VERSABUILT ROBOTICS

ROBOT2CNC
BASIC EDITION
UNIVERSAL ROBOTS
HAAS LEGACY
INSTALLATION AND OPERATION

TABLE OF CONTENTS

SECTION

SECTION

SAFETY WARNINGS 1

DANGER

The Robot2CNC is an industrial control product designed to be operated by trained personnel only. The Robot2CNC is capable of starting the CNC, actuating clamping devices, and making changes to the CNC's operating parameters.

Before deploying the Robot2CNC, a safety risk assessment must be completed in accordance with local, state, and/or federal requirements. When using the Robot2CNC all CNC safety interlocks must be maintained. Additional safety measures may be required to ensure the Robot2CNC device does not create a safety hazard when deployed.

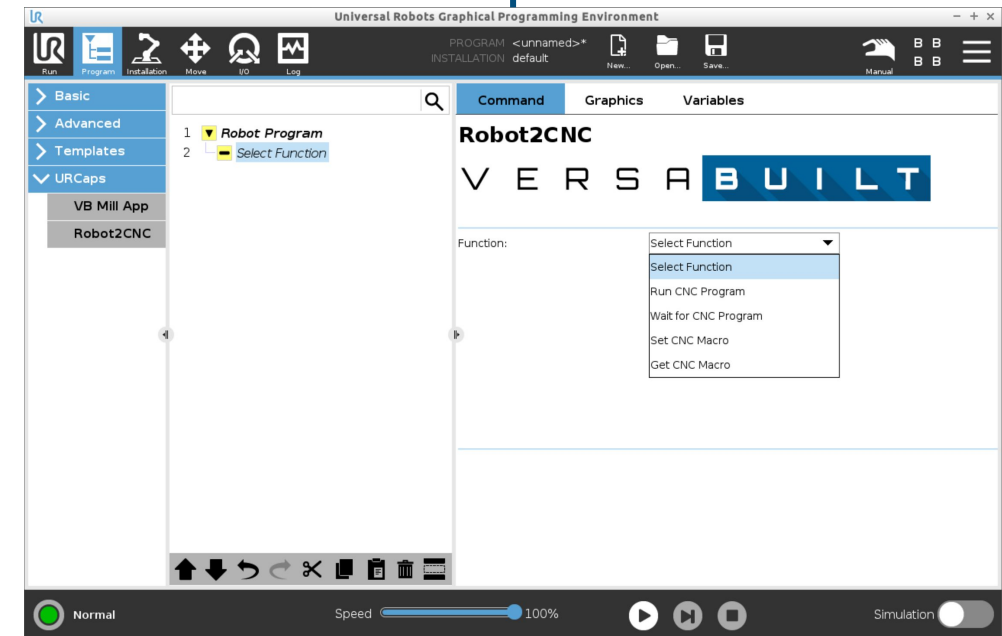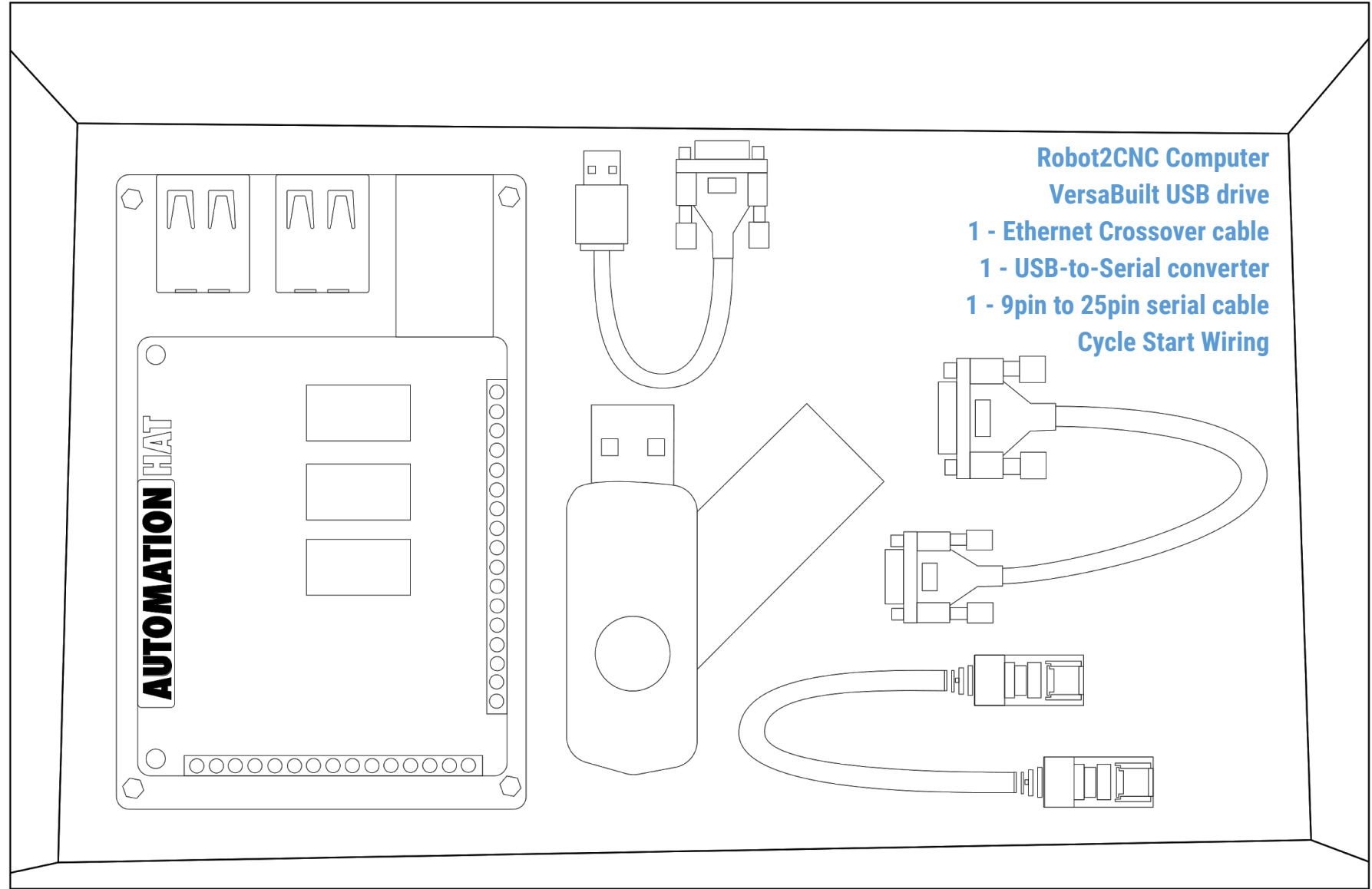**The Robot2CNC should only be used by trained operators**

Robot2CNC communicates with the **Haas CNC** using the Haas Machine Data Collection protocol. Machine Data Collection protocol allows the Robot2CNC to **read** and **write** macro variables **on the CNC**. Values in the macro variables are used to **communicate information** and commands **between the Robot** and the **CNC machine**. When used with the provided **VersaBuilt CNC programs**, the Robot2CNC allows the robot to select and run any program stored on the CNC and be notified when the **program completes.**

In the Robot2CNC Basic edition, the following commands are available:

1

Run CNC Program
(CNC Program Number)

2

Wait for CNC Program

3

Set CNC Macro Variable

4

Get CNC Macro Variable

SECTION

IN THE BOX

1
2
3

Robot2CNC Computer
VersaBuilt USB drive
1 - Ethernet Crossover cable
1 - USB-to-Serial converter
1 - 9pin to 25pin serial cable
Cycle Start Wiring

Tools Needed

- Make sure CNC is **powered off** at main breaker

- Rotate Hass Control Panel to **show back of panel**

- Remove the back cover panel on the Hass Control Panel by **unscrewing the 4 fastener with a screwdriver** or Allen Wrench

- Locate the **Cycle Start Button in the lower right hand corner** of the panel

- Connect the **two wires from the cycle start wire kit** to the terminal **on the button**. Polarity does not matter. Either wire can go to either terminal.

- Route the cycle start wirest cable **through the cable pass through hole** on the Hass Control Panel

- Route the cable to the **Robot2CNC**

- Put back **sheet metal cover panel and fasten the 4 screws** with a screwdriver or Allen Wrench

*note: some hardware may vary depending on CNC model and Year
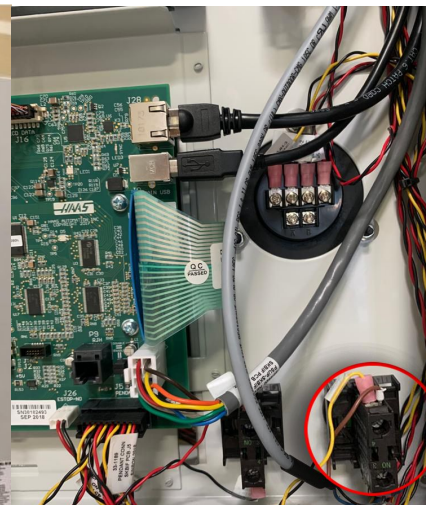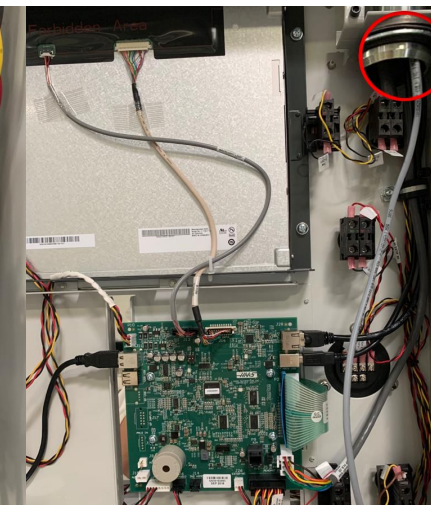
| 4 Fastener | Cycle Start Button | Cycle Start Wires Connection | Routing Cycle Start Wires |
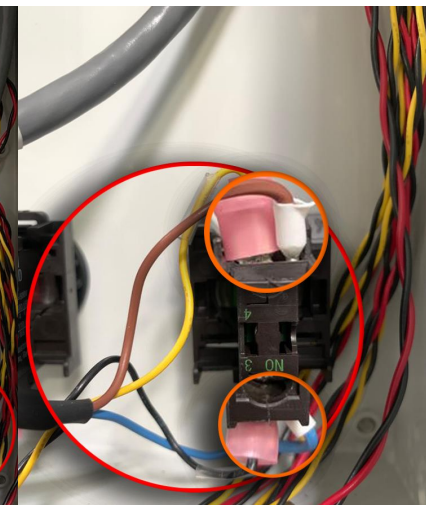
INSTALLATION STEPS

4.2

Mount Robot2CNC Computer in CNC Cabinet

- Turn-off power at the breaker to the CNC

- Open CNC cabinet door

- Place Robot2CNC on the bottom shelf of the CNC cabinet away from exposed electrical wires

- Connect Robot2CNC power supply to Robot2CNC
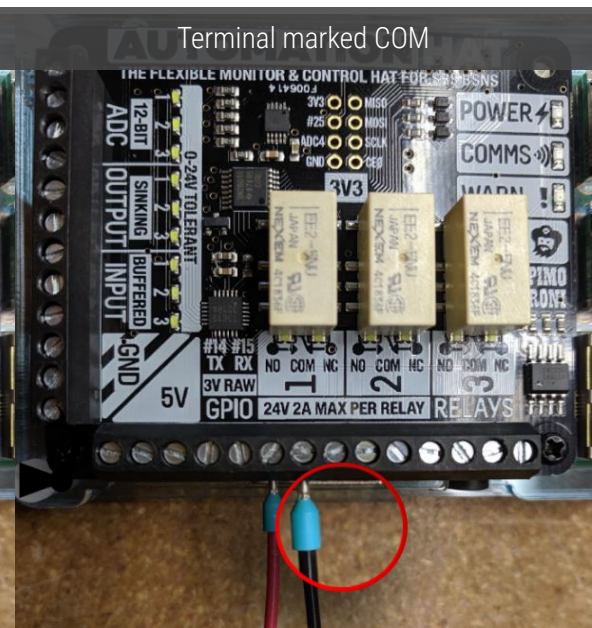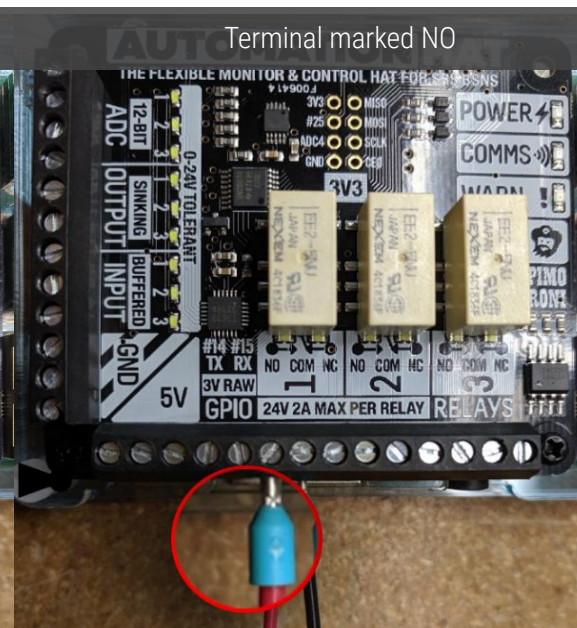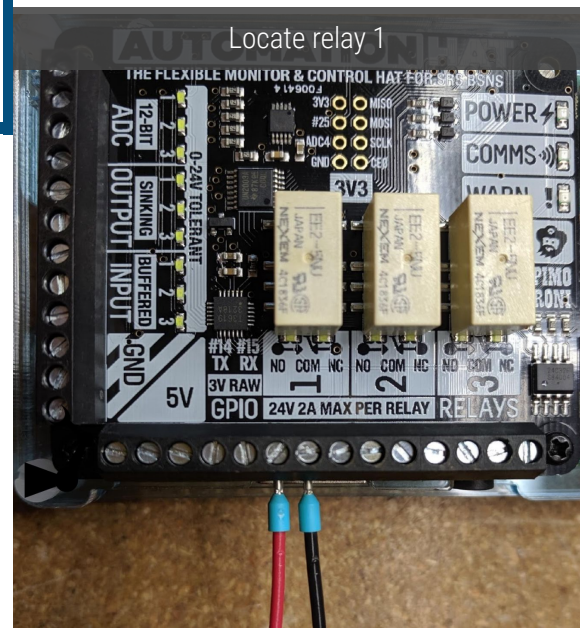
Tools Needed 1/16" Flathead Screwdriver

○ Route wires down to the Robot2CNC

○ Locate relay 1 on the Robot2CNC

○ Using the screwdriver, loosen the terminal marked NO and connect the red wire and tighten it down

○ Repeat the process for the black wire in the terminal marked COM

Locate relay 1   Terminal marked NO   Terminal marked COM

- Insert USB-to-Serial into one of the available USB ports on the Robot2CNC computer

- Route 9pin connector of serial cable into CNC cabinet

- Connect 9pin serial cable connector to USB-to-Serial adapter

- Connect 25pin serial cable connector to Haas CNC

SECTION

○ Lay the UR controller on it's back, remove a round access hole plug from the bottom of the controller

○ Route one end of the Ethernet cable through the access hole and into the UR Controller

○ Plug the Ethernet cable into the Ethernet port of the UR controller

○ Route the other end of the Ethernet cable into the CNC cabinet

○ Plug the Ethernet cable into the Robot2CNC Ethernet port
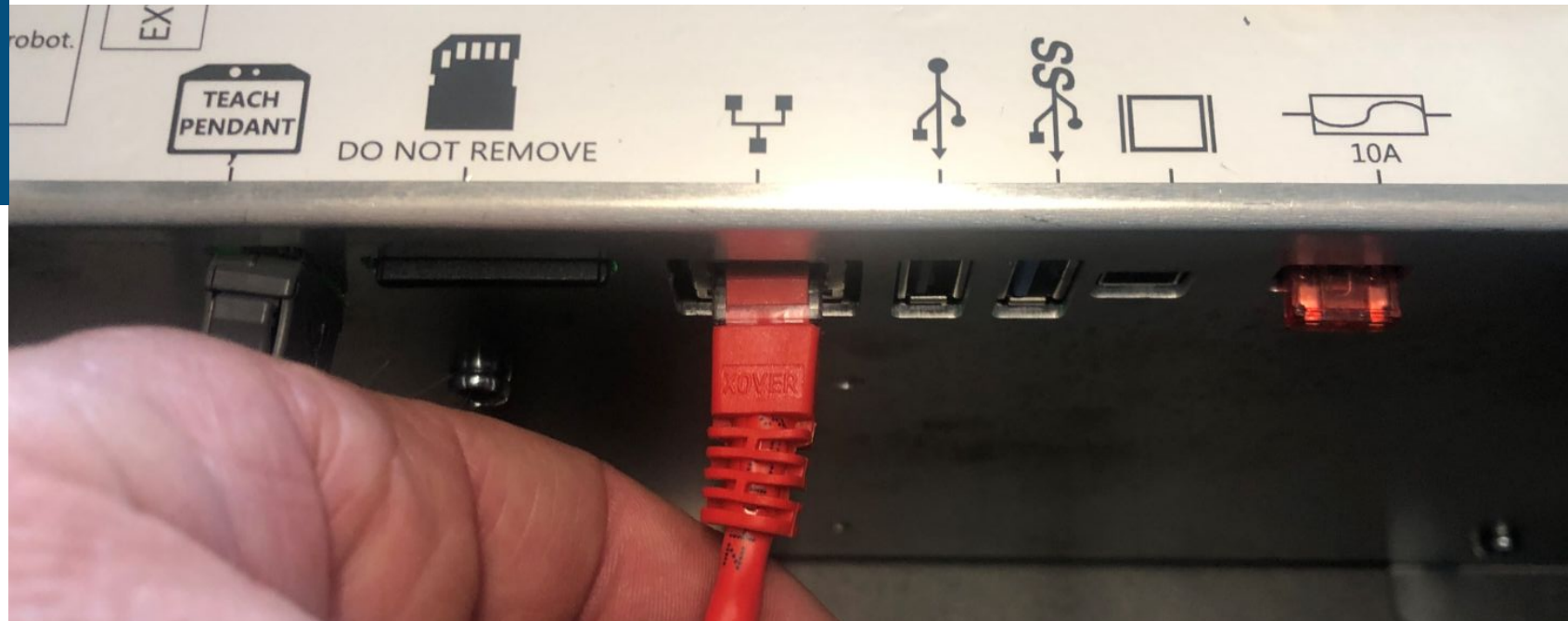
Change the following CNC settings:

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

GENERAL	PROGRAM	I/O	CONTROL PANEL	SYSTEM	MAINTENANCE	POWER SETTINGS

RS-232 PORTS

11	MAX FEED (INCH/MIN)	115200
12	MAX FEED (DEG/MIN)	NONE
13	FEED ACCEL ROUGH	1
14	FEED T CONST ROUGH	XON/XOFF
37	FEED DELTA V ROUGH	8
24	FEED ACCEL MEDIUM	NONE
25	FEED T CONST MEDIUM	CR LF
41	FEED DELTA V MEDIUM	ON
50	FEED ACCEL FINISH	XON/XOFF
54	FEED T CONST FINISH	4800
69	FEED DELTA V FINISH	OFF
70	AUTOFEED-STEP-UP	ON
143	AUTOFEED-STEP-DOWN	ON
187	AUTOFEED-MIN-LIMIT	OFF
155	RIG TAP FINISH DIST	OFF
156	ROTARY AXIS INCRMNT	ON
157	CELL SAFE PORT	A

Setting 11 - Baud Rate Select

CNC settings Screen

- Insert VersaBuilt USB drive into Haas USB port

- Navigate to the Haas Legacy directory on the VersaBuilt USB drive

- Copy the 9000.NC and the 9004.NC programs onto the Haas CNC control
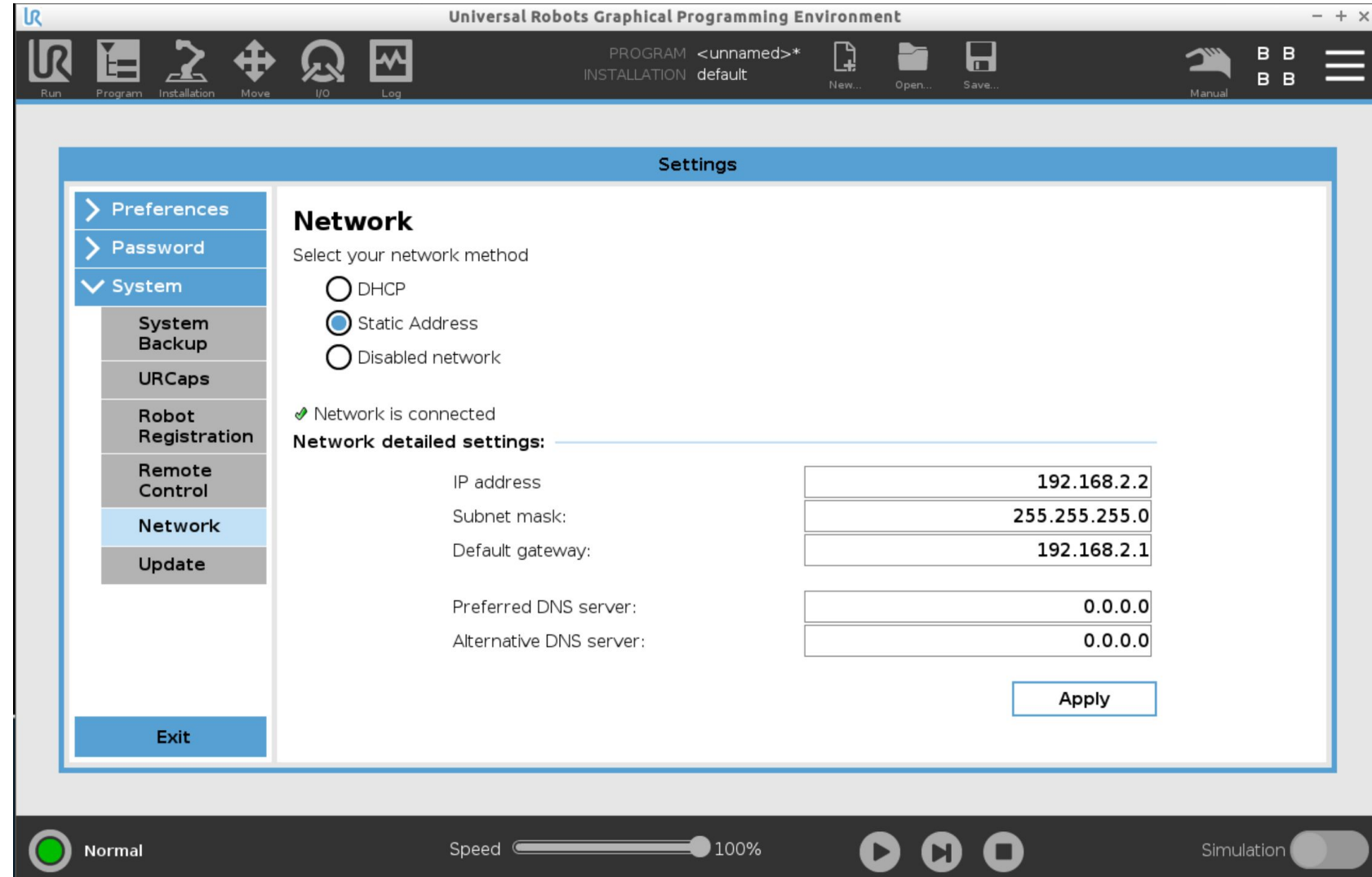
| MEMORY | USB DEVICE | HARD DRIVE | NET SHARE |

CURRENT DIRECTORY: USB DEVICE\Haas Legacy

⌐ (USB DEVICE)

9004. NC	431 07-24-2020 18:28
9000. NC	513 07-24-2020 18:28
9001. NC	889 07-24-2020 18:35
9002. NC	1617 07-24-2020 18:33
9003. NC	582 07-24-2020 18:31

Gcode File on CNC Screen

○ Click on the 3 horizontal bars in the upper right-hand corner of the UR teach pendant and select **Settings**

○ On the Settings page, select **System ❯ Network**

○ Select **Static Address**

○ Enter the network detailed settings as shown

Universal Robots Graphical Programming Environment

PROGRAM <unnamed>*
INSTALLATION default

Run | Program | Installation | Move | I/O | Log | New... | Open... | Save... | Manual

Settings

> Preferences
> Password
∨ System
  System Backup
  URCaps
  Robot Registration
  Remote Control
  Network
  Update

Exit

Network

Select your network method

○ DHCP
● Static Address
○ Disabled network

✔ Network is connected

Network detailed settings:

IP address	192.168.2.2
Subnet mask:	255.255.255.0
Default gateway:	192.168.2.1
Preferred DNS server:	0.0.0.0
Alternative DNS server:	0.0.0.0

Apply

● Normal   Speed ———————100%   ▶ ▶| ■   Simulation

○ Insert the VersaBuilt USB drive into the UR Teach Pendant

○ Click on the 3 horizontal bars in the upper right-hand corner of the UR Teach Pendant and select **Settings**

○ On the **Settings** page, select **System** ➤ **URCaps**

○ Press the **+** button in the lower left of the **Settings** page to **add a URCap**

○ Navigate to the usbdisk and select the **robot2cnc-.2.0.urcap** file *note: file name may be different on USB drive

○ Press the **Restart** button in the lower right corner of the **Settings** page

---

Universal Robots Graphical Programming Environment — + ×

Run **Program** **Installation** **Move** **I/O** **Log**	PROGRAM <unnamed>* INSTALLATION default	**New...** **Open...** **Save...** **Manual** B B / B B ☰

Settings

	Active URCaps	Inactive URCaps
> Preferences	⟳ VersaBuilt Robot2CNC	⊖ Remote TCP & Toolpath
> Password		
∨ System		
System Backup		
URCaps		
Robot Registration		
Remote Control		
Network		
Update		

URCap Information

URCap name: VersaBuilt Robot2CNC
Version: 1.0.0
Developer: VersaBuilt Robotics Inc.
Contact Info: 12000 W Franklin, Boise, ID 83709
Description: This cap contains nodes to communicate with a VersaBuilt Robot2CNCto allow for checking status, running CNC programs, and validating programs completed successfully.http://versabuilt.com (208)906-0814
Copyright: Copyright notice (C)
License Type: License type
License:
VERSABUILT ROBOTICS

[2014] - [2019] VERSABUILT, INC.

Exit	+	−	Restart

● Normal   Speed ▭━━━━━━● 100%   ▶ ▶| ■   Simulation ⊙

○ Insert the VersaBuilt **USB drive** into the UR Teach Pendant

○ Click on the **Installation Icon** near the top left of the **UR Teach Pendant** then select **URCaps** ❯ **R2C Config**

○ Click on the **Copy USB Files Button**

○ Click on the **Update Status Button**

○ Confirm Robot2CNC Status: **UP**

○ Confirm CNC Status: **IDLE**

○ On the CNC, select **program 9000**, place CNC in memory mode and close CNC door

○ Press **Cycle Start Test** Button

○ Confirm CNC Status: **CNC Cycle Start Test Passed**   Note: if any test fails, see Appendix A Troubleshooting
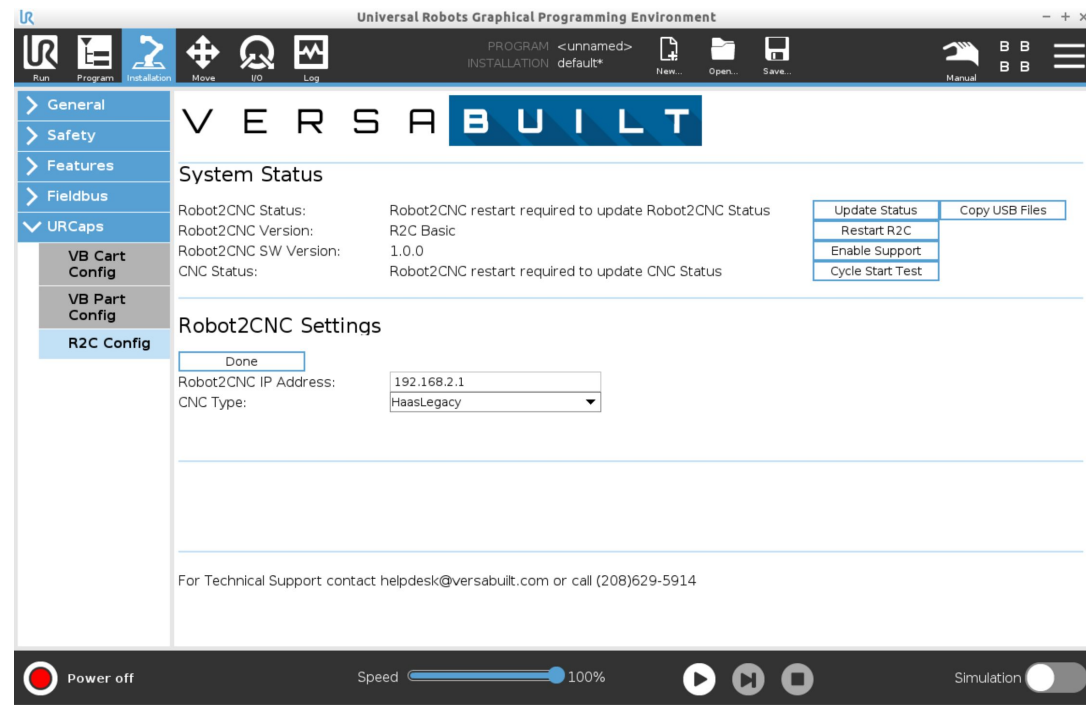
**Before using Robot2CNC** each CNC program to be run by Robot2CNC must be modified:

○ The included 9004 gcode program sends a handshake signal to the Robot2CNC

○ Right before the M30 at the bottom of each CNC program add a line: **M98 P9004**

○ The **M98 P9004** is compatible with Robot2CNC or manual execution

○ **Tip:** add the **M98 P9004** to your CAM post processor so it is included at the end of all programs

○ Example:

○ ...

○ **M98 P9004**

○ **M30**

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

○ From the Program page, click on the **Robot Program**

○ Click on the **Add Before Start Sequence** checkbox

○ Click on the line marked **<empty>** below the BeforeStart

○ Click ▶**Advance** ▶**Script**

○ In the upper right, **select File**

○ Click on the **Edit Button**

○ Click the **Open Button** then navigate to the VersaBuilt folder and select **R2CScript.script** and press the **Open Button**

○ Click the **Exit Button**
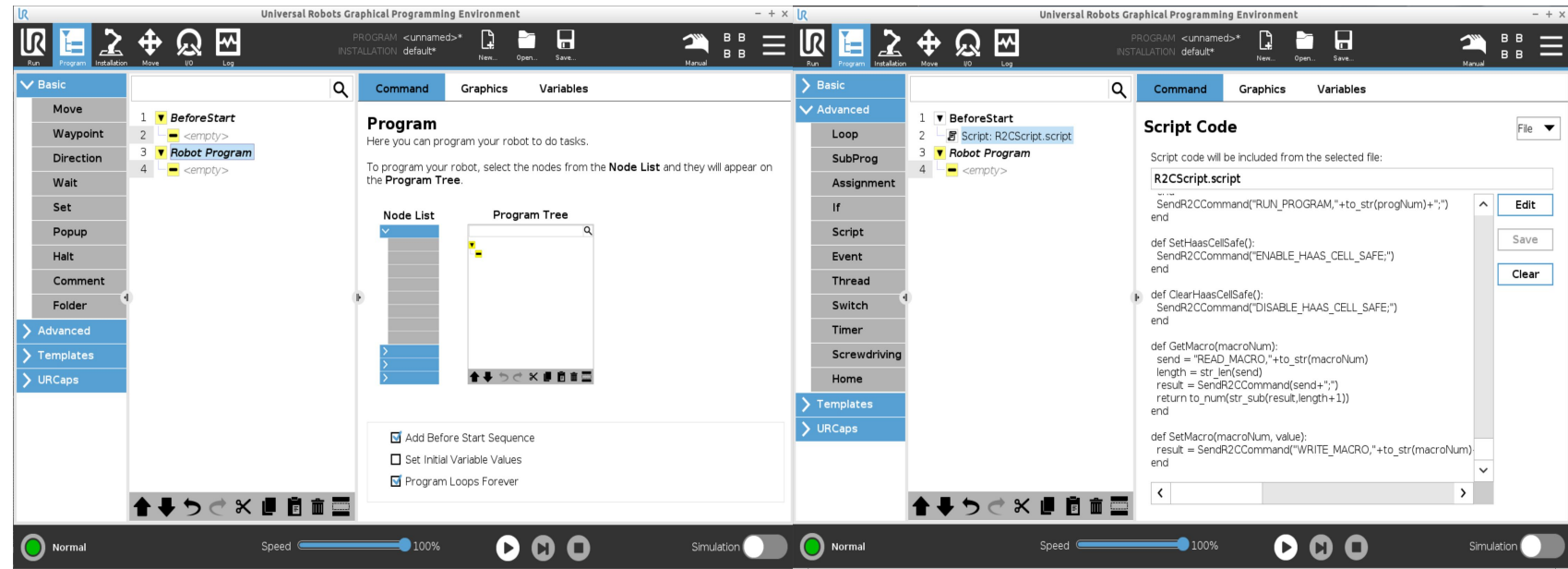
Robot2CNC commands can be added into the **Polycope** programming tree via the **Robot2CNC program node** accessible in the URCaps section. To add a Robot2CNC command to a program do the following:

○ Click on the program tree where the Robot2CNC command is required

○ Select ❯**URCaps**❯**Robot2CNC**

○ Click **Select Function**

○ Select the required function from the list
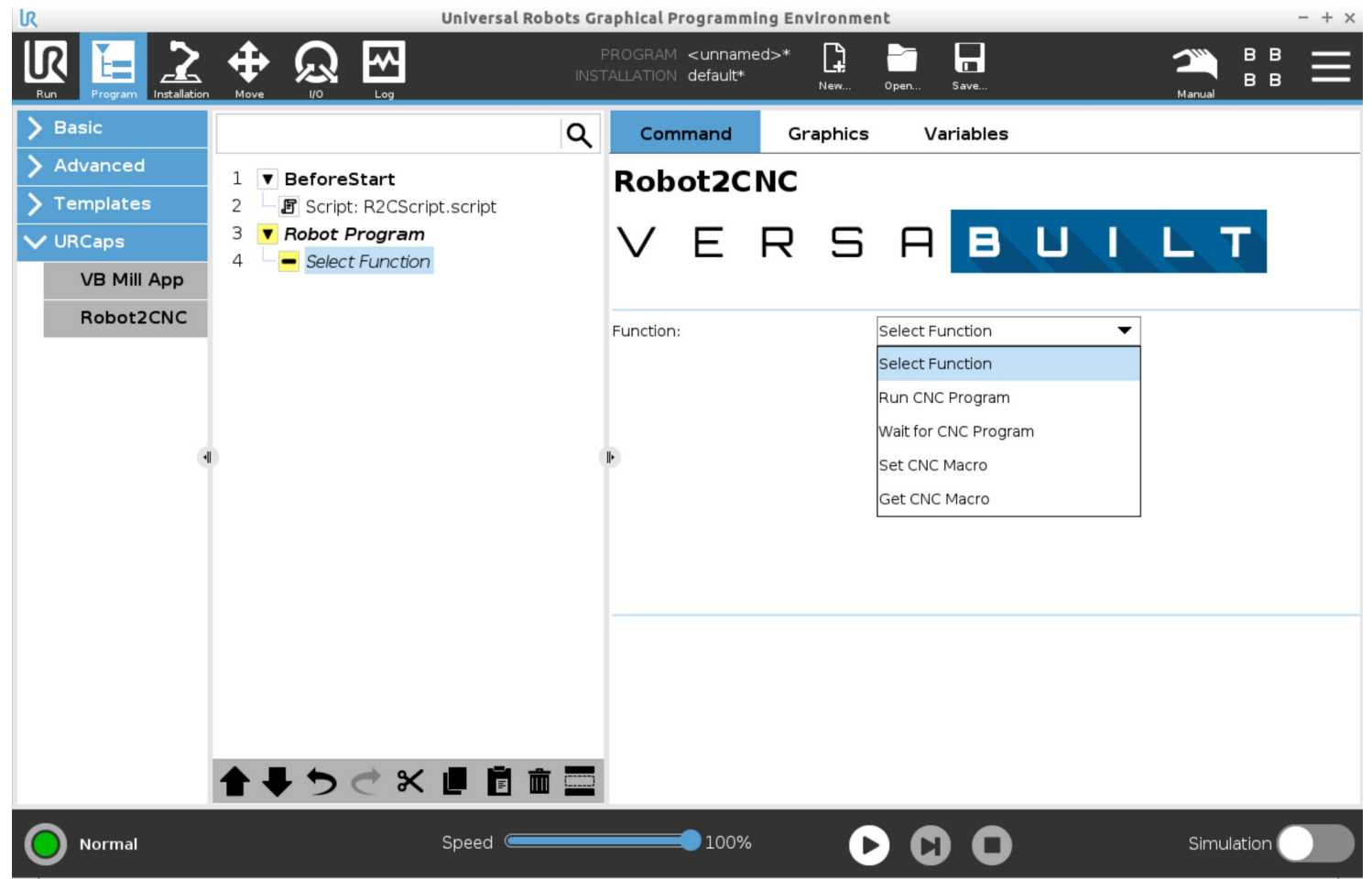
Run CNC Program

Runs the CNC program number entered in the CNC Program Number field. 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.

Optional: Enable Haas Cell Safe Signal

When Enable Haas Cell Safe Signal is checked and the Haas Cell Safe Signal settings have been configured on the Haas CNC, the Robot2CNC will set the Haas Cell Safe signal allowing some CNC programs to function with the CNC door open. See Appendix C: Enabling Haas Legacy Cell Safe

Wait for CNC Program

Waits for the currently executing CNC program to complete. If the CNC program completes successfully, Polyscope program execution continues. If an error occurs in the CNC program, a popup message is displayed with information about the error and allowing the operator to stop or continue processing.

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.

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
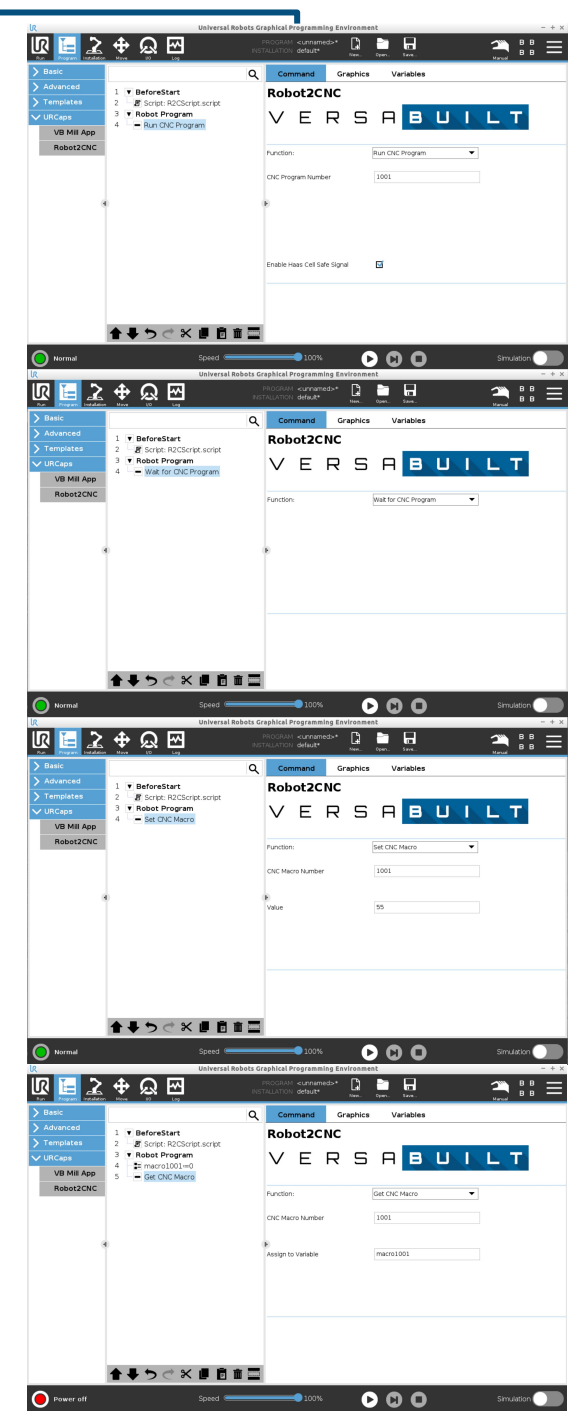
Robot2CNC Status: Error, Unable to Connect to Robot2CNC

The UR robot cannot communicate with the Robot2CNC over the Ethernet network. Check the following:

- Red Ethernet cable is connected between the UR robot and the Robot2CNC
- The Robot2CNC Ethernet port LED is yellow or flashing yellow
- The IP Address of the robot is set to according to the Step 8 in this manual
- Connect to the Robot2CNC using a portable computer or smart phone and verify Robot2CNC network settings (see Appendix B)

CNC Status: CNC State must be IDLE for Cycle Start Test

The CNC is not in a state that allows it to be cycle started. Check the following and try again:

- Make sure the CNC settings are set according to Step 6
- Make sure the CNC has the User-Definable Macros option enabled
- CNC Door is closed
- CNC is in memory mode, program 9000 is selected and CNC is not alarmed
- Press the reset button

CNC Status: CNC Cycle Start Test failed

Likely causes to the failure:

- The CNC is not in memory mode; verify CNC is in memory mode, retry Cycle Start Test
- 9000 program is not selected; select 9000 program then retry Cycle Start Test
- CNC door is not closed; make sure the CNC door is closed then retry Cycle Start Test
- Cycle Start Wiring problem
    - To confirm wiring problem, press the Cycle Start Test button on the R2C Confing URCap page of the teach pendant, then press the Cycle Start button on the CNC within 15 seconds; if the test passes, the wiring problem is confirmed
    - Confirm the Cycle Start Relay wires are secure
    - Put an ohmmeter across the the Cycle Start relay contacts on the Robot2CNC, the contacts should be open
    - While monitoring the Cycle Start Relay contacts with the ohmmeter, have a partner press the Cycle Start Test button, the ohmmeter should show a momentary closing of the contacts; if it does not, contact VersaBuilt for warranty exchange of the Robot2CNC
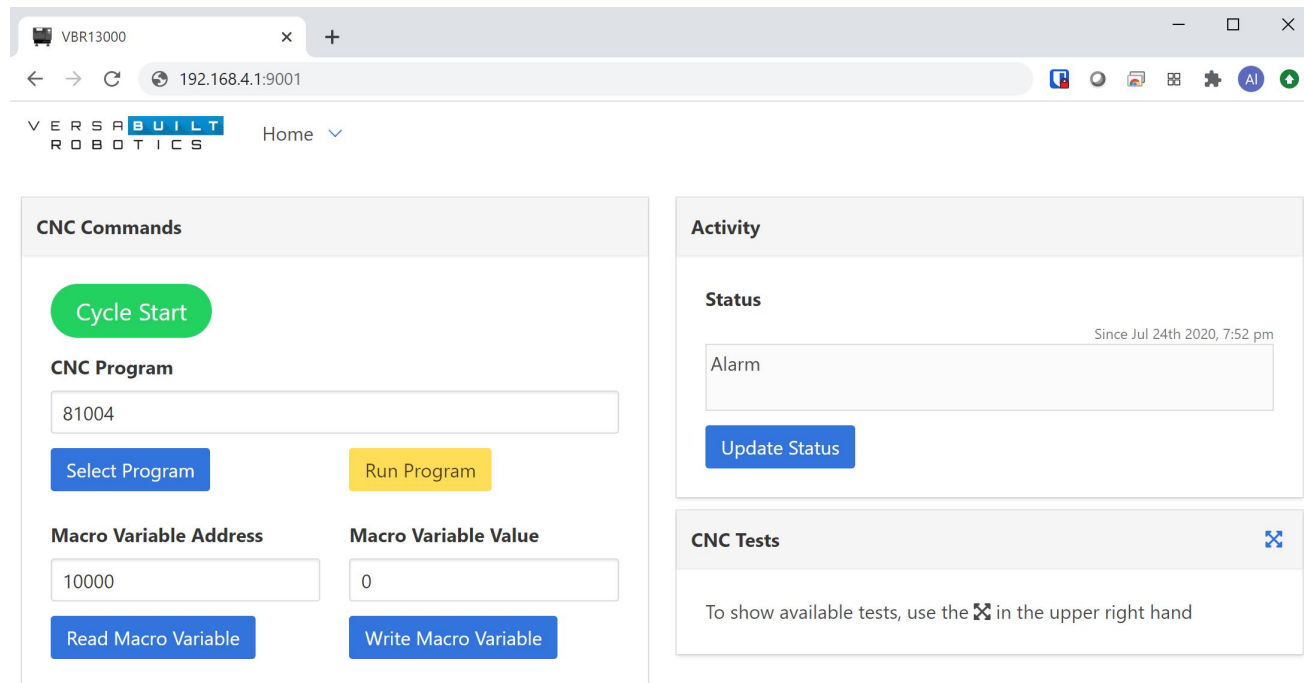
SECTION

APPENDIX A

Troubleshooting

Compile error when running program with Robot2CNC URCap
- The R2CScript.script file has not been added to the Before Start sequence of the UR Polyscope program
- See Section 5 of this manual for instructions on how to add the R2CScript.script file to your program

An error occurred in the running program − + ✕

An error occurred in the running program

⚠ Compile error: name 'RunCNCProgram' is not defined

Program node:	Run CNC Program
Program node type:	Robot2CNC
Error position:	line 2
URCap:	VersaBuilt Robot2CNC
	VersaBuilt Robotics Inc.

[OK] [Go to problem]

⌄ Advanced view (script)

The **Robot2CNC** includes an advanced interface that allows advanced settings to be configured and allows the Robot2CNC to connect to the Internet for remote support or to download software updates. To connect to the Robot2CNC Web Configuration Interface do the following:

- Using a laptop computer or a smartphone with wi-fi, go to wifi settings and connect to a network titled vbrXXXXX (where XXXXX is the serial number of the Robot2CNC)
- Password: **versabuilt**
- Open a web browser and enter the address: **192.168.4.1:9001**

The Haas Cell Safe signal allows the Robot2CNC to execute some CNC programs with the CNC door open. Use extreme caution when using this setting and perform a risk assessment to assure the safety of the system.

At the Haas control, configure the following Parameters:

1272   Cell Safe Port   892

1273   Cell Safe Timer   5000

COMMON	SOFTWARE	INPUT INVERT	SYSTEM	AXIS	COMPENSATION

SOFTWARE

59	MAX FEED (INCH/MIN)	650
298	MAX FEED (DEG/MIN)	0
749	FEED ACCEL ROUGH	48000000
750	FEED T CONST ROUGH	3
751	FEED DELTA V ROUGH	384
302	FEED ACCEL MEDIUM	24000000
303	FEED T CONST MEDIUM	3
314	FEED DELTA V MEDIUM	192
752	FEED ACCEL FINISH	12000000
753	FEED T CONST FINISH	3
754	FEED DELTA V FINISH	96
299	AUTOFEED-STEP-UP	10
300	AUTOFEED-STEP-DOWN	20
301	AUTOFEED-MIN-LIMIT	5
144	RIG TAP FINISH DIST	100
222	ROTARY AXIS INCRMNT	0
1272	CELL SAFE PORT	892
1273	CELL SAFE TIMER	5000

The default Robot2CNC network configuration is simple and reliable. In some cases it may be desirable for the Robot2CNC to communicate with the Internet and/or the LAN. Advanced Network Configuration can be completed in the Robot2CNC Web Configuration Interface by an experienced network administrator. Keep the following in mind:

o The Robot2CNC and the CNC IP addresses should be static or statically assigned by a DHCP server

o For Remote Support and Software Updates, the Robot2CNC must have access to the Internet

o The Robot2CNC can access the Internet by configuring the built-in Wifi adapter or by connecting the Robot2CNC and the CNC to a network hub as part of a LAN configuration

ROBOT
192.168.2.2

Network cable

192.168.4.1
SSID: VBRxxxxxx

ROBOT2CNC

eth0
192.168.2.1

USB-Serial Dongle

Serial cable

Cycle start wires

HASS CNC