VERSA BUILT ROBOTICS

UR Mill Application Kit
Operator Manual

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Safety Warnings

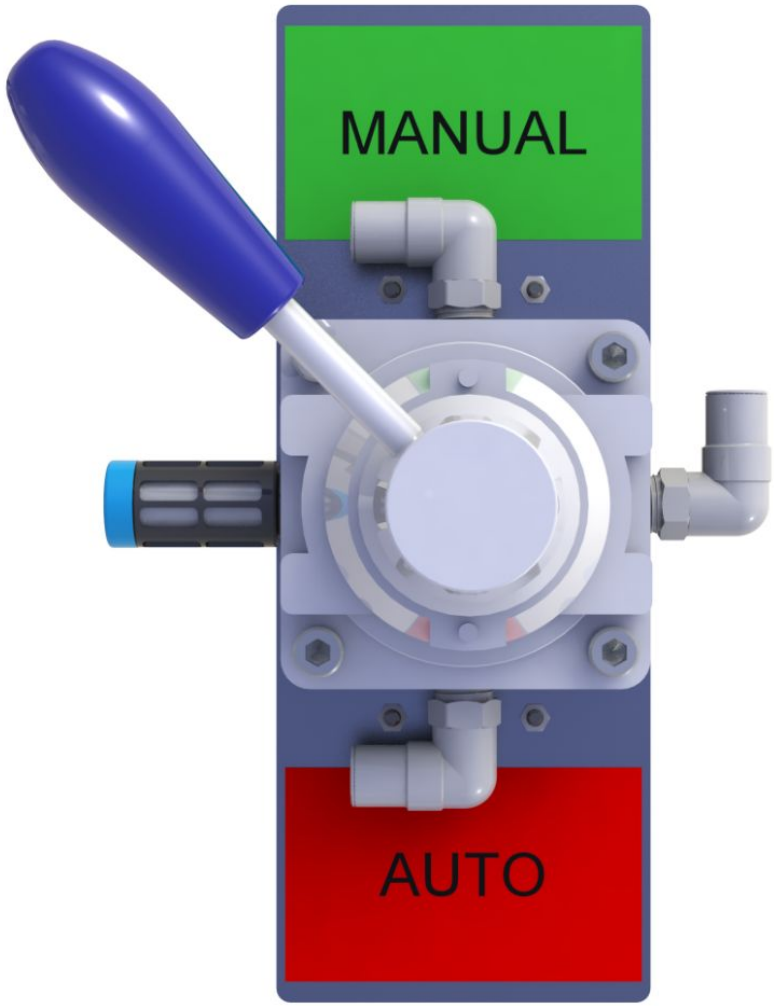
DANGER: The VersaBuilt UR Mill Application Kit is an industrial machine tool designed to be operated by trained personnel only. Devices within the UR Mill Application Kit may move suddenly and without warning. Serious or fatal crushing injuries can occur from contact with the robot, gripper or vises.

Before deploying the VersaBuilt UR Mill Application Kit, a safety risk assessment must be completed in accordance with local, state and/or federal requirements.

The UR Mill Application Kit should only be used by trained operators.

Safety Warnings

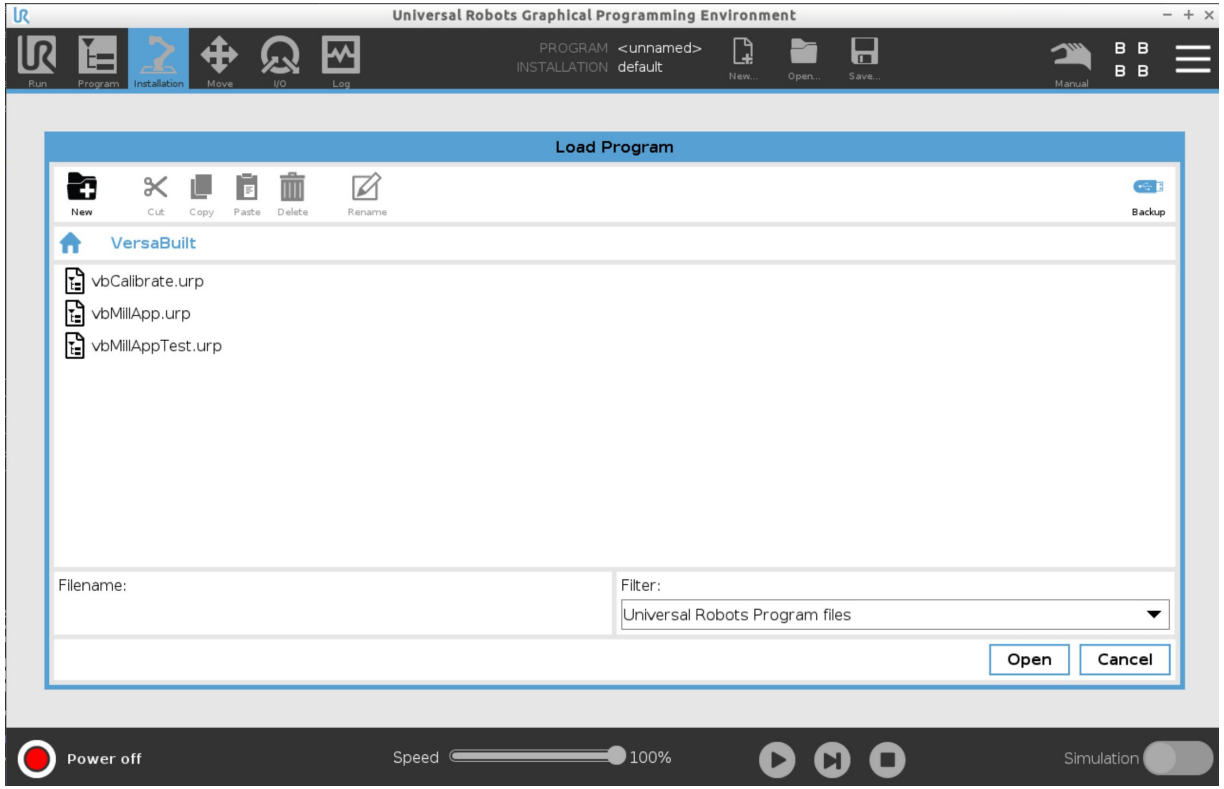
When the UR Mill Application Kit is not in use, remove the power to the Robot2CNC and switch the diverter valve to **manual mode** to prevent accidental automatic actuation of a connected pneumatic device.



Manual Mode

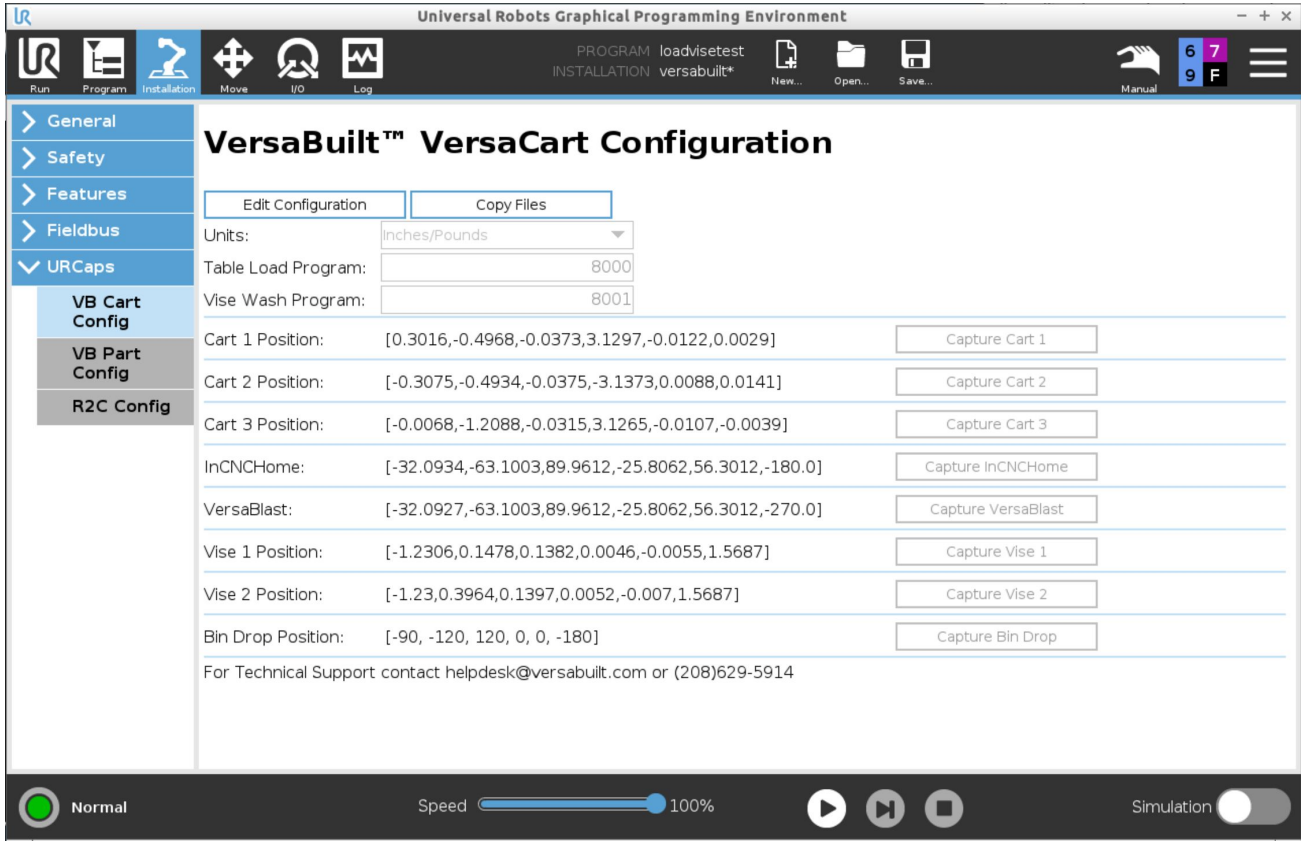
VersaBuilt UR Mill Application Kit Software

- The VersaBuilt UR Mill Application Kit includes software to help calibrate, configure, test and automate CNC production
- The included software allows most CNC milling automation tasks to be accomplished without ***any*** robot programming
- All VersaBuilt software should have been installed on the UR robot and the CNC during the installation process
- If the software is not installed, please refer to the UR Mill Application Kit - Installation Guide to ensure all steps have been completed



VersaBuilt UR Mill Application Kit Software

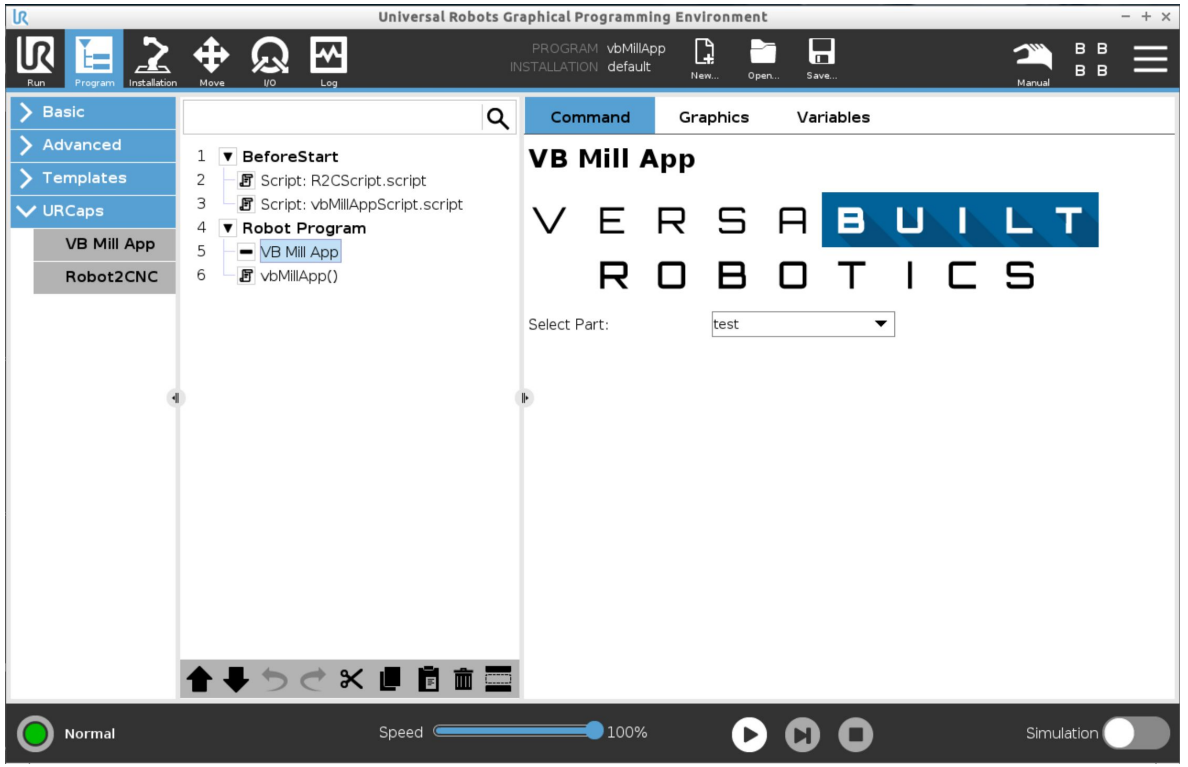
- Two VersaBuilt URCap plug-ins are included in the kit:
  - VersaBuilt Robot2CNC URCap
  - VersaBuilt Mill App Kit URCap
- Installation of the VersaBuilt URCaps is documented in the UR Mill Application Kit - Installation Guide
- This manual assumes the installation and configuration of the VersaBuilt URCaps is complete



VersaBuilt UR Mill Application Kit Software

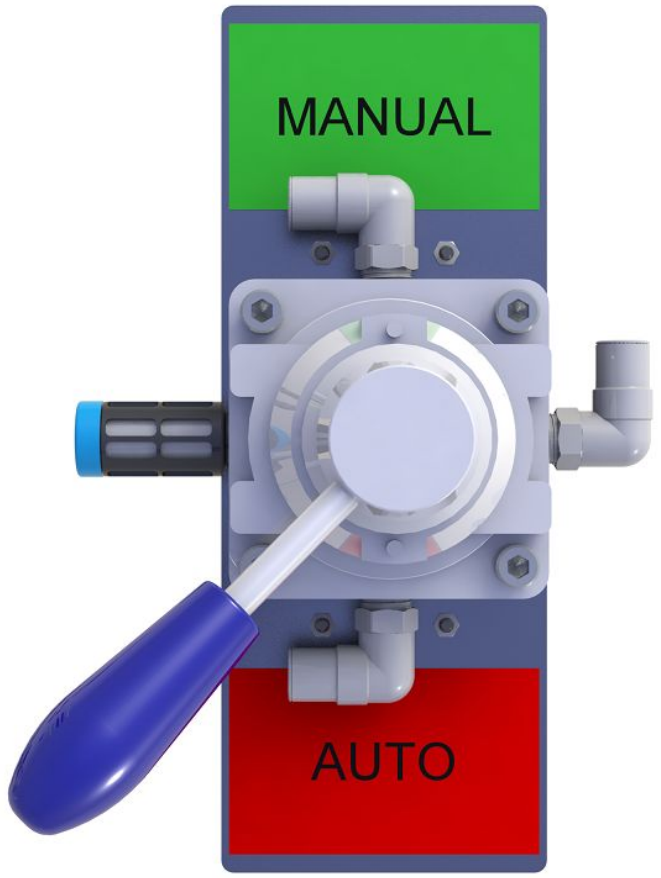
Three UR programs are included in the kit:

- **VBCalibrate** is a menu-driven program that assists in calibrating the VersaCart and the CNC and is documented in the **UR Mill Application Kit - Installation Guide**
- **VBMillAppTest** is a menu-driven program that can be used to verify and test an automation process and is documented in the **UR Mill Application Kit - Machinist Manual**
- **VBMillApp** performs the automated processing of parts and is the primary operator interface to the system



Selecting Automatic vs Manual Mode

- The UR Mill Application Kit has 2 pneumatic modes:
  Auto and Manual
  - Auto mode is for running parts in the CNC with robotic tending
  - Manual mode is for running parts in the CNC via hand loading
- When the system is in Auto Mode, air to the hand valves on the CNC table is blocked.
- When the system is in Manual Mode, air to the Robot2CNC Mill Panel and **optionally**[1] the Robot Controller (for gripper) is blocked, disabling automatic functionality.
- Switching between these 2 modes is done by way of the Diverter Valve and the Vise Hand Valves[2]



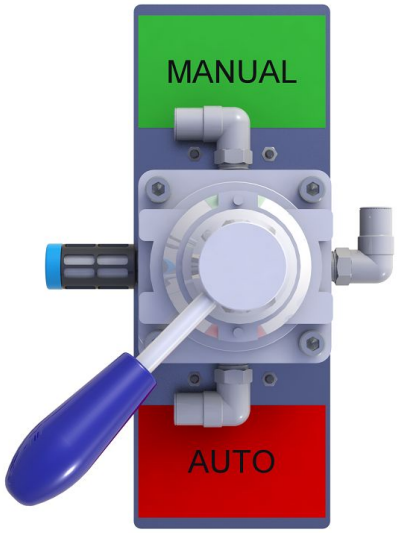
Diverter Valve shown in “Auto-Mode”

Notes:

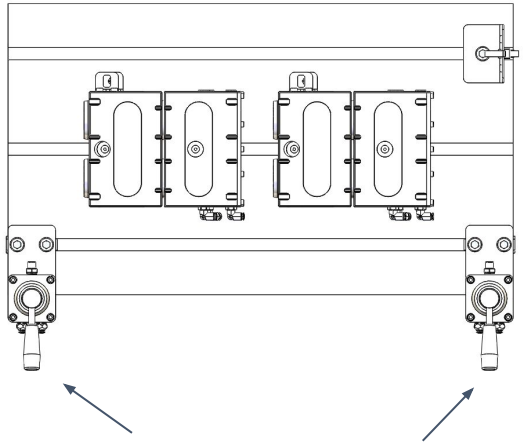
1) The UR Mill Application Kit - Installation Guide allows the Robot Controller pneumatics to be supplied by the Diverter Valve or be independent of the Diverter Valve; be sure to understand how the system is configured and what the diverter valve controls and does not control
2) Always test for proper pneumatic functionality when switching between Auto and Manual modes

Selecting Pneumatic Automatic vs Manual Mode

- Setting Automatic Mode:
  1. Be prepared for sudden movement of the vises, gripper, door opener and/or VersaBlast
  2. Set each Vise Hand Valve to the center position
  3. Ensure all persons are clear of the vises, gripper, door opener and VersaBlast
  4. Move the Diverter Valve handle to the AUTO position
  5. On the UR Teach Pendant -> Installation -> URCaps -> R2C Config validate vise, door and VersaBlast operation are working correctly



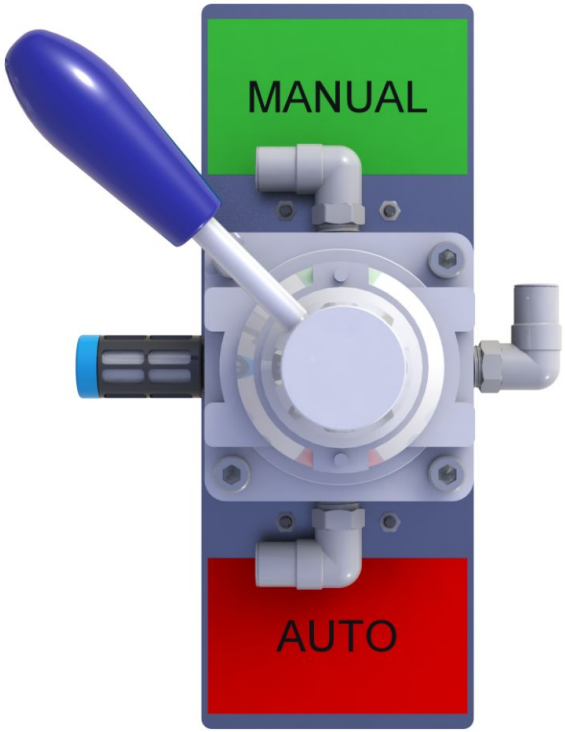
Diverter Valve shown in "Auto-Mode"



Vise Hand Valves shown in center position

Selecting Pneumatic Automatic vs Manual Mode

- Setting Manual Mode:
  1. Be prepared for sudden movement of the vises, gripper, door opener and/or VersaBlast
  2. Ensure all persons are clear of the vises, gripper, door opener and VersaBlast
  3. On the UR Teach Pendant -> Installation -> URCaps -> R2C Config press the Float Vises button
  4. Move the Diverter Valve handle to the MANUAL position
  5. With ALL body parts clear of each vise, set each Vise Hand Valve away from the center position



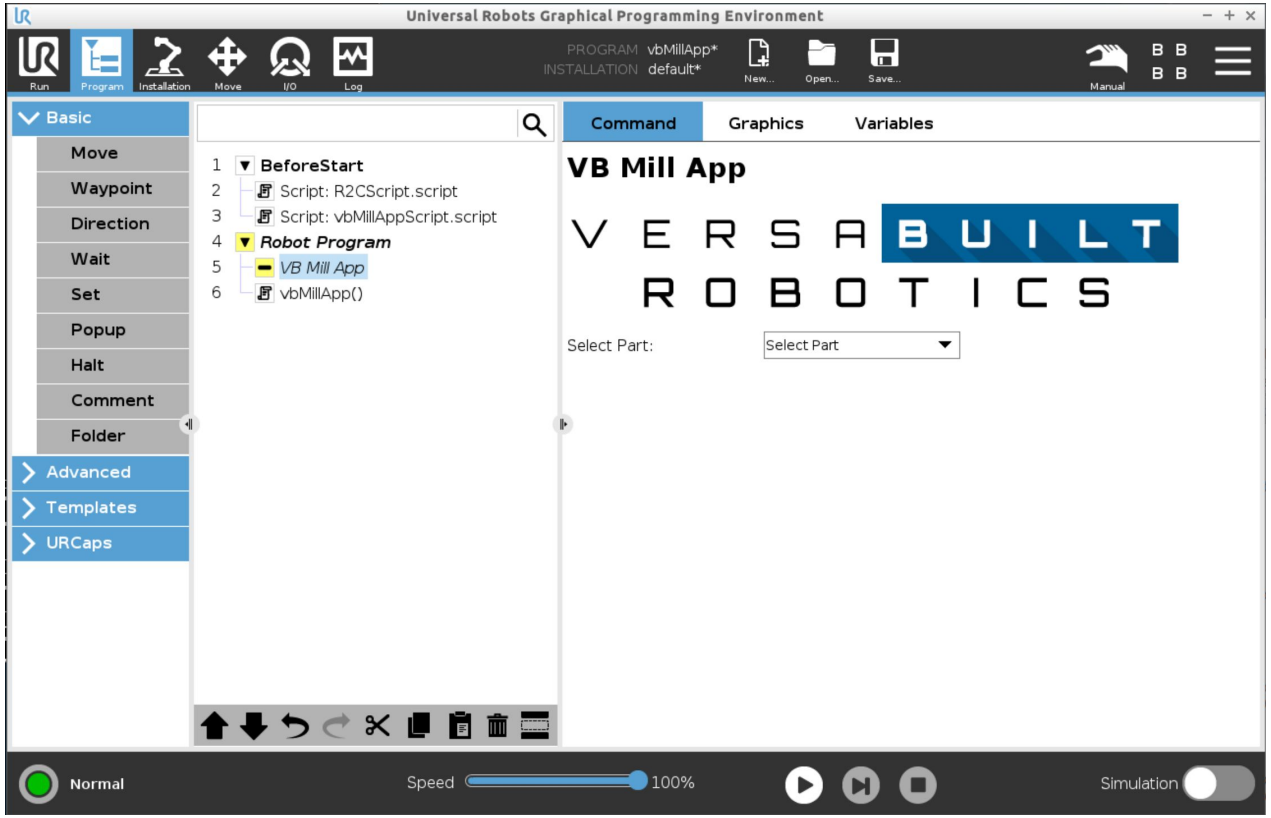
Diverter Valve shown in “Manual-Mode”

Preparing to Run the VB Mill App Program

1. Prepare CNC
   a. Clean vises of chips and load OP 1 and OP 2 MultiGrip Jaws onto vises
   b. Ensure VersaBlast is properly positioned in CNC
   c. Clean CNC of chips, check coolant level, ensure proper tooling is loaded
   d. Ensure OP 1 and OP 2 programs are loaded in CNC memory
   e. If applicable, ensure Robot2CNC dispatcher program is selected
   f. Put CNC in Memory mode
2. Prepare UR Mill App Kit
   a. Ensure the part to be run has been configured in the VB Part Config URCap in the Installation tab of the UR Teach Pendant
   b. Clean VersaCart Visual Infeed of chips and other debris
   c. Ensure robot is in a position where it can safely move to a home location
   d. Select Pneumatic Automatic Mode
   e. Load the VBMillApp program on UR Teach Pendant

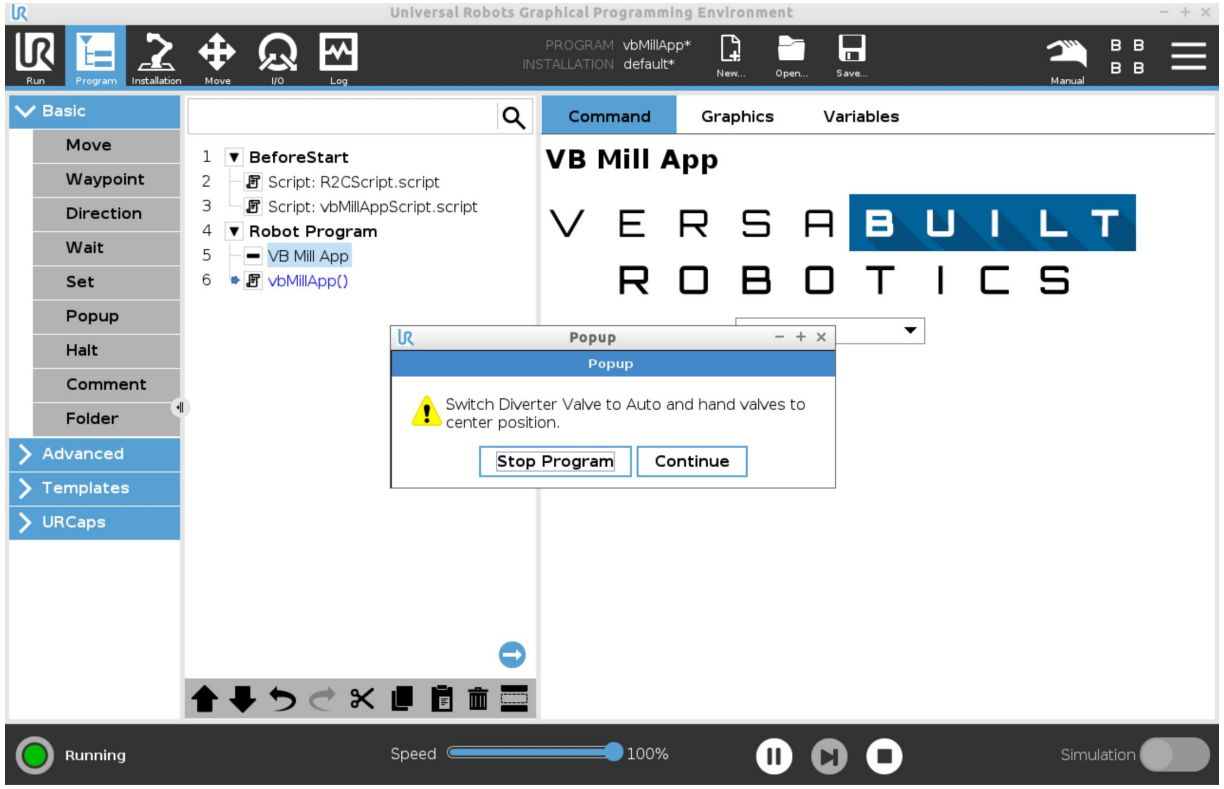
Using the VB Mill App Program

- Open the **vbMillApp** program installed in the VersaBuilt directory of the UR Teach Pendant
- Select the Program tab on the UR Teach Pendant
- Click on the VB Mill App program node under the Robot Program tree
- Select the part to be run from the drop down list of the VB Mill App program node
- Press play on the UR Teach Pendant



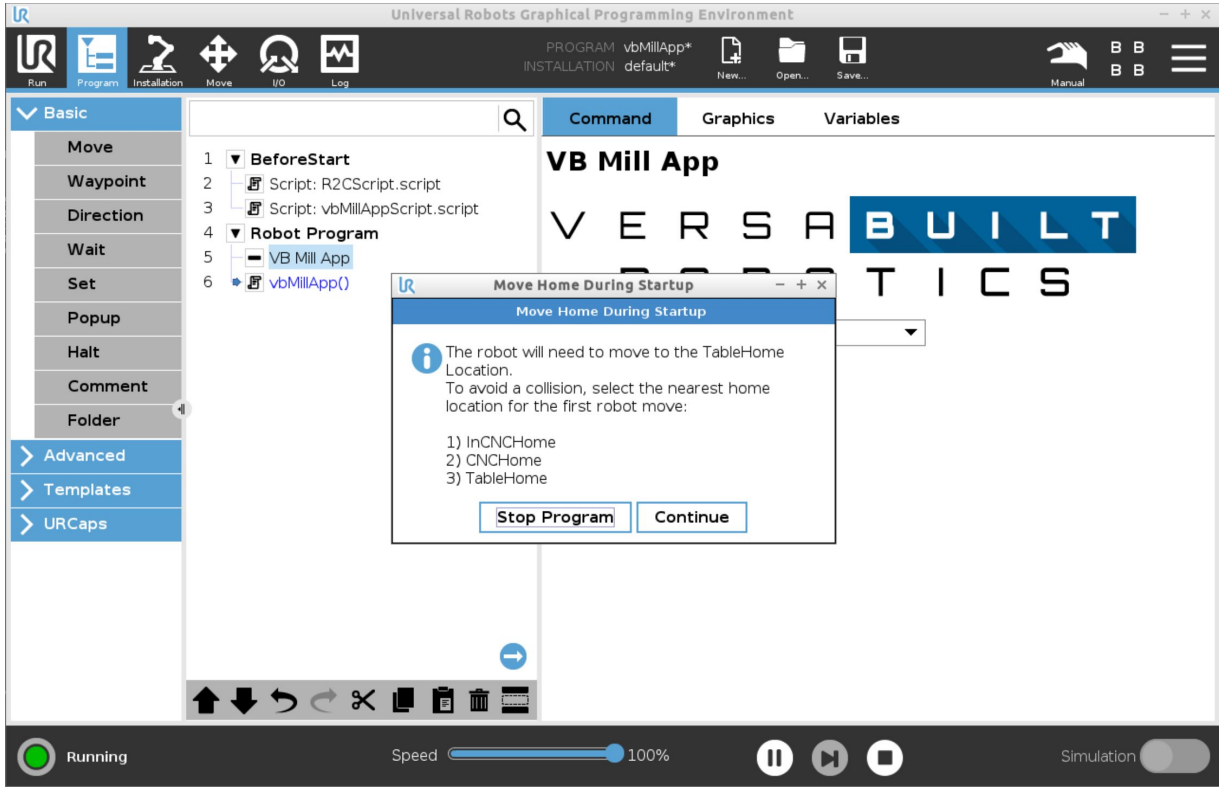
Confirm Diverter Valve and Vise Hand Valves Position

- At startup, the VB Mill App program will first ask the operator to validate the Diverter Valve is in the Auto position and that the Vise Hand Valves are in the center position



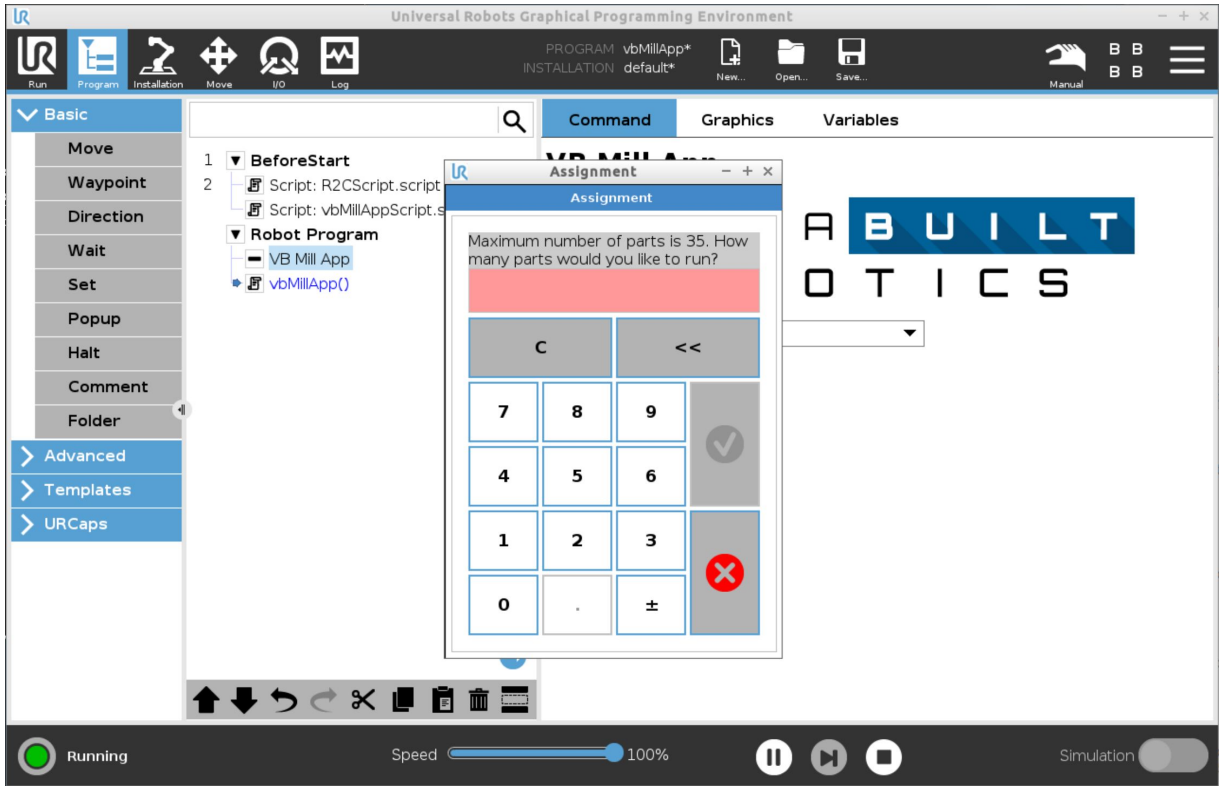
Moving to the Table Home Location

- Next, the VB Mill App Program will ask the Operator which home location the robot should move to before moving to the TableHome location
- The Operator is responsible for making sure the robot can get to the home location without any collisions
- Select the home location the robot gripper is nearest:
  a. InCNCHome if the robot gripper is inside of the CNC
  b. CNCHome if the robot gripper is near the CNC but not inside the CNC
  c. TableHome if the robot gripper is near the table
- Be prepared to stop the VB Mill App program if the robot is moving towards a collision and jog the robot away from the collision using the Move tab on the UR Teach Pendant or using the Freedrive button on the UR Teach Pendant



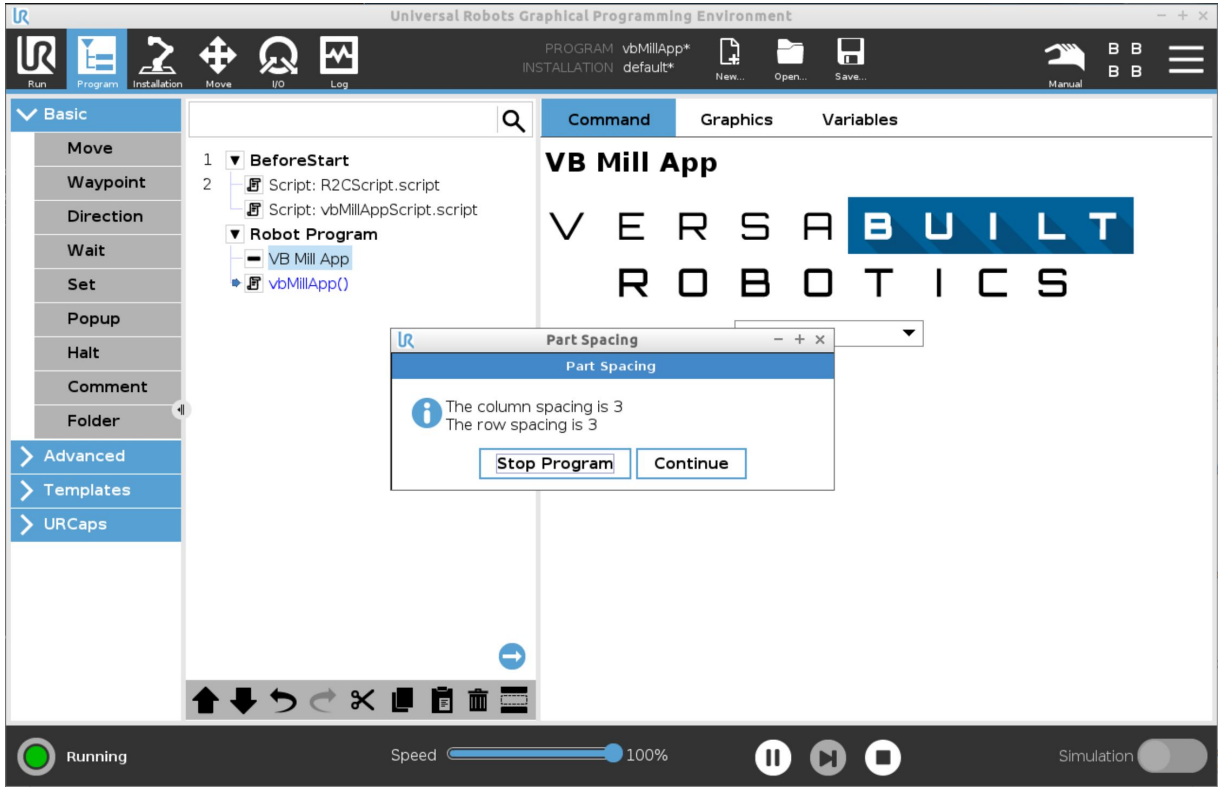
Enter Number of Parts to Run

- When prompted, enter the number of parts to run then press the green check mark
- Note: maximum number of parts is given in the prompt



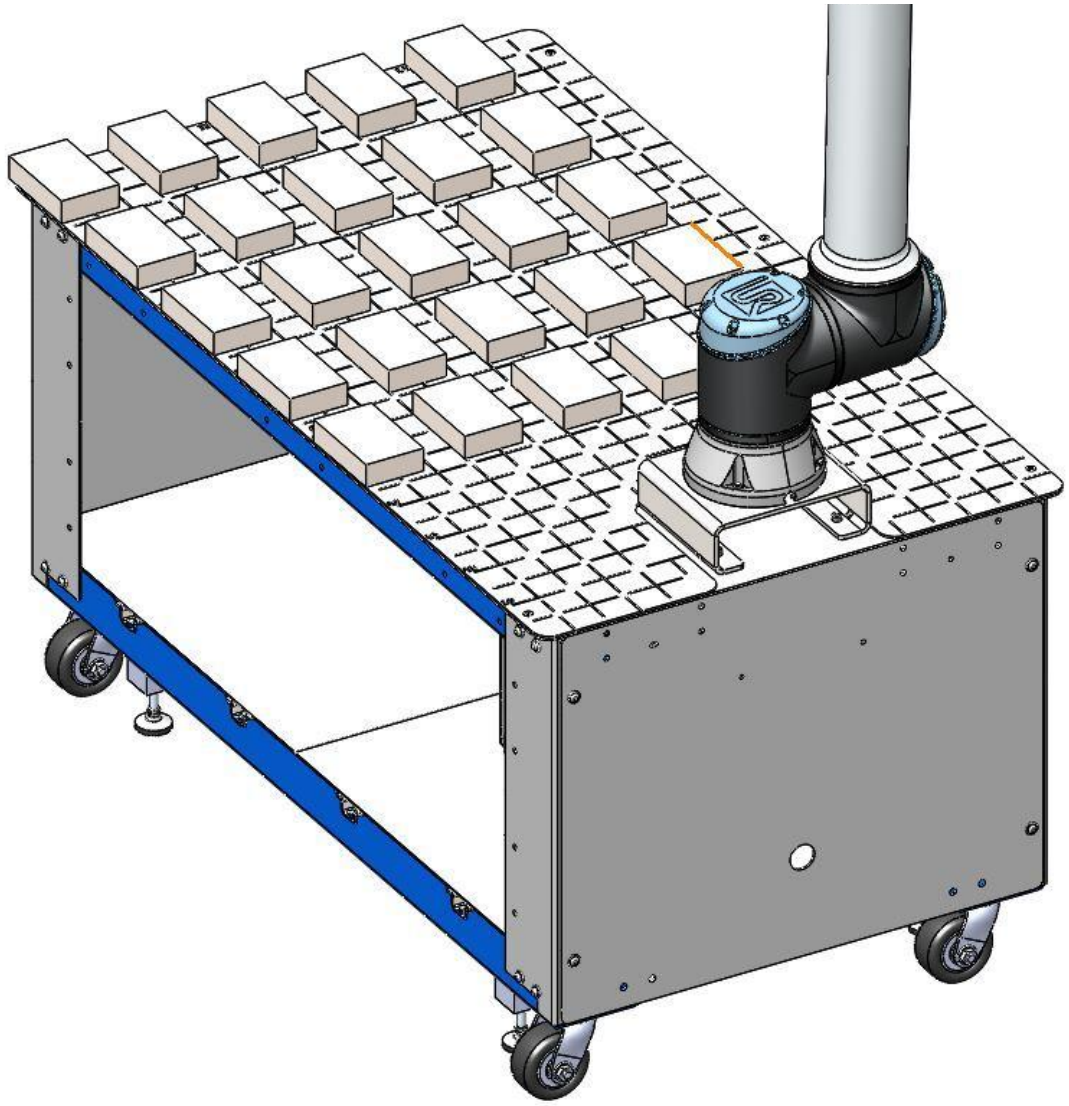
Align Parts in the Visual Infeed Area

- A popup message will appear instructing the row and column spacing for the parts
- Align all parts in the Visual Infeed area according to the column and row spacing provided (see next section for alignment instructions)



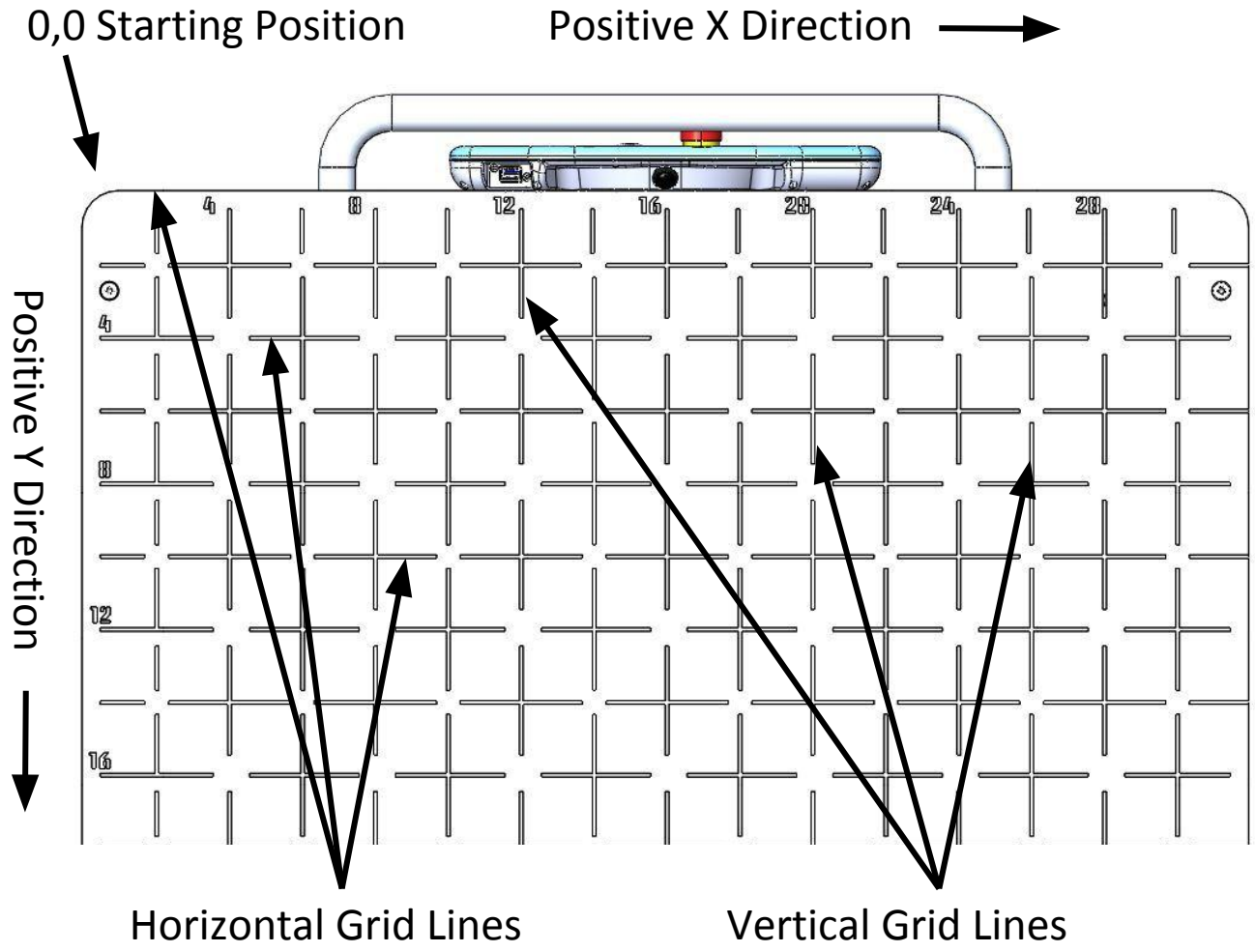
Aligning Parts Using the VersaBuilt Visual Infeed System

- The VersaBuilt Visual Infeed System is a grid pattern engraved into the robot's part infeed area combined with UR software that allows the robot to accurately pick and place parts for automated processing
- By following a few simple rules an operator is able to quickly and accurately place parts in the infeed area while maximizing the total part storage capacity across a wide range of part sizes



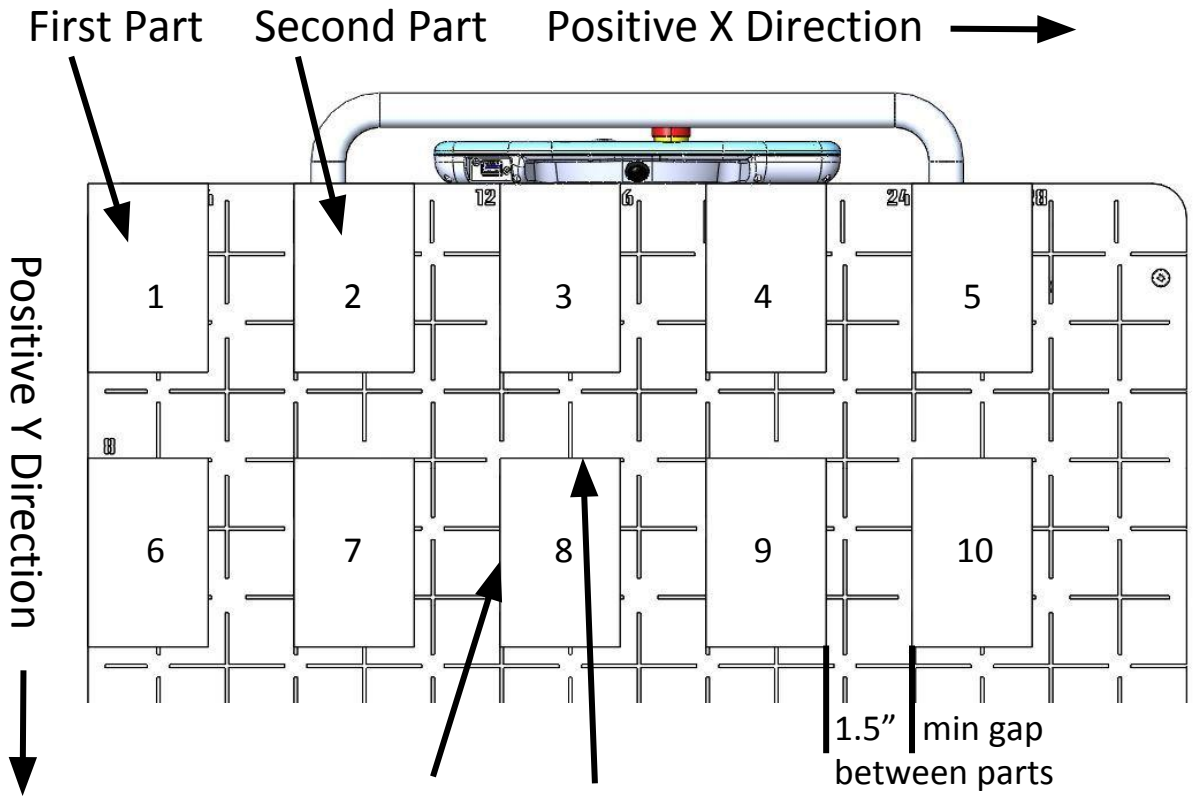
Aligning Parts Using the VersaBuilt Visual Infeed System

- The Visual Infeed System's grid pattern uses 2" spacing between grid lines in both rows and columns
- Engraving along the top and left-side of the VersaCart shows the distance from the 0,0 position in the upper left of the cart and is marked every 4"



Aligning Parts Using the VersaBuilt Visual Infeed System

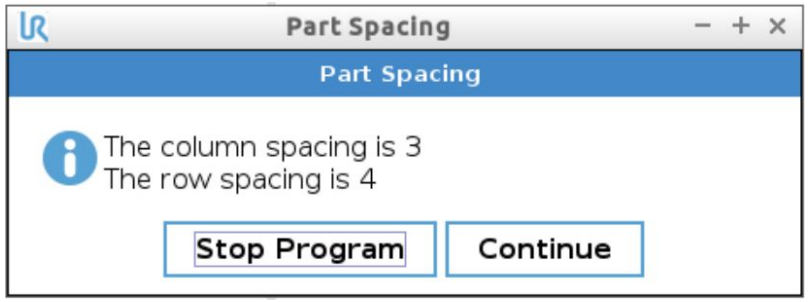
- The upper left edge of the grid is the initial index point - the first part will always be located in the upper left corner of the visual grid
- Top and left edge of a part are ***always*** aligned with the grid lines
- Parts are allocated left to right in the positive X direction and then positive Y direction
- At the start of a job, the VB Mill Process program will provide part spacing information to the operator
- The minimum spacing between parts in the X direction is 1.5” and in the Y direction is 0.25”

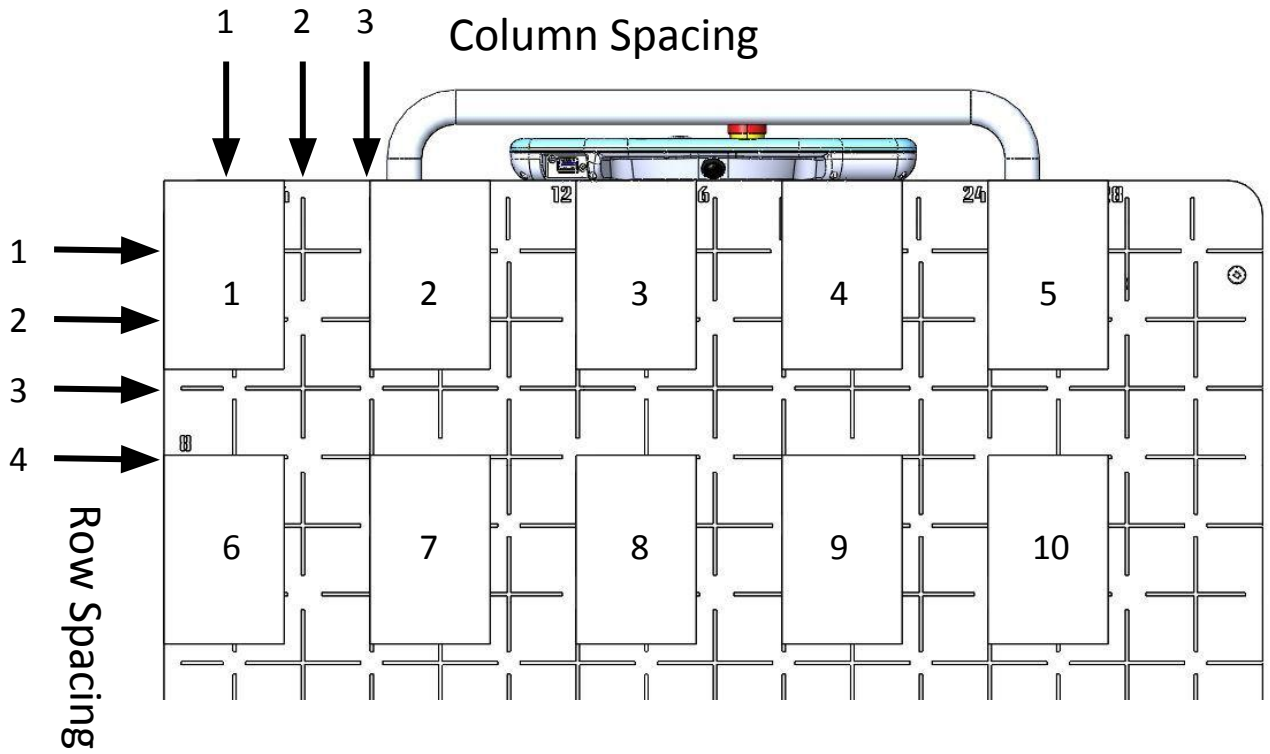


Align part left and top edges to the cart grid lines specified

Aligning Parts Using the VersaBuilt Visual Infeed System

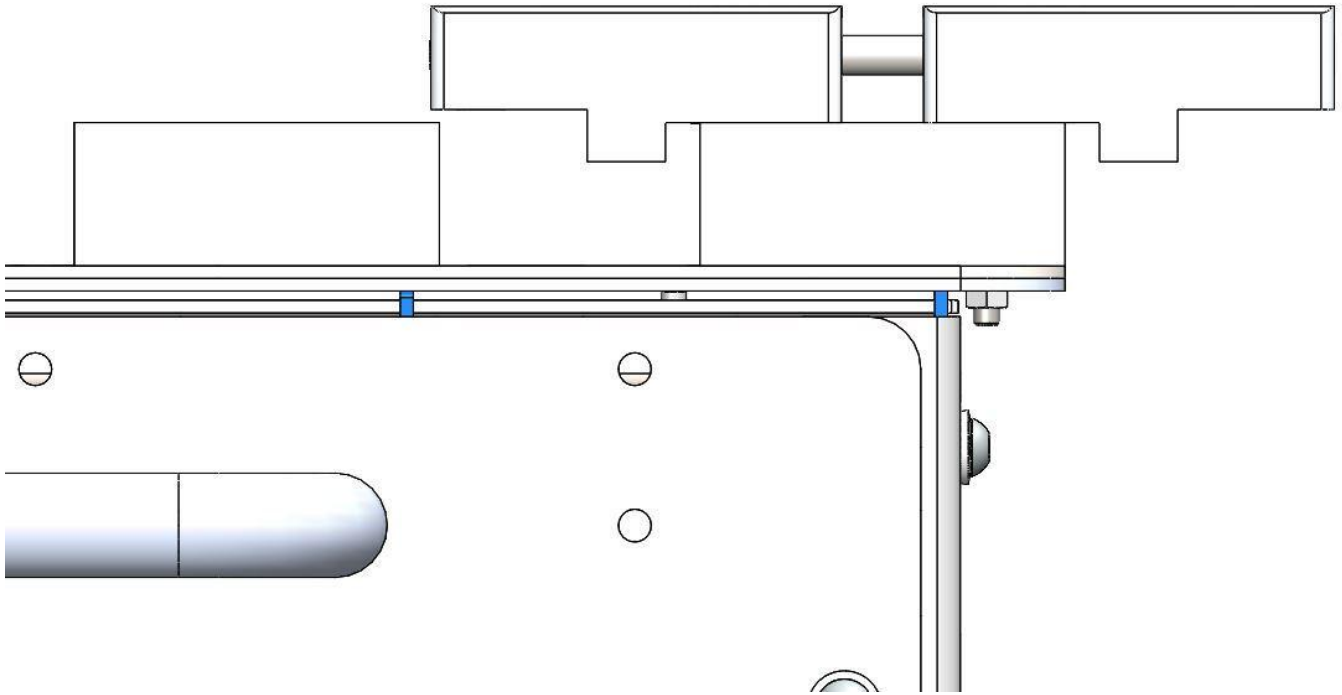
- The VB Mill App will tell the operator what the row and column spacing requirements are for each part:





Aligning Parts Using the VersaBuilt Visual Infeed System

- Column spacing allows room for the MultiGrip Jaw pocket sidewall and the maximum opening travel of the MultiGrip FJ Gripper
- The maximum suggested MultiGrip Jaw pocket sidewall is 0.75” - see the UR Mill Application Kit - Machinist Manual for more information on MultiGrip Jaw design



Infeed X Spacing Chart

Part Width	0 to 0.5”	>0.5” to 2”	>2” to 4”	>4” to 6”	>6” to 8”	>8” to 10”
X Spacing Inches	2”	4”	6”	8”	10”	12”
X Spacing Columns	1	2	3	4	5	6

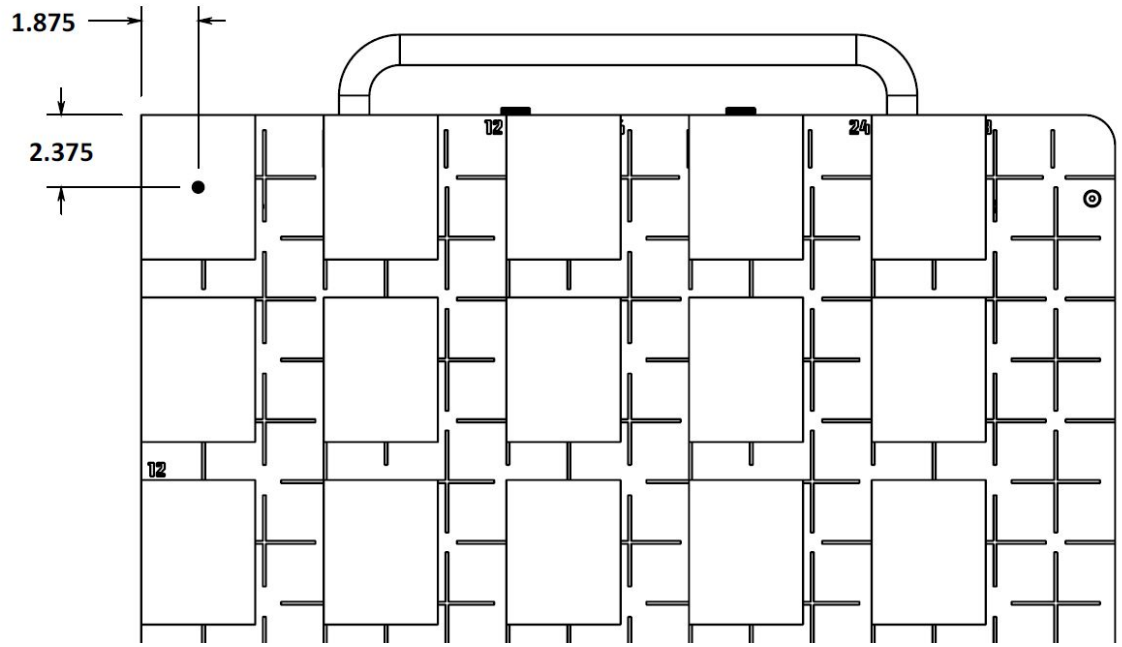
Infeed Y Spacing Chart

Part Length	0” to 1.5”	>1.5” to 3.5”	> 3.5” to 5.5”	> 5.5” to 7.5”	> 7.5” to 9.5”	> 9.5” to 11.5”
Y Spacing Inches	2”	4”	6”	8”	10”	12”
Y Spacing Rows	1	2	3	4	5	6

Aligning Parts Using the VersaBuilt Visual Infeed System

Pick Information:

- By default, parts are picked and placed relative to the center of the part
- A part that is 3.75” wide and 4.75” long will be picked at an offset of 1.875” in X and 2.375” in Y relative to the upper left corner of the part
- In the Part Configuration, an Infeed Y offset can be specified by the machinist during part configuration to clear a datum in the jaws or to allow the robot to perform a Y push to center the parts in the jaws



Recovering from Errors

- If an error occurs during processing, press the Stop button on the popup message or the stop button at the bottom of the UR Teach Pendant screen
- Determine the cause of the error and rectify the cause
- Remove any finished parts from the VersaCart
- Remove any parts from inside the CNC
- If the robot is holding MultiGrip Jaws, carefully remove the jaws from the gripper following Hand Loading and Unloading of MultiGrip Jaws
- Follow the Preparing to Run the VB Mill App Program and the Using the VBMillApp Program sections of this manual to restart the job

Cleaning and Maintenance

Daily Maintenance:

- Lightly dampen a cloth with warm, soapy water
- Wipe down the robot, gripper and the VersaCart
- Use a clean dry cloth to remove any remaining soapy water

Cleaning and Maintenance

Weekly Maintenance:

- Remove the Visual Infeed top by removing the M6 flat head screws that hold it in place
- Lightly dampen a cloth with warm, soapy water
- Wipe down the VersaCart table top
- Use a clean dry cloth to remove any remaining soapy water
- Wash the Visual Infeed using running water or a pressure washer
- Once dry, re-install Visual Infeed top onto VersaCart

Cleaning and Maintenance

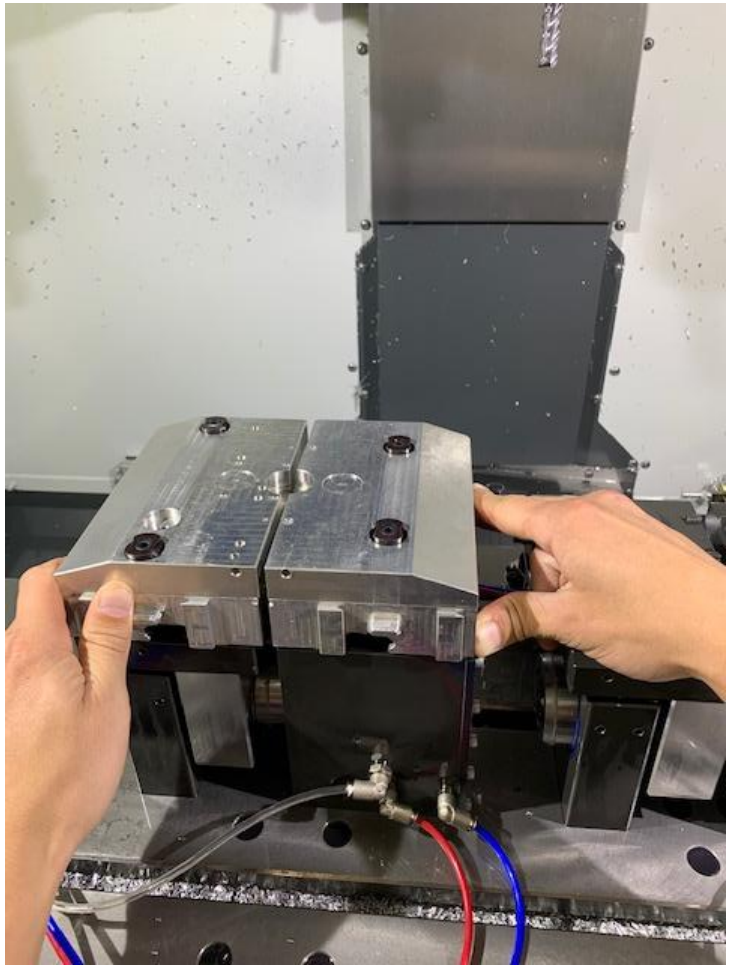
Monthly Maintenance:

- Remove UR control cabinet air filter by pulling where the red arrows are shown
- Inspect and replace when air filter becomes visibly dirty

Hand Loading and Unloading MultiGrip Jaws

Loading MultiGrip Jaws onto a Vise:

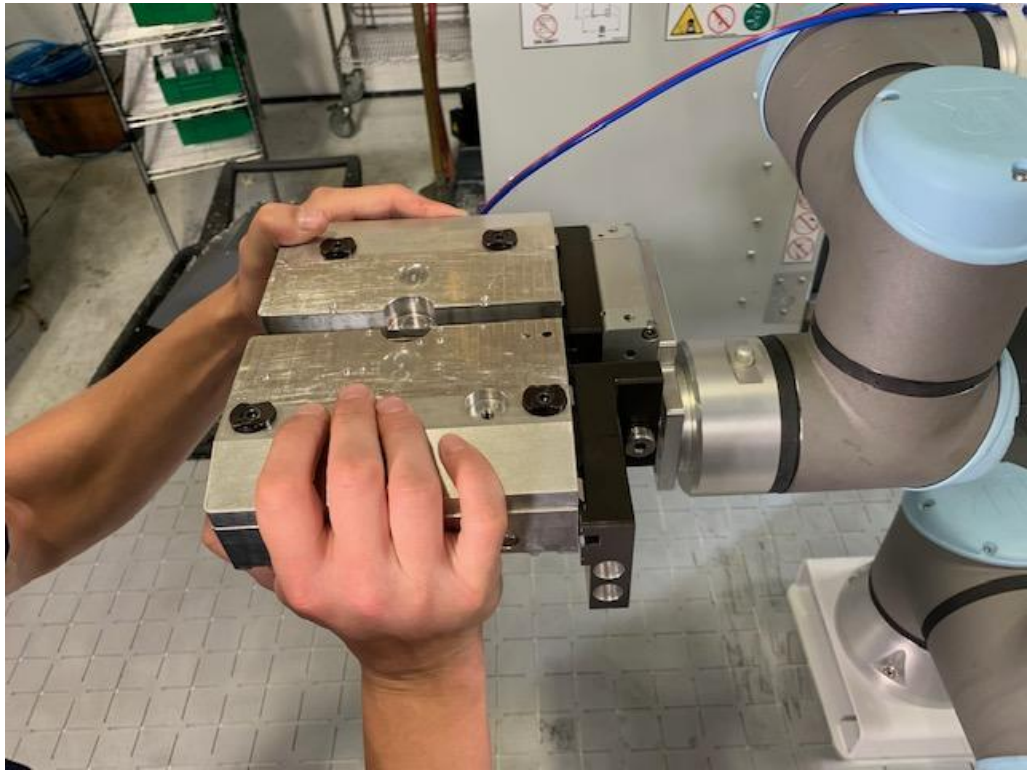
- Set the Pneumatics to Manual Mode
- Unclamp the the vise using the Vise Hand Valves
- Remove the pneumatic supply to the vise for safety
- For OD jaws, push the jaws together, center the jaws over the vise, place the jaws onto the vise and allow the jaws to open onto the vise by releasing the pushing force
- For ID jaws, pull the jaws apart, center the jaws over the vise, place the jaws onto the vise and allow the jaws to close onto the vise by releasing the pulling force



Hand Loading and Unloading MultiGrip Jaws

Removing MultiGrip Jaws from the Gripper:

- Unclamp the gripper by going to the I/O Tab and de-selecting GripperClosed and selecting GripperOpen in the Digital Output pane
- Remove the pneumatic supply to the gripper for safety
- For OD jaws, push the jaws together until the dovetail feature on the jaw can clear the dovetail feature and the jaws can be pulled away from the gripper
- For ID jaws, pull the jaws apart until the dovetail feature on the jaw can clear the dovetail feature and the jaws can be pulled away from the gripper



Bin Drop Option

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