

Work Inspection Camera

RICOH SC-20

Easy Setup MANUAL

RICOH PFU COMPUTING Co., Ltd.

Set up procedures for the administrator (Administrator mode)

<p>prerequisite (Please prepare some tools yourself.)</p> <ul style="list-style-type: none"> ■ Required environment for handling the SC-20 <ul style="list-style-type: none"> ● Camera stand ● Monitor/HDMI® cable ● USB Mouse/USB Keyboard ■ Option <ul style="list-style-type: none"> ● USB flash drive/SD card ● USB hub (3 or more ports) *Self-powered USB recommended 	
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Process 1 Initial Setting

<p>1-1: Power on</p> <p>Press the power button.</p>	<p>Power button</p>
<p>1-2: Initial Setting</p> <p>The initial setup screen will be displayed at first startup. For use in Japan, please configure as follows.</p> <p>Click the Save and Reboot the system.</p> <p>* The settings can be changed at any time from the "Initial Settings" menu under "System Settings".</p>	<p>Example</p> <p>Regional Settings</p> <p>Area : Asia Location : Tokyo Language : Japanese Keyboard : jp106</p>
<p>1-3: Log in</p> <p>Log in as an administrator. Enter user ID "Administrator" and click the Login button.</p>	
<p>1-4: Creating User ID for workers</p> <p>Select the "Log in/User Settings" from the "System Settings" in the menu bar. Then, create a User ID for the actual workers so that they may log in using that ID.</p> <p>* For the worker's operation procedures, please refer to "Worker Operation Procedures" section below.</p>	<ul style="list-style-type: none"> ● Sets the worker's user ID within 1-32 characters. ● Set the user's first name and last name, each within 0-32 characters. ● Leave the "Administrator" checkbox OFF to (if checked, the user will be registered as a user with "Administrator" privileges).

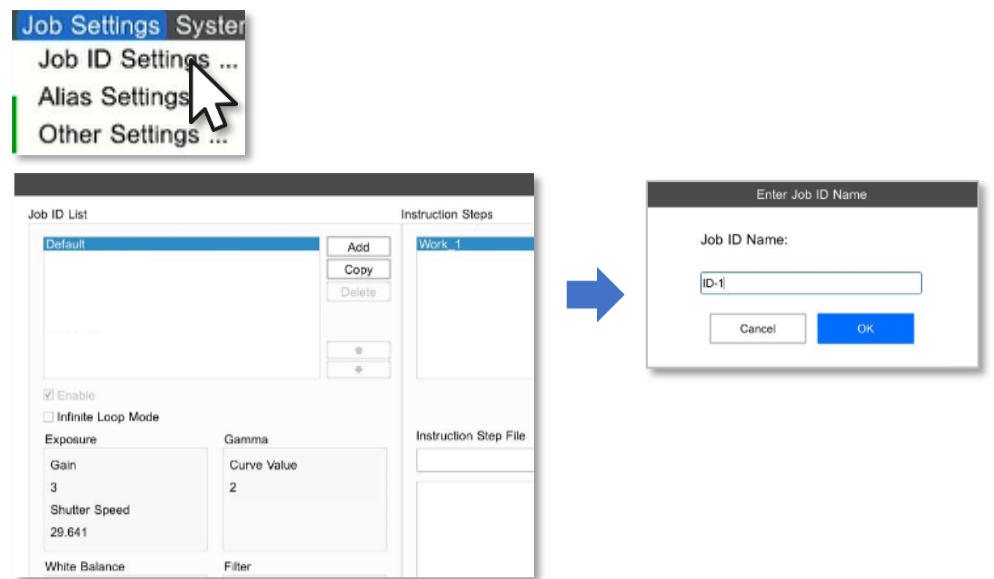
process Setting up the Job ID

2-1: Register Job ID

A series of workflows are registered as a [Job ID].
Multiple work processes from the start of inspection to the end of inspection are defined in a single [Job ID] for the object to be assembled by the operator.

Click [Job Settings] - [Job ID Settings...] at the top of the screen to display the settings screen. at the top of the screen to display the settings screen.

Click the [Add] button in the Job ID list to register a new Job ID.



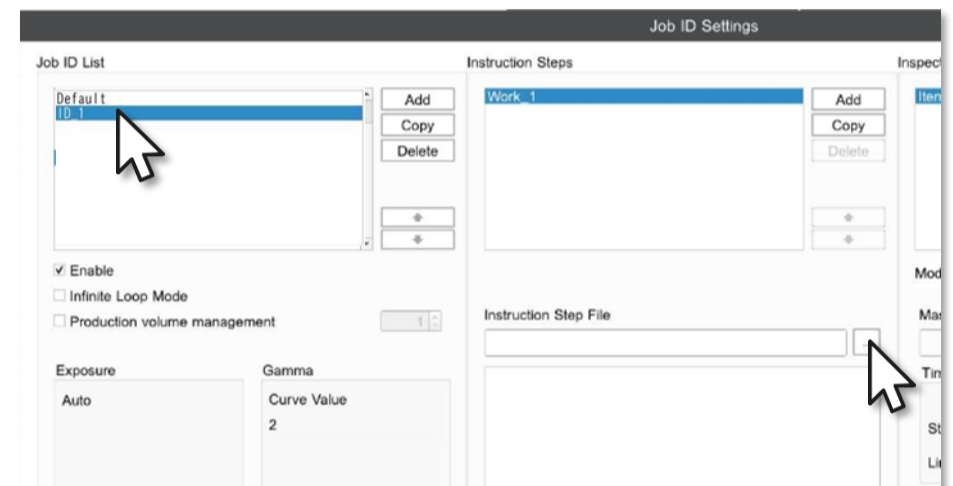
2-2: Setting the "Instruction Steps"

Select the registered Job ID from the [Job ID List] shown on the left side of the screen.

[Work_1] will automatically be created in the [Instruction Steps], shown on the center of the screen.

Example) If there are the three processes: **Parts Insertion** → **Cover Installation** → **Screw Installation**, Register the work items in Work_1 for parts insertion, Work_2 for cover installation, and Work_3 for screw installation. Create as many work items in the Inspection Steps as the number of required processes by clicking the "Add" button

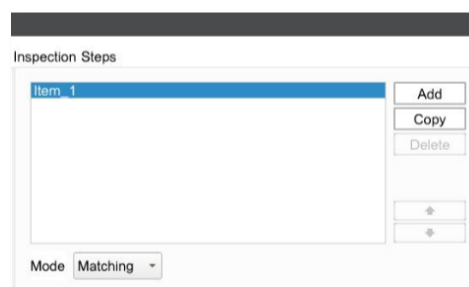
- * If there are work instruction images, select the work instruction image from the Instruction Step File [...] under [Instruction Steps] in the center of the screen. The work instruction image will be displayed in the lower area.
- * Only JPEG images can be used for the Instruction Step File. Please convert data created in Word, PowerPoint, Excel, etc. to JPEG using the provided editor software.



2-3: Setting the "Inspection Steps"

"Item_1" is automatically created in [Inspection Steps] on the right side of the screen. Up to 20 points can be determined for one work item.

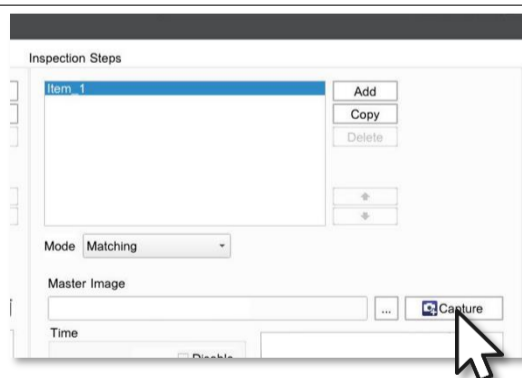
If you need to judge more than 21 points, please add the item.



2-4: Capturing the Master Image

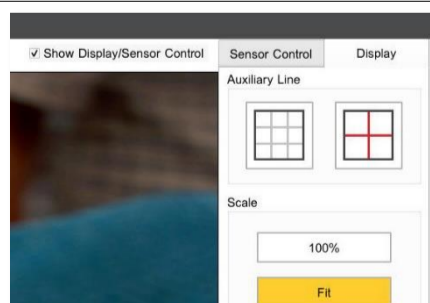
Preparing the Master Image.

- * This image will be used as a comparison image (example of the correct assembly). The camera compares this image with the state of the work in progress, to detect any errors.
- * For assembly processes, a Master Image will be required for each Item.



Press the [Capture] button under the [Inspection Steps] to display the capture window.

Before capturing the image, please check and adjust the camera settings.



Before capturing the master image, adjust the focus and aperture. Turn ON the [Show Display/Sensor Control] check box at the top of the screen.

To make it easier to see the object, the camera image can be enlarged by clicking the [100%] button in the [Display] tab.

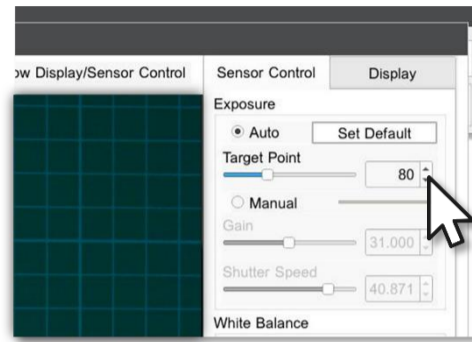


Aperture Ring

Focus Ring

Adjust the focus with the Focus Ring on the lens and use the Aperture Ring as necessary to bring the entire working area into focus

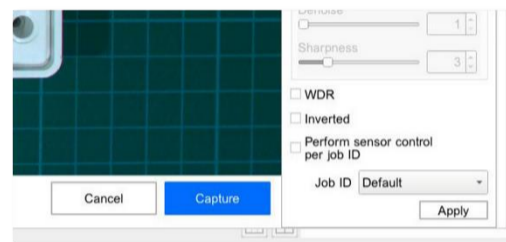
- * The larger the aperture value, the wider the area in focus, but at the same time, the noisier the image.
- * When using the lens for the first time, loosen the ring fixing screw with a precision screwdriver to unfasten the ring.



Adjust the brightness and hue of the image, etc. Use [Target Point] in the [Sensor Control] tab to adjust the brightness so that the object to be inspected is clearly visible.

Manual Exposure settings, White Balance, Gamma, etc. can also be adjusted if necessary.

Once the settings are done, please set the finished product under the camera and capture the Master Image.



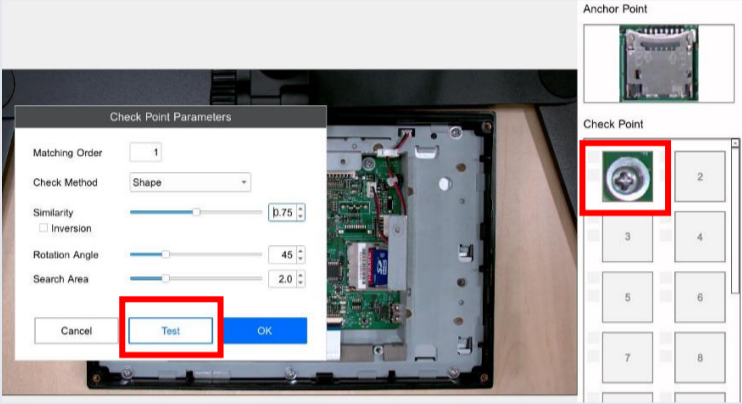
When ready, set the object to be inspected with the work completed and press the [Capture] button to have the camera take a picture.

In the file dialog, give it a name of your choice and [Save].

Q : What is the work inspection process for SC-20?

A : For each checkpoint, the degree of conformity of the shape (or color in the case of color recognition) with the master image is measured by image recognition, and if they match, it is judged as OK. The setup work can be repeated to find the optimal settings while repeatedly testing the judgment, thereby preventing misjudgment.

■■■ Glossary ■■■

Checkpoint	Actual inspection points. For example, in the case of screw tightening work, the screw point is the checkpoint.
Test	Function to test the judgment. Click the thumbnail image of the checkpoint on the right side of the standby screen and click the "Test" button in the dialog to test. 
Score	This is a numerical value of the shape matching (or color matching in the case of color recognition) with the master image. A score of 1.00 is assigned when there is a 100% match with the master image.

Process 3 Master settings

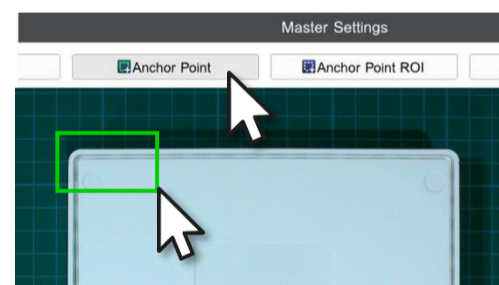
Once the Master Image is taken, please move on to the "Master Settings".



The Master Image is displayed as a thumbnail. Click on the thumbnail to display the Master Setting dialog box.

3-1: Anchor Point/Anchor Point ROI settings

The first step is to set the "Anchor Point" as a reference for locating the object. This setting allows you to inspect even when the object slightly moves around from the original position set in the Master Image. The camera will search for the Anchor Point and locate the check points quickly and accurately.

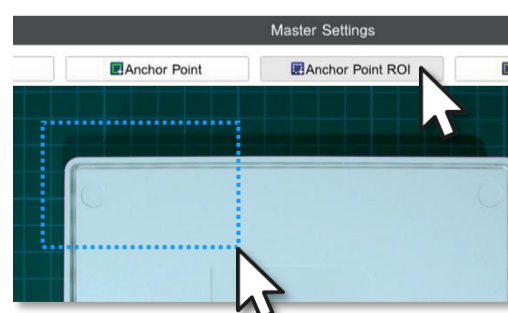


Click the [Anchor Point] button at the top.

Use the mouse to enclose the object in the Master Image with a distinctive shape.

- The maximum specified size of the Anchor Point is 700x700(pixel), the minimum specified size of the Anchor Point is 50x50 (pixel).

Next, specify the area where the camera will search for the Anchor Point.



Click the [Anchor Point ROI] button at the top.

Use the mouse to enclose the area that includes the Anchor Point, slightly larger than the Anchor Point.

Tips **Anchor Point**

Q : Why is it necessary to set an Anchor Point

A : To specify the location of the object (product) to be assembled and one anchor point from which to search for checkpoints.

Since the setting of the anchor point affects the speed at which the inspection starts and the accuracy of the judgment, we recommend making optimal adjustments here as well.

* When using a positioning mechanism for the object (product) to be assembled (e.g., a jig to place the product in a fixed location), setting of an anchor point is not required.

■■■ This is the trick ! ■■■

Trick①	Specifying a position as close as possible to each checkpoint reduces errors in relative position to the checkpoint and improves search accuracy.
Trick②	As with checkpoint, the Anchor Point is searched for by comparison with the master image through image recognition. Therefore, specify areas where the shape is unique and no similar shape exists. <ul style="list-style-type: none">● The maximum specified size of an Anchor Point is 700 (pixel)x700 (pixel).● The minimum specified size for an Anchor Point is 50 (pixel)x50 (pixel).
Trick③	Please specify a part of a shape that includes straight lines, not a circular object. If you specify a circular object, the orientation of the object's installation will be incorrectly recognized, resulting in a large error in the relative position to the checkpoint.

Tips **Anchor Point ROI**

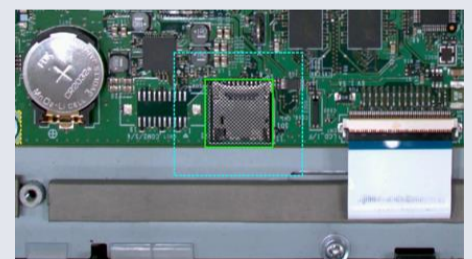
Q : What is the Anchor Point ROI ?

A : In order to search for the Anchor Point quickly and improve processing speed, the search can be focused on the area specified in the "Anchor Point ROI" instead of the entire screen.

* If you do not set an Anchor Point, you do not need to set a search area.

■■■ This is the trick ! ■■■

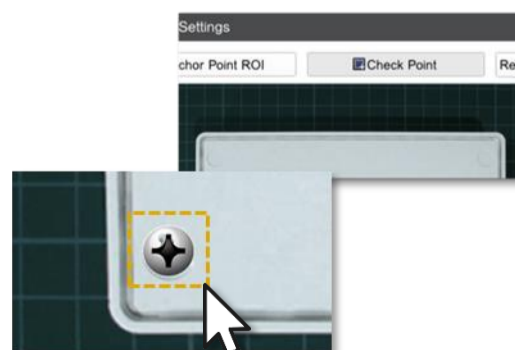
Trick①	Specify a range so that the Anchor Point is in the center of the search area.
Trick②	Specify a range wider than the Anchor Point (About 3 times larger). If the range is too large, the search area will expand and processing speed will decrease.



3-2: Set checkpoint

Next, designate the actual assembly areas as [Check Points].
A maximum of 20 Check Points can be set to be inspected at once.

* To set more than 21 checkpoints, add items from the "Add" button in Process 10 [Inspection Steps] and set the 21st and subsequent checkpoints.



Click on the [Check Point] button at the top.

Use the mouse to enclose the area to be inspected.

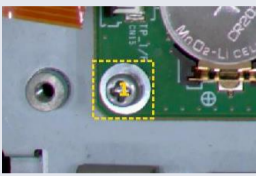
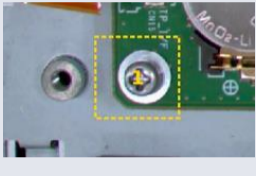
When a checkpoint is specified, a yellow dotted frame is displayed. The number of the search order is displayed in the frame.

Tips Checkpoint size

Q : How large should the checkpoint be?

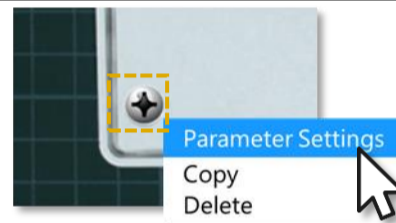
A : When specifying checkpoint, the size of the area to be surrounded is important. Perform a "test" of the judgment before and after the work to be inspected, respectively, and set the size to which the score difference is the largest.

■■■ This is the trick ! ■■■

Trick①	Basically, set the minimum size according to the size (shape) of the object to be inspected. If other items are included, the score will also reflect the size of the items, and therefore, the difference in score tends to be less pronounced.	
Trick②	If the score varies with the minimum size and the judgment is not stable, please try a slightly larger enclosure. Since SC-20 is a high-definition product, the scores may be skewed depending on the way the light hits the object or the condition of the object. In such cases, including the area around the object to be inspected in the checkpoints will stabilize the score difference and make it effective.	
Trick③	If the inspected object is too large to fit in the specified size of checkpoint, please specify a characteristic point of the inspected object (a point where there is a clear difference between before and after work). <ul style="list-style-type: none"> ● The maximum specified size of checkpoints is 500 (pixel) x 500 (pixel). ● The minimum checkpoint size is 50 (pixel) x 50 (pixel). 	

3-3: Checkpoint Parameter Settings

Right click on the specified Check Point (yellow frame) and go to Parameter Settings for more detailed settings.

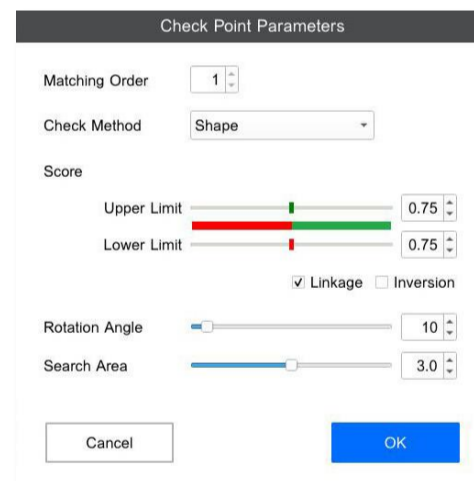


In case of "Shape" matching.

In the [shape] check method, the shape after the work is compared with the master image, and an OK/Fail decision is made based on the degree of conformity of the shape's edges.

The parameters that can be set are as follows.

[Score]	Set the threshold for judging how well the shapes match to determine if it is OK.
[Rotation Angle]	Sets the degree to which the shape can be rotated and the allowable angle.
[Search Area]	Sets the Tolerance for misalignment when searching for Check Point locations.

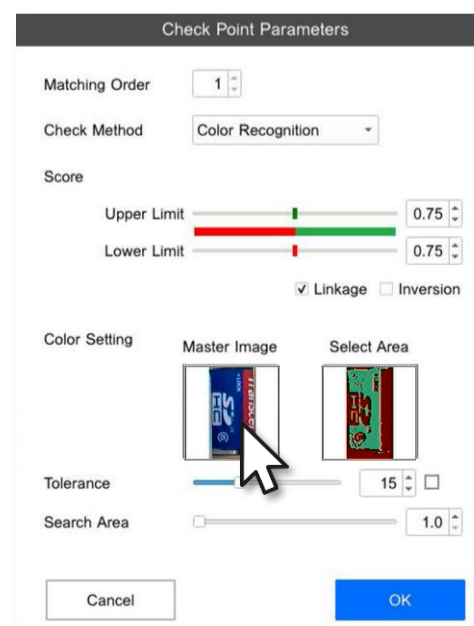


In case of "Color Recognition"

In the [Color Recognition] check method, the condition of the image after the work is compared with the master image, and an OK/Fail decision is made based on the specified color match.

The parameter items that can be set are as follows.

[Score]	Sets the threshold as the percentage of area that matches the specified color.
[Color Setting]	Click on the area of the color you want to judge in the thumbnail and check it in the "Select Area".
[Tolerance]	Adjust the allowable range of colors used in the judgment by looking at the Select Area.
[Search Area]	Sets the Tolerance for misalignment when searching for Check Point locations.

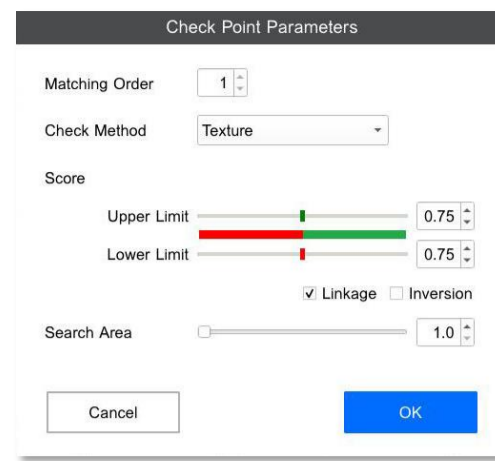


In case of "Texture" matching

In the [Texture] check method, the state of the image after the work is compared with the Master Image, and an OK/Fail decision is made based on the degree of texture match.

The parameter items that can be set are as follows.

- [Score] Set a judgment threshold to determine how well the textures match to be OK.
- [Search Area] Sets the Tolerance for misalignment when searching for Check Point locations.

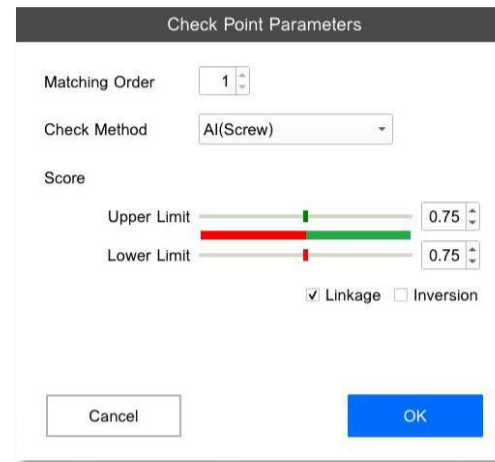


In case of "AI (screw)" detecting

In the [AI(Screw)] checking method, various screw-specific shape data learned by AI are compared with the inspected object after operation to make the best judgment.

The parameter items that can be set are as follows.

- [Score] Set a judgment score threshold to determine how well the target part matches the data with screw heads that the AI has learned.



Tips Logic for Judgment

Q : What logic is used to calculate scores for "Shape" and "Color recognition", respectively?

A : In the "Shape" check method, the image to be inspected is binarized, and the degree of agreement is calculated by comparing only the shape of the outline (color differences have no effect). The "Color" check method compares the area of the color specified in the "Specified Area" to calculate the degree of matching (shape differences have no effect).

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Shape	Color																
<p>Similarity: Outline similarity (Any color) Application: For shape differences</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">Subject of inspection</th> <th style="width: 30%;">Score</th> </tr> </thead> <tbody> <tr> <td>Master image / Sample 0 </td> <td style="text-align: right;">0.997</td> </tr> <tr> <td>Sample 1 </td> <td style="text-align: right;">0.422 <small>Shape is different</small></td> </tr> <tr> <td>Sample 2 </td> <td style="text-align: right;">0.992 <small>Shape is the same (Any color)</small></td> </tr> </tbody> </table> <p>Usage example: Check for screws</p>	Subject of inspection	Score	Master image / Sample 0 	0.997	Sample 1 	0.422 <small>Shape is different</small>	Sample 2 	0.992 <small>Shape is the same (Any color)</small>	<p>Similarity: Designated color area similarity (Any shape) Application: For color differences For designated color area differences</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">Subject of inspection</th> <th style="width: 30%;">Score</th> </tr> </thead> <tbody> <tr> <td>Master image / Sample 0 </td> <td style="text-align: right;">0.993</td> </tr> <tr> <td>Sample 1 </td> <td style="text-align: right;">0.905 <small>Same red color with minor area differences</small></td> </tr> <tr> <td>Sample 2 </td> <td style="text-align: right;">0.000 <small>No red color area</small></td> </tr> </tbody> </table> <p>Usage example: Check cord color differences</p>	Subject of inspection	Score	Master image / Sample 0 	0.993	Sample 1 	0.905 <small>Same red color with minor area differences</small>	Sample 2 	0.000 <small>No red color area</small>
Subject of inspection	Score																
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Master image / Sample 0 	0.993																
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Sample 2 	0.000 <small>No red color area</small>																

Process 4 Other settings and data savings

4-1: Time and image storage settings

- [Standard (sec)] → Allows you to set the standard time for that operation.
 * When the standard time elapses, the elapsed time bar on the main screen changes to yellow.
- [Limited (sec)] → If the set time is exceeded, a Fail judgment will be made.
- [Save image] → The image of the OK/Fail judgment can be saved.
 * The frames of checkpoints, etc. can also be saved as JPEG images.



4-2: Flow methods setting

Please set up the inspection flow at your choice.

Sequentially	Check registered checkpoints in order.
Batch	Check all registered checkpoints at once.
One Shot	Check all registered checkpoints only once.

- * [Sequentially] and [Batch]: The camera will keep inspecting the process until the set time limit is over.
- * [One shot]: The inspection will start immediately after you press start.



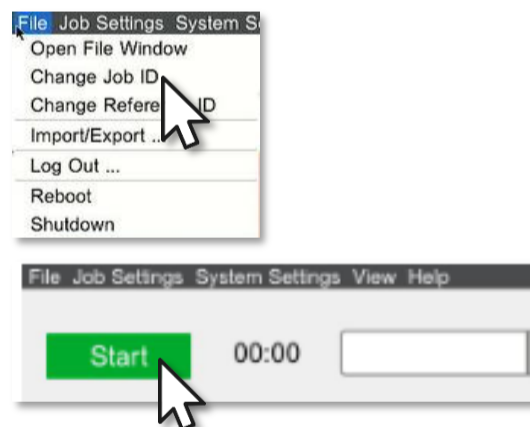
4-3: Save Settings

Click the "Apply" button in the lower right corner to save the settings.



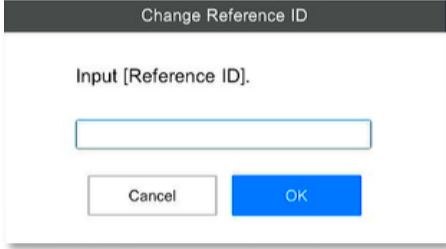


4-4: Confirmation of Settings

Return to the main screen, select the Job ID created in Process 7 from "Change Job ID" in the "File" menu, and confirm the judgment status with the [Start] button.



Operation procedure (worker mode)

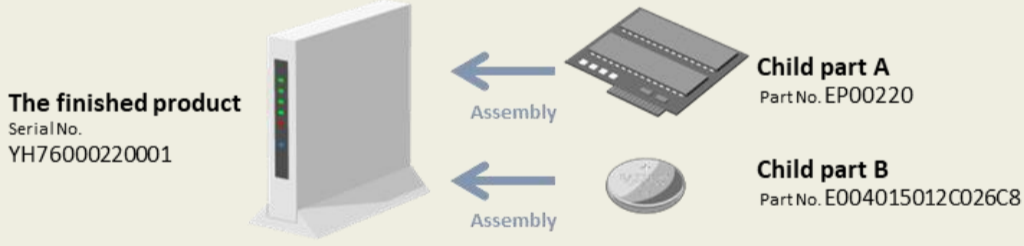
<p>Process 1: Login</p> <p>Log in with the worker's user ID.</p> <ul style="list-style-type: none"> * By logging in with a worker's user ID, you may operate the camera in worker mode. * User ID is recorded as data in the operation log. 	
<p>Process 2: Job ID</p> <p>Enter the Job ID from the pulldown.</p> <ul style="list-style-type: none"> * You may also select/switch Job IDs through pre-prepared barcode/two-dimensional code information or by receiving signals from external devices. 	
<p>Process 3: Reference ID</p> <p>Enter the Reference ID.</p> <ul style="list-style-type: none"> * The entered data will be recorded in the operation log. (The data entered will be recorded in the operation log.) * The camera flow starts automatically when the Reference ID is entered. 	

Tips about work ID

Q : How can I utilize the Reference ID?

A: This is used when you want to set a unique number for each inspection cycle and manage it. By entering individual information such as serial numbers, the information is recorded in the work log and can be used for traceability.

Usage example



The finished product
SerialNo.
YH76000220001

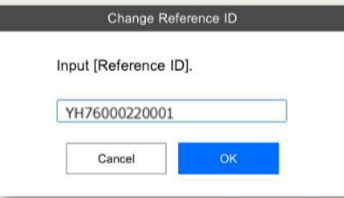
Child part A
PartNo. EP00220

Child part B
PartNo. E004015012C026C8


Assembly

Assembly

Leave logs of unique identifying numbers for each assembly operation.



Enter the serial number of the finished product in the Reference ID section*



Enter the serial number of each child parts in the Part No. section✘

* You may input data with a barcode reader. Reading data of barcodes/two-dimensional codes and OCR through the SC-20's camera is also possible when you install the optional functions.

Both the serial number of the finished product itself, and the serial number of the child parts are preserved in log data.

Both the serial number of the product itself and the serial numbers of the child parts are recorded in the log data.

1	2	3	4	5	6	7	8	9	10	11	12	14	15	20	21
Type of log (=1: Camera log) (=2: Job result log) (=4: Job ID result log)	Year, month, day	Time	Job ID	Reference ID	User ID	Instruction step name	Instruction item name	Standard (sec)	Elapsed time (sec)	Inspection step mode (=Matching)	Inspection step judgment result (1=OK, 2=FAIL)	Checkpoint ID	Checkpoint matching result (1=OK, 2=FAIL)	Matching processing time (msec)	Score for color matching
1	2025/2/3	15:23:42	Start												
2	2025/2/3	15:23:42	YH76000220	YH76000220001	worker	Work_1	Item_1	10	0	Matching	OK	1	OK	263	1
2	2025/2/3	15:23:42	YH76000220	YH76000220001	worker	Work_1	Item_1	10	0	Matching	OK	2	OK	240	1
2	2025/2/3	15:23:46	YH76000220	YH76000220001	worker	Work_2	Item_1	5	3	Data input	OK		EP00220		
2	2025/2/3	15:23:46	YH76000220	YH76000220001	worker	Work_3	Item_1	10	0	Matching	OK	1	OK	255	0.999
2	2025/2/3	15:23:51	YH76000220	YH76000220001	worker	Work_4	Item_1	5	4	Data input	OK		E004015012C026C8		
4	2025/2/3	15:23:51	YH76000220	YH76000220001	worker	OK									
1	2025/2/3	15:24:10	change S/N												
1	2025/2/3	15:24:11	Start												
2	2025/2/3	15:24:11	YH76000220	YH76000220002	worker	Work_1	Item_1	10	0	Matching	OK	1	OK	224	1
2	2025/2/3	15:24:11	YH76000220	YH76000220002	worker	Work_1	Item_1	10	0	Matching	OK	2	OK	217	1
2	2025/2/3	15:24:14	YH76000220	YH76000220002	worker	Work_2	Item_1	5	2	Data input	OK		EP00220		
2	2025/2/3	15:24:14	YH76000220	YH76000220002	worker	Work_3	Item_1	10	0	Matching	OK	1	OK	256	0.999
2	2025/2/3	15:24:19	YH76000220	YH76000220002	worker	Work_4	Item_1	5	4	Data input	OK		E004015012C026C8		
4	2025/2/3	15:24:19	YH76000220	YH76000220002	worker	OK									
1	2025/2/3	15:24:26	log out												
1	2025/2/3	15:24:34	Login												

The following settings can be made in the “Preset Settings” in the administrator mode to omit the input during the inspection flow.

Preset Settings

Job ID

Disable blank Job ID

Display the Job ID input dialog when the work flow is completed

Enter Job ID and Reference ID at the same time

Use a fixed Job ID

Use the camera code function for input

Enable Job ID Input Range

Extraction Start Point

Num. of Extracted Char.

Reference ID

Use a fixed Reference ID

Use the camera code function for input

By making either of the settings listed on the left, You may prevent the job number input dialog from appearing.