

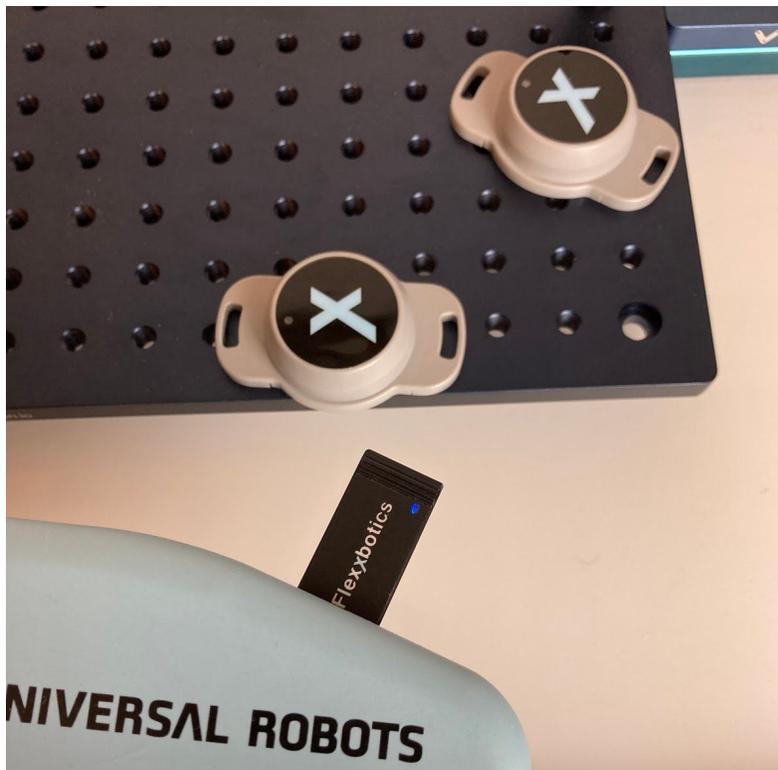
# Flexxbotics

## Flexx Beacon User Manual

Flexxbotics Corporation Product

Version 1.0.0

December 2020



# Revisions

<b>Revision</b>	<b>Date</b>	<b>Description</b>
1.0.0	12/29/20	Initial Release

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# 1. Product Overview

## 1.1. Product Description

Flexx Beacon is a location system using wireless technology designed to detect the presence of a tagged workstation or asset in proximity to the Universal Robot. It consists of a Flexx USB Dongle and up to eight unique tags.

The tags, referred to as Flexx Beacons, are battery operated, long lasting devices, that emit a signal with a unique identifier. The Flexx USB Dongle is able to detect these devices and reliably determine which is closest to the robot.

This provides a solution for applications where the robot or assets may be moving and the need to reliably detect the station, fixture, or part is closest to the robot.

Flexx Beacon is also designed to pair with the Flexx Reference. It provides an interface to configure the beacons with Programs and Flexx Features that may need to be loaded at runtime after a robot is moved. When in proximity of a configured Flexx Beacon, the Flexxbotics Toolbar will automatically load and configure the UI to the end user. The Flexxbotics Toolbar provides a set of instructions and controls for an operator to get the robot up and running after it is moved.

## 1.2. Key Terms and Definitions

Term	Definition
Flexx Beacon	Battery operated, long lasting devices, that emit a signal with a unique identifier. Easily applied with screws or adhesive to any surface.
Flexx USB Dongle	A USB scanner that detects the presence of Flexx Beacons. Captures data that can differentiate and determine which Beacon is closest to the robot.

## 2. Installation

The following section provides instructions on how to install the Flexx Beacon hardware and URCap on your robot and in your workstations.

### 2.1. Hardware Overview

2.1.1. Verify you have the following components:

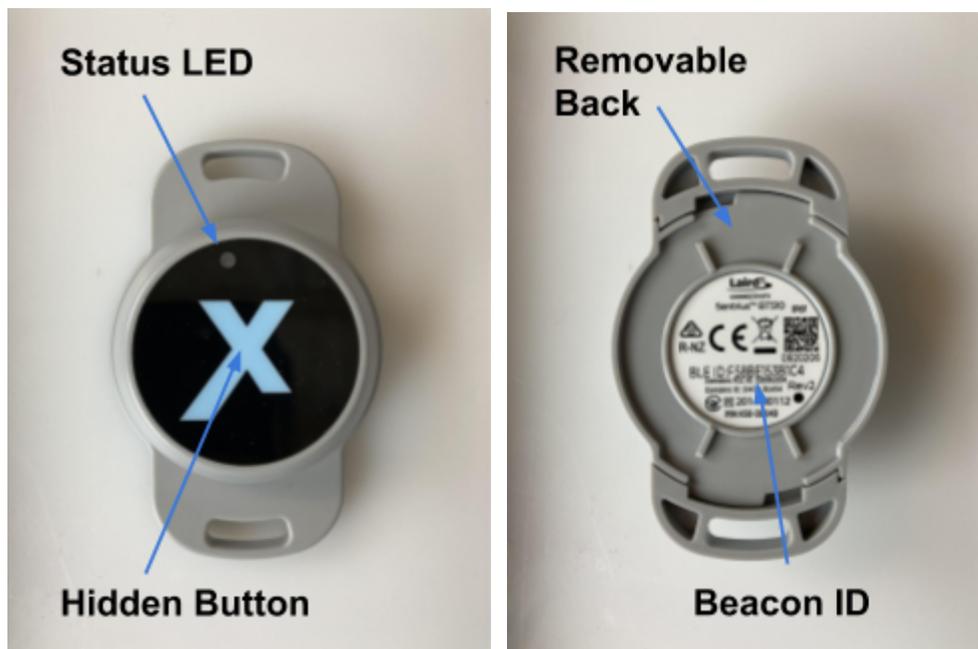
- URCap USB (1) (Not Pictured)
- Flexx Beacons (2)
- Flexx USB Dongle (1)



### 2.1.2. Flexx USB Dongle

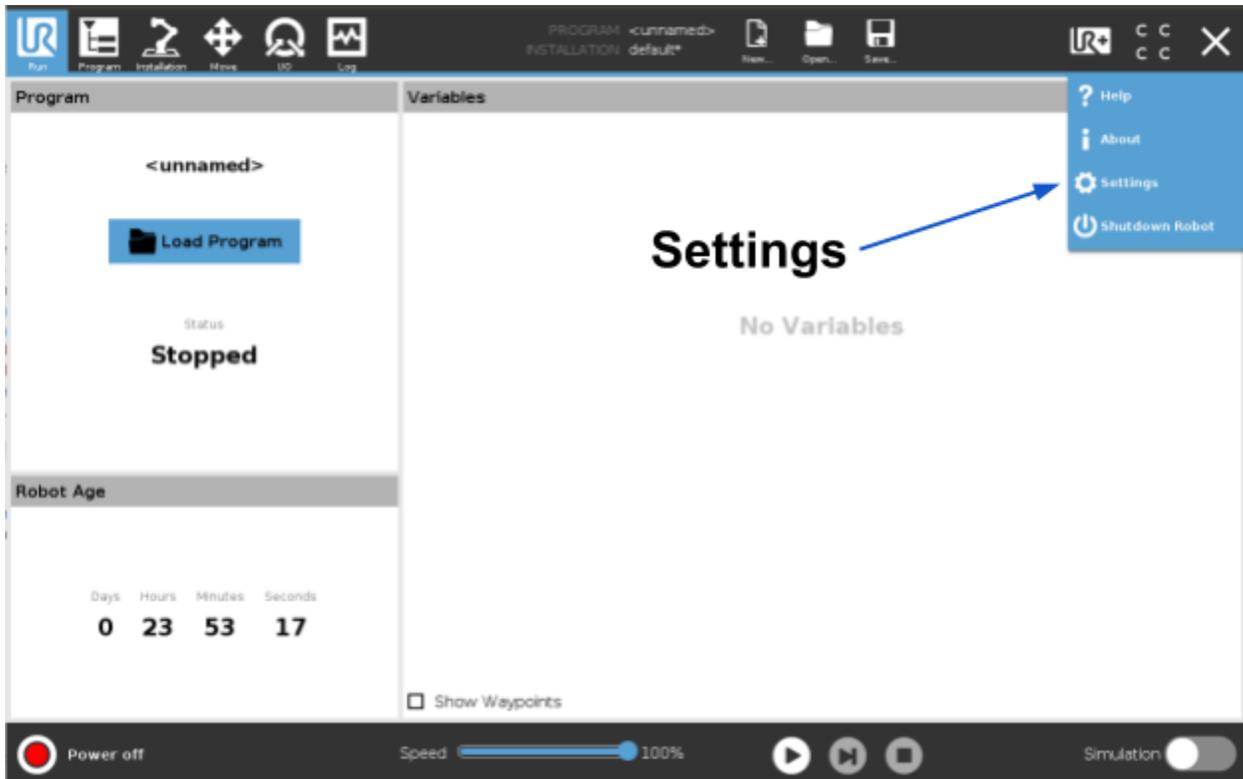


### 2.1.3. Flexx Beacon



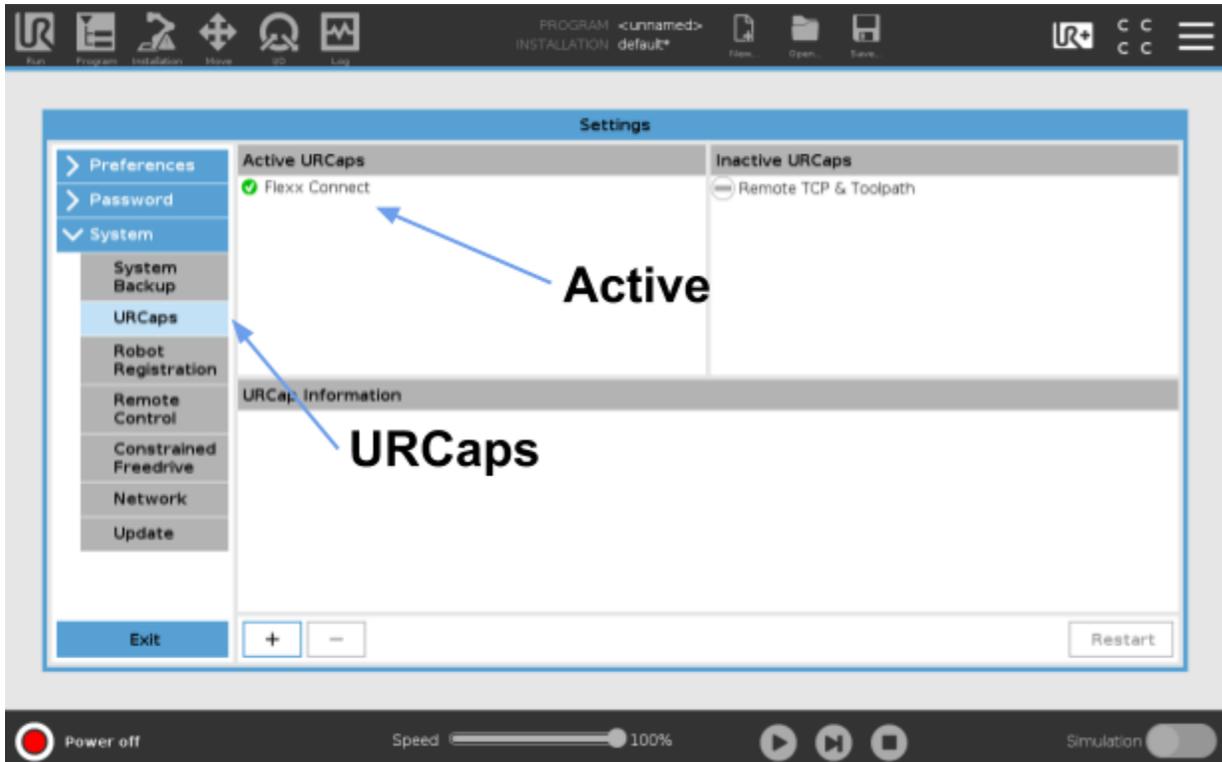
## 2.2. URCap Installation

- 2.2.1. Power on the robot controller.
- 2.2.2. Insert the URCap USB into the port on the teach pendant.
- 2.2.3. Navigate to the **Settings** page within Polyscope.



- 2.2.4. On the left side of the screen, click the **System** tab.
- 2.2.5. Click the **URCap** tab.
- 2.2.6. Click the **plus (+)** button in the bottom left corner of the screen.
- 2.2.7. Open the **usb device folder** from the file explorer.
- 2.2.8. Select the **connect-x.x.x.urcap** file and click **Open**.

- 2.2.10. Verify the Flexx Connect URCap appears in the **Active URCaps** menu.



- 2.2.11. Restart the robot to complete installation.

- 2.2.12. Remove the URCap USB from the teach pendant.

## 2.4. Flexx Dongle & URCap Activation

The Flexx USB Dongle is used to determine the proximity of the robot to Flexx Beacons.

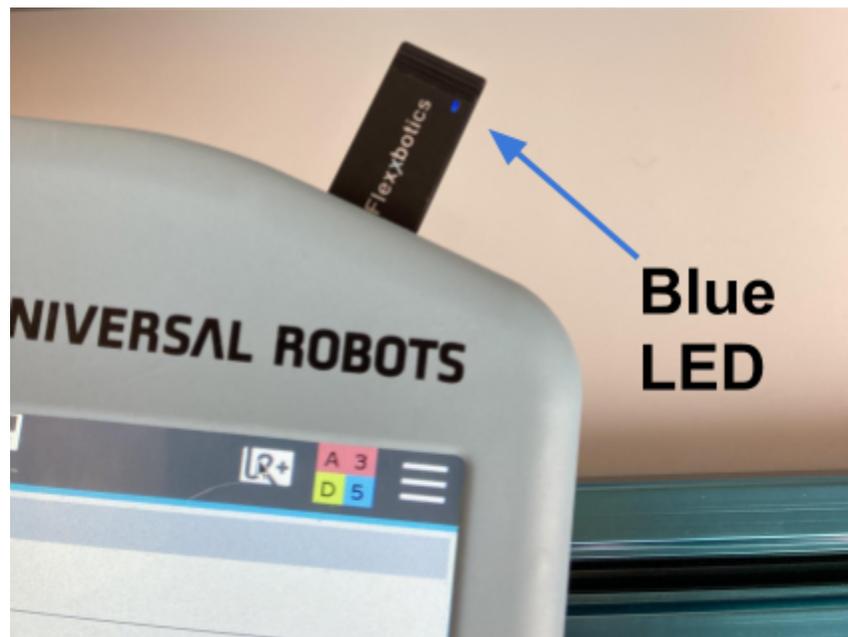
It is also used to activate the software using a license at the time of setup.

2.4.1. Confirm that the robot is powered on.

2.4.2. Insert the **Flexx USB Dongle** into the USB port on the teach pendant.

*NOTE:* The Flexx USB Dongle may also be inserted into one of the two USB ports inside the controller; however, with the controller door closed a decrease in signal strength will occur. It is recommended to use a USB-A to USB-A extended to bring the Flexx USB Dongle outside of the controller box.

2.4.3. Verify the **blue light** on the scanner is ON.



2.4.4. Navigate to the **Installation Tab** in Polyscope.

2.4.5. On the left side of the screen, click the **URCaps** tab.

2.4.6. Click the **Flexx Beacon** tab.

2.4.7. Click the **Activate** tab.

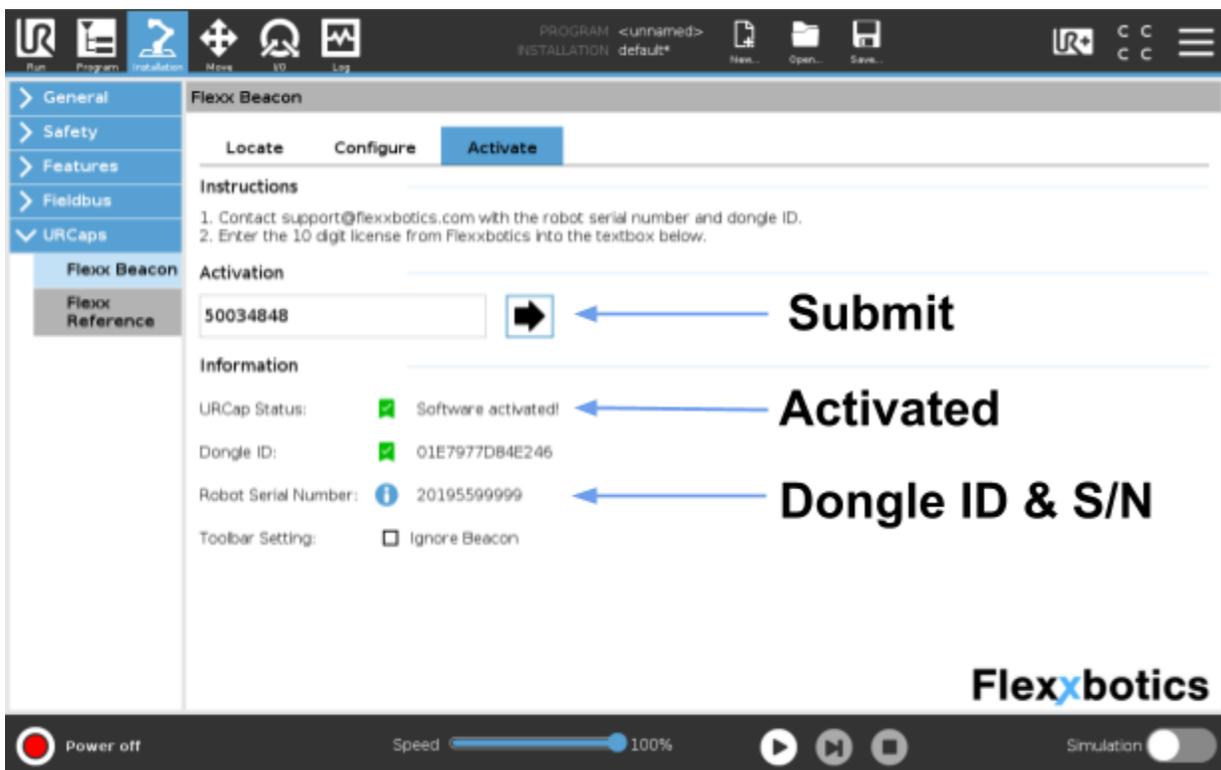
2.4.8. Verify that the **Flexx USB Dongle ID** is displayed.

*NOTE:* Click the **Submit** button if need be to refresh the UI.

2.4.9. Enter the **license activation code** provided by Flexxbotics.

*NOTE:* It is required that the robot serial number be sent to Flexxbotics to retrieve the activation code.

2.4.10. Verify that the license is **activated**.



2.4.11. **Save** the Installation file.

## 2.5. Flexx Beacons

When unpackaged, the Flexx Beacon should be fully powered on and ready to use. On initial setup, likely only the Power Check section will need to be performed; however, if a Beacon's battery becomes depleted it is important to know the additional steps.

## 2.6. Beacon Power Check

- 2.6.1. Press and release firmly on the front face of the Flexx Beacon with your thumb.
- 2.6.2. Verify that the Status LED on the front face blinks green one time. This indicates the Flexx Beacon is powered on and ready to use.



- 2.6.3. If the Status LED does not blink green, this means the Beacon is not activated. Continue with the next section.

## **2.7. Beacon Activation**

- 2.7.1. Press and hold firmly on the front face of the Flexx Beacon for approximately 5 seconds.
- 2.7.2. Verify that the Status LED on the front face blinks green 3 times and then stops. This indicates that the Flexx Beacon is activated.
- 2.7.3. Perform the Power Check above to verify that the Flexx Beacon is on and ready to use.
- 2.7.4. If the Status LED does not blink green, this means the Beacon battery is depleted. Continue with the next section.

## 2.8. Beacon Battery Replacement

- 2.8.1. If the Power and Activation steps above fail, the battery inside the Flexx Beacon may be depleted.
- 2.8.2. Open the Flexx Beacon by turning the back cover to the left.



- 2.8.3. Remove the battery from the device.

- 2.8.4. Place a new battery inside the device. Ensure that it is snug and making contact with the leads on the PCB.



- 2.8.5. Place the back cover back onto the device and secure it by turning it to the right.
- 2.8.6. Activate the Flexx Beacon and Perform the Power Check as described in the previous sections.

## 2.9. Beacon Mounting

2.9.1. The Flexx Beacons can be mounted in two ways.

- Two Mounting Screws
- Double Sided Adhesive (>3mm thickness)

2.9.2. Tap holes into the mounting surface. Screw the mounting screws into the mounting holes on the Flexx Beacon.



2.9.3. Apply a double sided adhesive to the backside of the Flexx Beacon. Remove the second side of the adhesive and place it onto the mounting surface.

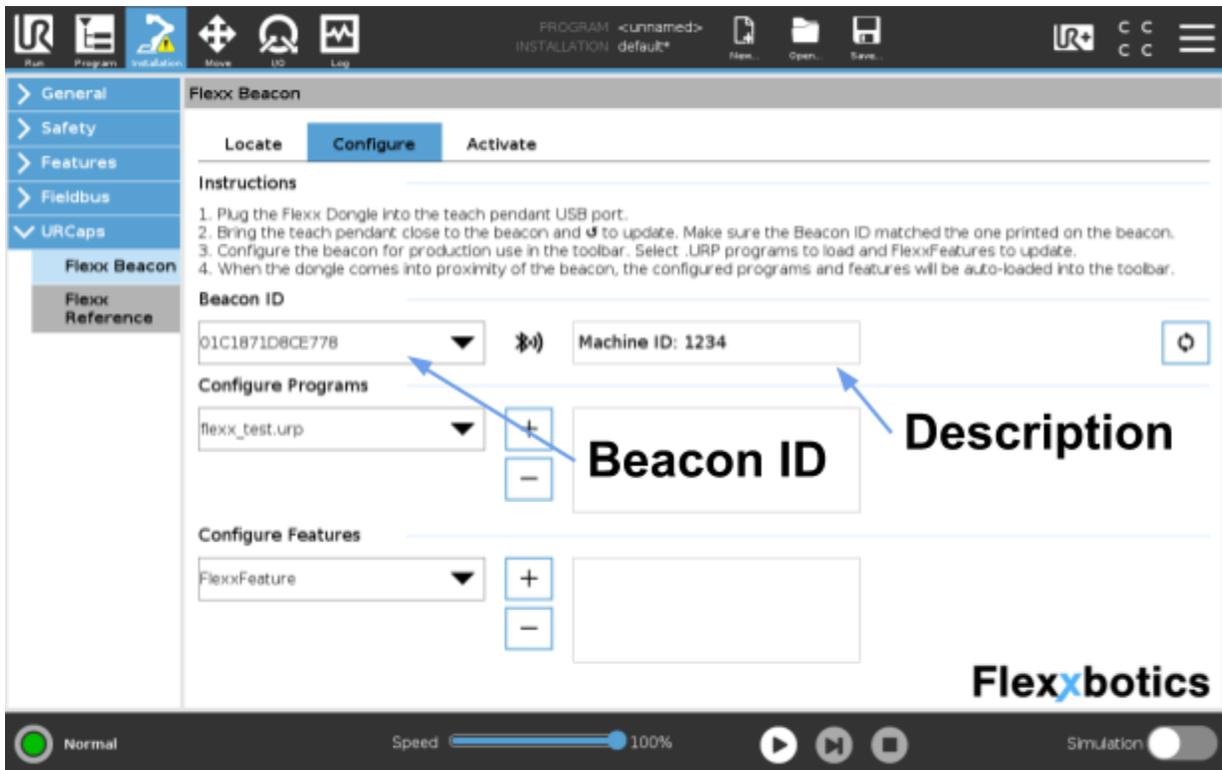


**DO NOT FINALIZE THE MOUNTING POSITION OF THE FLEXX BEACON BEFORE**  
**READING [Location System Setup & Test](#).**

## 3. Location System Setup & Test

### 3.1. Find and Name Beacons

- 3.1.1. Navigate to the Flexx Beacon tab in the Installation tab.
- 3.1.2. Click the Configure tab.
- 3.1.3. In the Station ID section, click the  button to find the surrounding Flexx Beacon IDs.
- 3.1.4. Provide the Flexx Beacon with a useful Description representing the location or association of the beacon.



- 3.1.5. Repeat for each Flexx Beacon ID.

## 3.2. Position Beacons

It is essential to performance that Flexx Beacons be strategically positioned in relation to each other and the ultimate position of the Flexx USB Dongle. This allows for enough differentiation of the signals, so that the Flexx USB Dongle can adequately determine which beacon the robot is in closest proximity.

Some of the factors that influence the performance of proximity detection of the robot to a beacon are:

- Distance of Flexx USB Dongle to Flexx Beacon
- Distance between Flexx Beacons
- Metal Blockages

## 3.3. Distance of Scanner to Beacon

3.3.1. The recommended distance between the Flexx USB Dongle and Beacon is  **$\leq 4$  feet**. The closer the scanner to the beacon, the better. There are a few ways to achieve this.

3.3.2. **Teach Pendant:** Leave the Flexx USB Dongle connected to the teach pendant. Place the teach pendant close to the Flexx Beacon when performing tasks on the robot.

3.3.3. **USB-Extender:** Connect the Flexx USB Dongle to the USB port inside the controller via a USB-Extender. Run the USB-Extender cable outside of the controller box.

### 3.4. Distance Between Beacons

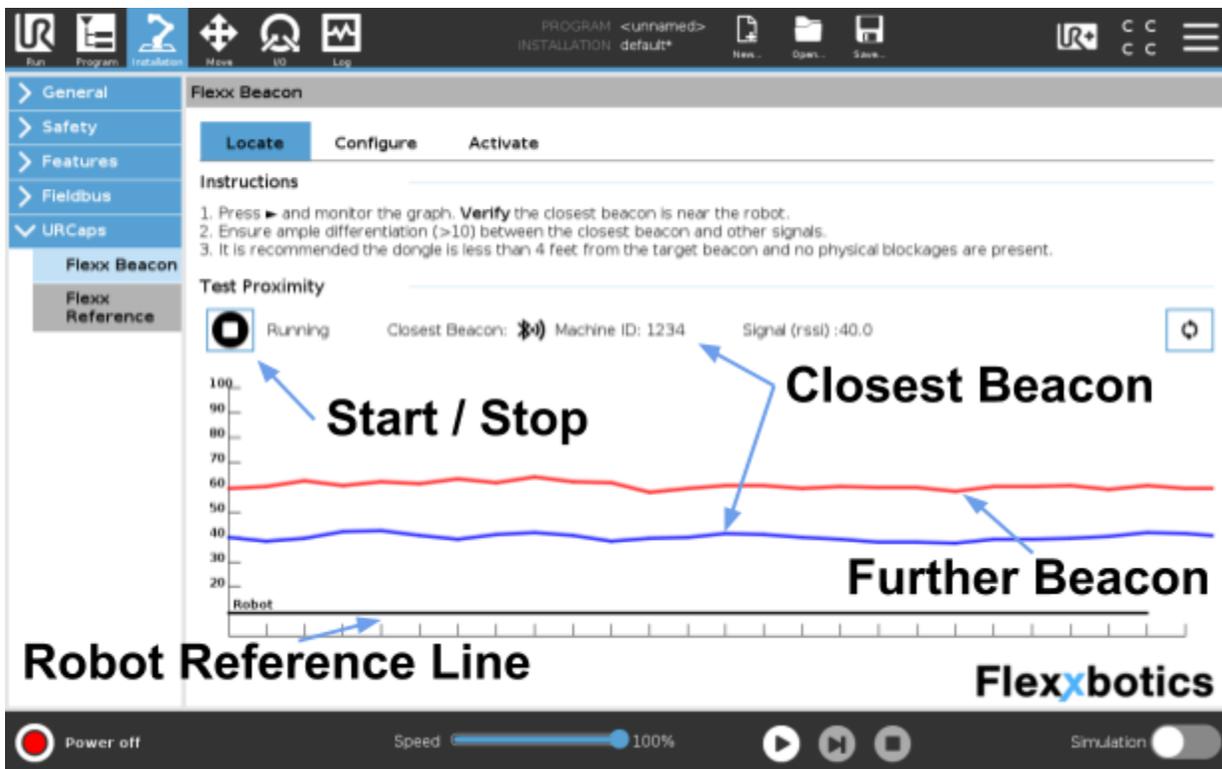
- 3.4.1. The recommended distance between two Flexx Beacons is **>= 12 feet**.  
The farther the distance between two beacons, the better. This is recommended at a **Scanner to Beacon distance of 4 feet**.
- 3.4.2. If the distance between the **Scanner to Beacon distance** is reduced to **< 1 foot**. The distance between beacons can be reduced. It is recommended to use the **Proximity Test** to determine the ideal positioning.

### 3.5. Metal Blockages

- 3.5.1. Direct metal blockages between the Flexx USB Dongle and Flexx Beacon have a great effect on the signal strength used to determine proximity. It is recommended to position the beacon so that it will not have a large blockage between it and the Flexx USB Dongle.
- 3.5.2. This also means it is not recommended to connect the Flexx USB Dongle inside the controller box unless:
- USB-Extender is used to bring it outside the controller.
  - Controller door is left open and the controller is positioned with the opening facing the beacon.

### 3.6. Proximity Test Tool

- 3.6.1. Navigate to the **Flexx Beacon** tab in the Installation tab.
- 3.6.2. Click the **Locate** tab.
- 3.6.3. Click the **Play** button to begin plotting Flexx Beacon proximity.
- 3.6.4. Above the plot, you will notice a status bar. This will display the **Closest Flexx Beacon** to the robot as well as its relative signal strength (rssi).



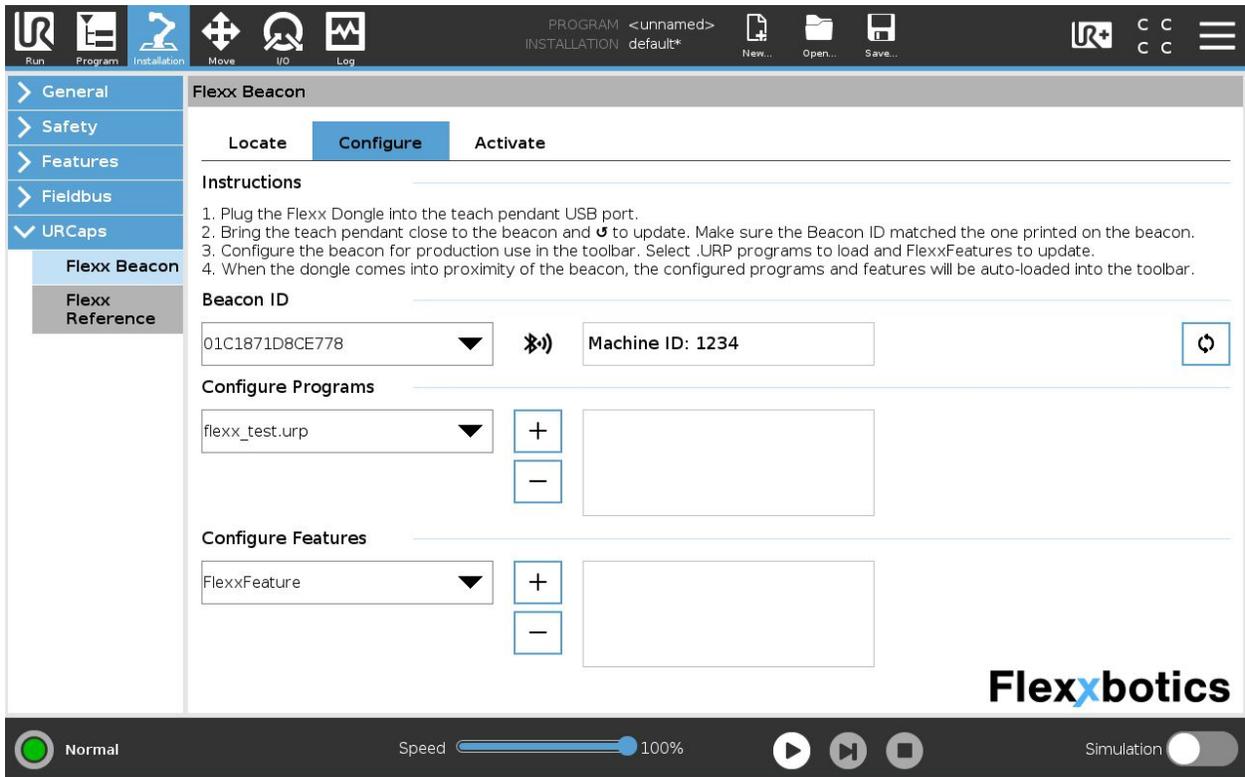
- 3.6.5. Within the plot, each Flexx Beacons signal strength will be plotted. You can use this to visualize how well the Flexx USB Dongle is able to **differentiate** between the multiple Flexx Beacons.

- 3.6.6. The Proximity Test will update in **real time**, allowing you to **re-position** Flexx Beacons until an adequate location setup is achieved.
- 3.6.7. The line that is **closest to the Black Robot Line in the graph** represents the closest beacon.
- 3.6.8. An adequate location setup is defined by these **parameters**:
- Identifies the correct closest Flexx Beacon.
  - Difference of ~10 rssi between the next closest Flexx Beacon (**good differentiation**)
  - Able to move the robot or Flexx Beacons closer and further from the Flexx USB Dongle and see the correct **change over**.

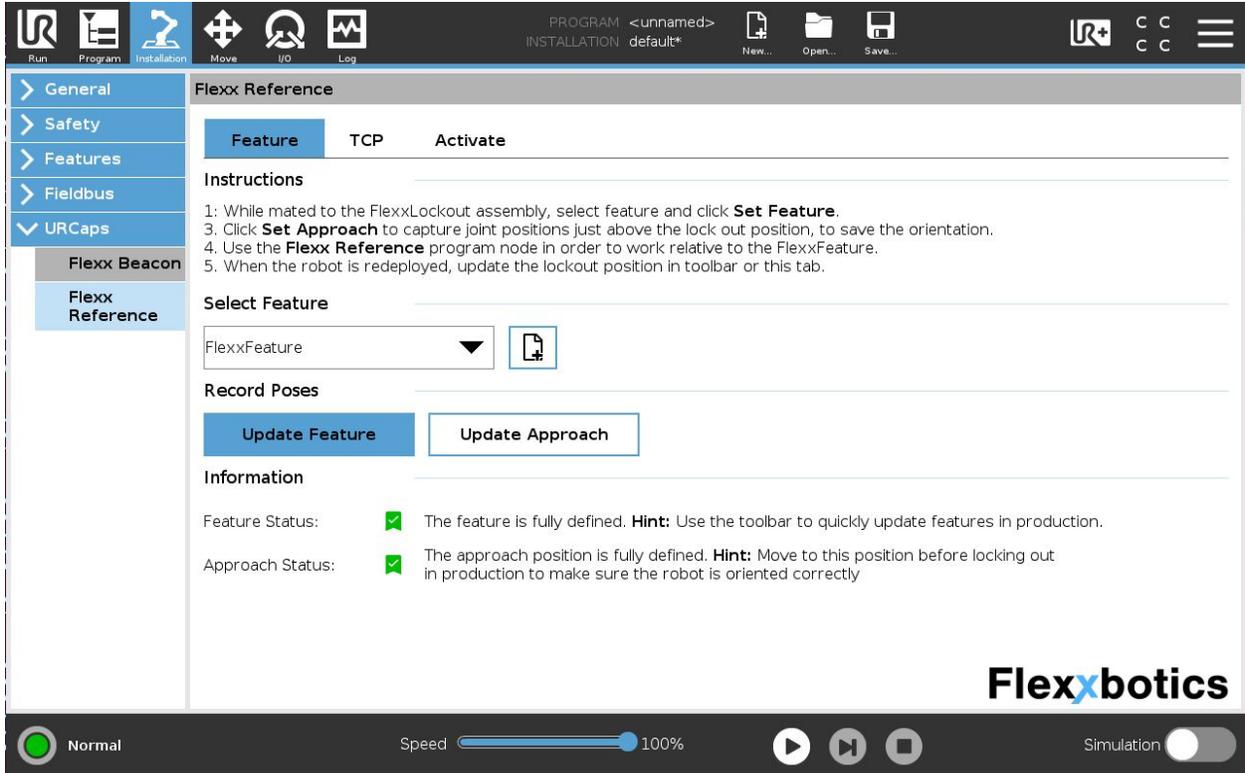


## 3.7. Configure Beacons

- 3.7.1. Navigate to the **Flexx Beacon** tab in the Installation tab.
- 3.7.2. Click the **Configure** tab.
- 3.7.3. Select a **Flexx Beacon ID**.



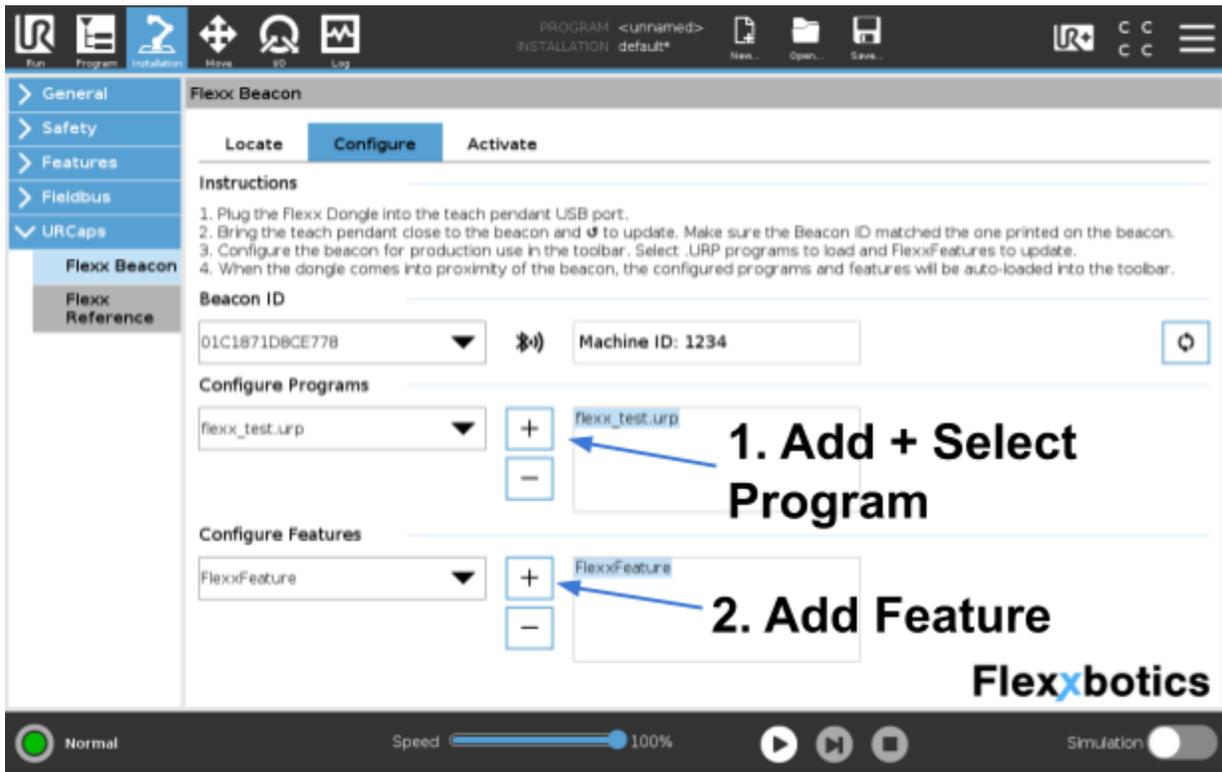
- 3.7.4. Ensure that the Feature to be added to the configuration is fully defined in the **Flexx Reference** node.



### 3.9. Add Programs and Features

3.9.1. These objects should be loaded when in proximity to the selected Flexx Beacon. Features are “nested” in relation to programs, so a program must be selected to add a Feature.

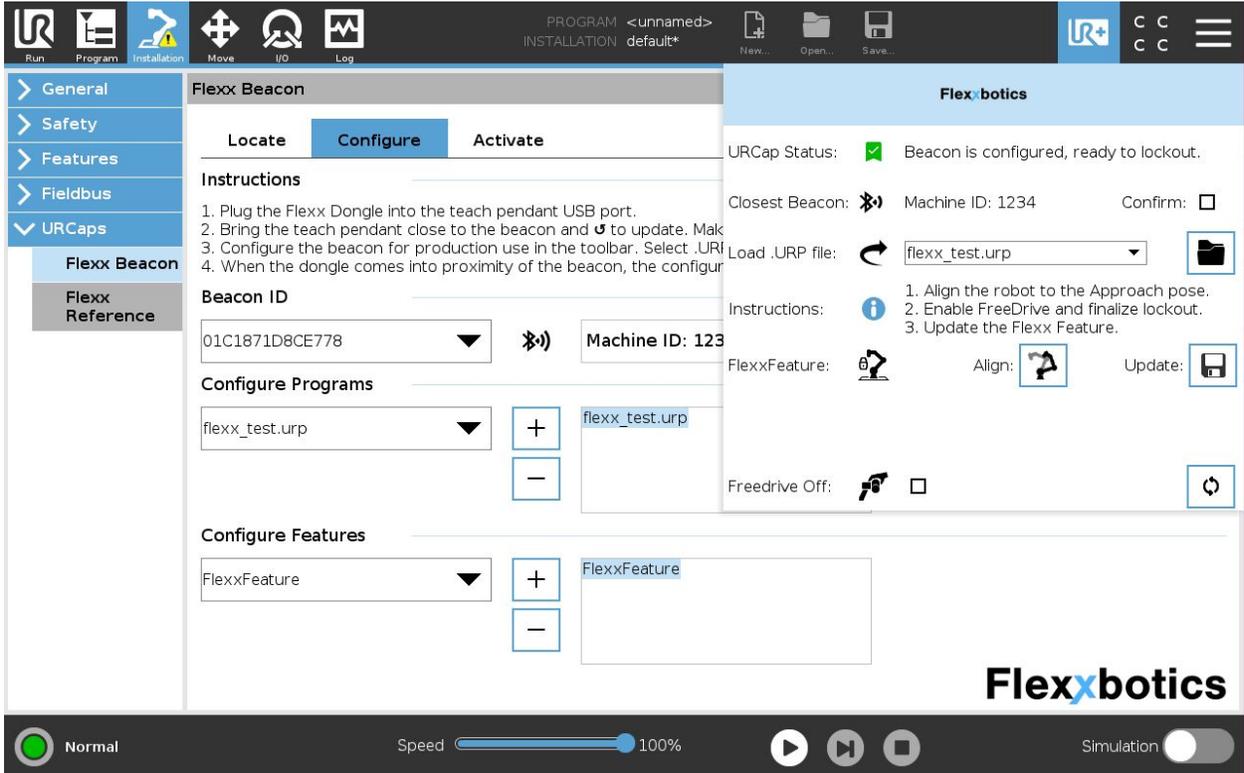
**CRITICAL: It is important that the programs that are configured are saved with the installation file being used for this Beacon configuration prior to loading.**



- 3.9.2. Use the + / - buttons to add and remove programs and features to Flexx Beacons as needed. Ensure that the Installation file is saved after configuration.
- 3.9.3. When in Proximity of the Flexx Beacon, the Flexxbotics Toolbar will automatically load and configure the UI to the end user based on the configuration above.

# 4. Flexxbotics Toolbar - Beacon Mode

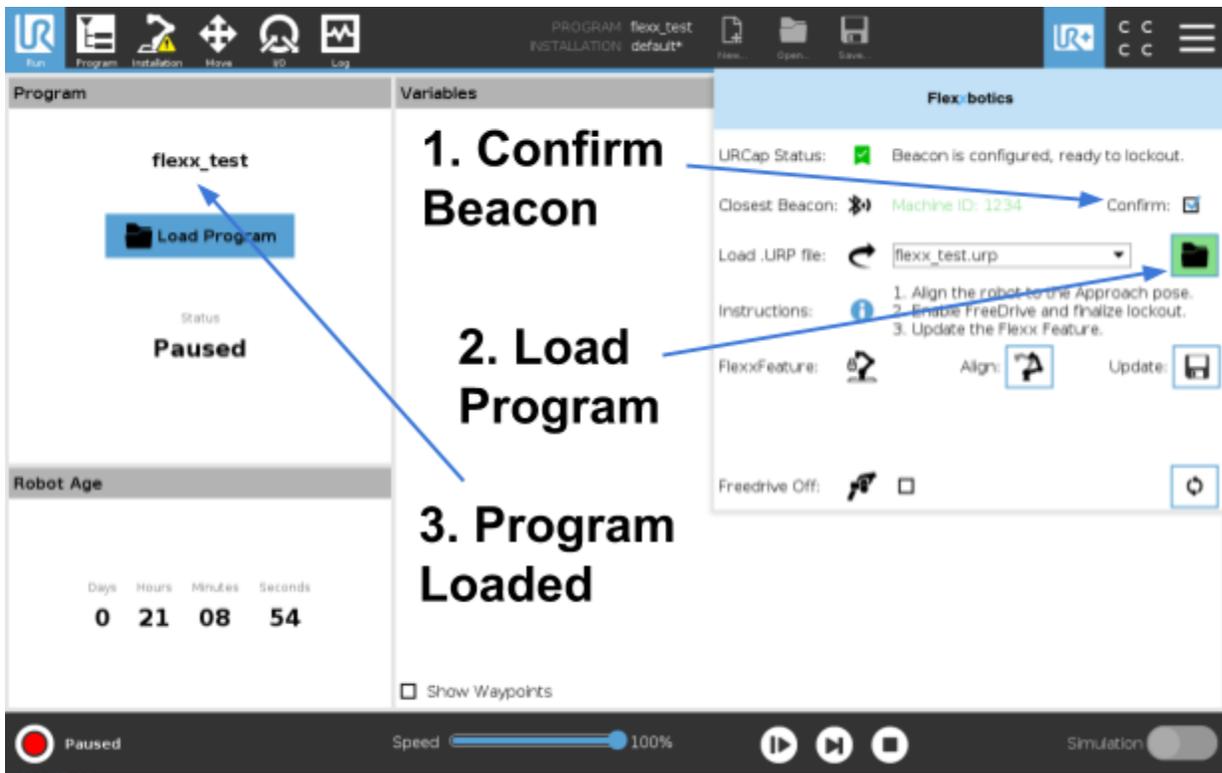
The Flexxbotics Toolbar provides a set of instructions to get the robot up and ready to run a program. In Beacon Mode, the Flexx Beacon functionality is fully utilized, allowing for automatic configuration of the Flexxbotics Toolbar based on location.



## 4.2. Confirm and Load Program

- 4.2.1. Ensure that the Flexx USB Dongle is in the **correct position** relative to the Flexx Beacon.
- 4.2.2. Click the **Confirm** button to verify that the correct Flexx Beacon is identified.
- 4.2.3. Select the program that needs to be loaded. Click the **Load** button.

The program will be loaded into the **Run tab**.



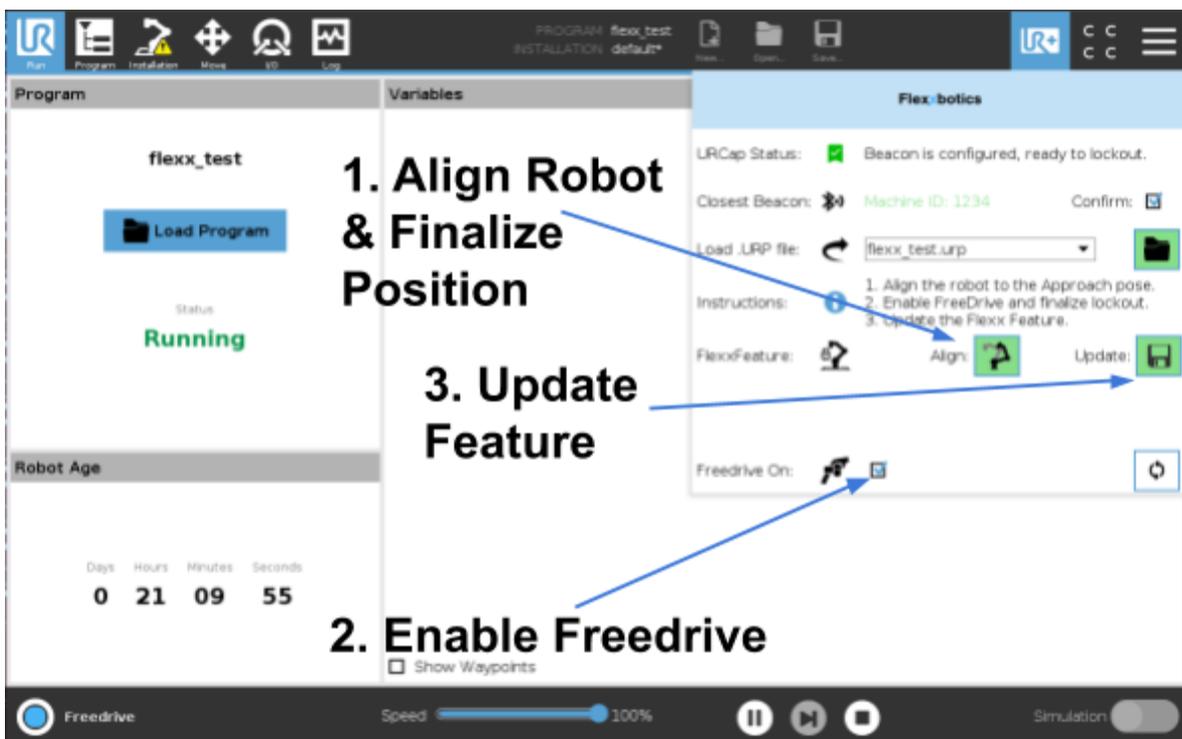
## 4.4. Update Flexx Features

For each Flexx Feature configured for the station, perform the following steps.

- 4.4.1. Ensure the robot has enough space to move into alignment.

*NOTE:* This may not be the final position of the robot or mobile fixture that the robot needs to tend.

- 4.4.2. Click the **Align** button. This will automatically move the robot to align it with the Flexx Lockout Interface Block.
- 4.4.3. **Finalize** the position of the robot or mobile fixture, so that the Flexx Lockout End of Arm Tooling aligns with the Flexx Lockout Interface Block.
- 4.4.4. **Enable Free Drive** and lockout the robot into the Lockout Assembly.
- 4.4.5. Click the **Update** button to update the position of the FlexxFeature.



- 4.4.6. Repeat step 4.2.2, 4.2.4, and 4.2.5 for each Flexx Feature that needs to be updated.

*NOTE:* The Finalization of the robot or mobile fixture only needs to be performed for the first Flexx Feature updated. The robot should not be moved after the Flexx Feature is updated.

- 4.4.7. Once all steps are completed, the robot program can now be run.

