

VERSA BUILT  
ROBOTICS

# ROBOT2CNC

## BASIC EDITION

### UNIVERSAL ROBOTS

### HAAS NGC

INSTALLATION AND OPERATION



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# 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**

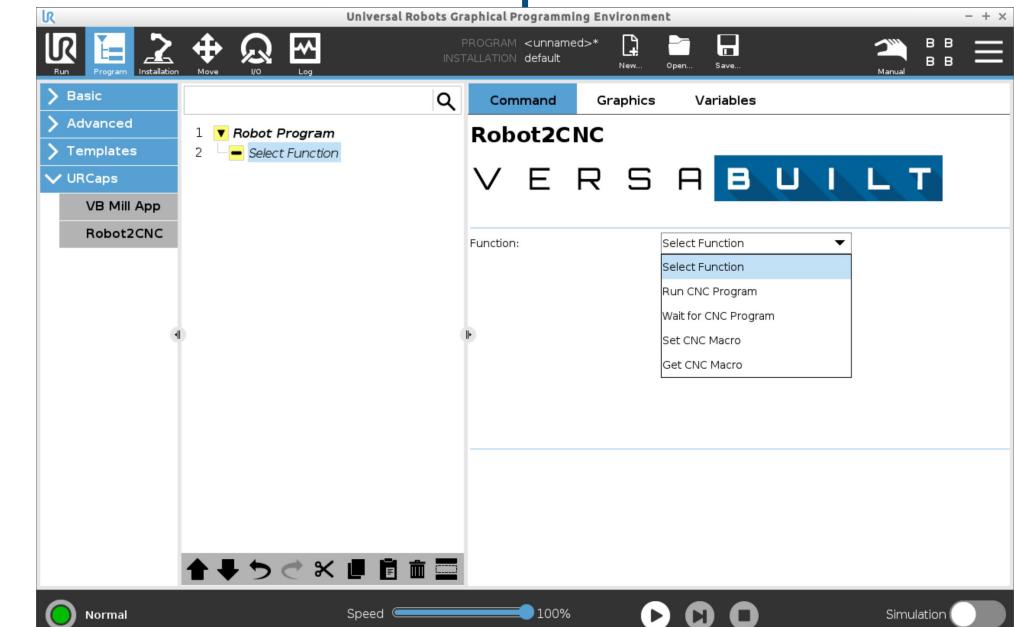
# SECTION 2

## HOW IT WORKS

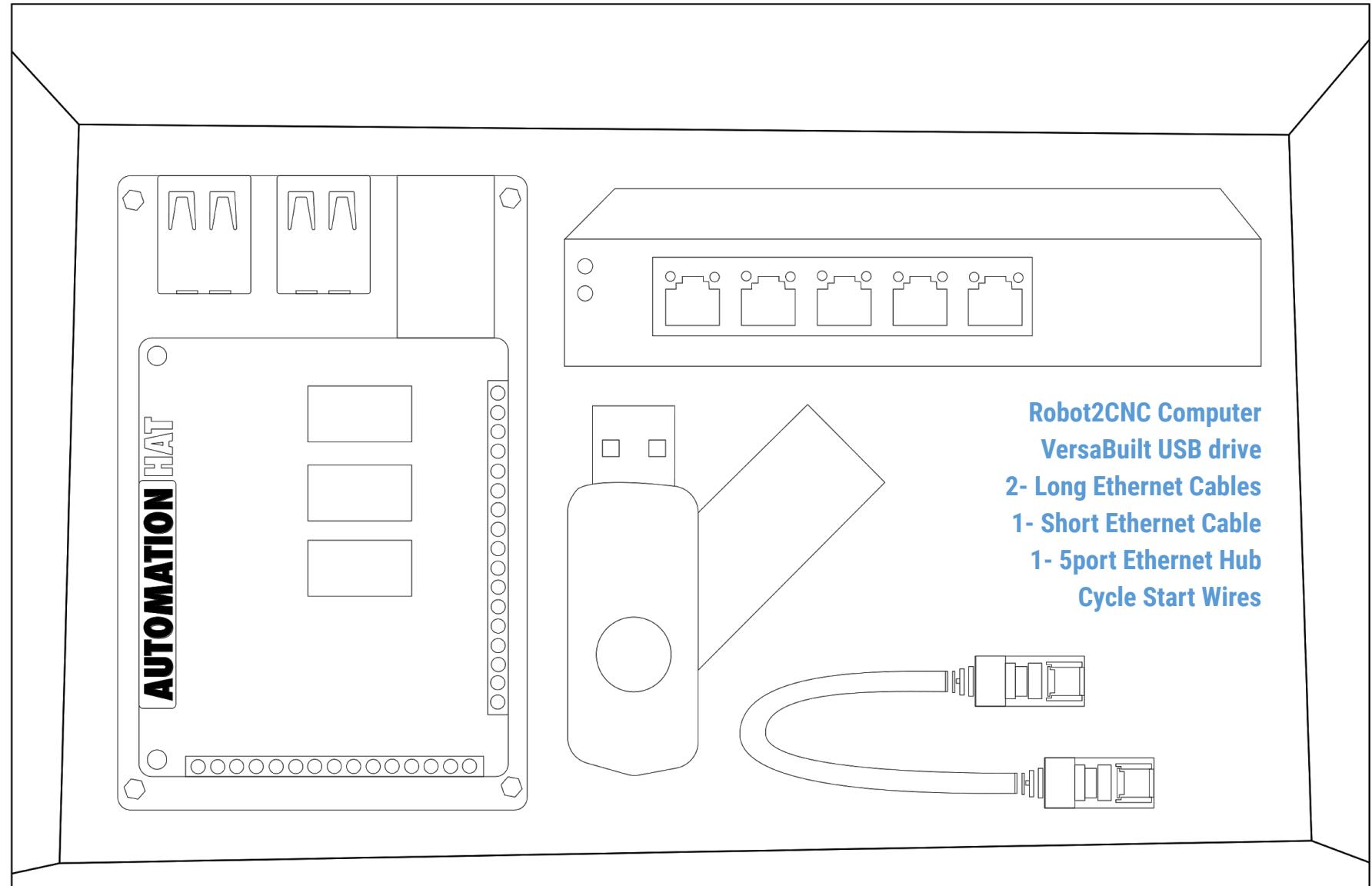
Robot2CNC communicates with the **Haas CNC** using the Haas Machine Data Collection protocol. Machine Data Collection protocol allows the Robot2CNC to **read** and **write** macro variables **on the CNC**. Values in the macro variables are used to **communicate information** and commands **between the 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 3



# SECTION

## INSTALLATION STEPS

### 4 Install Cycle Start Wires to CNC

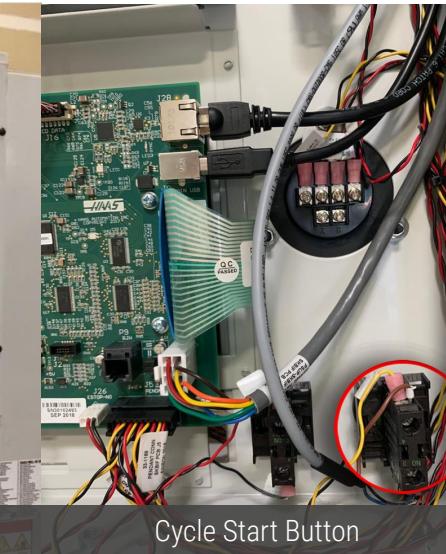
## Tools Needed

Phillips Head Screwdriver

M4 Allen Wrench

Flat Head Screwdriver

- Make sure CNC is **powered off** at main breaker, lock-out-tag-out
- 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 terminals **on the button**.  
Polarity does not matter. Either wire can go to either terminal.
- Route the cycle start wires **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



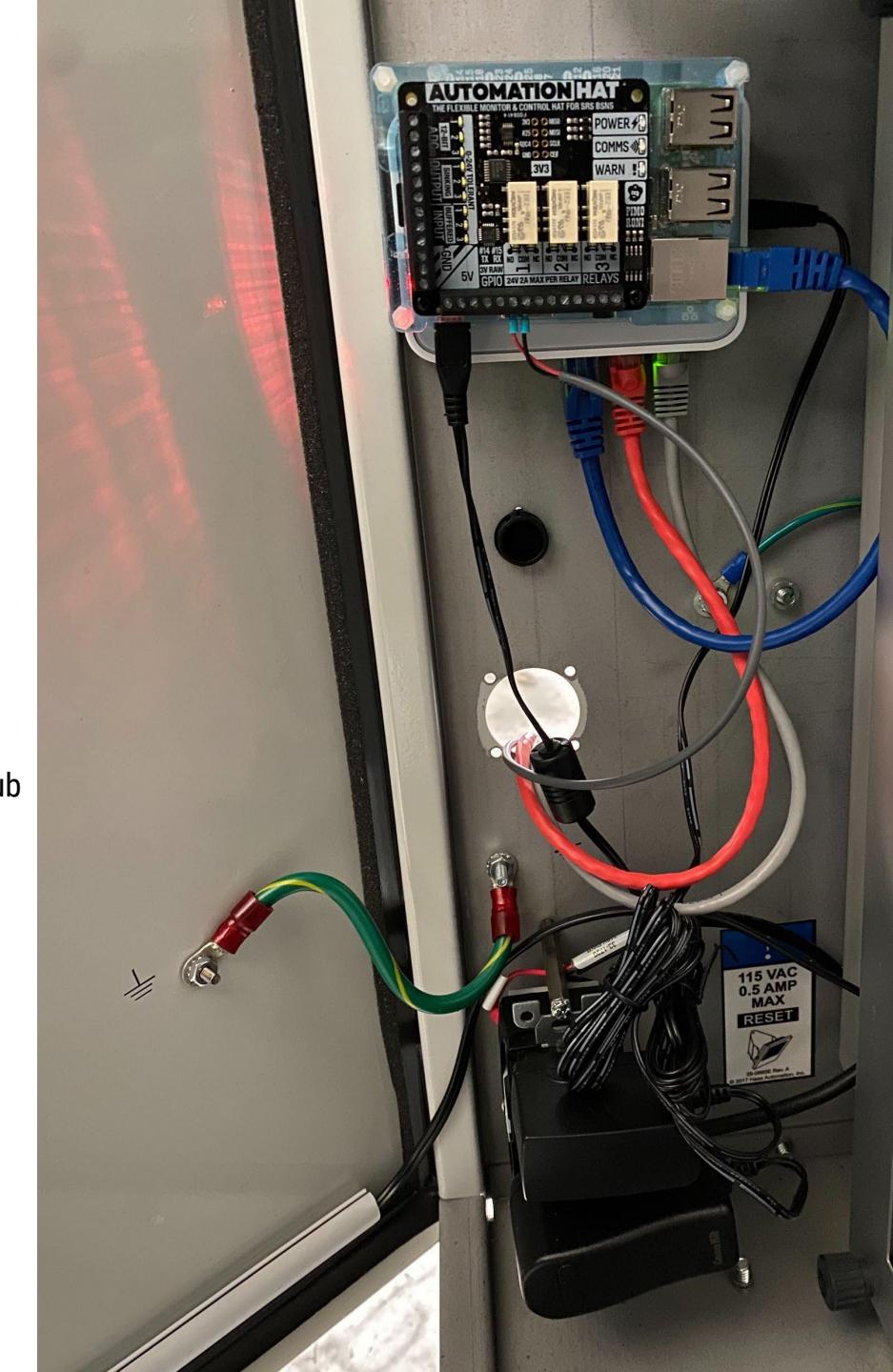
# SECTION 1

## 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 in the CNC cabinet away from exposed electrical wires
- Optionally bond Robot2CNC and Network Hub with included double-sided tape
- Connect power supplies to Robot2CNC and Network Hub
- Connect 1-foot long Ethernet cable between Robot2CNC and Network switch



# SECTION 4

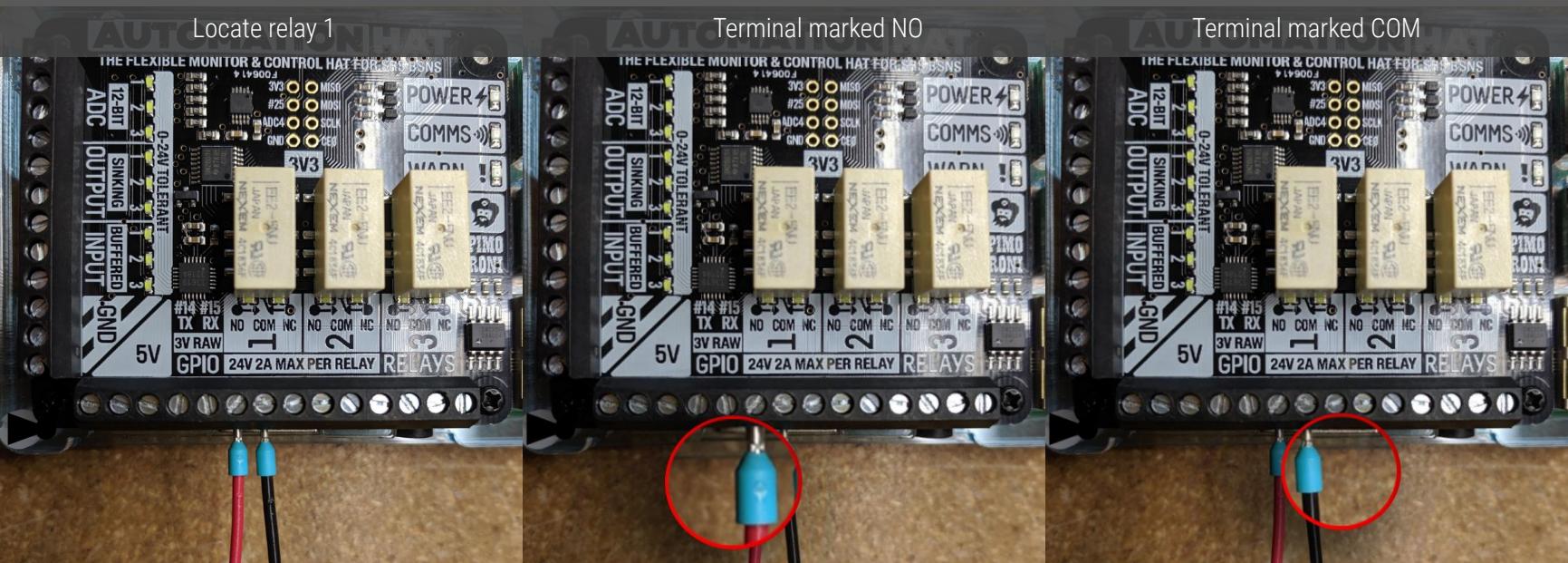
## INSTALLATION STEPS

### 4.3 Connect Cycle Start Wires 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



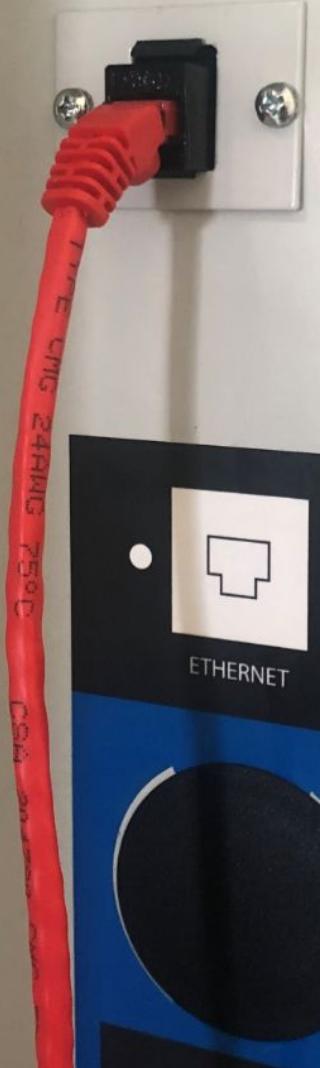
# SECTION

# INSTALLATION STEPS

Connect Ethernet Cable Between  
Robot and Robot2NC

**4**

- Plug one end of a Long Ethernet cable into an available port on the 5-port switch
- Route the Ethernet cable out of the CNC cabinet and up to the Ethernet port on the side of the CNC cabinet
- Plug the Ethernet cable into the Ethernet port of the CNC



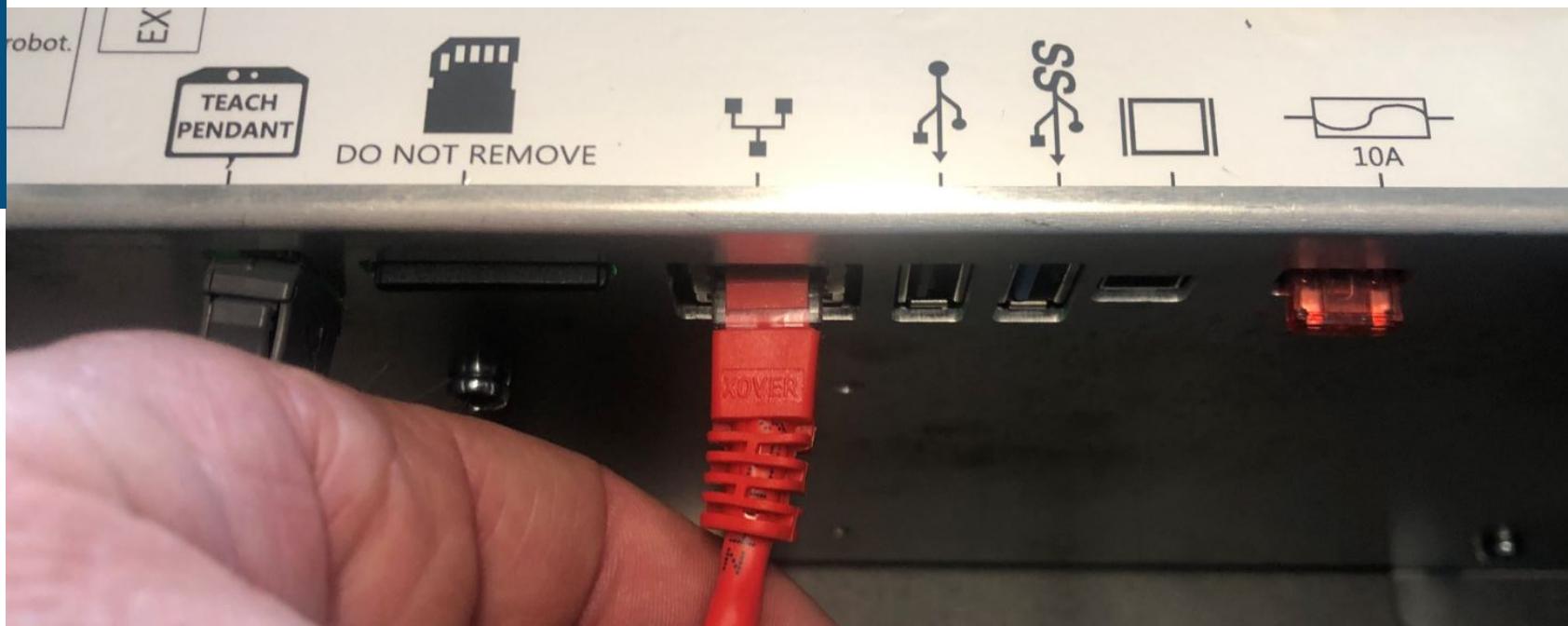
# SECTION

## INSTALLATION STEPS

Connected Ethernet Cable Between  
Robot and Robot2NC

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- 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 one of the available ports on the 5-port switch



# SECTION

## INSTALLATION STEPS

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Configure CNC Settings

Change the following CNC settings:

<b>Wired Network Enabled</b>	On
<b>Obtain Address Automatically</b>	Off
<b>IP Address</b>	192.168.2.3
<b>Subnet Mask</b>	255.255.255.0

Change the following CNC settings on the Settings tab:

<b>143 Machine Data Collection</b>	9000
------------------------------------	------

Settings					
Settings	Network	Rotary	User Positions	Alias Codes	
Wired Connection	Wireless Connection			Net Share	Haas Connect
Wired Network Information					
Host Name	HaasCNC1234567	DHCP Server	*		
Domain		IP Address	192.168.2.3		
DNS Server		Subnet Mask	255.255.255.0		
Mac Address	00:C0:08:88:47:7A	Gateway	*		
DHCP Enabled	OFF	Status	UP		

CNC settings Screen

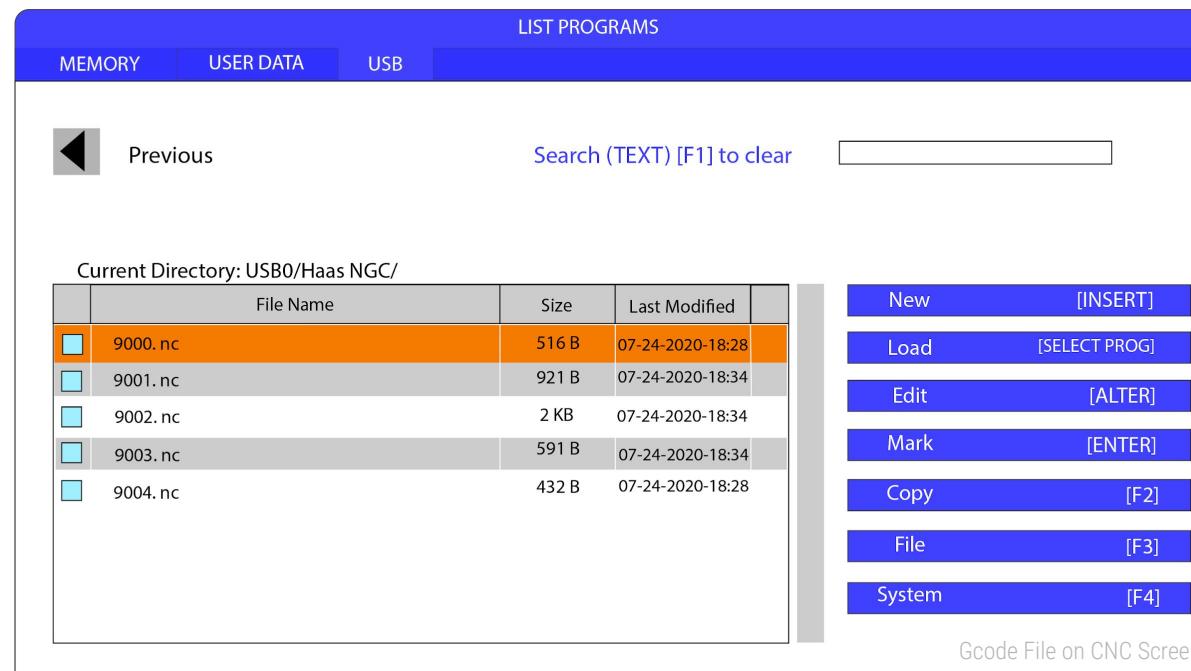
# SECTION

## INSTALLATION STEPS

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Install VersaBuilt Gcode Settings

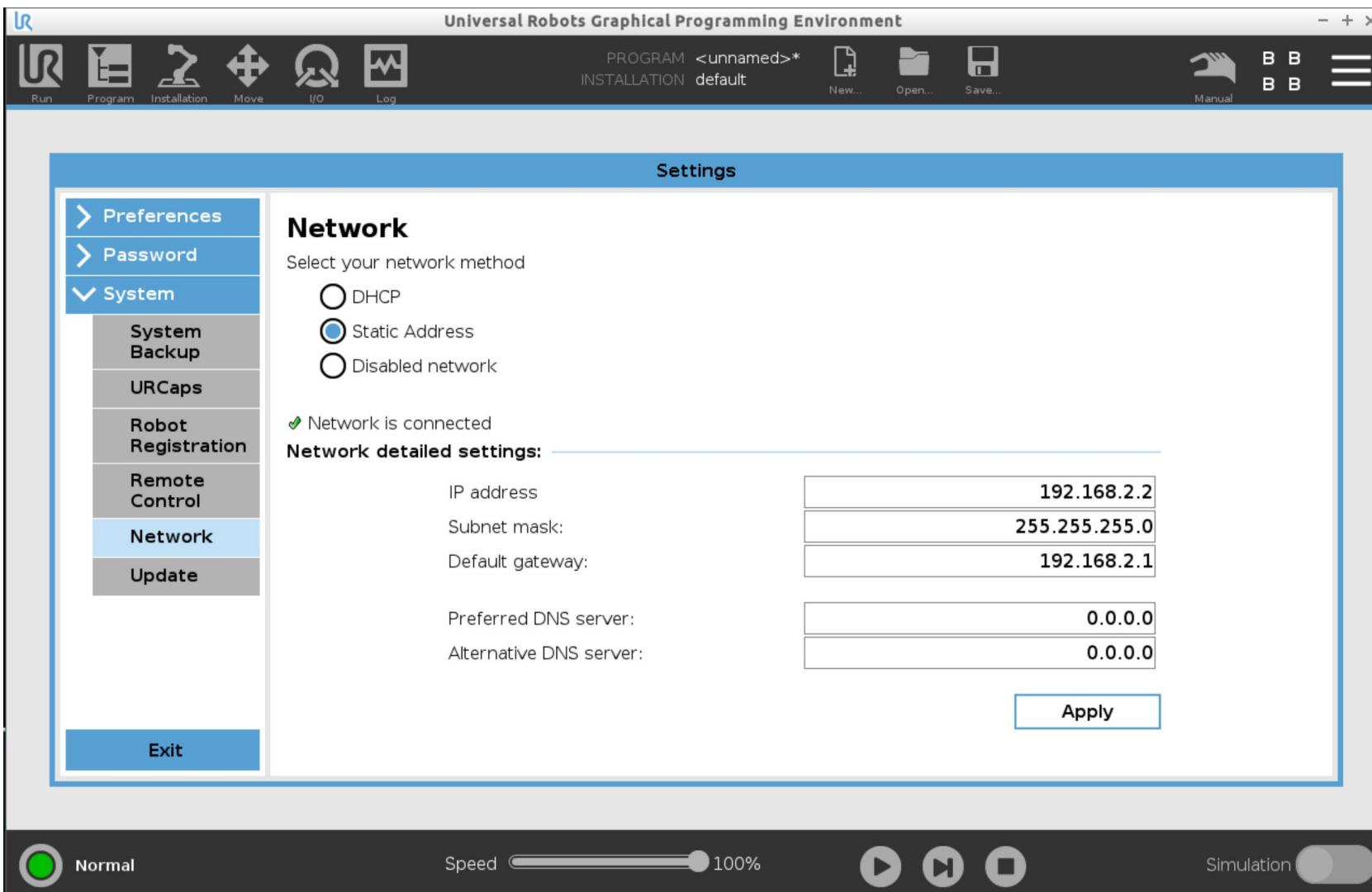
- Insert VersaBuilt USB drive into Haas USB port
- Navigate to the Haas NGC directory on the VersaBuilt USB drive
- Copy the 9000.NC and the 9004.NC programs onto the Haas CNC control



# SECTION INSTALLATION STEPS

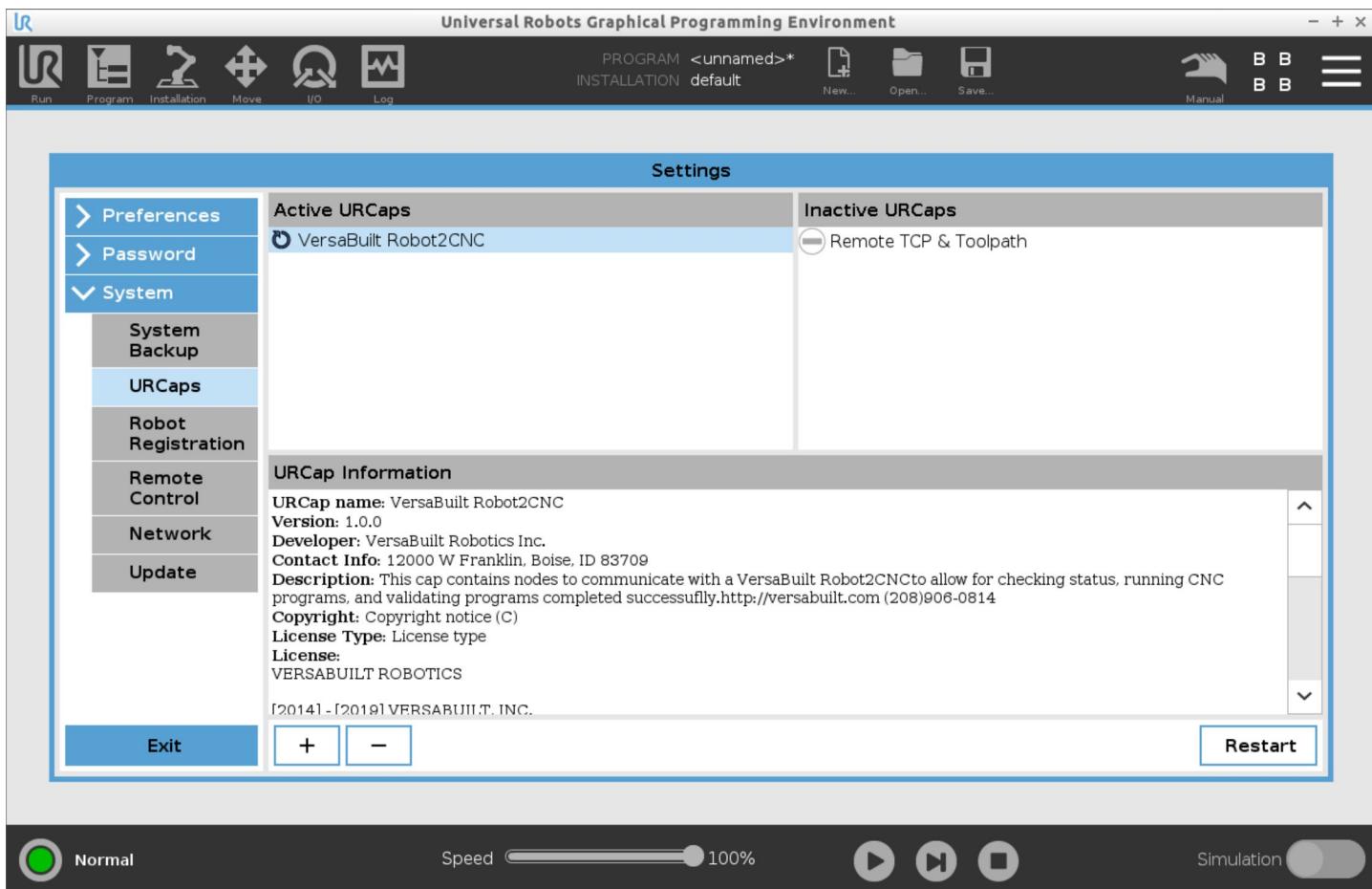
## 4.8 Configure UR Robot Settings

- 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



# SECTION 1 INSTALLATION STEPS 1 2 3 4 5 4.9 Install UR Robot Software

- 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

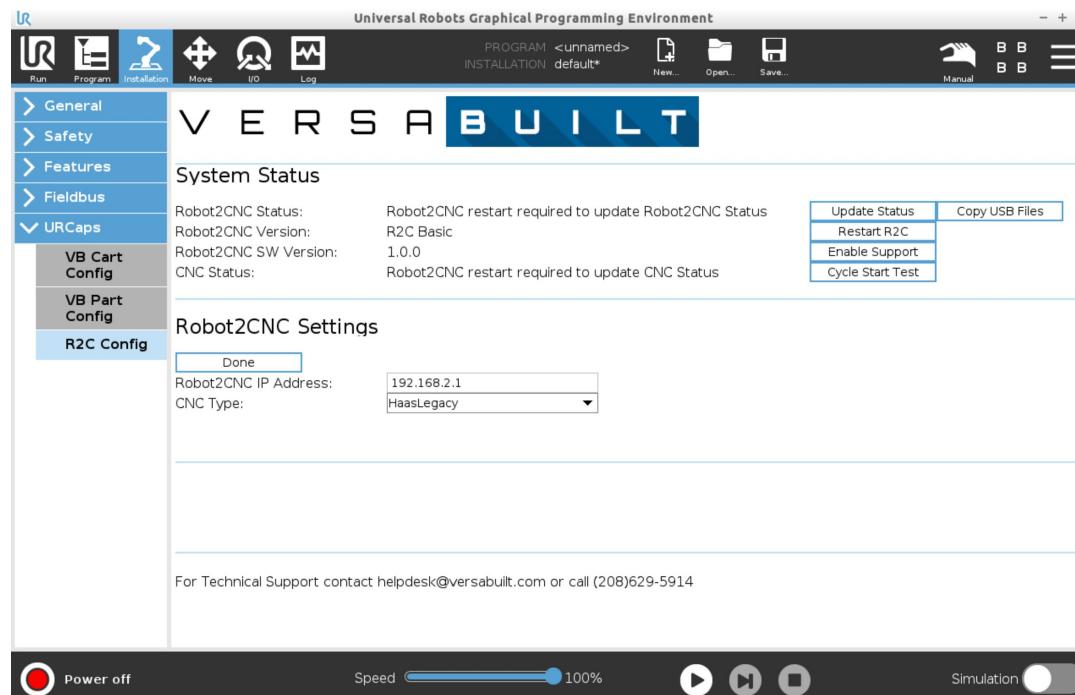


# SECTION 1 INSTALLATION STEPS

## 4.10 Install Script File and Validate Robot2CNC

- 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



# SECTION

## PROGRAMMING WITH THE Robot2CNC



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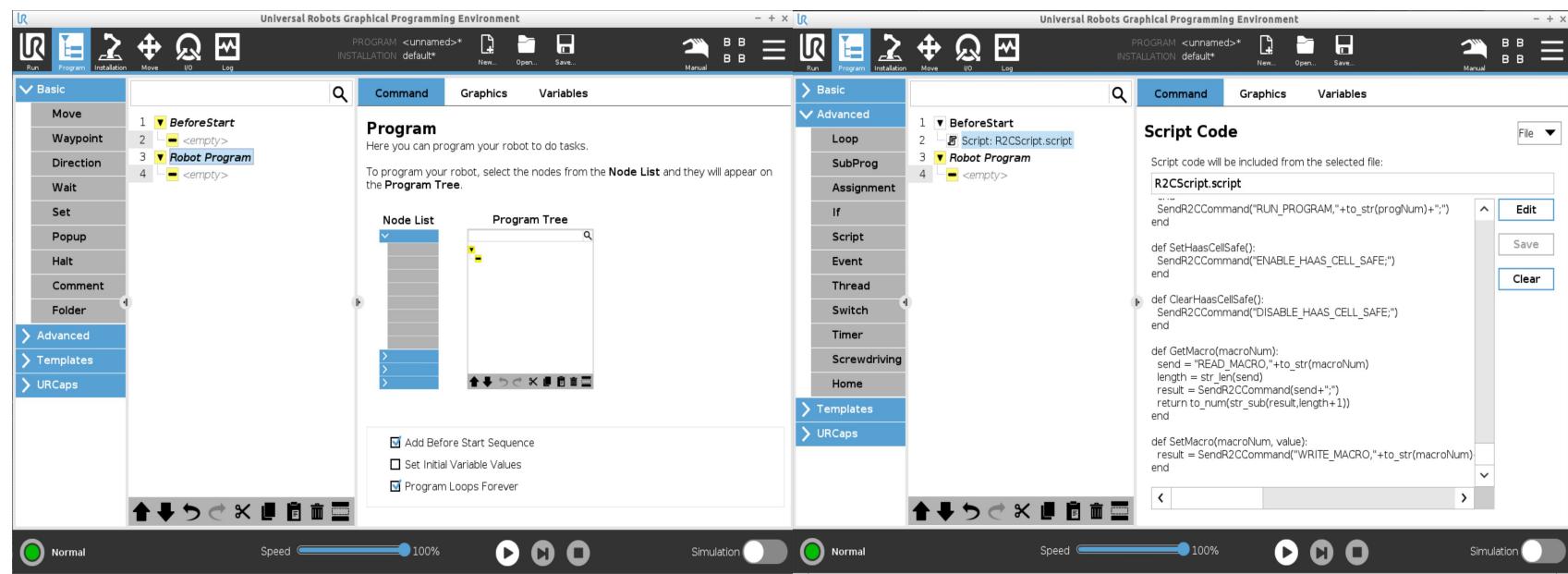
Before using Robot2CNC each CNC program to be run by Robot2CNC must be modified:

- 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**

# SECTION 1 PROGRAMMING WITH THE Robot2CNC

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**



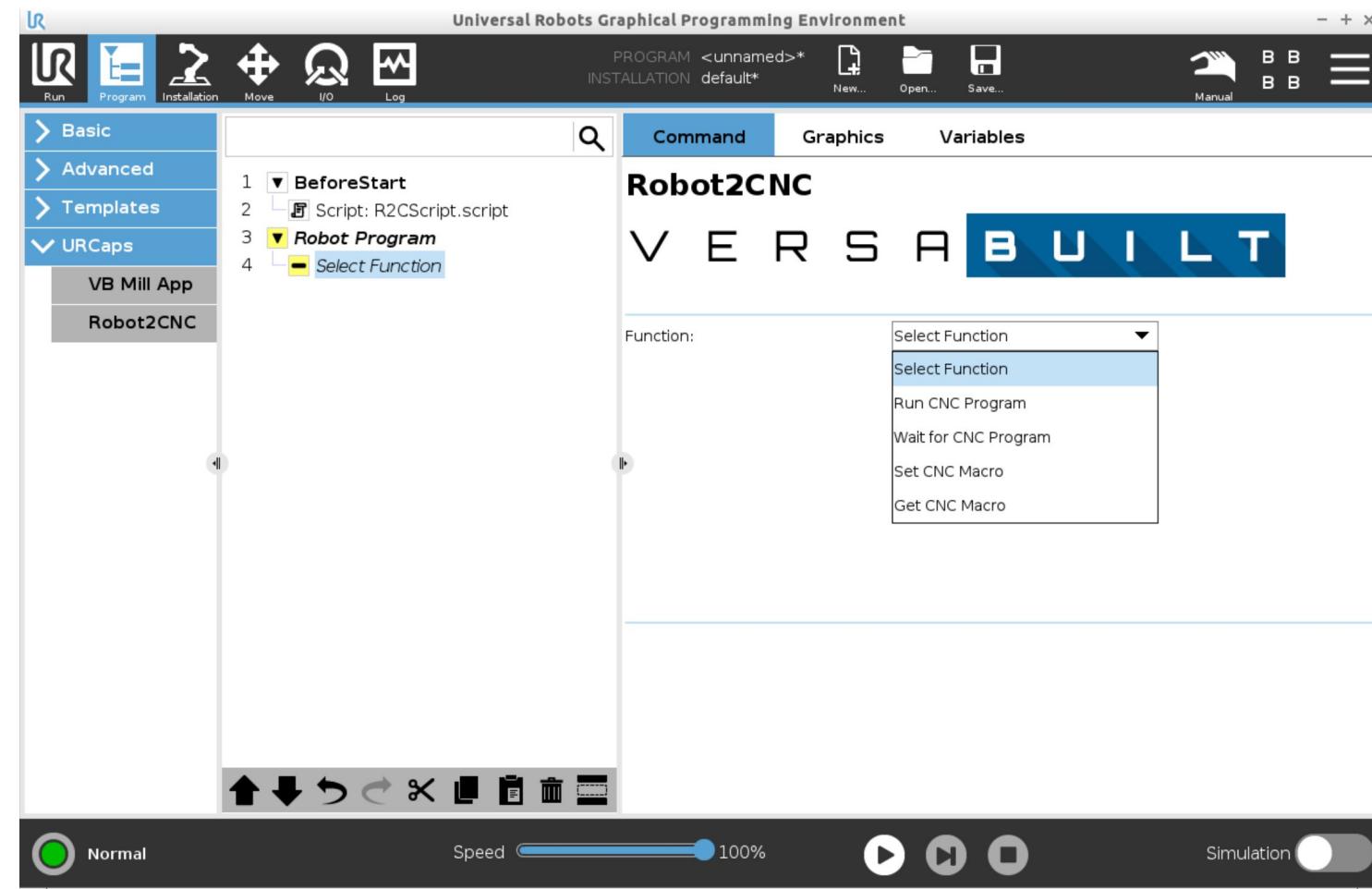
# SECTION 2

## PROGRAMMING WITH THE Robot2CNC

### 1 2 3 4 5

Robot2CNC commands can be added into the Polycopé 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



# SECTION 123456 ROBOT2CNC COMMANDS

## 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

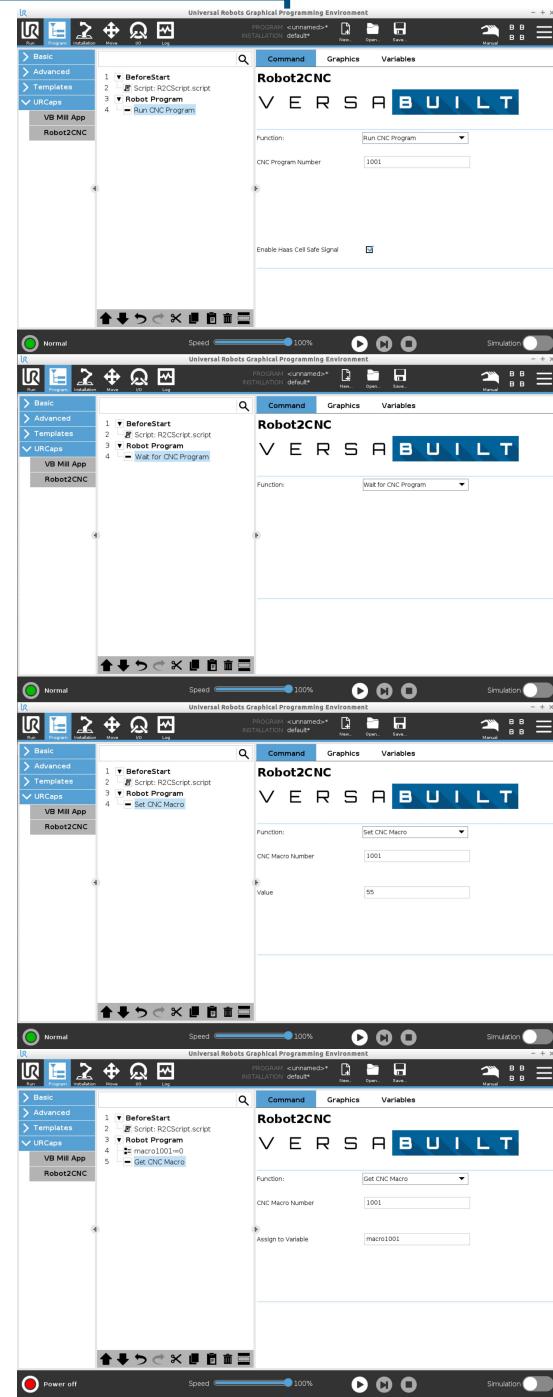
Waits for the currently executing CNC program to complete. If the CNC program completes successfully, Polyscope program execution continues. If an error occurs in the CNC program, a popup message is displayed with information about the error and allowing the operator to stop or continue processing.

## 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



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## APPENDIX A

### Troubleshooting

#### Robot2CNC Status: ERROR, Unable to Connect

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

- The link status LED is on for each port of the 5-port Hub with an ethernet cable plugged in
- 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: ERROR, Unable to Connect

The Robot2CNC computer cannot communicate with the CNC over the Ethernet network. Check the following:

- Make sure the Robot2CNC Status: Up; CNC Status is not valid until Robot2CNC Status: Up
- The link status LED is on for each port of the 5-port Hub with an ethernet cable plugged in
- The IP Address of the CNC is set properly
- Connect to the Robot2CNC using a portable computer or smart phone and verify Robot2CNC network settings (see Appendix B)

#### CNC Status: Refused

- The Robot2CNC is able to communicate with the CNC but setting 143 is not properly configured
- Make sure setting 143 Machine Data Collection is set to 9000

#### 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:

- CNC Door is closed
- CNC is in memory mode, program 9000 is selected and CNC is not alarmed
- Press the reset button

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## APPENDIX A

### Troubleshooting

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 Config 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 set the 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

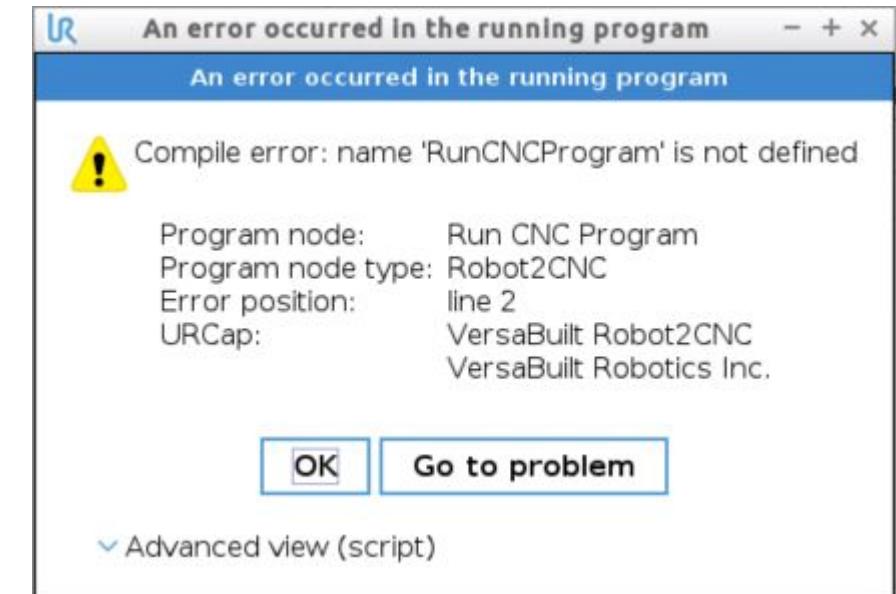
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## APPENDIX A

### 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



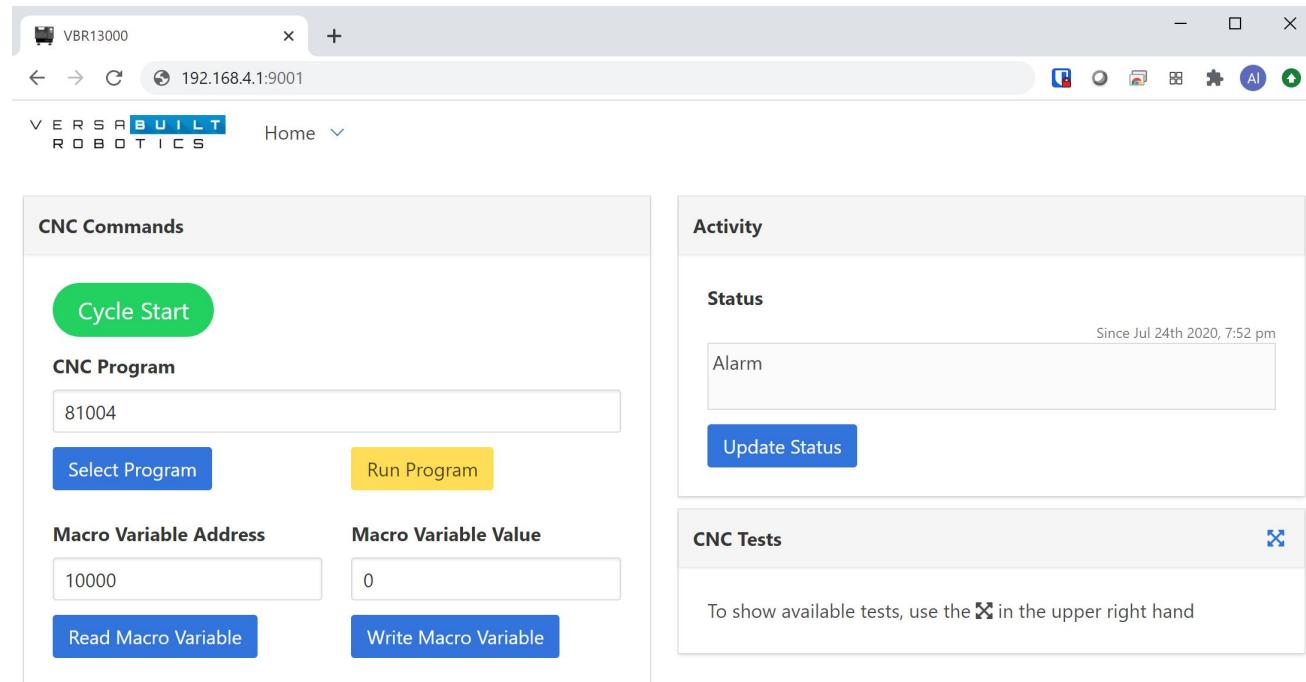
# SECTION 1

## APPENDIX B

### Robot2CNC Web Configuration Interface

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, goto wifi settings and connect to a network titled vbrXXXXX (where XXXXX is the serial number of the Robot2CNC). The wifi password is: **versabuilt** . Open a web browser and enter the address: **192.168.4.1:9001**
- Alternatively, plug a computer into the Robot2CNC 5-port Hub. Configure the computer's Ethernet adapter for the IP address 192.168.2.4, open a web browser and enter the address: **192.168.2.1:9001**



# SECTION

## APPENDIX D

### Advanced Network Configuration

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:

- The Robot2CNC and the CNC IP addresses should be static or statically assigned by a DHCP server
- For Remote Support and Software Updates, the Robot2CNC must have access to the Internet
- The Robot2CNC can access the Internet by configuring the built-in Wifi adapter or by connecting the 5-port Hub to a router and configuring the Robot2CNC default gateway and DNS server from the Robot2CNC Web Configuration interface.

