

VERSABUILT ROBOTICS



DuoGrip Puck Configuration Manual

Safety Warnings

DANGER: VersaBuilt makes industrial machine tool automation components designed to be operated by trained personnel only. Machine tool automation components may move suddenly and without warning. Serious or fatal crushing injuries can occur from contact with the robot, gripper or vises.

Before deploying VersaBuilt industrial machine tool automation components, a safety risk assessment must be completed in accordance with local, state and/or federal requirements.

VersaBuilt industrial machine tool automation components should only be used by trained operators.

Read and understand the VersaBuilt Automation System Safety Manual before proceeding

Step 1- Prove Out CNC Process

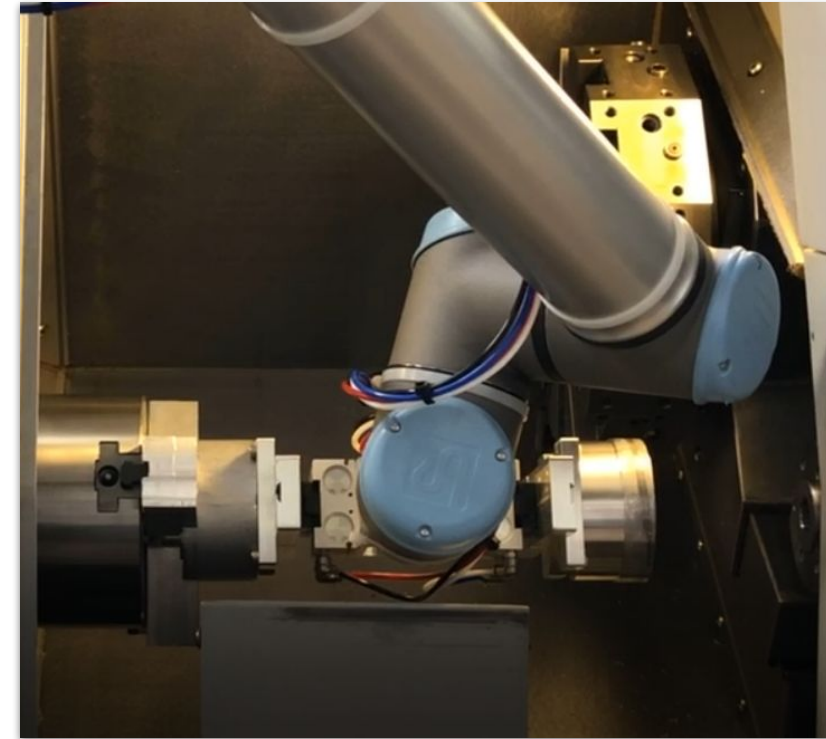
- Prior to automating a new part, prove out the CNC process using hand-loading
- Validate that after the part is removed from the CNC, that no chips will interfere with the next part loaded into the chuck
 - If chips are present that would interfere with the next load, improve the wash motion at the end of the cycle
 - If the wash program can't remove all of the chips, develop a separate wash program to wash the chuck after the part is removed; verify the program adequately removes all the chips from the critical chuck surfaces
 - The separate program will be used in conjunction with the "Wash Chuck after Unload" option in the part configuration



Puck Process Overview

The standard 'Lathe Puck' process is designed to maximize efficiency by using the dual gripper to minimize the time spent exchanging parts. The process works as follows:

1. Robot picks part from infeed using gripper 1
2. Robot loads part into chuck
3. Robot closes CNC door and begins CNC turning cycle
4. Robot moves back to infeed and picks another part with gripper 1
5. When CNC turning cycle completes, the robot unloads the completed part with gripper 2 and loads the new part with gripper 1
6. Robot closes the CNC door and begins CNC turning cycle
7. Robot places the completed part in the infeed with gripper 2
8. Robot picks another part from the infeed using gripper 1
9. System goes back to step 5 and repeats until all parts are complete



Puck Process Measurements

There are a handful of measurements required to process each part with the Lathe Automation System. These measurements are described below and shown in images on the following page.

- **Raw Material**
 - Raw Material Diameter
 - Raw Material Height
 - Raw Material Weight
- **Finished Part**
 - Finished Part Height
 - Finished Part Weight
- **Chuck Measurements**
 - Distance from Face of Chuck* to the Face of Jaws
 - Distance from Face of Chuck* to the End of Raw Material
 - Distance from Face of Chuck* to the End of Finished Part
 - Distance from Load Position to Apply Force

Chuck Measurements

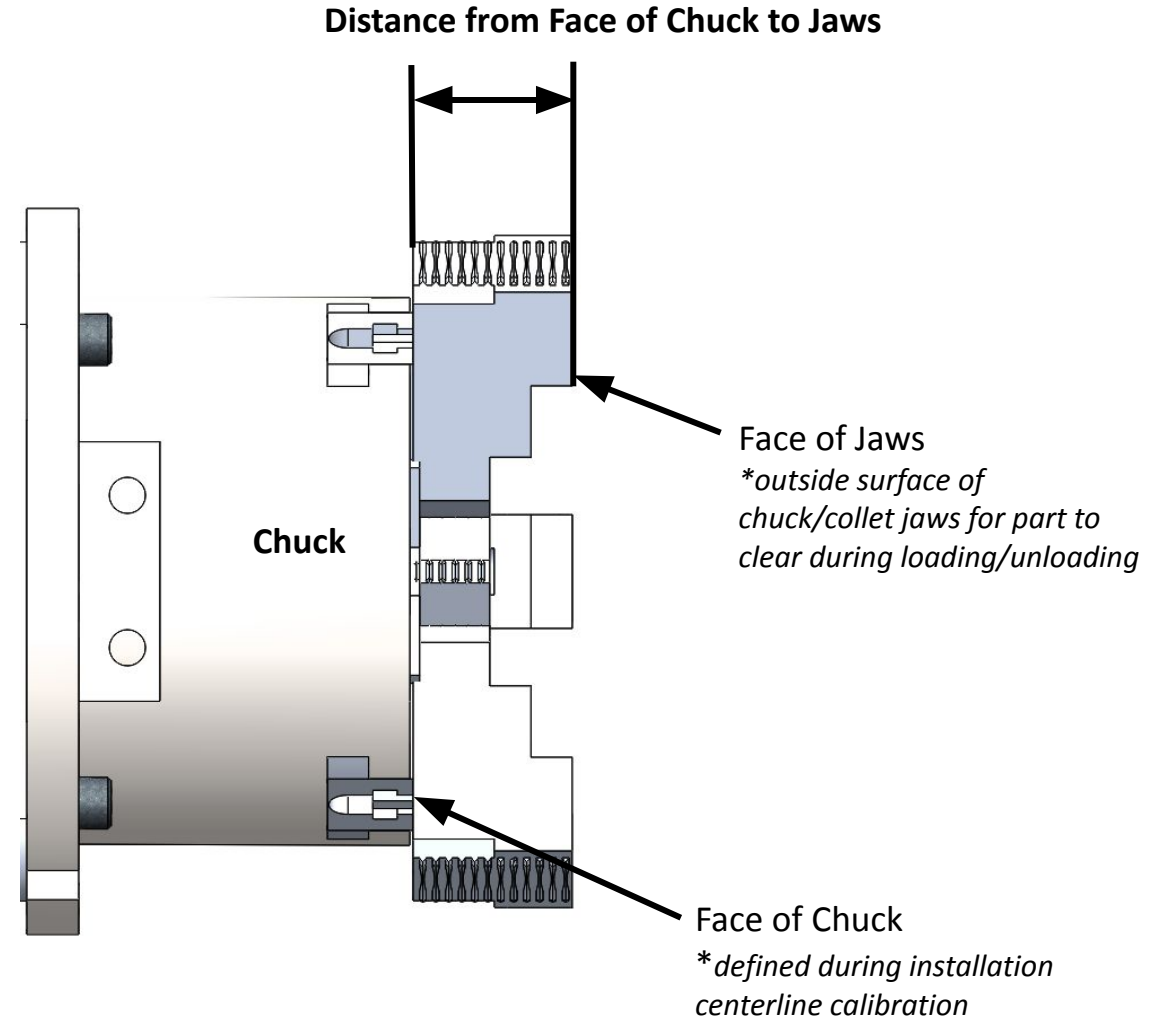
Distance from Face of Chuck to Jaws

Measure the distance from the Face of the Chuck to the Face of the Jaws.

The part configuration requires this dimensions for the **Load Chuck Options** and the **Unload Chuck Options** sections to account for differences between jaws on a main spindle and a sub-spindle. If there is no sub spindle, the same dimension will be entered for the **Load Chuck Options** and the **Unload Chuck Options** sections of the part configuration.

Face of Chuck is a z-datum feature that can be used to measure jaw and part position.

The Face of Chuck should be consistent across setups (jaw change, collet change) to prevent the need for recalibration or re-setup on a per part basis



Chuck Measurements

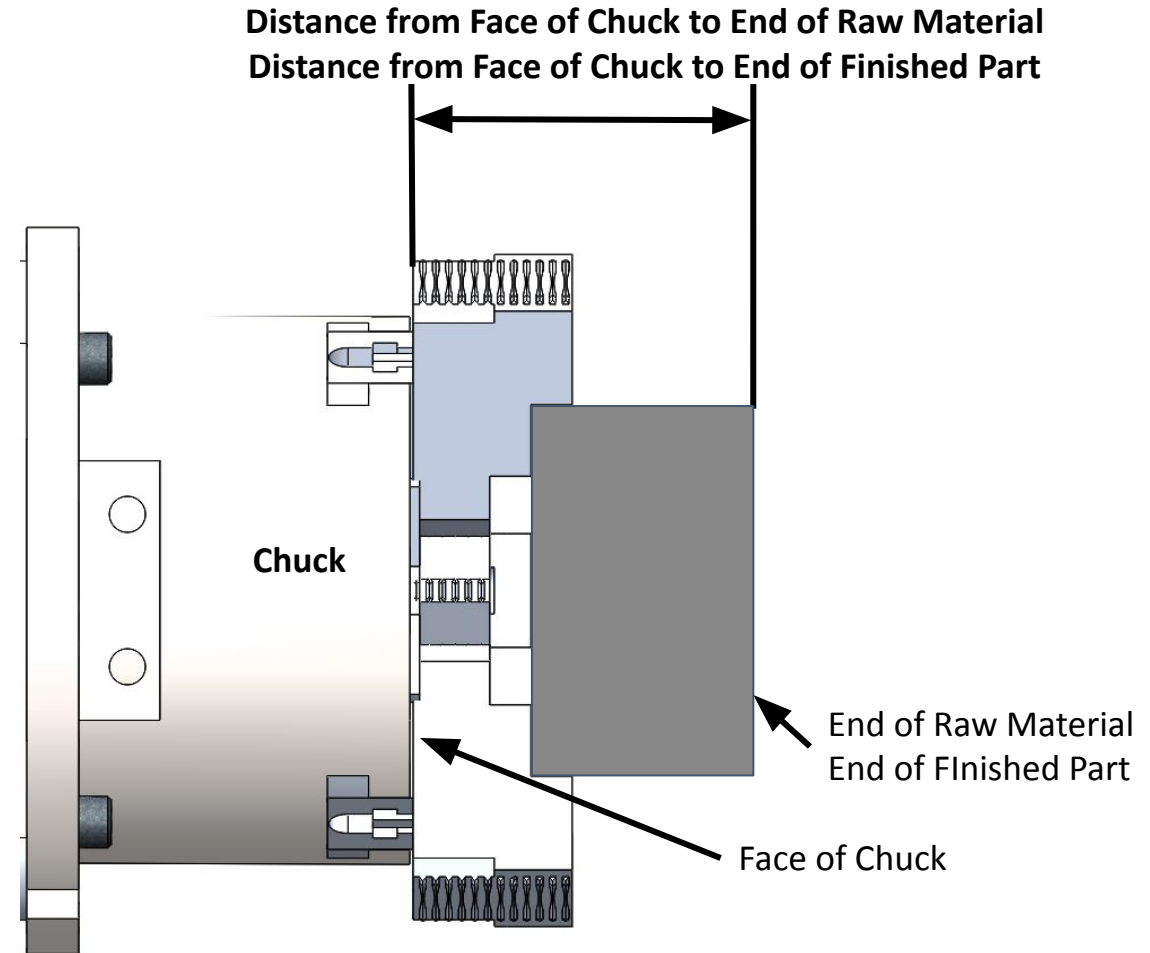
Distance from Face of Chuck to End of Raw Material

Load a piece of raw material into the chuck, make sure it is seated on the Z locating surface of the chuck jaws. If there is no Z surface, position the Raw Material to the desired depth in the chuck. Clamp the chuck.

Measure the distance from the Face of the Chuck (determined during calibration) to the end of the Raw Material. Enter this measurement into the **Chuck Load Options** section of the part configuration form.

Distance from Face of Chuck to End of Finished Part

Machine a piece of raw material into a finished part. Measure the distance from the Face of the Chuck (determined during calibration) to the end of the Finished Part. Enter this measurement into the **Chuck Unload Options** section of the part configuration form.



Part Configuration: Puck

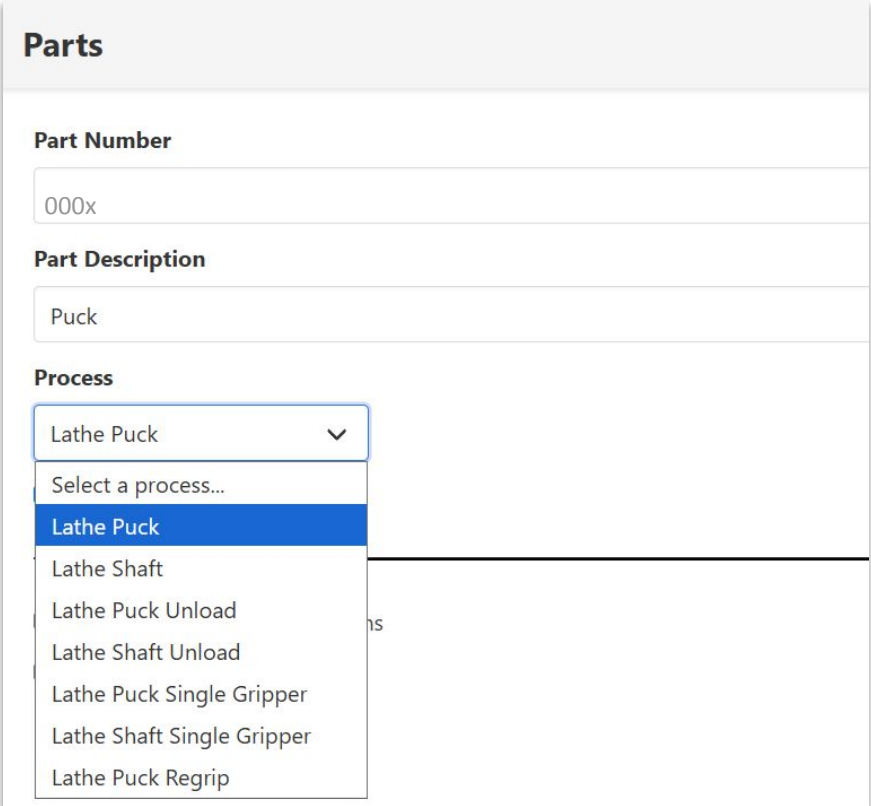
On VSC Interface, go to the “Configuration” page

VSC interface default page is “Home”

1. Click on pulldown menu in the upper left corner of the screen and select Configuration
2. On the configuration page, click on the + symbol in the upper right of the screen to add a part

Part Information

1. Part Number - Enter identifiable internal part number
2. Part Description - Enter a description of the part
3. Select Process
 - Lathe Puck
4. Enter part and process specific data described on the following pages



Parts

Part Number

000x

Part Description

Puck

Process

Lathe Puck ▼

Select a process...

Lathe Puck

Lathe Shaft

Lathe Puck Unload

Lathe Shaft Unload

Lathe Puck Single Gripper

Lathe Shaft Single Gripper

Lathe Puck Regrip

VSC Process Scripts - DuoGrip Puck Systems

VSC Process Script Overview

VSC Process Scripts drive how the Automation System moves parts through the automation process. VSC Process scripts include parameters entered in the part configuration and how the VSC uses those parameters to coordinate robot motion, IO and CNC processing.

The Automation Systems include standard scripts. If you're automation application has special requirements, contact VersaBuilt for a quote on a custom Process Script.

Standard Scripts for Puck Processing are:

- **Lathe Puck**
- **Lathe Puck Unload**
- **Lathe Puck Regrip**
- **Lathe Puck Single Gripper**

VSC Process Scripts - DuoGrip Systems

- **Lathe Puck** (Macro Version and Standard Driver (generic handshake) Version)
 - Used for 1 operation parts on a single vise or chuck.
- **Lathe Puck Unload** (Macro Version and Standard Driver (generic handshake) Version)
 - Used for parts that are presented to the machine through other means (e.g., bar feeder) and only require the robot to unload the finished parts and place them on the cart or to the bin drop location.
- **Lathe Puck Regrip** (Macro Version and Standard Driver (generic handshake) Version)
 - Used for 2 operation parts with 1 Vise or Chuck. Gripper 1 Loads Op1, Gripper 2 Unloads Op1 completed part and places the Op1 part on the Regrip Station, the Gripper rotates and regrips the part with Gripper 1 and reloads the Vise or Chuck.
- **Lathe Puck Single Gripper**
 - Used for parts that exceed the total robot payload when holding parts in both Gripper 1 and Gripper 2 during transfer from one part to the next. Gripper 2 is empty when loading with Gripper 1 and Gripper 1 is empty when Gripper 2 is unloading. This is less efficient than the standard processes, but allows for heavier parts to be processed.

Puck Configuration (Complete Form)

Process Options			
☐ Show Advanced Process Options			
☐ Bin Drop		CNC Turning Program	
		0	
Raw Material Definition			
☐ Show Advanced Raw Material Definition			
☒ Use Part Detection		Raw Material Diameter (Inches)	Raw Material Height (Inches)
		4	2.09
			Raw Material Weight (Pounds)
			2.55
Finished Part Definition			
☐ Show Advanced Finished Part Definition			
Finished Part Height (Inches)		Finished Part Weight (Pounds)	
2.09		2.55	
Optional Chuck Calibration Definition			
☐ Part Specific Chuck Calibration			
Chuck Load Options			
☐ Show Advanced Chuck Load Options			
Distance from Face of Chuck to Face of Jaws (Inches) ?		Distance from Face of Chuck to End of Raw Material (Inches) ?	
1.618		3.394	
Chuck Unload Options			
☐ Show Advanced Chuck Unload Options			
Distance from Face of Chuck to Face of Jaws (Inches) ?		Distance from Face of Chuck to End of Finished Part (Inches) ?	
1.618		3.394	
VersaBlast and VersaWash Options			
☐ VersaBlast Before Unload	☒ VersaBlast After Unload	☐ Use User Defined VersaBlast Diameter	☐ VersaWash Before Place
Offset from Face of Jaws for VersaBlast After Unload (Inches)		Number of Cycles for VersaBlast After Unload	
2		1	

Puck Configuration Parameters - Definitions

Show Advanced Options

Selecting this checkbox will show many additional options in each section of the form. In general, the non-advanced fields are required, and the advanced fields are used for optimization. Descriptions of the the advanced options follow this section

Bin Drop

When selected, the system will drop the part in the calibrated Bin Drop location instead of placing the part back on the VersaCart table
Bin Drop location is pre-calibrated, but can be repositioned in the Calibration process, shown in the Installation Manual

CNC Turning Program

The CNC Program to machine the part during the automation process

Use Part Detection

Enable if using a sensor cable connected from an actuator to the robots tool flange. Disables 'Find Part on Pick'

Raw Material Diameter

Diameter of the raw material before processing

Raw Material Height

Height of the raw material before processing

Raw Material Weight

Weight of the raw material before processing

Finished Part Height

Height of the finished part

Finished Part Weight

Weight of the finished part

Process Options

☐ Show Advanced Process Options

☐ Bin Drop

CNC Turning Program

0

Raw Material Definition

☐ Show Advanced Raw Material Definition

☐ Use Part Detection

Raw Material Diameter

(Inches)

4

Raw Material Height (Inches)

2.09

Raw Material Weight (Pounds)

2.55

Finished Part Definition

☒ Show Advanced Finished Part Definition

Finished Part Height (Inches)

2.09

Finished Part Weight (Pounds)

2.55

Puck Configuration Parameters - Definitions

Pat Specific Chuck Calibration

Allows for capture of a 'Chuck Load Puck Position' and 'Chuck Unload Puck Position' (**Overrides global calibration**)

Distance from Face of Chuck to Face of Jaws (Load and Unload)

See previous pages for picture and description

Distance from Face of Chuck to End of Raw Material

See previous pages for picture and description

VersaBlast Before Unload

Blow off part before unload

VersaBlast After Unload

Blow off part after unload

Use User Defined VersaBlast Diameter

Overrides default diameter for the VersaBlast pathing

VersaWash Before Place

Wash the part before placing on table

Note: The question marks throughout the config open an image window referencing the field!

Optional Chuck Calibration Definition

☐ Part Specific Chuck Calibration

Chuck Load Options

☐ Show Advanced Chuck Load Options

Distance from Face of Chuck to Face of Jaws (Inches) ?

1.618

Distance from Face of Chuck to End of Raw Material (Inches) ?

3.394

Chuck Unload Options

☒ Show Advanced Chuck Unload Options

Distance from Face of Chuck to Face of Jaws (Inches) ?

1.618

Distance from Face of Chuck to End of Finished Part (Inches) ?

3.394

VersaBlast and VersaWash Options

☐ VersaBlast Before Unload

☒ VersaBlast After Unload

☐ Use User Defined VersaBlast Diameter

☐ VersaWash Before Place

Puck Configuration Parameters - Advanced Options (Process - Raw)

Process Options

- **Using Oversized Puck Fingers**
Select this option when using the oversized puck fingers to avoid collisions with the robot
- **Maximize Infeed Area with Gripper Rotation**
Robot pathing allows for additional rotations in attempt to maximize number of parts permitted to be loaded for one job. Parts are picked at a 90-degree angle about the Z-axis. Recommend disabling on non-symmetric or non-round parts, as this feature was introduced for round parts.
- **Use In CNC Home Position**
Robot will move to a calibrated InCNC Home Position before Load / Unload moves. Disabling causes the robot to move to a default location instead.
- **Transfer in CNC**
If equipped with a sub-spindle, the LAS will move directly from the main spindle to the sub-spindle, without exiting to the CNC Home position during load/unload process
- **Custom Infeed Spacing**
When selected, the automatic calculation of infeed spacing is overridden and the operator is prompted to enter starting X and Y locations, part spacing in X and Y and the number of rows and columns ([Refer to Appendix for further information](#)).
- **Override COG (Center of Gravity)**
By default, the center of gravity (COG) for each part is calculated assuming a uniform distribution of mass along the length of the part, at the different states of operation. If needed, the COG definition for each process step can be entered manually. COG definition can be calculated via UR Robot process (see UR manual) or via CAD. COG is needed for Part in Gripper 1 only, Part in Gripper 2 only, and Part in both Grippers

Raw Material Definition

- **OD Clamp on Raw Material Pick**
If selected, the Gripper will OD clamp on raw material pick from cart, otherwise the Gripper will ID clamp
- **Find Part on Pick**
If selected, the Robot will move towards VersaCart table until the puck fingers touch the part. If not selected, the gripper will attempt to pick the Raw Material based on the Raw Material Height entered
- **Float Robot on Pick**
If selected, the Robot will move go into freedrive mode before clamping the part
- **Clamp Settle Part after Pick**
If selected, the robot will flip the gripper after picking the part, so part is facing up, then open and close the gripper to settle the part in the gripper.
- **Float Settle Part after Pick**
If selected, the robot will flip the gripper after picking the part, so part is facing up, then remove the pressure in the gripper to settle the part in the gripper.

Key



Enabled by Default

Puck Configuration Parameters - Advanced Options (Finished - Load)

Finished Part Definition

■ OD Clamp on Finished Part Place

If selected, the Gripper will OD clamp when unloading the part from the chuck and when placing the part on the cart

If unselected, the Gripper place with ID clamp logic

■ Find Part on Place

If selected, the Robot, holding a part in the gripper, will move towards VersaCart table until the part in the puck fingers touch the table, then the gripper will release the part, if not selected, the gripper will attempt to place the Finished Part based on the entered Finished Part Height

■ Clamp Settle Part before Place

If selected, the robot will open and close the gripper to settle the part in the gripper before placing the part on the table.

○ Float Settle Part after Pick

If selected, the robot will remove the pressure in the gripper to settle the part in the gripper before placing.
unload

Key



Enabled by Default

Puck Configuration Parameters - Advanced Options (Finished - Load)

Chuck Load Options

- **Load Chuck Number**
To load main spindle, enter 1; to load sub-spindle, enter 2
- **Additional Distance for Part Length Variance**
Add additional distance away from chuck during the load process to prevent a collision if part is slightly oversized
- **Load Chuck Jaw Z Clearance Distance**
During the approach of the part to load in the chuck, the distance away from the chuck jaws to position the part on the chuck centerline
- **Offset from Calibrated Chuck Position**
Offset from the calibrated position of the chuck in Z. Useful for sub-spindles that need to be positioned differently than the calibration position during unload
- **Load Tuning Adjustment**
For parts that may sag in the gripper, and offset to apply to the load position. Generally, only the last position rZ (rotation about Z) is used; positive numbers tilt the part up and negative numbers tilt the part down
- **OD Clamp on Load Chuck**
When selected, the part is OD clamped in the chuck, otherwise part is ID clamped in the chuck
- **Find Chuck on Load**
When selected, robot will use its force sensor to determine when the Z surface of the chuck is reached
- **Apply Force During Chuck Clamp**
If selected, will run the CNC program in the **Wash Program** field after unloading parts to clear chips from the chuck
- **Validate Load Position During Apply Force**
If selected, the system will validate the part gets into the chuck at the specified position within the Max Load Position Error. Opens Max Load Position Error using Apply Force field
 - **Max Load Position Error using Apply Force**
When selected, robot will validate the position reached after applying force. If the robot is not within the specified distance (plus and minus the specified distance) the robot will generate an error and stop the process
- **Distance from Face of Jaws to Apply Force**
Relative to the configured load position, the distance away from that position to begin applying force
- **Applied Force (Newtons)**
The force the robot will apply during apply force in Newtons; there are approximately 4.5 newtons per pound of force
- **Time to Apply Force**
The amount of time the robot will apply force before issuing a clamp chuck command, the longer the distance the robot must move during apply force, the longer this time should be
- **Float Robot on Load Chuck**
If selected, the Robot will move go into freedrive mode before loading the part

Key



Enabled by Default

Puck Configuration Parameters - Advanced Options (Unload)

Chuck Unload Options

- **Load Chuck Number**
To load main spindle, enter 1; to load sub-spindle, enter 2
- **Unload Chuck Jaw Z Clearance Distance**
Distance from chuck jaws before approaching the part to unload from the chuck
- **Offset from Calibrated Chuck Position**
Offset from the calibrated position of the chuck in Z. Useful for sub-spindles that need to be positioned differently than the calibration position during unload
- **OD Clamp on Unload Chuck**
When selected, the part is OD clamped in the gripper when removing the part from the chuck, otherwise part is ID clamped in the gripper
- **Find Chuck on Unload**
When selected, robot will use its force sensor to determine when the Z surface of the chuck is reached
- **Wash Chuck After Unload**
If selected, will run the CNC program in the **Wash Program** field after unloading parts to clear chips from the chuck
- **Dump Coolant on Unload**
If selected, gripper will rotate down to dump coolant trapped in the part and allow it to drip dry
- **Dump Coolant Drip Time**
Time spent in CNC allowing coolant to drip off part during Dump Coolant

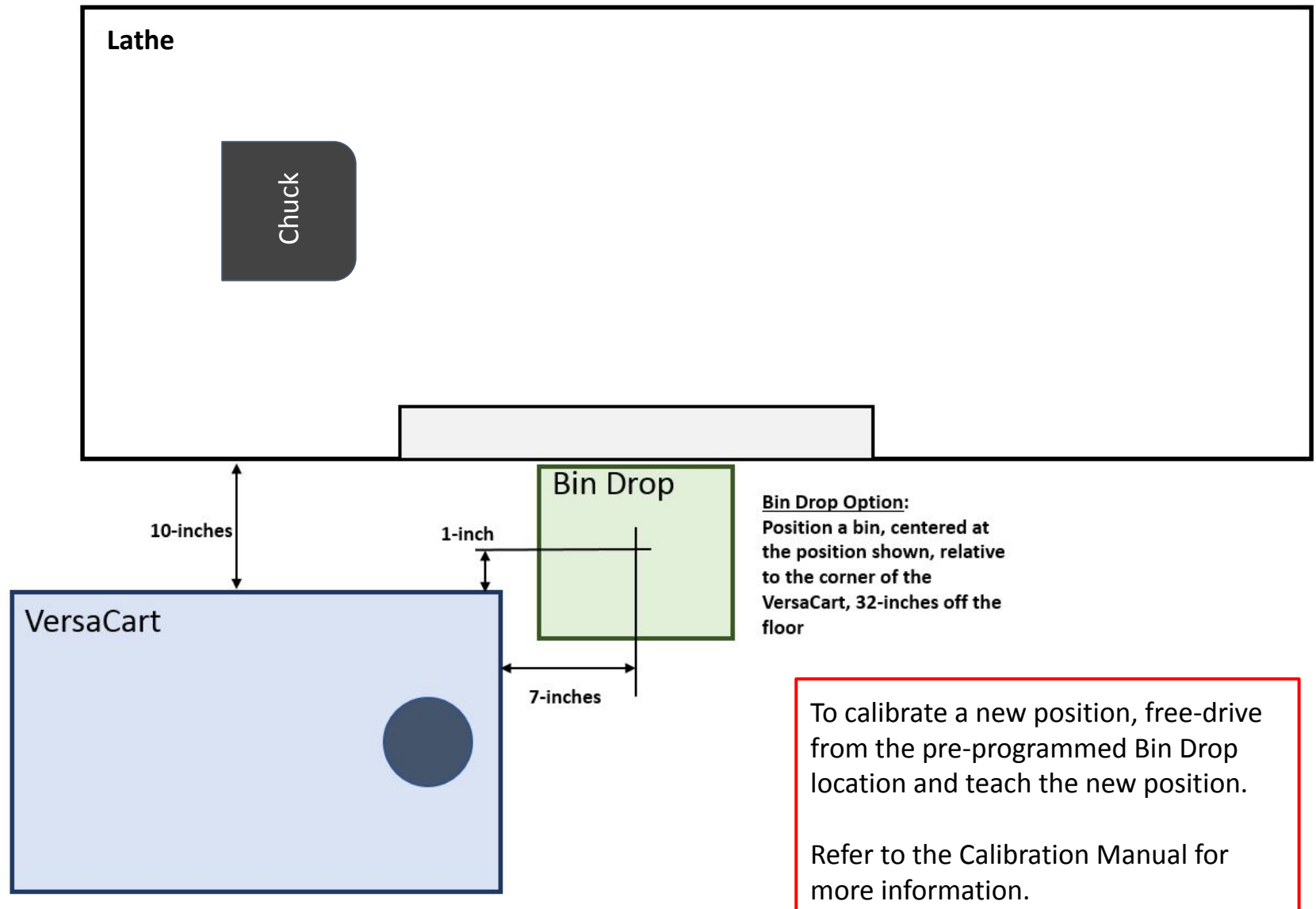
Key



Enabled by Default

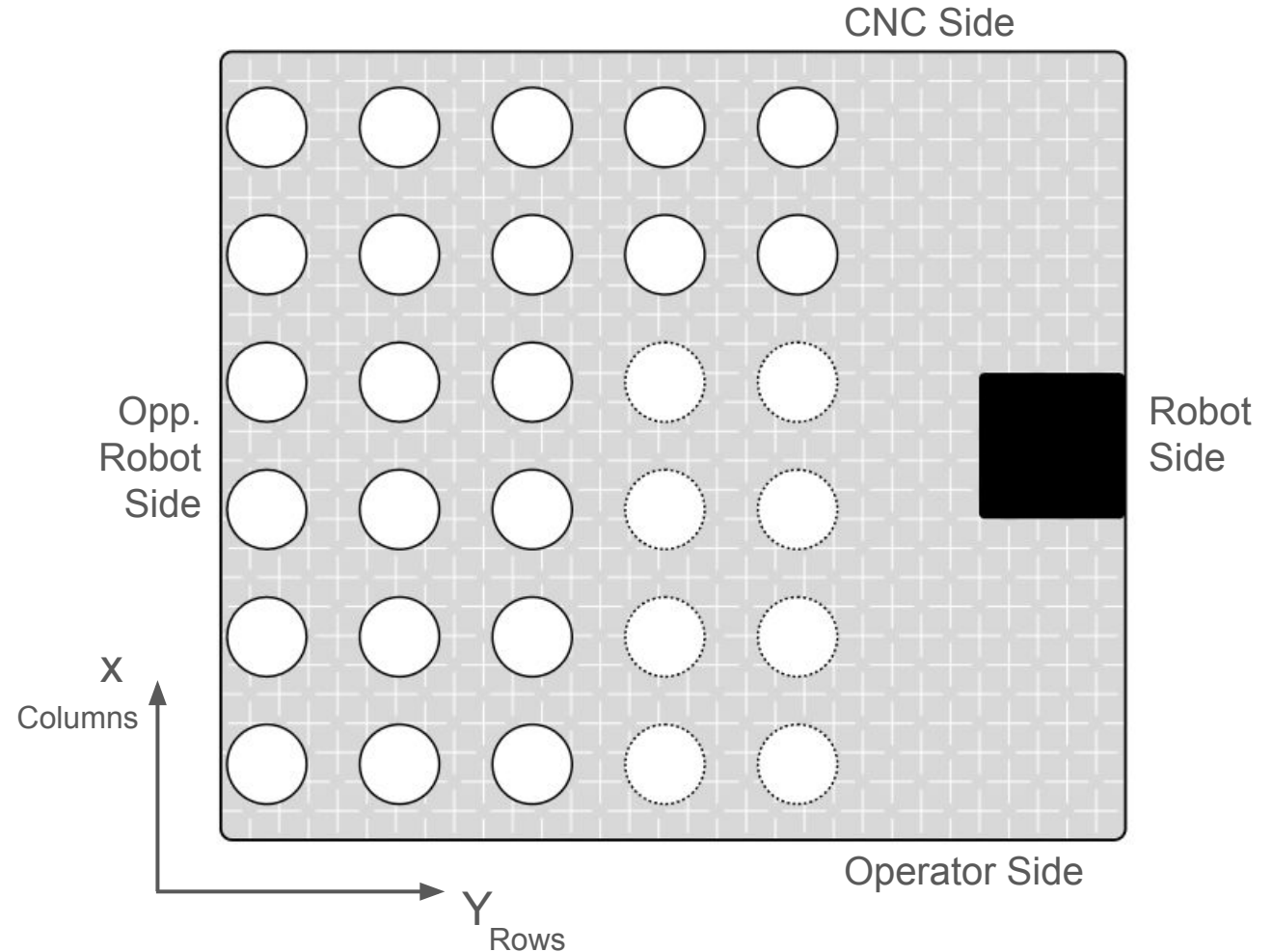
Bin Drop Option

- Place bucket or bin at location shown
- Protect parts with foam, water or other means

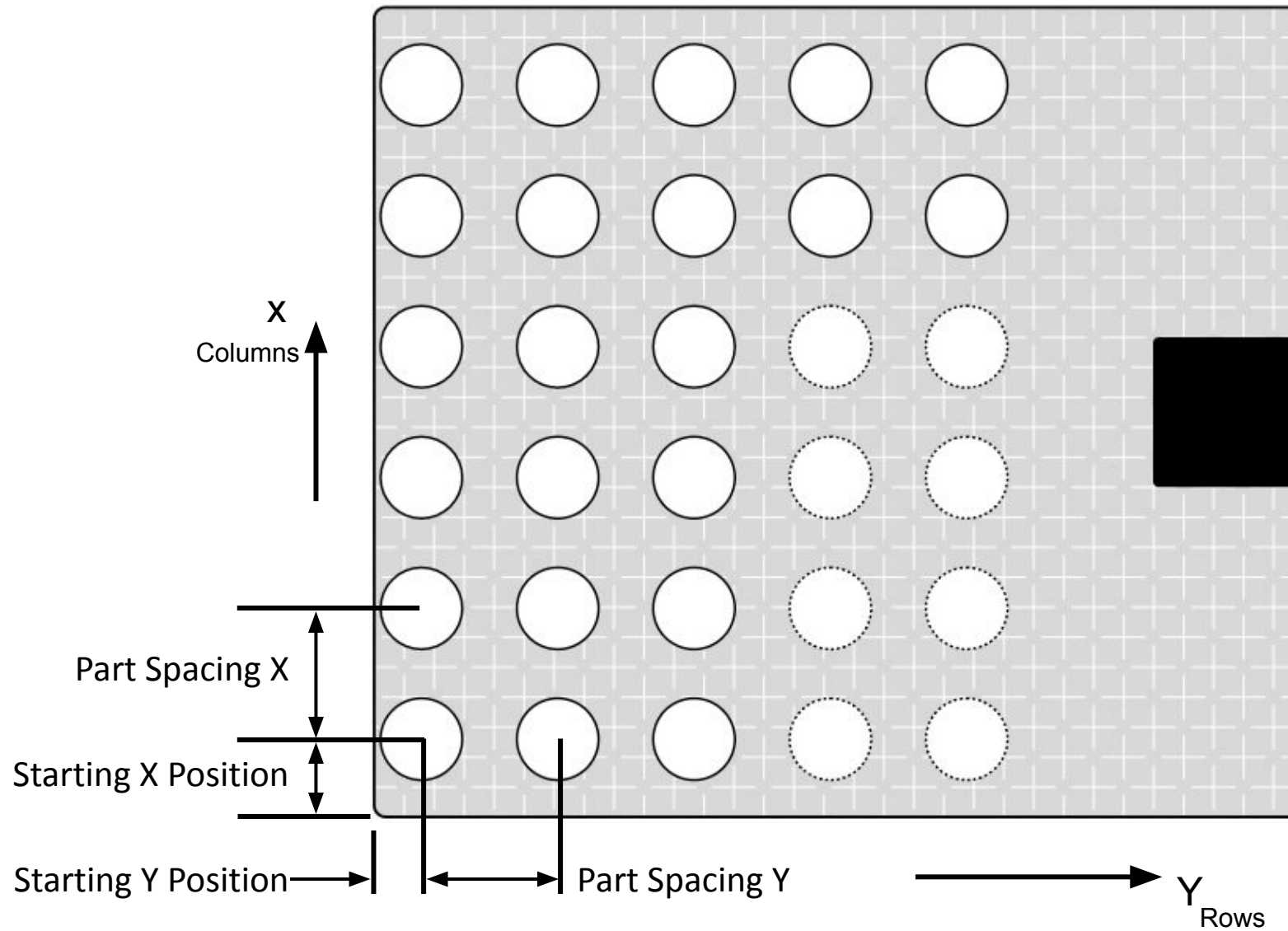


Custom Infeed Option

- The Infeed layout can be customized, typically for infeed optimization.
- The custom locations are set in the Part Configuration, with offsets relative to the calibrated Stainless Steel Visual Infeed (refer to calibration manual).
- In the part configuration, the following information is entered:
 - **Starting X Position** = Distance from Edge of Calibrated Infeed (Operator Side) to Center of Part Picking Location
 - **Starting Y Position** = Distance from Edge of Calibrated Infeed (Opposite Robot) to Center of Part Picking Location
 - **Part Spacing in X** = Center to Center distance in X Direction
 - **Part Spacing in Y** = Center to Center distance in Y Direction
 - **Number of Columns** = X-Direction Part Count
 - **Number of Rows** = Y-Direction Part Count
- For custom infeed design, contact VersaBuilt or use 3D models, available at <https://www.versabuilt.com/resources/>.

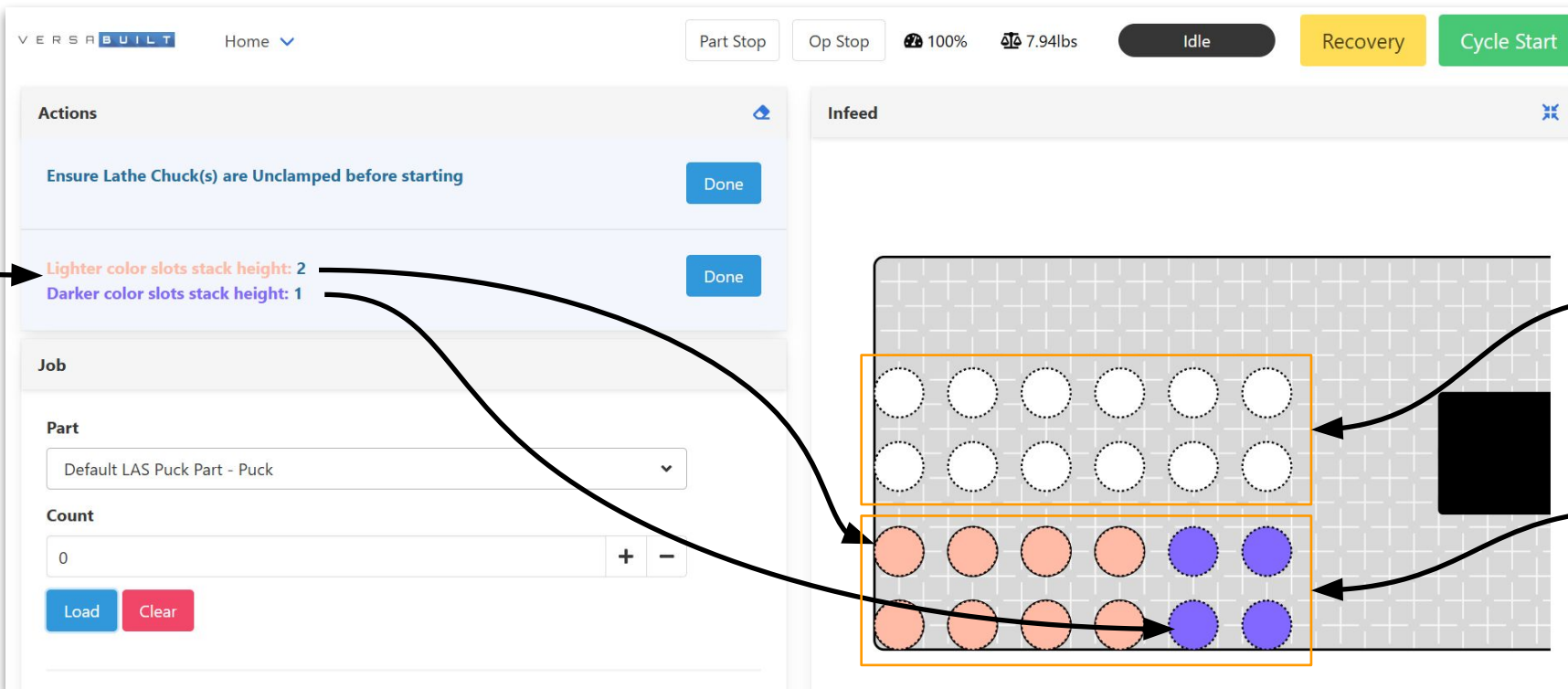


Custom Infeed Option



DuoGrip Mill Stacked Infeed

- The option for stacked infeed can be enabled via the System Settings Page in the dropdown menu for Infeed Template.
- The fundamental change this implements is the ability to stack parts on the VersaCart Infeed.
- This change is reflected in the User Interface Home Page
 - Color coordinated stack height and dot borde
- When loading parts, half the table will be used for Infeed, the other half will be used for outfeed.
- Configurations will remain exactly the same, and do not need adjustments to compensate for a change of infeed template (unless using a custom infeed, in which case the number of rows and columns change)
- When loading parts, adding additional parts once already loaded is not supported. A user must clear parts in the UI, then reload desired quantity.



Stack Key

Lighter color slots stack height: 2

Darker color slots stack height: 1

Job

Part

Default LAS Puck Part - Puck

Count

0

Load Clear

Infeed

Outfeed

Infeed

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