

VERSABUILT ROBOTICS



Mill Automation Kit 1300 Installation Guide

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Safety Warnings

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

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

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

Read and understand the VersaBuilt Mill Automation Kit Safety Manual before proceeding

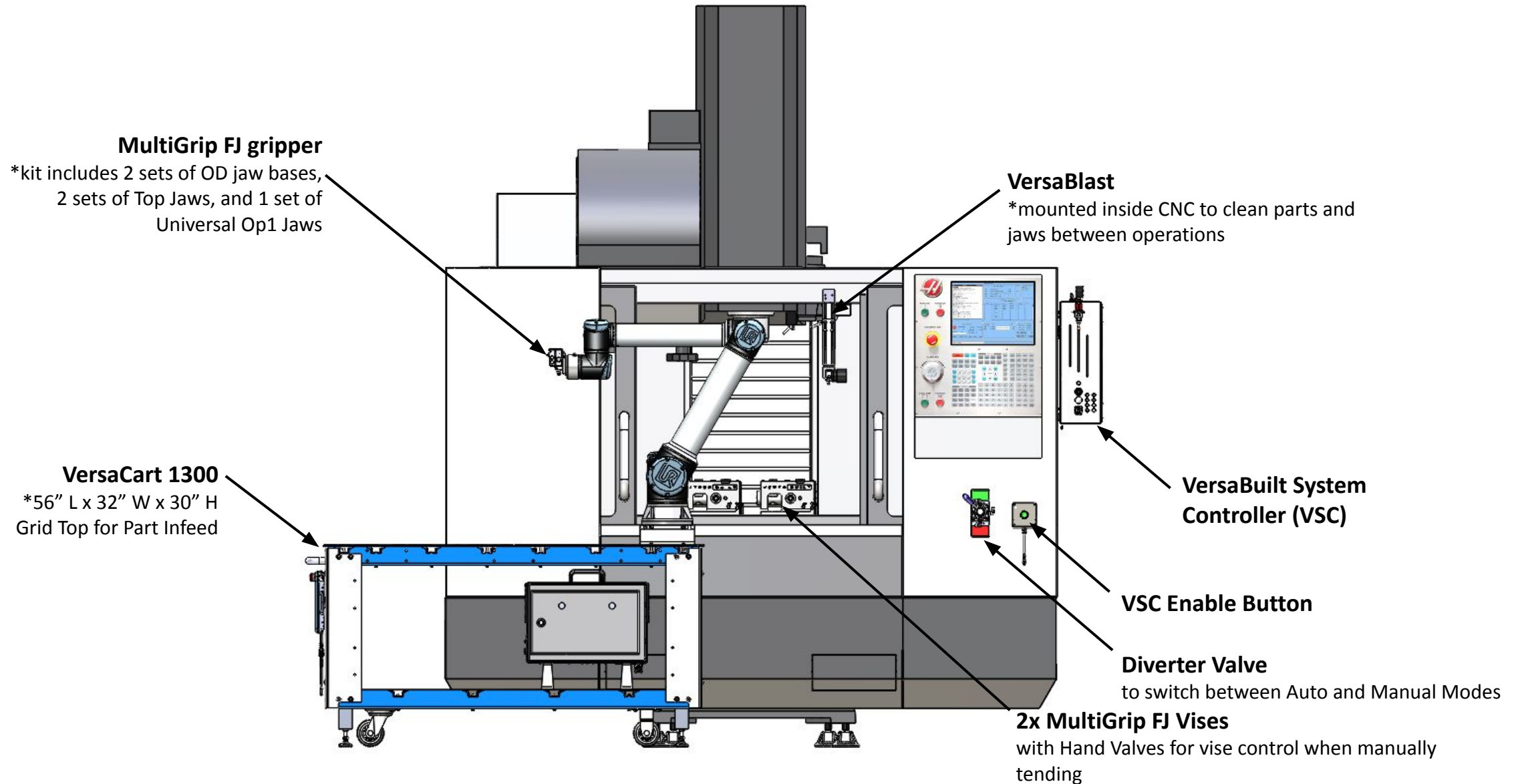
Mill Automation Kit Contents

Section 2

Mill Automation Kit Contents

- | | |
|---------------------------------------|--------------------------------|
| 1. VersaCart 1300 | 6. VersaBlast Assembly |
| 2. MultiGrip FJ Gripper | 7. VersaBlast Valve Assembly |
| 3. VersaBuilt System Controller (VSC) | 8. MultiGrip Calibration Plate |
| 4. 2 x MultiGrip FJ Vises | 9. MultiGrip Jaws |
| 5. MultiGrip FJ Vise Sensor Kit | 10. Tubing Kit |
| 6. Hand Valves Kit | |

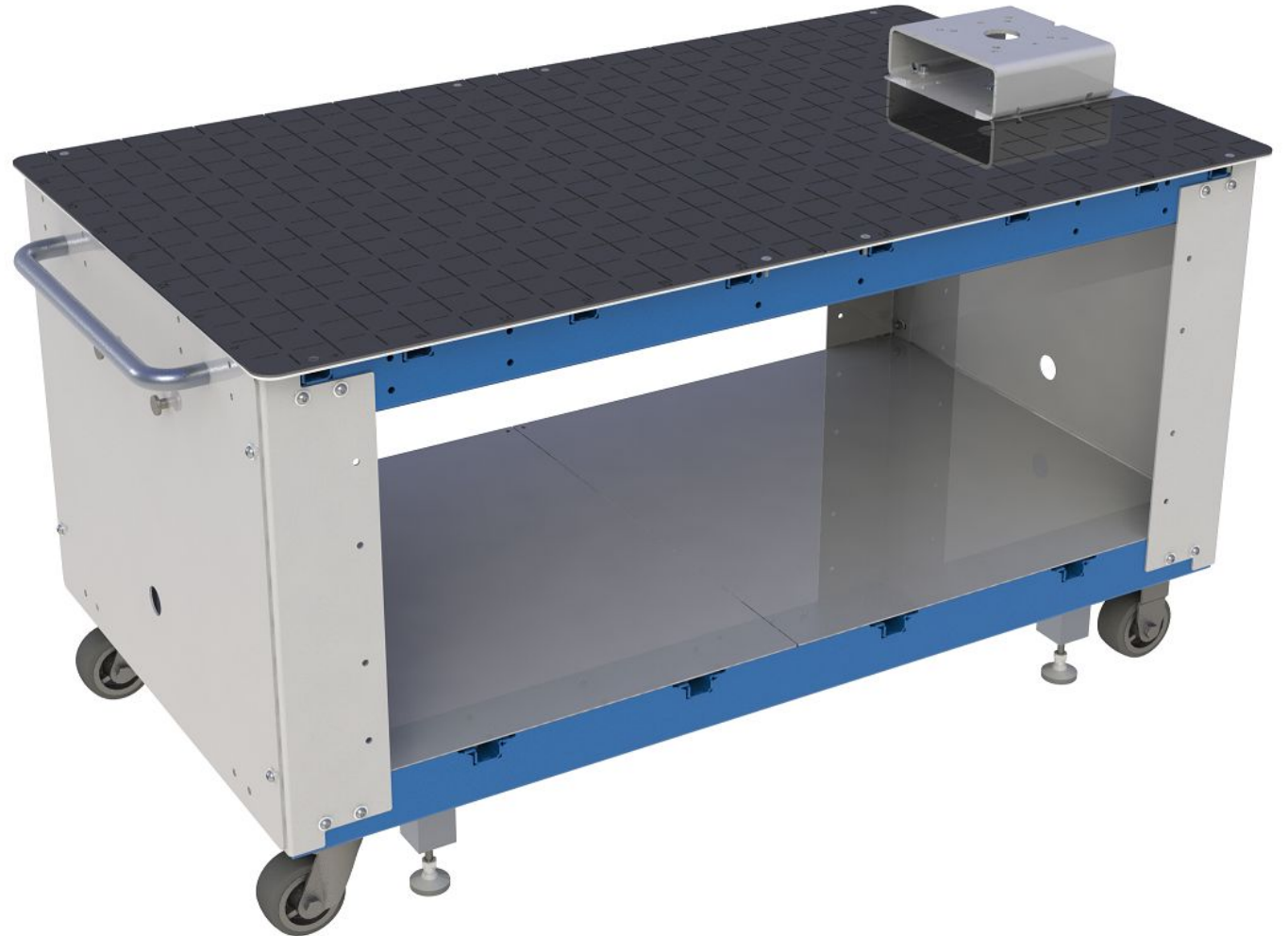
Mill Automation Kit Overview



VersaCart 1300

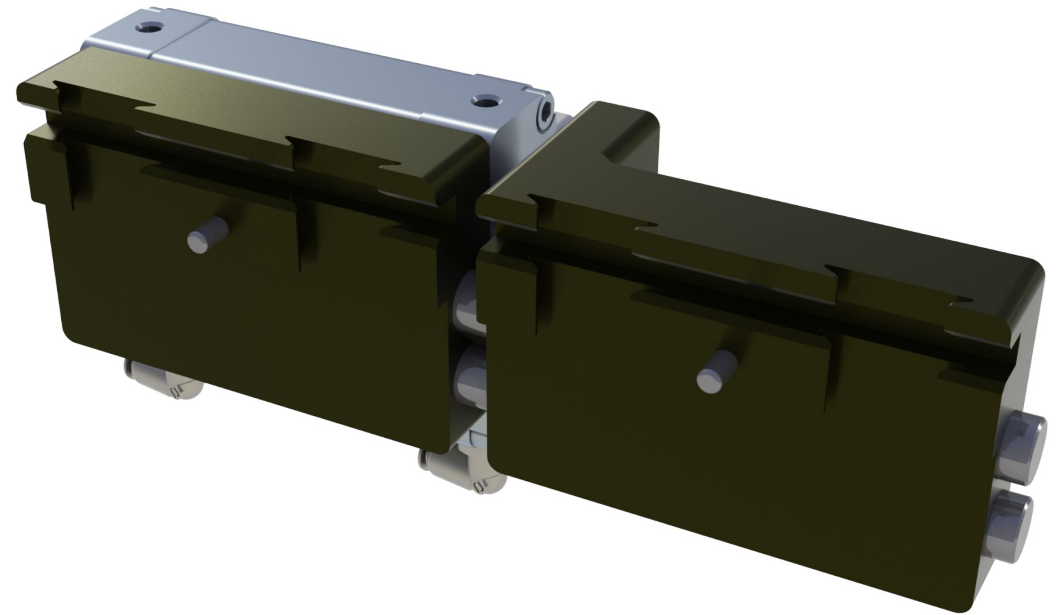
VersaCart 1300:

- 32" W x 55" L x 30" H Cart
- Visual infeed for robot pick and place
- Robot pedestal for Robots
- Casters for easy transport
- Foot pads to lock cart in place



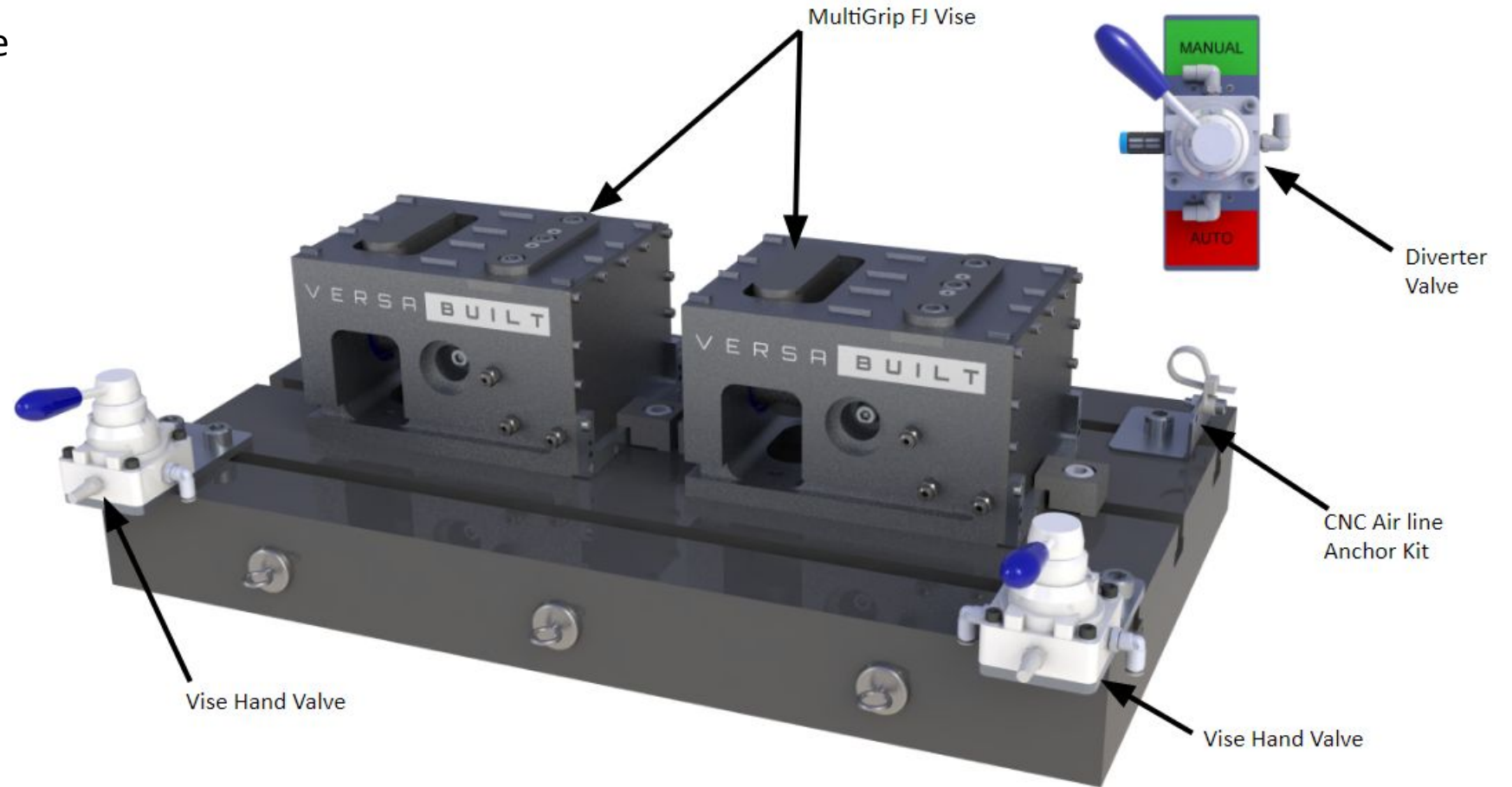
MultiGrip FJ Gripper

- 2 x Gripper Fingers with features to pick and place MultiGrip Jaws
- Adapter Plate to attach to Robot
- 5/32" Tubing to connect to supply from gripper valve in VSC
- Zip Ties for tube routing on Robot arm



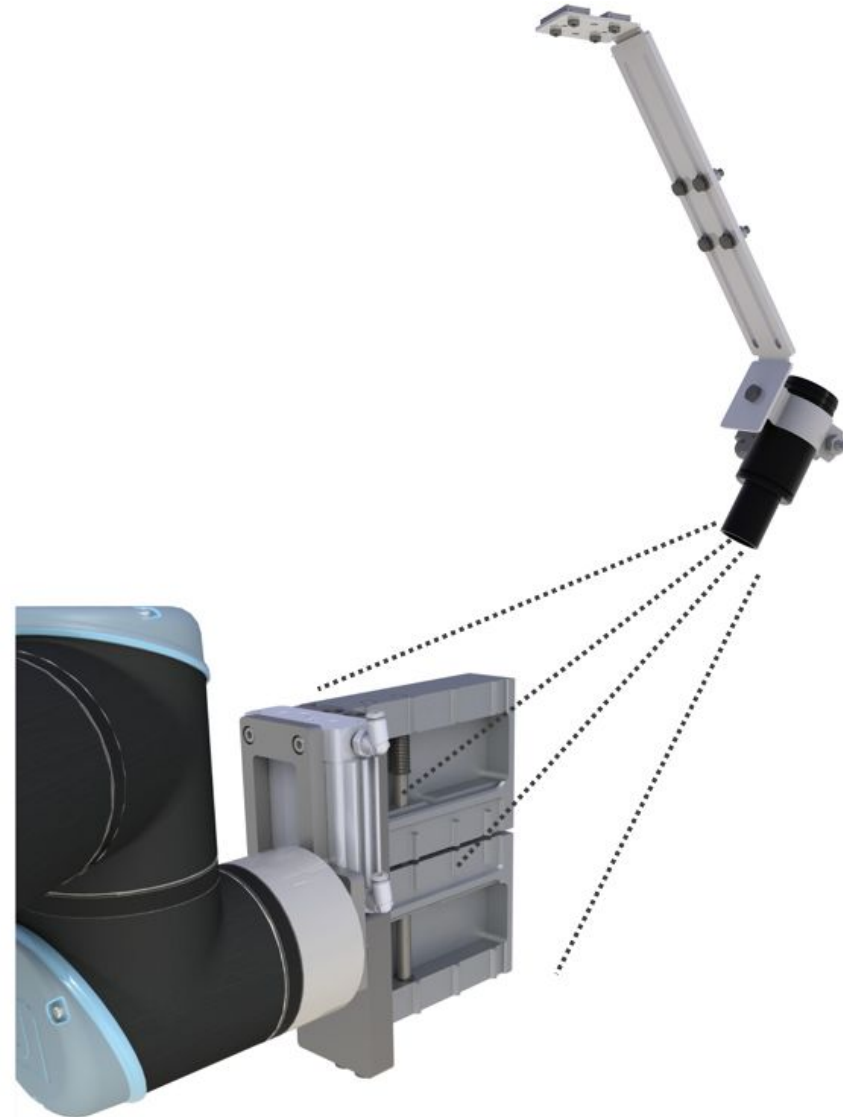
MultiGrip FJ Vises and Valves

- 2 x MultiGrip FJ Vises
- 2 x Vise Hand Valves for Manual Loading
- Diverter Valve to switch between “Auto” mode and “Manual” Mode
- CNC Air Line Anchor Kit
- Vise Sensor Kit



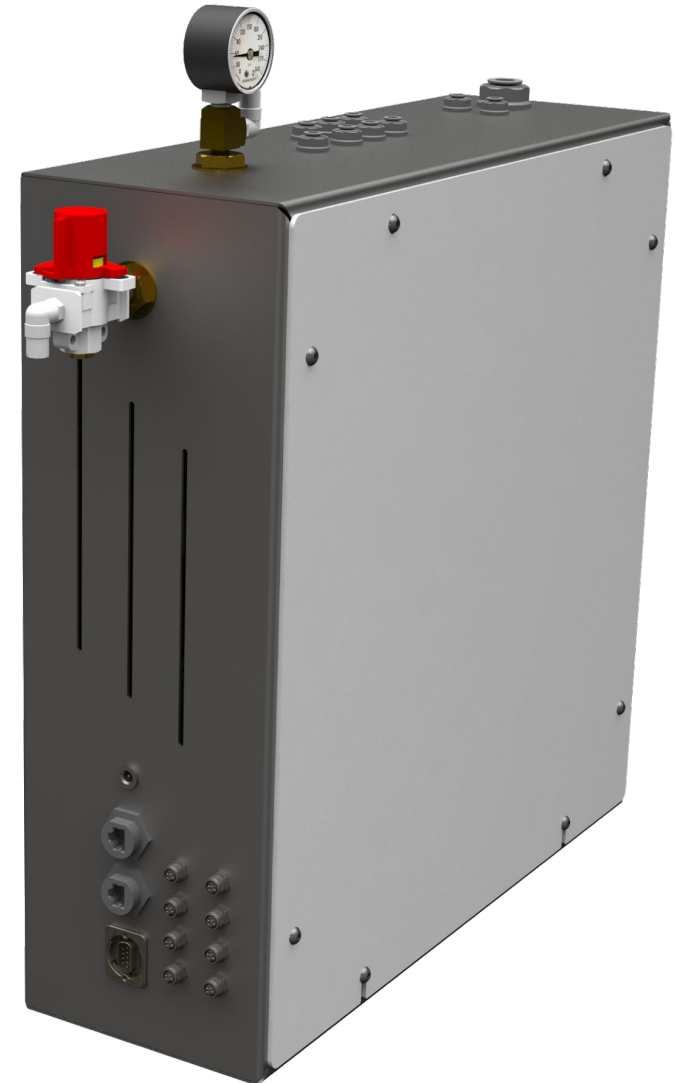
VersaBlast

- Air Amplifier/Booster supplying jet of air to blow chips and debris off of MultiGrip Jaws before and after machining
- Adjustable bracket assembly, with option to flip bottom bracket for flexible assembly to accommodate variety of CNC configurations
- Strong magnet mount
- Air Pilot valve to maximize air flow to Air Amplifier/Booster



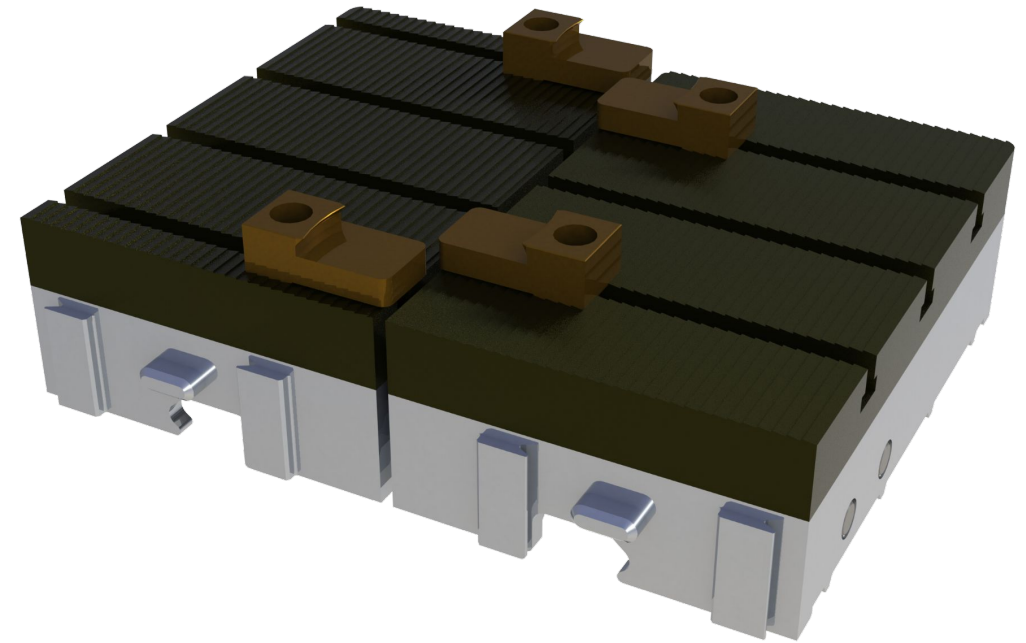
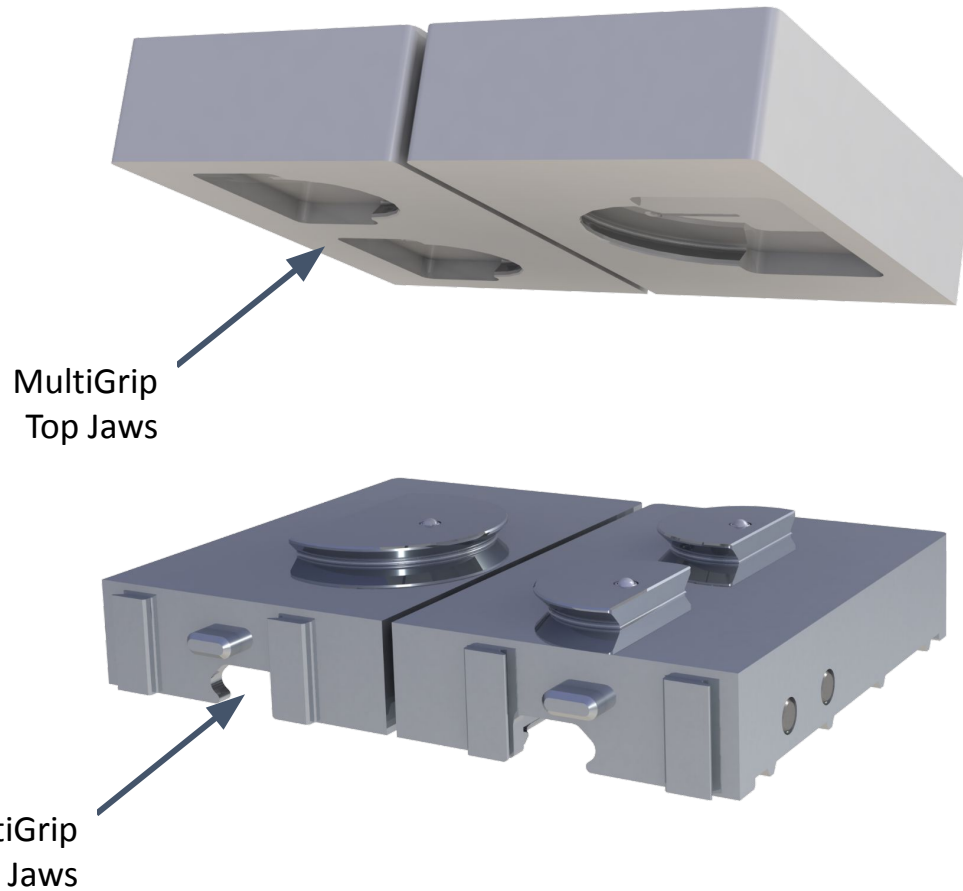
VersaBuilt System Controller (VSC)

- VersaBuilt System Controller 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 FJ Vise and VersaDoor sensors
- VSC Enable Button with magnetic attachment, connecting to Digital Input
- RS232 DB9 connection to CNC for Haas Legacy controls



MultiGrip Jaws

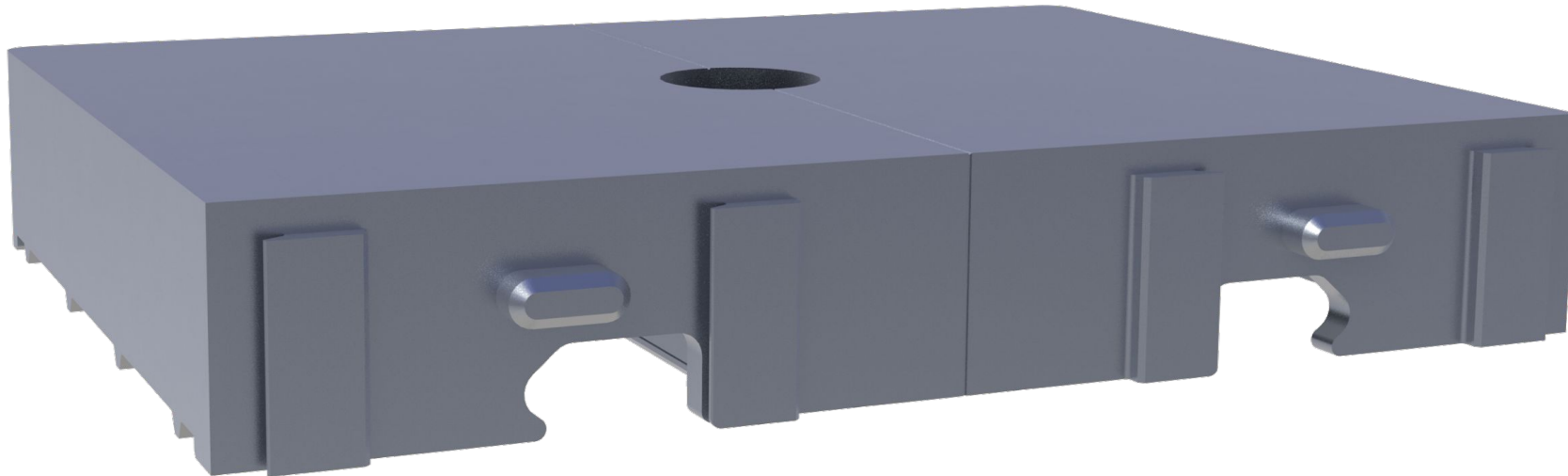
- 2 x MultiGrip OD Jaw Bases
- 2 x MultiGrip OD Top Plates (1.5" Height)
- 1 x Universal Top Jaws w/ 4x VersaBites (3/16" z-height)



MultiGrip Base Jaws with Universal Top Jaws and VersaBites

Calibration Plate

- Calibration Plate are used during the Cart and Vise calibration process
- Calibration Plate include features for vise clamping, and alignment with cart edges



Tubing and Fittings

- 0.50" tubing:
 - 15-ft Connecting from Plant Supply to VersaBlast air pilot valve
 - 10-ft Connecting VersaBlast air pilot valve to VersaBlast blower
 - 3-ft Connecting ¼" quick disconnect and ½" tee fitting with reducer to ¼" to connect supply to Diverter Valve
- 0.25" tubing:
 - 25-ft white tubing - Connecting from Plant Supply to Diverter Valve
 - 25-ft black tubing - Connecting from Diverter Valve to Manual Valves in CNC
 - 25-ft red tubing - Connecting from Diverter Valve to VersaBuilt System Controller (VSC)
 - 15-ft blue tubing - Connecting VSC to VersaBlast air pilot valve
- 5/32" tubing:
 - 25-ft red tubing - Connecting from VSC to Vise 1 Close
 - 25-ft blue tubing - Connecting from VSC to Vise 1 Open
 - 25-ft clear or black tubing - Connecting VSC to Vise 2 Close
 - 25-ft white tubing - Connecting from VSC to Vise 2 Open
 - 15-ft red tubing - Connecting VSC to Gripper Close
 - 15-ft blue tubing - Connecting from VSC to Gripper Open
 - 15-ft black tubing - MG Vise exhaust to exit CNC from tee fitting
 - 2x 3-ft black tubing - MG Vise exhaust from vises to tee fitting

**Refer to Appendix A for a pneumatic schematic*

Tubing and Fittings

- Fittings:
 - QTY: 1 Tee Fitting for 5/32" tubing - From exhaust on MultiGrip Vises to outside CNC
 - QTY: 1 Silencer and Fitting - Vise exhaust line connection to end of tubing on top of CNC (connected to 15 ft 5/32" tubing)
 - QTY: 7 Magnets with Loop - to aid routing of tubing in, on, and around CNC

All air fittings are “push-to-connect” (PTC), allowing quick and easy connectivity

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.

Refer to Appendix A for complete Pneumatics Schematics

Required Tools

- Hex Keys:
 - 1/4-inch
 - 3/8-inch
 - 3mm
 - 4mm
 - 5mm
 - 6mm
- Wrenches:
 - 9/16-inch open end wrench
 - 7/8-inch open end wrench
 - 8mm open-end wrench (QTY: 2)
 - 10mm open-end wrench
 - 13mm deep socket wrench
 - 13mm open-end wrench
 - 15mm open-end wrench
 - 17mm open-end wrench
 - Adjustable wrench (Crescent)
 - Ratchet for Deep Socket Wrench
- Torx Driver
- Hand Drill
- Drill Bits:
 - 0.22-inch (7/32") or equivalent
 - 0.31-inch (5/16") or equivalent
- Tube cutters
- Side cutting pliers
- Lineman's Pliers (QTY: 2)
- Level
- Tape Measure
- Steel Square (or equivalent)
- Rubber mallet
- Ball Peen Hammer
- Flat Head Screwdriver (3.0 x 50mm or equivalent)
- Bench top vise
- Medium strength threadlocker (e.g., Loctite 243 blue)
- Spindle mount dial indicator 1/10,000" (0.0001")

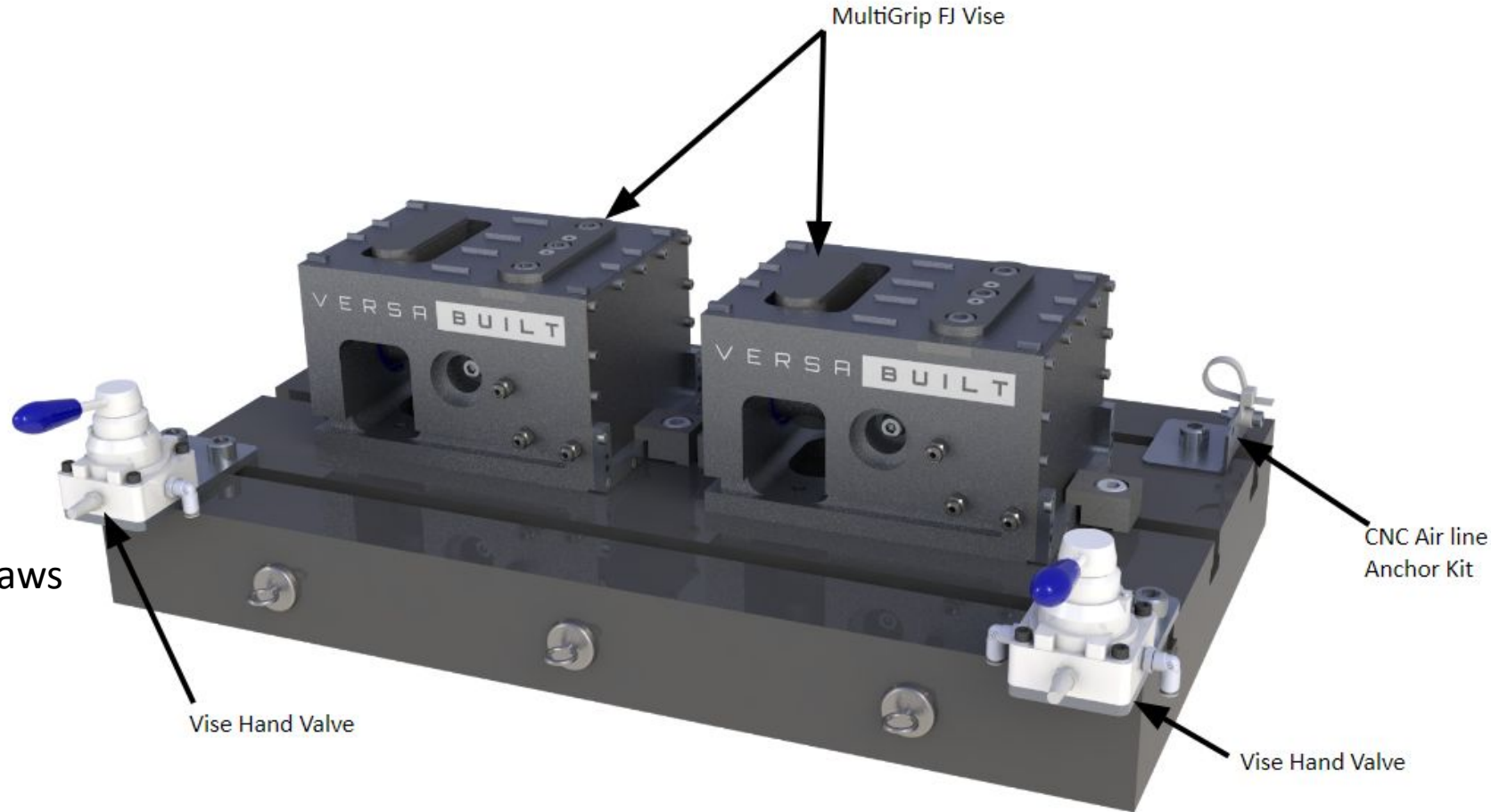
MultiGrip FJ Vise Installation and Manual Tending

Section 3

MultiGrip Vises and CNC Components

Steps:

1. Install Vise Sensors*
2. Install Vises in CNC
3. Alignment and Tramming
4. Install Hand Valves
5. Install CNC Air line anchor kit
6. Install Diverter Valve
7. Route tubing & test with plant air
8. Prepare/cut jaws for manual tending
9. Prove out machining with MultiGrip Jaws

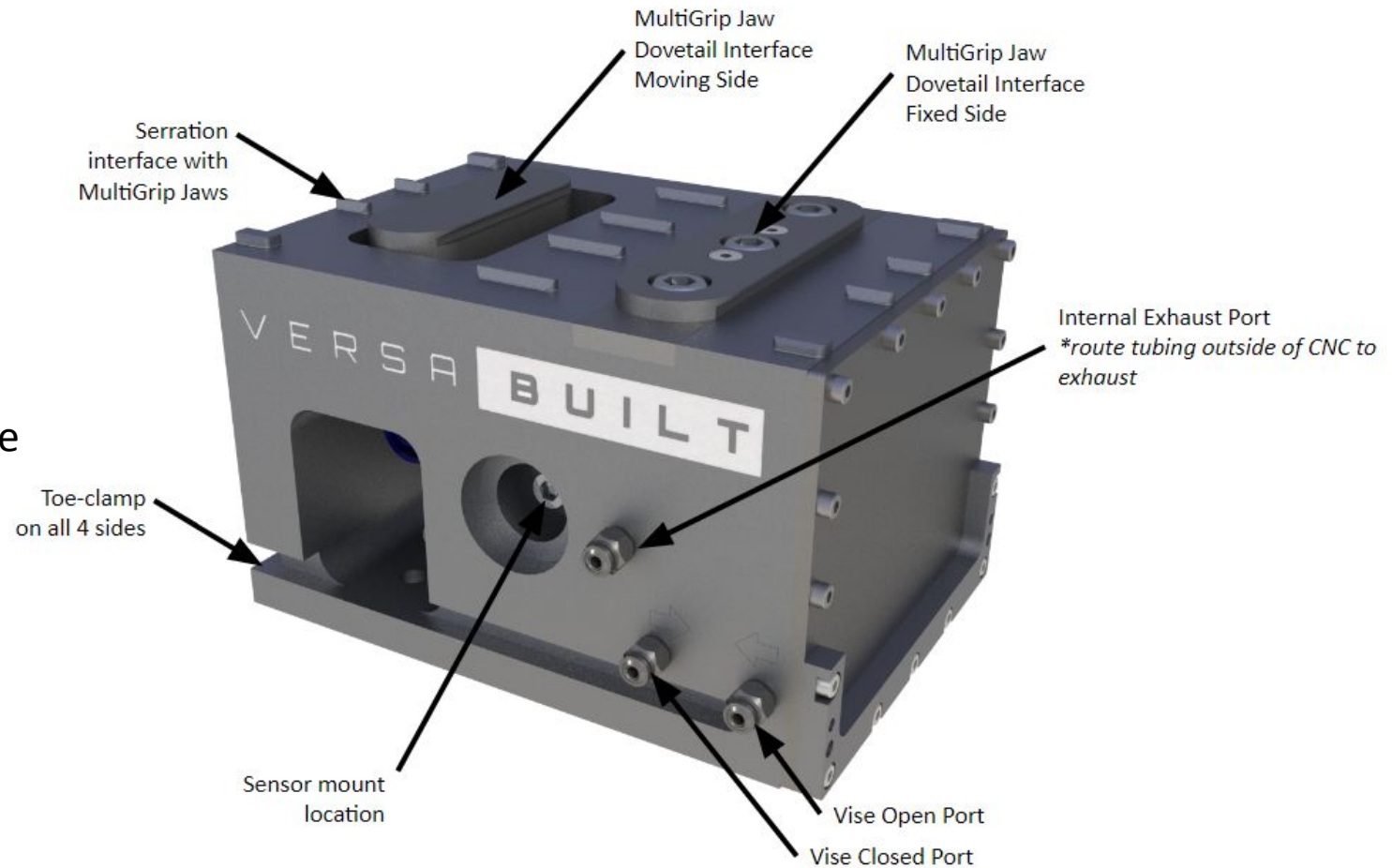


***Vise sensors are pre-installed by VersaBuilt on Vises shipped with CNC Automation Kits (sensors installed on back side of vise)**

MultiGrip FJ Vise Overview

The MultiGrip FJ Vise includes the following features:

- $\frac{1}{8}$ NPT ports, 3 per side
 - Plug un-used side
 - Vise Open
 - Vise Closed
 - Internal Exhaust Port
- Sensor mount, front and back available
 - Only 1 sensor required
 - Plug un-used side with supplied hardware
- Toe-clamp feature around vise
- MultiGrip Jaw interface features
 - Fixed dovetail
 - Moving Side dovetail
 - Serrations
- Clamp with both OD and ID MultiGrip Jaws



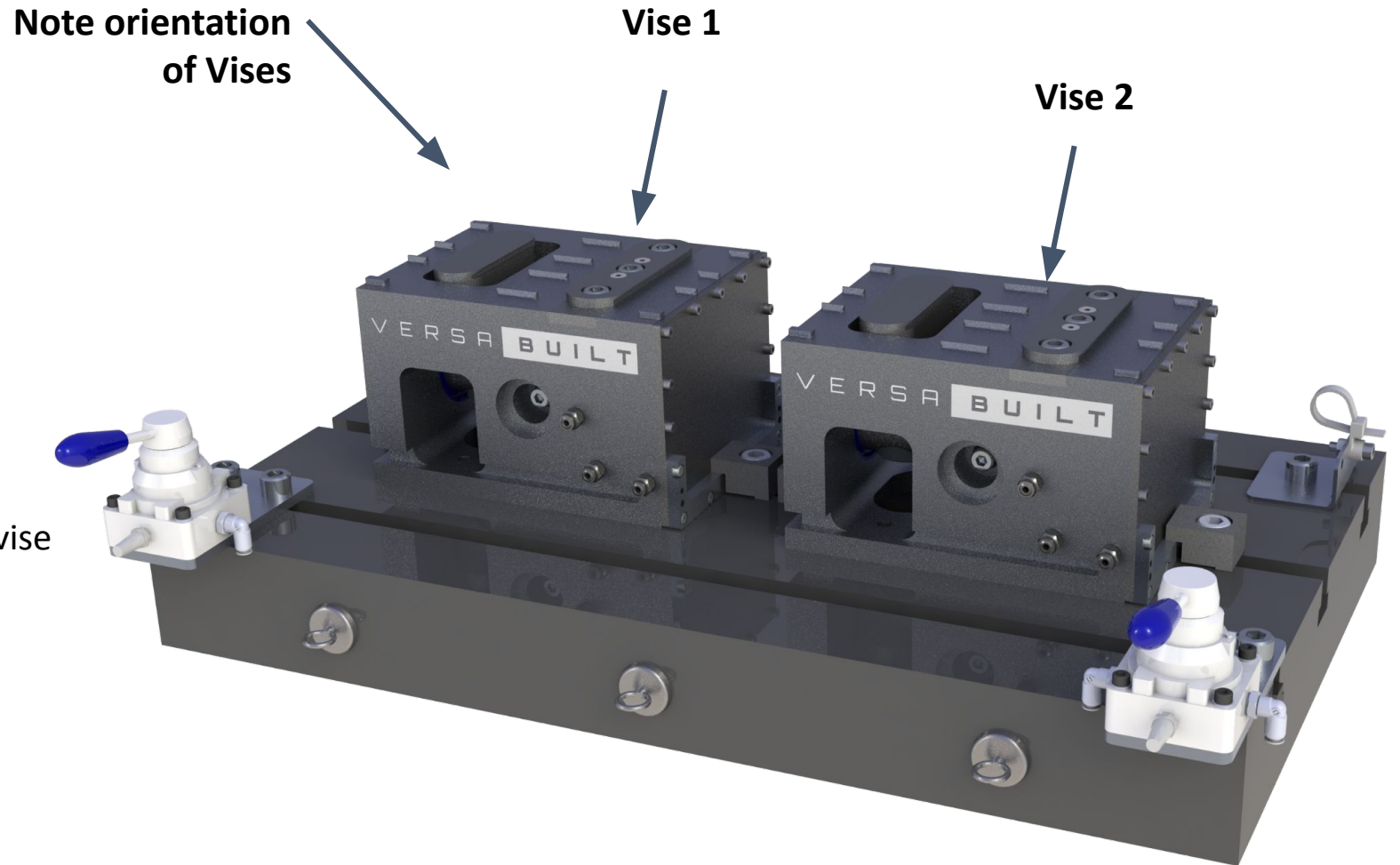
MultiGrip FJ Vise Installation

Tools:

- 13mm wrench
- 3/8" Hex Key
- Torque wrench
- Tape Measure
- Spindle mount dial indicator

Parts:

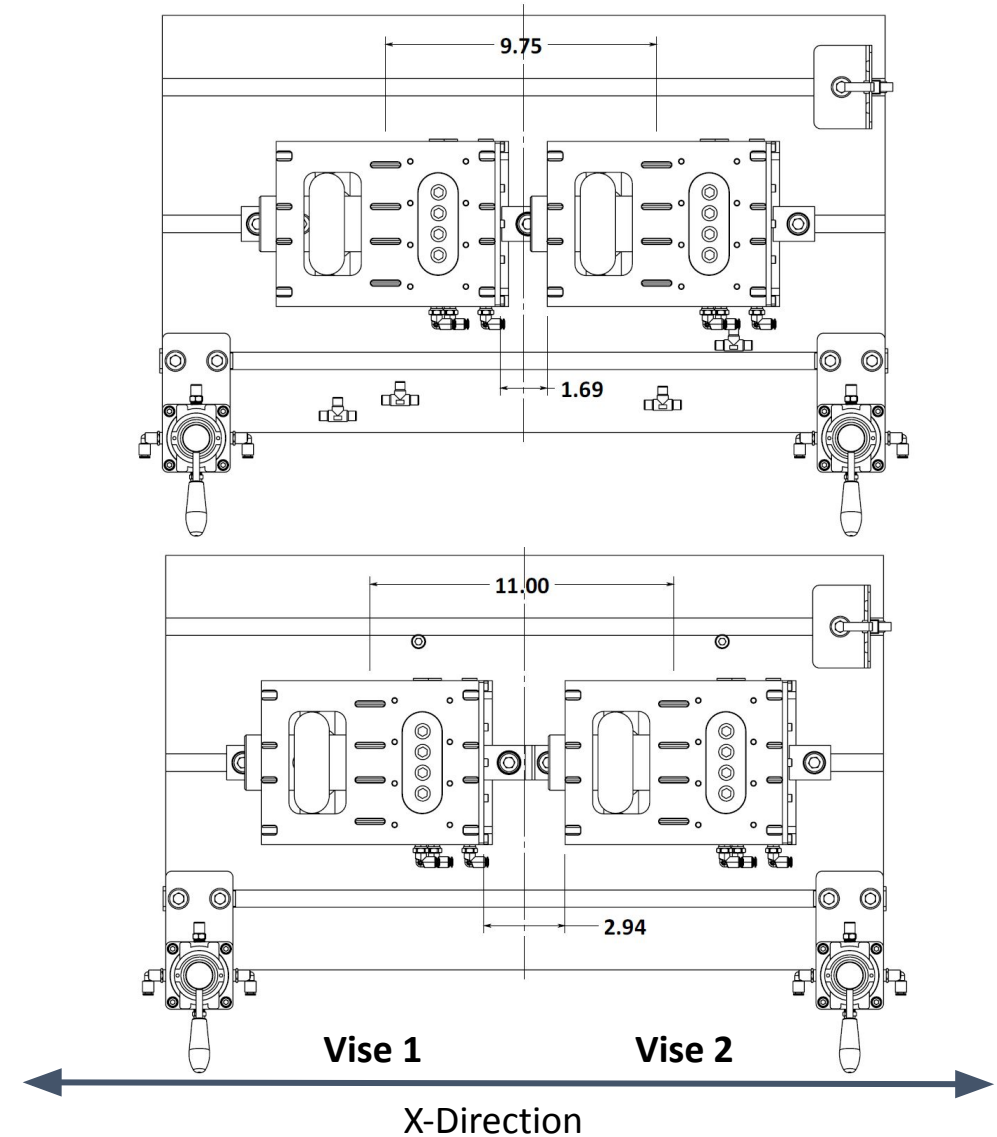
- 2 x MultiGrip FJ Vises
- 2 x L-Mount Clamps
- 1 x T-Mount Clamp
- 2 x 0.50-13 Socket Head Screw x 1.25" L per vise
- 2 x 0.50-13 T-Nut per vise
- 3 x 5/32" x 1/8 NPT fittings per vise



MultiGrip FJ Vise Installation

Vise installation & tramming steps:

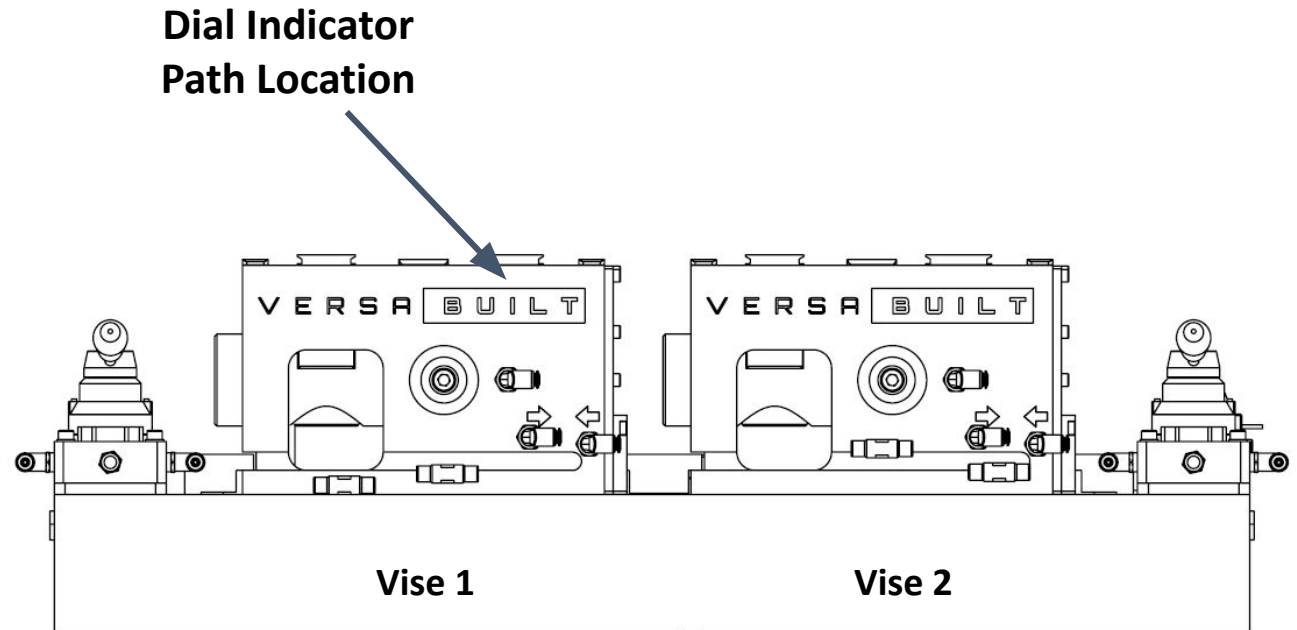
1. Attach 5/32" fittings with 13mm wrench
2. Wipe down CNC table, clean and free of debris
3. Wipe down bottom side of vise, clean and free of debris
4. Measure CNC table center and mark
5. Vise Spacing:
 - a. For CNCs with X travel less than 22": Center of vises are spaced 9.75" on center or with 1.69" 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
6. Place Vise 1 on Table
7. 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
8. Place Vise 2 on Table
9. Insert Side-Clamps on sides of vises
10. Loosely clamp vises in place



MultiGrip FJ Vise Trimming

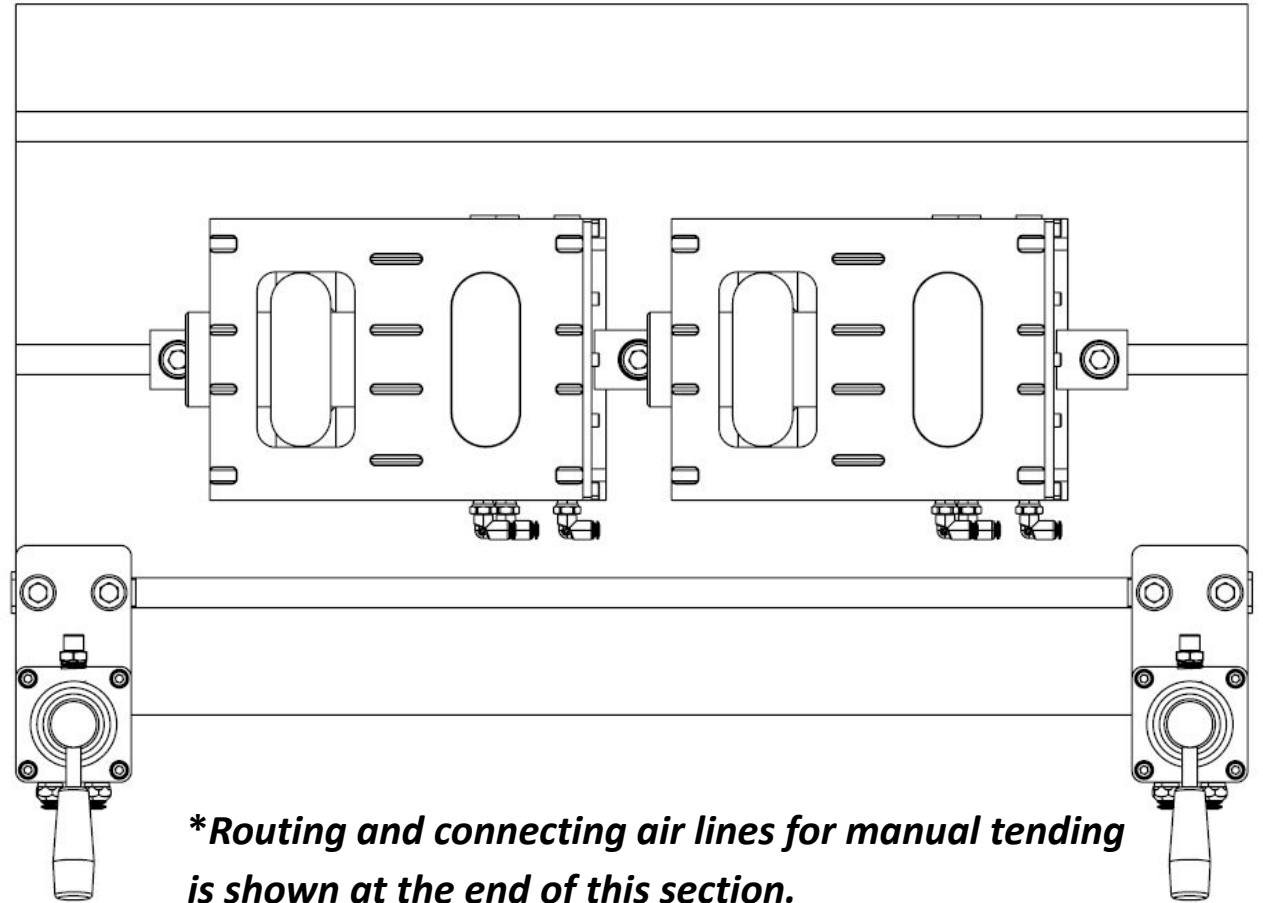
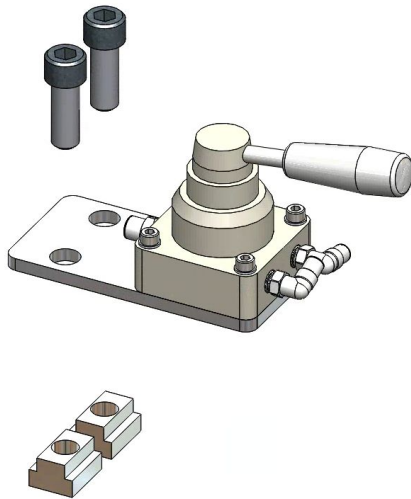
Vise installation & trimming steps:

11. Install spindle mount dial indicator
12. Engage dial indicator with vises on the front surface, above the engraved VersaBuilt logo
13. Move Table/Spindle relative to each other in the X-direction, aligning the front of each vise with the X-axis of the machine
14. Adjust position of vises as needed and re-measure with dial indicator
15. Lock down position of vises with clamps, with T-nuts and 0.50-13 Socket Head Screws, **tightening to 118 ft-lbs of torque**



Attach Hand Valves to CNC table

- Each hand valve includes the following hardware:
 - 2 x 0.50" Socket Head Screw x 1-3/8" L
 - 2 x 0.50" T-Nuts
 - Valve mounted to base plate
- The image to the right shows a convenient location for attaching the hand valves to the CNC table

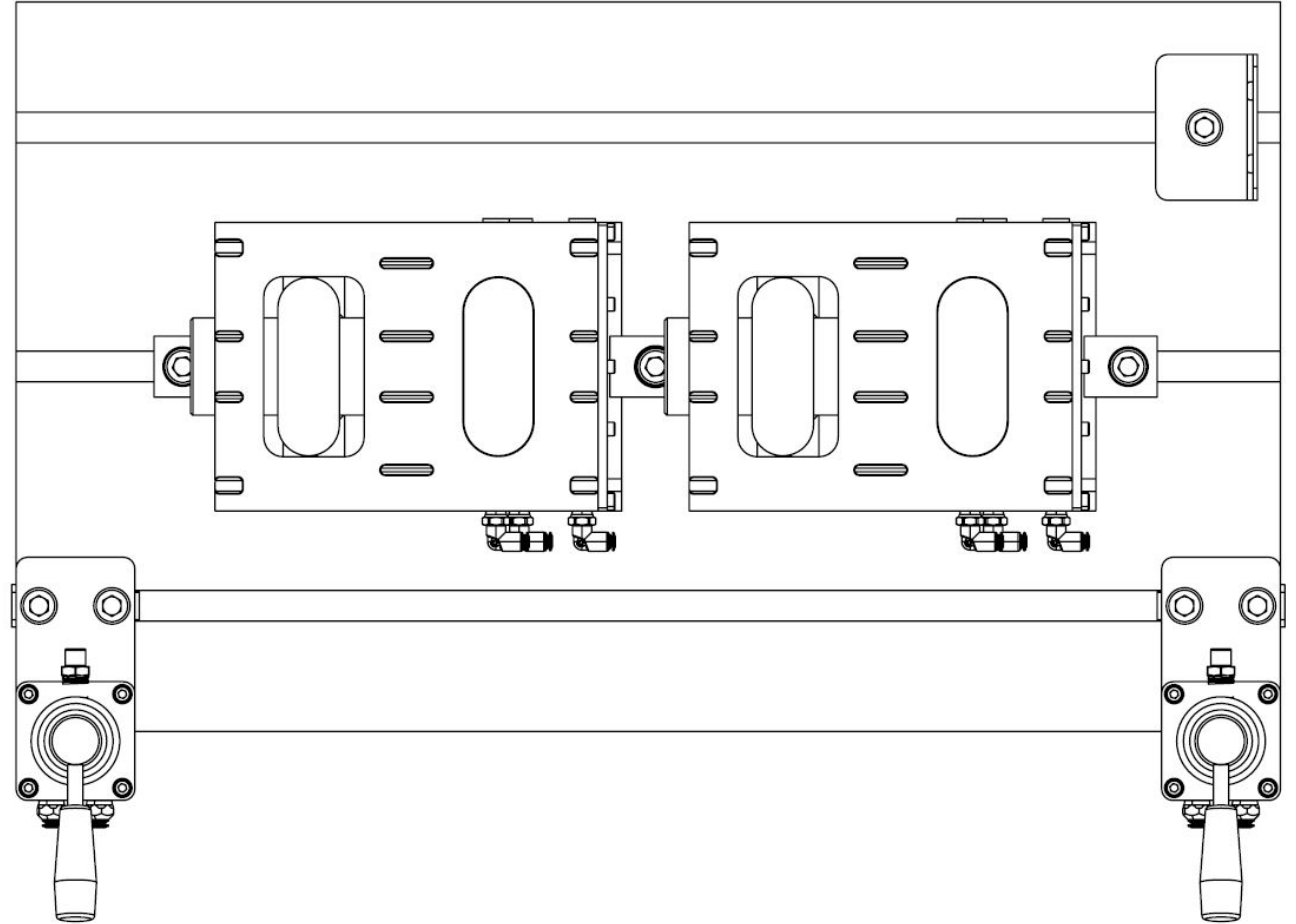


****Routing and connecting air lines for manual tending is shown at the end of this section.***

*****Routing air lines to automation equipment is shown in Section 9***

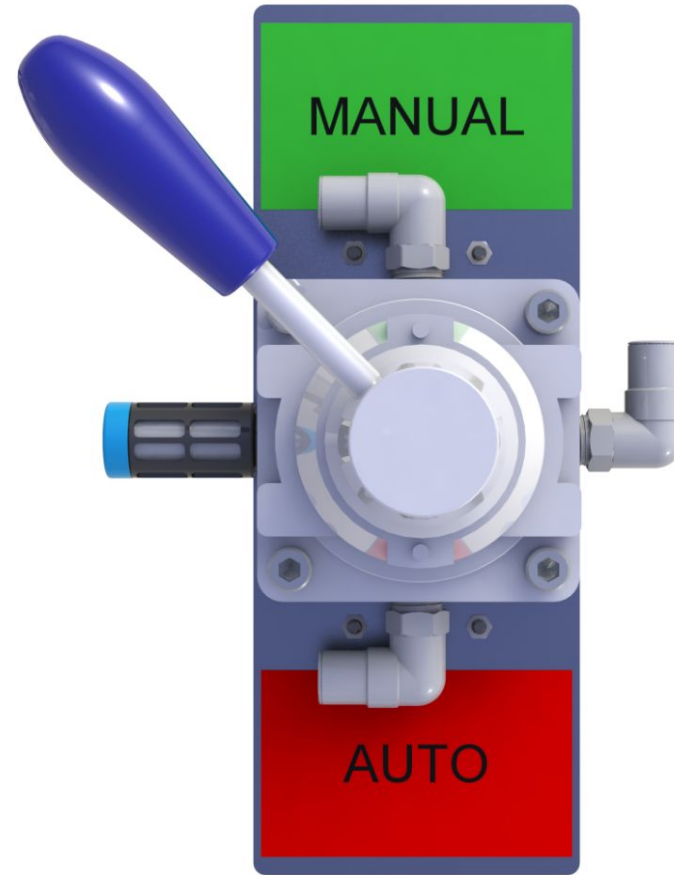
Attach CNC Air Line Anchor kit to CNC table

- The purpose of the CNC Air Line Anchor Kit is to provide a routing anchor and strain relief for pneumatic tubing and signal cables
- Each CNC Air Line Anchor kit includes the following hardware:
 - 1 x 0.50" Socket Head Screw x 1-3/8" L
 - 1 x 0.50" T-Nuts
 - Mount bracket
 - 3 x screw mount cable ties
 - 3 x M6 Socket Head Screws x 20mm L
 - 3 x M6 Hex Nuts
- The image to the right shows a convenient location for the anchor kit (back right corner)

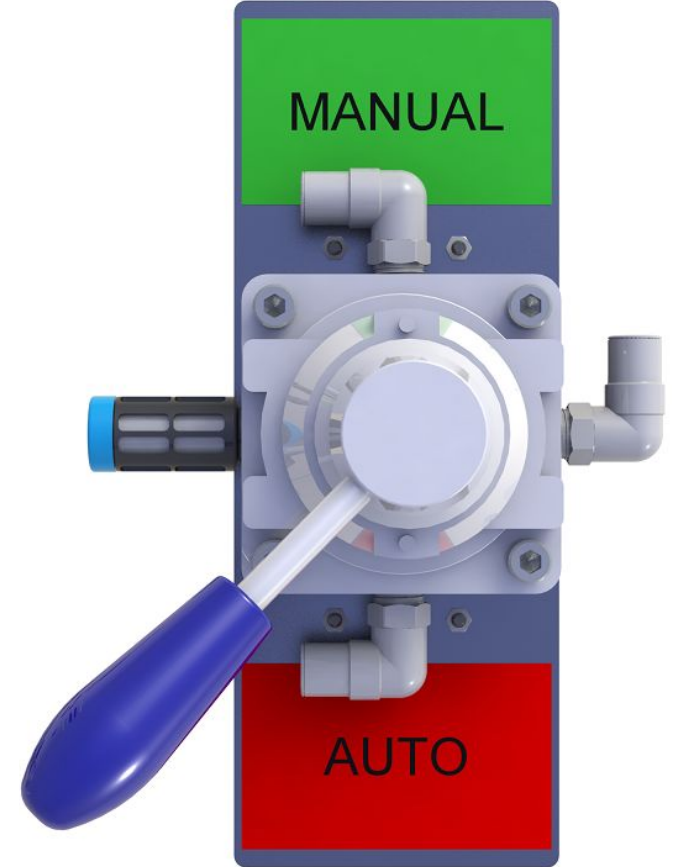


Install Diverter Valve

- 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 exhausted. When in Manual Mode, air to the VersaBuilt System Controller is exhausted.
- 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.

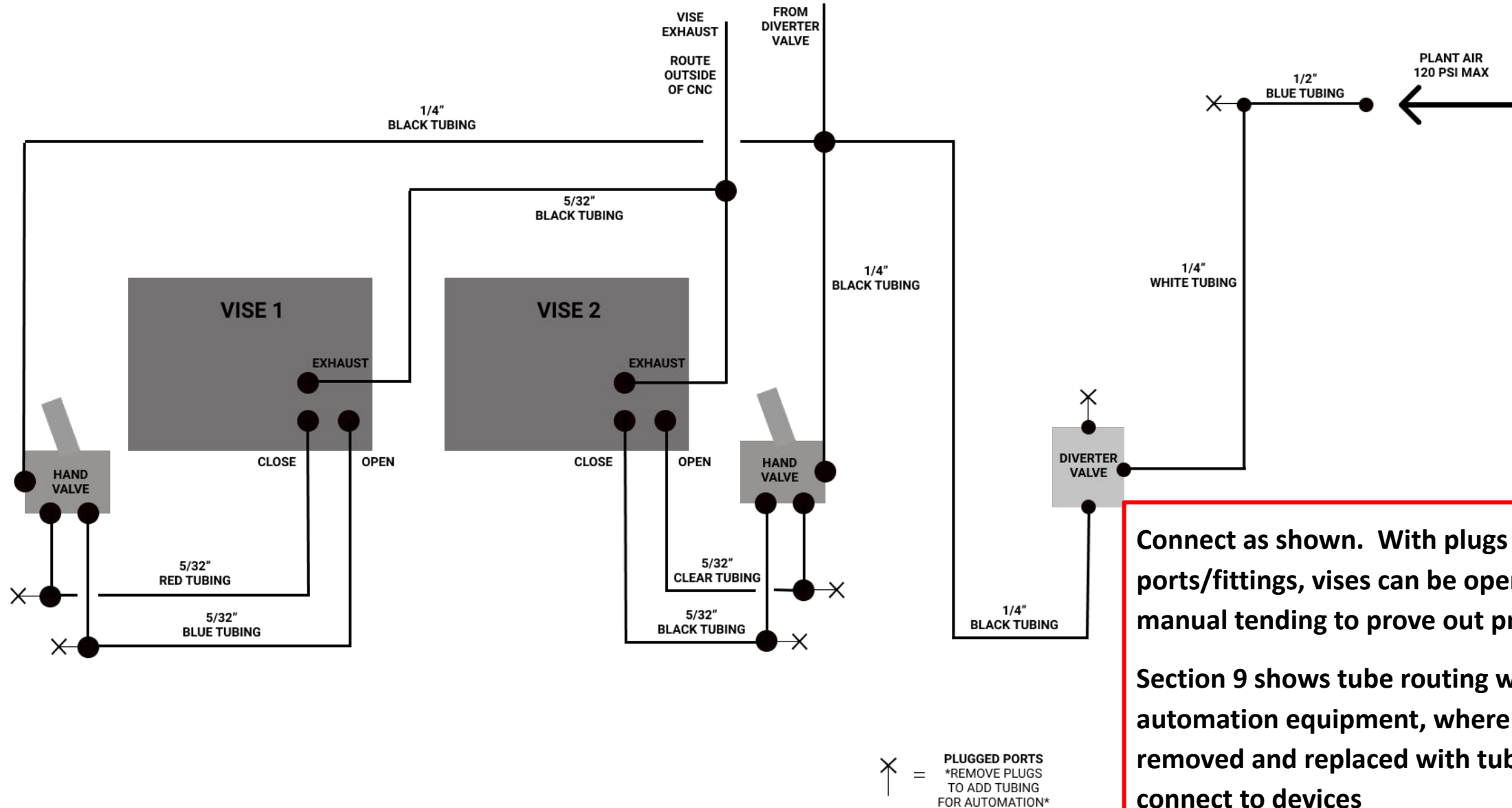


Manual Mode



Auto-Mode

Route Air Lines for Manual Operation of Vises



Connect as shown. With plugs in ports/fittings, vises can be operated for manual tending to prove out processes.

Section 9 shows tube routing with automation equipment, where plugs are removed and replaced with tubing to connect to devices

Route Air Lines and Vise Sensor Cable

- Connect vise sensor cable, from vise sensor kit, to pre-installed vise sensor on the back of each vise.
- Air lines 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

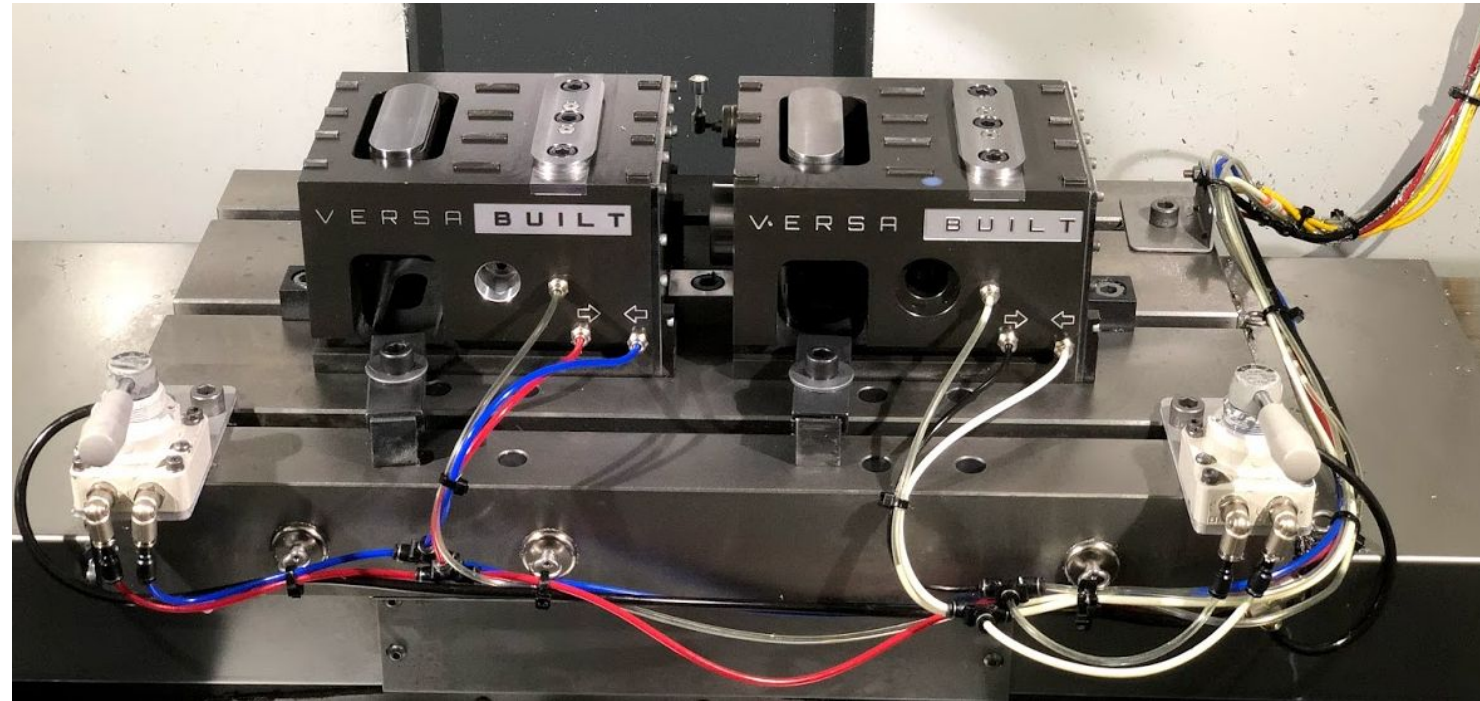


Image shown above includes tubing routed from VersaBuilt System Controller (VSC)

Prep Jaws and Manually Prove out CNC Process

- Refer to the Machinist Manual for guidance on implementation of MultiGrip Jaws
- Provided with the Mill Automation Kit:
 - QTY: 1 - Universal Op1 Jaws
 - QTY: 2 - MultiGrip OD Base Jaws
 - QTY: 2 - MultiGrip OD Top Jaws
- Machine pockets for jaws, mindful of the application as workholding as well as robot pick and place tool - see Mill Automation Kit - Machinist Manual
- Consider the jaw stroke and nominal clamp positions during pick. The gap between left and right jaws are:
 - OD jaws nominal machining gap = 0.125"
 - OD jaws max opening = 0.75" (~20mm)
 - ID jaws nominal clamp = 0.394" (10mm)

Proving out machining by manual loading is a critical first step to prove out workholding.

Once manual machining is proven, implement robot tending. This 2 step process separates variables and enables easier troubleshooting of issues that may arise.

Prior to installation of automation equipment, disconnect lines to plant pressure and discharge trapped air by toggling the manual vise valves until all air is exhausted.

VersaCart Assembly

Section 4

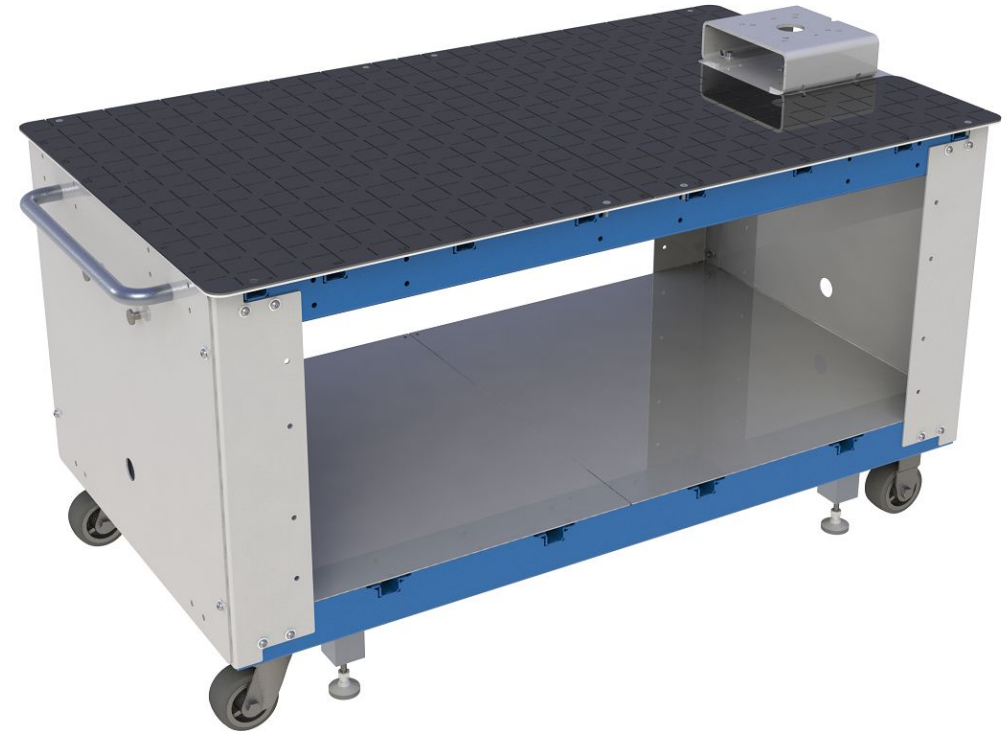
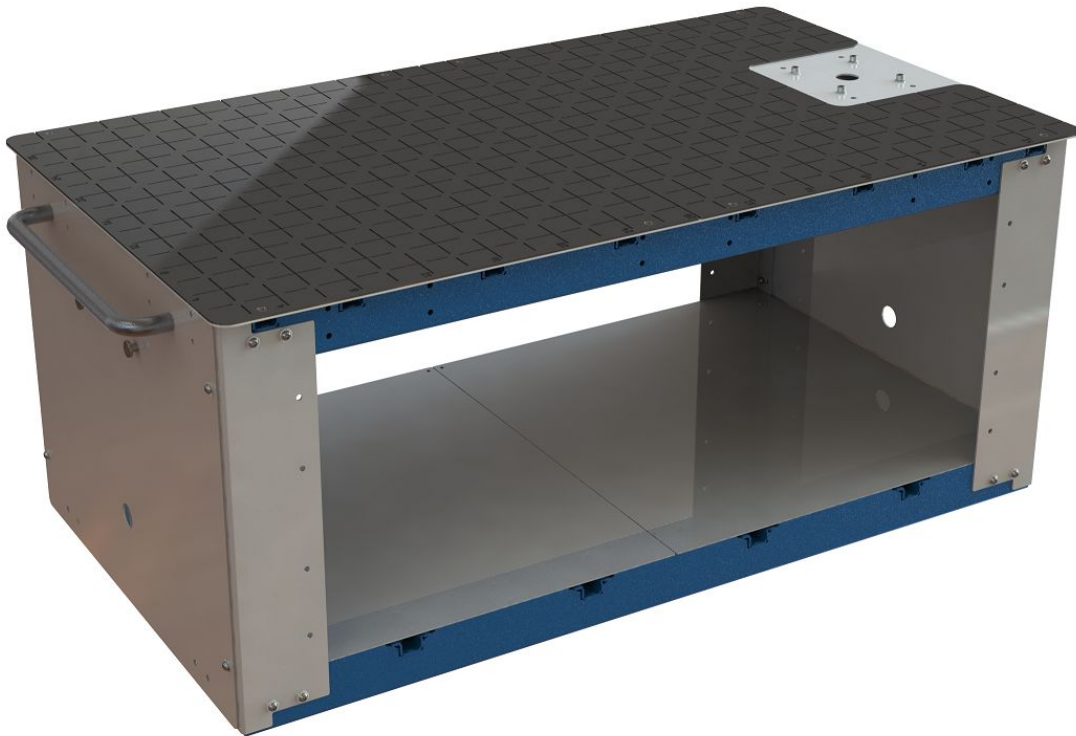
Install Robot Pedestal, Casters and Foot Pads

Tools:

- 5mm hex key
- 6mm hex key
- 15mm open-ended wrench
- 17mm open-ended wrench
- Medium Strength Threadlocker (e.g., Loctite)

Parts:

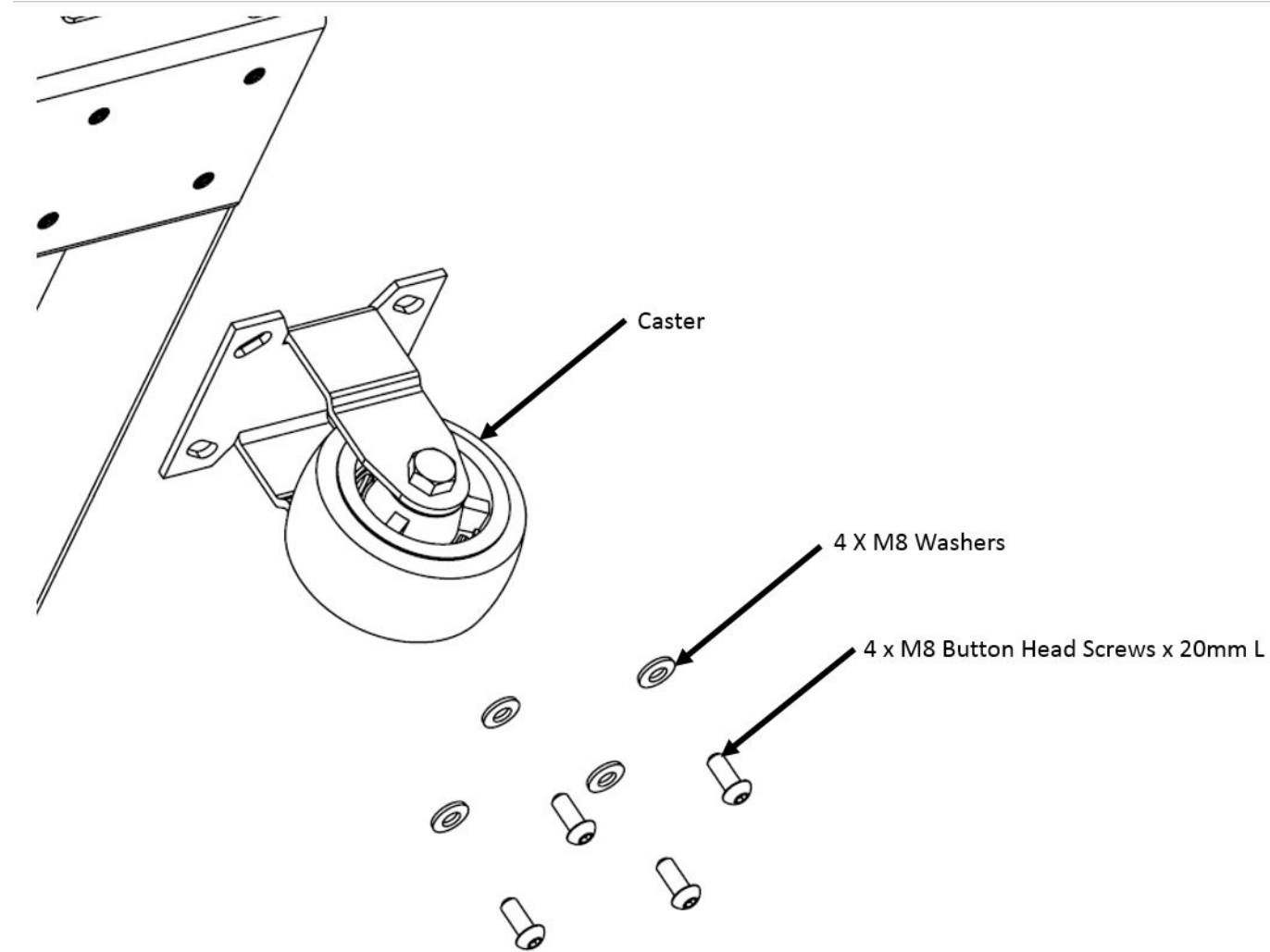
- Robot Pedestal with 4 x M8 Socket Head Screws x 45mm L and washers
- 4 x Casters with 16 x M8 Button Head Screws x 20mm L and washers
- 4 x Foot Pad assembly with 16 x M6 Socket Head Screws x 80mm L



Install Casters

Steps:

1. Position cart with access to bottom for caster and footpad installation, via one of the following methods
 - VersaCart on side
 - Lift VersaCart with pallet jack or forklift
2. Assemble 4 x Casters, noting the orientation:
 - Swivel casters on handle side of cart
 - Fixed casters on robot side of cart
 - Each caster is fastened with 4 x M8x1.25 BHCS x 20mm L and 4 x M8 washers

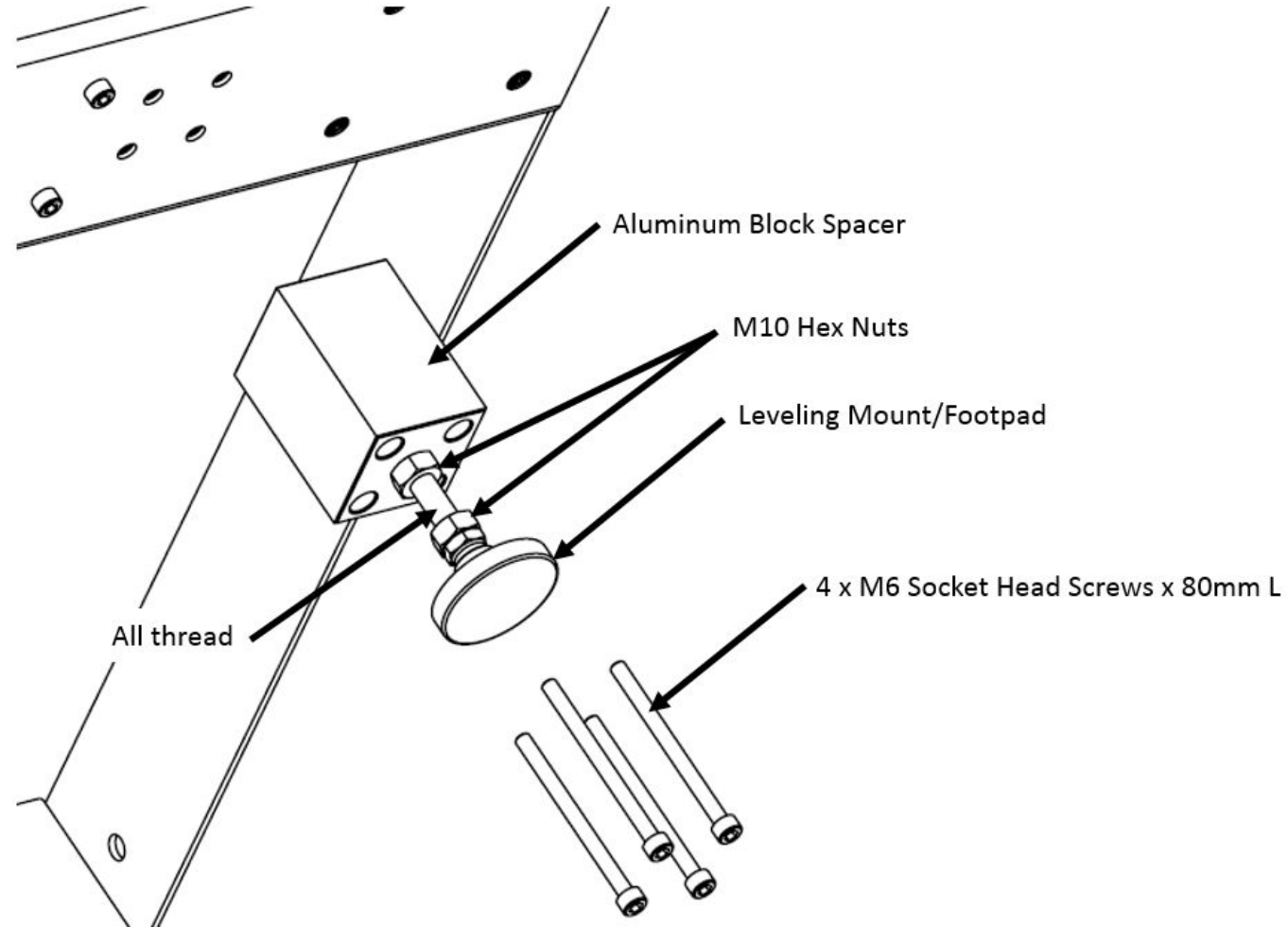


Install Foot Pads

Steps:

3. Assemble 4 x Footpads

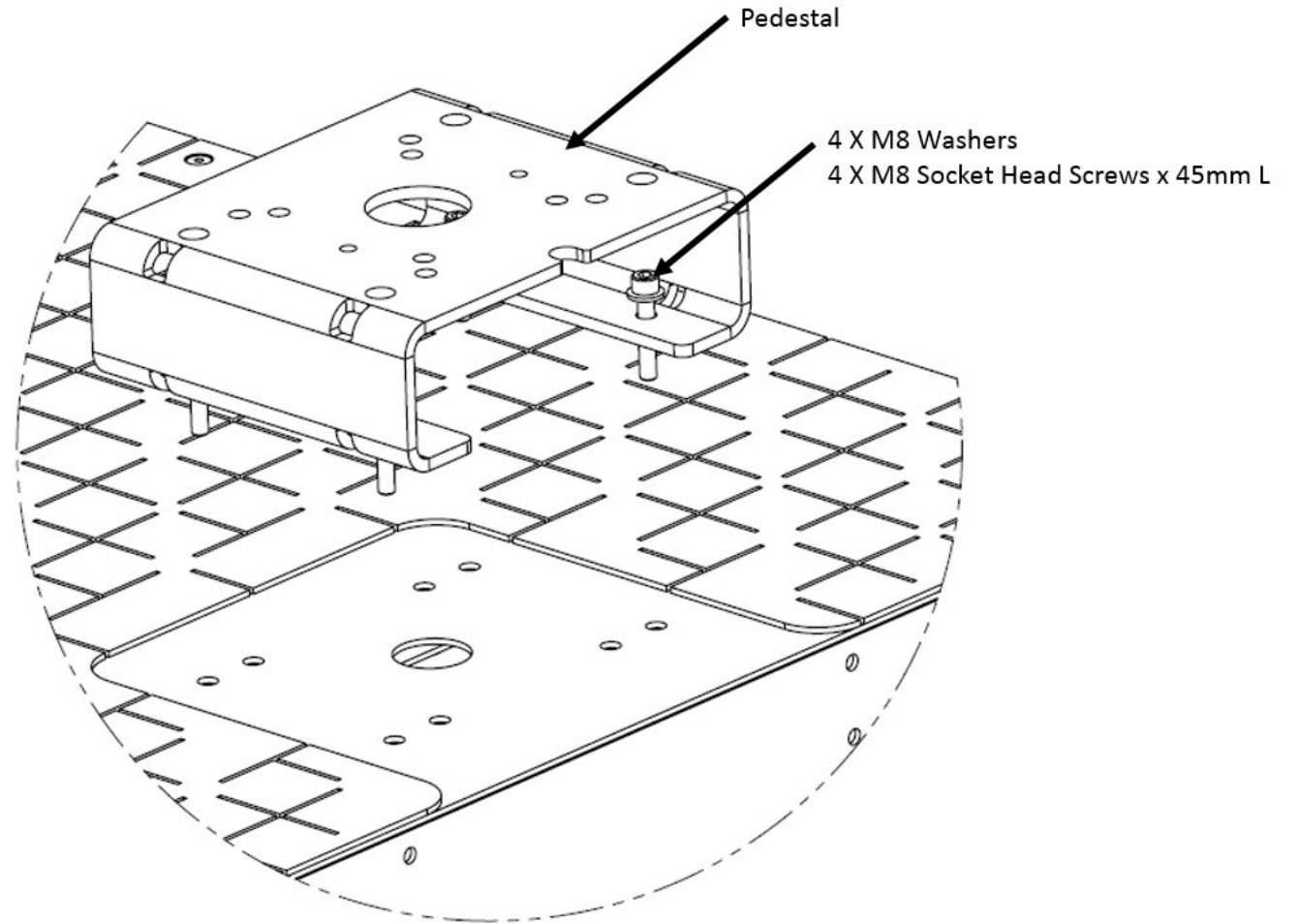
- Footpad assembly includes:
 - Aluminum block spacer with 4 x thru holes and M10 thread thru center
 - M10 all-thread
 - Leveling Mount/Footpad with M10 thread
 - 2 x M10 Hex Nuts
- Each footpad is fastened with 4 x M6x1.00 SHCS x 80mm L
- Adjust footpads such that the when placed on the ground, the weight of the cart is on the casters



Install Pedestal

Steps:

4. Position cart resting on 4 casters
5. Assemble Robot Pedestal to Cart top
 - Locate pedestal in open space on top of cart
 - Fasten with 4 x M8x1.25 SHCS x 45mm (with threadlocker) and 4 x M8 washers



Robot & MultiGrip FJ Gripper Installation

Section 5

Install Robot & MultiGrip FJ Gripper

Installation steps for Robot, MultiGrip FJ Gripper, routing gripper tubing along robot body and Robot configuration is robot model specific. Follow the instructions in the VersaBuilt Robot Installation manual.



VersaBuilt System Controller Installation & Configuration

Section 6

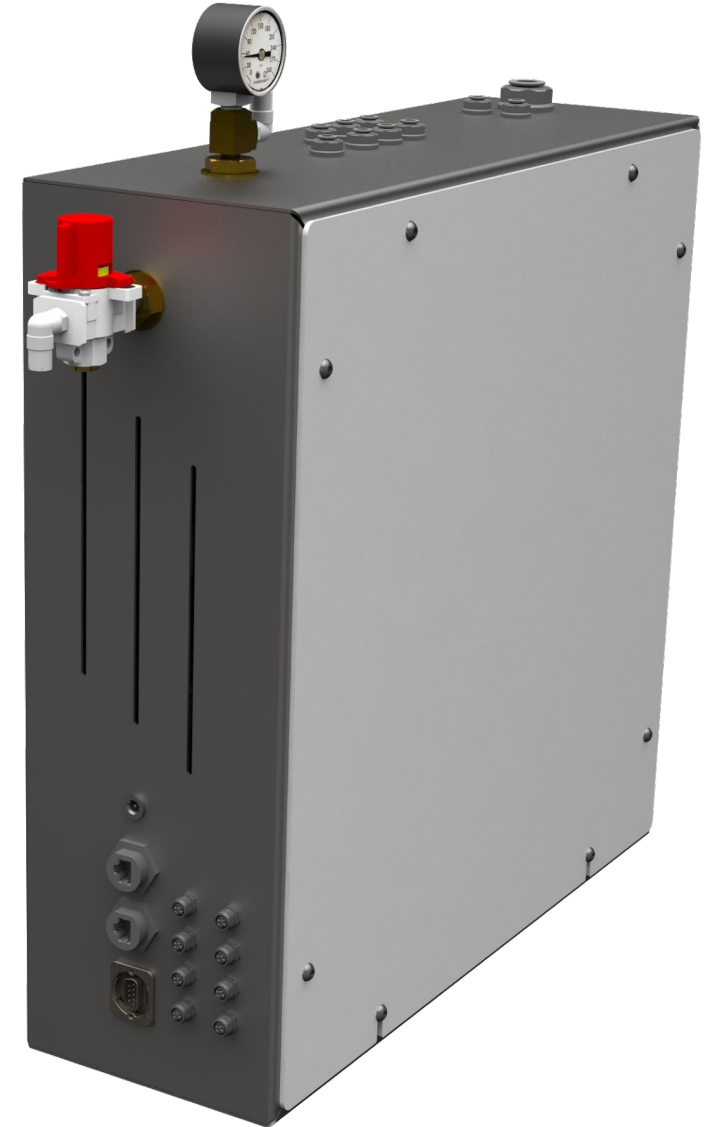
VersaBuilt System Controller (VSC) Parts and Tools

Parts:

- VersaBuilt System Controller (VSC)
- 5 Port Ethernet Switch
- 110 VAC to 24VDC Power Cable
- Cycle Start Cable
- 3-Foot Ethernet Cable
- 2 x 25-foot Ethernet Cables
- Shut-off valve assembly
- Pressure Gauge
- DIN Rail with mounting hardware
- Adhesive-back Rubber Pad
- 4 x 1/4" to 5/32" reducer fittings
- VSC Enable Button with magnetic mount and I/O cable (connecting to B2)

Tools:

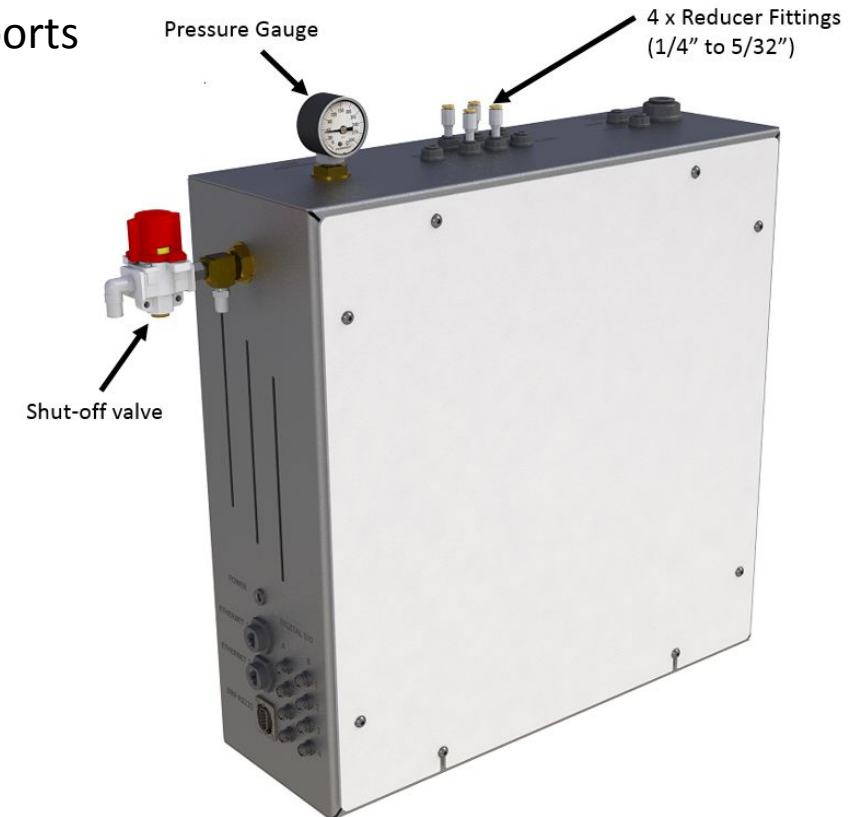
- Tape Measure
- Level
- Hand Drill
- 0.22" (7/32") or equivalent drill bit
- 3mm Hex Allen Key
- 8mm open-end wrench
- 9/16" open-end wrench
- 7/8" open-end wrench



Assemble VersaBuilt System Controller

Steps:

1. Assemble components to panel
 - Shut-off valve assembly
 - Pressure Gauge
 - Insert 6 x 5/32" to 1/4" reducer fittings in Vise 1 & 2, Gripper Open/Close ports



Position and Mount VersaBuilt System Controller

Steps:

2. Determine Mounting locator for panel

- Side of CNC
- Top of CNC
- Wall or Racks near CNC

*Optimal location is near the right side of the CNC within 10 feet of front of CNC

*Power cable requires 110 VAC outlet

*5 Port Ethernet switch connects to VersaBuilt System Controller with 3-foot Ethernet cable



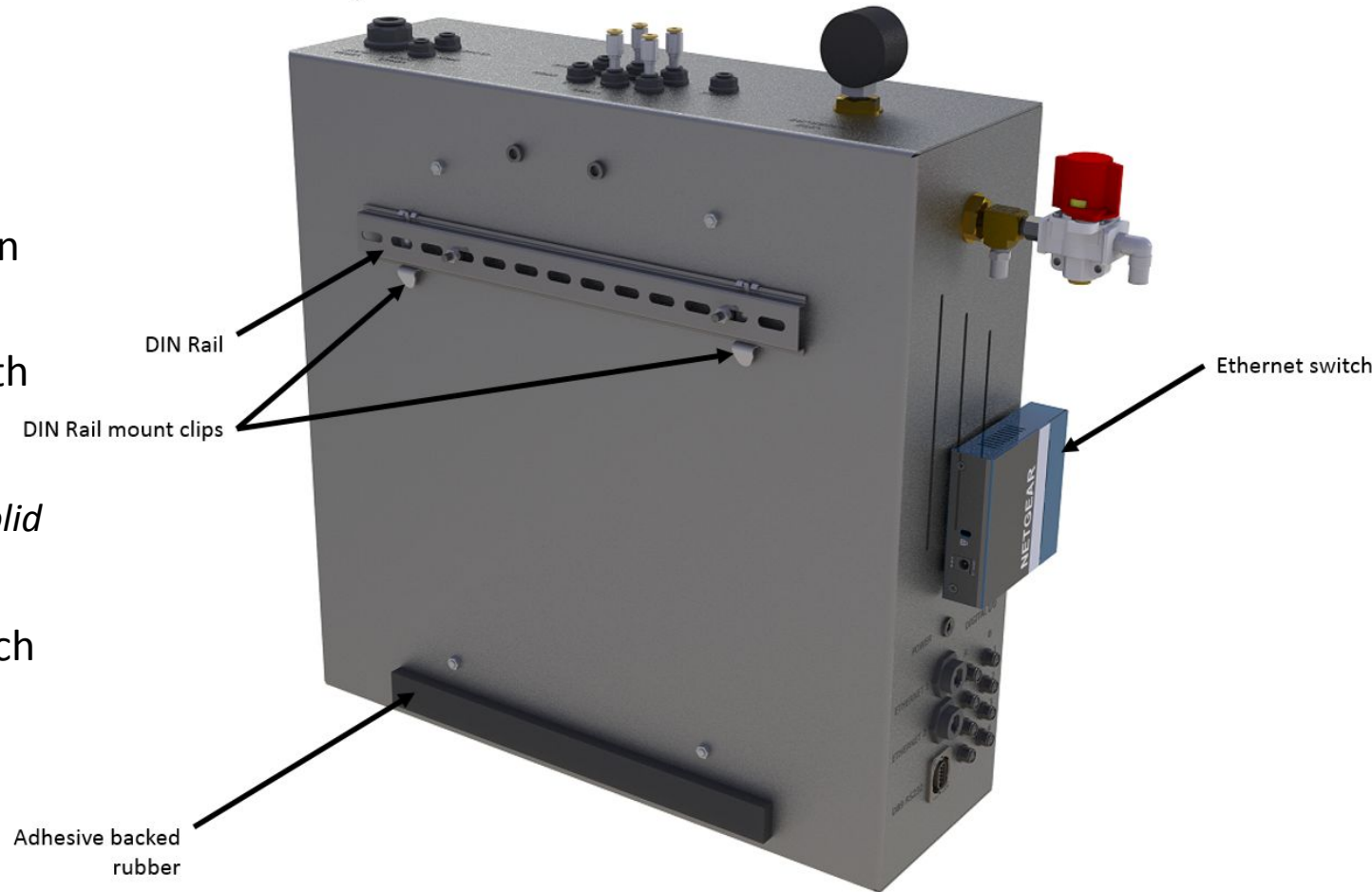
Position and Mount VersaBuilt System Controller

Steps:

3. Install DIN rail with supplied M5 screws or with traditional fasteners (not included) thru clearance slots, 0.23" wide
4. Attach adhesive backed rubber, with most common location shown in image to the right
5. Secure VersaBuilt System Controller to DIN Rail with DIN Rail Clips pre-installed on panel

Attach VersaBuilt System Controller to DIN Rail **verify solid attachment*

6. With adhesive backed velcro, attach Ethernet switch
7. Connect supplied Ethernet cable (3-ft length) from Ethernet Port 1 to Ethernet Switch
8. Connect power supply
9. Connect VSC Enable Button cable to Digital I/O connection B2



Connect to the VSC

Configure Robot for VSC (robot dependent)

Some robots require a VersaBuilt program to be run on the robot's teach pendant or the robot to be put in a special mode for the VSC to be able to control the robot.

Check the **VersaBuilt Robot Installation, Configuration and Operation** manual that matches your robot make and model for additional steps required to enable operation with the VSC.

Open the VSC Home Page

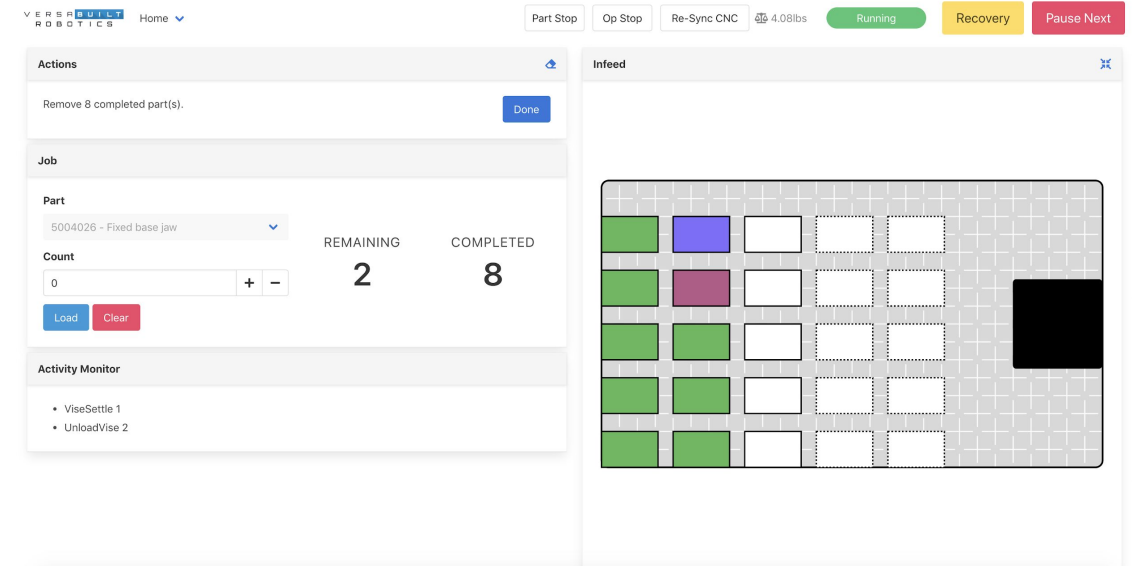
The VSC is accessed by a phone, tablet or computer.

Using a phone, tablet or computer, open the VSC web page using the following address:

192.168.4.1:9000 for Wifi connected devices

192.168.2.1:9000 for Ethernet connected devices

*For more information on how to configure the device networking to access the VSC, see the VSC Mill Operators Manual.



Wifi connection is vsc + serial number (e.g., vsc00125)
Wifi password = versabuilt

Configure VSC System Settings

Navigate to the Settings Page

Click on the Navigation down arrow and select Settings. Press the Edit System Settings button at the bottom of the page. Edit the System Settings to match the configuration of your system (see following pages for descriptions of each setting)

V E R S A **B U I L T** R O B O T I C S Settings ▾

Part Stop Op Stop Re

Main System Settings	
Setting	Value
Units	Imperial
Infeed Template	UR10
CNC Dispatcher Program	9000
Default CNC Wash Program	8001
Vises	2
Robot	Sim
Robot IP	192.168.2.2
CNC	Sim
CNC IP	192.168.2.3
IO	Sim
CNC Door Controller	VBX Controlled Autodoor
Vise Mode	Sim
Ignore Gripper Sensors	false
Ignore Vise Sensors	false
Ignore Door Sensors	false
Door Wait Time	7000
Remote Support Token	Not yet configured

VSC Main System Settings

Units: Choose imperial or metric units to be used in the VSC

Infeed Template: Select based on the type of robot installed in the system

CNC Dispatcher Program: CNC Dispatcher program number, 9000 by default (Haas and Fanuc CNCs only)

Default CNC Wash Program: CNC wash program number, 8001 by default

Vises: number of CNC vises installed

Robot: Select the type of robot installed in the system

Robot IP: IP address of the robot, 192.168.2.2 by default

CNC: Select the type of CNC control the VSC is connected to

CNC IP: IP Address of the CNC (not applicable for Haas Legacy or Generic), 192.168.2.3 by default

IO: IO driver for the VSC; typically I2C, Sim can be used for testing purposes

CNC Door Controller: Select one of VSC Controlled Autodoor or CNC Controlled Autodoor

NOTE: a CNC Controlled Autodoor must be configured to automatically close on CNC Cycle Start and Open on CNC Cycle End

VSC Main System Settings

Vise Mode: normally IO mode is selected; Sim mode can be used for testing purposes

Ignore Vise Sensors: set to true if vise sensors are not installed

Ignore Door Sensors: set to true if VersaBuilt door sensors are not installed

Door Wait Time: For CNC Controlled Autodoor:

If Ignore Door Sensors is true, the amount of time the VSC will wait after the Cycle End signal is received before proceeding

Door Wait Time: For VSC Controlled Autodoor:

If Ignore Door Sensors is selected, the amount of time the VSC will wait after commanding a door open or door close before proceeding

If Ignore Door Sensors is not selected, the amount of time the VSC will wait after commanding a door open or door close before generating an error

NOTE: without door sensors, the robot will try to move into the CNC even if the CNC door did not open successfully

Configure the VSC Network Settings

Navigate to the Network Settings Page

Click on the Navigation down arrow and select Network Settings.

Network Settings Overview

VersaBuilt recommends keeping the default Ethernet settings, keeping the Access Point enabled and configuring the VersaBuilt System Controller (VSC) to access the Internet via a local Wifi network. VSC Internet access is optional and allows VersaBuilt technical support to access the VSC remotely when the Remote Support option is enabled from the About page of the VSC.

Alternatively, the VSC may be connected to the corporate network. In this configuration, the VSC, CNC and Robot should all be assigned IP addresses that will not change and the Gateway parameter should be set to the corporate Internet router IP address. Consult an IT specialist familiar with the corporate network for proper custom network configuration.

The screenshot displays the 'Network Settings' page of the VersaBuilt System Controller. The page is divided into three main sections: Ethernet, Wifi, and Access Point. The Ethernet section shows the 'eth0' interface with fields for DHCP (unchecked), IPv4 Address (192.168.2.1), Gateway (192.168.2.1), and DNS Servers (8.8.8.8). There is a checkbox for 'Disable IPv6' which is checked, and 'Save' and 'Reboot' buttons. The Wifi section shows a dropdown for 'Wifi Networks' with 'Rekluse Public' selected, and 'Save' and 'Reboot' buttons. The Access Point section has a description and a 'Disable' button. On the right, a 'Current Network Settings' panel lists the active configuration for each interface.

Current Network Settings	
Interface:	eth0
MAC:	b8:27:eb:68:e5:4e
IPv4:	192.168.2.1
Subnet Mask:	255.255.255.0
IPv4 Broadcast:	192.168.2.255
IPv6:	fe80::ba27:ebff:fe68:e54e
Up:	true
Broadcast:	true
Running:	true
Multicast:	true
Interface:	uap0
MAC:	b8:27:eb:3d:b0:1b
IPv4:	192.168.4.1
Subnet Mask:	255.255.255.0
IPv4 Broadcast:	192.168.4.255
IPv6:	fe80::ba27:ebff:fe3d:b01b
Up:	true
Broadcast:	true
Running:	true
Multicast:	true
Interface:	wlan0
MAC:	b8:27:eb:3d:b0:1b
IPv4:	192.168.155.178
Subnet Mask:	255.255.255.0
IPv4 Broadcast:	192.168.155.255
IPv6:	fe80::cbd5:a12:b357:8c2
Up:	true
Broadcast:	true
Running:	true
Multicast:	true

VersaBuilt System Controller CNC Installation

Installing CNC portion of the VersaBuilt System Controller (VSC) is CNC dependent. Follow the instructions in the VersaBuilt System Controller CNC Installation and Operation Manual to complete the VSC to CNC installation.



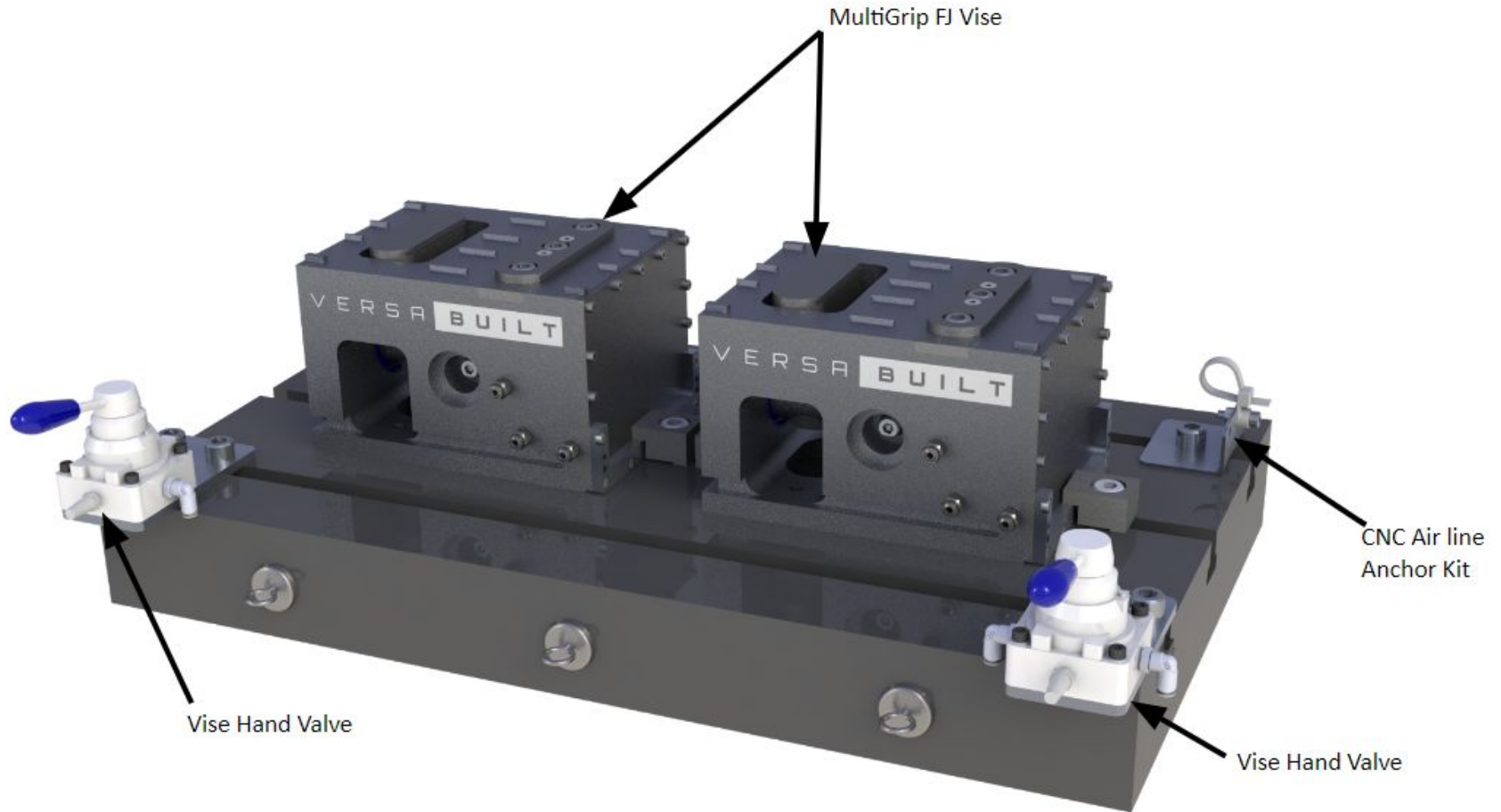
MultiGrip FJ Vise Installation

Section 6

MultiGrip Vises and CNC Components

Steps:

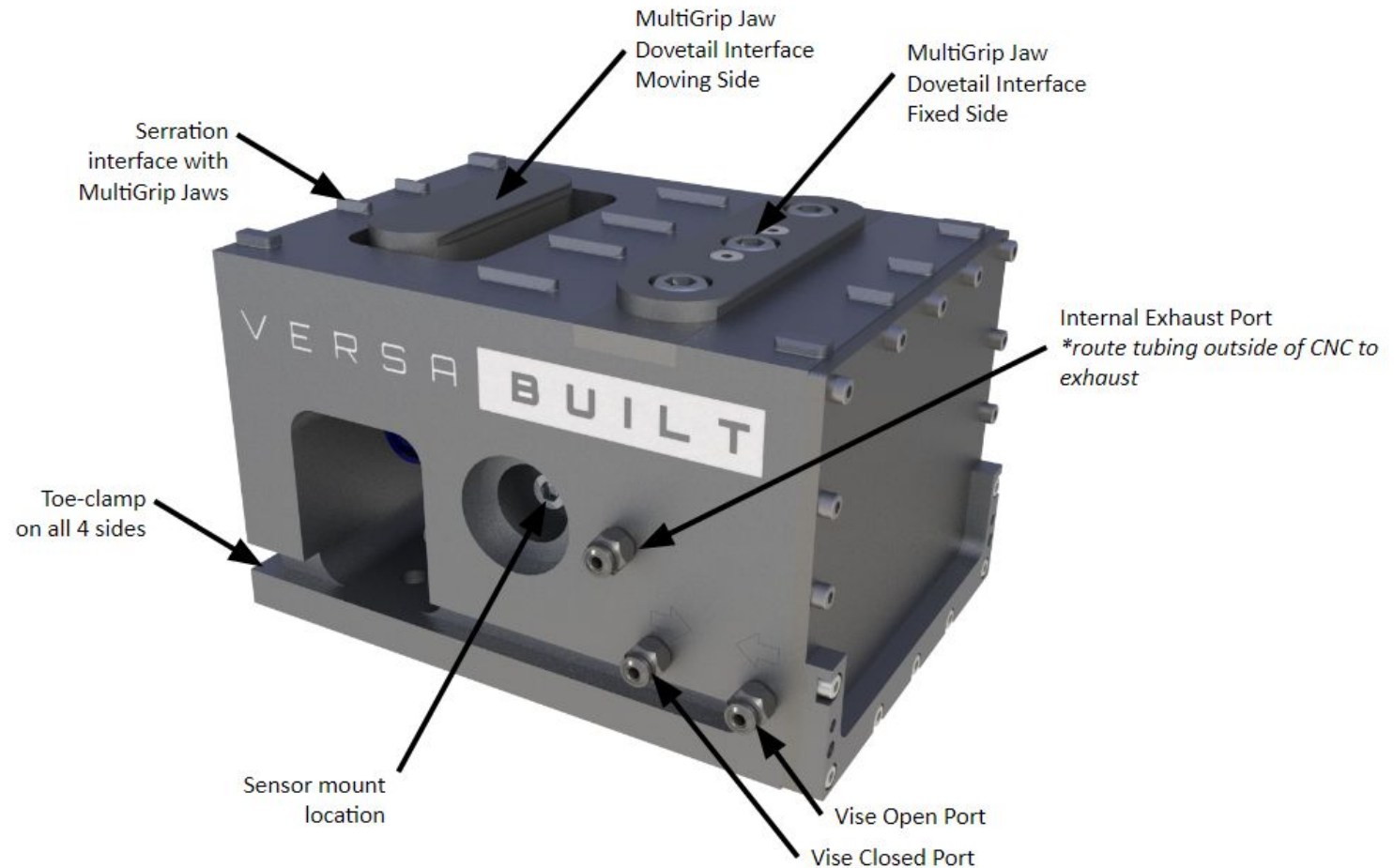
1. Install Vise Sensors
2. Install Vises in CNC
3. Alignment and Tramming
4. Install Hand Valves
5. Install CNC Air line anchor kit
6. Install Diverter Valve



MultiGrip FJ Vise Overview

The MultiGrip FJ Vise includes the following features:

- $\frac{1}{8}$ NPT ports, 3 per side
 - Plug un-used side
 - Vise Open
 - Vise Closed
 - Internal Exhaust Port
- Sensor mount, front and back available
 - Only 1 sensor required
 - Plug un-used side with supplied hardware
- Toe-clamp feature around vise
- MultiGrip Jaw interface features
 - Fixed dovetail
 - Moving Side dovetail
 - Serrations
- Clamp with both OD and ID MultiGrip Jaws



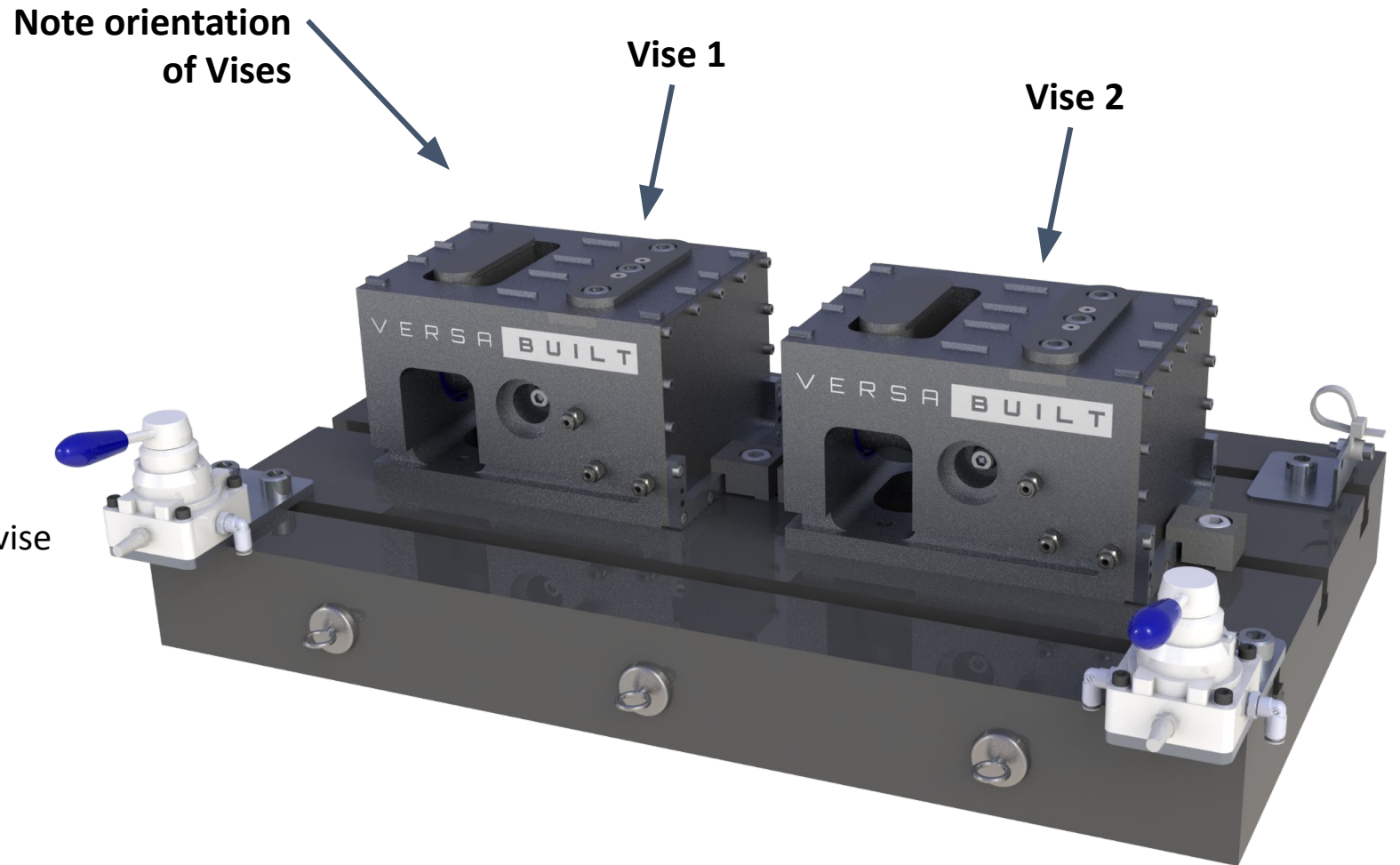
MultiGrip FJ Vise Installation

Tools:

- 13mm wrench
- 3/8" Hex Key
- Torque wrench
- Tape Measure
- Spindle mount dial indicator

Parts:

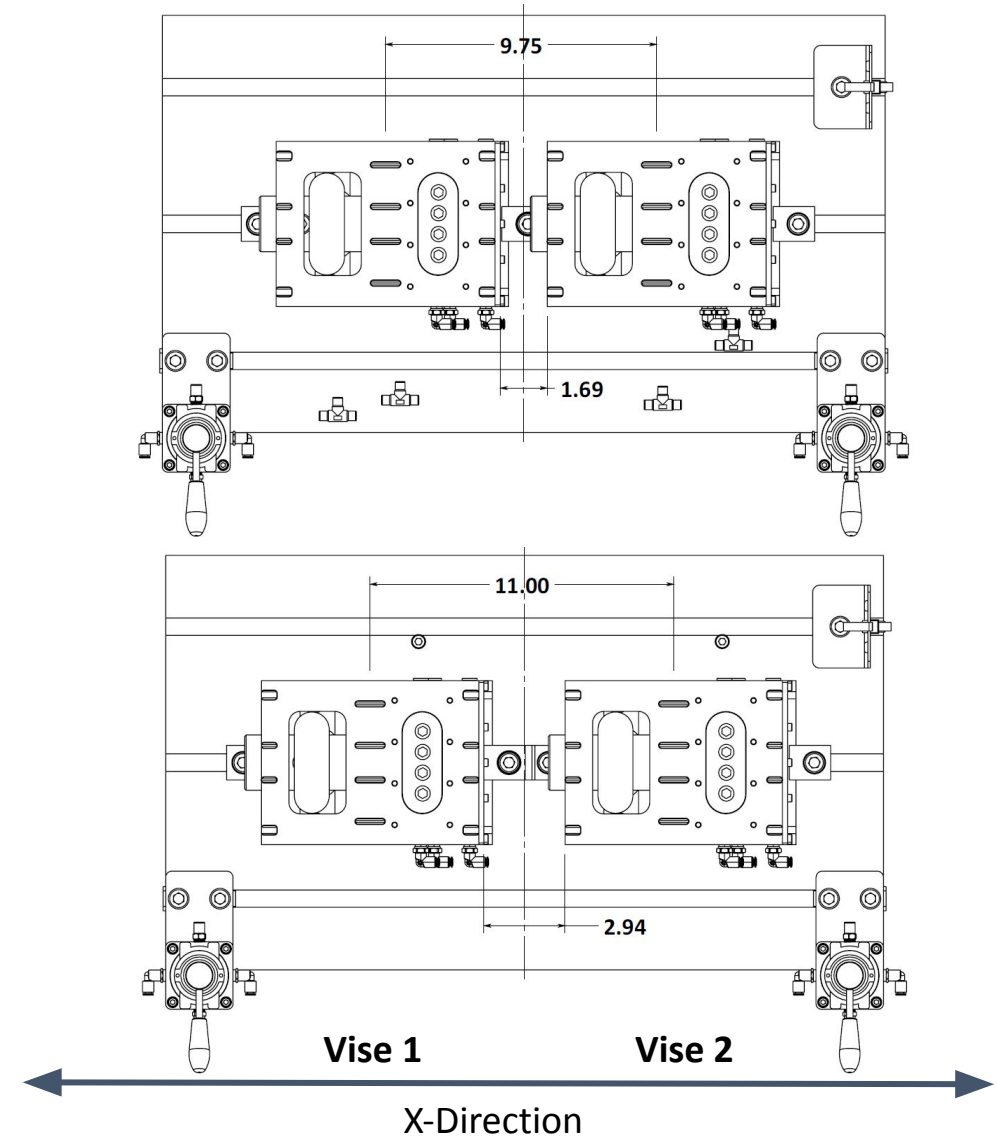
- 2 x MultiGrip FJ Vises
- 2 x L-Mount Clamps
- 1 x T-Mount Clamp
- 2 x 0.50-13 Socket Head Screw x 1.25" L per vise
- 2 x 0.50-13 T-Nut per vise
- 3 x 5/32" x 1/8 NPT fittings per vise



MultiGrip FJ Vise Installation

Vise installation & tramming steps:

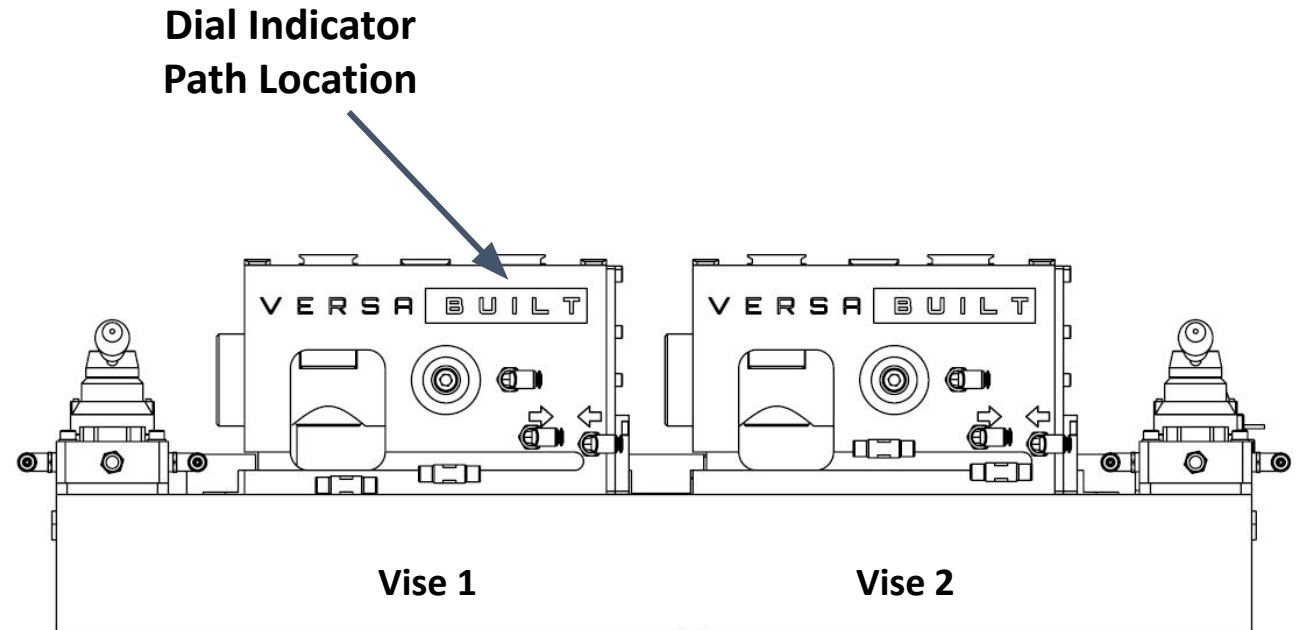
1. Attach 5/32" fittings with 13mm wrench
2. Wipe down CNC table, clean and free of debris
3. Wipe down bottom side of vise, clean and free of debris
4. Measure CNC table center and mark
5. Vise Spacing:
 - a. For CNCs with X travel less than 22": Center of vises are spaced 9.75" on center or with 1.69" 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
6. Place Vise 1 on Table
7. 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
8. Place Vise 2 on Table
9. Insert Side-Clamps on sides of vises
10. Loosely clamp vises in place



MultiGrip FJ Vise Trimming

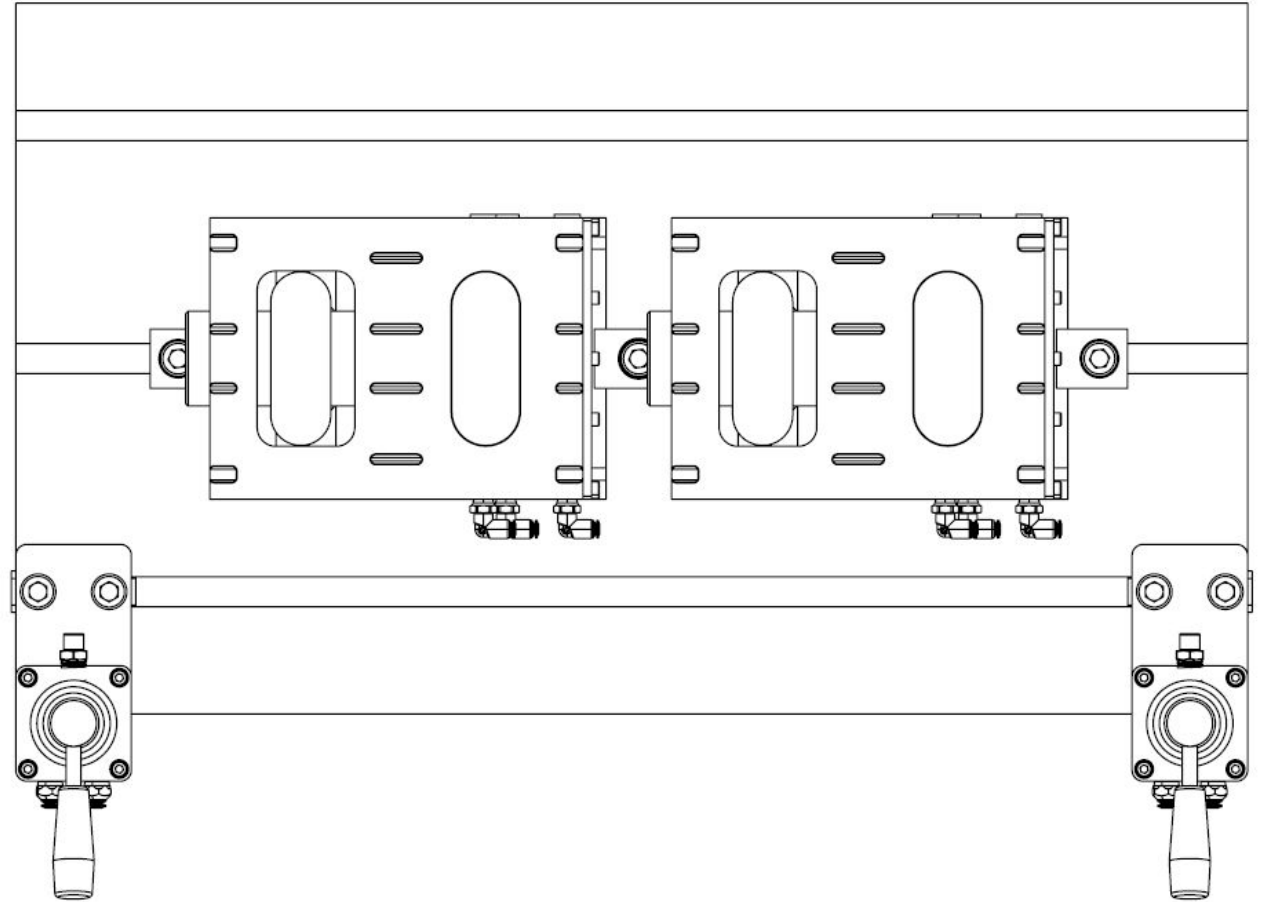
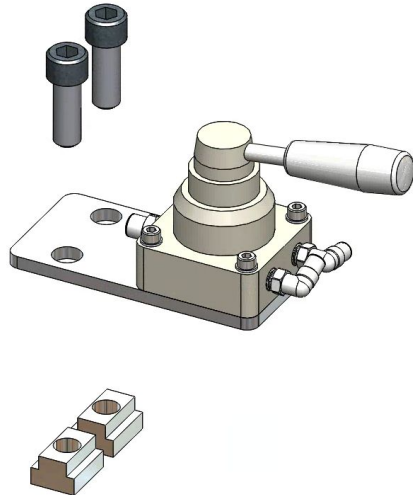
Vise installation & trimming steps:

11. Install spindle mount dial indicator
12. Engage dial indicator with vises on the front surface, above the engraved VersaBuilt logo
13. Move Table/Spindle relative to each other in the X-direction, aligning the front of each vise with the X-axis of the machine
14. Adjust position of vises as needed and re-measure with dial indicator
15. Lock down position of vises with clamps, with T-nuts and 0.50-13 Socket Head Screws, **tightening to 118 ft-lbs of torque**



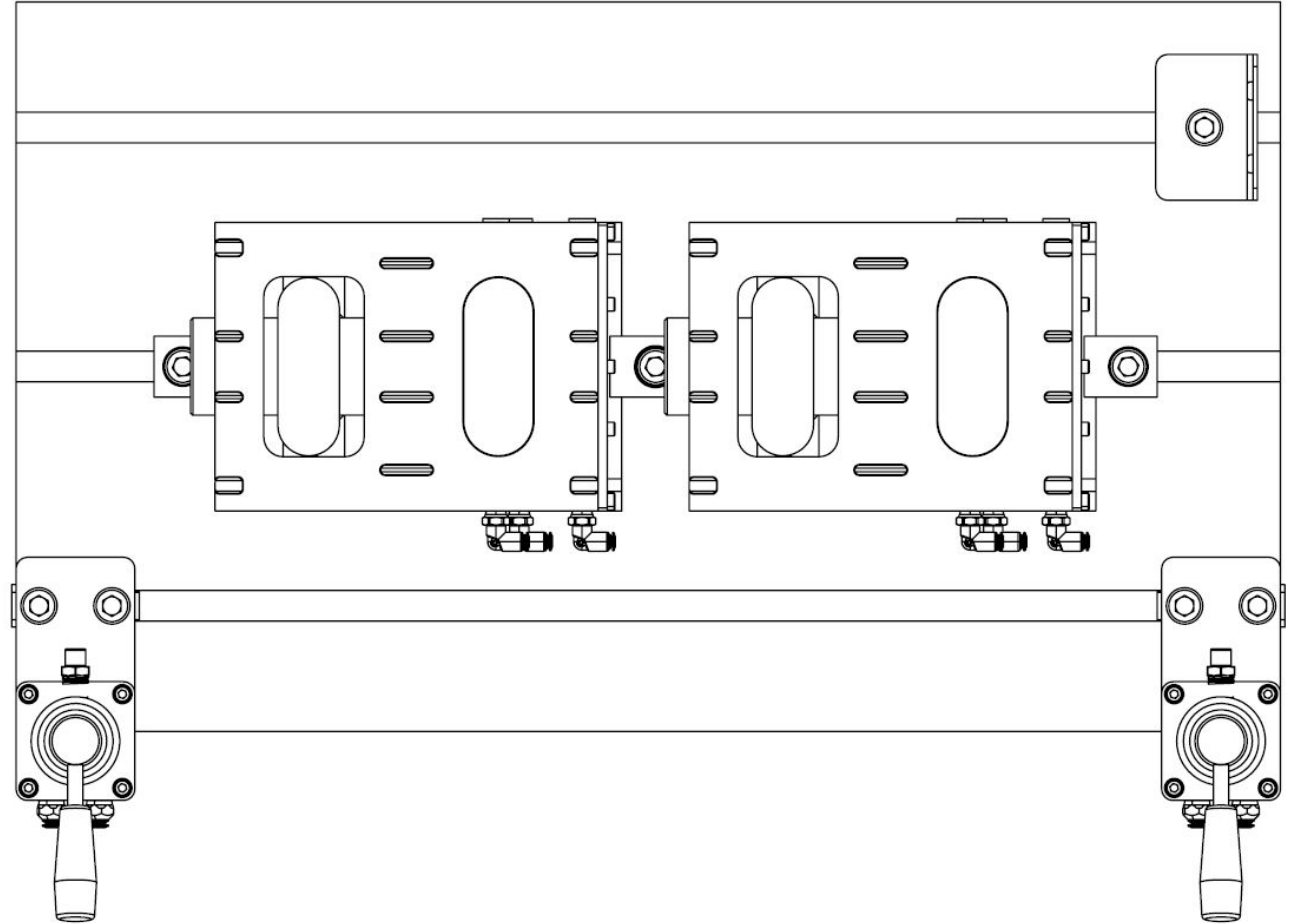
Attach Hand Valves to CNC table

- Each hand valve includes the following hardware:
 - 2 x 0.50" Socket Head Screw x 1-3/8" L
 - 2 x 0.50" T-Nuts
 - Valve mounted to base plate
- The image to the right shows a convenient location for attaching the hand valves to the CNC table **Routing and connecting air lines is shown in Section 9*



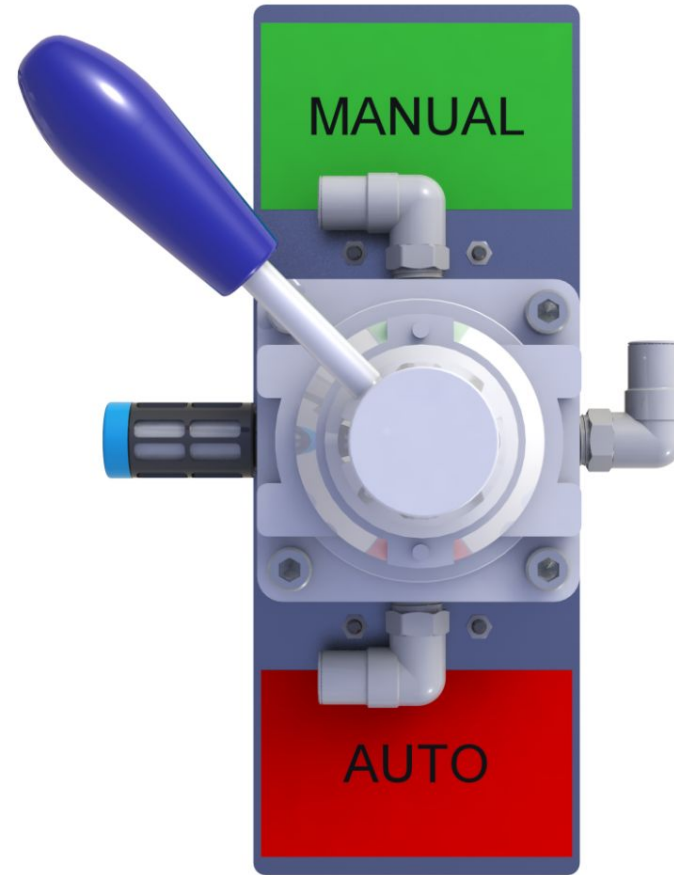
Attach CNC Air Line Anchor kit to CNC table

- The purpose of the CNC Air Line Anchor Kit is to provide a routing anchor and strain relief for pneumatic tubing and signal cables
- Each CNC Air Line Anchor kit includes the following hardware:
 - 1 x 0.50" Socket Head Screw x 1-3/8" L
 - 1 x 0.50" T-Nuts
 - Mount bracket
 - 3 x screw mount cable ties
 - 3 x M6 Socket Head Screws x 20mm L
 - 3 x M6 Hex Nuts
- The image to the right shows a convenient location for the anchor kit (back right corner)

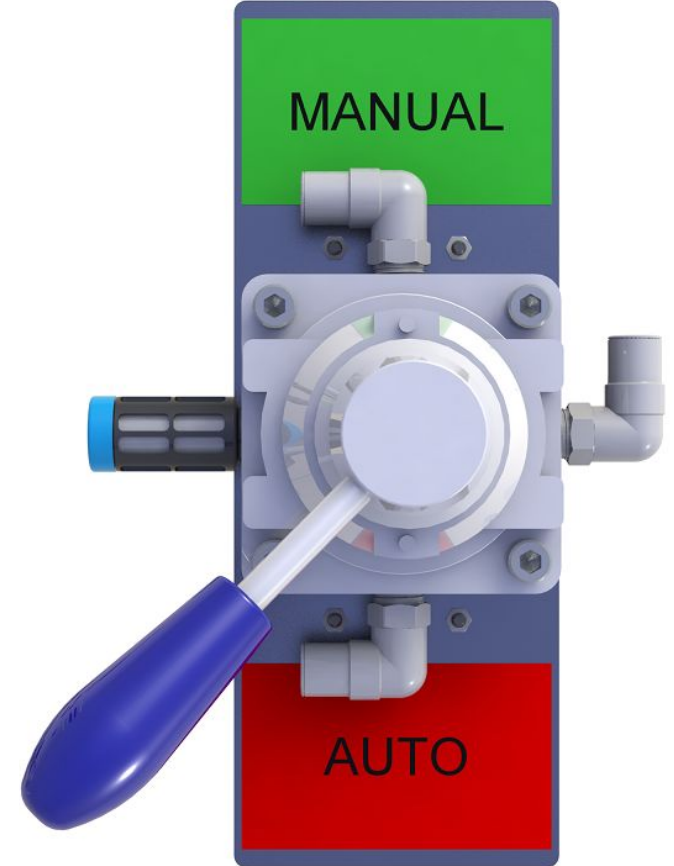


Install Diverter Valve

- 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 exhausted. When in Manual Mode, air to the VersaBuilt System Controller is exhausted.
- 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.



Manual Mode



Auto-Mode

VersaBlast Installation

Section 7

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*



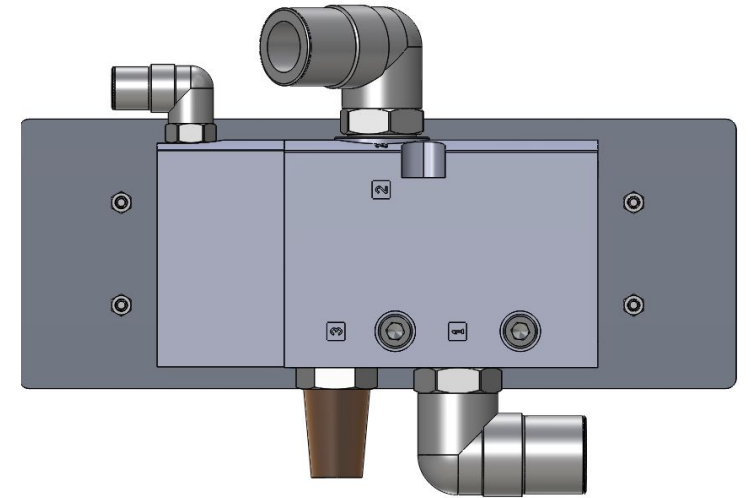
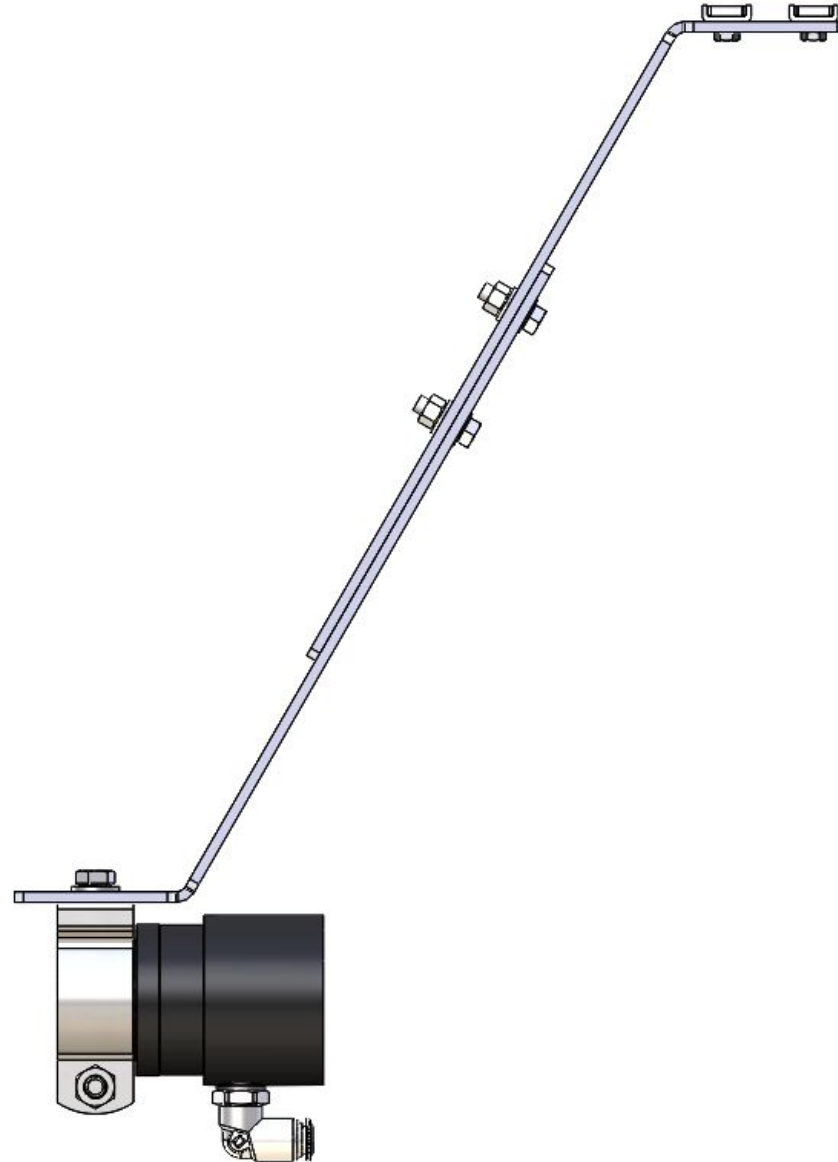
Position and Secure VersaBlast in CNC

Tools:

- 2 x 8mm Wrenches
- 1 x 10mm Wrench
- 0.25" Hex Key
- Bench top vise (to bend b

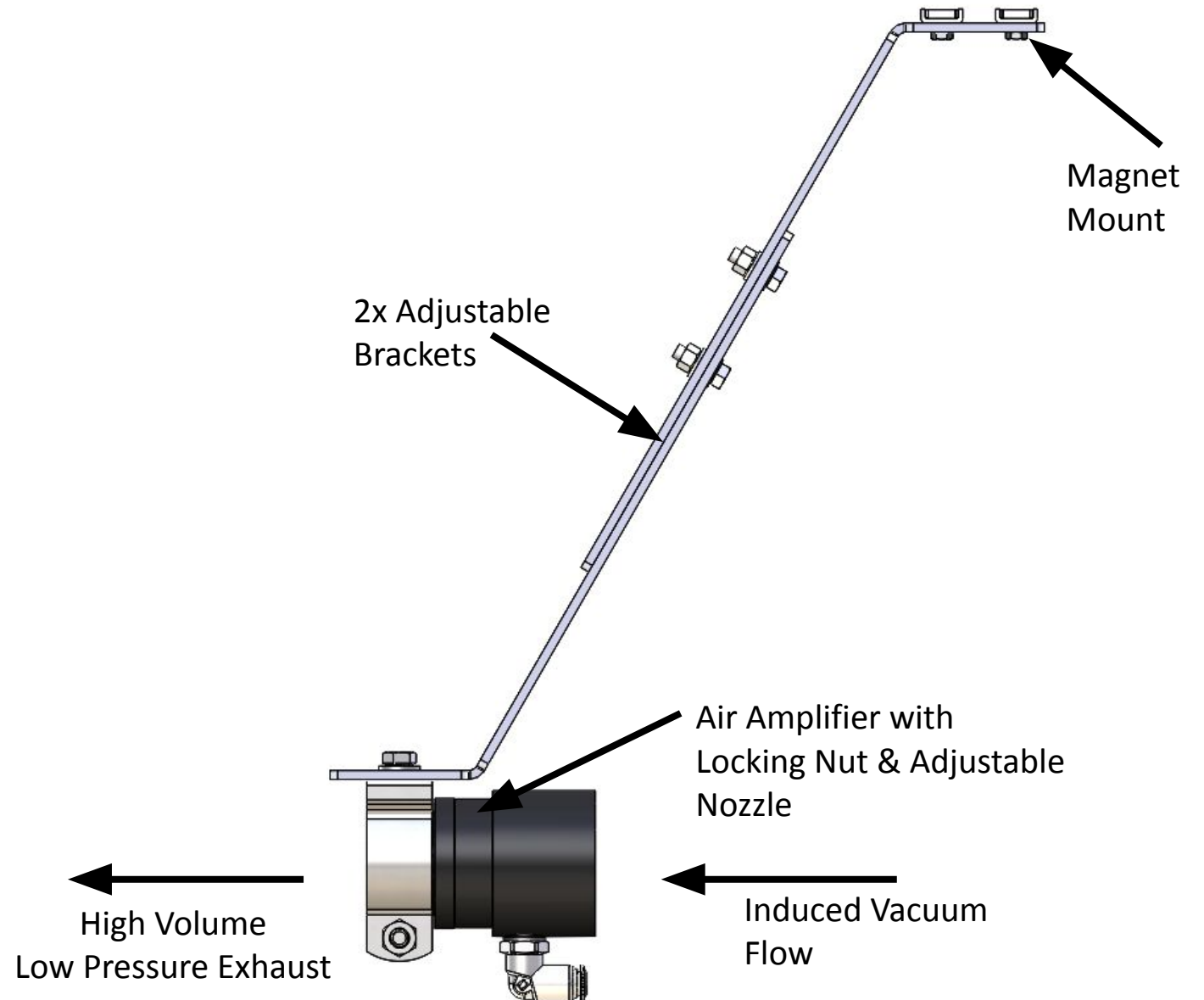
Parts:

- VersaBlast Kit
- VersaBlast Valve Assembly



Position and Secure VersaBlast in CNC

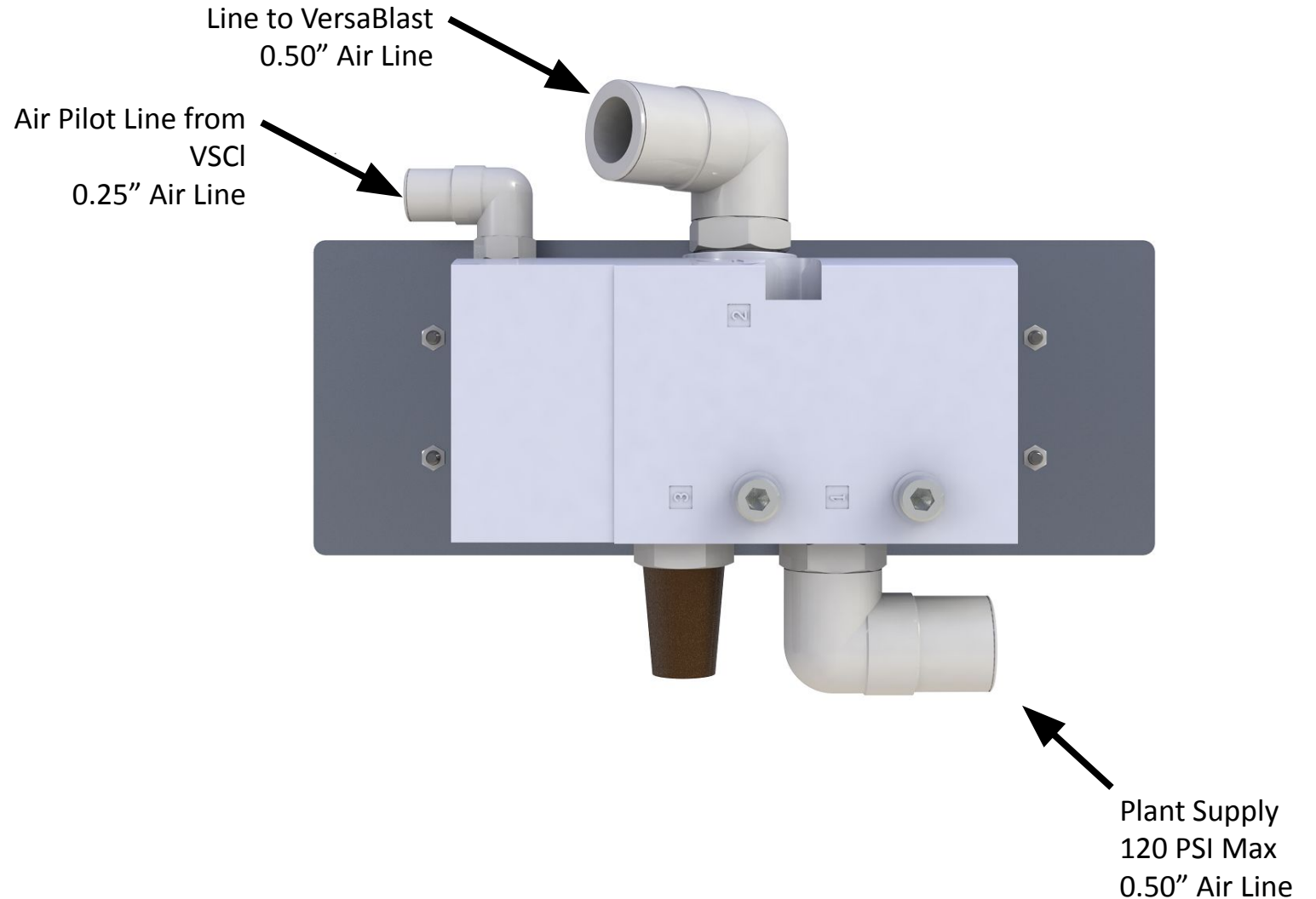
- The VersaBlast air amplifier is mounted on an assembly of 2 adjustable brackets and an adjustable blower bracket.
- By default, the assembly is located with magnet mounting. *Holes are also available for bolt or riveting (0.1875" clearance holes)*
- The angle is adjustable by revising the bend, as the bracket has bend relief cuts to aid manual bending.
- For optimal flow: connect compressed air to amplifier fitting, tighten-down nozzle, then slightly back-off nozzle to maximum flow and tighten with nut
- Included with VersaBlast kit is ¼" air line with adapter fittings to ½" size. Connect ½" line, provided in Mill Automation Tubing Kit, to Air Pilot Valve. To increase flow, ¼" tubing can be cut to shorter length.



VersaBlast Air Pilot Valve

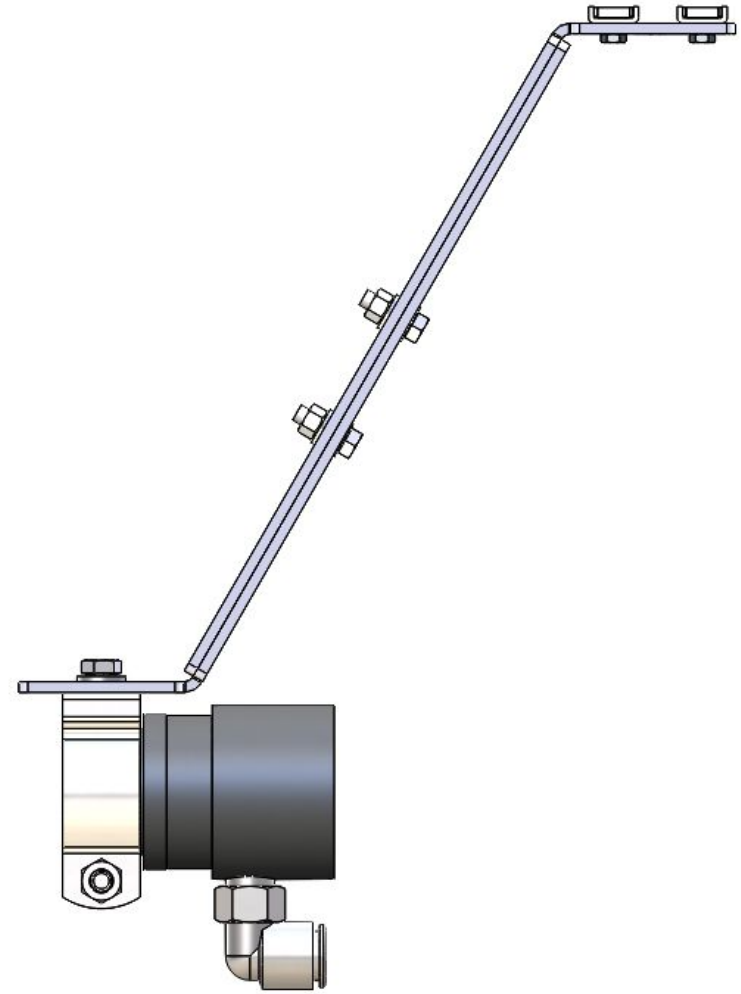
Air Pilot Valve Assembly:

- Place valve assembly on side or on top of CNC
- Refer to Section 10 for tube routing information, with the following tubing required:
 - 0.50" Line from Plant Supply to #1 Port
 - 0.25" Line from VersaBuilt System Controller VersaBlast port to Air Pilot Port
 - 0.50" Line from Port #2 to VersaBlast



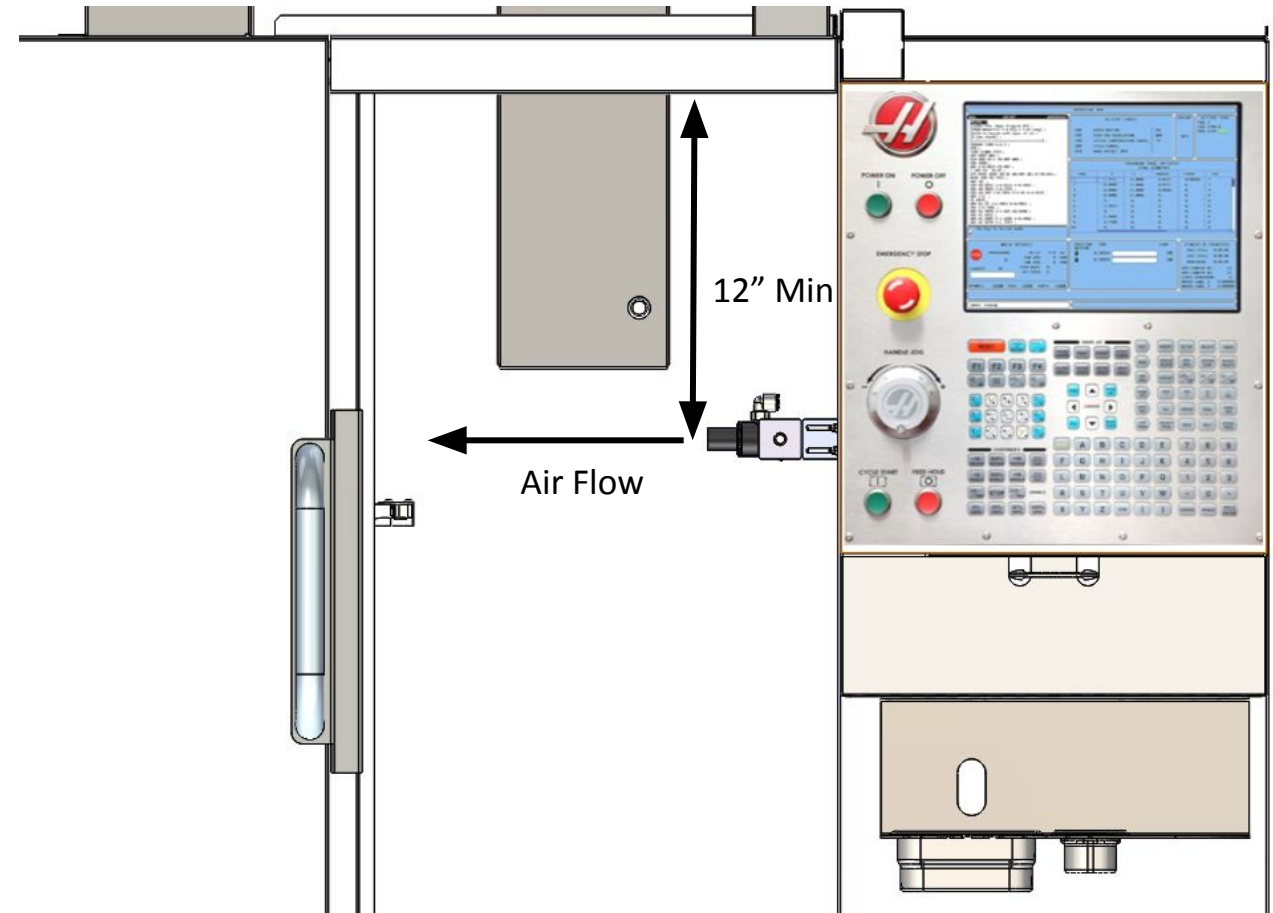
Position and Secure VersaBlast in CNC

- Adjustments and modifications to the bracket assembly are available
 - Brackets include reliefs in the bends to aid bend modifications, as needed
 - Rotate the clamp hanger holding the VersaBlast blower, as needed
- Position the blower as close to a horizontal position as possible to maximize air blast impact on jaws. See image to the right, showing the blower in the horizontal position.

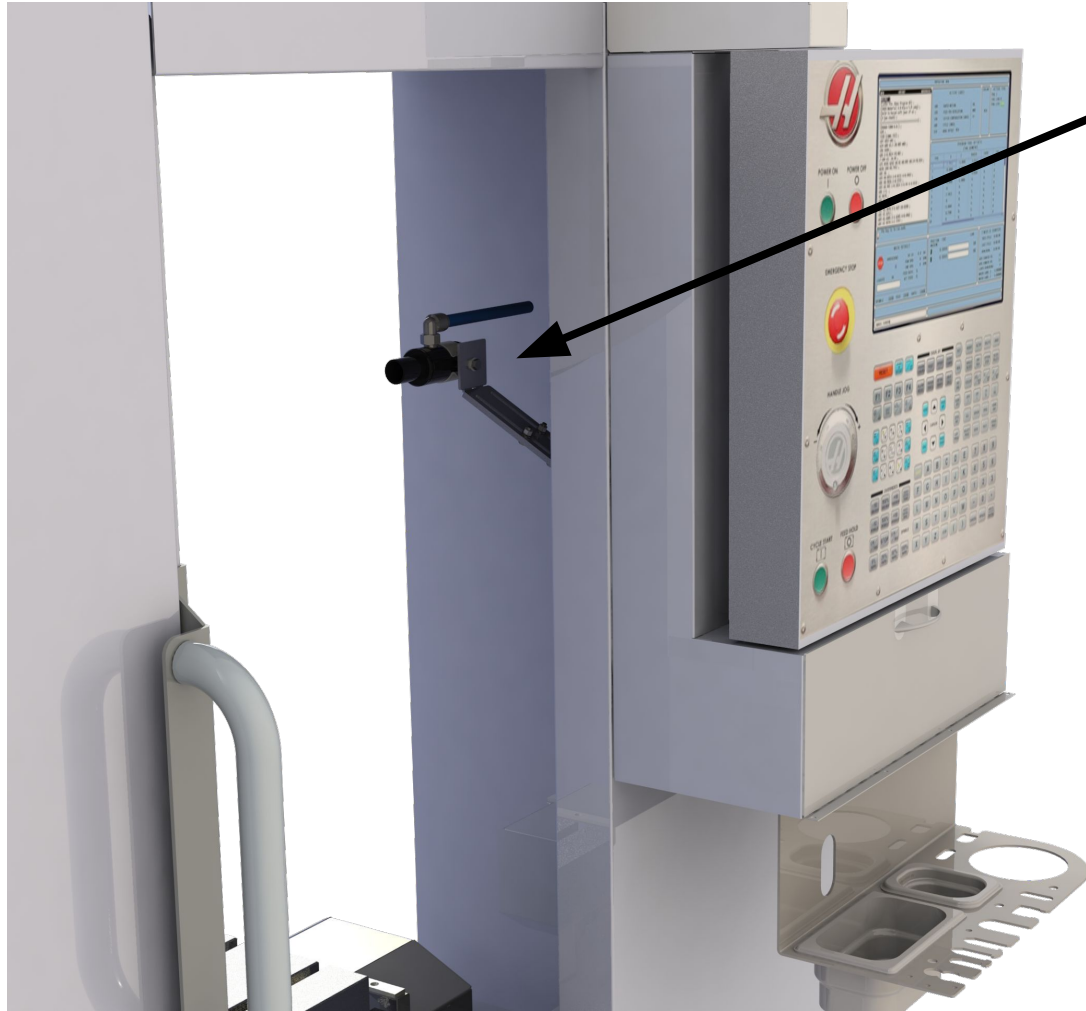


Position and Secure VersaBlast in CNC

- 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 9-inches from ceiling or top of door frame.



Haas DT Series Example



Position bracket in approximate position and adjusted length, as shown

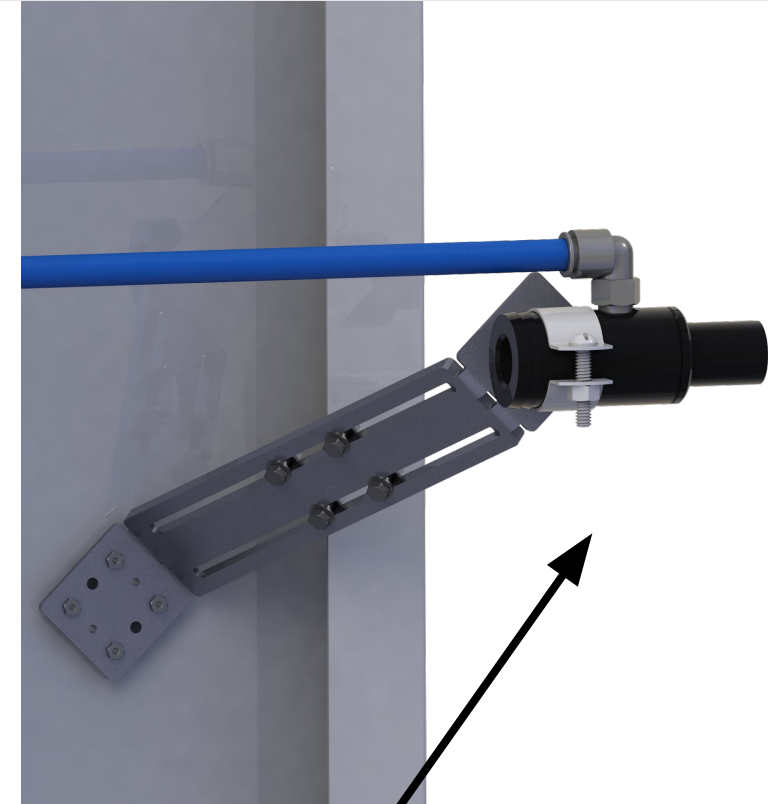


Assembly orientation



View of VersaBlast Assembly inside CNC

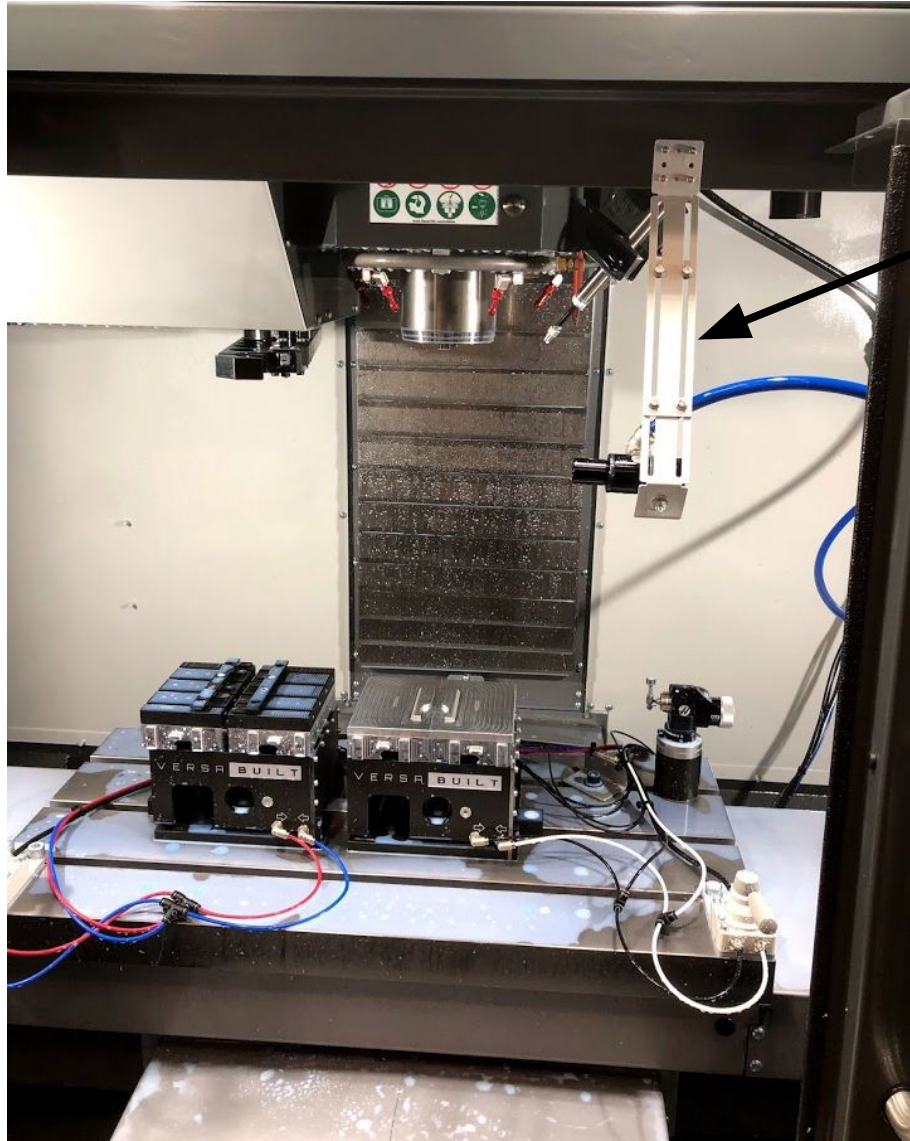
Haas UMC Series Example



View of VersaBlast
Assembly inside CNC

Assembly orientation

Haas VF Series Example



Position bracket in
approximate
position and
adjusted length, as
shown

Bend bracket to
prevent assembly
from interfering with
CNC door on VF2
series



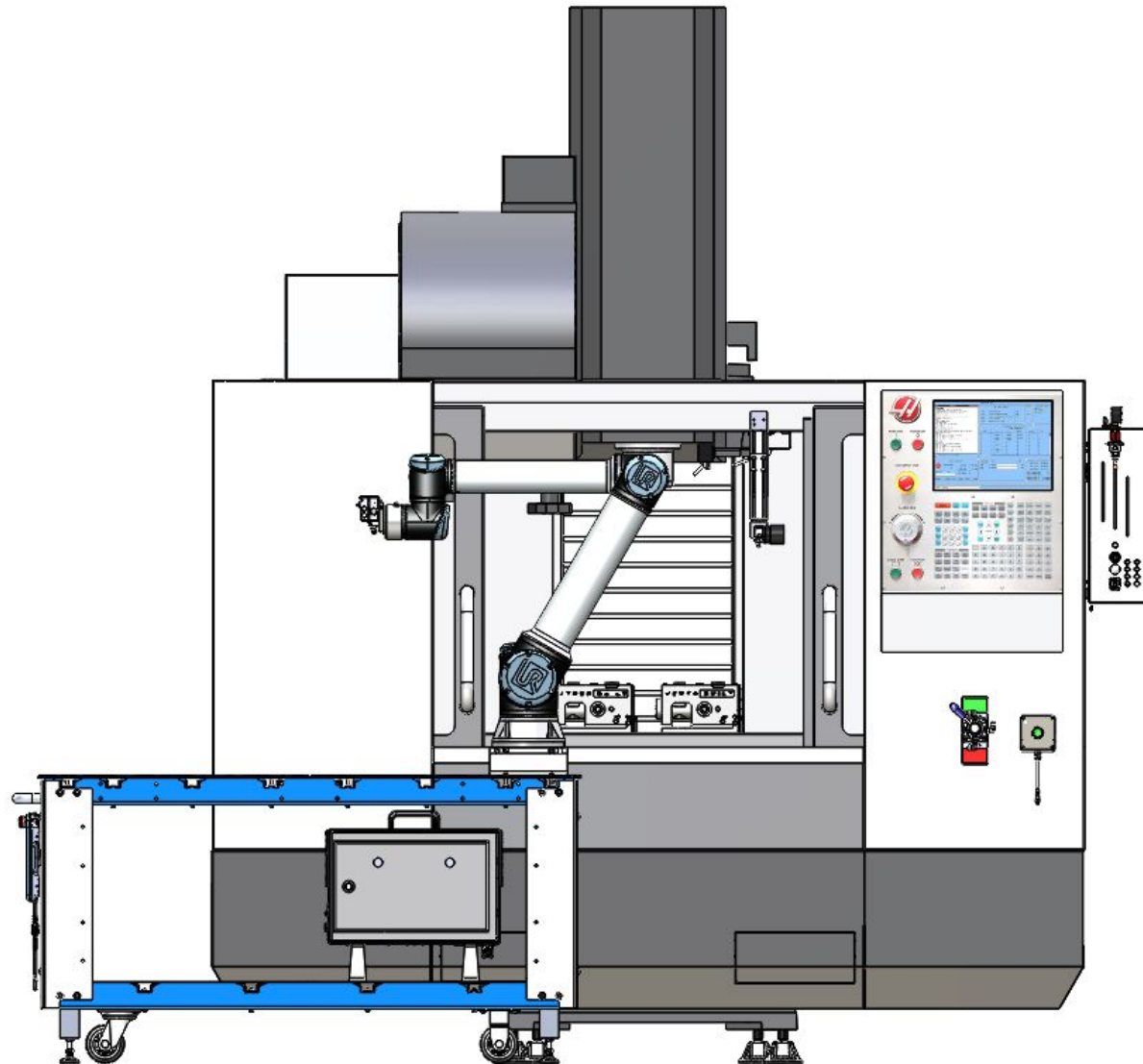
VersaCart to CNC Installation

Section 8

Position VersaCart in front of CNC

Tools:

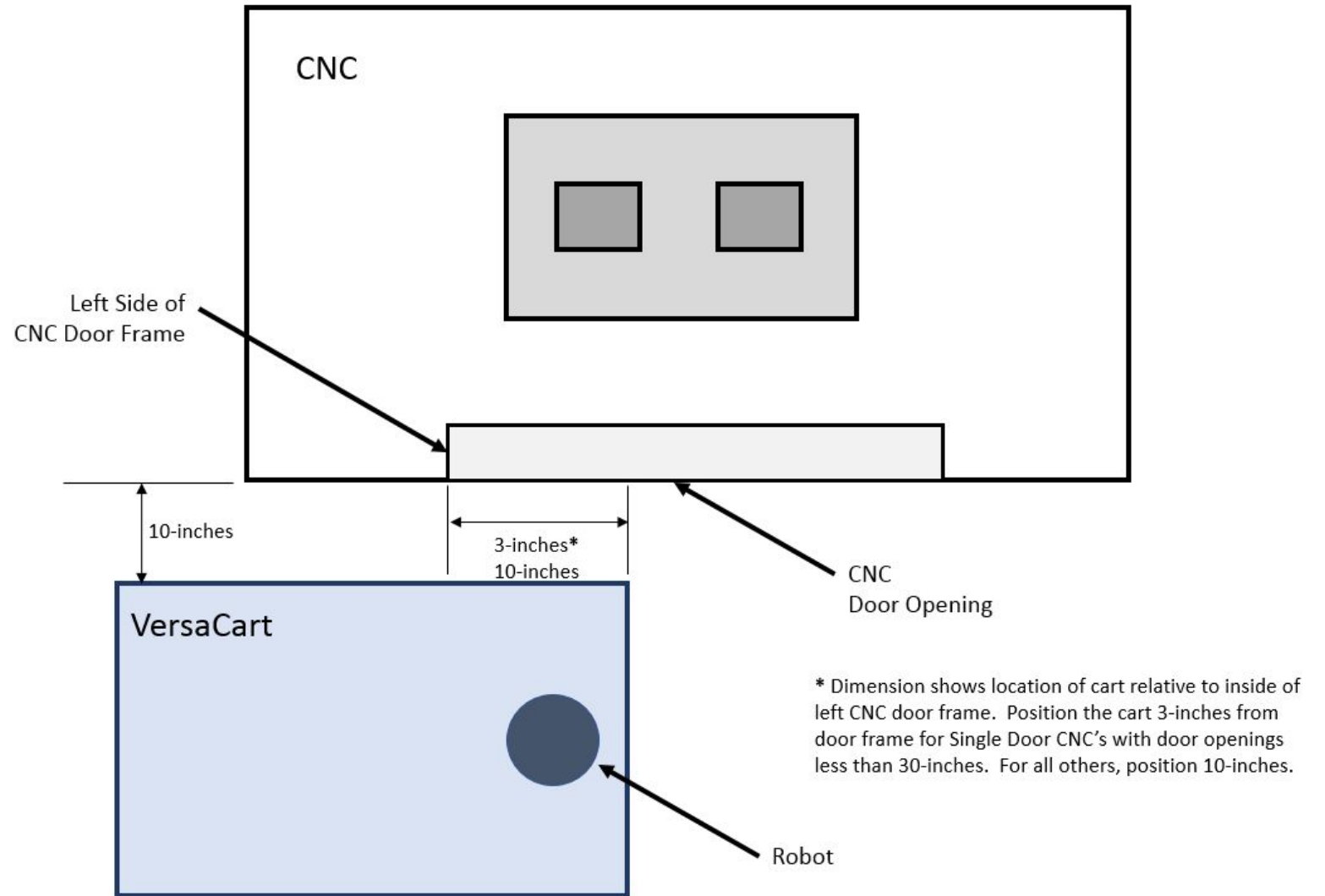
- 15mm Wrench
- 17mm Wrench
- Level
- Tape Measure
- Steel Square or equivalent



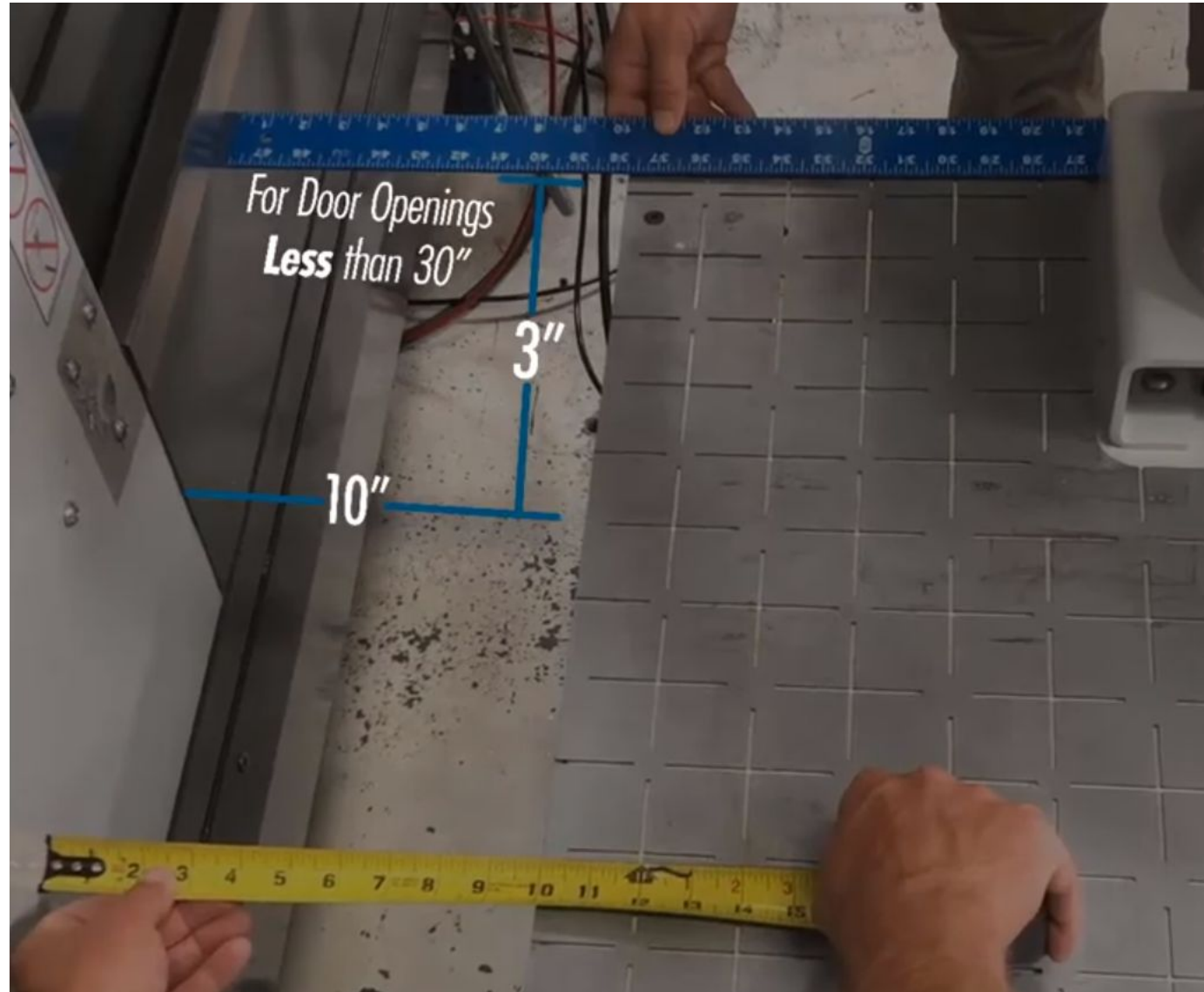
Position VersaCart in front of CNC

Steps:

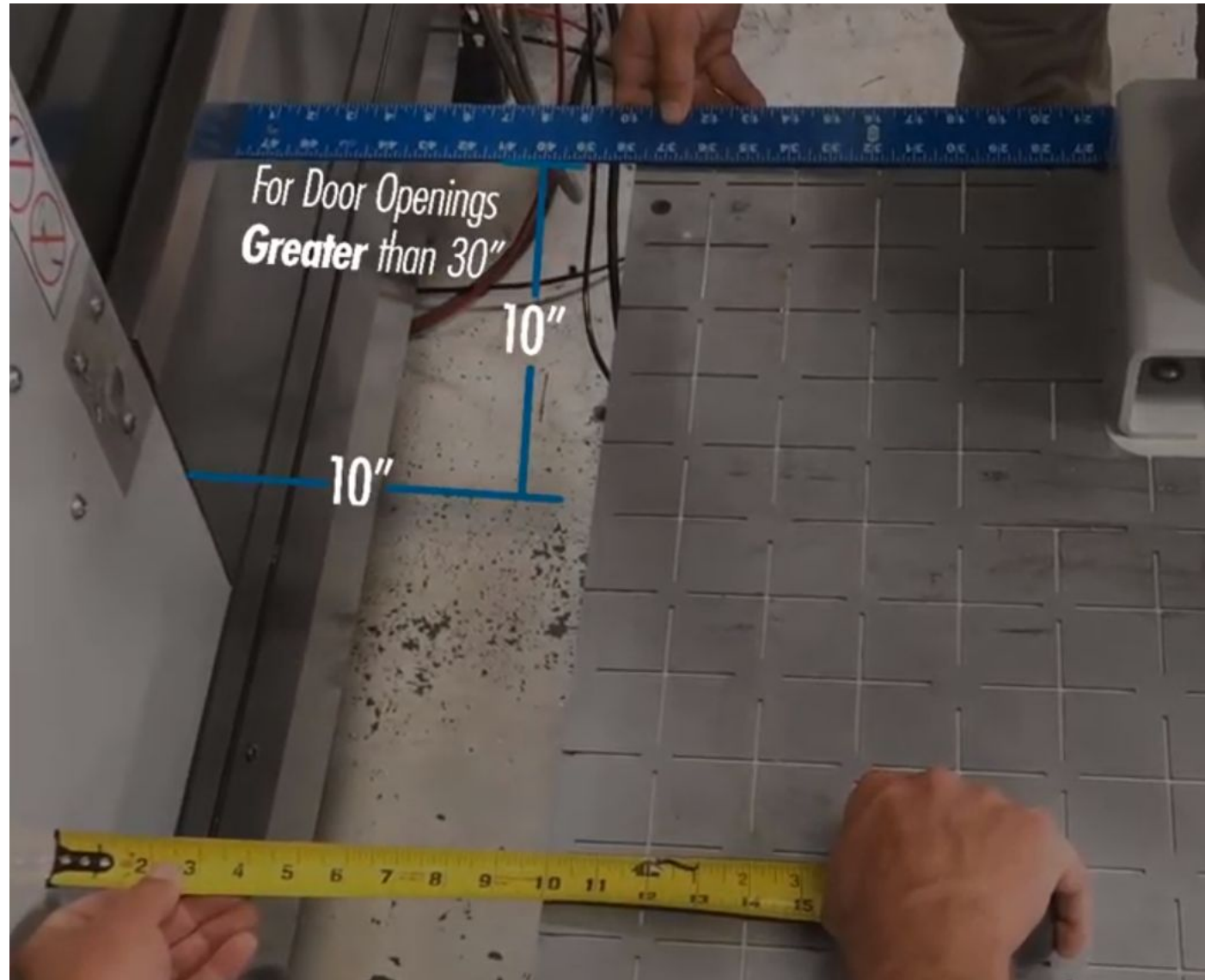
- Position VersaCart in front of CNC as shown on the right and following pages
- Using an 15mm open end wrench, turn each of the leveling feet until the nearest castoring wheel is raised off the ground at least $\frac{1}{8}$ "
- Place the level on the top of the VersaCart
- Adjust the leveling feet until 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



Position VersaCart in front of CNC



Position VersaCart in front of CNC



Position VersaCart in front of CNC



- Use a wrench to turn the nuts closest to the footpad to lower the foot pad and raise the VersaCart
- Make sure each wheel of the VersaCart is off the ground, the VersaCart is level and all 4 foot pads are firmly on the ground
- Tighten the locknuts against the aluminum block to keep the foot pads in place

Connect and Route Tubing and Cabling

Section 9

Tubing

The Mill Automation Kit includes a tubing kit with the following:

- 0.50" tubing:
 - 15-ft Connecting from Plant Supply to VersaBlast air pilot valve
 - 10-ft Connecting VersaBlast air pilot valve to VersaBlast blower
- 0.25" tubing:
 - 25-ft white tubing - Connecting from Plant Supply to Diverter Valve
 - 25-ft black tubing - Connecting from Diverter Valve to Manual Valves in CNC
 - 25-ft red tubing - Connecting from Diverter Valve to VersaBuilt System Controller (VSC)
 - 15-ft blue tubing - Connecting VSC to VersaBlast air pilot valve
- 5/32" tubing:
 - 25-ft red tubing - Connecting from VSC to Vise 1 Closed
 - 25-ft blue tubing - Connecting from VSC to Vise 1 Open
 - 25-ft clear or black tubing - Connecting from VSC to Vise 2 Closed
 - 25-ft white tubing - Connecting from VSC to Vise 2 Open
 - 15-ft red tubing - Connecting from VSC to Gripper Closed (connecting to tubing supplied with MultiGrip FJ Gripper)
 - 15-ft blue tubing - Connecting from VSC to Gripper Open (connecting to tubing supplied with MultiGrip FJ Gripper)

**All air fittings are "push-to-connect" (PTC), allowing quick and easy connectivity*

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

****Refer to Appendix A for complete Pneumatics Schematics*

Route air to Automation Equipment

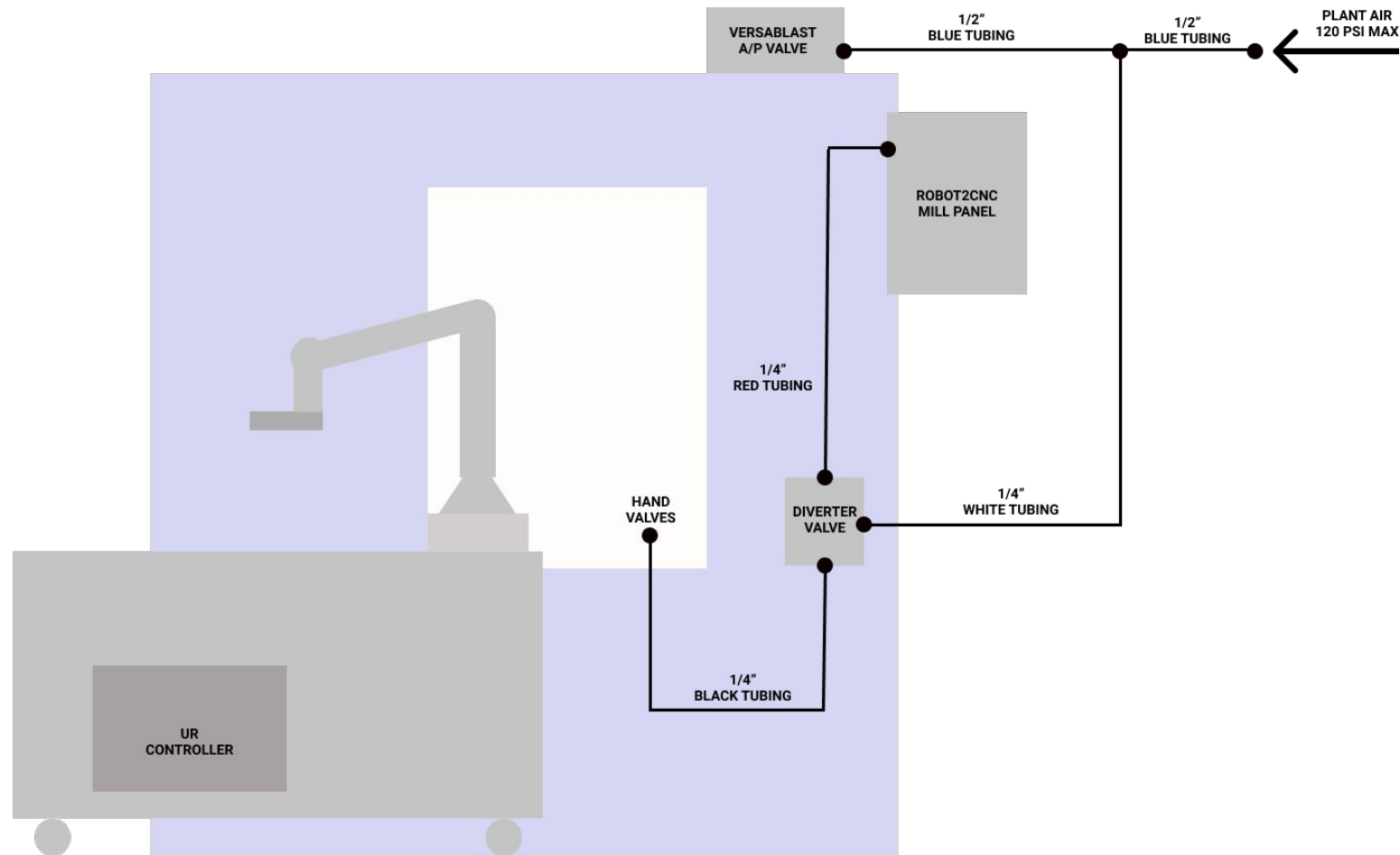
The figure to the right shows supply air to devices in the Mill Automation Kit

- ½" Tubing to the VersaBlast Valve*
- ¼" Tubing to the Diverter Valve
 - ¼" line to Hand Valves inside CNC**
 - ¼" line to VersaBuilt System Controller

**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.*

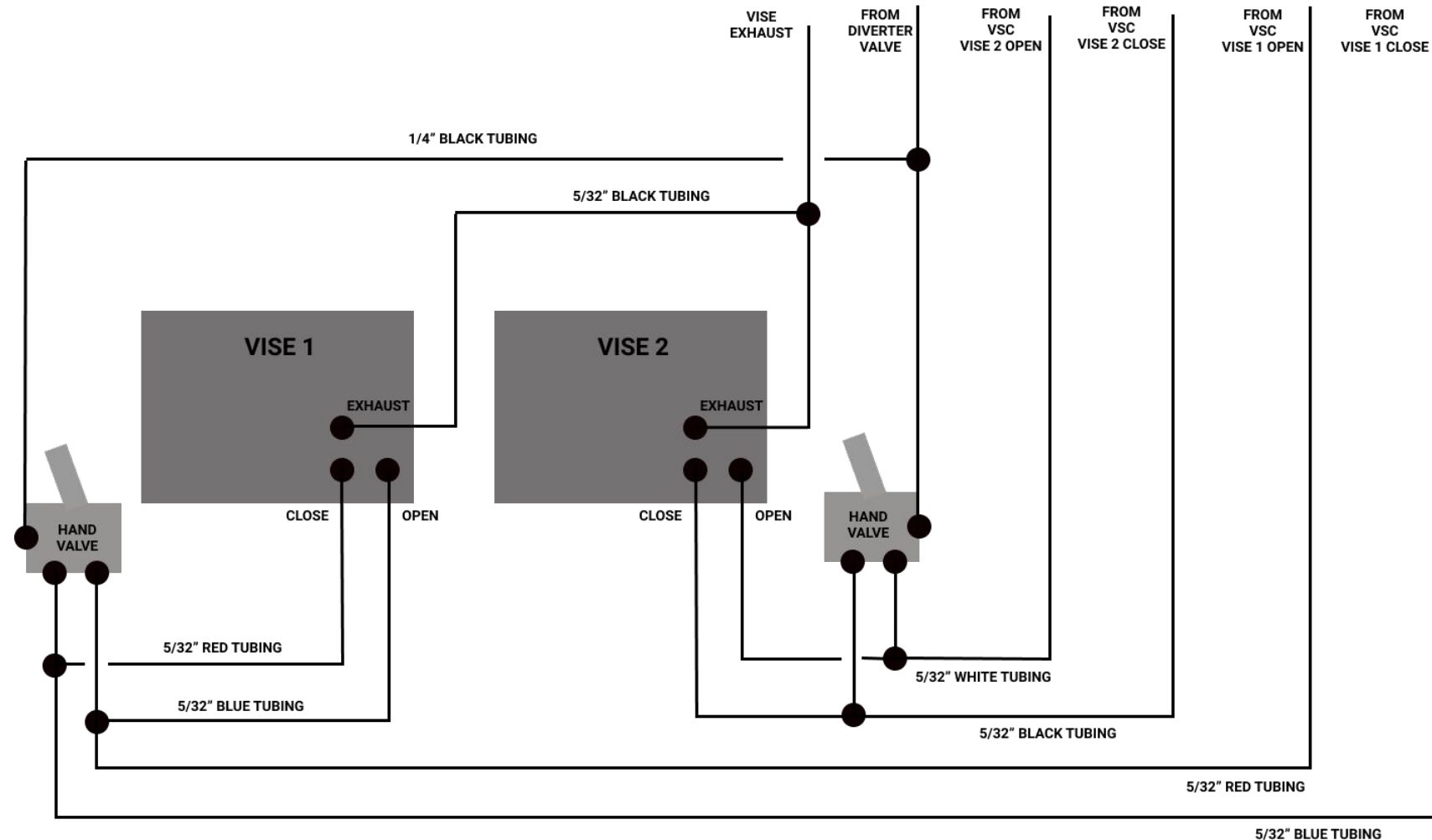
Connect Supply Air after all devices are connected, then check for leaks or poor connections



Vise Air Routing In/Out of CNC

The figure on the right shows routing of lines to MultiGrip Vises in the CNC

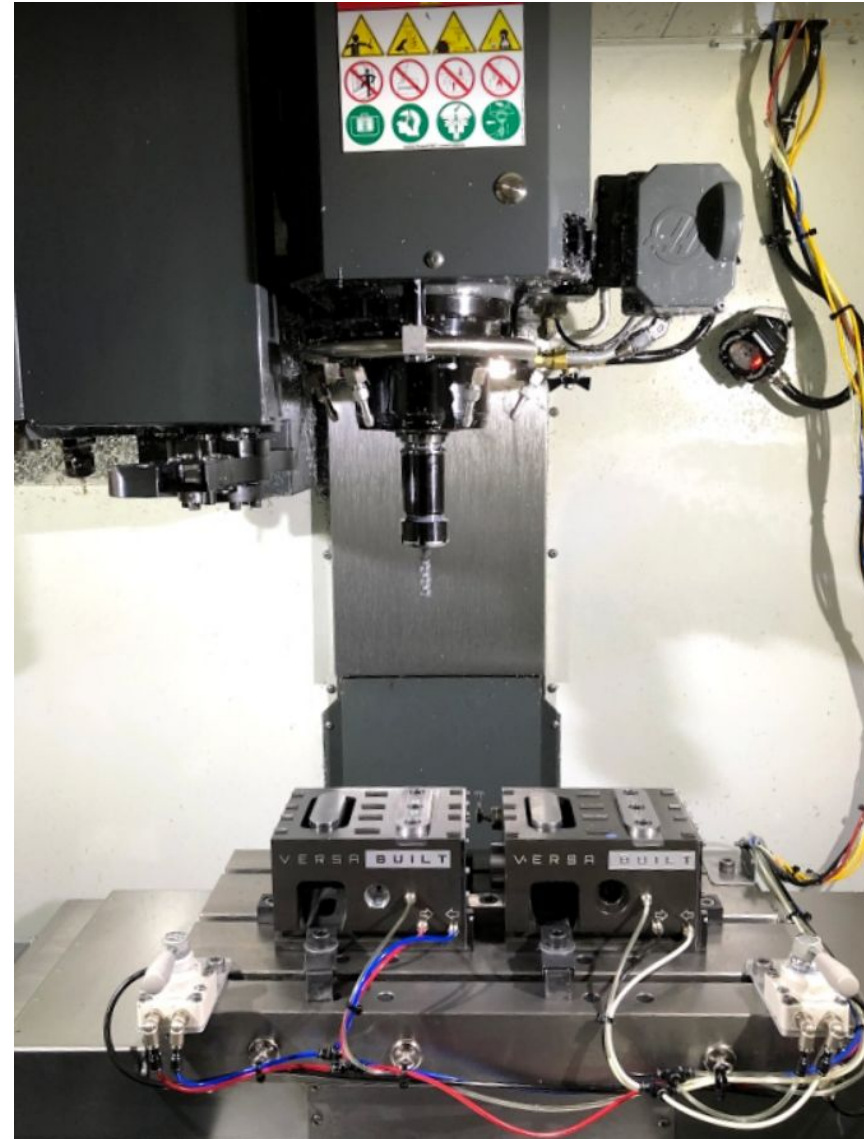
- 1/4" tubing is provided to the 2 x Hand Valves from the Diverter Valve
- 5/32" (4mm) tubing is supplied from the VersaBuilt System Controller for Vise 1 and Vise 2 Open and Close
- 5/32" (4mm) tubing and Tee-fittings connect the VSC and Hand Valves air lines to the Open and Close fittings on the Vises
- TUBING COLORS:
 - 1/4" TUBING = BLACK
 - VISE 1 OPEN = BLUE
 - VISE 1 CLOSE = RED
 - VISE 2 OPEN = WHITE
 - VISE 2 CLOSE = BLACK



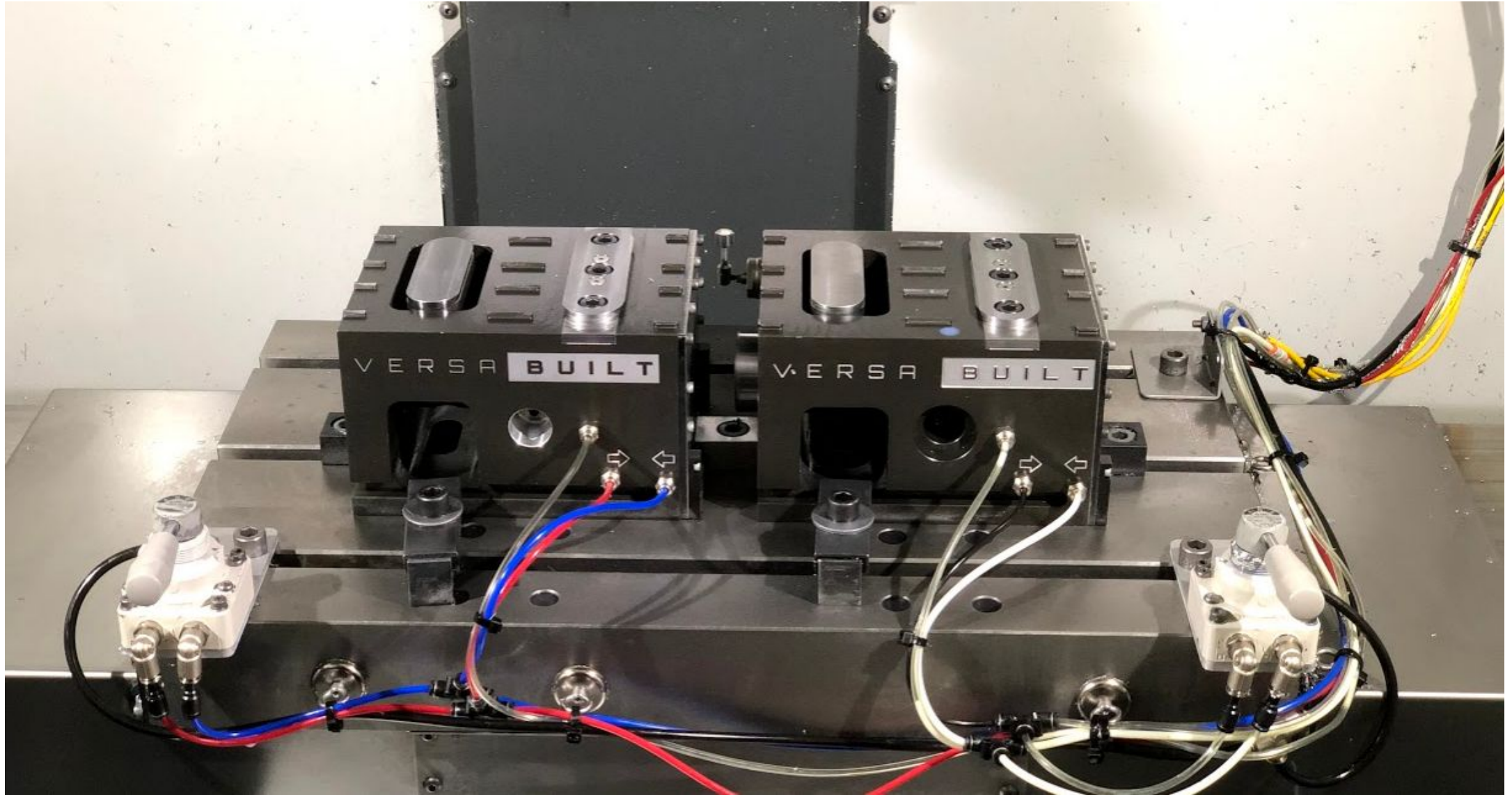
Vise Air Routing In/Out of CNC

Refer to the image to the right and on the following page for guidance on tube and cable routing inside the CNC.

- Use provided magnets with loops and cable-ties to route air-lines along the front and side of the CNC table.
- Anchor tubing and cables on the back corner of the table with the provided CNC Air Line Anchor Kit (aluminum angle, fasteners and cable-ties).
- Route air and cable lines out the top of the CNC, with lines and cables bundled and held together with cable-ties.



Vise Air Routing In/Out of CNC

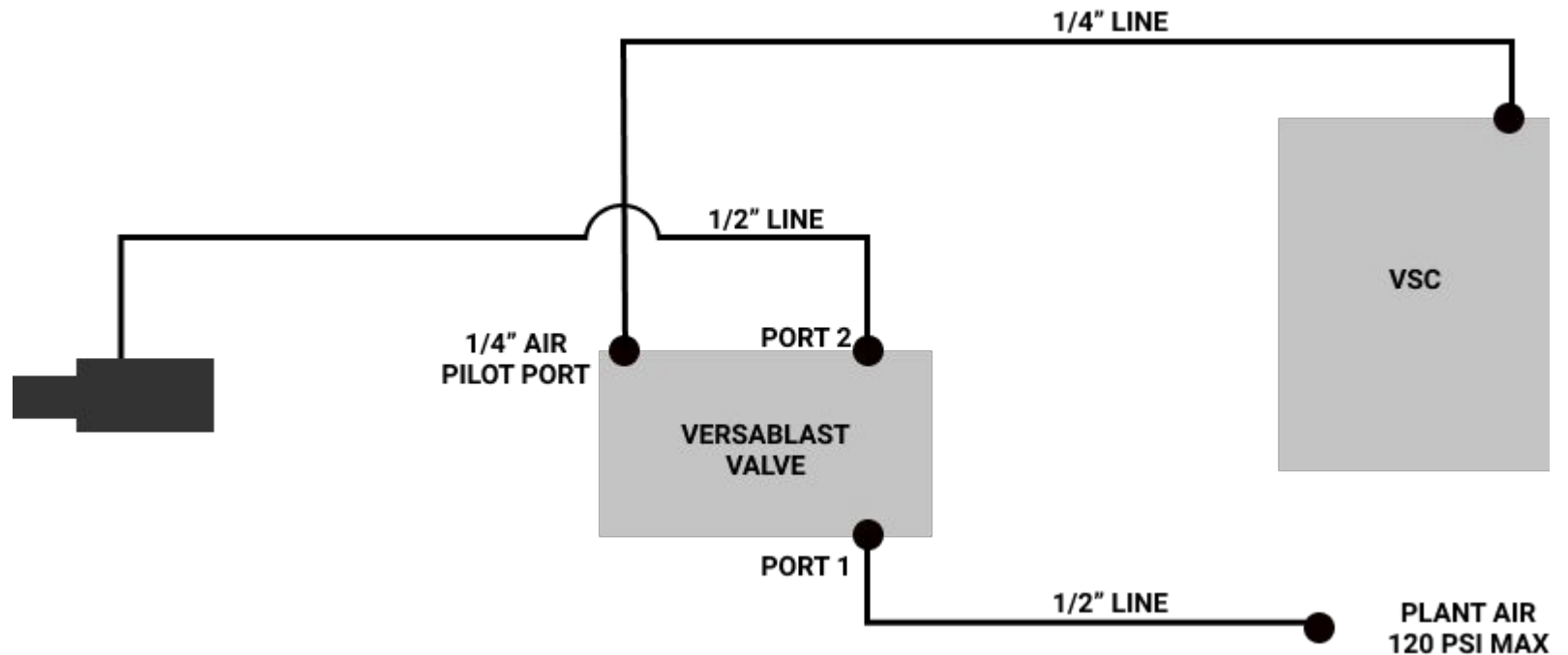


VersaBlast Air Routing

Connect the following tubing to VersaBlast:

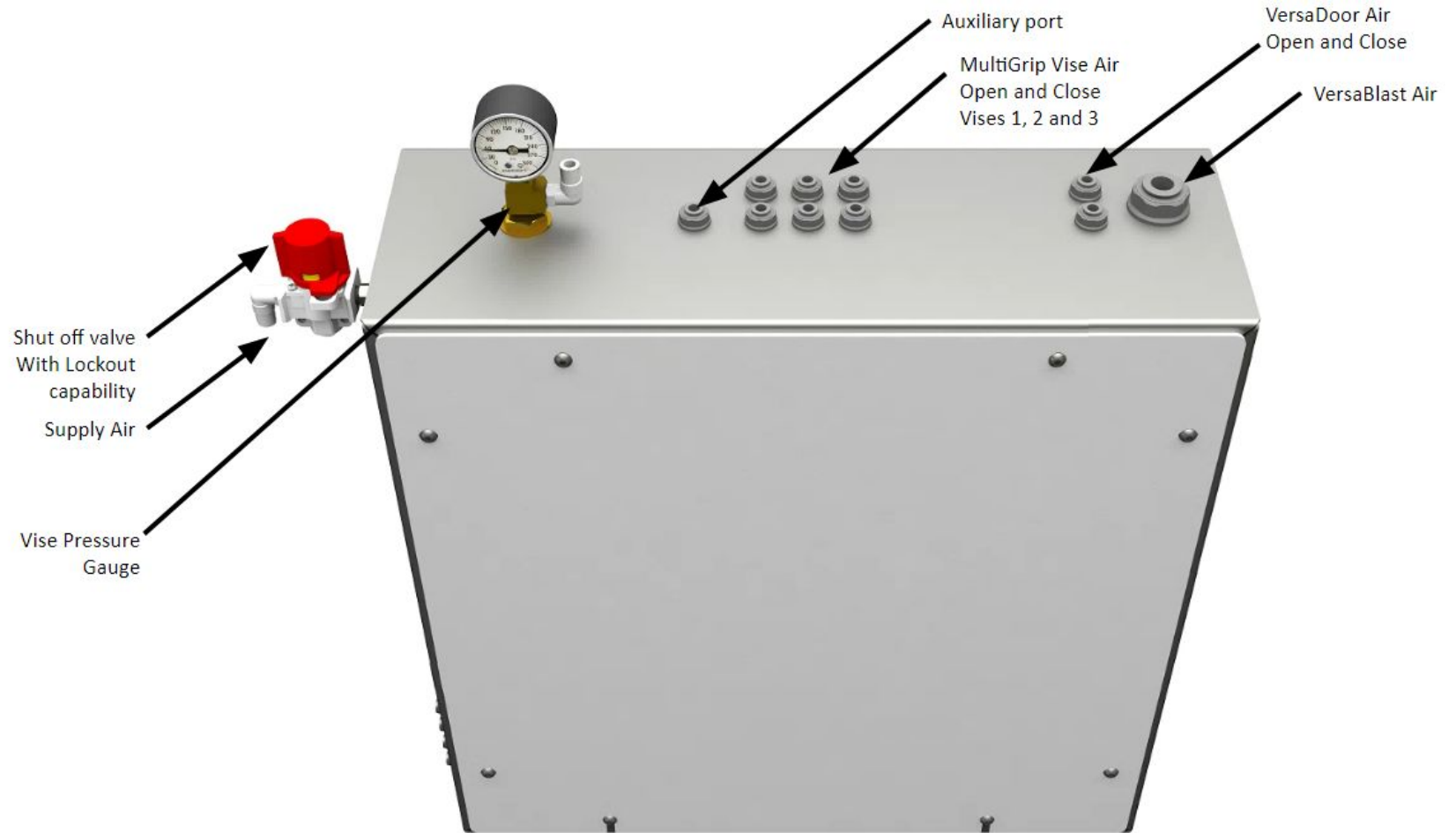
- 1/4" tubing from the VersaBuilt System Controller (VSC) to the 1/4" air pilot fitting on the VersaBuilt Valve
- 1/2" tubing from Plant Air to port 1 of the VersaBlast Valve
- 1/2" tubing from port 2 of the VersaBlast Valve to the VersaBlast blower

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



Diverter Valve and Shut-off Valve

- The Diverter Valve provides the user with the ability to shut off air to the 24VDC solenoid valves, used in automatic operation, diverting air to manual valves in the CNC for hand loading
- To switch between Auto and Manual modes, depress the button on the valve handle and position to the labeled ends of the valve assembly
- When in Manual mode, the air gauge on the VSC should be at 0 psi, with all pressure on the automatic side relieved.
- To lock out or prevent supply of air to components, exhaust and lock-out with the Red Shut-off Valve

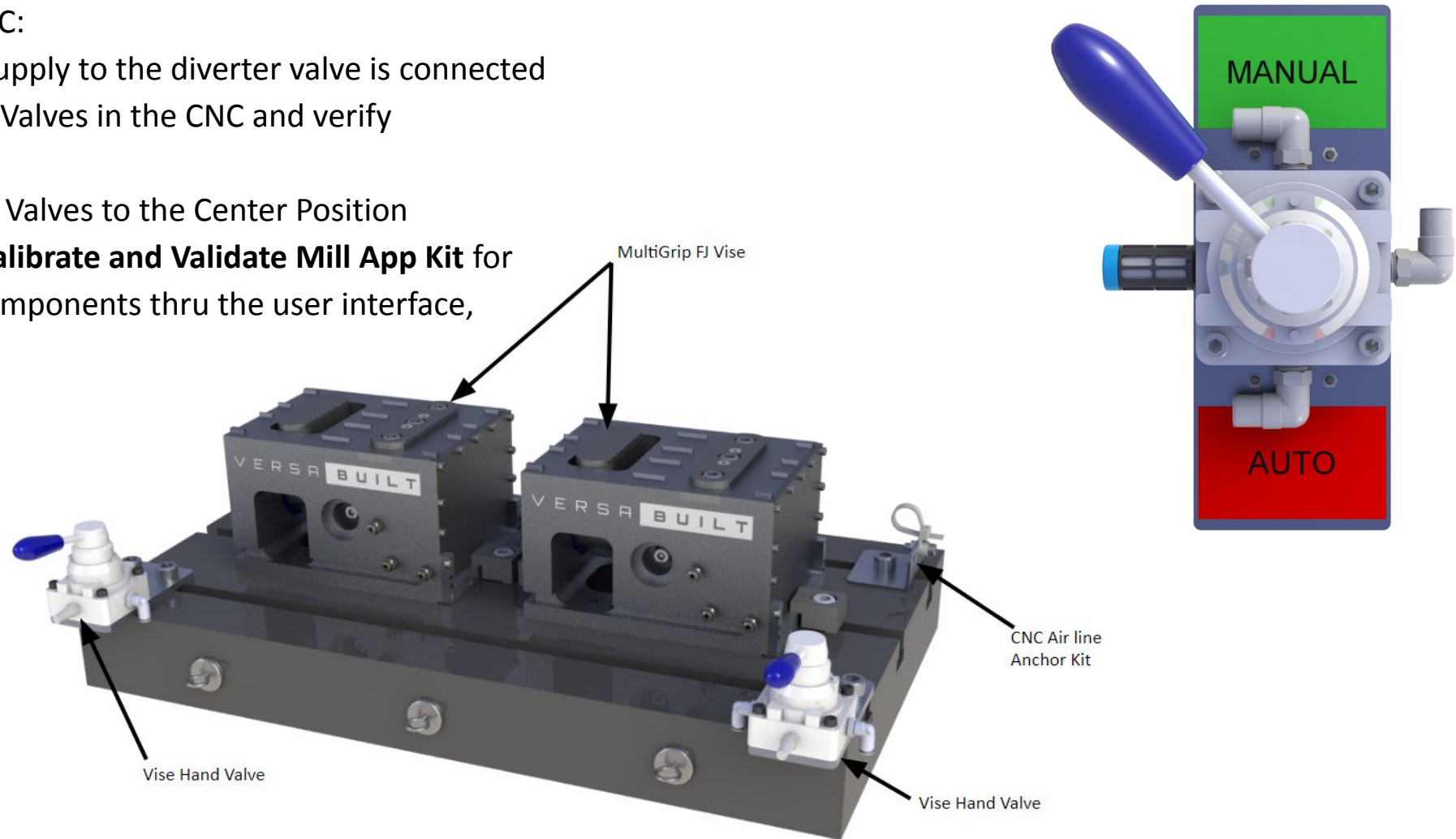


Connect Supply Air and Test

- Before connecting air, make sure no person is in contact with the MultiGrip FJ Gripper, MultiGrip Vises, or VersaDoor as it may close suddenly during this step.
- Ensure the Diverter Valve is set to the Green Manual position, the CNC door is closed and that no person will come in contact with the MultiGrip vises
- Connect Supply Air to 3 x ½" Air Lines, as shown in the diagram on previous pages
- Check for leaks, loose connections and fix as needed

Connect Supply Air and Test

- With Diverter Valve in Manual Position, Test operation of Hand Valves inside CNC:
 - Verify plant air supply to the diverter valve is connected
 - Toggle the Hand Valves in the CNC and verify open/close
 - Return the Hand Valves to the Center Position
- Refer to **Section 12: Calibrate and Validate Mill App Kit** for complete testing of components thru the user interface, after loading software



MultiGrip Vise Sensor Installation

Tools:

- 6mm Hex Key
- 13mm Deep Socket Wrench
- Ratchet for Deep Socket Wrench

Parts:

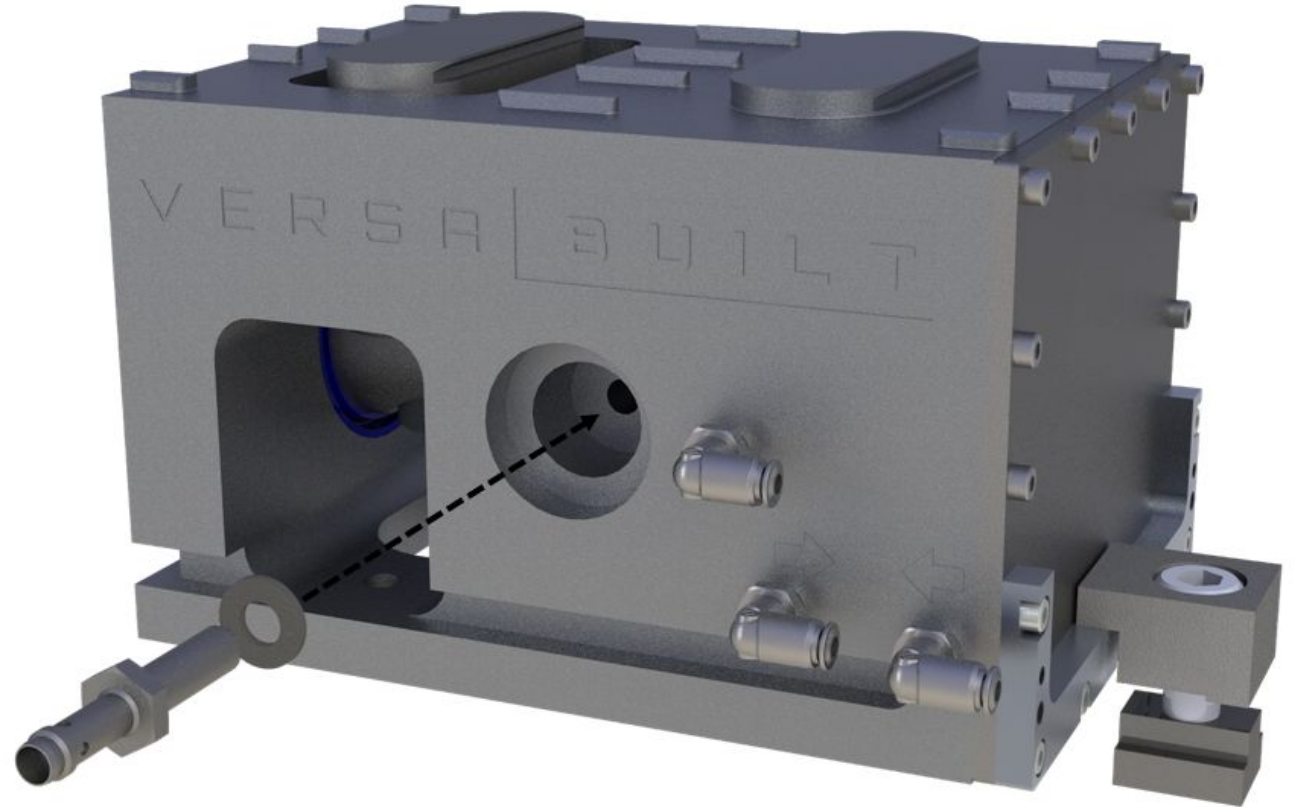
- MultiGrip FJ Vise
- MultiGrip Vise Sensor Kit
 - 2 x M8 Proximity Sensors
 - M8 Y-Cable, 3-pin to 4-pin
 - M8 Cable, 4-pin, 15-feet



MultiGrip FJ Vise Sensor Installation

Caution

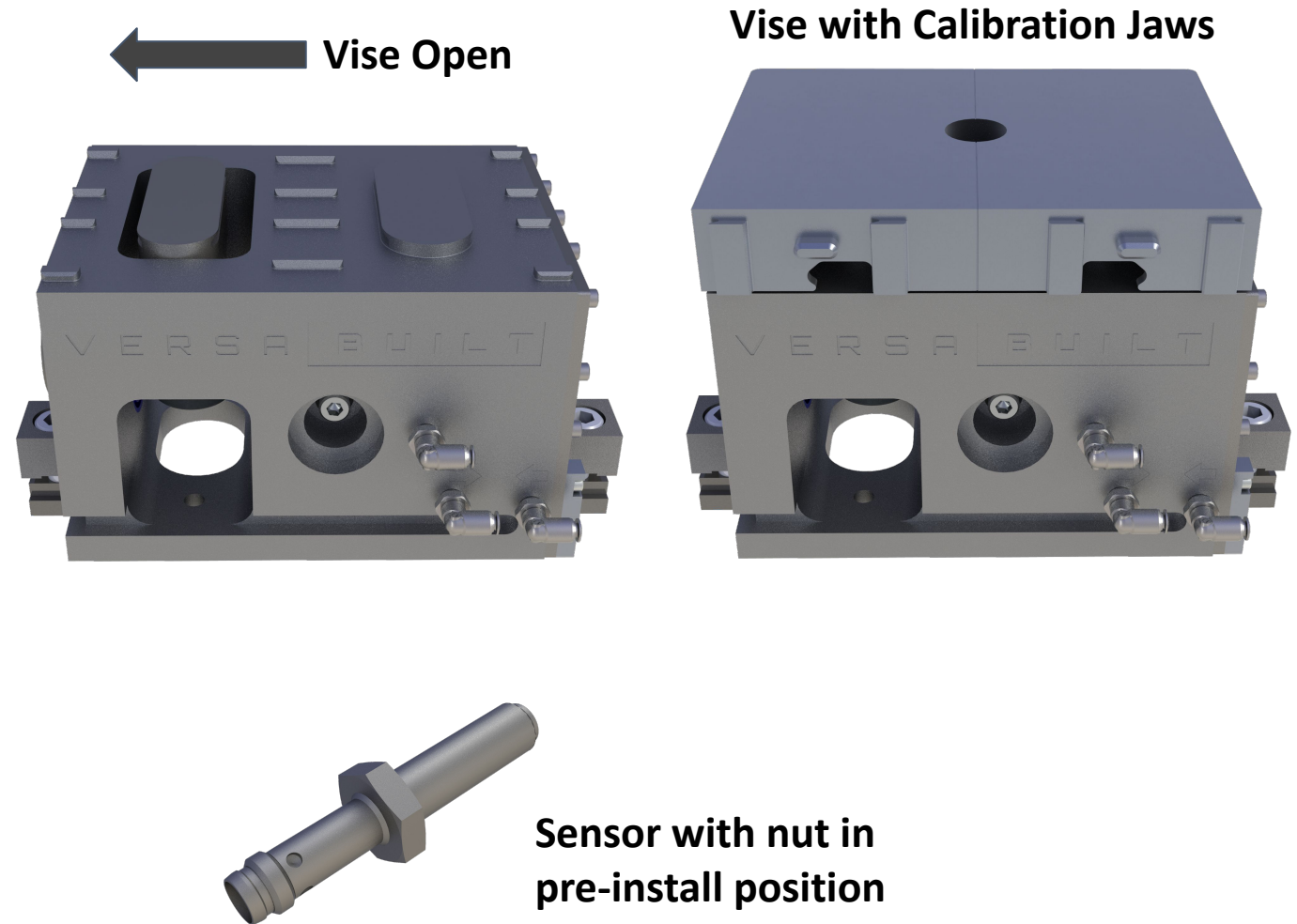
Sensors can be crushed by actuated vise, if installation steps are not properly followed.



MultiGrip FJ Vise Sensor Installation

Vise Sensor Installation Steps:

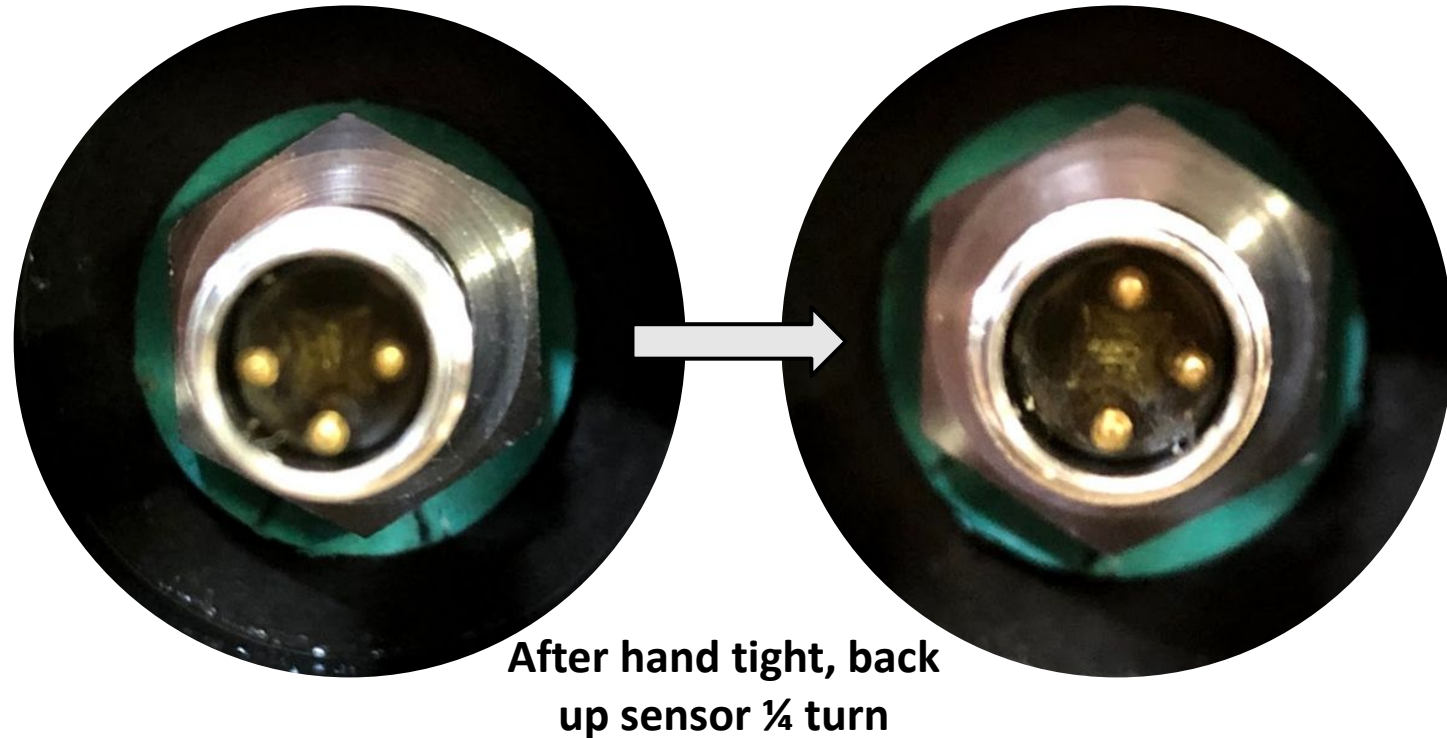
1. Place Diverter Valve in Manual Position
2. Verify Open and Close of each visePlace Calibration Jaws on Vise
3. Place vise in **OPEN** position
4. Close Vise to clamp on Calibration Jaws
Setting sensor in vise fully open or fully closed position can result in crushed vise sensor
5. Remove M8 Socket Head Screw and M8 Washer from front side of the vise (using 6mm hex key)
6. Place nut on sensor body, near the back of the sensor body (at least 1" from the **threaded** end of the sensor)
7. Reuse M8 washer, placing on sensor body
8. Thread sensor into vise body, by hand until sensor bottoms out on shaft inside vise
9. Using 13mm Deep Socket Wrench, hand tighten sensor nut



MultiGrip FJ 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**

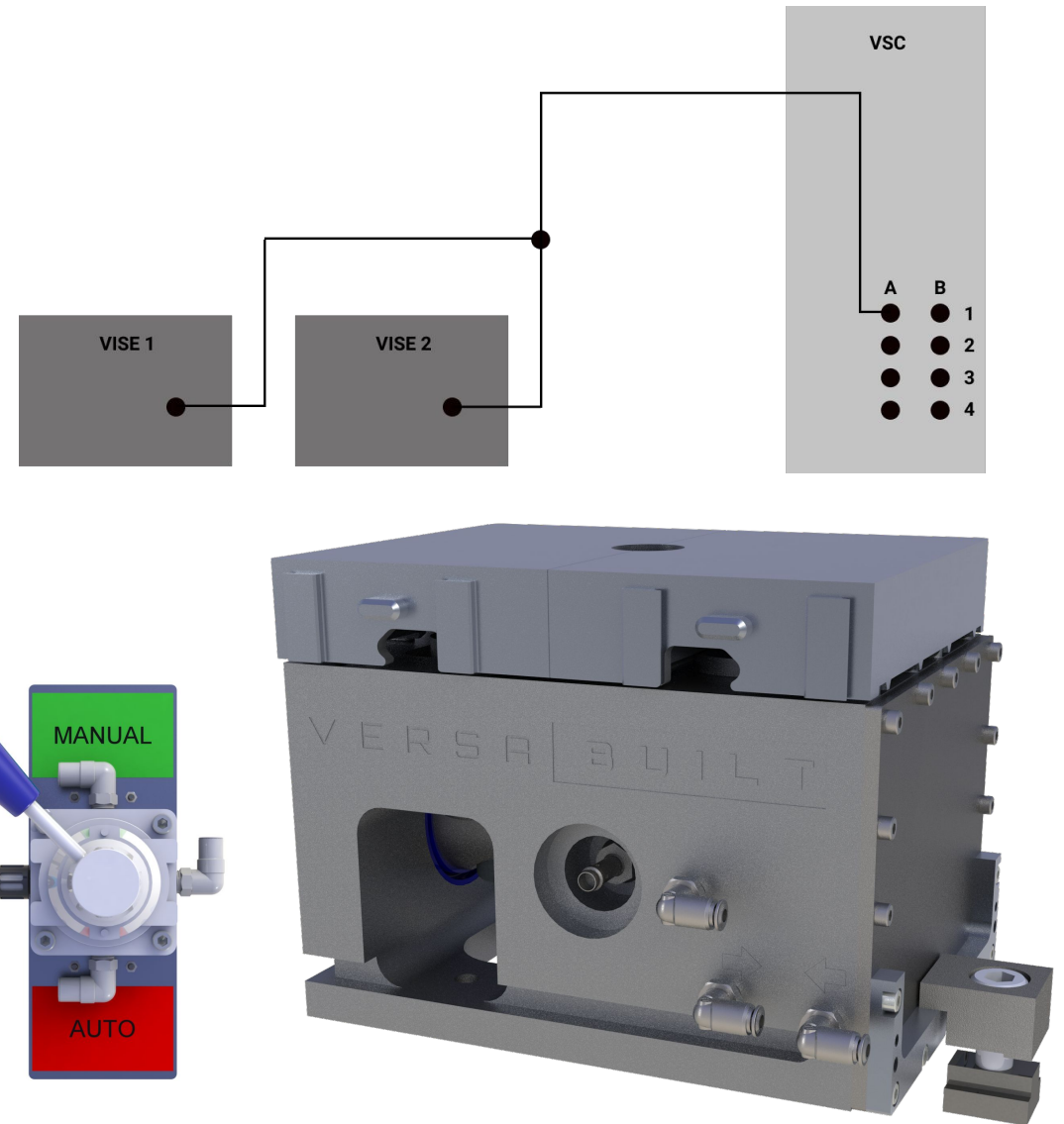


MultiGrip FJ Vise Sensor Installation

Connect Vise Sensor Cables and Test:

14. Connect Sensor Cables to VersaBuilt System Controller
 - 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

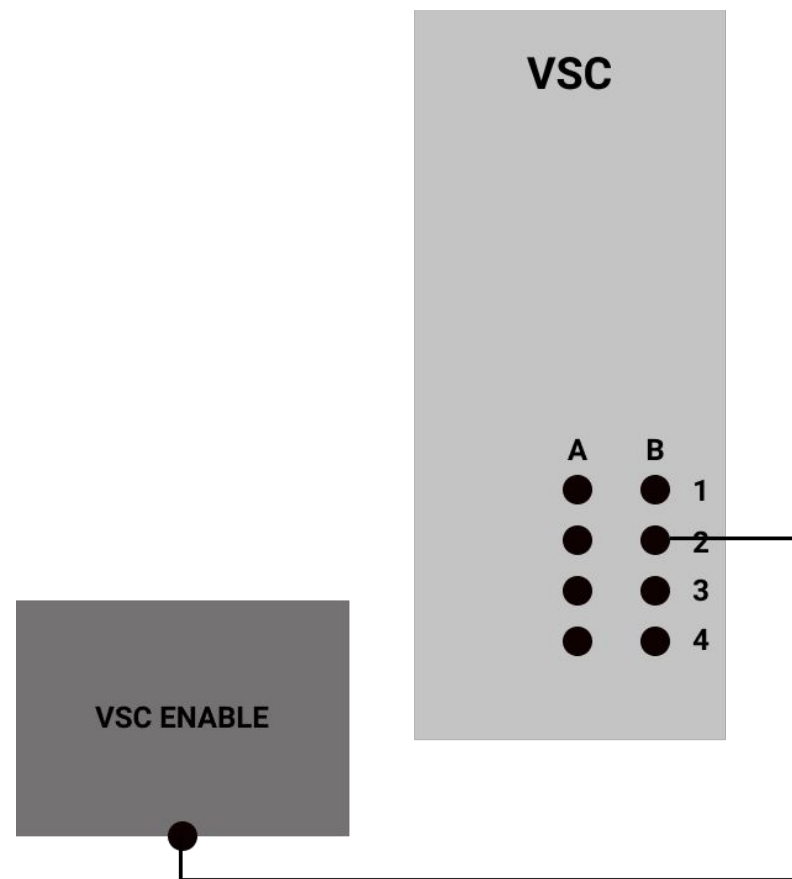
If sensor light is not working as noted, restart sensor installation process *verify sensor is not damaged and/or power is connected to Mill Panel*



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.



Routing cables and tubing

- Secure cables and tubing to Air Line Anchor Kit, leaving slack in all lines to prevent strain and undue stress during table movements
- Bundle lines together with cable ties and route lines out of the top of the CNC thru an access hole
- Test tube and cable length by moving the CNC table to the furthest and closest table positions relative to the access hole
- Adjust lengths to avoid tight lines at the furthest position and snags on the shortest position



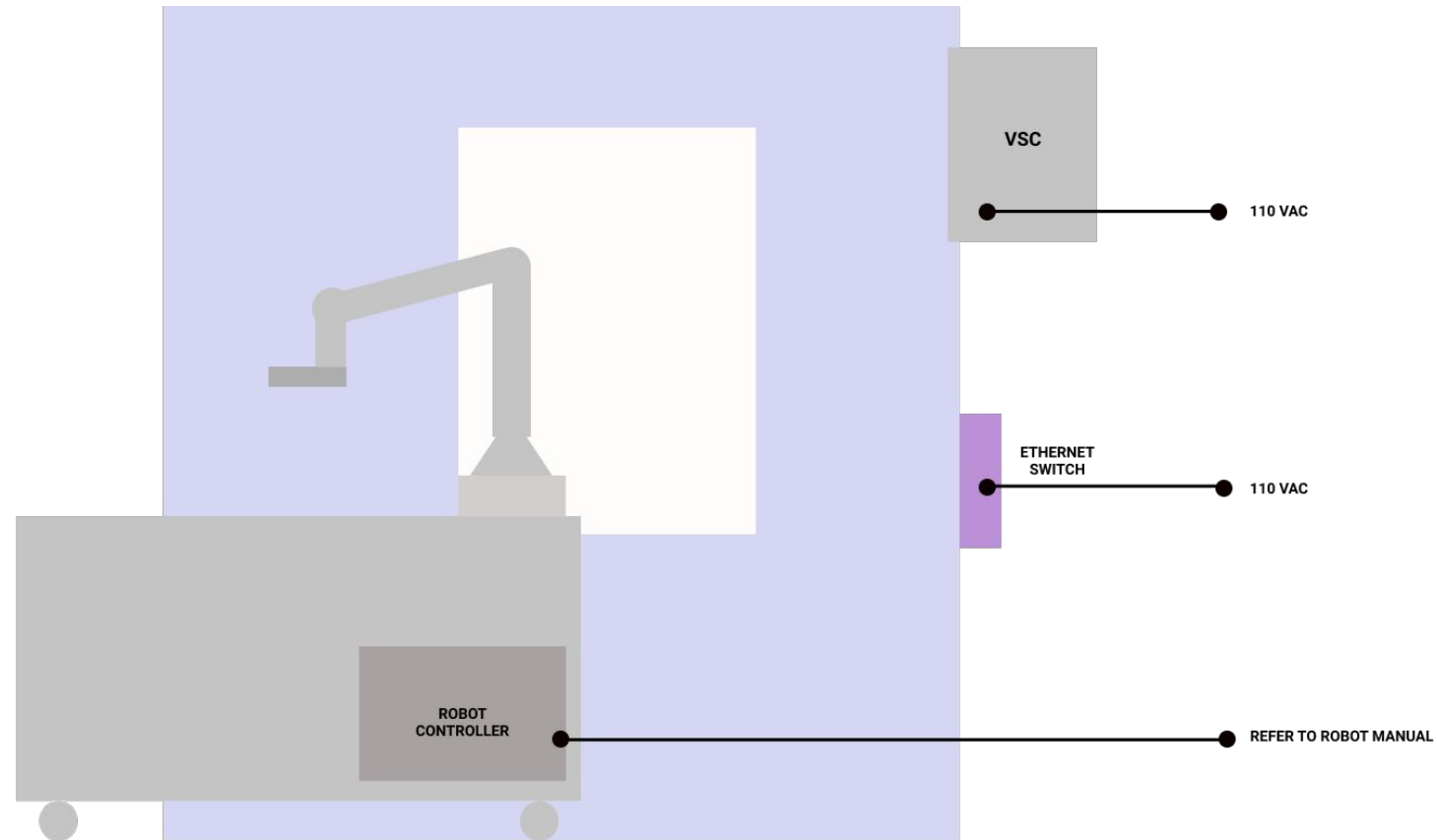
Routing cables and tubing

- Included with the Tubing Kit are Magnets with anchoring loops
- Use cable ties and magnets to organize and route cables and tubing on, in, and around the CNC



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

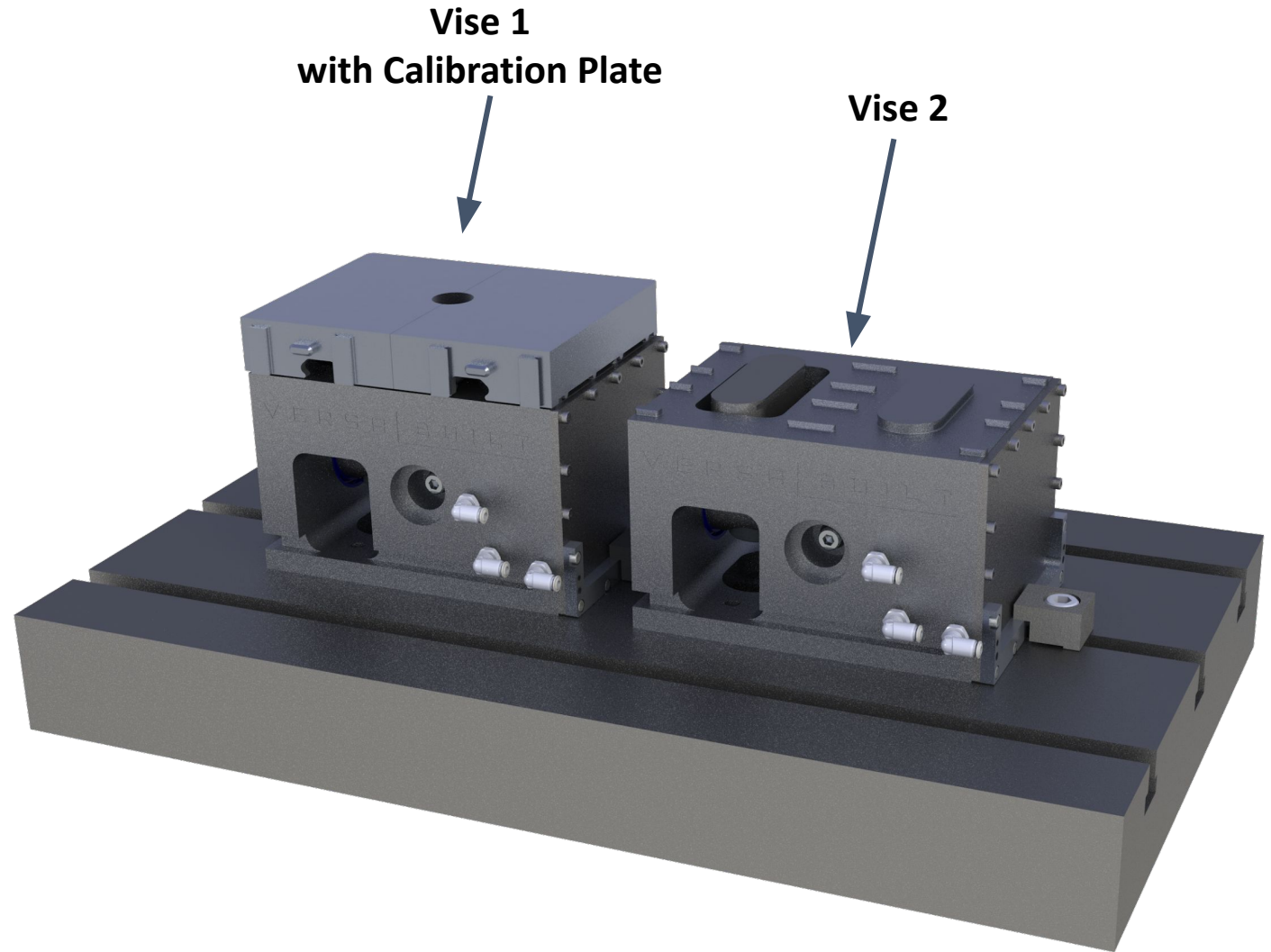


Find and Store CNC Vise Locations

Section 10

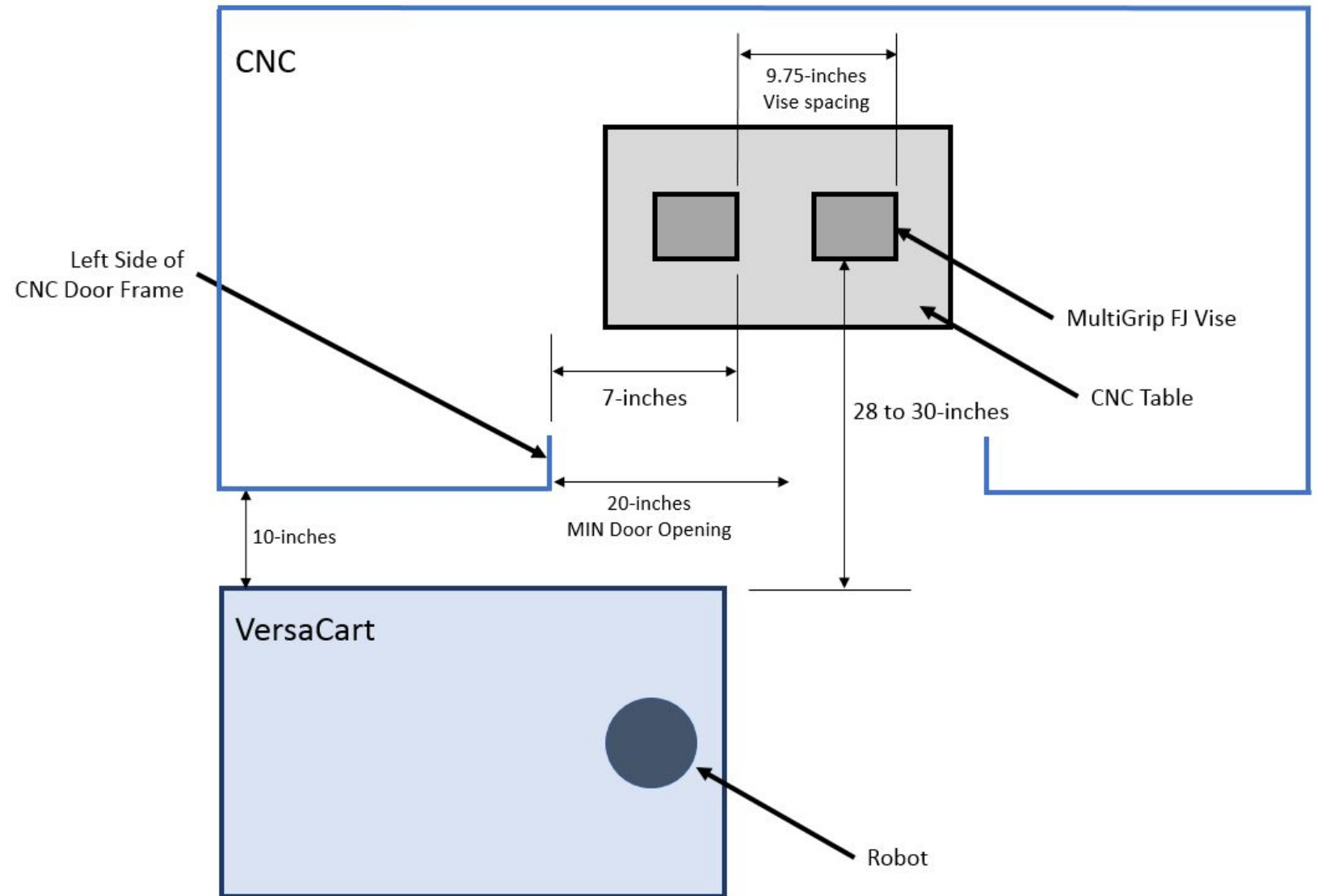
Find and Store Vise Home Locations

- Place Calibration Plate on Vise:
 - With vises open, place the Calibration Plate onto Vise #1 and use the hand valve to close the vise and secure the Calibration Plate
 - Verify the Calibration Plate is fully seated on the Vise Serrations
- Use a spindle probe or indicator to find the center of the hole for XY
- Repeat the process for the second vise
- Store each vise home location in the CNC control
- The vise home locations will be used in the Vise Wash program in Section 12



Set CNC Table Load Position

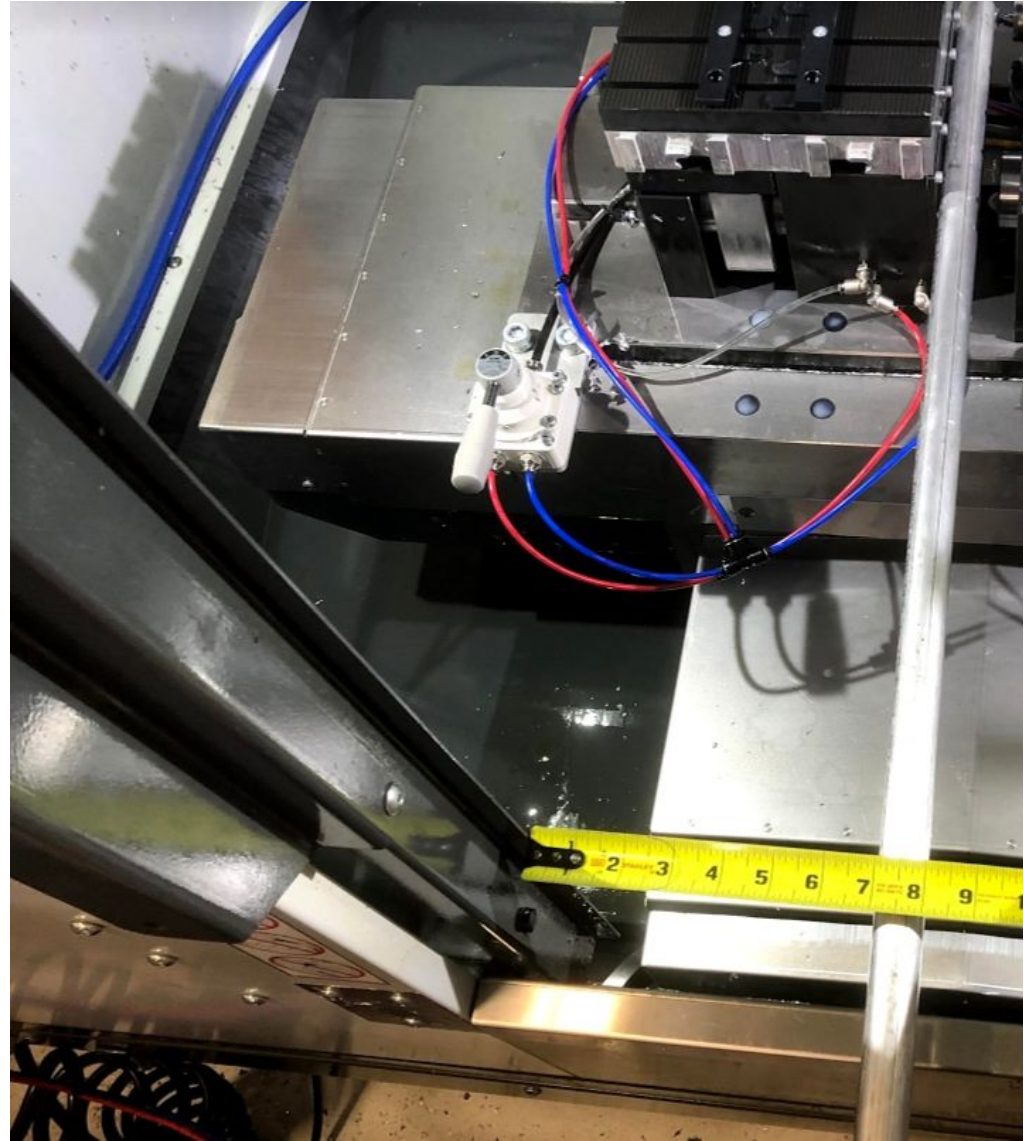
- Open the CNC Door and move the CNC table to a the table load position according to the diagram at the right
- Save the Table Load Position as a CNC home location in the CNC control, VersaBuilt recommends using G53 for the Table Load Position
- The Table Load position will be used in Section 12 when editing the table load program



Set CNC Table Load Position

To set position of CNC Table, relative to doorway:

- Open CNC Door
- Place bar across side of Vise #1
- Measure from inside edge of the door or door frame to the inside of the bar
- The Table Load position needs to be 7-inches, as shown in the image to the right

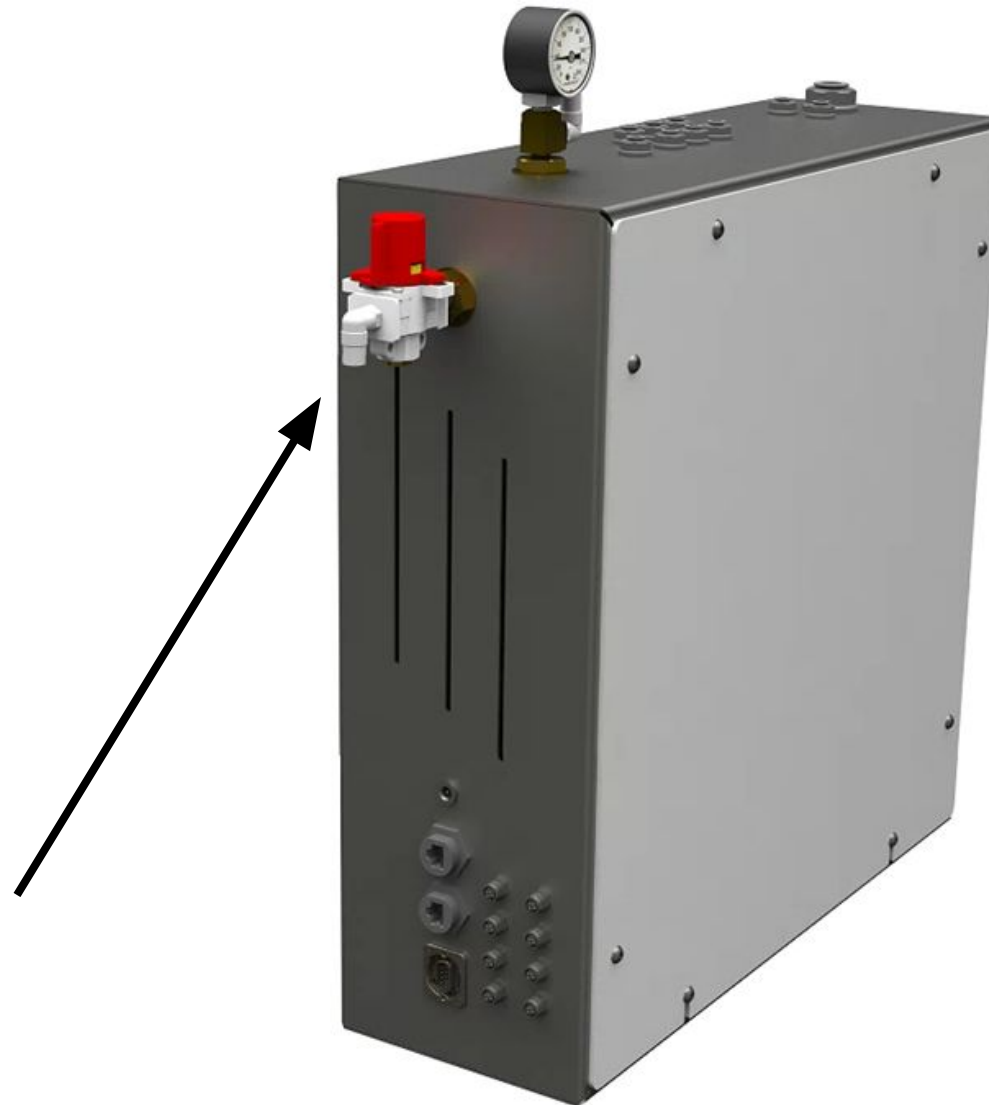


Calibrate and Validate Mill App Kit

Section 11

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



Familiarization with VSC Recovery Panel

Review the Mill Automation Kit Operator's Manual

Before beginning the calibration process, take time to review the VersaBuilt System Controller Mill Operator's Manual. In particular, carefully review Section 7: Recovery Panel.

Review the VersaBuilt Robot Installation, Configuration and Operation Manual

Before beginning the calibration process, take time to review the Robot Installation, Configuration and Operation manual that matches the make and model of your robot. In particular, review and configuration required to allow the VSC to control the robot and steps required to properly use the Freedrive mode of the robot.



Validate VersaBuilt System Controller Configuration

Configure Robot for VSC (robot dependent)

Some robots require a VersaBuilt program to be run on the robot's teach pendant or the robot to be put in a special mode for the VSC to be able to control the robot.

Review the **VersaBuilt Robot Installation, Configuration and Operation** manual that matches your robot make and model for possible additional steps required to enable operation with the VSC.

Open the VSC Home Page

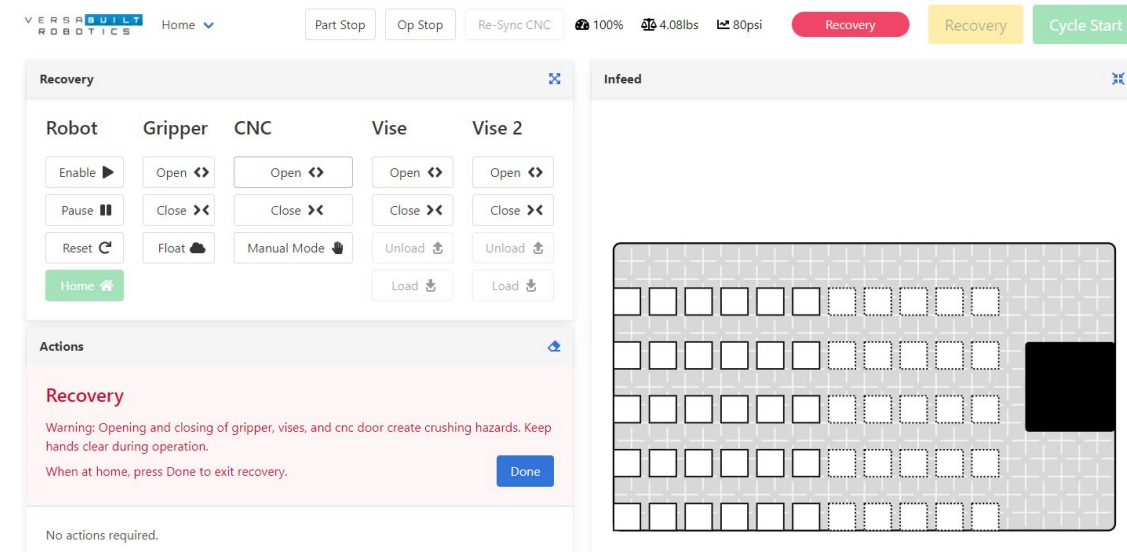
The VSC is accessed by a phone, tablet or computer.

Using a phone, tablet or computer, open the VSC web page using the following address:

192.168.4.1:9000 for Wifi connected devices

192.168.2.1:9000 for Ethernet connected devices

*For more information on how to configure the device networking to access the VSC, see the VSC Mill Operators Manual.



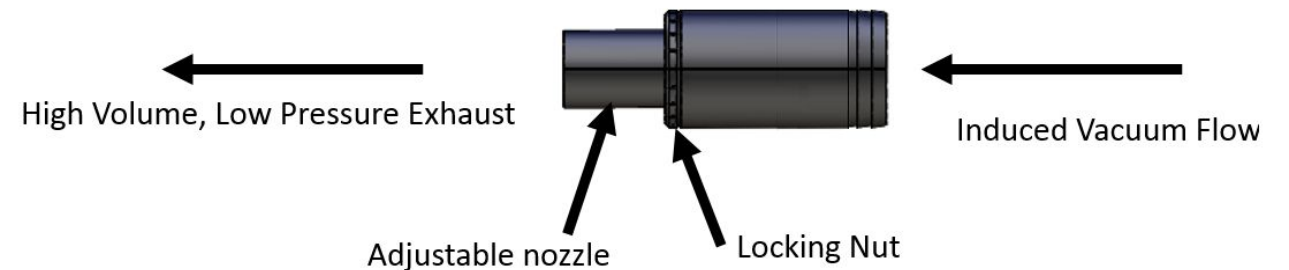
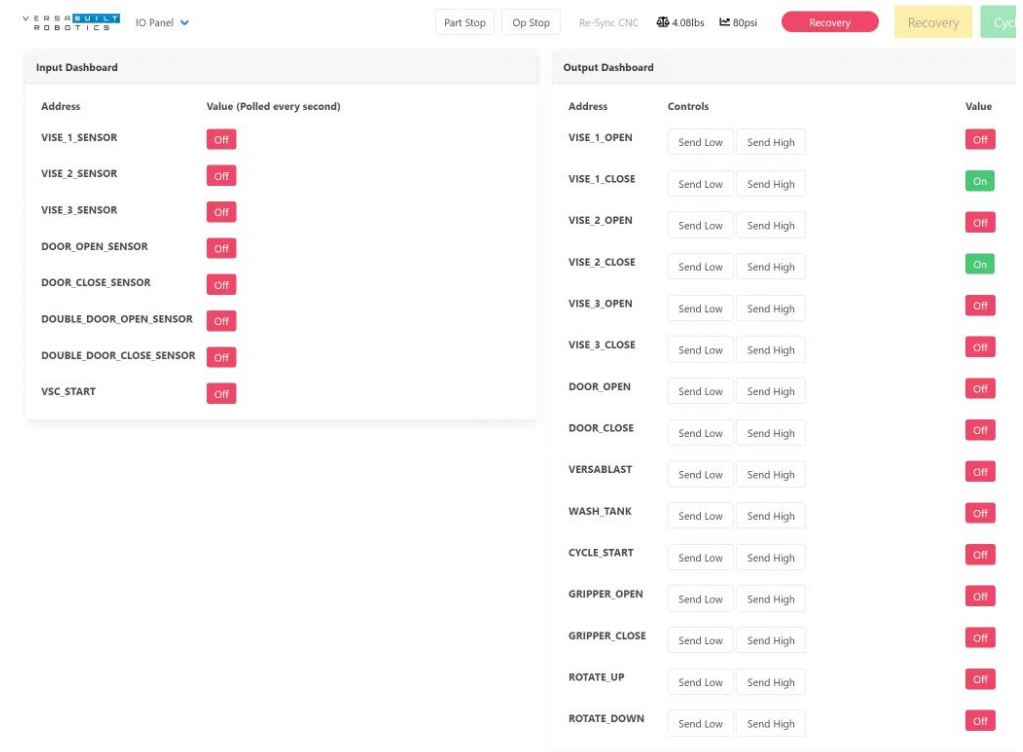
Validate VersaBlast

VersaBlast Validation and Adjustment

In the VSC Navigation Menu, select IO Panel. Make sure all people are clear of the vises, VersaBlast and CNC door during these tests. Press the VERSABLAST Send High button.

Make sure the VersaBlast is blowing air. Adjust nozzle to maximize air velocity with reasonable noise; tighten lock nut after adjustment is complete.

Turn the VersaBlast off by pressing the VERSABLAST Send Low button.



Validate Diverter Valve and Vise Actuation

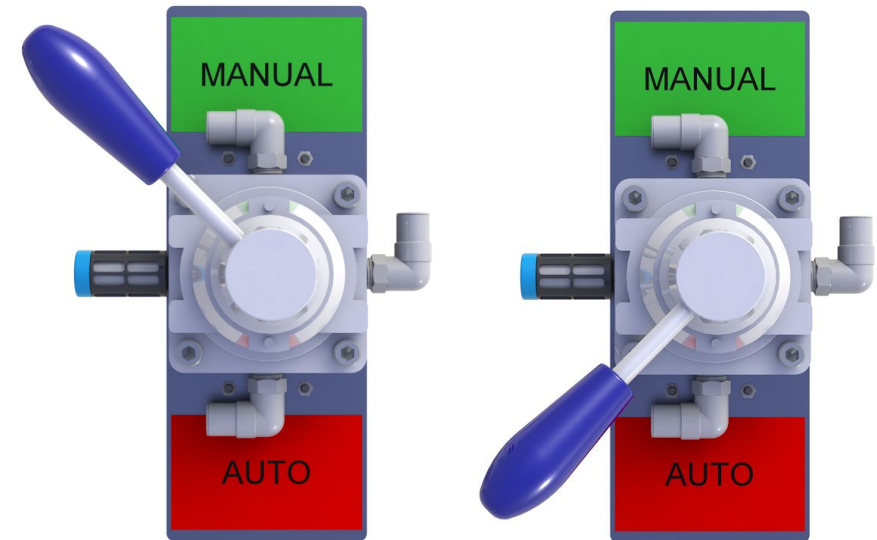
Manual/Auto Mode Validation:

Navigate to the VSC Home page and press the yellow Recovery button in the upper right hand section of the page.

- Switch the Diverter valve to Manual
- Using the CNC table hand-valves, verify that each vise actuates with its corresponding hand valve
- *If necessary, remove air to the VSC and swap airlines to get correct open/close order*

Vise Open/Close 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
- *If necessary, remove air to the VSC and swap airlines to get correct open/close order*

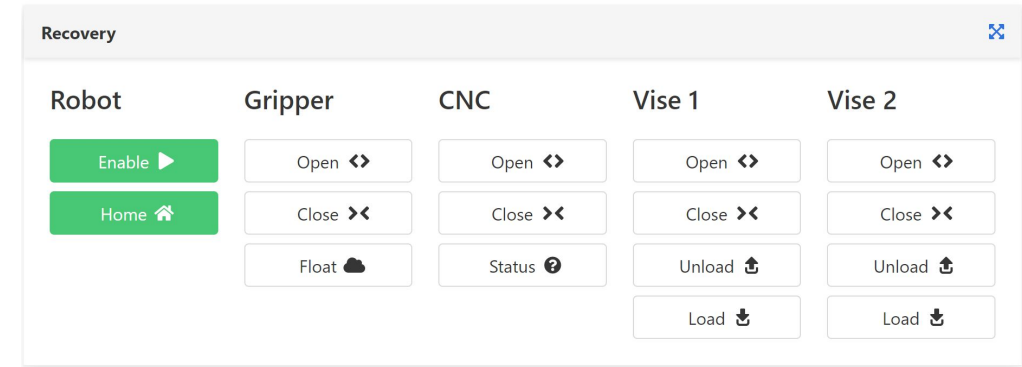


Validate Gripper

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*

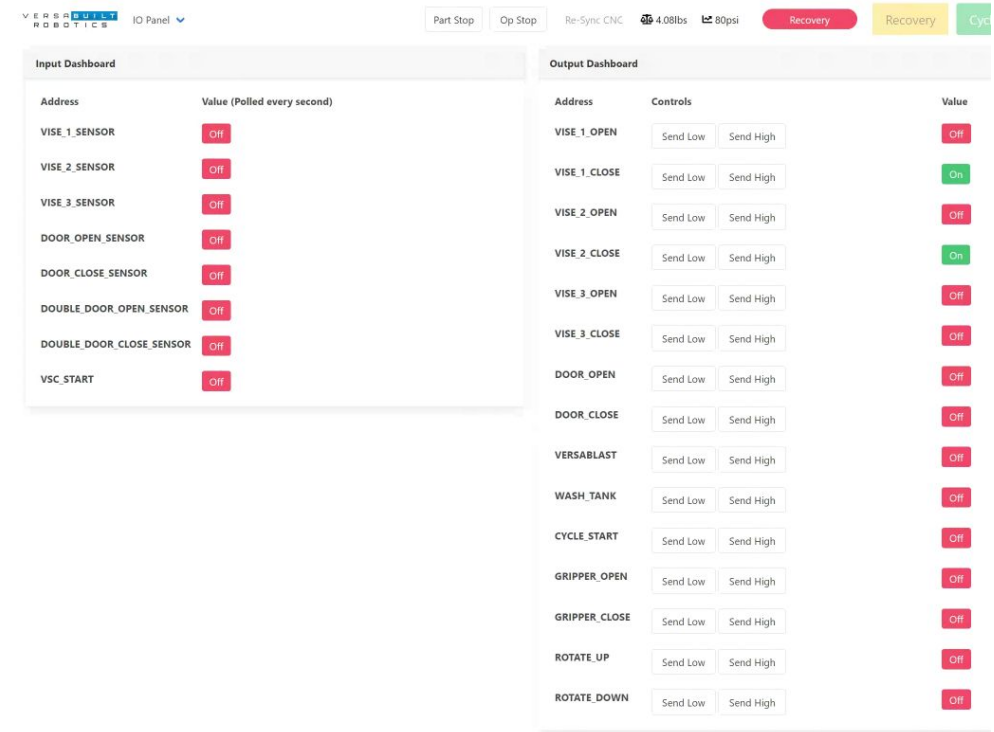


Validate Vise and Door Sensors

Vise Sensor Validation:

Navigate to the VSC IO Panel page.

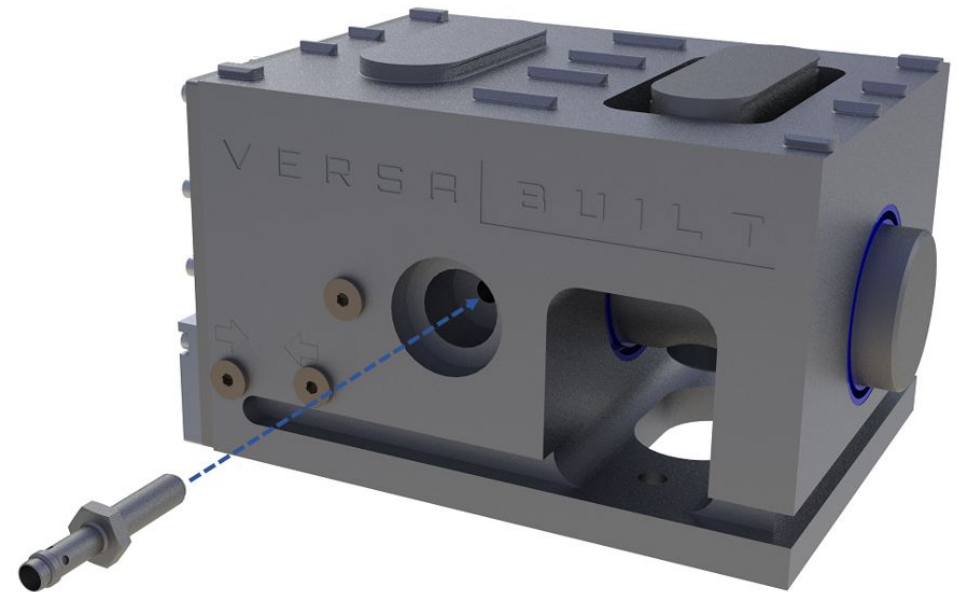
- With both vises Closed, verify Vise 1 and Vise 2 sensors are “Off”
- With both vises Open, verify Vise 1 and Vise 2 sensors are “Off”
- Place the Calibration Plate onto Vise 1 and Close Vise 1, verify the Vise 1 sensor is “On”
- Place the Calibration Plate onto Vise 2 and Close Vise 2, verify that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



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. 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.



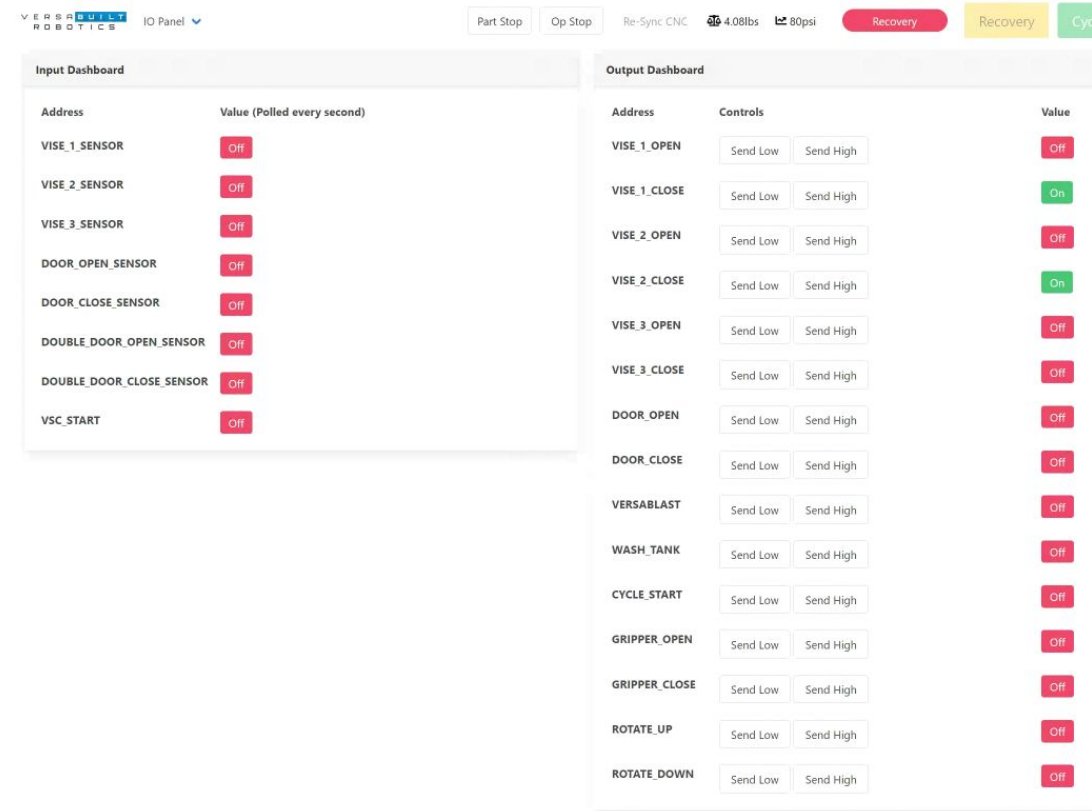
Validate VersaDoor and Door Sensors

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

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 the Door Close and Door Close Sensor



Refer to VersaDoor and VersaDoor Sensor Kit Manuals as needed

VSC Robot Calibration Overview

Calibration of the Mill Automation Kit 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

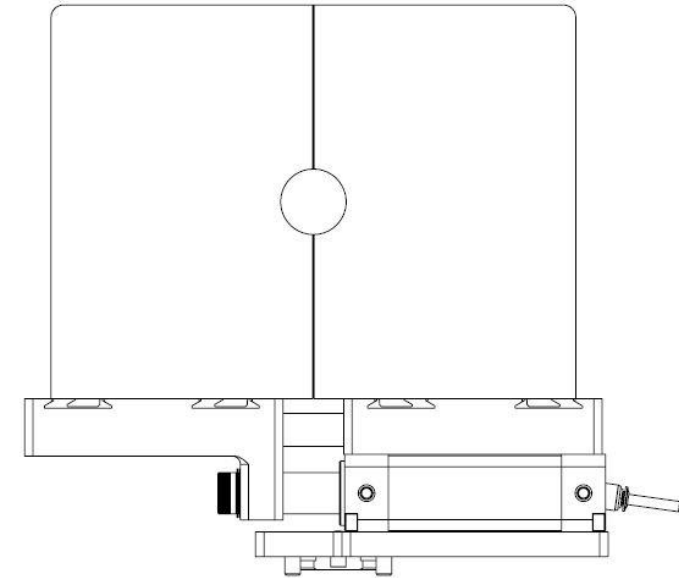
Important: Before starting the calibration procedure VersaBuilt recommends warming up the robot by pressing the Warmup button in the Calibration page.

The screenshot displays the 'UR Calibration' interface. It is organized into three main sections: 'Utility Functions', 'Calibrate Table', and 'Calibrate Positions'.
1. 'Utility Functions' includes buttons for 'Robot Warmup' (labeled 'Warmup'), 'Freedrive' (labeled 'Enable Freedrive'), and 'Run Table Load' (labeled 'Table Load').
2. 'Calibrate Table' contains three rows for 'Table Point 1', 'Table Point 2', and 'Table Point 3'. Each row has a yellow 'Move To' button, a blue 'Capture' button, and a grey 'Return Home' button. Below these is a green 'Calculate' button.
3. 'Calibrate Positions' includes buttons for 'InCNC', 'VersaBlast', 'Bin Drop', and three 'Vise' positions (Vise 1, Vise 2, Vise 3). Each has a yellow 'Move To' button and a blue 'Capture' button. The 'VersaBlast' row also includes a grey 'Test' button.

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

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

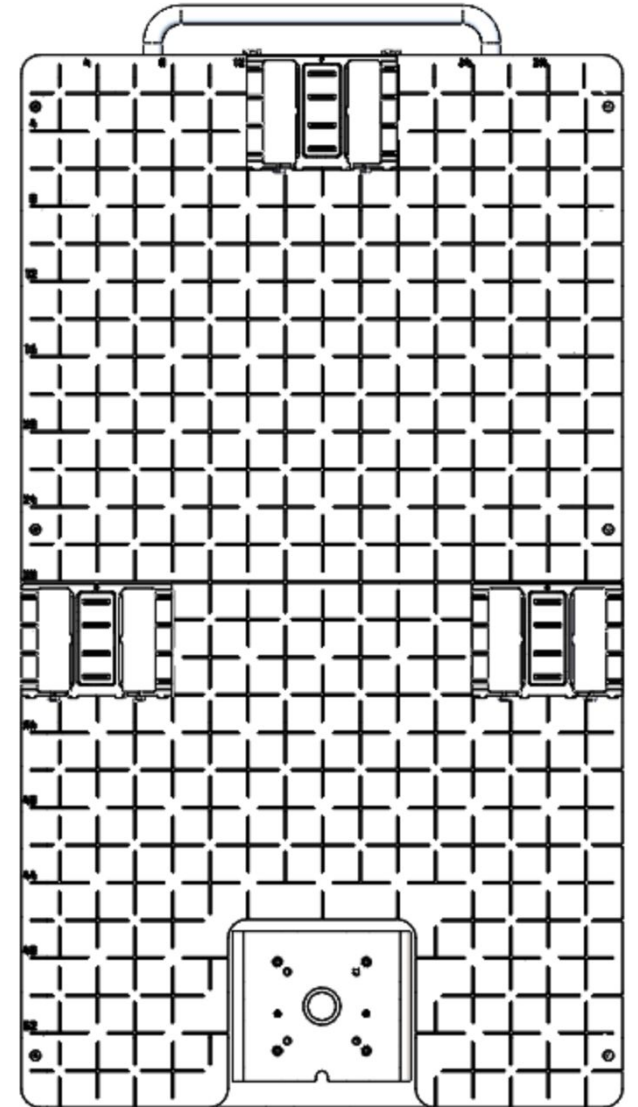
Capture Vise 3

Calibrate Table Points 1 through 3

From the Calibration page, with the calibration plate on the gripper, press the Move to 1 button in the Calibrate Table section. The VSC will move the robot to the first calibration position.

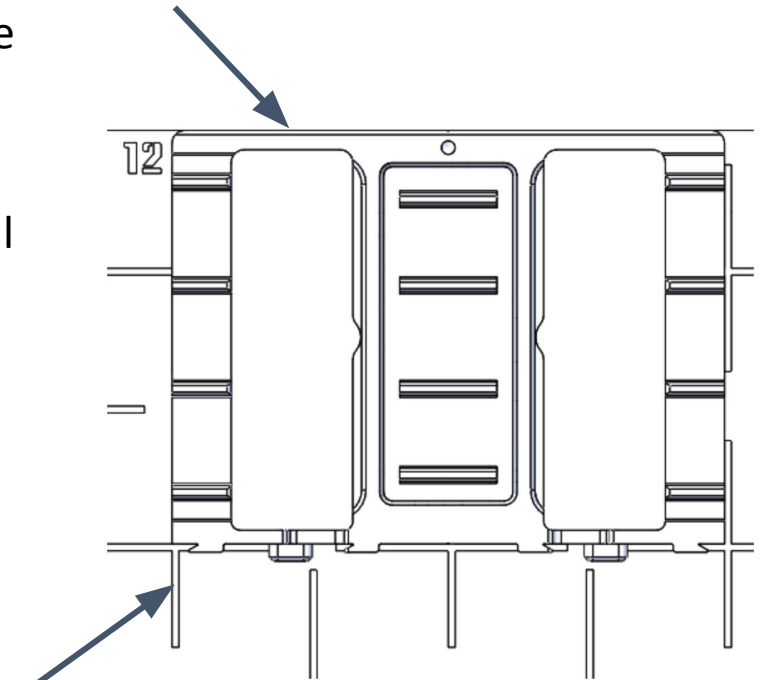
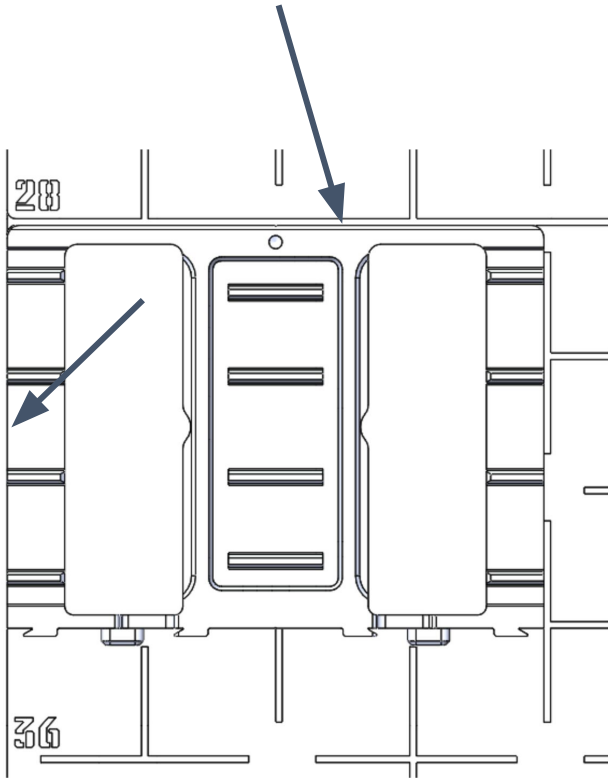
To move the calibration plate to the precise table calibration position, press the Enable Freedrive button (set weight to calibration plate).

Follow the instructions on the following pages for precisely positioning the calibration plate in each position. When the calibration plate is properly positioned, press the Stop Program button on the UR Teach pendant. Press the Capture 1 button in the Calibration panel to capture Table Point 1. Repeat for Table Points 2 and 3. Press the Return Home button to safely move the robot back to the Table Home position.



Calibrate VersaCart

- Precise alignment of the Calibration Plate is critical to the calibration process
- The Calibration Plate top and left edges are aligned with the VersaCart
- The top edge of the Calibration Plate must be aligned with the top edge of each Visual Infeed plate
- The left edge of the Calibration Plate is aligned with the left edge of the Visual Infeed plate for position 1
- For positions 2 and 3, the left edge of the Calibration Plate must be aligned with the left edge of the cut-out of the alignment mark



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

Calibrate VersaCart

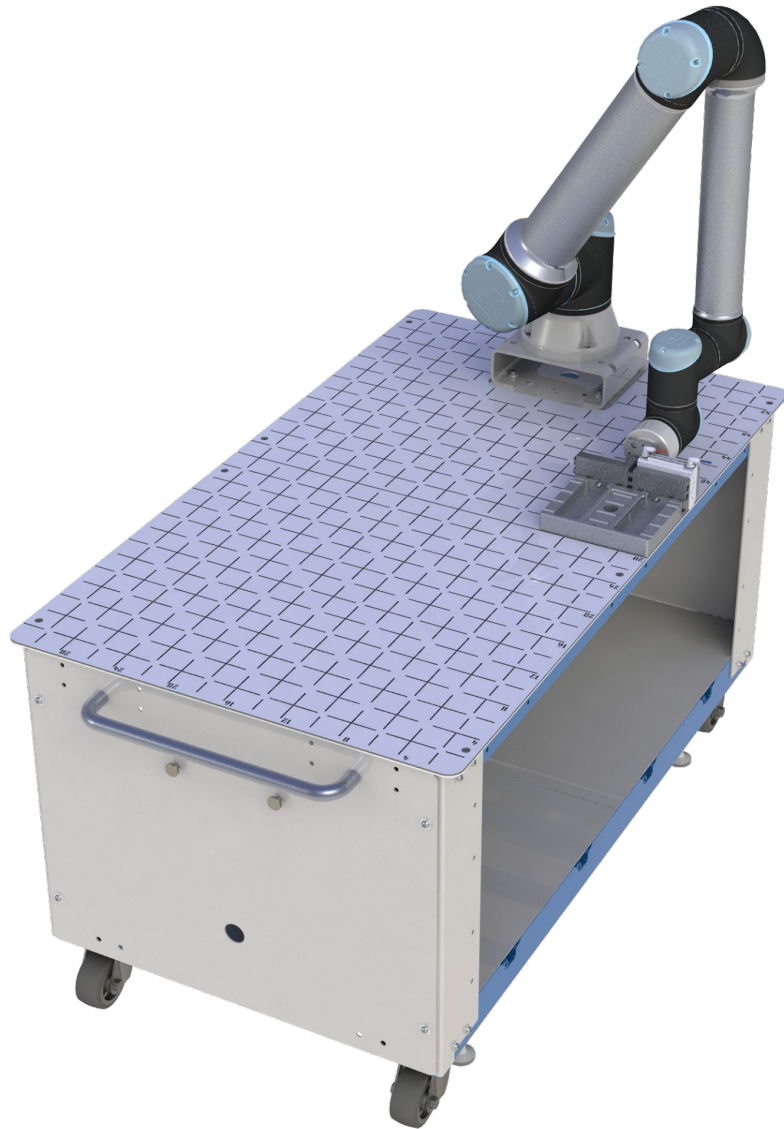


Table Point 1

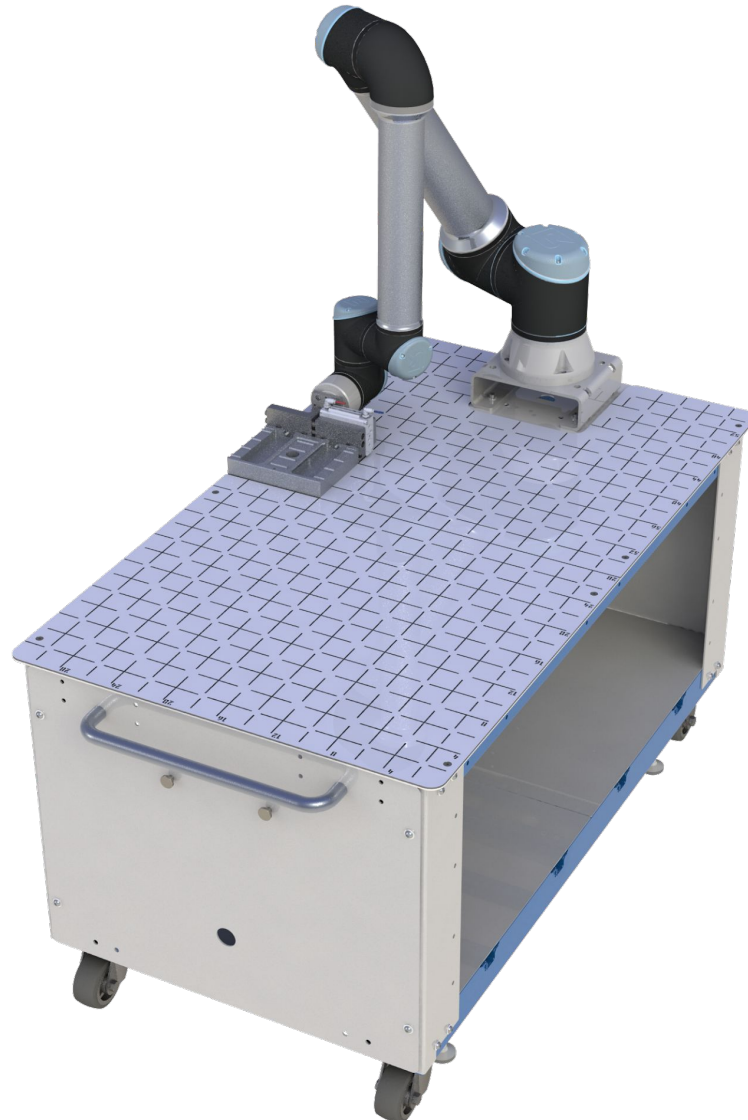
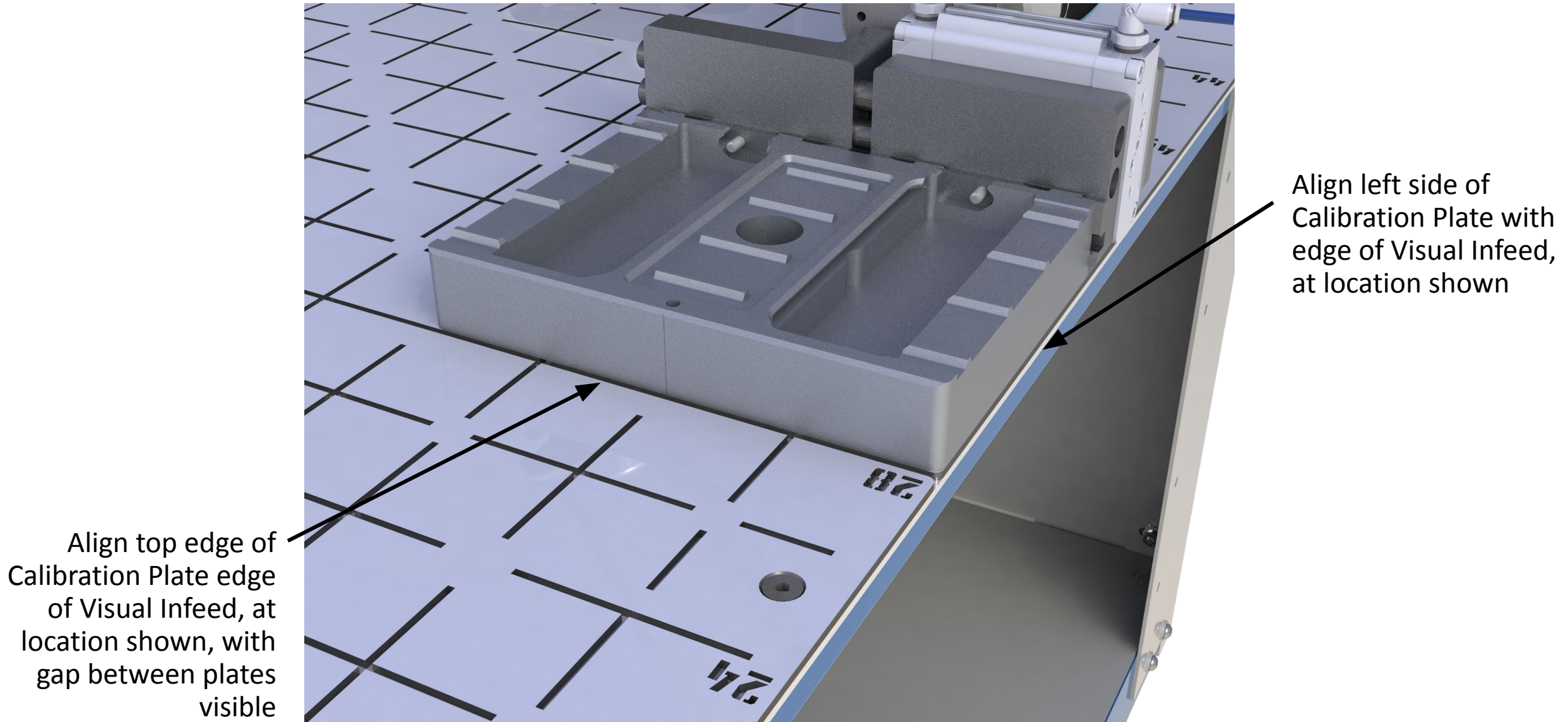


Table Point 2

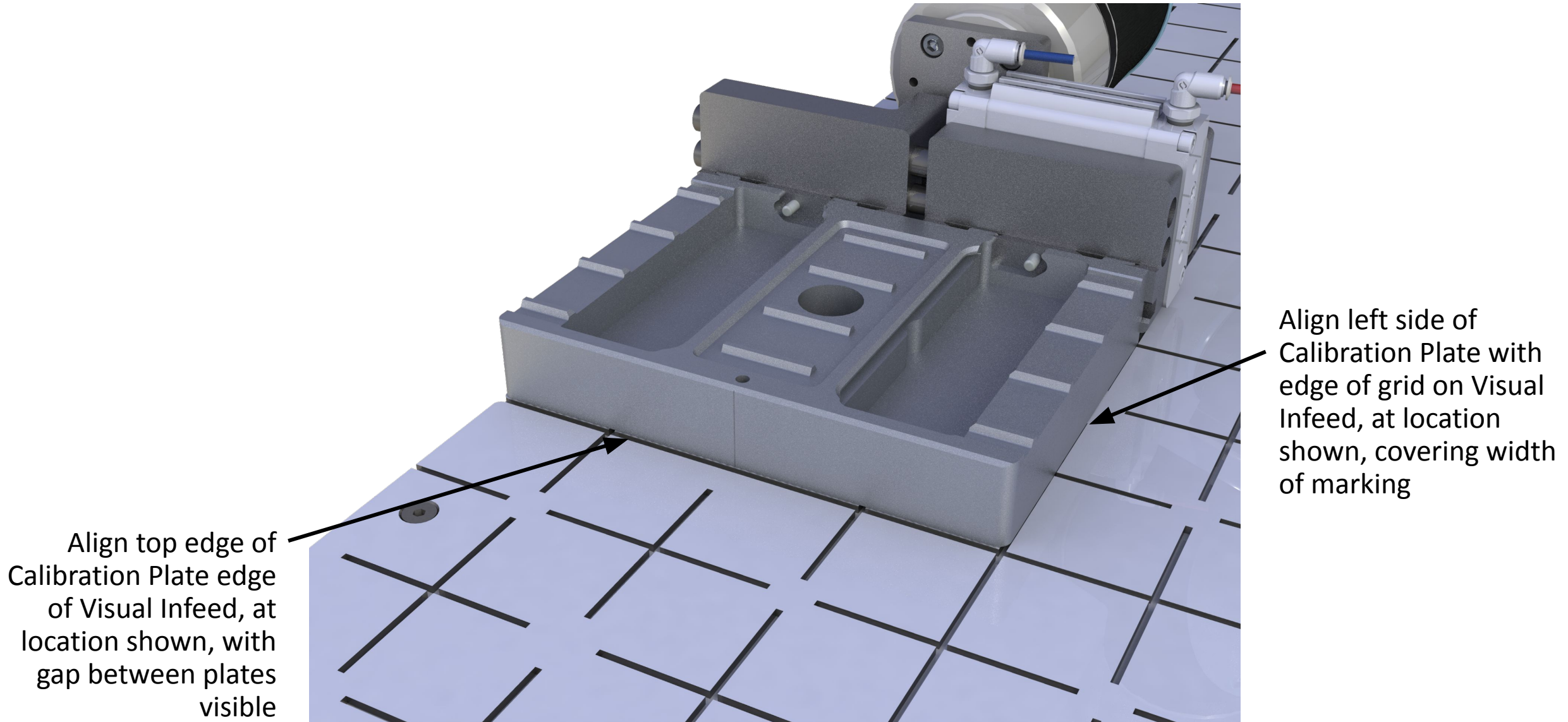


Table Point 3

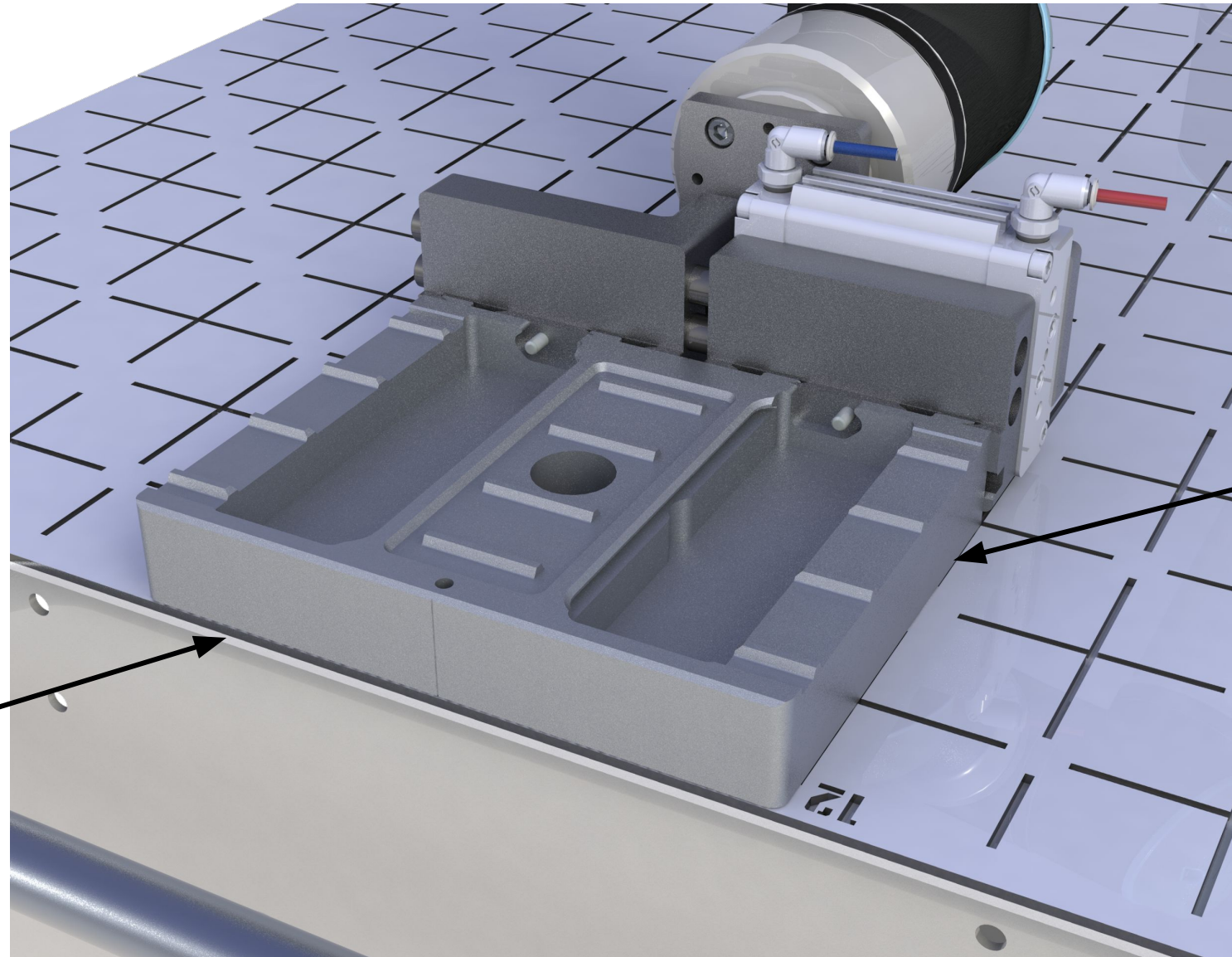
Calibrate VersaCart Table Point 1



Calibrate VersaCart Table Point 2



Calibrate VersaCart Table Point 3



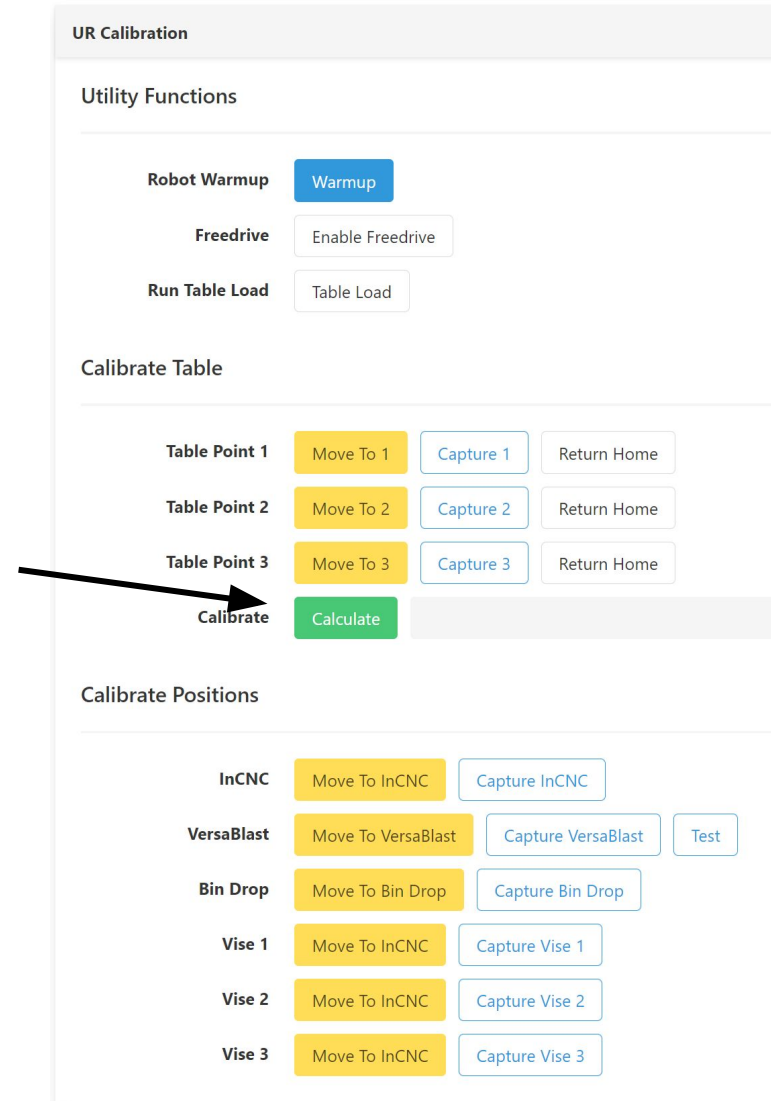
Align top edge of Calibration Plate edge of top of Visual Infeed, at location shown

Align left side of Calibration Plate with edge of grid on Visual Infeed, at location shown, covering width of marking

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

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

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.

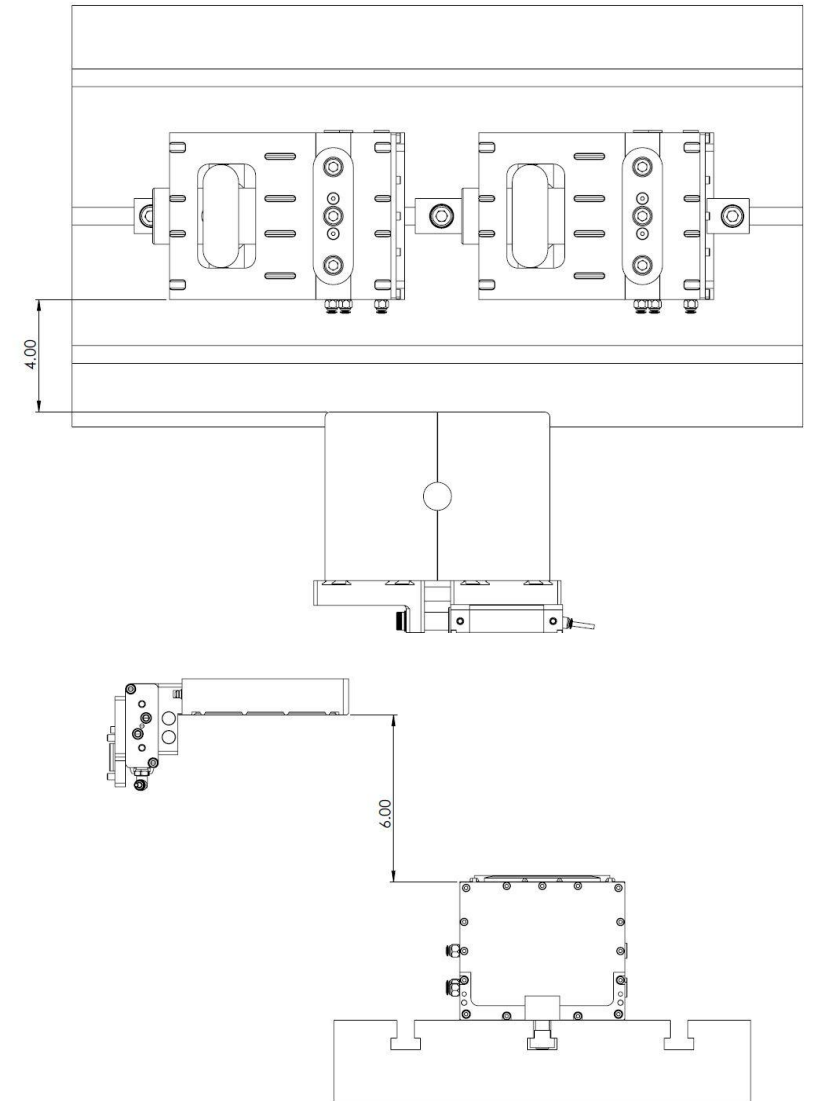
Move to Default InCNC Home Position

With the calibration plate in the Gripper, press the Move to InCNC 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. Do not use the rx, ry or rz buttons.

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. **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).

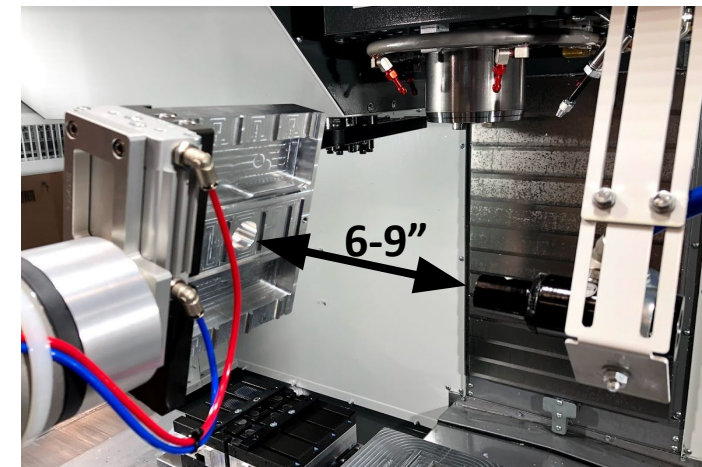
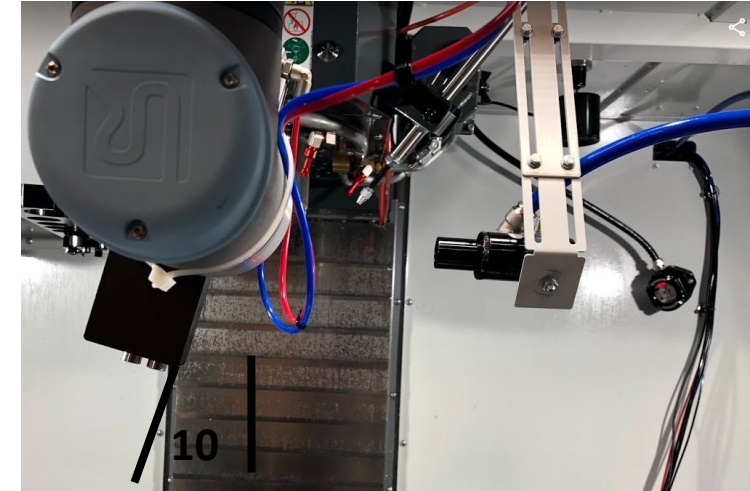
Move CNC to VersaBlast Position

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 InCNC 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

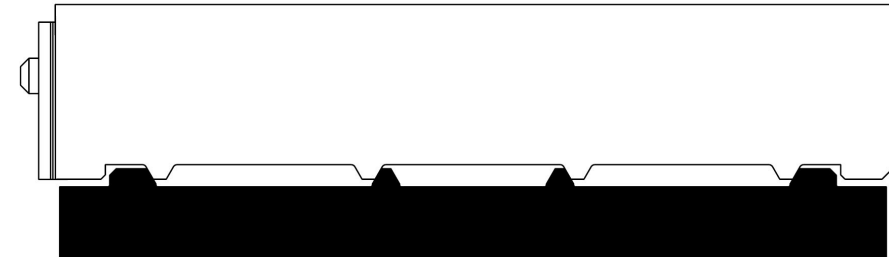
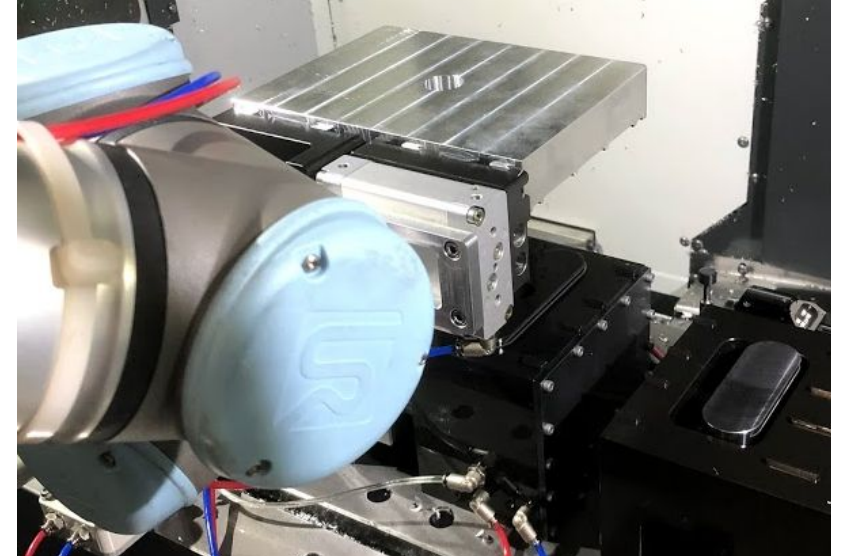
Move the CNC to the Table Load position. For CNC Macro Driver installations, press the Table Load button to run the CNC Table Load program from the VSC. For Generic CNC installation, run the Table Load program manually.

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.

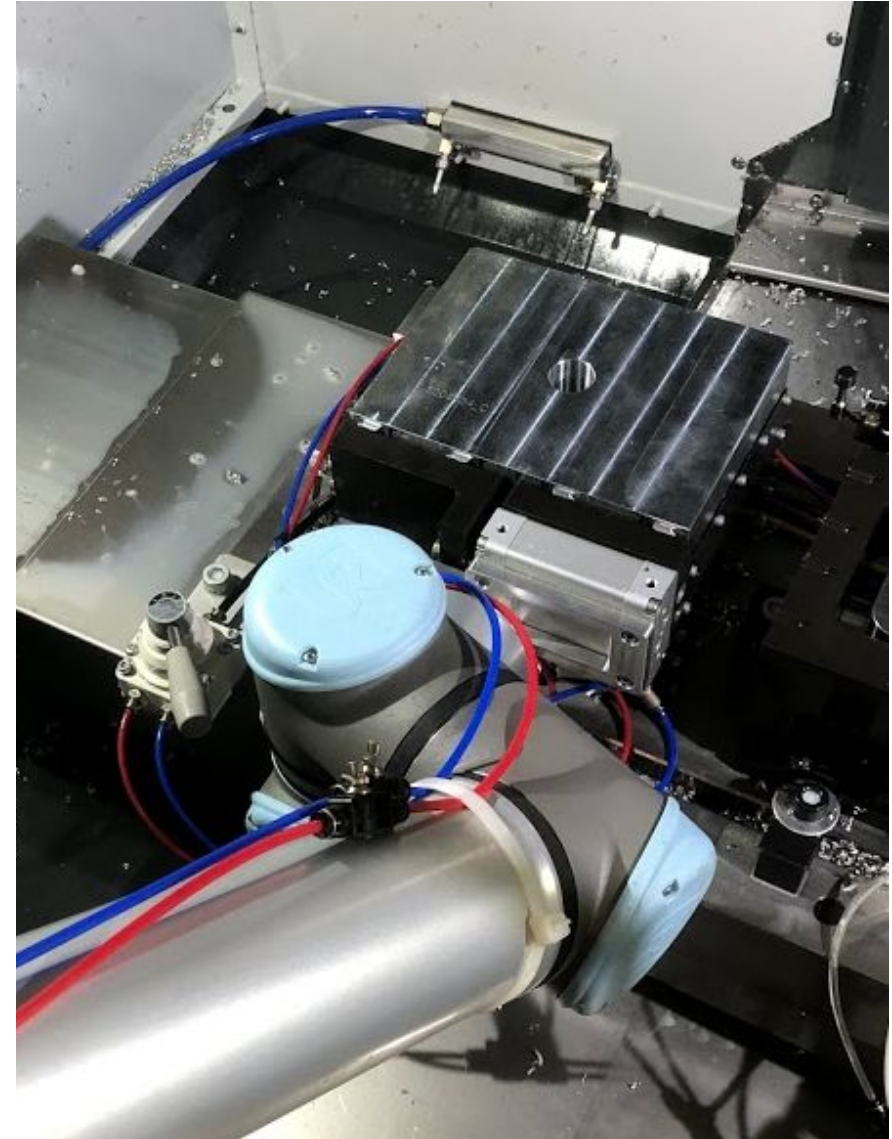
With the vise closed, press the Stop Program button on the UR teach pendant to end Freedrive mode.

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

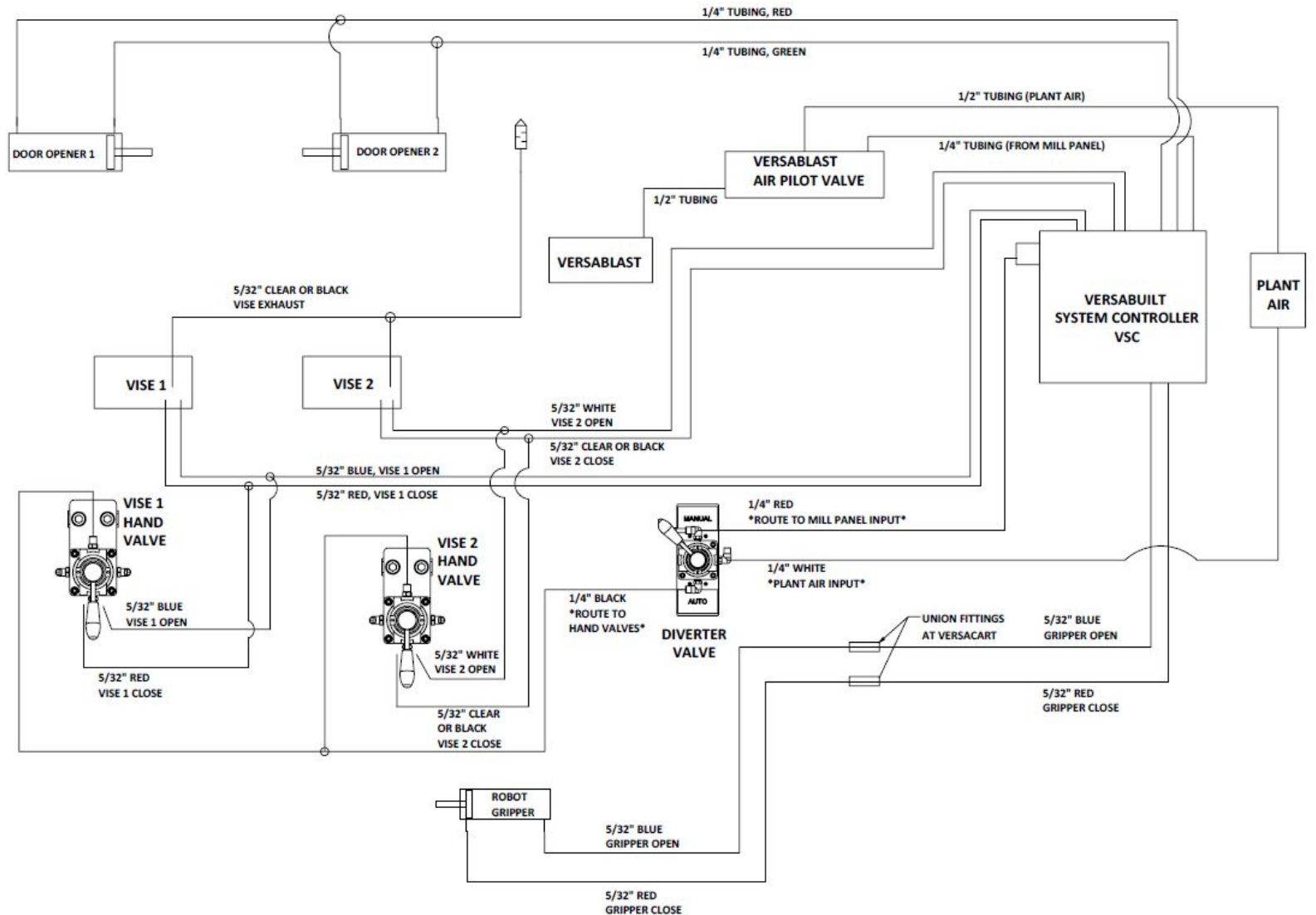
Appendices

Pneumatic Schematics

Block diagram of Mill Kit Pneumatics:

- Supply air to Diverter Valve
- Diverter Valve toggles system between “Manual Mode” with air supplied to Manual Valves and “Auto Mode” with air supplied to the VersaBuilt System Controller (VSC).
- VersaBuilt System Controller (VSC) controls air to Door Opener(s), VersaBlast, Robot Gripper and MultiGrip Vises.
- The following pages show detailed schematics of each device and block shown.

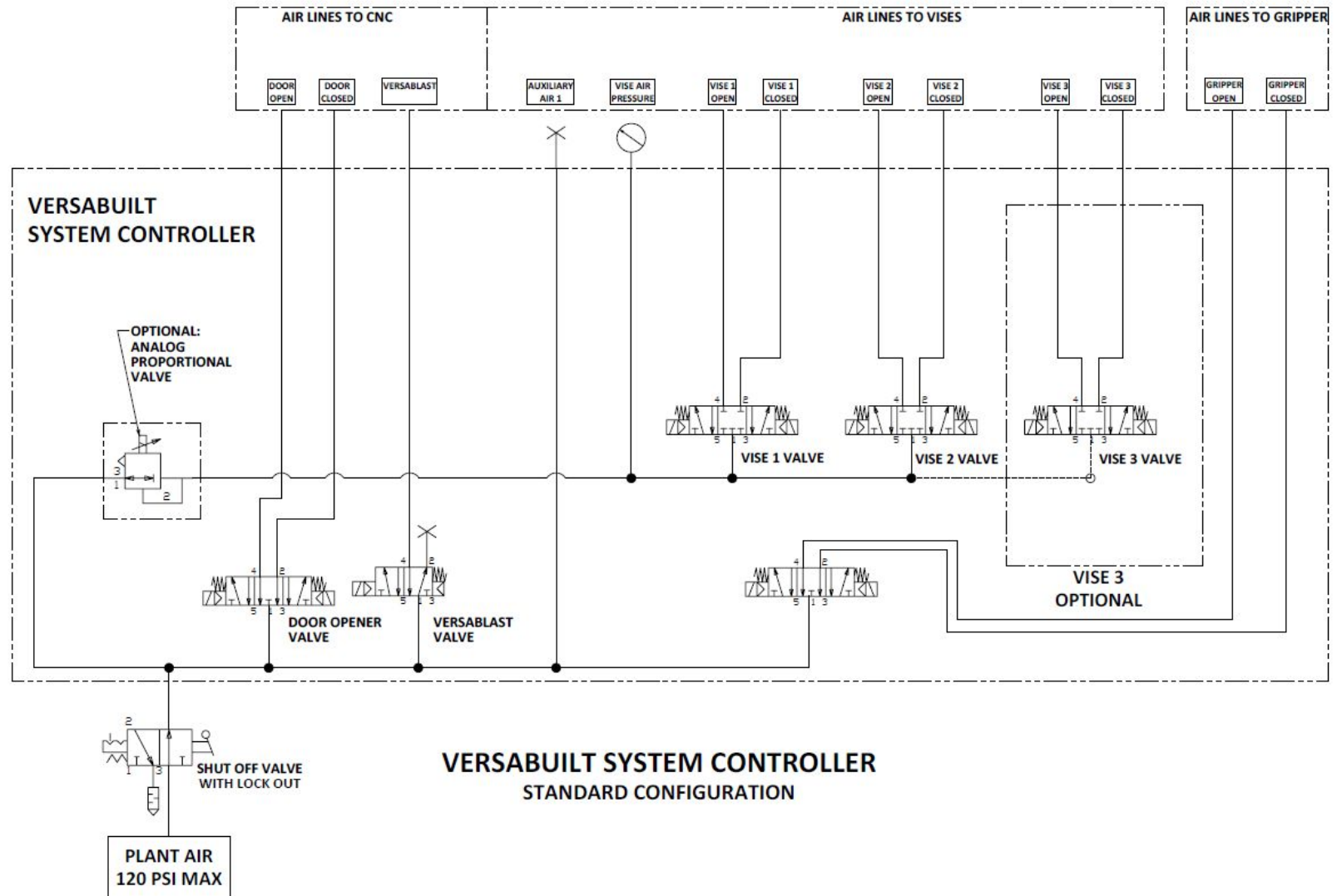
*Note: when in “Auto Mode”, manual valves need to be in center-position. When in “Manual Mode” vise valves need to be in center position, without power to either side of the solenoid valve



Pneumatic Schematics

Schematic shows inside detail of
VersaBuilt System Controller, including:

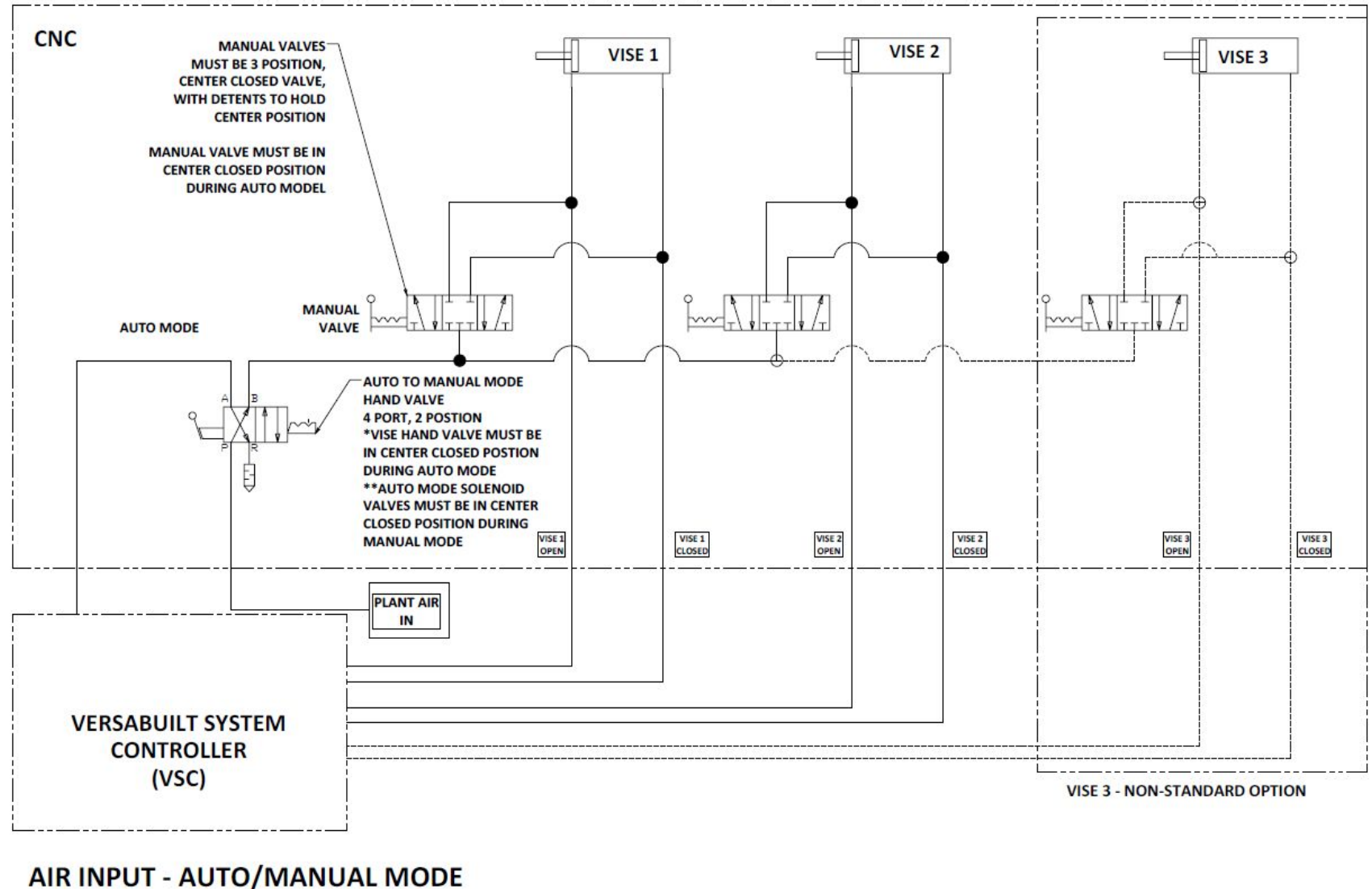
- 24VDC solenoid valves
- Vise valves are 5 port, 3 position, center closed
- Gripper valve is 5 port, 3 position, center exhaust
- Door valve is 5 port, 3 position, center exhaust
- VersaBlast is 5 port, 2 position
- Optional:
 - *Analog Proportional Valve for Vises to control pressure from 0 PSI up to the supplied plant pressure*
 - *Vise 3 Valve*



Pneumatic Schematics

Schematic shows detail of routing air with Auto-Mode/Manual-Mode Switch Valve:

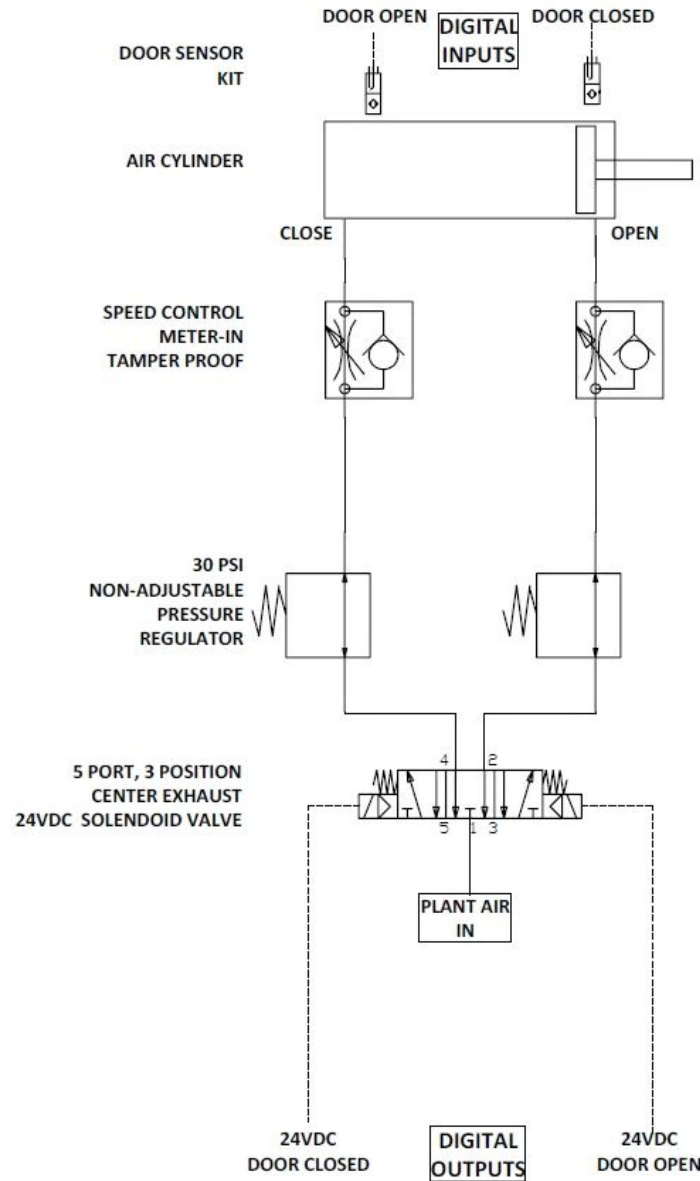
- The Diverter valve is a 2 position valve that will relieve downstream air on the unused side of the valve (when in manual mode, air to the Robot2CNC panel is exhausted, and when in auto mode, air to the manual valve is exhausted).
- A manual valve is used for each vise, with lines tee'd into the vise lines from the Robot2CNC Mill panel
- Manual valves are 3 position, center closed valve - this valve must be in the center position during Auto Mode
- The Robot2CNC vise valves are 3 position, center closed valves - these valves must be powered off (in the center position) during Manual Mode



Pneumatic Schematics

Schematic shows detail of routing air to VersaDoor (single door application)

- Plant Air is routed to a 5 port, 3 position, Center Exhaust, 24VDC solenoid valve. Center Exhaust allows the door to “float” or move freely, when power is removed from the valve.
- Robot controller panel includes 3 unused ports, shown with plug symbols: 2 are for second gripper and 1 is used for wrist blow-off. These are reserved for Lathe applications.
- Schematic shown to the right includes notes and symbols for Digital Outputs (24VDC) and Digital Inputs (Door Sensors). The required Digital Inputs and Outputs are supplied by the VersaBuilt System Controller.

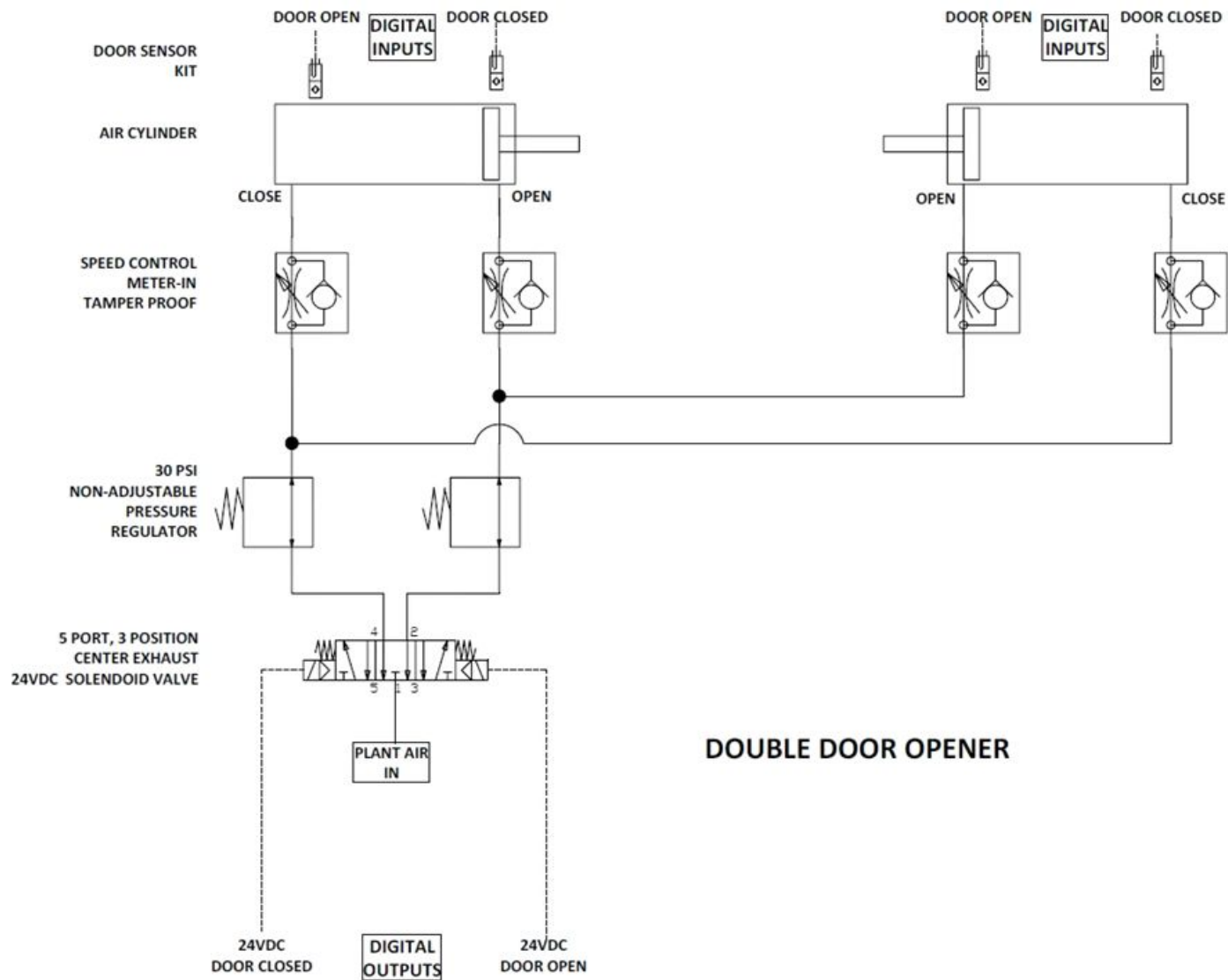


SINGLE DOOR OPENER

Pneumatic Schematics

Schematic shows detail of routing air to VersaDoor (double door application)

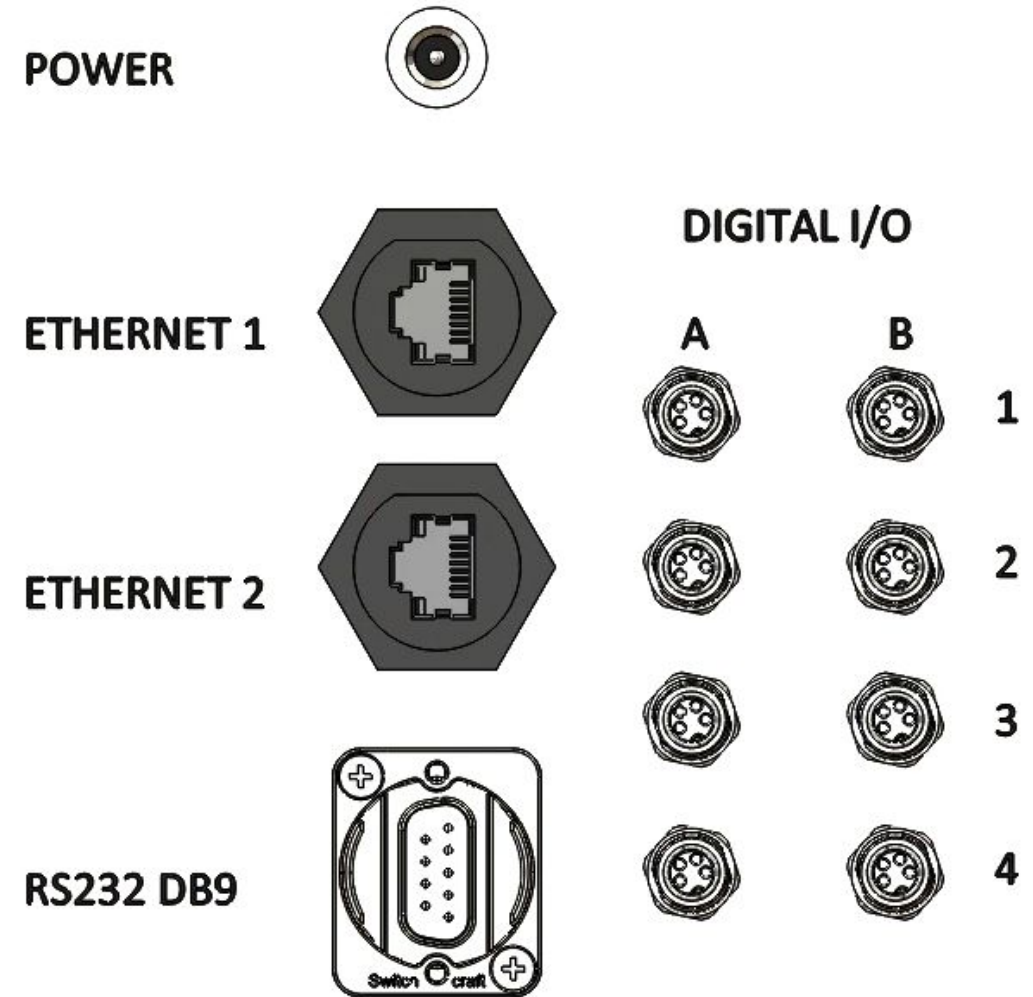
- Double door application is nearly equivalent to single door application, with exception of additional door actuator, 2x 30 PSI regulators, 2x door sensors, and 2x tee fittings to connect second door actuator with open/close signals.



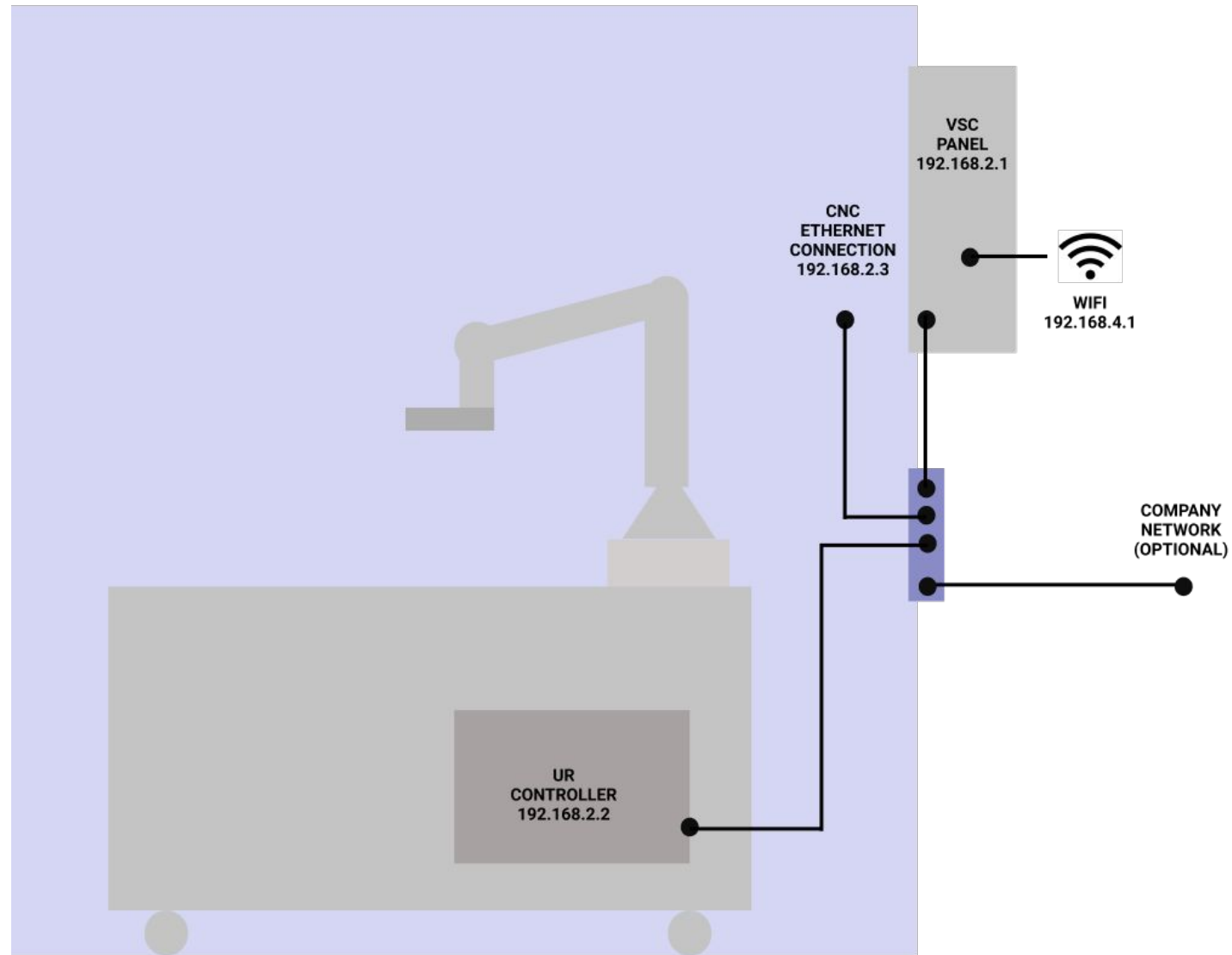
VersaBuilt System Controller (VSC) Panel Connections

- 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 = Generic Driver input or Vise Sensor, Vise 3
- 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
- B4 = Open



Network Diagram



V E R S A **B U I L T**
R O B O T I C S