



System Test Plan for LiteSpeed Gate

A pleasant, fast and light shopping experience

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1 System Test Plan

First, individual testing of the different unit systems will be conducted to verify that their respective performances match the requirements laid out in the functional specifications. After unit tests are complete, testing and verification will be done on the entire system by simulating several normal and extreme conditions. This includes the system's response to shoplifting, which is a serious problem for retailers.

1.1 Central Reading Unit and Core System Test Plan

The function of the CRU is to wirelessly scan multiple items in a given period of time. To confirm that the CRU is operational, a performance test will be conducted. Different quantities (10 and 25) of passive RFID tags will be placed near the antennas. After the central reading unit is activated, all tags should be detected in less than 10 seconds, which will be verified by checking the serial number of the tags and comparing them with the serial numbers read into the core system.

In addition, integration of the CRU with the core system and verification system will be tested. When a shopping cart is pushed onto the scale, the core system should activate the central reading system and begin a scan.

1.2 Location Control Unit Test Plan

The location control unit increases the accuracy of the whole system by rotating the antennas. The unit consists of four stepper motors, four motor drivers and a micro-controller. To confirm the functionality of the location control unit, the following tests will be performed:

1. A simple software testing framework will test each motor individually for appropriate responses to input from the micro-controller and the driver.
 2. Motor torque will be tested by verifying that the two stepper motors can rotate the antenna with respect to the x and y axes (Figure 6).
 3. Place the stepper motors into the location control unit, and verify the maximum rotation range by activating the micro-controller and observing the range.
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4. Verify that the micro-controller can rotate the two antennas concurrently in a parallel pattern.

1.3 Verification Unit Test Plan

The Verification Unit consists of a scale and ensures the accuracy of the LSG. To confirm the functionality of the verification unit, the following tests will be performed:

1. Put a known weight or several known weights onto the scale and verify the accuracy of the scale.
2. Connect the verification unit to the core system and verify that the value of the weight is received by the core system.

1.4 Database Test Plan

The database stores item information, including weight, price, name, and serial ID. As all items will have tags with unique IDs, the accuracy of the database will be tested by scanning individual items and checking that the correct information is retrieved.

1.5 User Interface Unit Test Plan

The following tests will be conducted to verify the functionality of the user interface unit:

1. Verify that the right information is displayed on the user interface unit. The name and price should be displayed correctly on the interface when the corresponding item has been scanned by the gate.
 2. Verify that items cannot be cancelled from the interface except by the system administrator.
 3. Test that the correct functional abilities are displayed by the interface, and verify that the user can checkout or ask for assistance by clicking the corresponding buttons on the UI.
 4. Check that a status indicator properly conveys a completed transaction as well as a failed one.
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1.6 Normal Case 1: Light Shopper (10 items or less)

User input: A shopper places a bag on the scale to start the scanning process.

Conditions: The bag contains 10 items.

Expected Results: The central reading unit powers up and initializes the scanning process, the location control unit rotates both of the antennas, and the verification unit outputs the total weight of the items.

The LSG should detect all of the RFID tags attached on the items and also obtain the total weight of the items in less than 10 seconds. There should be an accuracy of 100%. The serial numbers of the tags will be output to the core system, and corresponding item information will be retrieved from the database. The information includes item name, unit price, and total price, which are then displayed on the UI.

1.7 Normal Case 2: Heavy Shopper (25 items or more)

User input: A shopper pushes a cart onto the scale to start the scanning process.

Conditions: The cart contains 25 items.

Expected Result: The central reading unit powers up and initializes the scanning process, the location control unit rotates both of the antennas, and the verification unit outputs the total weight of the items.

The LSG should detect all of the RFID tags attached on the items and also obtain the total weight of the items in less than 10 seconds. There should be an accuracy of 100%. The serial numbers of the tags will be output to the core system, and corresponding item information will be retrieved from the database. The information includes item name, unit price, and total price, which are then displayed on the UI.



1.8 Extreme Case 1: Tag has been removed from an item

User input: A shopper pushes a cart onto the scale to start the scanning process.

Conditions: One item tag has been removed.

Expected Result: The central reading unit powers up and initializes the scanning process, the location control unit rotates both of the antennas, and the verification unit outputs the total weight of the items.

During the scan, the actual weight obtained from the verification unit system will be compared with the total weight calculated from the scanned tags. Though the CRU will miss an item, the scale will have measured its weight. Since the numbers will not match, a message will appear on the user interface indicating that store personnel will be called.

1.9 Extreme Case 2: Shoplifting

User input: A shopper pushes a cart onto the scale to start the scanning process.

Conditions: One of the items is in the shopper's pocket.

Expected Result: The central reading unit powers up and initializes the scanning process, the location control unit rotates both of the antennas, and the verification unit outputs the total weight of the items.

During the scan, the actual weight obtained from the verification unit system will be compared with the total weight calculated from the scanned tags. As the item in the shopper's pocket will be scanned by the central reading unit but not weighed by the verification unit, the weights will not match. Since the numbers will not match, a message will appear on the user interface indicating that store personnel will be called.
