KEYENCE

VISION SENSOR

IV Series

QUICK SETUP GUIDE

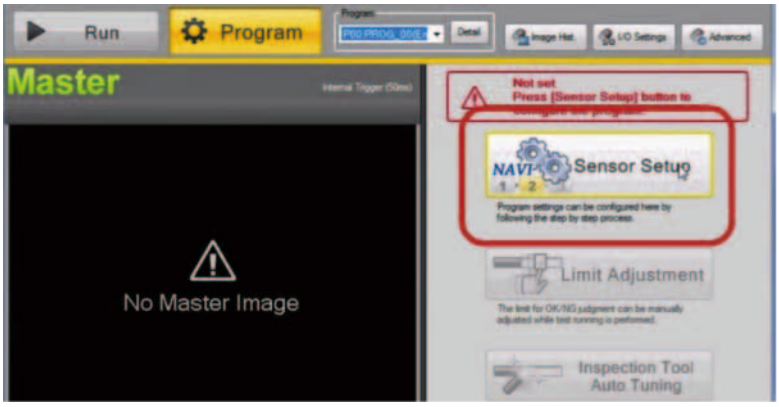
1094-1 611965

PC SETUP

The IV setup is a 4 step process.

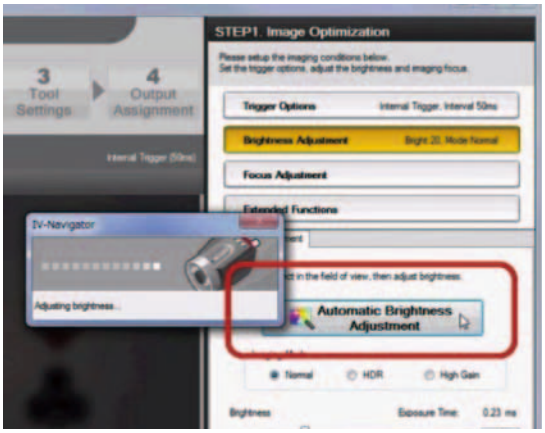
1. IMAGE OPTIMIZATION
2. SAVE MASTER
3. TOOL SETTINGS
4. OUTPUT ASSIGNMENT

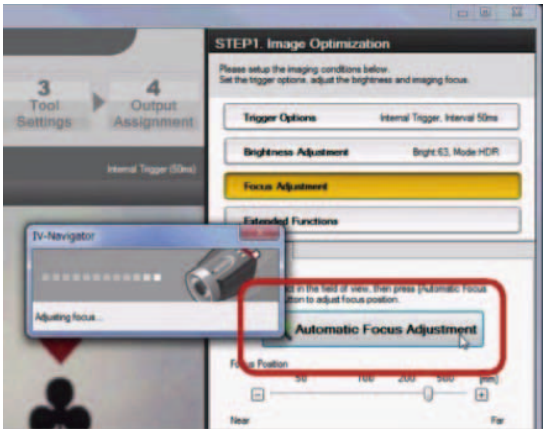
START BY SELECTING
SENSOR SETUP



STEP 1.
IMAGE OPTIMIZATION

First choose whether the trigger will be internal, at a desired interval, or external, when a signal is received. Next, you can automatically adjust the brightness and focus with just a single click.

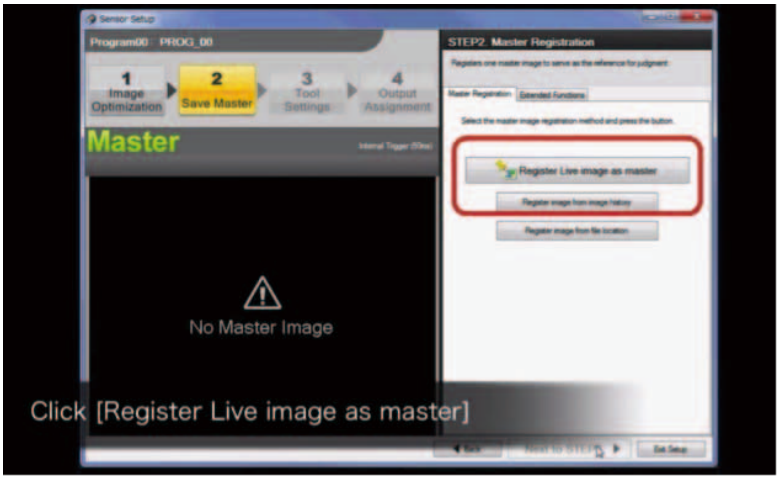




Automatic Brightness Adjustment will cycle through all the lighting options automatically to find the optimal brightness for the image. It can also be manually adjusted.
Automatic Focus Adjustment will cycle through all focal distances and finds the optimal distance based on the sharpness of the image. It can also be manually adjusted.

STEP 2.
MASTER IMAGE REGISTRATION

Here you can take a live image of the part under the camera and save it as the “master image” – the image upon which all tools will be built. Make sure this is a good representation of what your parts look like as this is the basis of a good part for inspection.

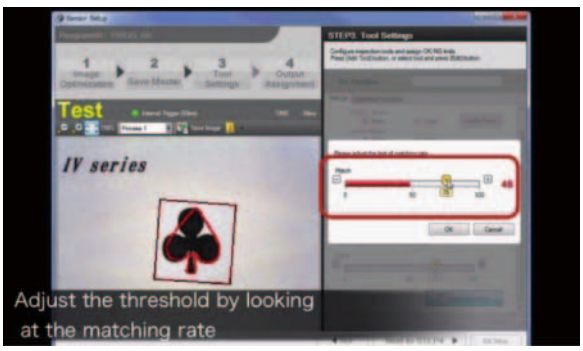


STEP 3.
TOOL SETTINGS

There are 3 different types of tools: outline tool, color area/area tool, and position adjustment. Begin by clicking the ‘Add Tool’ button.

1. OUTLINE TOOL – to distinguish the shape of a part

The outline tool automatically detects outlines of parts based on contrast. Drag and resize the box around the desired shape. “Remove Outline” can erase unnecessary outlines from inspection. You can also adjust the search region (where the IV will look for the outline within the field of view), sensitivity for picking up outline (high, standard or low), and the matching threshold for what is passing. A smaller search region and higher threshold will result in faster image processing times.

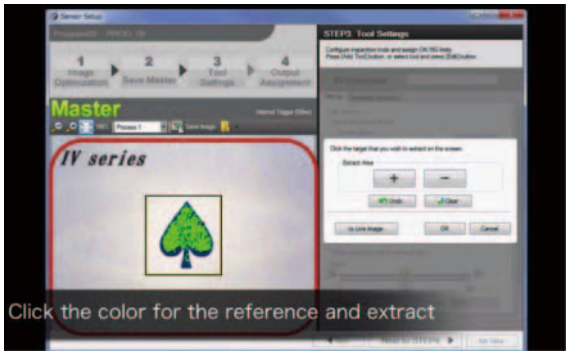


2. COLOR AREA/AREA TOOL –to detect the color/brightness of a part

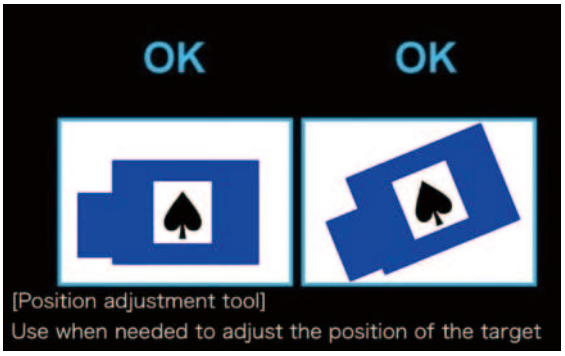
The color area tool looks at areas of similar color on the target object. The IV relies on more advanced HSV (hue, saturation, brightness) values rather than the typical RGB values to differentiate between colors. This allows for maximum flexibility in color detection.

You first will want to edit the tool window to cover the area where the IV will search for a certain color (or brightness on monochrome models). You can change the shape of the window and also create a mask over an area for the IV to ignore.

Color extraction allows you to adjust the threshold of allowed pixels which will be deemed OK by the IV. The larger the threshold, the more acceptable color (brightness) variations there will be.



3. POSITION ADJUSTMENT TOOL – to account for parts which may change in orientation



You should place the tool window over a unique section of the part which is present in both good and bad parts, so that the orientation can be easily recognized by the IV. The other tools will orient themselves based off of the position adjustment tool.

You can edit the tool window the same as the outline tool, as well as adjust sensitivity and remove outlines.

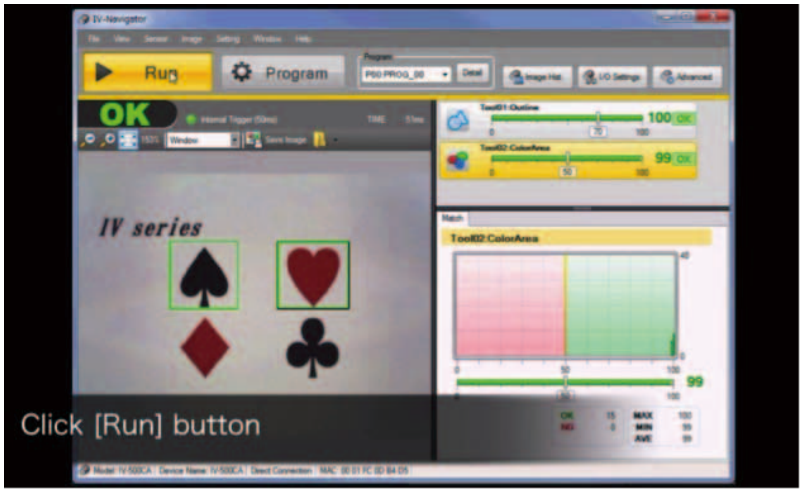
A maximum of 16 outline and color/area tools can be set for detection in addition to one position adjustment tool.

STEP 4.
OUTPUT ASSIGNMENT

After you are done adding tools, advance to Step 4: Output Assignment.

Here you can assign the desired functions for the 4 output wires. Each output is assigned to a specific wire coming out of the IV. The outputs can vary between things like overall status (OK or NG judgment), run, busy, error, status of a specific tool, or logic results. When these have been set, click complete and return to the main menu.

At the main menu, you can test your settings by clicking ‘Run’ and opening the run window.



This will display the program working in real time. Specific tool conditions can also be monitored in the upper right-hand of the window.

IMAGE OPTIMIZATION

The section describes how to properly capture an image with the IV's automatic adjustment tools – brightness and focus.

TARGET:

Achieving the optimal image by adjusting the brightness and focus

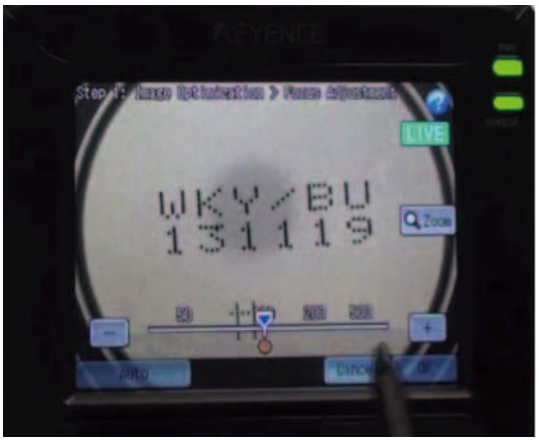
1. MULTICOLOR CONNECTOR

BEFORE ADJUSTMENT:

AFTER ADJUSTMENT:

There is a great benefit to image quality by using the auto adjusting features of the IV.
Begin by clicking "Sensor Setup" in the main window. This will take you to Image Optimization. After choosing the trigger type, move on to brightness adjustment. With one click, the IV will try all possible brightness settings and determine which one illuminates the part the best.
With the brightness set, advance to the focus adjustment section. Just as the IV selected the optimal brightness, it will also choose the optimal focus position. In fact, if there are multiple focal points in the image, the IV will allow you to choose which one you want by selecting corresponding marks underneath the focal range selector.

The IV has two external lighting attachment options: the polarizing filter and the dome attachment. The polarizing filter is generally used for shiny printing such as reflective labels, and the dome attachment is generally used for reflective or unevenly shaped objects. If you can't get a good image initially, try using one of these attachments.



HS-HDR FUNCTION

This section describes how to properly use the HS-HDR (high speed, high dynamic range) lighting function to obtain optimal images.

TARGET1:

Capture the image of an irregularly shaped metal part

WITHOUT HDR:

WITH HDR:

The light is spread evenly around the part – there are no places which are too dark, yet there are also no places with too much glare. HDR spreads light evenly on metal surfaces.

TARGET2:

Capture the image of a colorful crimp contact

WITHOUT HDR:

WITH HDR:

When using the HDR function, each color is vividly and uniquely displayed. When HDR is not used, green and black begin to look similar, and yellow looks like white. HDR shows the crimps' true colors the most accurately.

USING THE POLARIZATION FILTER

This section describes how to properly utilize the polarization filter.

TARGET: Capturing the image of a shiny printed material

BAD (WITHOUT FILTER):

GOOD (WITH FILTER):

The polarization filter simply slides onto the front of the IV, guided by the built in grooves.

The polarization filter is useful for reducing glare on reflective and glossy surfaces by blocking light waves into the CMOS in the same direction as they were emitted.

USING THE DOME ATTACHMENT

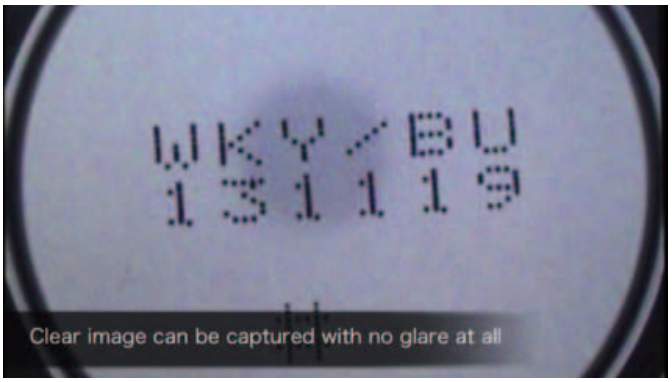
This section describes how to properly utilize the dome attachment.

TARGET:

Capturing printed characters on a glossy metal surface

BAD (WITHOUT ATTACHMENT):

GOOD (WITH ATTACHMENT):



The dome attachment simply slides onto the front of the IV, guided by the built in grooves.

The dome attachment should be primarily used to reduce glare on reflective surfaces due to the high powered LEDs. It is also capable of spreading light evenly over uneven surfaces to prevent shadows within the image.

MULTICOLOR DETECTION

This section explains how to set up a multicolor detection scenario with the IV.

TARGET: Color detection of a crimp contact

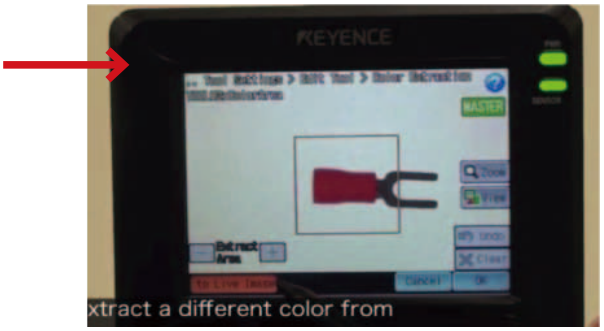
GOOD: READ, GREEN, YELLOW

BAD: BLUE, BLACK

Begin “Sensor Setup” and adjust brightness and focus with one of the OK parts in the IV’s field of view. Register the master image.

Next, create a color area tool and extract the color from the OK part.

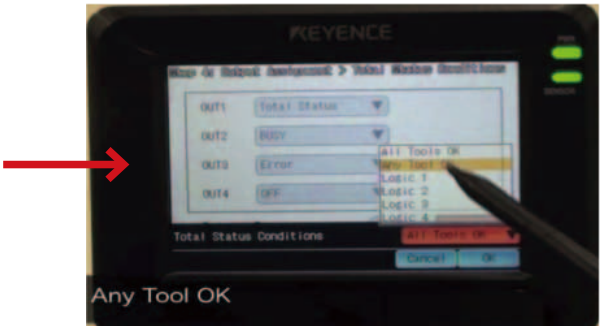
After creating the first tool, create another one to register a different color. To extract a different color, select “Extract from live image”. Put the second OK part into the field of view so that you can extract its color.



Enable “Fixed Reference Area” (either “Small” or “Large” depending on size) because this second color doesn’t exist inside the master image.

Create a third color area tool with the final OK part in the same way you created the second tool.

In “Output Assignment”, change the total status condition to “Any Tool OK”.



LABEL ALIGNMENT

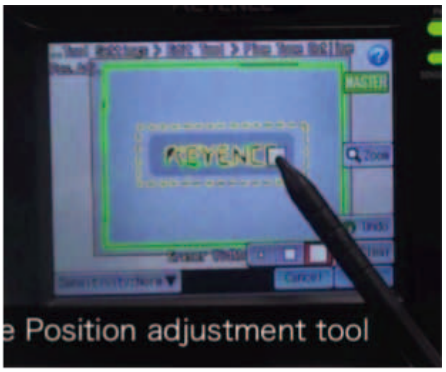
This section describes the advanced settings of the outline and color area tools, and how they can be used in conjunction.

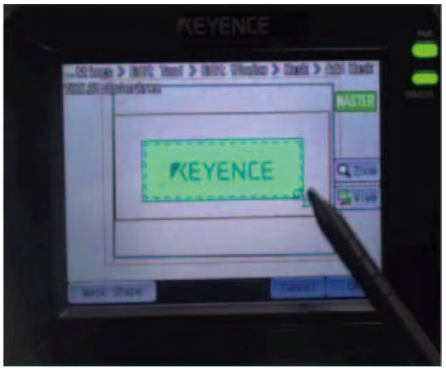
TARGET: Detect misalignment of a label

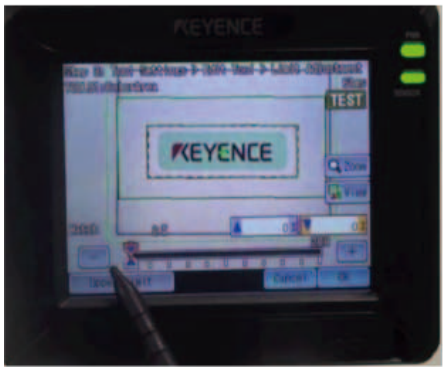
GOOD: ALIGNED

BAD: MISALIGNED

Begin by clicking “Sensor Setup” from the main window. Adjust imaging settings and register the OK part as the master image. Add the position adjustment tool around a unique feature on both OK and NG parts. Remove the outlines from the label and outline box so that the IV will be able to find the label anywhere in the FOV. Add the color area tool and include the OK part inside the tool window. Add a mask to cover the OK area. This will allow you to detect the presence of the label color outside of the OK area. Expand the search area around the OK area. Enable “Fixed reference area” in extended settings and select “Small”. Extract the color from the label in the live image outside of the mask.
Enable the upper limit of the threshold and set both the upper and lower limits to 0. This setting will output a NG if a color is detected outside the OK area.





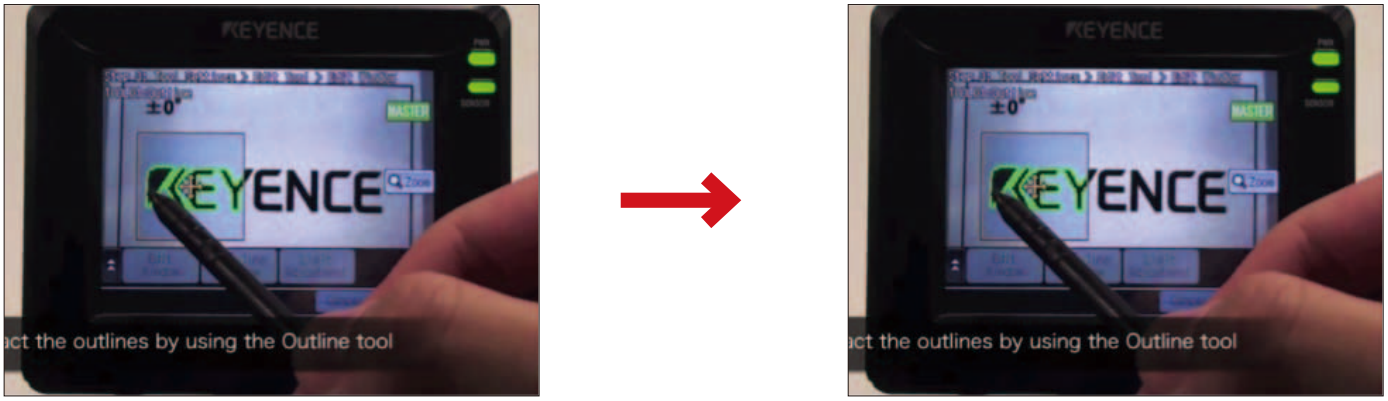


ROTATION RANGE

This section demonstrates the rotation range function used in the outline tool and position adjustment tool.

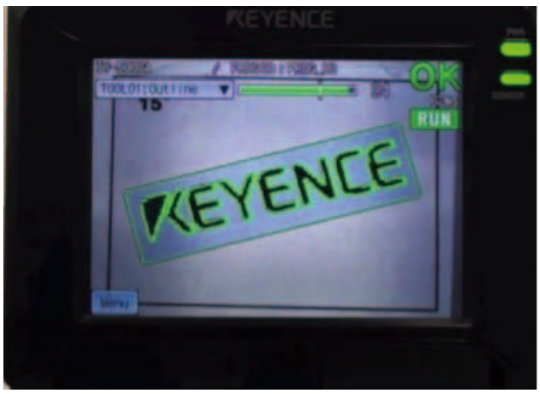
TARGET: Allow for part rotation

Start by creating an outline tool as normal.

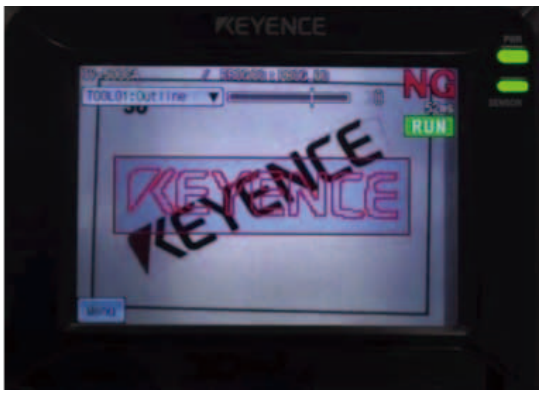


Under the extended functions tab, you can set the rotation range to be anywhere between ±0˚ to ±180˚. The range that you set will determine what degree of rotation is registered as OK or NG. Turning on the "Margin" will allow for an additional few degrees of rotation beyond the range if judgment is unstable.

EXAMPLE: When the rotation range is ±20˚

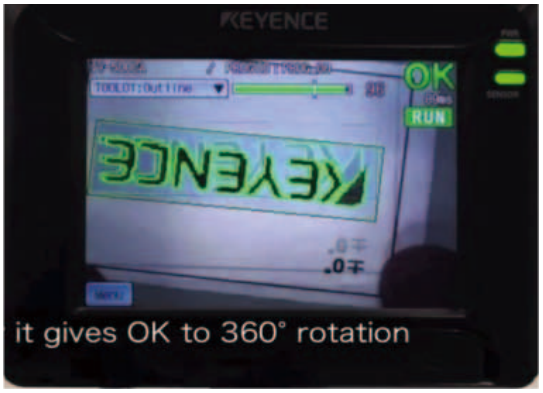


At 15˚ rotation:



At 30˚ rotation:

When the rotation range is ±180˚, the part will be OK at all possible rotations:

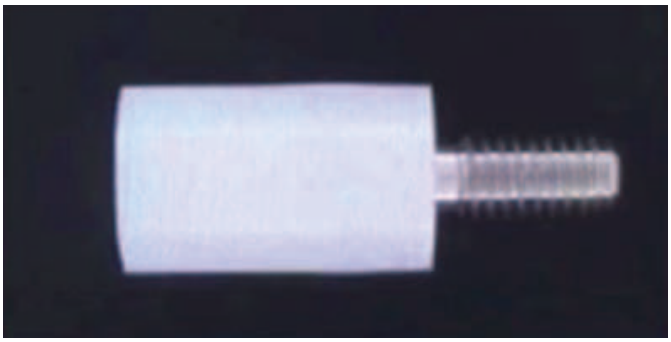


LOGIC FUNCTION

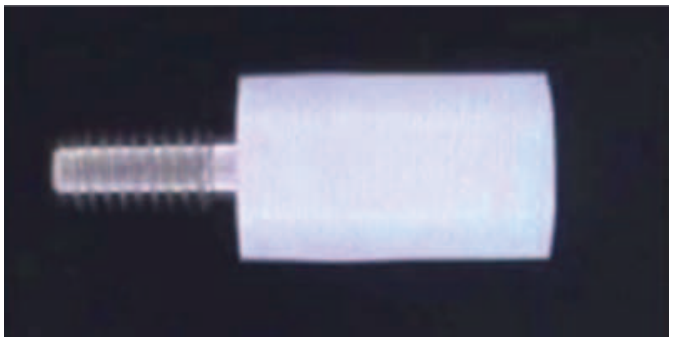
This section demonstrates a quick example of how to use the IV's logic output function.

TARGET: Detection of a screw with proper orientation

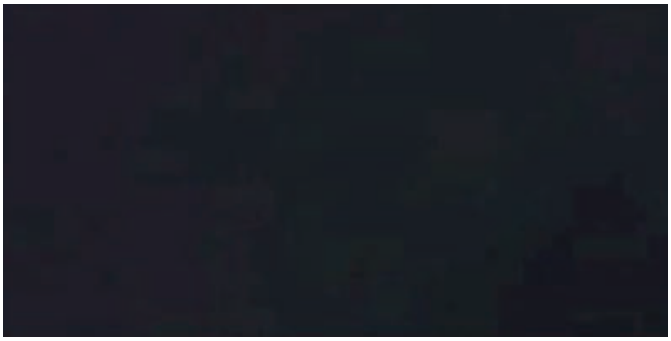
GOOD: SCREW ORIENTED RIGHT



BAD: SCREW ORIENTED LEFT

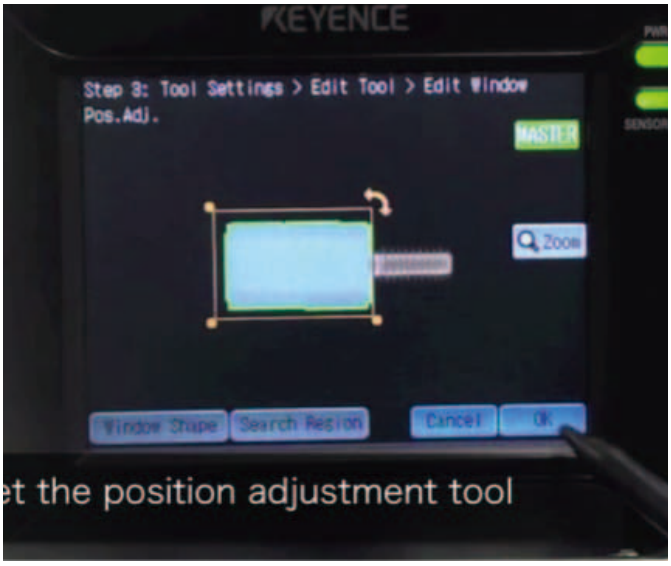


GOOD: NO SCREW



GOOD: TARGET OUTSIDE OF IMAGING AREA

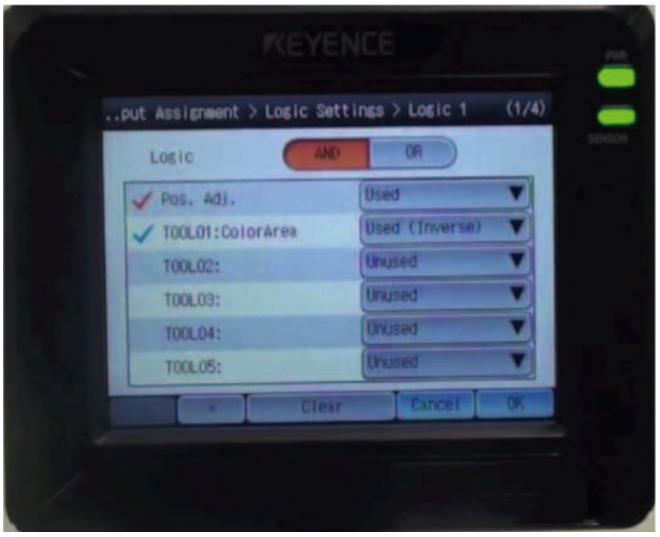
Ultimately, all images are good except when the IV sees a screw pointed left.
First, set the position adjustment tool around the white rectangle and designate the search region.



Set the color area tool and adjust the search region to detect the direction of the target.

In step 4 “Output Assignment”, set up the logic output function. Click on Logic 1 and select “used” for position adjustment and “used inverse” for the color area tool. Confirm the logic type is “AND”.

The logic will be true when position adjustment is OK and color area is NG.



Lastly, change the “Total Status Conditions” to “Logic 1”. With these settings, the IV will only output NG when a bad part is sent through. It will output OK at all other times.

HIGH SPEED TARGET DETECTION

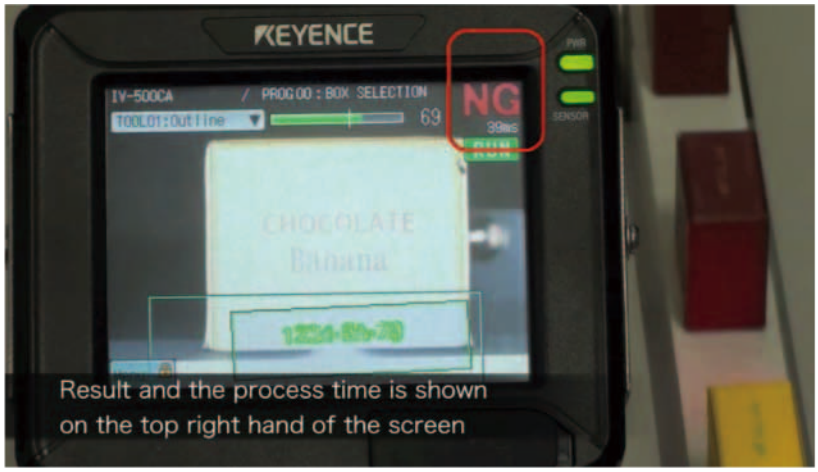
This section describes how to set up the IV to detect targets moving at high speeds.

TARGET: Print and coloring on packaging

GOOD:

Bad:

Begin by clicking “Sensor Setup” from the main window. Adjust imaging settings and register the master image for judgment.
Choose an Outline tool to look for the text. Select “High Speed Search Algorithm” under Extended Functions.
Choose a Color Area tool to look for the package coloring. A smaller tool window can result in faster processing times.
Additionally, fewer tools and a shorter “Imaging Area” (Extended Function in Imaging Optimization) can speed up the processing time.
Go to Output Assignment and complete setup. Test results in Run mode. Check the processing time in the upper right hand corner of the display.

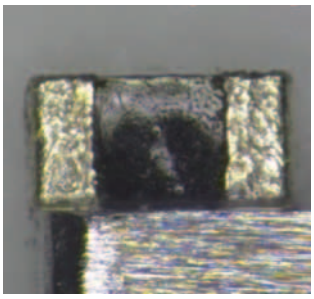


ULTRA SMALL TARGET DETECTION

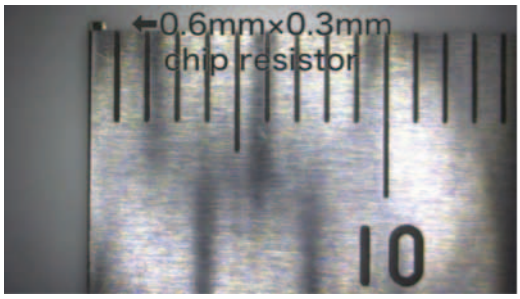
Monochrome models offer a function called Digital Zoom to provide stable detection for very small targets.

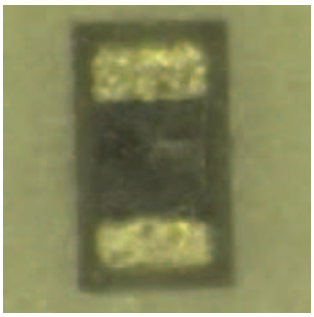
TARGET: 0.6 × 0.3 mm resistor

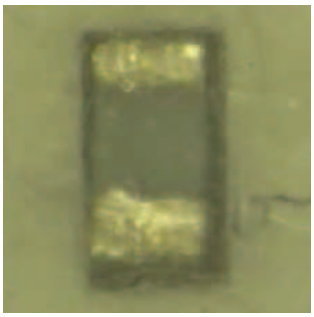
GOOD: FACE UP



BAD: FACE DOWN OR EMPTY



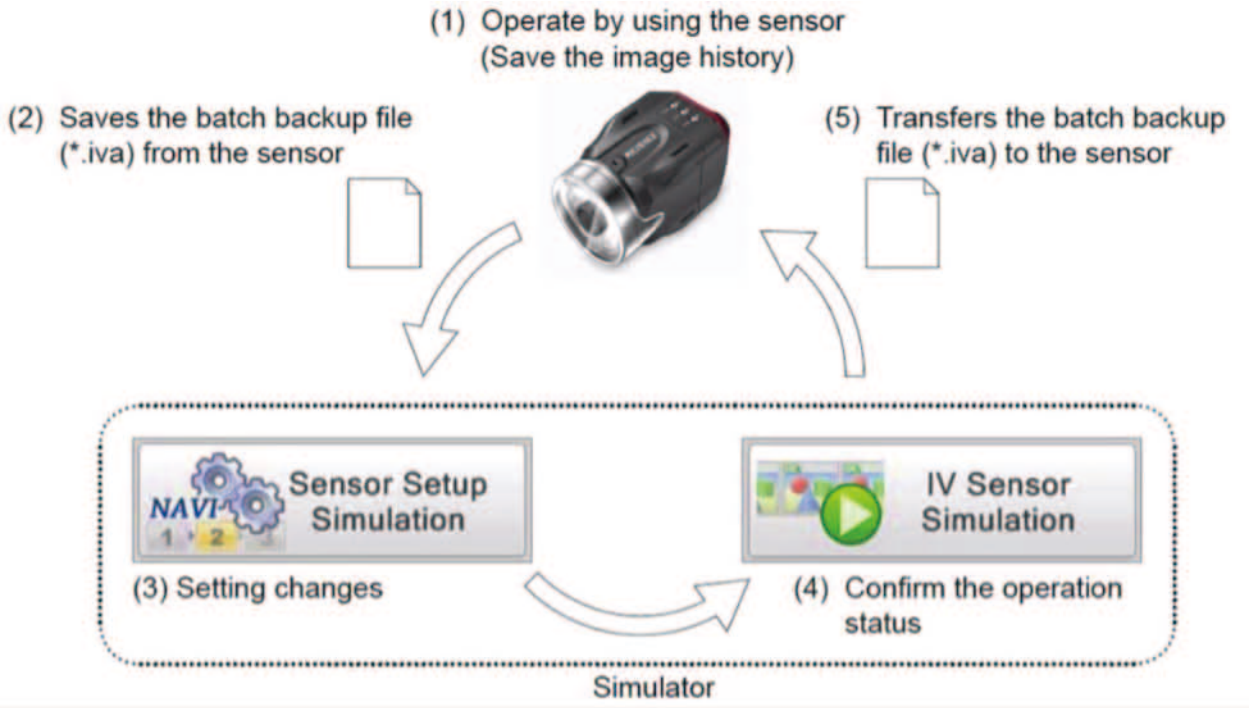




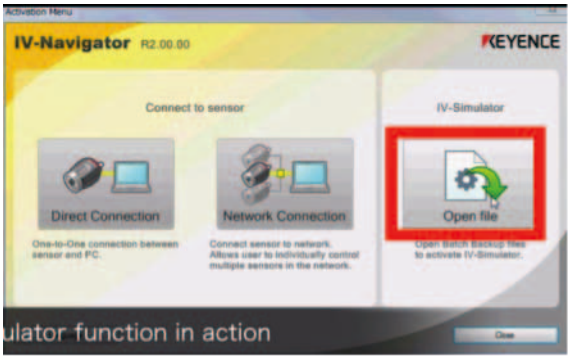
Begin by clicking “Sensor Setup” from the main window. Use the Auto Brightness Adjustment and Auto Focus Adjustment with the target in the IV’s field of view.
Go to Extended Functions and select “Digital Zoom” to magnify the target to four times greater resolution. Change the Imaging Area to “Partial” and limit the field of view to improve the processing time.
Register the master image for judgment.
In Tool Settings, set up the desired tools.
In the example, the area tool is used. Go to Output Assignment and complete. Test results in Run mode.

SIMULATOR FUNCTION

This section describes how to use the IV Navigator software's simulator function for situations such as confirming settings offline or testing different settings without affecting the current operation.
To use the simulator, you must first save a batch backup file (including images) from the IV while working normally. You can open this file in the simulator and change sensor settings and confirm the new operation conditions based off of the saved images. It is then possible to save the new settings and upload them to the IV in question. The simulator is convenient when you are not in the same location as the IV or need to troubleshoot offsite.

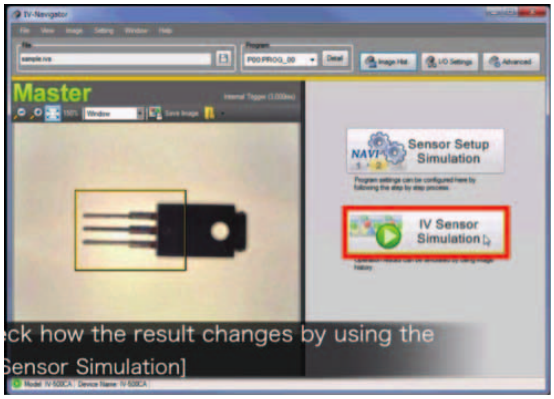


Start by clicking on "open file" under IV Simulator. Then open the .iva file you want to view/edit.



Then choose “Sensor Setup Simulation”. Image optimization settings can only be viewed, not edited. You can however adjust the tool settings based off of the master image. Adjust them to meet your needs and save the settings.

Check how the result changes by using the IV Sensor Simulation.



Selecting the image history will allow you to confirm the results. Click the batch retest button to test the entire image history with the new settings. This will allow you to confirm that your changes are adequate or if you need to go back and re-adjust settings.
It is also possible to change the matching level threshold to confirm the effectiveness of the settings.