VERSA BUILT ROBOTICS

Robot2CNC Mill Edition Installation and Operation Manual

Copyright VersaBuilt 2021

Table of Contents

Section 1	Safety Warnings
Section 2	Robot2CNC Mill Edition Installation & Configuration
Section 3	Cycle Start and Communication Cable Installation
Section 4	Install CNC Files
Section 5	Configure CNC Settings
Section 6	Configure UR Robot and Install URCap
Section 7	URCap Programming
Section 7	Robot2CNC Macro CNC Drivers - Features and Programming
Section 8	Robot2CNC Generic CNC Driver - Features and Programming
Appendix	Schematics

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.

Robot2CNC Mill Edition Installation & Configuration

Section 2

Robot2CNC Mill Edition Parts and Tools

Parts:

- Robot2CNC Mill Edition
- 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

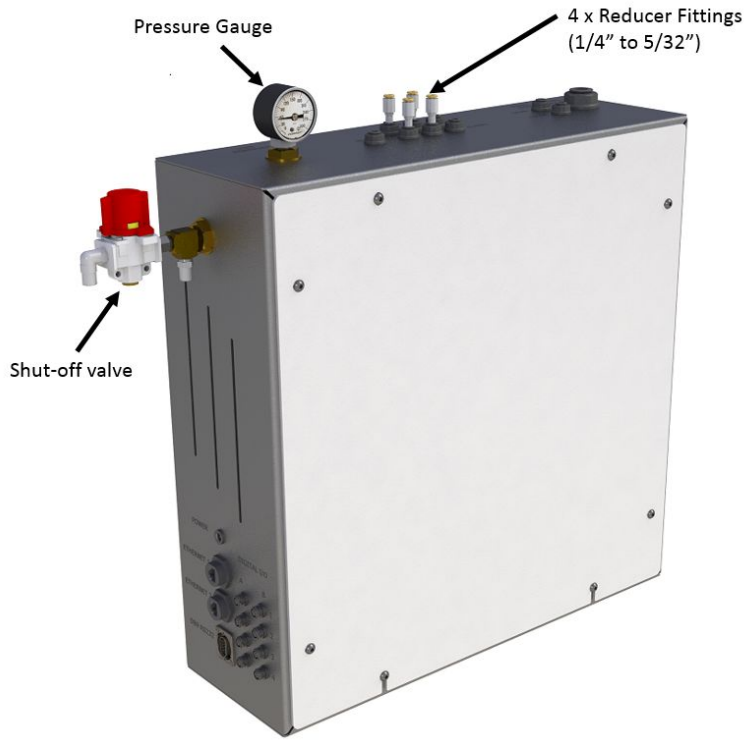
Tools:

- 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 Robot2CNC

Steps:

1. Assemble components to panel
    - Shut-off valve assembly
    - Pressure Gauge
    - Insert 6 x 5/32” to ¼” reducer fittings in Vise 1 & 2, Gripper Open/Close ports (if required)



Position and Mount Robot2CNC

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

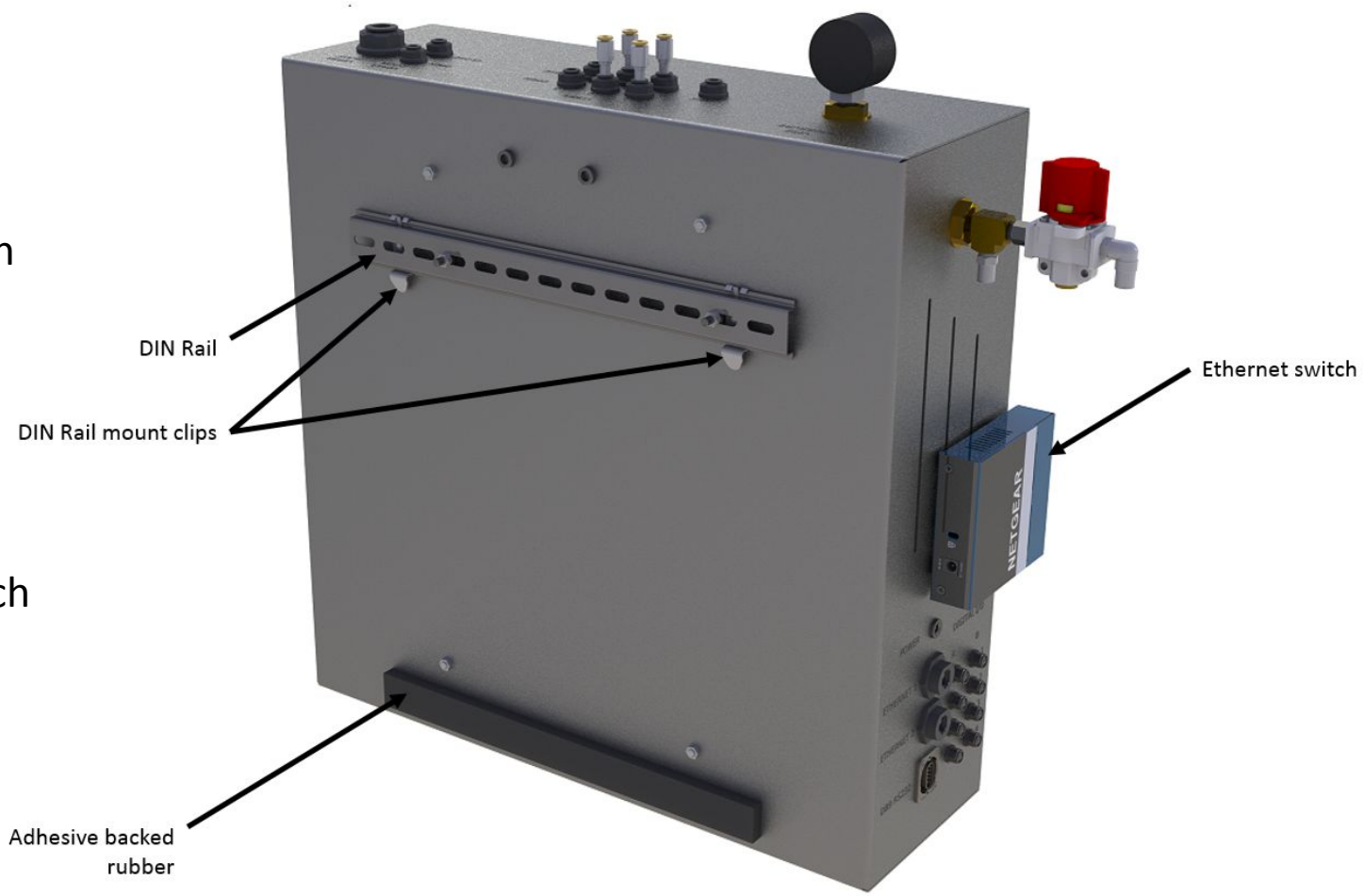
    *5 Port Ethernet switch connects to Robot2 with 3-foot Ethernet cable

Position and Mount Robot2CNC

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 Robot2CNC to DIN Rail with DIN Rail Clips pre-installed on panel

   Attach Robot2CNC 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

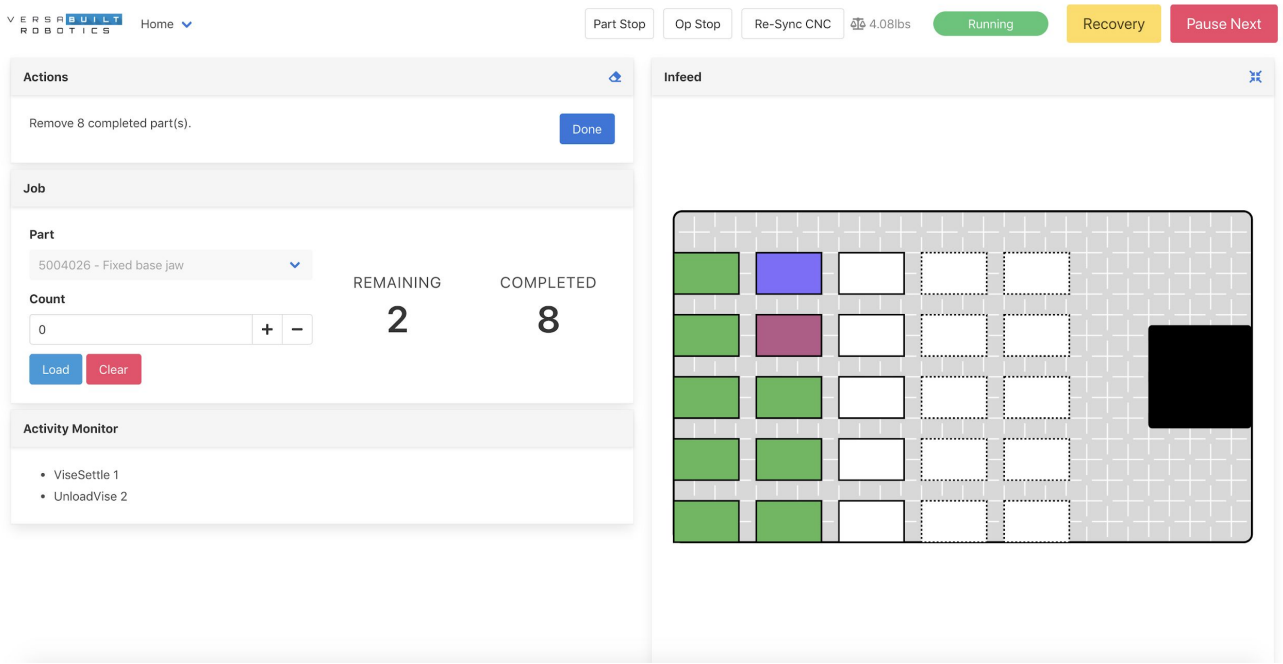


Accessing the Robot2CNC

The Robot2CNC can be accessed by any computer, tablet or phone with WiFi or Ethernet using a web browser such as Google Chrome.

VersaBuilt recommends dedicating a laptop computer or a full-sized tablet (10” or greater) such as an IPad.

The Robot2CNC can be accessed via a smartphone or small tablet, with some changes to how the user interface is displayed.

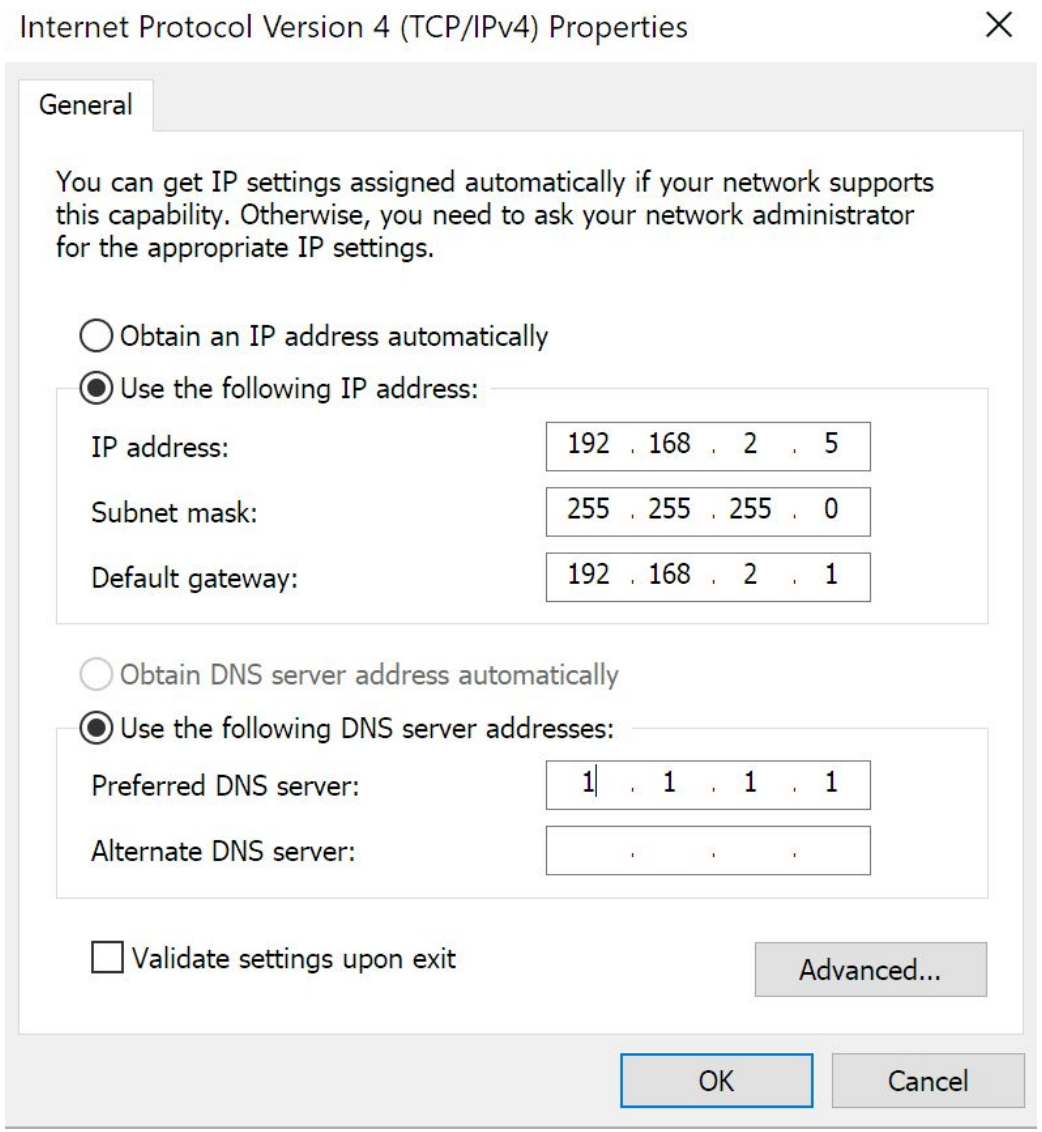


Accessing the Robot2CNC

Connecting to the Robot2CNC via Ethernet

For an Ethernet device such as a laptop, plug the device into an available port on the Ethernet switch the Robot2CNC is plugged into. Go to the device's Ethernet settings and configure the Ethernet port to:

DHCP:	Manual, disabled or do not automatically assign address
IP Address:	192.168.2.5
Subnet Mask:	255.255.255.0
Default Gateway:	192.168.2.1
DNS:	1.1.1.1



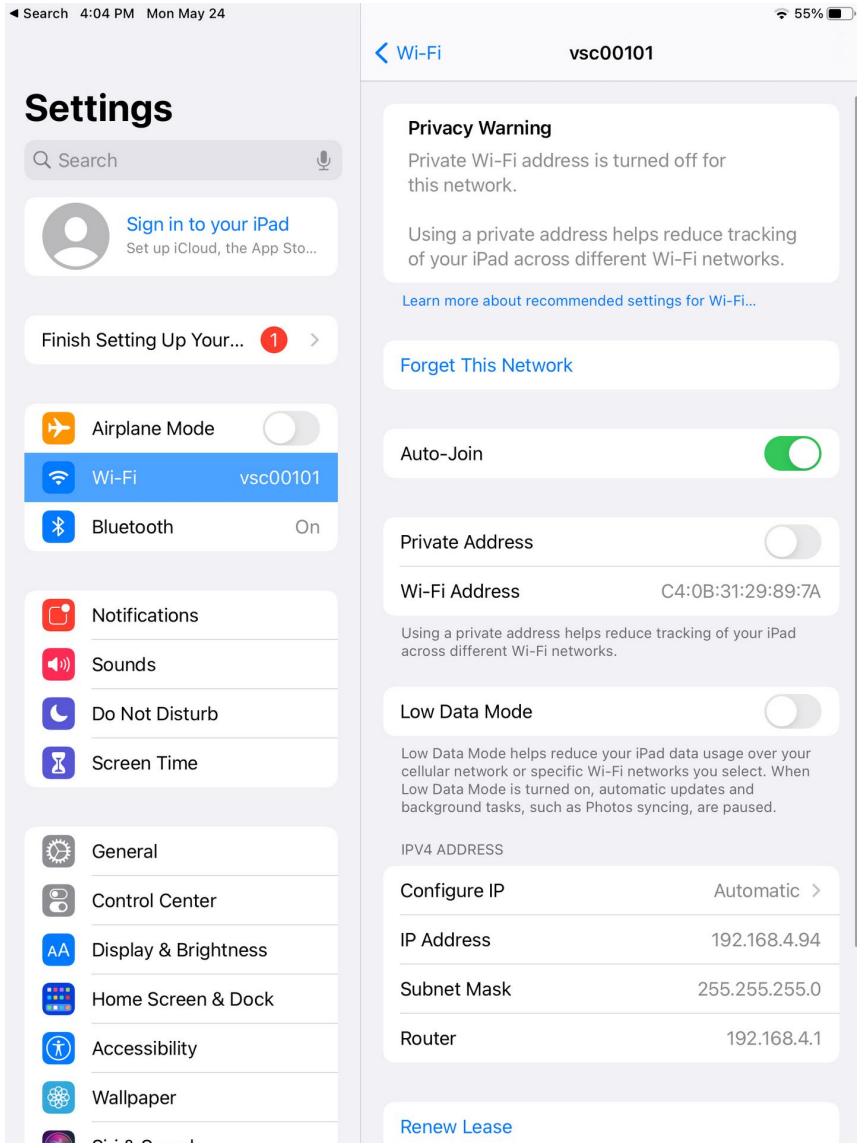
Accessing the Robot2CNC

Connecting to the Robot2CNC via Wifi Access Point

For a Wifi connected device such as an IPad, device network settings will be automatic. Open your device's Wifi settings and search for a network named vscXXXXX where the XXXXX is the serial number of your VSC (e.g., vsc00125).

Because the VSC does not have an Internet connection, your device may try to connect to another WiFi device. To prevent this, do two things:

1. Select Auto-Join on the VSC Wifi network
2. If the device connects to any other Wifi network, modify the settings for that Wifi network to "forget" the settings

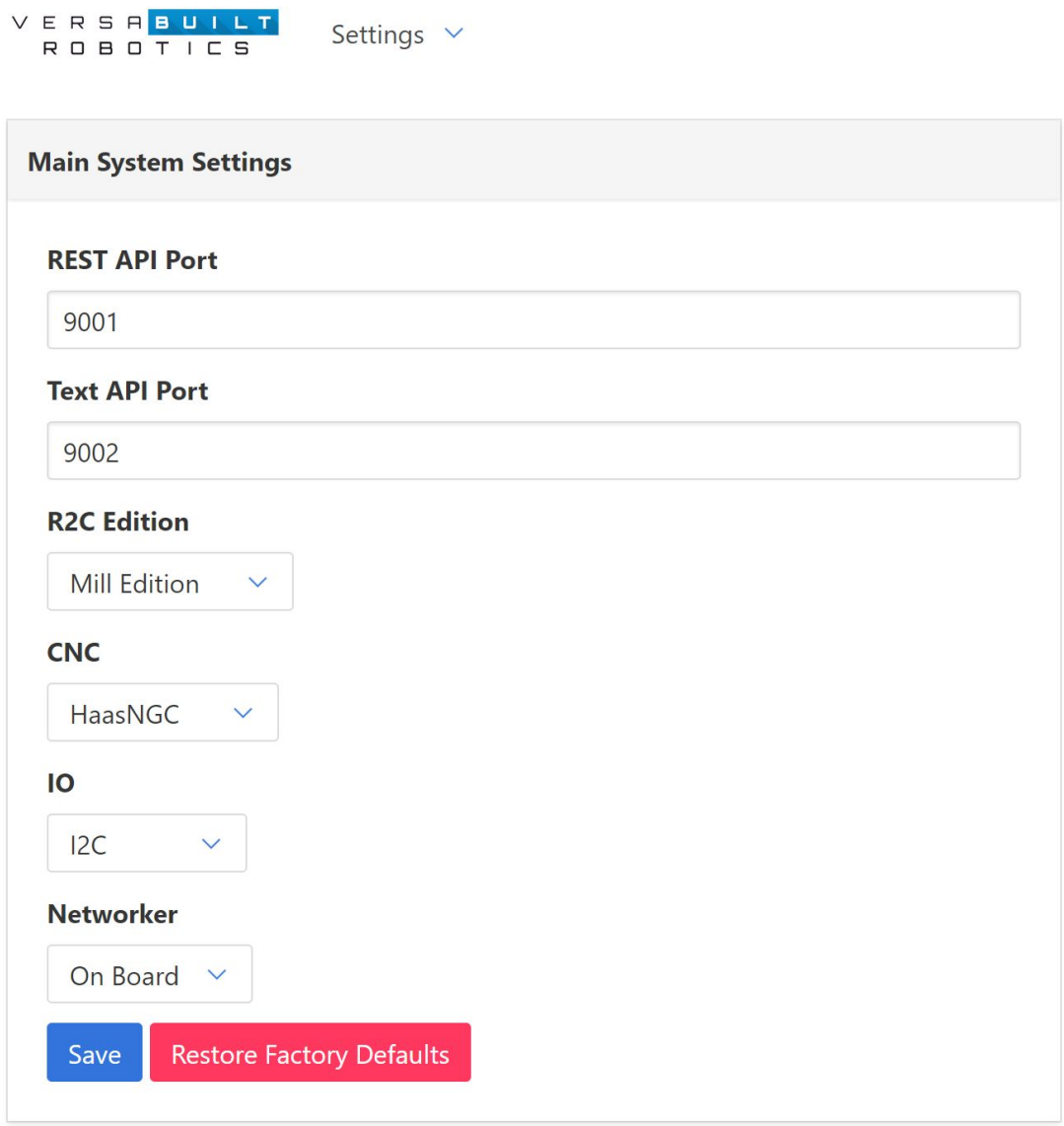


Configure Robot2CNC CNC Type

Navigate to the Settings Page

Click on the Navigation down arrow and select Settings. Under the CNC setting, select the CNC type that matches the CNC the Robot2CNC is attached to.

No other settings should be modified unless instructed by VersaBuilt support.



Configure the Robot2CNC Network Settings

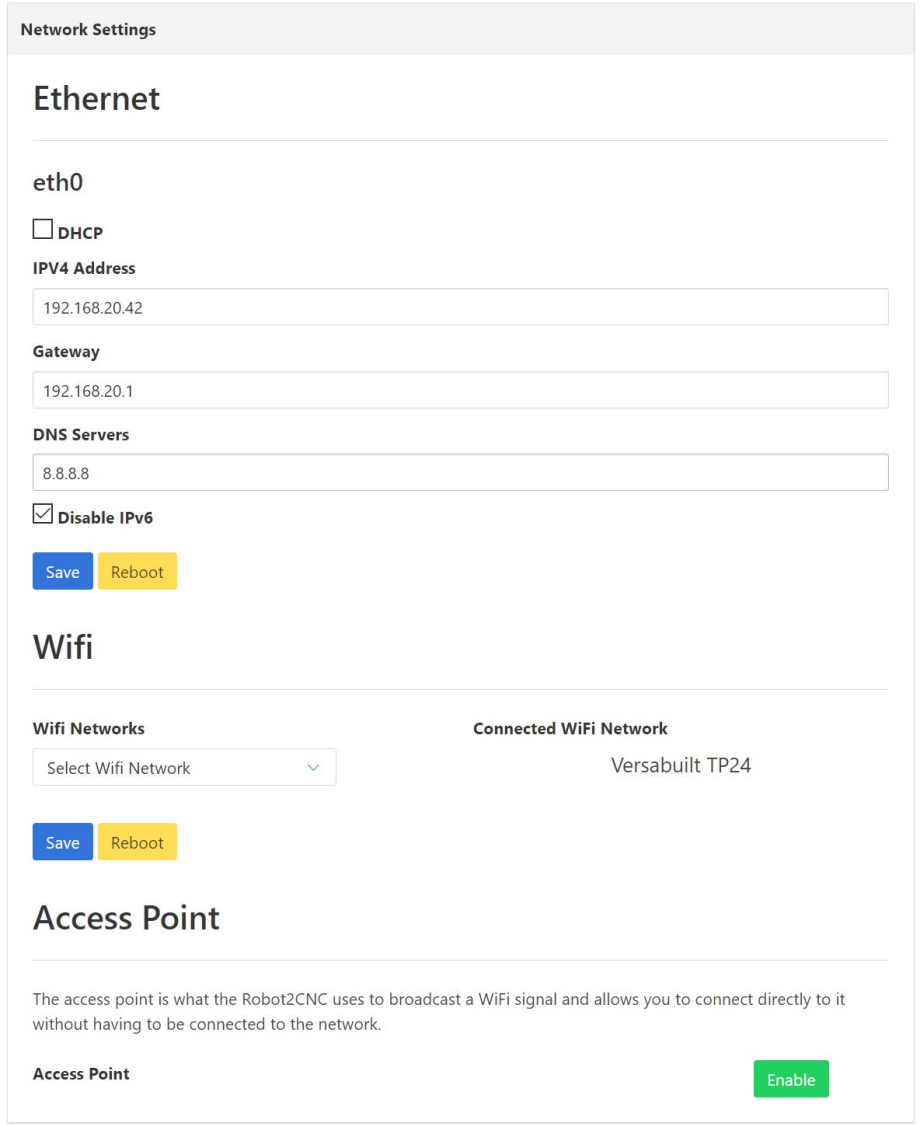
Navigate to the Network Settings Page

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 Robot2CNC (Robot2CNC) to access the Internet via a local Wifi network. Robot2CNC Internet access is optional and allows VersaBuilt technical support to access the Robot2CNC remotely when the Remote Support option is enabled from the About page of the Robot2CNC.

Alternatively, the Robot2CNC may be connected to the corporate network. In this configuration, the Robot2CNC, 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.



Install All Pneumatic Air Lines

Refer to the Appendices for the pneumatic diagram and description of the valving functions. Confirmation of the pneumatics is performed in a later step.

Cycle Start and Communication Cable Installation

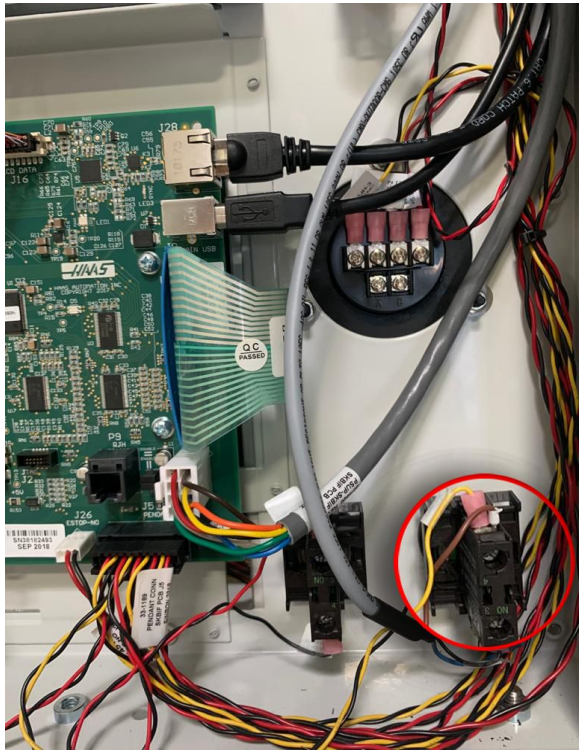
Section 3

Install Cycle Start Cable

Installation instructions for Cycle Start wiring is CNC make/model/year dependent, with the following instructions provided as a guideline only

- Verify proper Cycle Start wiring installation carefully, consult with a properly trained CNC repair technician if necessary
- Remove the back panel of the CNC control
- The Cycle Start button is generally located in the back right corner of the control; trace the location of the cycle start button by locating the cycle start button on the front of the control and then looking for it in the back of the control

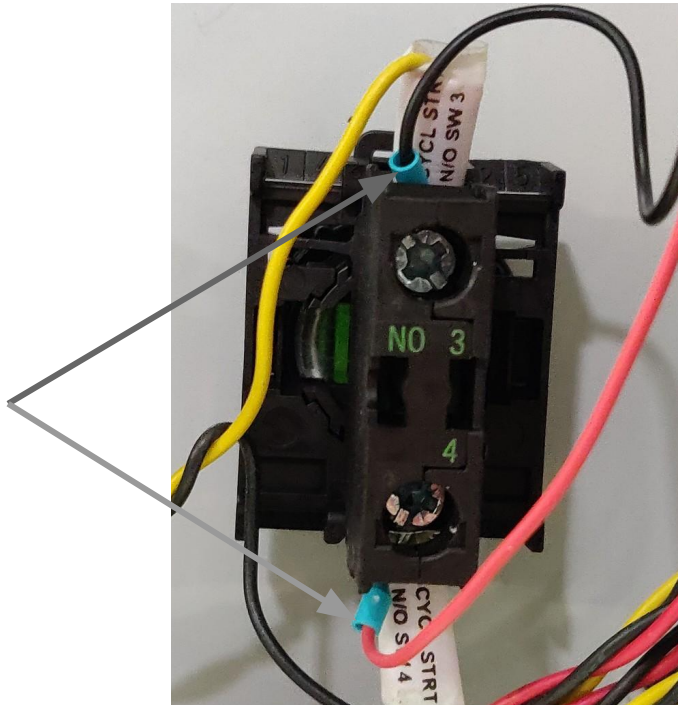
Back of CNC

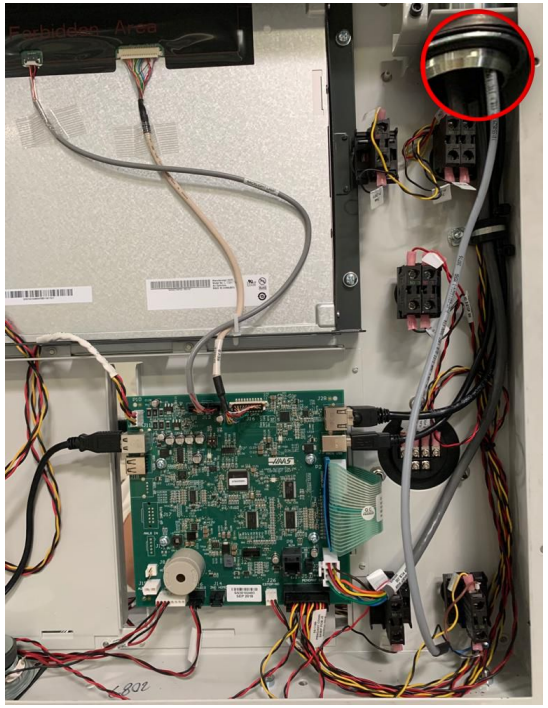


Back of Cycle Start Button

Install Cycle Start Cable

- The Cycle Start Cable includes two wires that must be attached to the Cycle Start terminals
- The Cycle Start button should have two terminals, loosen the terminal screw and attach one of the Cycle Start Cable wires to each terminal
- Polarity of the wires does not matter
- Route the M8 connector side of the Cycle Start Cabling through the CNC’s wire chase and back to the Robot2CNC (Robot2CNC)
- Plug the M8 connector into the **Digital I/O connector B1** on the Robot2CNC





Connect Communication Cable

Haas Legacy

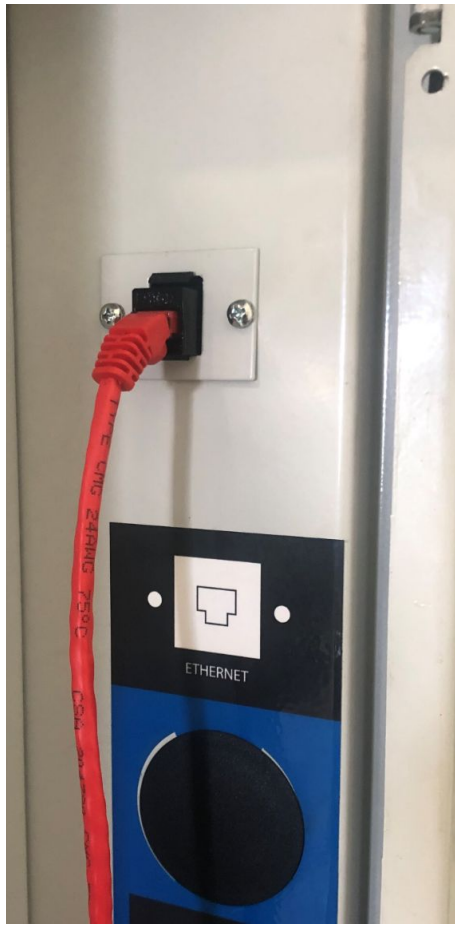
Plug the 25-pin end of the provided serial cable into the CNC, plug the 9-pin end of the cable into the Robot2CNC (Robot2CNC).

Haas NGC, Fanuc or Okuma

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

Plug one end of the provided Ethernet cable into the CNC Ethernet port and the other end into the Ethernet switch mounted on the Robot2CNC.

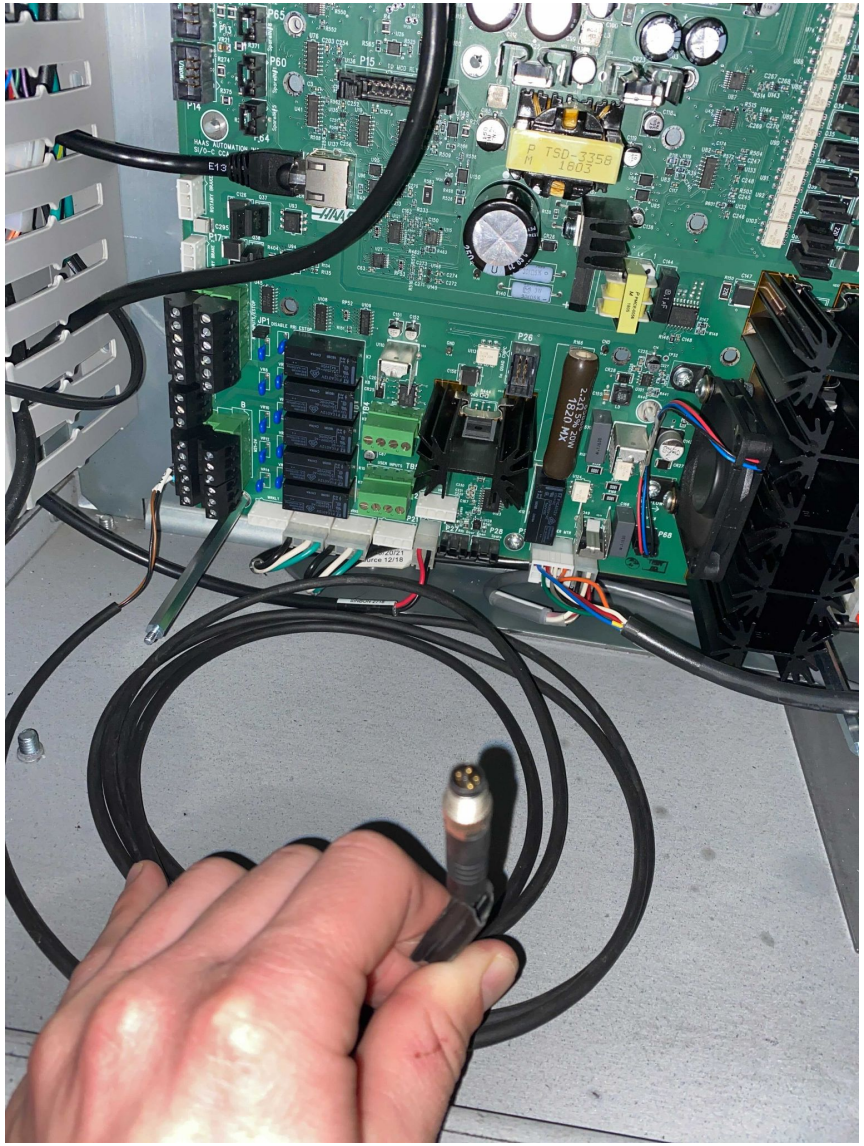
***Route cables so they are protected from coolant and chips, anchor as needed using included cable-ties and magnetic loops*



Ethernet Cable

Serial Cable

Connect Generic CNC Driver Cycle End Cable



NOTE: This section only applies to Generic CNC Driver Installations

Identify CNC End of Cycle Signal

The Robot2CNC (Robot2CNC) requires a 24 volt input signal when the CNC cycle is complete. Most CNCs provide one or more m-codes that are tied to a 24 volt output signal. When one m-code is executed, the 24 volt output is triggered, when another m-code is executed, the 24 volt output is reset. Most CNCs provide terminal blocks in the control cabinet to connect the provided Cycle End cable. Check your CNC documentation or your CNC dealer for more information.

Cycle End Cable

A Cycle End cable is provided having an M8 connector on one end and flying leads on the other end. Connect the flying leads to the CNC m-code output and the M8 connector to the **Digital I/O connector A2** on the Robot2CNC

WARNING

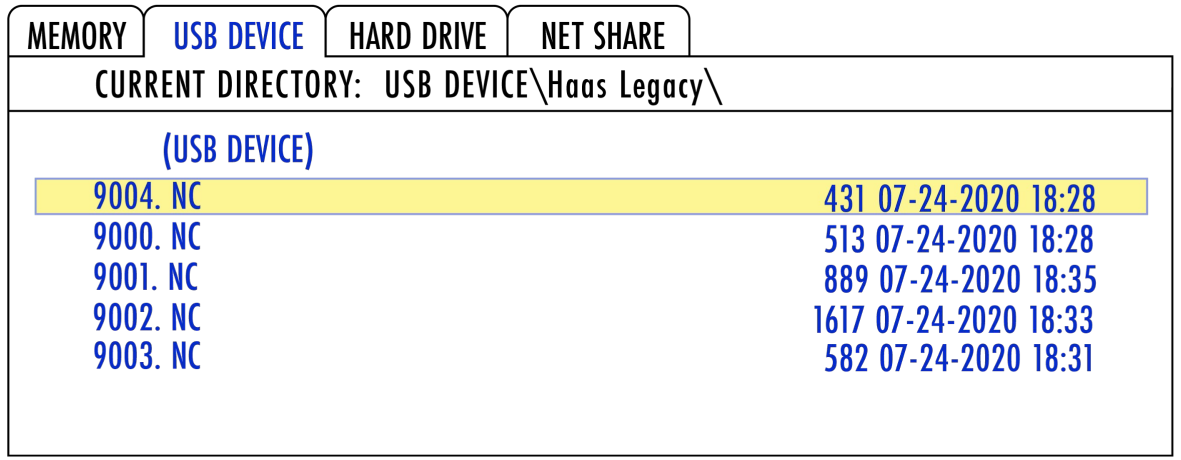
Verify the voltage and the polarity of the CNC cycle end signal before connecting the Cycle End cable. Failure to do so could result in damage to the Robot2CNC or the CNC.

Install CNC Files

Section 4

Install Gcode Files on CNC

- Insert the VersaBuilt USB Drive into the CNC control
- Navigate to the folder on the USB drive machine that matches the CNC machine control
- Copy all gcode files from the folder onto the CNC control



Okuma Only: Install VersaBuilt vbDispatcher Program

1. Insert VersaBuilt USB drive into the Okuma USB port
2. Navigate to the Okuma directory on the VersaBuilt USB drive
3. Double-click on the setup.exe program
4. Follow the on-screen instructions
5. Click Yes to override User Account Control if prompted

The vbDispatcher program can be started from the Start menu manually or can be started automatically every time the CNC boots by adding a short cut of the vbDispatcher program to the Windows Startup folder

Configure CNC Settings

Section 5

Haas NGC CNC and Autodoor Settings

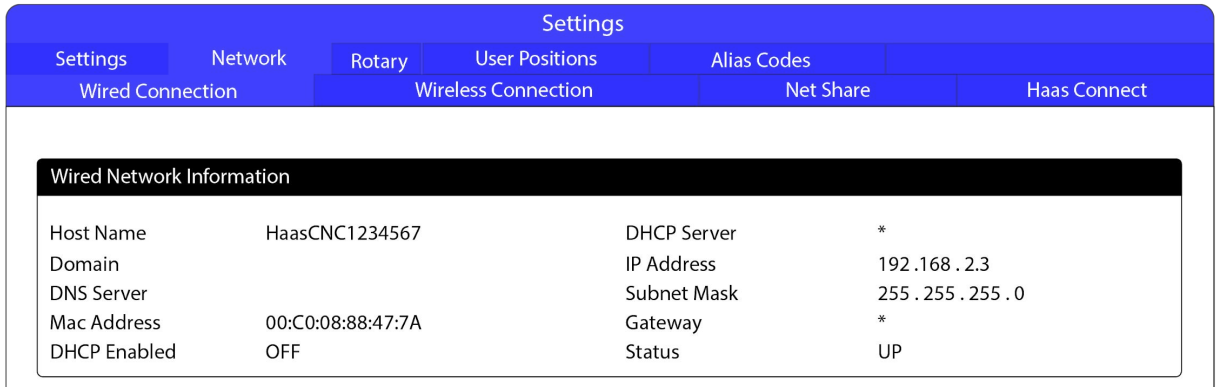
Settings: Network Tab

Wired Network Enabled	On
Obtain Address Automatically	Off
IP Address	192.168.2.3
Subnet Mask	255.255.255.0

Settings: Settings Tab

131 Auto Door	On*
143 Machine Data Collection	9000

* Only if Haas-brand auto door is installed

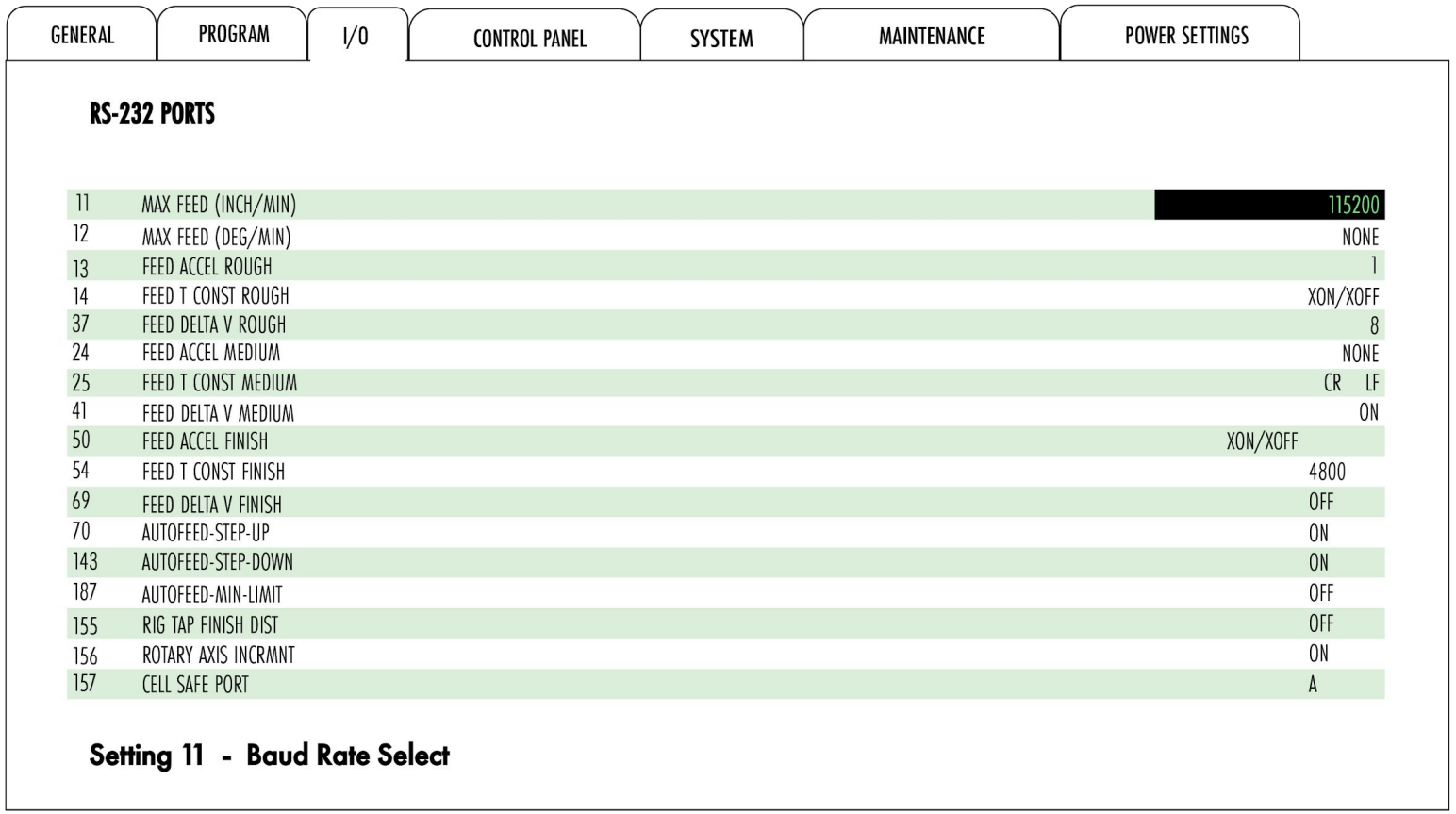


Haas Legacy CNC and Autodoor Settings

Settings: IO Tab

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

* Only if Haas-brand auto door is installed

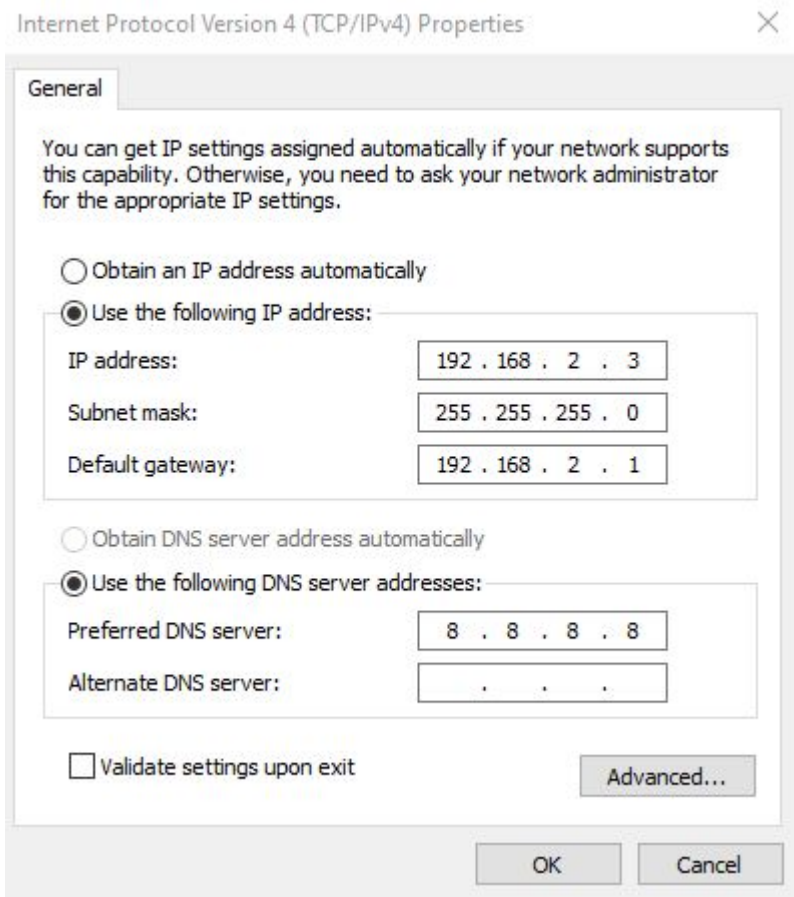


Okuma CNC and Autodoor Settings

Setup a static TCP/IP address configuration on the Okuma CNC using the built-in Windows network setup:

IP Address	192.168.2.3
Subnet Mask	255.255.255.0
Gateway	192.168.2.1
Preferred DNS Server	8.8.8.8

Configuration of the Okuma CNC autodoor varies by model year. Refer to the documentation included with your CNC to configure the Okuma CNC to close the door on Cycle Start and open the door on Cycle End.

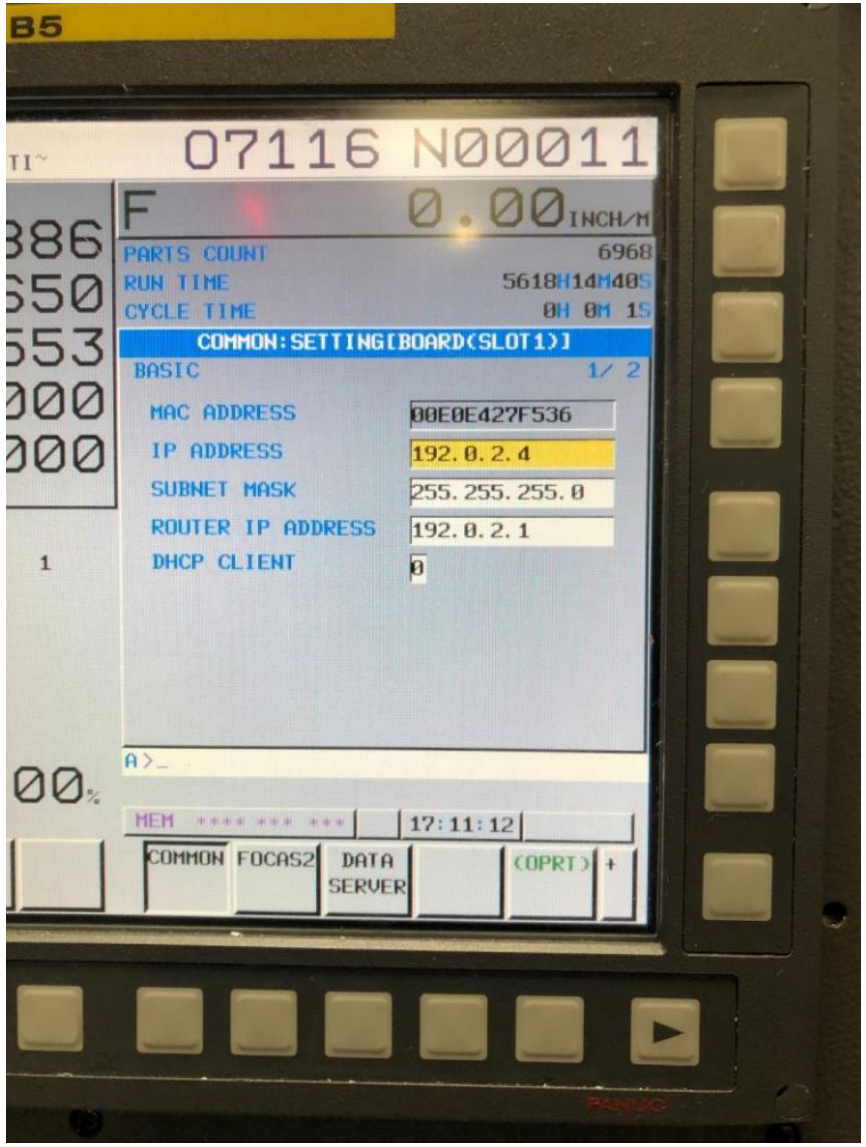


Fanuc CNC Settings

- On the Fanuc control, press the System button
- Press the right arrow until the Ethernet soft key appears
- Press the Ethernet soft key

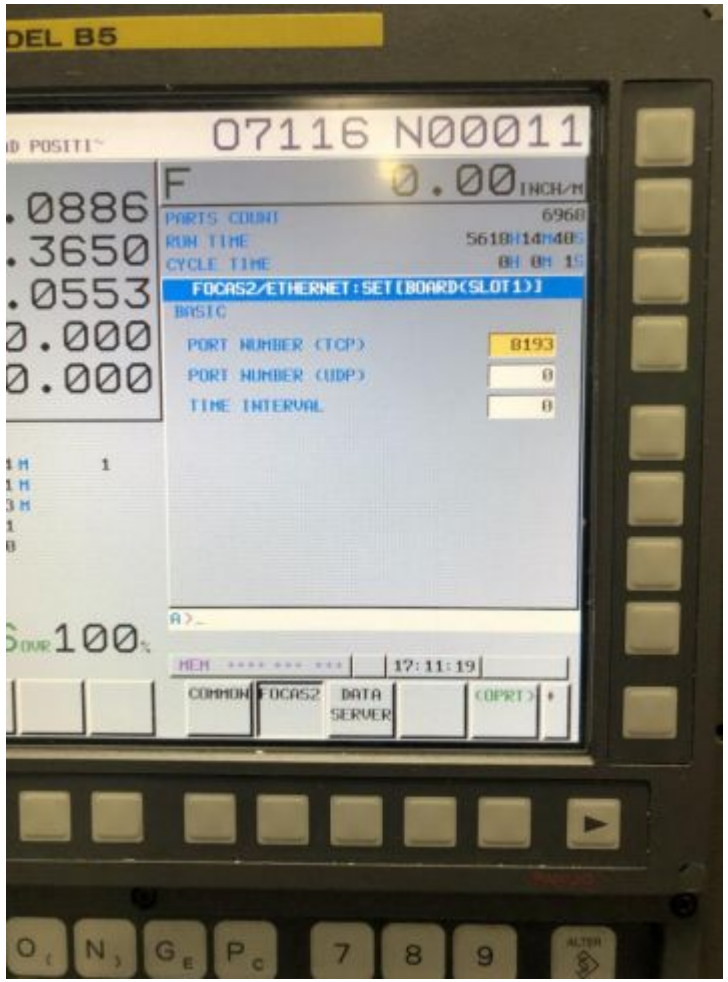
Set the following CNC Network settings:

IP Address	192.168.2.3
Subnet Mask	255.255.255.0
Router IP Address	192.168.2.1
DHCP Client	0



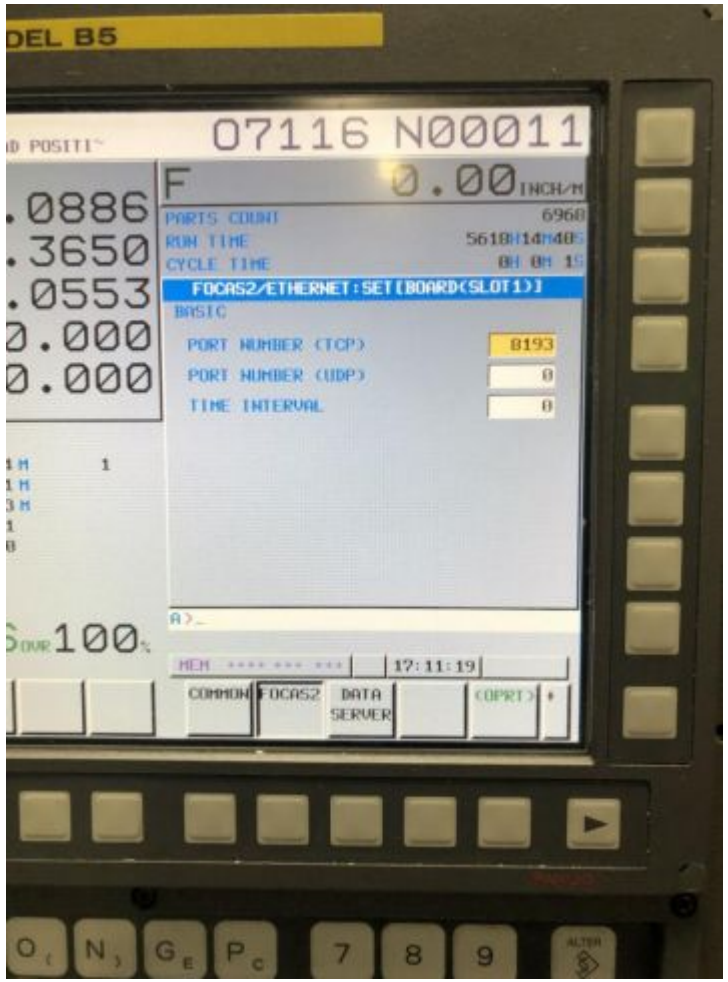
Fanuc CNC Settings

- Press the FOCAS2 soft key
- Set the Focas2 TCP port to 8193
- The other settings can be left alone



Fanuc CNC Autodoor Settings

- Autodoor settings for Fanuc-based CNC controls are machine builder-specific
- Refer to your CNC documentation to configure the CNC autodoor to close on Cycle Start and Open on Cycle End



Configure UR Robot and Install URCap

Section 5

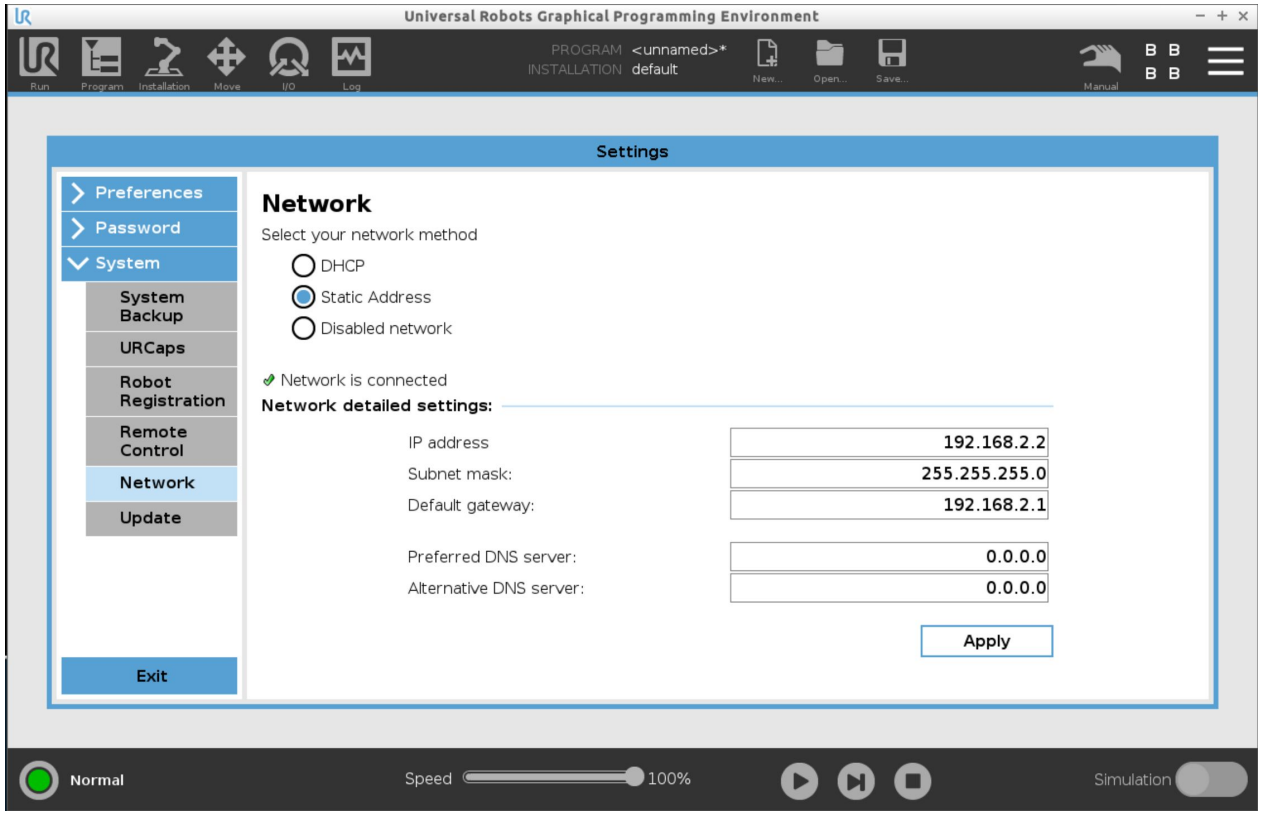
Configure UR Robot Settings

1. Click on the 3 horizontal bars in the upper right-hand corner of the UR teach pendant and select Settings
2. On the Settings page, select System -> Network
3. Select Static Address
4. Enter the Network detailed settings:

   IP Address: 192.168.2.2

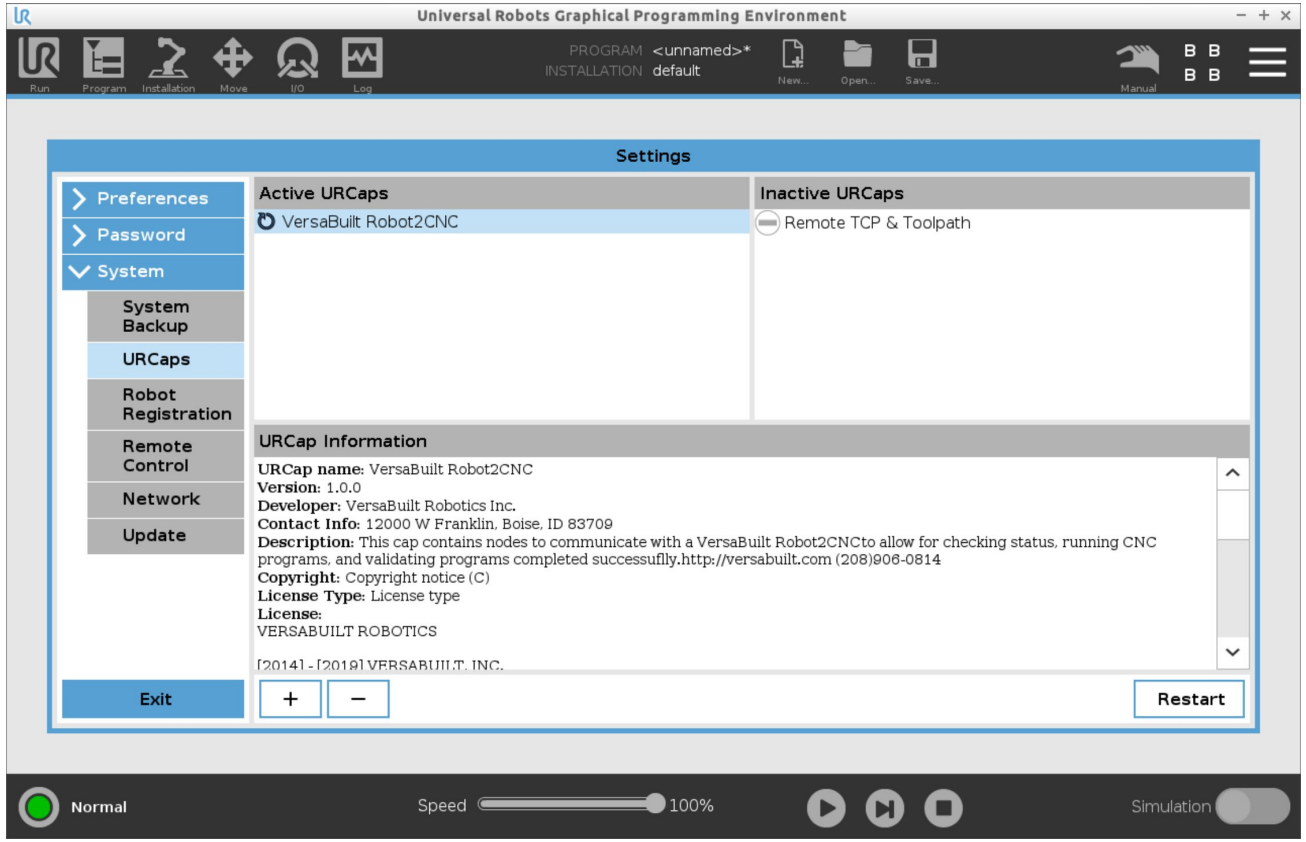
   Subnet Mask: 255.255.255.0

   Default Gateway: 192.168.2.1



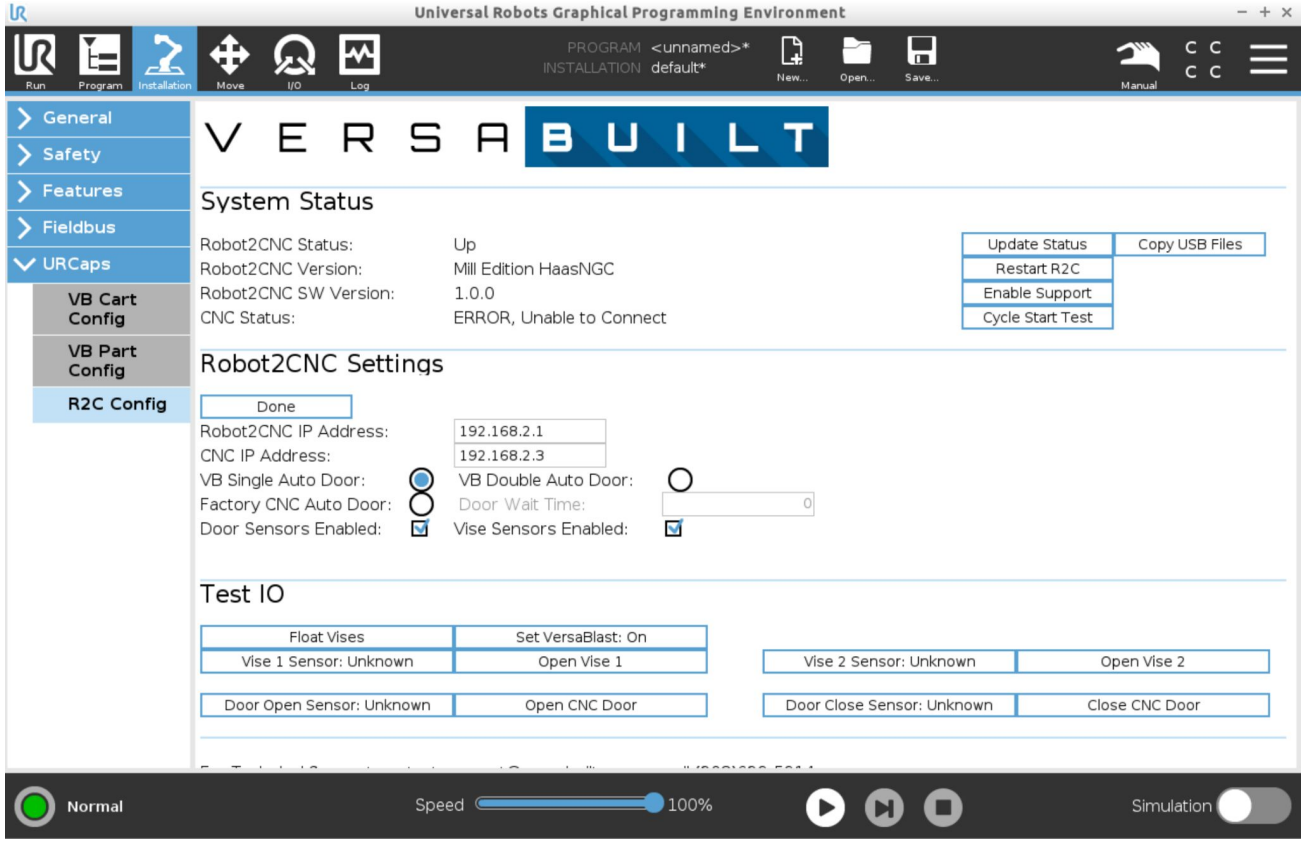
Install UR Robot Software

1. Insert the VersaBuilt USB drive into the UR Teach Pendant
2. Click on the 3 horizontal bars in the upper right-hand corner of the UR teach pendant and select Settings
3. On the Settings page, select System -> URCaps
4. Press the + button in the lower left of the Settings page to add a URCap
5. Navigate to the usbdisk and select the robot2cnc-2.0.urcap file (note: file name may be different)
6. Press the Restart button in the lower right corner of the Settings page



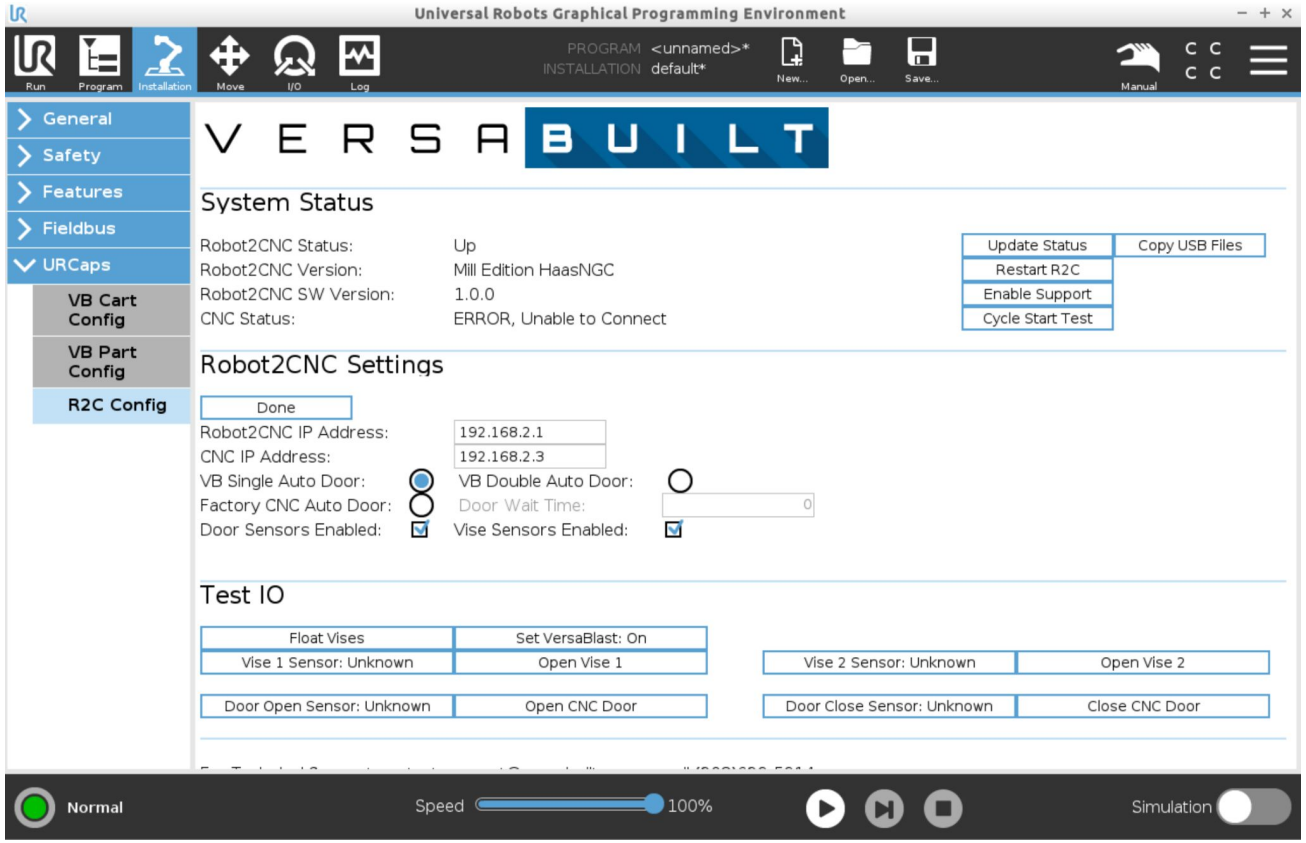
Configure and Test Robot2CNC

1. Insert the VersaBuilt USB drive into the UR Teach Pendant
2. Click on the Installation icon near the top left of the UR teach pendant then select URCaps -> R2C Config
3. Click on the Copy USB Files button
4. Press the Update Status button
5. Confirm Robot2CNC Status: UP
6. Confirm CNC Status: IDLE
7. On CNC, select program 9000, place CNC in memory mode and close CNC door
8. Press Cycle Start Test button
9. Confirm CNC Status: CNC Cycle Start Test Passed



Configure and Test Robot2CNC

1. Click the Edit Settings button under Robot2CNC Settings
2. Select the door configuration, VersaBuilt Single Door Opener, VersaBuilt Double Door Opener or Factory CNC Auto Door; if Factory CNC Auto Door is selected, measure the time to open or close the door and enter in the Door Wait Time parameter
3. Select Door Sensors Enabled if VersaBuilt Door Sensors are installed
4. Select Vise Sensors Enabled if VersaBuilt Vise Sensors are installed
5. Test IO, use the buttons provided to test the pneumatic and sensor functions; make sure all people are away from the vises, doors and VersaBlast before testing; verify all functions work in the correct direction



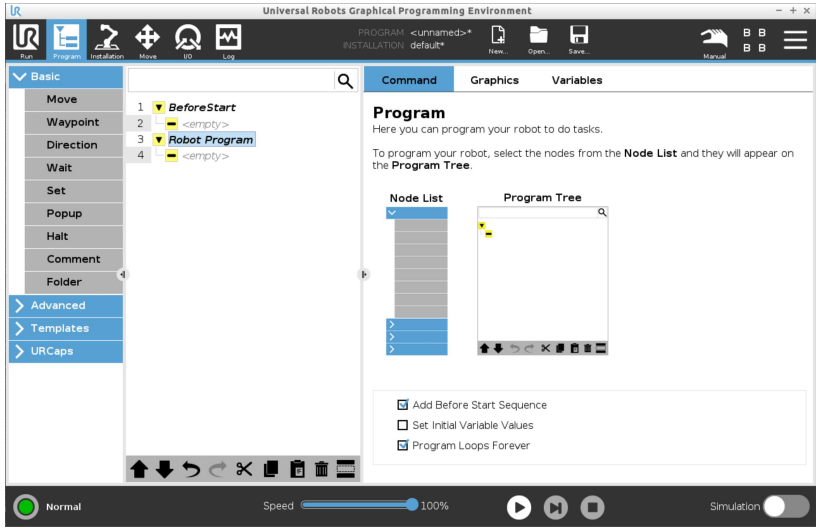
URCap Programming

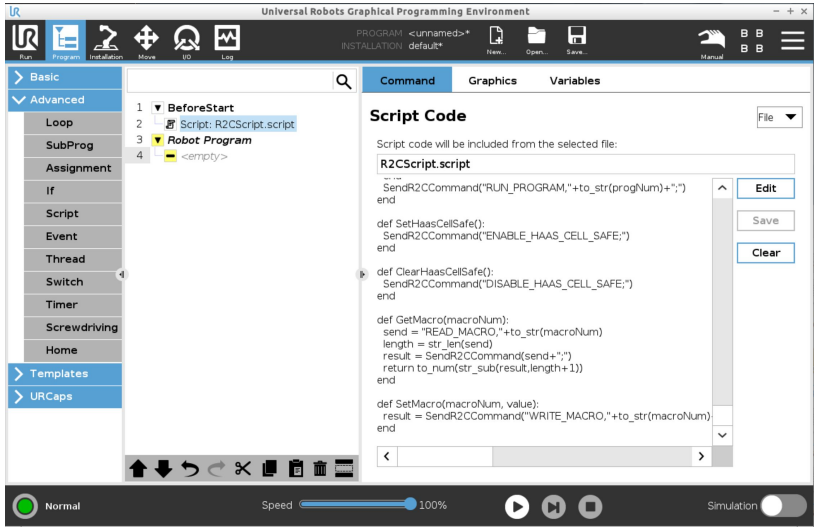
Section 6

UR Robot Programming with the Robot2CNC

Before using Robot2CNC in a UR Polyscope program, the R2CScript.script file must be added to the Before Start Sequence:

1. From the Program page, click on the ***Robot Program***
2. Click on the Add Before Start Sequence checkbox
3. Click on the line marked <empty> below the ***BeforeStart***
4. Click > Advanced -> Script
5. In the upper right, select File
6. Click on the Edit button
7. Click the Open button then navigate to the VersaBuilt folder and select R2CScript.script and press the Open button
8. Click the Exit button

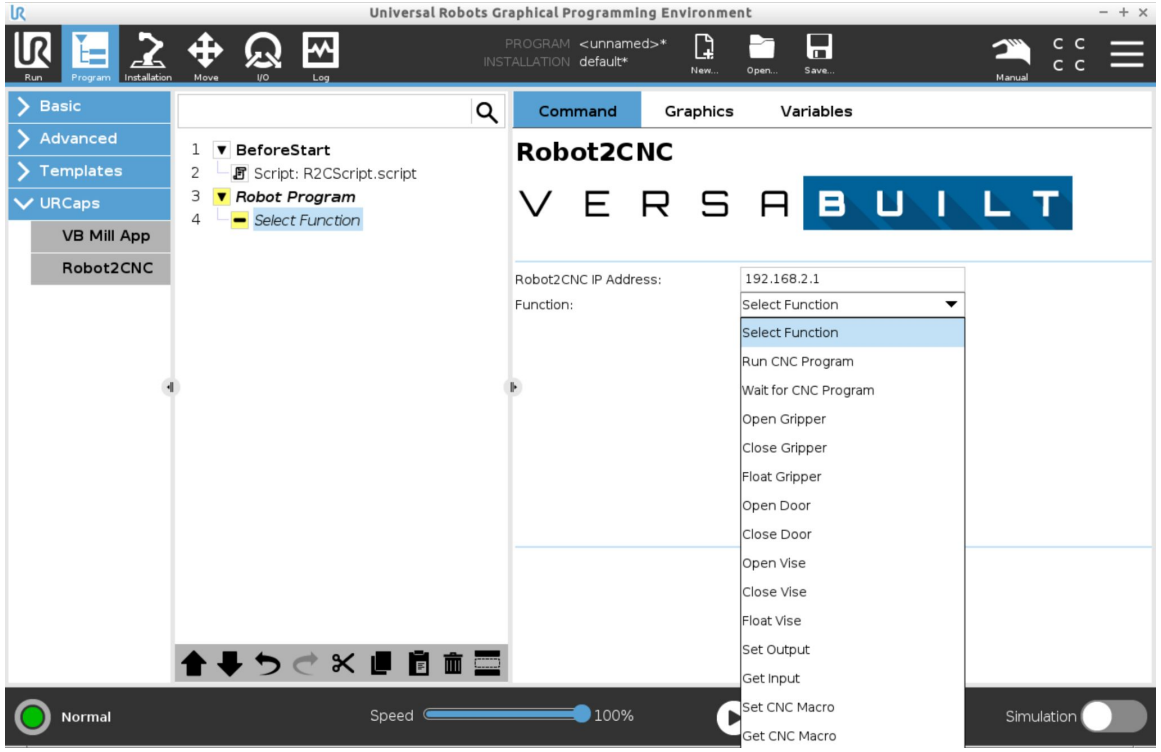




Programming with Robot2CNC

Robot2CNC commands can be added into the Polyscope programming tree via the Robot2CNC program node accessible in the URCaps section. To add a Robot2CNC command to a program do the following:

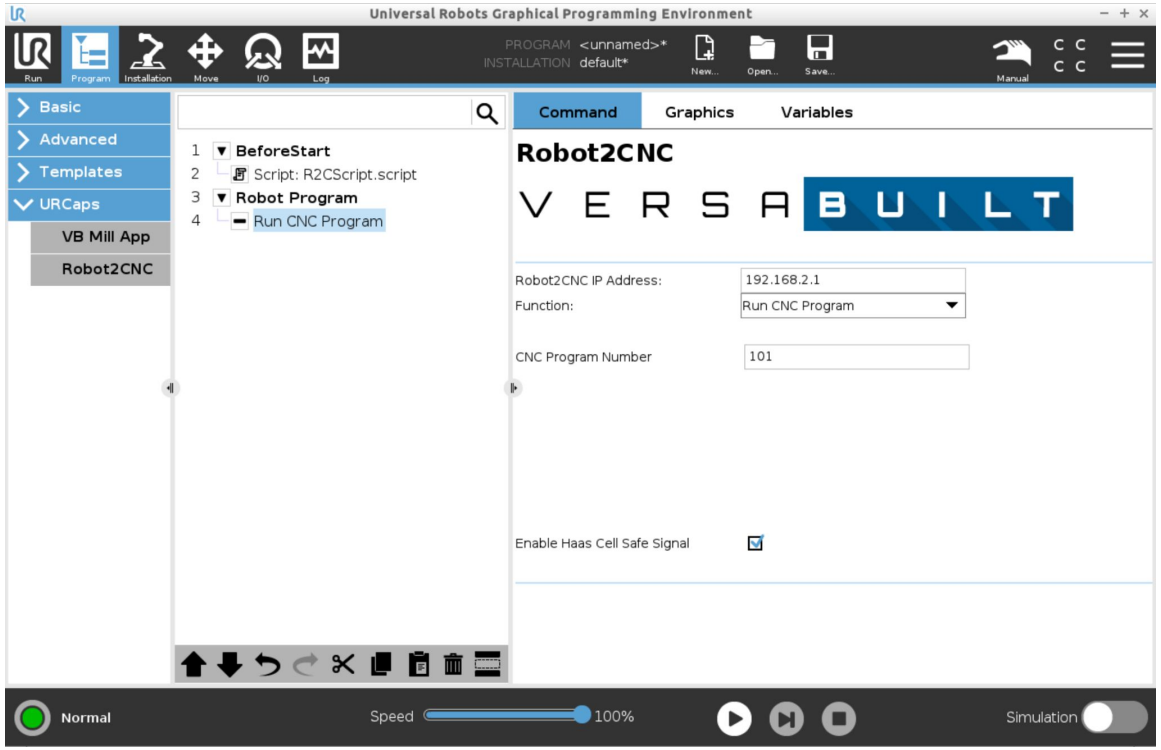
1. Click in the program tree where the Robot2CNC command is required
2. Select > URCaps -> Robot2CNC
3. Click Select Function
4. Select the required function from the list



Robot2CNC Commands

Run CNC Program

Runs the CNC program number entered in the CNC Program Number field. For Haas and Fanuc controls, program 9000 must be selected, for Okuma the vbDispatcher program must be running, the CNC program number must be in the CNC memory and the CNC must be in memory mode with the CNC door closed. CNC program completion can be detected with the Wait for CNC Program command.



Enable Haas Cell Safe Signal

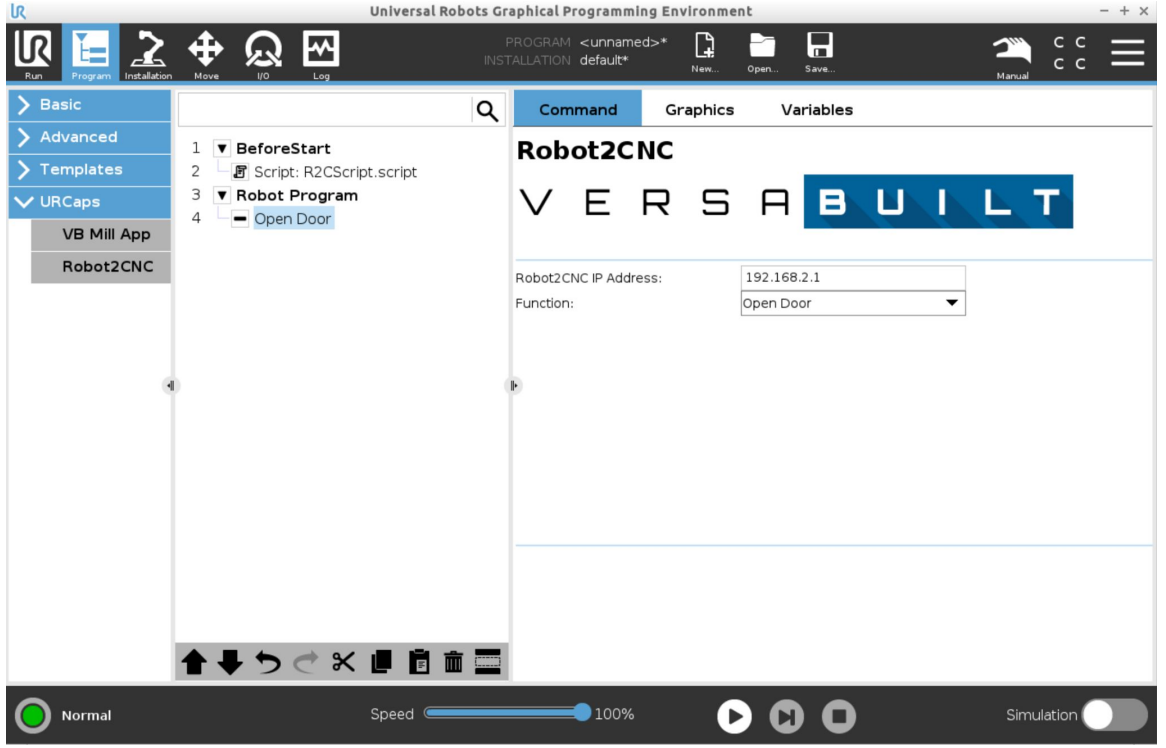
For Haas controls, this option allows a CNC program to be executed with the door open. Be very careful using this option.

Robot2CNC Commands

Open Door/Close Door

Opens the CNC door or Closes the CNC door. Only works with VersaBuilt Auto Door.

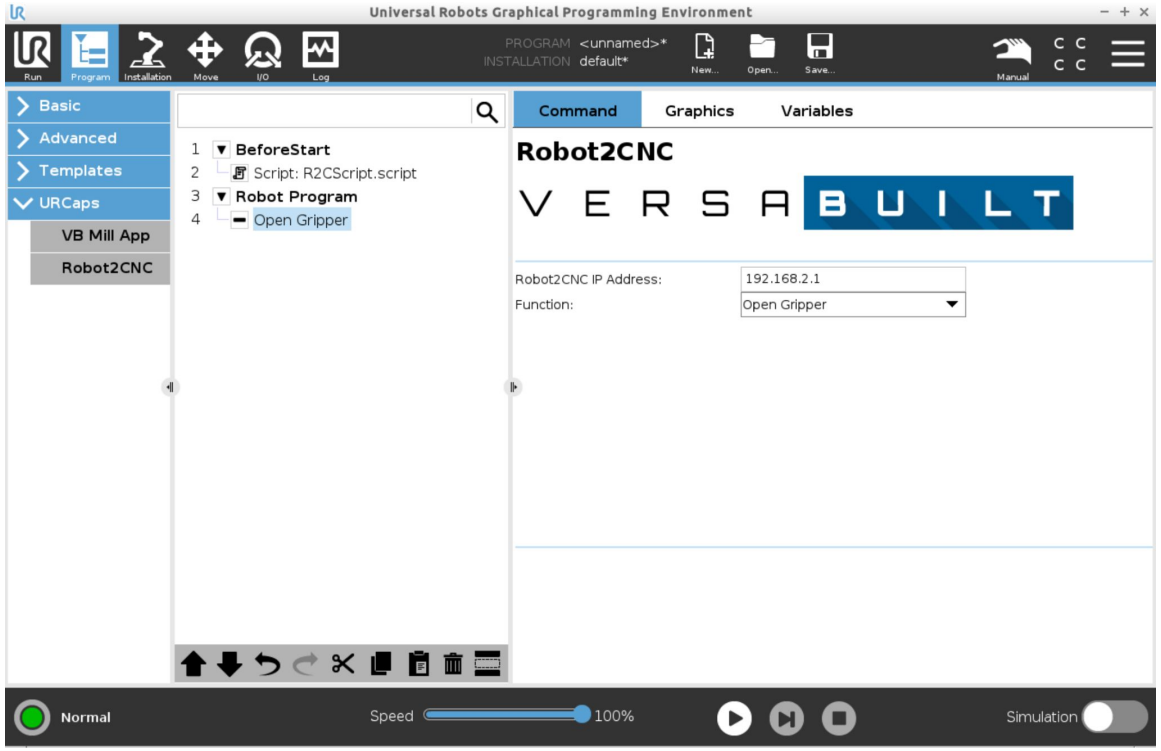
CNC Controlled Auto Door should be configured to close the CNC door on Cycle Start and open the CNC door on Cycle End.



Robot2CNC Commands

Open Gripper/Close Gripper/Float Gripper

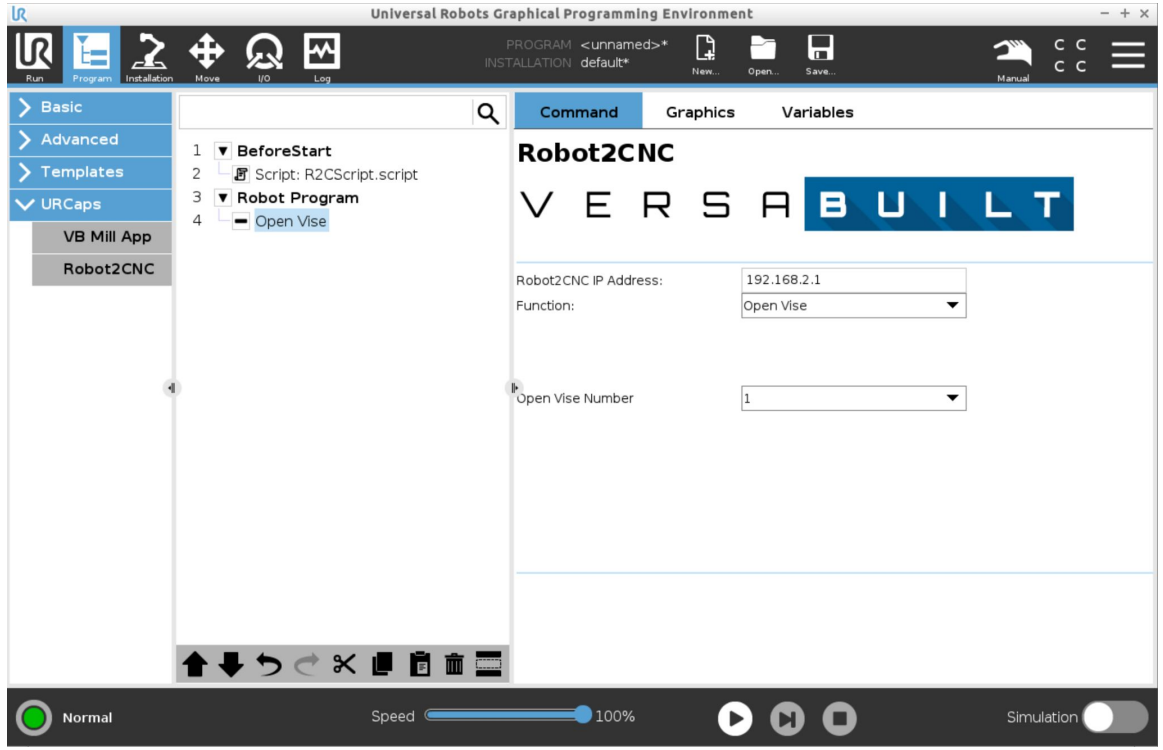
Opens/Closes/Floats the pneumatic gripper attached to the Robot2CNC Mill Edition. The Float command removes pneumatic pressure from both the open and close side of the gripper.



Robot2CNC Commands

Open Vise/Close Vise/Float Vise

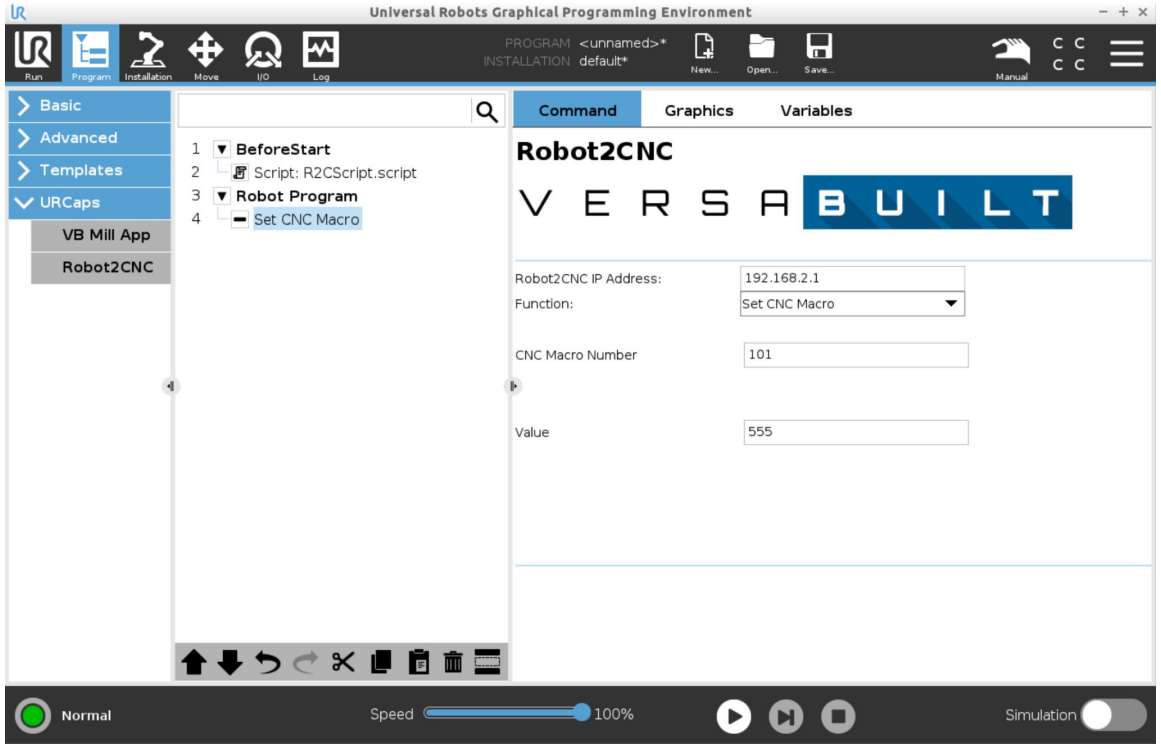
Opens, closes or floats the selected vise number. Floating the vise removes pressure from both the open and close sides of the vise.



Robot2CNC Commands

Set CNC Macro

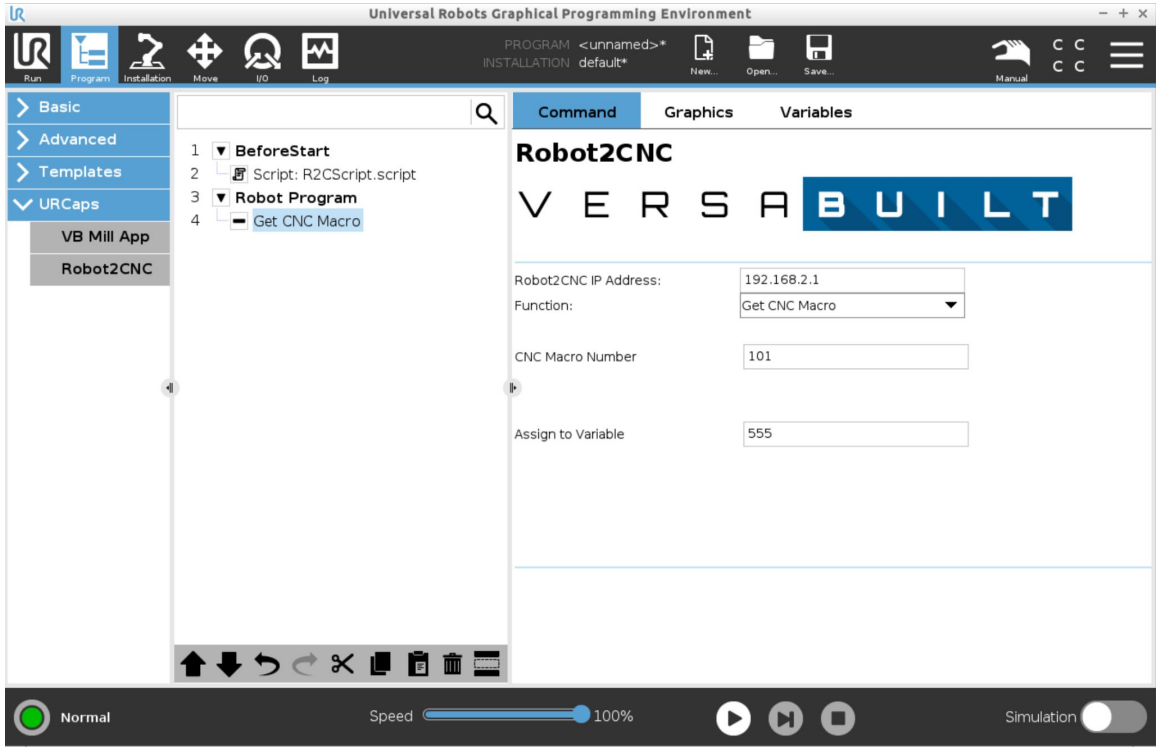
Sets the CNC Macro Number entered to the Value entered. The CNC Macro Number parameter must be a valid macro variable number on the Haas CNC control.



Robot2CNC Commands

Get CNC Macro

Gets the CNC Macro variable specified by the CNC Macro Number parameter and stores it in the Polyscope variable entered in the Assign to Variable parameter. The Assign to Variable must be a valid Polyscope variable, typically created with a Polyscope Assignment program node.

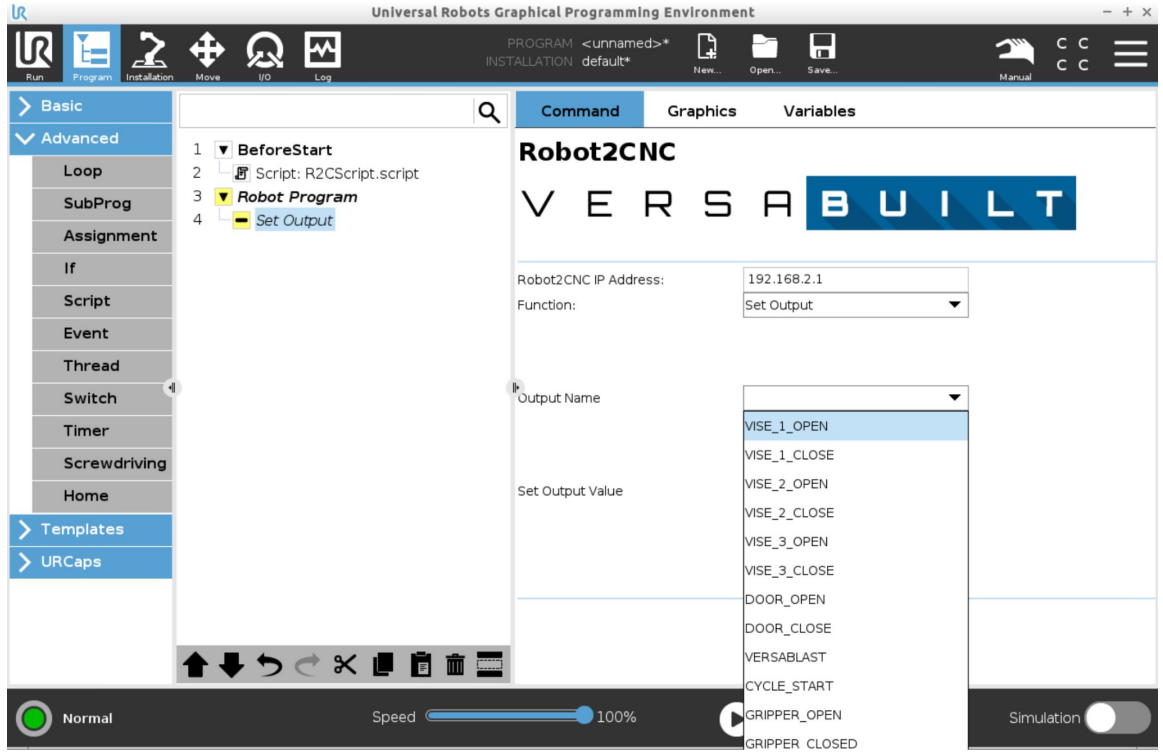


Robot2CNC Commands

Set Output/Get Input

Set Output allows the list of available outputs to be controlled manually. VersaBuilt recommends using the built-in functions such as Open Door, or Close Vise instead of setting the outputs directly.

Get Input allows an input to be read and stored in a variable. Generally, inputs are managed through the higher level functions.



Robot2CNC Macro CNC Drivers Features and Programming

Section 7

Robot2CNC Macro CNC Driver Overview

The Robot2CNC includes two types of drivers to control a CNC during automation processing: Generic CNC Driver and Macro CNC Drivers. The Generic CNC Driver features and programming is documented in the next section.

The Robot2CNC Macro CNC Drivers allow bi-directional communication between the CNC and the Robot2CNC using the CNC's macro variables via a communication link. Bi-directional communication between the CNC and the Robot2CNC enables the following features:

- Run any gcode program stored on CNC from Robot2CNC
- Verify CNC is ready for automation processing
- CNC and Robot2CNC control of vises and vise pressure
- Robot2CNC notification of successful or failed CNC program

The Robot2CNC starts the CNC by tying into the CNC's cycle start button and using a relay to close the circuit, simulating the effect of pressing the cycle start button. The Robot2CNC Macro CNC Drivers detect the end of a signal by first looking for a positive acknowledgement of end of program from the CNC gcode program followed by polling the CNC status for an Idle status.

Robot2CNC Macro CNC Driver Supported CNC Controls

The Robot2CNC includes macro CNC driver support for following CNC control types:

- Haas Legacy Controls for mills and lathes
  - Must include setting 143 machine data collection
  - Must have user-definable macros option enabled
- Haas NGC Controls for mills and lathes
  - Must have user-definable macros option enabled
- Fanuc Controls for mills and lathes:
  - FANUC Series 30i /31i /32i-MODEL A
  - FANUC Series 31i-MODEL A5
  - FANUC Series 30i /31i /32i /35i-MODEL B
  - FANUC Series 31i-MODEL B5
  - FANUC Power Motion i-MODEL A
  - FANUC Series 0i-MODEL D/F
- Okuma OSP-P300 Mill Controls with ThinkAPI version 1.17.2 or newer

Robot2CNC Macro CNC Driver Operational Overview

Dispatcher Program (Haas and Fanuc Controls)

For Haas and Fanuc CNC controls, a dispatcher program is provided. The dispatcher program, program 9000 by default, must be selected in memory prior to starting the automation process. Before execution, the Robot2CNC writes to a set of shared macro variables on the CNC. One macro variable is for command control the other macro variable stores parameters. For program execution, the Robot2CNC writes to the command macro variable a request for program execution and writes the number of the CNC program to be executed in the parameter macro variable.

When cycle started, the dispatcher program looks to the command macro variable for the CNC program execution command and then reads the parameter variable to determine what CNC program to execute.

During execution, the Robot2CNC polls the command variable looking for other requests, such as CNC vise control and for a positive acknowledgement of end of cycle.

Robot2CNC Macro CNC Driver Operational Overview

Direct Program Select (Okuma Controls)

For Okuma controls, a vbDispatcher program is provided as an MS Windows executable program. This program must be running in the background before the Robot2CNC automation process is started. The vbDispatcher program allows the Robot2CNC to read and write macro variables and to select the current CNC program in memory.

Before the CNC is cycle started, the Robot2CNC sends a command to the vbDispatcher program to select the required program number.

During execution, the Robot2CNC polls the command variable looking for other requests, such as CNC vise control and for a positive acknowledgement of end of cycle.

Robot2CNC Macro CNC Driver End of Program Sequence

Positive Acknowledgement of CNC Program Completion

The protocol between the CNC and the Robot2CNC requires any gcode program run by the Robot2CNC to positively acknowledge to the Robot2CNC successful completion of the program. This is done by writing a value to a macro variable shared between the CNC and the Robot2CNC and should be done just prior to program end. For Haas and Fanuc controls a helper sub-program 9004 is provided. Example:

```
…
M98 P9004
M30
%
```

For the Okuma controls, the value 2 is written to variable VC190. Example:

```
…
VC190=2
M30
%
```

Robot2CNC Macro CNC Driver Vise Control

The Robot2CNC Macro CNC Driver allows each of the MutliGrip FJ Vises to be opened or closed from within a CNC program using the included CNC subprograms:

- 9002 program is used for vise control
- Call the 9002 program using the G65 command and using D and C parameters:
  - D01. selects vise 1
  - D02. selects vise 2
  - C02. closes the vise
  - C03. opens the vise
- Recommend dwelling 1 second to allow vise to actuate:
  - G04 P1.

EXAMPLES:

- Close Vise 1: G65 P9002 D01. C02.
- Open Vise 1: G65 P9002 D01. C03.
- Close Vise 2: G65 P9002 D02. C02.
- Open Vise 2: G65 P9002 D02. C03.

NOTE: decimals after the numeric values shown are important for proper function

Robot2CNC Generic CNC Driver Features and Programming

Section 8

Robot2CNC Generic CNC Driver Overview

The Robot2CNC Generic CNC Driver can be used with almost any CNC but is limited to the following features:

- Run the gcode program currently selected in memory
- Run one op or two op milling operation automation processes
- Robot2CNC notification when a program completes successfully

Before starting the automation process, the operator must select the proper CNC program for the automation process. The CNC must provide an end of cycle signal to the Robot2CNC after the milling operation is complete.

For multi-operation automation processes, all milling operations must be in a single program. The end of each milling operation must set the end of cycle signal, then execute an M0 command to pause the CNC at the current location. After the M0, the CNC milling program must reset the end of cycle signal. Single operation and multi-operation programs should end in an M30.

Examples are provided on the following pages for CNC machines that have macros enabled and without macros enabled. Consult your CNC documentation to determine if your CNC has macros enabled.

Robot2CNC Macro CNC Driver Programing Requirements

Edit Mcodes for CNC Configuration

Sample gcode for use with Generic CNC Driver is included on the VersaBuilt USB in the Generic-Macro directory. This gcode must first be edited to replace the sample mcodes used to set and clear the End of Cycle signal from the CNC with the actual mcodes used in your configuration.

Generic-Macros Gcode Two Op Program Editing

```
%
O9000       (Dispatcher Program - Two Op - Generic
#10000=100  (Op1 Program - Edit)
#10001=101  (Op2 Program - Edit)
#10002=8001 (Wash/Table Load Program)

G103 P0.    (Enable Look-ahead)
M98 P[#10000]    (Op1 Program)
M98 P[#10002]    (Wash/Table Load Program)
G103 P1.        (Disable Look-ahead)
M51             (Set Handshake)
M0              (Wait for robot)
M61             (Clear Handshake)
```

- Edit each milling program and replace the M30 at the end of the file with an M99
- Edit the 9000 gcode program to map Op 1 and Op 2 milling program numbers to the #10000 and #10001 macro variables
- Confirm 8001 Wash/Table Load, Op 1, and Op 2 programs are stored as files in memory; make sure to end programs with the Wash/Table Load (wash table load is optional and can be edited out)
- Select the edited 9000 program as the active program
- Place CNC in Memory Mode

NOTE: If desired, the edited 9000 program can be copied and saved to a new program number so the 9000 program will not need editing before each job

Generic-Macros Gcode One Op Program Editing

```
%
O9000       (Dispatcher Program - One Op -
#10000=100  (Op1 Program - Edit)
#10002=8001 (Wash/Table Load Program)

G103 P0.        (Enable Look-ahead)
M98 P[#10000]    (Op1 Program)
M98 P[#10002]    (Wash/Table Load Program)
G103 P1.        (Disable Look-ahead)
M51             (Set Handshake)
M0              (Wait for robot)
M61             (Clear Handshake)
G103 P0.        (Enable Look-ahead)
M30
%
```

- Edit the milling program and replace the M30 at the end of the file with an M99
- Edit the 9000 gcode program to map Op 1 milling program number to the #10000 macro variables
- Confirm 8001 Wash/Table Load and Op 1 program is stored as files in memory; make sure to end milling programs with the Wash/Table Load (wash table load is optional and can be edited out)
- Select the edited 9000 program as the active program
- Place CNC in Memory Mode
- Make sure CNC door is open

NOTE: If desired, the edited 9000 program can be copied and saved to a new program number so the 9000 program will not need editing before each job

Generic Gcode Two Op Program Editing

```
%
O9000       (Dispatcher Program - Two Op - Generic Macro Disabled)

G103 P0.                (Enable Look-ahead)
(Insert Op1 Program)    (Op1 Program)
(Insert Wash Program)   (Wash/Table Load Program)
G103 P1.                (Disable Look-ahead)
M51                     (Set Handshake)
M0                      (Wait for robot)
M61                     (Clear Handshake)
G103 P0.                (Enable Look-ahead)
(Insert Op2 Program)    (Op2 Program)
(Insert Wash Program)   (Wash/Table Load Program)
G103 P1.                (Disable Look-ahead)
M51                     (Set Handshake)
M0                      (Wait for robot)
M61                     (Clear Handshake)
G103 P0                 (Enable Look-ahead)
M30
%
```

- In a text editor, open a copy of the Generic Two Op gcode program, Table Load, Wash, Op1 and Op 2 milling programs
- In the Op1 milling program, begin text selection after the %OXXXX program number down to but not including the M30 at the end of the program and copy the selection
- In the Generic Two Op gcode program, paste the Op 1 program text below the line that begins with:

  (Insert Op 1 Program)
- Repeat the text selection, copy and paste steps for the Wash, Table Load and Op 2 programs (note Wash and Table load will be pasted below the Op 1 and Op 2 programs (wash table load is optional)
- Select the edited 9000 program as the active program
- Place CNC in Memory Mode

NOTE: If desired, the edited 9000 program can be copied and saved to a new program number so the 9000 program will not need editing before each job

Generic Gcoe One Op Program Editing

```
%
O9000       (Dispatcher Program - One Op - Generic Macro Disabled)

G103 P0.                (Enable Look-ahead)
(Insert Op1 Program)    (Op1 Program)
(Insert Wash Program)   (Wash/Table Load Program)
G103 P1.                (Disable Look-ahead)
M51                     (Set Handshake)
M0                      (Wait for robot)
M61                     (Clear Handshake)
G103 P0.                (Enable Look-ahead)
M30
%
```

- In a text editor, open a copy of the Generic One Op gcode program, Table Load, Wash and milling programs
- In the milling program, begin text selection after the %OXXXX program number down to but not including the M30 at the end of the program and copy the selection
- In the Generic One Op gcode program, paste the Op 1 program text below the line that begins with:
  (Insert Op 1 Program)
- Repeat the text selection, copy and paste steps for the Wash, Table Load programs (wash table load is optional)
- Select the edited 9000 program as the active program
- Place CNC in Memory Mode

NOTE: If desired, the edited 9000 program can be copied and saved to a new program number so the 9000 program will not need editing before each job

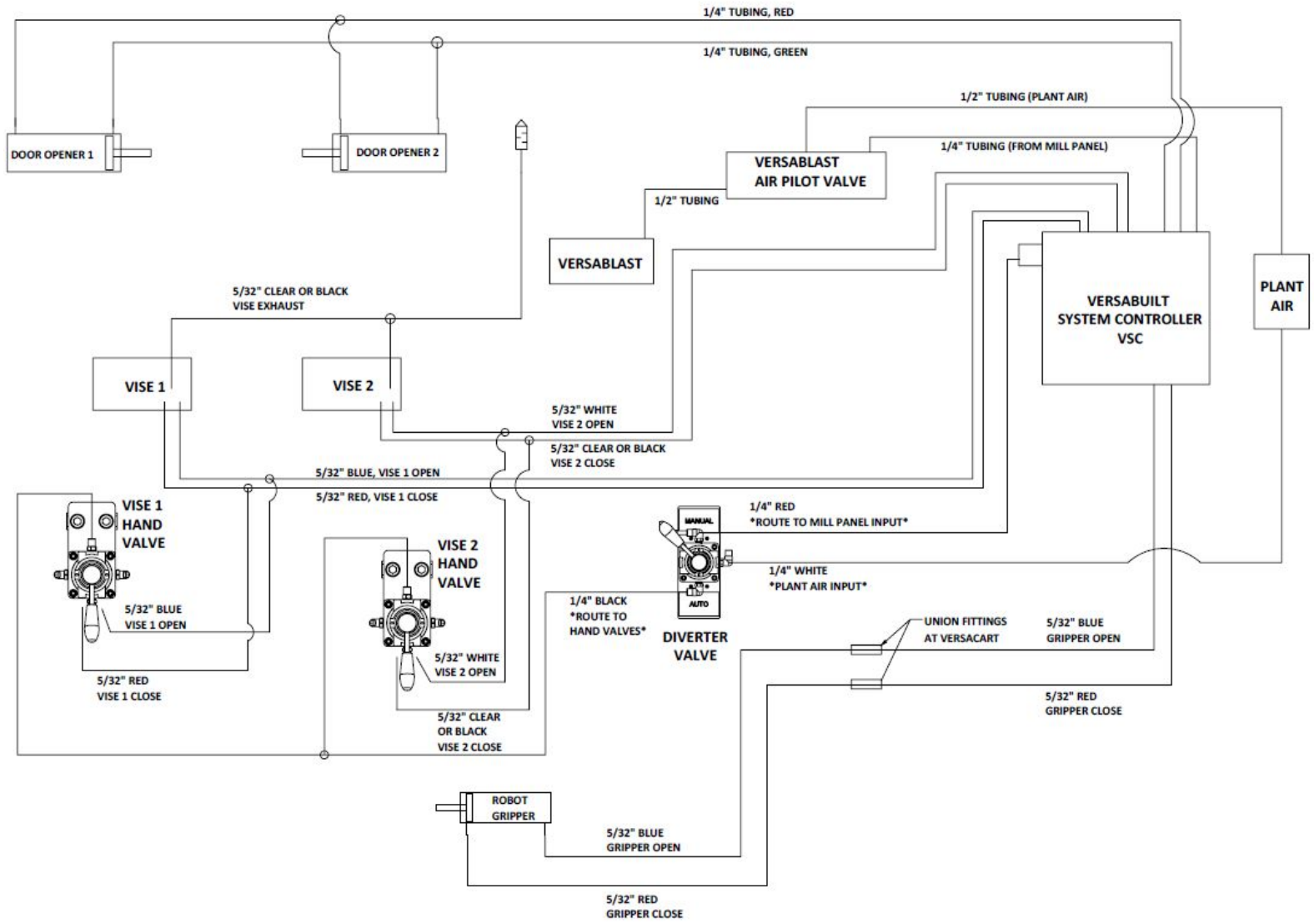
Appendices

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.

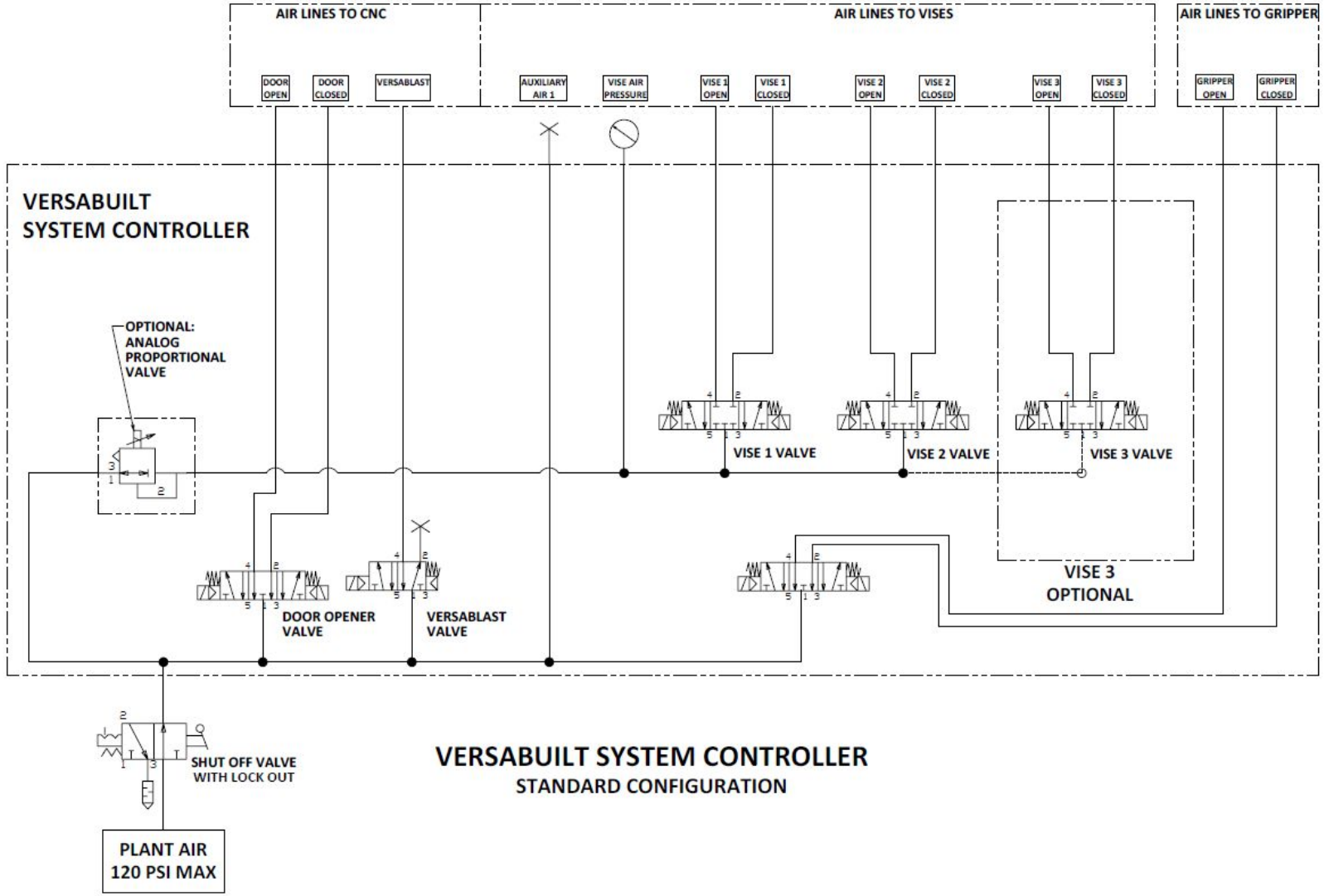
*Note: when in “Auto Mode”, manual valves need to be in center-position. When in “Manual Mode” vise valves need to be in center position, without power to either side of the solenoid valve



Pneumatic Schematics

Schematic shows inside detail of VersaBuilt System Controller, including:

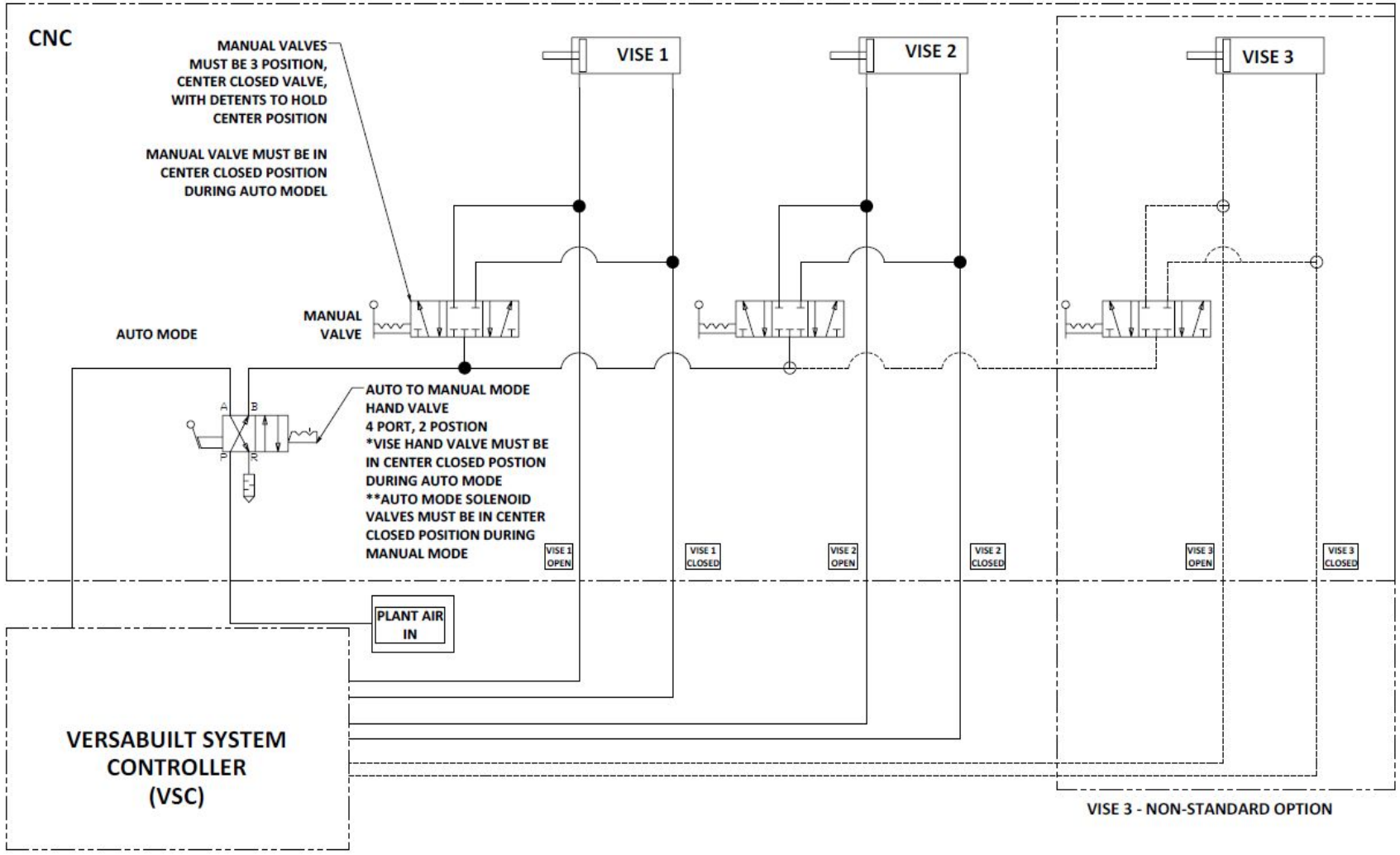
- 24VDC solenoid valves
- Vise valves are 5 port, 3 position, center closed
- Gripper valve is 5 port, 3 position, center exhaust
- Door valve is 5 port, 3 position, center exhaust
- VersaBlast is 5 port, 2 position
- Optional:
  - *Analog Proportional Valve for Vises to control pressure from 0 PSI up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

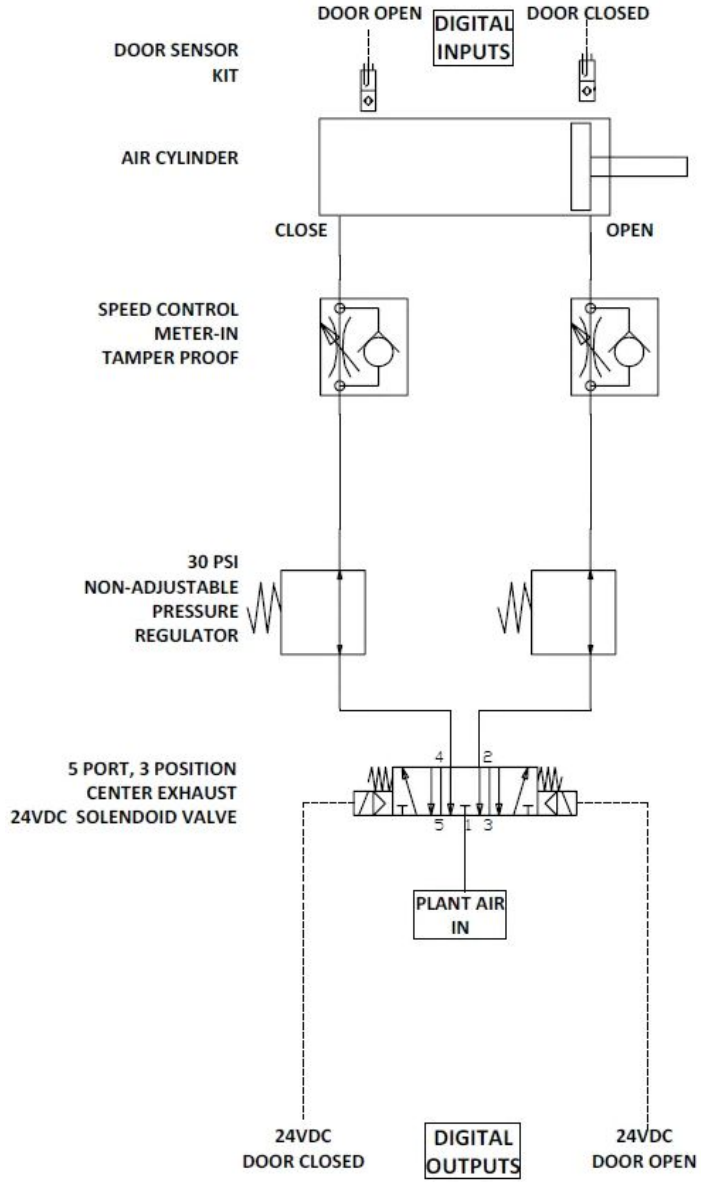


AIR INPUT - AUTO/MANUAL MODE

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.

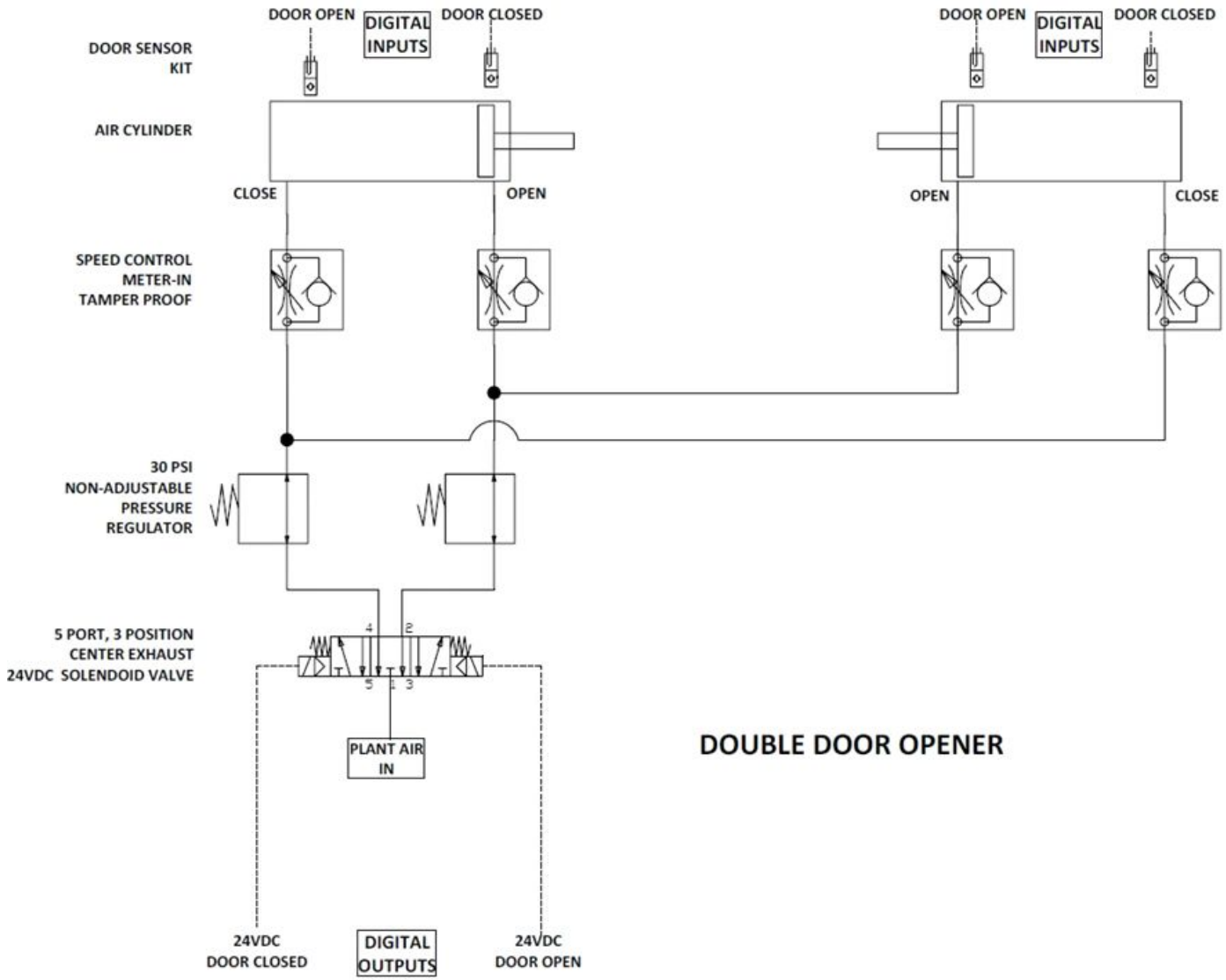


SINGLE DOOR OPENER

Pneumatic Schematics

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

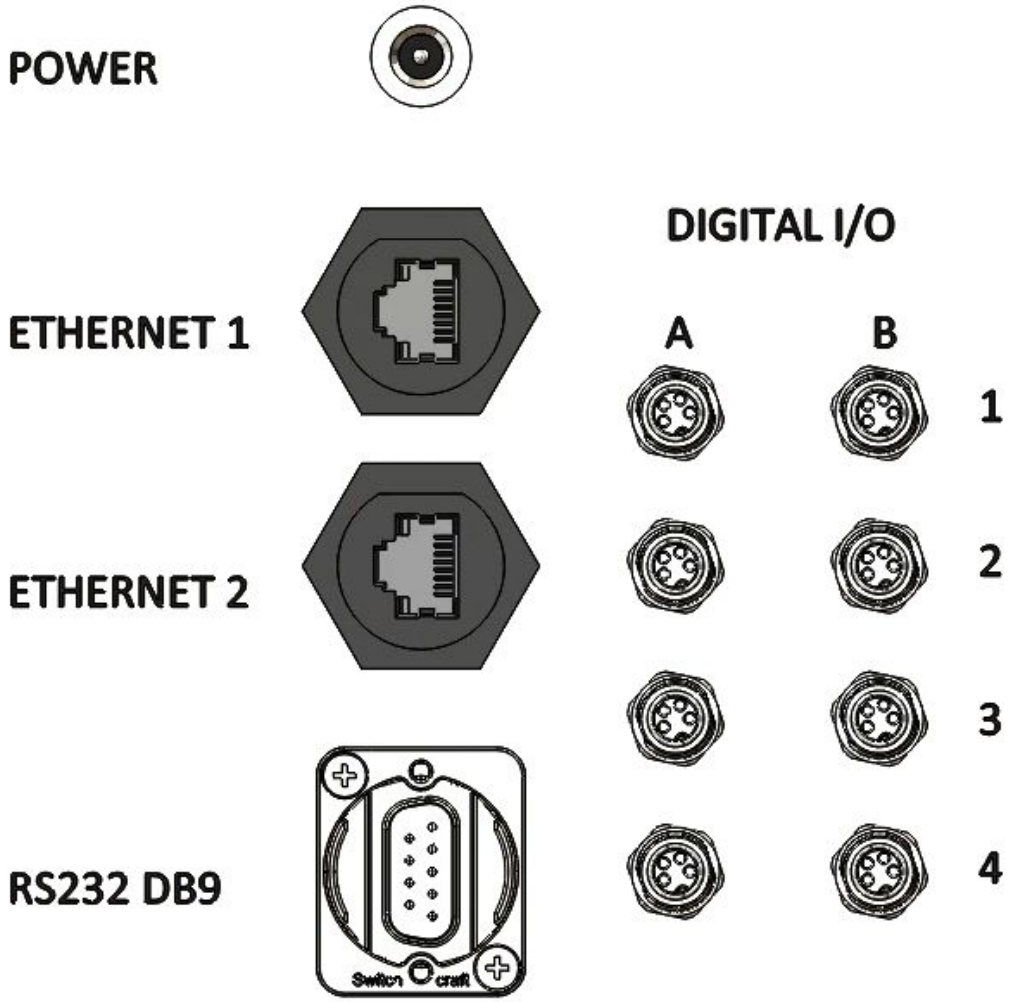
- Double door application is nearly equivalent to single door application, with exception of additional door actuator, 2x 30 PSI regulators, 2x door sensors, and 2x tee fittings to connect second door actuator with open/close signals.



Robot2CNC Panel Connections

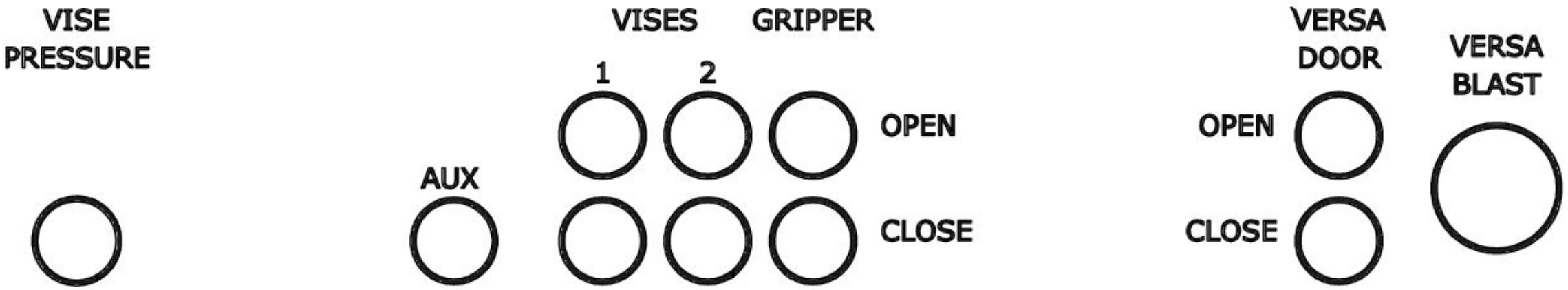
- **Power = 110VAC to 24VDC cord provided with VSC Panel**
- **Ethernet 1 = VSC Communication to Ethernet Switch**
- **Ethernet 2 = Open**
- **RS232 DB9 = Connection to CNC if Ethernet is not available**

- **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 = Open**
- **B4 = Open**



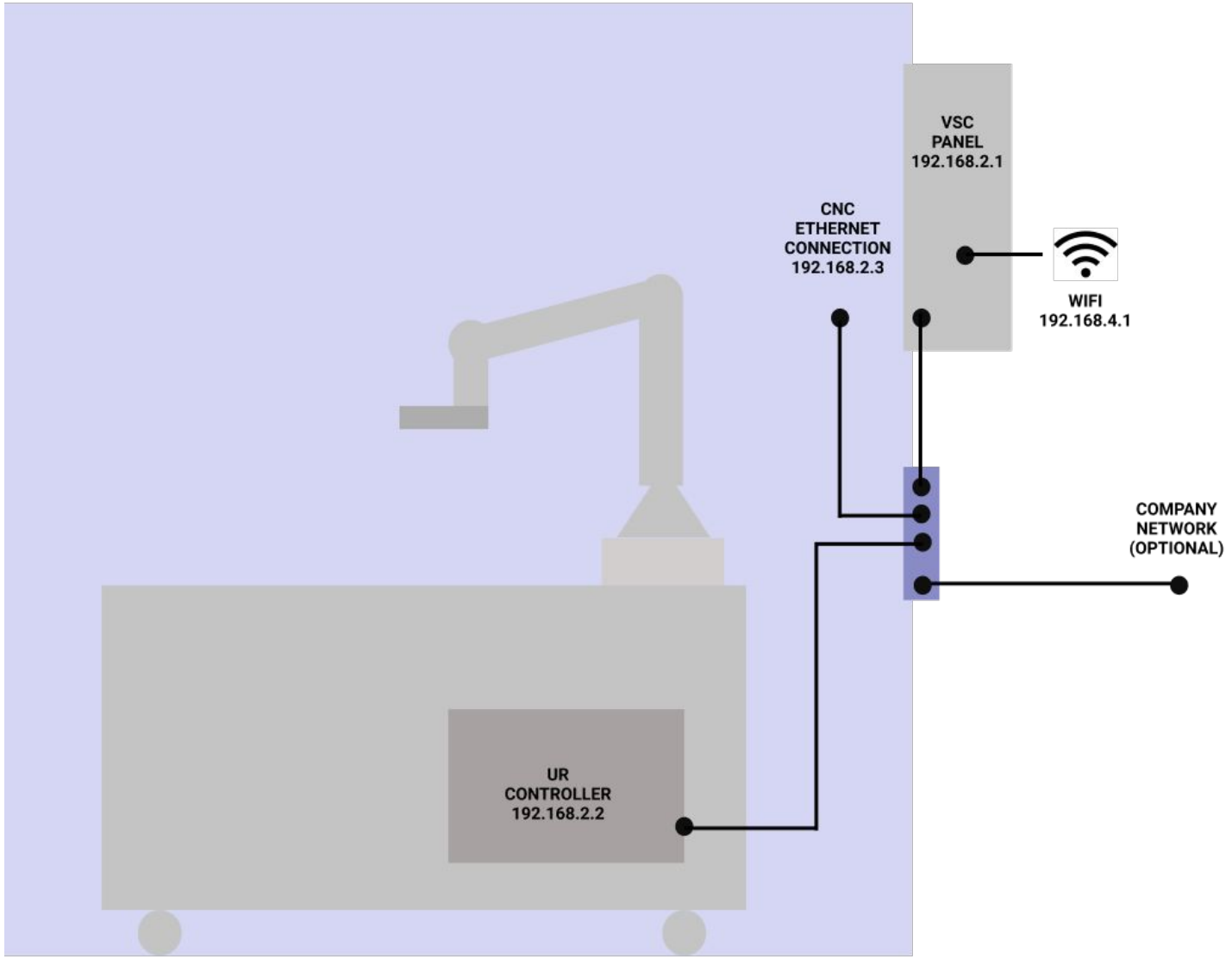
Robot2CNC Panel Connections

- **Vise Pressure - Gauge showing air pressure supplied to Robot2CNC Mill Panel**
- **Aux - Extra air connection point available for custom applications**
- **Vises 1 & 2 - Open/Close connections for vise valves (5 port, 3 position, center closed 24VDC solenoid valves)***
- **Gripper - Open/Close connections for gripper valve (5 port, 3 position, center exhaust 24VDC solenoid valves)****
- **VersaDoor - Open/Close connections for door opener valve (5 port, 3 position, center exhaust 24VDC solenoid valves)*****
- **VersaBlast - Single air connection to supply air directly to a high-flow, air-pilot valve for an air amplifier/blower (5 port, 2 position, spring return, configured for normally closed 24VDC solenoid valve)**



*Vises valves are center closed for vises to hold position in the event of a power loss
**Gripper valves are center exhaust to allow gripper actuator to “float” for compliance in pick and place applications
***Door Opener valves are center exhaust to allow manual override of door mechanism

Network Diagram



VERSA BUILT
ROBOTICS

Copyright VersaBuilt 2021