

# Robotics, Integration, and Automation

## SMARTCART VISION: PART 2

Name	Class/Period	Date

### 1. Overview

In the previous activity, you designed a PLC project with two executable subroutines. One of the subroutines, called *Vision\_Sequence*, had a sequence that was used to load a camera job, trigger the camera, and obtain an inspection result. The other routine, named *Vision\_Test*, contained the instructions used to externally trigger the camera. It also included the instructions for what the system should do after each type of inspection result (pass or fail).

In this lab activity, you will create an application in which the conveyor will move a block to the area underneath the SmartCart's QC camera. The camera will acquire an image of the block and run one of the inspection jobs that you created in the previous lab activity. If the block passes inspection, the robot will move it to the rotary table. If the block fails inspection, the robot will dispose of it into the bin.

### 2. Performance Objectives

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

- Create a SmartCart application with robot jobs, PLC logic, smart sensors, the HMI, and the vision sensor (QC camera).

### 3. Required Materials

You need the following materials to complete the lab activity:

- SmartCart 4.0
- Computer
- Ethernet cables
- Workpieces (blocks)
- Hex key (Allen wrench)

### 4. Required Software

**In-Sight Explorer**, **Logix Designer** and **View Designer** are required for this lab activity.

## 5. Inventory and Safety

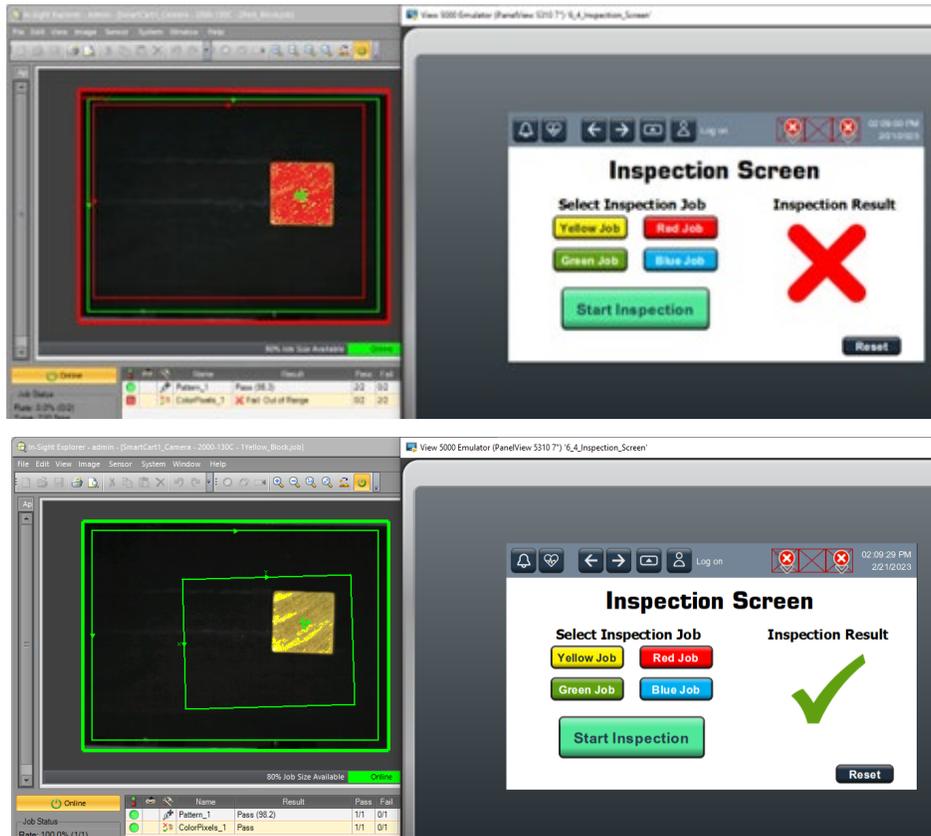
Before beginning the lab activity, review this checklist and mark off each item as you complete it.

- 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. Overview

In this task, you will create a SmartCart application in which the conveyor will move a block to the area underneath the vision sensor. Once the block arrives, the inspection job for the yellow block will be triggered. If the block is indeed yellow (passes inspection), the robot will move it to the rotary table. If the block is a different color (fails inspection), the robot will place it into the bin.



Example interface for the application with a part failing inspection for a red block (top) and passing inspection for a yellow block (bottom).

Follow the guidelines on the next page and show your final application to your instructor for approval.

## 6.2. Guidelines

### Overall Process

The process sequence is as follows:

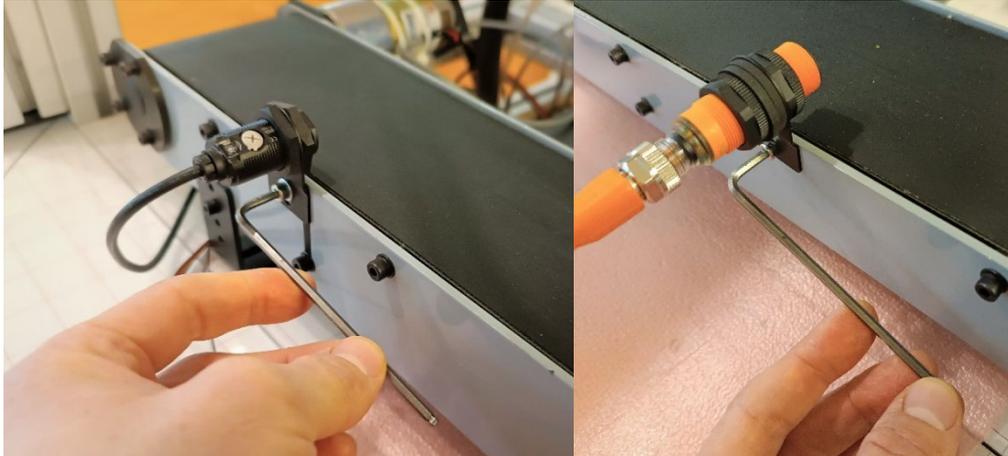
1. The camera is switched online.
2. The main robot job is started using the programming pendant. The robot polls while it waits for input from the PLC.
3. Using the HMI, the operator selects the job to be loaded onto the camera.
4. A block is placed at the front of the conveyor by an operator.
5. The operator presses the **Start** button on the HMI.
6. The conveyor turns on and moves the block towards the camera.
7. There is a (conventional) digital optical sensor on the conveyor underneath the camera. Once the block reaches this sensor, the conveyor stops.
8. If necessary, the camera loads the required job.
9. The camera is triggered, and the inspection job is run.
10. The inspection result appears on the HMI screen.
11. The conveyor turns on and moves the block in the opposite direction until it reaches a smart IO-Link proximity sensor at the front of the conveyor.
12. The manipulator performs a job based on inspection results:
  - If the result was a pass, the block is moved to the rotary table.
  - If the result was a fail, the block is placed in the bin.
13. The system waits for the operator to press the **Start** button again.

The HMI also has a Reset button which, when pressed, resets the system, and ends the main robot job.

## Other Guidelines, Warnings, and Tips

Here are some additional points to consider:

- The physical setup of the SmartCart needs to be aligned to the application process. Ensure that the smart devices are mounted in the correct locations.



Use a hex key to remove and mount sensors on the peripheral devices.

- Always test your robot jobs individually (in Teach mode using the INTERLOCK + TEST START option and then in run mode) without, and then with the workpiece, before you test them collectively in the SmartCart application with the PLC. When playing robot jobs, ensure that all safety measures are in place and that you are ready to press the programming pendant's Emergency Stop button if needed.
- You do not have to create the PLC project from scratch. Save the project you used in the previous lab activity with a new name and start from there.
- Because you are now using the conveyor to present the parts to the camera instead of simply placing them underneath the camera, you may have to adjust your camera jobs. Specifically, you may want to deselect the fixturing option in the inspection tool if this type of fixturing is a hindrance.

Name	Yellow
Include in Job Pass	<input checked="" type="checkbox"/>
Enabled	On
Fixture	 Pattern_1.Fixture
Description	

## 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

This lab activity does not have any reset steps.

## 9. Shutdown

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

- Close In-Sight Explorer.
- Save your PLC project and close Logix Designer.
- Save your HMI project and close View Designer.
- Power down the robot controller, the air compressor, and the I/O box.
- Return all blocks to storage.