Robotics, Integration, and Automation

INTEGRATING THE VISION SENSOR

Name	Class/Period	Date

1. Overview

In this lab activity, you will add the vision sensor (QC camera) to the SmartCart LAN and create a rudimentary camera job.

2. Performance Objectives

After completing this lab activity, you will be able to:

- Add the QC camera to the SmartCart network.
- Update camera firmware.
- Create an In-Sight Explorer job.

3. Required Materials

You need the following materials to complete the lab activity:

- SmartCart 4.0
- Computer
- Ethernet cables
- Flat Screwdriver
- Workpieces (blocks)

4. Required Software

In-Sight Explorer is required for this lab activity. If you are having problems installing or licensing the software, contact your instructor or IT manager.

5. Inventory and Safety

Before beginning the lab activity, review this checklist and mark off each item as you complete it.

- ☐ All hardware components are available for this lab activity.
- ☐ Hands, hair, and clothing are securely away from the work area.
- ☐ The work area is clean and devoid of food or drink.
- ☐ Review the SmartCart safety guidelines.
- ☐ Read through the entirety of this lab activity to familiarize yourself with the requirements.

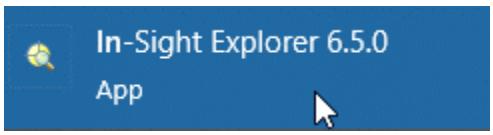
6. Lab Activity

6.1. Adding the Camera to the LAN

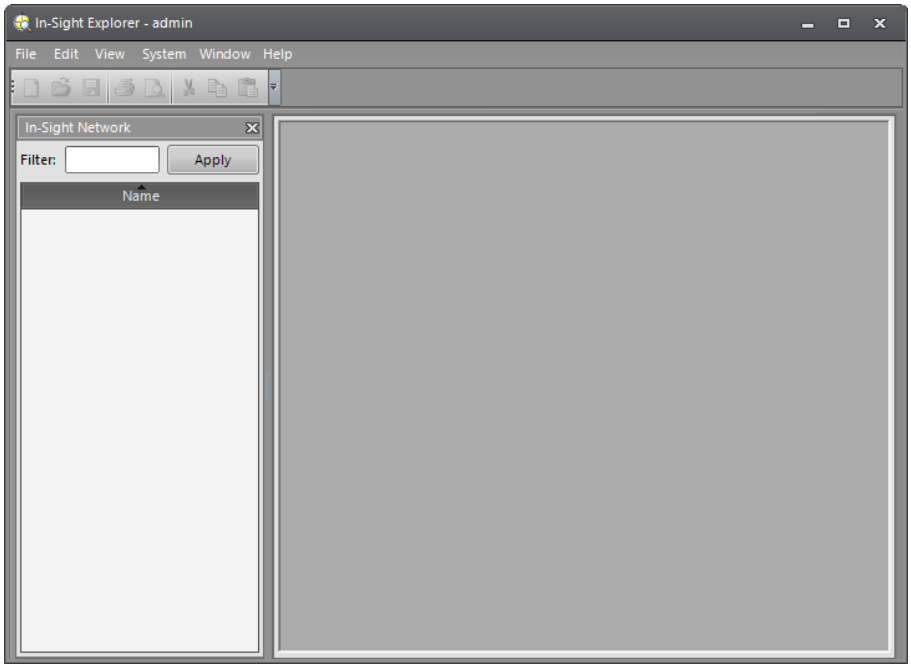
In this task, you will add the IS2000 vision sensor to the SmartCart LAN.

Complete these steps:

1. Check that your SmartCart 4.0's Cognex IS2000 vision sensor's power cable is connected to the I/O box and the green Ethernet cable is connected to the switch. Ensure also that your workstation is connected to the switch via an Ethernet cable.
2. Turn on the I/O box. Ensure that the vision sensor powers on.
3. Ensure that your workstation's IP address is set to **192.168.0.1** and the subnet mask to **255.255.255.0**. Change the IP address and subnet mask of the workstation If necessary.
4. Launch In-Sight Explorer.

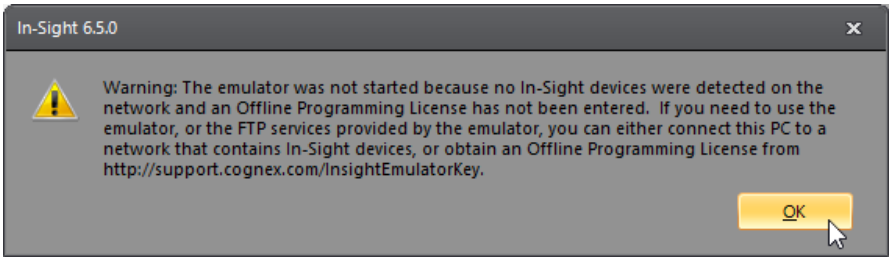


The In-Sight Explorer window is displayed. There should not be any devices listed yet.

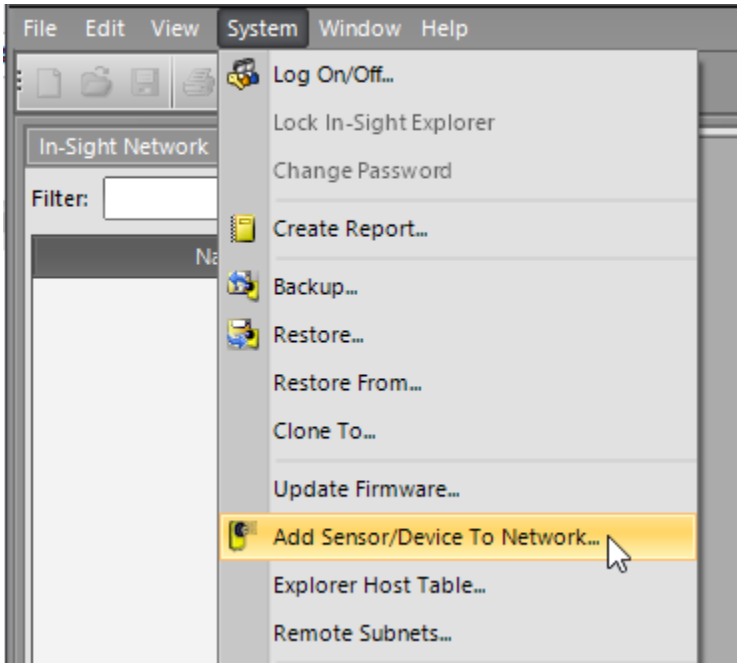


ⓘ ***Note:*** *If the vision sensor is listed, perform the reset steps in* ***Section 8.1 Resetting the Camera to Factory Defaults*** *on page 22 and then continue with this task.*

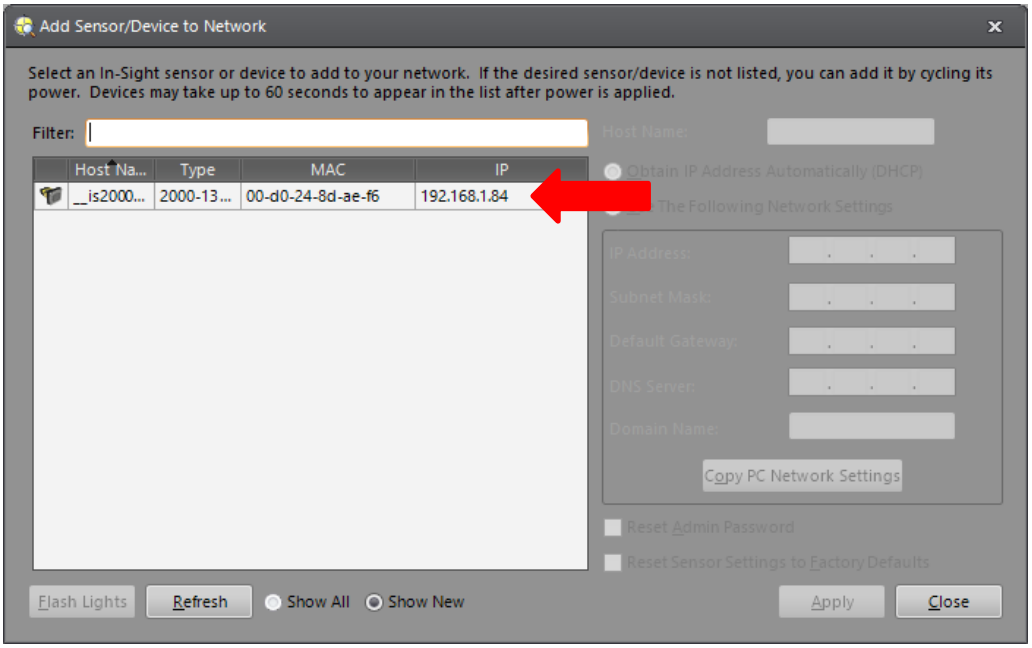
5. If prompted by a warning, close the window or click **OK**.



6. Select **System > Add Sensor/Device to Network**.

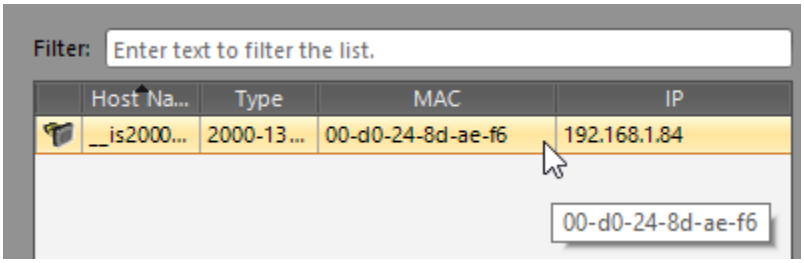


The Add Sensor/Device to Network window opens. The SmartCart's IS2000 vision sensor is displayed in the list of devices, even though its IP address is not on the LAN.



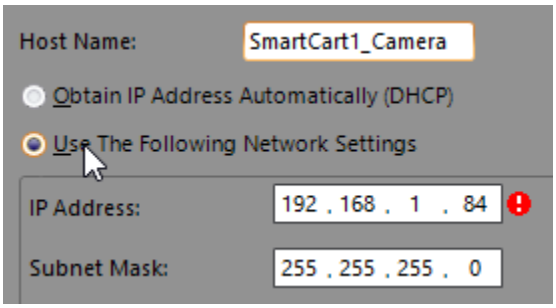
ⓘ ***Troubleshooting Tip:*** *If the vision sensor is not listed, select* ***Show All*** *at the bottom of the window. If it is still not listed, check the physical connection of the vision sensor to the switch. The vision sensor's green Ethernet cable may have come loose during fixturing.*

7. Select the vision sensor.

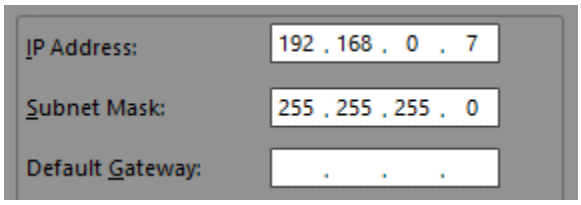


8. Change the Host Name to something that will help you identify the device later.

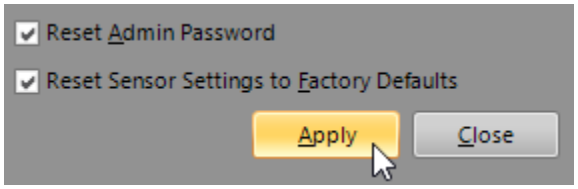
9. Select **Use The Following Network Settings**.



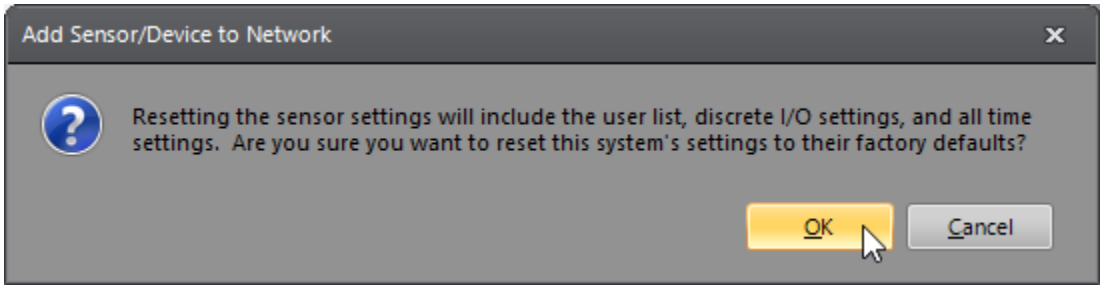
10. Change the IP Address to **192.168.0.7**. Keep the Subnet Mask at **255.255.255.0**, and leave the other fields blank.



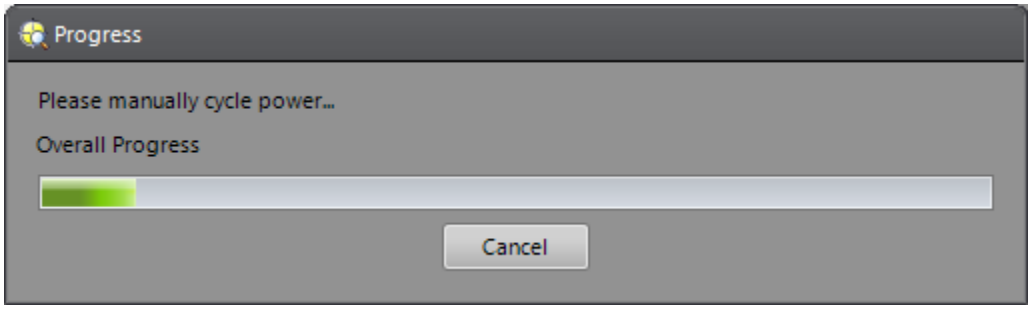
11. Check the **Reset Admin Password** and **Reset Sensor Settings to Factory Defaults** options and then click **Apply**.



12. A popup dialog is displayed. Click **OK**.



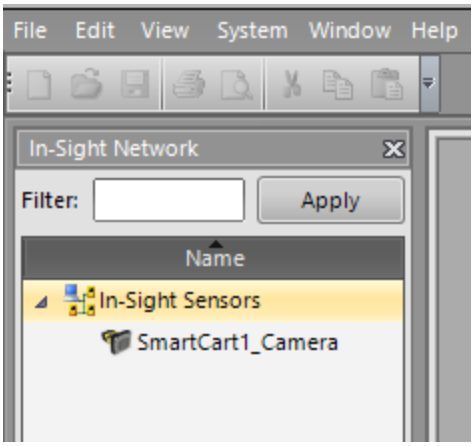
13. The Progress window is displayed. Turn the I/O box off and then on again.



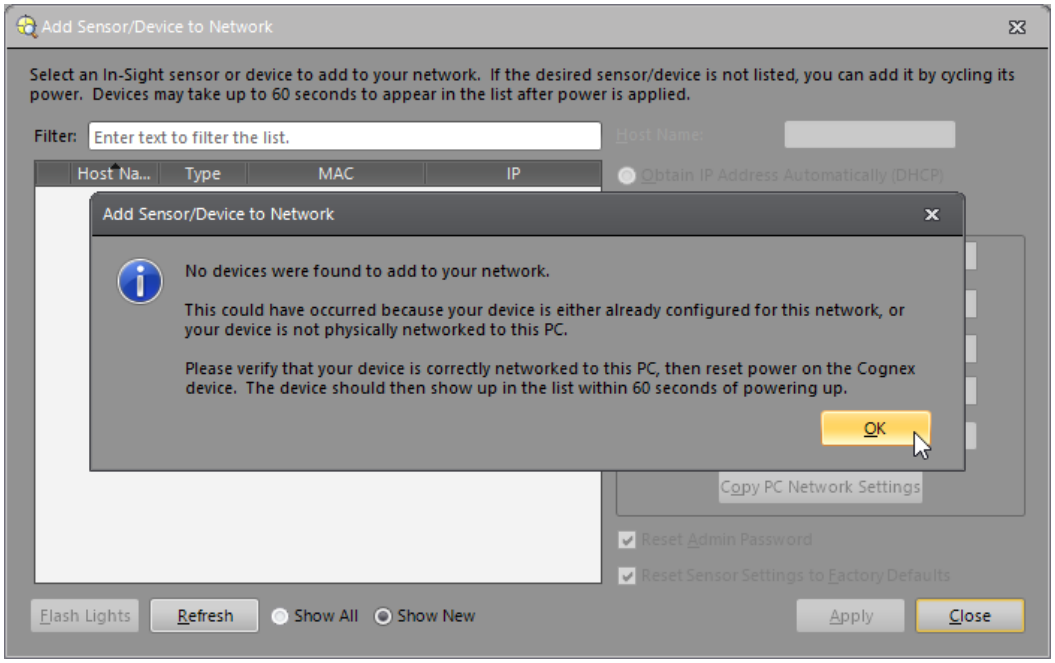
ⓘ ***Note:*** *You may be prompted to cycle the power several times.*

14. The network settings are changed. Click **OK**.

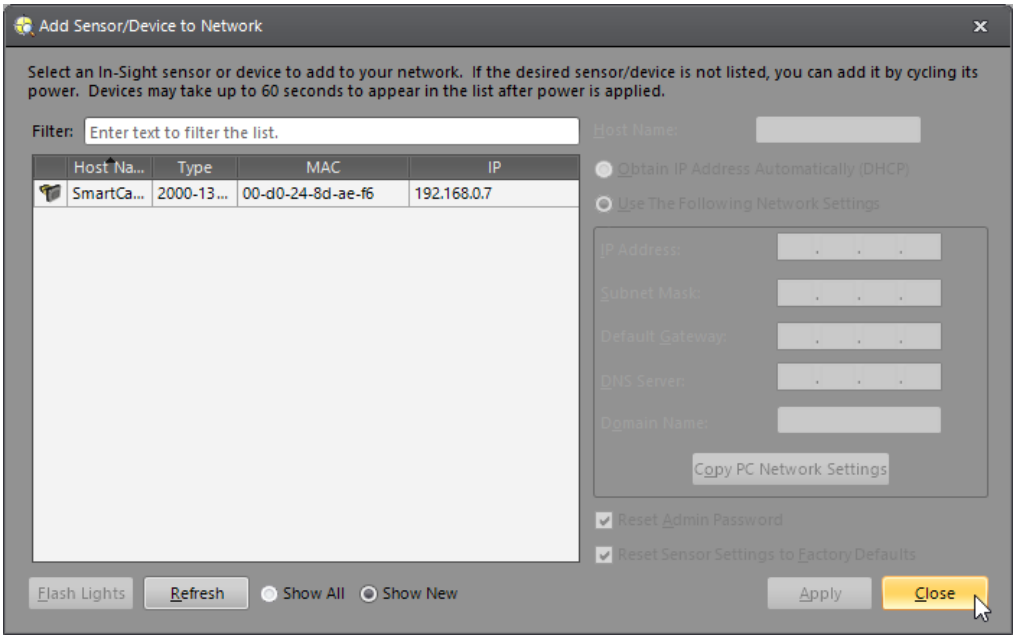
The SmartCart vision sensor is added to the list of devices on the left side of the In-Sight Explorer window.



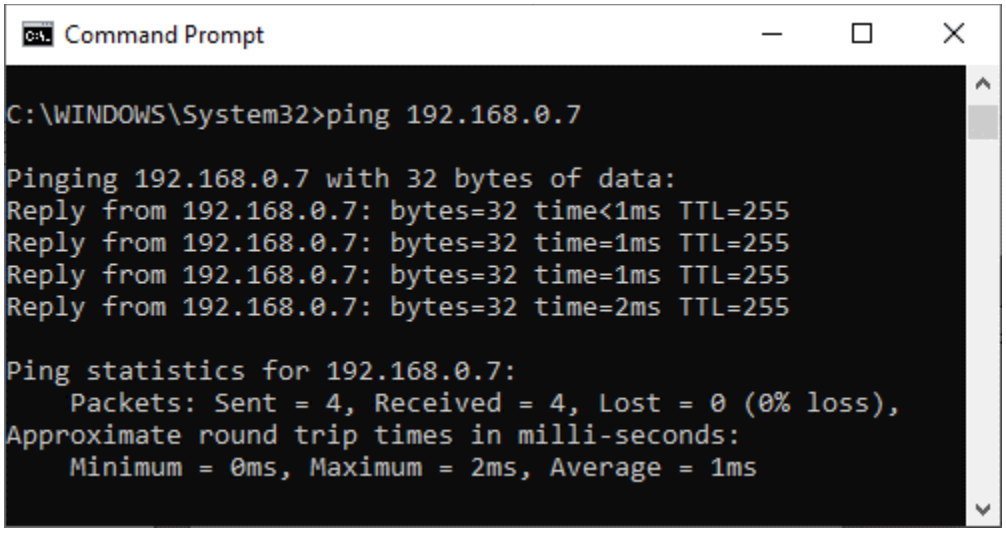
15. Close the popup window.



16. Close the Add Sensor/Device to Network window.



17. Run the Windows Command Prompt and ping **192.168.0.7** to confirm network connectivity.

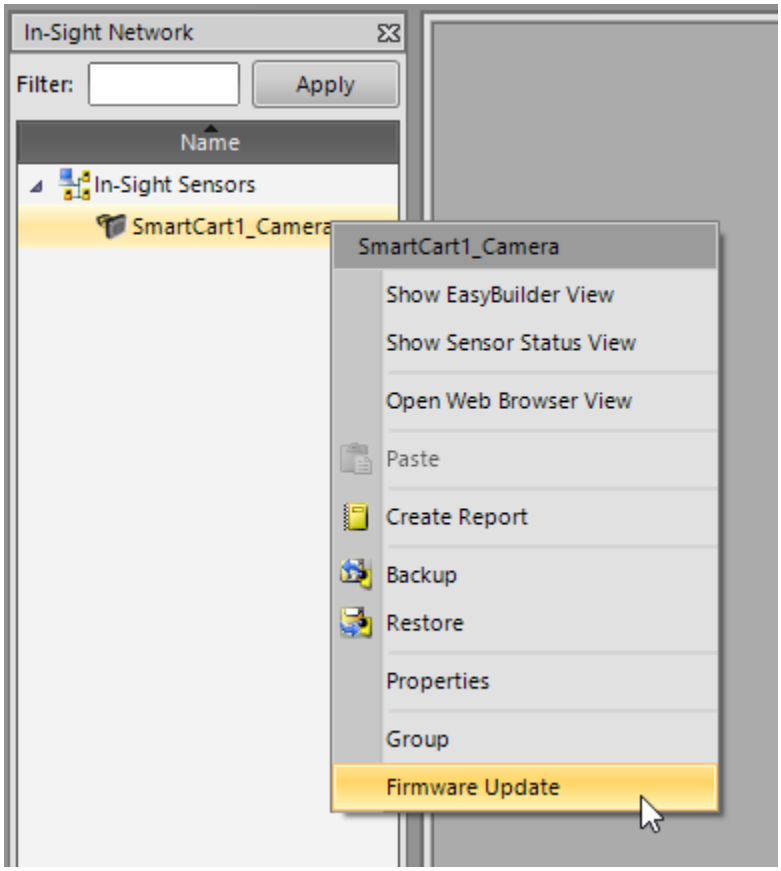


6.2. Updating Camera Firmware

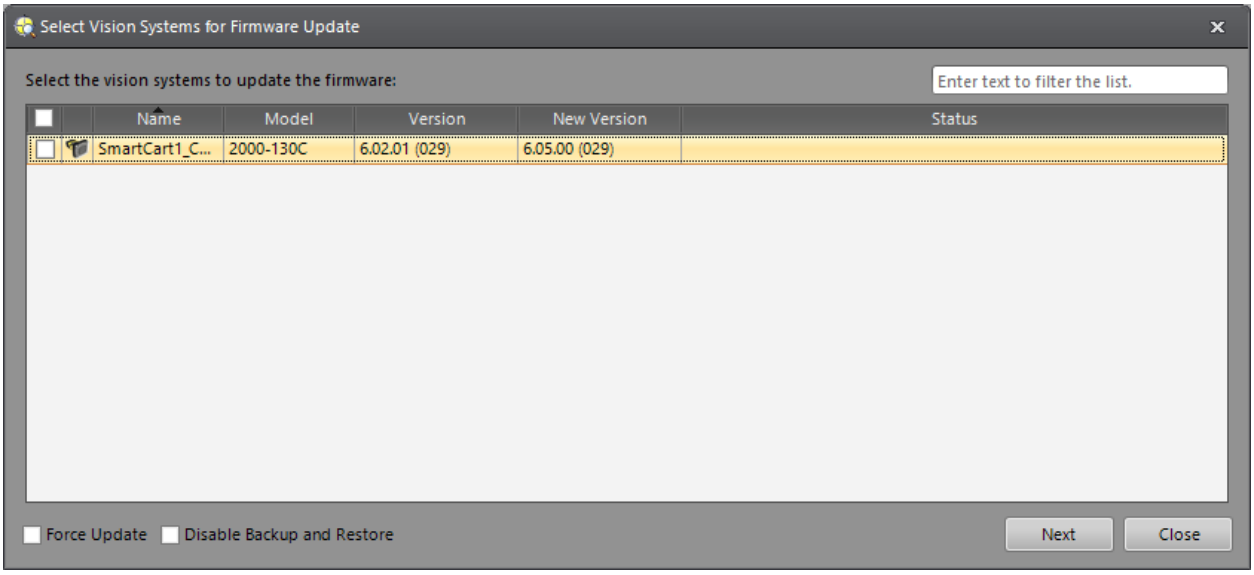
In this task, you will update the vision sensor's firmware.

Perform these steps:

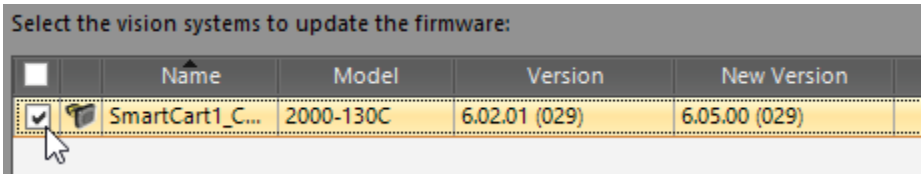
1. In the In-Sight Network pane, right-click the SmartCart's vision sensor. In the popup list, select **Firmware Update**.



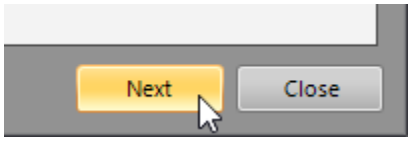
The Select Vision Systems for Firmware Update window is displayed.



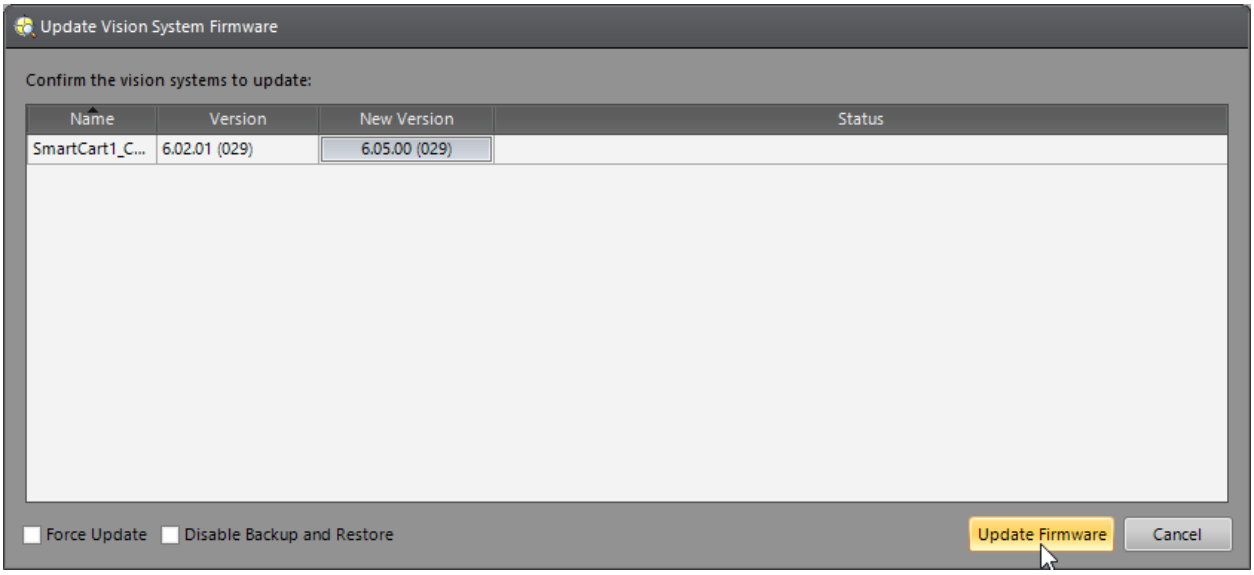
2. Select the SmartCart QC camera.



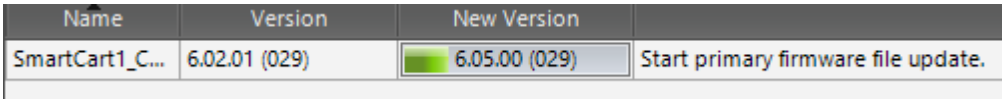
3. Click **Next**.



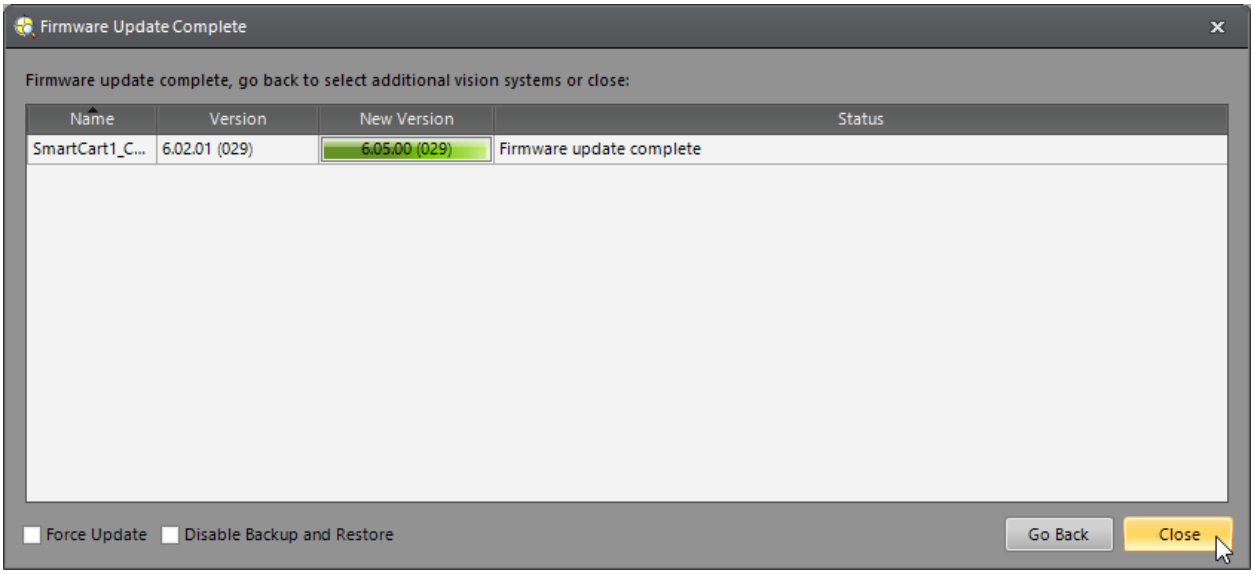
4. The Update Vision System Firmware window is displayed. Click **Update Firmware**.



5. Wait patiently for the firmware to update and for the camera to restart. The process may take several minutes.



6. When the firmware update is complete, click **Close**.



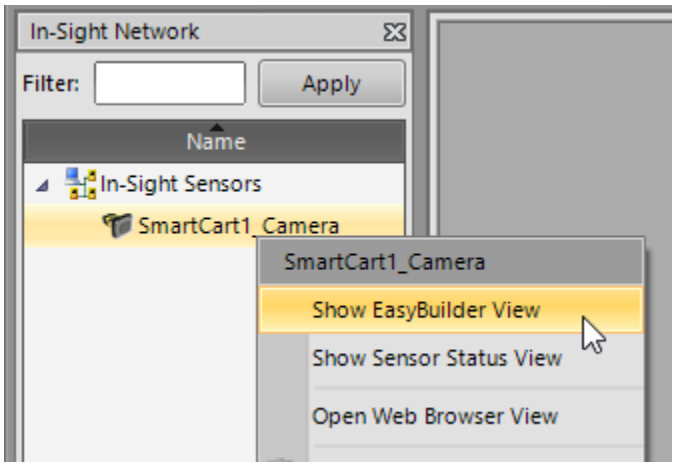
6.3. Creating a Job with EasyBuilder – Initial Steps

In this task, you will follow the EasyBuilder steps to create a camera job for identification and inspection of a specific color of workpiece (block). The job should register a pass for the block of the correct color and a fail for blocks of other colors.

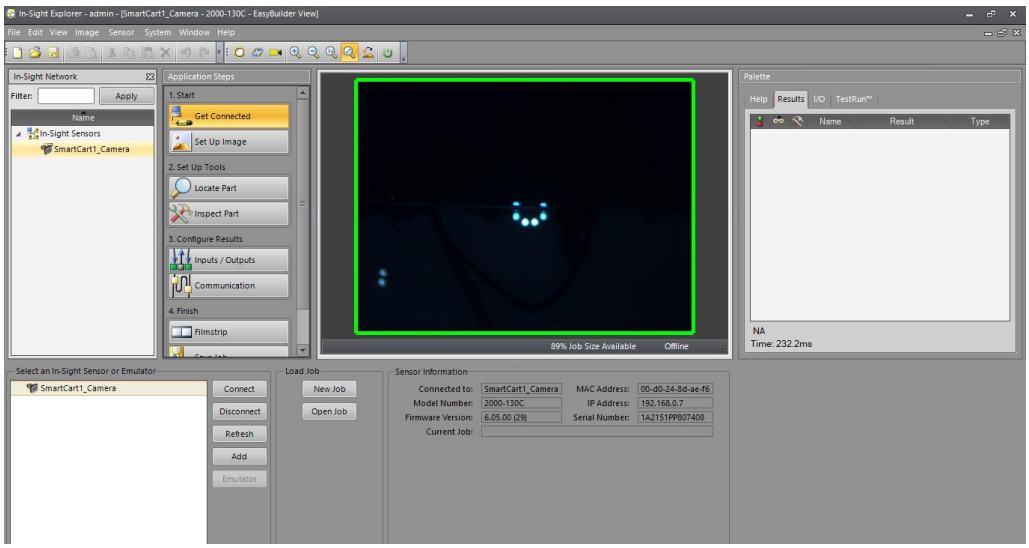
In this example, a yellow block is used. You may use any color of block for your system.

Perform these steps:

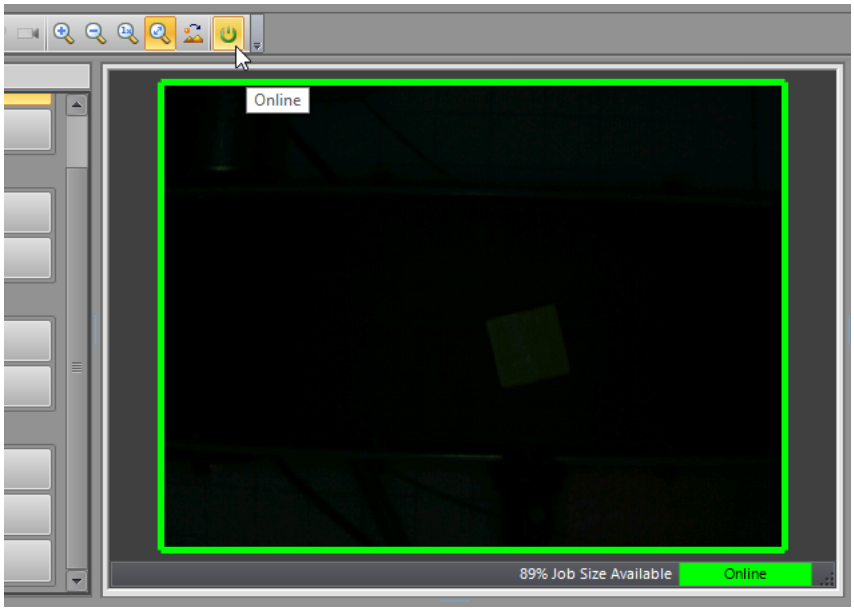
1. Place the block under the camera.
2. In the In-Sight Network pane, double-click the SmartCart camera or right-click it and select **Show EasyBuilder View**.



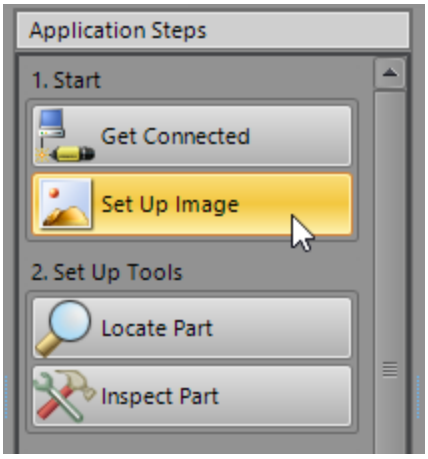
The EasyBuilder view is displayed.



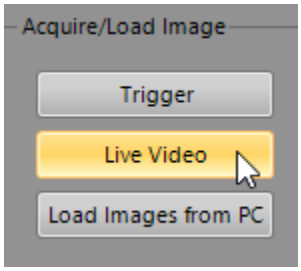
ⓘ *Note: Ensure that the camera is **Offline**. If it is Online, click the Online/Offline button to turn the camera offline.*



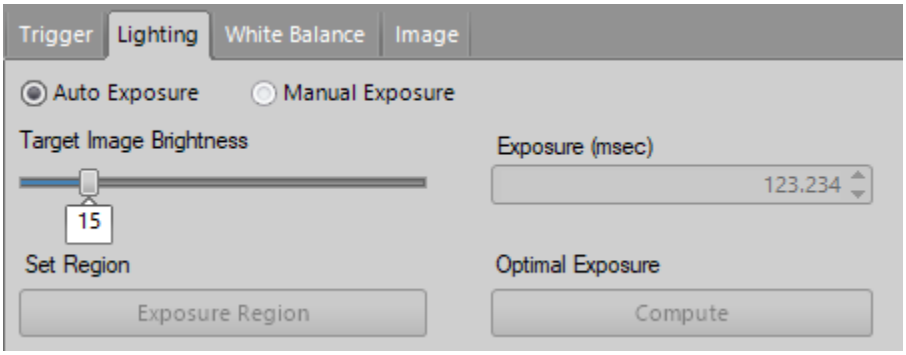
3. Click the **Set Up Image** step.



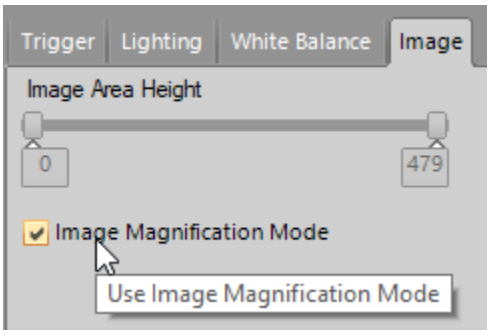
4. In the Acquire/Load Image area on the bottom left, select **Live Video**.



5. Adjust the lighting and exposure using the settings in the Lighting tab.

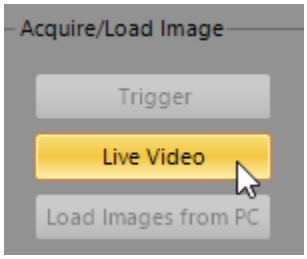


ⓘ ***Note:*** *If necessary, navigate to the Image tab and select Image Magnification Mode.*

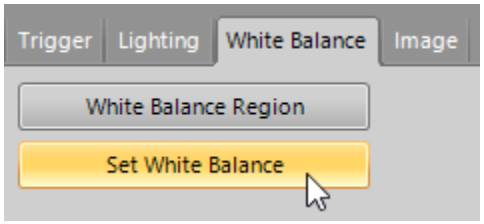


6. Adjust focus by slowly turning the screw at the back of sensor's light module using a flathead screwdriver.

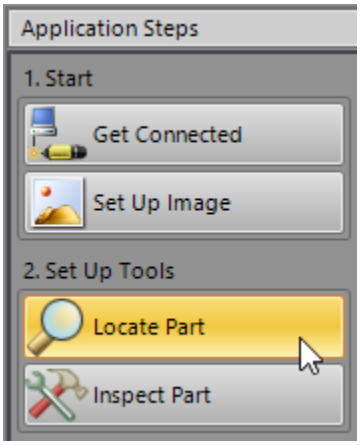
7. Click **Live Video** to stop live video.



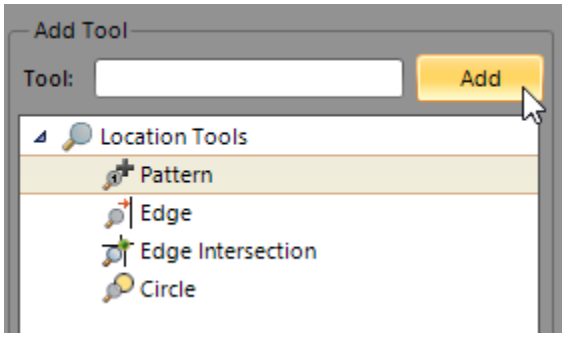
8. In the White Balance tab, click **Set White Balance**.



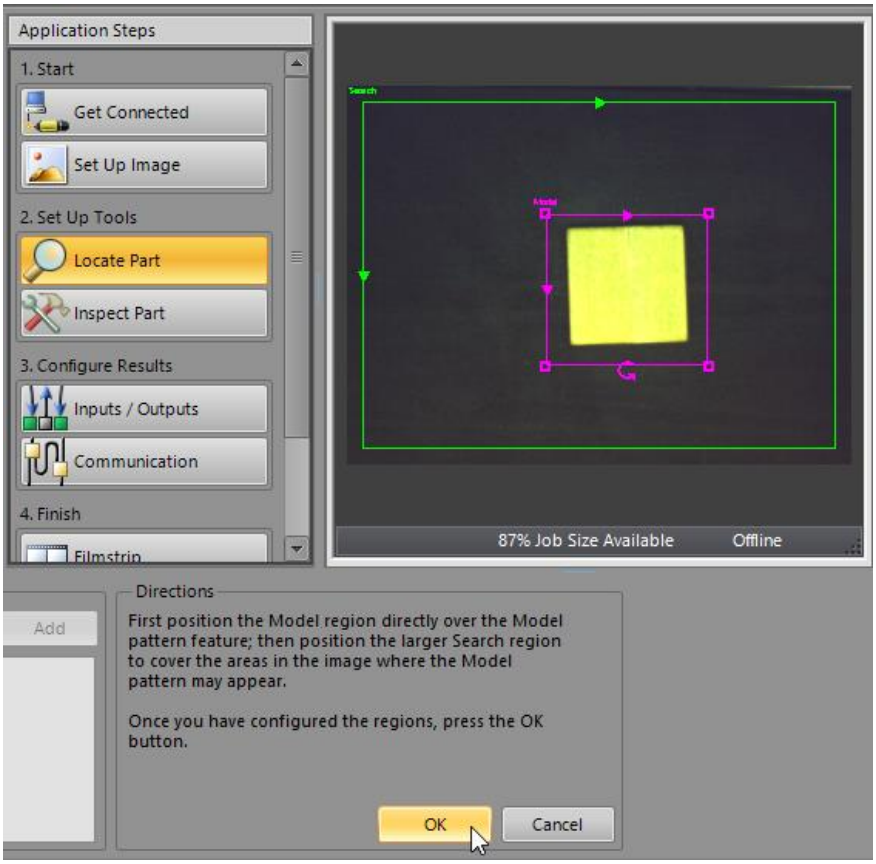
9. Click the **Locate Part** application step.



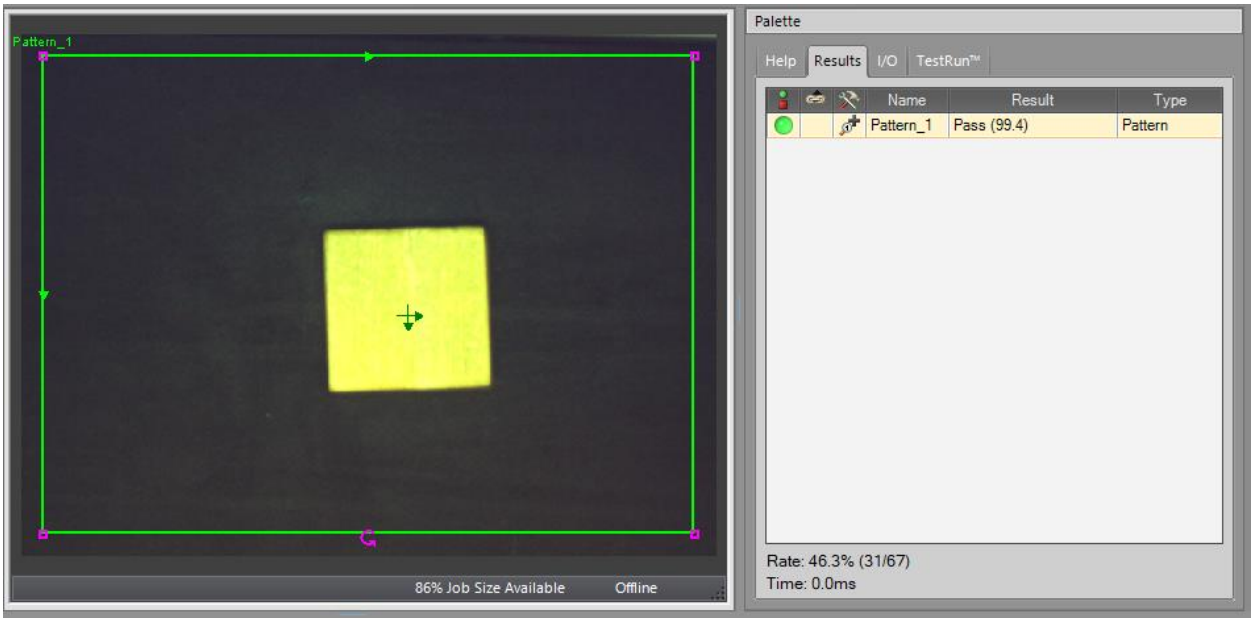
10. Add a **Pattern** location tool for identification of the block.



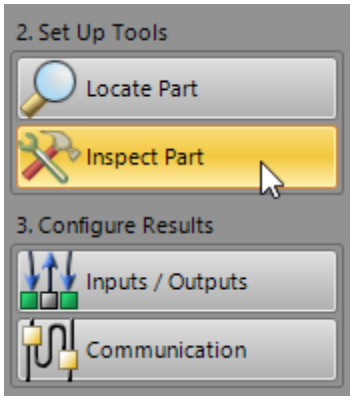
11. Adjust the Search and Model regions, and then click **OK**.



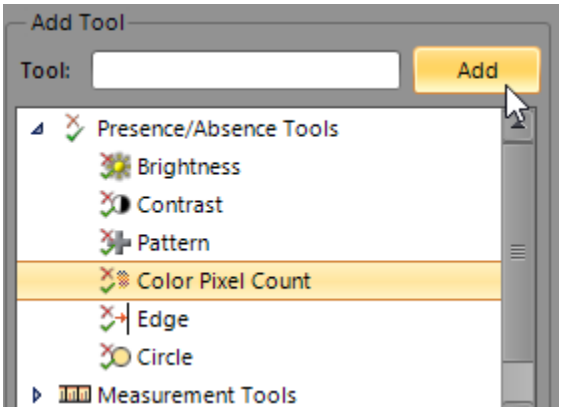
12. The tool is added to the Palette. A pass should be registered.



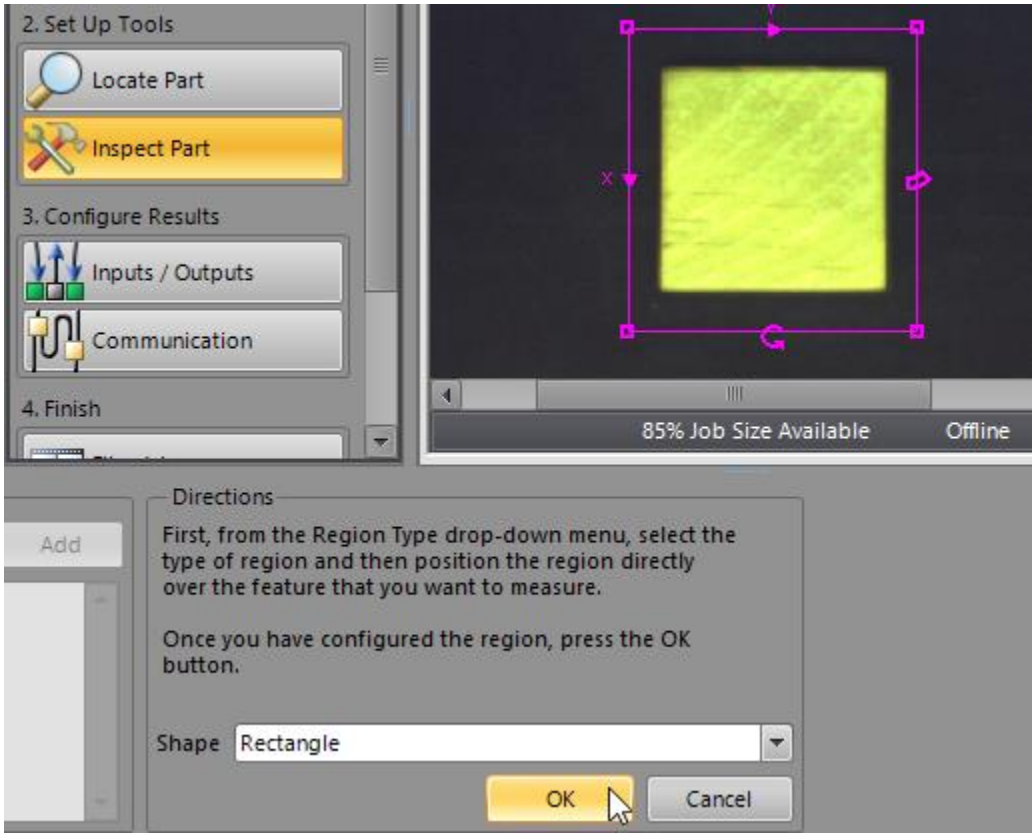
13. Click the **Inspect Part** step.



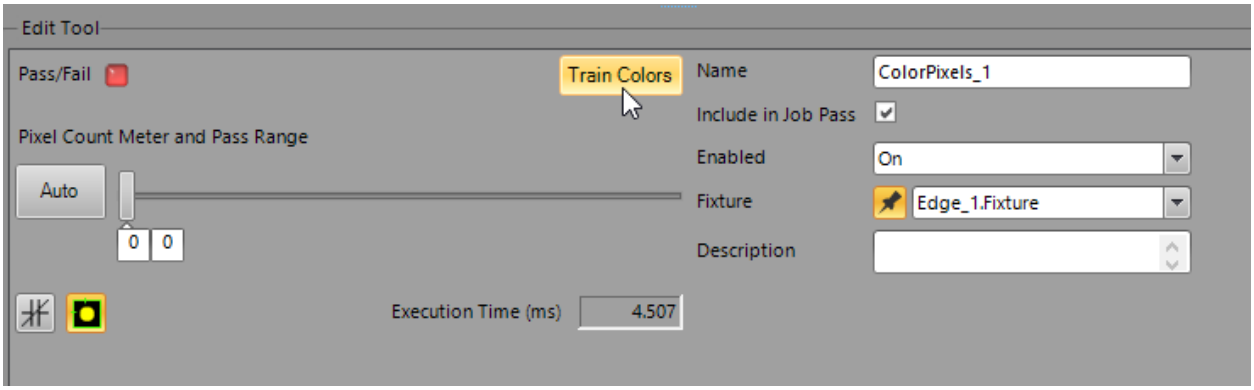
14. Select **Color Pixel Count** and then click **Add**.



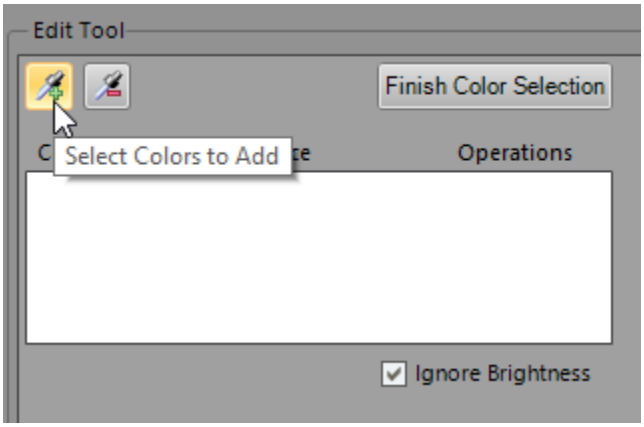
15. Resize the region around the block and then click **OK**.



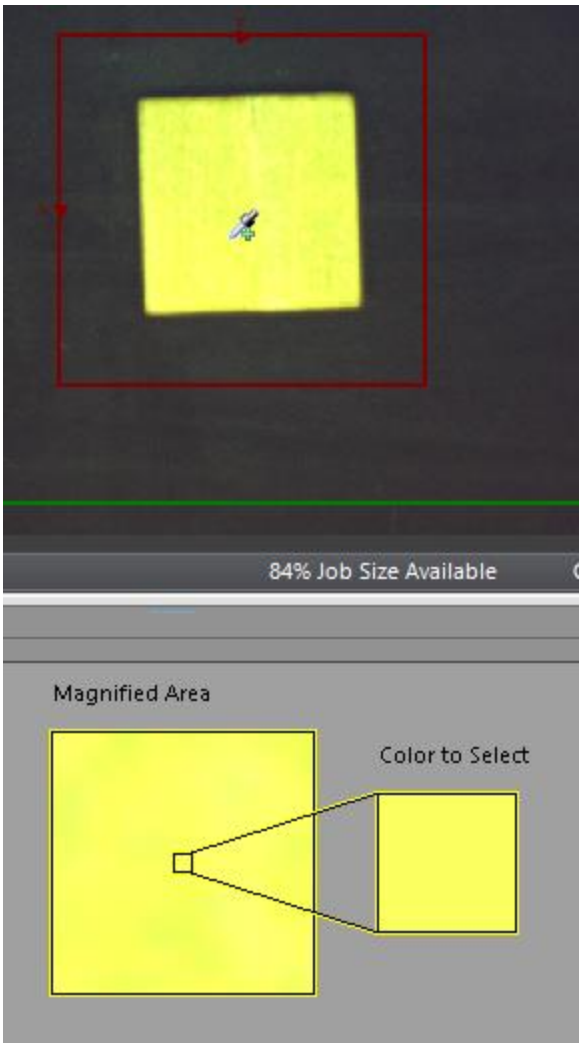
16. Click **Train Colors**.



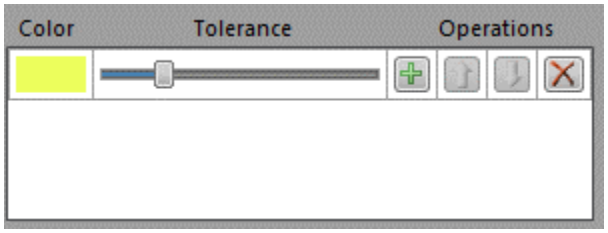
17. Click the **Select Colors to Add** button.



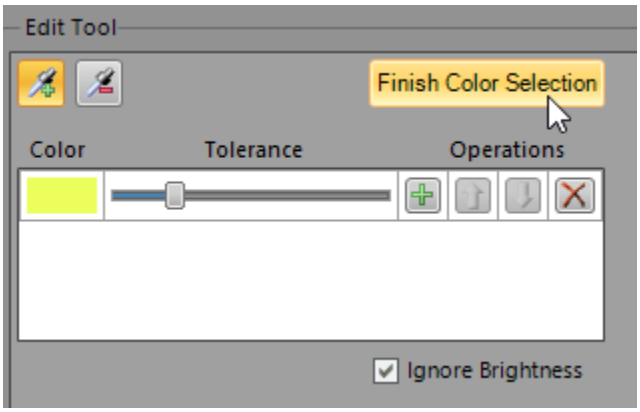
18. Select a pixel whose color is representative of most pixels of the block.



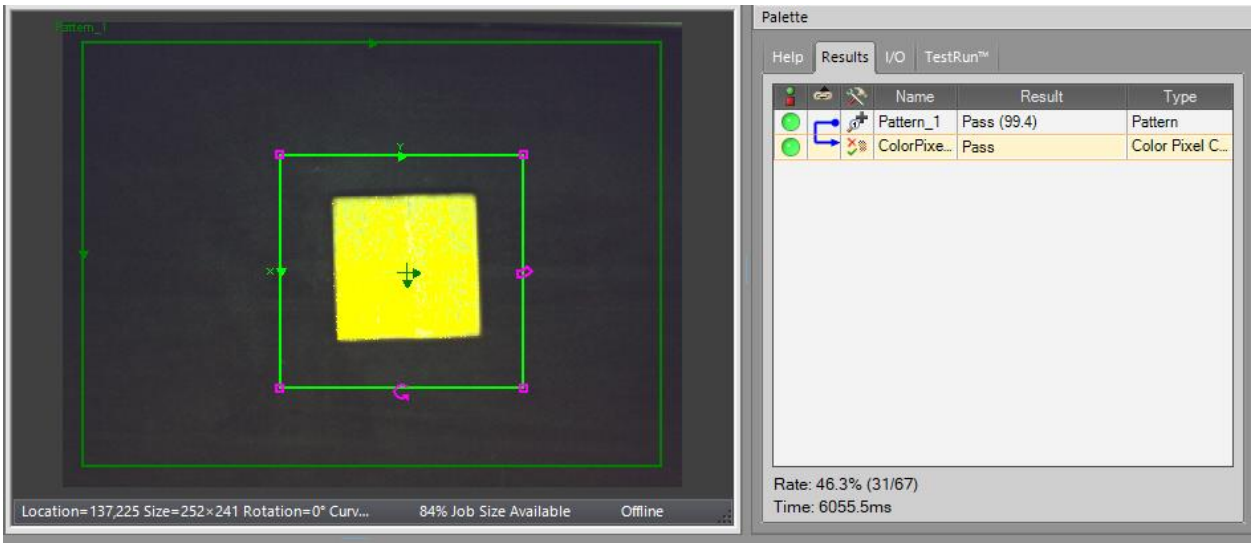
The color is added.



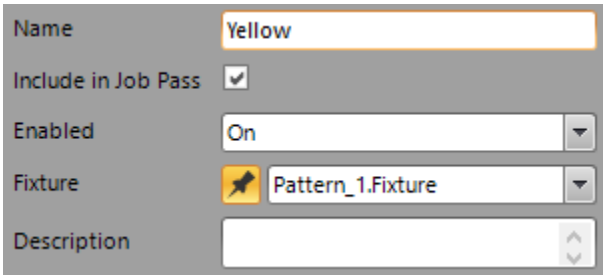
19. Click **Finish Color Selection**.



20. The Edit Tool pane for the color pixel tool count is displayed again. The tool should register a pass for the yellow block.

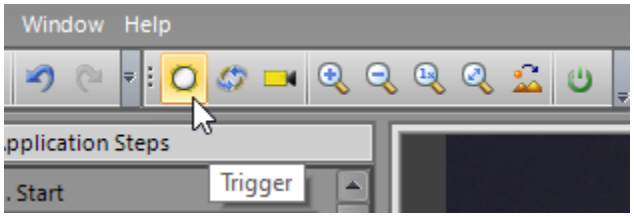


21. Change the name of the tool to the color of the block you used or similar.



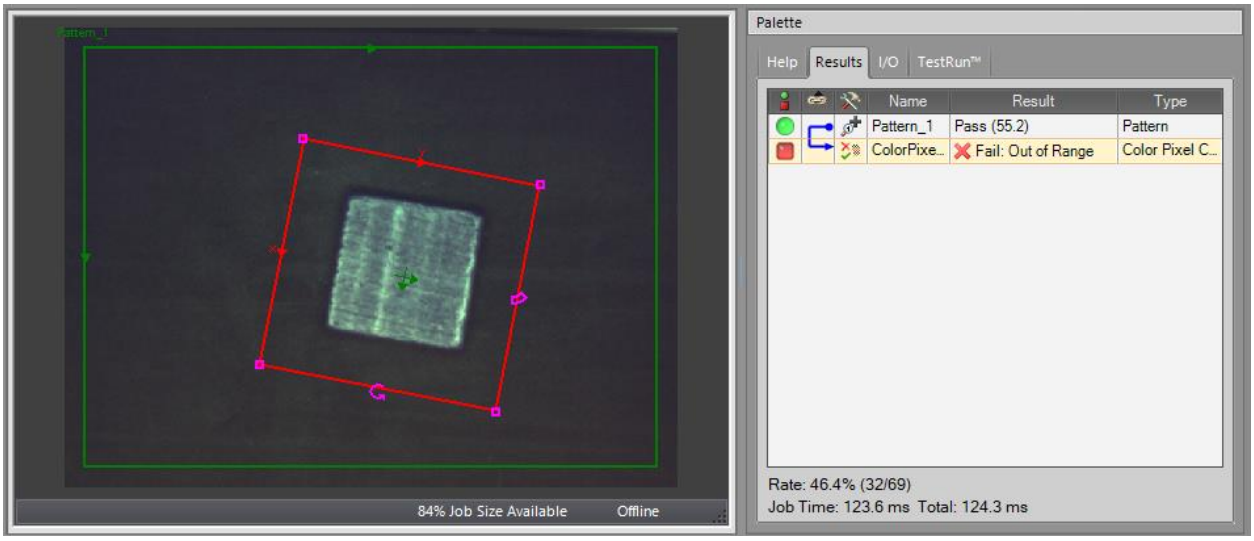
22. Remove the block and replace it with a block of another color.

23. Click the Trigger button to acquire an image.



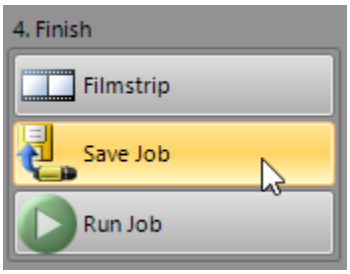
24. Ensure that the block registers a pass for the locate tool and a fail for the inspection tool.

- If a fail is registered for the location tool, return to the pattern tool and adjust the parameters.
- If a pass is registered for the inspection tool, return to the color pixel count tool and adjust the parameters.

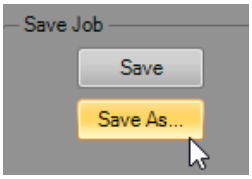


25. Repeat steps 22 to 24 for all other block colors, including the original block again. Ensure that only the original block and blocks of its color result in a pass for the inspection tool. If the yellow block results in a fail, train additional colors, increase color tolerance (including unchecking the Ignore Brightness option), or adjust the Pixel Count Meter and Pass Range.

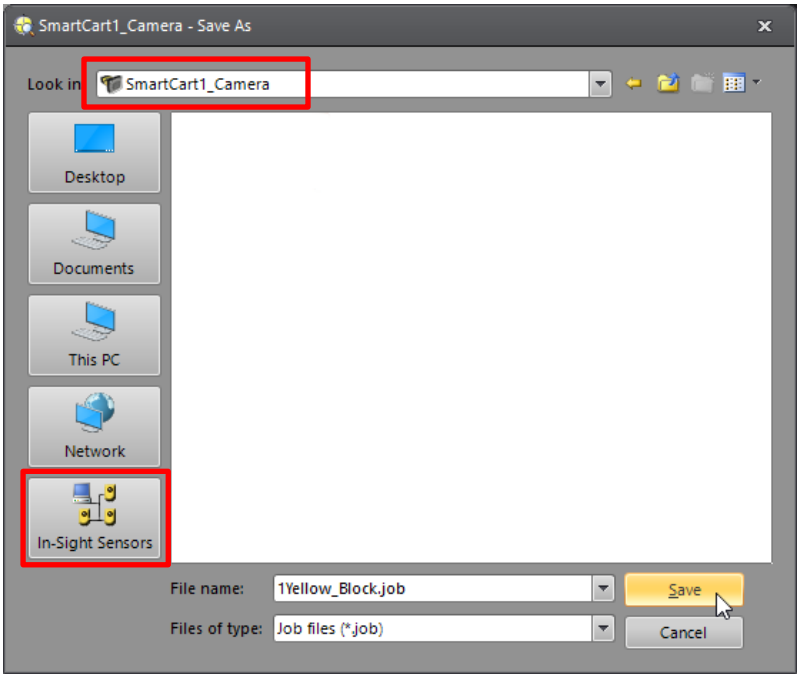
26. Select the **Save Job** step.



27. Select **Save As**.



28. Save the job to the IS2000 (in the In-Sight Sensors folder) with the name **1_Yellow_Block** or similar. The file must be saved *on the camera* (not in a folder on the workstation) and the file name must begin with a number, because this number value will be referenced by the PLC routine which you will create in the next lab activity. If you are sharing the SmartCart with other participants, make sure that the numbers of all job file names are unique.



29. Repeat this task to create jobs for all other colors of blocks.

7. Authentic Skill Assessment

Have your instructor verify that your work meets the requirements in the performance objectives and sign below. Keep this lab activity sheet for future reference.

Instructor Signature	Date

8. Reset Steps

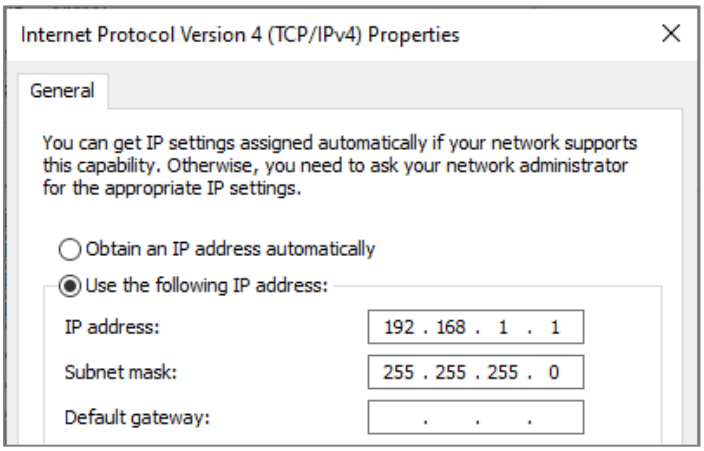
If someone else is going to be performing this lab activity after you, perform the reset steps below. Consult with your instructor before doing so.

8.1. Resetting the Camera to Factory Defaults

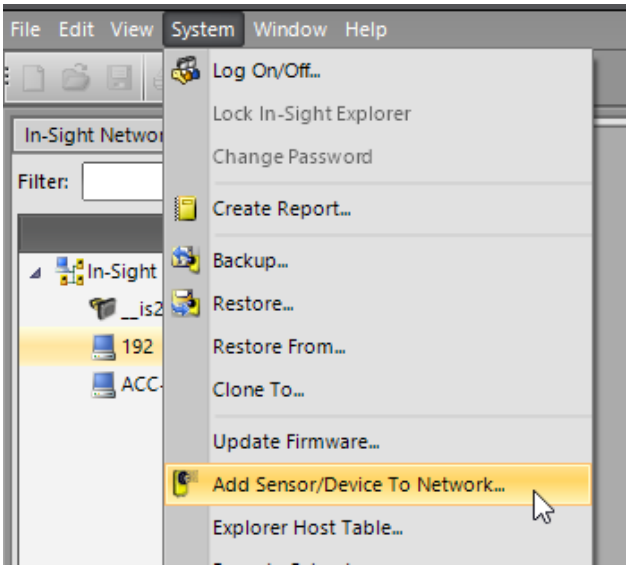
> ***Note:*** *Resetting the vision sensor to Factory Default settings does not reset the device's IP address.*

Perform these steps to change the vision sensor's IP address and to reset it to factory default settings:

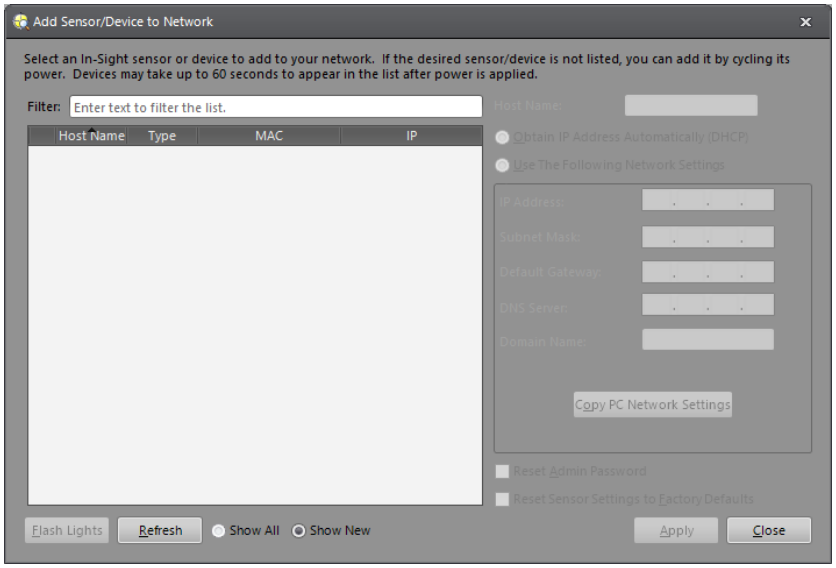
1. Change your *workstation's* IP address to **192.168.1.1**.



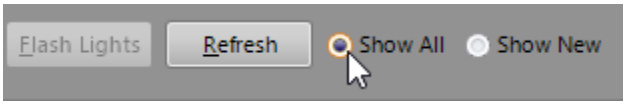
2. In In-Sight Explorer, navigate to **System > Add Sensor/Device to Network**.



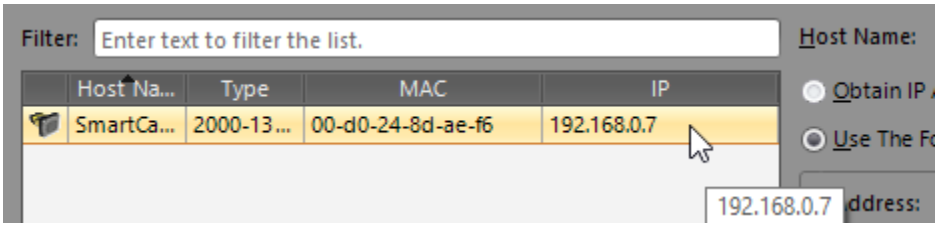
The **Add Sensor/Device to Network** window is displayed.



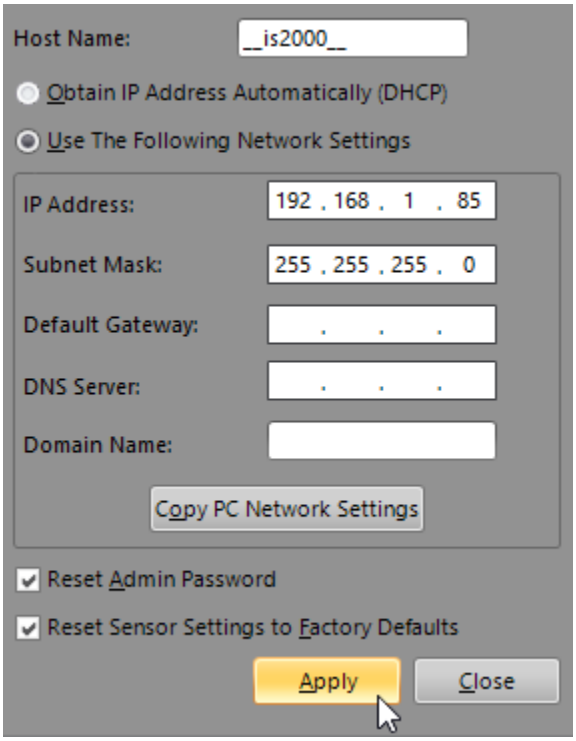
3. In the bottom-left area of the window, select **Show All**.



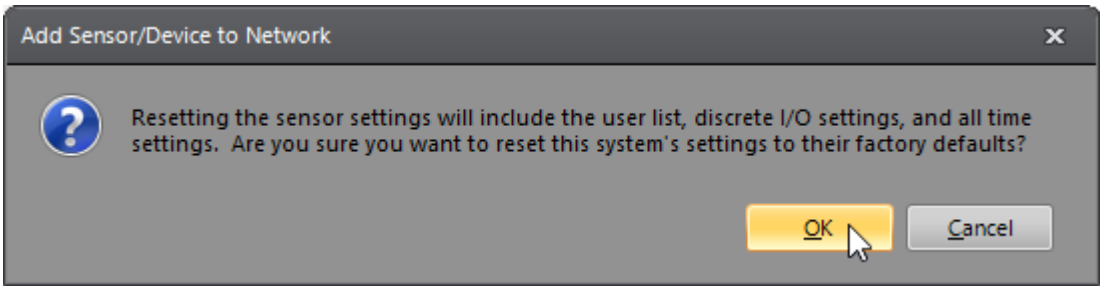
4. The SmartCart camera is displayed in the list. Select it.



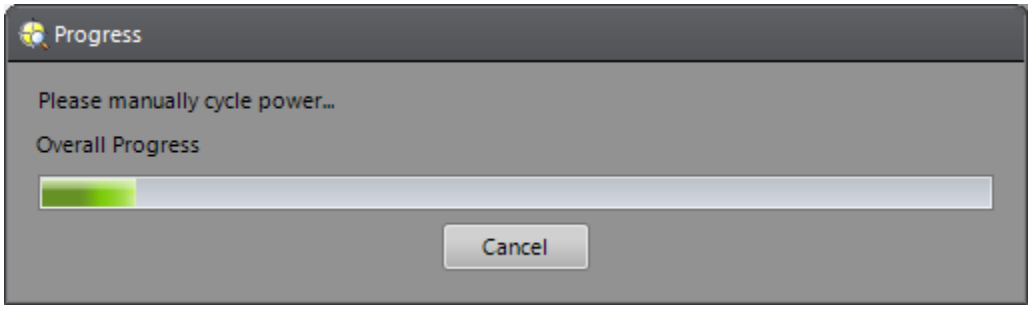
5. Modify the network settings as shown below and then click **Apply**.



6. Accept the popup message by clicking **OK**.

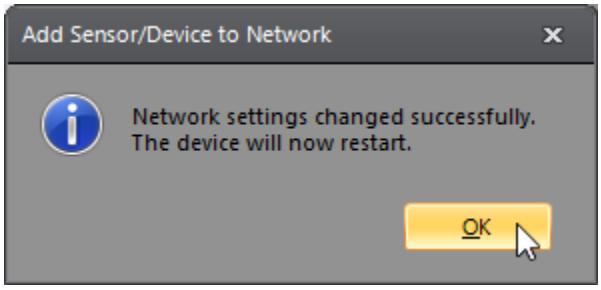


7. The Progress window is displayed. Turn the I/O box off and then on again.



ⓘ ***Note:*** *You may be prompted to cycle the power several times.*

8. The network settings are changed. Click **OK**.



9. Close any popup windows and close the Add Sensor/Device to Network window.

10. Restore the *workstation's* IP address to **192.168.0.1**.

9. Shutdown

Unless instructed otherwise by your instructor, review and complete each of the items on the checklist below.

- ☐ Close In-Sight Explorer.
- ☐ Power down the I/O box.