
| | With red LD and screen | H400-C□□□S | Measuring Range ±0.16°~ ±0.35° |
| | V-type LAC with red LD | H450R-C□□□ | Measuring Range ±0.5°~ ±1.5° |
| | V-type LAC with blue LD | H450B-C□□□ | Measuring Range ±0.5°~ ±1.5° |
| | For 2 wavelength (with screen) | H600-C□□□S | Measuring Range ±0.2°, ±0.3° |
| | For 2 wavelength with red and blue LDs | H600B-C□□□S | Measuring Range ±0.2°, ±0.3° |
| 2-axes Tilt Stage | | HB10 | For H400-C, H350 |
| | | HB11 | For H400-CS, H450, H600-CS |
| Mount | | HA10 | |
| | | HA11N | High Stiffness Type |
| Parallel Mirror | | HS-0 | φ30, t=10, One side AL coating<br>Parallelism less than 5arcsec. |
| Wedged Substrate | 1° (60 arcmin) | HS-100 | □40, t=10<br>Angle accuracy less than ±10 arcsec. |
| | 0.5° (30 arcmin) | HS-050 | |
| | 0.25°(15 arcmin) | HS-025 | |
| | 0.2° (12 arcmin) | HS-020 | |
| | 0.1° (6 arcmin) | HS-010 | |
| Wedged Mirror | 1° (60 arcmin) | HS-100AL | □40, t=10<br>Angle accuracy less than ±10 arcsec.<br>AL+$MgF_2$ |
| | 0.5° (30 arcmin) | HS-050AL | |
| | 0.25°(15 arcmin) | HS-025AL | |
| | 0.2° (12 arcmin) | HS-020AL | |
| | 0.1° (6arcmin) | HS-010AL | |
| Monitor | | VCM-562HIP | |
| DC power source cable | | HDC-CABLE1 | This cable is supplied power to the LC mnitor VCM-562 from the power supply for LC monitor placed on the back of HIP-550.<br>Attached to some set-model or single that included VCM-562HIP. |

## 1.2. Principle of Measurement Using a Laser Auto Collimator

Light emitted from the semiconductor laser is transformed into parallel laser light by the collimating lens.

The laser light that is reflected by the half-mirror back to reflect to object, then collected by collective lens, and focused onto CCD that set on focal length.

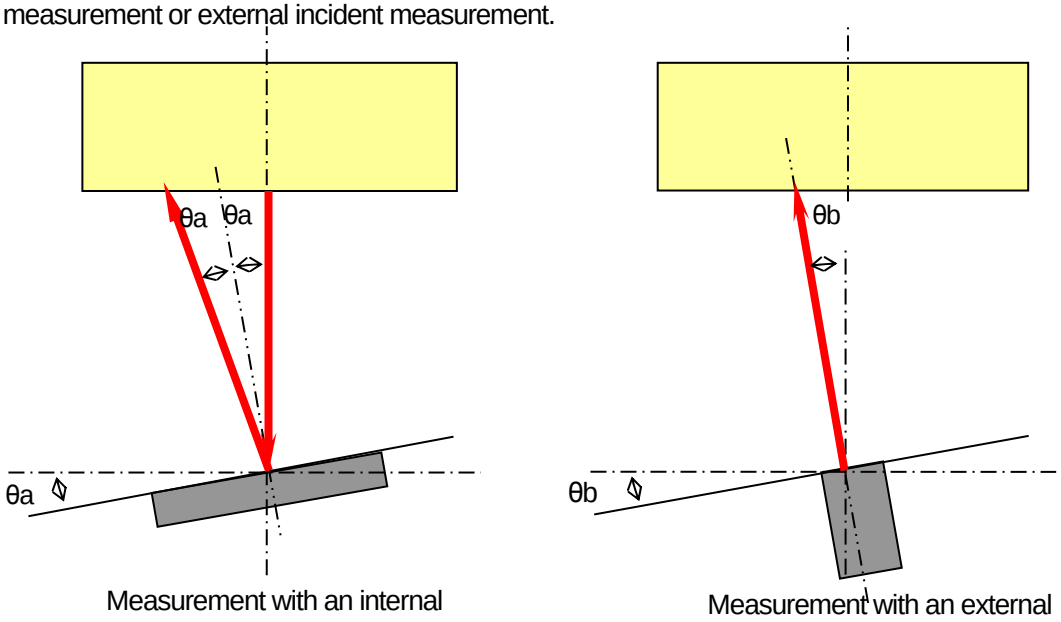
Can be measuring object tilt according to get the length of focus point on the CCD.




### 1.2.1. Principles of Reflection and External Incidence Measurements

In reflection measurement using a common internal laser light source, the optical axis of the reflected light is entered into an autocollimator in double tilt of θa/

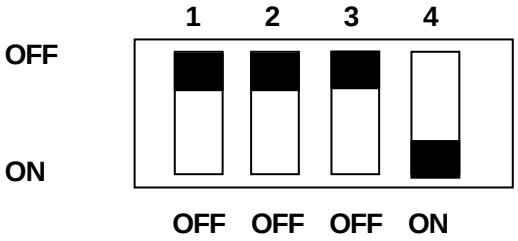
In an autocollimator, θa that adjusts tilt of the laser of this 2Xθa a half is displayed as a tilt angle of the measurement object. When measuring the tilt of external laser light source, should be display the angle of incidence of the laser (θb) as a measurement angle. Therefore it must be setup refrection measurement or external incident measurement.



### 1.2.2. Switching to External Incidence Measurement

Turn power off. Locate the DIP switch in back of the unit and set No.4 pin to ON and all other pins to OFF. The unit will start in external incidence measurement mode when it is turned on.

1)DIP switch



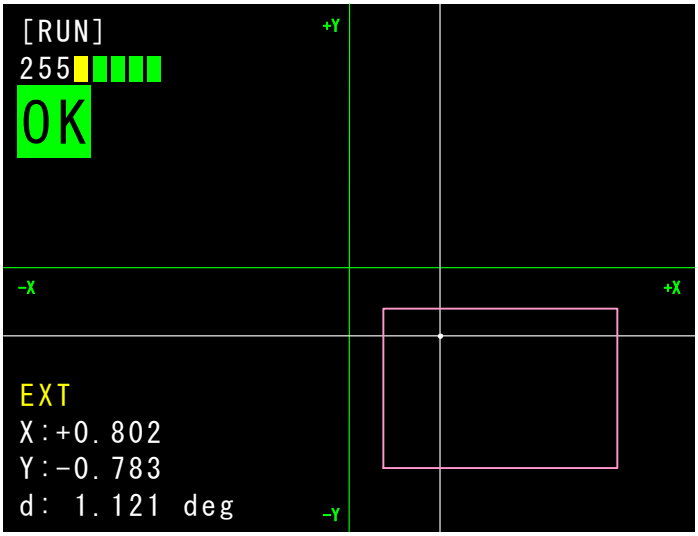

(Note)

- When the calibration is performed, return the DIP switch and checked with internal light source. See “6. Angle Calibration” for detailed information.

### 1.2.3. Screens in External Incidence Measurement Mode

“EXT” displayed while in external incidence mode

Results are shown in values twice those from internal light source mode



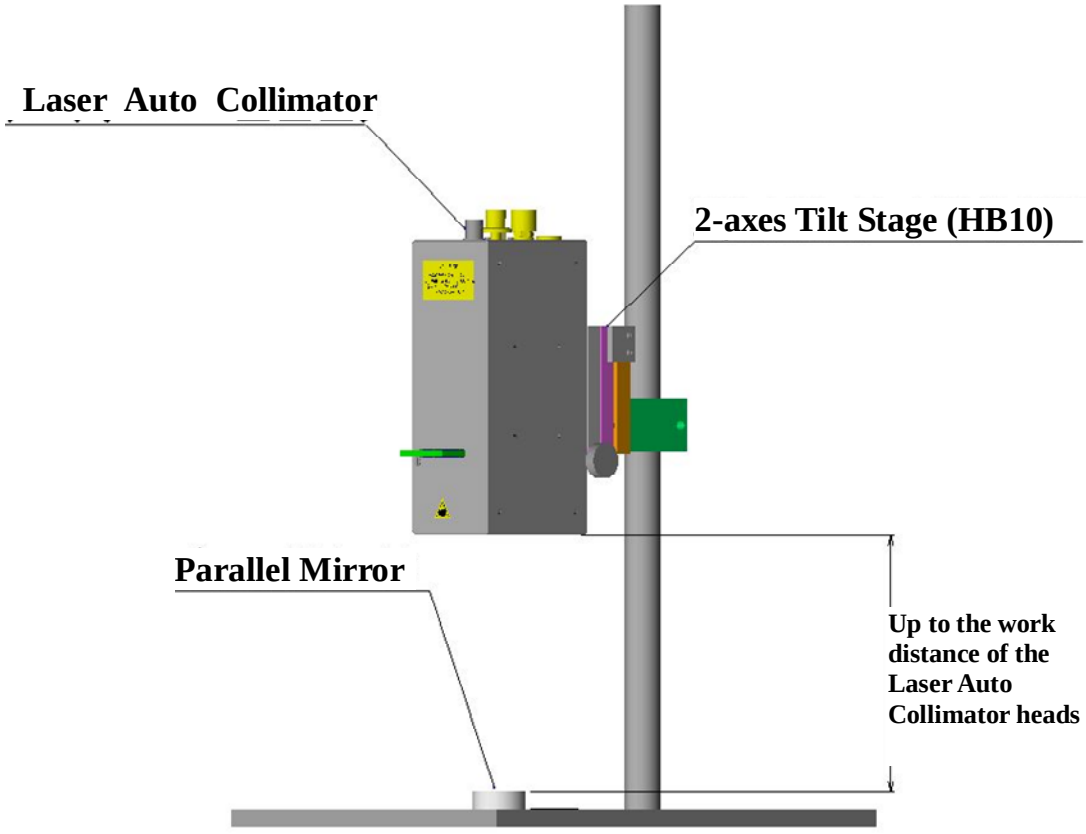

Measurement screen

# 2. Preparation

This manual assumes the use of Suruga Seiki's Laser Autocollimator (H400 series), 2-axes tilt stage (HB10) and parallel mirror (HS-0). Set those or other units as instructed below.

## 2.1. Assembling

Attach the Laser Auto Collimator to the 2-axes tilt stage (HB10) and mount the parallel mirror (HS-0). Keep the distance between the laser output of the Laser Auto Collimator and the parallel mirror (HS-0) to the work distance of the Laser Auto Collimator heads (as shown below).

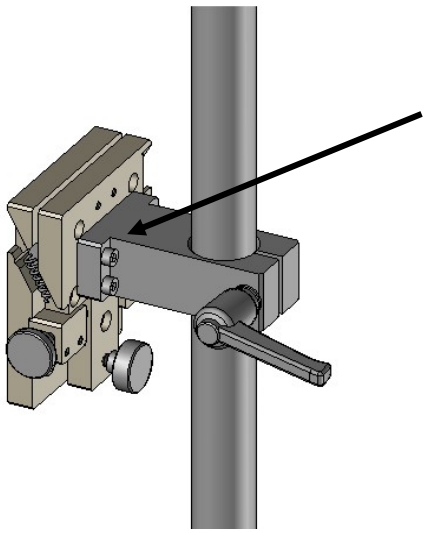



Installation

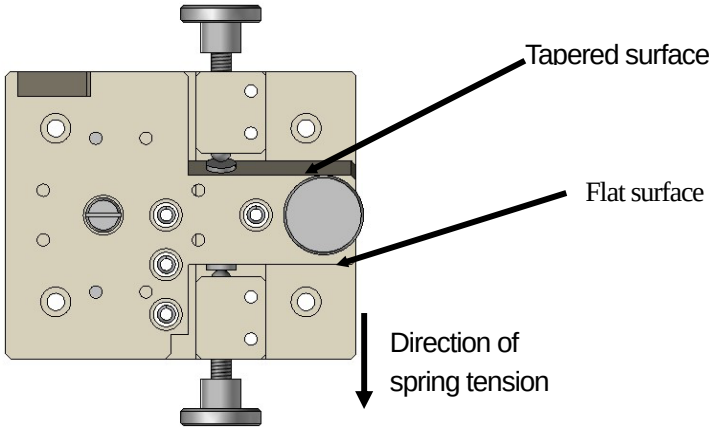
Refer to the following pages about the detailed method of assembling the stand and the tilt stage (if applicable).

### 2.1.1. Assembling method

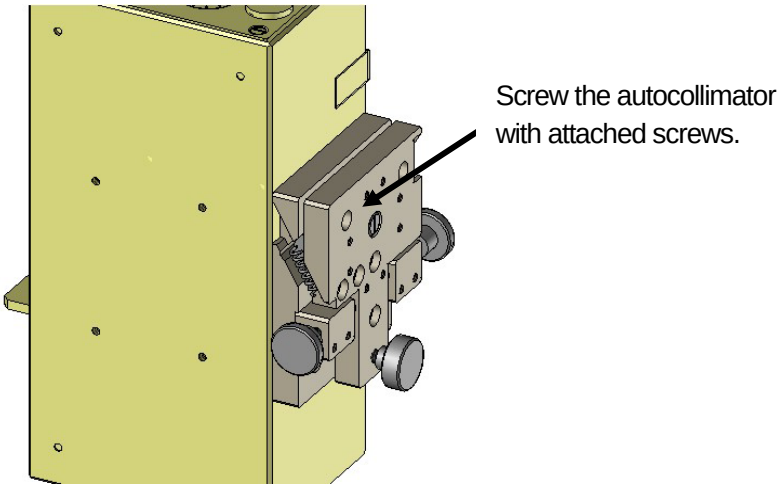
Screw on the tilt stage to stand.



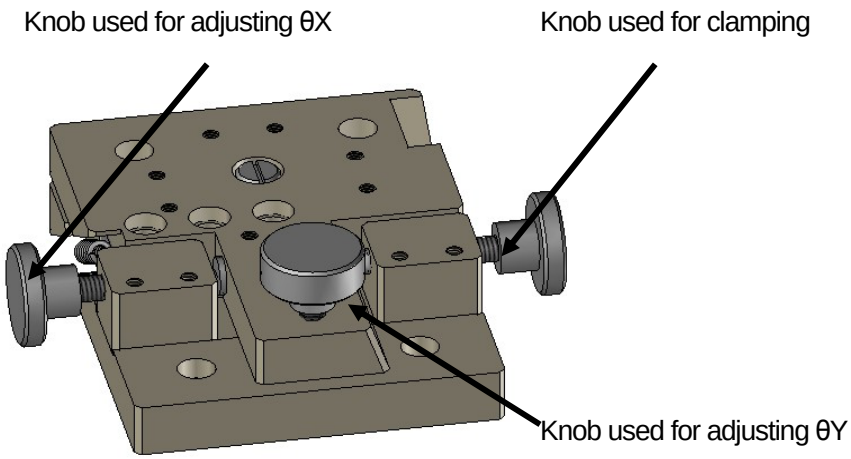

The tilt stage may be installed horizontally. In that case, place it in such a way the flat surface of the opposing knob seats is below the tapered surface as shown (along the direction of spring tension).




Screw the autocollimator with attached screws.

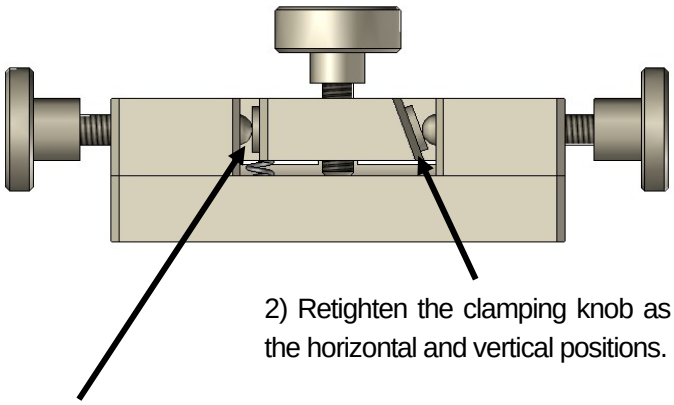



Can be controlled θX, θY with tilt stage. Also control θX with right and left knob, center nob can be controlled θY. Clamp the tilt stage with squeezing the front knob in tapered side.(see next page)




### 2.1.2. Adjusting method

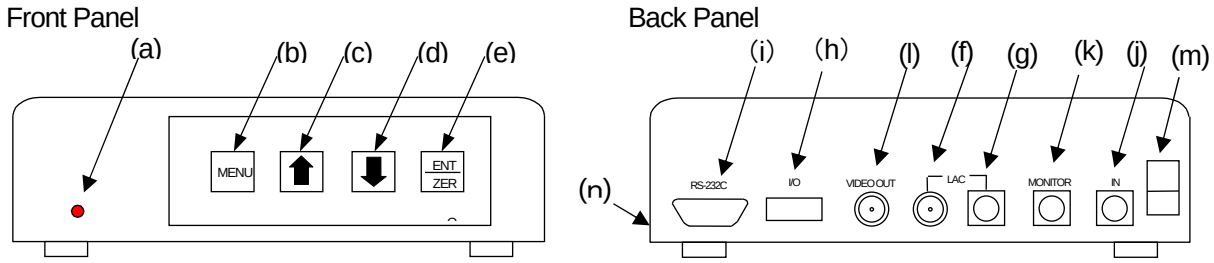
1) Adjust the detected light to the desired position by rotating the right and left knobs (θX) and the middle knob (θY).
2) Retighten the right and left knobs as needed for clamping.
3) Finally, retighten the middle knob (θY) as needed for pressurizing.



2) Retighten the clamping knob as needed to determine the horizontal and vertical positions.

3) After clamping, retighten the middle knob (θY) as needed for pressurizing.

## 2.2. Connections




| No. | Name | Function |
|---|---|---|
| (a) | LED | Light on when power switch is ON. |
| (b) | [MENU] Key | Switch the setting screens |
| (c) | [↑] Key | At Setting screen, press this to select items.<br>**Remote Mode should be cancelled when hold down a key for over 3 seconds.**<br>The title on upper left of monitor must be changed to [HOST] when remote mode. |
| (d) | [↓] Key | At Setting screen, press this to select items.<br>**Key Lock should be cancelled when hold down a key for over 3 seconds.**<br>The title back ground color on upper left of monitor must be changed to blue when key locked**.** |
| (e) | [ENT/ZERO] Key | At Setting Screen press this to fix the setting contents.<br>ZERO SET should be operated when hold down a key for over 3 seconds at the Angle Measurement Screen. *2 |
| (f) | LAC Connector (LAC) | Connecting Laser Autocollimator's cable connector (BNC) |
| (g) | Power supply for LAC (DC-OUT) | Service Power supply for Autocollimator（DC12V） *3 |
| (h) | I/O Connector (I/O) | For wiring input-output signals with external instruments<br>Removable terminal table. |
| (i) | Communication Connector<br>(D-sub 9-pin, male) | Cross cable for connecting to the RS232 port of the PC |
| (j) | DC Jack (DC12V/1A-IN) | Connect the dedicated AC Adapter(AC100V～240V required） |
| (k) | Power Source for LCD Monitor | Power source for LCD monitor (12VDC/0.5A) *1 |
| (l) | Monitor Output Connector | For connecting monitor with BNC cable. |
| (m) | Power Switch | Switch to turn on or off the power（Work with extra power supply） |
| (n) | DIP switch (sided) | Optional setting |

***1 When connect VCM-562W to the power supply for LCD monitor (k), do not use adaptor provided in LCD monitor. (Need DC power supply cable HDC-CABLE1 when connect to power supply for LC monitor)**

***2 ZeroSet**

**Set the current angle value to zero point. Configuration condition must not momorize.**

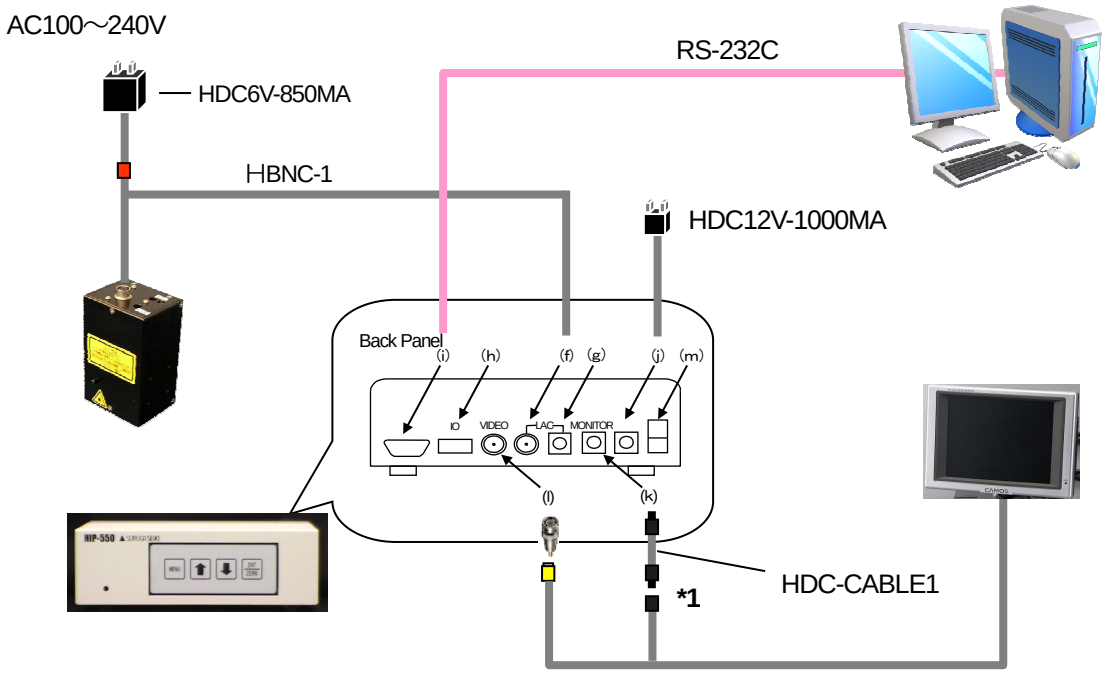
***3 Power supply for Autocollimator**

**H400，450，600 series and H350R-C175 can get power supply from HIP-550.**

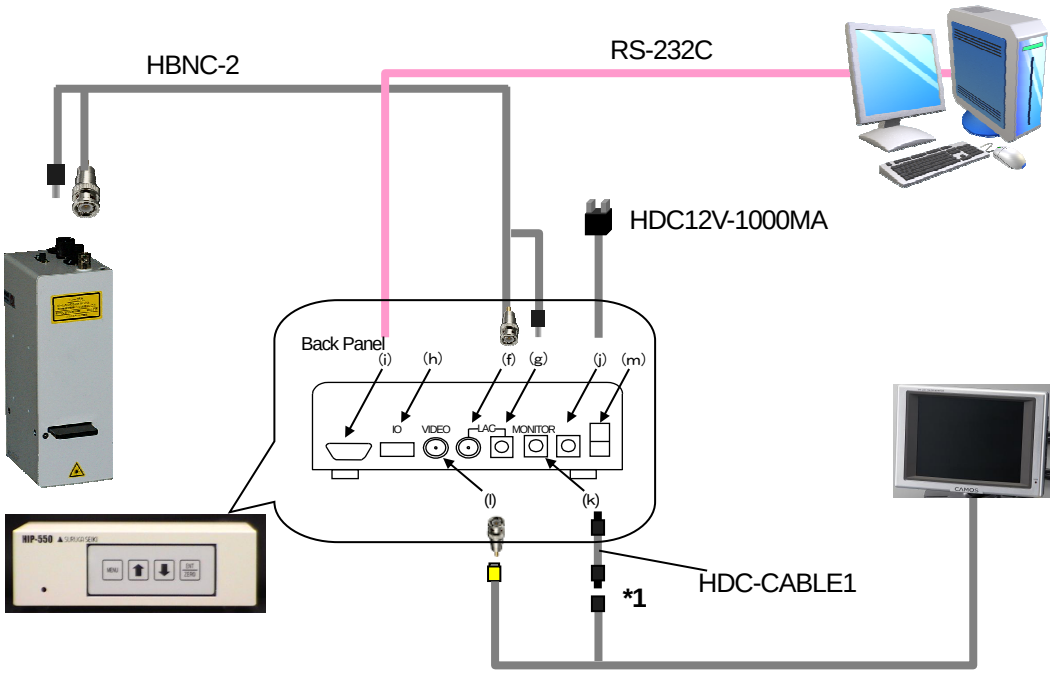
**Use attachment AC adaptor(HDC6V-850MA) for H350*—C050/C100 cause of DC6V driving.**

## System Configuration

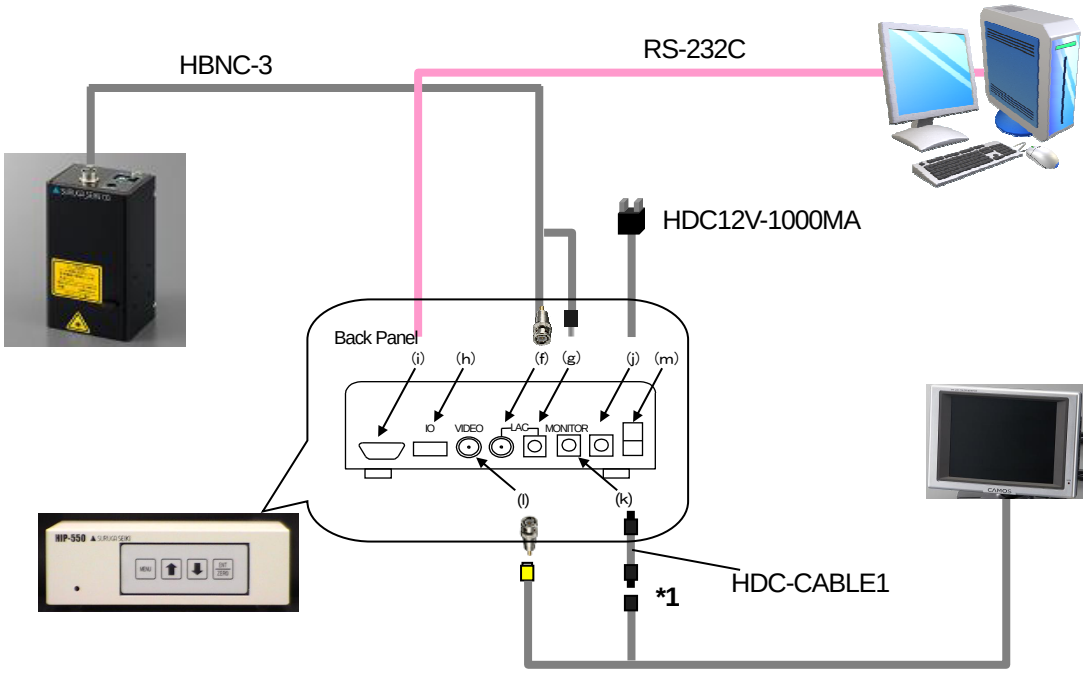
### H350 Series
**（HIP Set 550 / Monitor&HIP Set 550 / Full Set 550）**




### H400 / H450 / H600 Series
**（HIP Set 550 / Monitor&HIP Set 550 / Full Set 550 / High rigidity Set 550）**



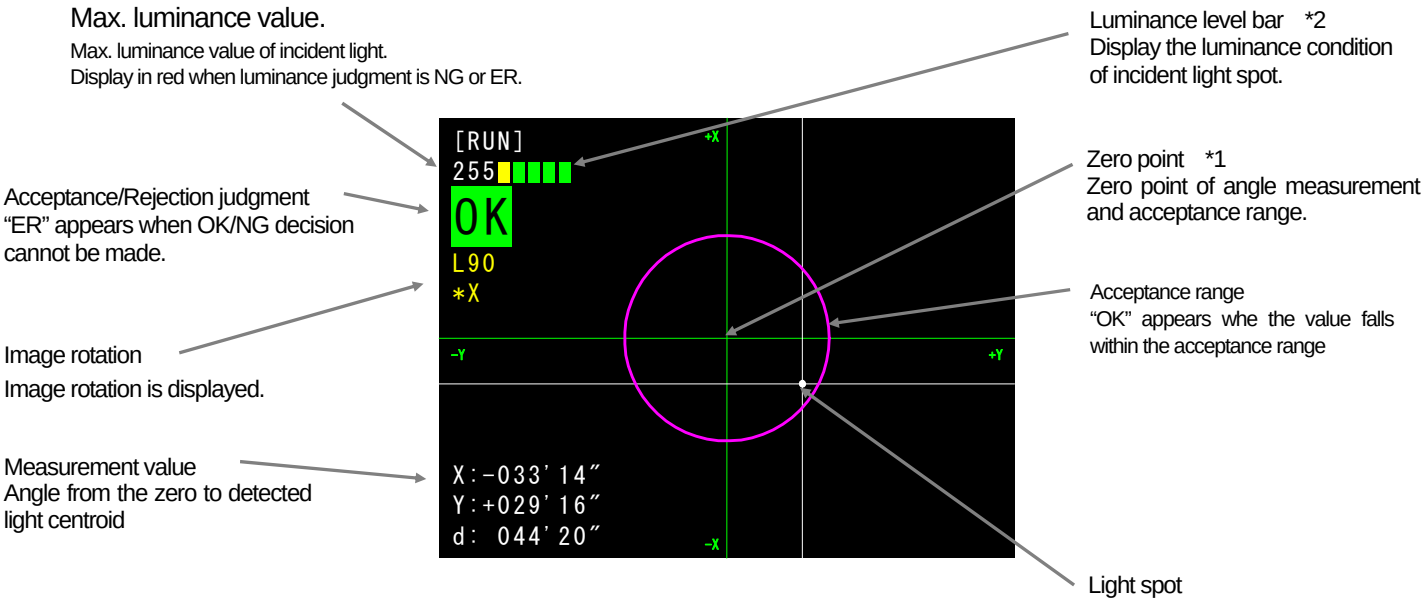
**H350R-C175 Series**
**（HIP Set 550 / Monitor&HIP Set 550 / Full Set 550）**




**<u>*1:DC power supply cable (HDC-CABLE1) is attached set model or single piece of kodel that have CM-562HIP.</u>**

# 3. Measurement screen

**Display firmware version on upper left of screen for 1 sec. after power on.**




***1 Zero point**

Zero point of measurement angle.

Current light spot centroid can be set to zero point with zero set operation of panel key.

(See details 4.1.3.ZERO SET.)

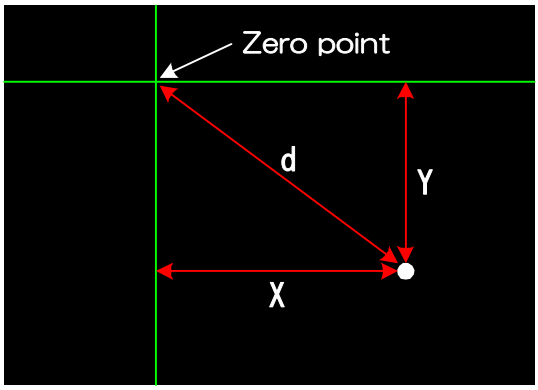
***2 Luminance level**

Display the luminance condition of light spot with level bar. (See next page "Luminance level bar")

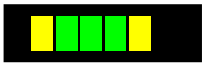
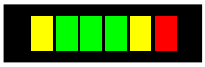
The displayed items vary by the measurement function (center of area and luminance centroid)

***3 Measurement value**

Display the measurement value of target spot



Luminance Level Bar

| No. | Bar Display | Color | Status | Content |
|---|---|---|---|---|
| 1 |  | Black | Under (Error) | Unmeasurable as the minimum luminance level is not reached.<br>• BIN (Center of area)：Binary level<br>• GRAY (Luminance centroid)：NOIZE level<br>See 4.5.MODE for each levels |
| 2 |  | Yellow | Low | Measurable but unstable due to low luminance value. |
| 3 |  | Green | Good | Three green bars represent the best condition for measurement. |
| 4 |  | Green | | |
| 5 |  | Green | | |
| 6 |  | Y/G | High | Measurable but luminance is saturating.<br>Luminance centroid:Yellow, Center of area:Green |
| 7 |  | Red | Over (Error) | Unmeasurable due to saturated pixels<br>Pixels over 255<br>Luminance centroid：3 pixels or more<br>Center of area : 32768 pixels or more |
| |  | 赤 | Over (Error) | Cannot measure smoothly cause of luminance value is out of range. |

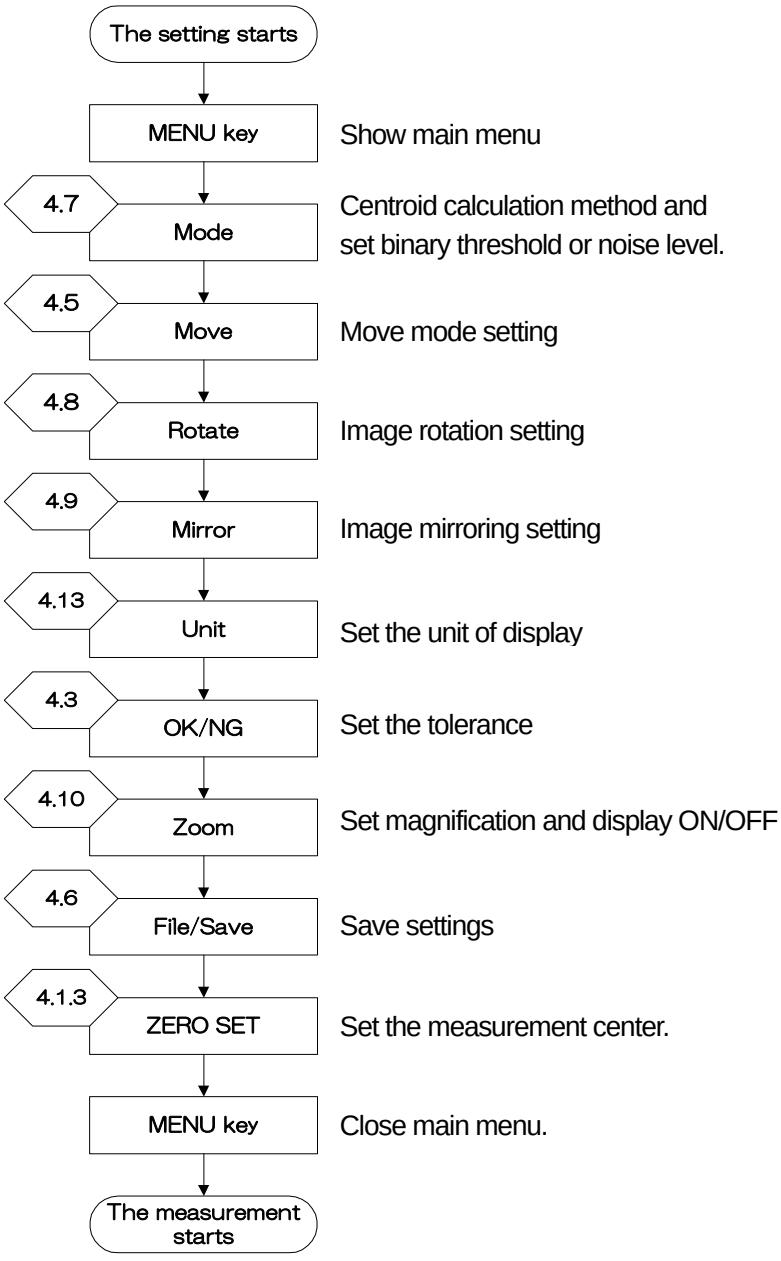
# 4. Measurement condition setting

## 4.1. Angle measurement operation guide

### 4.1.1. New measurement

System setting is required before using the HIP-550 for the first time or whenever resetting of measurement conditions is necessary.

Follow setting steps shown below and see the applicable sections(numbers written to the left) for details.

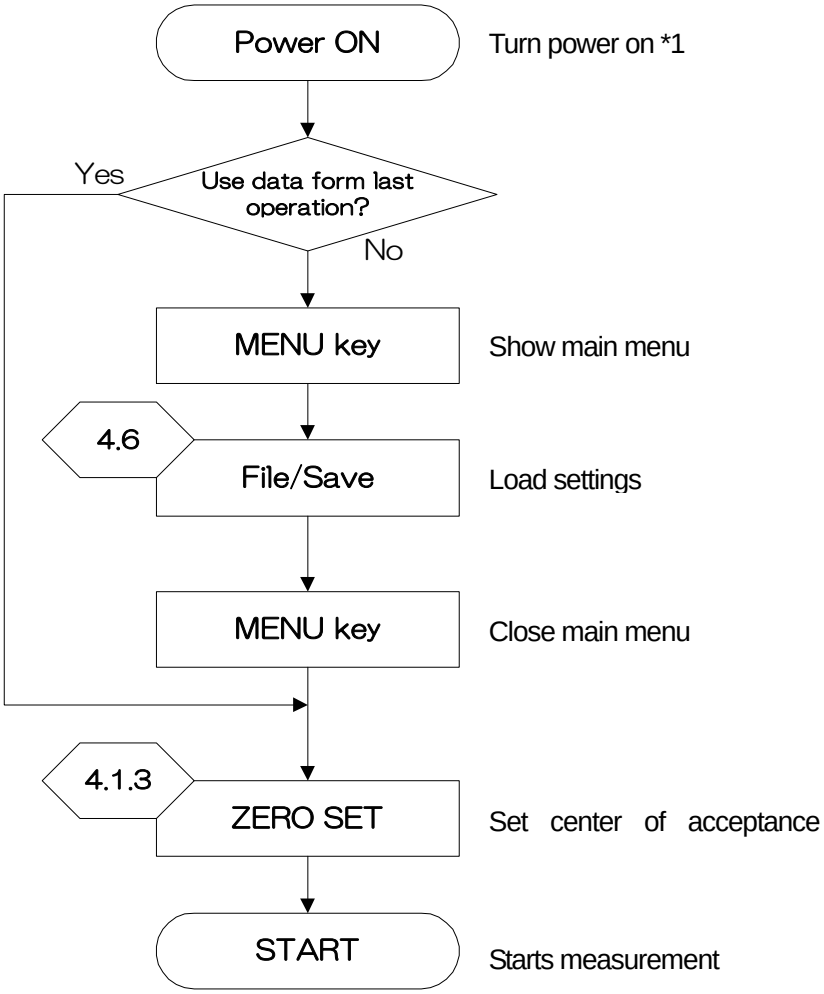



**(Note)**

- **Default settings assuming the use of the Laser Autocollimator are stored in FILE1 before shipment from the factory. Load FILE 1 as needed.**
- **Do not overwrite FILE1. Otherwise, all default settings will be lost.**
- **At power on, the system will start with the last saved or loaded file number and mode of operation.**

### 4.1.2. Measurement Using Saved Setting Data

This section applies to the measurement conditions that are set already.
See the applicable sections(numbers written to the left) for details.
At power on, the system will start with the last saved or loaded file number.




**(Note)**

- **Default settings assuming the use of the Laser Autocollimator are stored in FILE1 before shipment from the factory. Load FILE1 as needed.**
- **Do not overwrite FILE1. Otherwise, all default settings will be lost.**

***1 "Memory Error" will appear when the saved data contain an error at power on. And then, push the [ENT]key and forcibly initialize. After calibration is required after memory initialization. See "6.1.ANGLE CALIBRATION" for details about angle calibration.**

### 4.1.3. ZERO SET

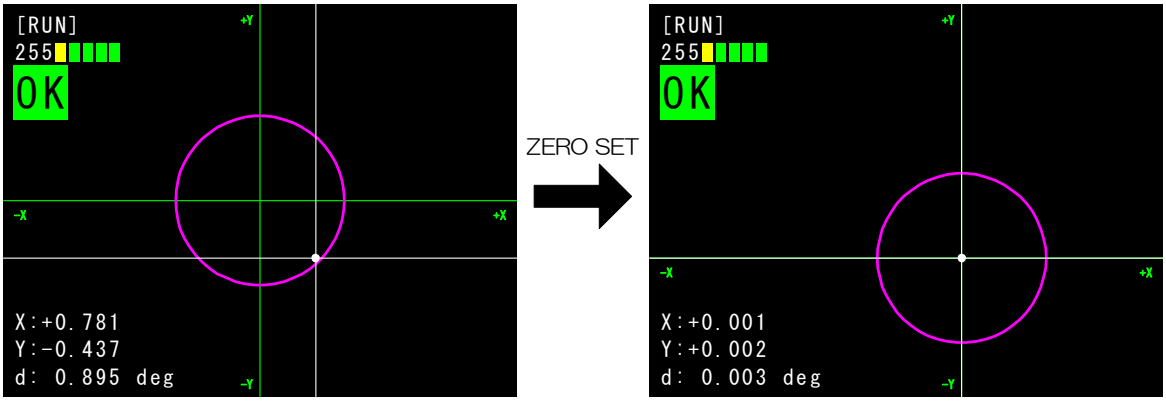
Set the reference (Zero point) at the measurement processing.
Angle is calculated to be reference.

**Setting the zero point**

The center is to be a zero point.
Zero point can be shifted as needed within the range of measurement.

1)After angle calibration is completed, display a detected light that is to be a zero spot.
Recommend checking reflected value, threshold and focus.
2)Push [ZERO] key over 3 sec.
3)Centroid light spot is to be a zero point.

**＊Zero point must not save. When the power off, it will be same position as measurement range point.**




• **Definition of centers**

**A.Optical center**

The optical center is the unique center of an optical system of the Laser Autocollimator. It is adjusted to the center of the CCD built into the Laser Autocollimator head.
The intersection of the green line is the optical center.

**B.Center of measurement range**

The center of measurement range is the zero point referenced in angle calibration.
Set with Opt Center of calibration sequence. Prefer to set as same as A, optical center.

**C.Zero Point**

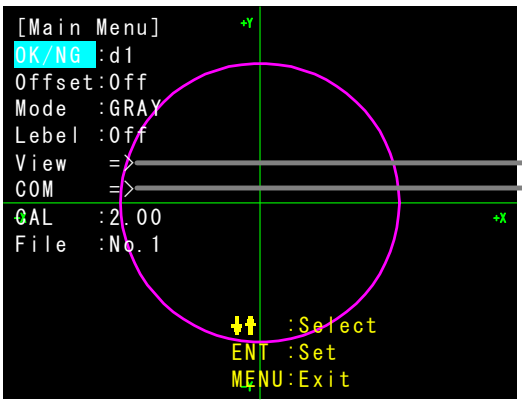
Should be zero point of measurement value. (Must be same spot zero point and center of acceptance when the single multi mode. Display blue cross-point)
Can be shifted zero point with ZERO SET.

**D.Center of tolerance**

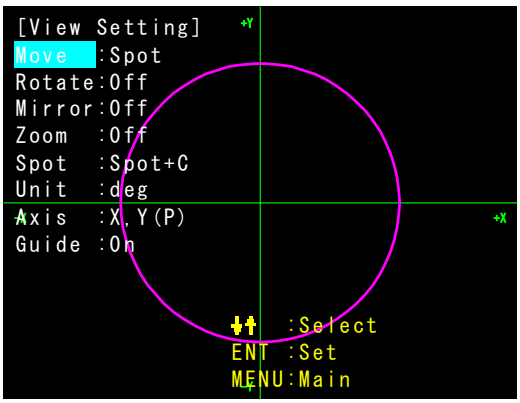
Display blue cross-point on enlarged display.
Can be offset the center of tolerance (center of pink circle) from zero point at the only offset mode.

## 4.2. Setting screen and setting items

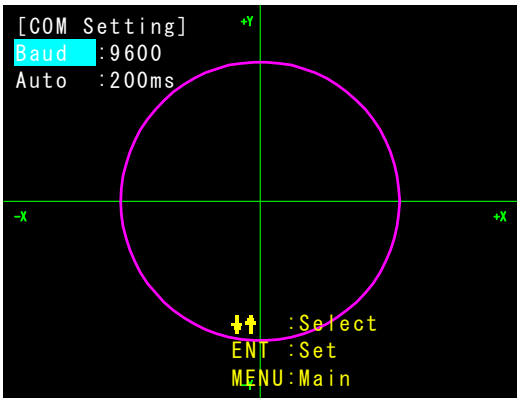
Various settings can be made with main menu, display setting menu, and communication menu.




Main menu




Display setting menu




Communication setting menu

### Setting items

Main menu

| Name | Description | Setting value | Referential page |
|---|---|---|---|
| OK/NG | Sets judgment type (d or XY) and judgment value | d1/d2/XY | 4.3 |
| OffSet | Offsets the center of judgment for X and Y input values | On/Off | 4.4 |
| Mode | Sets the method for calculating gravity center of light spot and detection threshold value | BIN/GRAY (35 to 254) | 4.5 |
| Level | Sets On/Off, upper and lower limits of brightness level judgment | High/Low (35 to 254) | 4.6 |
| View | Opens the display setting menu | — | — |
| COM | Opens the communication setting menu | — | — |
| CAL | Calibrates the angle | LAC range | 4.7 |
| File | Reads out / saves the setting data | 1 to 5 | 4.8 |

Display setting menu

| Name | Description | Setting value | Referential page |
|---|---|---|---|
| Move | Sets the movement mode | Spot/Axis | 4.9 |
| Rotate | Sets the rotation display | No rotation /:<br>rotation by 90° in anticlockwise direction /<br>rotation by 90° in clockwise direction | 4.10 |
| Mirror | Sets the mirror display | No reverse /<br>only X direction is reversed /<br>only Y direction is reversed /<br>X and Y directions are reversed | 4.11 |
| Zoom | Sets the zoom display | Off / 4× / 8× / 16× | 4.12 |
| Spot | Sets the method for displaying the light spot | Light spot and cross /<br>light spot or cross mark /<br>light spot or cross /<br>cross mark /<br>cross | 4.13 |
| Unit | Selects the display unit of angle | deg/sec/mrad | 4.14 |
| Axis | Selects the coordinate display | X, Y (axis is not displayed) /<br>X, Y (axis is displayed) /<br>Rad, Tan (axis is not displayed) /<br>Rad, Tan (axis is displayed) | 4.15 |
| Guide | Sets the menu guide display On/Off | Off/On | 4.16 |

Communication setting menu

| Name | Description | Setting value | Referential page |
|---|---|---|---|
| Baud | Selects the baud rate | 9600bps/<br>19200bps/<br>38400bps | 4.17 |
| Auto | Selects the measurement value automatic output interval | 33msec/200msec | 4.18 |

## 4.3. OK/NG

Set the type and value of acceptance

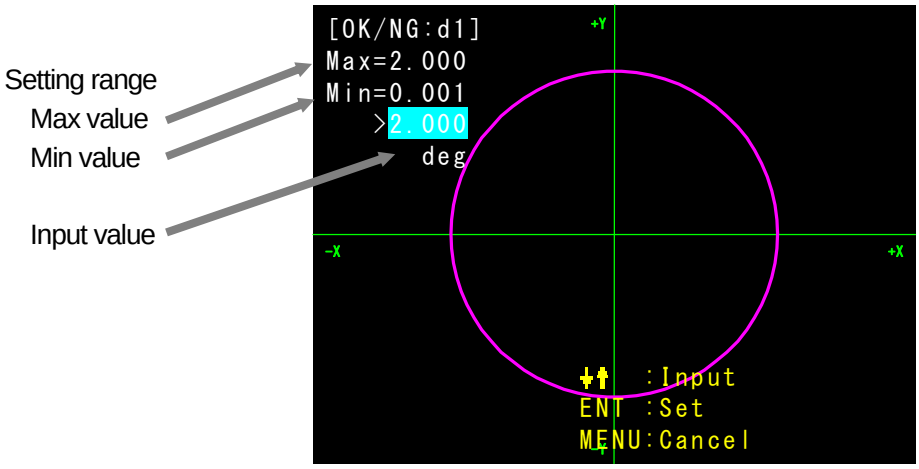
1)d1 ：d Setting to measurement value of acceptance value 1
Set the angle from center of tolerance

2)d2 ：d Setting to measurement value of acceptance value 2
Set the angle from center of tolerance

3)X-Y ：Set ting to X,Y measurement value of acceptance value
Set the X,Y angle from center of tolerance

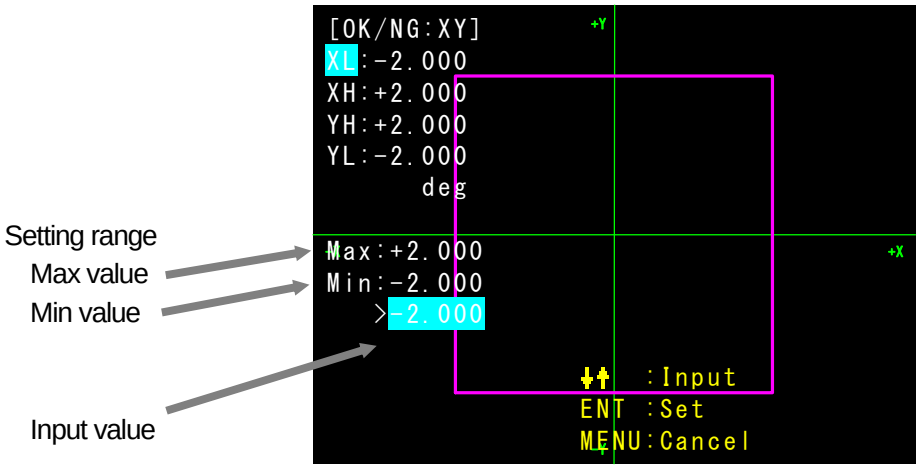
* See 3. about measurement value X,Y

d1／d2 setting




XY Setting

Set the acceptance angle selecting each acceptance range [XL], [XH],[YH],and [YL]

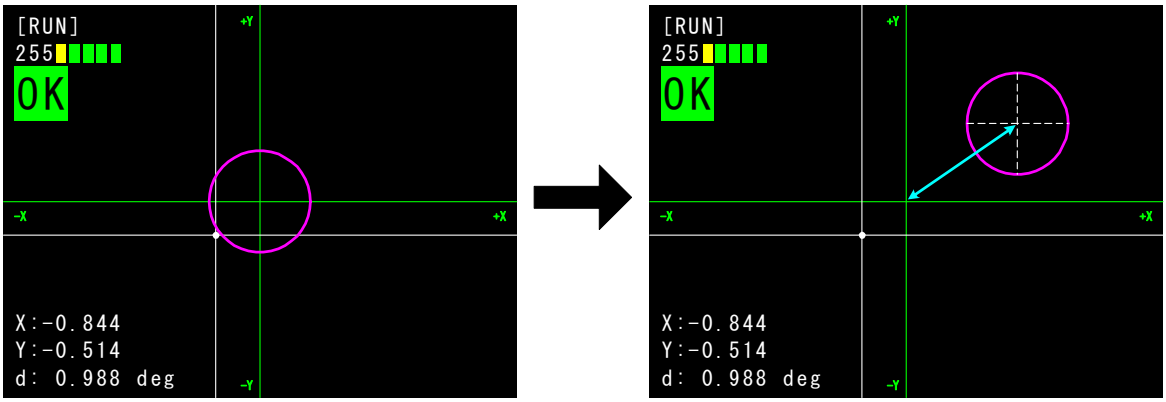


## 4.4. Offset

Offset the center of tolerance from center of measurement for X,Y input value.

1）Select “Offset” and press [ENT] key
2）Select [On]
a)X ：Setting X is center of tolerance offset angle that is changed to number
b)Y ：Setting Y is center of tolerance offset angle that is changed to number

Offset processing sample
Offset X,Y center of tolerance from center of measurement(blue cross-point)




Offset ［Off］
(center of tolerance=center of measurement)

Offset ［On］

Offset value

## 4.5. Mode

Set the method of the detection of the point

1)BIN（Center of area）

The angle is determined by calculating the center of area based on the valid pixels having luminance higher than the threshold

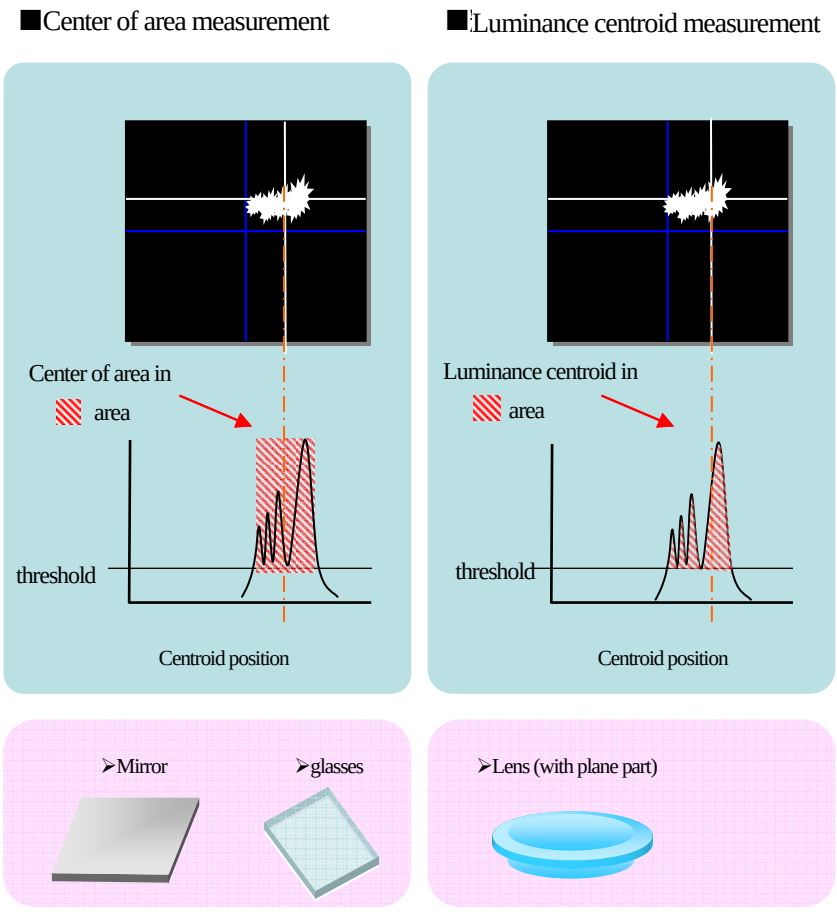
2)GRAY（Luminance centroid）

The angle is determined by calculating the weighted luminance centroid based on the valid pixels having luminance higher than the defined noise level.

Recommended mode by the purpose (*Objects characterized by scattering light cannot be measured.)

Center of area（BIN） → Mirror, beam splitters, etc.
(Objects of measurement characterized by direct reflection)

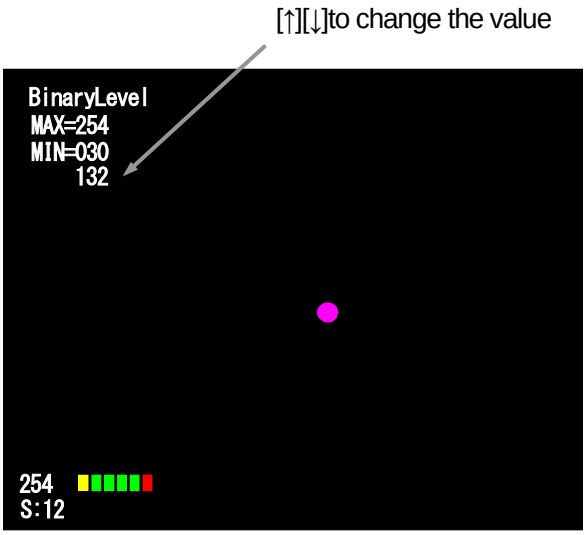
Luminance Centroid(GRAY) → Objective lenses, edge , etc.
(Objects of measurement characterized by strained reflection)



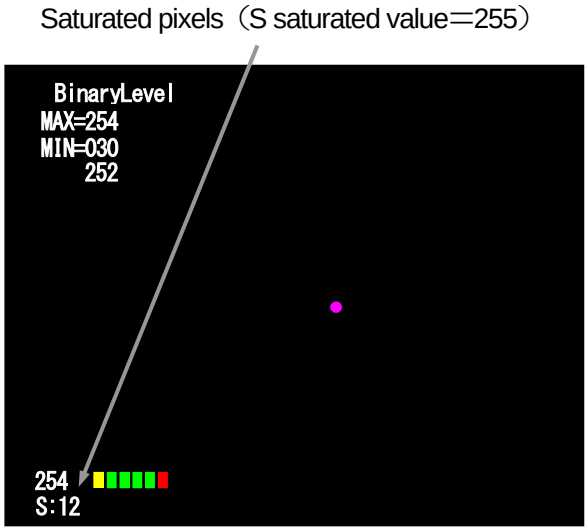
### 4.5.1. BIN(Center of area)

1）Select “MODE” on the setting screen and press [ENT] key
2）Select “BIN” and press [ENT] key
Detected part is displayed in red.
3）Adjust levels of binary threshold with [↑][↓] key. When the adjustment is done, press [ENT] key.
When the cancellation, press [MENU/RUN] key.

• about binarization
Binarization refers to setting the threshold using a gradation level between 30 and 254. Pixels over the threshold are considered valid. An error is returned when the number of valid pixels exceeds 32767.



Before



After

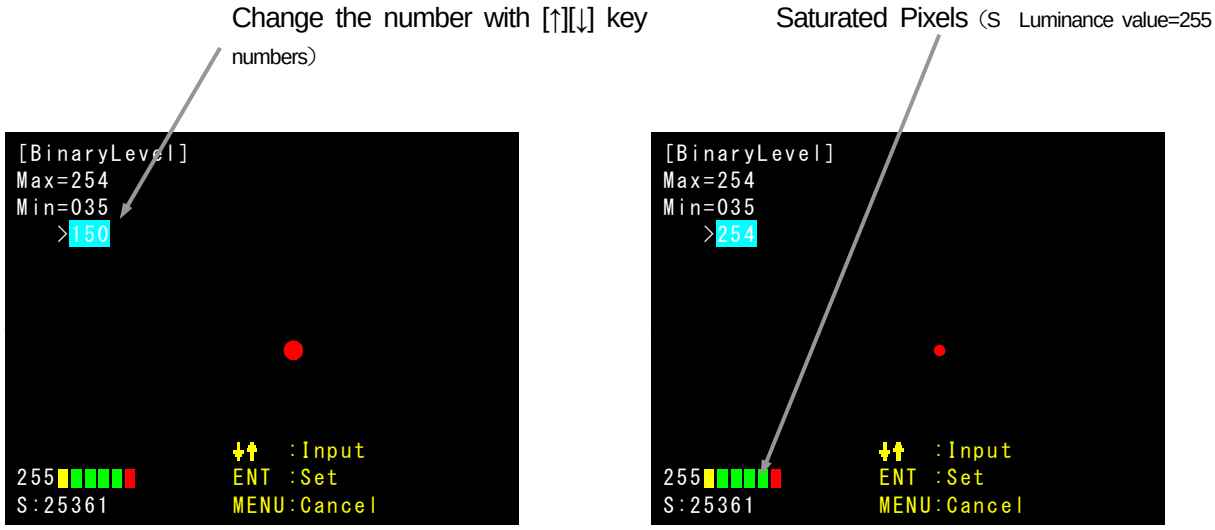
• Important notes about setting
When more than one detected light is in view for threshold setting the light dots must be adjusted as shown below so that there is only one dot.
1）Low-light
- Higher the LD volume of the Laser Autocollimator.
- Decrease the shutter speed of the Laser Autocollimator
- Decrease the binary threshold.

2）High-Light
- Lower the LD volume of the Laser Autocollimator.
- Focus the beam diameter of the Laser Autocollimator with the pinhole plate so that light lands on the desired measurement point.
- Increase the shutter speed of the Laser Autocollimator.
- Increase the binary threshold.

### 4.5.2. GRAY（Luminance centroid）

1）Select “MODE” on the Setting screen, and press [ENT] key.
2）Select “GRAY”, and press [ENT] key.
Detection range is displayed in red
3）Adjust noise level with [↑][↓] key.
Press [ENT] when adjustment is done. If cancellation, press [MENU] key.

• About noise level
A noise level refers to the threshold defined with a gradation level between 30 and 254. Pixels under the defined noise level are excluded from measurement or calculation.




Before　　After

• Important notes about setting
Adjust the laser output (volume) and shutter speed of the Laser Autocollimator so that only the measurable detected light is measured.
An error is returned (unmeasurable) when the number of saturated pixels (luminance level 255) is 2 or more but the measured value is displayed. (For best results, work with settings that lead to green bars.)

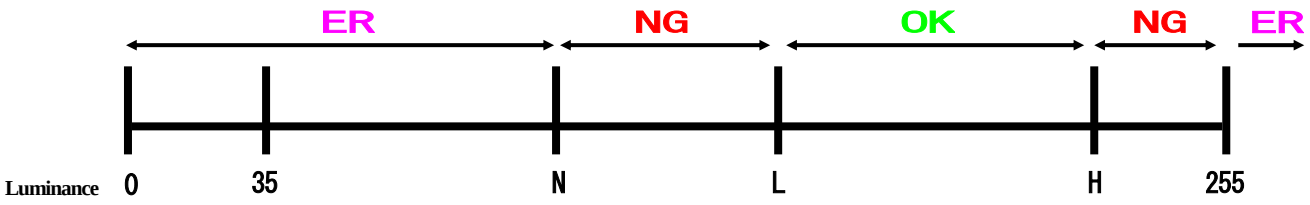
## 4.6. Level（Max. luminance value judgment）

1）Select “Level” on the setting screen and press [ENT] key.
2）Select on or off with Off/On.
3）Choose On
a）High：Set Max of the detected luminance level.
(Must be NG over this level or under 255)
b）Low：Set Min. of the detected luminance level.
(Must be NG less than this level or over threshold)

Discribe each setting value in relation to judgment.

*The following relation applies to N,L, and H when luminance level checks performed:
Luminance value 35≦N ＜ L ＜ H ≦254
If N is greater than L,N is changed to a value smaller than 1.
The following applies to N when luminance level check is not performed:
Luminance value 35 ≦N ≦254

Must be “ER” error if luminance level is smaller than N or over 255.




Threshold : N, Lower limit: L, Upper limit: H

## 4.7. CAL(Calibration)

Angle calibration operation

A new measurement range must be set when using a new Laser Autocollimator.
See page 6 for more details about angle calibration.
Can not be in external incidence measurement mode.

## 4.8. File

**1) Save**

Saving setting data

1) 1～5 ：Angle measurement conditions and system data are saved under the selected number.

**2) Load**

Reading out setting data

1)1～5 ：Load data from the selected number.

An error is returned when no data have been saved under the selected number.

- **Default settings assuming the use of the Laser Autocollimator are stored in FILE1 before shipment from the factory.**
- **Load FILE1 when you wish to return to default settings.**

***Each file contains angle calibration data in addition to the conditions of measurement. Measurement conditions can be saved for up to five autocollimators having different ranges of measurement.**

**(Note)**

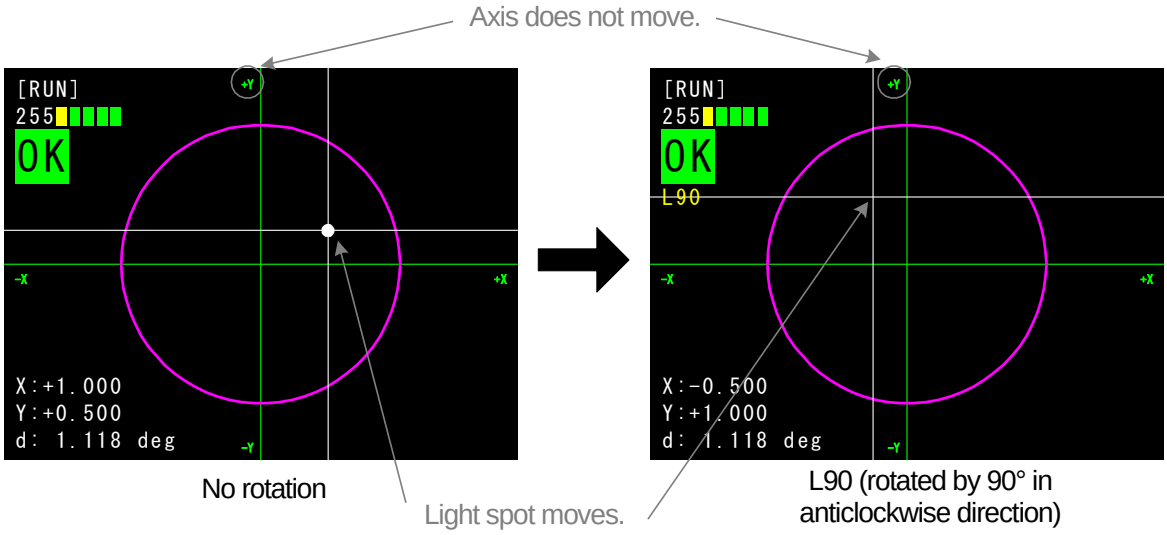
- **Default settings assuming the use of the Laser Autocollimator are stored in FILE1 before shipment from the factory.**

## 4.9. Move

Select whether the light spot moves or the axis moves for rotation display and mirror display.

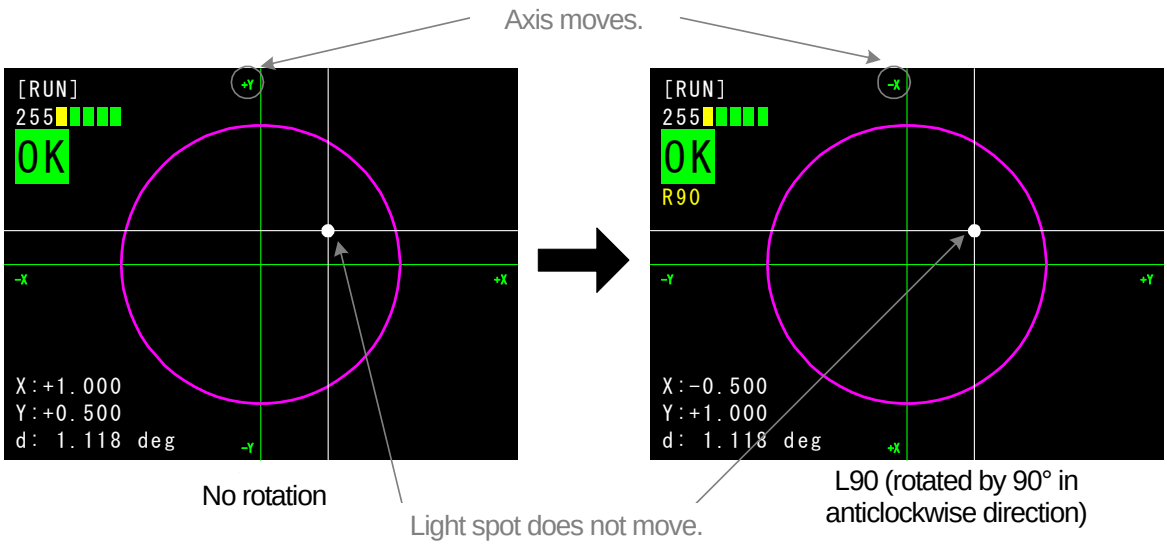
**- When Spot is selected**

The light spot moves for the setting of rotation and reverse.




**- When Axis is selected**

The axis moves for the setting of rotation and reverse.



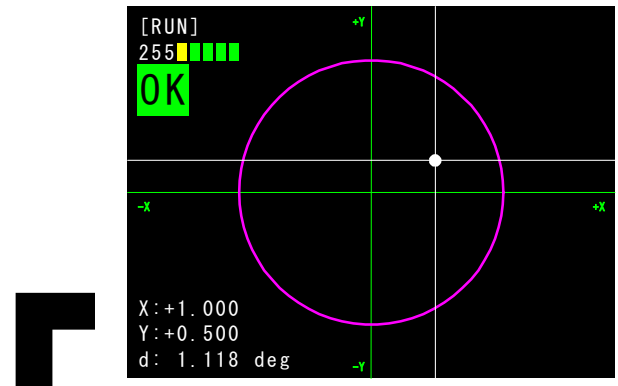
## 4.10. Rotate (Rotation)

The movement directions are matched if the tilted axis direction of object to be measured does not correspond to the movement direction of light spot on the monitor using the setting screen of autocollimator main unit.

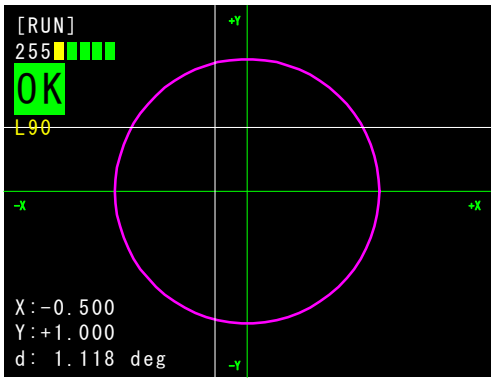
1) OFF: no rotation (normal)
2) L90: rotated by 90° in anticlockwise direction
3) R90: rotated by 90° in clockwise direction

**- When Spot is selected for Mode**

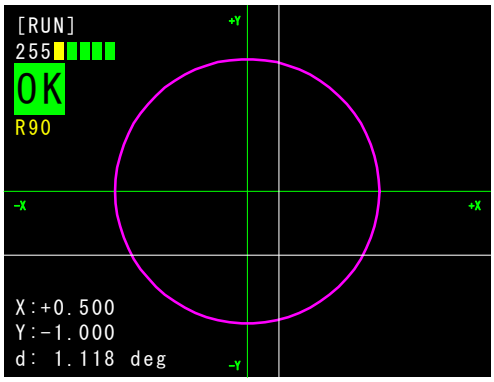
The light spot (video) is rotated in a pseudo manner.
When the rotation is set, the live video of light sport is not displayed on the measurement screen.
(For the substitute display of light spot, follow the display setting shown in "4.13. Spot".)




1) No rotation



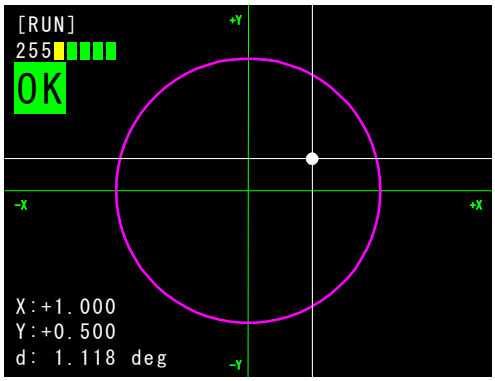

2) L90 (rotated by 90° in anticlockwise direction)



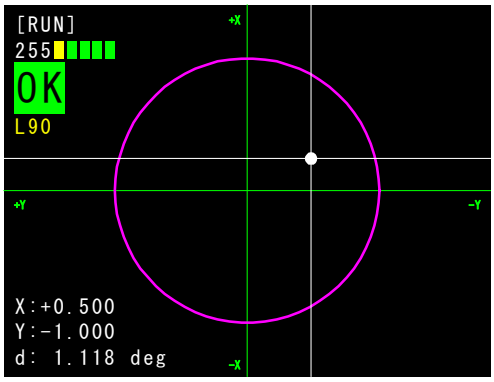

2) R90 (rotated by 90° in clockwise direction)

**- When Axis is selected for Mode**

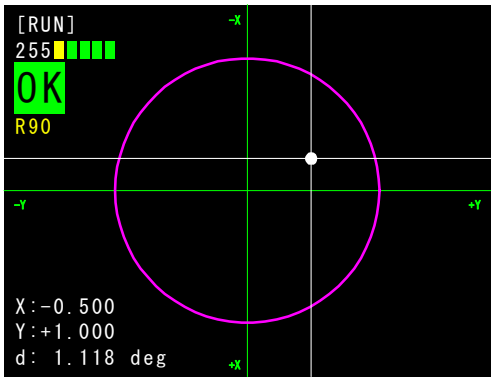
The axis is rotated. The light spot does not move.




1) No rotation




2) L90 (rotated by 90° in anticlockwise direction)




2) R90 (rotated by 90° in clockwise direction)

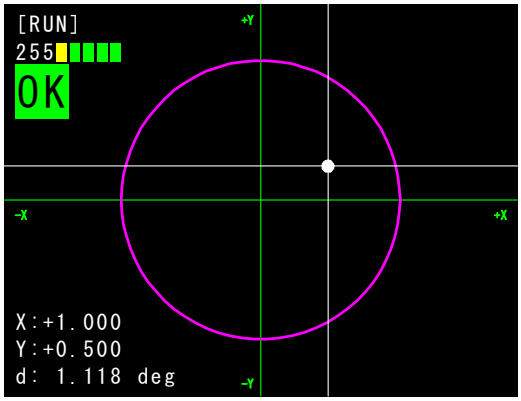
## 4.11. Mirror (Mirroring)

When an object to be measured is declined, the video is reversed and the movement is matched if the light spot moves to the opposite direction of declined direction.

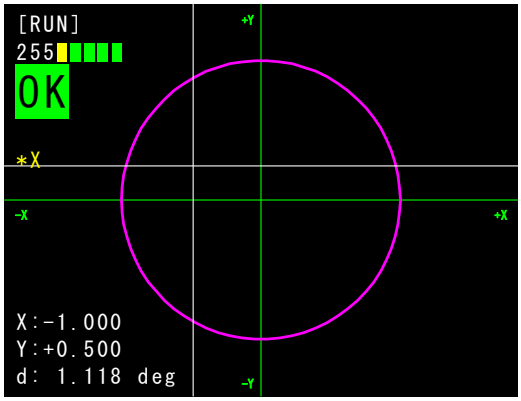
1) OFF : not reversed
2) *X : the video is reversed to X direction only
3) *Y : the video is reversed to Y direction only
4) *X*Y : the video is rotated to both of X and Y directions

**- When Sport is selected for Mode**

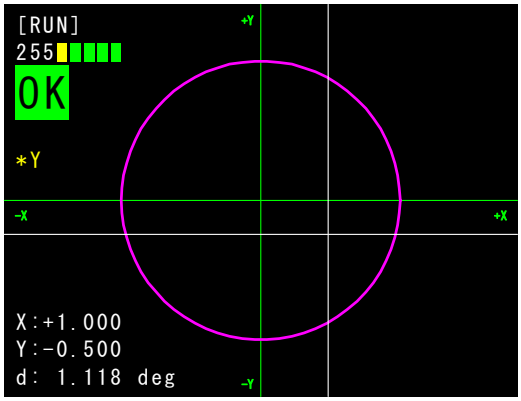
The light spot (video) is reversed in a pseudo manner.
When the mirroring is set, the live video of light spot is not displayed on the measurement screen.
(For the substitute display of light spot, follow the display setting shown in "4.13. Spot".)



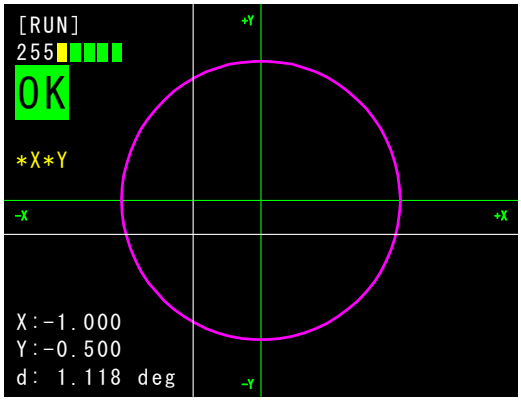

1) No reverse




2) *X (only X direction is reversed)



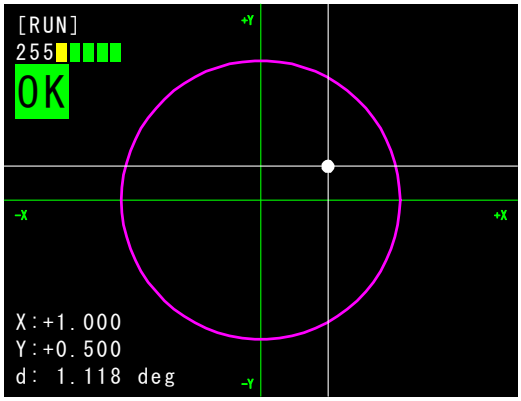

3) *Y (only Y direction is reversed)



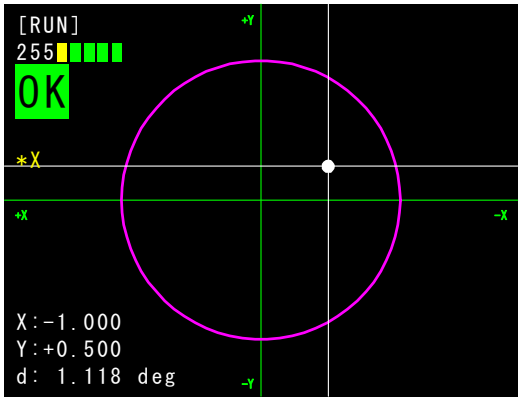

4) *X*Y (both of X and Y directions are reversed)

**- When Axis is selected for Mode**

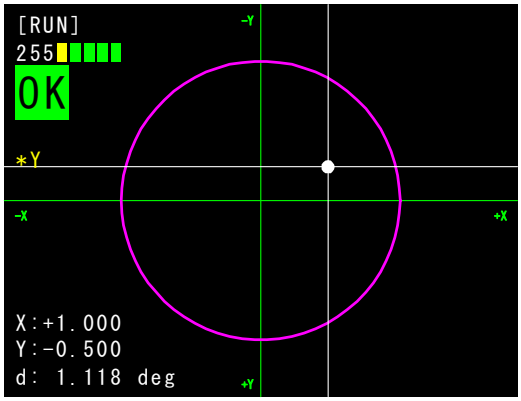
The axis is reversed. The light spot does not move.



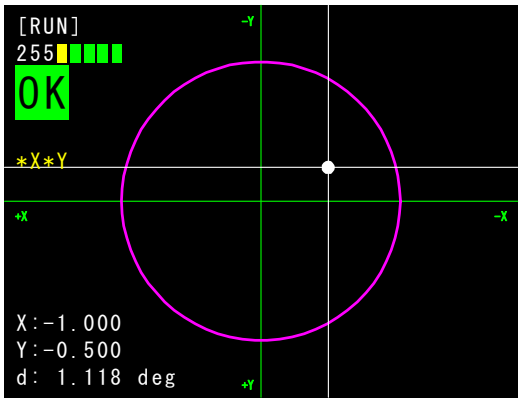

1) No reverse




2) *X (only X direction is reversed)

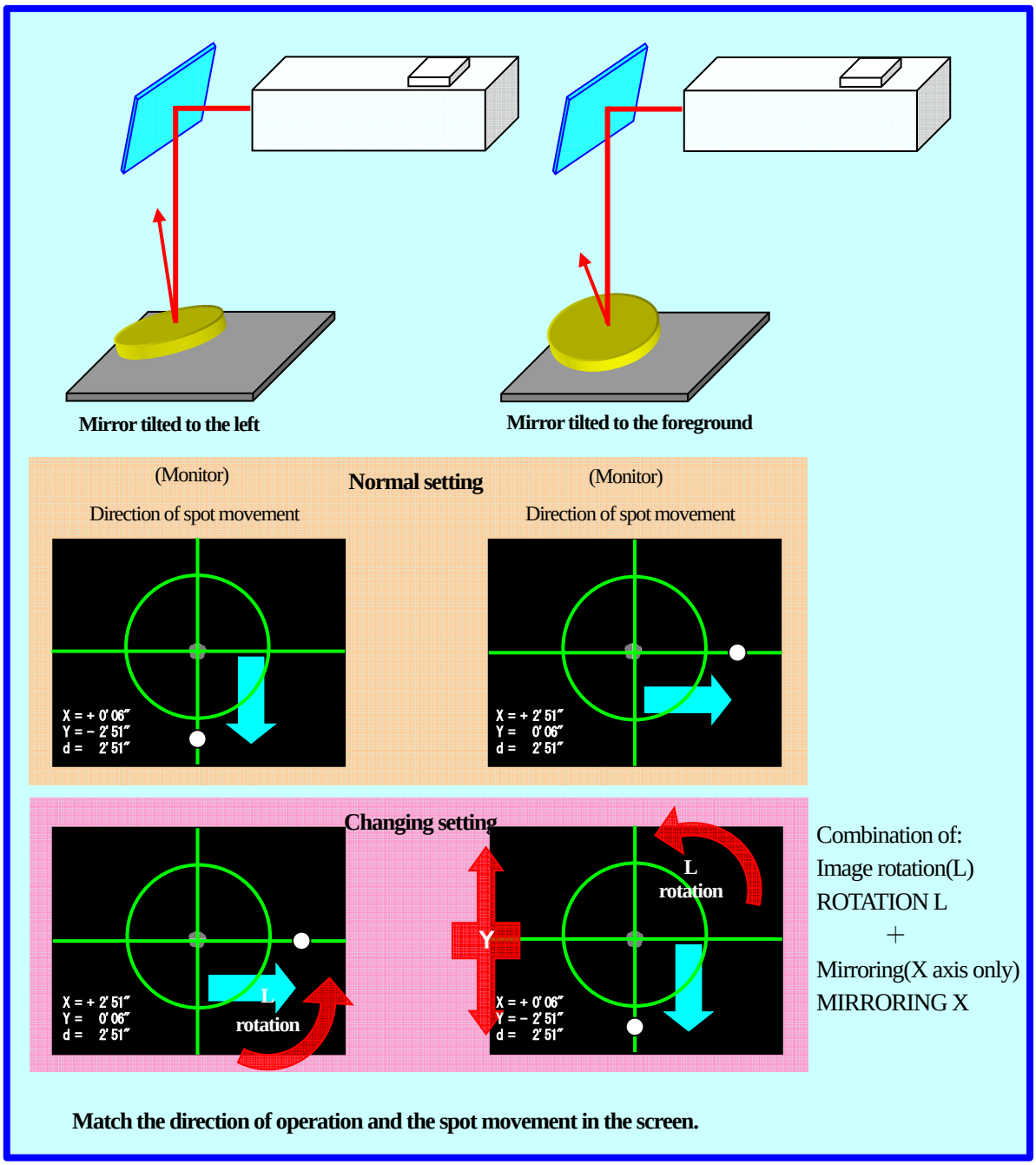



3) *Y (only Y direction is reversed)




4) *X*Y (both of X and Y directions are reversed)

Example of processing



## 4.12. Zoom

In usage driving into the center of acceptance, it is hard to recognize around the center of acceptance as display of the acceptance range on the screen may be very small depending on an acceptance value. In this case , light spot is in the enlarged area when turning on the zoom setting and center of acceptance is enlarged automatically as the center and displays it.

1)Off ： Zoom display is not performed.
2)x4 ： x4 zoom display.
3)x8 ： x8 zoom display.
4)x16 ： x16 zoom display.

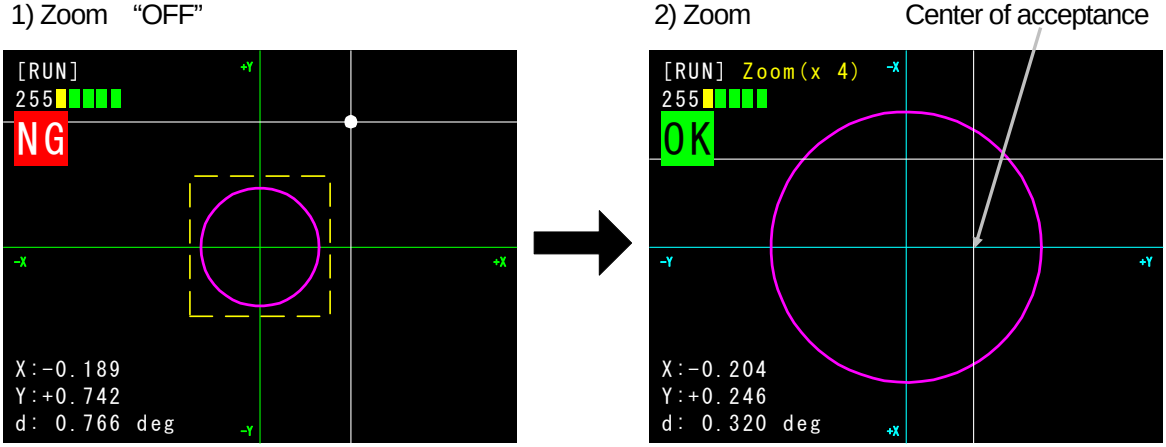
*The zoom display is displayed by a yellow rectangle according to the zoom specification,

• When OK/NG setting is “d*”

1) Zoom “OFF”

2) Zoom

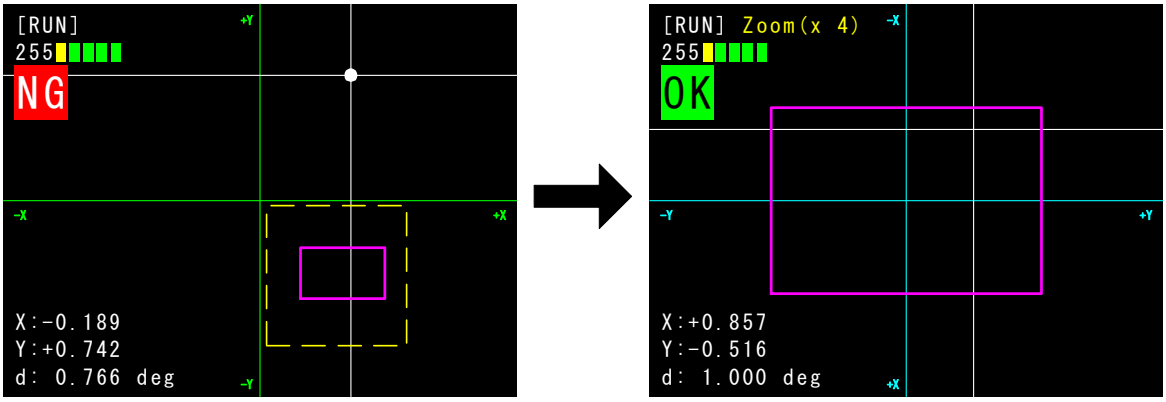
Center of acceptance




• When OK/NG setting is “XY”

1) Zoom “OFF”

2) Zoom




**• The enlarged area is not displayed on a screen at the measurement screen.**
**• ”ZOOM” appears in the monitor and the detected light disappears while the enlarged view is displayed(only the crossline is visible)**
**• An acceptance range falling outside of the enlarged view area will not be displayed.**
**• Display center of acceptance on light blue during the zoom.**
**• When “AREA” is set to “XY” the view will be enlarged about the center of the rectangle.**

## 4.13. Spot

Select the display type of light spot.

1) Spot+C : Light spot and cross are displayed.
If the light spot cannot be displayed, only cross is displayed.

2) Spot-M : Light spot is displayed.
If the light spot cannot be displayed, only cross mark is displayed.

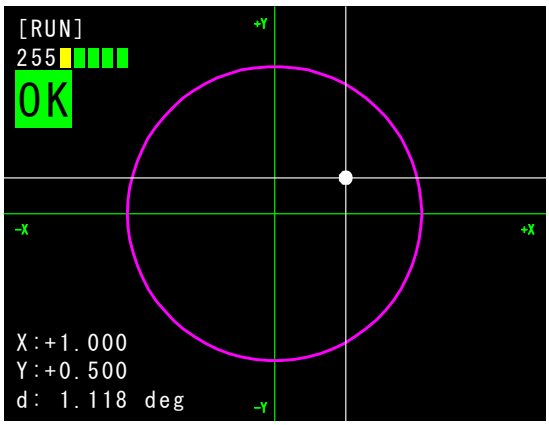
3) Spot-C : Light spot is displayed.
If the light spot cannot be displayed, only cross is displayed.

4) Mark : Cross mark is always displayed.

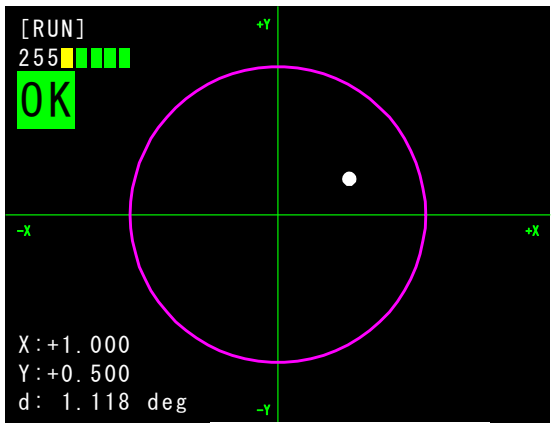
5) Cross : Cross is always displayed.

* If rotation / mirroring is not set to Off at zooming and when the movement mode is not set to the light spot movement mode, the light spot cannot be displayed.

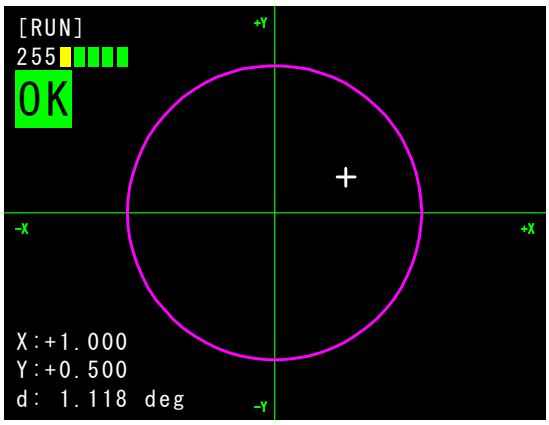
Types of light spot display



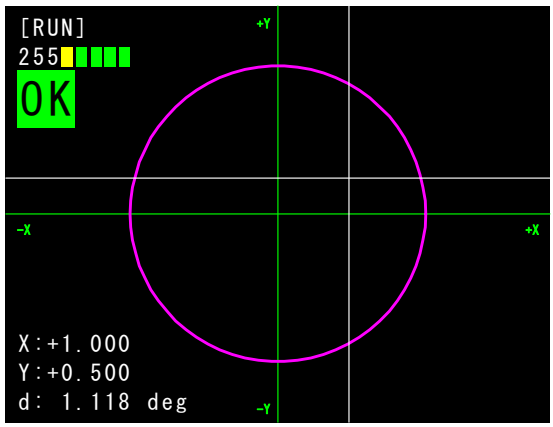

Light spot and cross




Light spot




Cross mark




Cross

## 4.14. Unit

Set the display unit of measurement angle.

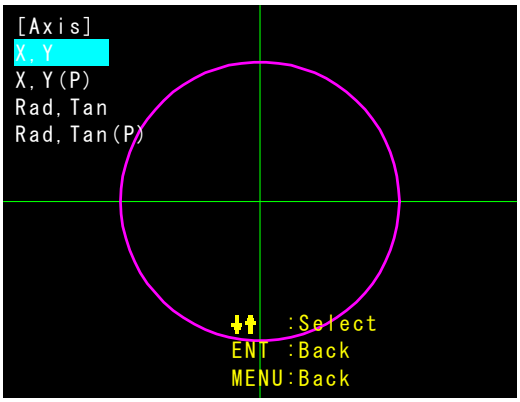
1) deg : degree
2) sec : second
3) mrad : milli radian

* The output unit of measurement data by serial communication is [deg] regardless of setting.

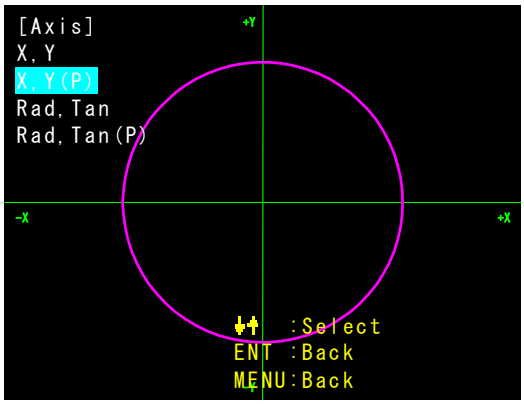
## 4.15. Axis

Set the display unit of axis.

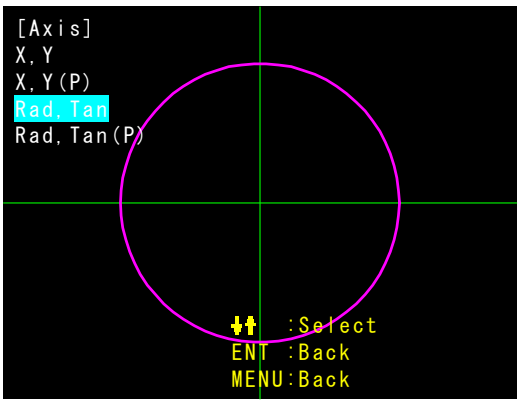
| | | | |
|---|---|---|---|
| 1) X,Y | : | X,Y | (axis is not displayed) |
| 2) X,Y(P) | : | X,Y | (axis is displayed) |
| 3) Rad,Tan | : | Rad,Tan | (axis is not displayed) |
| 4) Rad,Tan(P) | : | Rad,Tan | (axis is displayed) |



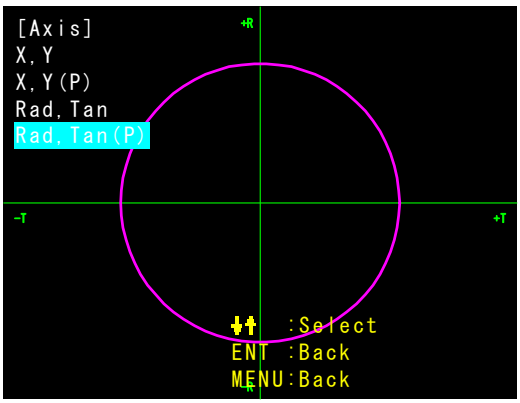

1) X, Y (axis is not displayed)




2) X, Y (axis is displayed)




3) Rad, Tan (axis is not displayed)




4) Rad, Tan (axis is displayed)

## 4.16. Guide

Switch display / nondisplay of guide message of menu.

1) Off : a message is not displayed at the center of the menu
2) On : a message is displayed at the center of the menu

## 4.17. Baud

Set the baud rate of RS-232C.

1) 9600 : 9600bps
2) 19200 : 19200bps
3) 38400 : 38400bps

## 4.18. Auto

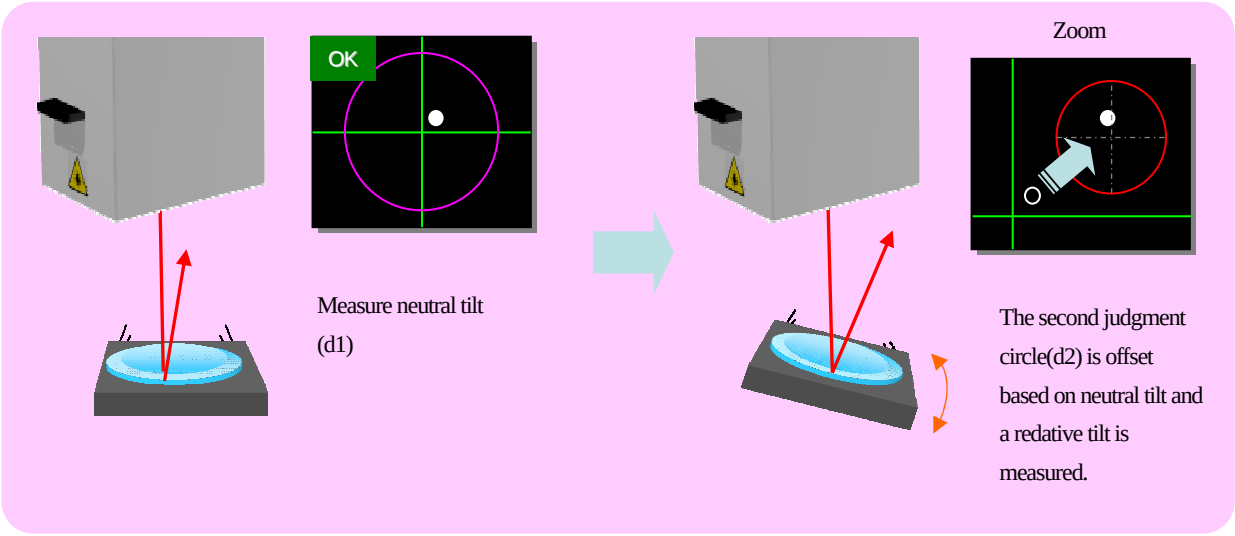
Set the judgment result in measurement value continuous sending mode and sending cycle of measurement value.

1) 33msec : 33msec (vertical synchronization signal of video) cycle
2) 200msec : 200msec cycle

## 5. OFFSETTILT Measurement

This means relative tilt is measured mainly on tilt in the neutrality after measuring neutral tilt.

Case of I/O in_1 input is OFF, measure neutral tilt from center of measurement(No.1 judgment:d1).
Case of I/O in_1 input is ON, measure relative angle be position center of measurement the light spot
(No.2 judgment:d1,d2,XY). Should select d1, d2 from XY in OK/Ng of menu.
(As for the 1st. judgment, d1 is fixed.)

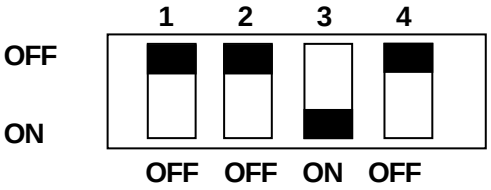



Can be saved results of judgment (NG or ER) at the relative measurement with DIP switch.
(See page 33 for setting)

## Change to Tilt measurement

Turn on only the third pin of the DIP switch of the processing side in a state of power supply OFF.
Tilt measurement mode can be work after re-switch.

1) DIP switch



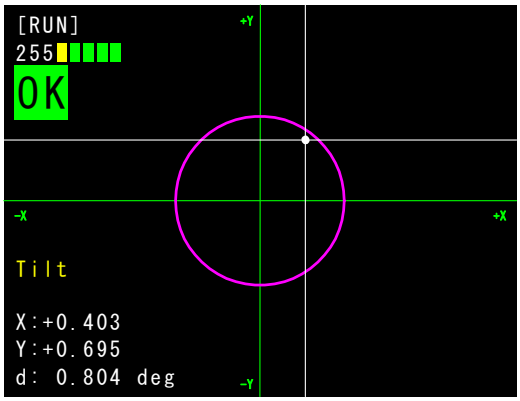

**(Note)**

- **Third pin is OFF at the shipment from the factory.**

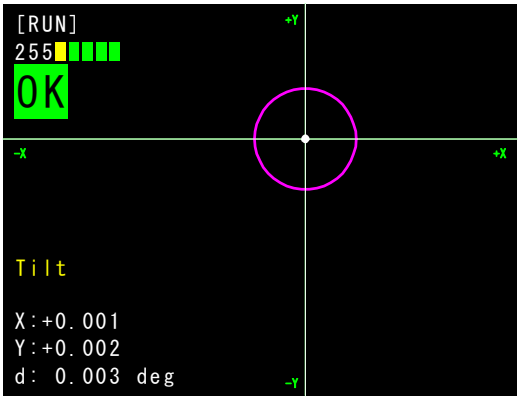
Tilt measurement motion

［OK/NG］setting is d2 (d1<d2)

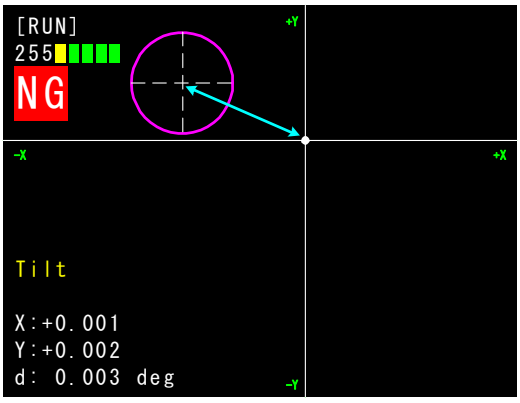
Absolute measurement（d1 Judgment & Display）




Relative measurement（d2Judgment & Display）




Offset setting [ON]




（ Offset）

**Change to Tilt Measurement, Keeping Judgment**

When keeping result (ER, NG) of relative measurement, turn on second and third pin of DIP switch on the side of processing in power supply OFF.

After power on again, should be tilt(judgment keeping) measurement mode .

1) DIP switch


**(Note)**

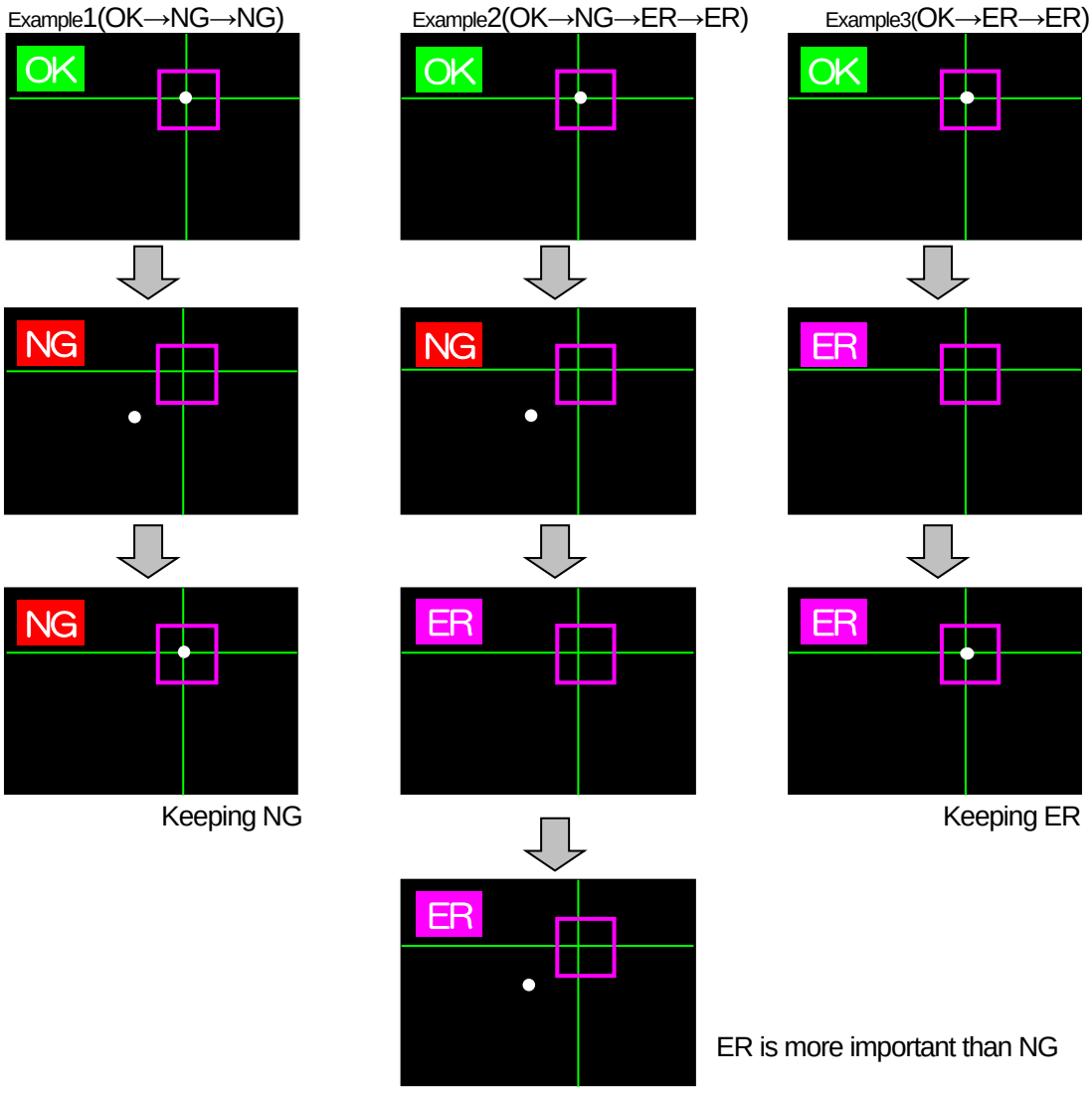
- **At the time of the shipment, the second and third pin becomes OFF.**

Judgment results keeping motion

Judgment results keeping is for only relative measurement that IN_1 input is ON. Relative measurement is cancelled and the result that is kept is cleared.

In case of no performing relative measurement, judge at the real time without judgment results keeping.

Process example (relative measurement)



# 6. Calibration

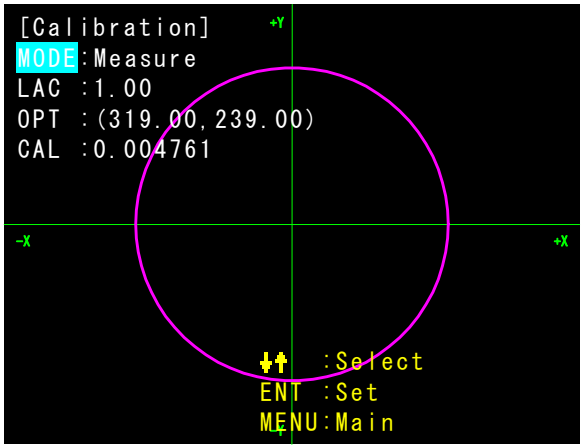
The calibration is carried out when the autocollimator is changed or the angle is calibrated again.

The angle displacement per pixel of CCD camera built in the autocollimator is decided by the calibration.

*** If the calibration is carried out, the setting data when the product is shipped from factory may be deleted, so pay attention to the procedure and the saving sufficiently.**

## 6.1. CAL menu

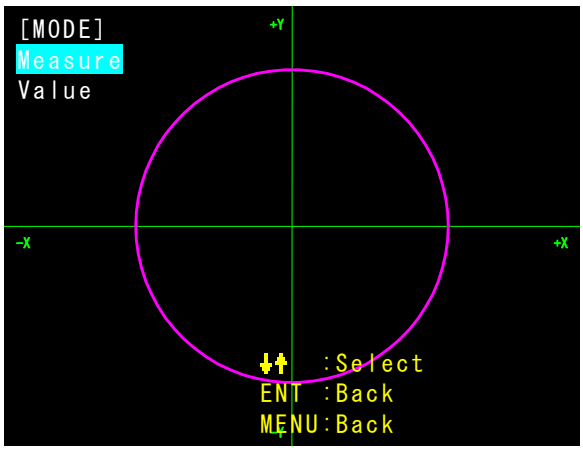
If you select "CAL" from main menu, the calibration menu is opened.




**"MODE"** : select the setting method of "OPT" and "CAL" from "Measure" and "Value"
**"LAC"** : set the range of autocollimator
**"OPT"** : set the center of measurement range (refer to 4.1.3)
**"CAL"** : set the angle calibration value

## 6.2. Notes on MODE

Select the setting method of "OPT" and "CAL" from Measure (measurement input) and Value (value input).



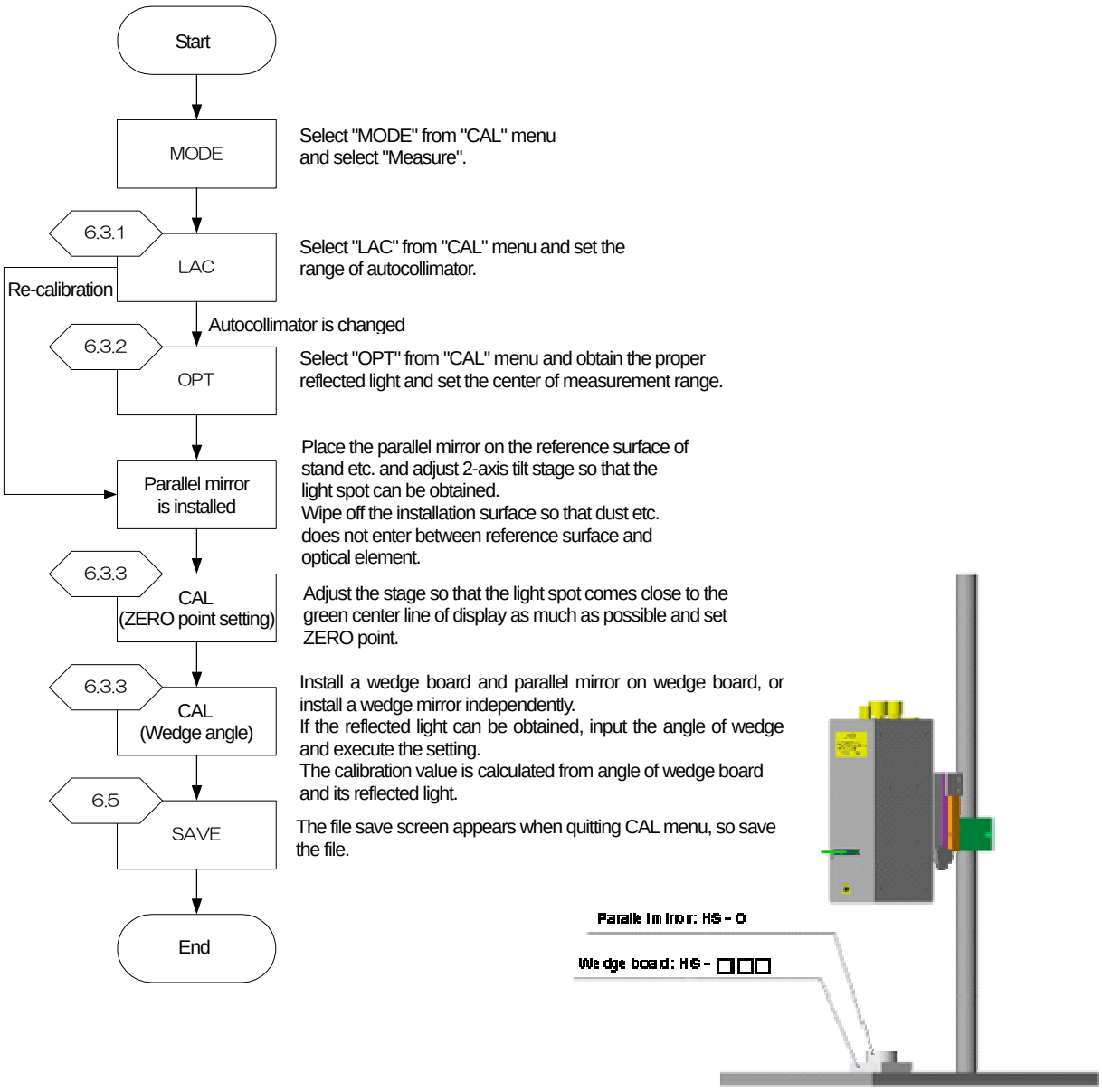

**"Measure"** **:** the calibration is carried out measuring the wedge mirror etc. whose wedge angle is known
**"Value"** **:** if there is value information of calibration value etc., input the value directly

The procedure for calibrating the angle for Measure (6.3) and Value (6.4) are separately described as following.

## 6.3. Angle calibration (MODE: Measure)

- **The angle calibration requires the reference mirrors such as parallel mirror (HS-O) that is the parallel standard and wedge board (HS-□□□) that is reference angle.**
- **Adjust the distance between laser beam window of autocollimator and parallel mirror to within the measurement distance of object to be measured described in the catalogue.**
- **When a wedge board is sued, place a parallel mirror on the wedge board to check the number of light spots is one before making an adjustment. When a wedge mirror is used, use it without any change.**

For details on each setting item, refer to the section described on the left of each item name.

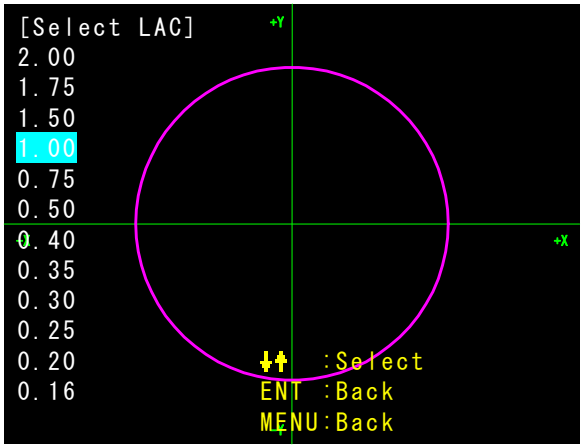



- The setting is made according to the autocollimator range you specified in the order type when the product is shipped from factory.
- After the measurement range of autocollimator is selected, carry out the angle calibration continuously.
- If the operation is interrupted during the calibration, restart the operation from the beginning.
- The calibration data is saved at the end of calibration. If it is not saved, the content of calibration is not reflected.
- In the mode of external incidence measurement, the calibration cannot be carried out.

### 6.3.1. LAC

If "LAC" is selected from CAL menu, the measurement range of autocollimator is set.

e.g.) For H400-C100, select 1.00.




### 6.3.2. OPT (Measure)

If "OPT" is selected from CAL menu, the center of measurement range is set.

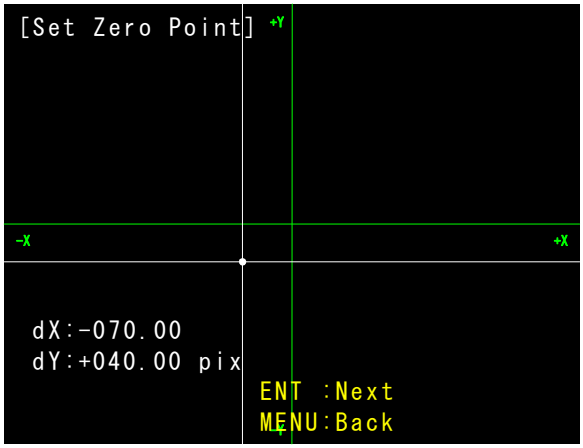
If the product is purchased as a set of autocollimator, the optical center of autocollimator in the set is set as a center of measurement range when the product is shipped from factory. Make this setting when the autocollimator is changed or in other cases.


If ENT is pressed, the center of measurement range is set to the current light spot position. In order to set the optical center of autocollimator to the center of measurement range, use the reflected light of a corner cube, for example. X and Y at the lower left of screen indicate the coordinate of light spot for which the upper left of screen is set to origin by pixel unit.

### 6.3.3. CAL (Measure)

If "CAL" is selected from CAL menu, the angle is calibrated.

**ZERO point setting screen**

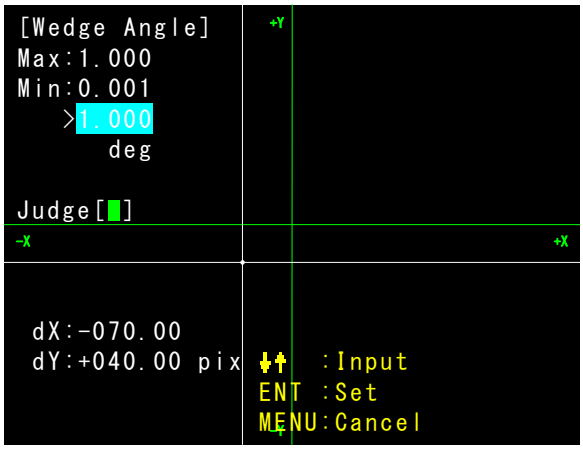



After the parallel mirror is installed, adjust stage so that the reflected light comes close to the green center line of display (center of measurement range) as much as possible and set the current light spot position to ZERO point by pressing ENT. At that time, dX and dY at lower left of screen indicate the difference between coordinates of light spot and center of measurement range by pixel unit, so adjust the stage so that this value becomes 0.

After ZERO point is set, the screen shifts to the wedge angle input screen.

* ZERO point set here is used for just calculating the angle correction value and it is not saved.

**Wedge angle input screen**

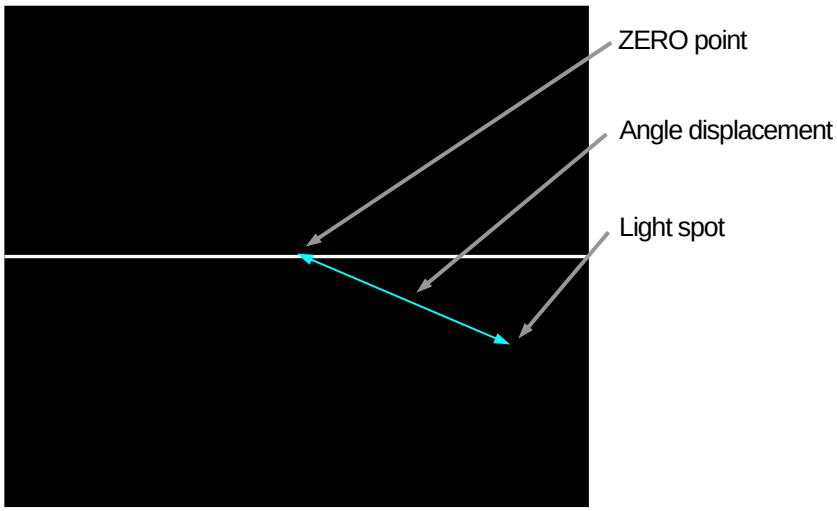



Install a wedge board and a parallel mirror on wedge board, or install a wedge mirror independently. If the reflected light can be obtained, input the angle of wedge and execute the setting by pressing ENT. The calibration value can be calculated with angle of wedge and its reflected light.

Calculate and set the angle calibration value from angle of wedge, current light spot position, and ZERO point set on the previous screen following the formula shown in the next page.

If the Judge is displayed in red, the calculated calibration value is improper. If the Judge is displayed in green, the angle calibration setting is terminated successfully.

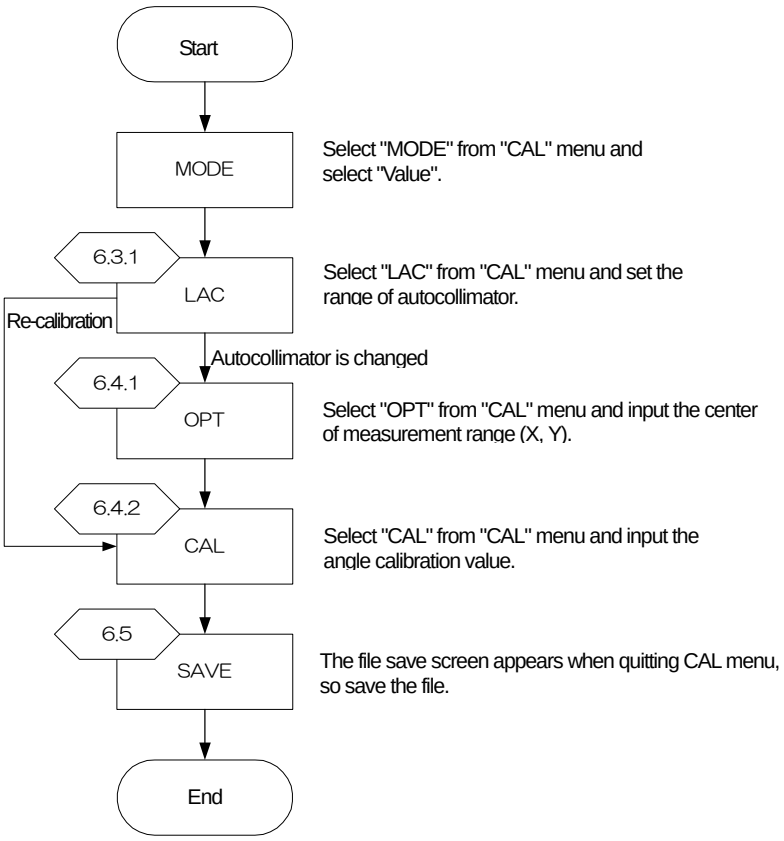
$$\frac{\text{wedge angle (deg)}}{\text{light spot – ZERO point (pixel)}} = \text{angle per pixel (deg/pixel)}$$



## 6.4. Angle calibration (MODE: Value)

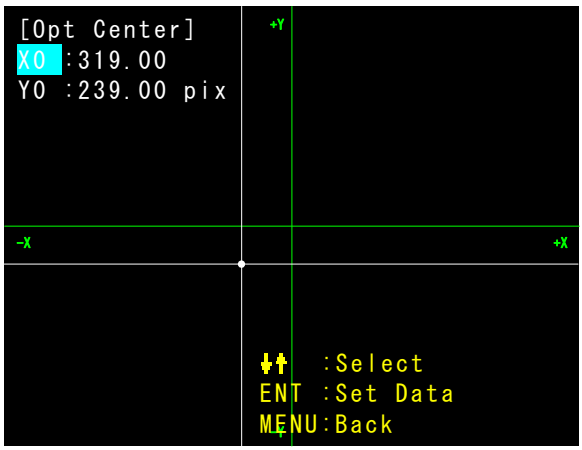
**- If there is value information of center of measurement range and calibration value of autocollimator, input the values directly.**

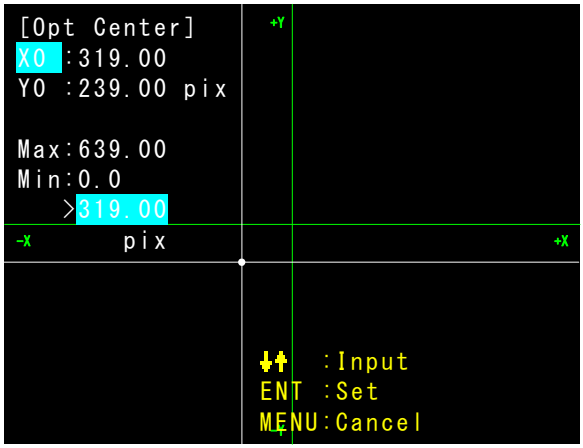
For details on each setting item, refer to the page described on the left of item name.




### 6.4.1. OPT (Value)

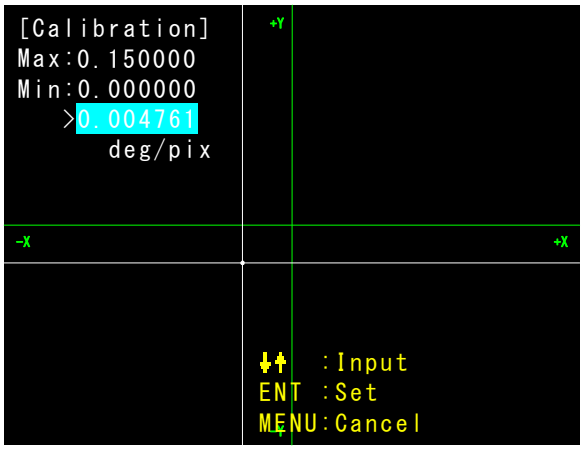
Set the center of measurement range by setting a value. In the left figure, the screen shifts to the value input screen shown right if "XO" is selected, for example.



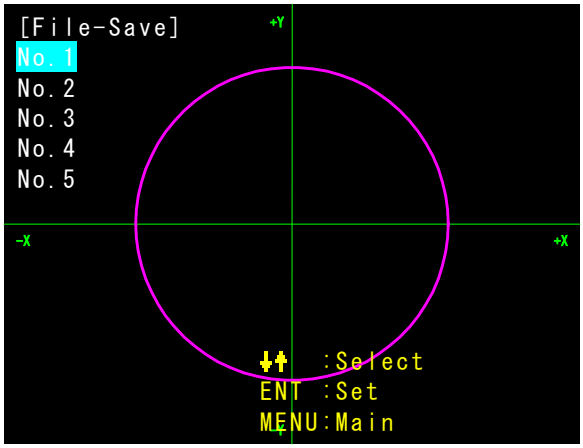
### 6.4.2. CAL (Value)

Input the angle calibration value directly with a value.




## 6.5. Save

If the center of "OPT" measurement range and "CAL" angle calibration value are changed, the menu shifts to File save screen if CAL menu is quit.




If the file is saved, the settings are reflected, however, if it is not saved, the changed settings return to the values before they are changed.

**(CAUTION)**

- **The setting that is set adoring to the autocollimator is saved in FILE1 when the product is shipped from factory.**
- **Take note that If the setting is written over FILE1, the setting cannot be reset to the factory setting.**

* The measurement condition setting and the calibration data are saved in each file.
Up to five measurement conditions of autocollimator with different measurement range can be saved in one unit of this machine.
If the range of autocollimator is different from setting data, the measurement cannot be carried out properly.

If you do not have parallel mirror for calibration, wedge board, or wedge mirror, please contact the customer service.

# 7. Communication Control

## 7.1. Serial Interface

HIP-550 supports data output by RS-232C and command control.

Communication modes

Set the external input transmitting mode

A. External Input Transmission Mode

The result of judgment is sent with the measured value at a rising edge of the HOLD input signal from the external I/O interface (See "8. I/O").

B. Continuous Transmission Mode

This mode sends the results and measured values about 200ms.

(Method of switching to Continuous Transmission Mode)

On (turn down) the switch [2] of DIP switch on the side of HIP-550.

C. Remote Control Mode

A communication command sent from the host equipment enables reading the results and measured values, writing settings, zero setting, etc.

(Method of switching to Remote Control Mode)

Hold panel key [↑] for 3 seconds or longer, it should be remote mode. For cancellation, hold for 3 seconds or longer again. The title must be changed to [HOST] on upper left of screen case of remote mode.

(*See 7.2 “Communication Command” for more details)

RS-232C Connector (Pin assignment)

The RS232C connector of HIP-550 has the following pin-outs.

The RS232C cable for connecting to external equipment is a D-sub 9-pin cross cable.

Pins 7-8 are jumped internally.

HIP-550 side (DE-9P-N(JAE))

| Pin No | Signal | Comment |
|---|---|---|
| 1 | | |
| 2 | RxD | Receive Data |
| 3 | TxD | Send Data |
| 4 | | |
| 5 | GND | |
| 6 | | |
| 7 | RTS | Request To Send |
| 8 | CTS | Clear To Send |
| 9 | | |

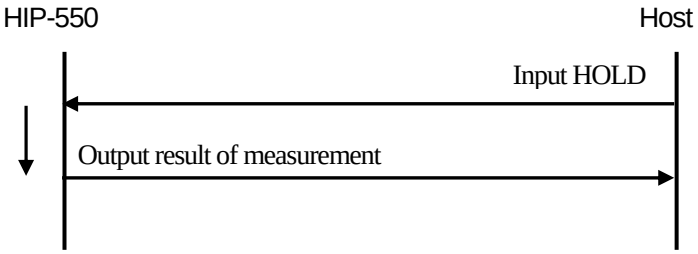
Communication Requirements

- Baud Rate ： 9600, 19200, 38400, bps
- Data Bit ： 8bit
- Parity ： None
- Stop Bit ： 1
- Flow Control ： None

## 7.2. Communication Control

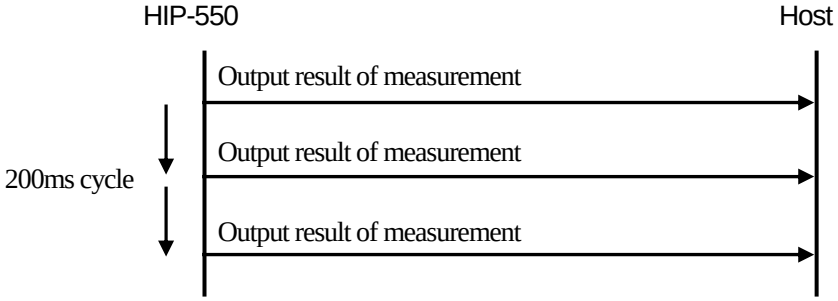
A. External Input Transmission Mode

Ex) External input




B. Continuous Transmission Mode

Ex) Continuous transmission




Measurement data is sent in the communication format shown below.

| HIP-550 | G | , | *S | , | *X | , | *Y | , | *D | , | CR | LF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

G： Header

*S : Judgment result " O "(OK),"N "(NG), "E "(ERROR)

| | | | | | | |
|---|---|---|---|---|---|---|
| *X : | ± | 0 | . | 0 | 0 | 0 |
| *Y : | ± | 0 | . | 0 | 0 | 0 |
| *D : | SP | 0 | . | 0 | 0 | 0 |

[SP] Space Character

The angle data *X, *Y, *D of the measurement result become the data in "deg" without being concerned with the setting of the menu [Unit].

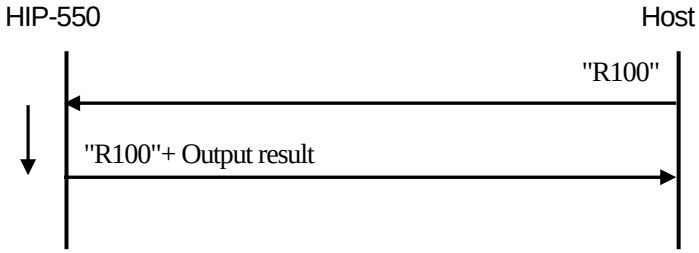
**(Note)**

**·When judgment is E, measurements are "999999".**

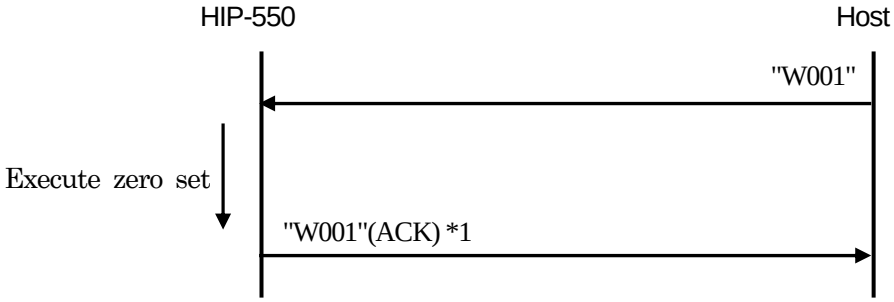
***When a label other than an error exists, the label outputs measured value.**

C. Remote Control Mode

Ex) Read measured value




Ex) Zero set




*1 An error command is returned if communication error exists.

## 7.3. Communication Commands

Communication Commands List

| No | ID Code | Function | Post-processing |
|---|---|---|---|
| 1 | W000 | Zero reset | Send ACK after zero reset |
| 2 | W001 | Zero set | Send ACK after zero set |
| 3 | W020 | Remote OFF | Send ACK after remote OFF |
| 4 | R022 | Read calibration value | Send calibration value |
| 5 | W022 | Change calibration value | Send ACK after changing calibration value |
| 6 | W030 | Save file | Send ACK is save successful |
| 7 | W031 | Switch load files | Send ACK after load and functional change is successful |
| 8 | R032 | Load system data | Send system data |
| 9 | W032 | Set system data | Send ACK after system data change |
| 10 | R100 | Read measured values | Send measured values |
| 11 | R101 | Load a set value | Send specified data |
| 12 | R102 | Load all set values | Send all settings |
| 13 | W101 | Change a set value | Send ACK after changing the specified item |
| 14 | W102 | Change all set values | Send ACK after change |
| 15 | W111 | Change OFFSETTILT judgment1 | Send ACK after change |
| 16 | W112 | Change OFFSETTILT judgment2 | Send ACK after change |

*Can be supported HIP-500 command type.

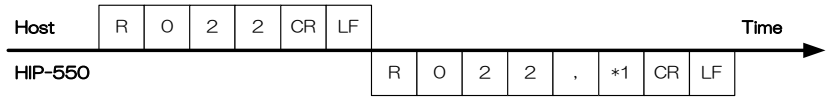
Can be replaced to HIP-550 without a problem if already set up the system with HIP-500.

| No | ID Code | Function | Post-processing |
|---|---|---|---|
| 1 | RA | Read measured values | Send measured values |
| 2 | RC | Read current settings | Send current settings |
| 3 | WA | Zero set | Send ACK after zero set |
| 4 | WB | Set acceptance circle range | Send ACK after setting new acceptance circle range |
| 5 | WC | Set acceptance square range | Send ACK after setting new acceptance square range |
| 6 | WD | Set binary threshold | Send ACK after setting binary threshold |
| 7 | WE | Save file | Send ACK at save successful |
| 8 | WF | Zero reset | Send ACK after zero reset |
| 9 | WG | Set noise level | Send ACK after setting new noise level |

See HIP-500 “Users Manual” about command format.

### 7.3.1. Read Calibration Data

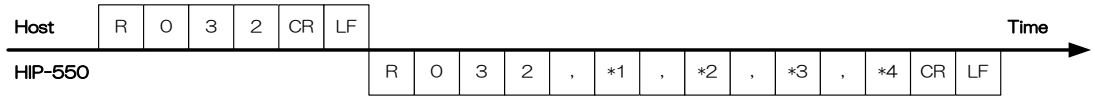
Calibration data is output.




| Value | Content | Set point |
|---|---|---|
| *1 | Calibration data | 0.00000～9.999999 |

### 7.3.2. Read system data

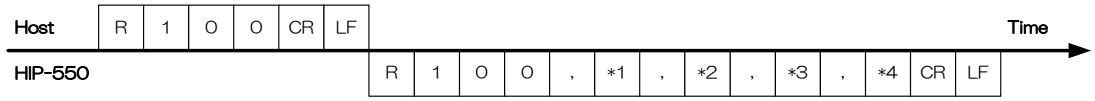
System data is output.




| Value | Content | Set point |
|---|---|---|
| *1 | LAC TYPE | 01～12(2.0～0.16) |
| *2 | Rotate | 1: Off, 2: 90°CCW, 3: 90°CW |
| *3 | Mirror | 1: XY Off, 2: X On, 3: Y On, 4:XY On |
| *4 | Unit | 1: deg, 2: min+sec, 3: mrad |

### 7.3.3. Read measure value

Out put the current angle measurement value.

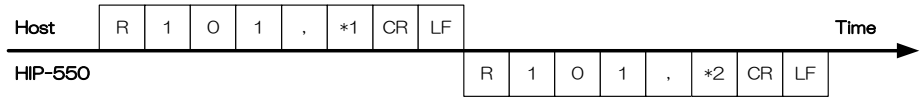



| Value | Content | Set point |
|---|---|---|
| *1 | Result | O(OK), N(NG), E(ERROR) |
| *2 | Measurement value X | -9.999~+9.999(deg) The space character enters the head in case of 0.000. |
| *3 | Measurement value Y | -9.999~+9.999(deg) The space character enters the head in case of 0.000. |
| *4 | Measurement value d | 0.000~9.999(deg) The space character enters the head. |

* The angle data of the all of communication command becomes the data in “deg” unit without being concerned with the setting of the menu [Unit].

### 7.3.4. Reading measurement setting data individually

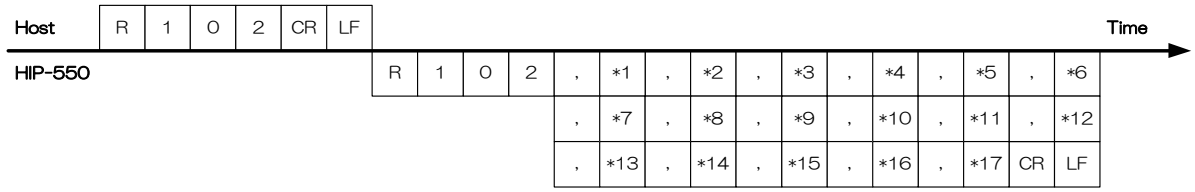
Current measurement setting data are outputted on the item by item basis.




| Value | Content | Set point |
|---|---|---|
| *1 | item | 01：Binarization level<br>02：Noise level<br>03：Criteria<br>04：Circle 1(d1) - Radius<br>05：Square - XL<br>06：Square - XH<br>07：Square - YH<br>08：Square - YL<br>09：Circle 2 (d2)- Radius<br>0A：Judgment X_Offset<br>0B：Judgment Y_Offset<br>0C：With or without of Max. luminance<br>0D：Higher limit of luminance acceptance<br>0E：Lower limit of luminance acceptance<br>0F：With or without of judgment offset<br>23：Method of center of gravity calculation<br>25：Application of ZOOM |
| *2 | Setting data | It is different according to item.<br>Refer to item of Reading all measurement setting data. |

### 7.3.5. Reading all measurement setting data

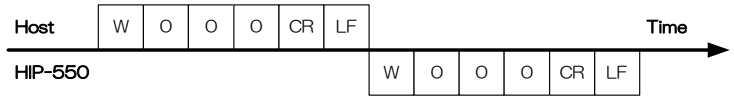
Current setting is read out.




| Value | Content | Set point |
|---|---|---|
| *1 | Binarization level | 035～254 |
| *2 | Noise level | 035～254 or 035～Lower limit of luminance acceptance |
| *3 | Lower limit of luminance acceptance | 035～Higher limit of luminance acceptance |
| *4 | Higher limit of luminance acceptance | Noise level～254 |
| *5 | With or without of Max. luminance | 1:Off, 2:On |
| *6 | Criteria | 1:Circle 1(d1), 2:Circle 2(d2), 3:Square |
| *7 | Circle 1(d1) – Radius | 0.001～LAC angle |
| *8 | Square – XL | -LAC angle～XH |
| *9 | Square – XH | XL～LAC angle |
| *10 | Square – YH | YL～LAC angle |
| *11 | Square – YL | -LAC angle～YH |
| *12 | Circle 2(d2) - Radius | 0.001～LAC angle |
| *13 | Judgment X_Offset | -LAC angle～0.000～LAC angle |
| *14 | Judgment Y_Offset | -LAC angle～0.000～LAC angle |
| *15 | With or without of judgment offset | 1:Off, 2:On |
| *16 | Method of center of gravity calculation | 1: Center of area (Bin), 2: Luminance centroid (Gray) |
| *17 | Application of ZOOM | 1:Off, 2:×4, 3: ×8, 4: ×16 |

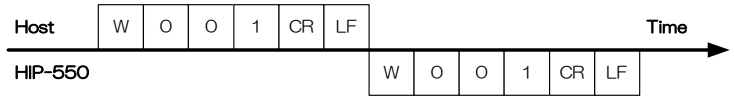
### 7.3.6. Zero Reset

This sets the zero point to the center of the monitor.



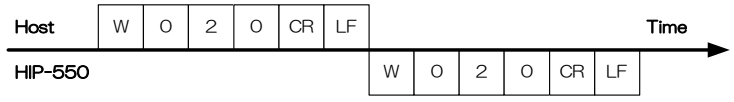

### 7.3.7. Zero Set

This sets the zero point to the detected light in the monitor.



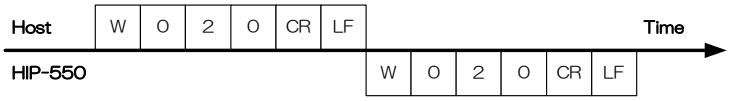

### 7.3.8. Remote Off

A remote controlled function is released.



### 7.3.9. Calibration Data Change

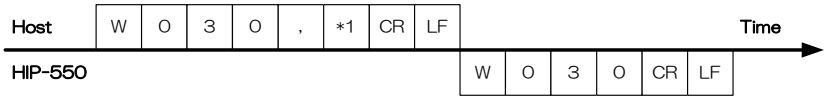
The calibration data is changed.




| Value | Content | Set point |
|---|---|---|
| *1 | Calibration data | 0.00000～9.999999 |

### 7.3.10. File Save

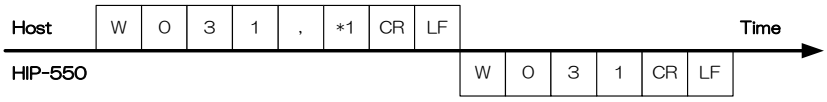
This saves the current settings in the specified file.




| Value | Content | Set point |
|---|---|---|
| *1 | File No. | 1～5 |

### 7.3.11. File Reading

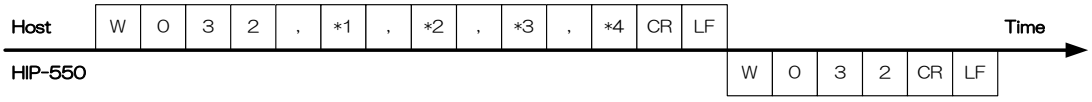
Change to the setting data that designated failing number.




| Value | Content | Set point |
|---|---|---|
| *1 | File No. | 1～5 |

### 7.3.12. System Data Change

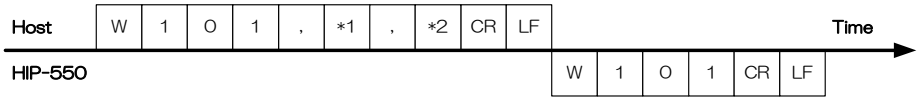
The system data is changed.




| Value | Content | Set point |
|---|---|---|
| *1 | LAC TYPE | 01～12(2.0～0.16) |
| *2 | Rotate | 1:Off, 2: 90°CCW, 3: 90°CW |
| *3 | Mirror | 1:XY Off, 2:X On, 3:Y On, 4:XY On |
| *4 | Unit | 1:deg, 2:min+sec, 3:mrad |

### 7.3.13. Changing settings individually

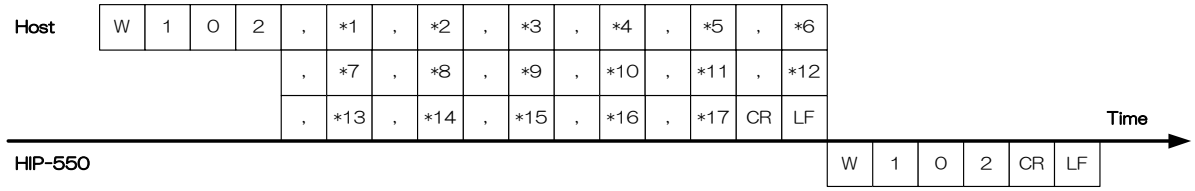
Current measurement setting data are changed by each items.




| Value | Content | Set point |
|---|---|---|
| *1 | item | 01：Binarization level<br>02：Noise level<br>03：Criteria<br>04：Circle 1(d1) - Radius<br>05：Square - XL<br>06：Square - XH<br>07：Square - YH<br>08：Square - YL<br>09：Circle 2 (d2)- Radius<br>0A：Judgment X_Offset<br>0B：Judgment Y_Offset<br>0C：With or without of Max. luminance<br>0D：Higher limit of luminance acceptance<br>0E：Lower limit of luminance acceptance<br>0F：With or without of judgment offset<br>23：Method of center of gravity calculation<br>25：Application of ZOOM |
| *2 | Setting data | It is different according to item.<br>Refer to item of Changing all settings. |

### 7.3.14. Changing all settings

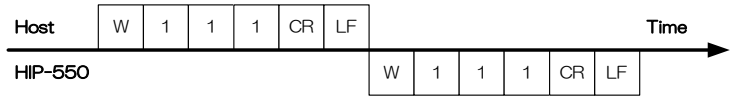
All measurement setting data are changed as a group.




| Value | Content | Set point |
|---|---|---|
| *1 | Binarization level | 035～254 |
| *2 | Noise level | 035～254 or 035～Lower limit of luminance acceptance |
| *3 | Lower limit of luminance acceptance | 035～Higher limit of luminance acceptance |
| *4 | Higher limit of luminance acceptance | Noise level～254 |
| *5 | With or without of Max. luminance | 1:Off, 2:On |
| *6 | Criteria | 1:Circle 1(d1), 2:Circle 2(d2), 3:Square |
| *7 | Circle 1(d1) – Radius | 0.001～LAC angle |
| *8 | Square – XL | -LAC angle～XH |
| *9 | Square – XH | XL～LAC angle |
| *10 | Square – YH | YL～LAC angle |
| *11 | Square – YL | -LAC angle～YH |
| *12 | Circle 2(d2) - Radius | 0.001～LAC angle |
| *13 | Judgment X_Offset | -LAC angle～0.000～LAC angle |
| *14 | Judgment Y_Offset | -LAC angle～0.000～LAC angle |
| *15 | With or without of judgment offset | 1:Off, 2:On |
| *16 | Method of center of gravity calculation | 1: Center of area (Bin), 2: Luminance centroid (Gray) |
| *17 | Application of ZOOM | 1:Off, 2:×4, 3: ×8, 4: ×16 |

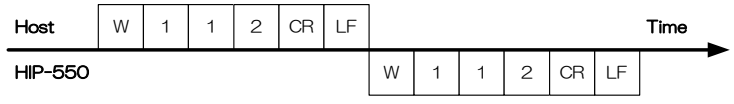
### 7.3.15. OFFSETTILT Switch to the judgment 1

Switch the tolerance from judgment range 2 (d1,d2,X-Y) to judgment range 1 (d1) at the OFFSETTILT measurement.



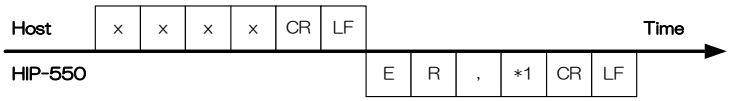

### 7.3.16. OFFSETTILT Switch to the judgment 2

Switch the tolerance from judgment range 1 (d1) to judgment range 2 (d1,d2,X-Y) at the OFFSETTILT measurement.



### Communication errors

An error is returned from the unit in the format shown below when the command fails to receive or execute normally.




| Value | Content | Set point |
|---|---|---|
| *1 | Error code | 1：Communication error<br>• 60 or more characters received between ID Code character and [CRLF]<br>• No characters received within 1 second after ID Code is received<br>• Overrun error or framing error<br>2：Setting data error<br>• A set value falls outside of the setting range<br>（When Setting command is used, this error may occur when the relative size is invalid.）<br>3：Command format error<br>• The number of characters between ID Code character and [CRLF] is invalid<br>• Setting data is missing or characters other than numeric characters are used in Set type command<br>• The character following ID Code is not in the above list<br>4：Execution error<br>• Zero set failed during “WA” command execution as no light dot was detected.<br>• No data have been saved under the specified file number. |

## 7.4. Data collection software

Data Collection Software is an Excel macro program for receiving results of measurement that are sent by serial output.

The software can be downloaded from Suruga Seiki OST Division's homepage (http://www.surugaost.jp/).

- **Operating environment and operation**

You will need Microsoft(R) Excel 2000 or later versions to run the software. You will also need a D-sub 9-pin cross cable for connection to the PC.

- **Start**

Start Microsoft(R) Excel file "HIP-550 Communication with macros enabled.

- **Setting** (See "7.1 Serial Interface" about setting in the image processor side)


**(a) COM**

Set the COM port number of the PC connected to HIP-550.

**(b) Baud rate**

Set the baud rate of communication set on the HIP-550.

**(c) Sampling time (ms)**

Set the interval for acquiring results of measurement sent continuously from the HIP-550.

**(d) Mode**

SINGLE: Receive data for a single result when START button is pressed; end when reception is completed.

* Enabled only when the HIP-550 is in Remote Control mode.

CONT: Receive data from the HIP-550 when START button is pressed; continue receiving data until END button is pressed (up to the end line on Excel; 65535th line on Excel 2000).

* Enabled only when the HIP-550 is in "STREAM" mode and set for continuous transmission.

**(e) Start button**

Press "Start Communication" button in Microsoft(R) Excel file "HIP-550 Communication to start receiving data.

**(f) End button**

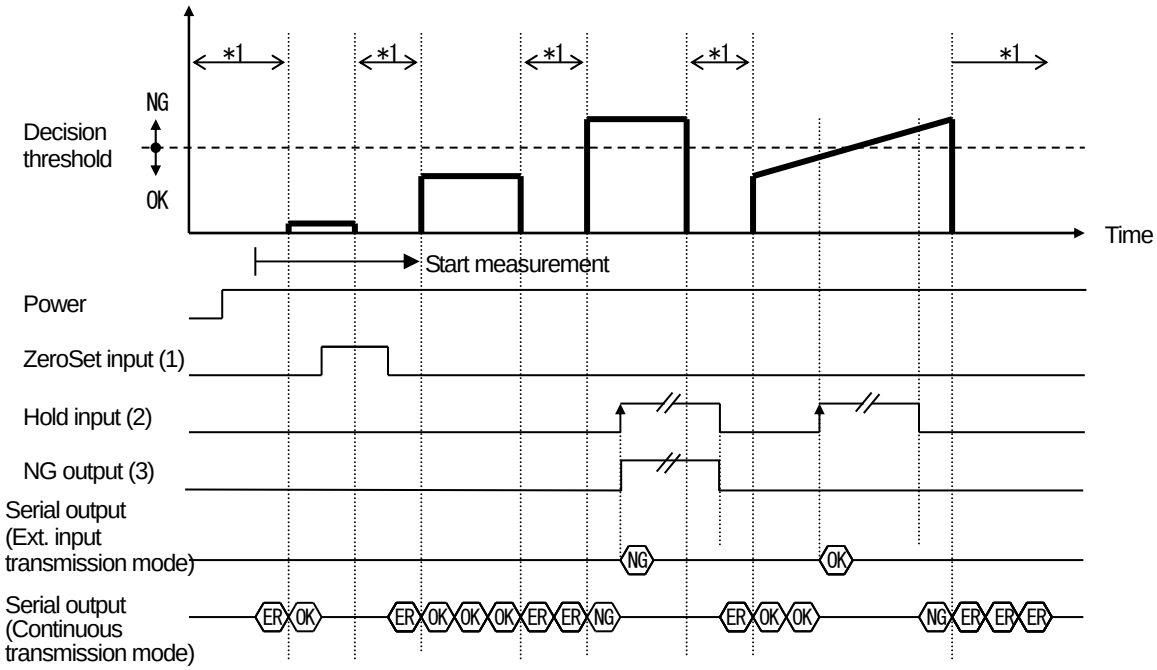
Press "End Communication" button in Microsoft(R) Excel file "HIP-550 Communication to end receive data.

# 8. I/O Control

Zero Set is performed by short-circuit 1pin and 4pin of I/O connector. The measurement value is outputted by short-circuit 2pin and 4pin. 3pin must be ON during judgment is NG.

• **Operation Timing Chart**

*1:Period without

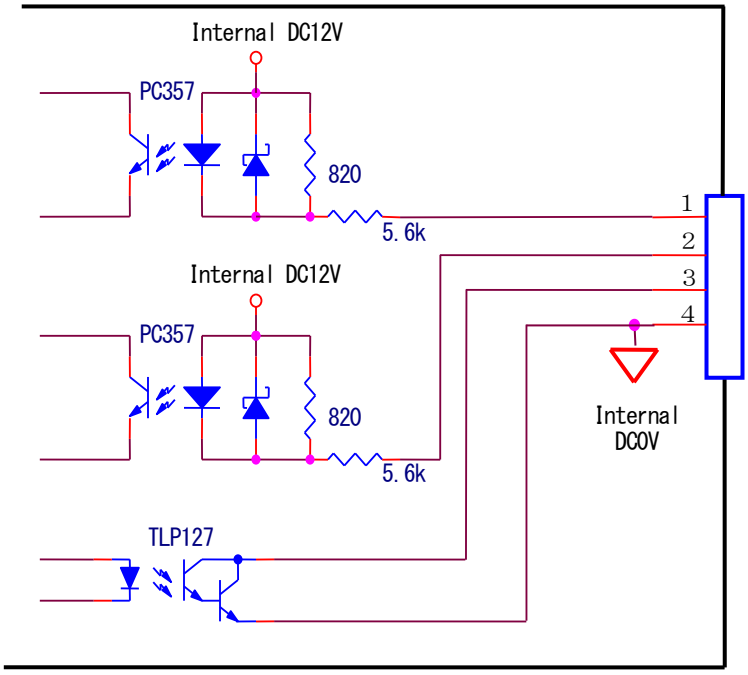



(Note) Input signals must remain ON for at least 100ms.

• **Electrical Specification**

In case of input ON, should be shorted 1, 2pin and COM(4pin).

Use no-voltage contacts for shorting. No-voltage contacts must accept 5mA or higher current with the leakage current of no higher than 0.1mA.




Connector Model

: XW4A-04B1-H1（Omron）

Compatible Connector Model

: XW4B-04B1-H1（Omron）

I/O terminal table

| Pin No. | Signal Name |
|---|---|
| 1 | ZERO Set Input |
| 2 | Hold Input |
| 3 | NG Output |
| 4 | Common (Internal 0VDC) |
| | |

# 9. Error message

The error message is displayed under the left of the screen at the error.

Error Message List

| Message | Content |
|---|---|
| Setting ERROR!! | Angle calibration failed. |
| Memory Error!! | System data loading failed. |
| No Data !! | Measurement data loading failed. |

# 10. Troubleshooting

| Case | Probable Causes | Countermeasure |
|---|---|---|
| No power supply | AC adapter is disconnected. | Securely connect to the wall outlet. |
| No light spot displayed in the screen | Connector cable is disconnected | Connect the cable correctly. |
| | Laser ON/OFF switch is set to OFF. | Set laser ON/OFF switch to ON. |
| | Low receiving sensitivity<br>Low light amount | Down the autocollimator's shutter speed or up the lazer power. |
| | End of the laser life | Contact Suruga Seiki. |
| Hard to detect laser light | Reflectance of the object is too low. | Adjust the variable aperture of the auto collimator or change the light intensity using the volume. |
| | Shutter speed is too slow. | Adjust the shutter speed by turning the shutter switch of the auto collimator. |

＜Revision History＞

| Edition | Date | Revised Content |
|---|---|---|
| First Edition | 07/24/2008 | New Document |
| 2nd Edition | 09/02/2008 | H350AC adaptor type corrected<br>Internal mirror explanation corrected<br>Offset Tilt measurement result keeping function added |
| 3rd.Edition | 10/09/2008 | I/O connector terminal table type corrected. |
| 8th Edition | 05/16/2011 | Menu change etc. |
| 10th Edition | 05/10/2019 | Clerical corrections |
| | | |
| | | |
| | | |
| | | |

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