

VERSABUILT ROBOTICS



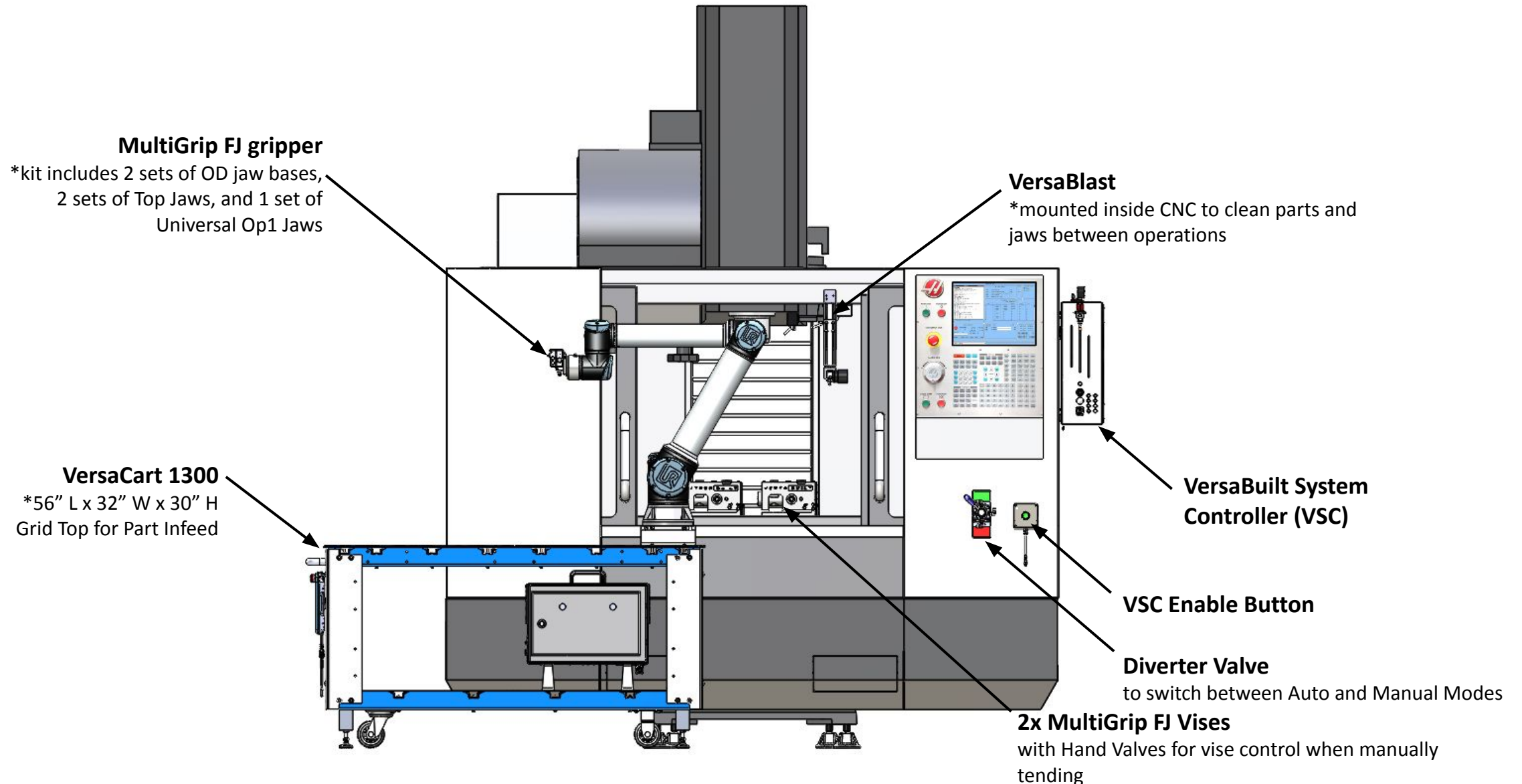
Mill Automation System Quick Start Guide

Mill Automation System - Installation Steps

1. **Install Vises & Hand Valves**
2. **Route Air Lines**
3. **Test functionality of vises in Manual Mode**
4. **Prove out machining with MultiGrip Jaws**
5. **Position VersaCart in front of CNC**
6. **Install VSC (side/top of CNC) *user preference**
7. **Install Cycle Start cable (from VSC to CNC Control)**
8. **Connect VSC Enable Button to VSC**
9. **Connect Vise Sensor cables from Vises to VSC**
10. **Install VersaBlast**
11. **Connect network cables**
12. **Connect power**
13. **Connect via Wifi or Ethernet a user interface device (laptop or tablet **user provided*)**
14. **Test functionality of devices with I/O screen**
15. **Copy files from USB to CNC**
16. **Create Wash and Table Load Programs**
17. **Calibrate Table, Intermediate Robot Positions and Vise positions**
18. **Configure Parts & Jaws**
19. **Set active program on CNC to program 9000**
20. **Run**

- Refer to all manuals for complete detail
- Quick Start Manual is a brief overview of the material and steps for installation
- The pages in this manual are copies of pages from the complete manual publication. At the bottom of each page is a description of source Manual and Section. Please refer to those Manuals and Sections for further detail.

Mill Automation System Overview

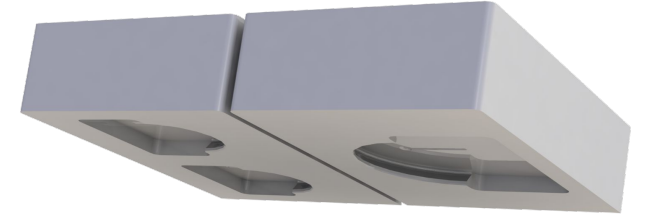


MultiGrip Introduction

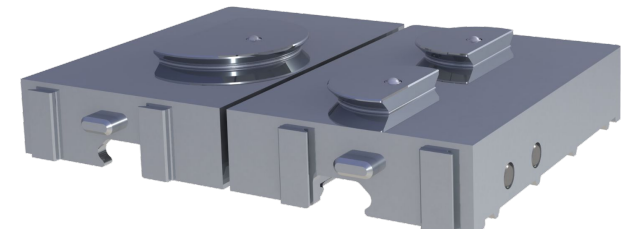
MultiGrip Jaws consist of Left and Right 6061-T6 aluminum jaws with mating features for clamping parts, engaging a vise and interfacing with a robot gripper.

MultiGrip Jaws are available in OD (outside diameter) and ID (inside diameter) clamping.

MultiGrip
Top Jaws



MultiGrip
Base Jaws



MultiGrip
FJ Vise



MultiGrip Vise & Gripper Specs

MultiGrip Vise:

- Pneumatic operation
- Capable of operation between 10 to 230 psi
- Clamping force at 120 psi = 4200 lbs
- Quick exchange of parts with MultiGrip Jaws
- Size: 6" W x 8" L x 5" H

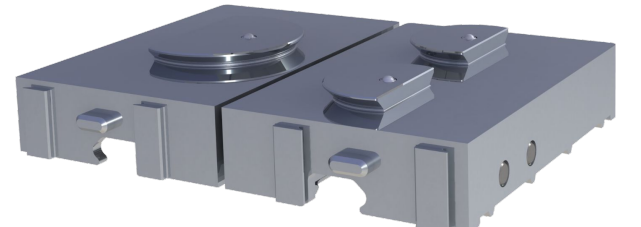
MultiGrip
Top Jaws



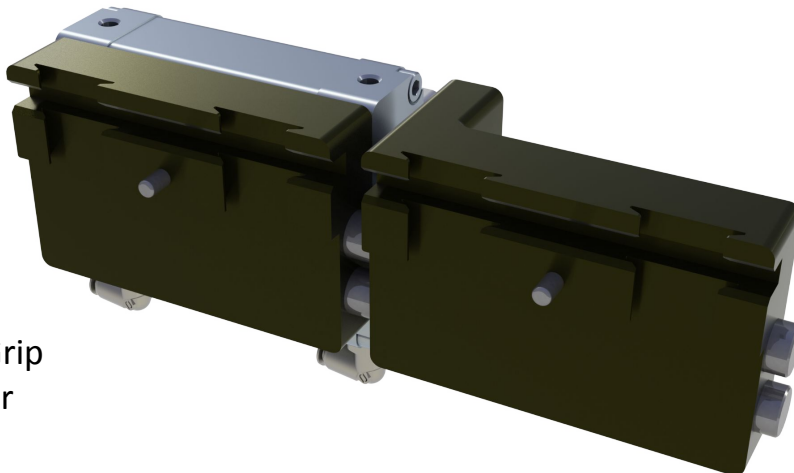
MultiGrip Gripper:

- Pneumatic operation, 120 psi Max
- Clamping force at 120 psi = 200 lbs
- Quick exchange of MultiGrip Jaws to pick and place parts

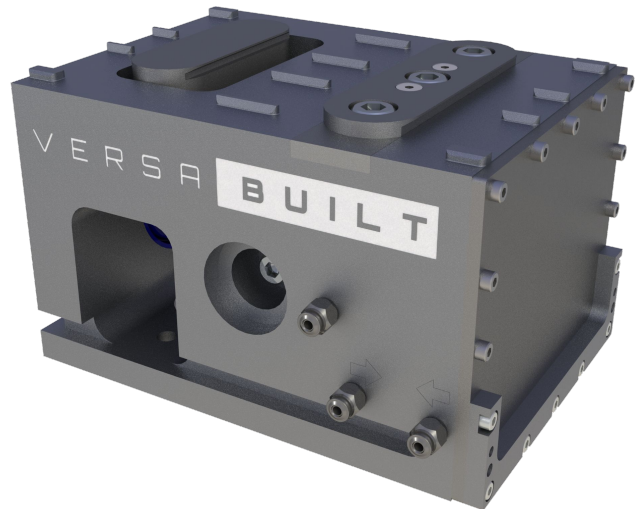
MultiGrip
Base Jaws



MultiGrip
Gripper

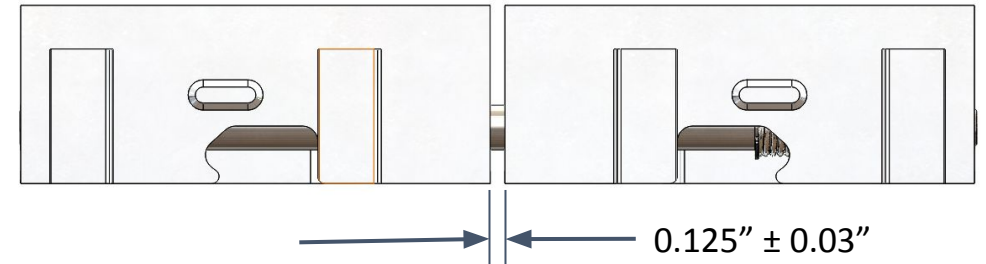


MultiGrip
Vise



MultiGrip Jaw Setup

- Left and Right Jaws need to include a gap to allow for raw material variations and allow open and close operations for robot processing
- The images to the right show the nominal gaps required

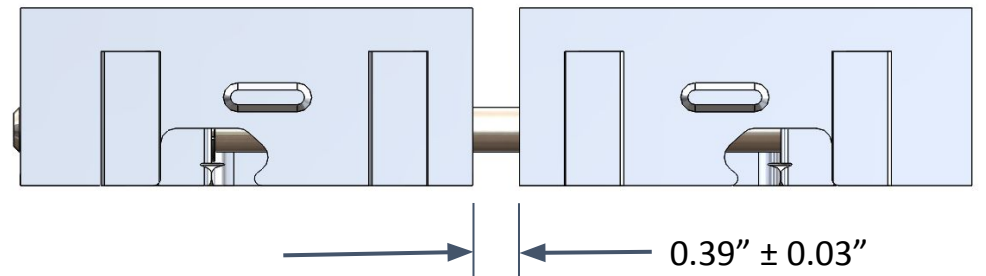


OD Jaws with 0.125" Nominal Gap

Machine Pocket with $\frac{1}{8}''$ spacer

*gaps above 0.16" may cause robot load/unload errors due to minimal vise to jaw feature interference

*gaps under 0.09" may cause vise sensor errors

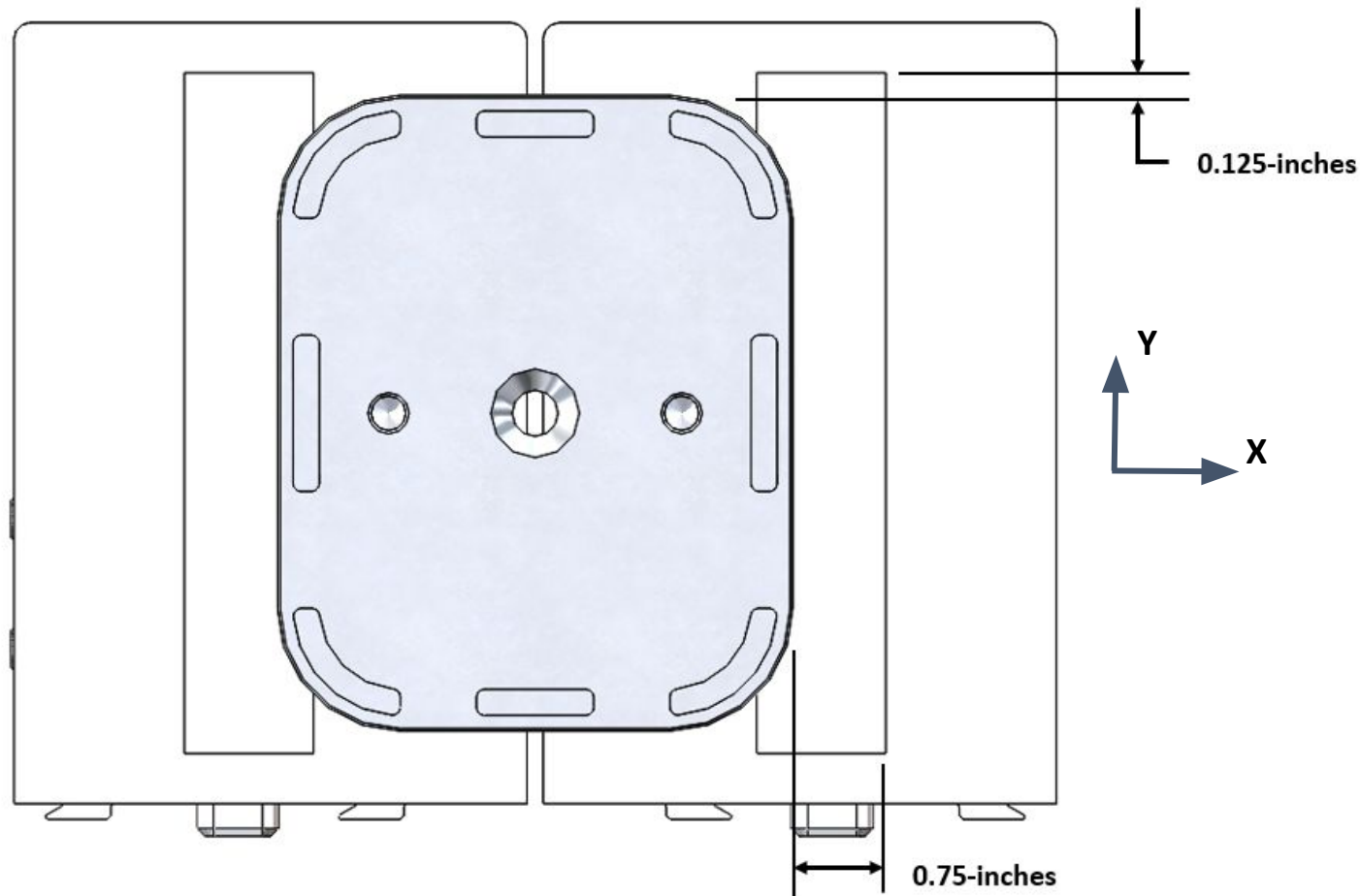


ID Jaws with 0.39" Nominal Gap

Machine Pocket with ID Jaw Fixture

Clearance Between Jaw Pocket and Part During Pick & Place

- Maximum X-direction sidewall = 0.75-inches
- Maximum Y-direction sidewall = 0.125-inches



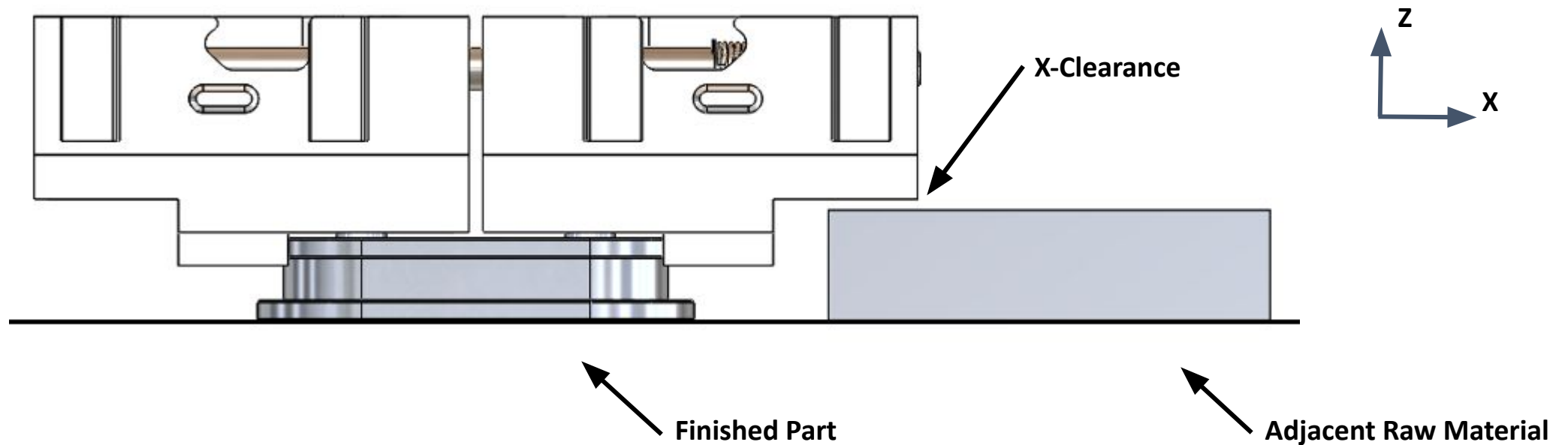
Default layout of parts on the VersaCart are arranged for maximum density, assuming the sidewall dimensions shown.

If you cannot design your jaws with minimized sidewalls, the layout of parts on the VersaCart will need to be changed to a lower density to clear the full jaw size.

Refer to the VSC Mill Operators Manual for information about custom part spacing.

Clearance Between Jaw Pocket and Part During Pick & Place

- Include Z-clearance between the jaw and adjacent parts on the VersaCart during picking of raw material and place of finished parts
- Clearance needs to be in X and Y Directions
 - Clearance recommendations on the previous page
- The image below shows placing a finished part on the VersaCart, with X-Clearance to clear adjacent raw material



VersaBuilt System Controller (VSC)

What is the VSC?

- VSC with Pneumatic and Electrical connections
- Pneumatic signals to Vises, Gripper, VersaBlast, and optional VersaDoor
- Ethernet connection to 5-Port Ethernet Switch, facilitating communication between Robot and CNC
- Digital Output Connection to CNC Cycle Start
- Digital Input connection to MultiGrip Vise and VersaDoor sensors
- VSC Enable Button with magnetic attachment, connecting to Digital Input
- RS232 DB9 connection to CNC for Haas Legacy controls



VSC can be mounted in any convenient location for routing air and cable lines. Typical installation locations are on top or side of CNC.

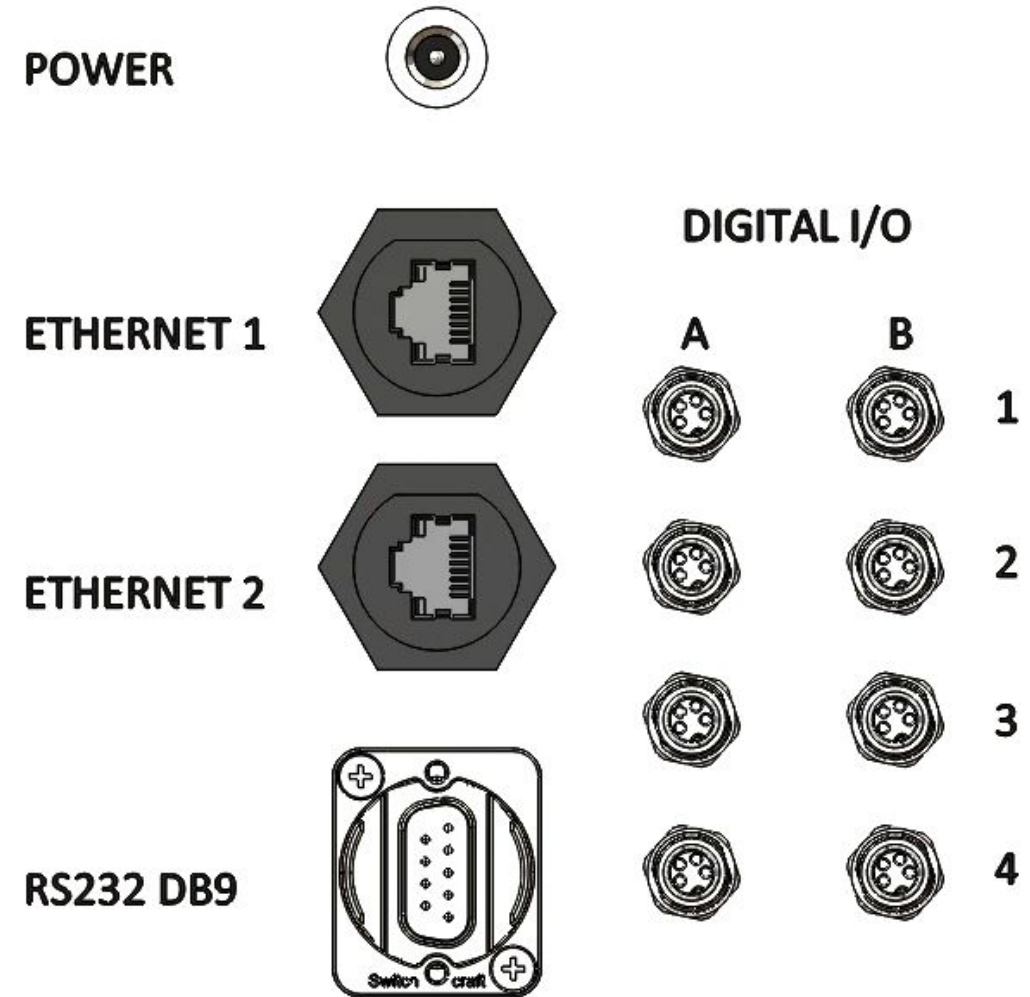
Din Rail and mounting clips are provided for easy mounting.

VersaBuilt System Controller (VSC) Panel Connections

Connection Guide

- Power = 110VAC to 24VDC cord provided with VSC Panel
 - Ethernet 1 = VSC Communication to Ethernet Switch
 - Ethernet 2 = Open
 - RS232 DB9 = Connection to CNC if Ethernet is not available
-
- A1 = Vise Sensor, Vise 1 and Vise 2
 - A2 = Vise Sensor, Vise 3 ¹
 - A3 = VersaDoor Sensor, Single Door
 - A4 = VersaDoor Sensor, 2nd Door (double door application)
 - B1 = Cycle Start Relay Connector
 - B2 = VSC Enable
 - B3 = Door Operator Panel (Door Open/Door Close) ²
 - B4 = Cycle End Command (Generic Driver input) ¹

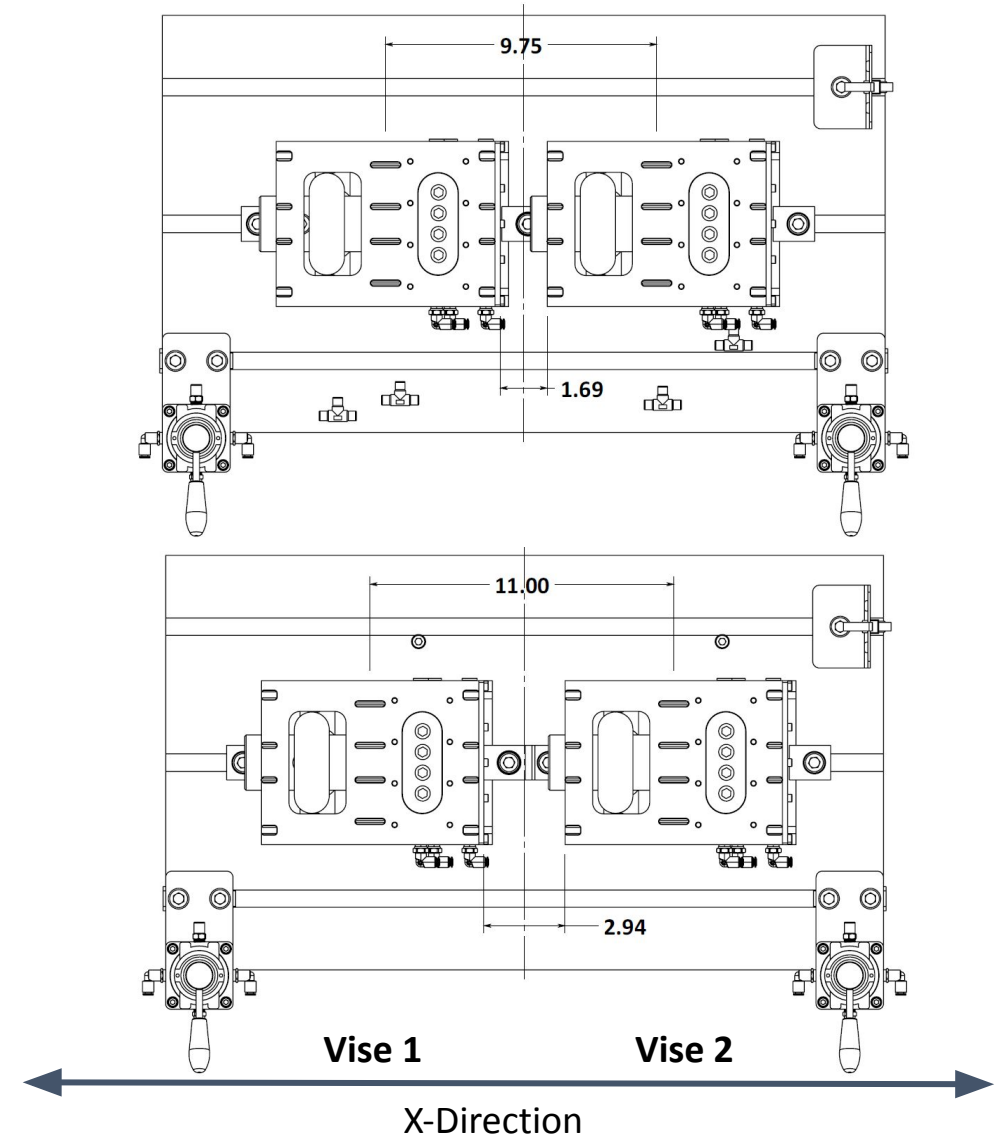
1. A2 wired for Cycle End Command and Vise 3 Sensor on serial numbers VSC00100 thru VSC00107, and VBR serial numbers
2. Door Operator Panel is an optional accessory for VersaDoors



MultiGrip Vise Installation

Install Vises for 3-axis configuration, as shown.

1. Vise Spacing:
 - a. For CNCs with X travel less than 22": Center of vises are spaced 9.75" on center or with 1.69" gap, as shown in upper drawing
 - b. For CNC with X travel greater than 22": Center of vises are spaced 11" on center or a 2.94" gap, as shown in lower drawing
2. Place Vise 1 on Table
3. Place center clamps in T-Slots
 - a. For CNCs with X travel less than 22", insert T-Clamp, with 0.5" bolt and t-nut
 - b. For CNCs with X travel greater than 22", insert 2 x side clamps, with 0.5" bolt and t-nut
4. Place Vise 2 on Table
5. Insert Side-Clamps on sides of vises
6. Loosely clamp vises in place
7. Indicate vises into position
8. Tighten 0.50-13 bolts to 118 ft-lbs of torque



Route Air Lines and Vise Sensor Cable

- Connect vise sensor cable, from vise sensor kit, to pre-installed vise sensors on each vise.
- Connect air lines, referencing air line diagrams on following pages.
 - Air line lengths that attach to the CNC table should be long enough to allow full travel of the CNC table without strain on the air lines
 - Anchoring the CNC table air lines and sensor cable to the corner of the CNC table will help prevent damage from strain - use the included CNC Air Line Anchor kit
 - Use included cable-ties to anchor air lines to prevent rubbing or chafing
 - Delay trimming and final securing of air lines that go to the CNC Table until all air lines have been routed and strain has been verified by positioning CNC table to its extents

Do not close cable tie on anchor line kit until after connecting cables to Vise Sensors and connecting all tubing to vises and hand valves

Anchor

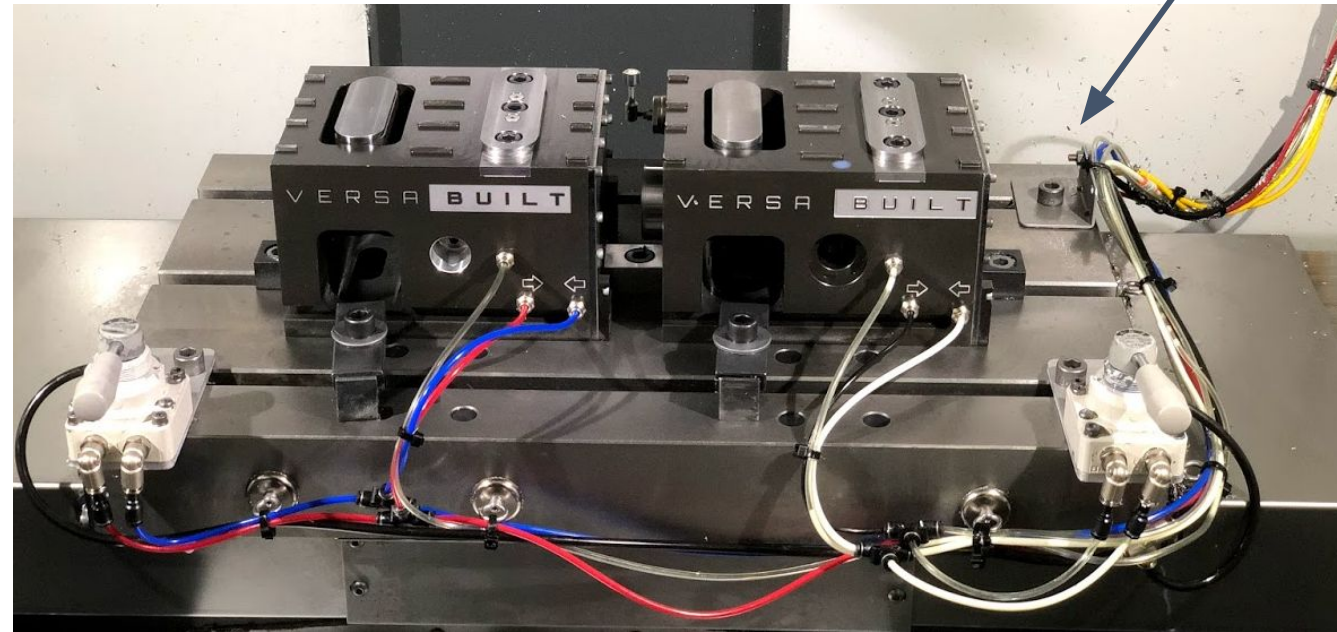


Image shown above includes tubing routed from VersaBuilt System Controller (VSC)

Route air to Automation Equipment

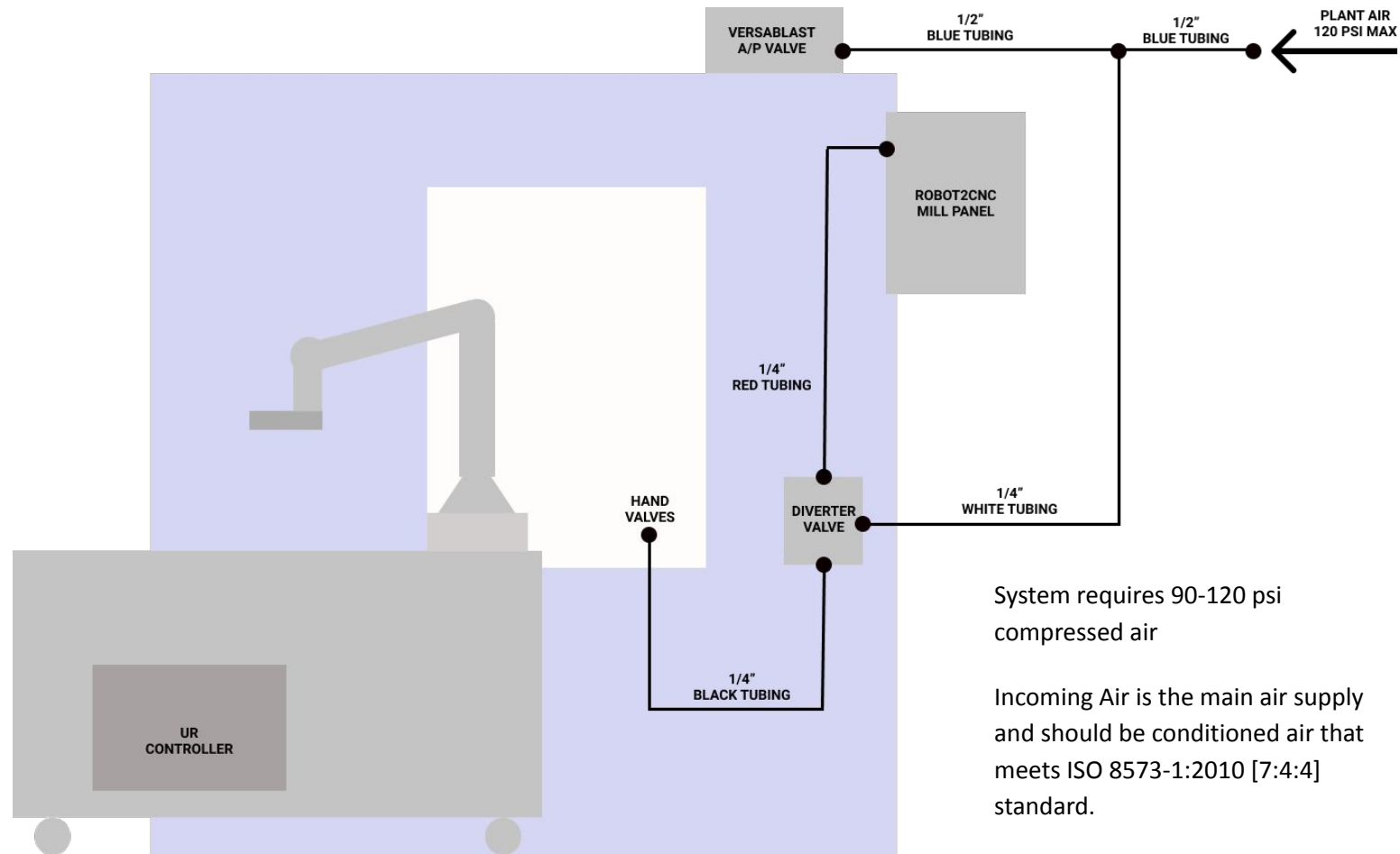
The figure to the right shows supply air to devices in the Mill Automation System

- ½" Blue Tubing to the VersaBlast Valve*
- ¼" White Tubing to the Diverter Valve
 - ¼" Black Tubing to Hand Valves inside CNC**
 - ¼" Red Tubing to VSC

**½" supply lines can be Tee'd from a single source or from different sources*

***Air line from Diverter Valve to Hand Valves is typically routed thru the top of the CNC.*

Connect Supply Air after all devices are connected, then check for leaks or poor connections



System requires 90-120 psi compressed air

Incoming Air is the main air supply and should be conditioned air that meets ISO 8573-1:2010 [7:4:4] standard.

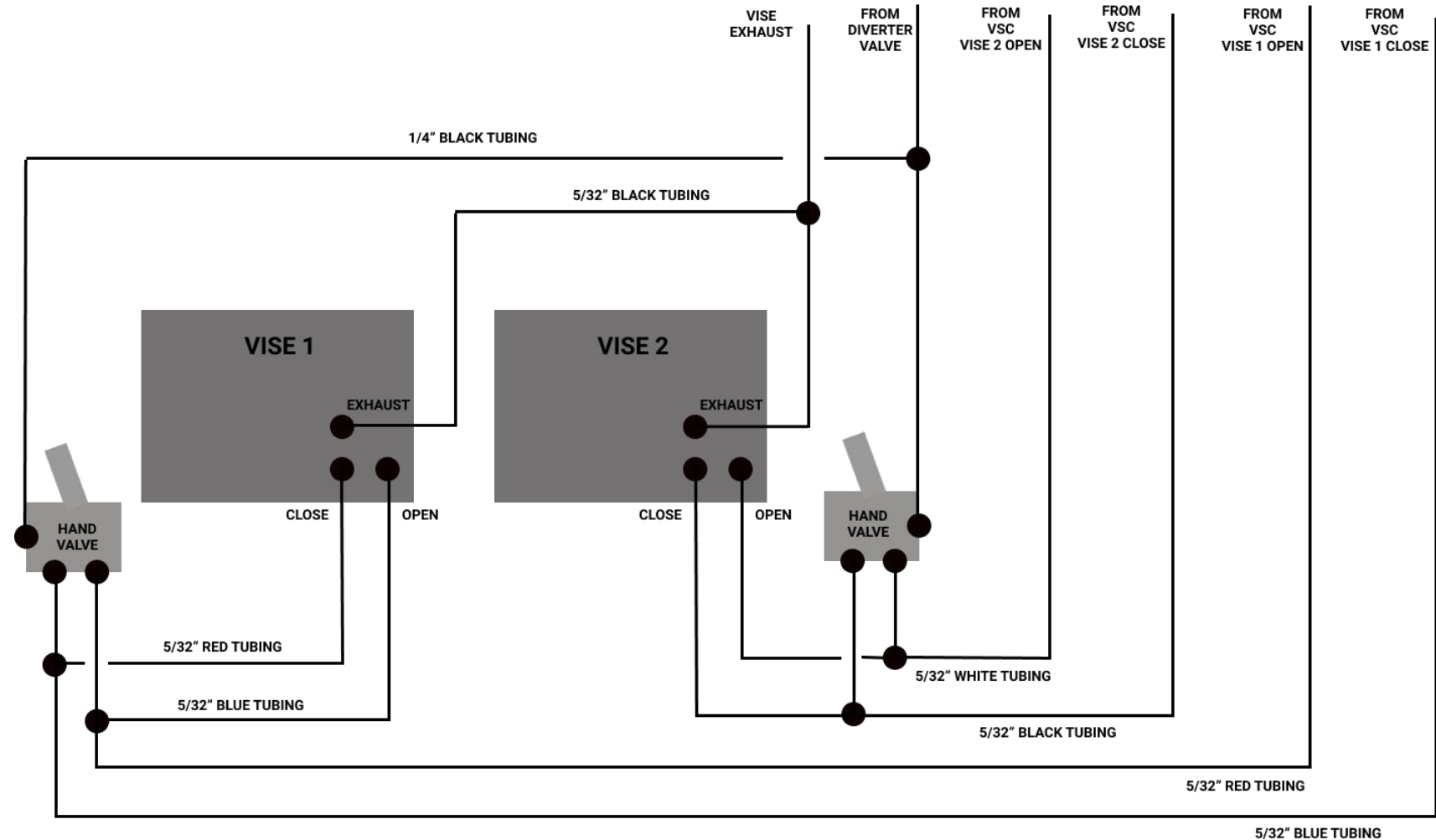
System air consumption is 15-20 SCFM during VersaBlast operation

Vise Air Routing In/Out of CNC

Route air lines as shown, from the VSC to the Vises and Hand Valves.

Use the provided tubing to connect:

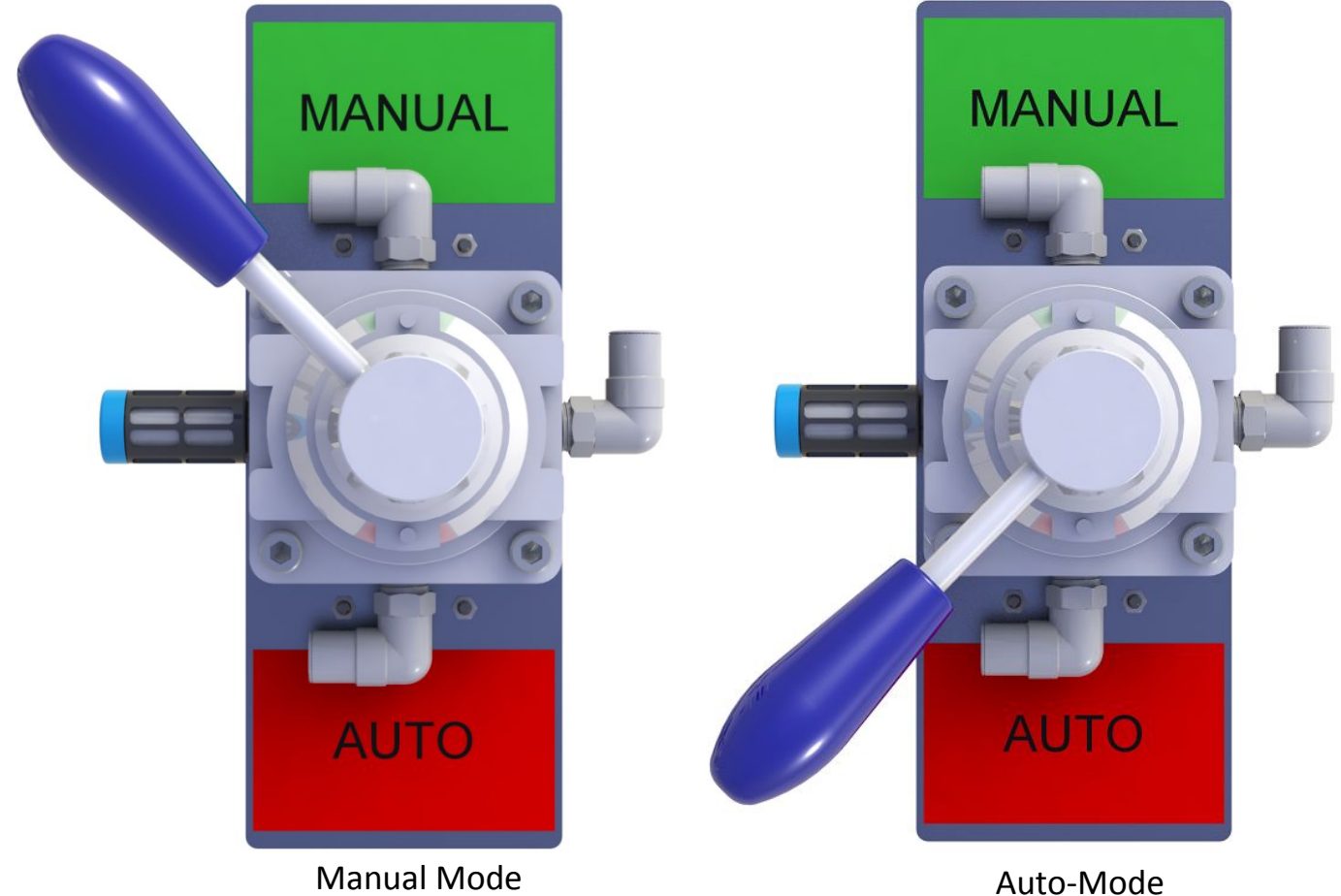
- 1/4" black tubing from the Diverter Valve to the Hand Valves, via t-fitting
- 5/32" (4mm) tubing from the VSC to t-fittings connected to lines from the Hand Valves, then connect lines from t-fittings to the vises
- 5/32" (4mm) tubing from the exhaust ports on each vise, connected with t-fitting and route outside the CNC
- TUBING COLORS:
 - 1/4" TUBING = BLACK
 - VISE 1 OPEN = BLUE
 - VISE 1 CLOSE = RED
 - VISE 2 OPEN = WHITE
 - VISE 2 CLOSE = BLACK



Diverter Valve

What is the Diverter Valve?

- The purpose of the Diverter Valve is to switch the pneumatic system to supply air to either the Manual Valves or the inlet to the VersaBuilt System Controller. When in Auto Mode, air to the manual valves is turned off. When in Manual Mode, air to the VersaBuilt System Controller is turned off.
- The Diverter Valve is mounted on an aluminum plate with 2 x Magnets. Find a convenient operator accessible location for the Diverter Valve, typically on the front of the CNC to the right of the door frame below the CNC controller.

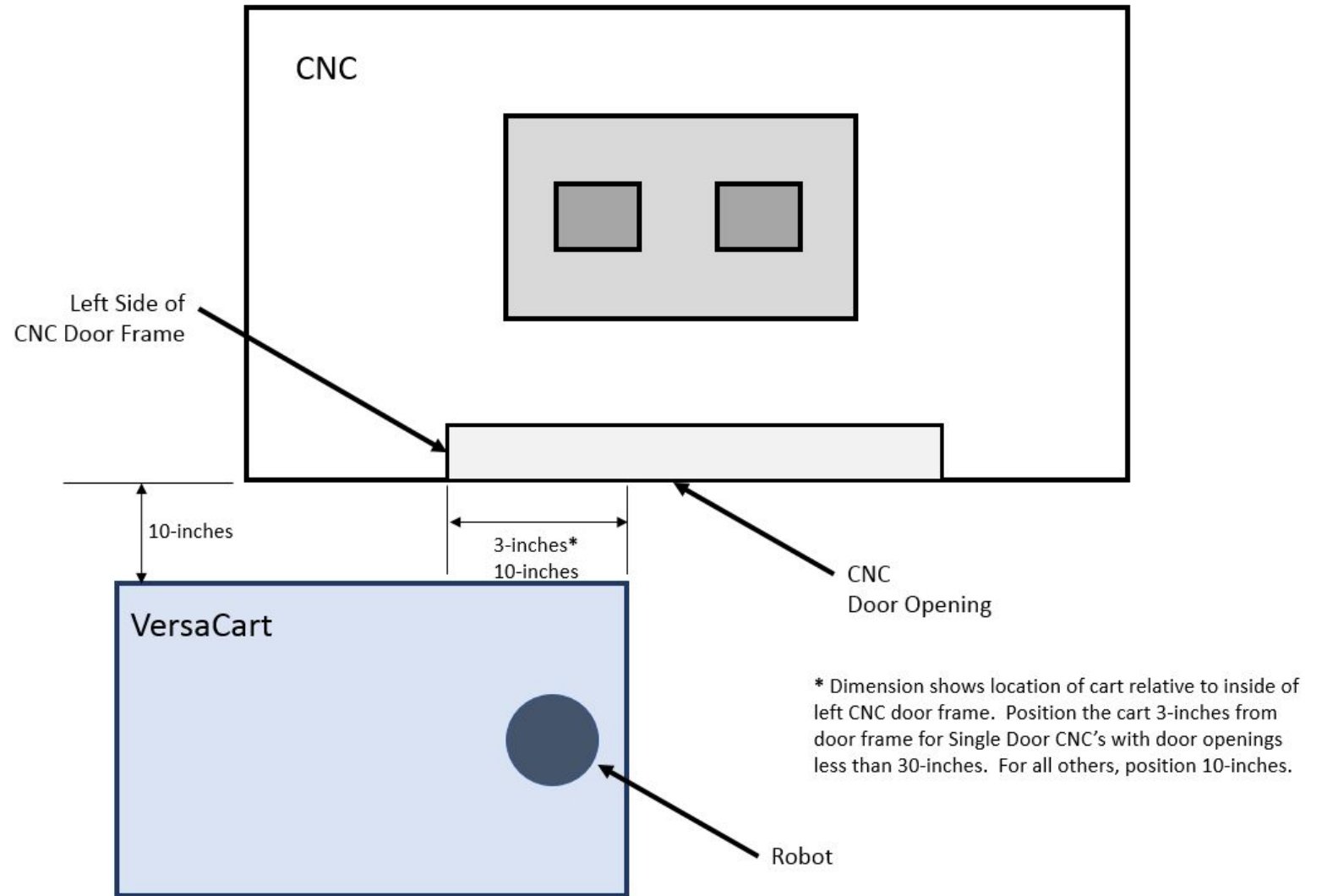


Position VersaCart in front of CNC

Steps:

- Position VersaCart in front of CNC as shown on the right and following pages
- Using a 15mm open end wrench, turn each of the leveling feet until the nearest castoring wheel is raised off the ground at least $\frac{1}{8}$ "
- Place the level on the top of the VersaCart
- Adjust the leveling feet until the VersaCart is level front-to-back and side-to-side
- Lock leveling feet in place with 2 x Hex nuts using 17mm open ended wrench

For double doors or wide opening CNC's, the "X" position of the cart can be greater than 10-inches to minimize robot reach

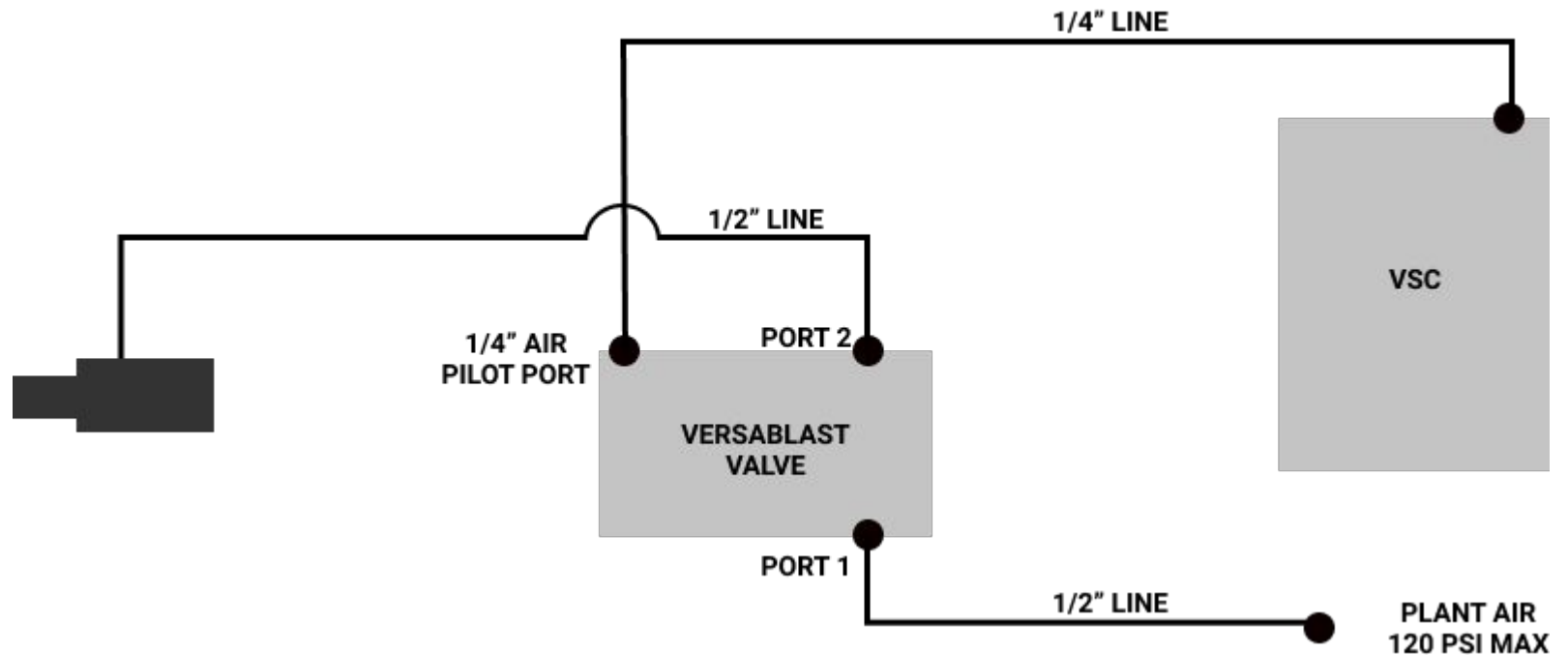


VersaBlast Air Routing

Connect the following tubing to VersaBlast:

- 1/4" tubing from the VersaBuilt System Controller (VSC) to the 1/4" air pilot fitting on the VersaBuilt Valve
- 1/2" tubing from Plant Air to port 1 of the VersaBlast Valve
- 1/2" tubing from port 2 of the VersaBlast Valve to the VersaBlast blower

Note: minimize tube lengths to the VersaBlast blower to maximize air flow



Position and Secure VersaBlast in CNC

Installation Steps:

1. Find mounting location for VersaBlast inside CNC
2. Locate VersaBlast Air Pilot Valve Assembly on top or side of CNC
3. Adjust or orient brackets to position VersaBlast within reach of robot
4. Lock brackets in position with 4 x bolts
5. Adjust & lock angle of VersaBlast blower with bolt and nut attachment
6. Secure assembly in CNC with magnets or 2 x 0.1875" rivets

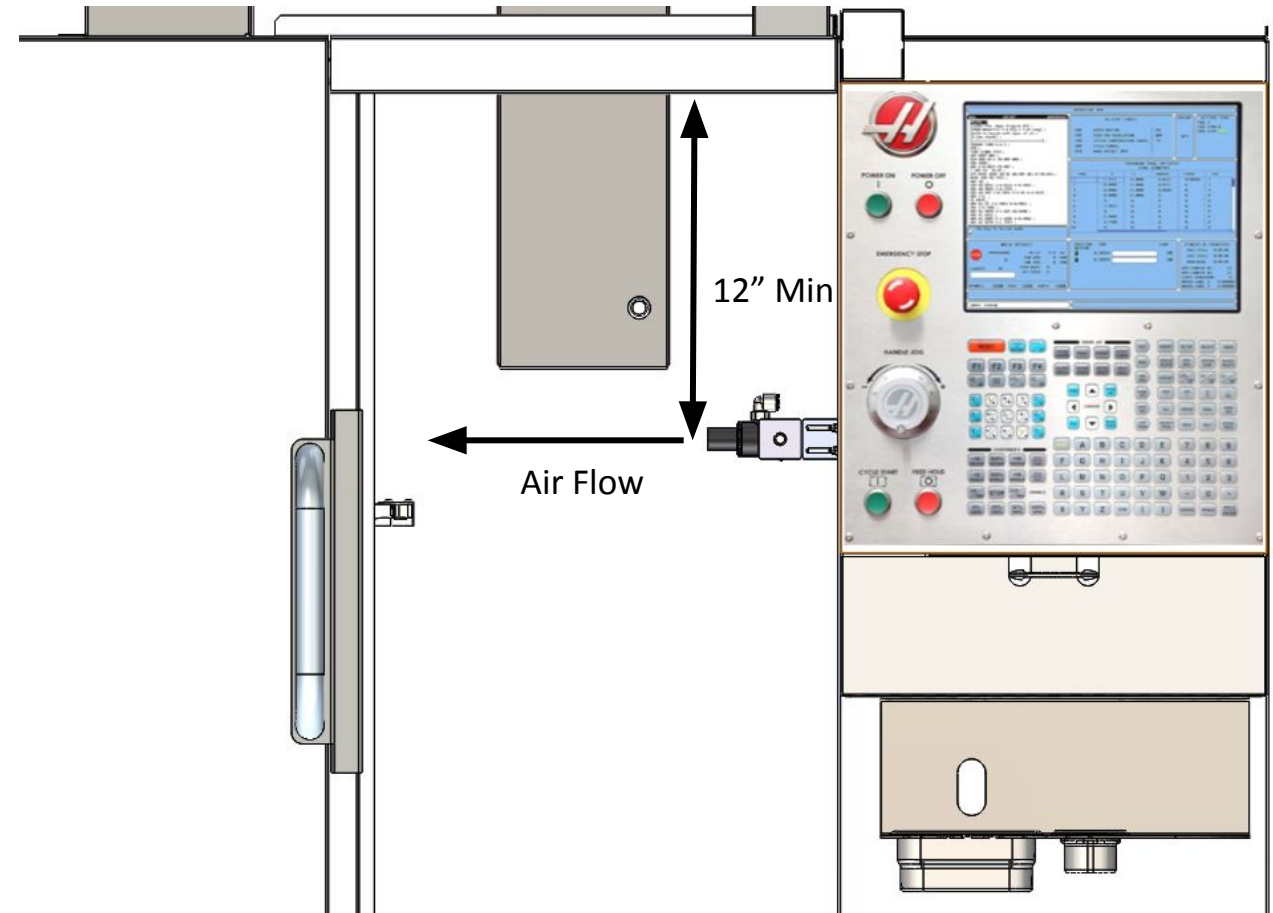
**During Robot Calibration, the position of the VersaBlast will be tested and may require repositioning*

***After connecting tubing, VersaBlast may require nozzle adjustment to maximize flow*



Position and Secure VersaBlast in CNC

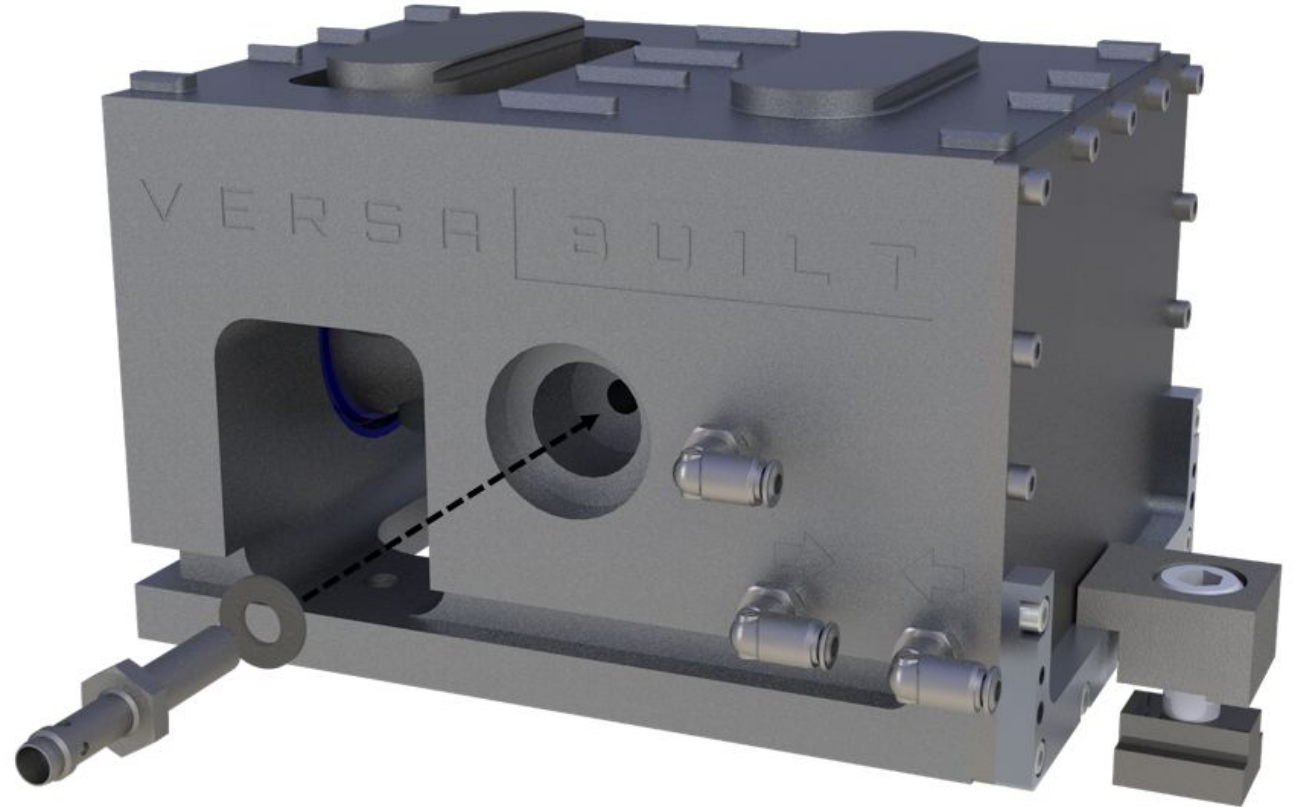
- VersaBuilt recommends securing the VersaBlast using the provided magnets
 - Outline mounting location with permanent marker to ease repositioning if knocked out of place
- Optionally, VersaBlast can be mounted with rivets or bolts (not included) with 2x 0.1875" clearance holes.
 - Do not finalize installation location until robot reach is determined
- Position VersaBlast within robot reach and pointing into CNC
 - For single door CNCs, adjacent to the door opening is a typical location
 - For double door CNCs, the ceiling is a typical location
- Final VersaBlast location will be determined during calibration
- To avoid robot collisions with CNC, position nozzle a minimum of 12 inches from ceiling or top of door frame.



MultiGrip Vise Sensor Installation

Caution

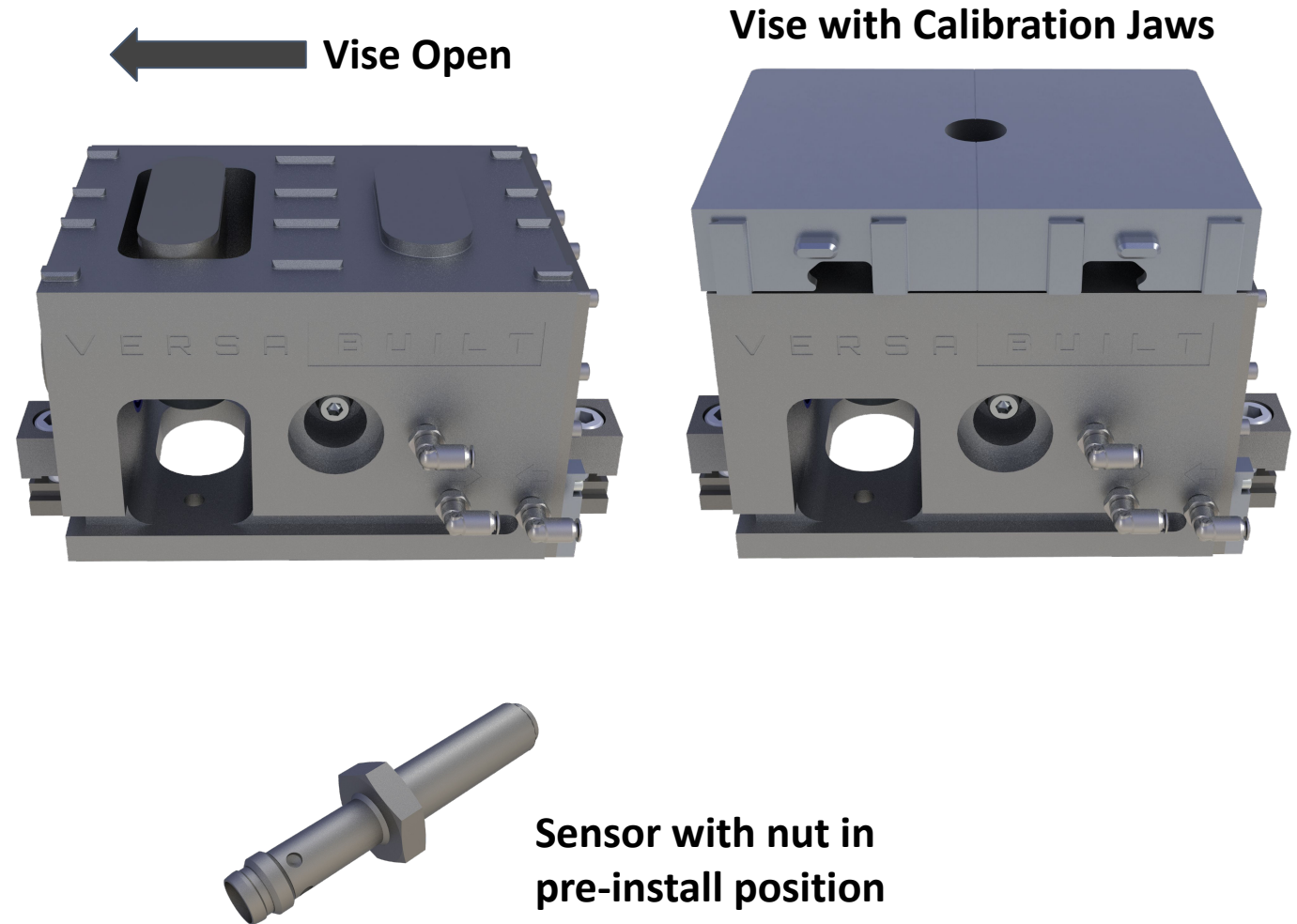
Sensors can be crushed by actuated vise, if installation steps are not properly followed.



MultiGrip Vise Sensor Installation

Vise Sensor Installation Steps:

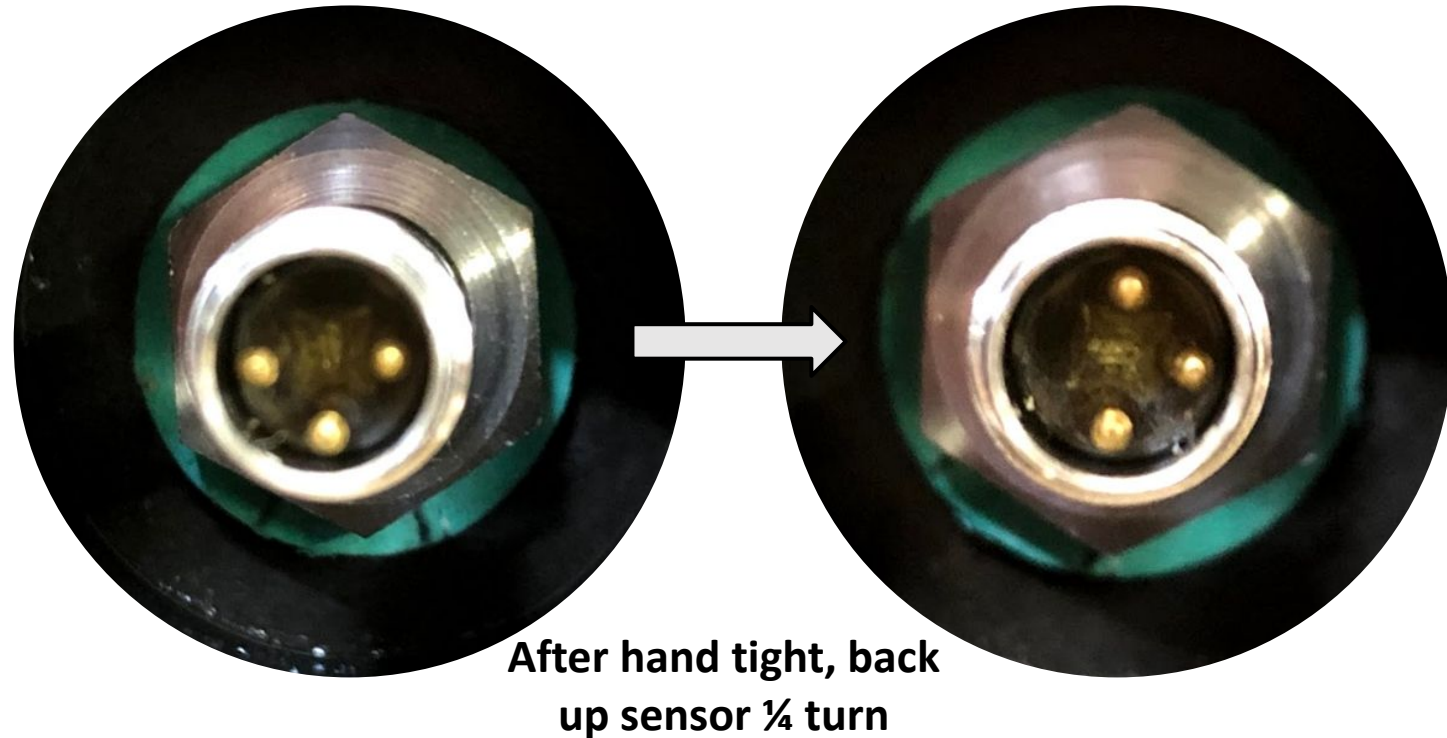
1. Place Diverter Valve in Manual Position
2. Verify Open and Close of each vise
3. Place Calibration Jaws on Vise
4. Place vise in **OPEN** position
5. Close Vise to clamp on Calibration Jaws
Setting sensor in vise without Calibration Jaws can result in crushed vise sensor
6. Remove M8 Socket Head Screw and M8 Washer from front side of the vise (using 6mm hex key)
7. Place nut on sensor body, near the back of the sensor body (at least 1" from the **threaded** end of the sensor)
8. Reuse M8 washer, placing on sensor body
9. Thread sensor into vise body, by hand until sensor bottoms out on shaft inside vise
10. Using 13mm Deep Socket Wrench, hand tighten sensor nut



MultiGrip Vise Sensor Installation

Vise Sensor Installation Steps, continued:

10. Note position of sensor in the fully inserted position
11. Loosen sensor nut ($\frac{1}{2}$ turn counter-clockwise)
12. Loosen sensor $\frac{1}{4}$ counter-clockwise turn, as shown on the right
13. Tighten sensor nut again (verify sensor is in same $\frac{1}{4}$ turn counter-clockwise turn position)
14. Repeat process until the sensor is roughly $\frac{1}{4}$ turn from fully seated position
15. Tighten nut with deep socket wrench and ratchet
16. **Repeat process on 2nd Vise**

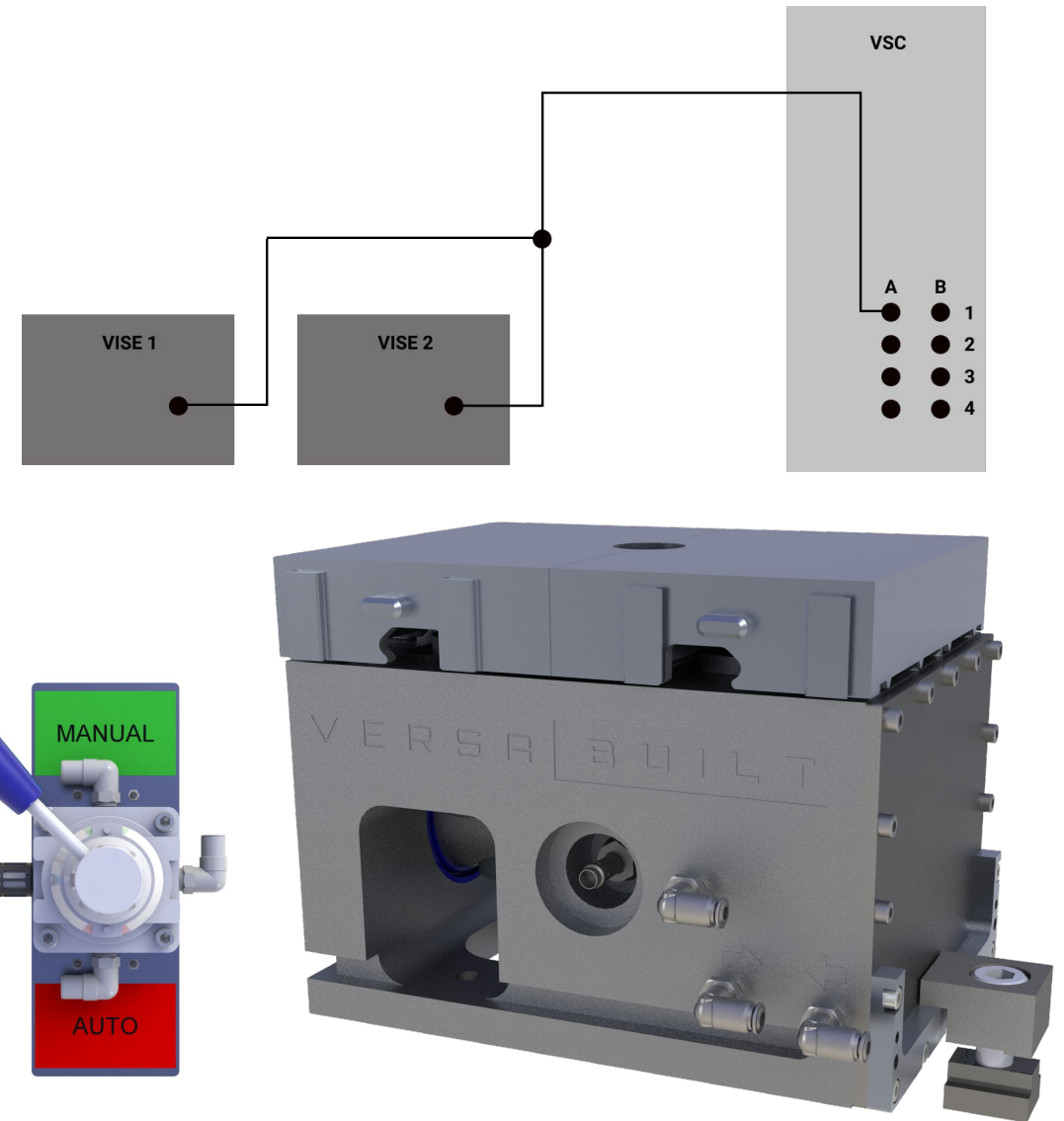


MultiGrip Vise Sensor Installation

Connect Vise Sensor Cables and Test:

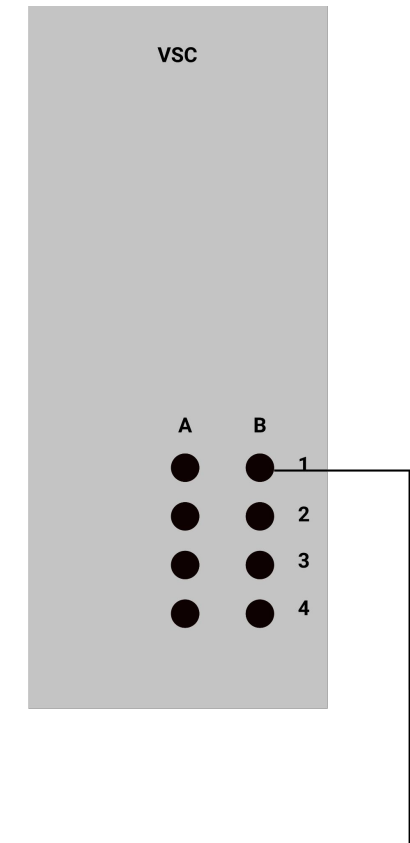
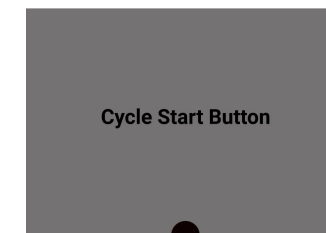
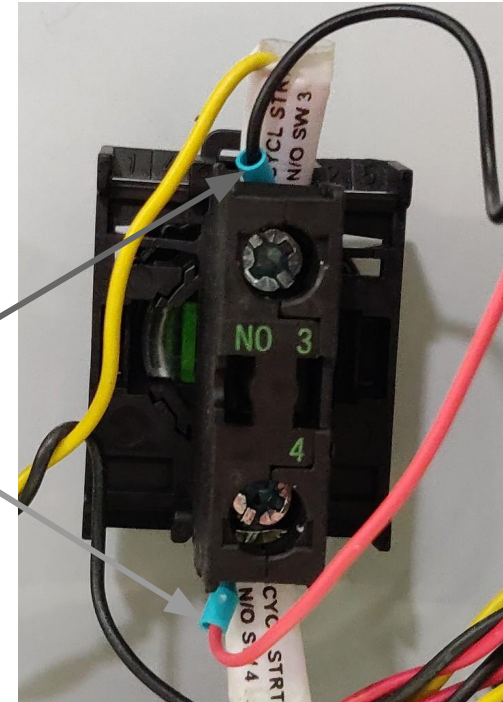
14. Connect Sensor Cables to VersaBuilt System Controller (VSC)
 - a. 3-Pin cables to each sensor
 - b. 3-Pin cables to 4-pin cable
 - c. 4-pin cable to VersaBuilt System Controller
 - d. Route out of CNC, anchored for stress-relief with the Air Line Anchor Kit, to the VersaBuilt System Controller (Digital I/O A1).
15. Connect power cable to the VersaBuilt System Controller
16. Note a light on the sensor body will illuminate in the middle of the vise stroke, then turn off at the ends of the stroke (Open and Closed)
17. For each vise and each sensor:
 - a. Open Vise, light should be OFF
 - b. Close Vise to clamp on Calibration Jaws, light should be ON
 - c. Open Vise, remove Calibration Jaws, then Close Vise, light should be OFF

If sensor light is not working as noted, restart sensor installation process *verify sensor is not damaged and/or power is connected to Mill Panel*



Install Cycle Start Cable

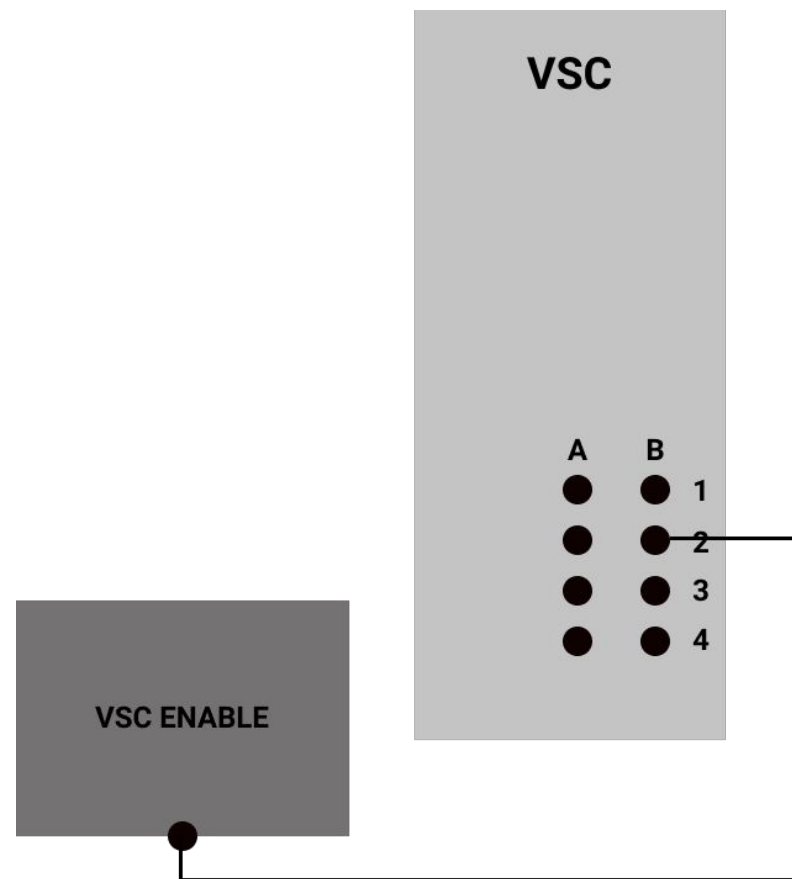
- The Cycle Start Cable includes two wires that must be attached to the Cycle Start terminals
- The Cycle Start Cable has two-ends, one end has flying leads (bare wires) the other end has an M8 connector on it.
- The Cycle Start button should have two terminals, loosen the terminal screw and attach one of the Cycle Start Cable wires to each terminal
- Polarity of the wires does not matter
- Route the M8 connector side of the Cycle Start Cabling through the CNC's wire chase and back to the VersaBuilt System Controller (VSC)
- Plug the M8 connector into the Digital I/O **B1** on the VSC



VSC Enable Button Installation

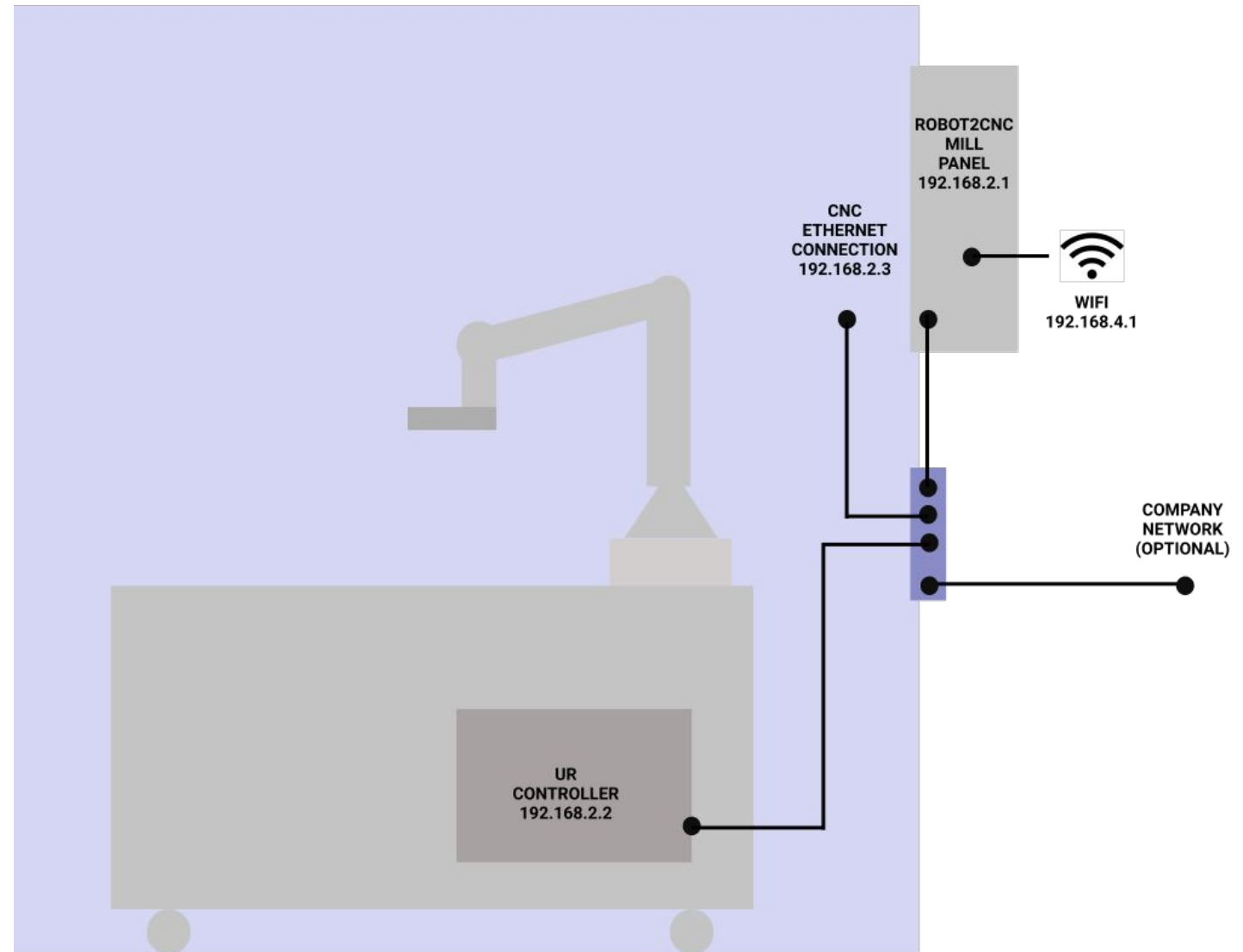
Installation of VSC Enable Button:

- VSC Enable Button enables control of moveable peripherals of the automation system, confirming user control of the system. The VSC Enable Button is utilized in system recovery and the start of a new job.
- The VSC Enable Button is magnetically mounted on the CNC or any ferrous surface. Place in a convenient location for operator reach.
- Connect the VSC Enable Cable to Digital I/O B2 on the VSC Panel.



Connect Communication Cable

- See Diagram to the right for ethernet connectivity
- For Haas Legacy, connect RS232 serial cable from VSC to CNC RS232 port



Connect Communication Cable

Haas Legacy

Plug the 25-pin end of the provided serial cable into the CNC, plug the 9-pin end of the cable into the VersaBuilt System Controller (VSC).

Haas NGC, Fanuc or Okuma

Location of the user Ethernet port is machine builder dependent. Review the documentation provided with your CNC to determine the location.

Plug one end of the provided Ethernet cable into the CNC Ethernet port and the other end into the Ethernet switch mounted on the VSC.

***Route cables so they are protected from coolant and chips, anchor as needed using included cable-ties and magnetic loops*



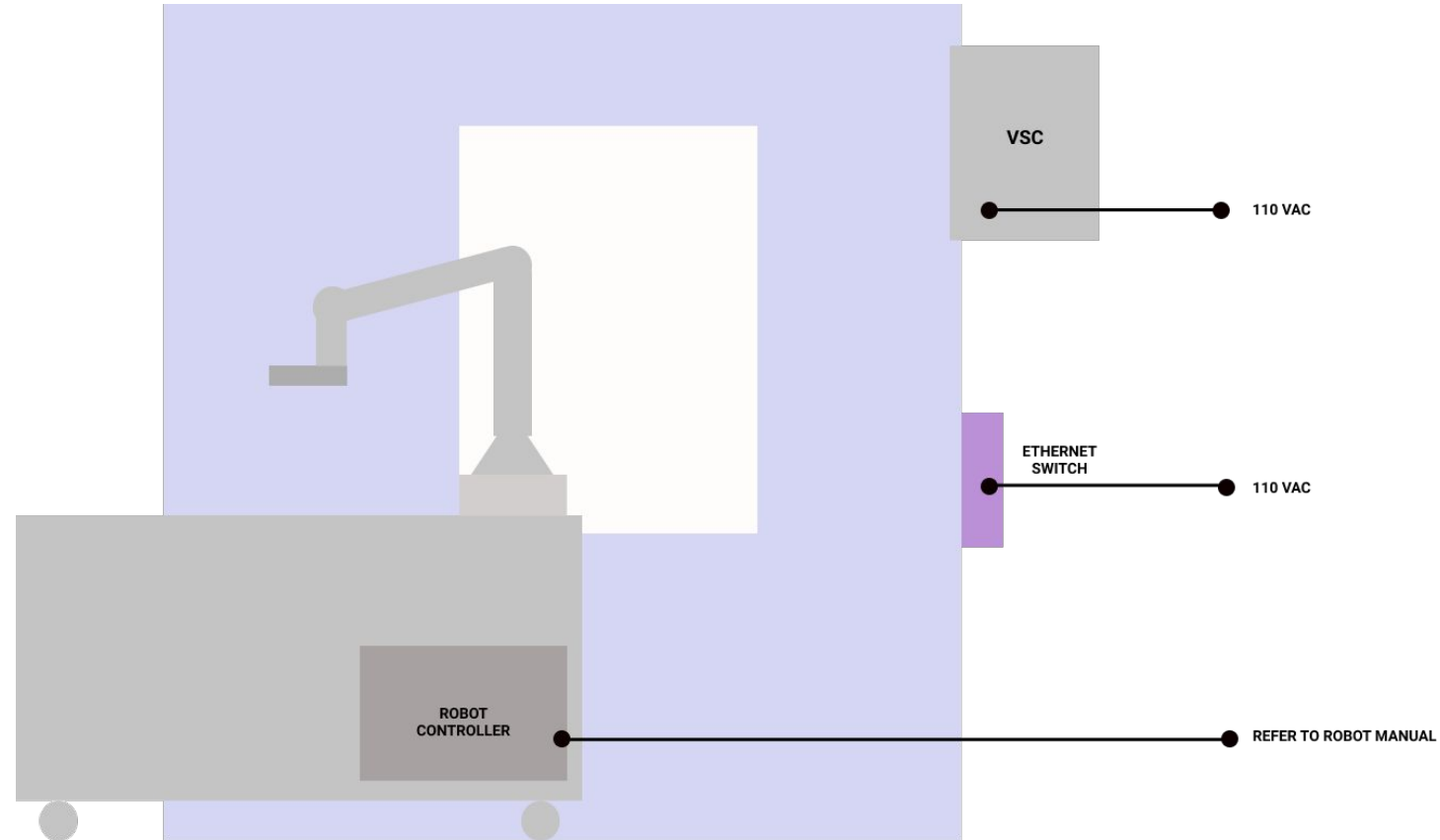
Ethernet Cable



Serial Cable

Connect Electrical Power

- Before connecting electrical power to the system, make sure no person within 6 feet of the robot, gripper, vises, door opener or any other mechanism capable of movement or actuation.
- Connect power cable for VersaBuilt System Controller (VSC) to 110 VAC outlet
- Connect power cable for Ethernet switch to 110 VAC outlet
- Connect power cable for Robot Controller to power specified in robot specification



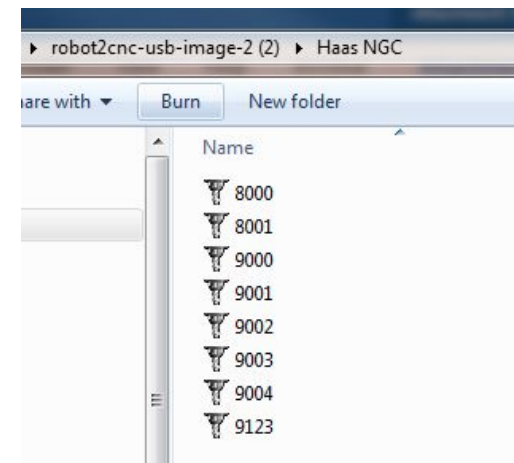
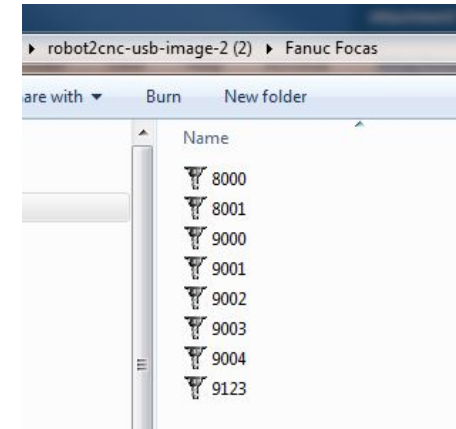
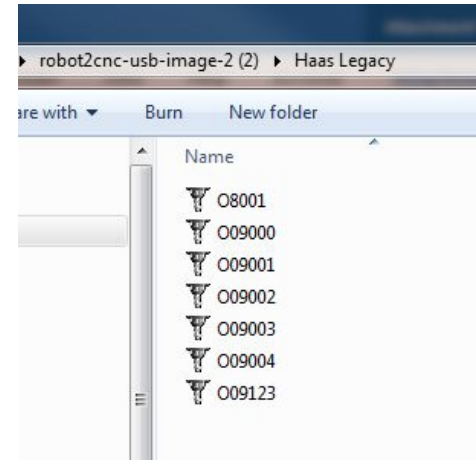
CNC Programs

Copy Files from provided USB to CNC

- Files are also available from VersaBuilt website
[www.versabuilt.com/resources/](http://www.versabuilt.com/resources/Software Downloads USB Image for Robot2CNC)
- CNC files are available for Haas NGC, Haas Legacy, Fanuc Focus & Okuma
- For other CNC controllers, use the “Generic” files and refer to the Generic Driver section of the “VSC CNC Installation and Programming Manual”

Refer to “**VersaBuilt System Controller - CNC Installation and Programming Manual**”, for more information

Copy 9000 files from USB to CNC, from the appropriate folder on the USB or Download



CNC Settings

Haas NGC/Fanuc Focus

CNC IP Address:	192.168.2.3
CNC Subnet Mask:	255.255.255.0
Wired Network Enabled:	On
Obtain Address Automatically:	Off
131 AutoDoor:	On ¹
143 Machine Data Collection:	9000 ²
Router IP Address:	192.168.2.1 ³
DHCP Client:	0 ³
Focus2 TCP port:	8193 ³

- 1. Only if Haas-brand auto door is installed
- 2. Haas NGC control only
- 3. Fanuc Focus control only

Haas Legacy

Settings: IO Tab		
11	Baud Rate:	115,200
12	Parity Select:	NONE
13	Stop Bit:	1
14	Synchronization:	XON/XOFF
37	RS-232 Data Bits	8
41	Add Spaces RS232	ON
69	DPRNT Leading Sp	OFF
143	Machine Data Col	ON
131	Auto Door	ON*
* Only if Haas-brand auto door is installed		

Refer to “**VersaBuilt System Controller - CNC Installation and Programming Manual**”, for more information

CNC Table Load Program

1. Copy 8000 program from USB with Mill Automation System or download from VersaBuilt website (<https://www.versabuilt.com/resources/>)
2. Edit the 8000 CNC Table Load Program, in a position where the robot can reach all vises. *Reference the Table Load position found in In the Mill Automation System - Installation Guide*
3. Note that the program is generic G-code and should be carefully reviewed and edited before running on your CNC
4. Make sure the program includes an M98 P9004 just before the M30

Example Program:

%

O8000(DEFAULT TABLE LOAD POSITION)

#3000=1(LOAD POSITION NOT SET)

(DELETE ALARM LINE WHEN SET AND TESTED)

G0G53Z0(MAKE SURE Z AXIS IS HOME)

G0G53X0.0Y0.0(SET TABLE LOAD POSITION)

M99

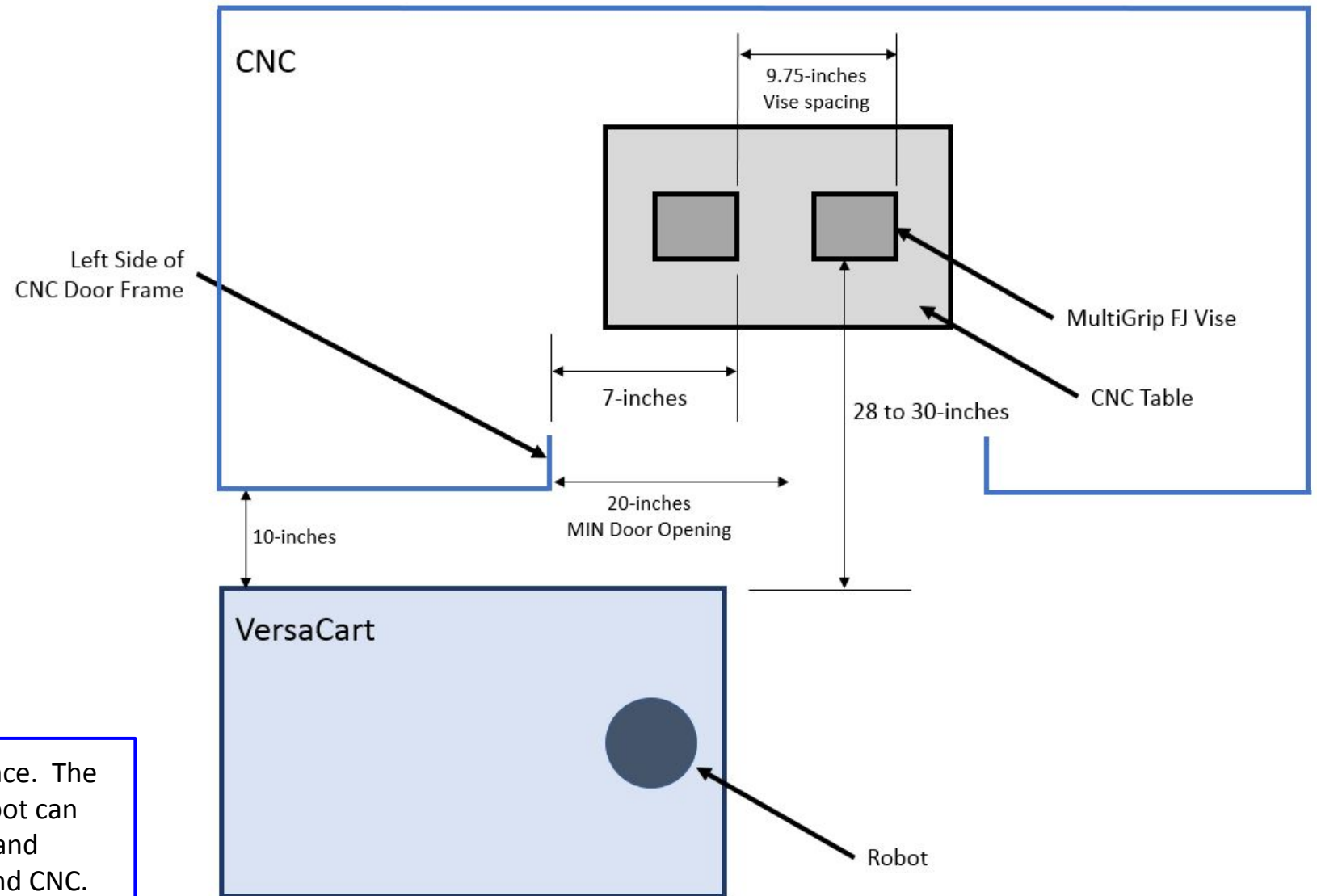
%

CNC Table Load Program positions the CNC table for robot exchange of parts and MultiGrip Jaws

Refer to **Installation Guide, section 10 & VersaBuilt System Controller - CNC Installation and Programming Manual, section 3**, for more information

Set CNC Table Load Position

- Open the CNC Door and move the CNC table to the table load position according to the diagram at the right
- Save the Table Load Position as a CNC home location in the CNC control, VersaBuilt recommends using G53 for the Table Load Position



The diagram dimensions are for generic guidance. The Table load position should be such that the robot can reach all vises without repositioning the table and without any interference between the robot and CNC.

Vise Wash Program

1. Copy 8001 program from USB with Mill Automation System or download from VersaBuilt website (<https://www.versabuilt.com/resources/>)
2. Edit 8001 CNC Vise Wash Program, to full wash vises , removing debris/chips from vises and jaws between operations.
3. Coolant is the preferred wash medium, with air blasting as a secondary option, noting that air can cause chips to fall back on the vises
4. Note that the program is generic G-code and should be carefully reviewed and edited before running on your CNC
5. Select a specific tool to be called when the CNC Vise Wash Program runs, should be a short tool that won't collide with parts on the vise
6. Test the CNC Vise Wash Program to ensure all chips will be adequately flushed from the vises
7. The Vise Wash Program must end with the CNC in the table load position (positive ack performed by Table Load program)

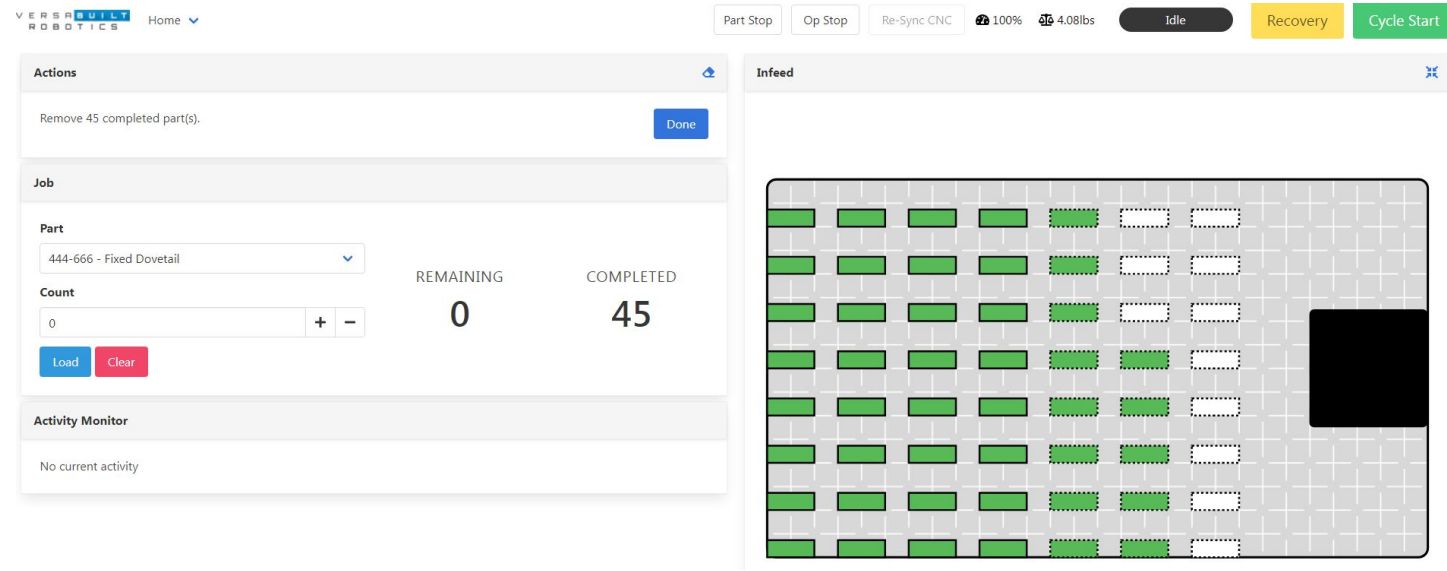
Example Program:

```
%  
O8001(VISE WASH)  
(-----ZIG ZAG PATTERN-----)  
#3000=1(WASH ROUTINE NOT SET)  
(DELETE ALARM LINE WHEN SET AND TESTED)  
G0G53Z0(MAKE SURE Z AXIS IS HOME)  
T20 M06 (ADJUST PER WASH TOOL LOCATION IN TOOL TURRET)  
G90  
G54(ADJUST WORK COORDINATE TO MATCH VISE 1)  
M08  
G00 X-3.0Y3.0  
G01X-1.5Y-3.0F400.  
X0.0Y3.0  
X1.5Y-3.0  
X3.0Y3.0  
G55(ADJUST WORK COORDINATE TO MATCH VISE 2)  
G00 X-3.0Y3.0  
G01X-1.5Y-3.0F400.  
X0.0Y3.0  
X1.5Y-3.0  
X3.0Y3.0  
M09 (IF YOU'VE MOVED Z-AXIS, MAKE SURE IT IS HOME BEFORE MOVING TABLE)  
M98 P8000 (RUN TABLE LOAD PROGRAM)  
M99  
%
```

**CNC Wash Program
cleans vises and jaws of
debris/chips between
operations**

Connect User Interface

- With laptop or tablet, connect to VSC via WiFi or Ethernet connection
- Connect to Wifi signal on VSC (vsc00xxx)
*serial number of VSC
 - password: versabuilt
- Open internet browser program (e.g., safari)
- Website addresses:
 - 192.168.4.1:9000 for Wifi connected devices
 - 192.168.2.1:9000 for Ethernet connected devices



Check system

- Check proper functionality of devices thru the user interface
- Go to IO Panel Screen
- On the Output Dashboard (right side)
 - Go thru each device turning on the signal to open vises, close vises, open door, close door, etc. Commanding “send high” sends a signal to the system command an action, “send low” turns off the signal
 - For example, test Vise 1 by clicking “Send High” on Vise_1_Open. Verify the Vise Opened. Then click “Send Low” on Vise_1_Open, and click “Send High” on Vise_1_Close. Verify the Vise Closed. Click “Send Low” on Vise_1_Close.
 - Test each relevant device for your system
- The Input DashBoard (left side) can be used to troubleshoot proper functionality of sensors and push button devices, such as the VSC Enable Button.

The screenshot displays the VERA BUILT IO Panel web interface. At the top, there's a navigation bar with 'Part Stop', 'Op Stop', 'Re-Sync CNC', a weight indicator '4.08lbs', and status buttons 'Idle', 'Recovery', and 'Cycle Start'. The main content is divided into two panels: 'Input Dashboard' on the left and 'Output Dashboard' on the right.

Input Dashboard: A table with two columns: 'Address' and 'Value (Polled every second)'. It lists various sensors and buttons, all currently showing 'Off'.

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_ENABLE	Off
DOOR_OPEN_BUTTON	Off
DOOR_CLOSE_BUTTON	Off

Output Dashboard: A table with three columns: 'Address', 'Controls', and 'Value'. It lists various actuators, each with 'Send Low' and 'Send High' buttons, and a current 'Value'.

Address	Controls	Value
WISE_1_OPEN	Send Low Send High	On
WISE_1_CLOSE	Send Low Send High	Off
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
WISE_4_OPEN	Send Low Send High	Off
WISE_4_CLOSE	Send Low Send High	Off
DOOR_OPEN	Send Low Send High	Off

Use this page for troubleshooting devices that are not functioning properly

Check system

- Verify the VSC is configured correctly
- Go to the System Settings page, and verify the following:
 - Number of Vises your system has is correct
 - CNC is correct
 - IO = I2C
 - Ignore Vise Sensors =
 - false **if your system is using vise sensors*
 - true **if your system is not using vise sensors*
 - Ignore Door Sensors =
 - false **if your system is using door open/close sensors that are connected to the VSC*
 - true **if your system is not using door open/close sensors*

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System Settings ▾

Main System Settings

Setting	Value
Units	Imperial
Infeed Template	UR10
CNC Dispatcher Program	9000
Default CNC Wash Program	8001
Vises	2
Robot	UR - UR10
Robot IP	192.168.2.2
CNC	Haas
CNC IP	192.168.2.3
IO	I2C
CNC Door Controller	VSC Controlled Autodoor
Vise Mode	IO
Ignore Vise Sensors	true
Ignore Door Sensors	false
Door Wait Time	7000
Remote Support Token	Not yet configured

VSC Robot Calibration Overview

Calibration of the Mill Automation System requires 4 steps:

1. VersaCart Calibration: calibrate the robot in 3 VersaCart Positions and optionally a Bin Drop location
2. InCNC Calibration: calibrate the position where the robot begins motion to and from the vises
3. VersaBlast Calibration: calibrate the position of the robot during VersaBlast operation
4. Vise Calibration: calibrate Vise 1 and Vise 2 positions

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

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

Calibrate Positions

InCNC

Move To InCNC

Capture InCNC

VersaBlast

Move To VersaBlast

Capture VersaBlast

Test

Bin Drop

Move To Bin Drop

Capture Bin Drop

Vise 1

Move To InCNC

Capture Vise 1

Vise 2

Move To InCNC

Capture Vise 2

Vise 3

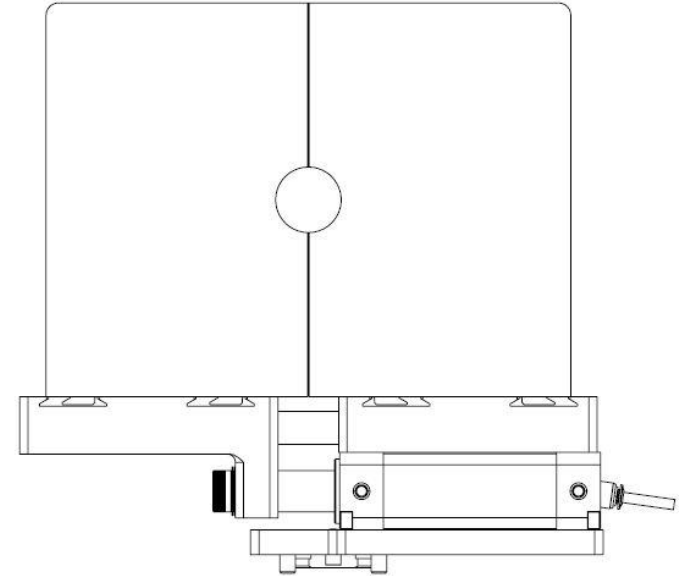
Move To InCNC

Capture Vise 3

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
4. Move the Gripper moveable jaw inward until the calibration plate gripper male dovetails align into the female dovetails on the gripper
5. Push the gripper closed onto the calibration plate dovetails
6. Press the Gripper Close button in the Recovery panel



Calibrate VersaCart



Table Point 1



Table Point 2

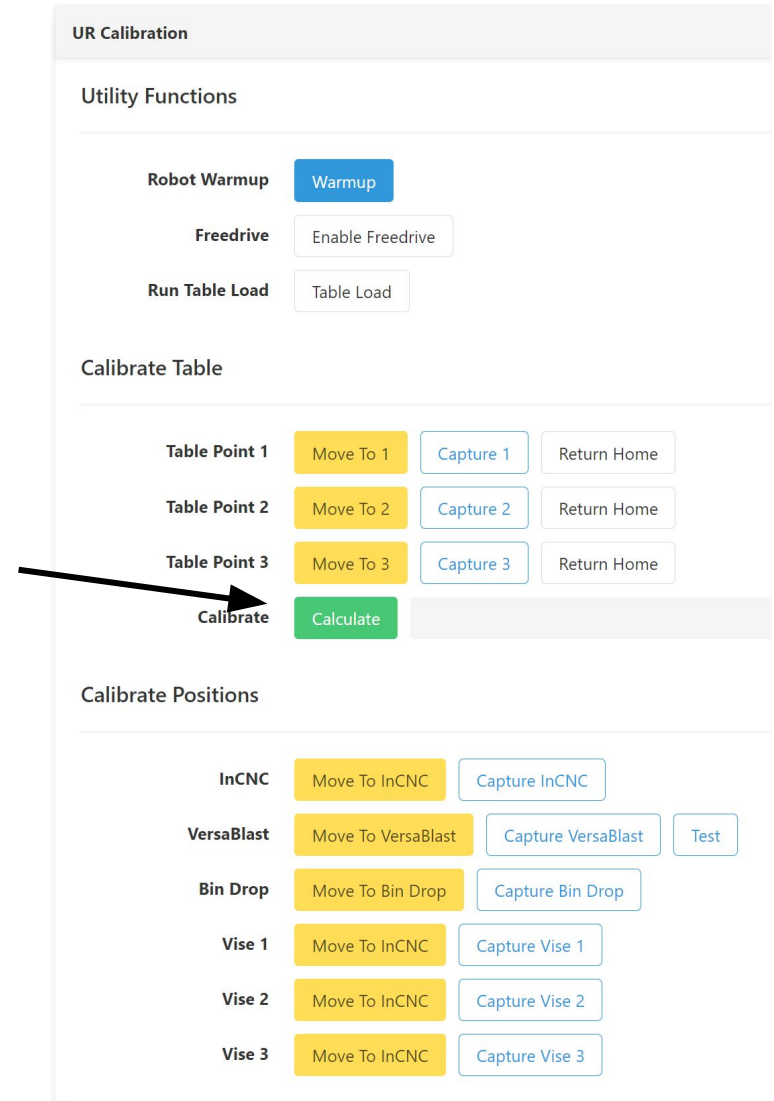


Table Point 3


Calibrate VersaCart

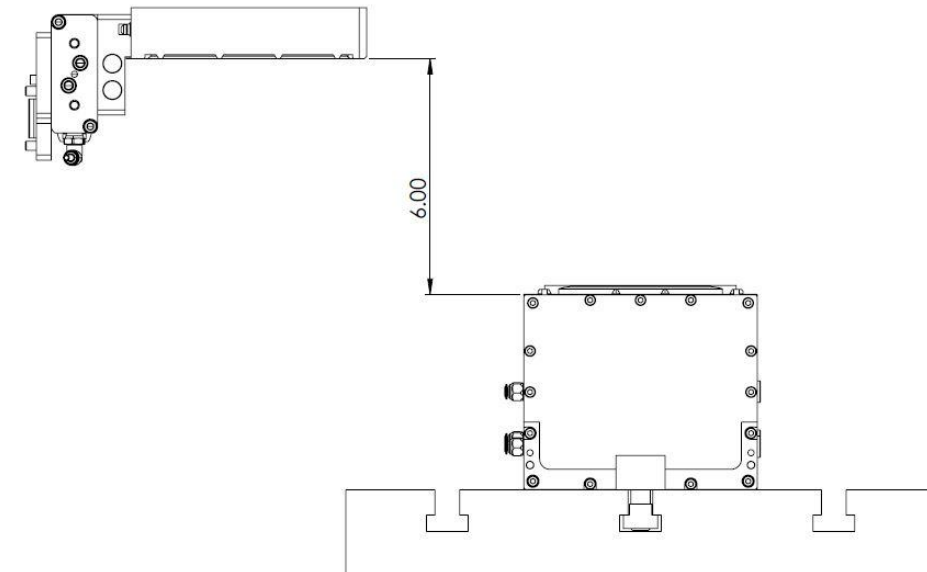
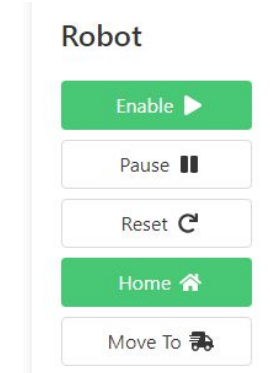
Calibrate VersaCart Table

Once all three Table Point positions have been accurately calibrated and Freedrive mode has been disabled **by pressing the Stop Program button** on the UR Teach Pendant, **press the green Calibrate button** in the Calibration Panel to set the calibration for the VersaCart Table.



Calibrate InCNC Home Position

1. Run CNC Table Load Position program (8000)
2. Open CNC Door
3. Navigate to the Calibration Page of the VSC User Interface
 - a. In upper right corner of Recovery section, expand the view 
 - b. With the calibration plate in the Gripper, press the “Move To” button and command the robot to move to “In CNC Home Pallet” position.
 - c. Use the Jogging Panel to move the robot in x, y and z. Do not use the rx, ry or rz buttons.
 - d. The calibration plate should be positioned between the vises, the front edge of the calibration plate should be 4” from the front of the vises and 6” above the vises.
 - e. Press the Capture InCNC button to set the InCNC Home position.



Calibrate VersaBlast Position

Navigate to the Calibration Page of the VersaBuilt System Controller (VSC).

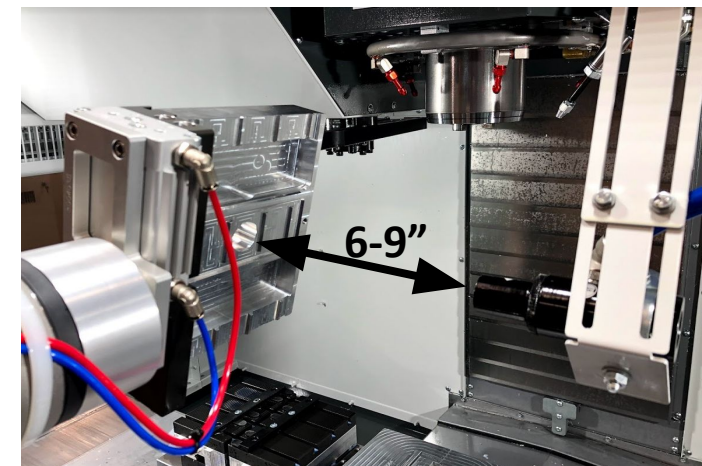
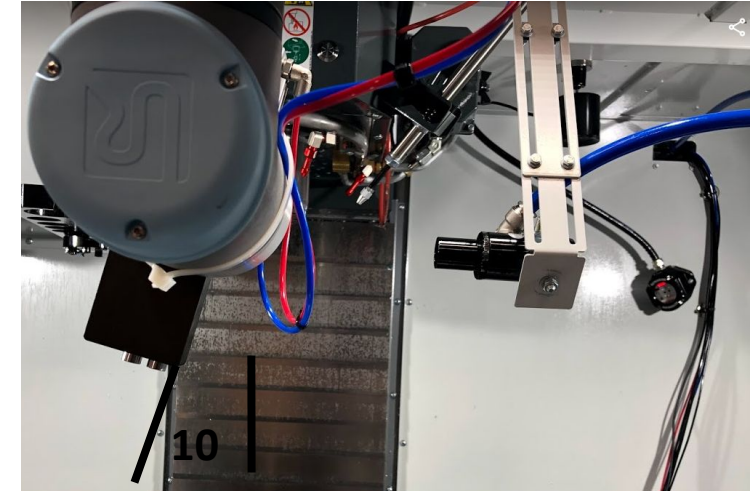
Move CNC to VersaBlast Position

With the calibration plate in the Gripper, press the Move to VersaBlast button.

Use Recovery Panel to Position Calibration Plate

On the right-hand side of the Calibration Page, in the Recovery Panel, press the blue expand button in the upper right of the Recovery Panel. Use the Jogging Panel to move the robot in x, y and z. Use the ry buttons, to adjust the tilt of the calibration plate relative to the VersaBlast.

The calibration plate should be 6" to 9" away from the VersaBlast, at about a 10 degree angle from vertical and positioned so that the VersaBlast will hit the center of the calibration plate. **Press the Capture VersaBlast button to set the VersaBlast position.**



Calibrate Vises

Navigate to the Calibration Page of the VersaBuilt System Controller (VSC). Make sure system is in Pneumatic Auto Mode and open each vise using the Open button in the Recovery Panel.

Move CNC to Table Load Position

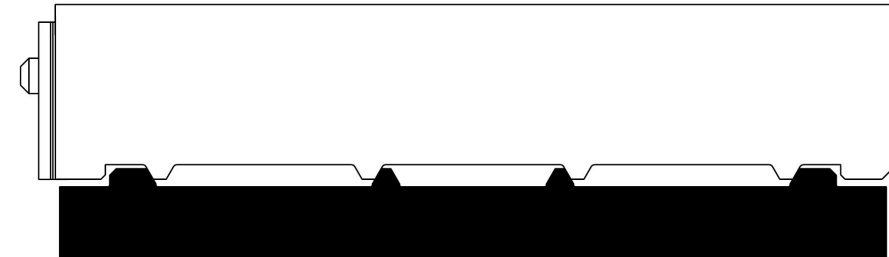
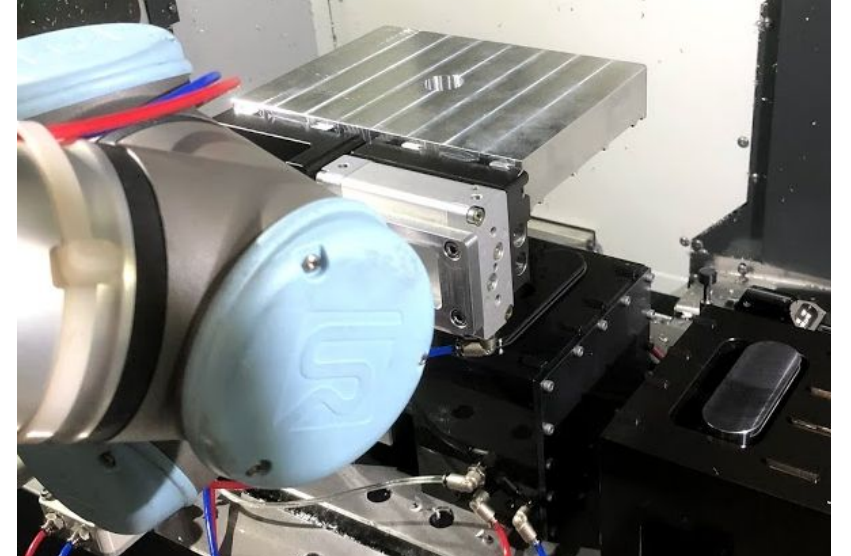
Move the CNC to the Table Load position. For CNC Macro Driver installations, press the Table Load button to run the CNC Table Load program from the VSC. For Generic CNC installation, run the Table Load program manually.

Move to InCNC Home Position

With the calibration plate in the Gripper, press the Move to InCNC button next to Vise 1.

Freedrive Robot and Move Calibration Plate Onto Vise

Press the Enable Freedrive button near the top of the page. When prompted, press the Calibration Plate button to set the weight. With robot in Freedrive, carefully move the robot and calibration plate onto the vise.



Calibrate Vises

Note: the system must remain in Pneumatic Auto Mode during vise calibration.

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.

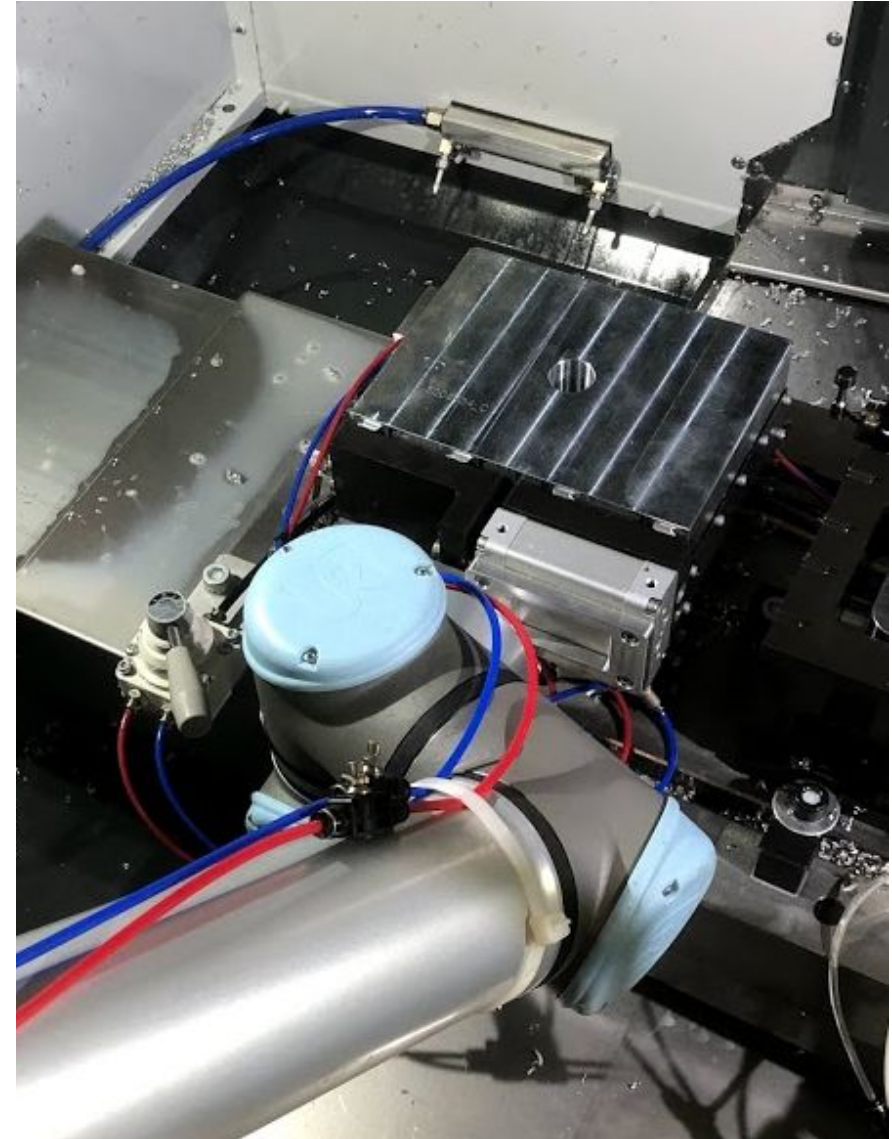
With the vise closed, press the Stop Program button on the UR teach pendant to end Freedrive mode.

Calibrate the Vise Location

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

Calibrate Remaining Vise Positions

Press the Enable Freedrive button near the top of the Calibration Page. Open the vise. Repeat the vise calibration steps for all vises.



Verify Vise Calibration

Test Load Vise

With the calibration plate on the robot, the CNC table in the Table Load position and the robot in a Home position, press the Load button under Vise 1. When the Vise Load window pops up, set jaw weight to 4 pounds and part weight to 0 pounds, Load Type: Jaws and Vise Clamp: OD. Press the Load Test 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

Configure Parts and Jaws

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Configurations ▾

Part Stop

Op Stop

Re-Sync CNC

100%

4.08lbs

Idle

Recovery

Cycle Start

Jaws +				
Name	Description	Clamp	Weight	Edit
123-765	Op2 Jaws	OD	6	
270-1073	OD Op1 Bases V3	OD	5.5	
270-669	Large diamond Op 30	ID	4.6	
My Test Jaws	testing	OD	6	
VersaBuilt Rectangle A	VB Test Rectangle	OD	0	
VersaBuilt Rectangle B	VB Test Rectangle	OD	0	

Parts +		
Part Number	Description	Actions
Test Part	Used as an example	
469-316	Thick Friction	
Test PMTS	Pmts	
444-666	Fixed Dovetail	
500-678	Fixed Dovetail	
Big Plates	8 x 14 inch plates	

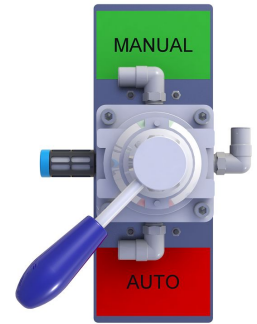
The following are required configuration:

- Jaw weight
- Raw material size and weight
- Op complete part weight
- Finished part weight
- Pick Heights
 - Raw Material + Op1 Jaws **for picking from cart*
 - Op1 Jaws + ½ completed part + Op2 Jaws **for op transfer*
 - Final Op Jaws + Finished Part **for placing on cart*

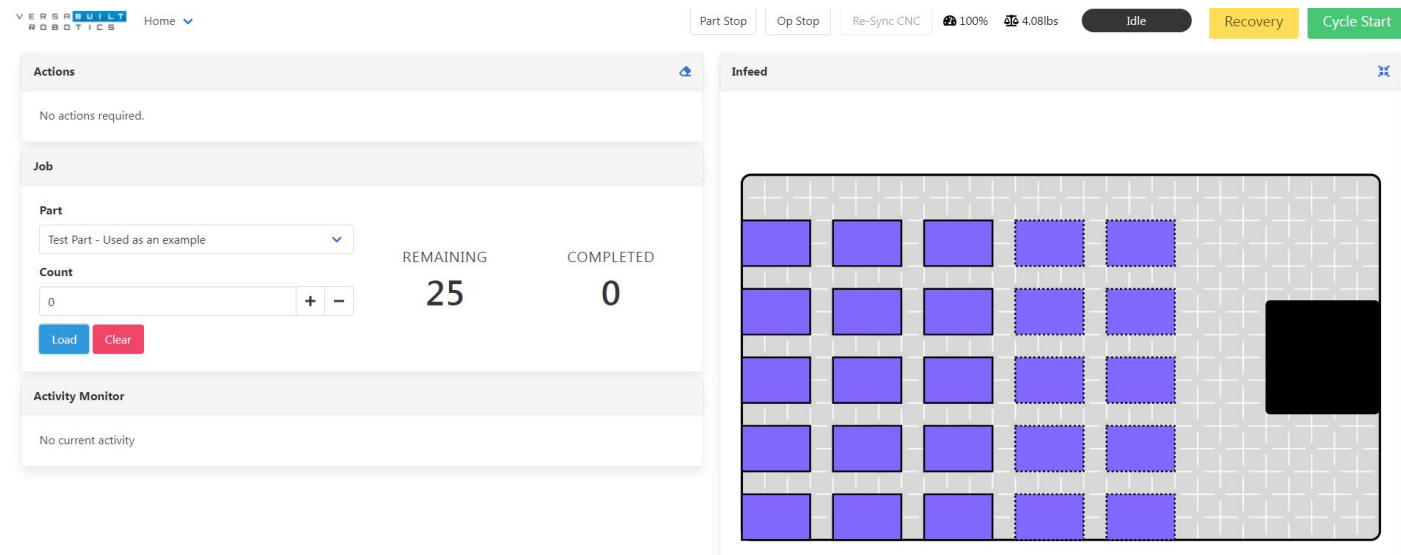
Ready to Run

- Put Diverter Valve in “Manual Position”
- Load MultiGrip Jaws for a job into the vises
- Put Hand Valves are in center position
- Change the Diverter Valve to the “Auto” position
- Set program 9000 as the active program in CNC memory
- Go to Home Page on user interface
 - Select the configured part you want to run
 - Add quantity of parts to run
 - Verify that the jaws are properly loaded
 - Load raw material, as shown in the user interface **material shown with dotted lines indicates that the material will be picked backwards by the robot*
 - Verify that the jaws are properly loaded
 - Click “Cycle Start”

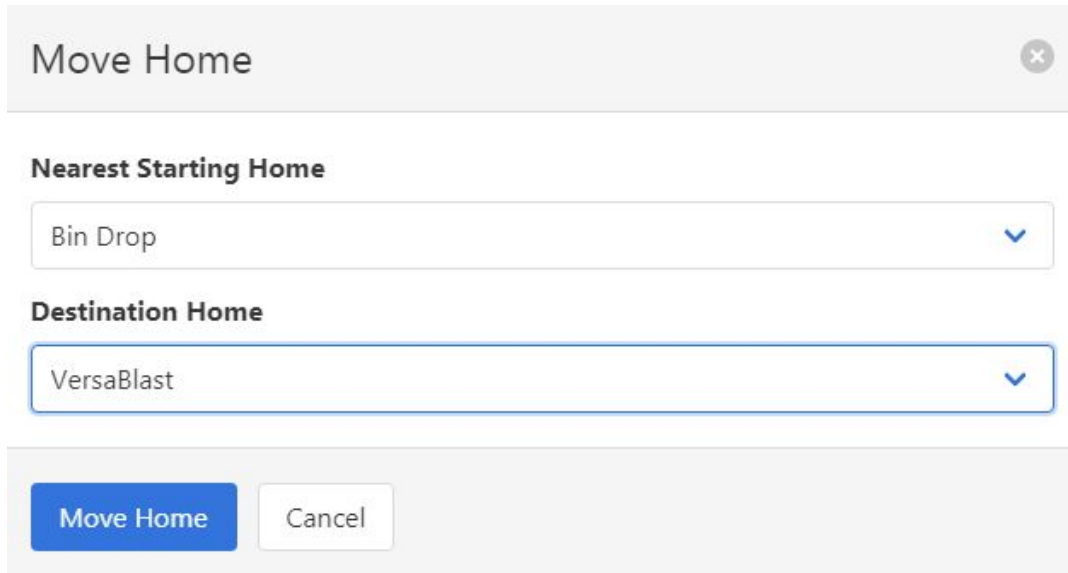
*Select Part Stop or Op Stop for system to stop after completion of part or operation, as desired



Auto-Mode



Recovering the Robot



Move Home

Nearest Starting Home

Bin Drop

Destination Home

VersaBlast

Move Home Cancel

Verify correct payload is selected

Note: Empty gripper = 2kg

In Recovery, when selecting the Move Home button, the system needs to know approximately where the robot is currently located and optionally where the robot is going.

There are 5 primary home positions:

- Table Home
- CNC Home
- InCNC Home
- Bin Drop
- VersaBlast

*Refer to Appendix of Installation Manual for images of the home positions

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