

VERSABUILT ROBOTICS



Automation System Calibration Manual

Software Version 1.3.0 Copyright VersaBuilt 2026
2026-06-18

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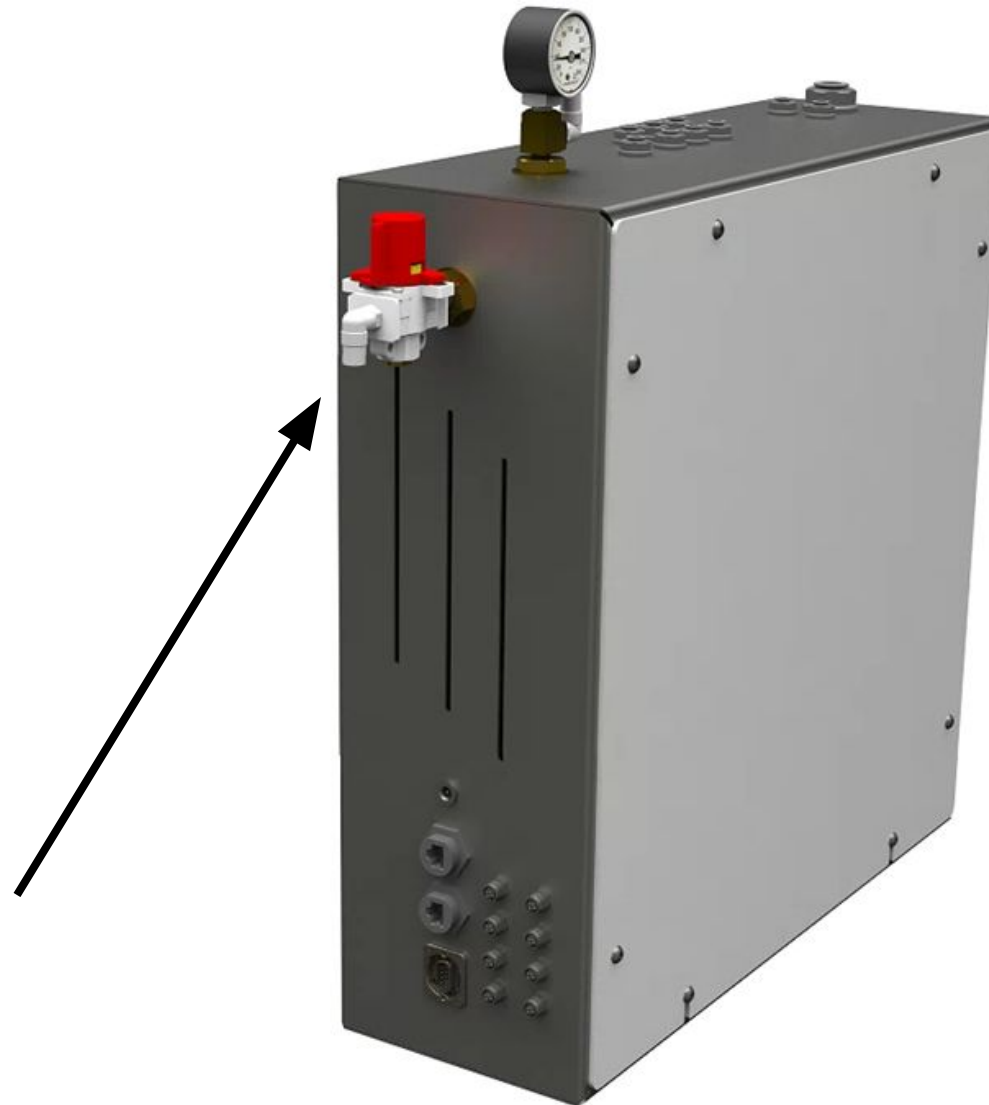
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Calibration Prep & System Review

Section 1

Configure and Validate VersaBuilt System Controller

- WARNING: this step opens and closes the vises, grippers and door. Keep all body parts away from the vises, grippers and door
- If an air line needs to be swapped, remove pneumatic energy to the system by turning the red air relief valve on the VersaBuilt System Controller



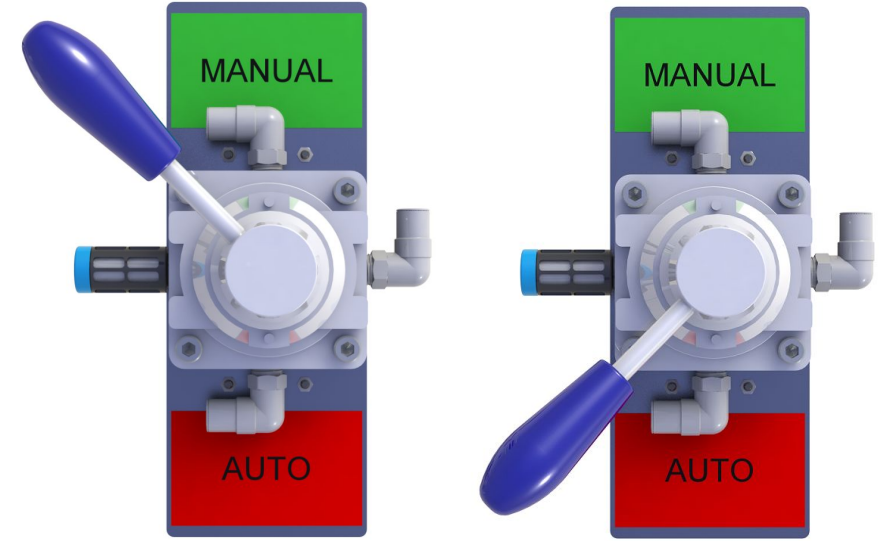
Mill Systems - Validate Vise Actuation (Manual & Auto)

Vise Open/Close Manual Validation:

- Switch the Diverter valve to Manual
- Toggle the vises open and closed with the hand valves

Vise Open/Close Automatic Validation:

- Switch the Diverter valve to Auto
- Press the **Open** button for each vise, ensure the correct vise opens
- Press the **Close** button for each vise, ensure the correct vise closes



Mill Systems only

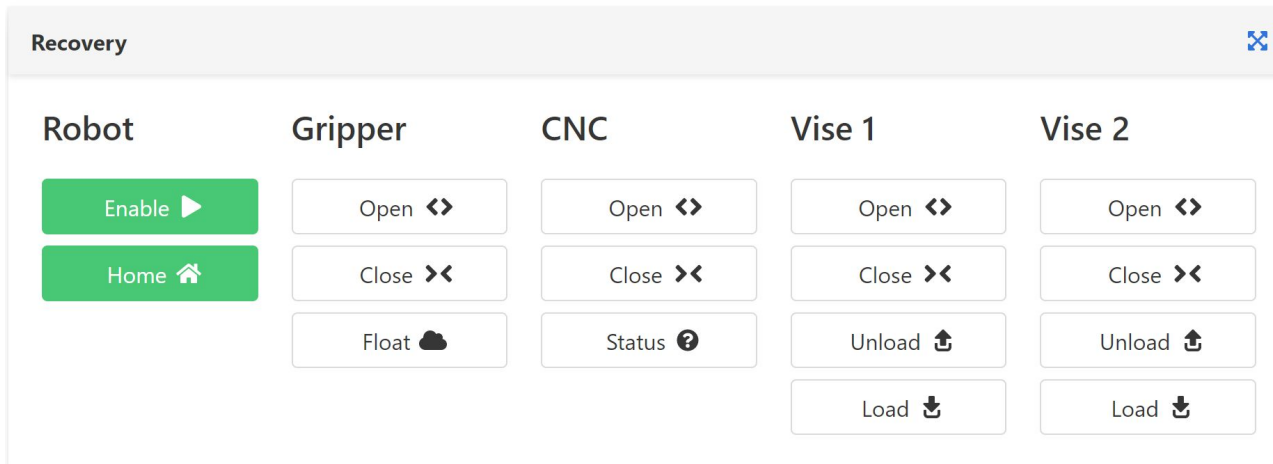
Recovery				
Robot	Gripper	CNC	Vise 1	Vise 2
Enable ▶	Open <>	Open <>	Open <>	Open <>
Home 🏠	Close ><	Close ><	Close ><	Close ><
	Float ☁	Status ?	Unload ⬆	Unload ⬆
			Load ⬇	Load ⬇

Validate Gripper

Gripper Open/Close Validation:

Navigate to the Home page and press the yellow Recovery button in the upper right hand section of the page. Make sure system is in Auto mode.

- Press the **Open** button for the gripper, ensure the gripper opens
- Press the **Close** button for the gripper, ensure the gripper closes
- *If necessary, remove air to the VSC and swap airlines to get correct open/close order*



Validate Vise and Door Sensors

Vise Sensor Validation:

Navigate to the VSC IO Panel page.

- With both vises Closed, verify Vise 1 and Vise 2 sensors are “Off”
- With both vises Open, verify Vise 1 and Vise 2 sensors are “Off”
- Place the Calibration Plate onto Vise 1 and Close Vise 1, verify the Vise 1 sensor is “On”
- Place the Calibration Plate onto Vise 2 and Close Vise 2, verify that the Vise 2 sensor is “On”

For systems with Vise and VersaDoor sensors installed

The screenshot displays the VSC IO Panel interface. At the top, there's a header with 'VERSABUILT ROBOTICS' and 'IO Panel'. Below this, there are buttons for 'Part Stop', 'Op Stop', 'Re-Sync CNC', and status indicators for '4.08lbs' and '80psi'. There are also 'Recovery' buttons. The main content is divided into two panels: 'Input Dashboard' and 'Output Dashboard'.

Input Dashboard:

Address	Value (Polled every second)
WISE_1_SENSOR	Off
WISE_2_SENSOR	Off
WISE_3_SENSOR	Off
DOOR_OPEN_SENSOR	Off
DOOR_CLOSE_SENSOR	Off
DOUBLE_DOOR_OPEN_SENSOR	Off
DOUBLE_DOOR_CLOSE_SENSOR	Off
VSC_START	Off

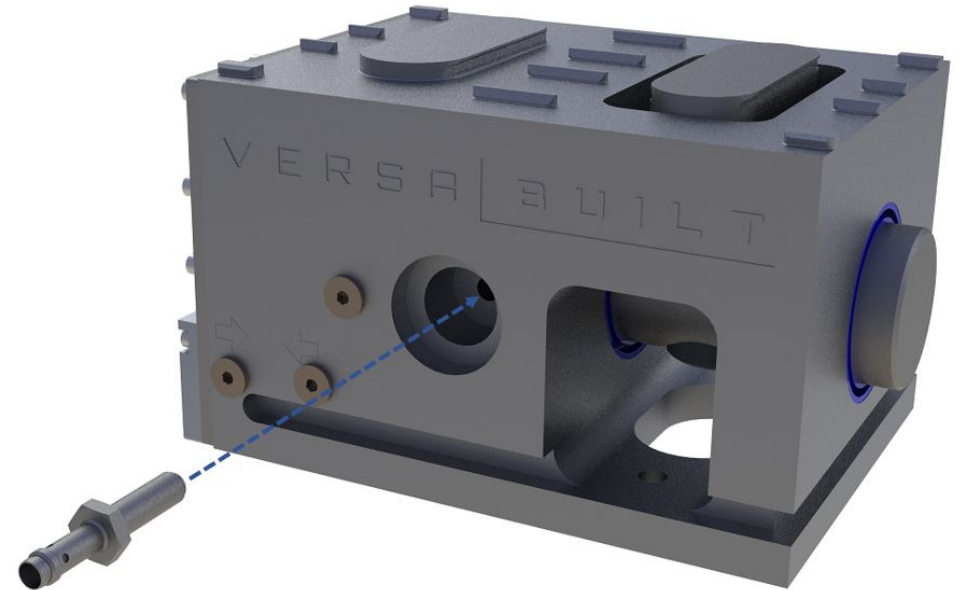
Output Dashboard:

Address	Controls	Value
WISE_1_OPEN	Send Low Send High	Off
WISE_1_CLOSE	Send Low Send High	On
WISE_2_OPEN	Send Low Send High	Off
WISE_2_CLOSE	Send Low Send High	On
WISE_3_OPEN	Send Low Send High	Off
WISE_3_CLOSE	Send Low Send High	Off
DOOR_OPEN	Send Low Send High	Off
DOOR_CLOSE	Send Low Send High	Off
VERSABLAST	Send Low Send High	Off
WASH_TANK	Send Low Send High	Off
CYCLE_START	Send Low Send High	Off
GRIPPER_OPEN	Send Low Send High	Off
GRIPPER_CLOSE	Send Low Send High	Off
ROTATE_UP	Send Low Send High	Off
ROTATE_DOWN	Send Low Send High	Off

Adjusting Vise Sensors

Vise Sensor Adjustment:

- Proper sensor adjustment is needed to determine the proper loading of MultiGrip Jaws and part during automation processing. When clamping on material, OD Jaws have a nominal 0.125" gap between left and right jaw, and ID Jaws have a nominal 0.39" gap between left and right jaw.
- Vise sensors can be adjusted in or out to achieve the necessary behavior, with a Calibration Plate in the vise. To adjust, remove sensor cable, loosen nut on sensor body with 13mm Deep Socket. If the Sensor is On in the Fully Open or Fully Closed state, rotate sensor counter-clockwise to loosen. If the Sensor is Off when clamping on the Calibration Plate, rotate the sensor clockwise to tighten. Secure the nut, reattach the cable and test again. Repeat as necessary.



Carefully review the vise sensor installation instructions

Incorrect installation can result in damage to the vise and sensors

Validate VersaDoor and Door Sensors

If the CNC has a Factory Auto Door:

- Ensure the CNC is configured to close the door on Cycle Start and to open the door on Cycle End
- Measure the CNC's auto door open and close time. Navigate to the Settings page and set the Door Wait Time to the longer of the measured door open or door close time plus 1 second

NOTE: some factory CNC auto doors, including most Haas CNCs, do not signal cycle end to the VSC until after the door is fully open. If you notice a delay in robot movement after the door opens, try using a value of 0 for the Door Wait Time

The screenshot displays the VersaRobotics IO Panel interface. At the top, there are status indicators for 'Part Stop', 'Op Stop', 'Re-Sync CNC', '4.08lbs', and '80psi'. Below these are 'Recovery' buttons. The main area is divided into two panels: 'Input Dashboard' and 'Output Dashboard'.

Input Dashboard:

Address	Value (Polled every second)
WISE_1_SENSOR	Off
WISE_2_SENSOR	Off
WISE_3_SENSOR	Off
DOOR_OPEN_SENSOR	Off
DOOR_CLOSE_SENSOR	Off
DOUBLE_DOOR_OPEN_SENSOR	Off
DOUBLE_DOOR_CLOSE_SENSOR	Off
VSC_START	Off

Output Dashboard:

Address	Controls	Value
WISE_1_OPEN	Send Low Send High	Off
WISE_1_CLOSE	Send Low Send High	On
WISE_2_OPEN	Send Low Send High	Off
WISE_2_CLOSE	Send Low Send High	On
WISE_3_OPEN	Send Low Send High	Off
WISE_3_CLOSE	Send Low Send High	Off
DOOR_OPEN	Send Low Send High	Off
DOOR_CLOSE	Send Low Send High	Off
VERSABLAST	Send Low Send High	Off
WASH_TANK	Send Low Send High	Off
CYCLE_START	Send Low Send High	Off
GRIPPER_OPEN	Send Low Send High	Off
GRIPPER_CLOSE	Send Low Send High	Off
ROTATE_UP	Send Low Send High	Off
ROTATE_DOWN	Send Low Send High	Off

If the CNC is configured with a VersaBuilt Auto Door:

- Navigate to the IO Panel
- With the door closed, press the DOOR OPEN Send High button, *if necessary swap the airlines to get the correct door open behavior*
- Make sure the Door Open Sensor turns on and remains on while the DOOR OPEN output is High if door sensors are installed
 - Adjust the door sensor as necessary so the door sensor remains on when the door cylinder is pressurized
 - Press the DOOR OPEN Send Low button when finished
 - Repeat the same steps for Door Close and the Door Close Sensor

Refer to VersaDoor and VersaDoor Sensor Kit Manuals as needed

Calibration Overview and Warm up

Section 2

Calibration Steps

Calibration of a VersaBuilt Automation System requires 3 steps:

1. VersaCart Calibration: calibrate the robot to the VersaCart table top and an optionally a Bin Drop location
2. InCNC Home Calibration: calibrate the position where the robot begins motion to and from the vises or chucks
3. Vise/Chuck Calibration:
 - MultiGrip Vises - calibrate Vise 1 and Vise 2 positions (*optional Vise 3 and Vise 4 positions are available*)
 - Chuck Centerline for part loading
 - Vise position for part loading

Optional

- Bin Drop Location

UR Calibration

Utility Functions

Robot Warmup

Warmup

Freedrive

Enable Freedrive

Run Table Load

Table Load

Calibrate Table

Quadrant-1	Move To 1	Capture 1	Return Home
Quadrant-2	Move To 2	Capture 2	Return Home
Quadrant-3	Move To 3	Capture 3	Return Home
Quadrant-4	Move To 4	Capture 4	Return Home
Quadrant-5	Move To 5	Capture 5	Return Home
Quadrant-6	Move To 6	Capture 6	Return Home
Quadrant-7	Move To 7	Capture 7	Return Home
Quadrant-8	Move To 8	Capture 8	Return Home

Robot Warm up

Important: Before starting the calibration procedure VersaBuilt recommends warming up the robot by pressing the **“Warmup”** button in the Calibration page.

UR Calibration

Utility Functions

Robot Warmup

Warmup

Freedrive

Enable Freedrive

Run Table Load

Table Load

Calibrate Table

Quadrant-1	Move To 1	Capture 1	Return Home
Quadrant-2	Move To 2	Capture 2	Return Home
Quadrant-3	Move To 3	Capture 3	Return Home
Quadrant-4	Move To 4	Capture 4	Return Home
Quadrant-5	Move To 5	Capture 5	Return Home
Quadrant-6	Move To 6	Capture 6	Return Home
Quadrant-7	Move To 7	Capture 7	Return Home
Quadrant-8	Move To 8	Capture 8	Return Home

VersaCart Calibration w/ MultiGrip

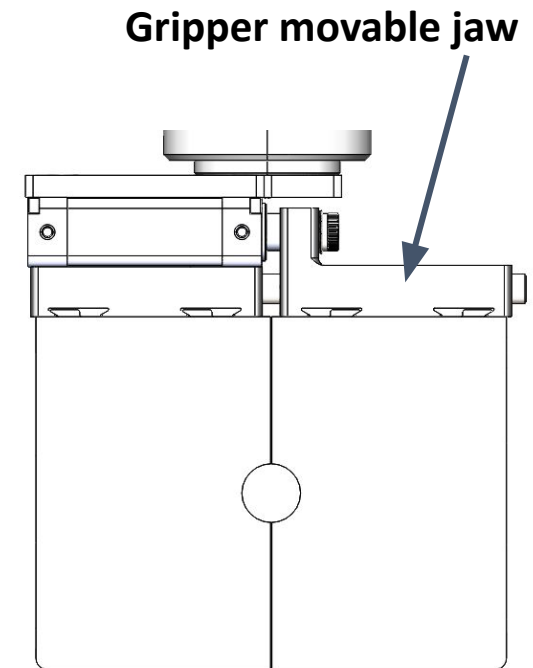
*standard 1300 visual infeed

Section 3

MultiGrip/VersaCart Calibration - Install Calibration Plate

Install Calibration Plate on Robot Gripper

1. Navigate to the VSC Calibration page
2. Press the Home button in the Recovery panel to move the robot to the Table Home location
3. Press the Gripper Float button in the Recovery panel **this allows the user to open and close the gripper by hand*
4. Move the Gripper moveable jaw until the calibration plate gripper male dovetails align into the female dovetails on the gripper
5. Push the Gripper closed onto the calibration plate dovetail features
6. Press the Gripper Close button in the Recovery panel to firmly attach the Calibration Plate to the Gripper



MultiGrip/VersaCart Calibration - Calibrate VersaCart

UR Calibration

Utility Functions

Robot Warmup

Warmup

Freedrive

Enable Freedrive

Run Table Load

Table Load

Calibrate Table

Quadrant-1

Move To 1

Capture 1

Return Home

Quadrant-2

Move To 2

Capture 2

Return Home

Quadrant-3

Move To 3

Capture 3

Return Home

Quadrant-4

Move To 4

Capture 4

Return Home

Quadrant-5

Move To 5

Capture 5

Return Home

Quadrant-6

Move To 6

Capture 6

Return Home

Quadrant-7

Move To 7

Capture 7

Return Home

Quadrant-8

Move To 8

Capture 8

Return Home

Calibrate Table Points 1 through 8

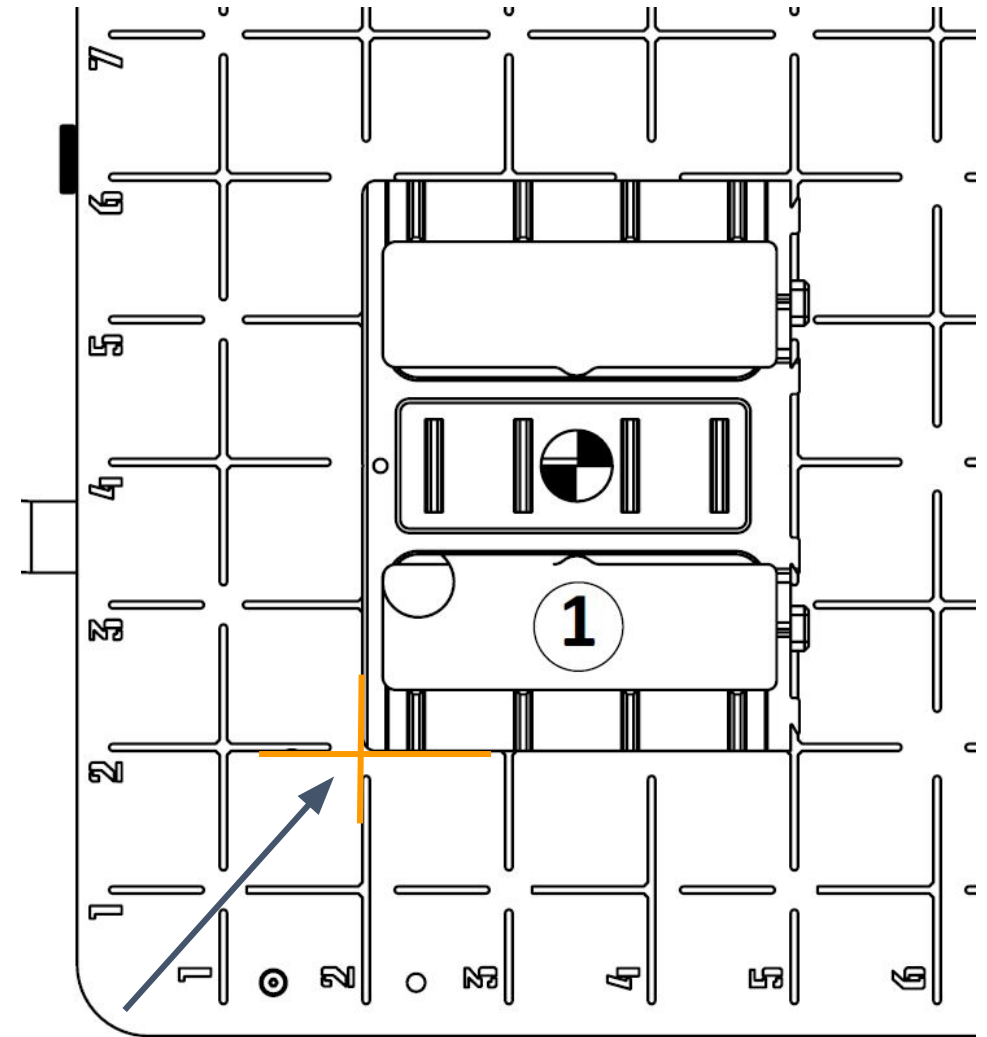
From the Calibration page, with the calibration plate on the gripper, and the robot in the Table Home position:

- Press the Move to 1 button in the Calibrate Table section. The VSC will move the robot to the first calibration position
- Press the Enable Freedrive button (set weight to calibration plate)
- By hand, position the calibration plate to the precise table calibration position, as shown on the following pages
- Hold the calibration plate in the proper precise position and press the Stop Program button on the UR Teach pendant
- Press the Capture 1 button in the Calibration panel to capture Table Point 1
- Select the “Return Home” button to move the robot back to the Table Home Position
- Repeat steps for Quadrants 2 thru 8
- Notes:
 - Quadrants 1 thru 4 are “gripper forward positions”, where the Gripper is facing away from the robot
 - Quadrants 5 thru 8 are “gripper back positions”, where the Gripper is facing towards the robot

MultiGrip/VersaCart Calibration - Calibrate VersaCart

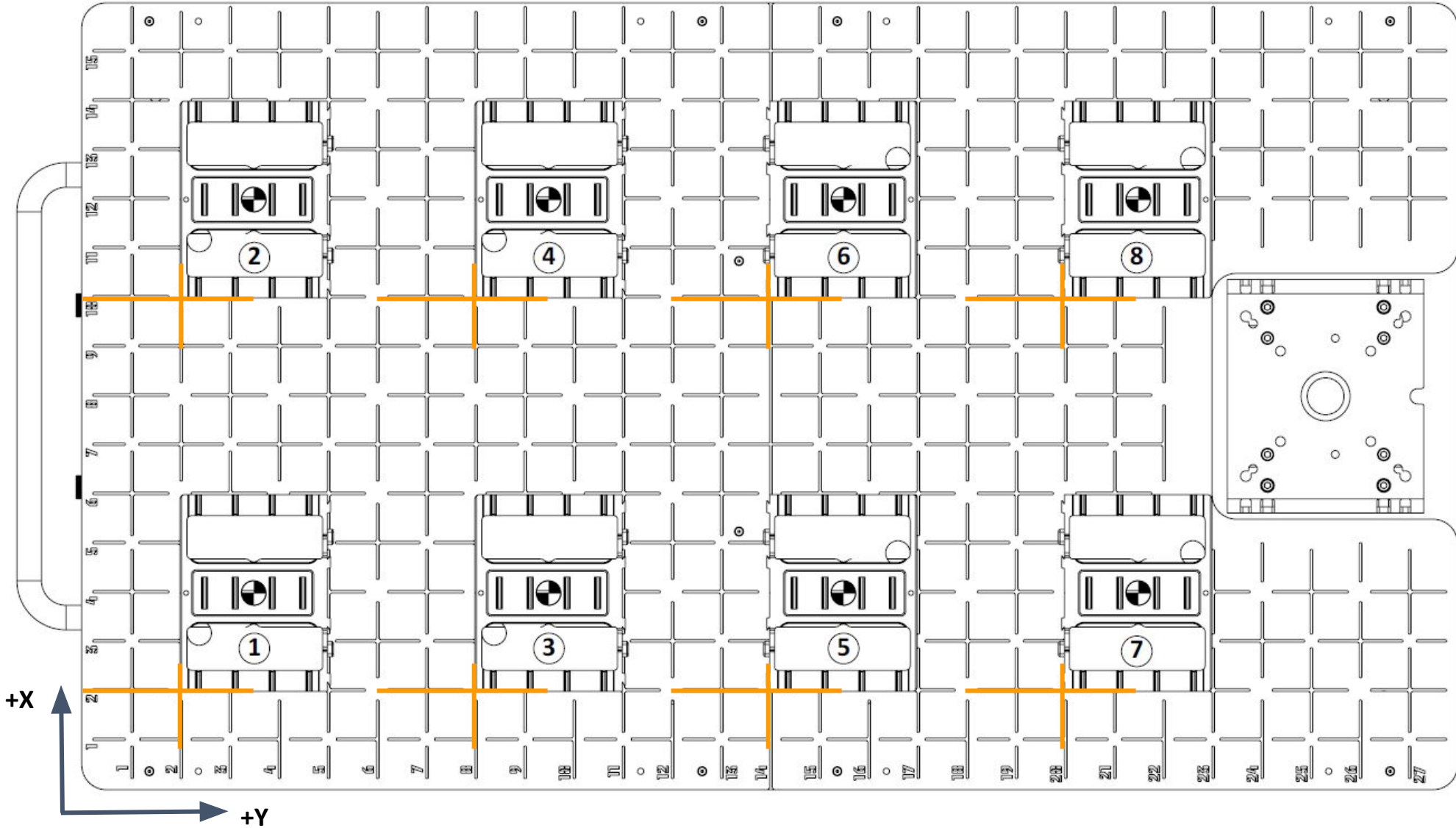
- Precise alignment of the Calibration Plate is critical to the calibration process
- The Calibration Plate needs to make full surface contact with the table top
- The Calibration Plate edges are aligned with the laser cut lines of VersaCart top grid
- The edges of the Calibration Plate must be aligned with the top edge of each Visual Infeed line
- Calibration Quadrants 1-4 align with the back side of the calibration plate
- Calibration Quadrants 5-8 align with the front side of the calibration plate

**Refer to the following pages for images showing the calibration locations*



VersaCart MultiGrip Calibration - **Standard 1300** Top Grid

Quadrant	X Location	Y Location
1	2	2
2	10	2
3	2	8
4	10	8
5	2	14
6	10	14
7	2	20
8	10	20

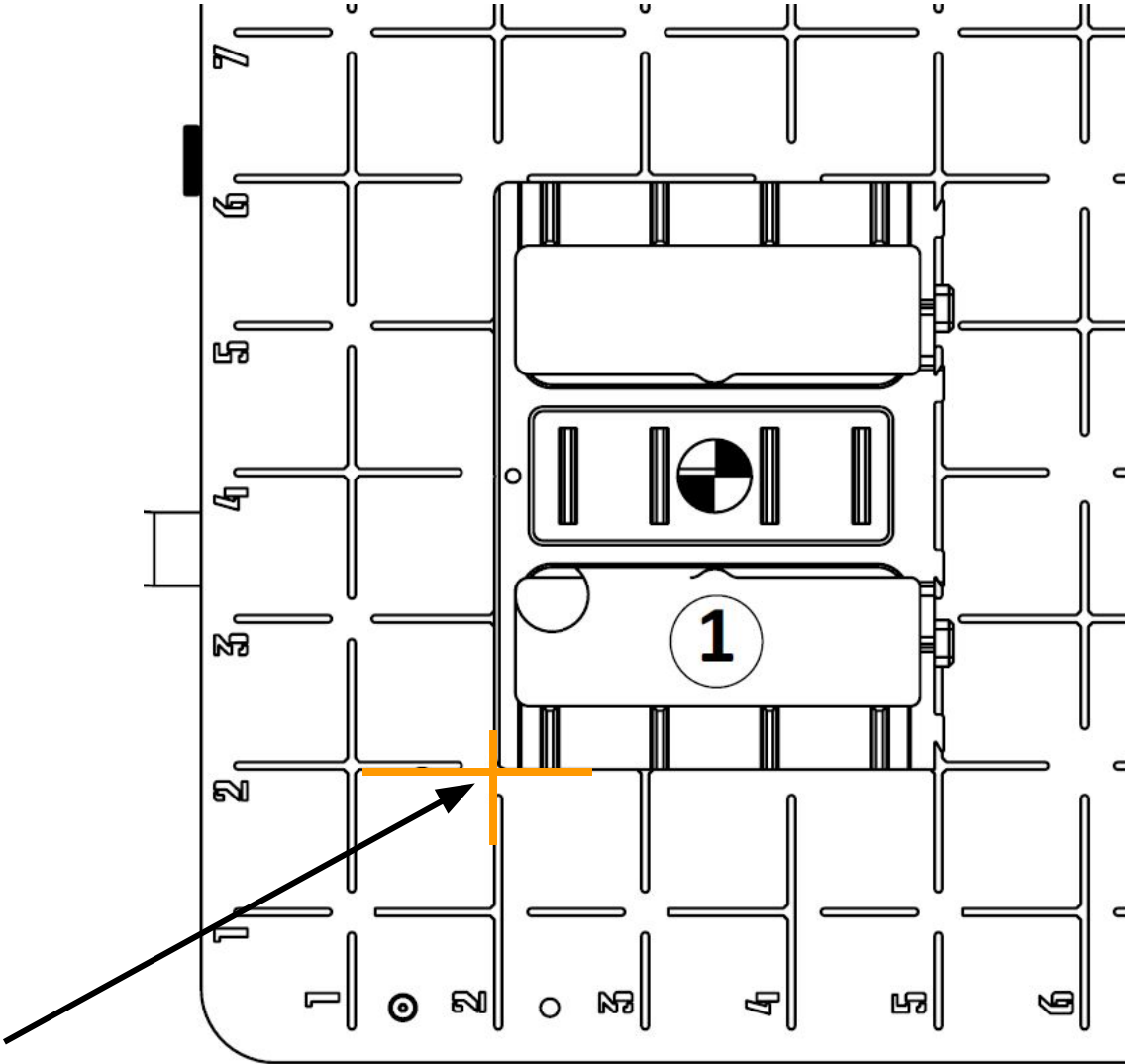


VersaCart MultiGrip Calibration Quadrant 1 - **Standard 1300** Grid

Quadrant	X Location	Y Location
1	2	2



Align corner of jaws, closest to outside corner of table with the Quadrant location

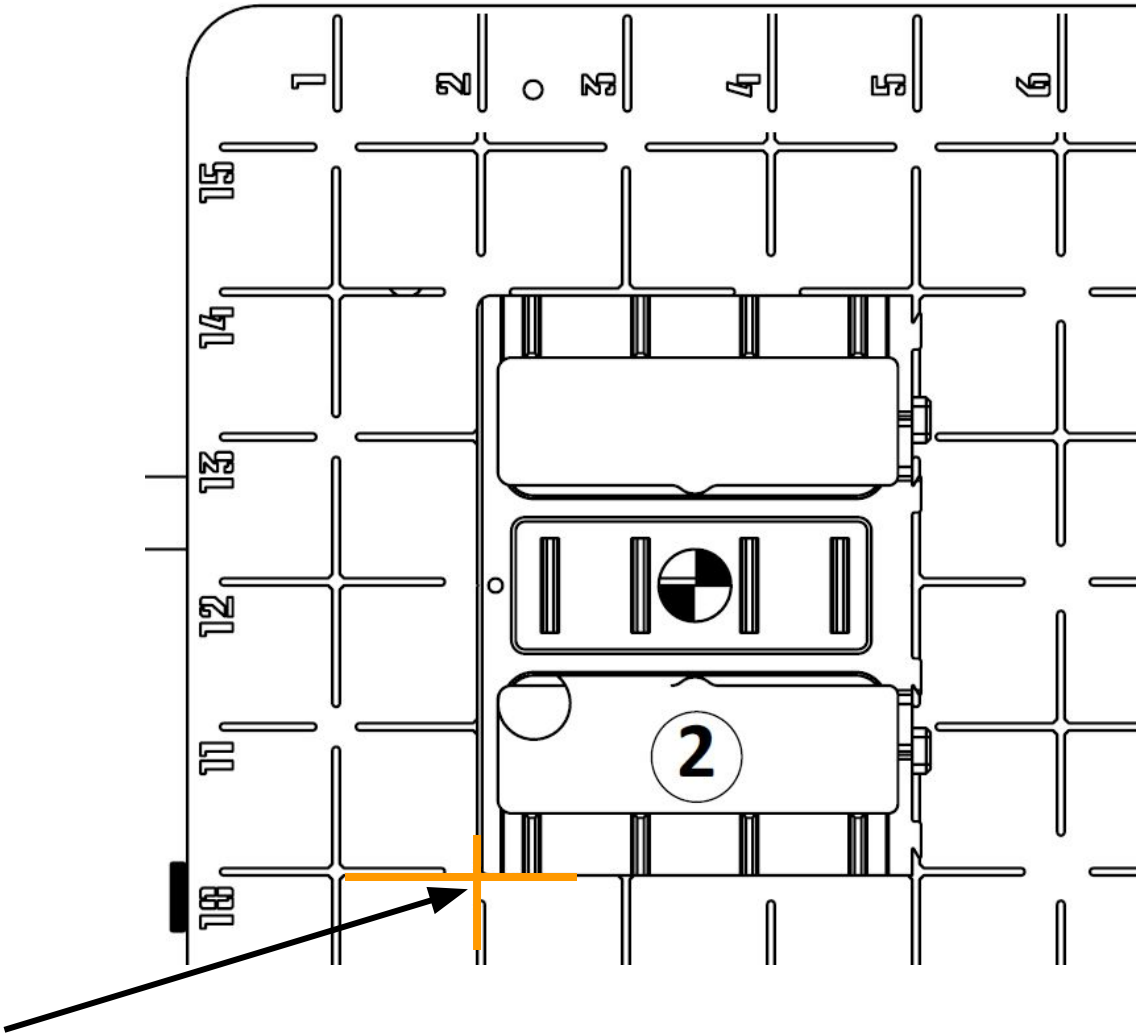


VersaCart MultiGrip Calibration Quadrant 2 - **Standard 1300** Grid

Quadrant	X Location	Y Location
2	10	2



Align corner of jaws, closest to outside corner of table with the Quadrant location

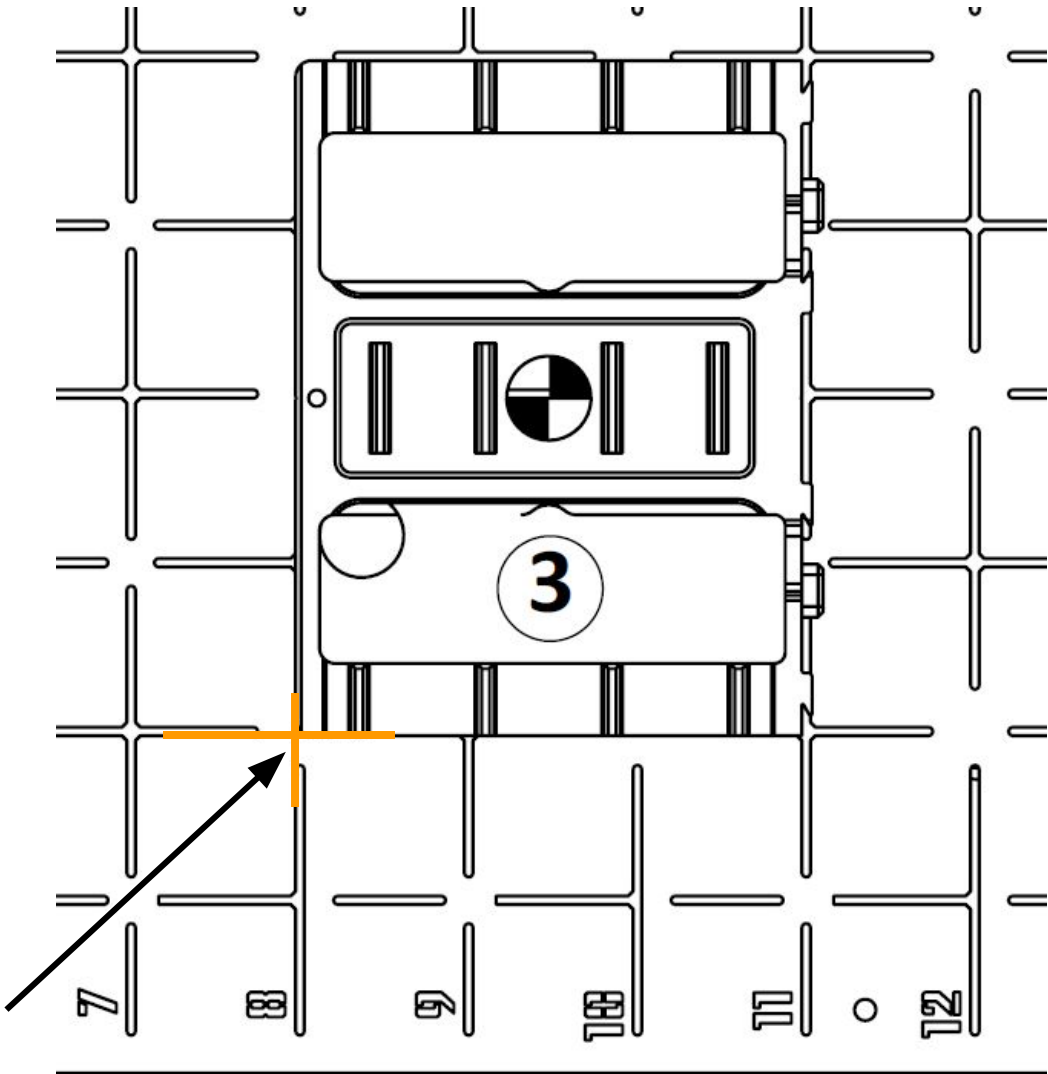


VersaCart MultiGrip Calibration Quadrant 3 - **Standard 1300** Grid

Quadrant	X Location	Y Location
3	2	8



Align corner of jaws, closest to outside corner of table with the Quadrant location

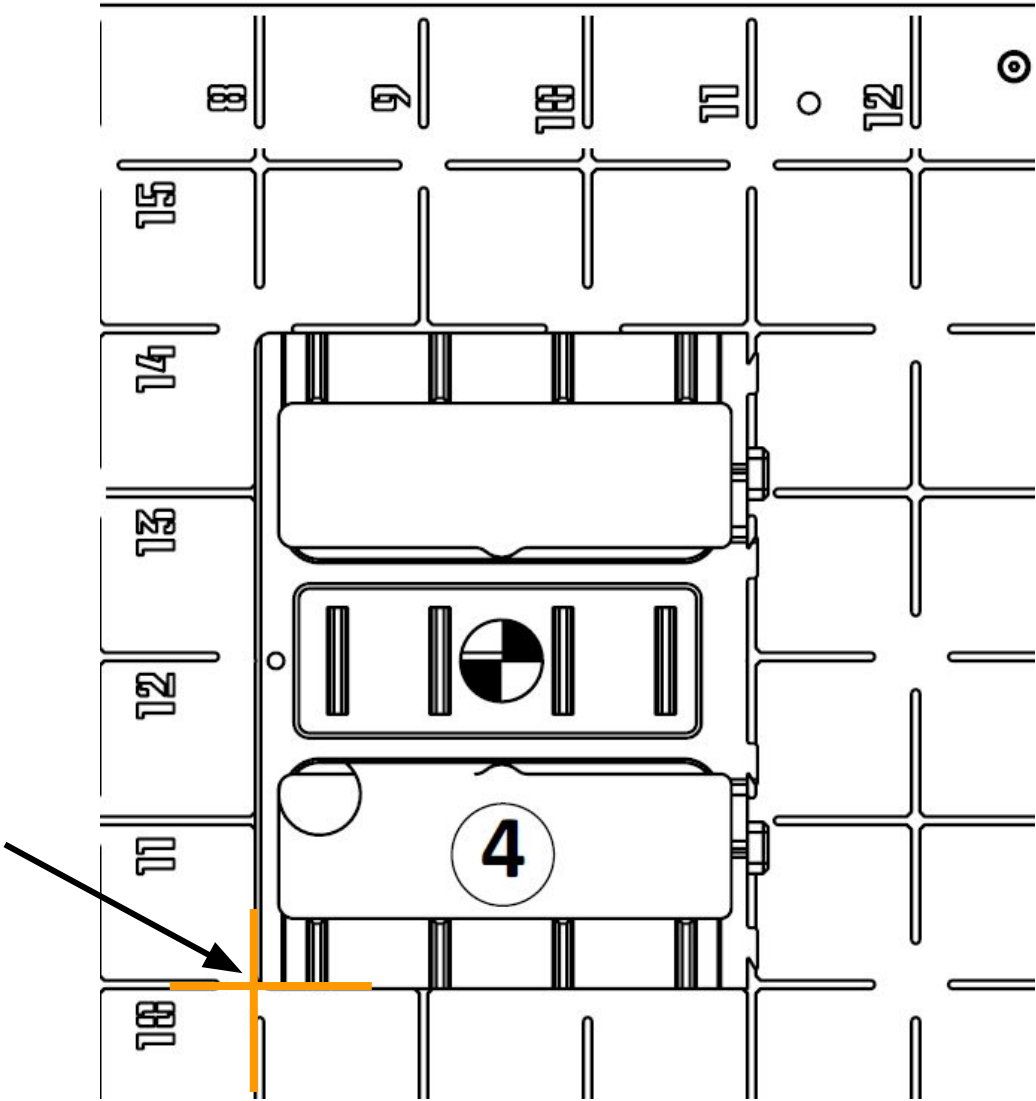


VersaCart MultiGrip Calibration Quadrant 4 - **Standard 1300** Grid

Quadrant	X Location	Y Location
4	10	8



Align corner of jaws, closest to outside corner of table with the Quadrant location

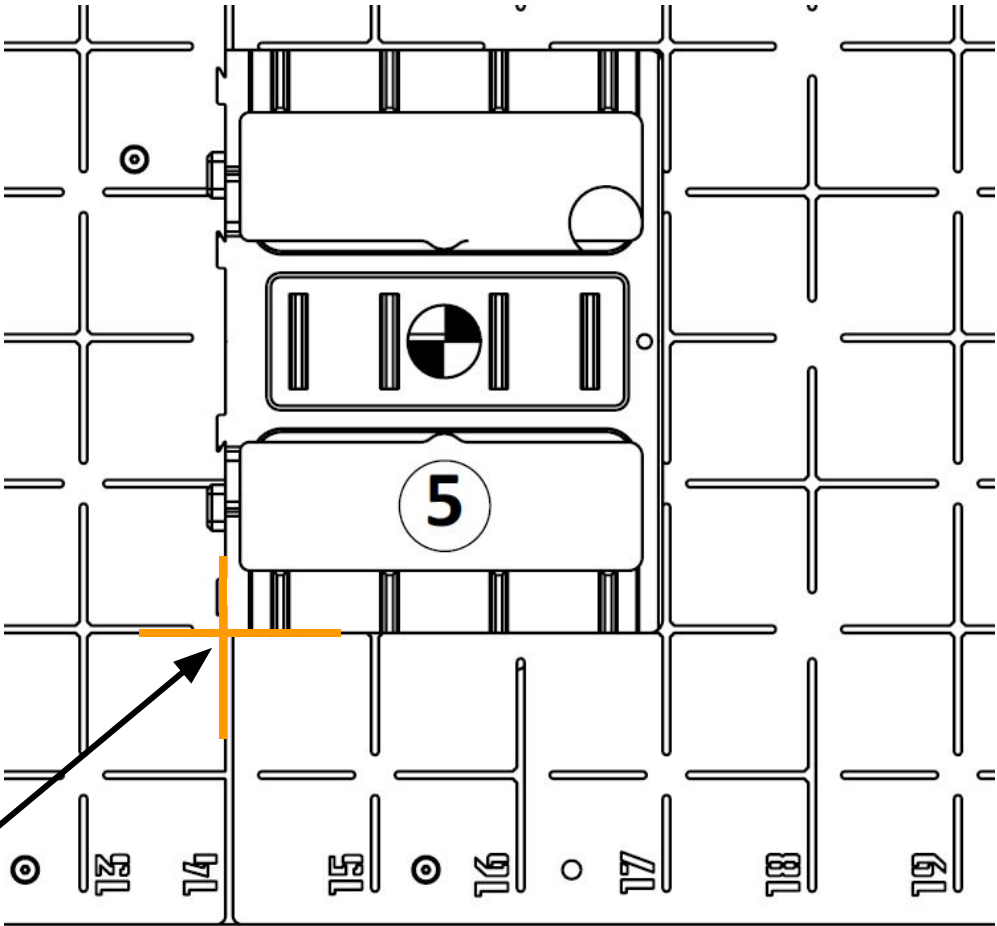


VersaCart MultiGrip Calibration Quadrant 5 - Standard 1300 Grid

Quadrant	X Location	Y Location
5	2	14



Note: for Quadrants 5-8, the reference corner of the jaws is opposite of Quadrants 1-4



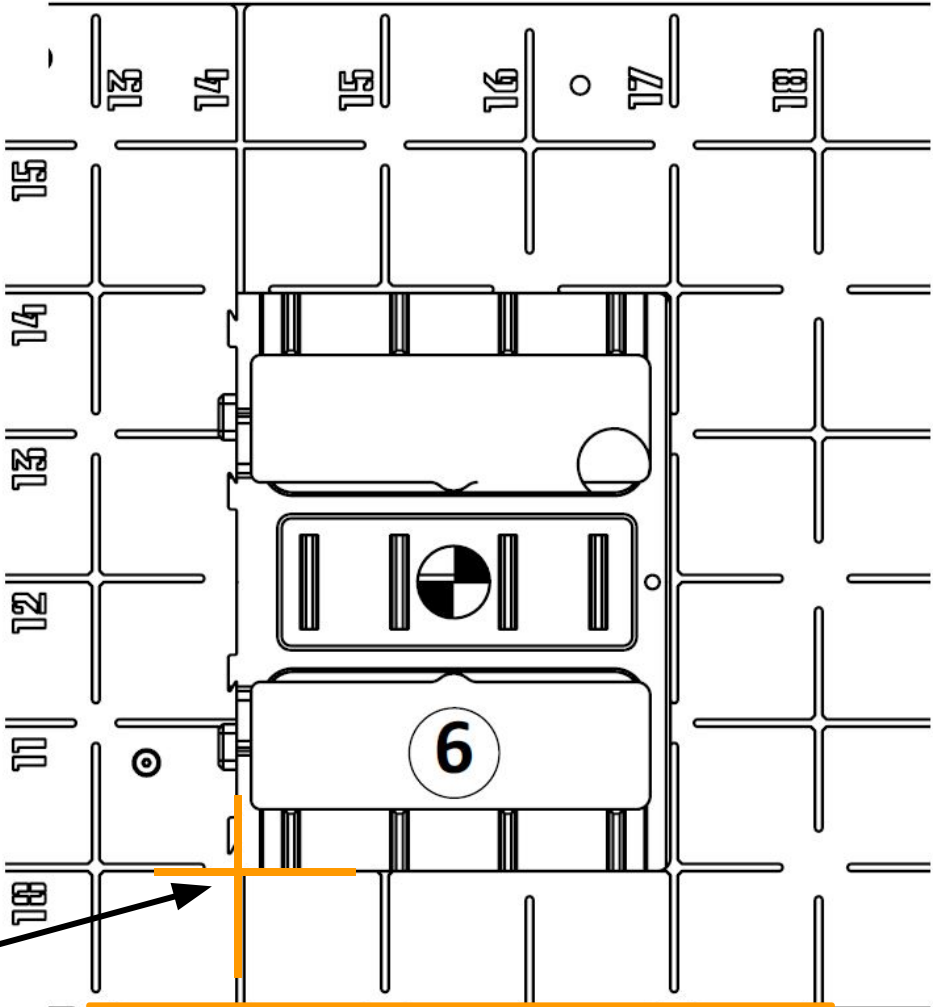
Align corner of jaws, closest to outside corner of table with the Quadrant location

VersaCart MultiGrip Calibration Quadrant 6 - Standard 1300 Grid

Quadrant	X Location	Y Location
6	10	14



Align corner of jaws, closest to outside corner of table with the Quadrant location



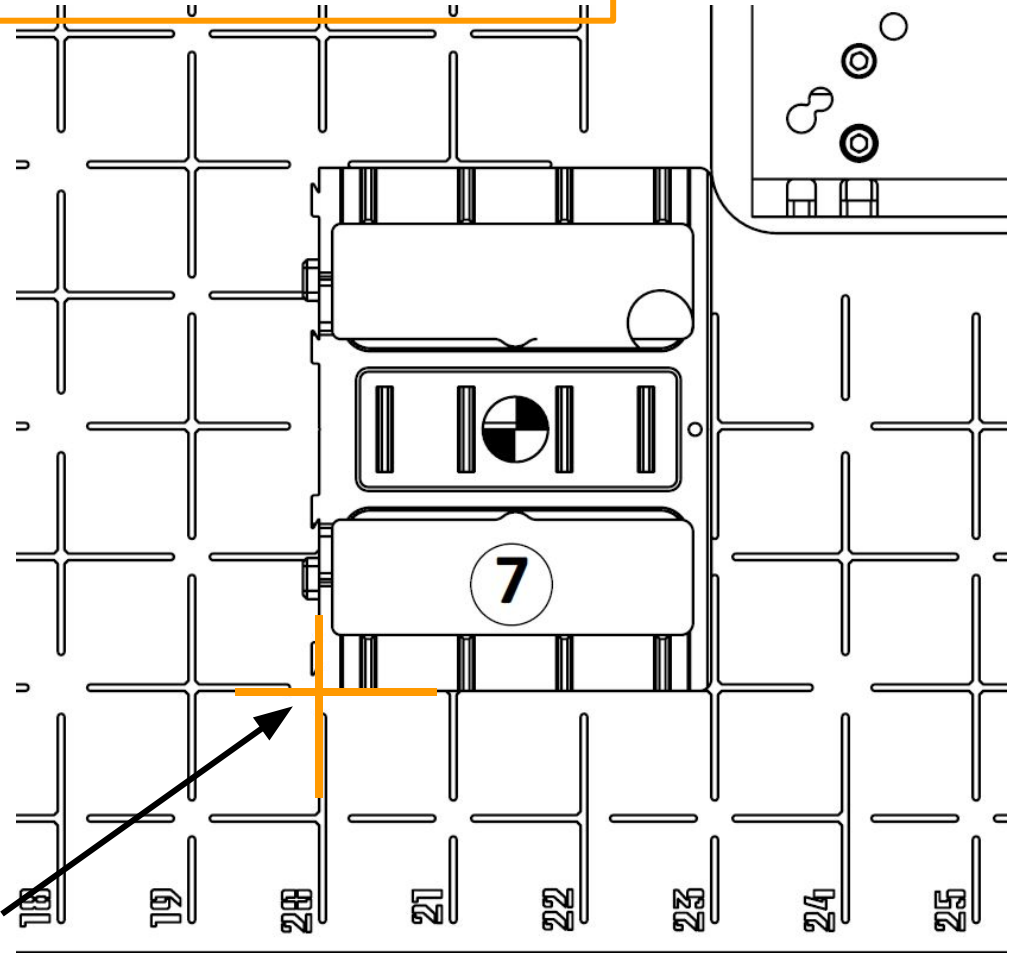
Note: for Quadrants 5-8, the reference corner of the jaws is opposite of Quadrants 1-4

VersaCart MultiGrip Calibration Quadrant 7 - Standard 1300 Grid

Quadrant	X Location	Y Location
7	2	20



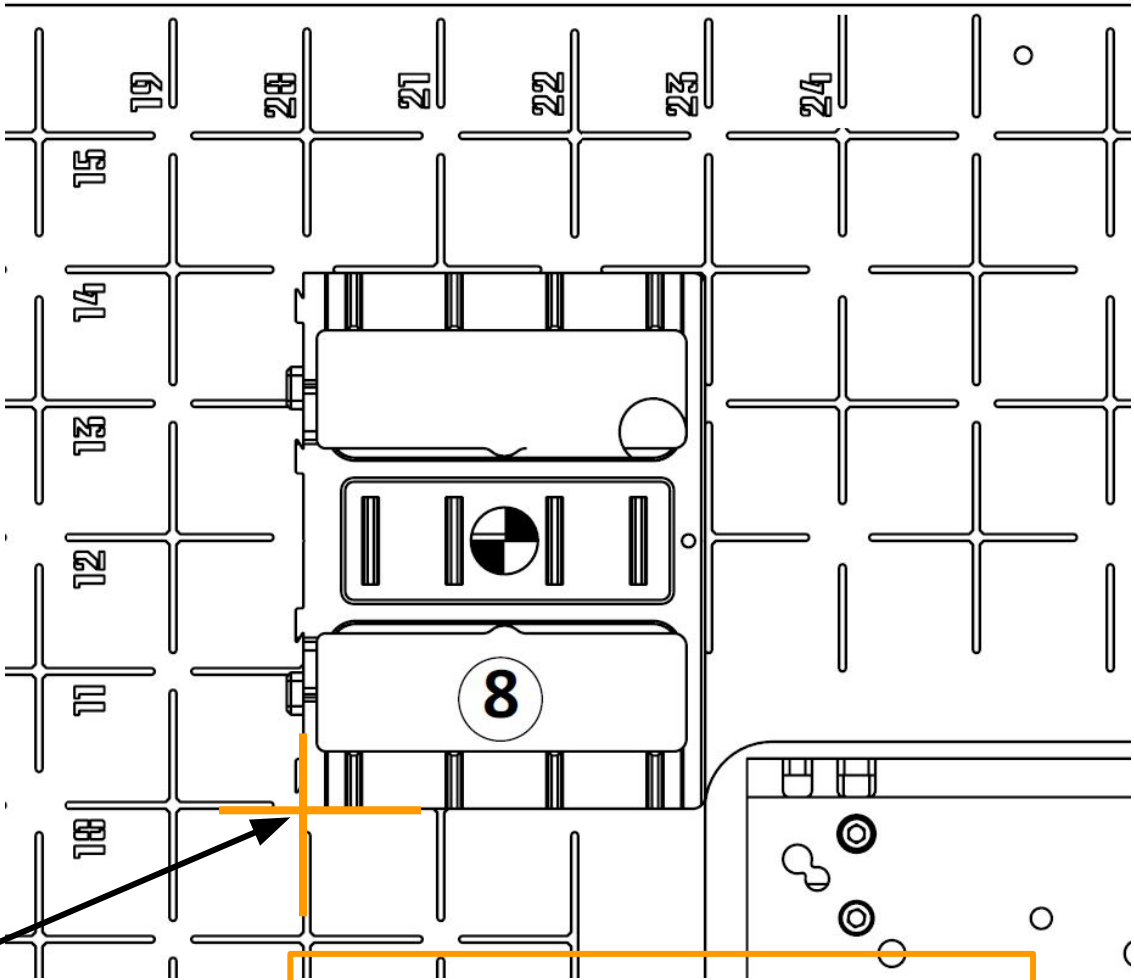
Note: for Quadrants 5-8, the reference corner of the jaws is opposite of Quadrants 1-4



Align corner of jaws, closest to outside corner of table with the Quadrant location

VersaCart MultiGrip Calibration Quadrant 8 - Standard 1300 Grid

Quadrant	X Location	Y Location
8	10	20



Align corner of jaws, closest to outside corner of table with the Quadrant location

Note: for Quadrants 5-8, the reference corner of the jaws is opposite of Quadrants 1-4

VersaCart MultiGrip Calibration - Calibrate VersaCart

Once all 8 Table Quadrants have been calibrated, the VersaCart is ready for part pick and place.

Each quadrant can be calibrated individually, to fine tune the quadrants, if pick/place inaccuracy is observed.

VersaCart Calibration w/ MultiGrip

*oversized 1300 cart

Section 4

VersaCart MultiGrip Calibration - **Oversized 1300** Top Grid

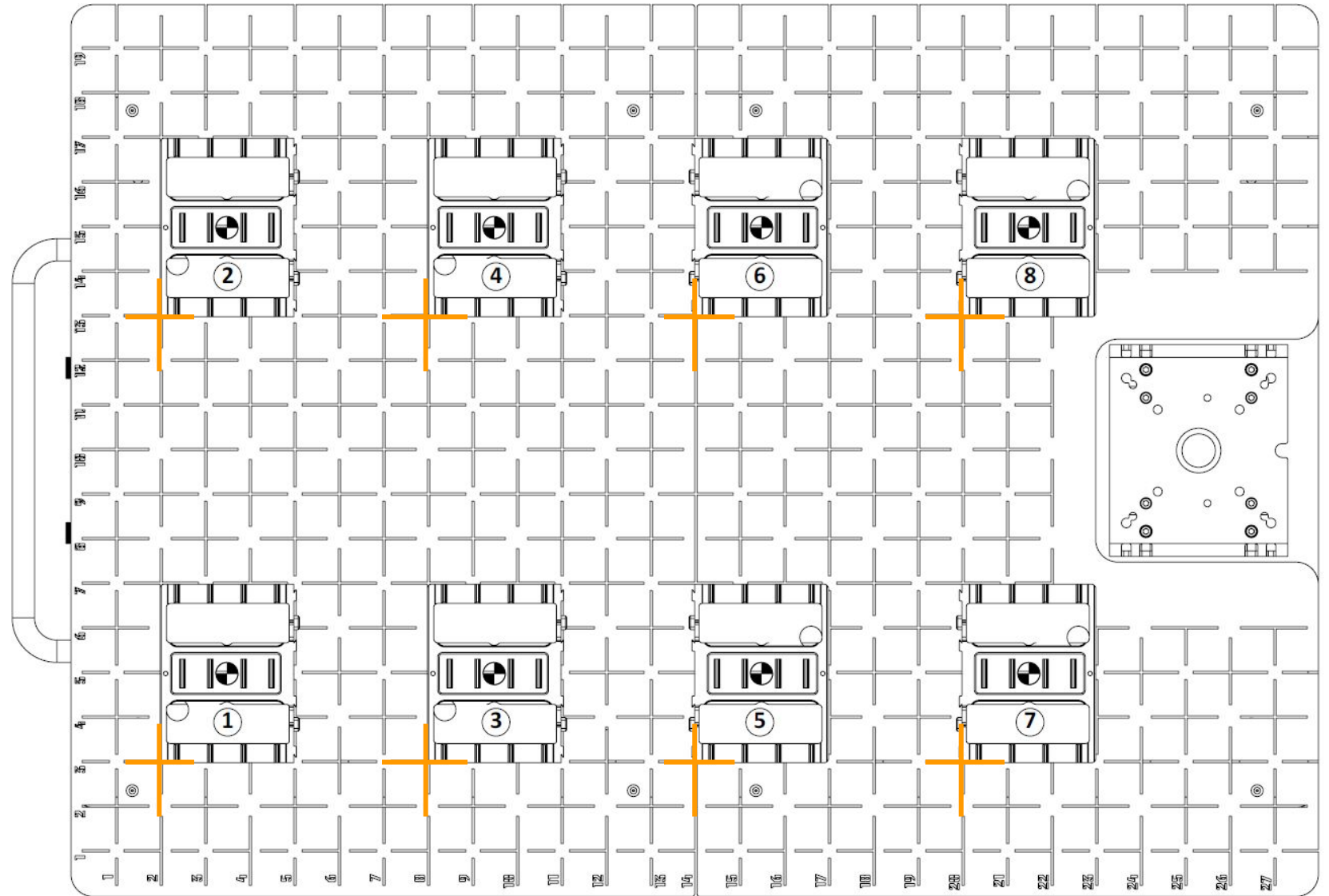
Oversized Top Grid Calibration

If your system includes an Oversized 1300 Top Grid, the calibration procedure is the same as the Standard 1300 cart, except the X-locations are different.

Follow the procedure and steps shown for the “Standard Top Grid”, except position the Calibration Plate in the X-Locations shown on the following page.

VersaCart MultiGrip Calibration - Oversized 1300 Top Grid

Position	X Location	Y Location
1	3	2
2	13	2
3	3	8
4	13	8
5	3	14
6	13	14
7	3	20
8	13	20



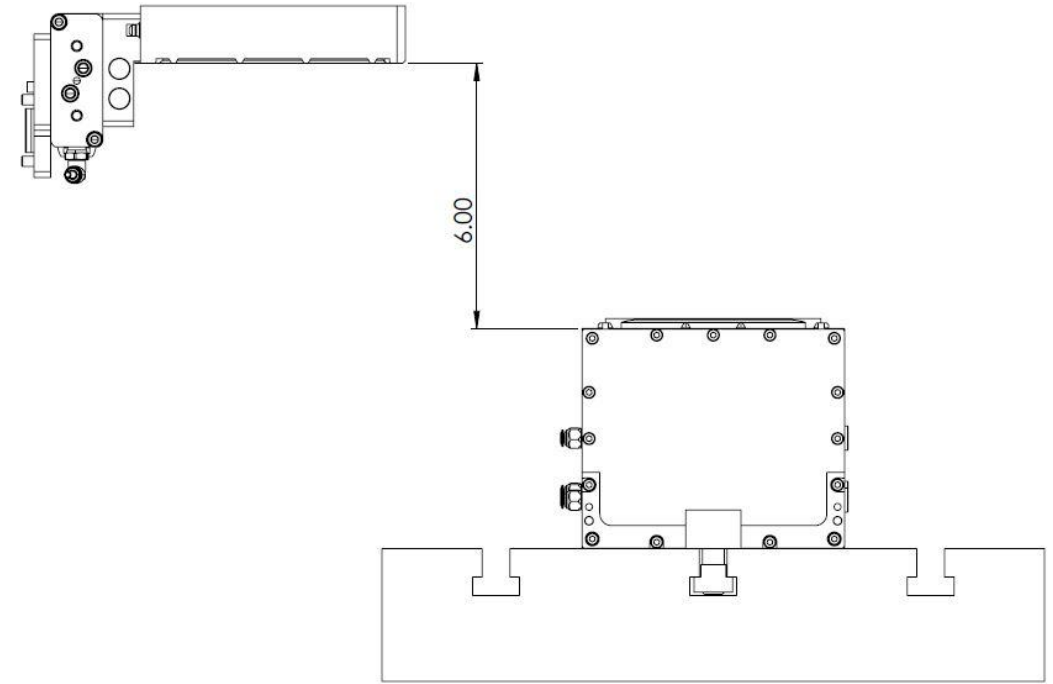
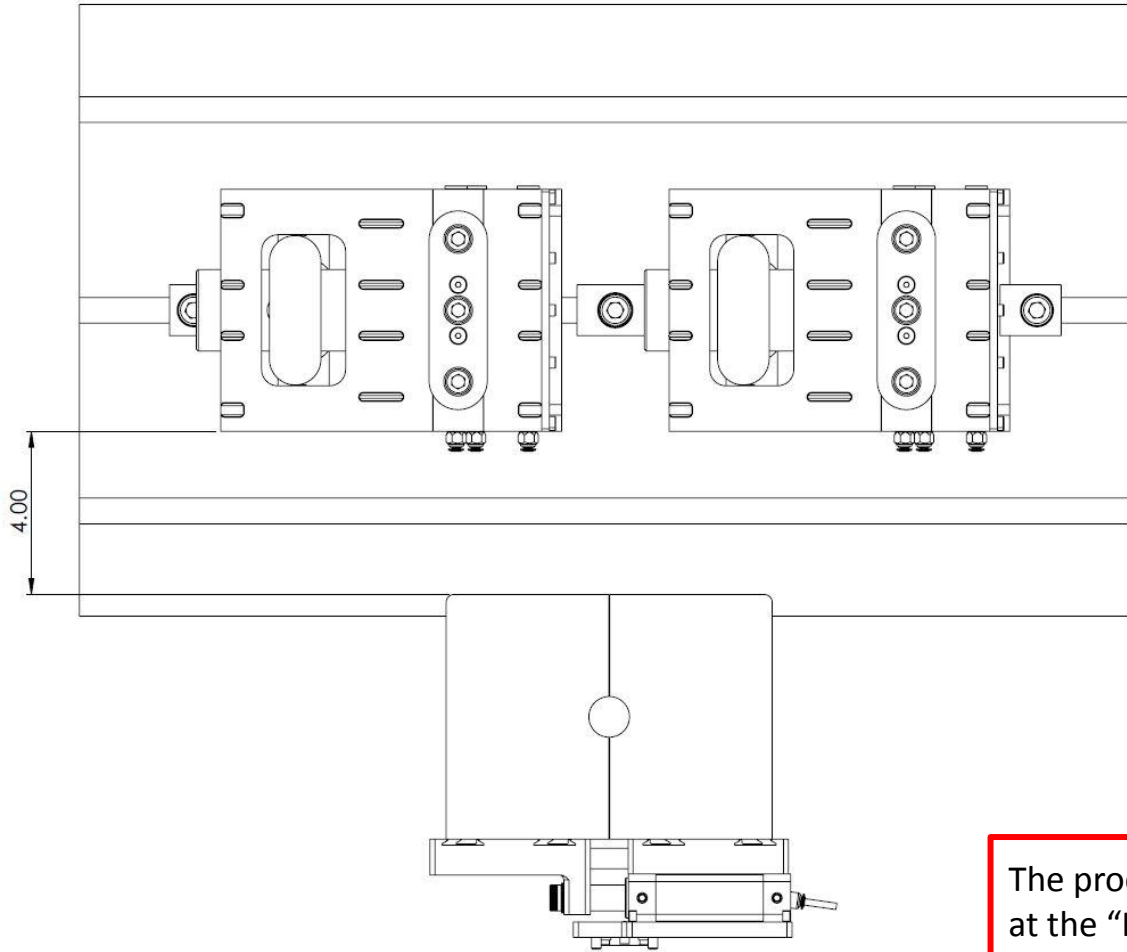
InCNC Home Calibration w/ MultiGrip

Section 5

MultiGrip Calibration - Calibrate InCNC Home Position

- 1. Navigate to the Calibration Page of the VersaBuilt System Controller (VSC).**
- 2. Move CNC to Table Load Position**
 - Move the CNC to the Table Load position. For CNC Macro Driver installations, press the Table Load button to run the CNC Table Load program from the VSC. For Generic CNC installation, run the Table Load program manually.
- 3. Move to Default InCNC Home Position**
 - With the calibration plate in the Gripper, press the Move to InCNC button.
- 4. Use Recovery Panel to Position Robot with Calibration Plate**
 - On the right-hand side of the Calibration Page, in the Recovery Panel, press the blue expand button button in the upper right of the Recovery Panel. Use the Jogging Panel to move the robot in x, y and z (Do not use the rx, ry or rz buttons)
 - Refer to the images on the following page. The calibration plate, on the robot, should be positioned between the vises, with the front edge of the calibration plate 4" from the front of the vises and 6" above the vises.
- 5. Press the Capture InCNC button to set the InCNC Home position.**

MultiGrip Calibration - Calibrate InCNC Home Position



The procedure above provides general guidance provided for the location of the Robot at the “InCNC Position” relative to the MultiGrip Vises in the CNC.

InCNC Positions should be within functional reach for robot pick/place/transfer to/from vises. The dimensions shown may need to be adjusted if needed due to the part length or part heights used in the application.

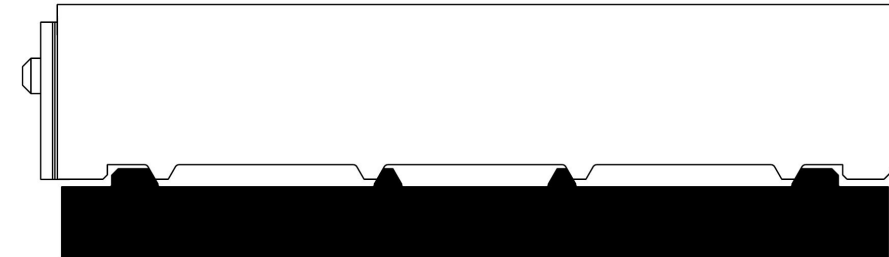
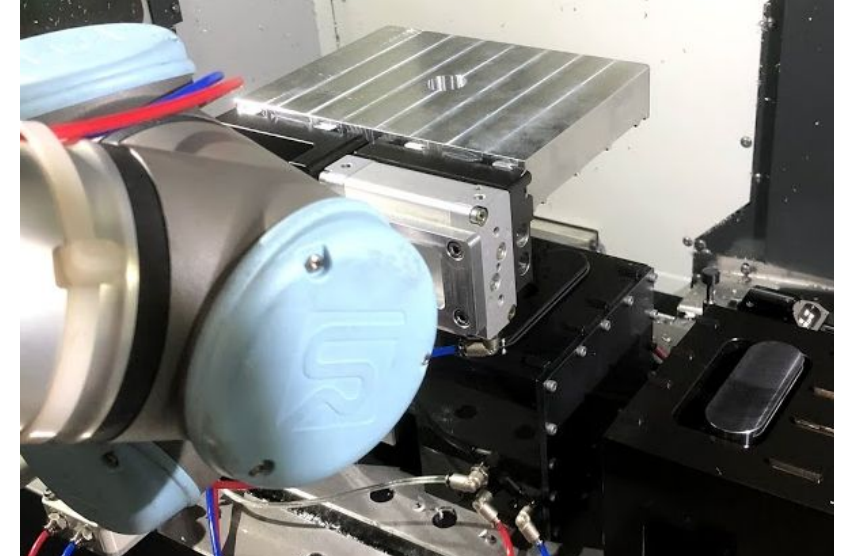
MultiGrip Vise Calibration

*For loading and unloading MultiGrip jaws

Section 6

MultiGrip Calibration - Calibrate Vises

1. **Navigate to the Calibration Page of the VersaBuilt System Controller (VSC).**
 - Make sure system is in “Auto Mode” and open each vise using the Open button in the Recovery Panel.
2. **Move CNC to Table Load Position**
 - Move the CNC to the Table Load position. For CNC Macro Driver installations, press the Table Load button to run the CNC Table Load program from the VSC. For Generic CNC installation, run the Table Load program manually.
3. **Move to InCNC Home Position**
 - With the calibration plate in the Gripper, press the Move to InCNC button next to Vise 1.
4. **Freedrive Robot and secure Calibration Plate to Vise**
 - Press the Enable Freedrive button near the top of the page. When prompted, select the Calibration Plate as the jaws in the gripper. With robot in Freedrive, carefully move the robot and calibration plate onto the vise.



MultiGrip Calibration - Calibrate Vises

5. Close Vise on Calibration Plate

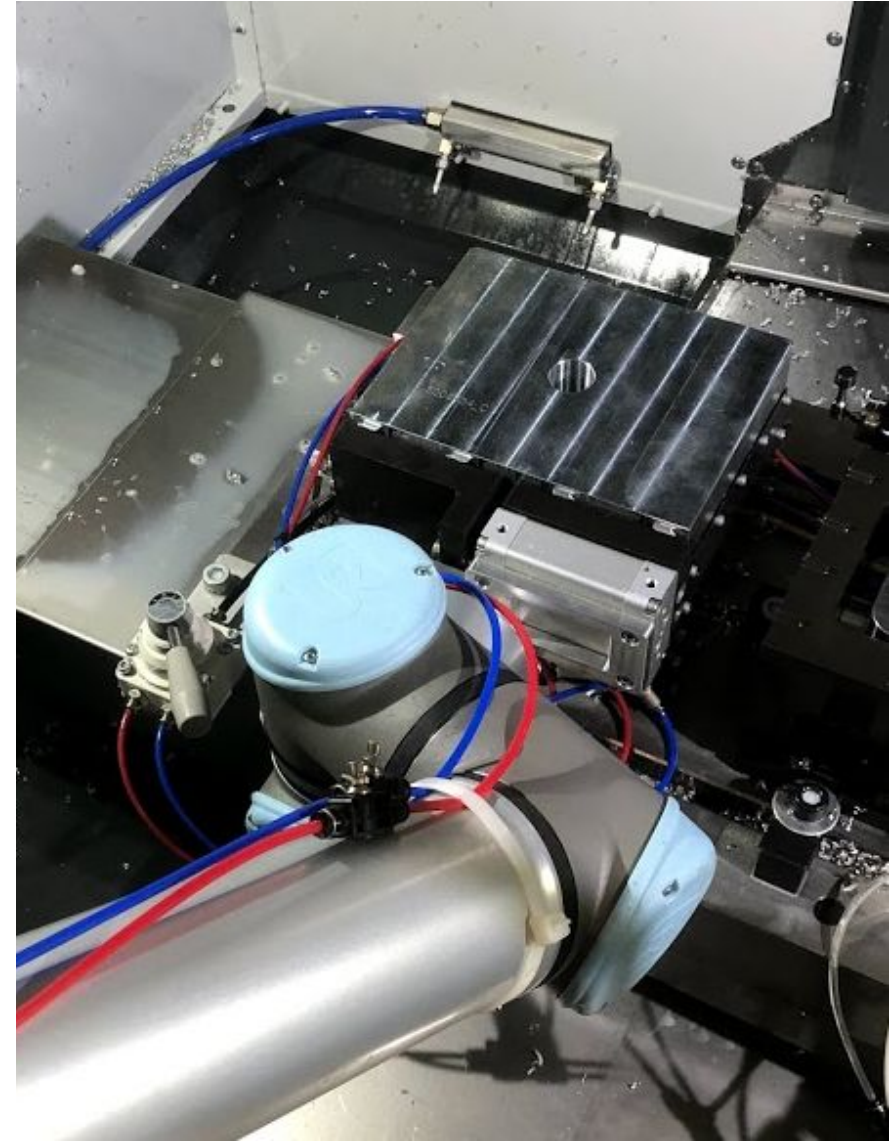
- Once the accurate placement of the calibration plate onto the vise is verified, close the vise using the vise control buttons in the VSC Recovery panel
- Open and close the vise several times so the robot “learns” the location
- With the vise closed, press the Stop Program button on the UR teach pendant to end Freedrive mode

6. Calibrate the Vise Location

- Press the Capture Vise 1 button to calibrate the vise position

7. Calibrate Remaining Vise Positions

- Press the Enable Freedrive button near the top of the Calibration Page
- Open the vise
- Manual remove the robot/calibration plate from the vise
- Repeat process from Step 3 above for all vises



Verify MultiGrip Vise Calibration

8. Test Load Vise

- Calibration plate on the robot
- CNC table/vises positioned in the “Table Load position”
- Move the robot in the CNC Home Pallet position **you can select “Run Wash/Table Load Program, if the program is in the CNC and 9000 dispatcher program is in memory*
- Press the Load button under Vise 1 on the Recovery Screen. When the Vise Load window pops up
 - select Jaws > Calibration Jaws
 - Load Type: Jaws
 - Vise Clamp: OD
 - Press the Test Load button
- The VSC will move the calibration plate onto the vise into the calibrated position and pause. The VSC will not clamp the calibration plate.
- Verify the calibration plate is in position for clamping by the vise. If the plate is not positioned properly, closing the vise will damage the calibration plate. When position is verified, the vise can be closed to provide final verification of the calibrated position. When the vise closes, that calibration plate should move very little. If the calibration plate is not in the right position, re-do the vise calibration.
- Press the **Test Load Return** button to move the robot and jaws out of the vise.

Vise 1 Load

Part Weight (Pounds)

0

Jaws

☐ Custom Jaw Weight

Load Type

☒ Jaws ☐ Part

Vise Clamp

☒ OD ☐ ID

☐ Run Wash / Table Load Program

Load

Test Load

Cancel

VersaCart Calibration w/ DuoGrip

*standard 1300 cart

Section 7

DuoGrip Calibration Overview

Calibration of the Automation System with DuoGrip includes the following:

1. [VersaCart Calibration](#):
 - Remove Shaft or Puck Fingers on Gripper 1
 - Select Gripper Close
 - Calibrate the robot in 3 VersaCart Positions (see following pages)
2. [Bin Drop Calibration](#): optional position for dropping off parts in a bin location (bin, bucket, ramp, etc), rather than placing back on VersaCart
3. [Lathe Chuck Calibration and Tuning](#): calibrate the centerline of the chuck for puck and shaft (see following pages)

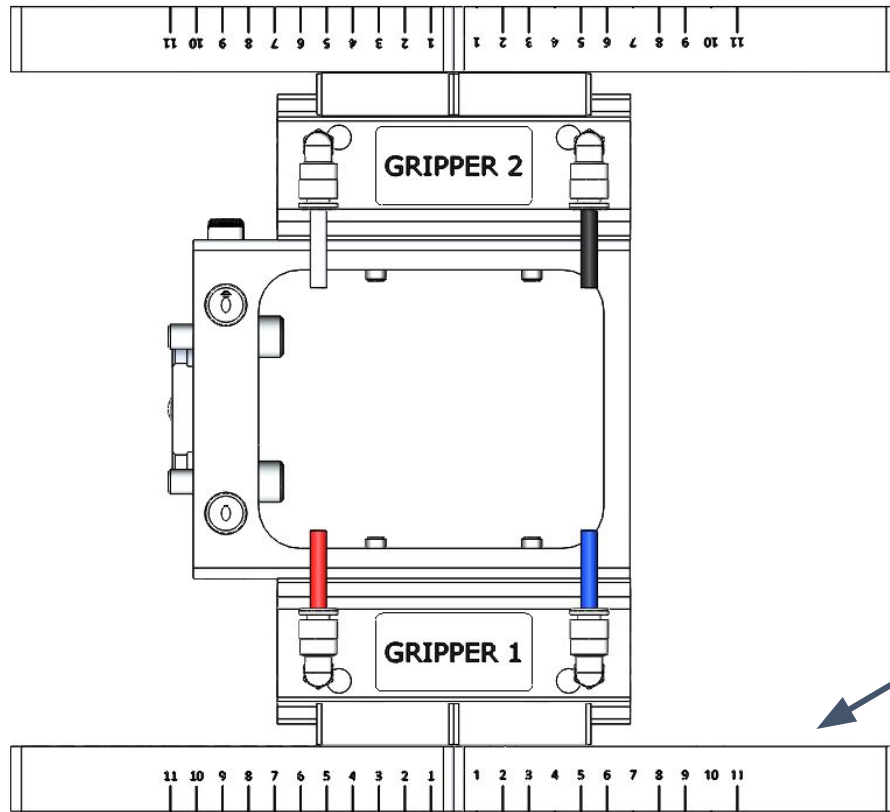
Important: Before starting the calibration procedure VersaBuilt recommends warming up the robot by pressing the **Warmup** button in the Calibration page. *Warmup requires the robot to be in a known “Home” position. If the Warmup routine errors out, select the “Move to” command and position the robot to Table Home Gripper 1.

The screenshot shows the 'UR Calibration' page in the VersaBuilt Robotics interface. At the top, there's a navigation bar with 'VERSABUILT ROBOTICS' and a 'Calibration' dropdown menu. To the right are status buttons: 'Part Stop', 'Op Stop', 'Recovery' (highlighted in red), 'Recovery' (yellow), and 'Cycle Start' (green). The main content area is titled 'UR Calibration' and contains several sections:

- Utility Functions:** Includes 'Robot Warmup' with a 'Warmup' button, 'Freedrive' with an 'Enable Freedrive' button, and 'Run Table Load' with a 'Table Load' button.
- Calibrate Table:** Features three rows for 'Table Point 1', 'Table Point 2', and 'Table Point 3'. Each row has a 'Move To' button (yellow), a 'Capture' button (grey), and a 'Return Home' button (grey). Below these is a 'Calculate' button (green) and a 'Calibrate' label.
- Tune Tool:** A table with six rows for tuning different components. Each row has a text input field showing '0,0,0,0,0' and a 'Save' button (green). The rows are: 'Table Puck Gripper 1', 'Table Puck Gripper 2', 'Table Shaft Gripper 1', 'Table Shaft Gripper 2', 'TCP Gripper 1 Tune Tool', and 'TCP Gripper 2 Tune Tool'.
- Calibrate Positions:** A section at the bottom, currently empty.

VersaCart 1300 Calibration w/ DuoGrip Gripper System

DuoGrip 400

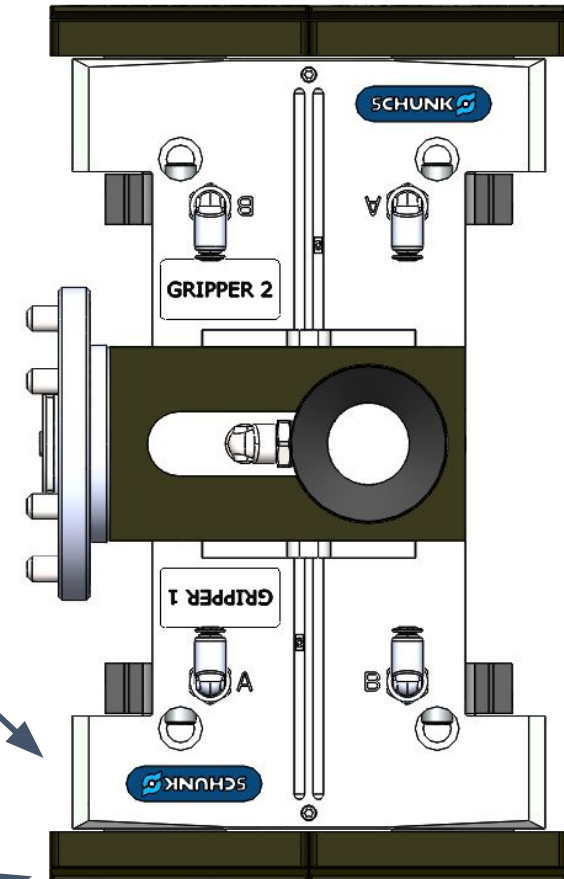


Gripper 1 and 2 shown with Shaft and Puck
Fingers **removed** & in the
Gripper Close position

Gripper 1 is used to calibrate
VersaCart

Gripper 1 Base Finger face
is used to calibrate the
plane of the VersaCart

DuoGrip 2000



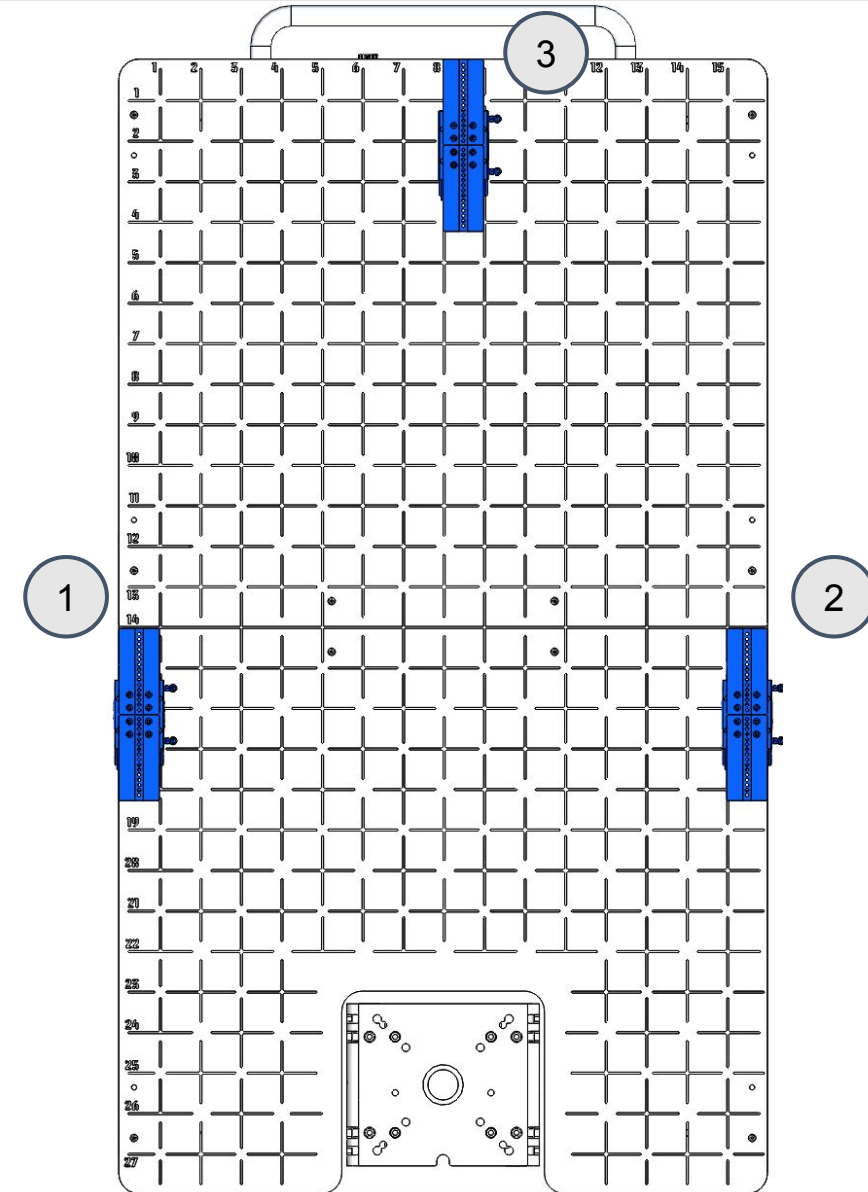
VersaCart 1300 Calibration w/ DuoGrip Gripper System

Robot Warmup	<button>Warmup</button>
Freedrive	<button>Enable Freedrive</button>
Run Table Load	<button>Table Load</button>
Calibrate Table	
Table Point 1	<button>Move To 1</button> <button>Capture 1</button> <button>Return Home</button>
Table Point 2	<button>Move To 2</button> <button>Capture 2</button> <button>Return Home</button>
Table Point 3	<button>Move To 3</button> <button>Capture 3</button> <button>Return Home</button>
Calibrate	<button>Calculate</button>

Calibration Steps are shown on the following pages

VersaCart Calibration Prep

- Refer to the images and detailed steps on the following pages
- Remove Puck or Shaft Gripper Fingers
- Move Robot to Table Home Gripper 1
- Navigate to the Calibration Page on the user interface
- On the calibration page, the following buttons will be used:
 - Warmup
 - Enable Freedrive
 - Move to...
 - Capture
 - Return Home
 - Calculate
- Steps:
 - Warm Up Robot
 - Capture Table Point 1
 - Capture Table Point 2
 - Capture Table Point 3
 - Click "Calculate" to save the calibration



VersaCart 1300 Calibration w/ DuoGrip Gripper System

Calibration Steps are shown on the following pages



Table Point 1



Table Point 2

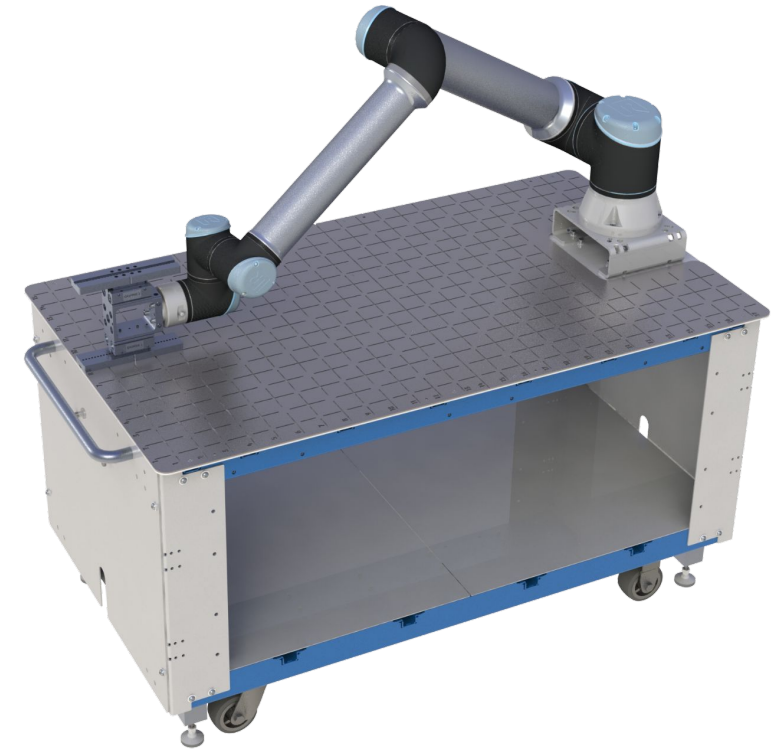


Table Point 3

VersaCart 1300 Calibration w/ DuoGrip Gripper System

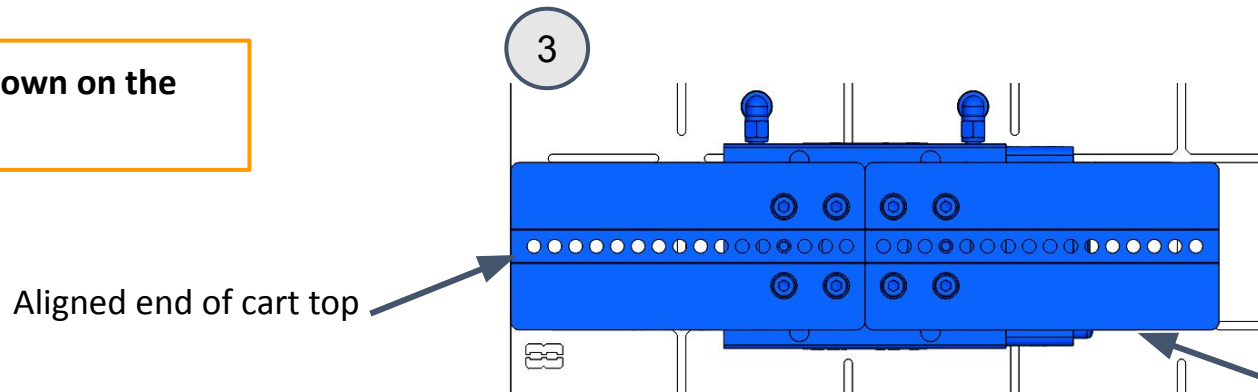
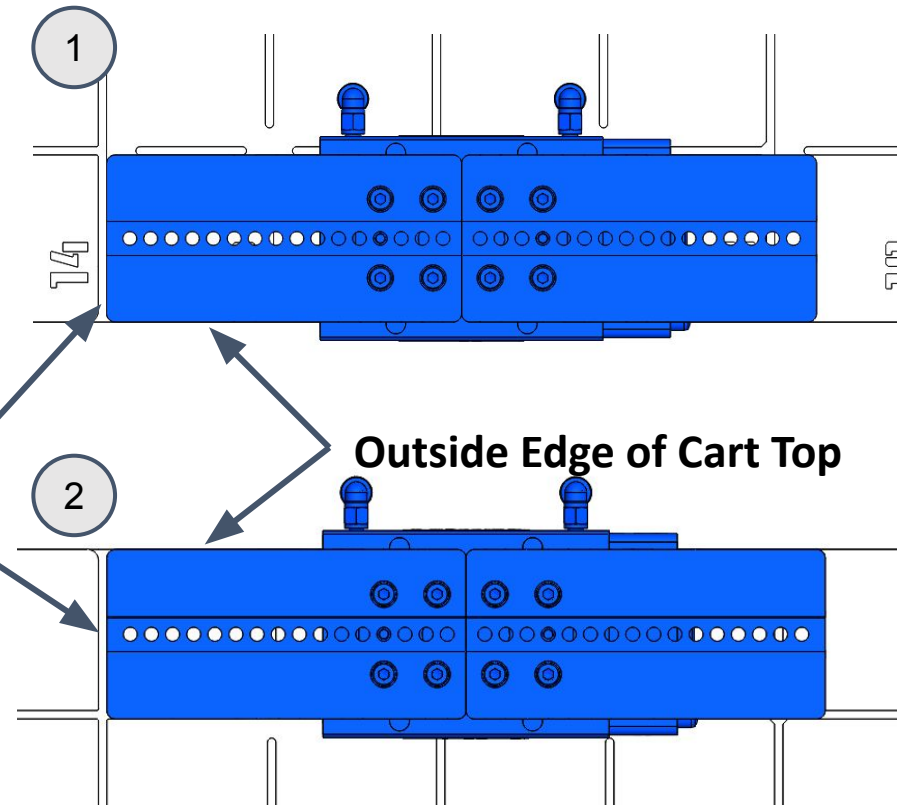
- Precise alignment of the Gripper Base Fingers on the table top is critical to the calibration process
- The side and end of the Base Fingers are aligned with the VersaCart
- Positions 1 and 2 are aligned on edge next to #14, with side of Base Fingers aligned with the outside edge of the cart
- Position 3 is next to mark #8 with the end of the Base Finger aligned with the end of the cart

**Refer to the following pages for images showing the calibration locations*

Calibration Steps are shown on the following pages

**Gripper 1
is pushed down
with Base Fingers
touching the surface
of the VersaCart**

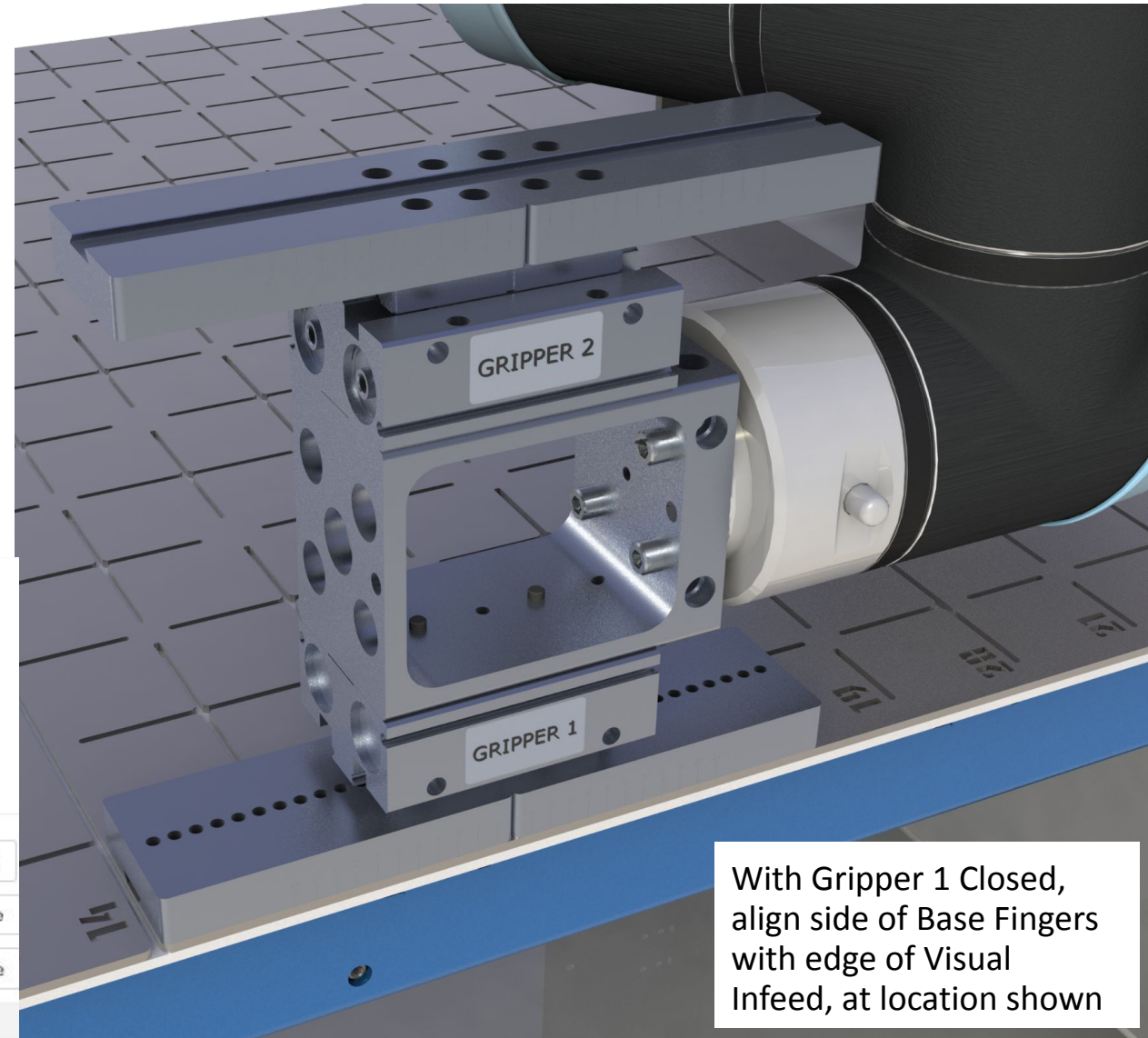
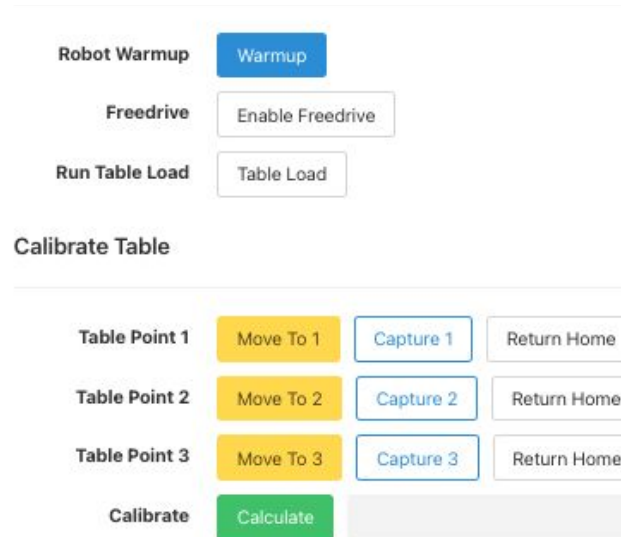
**For #1 and #2, align
with edge of top
across from #14**



For #3, aligned with line #8

Calibrate VersaCart Table Point 1

1. With Robot at Table Home Gripper 1, Select “Warmup “
2. Calibrate Table Point 1:
 - a. Select “Move to 1” **this will position robot above Table Point 1*
 - b. Select Enable Freedrive (select Empty Gripper, then Enable Freedrive) **this allows the user to drag-to-teach*
 - c. By hand, gently move the robot into the Table Point 1 position, with Gripper 1 Base Fingers pushed against the VersaCart surface.
 - d. With Gripper 1 Closed, align the side of Base Fingers with edge of Visual Infeed, at location shown (line below #14)
 - e. Select “Stop Program” on the UR Teach Pendant **this disables Freedrive*
 - f. Select “Capture 1”
 - g. Select “Return Home”

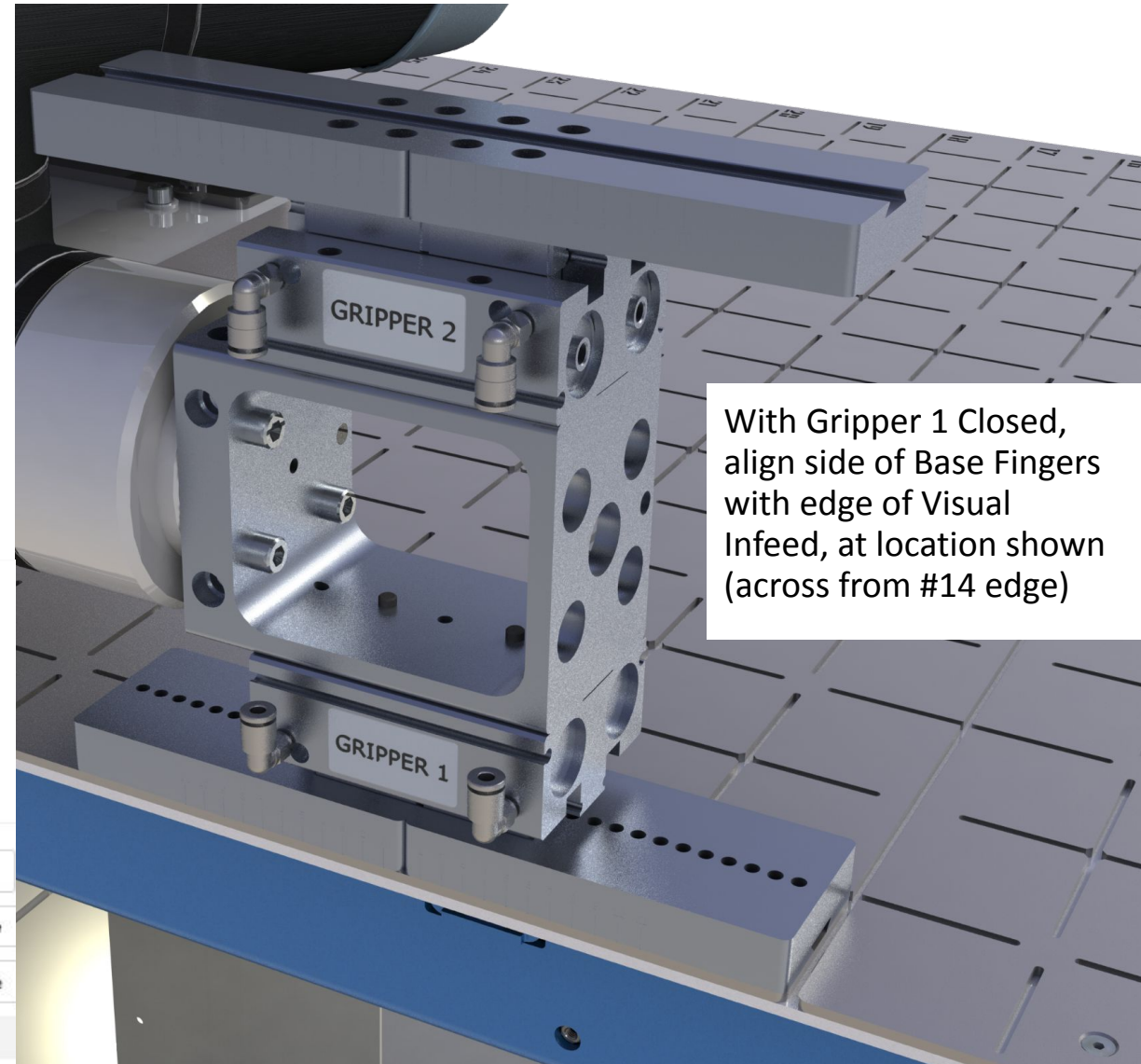
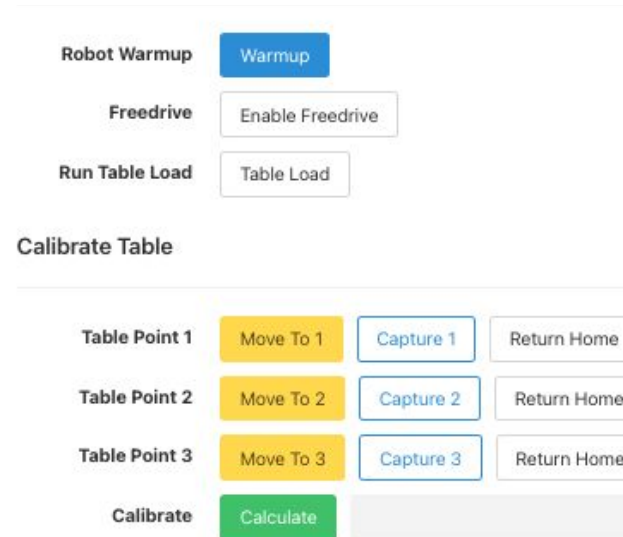


With Gripper 1 Closed, align side of Base Fingers with edge of Visual Infeed, at location shown

Calibrate VersaCart Table Point 2

2. Calibrate Table Point 2:

- Select "Move to 2" **this will position robot above Table Point 2*
- Select Enable Freedrive (select Empty Gripper, then Enable Freedrive)
- By hand, gently move the robot into the Table Point 2 position, with Gripper 1 Base Fingers pushed against the VersaCart surface.
- With Gripper 1 Closed, align the side of Base Fingers with edge of Visual Infeed, at location shown (line below #14) **on the opposite side of the table from Table Point 1*
- Select "Stop Program" on the UR Teach Pendant **this disables Freedrive*
- Select "Capture 2"
- Select "Return Home"



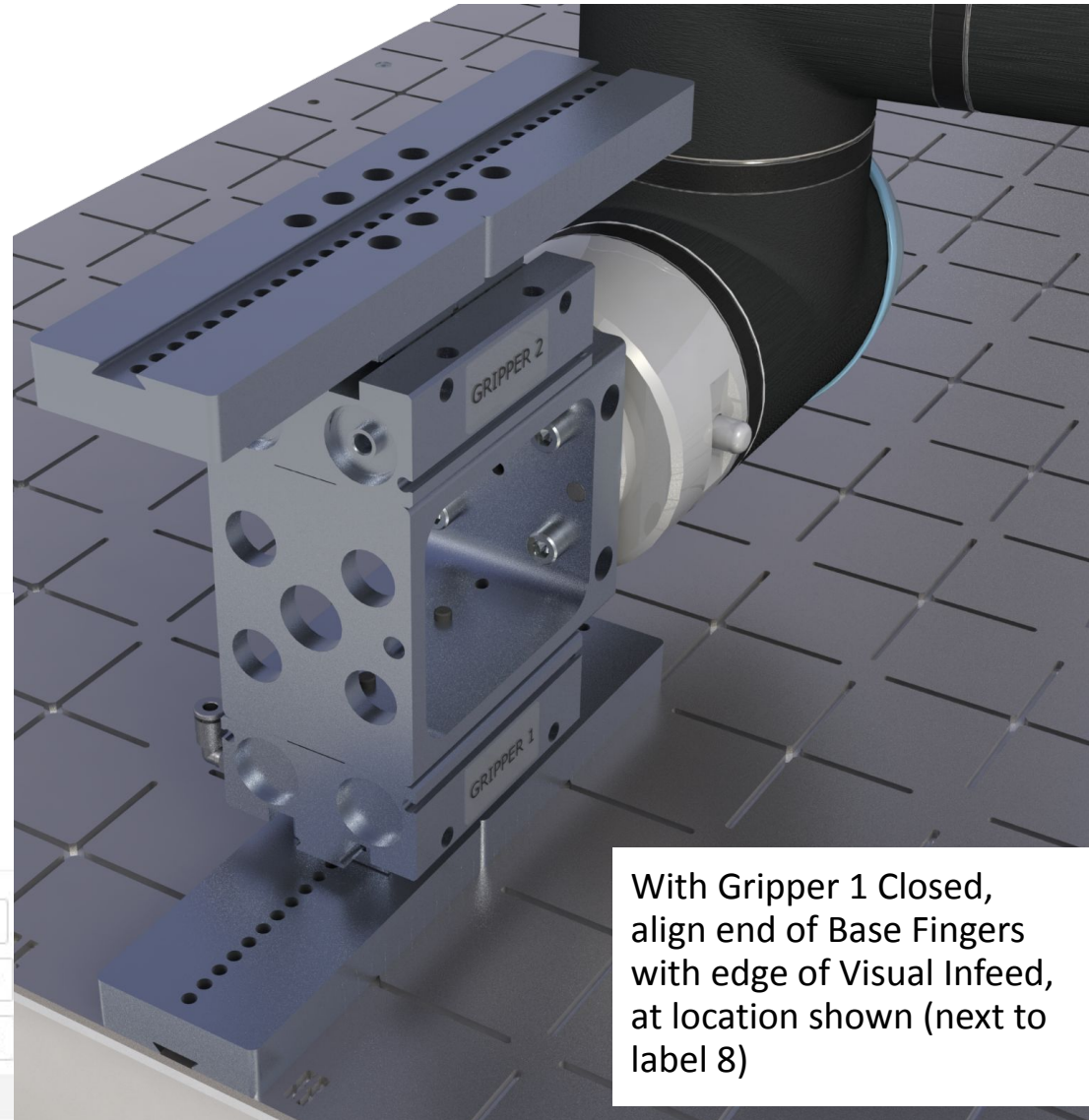
Calibrate VersaCart Table Point 3

3. Calibrate Table Point 3:

- Select "Move to 3" **this will position robot above Table Point 3*
- Select Enable Freedrive (select Empty Gripper, then Enable Freedrive)
- By hand, gently move the robot into the Table Point 3 position, with Gripper 1 Base Fingers pushed against the VersaCart surface.
- With Gripper 1 Closed, align the side of Base Fingers with edge of line next to #8.
- Select "Stop Program" on the UR Teach Pendant **this disables Freedrive*
- Select "Capture 3"
- Select "Return Home"

4. Save Calibration - Select "Calculate"

Robot Warmup	Warmup
Freedrive	Enable Freedrive
Run Table Load	Table Load
Calibrate Table	
Table Point 1	Move To 1 Capture 1 Return Home
Table Point 2	Move To 2 Capture 2 Return Home
Table Point 3	Move To 3 Capture 3 Return Home
Calibrate	Calculate



With Gripper 1 Closed, align end of Base Fingers with edge of Visual Infeed, at location shown (next to label 8)

VersaCart Calibration w/ DuoGrip

*oversized 1300 cart

Section 8

VersaCart DuoGrip Calibration - **Oversized** Top Grid

Oversized Top Grid Calibration

If your system includes an Oversized 1300 Top Grid, the calibration procedure is the same as the Standard 1300 cart, except the X-locations are different. Refer to previous section for more detail.

- Table Point 1 - 4" offset from side of cart at #14
- Table Point 2 - 4" offset from side of cart at #14, on opposite side of cart from Table Point 1
- Table Point 3 - #10 position (rather than #8 with standard top)

Follow the procedure and steps shown for the "Standard Top Grid", aligning the gripper fingers to the edge of the oversized top.

VersaCart 1300 DuoGrip Calibration - Oversized Top Grid

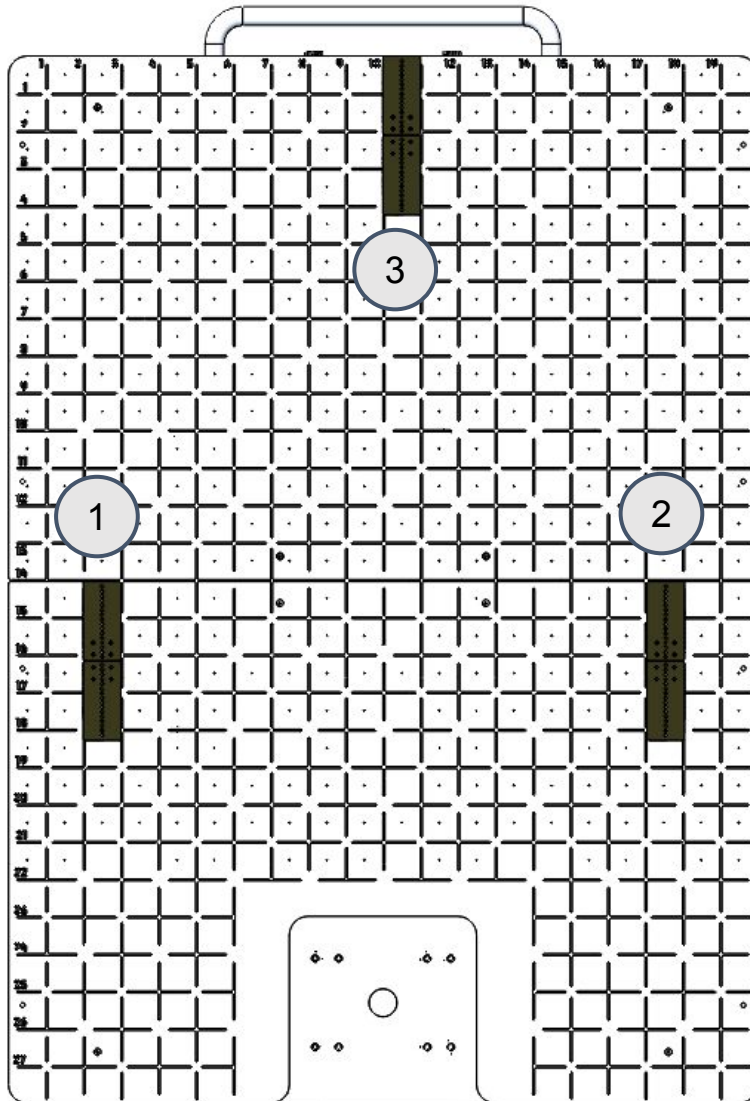
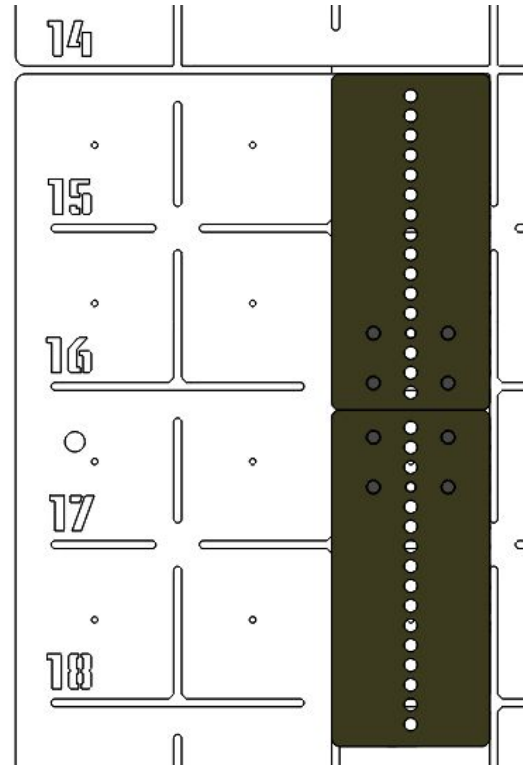
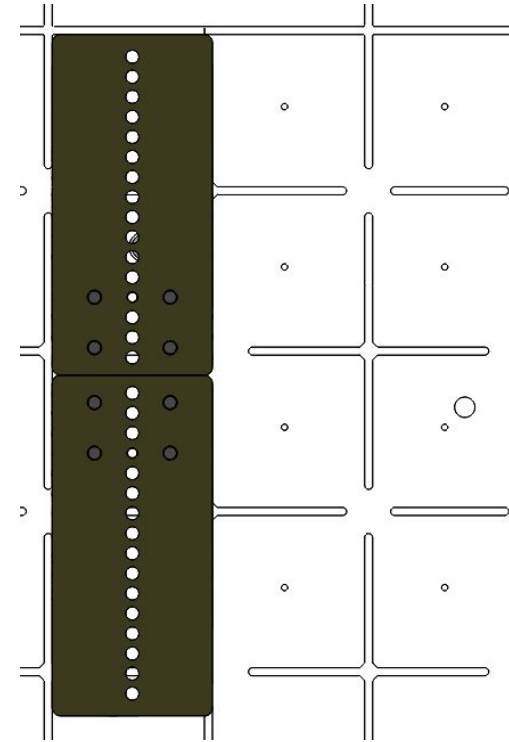


Table Point 1



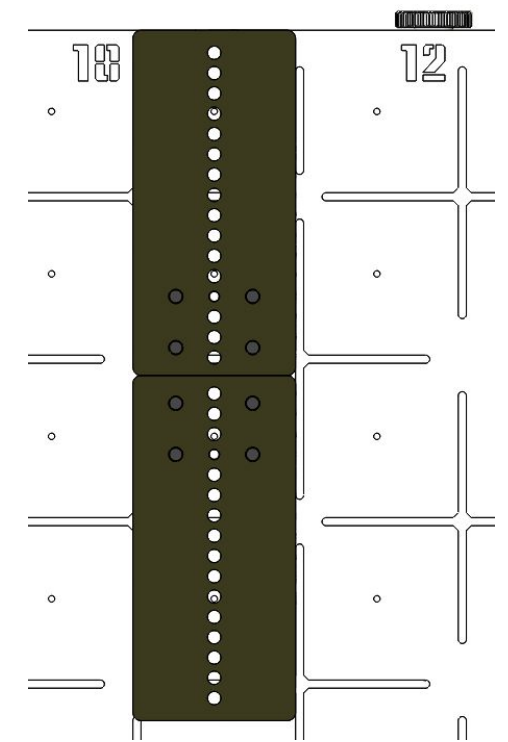
- Aligned with #14 on with slot showing
- 4" Offset from side of cart, covering slot

Table Point 2



- Aligned with #14 on with slot showing
- 4" Offset from side of cart, covering slot (opposite side from Point

Table Point 3



- Aligned with #10 covering slot
- End of Base Finger aligned with end of cart top

VersaCart Calibration w/ DuoGrip

*1700 cart w/ 1700mm Reach Robot

Section 9

VersaCart 1700 DuoGrip Calibration - **Standard Top Grid**

Standard Top Grid Calibration

For the VersaCart 1700 Standard Stainless Steel Visual Infeed, the calibration procedure is the same as the Standard 1300 cart, except the locations are different. *These calibration points are for a 1700mm reach robot with DuoGrip.*

- Table Point 1 - Gripper Closed, aligned against the cart edge at #16
- Table Point 2 - Gripper Closed, aligned against the cart edge at #16, on opposite side of cart from Table Point 1
- Table Point 3 - Gripper Closed, aligned against end of cart at #11

Follow the procedure and steps shown for the “Standard Top Grid”, aligning the gripper fingers to the edge of the oversized top.

VersaCart 1700 DuoGrip Calibration - **Standard** Top Grid

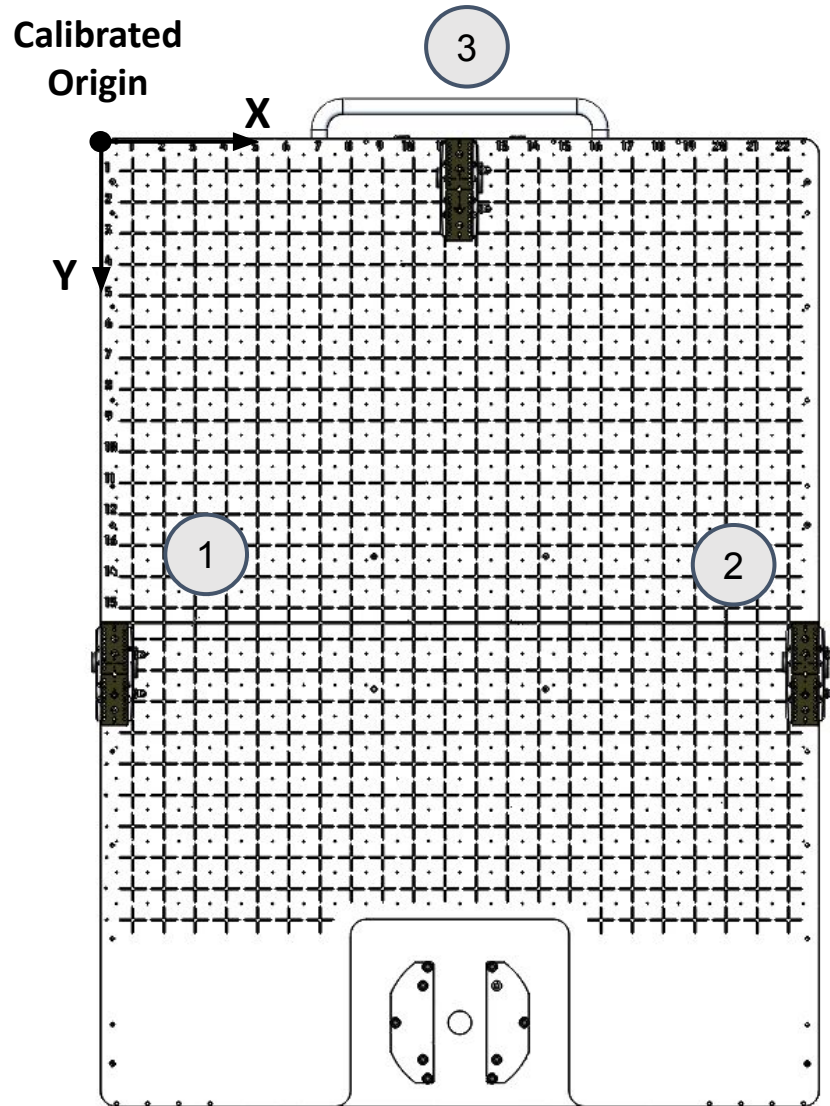
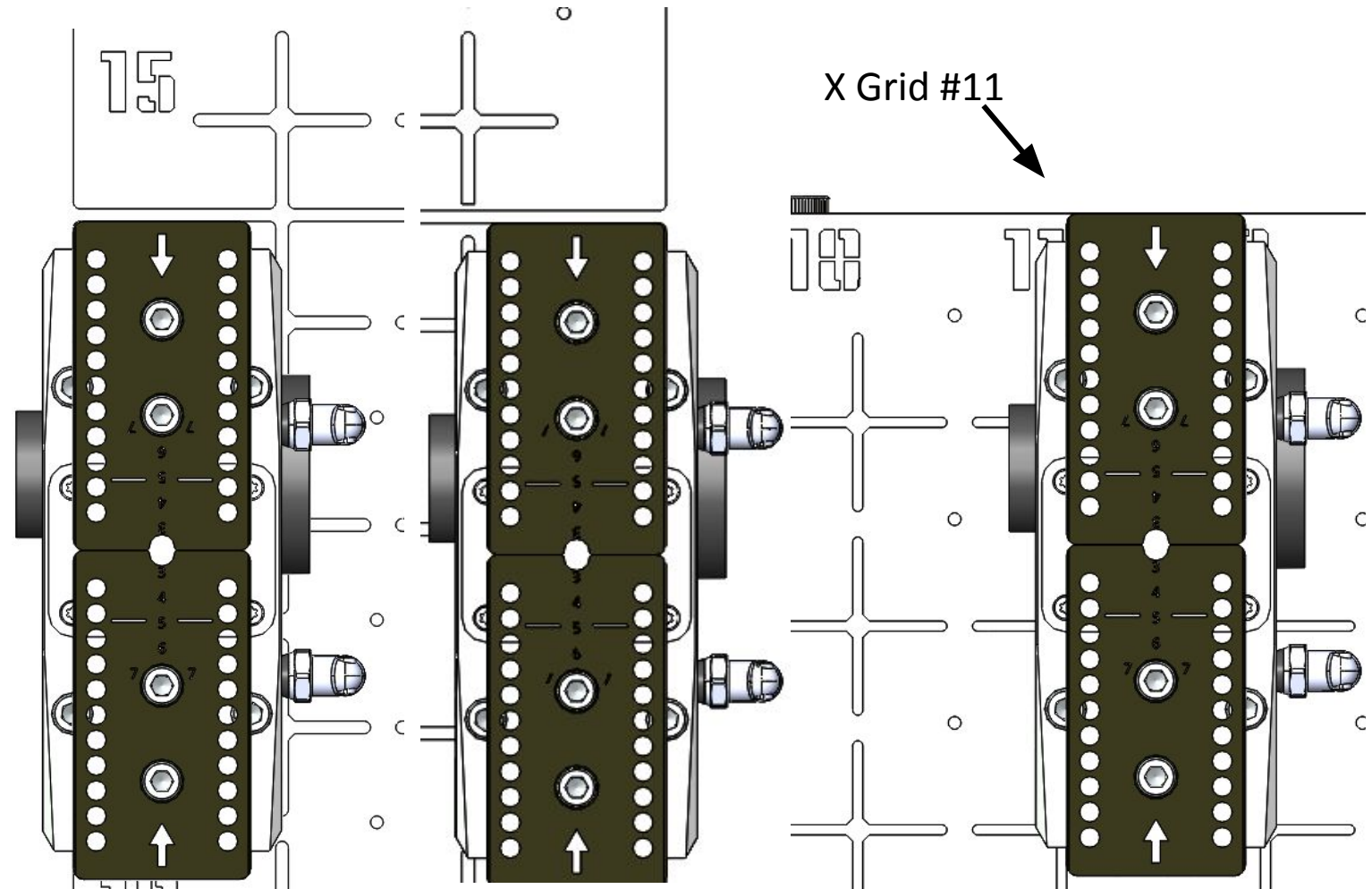


Table Point 1

Table Point 2

Table Point 3



VersaCart 1700 DuoGrip Calibration - **Standard Top Grid**

Oversized Top Grid Calibration

If your system includes an Oversized 1700 Top Grid, the calibration procedure is the same as the Standard 1300 cart, except the locations are different.

- Table Point 1 - Gripper Closed, aligned against the cart edge at #16
- Table Point 2 - Gripper Closed, aligned against the cart edge at #16, on opposite side of cart from Table Point 1
- Table Point 3 - Gripper Closed, aligned against end of cart at #13

Follow the procedure and steps shown for the “Standard Top Grid”, aligning the gripper fingers to the edge of the oversized top.

VersaCart 1700 DuoGrip Calibration - **Oversized** Top Grid

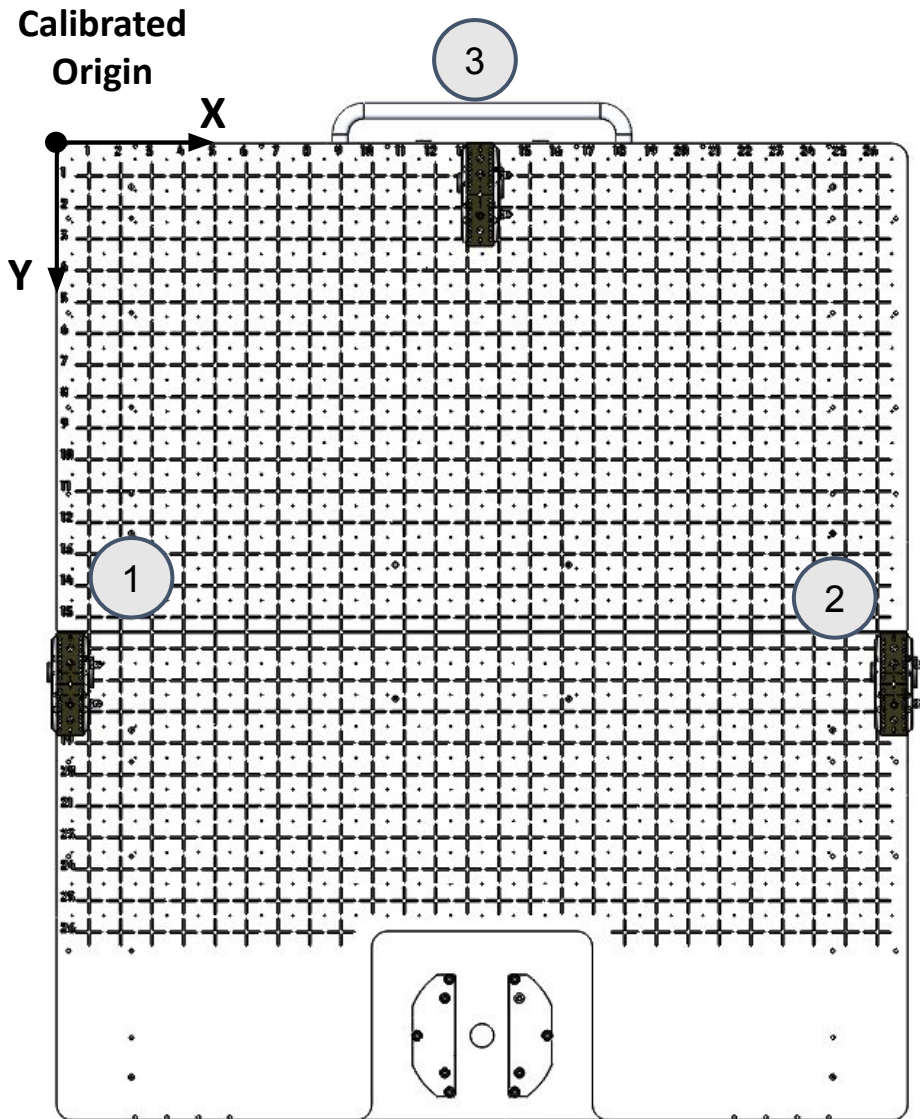


Table Point 1

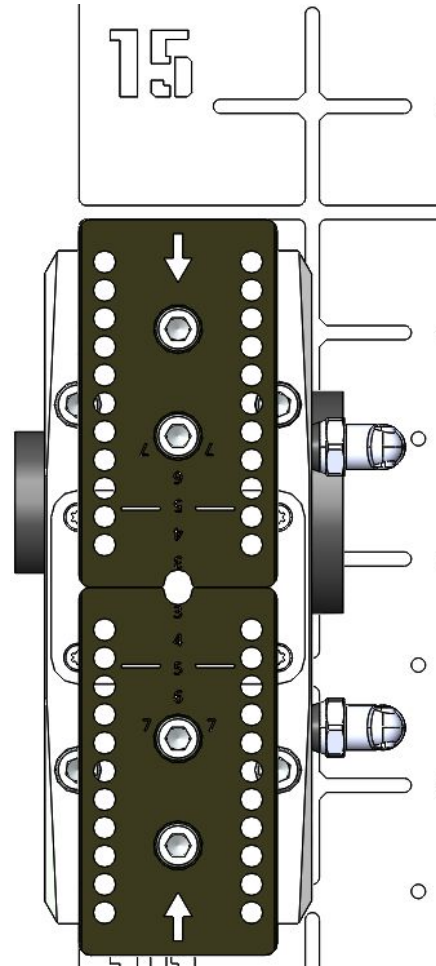


Table Point 2

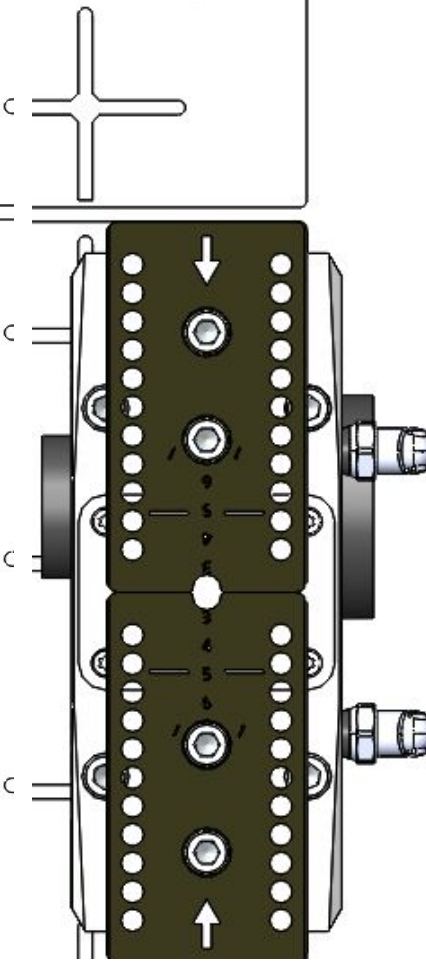
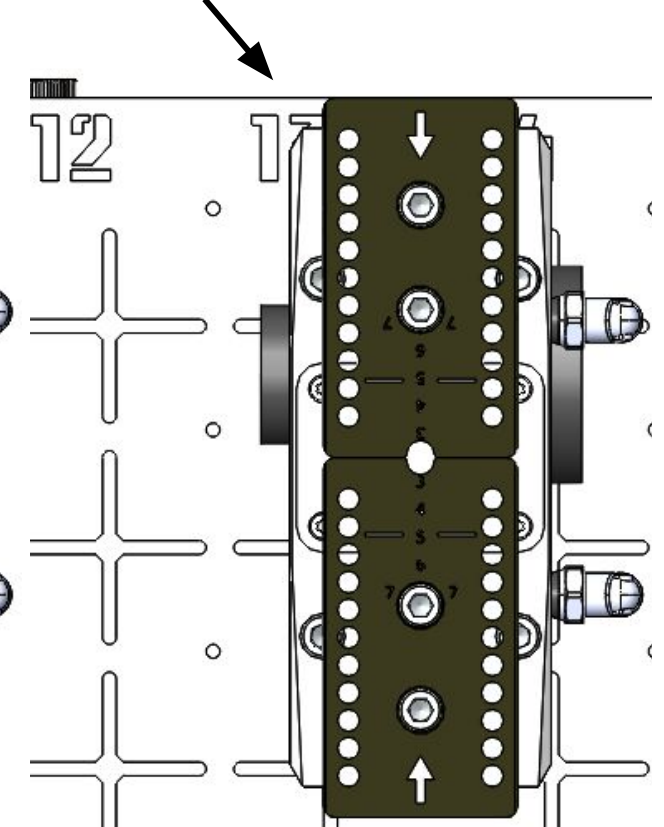


Table Point 3

X Grid #13



Lathe Chuck Calibration w/ DuoGrip

Section 10

Calibrate Puck & Shaft Centerline

- The following pages detail the process to calibrate the general centerline (z-axis) of the primary and sub-spindle relative to the robot gripper
- Part specific size (part height/length), workholding (jaw depth), and location of the part relative to the gripper are entered in the part specific configuration.
- Chuck 1 & Chuck 2 are calibrated with Gripper 1, from the Move To CNC-Home position rotate the gripper as needed towards Chuck 1 or Chuck 2
- Puck specific note:
 - Puck Pick and Place to/from the VersaCart Visual Infeed Grid is calibrated in the process above (VersaCart Calibration).
 - Puck load and unload to/from the Chuck(s) requires fields to be entered in each part configuration.
- Shaft specific note:
 - Shaft Pick and Place to/from the VersaCart is calibrated on a per part basis, during Part Configuration, with the Shaft Infeed secured to the VersaCart **refer to the Machinist Manual for details*

Calibrate Positions

Chuck 1 Puck Calibration

Puck Gripper 1

Move To CNC Home Chuck 1 Puck Gripper 1

Capture Chuck 1 Puck Gripper 1

Puck Gripper 2

Move To CNC Home Chuck 1 Puck Gripper 2

Capture Chuck 1 Puck Gripper 2

Chuck 2 Puck Calibration

Puck Gripper 1

Move To CNC Home Chuck 2 Puck Gripper 1

Capture Chuck 2 Puck Gripper 1

Puck Gripper 2

Move To CNC Home Chuck 2 Puck Gripper 2

Capture Chuck 2 Puck Gripper 2

Chuck 1 Shaft Calibration

Shaft Gripper 1

Move To CNC Home Chuck 1 Shaft Gripper 1

Capture Chuck 1 Shaft Gripper 1

Shaft Gripper 2

Move To CNC Home Chuck 1 Shaft Gripper 2

Capture Chuck 1 Shaft Gripper 2

Chuck 2 Shaft Calibration

Shaft Gripper 1

Move To CNC Home Chuck 2 Shaft Gripper 1

Capture Chuck 2 Shaft Gripper 1

Shaft Gripper 2

Move To CNC Home Chuck 2 Shaft Gripper 2

Capture Chuck 2 Shaft Gripper 2

Other

Bin Drop

Move To Bin Drop

Capture Bin Drop

Chuck Face To Gripper Cal Point

Chuck 1

Puck Gripper 1 (Inches)

3.26

Shaft Gripper 1 (Inches)

1.375

Puck Gripper 2 (Inches)

3.26

Shaft Gripper 2 (Inches)

2

Chuck 2

Puck Gripper 1 (Inches)

0

Shaft Gripper 1 (Inches)

2.12

Save

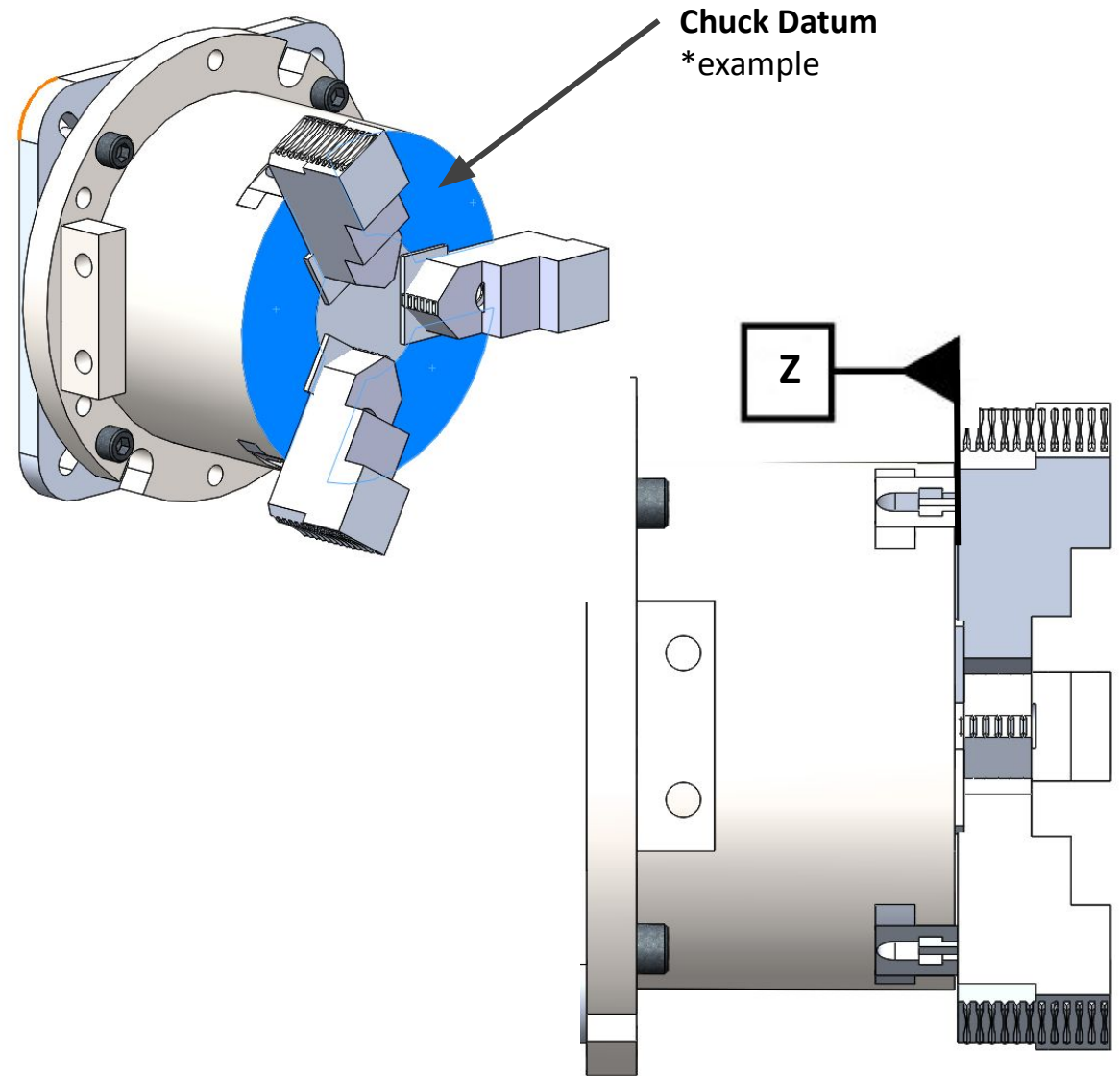
Calibrate Puck Centerline

Items required for Puck Calibration:

- Connection to VSC interface, on Calibration Page
- Tape Measure and/or Calibers
- Level
- Calibration Part - a part to hold in the chuck and the gripper to align the chuck and gripper centerline

NOTE: the Calibration Part should be ***faced off on each side and the OD turned*** to get the most accurate chuck centerline

- **Define a Datum** on the Chuck that can be used as a measuring zero location.
 - This datum needs to be a constant, available to measure regardless of the workholding in the machine.
 - For the purposes of this manual, the images to the right show a 3-Jaw Chuck with the highlighted surface as the Datum.



Freedrive Control Window

The Freedrive Control window is used to help calibrate chucks and the regrip station. It allows the user to actuate the gripper and enable / disable freedrive without use of the teach pendant.

The window will render on the interface during chuck calibration after clicking any of the yellow 'Move to' buttons within the Chuck Calibration sections.

Freedrive Control

Instructions:

1. Enable freedrive and move to the calibration position

2. Ensure your fingers are clear of the gripper before clamping!

3. Clamp the gripper at desired location in freedrive

4. Verify the gripper is properly aligned, repeat freedrive and clamp as needed

5. Disable freedrive when finished and capture the calibration point

Open Gripper

Float Gripper

Close Gripper

Enable Freedrive

Close

Calibrate Puck Centerline

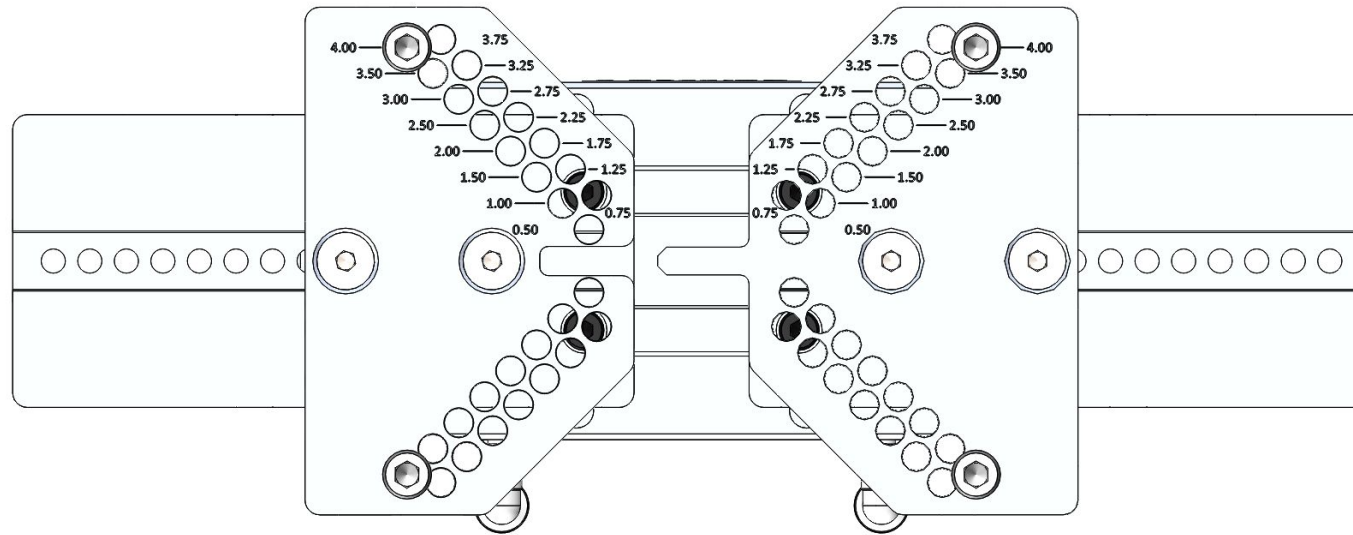
Calibration Steps

1. Choose a part to be used for Puck Calibration

- Calibrate with a part that has been faced and the OD turned, such that the surface is perpendicular to z-axis (rather than saw cut material)

2. Install the Puck Gripper Fingers

- Attach fingers on Gripper 1 and Gripper 2
- Attach Socket Head Cap Screws or Headless Screws in a position for holding a part for calibration purposes
- Refer to the Machinist Manual for position of screws for material size ranges. The image below shows Socket Head Cap Screws in Position 4, for material 4.0" to 4.25"

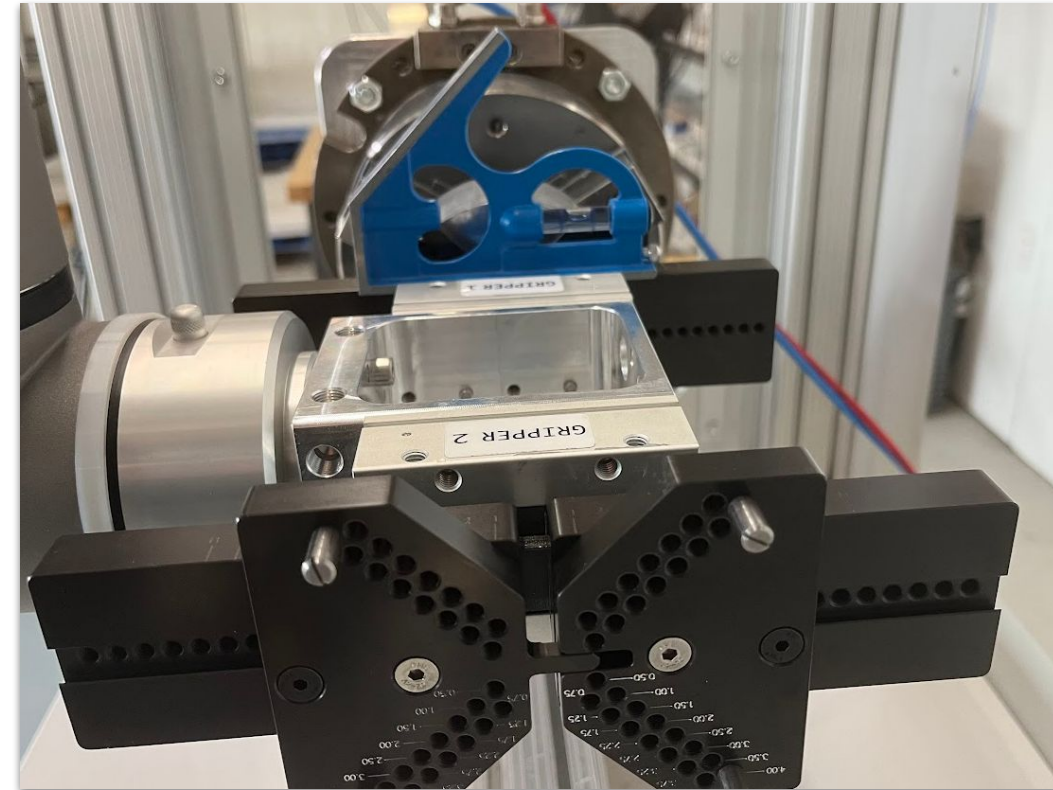


Calibrate Puck Centerline

3. Calibrate 'Chuck 1 Puck Gripper 1 or 2 Position'

- Clamp part in Chuck 1 (fully seat part in Z, if there is a z-stop)
- Select 'Move To CNC-Home Chuck 1 Gripper 1/2'
- The robot will move into position and open the Freedrive Control window
- Enable freedrive and float or open the gripper (float capability is not available on DuoGrip2000)
- Gently move robot engaging Gripper Puck Fingers with the part in the Chuck
- Position the gripper *at a level position*, pushing on gripper such that the fingers are coplanar with the material, hand clamping on the part if using float feature.
- Close Gripper and ensure position is still level and flush with the part.
- Disable Freedrive
 - Select "Capture Chuck 1 Puck Gripper 1 / 2".
 - Do not move the robot yet.
- The final step is to measure the 'Chuck Face to Gripper Cal Point' detailed in the following slides.

For best results - Part used for calibration should be faced on both sides, with faces perpendicular to the spindle axis



Calibrate Positions

Chuck 1 Puck Calibration

Puck Gripper 1

Move To CNC Home Chuck 1 Puck Gripper 1

Capture Chuck 1 Puck Gripper 1

Puck Gripper 2

Move To CNC Home Chuck 1 Puck Gripper 2

Capture Chuck 1 Puck Gripper 2

Calibrate Puck Centerline

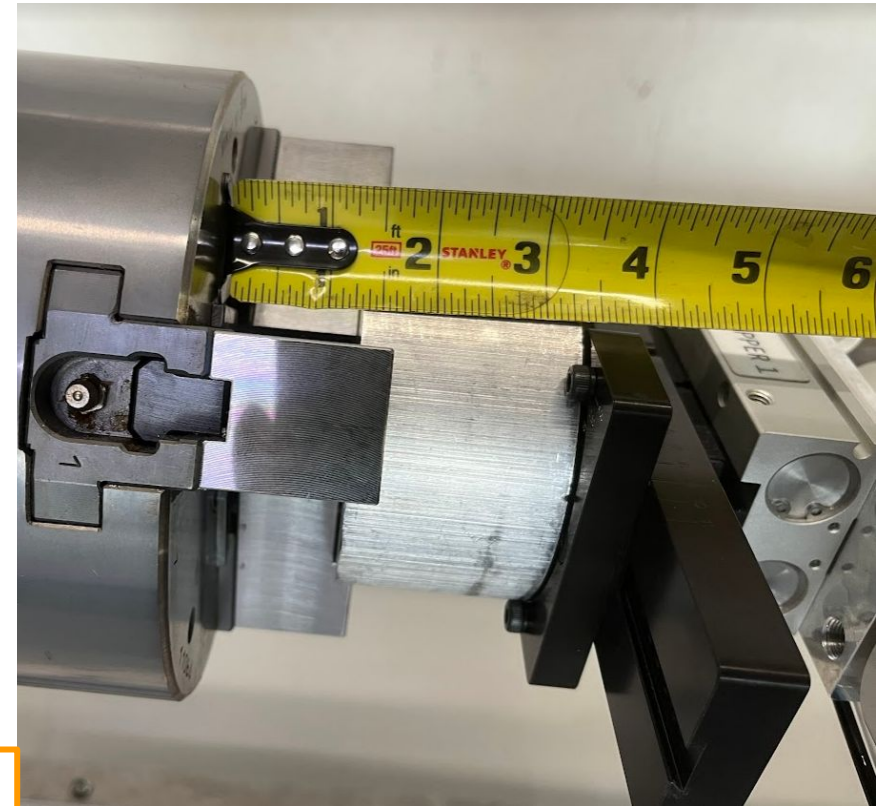
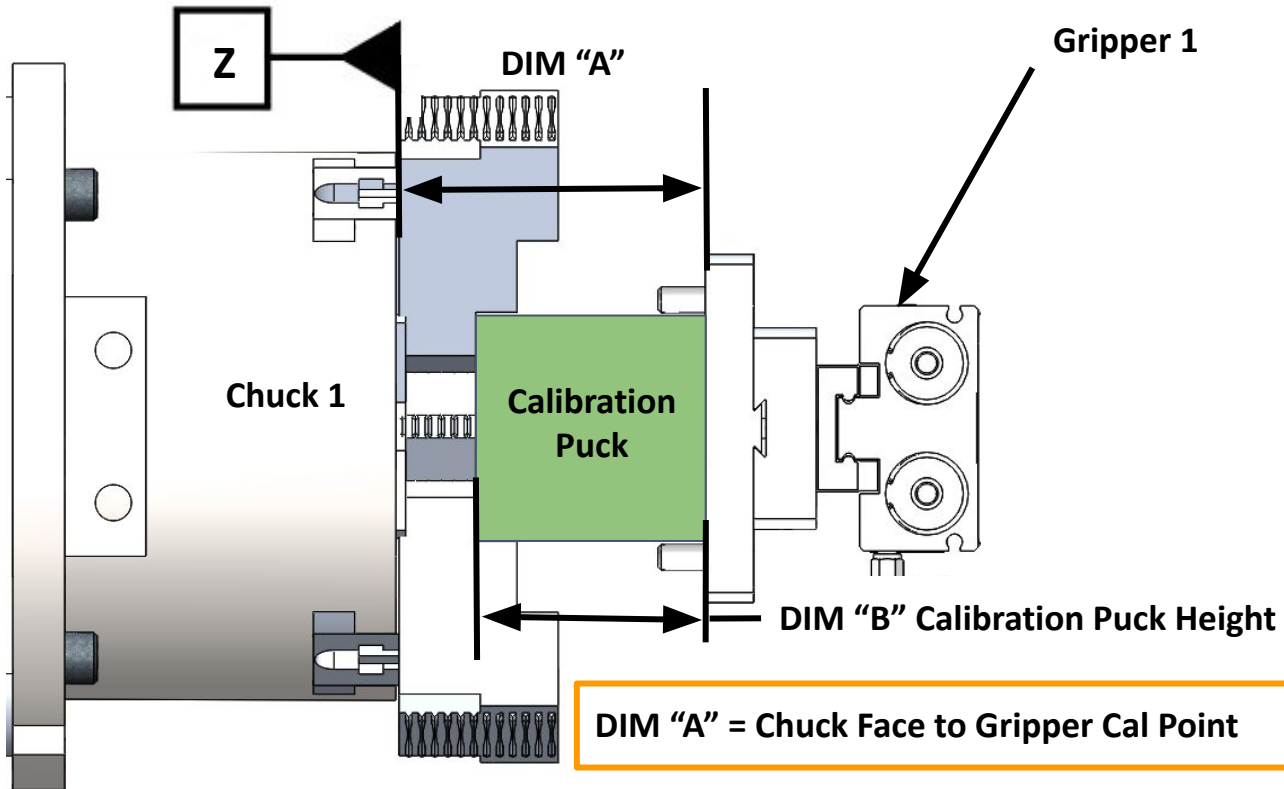
4. Define Chuck Face to Gripper Cal Point

- Measure distance from defined Datum on the chuck to the face of the gripper fingers and enter into Chuck 1 Puck field in the “Chuck Face to Gripper Cal Point” section
- Take note of the Calibration Puck Height **used during part configuration*

This value is referenced for each part configuration

Chuck Face To Gripper Cal Point			
Chuck 1	Shaft (Inches)	Puck (Inches)	3.375
Chuck 2	Shaft (Inches)	Puck (Inches)	

DIM “A”



Calibrate Puck Centerline

5. Move Robot Home

- a. Using the the recovery panel - Open Gripper and Enable Freedrive
- b. Gently move robot away from Chuck to a safe position for the robot to initiate a move to CNC Home - clear of doors or tool spindles, etc..
- c. Disable Freedrive
- d. Using the recovery panel Home button - Move robot to CNC Home

6. To Test

- a. These calibration locations can be tested only after first configuring a part and selecting it on the home page Part drop down menu of the Job section.
- b. For Load - Pick a part from the infeed, then select 'Load' in the recovery panel.
- c. For Unload - Clamp a part in the chuck, then select 'Unload' in the recovery panel.

7. Calibrate Chuck 2 Position *(if sub-spindle is included with CNC)*

- a. Repeat steps described for Chuck 1

*Gripper 1 always loads the Chuck and Gripper 2 unloads the Chuck

**For single Chuck applications, the finished part is removed from the Chuck with Gripper 2. Gripper 2 pick position is calculated from the Gripper 1 to Chuck 1 calibration

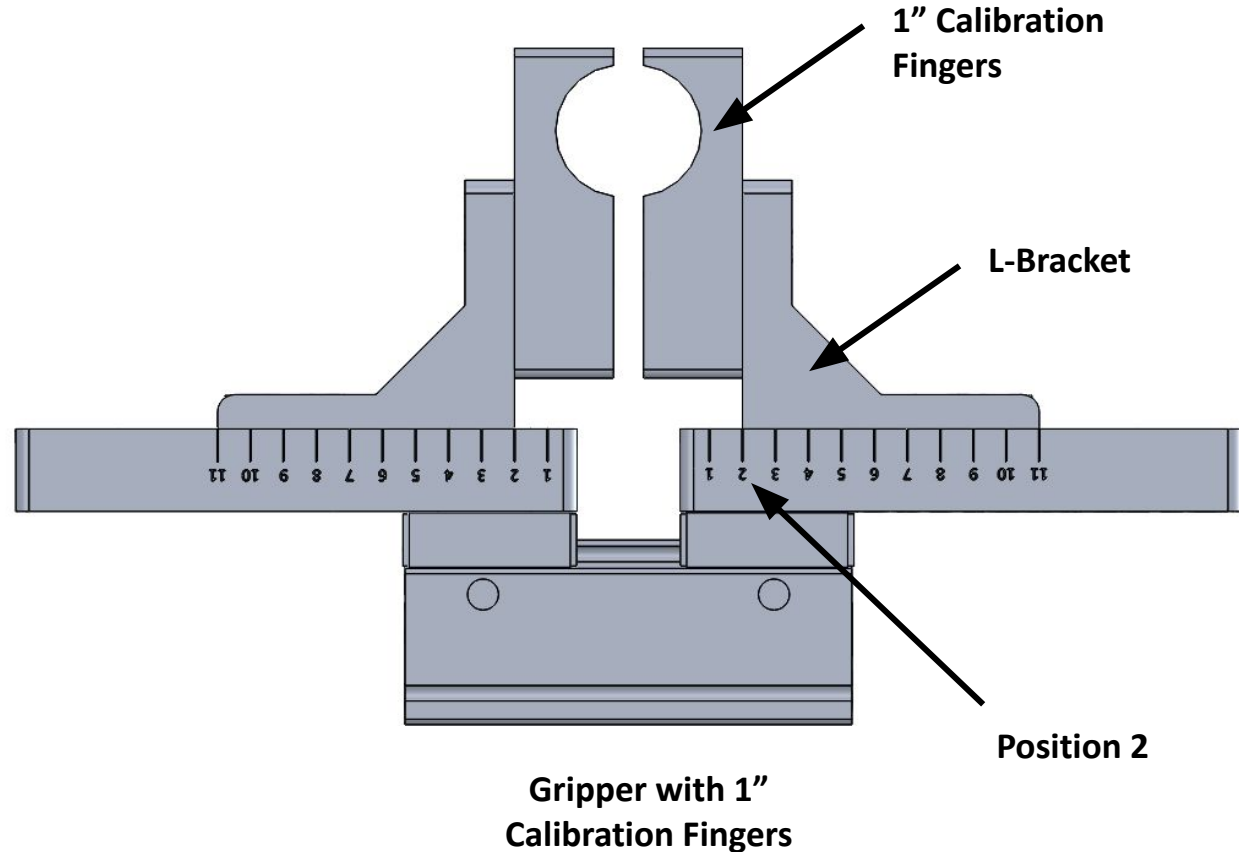
Calibrate Shaft Centerline

Items required for Shaft Calibration:

- Connection to VSC interface, on Calibration Page
- Tape Measure
- Level
- Calibration Part *1" Diameter shaft provided by VersaBuilt
- 1" Calibration Gripper Fingers
- Find a Datum on the Chuck that can be used as a measuring zero location

Calibration Steps

1. **Install the Shaft Gripper Fingers**
 - a. Attach Shaft L-Brackets with 1" Calibration Fingers on Gripper 1 at Position 2

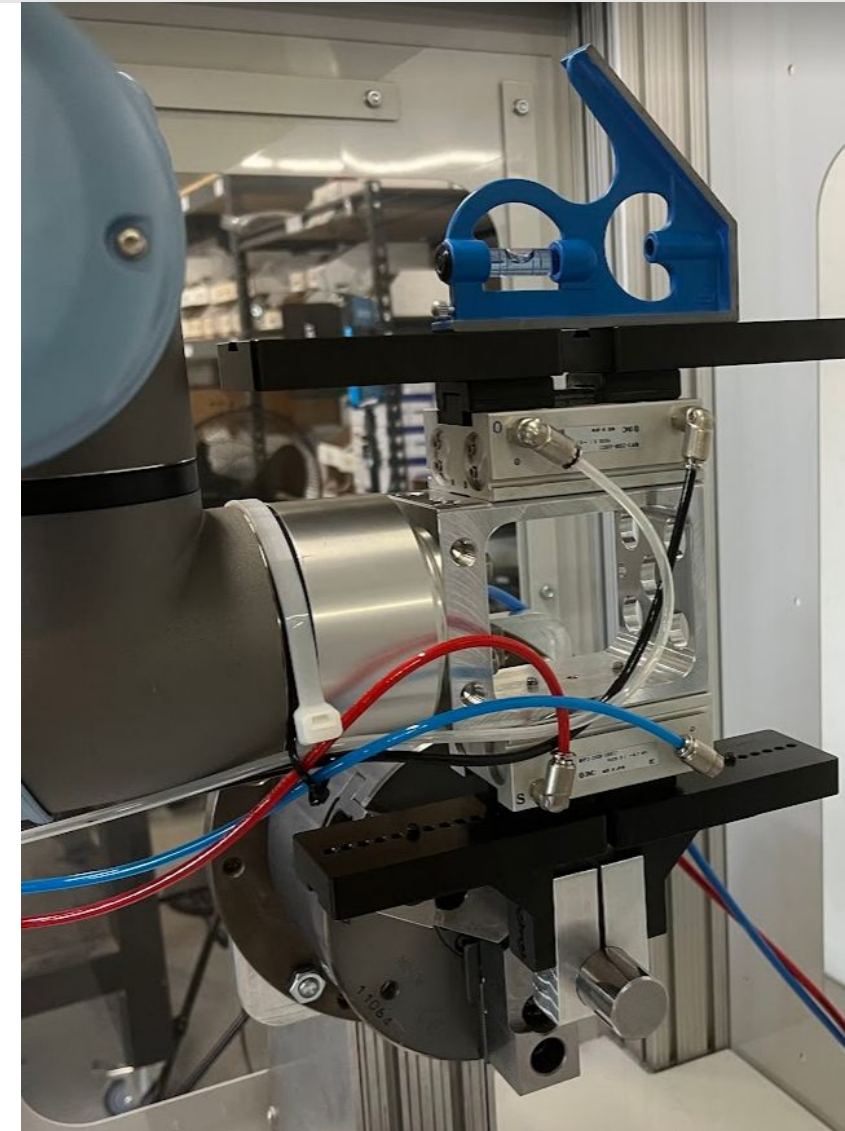


Calibrate Shaft Centerline

2. Calibrate Chuck 1 Shaft Gripper 1 / 2 Position

- a. Place 1-inch Calibration Part in Chuck 1
- b. Select 'Move To CNC Home Chuck 1 Shaft Gripper 1 / 2'
- c. Select Enable Freedrive and Float / Open Gripper (float capability is not available on DuoGrip2000).
- d. Gently move robot engaging Gripper Shaft Fingers with the part in the Chuck
- e. Position the gripper at a level position, with 1" shaft fitting thru mating hole in the gripper fingers, then hand clamping on the part if using float feature.
- f. Close Gripper 1 and ensure levelness again.
- g. Disable Freedrive
- h. Select "Capture Shaft 1"
- i. Do not move the robot yet.
- j. The final step is to measure the 'Chuck Face to Gripper Cal Point' detailed in the following slides.

Chuck 1 Shaft Calibration		
Shaft Gripper 1	Move To CNC Home Chuck 1 Shaft Gripper 1	Capture Chuck 1 Shaft Gripper 1
Shaft Gripper 2	Move To CNC Home Chuck 1 Shaft Gripper 2	Capture Chuck 1 Shaft Gripper 2



Calibrate Shaft Centerline

3. Define Chuck Face to Gripper Cal Point

- Measure distance from static face or feature (datum) on the chuck to the side of the gripper fingers and enter into Chuck 1 Shaft field in the “Chuck Face to Gripper Cal Point” section

4. Move Robot Home

- Using the recovery panel - Open Gripper and Enable Freedrive
- Gently move robot away from Chuck to a safe position for the robot to initiate a move to CNC Home - clear of doors or tool spindles, etc..
- Disable Freedrive
- Using the recovery panel Home button - Move robot to CNC Home

5. To Test Load /Unload

- These calibration locations can be tested only after first configuring a part and selecting it on the home page Part drop down menu of the Job section.
- Load
 - Pick a part from the infeed, then select ‘Load’ in the recovery panel. Make sure the configured part is selected on the Home Page.

6. To Test Unload

*Gripper 1 always loads the Chuck and Gripper 2 unloads the Chuck

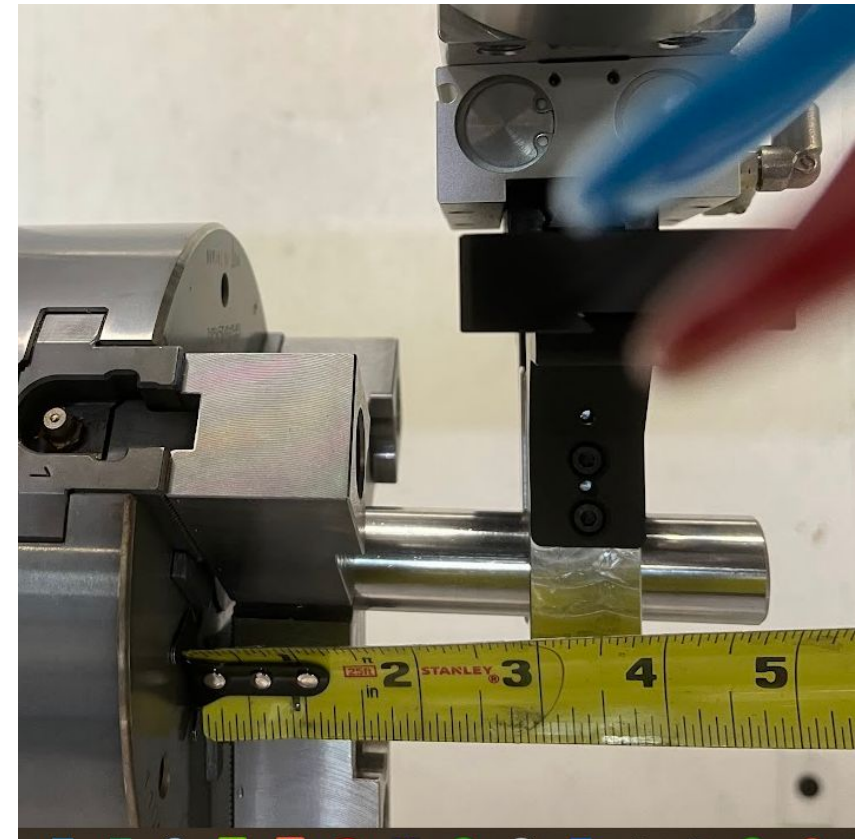
- This calibration location can be tested by

**For single Chuck applications, the finished part is removed from the Chuck with Gripper 2.

Gripper 2 pick position is calculated from the Gripper 1 to Chuck 1 calibration

Chuck Face To Gripper Cal Point

Chuck 1	Shaft (Inches)	3.00	Puck (Inches)	
Chuck 2	Shaft (Inches)		Puck (Inches)	
				<button>Save</button>



Calibrate Shaft Centerline

3. Define Chuck Face to Gripper Cal Point

- Measure distance from static face or feature (datum) on the chuck to the side of the gripper fingers and enter into Chuck 1 Shaft field in the “Chuck Face to Gripper Cal Point” section

Chuck Face To Gripper Cal Point			
Chuck 1	Shaft (Inches)	3.00	Puck (Inches)
Chuck 2	Shaft (Inches)		Puck (Inches)
Save			

4. Move Robot Home

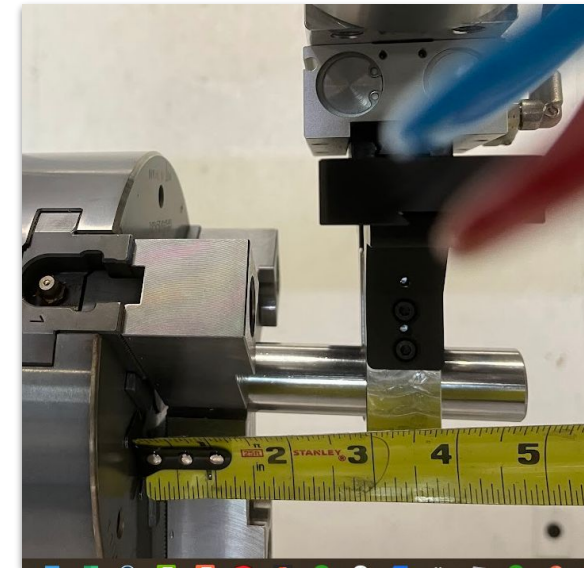
- Using the recovery panel - Open Gripper and Enable Freedrive
- Gently move robot away from Chuck to a safe position for the robot to initiate a move to CNC Home - clear of doors or tool spindles, etc..
- Disable Freedrive
- Using the recovery panel Home button - Move robot to CNC Home

5. To Test

- These calibration locations can be tested only after first configuring a part and selecting it on the home page Part drop down menu of the Job section.
- For Load - Pick a part from the infeed, then select ‘Load’ in the recovery panel.
- For Unload - Clamp a part in the chuck, then select ‘Unload’ in the recovery panel.

6. Calibrate Chuck 2 Position *(if sub-spindle is included with CNC)*

- Repeat steps described for Chuck 1



*Gripper 1 always loads the Chuck and Gripper 2 unloads the Chuck

**For single Chuck applications, the finished part is removed from the Chuck with Gripper 2. Gripper 2 pick position is calculated from the Gripper 1 to Chuck 1 calibration

Part Specific Calibration

Further detail on Calibration can be found in the Lathe Machinists Manual, where individual part configuration is detailed.

For Pucks

The calibration steps on the previous pages will enable pick and place from the VersaCart. With part size information, the system will calculate proper feed and placement to/from the Chuck(s).

For Shafts

The calibration steps on the previous pages give the system a chuck centerline used to load and unload from the chuck. In the part configuration, the user will:

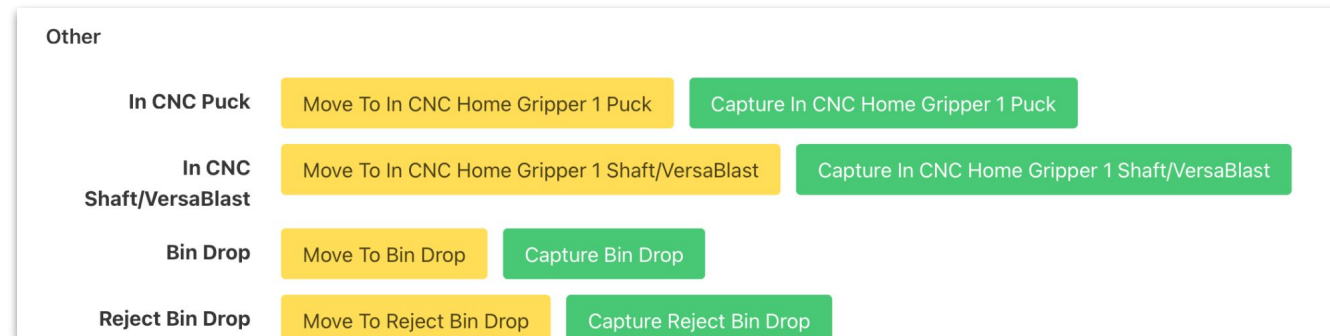
- Calibrate Part Load and Unload positions to/from VersaCart Shaft Infeed, based on the relative positions of the part to the fingers when loaded or unloaded to/from the Chucks

Bin Drop Calibration

Section 11

Calibrate Bin Drop

1. Select “Move to Table Home Gripper 1
2. Select “Move to Bin Drop” **this will position robot at the Factory Default Bin Drop Position*
3. Select Enable Freedrive from the recovery panel **this allows the user to drag-to-teach*
4. By hand, gently move the robot to the preferred position for dropping parts at a Bin, Bucket, Ramp, Conveyor, etc.
5. Select Disable Freedrive
6. Select “Capture Bin Drop”
7. Select “Return Home”
8. Follow the same instructions for capturing a ‘Reject Bin Drop’



Calibrate Bin Drop - Default MultiGrip Location

Robot is above Bin Drop location, outside CNC, with gripper flipped to drop parts

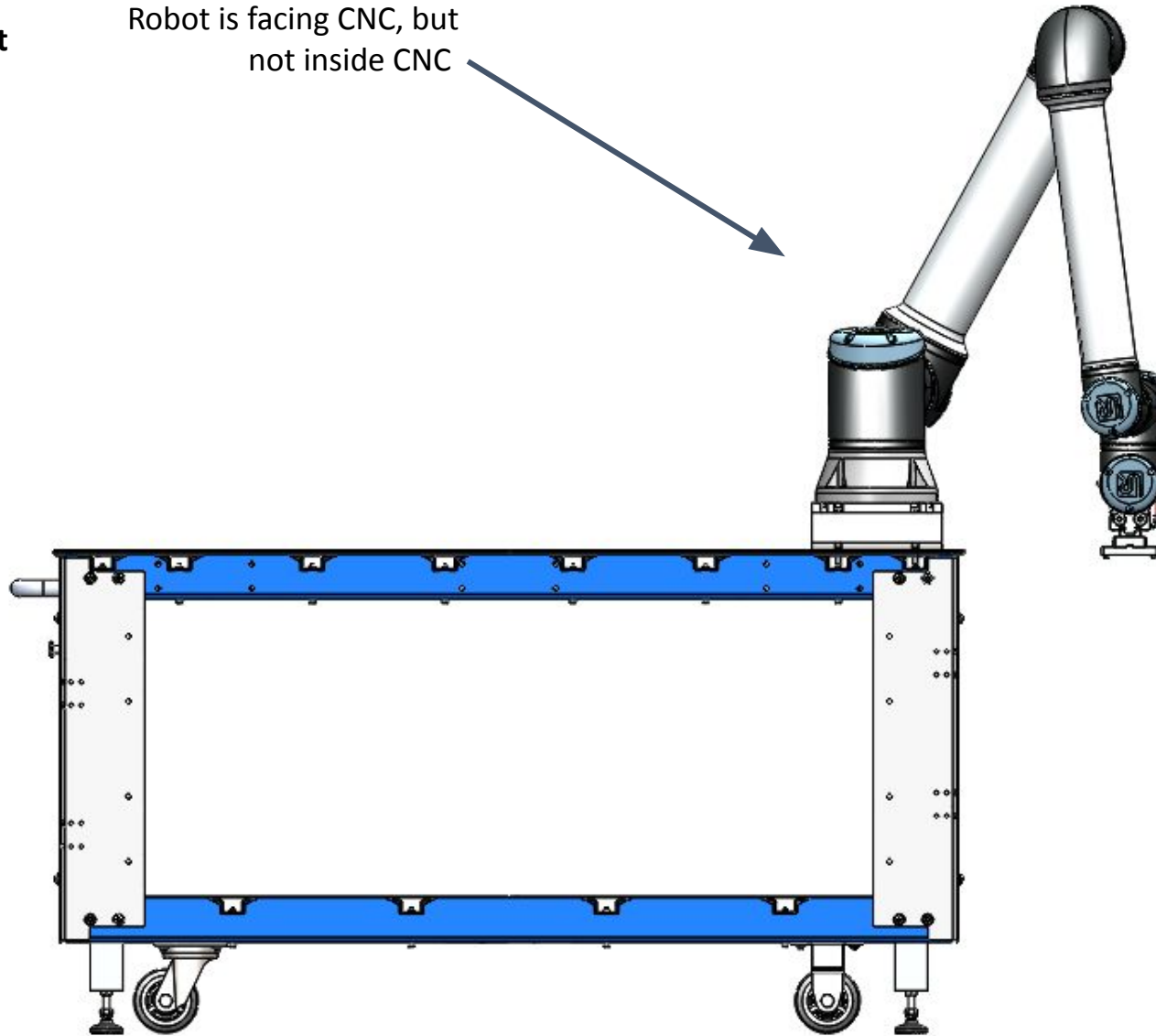


Calibrate Bin Drop - Default DuoGrip Location

Robot is positioned in front of the CNC in position for dropping parts

Gripper 2 is facing down

Robot is facing CNC, but not inside CNC

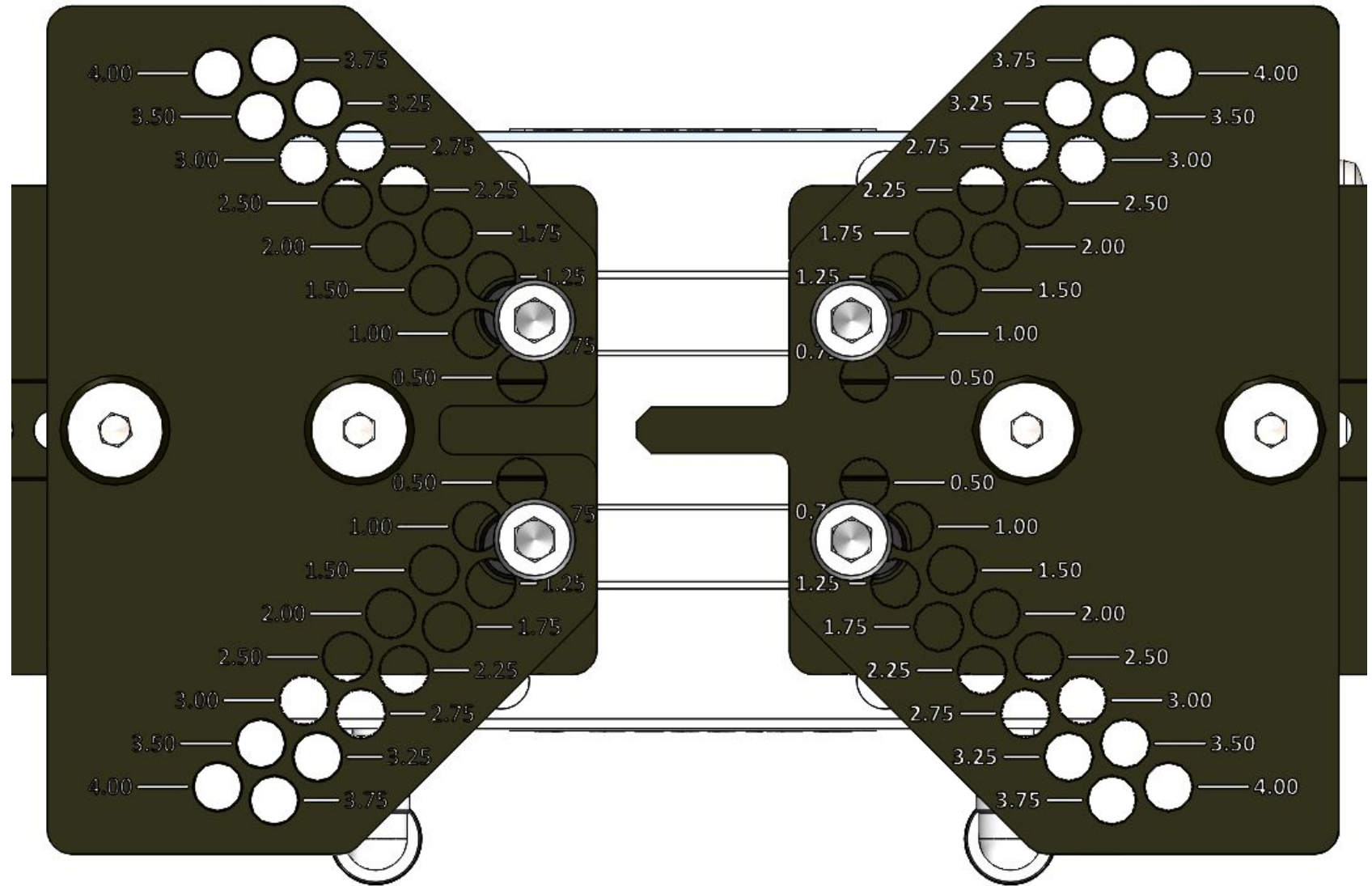


DuoGrip Regrip Station Calibration

Section 12

DuoGrip Regrip Calibration

- Configure the DuoGrip Gripper with Standard Puck Fingers
- On Gripper 1 and Gripper 2, attach the provided M5 Socket Head Cap Screws x 12mm L to standard Puck fingers, in position 0.75"

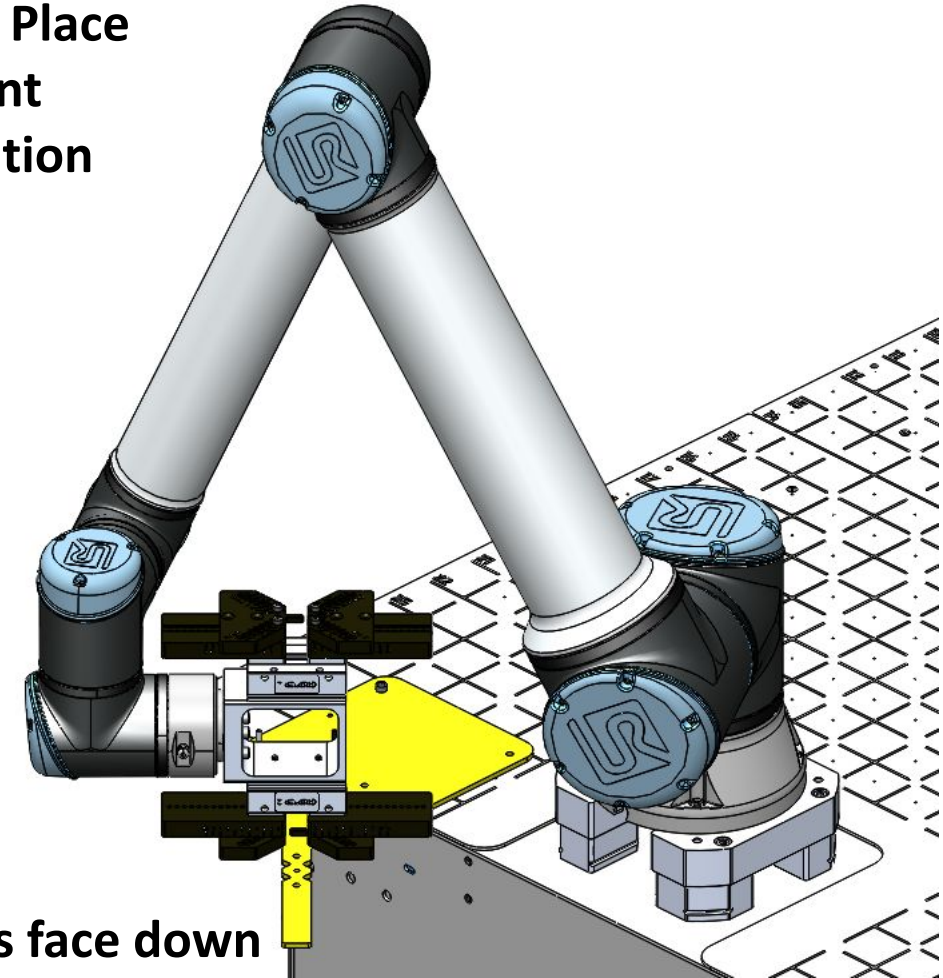


DuoGrip Regrip Calibration (Regrip Place Location)

Capture Gripper 2 Place

1. Go to the Calibration Page on the VSC User Interface
2. Select the "Move to CNC Home Gripper 2" in the Regrip Calibration Section (This opens the Freedrive Control window)
3. Enable Freedrive and Float / Open the Gripper (float capability is not available on DuoGrip2000)
4. Manually position the robot with Gripper 2 Puck Fingers touching/coincident with the top face of the Regrip Platform, in the robot joint configuration shown on the following pages, with the head of Socket Head Cap Screws hand-clamped into the 4x V-slots on the platform
5. Close the Gripper
6. With the Gripper Clamping on the Regrip calibration position, verify that the Puck face is pushed against the Regrip platform face.
7. Disable Freedrive
8. Capture Regrip Place Location
9. From the recovery panel - Open Gripper and Enable Freedrive to move the robot out of the way, into a recoverable position.
10. From the recovery panel - Select the Home button to move the robot to CNC Home

Gripper 2 Place Robot Joint Configuration

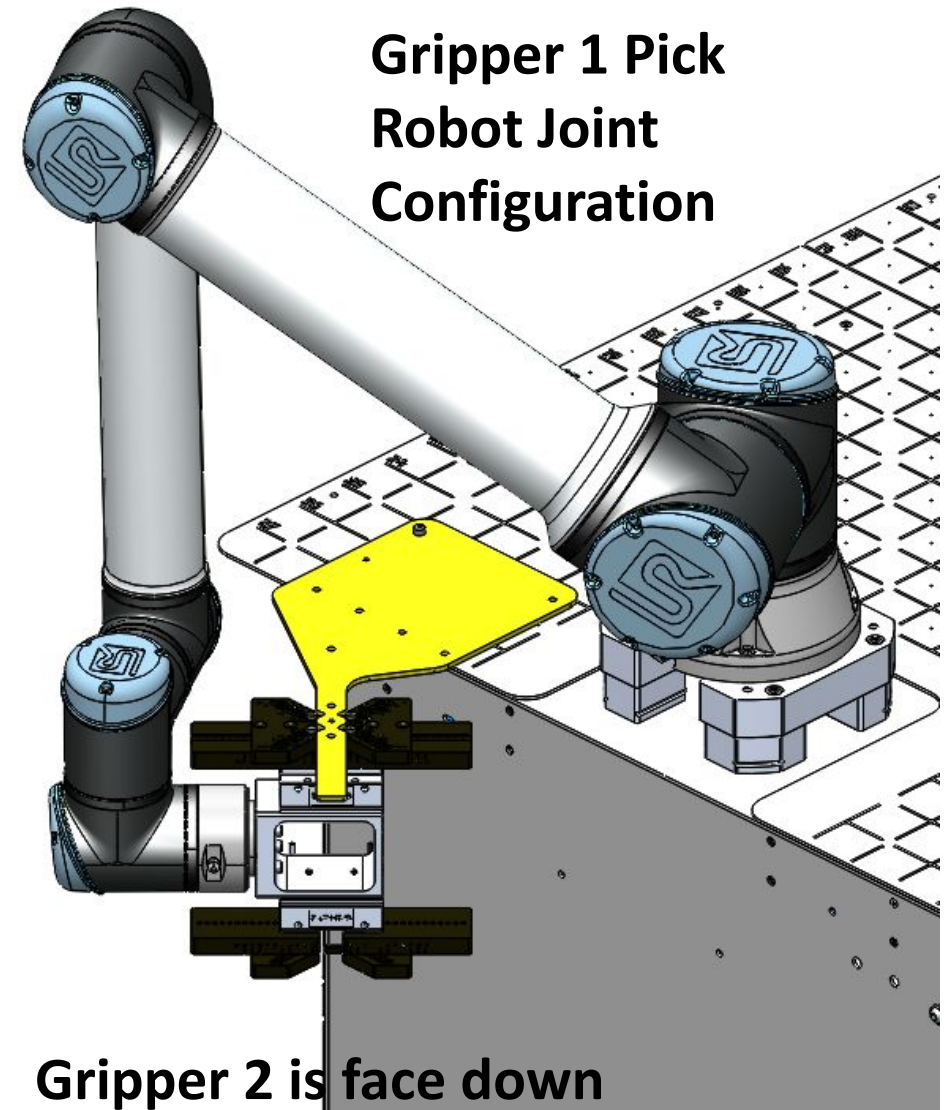


Gripper 2 is face down

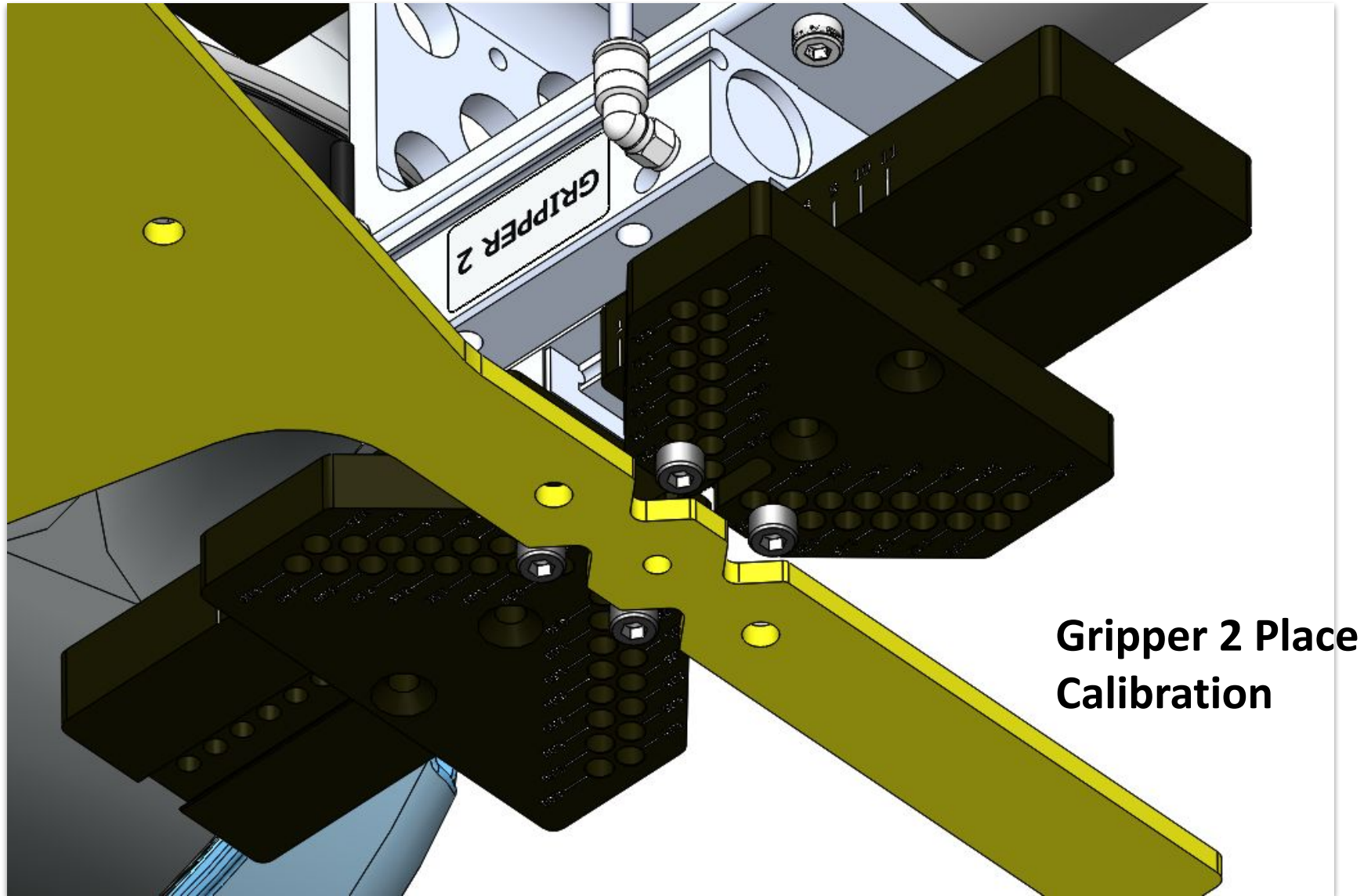
DuoGrip Regrip Calibration (Regrip Pick Location)

Capture Gripper 1 Pick

1. Go to the Calibration Page on the VSC User Interface
2. Select the "Move to CNC Home Gripper 2" in the Regrip Calibration Section (This opens the Freedrive Control window).
3. Enable Freedrive and Float / Open the Gripper (float capability is not available on DuoGrip2000)
4. Manually position the robot with Gripper 1 Puck Fingers touching/coincident with the bottom face of the Regrip Platform, in the robot joint configuration shown on the following pages, with the head of Socket Head Cap Screws hand-clamped into the 4x V-slots on the platform
5. Close the Gripper
6. With the Gripper Clamping on the Regrip calibration position, verify that the Puck face is pushed against the Regrip platform face.
7. Disable Freedrive
8. Capture Regrip Place Location
9. From the recovery panel - Open Gripper and Enable Freedrive to move the robot out of the way, into a recoverable position.
10. From the recovery panel - Select the Home button to move the robot to CNC Home

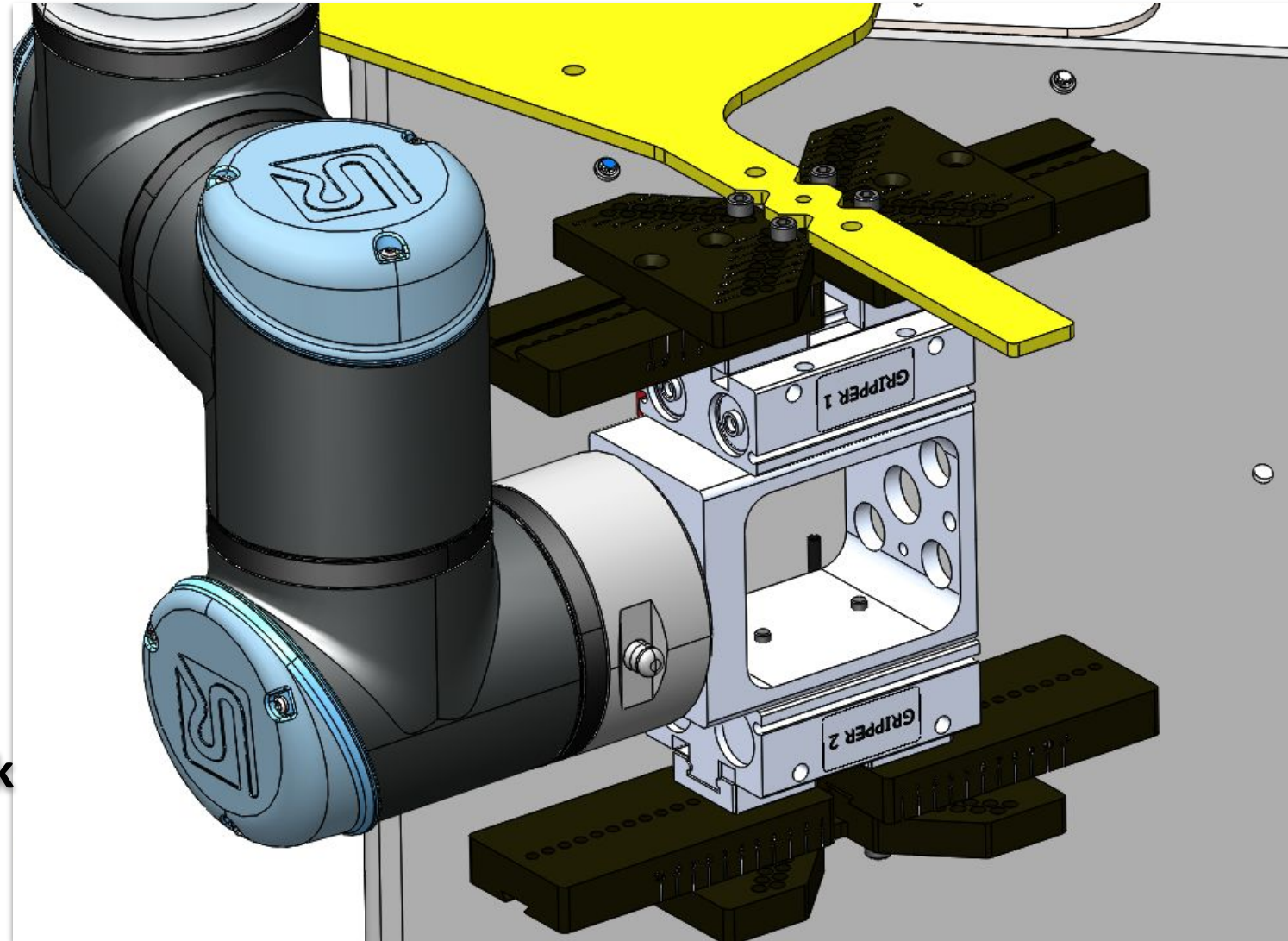


DuoGrip Regrip Calibration Place Image



DuoGrip Regrip Calibration Pick Image

**Gripper 1 Pick
Calibration**



DuoGrip Regrip Calibration

Regrip Move Off Distance - Distance robot 'moves off' the regrip station after a pick / place. Adjust to allow robot to clear the regrip station depending on the part length / geometry.

Regrip Pick Location Tune Tool - optional manual adjustment of robot motion on pick about x,y,z,rx,ry,rz.

Regrip Calibration

Regrip Place Location Move To CNC Home Gripper 2 Capture Regrip Place Location

Regrip Pick Location Move To CNC Home Gripper 2 Capture Regrip Pick Location

Regrip Move Off Distance (Inches) Save

Regrip Pick Location Tune Tool Save

Adjustments for both features require the 'Save' button to be clicked and the vsc to be restarted via the About page on the user interface.

ZPS Infeed & Chuck Calibration

Section 13

ZPS Calibration Overview

1. Freedrive:

- a. Robot Freedrive (Drag-to-Teach) is utilized to capture pre-defined points for infeed and chuck calibration.
- b. In Freedrive mode, the robot will move with gentle forces applied to the gripper or joints.
- c. **Do not force the robot to move** (if it takes more than a gentle nudge, the robot is not in a proper state)
- d. When starting from a Home Position, before selecting Freedrive, **select “Reset”** to allow the robot to calculate the load in a neutral state.
- e. If the robot starts moving when Freedrive is selected, the robot is referencing an external load and needs to be “Reset”. Exit Freedrive and select the “Reset” button, then enter Freedrive again.
- f. Move the robot with a combination of forces applied on the gripper and the robot joints (**Two Hands are Required**)
- g. If the U/I is unresponsive to commands, either navigate to the About Page and select Restart VSC, or do a power cycle and reboot.

2. Calibration Tools:

- a. VersaBuilt ZPS Calibration Tools must be used to achieve reliable pick and place.
- b. The ZPS Calibration Tools are **placed in the ZPS infeed slot or chuck first**, then Freedrive is used move the robot into position, then **gripping forces are used to align the robot into position**.

3. Infeed Calibration:

- a. The calibration tool will either have a tight fit or is bolted to the infeed rack, for precise and rigid alignment.
- b. Start Calibration at “Table Home”, then place the Calibration Tool in the infeed Slot and open the Gripper

4. Chuck Calibration:

- a. Start Calibration at “CNC Home”, then place the Calibration Tool in the chuck (seated and clamped) and open the Gripper

5. Recovery from a Fault:

- a. Any sudden stops or jerks will fault out the robot, requiring to 1) “Gripper Open”, 2) Disable Freedrive, 3) “Move to Home”, 4) Reset, 5) Restart Procedure
- b. If the robot or tool seems to be stuck, but the user interface displays that Freedrive is enabled, then the system has entered a Fault state without a notification. 1) “Gripper Open”, 2) Disable Freedrive, 3) “Move to Home”, 4) Reset, 5) Restart Procedure

ZPS Calibration Overview

6. Settings:

- a. Select or Verify that the correct information is entered for:
 - i. ZPS Rack Type (e.g., 52mm, Haas ZPS)
 - ii. ZPS Racks (number of infeed rows)
 - iii. Slots per Rack (number of vises/pallet slots per infeed row)
- b. If a change is needed on the Settings Page, select:
 - i. Edit > change the selection or enter new value > Save
 - ii. Go to the About Page > Restart VSC

ZPS Rack Type Haas ZPS Single Pin Rack ▼

ZPS Racks 52mm ZPS Rack
Haas ZPS Single Pin Rack

ZPS Slots Per Rack 7 ▼

ZPS Rack Type Haas ZPS Single Pin Rack ▼

ZPS Racks 6 ▼

ZPS Chuck Actuation Type 4
5
6 Only ZPS Chuck ▼

Wait For CNC At Table Home

ZPS Slots Per Rack 7 ▼

ZPS Calibration Overview

7. Calibration Page > Selecting Infeed and Chuck Calibration Workholding:

Lists the available workholding options for calibrating the Infeed and Chucks. The default calibration workholding for the selected Rack Type is shown by default *but can be overridden*

Calibrate Racks

Infeed Calibration Workholding

Haas 1 Inch by 5-25 Inch Square Pallet ▾

Rack 1	Capture Point 1	Capture Point 2	Calculate Rack 1
Rack 2	Capture Point 1	Capture Point 2	Calculate Rack 2
Rack 3	Capture Point 1	Capture Point 2	Calculate Rack 3
Rack 4	Capture Point 1	Capture Point 2	Calculate Rack 4

Calibrate ZPS Chucks

Run CNC Table Load Position Program

Table Load

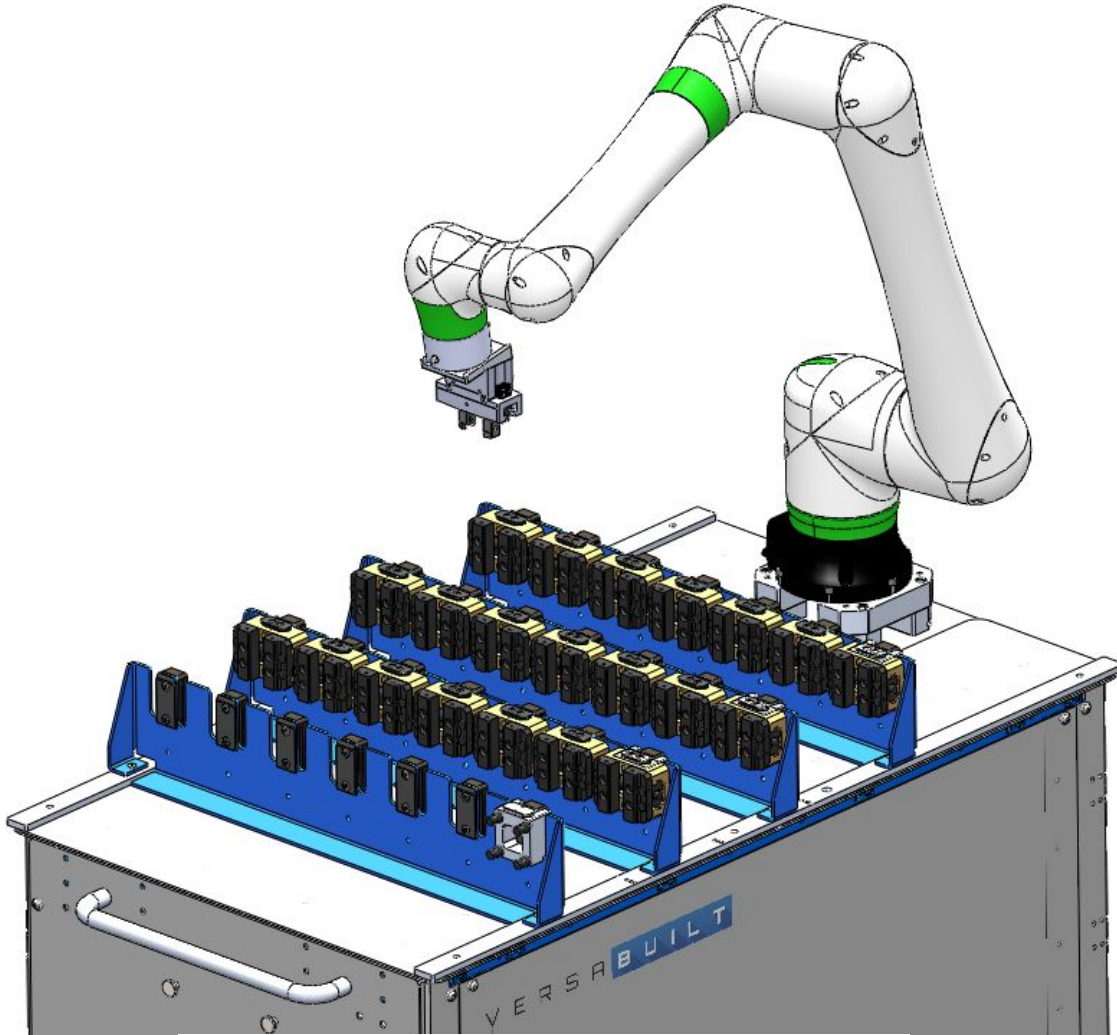
Chuck Calibration Workholding

Haas 1 Inch by 5-25 Inch Square Pallet ▾

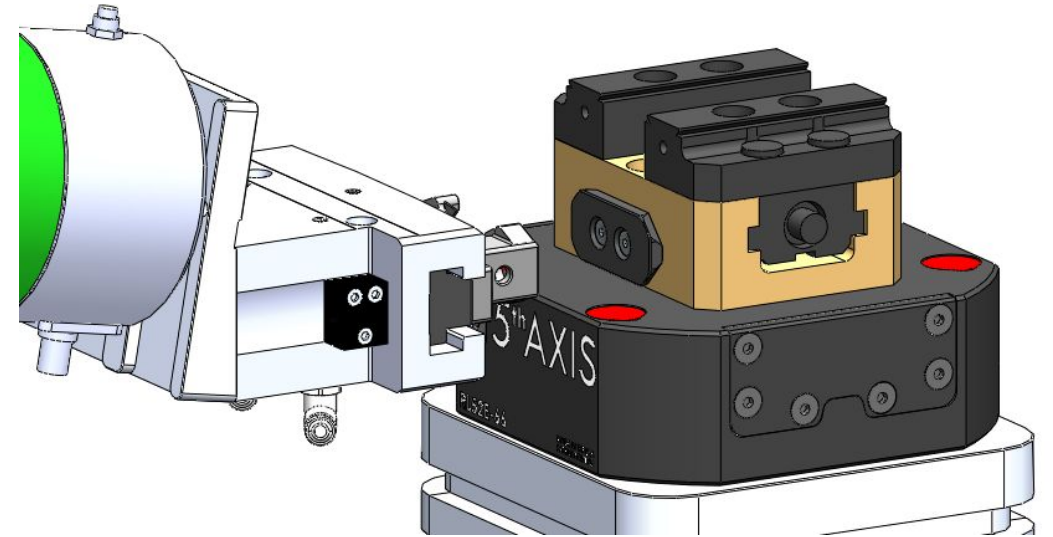
Chuck 1 Calibration

Capture Chuck 1

ZPS Calibration Tool - Placement and Orientation



**52mm ZPS Infeed
w/ Calibration Tool at Row 1 Slot 1**



52mm ZPS Chuck & Vise

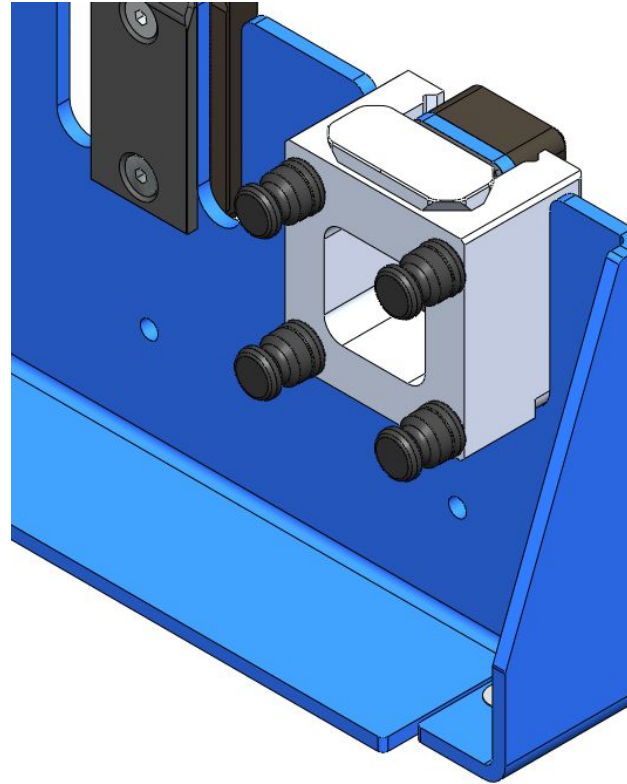
ZPS Infeed Calibration - Procedure

Overview:

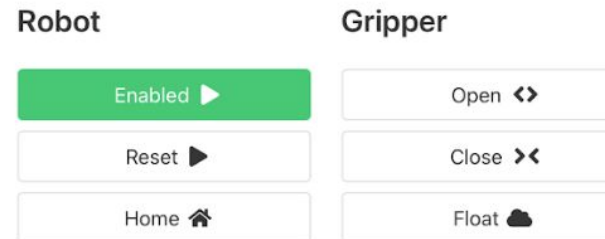
- For each Rack, there are 2 calibrated positions: First Slot and Last Slot,, as shown in the image to the right for a 7 slot infeed.
- To calibrate a Rack, the 2 slots are individually “captured”, then the Row is “calculated”
- Refer to “Freedrive tips” shown on the following slides for guidance on moving the robot into the tight fitting calibration positions.

Steps:

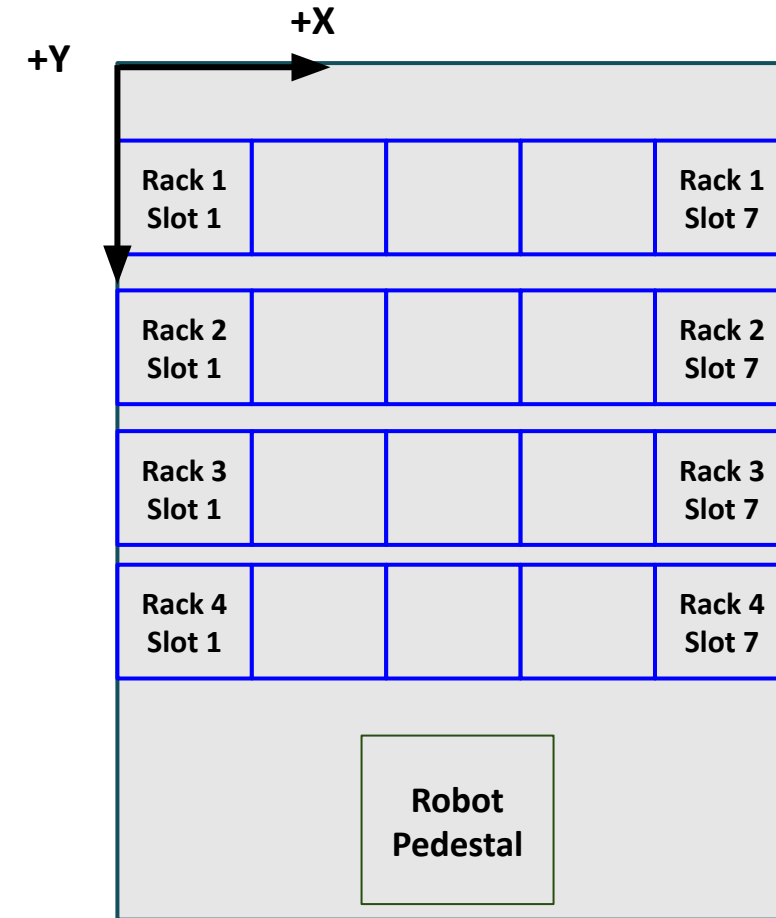
1. **Navigate to the Calibration Page**
2. **In the Recovery Panel:**
 - a. Verify the “Enable” button is active and green
 - b. Place the robot at Table Home, if not already
3. **Add the ZPS Calibration Tool in the Slot**
 - a. 52mm ZPS tools slide into place
 - b. Haas ZPS calibration tools are bolted in place
4. **Select Gripper Open**



Infeed Slot w/ 52mm ZPS Calibration Tool



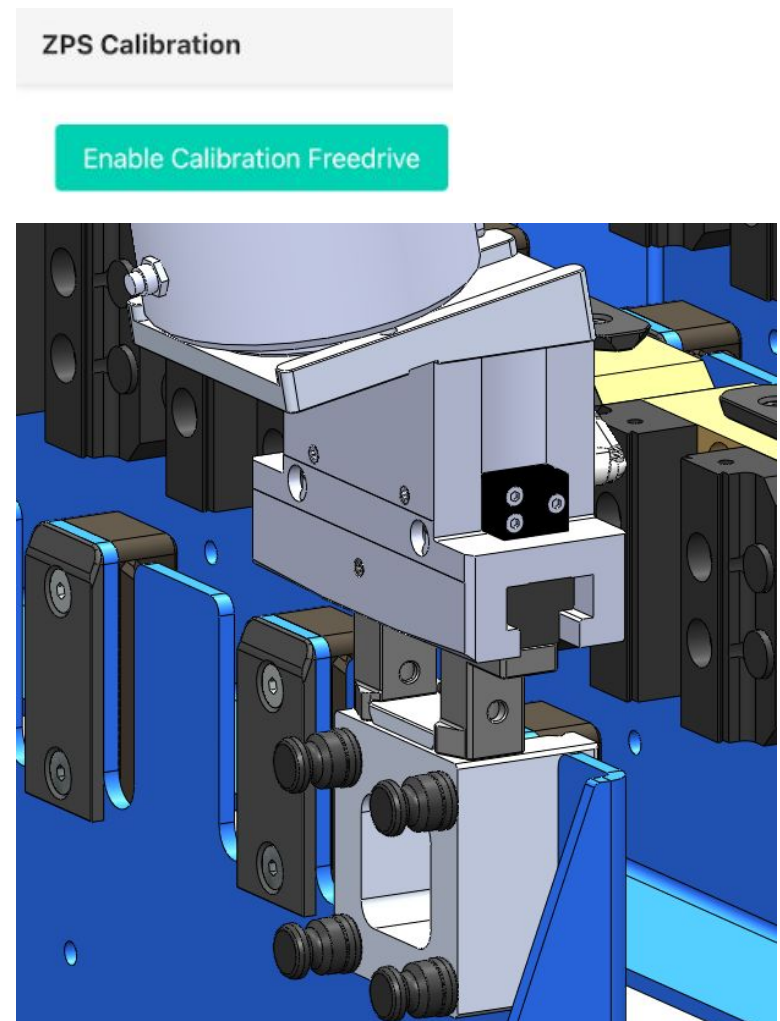
ZPS Infeed & Slots for Calibration



ZPS Infeed Calibration - Procedure

5. Manually moved the Robot into position to clamp on the Calibration Tool:

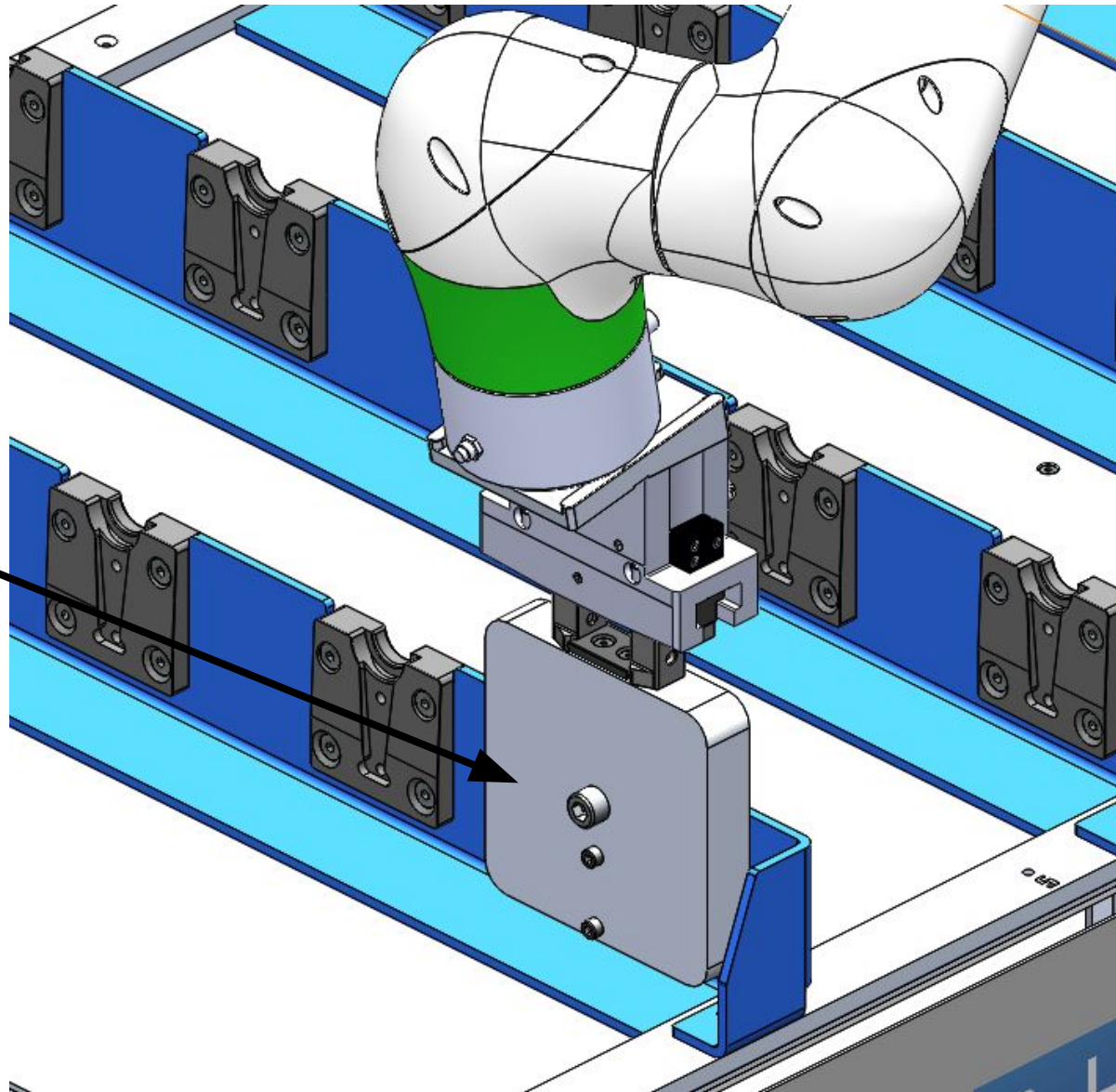
- a. With Robot at Table Home, select “Enable Calibration Freedrive”
- b. Gently by hand, move the robot to Slot
- c. Align the Gripper with the Calibration Tool in **rotation about X, Y, Z**, and with the gripper **fingers engaging the face of the tool** and **symmetric about the calibration tool’s gripper interface**.
 - i. Looking from the side, align the gripper to be **parallel to the vertical infeed** bracket (see images on the following page)
- d. Close Gripper to clamp on the gripper interface
 - i. The combination of the robot in Freedrive and Gripping force will cause the robot joints to align in a stable position.
 - ii. Repeat Open and Close at least 3-times to help align the robot joints
- e. ****52mm ZPS only****
 - i. **With both hands on the ZPS calibration tool**, anchored to the infeed bracket, **gently move the Tool up and down** from the fully engaged position to approximately halfway out of the infeed, then back to fully engaged **3-times**.
 - ii. If there are sudden movements or sudden stops, Freedrive will fault out, requiring a restart of the process: 1) Disable Freedrive, 2) “Gripper Open”. 3) “Move to Table Home”, 4) Restart Procedure



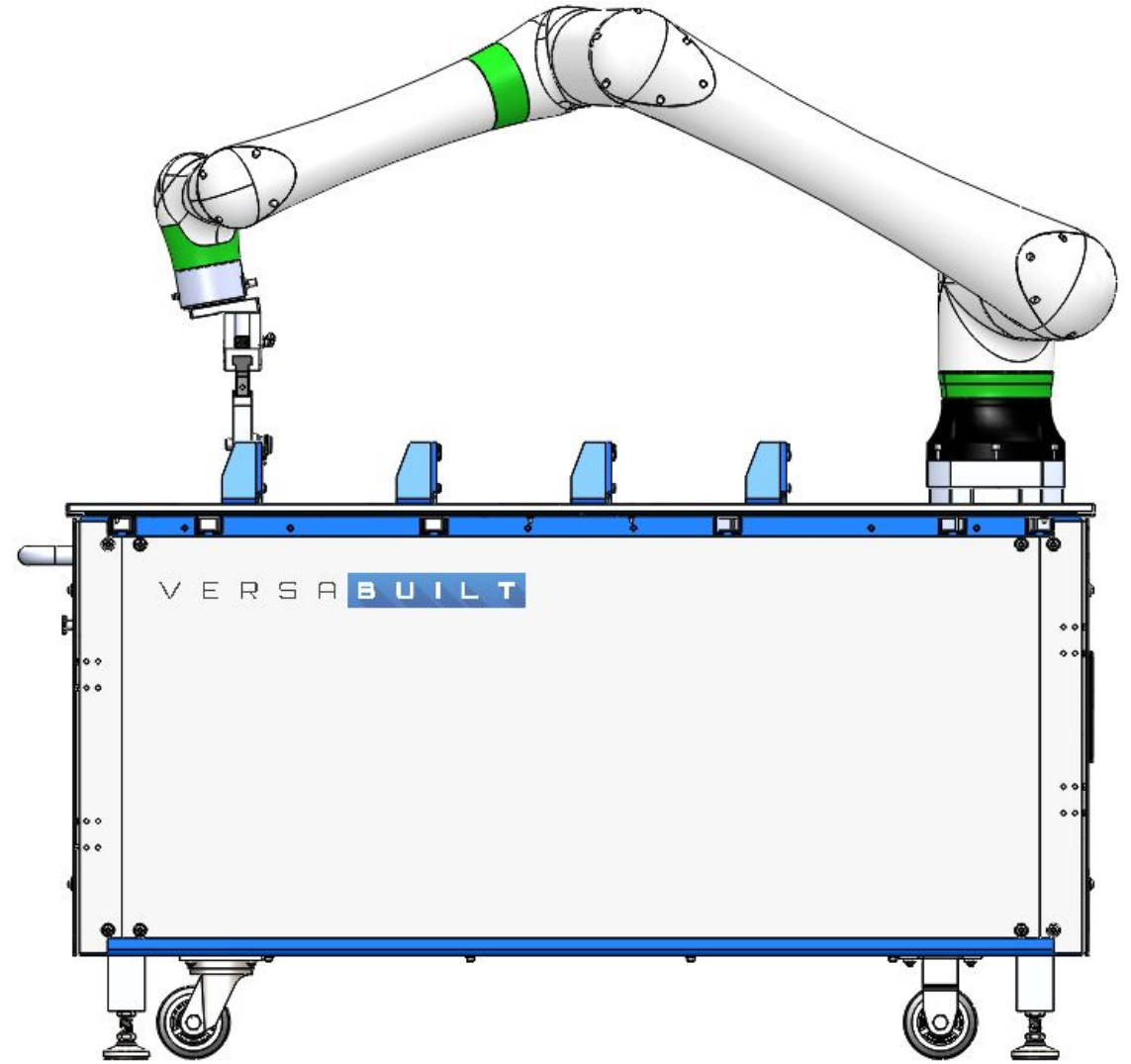
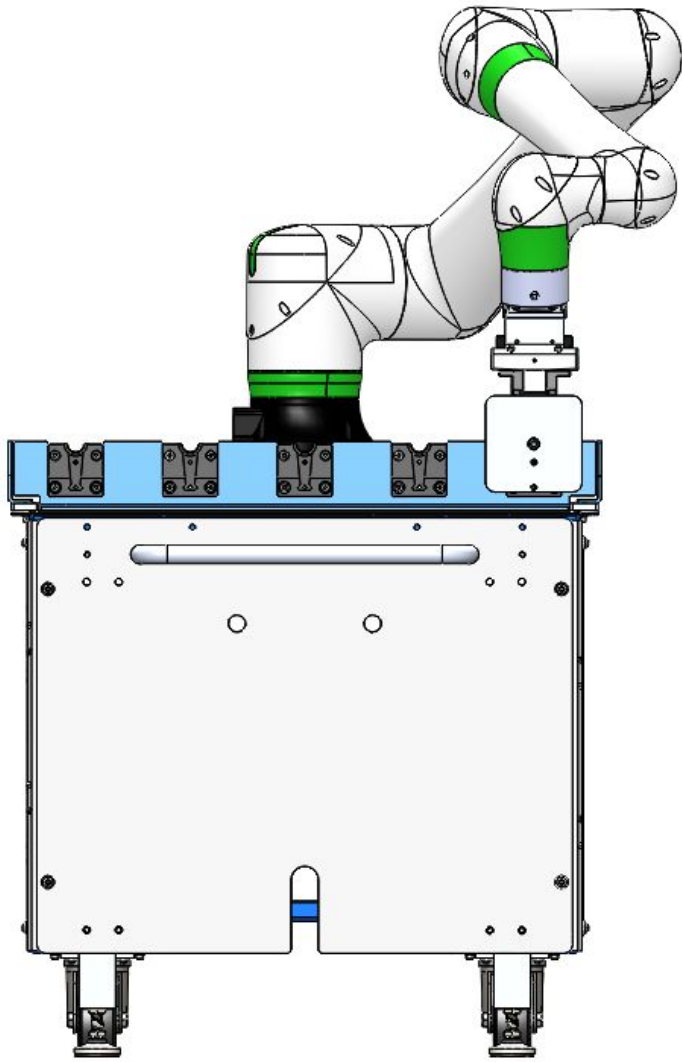
Infeed Slot w/ 52mm ZPS Calibration Tool & Robot in Calibration Position

ZPS Infeed Calibration - Haas ZPS

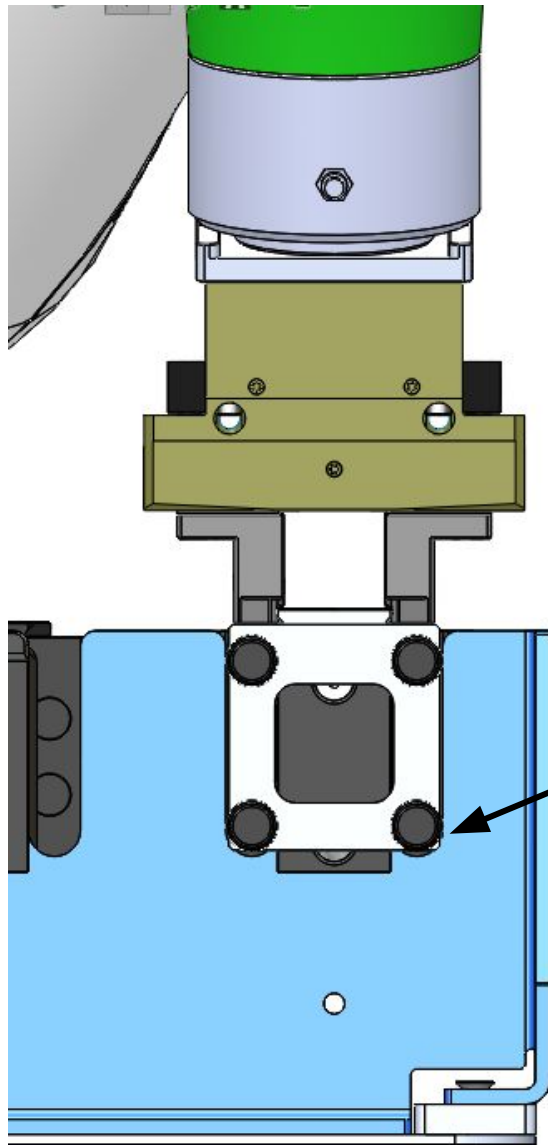
Haas ZPS Calibration Pallet
secured with M5x0.8mm SHCS x 45mm L



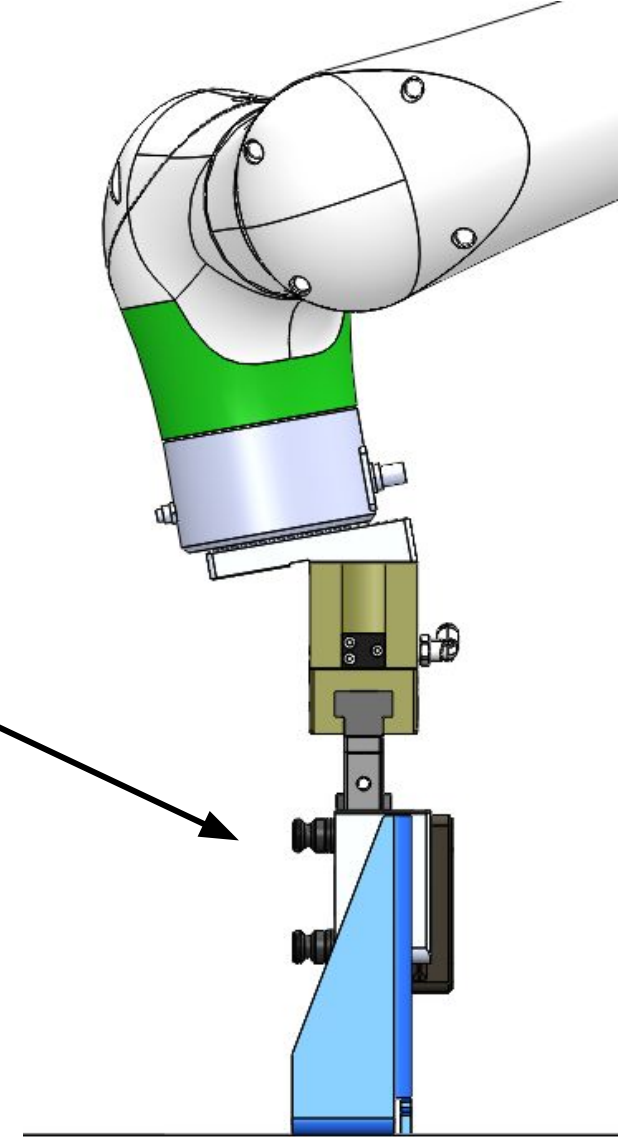
ZPS Infeed Calibration - Full Engagement of Tool to Infeed



ZPS Infeed Calibration - Full Engagement of Tool to Infeed



Move the robot/tool up and down
(from fully engaged to halfway
out) 3-times, then place in the
fully engaged position



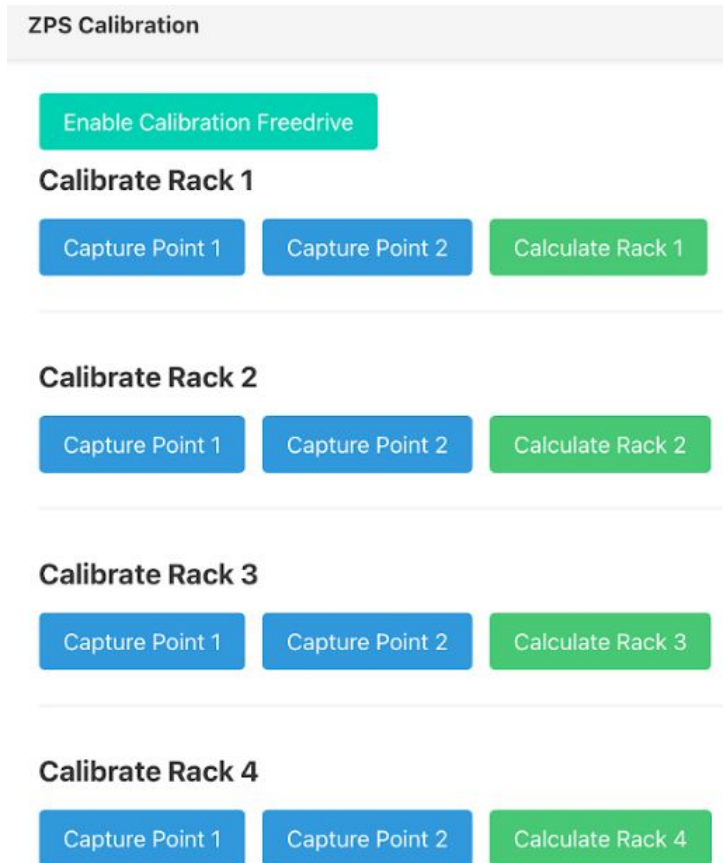
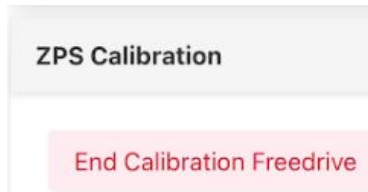
ZPS Infeed Calibration - Procedure

6. Capture Position & Calibrate Rack

- a. With the Tool in the Fully Engaged Position
 - i. Exit Freedrive by selecting “End Calibration Freedrive”
 - ii. Select “Capture Point”
- b. Calibrate a Rack / Row:
 - i. Select “Capture Point 1” after positioning in the Slot 1 position
 - ii. Select “Capture Point 2” after positioning in the Slot 7 position
 - iii. Select “Calculate Rack 1”
- c. Repeat for each Rack to complete Infeed Calibration

7. Test Pick and Place

- a. On Home Screen, select a part configuration
- b. Place a Vise corresponding to the part configuration in an infeed slot, with the ZPS cleat facing up
- c. While in the Recovery, select the slot where the vise is located, and select “Pick ZPS Workholding”
- d. After a successful pick, place the vise back in the slot
- e. Repeat for all slots or first and last slot for all rows.
- f. If you have pick issues:
 - i. Recalibrate > Capture Point 1 > Capture Point 2 > Calculate Rack
 - ii. Verify the vise and cleat are properly in position
- g. A test configuration is included and can be selected, where a single vise/pallet will be picked and placed into all slots, start at Row 1, Slot 1. The Quantity entered for the job is equal to the number of times the robot will cycle through the entire infeed.



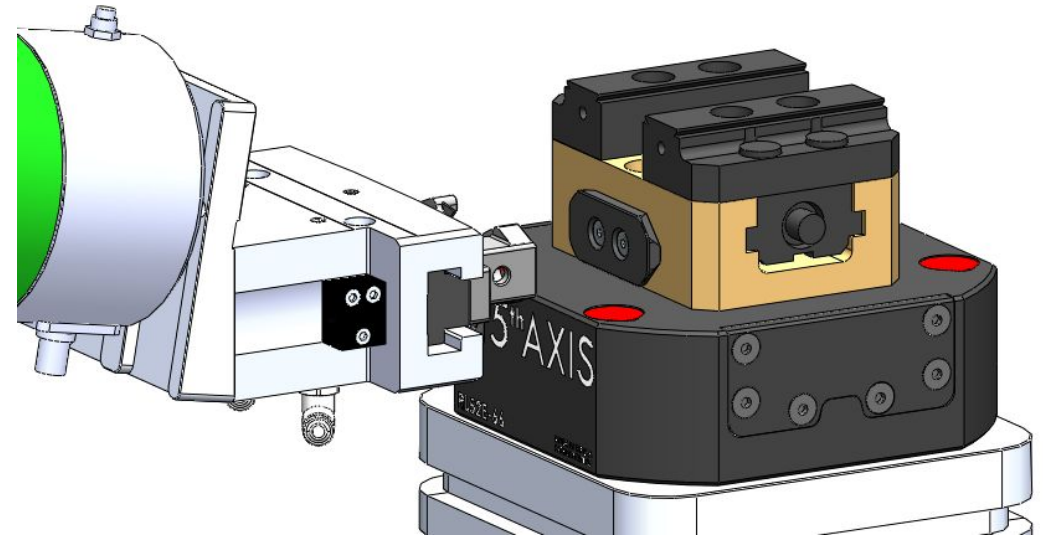
ZPS Chuck Calibration - Procedure

Overview:

- Chucks are calibrated in a repeatable CNC Table Load Program Position
- Robot to Chuck calibration is completed with the ZPS Calibration Tool or ZPS Vise/Pallet in the locked position, then using Freedrive, the ZPS Gripper clamps on the gripper interface to teach the position.
- After the Gripper Clamps, exit freedrive and select “Capture”
- Refer to “Freedrive tips” shown on the following slides for guidance on moving the robot into the tight fitting calibration positions.

Steps:

1. **Navigate to the Calibration Page**
2. **In the Recovery Panel:**
 - a. Verify the “Enable” button is active and green
 - b. Place the robot at CNC Home, if not already
3. **Place the ZPS Calibration Tool in the Chuck**
 - a. Select Chuck Clamp to seat the Vise/Pallet
4. **Select Gripper Open**



52mm ZPS Chuck Calibration Gripper Orientation

Robot	Gripper
Enabled ▶	Open ↔
Reset ▶	Close ▶◀
Home 🏠	Float ☁

ZPS Chuck Calibration - Procedure

5. **Manually moved the Robot into position to clamp on the Calibration Tool:**
 - a. With Robot at CNC Home & Gripper Open
 - i. Select “Enable Calibration Freedrive” in the ZPS Calibration Panel
 - b. Gently by hand, move the robot to the Vise/Pallet
 - c. Align the Gripper with the Calibration Tool or Vise in **rotation about X, Y, Z**, and with the gripper **fingers engaging the face of the tool** and symmetric about the calibration tool’s gripper interface.
 - d. Close Gripper to clamp on the gripper interface
 - i. The combination of the robot in Freedrive and Gripping force will cause the robot joints to align in a stable position.
 - ii. Repeat Open and Close at least 3-times to help align the robot joints

ZPS Calibration

Enable Calibration Freedrive

Chuck 1

Unclamp <>

Clamp ><

Unload ⬆

Load ⬇

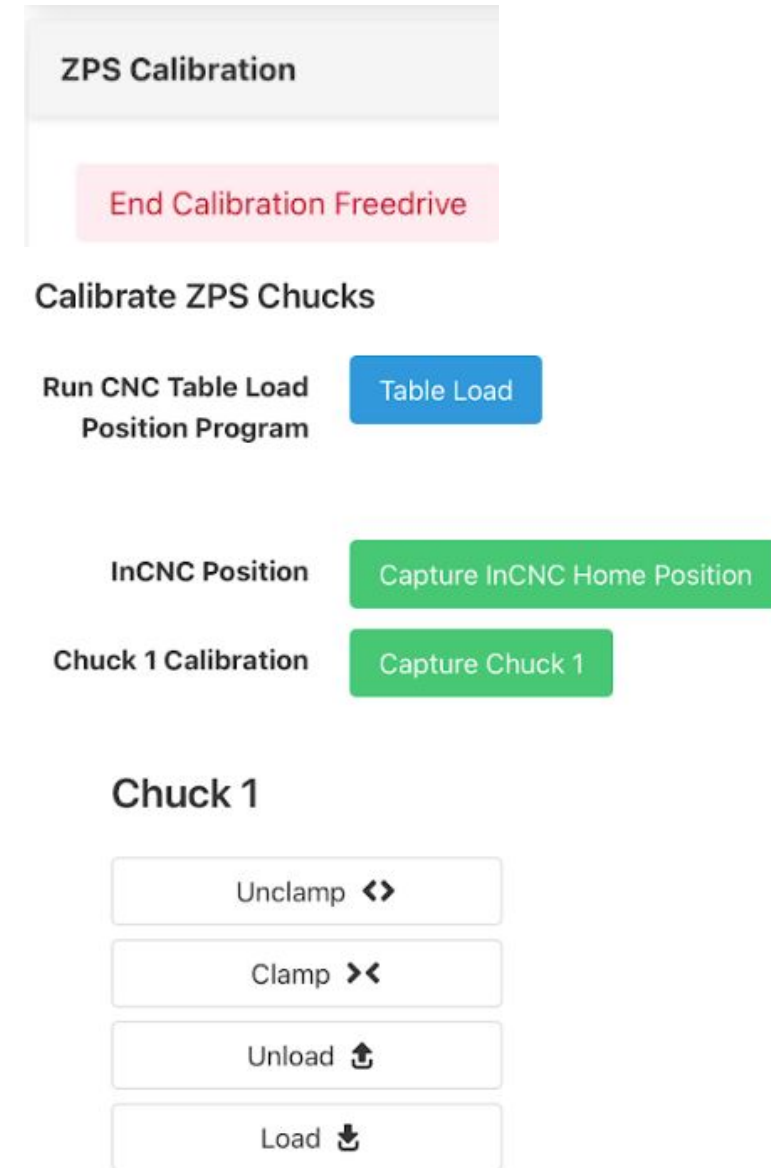
ZPS Chuck Calibration - Procedure

6. Capture Position & Calibrate Rack

- a. With the Gripper Closed and engaged with the Gripper interface:
 - i. Exit Freedrive by selecting “End Calibration Freedrive”
 - ii. Select “Capture Chuck”
- b. Move the Robot to CNC Home

7. Test Pick and Place

- a. Select “Unclamp”, then load a Vise into the Chuck, with the ZPS cleat facing out, then Select “Clamp”
- b. In the Recovery Panel, select select “Chuck Unload”
- c. After a successful pick, select “Chuck Load” to verify that the vise is loaded properly.



VERSABUILT ROBOTICS