

[\(/?home\)](/?home)

HOW TO GUIDE

Updated: July 16th, 2021

# URCap for Linear Motion (v1.x)

Version 1.xMM1



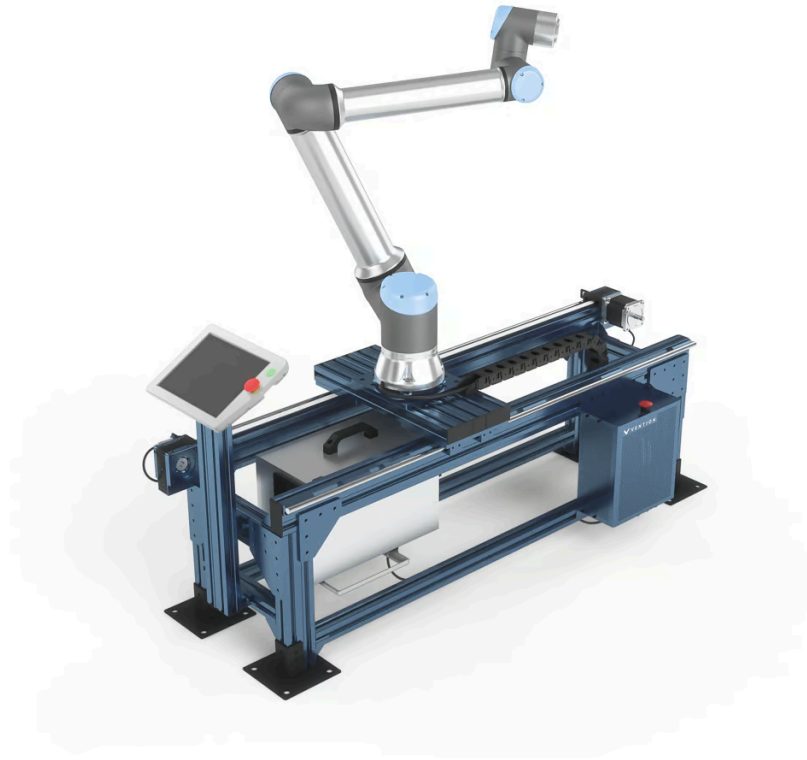
## Contents

- [Overview](#)
- [Install the URCap](#)
- [Connect your Controllers](#)
- [Configure the Network](#)
- [Configure your System](#)
- [Use the URCap](#)

## Overview

Vention offers Universal Robot Capability (URCap) extension packages enabling simple programming of Vention motion systems from within the UR teach pendant. Once loaded in the UR Polyscope HMI, these URCap applications provide an intuitive environment for seamlessly managing Vention components from the UR pendant. URCap integrations make it simple and cost-effective to create systems combining UR six-axis robot arms with Vention's MachineMotion controlled systems.

This document describes **Vention's URCap for Linear Motion**. This URCap allows a Vention linear axis to be controlled directly from the UR teach pendant. An example of which is a 7<sup>th</sup> Axis Range Extender (see Figure 1).



*Figure 1: UR10 Mounted on a Vention 7<sup>th</sup> Axis Range Extender*

This guide explains the steps required to:

1. Install the URCap
2. Connect your controllers
3. Configure the network
4. Configure your system
5. Use the URCap

This guide is for URCap installation on Polyscope version 5. For installation on Polyscope version 3, [click here](https://s3.amazonaws.com/ventioncms/vention_documents/documents/000/000/038/original/urcap-for-linear-motion-polyscope-v3.pdf?1582812780) ([https://s3.amazonaws.com/ventioncms/vention\\_documents/documents/000/000/038/original/urcap-for-linear-motion-polyscope-v3.pdf?1582812780](https://s3.amazonaws.com/ventioncms/vention_documents/documents/000/000/038/original/urcap-for-linear-motion-polyscope-v3.pdf?1582812780)).

## Install the URCap

The Vention URCap For Linear Motion software is distributed on a USB flash drive and must be installed on the UR teach pendant.

### Step 1: Insert USB Stick

Insert the Vention URCap for Linear Motion USB drive into the UR teach pendant's USB port. The USB stick includes the URCap file (.urcap) required by the UR setup assistant.

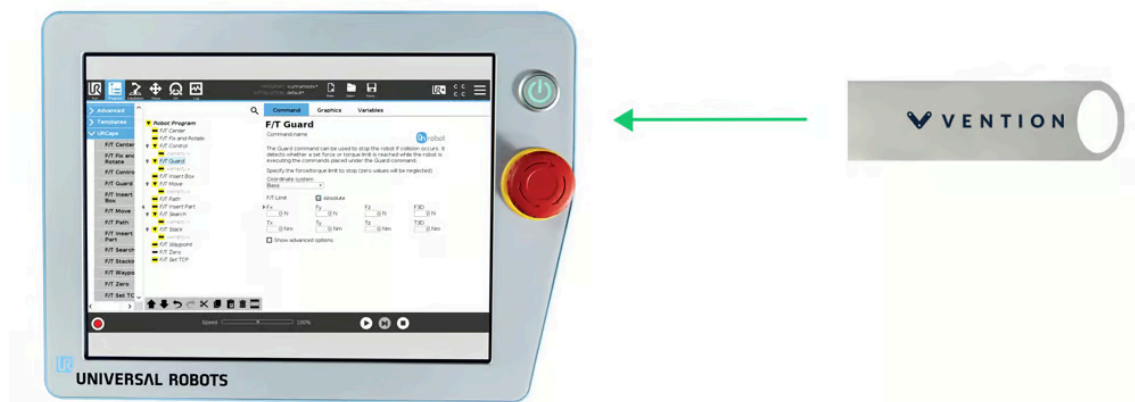


Figure 2: Location of the UR teach pendant's USB port

Note: If your Polyscope screens have a different style compared to the one above, you might have a different version of Polyscope. This guide is for URCap installation on Polyscope version 5. For installation on Polyscope version 3, [click here \(https://s3.amazonaws.com/ventioncms/vention\\_documents/documents/000/000/038/original/urcap-for-linear-motion-polyscope-v3.pdf?1582812780\)](https://s3.amazonaws.com/ventioncms/vention_documents/documents/000/000/038/original/urcap-for-linear-motion-polyscope-v3.pdf?1582812780).

## Step 2: Add the URCap to the UR environment

On the teach pendant home screen, select **Menu > Settings** (see Figure 3).

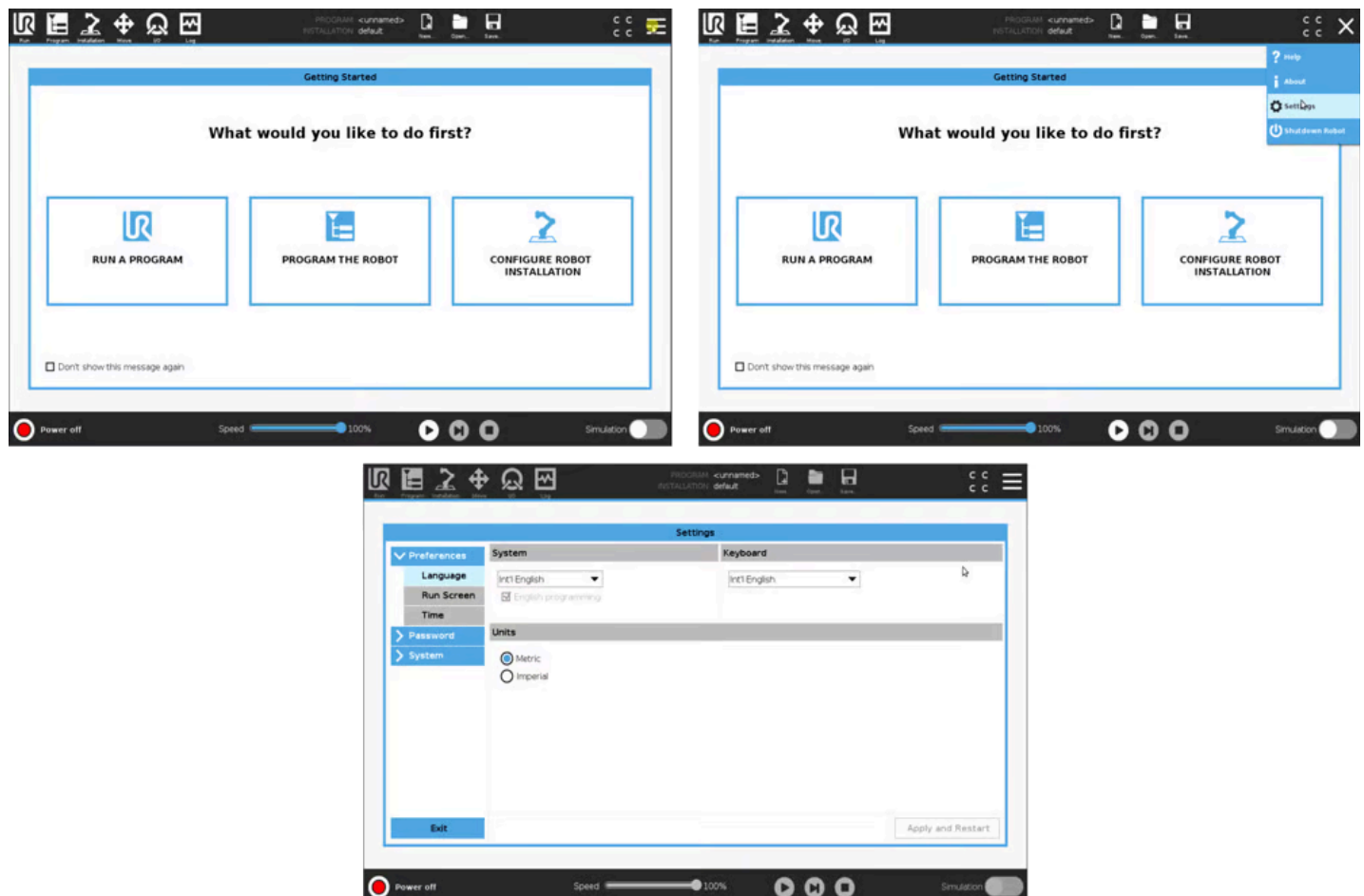


Figure 3: Opening the Settings screen

Select **System** > **URCaps**, then click the **+** icon at the bottom of the screen to add a new URCap to the UR teach pendant.

Select the **.urcap** file and click **Open** to install the URCap extension (see Figure 4).

When prompted to do so, restart the UR controller to complete the installation.

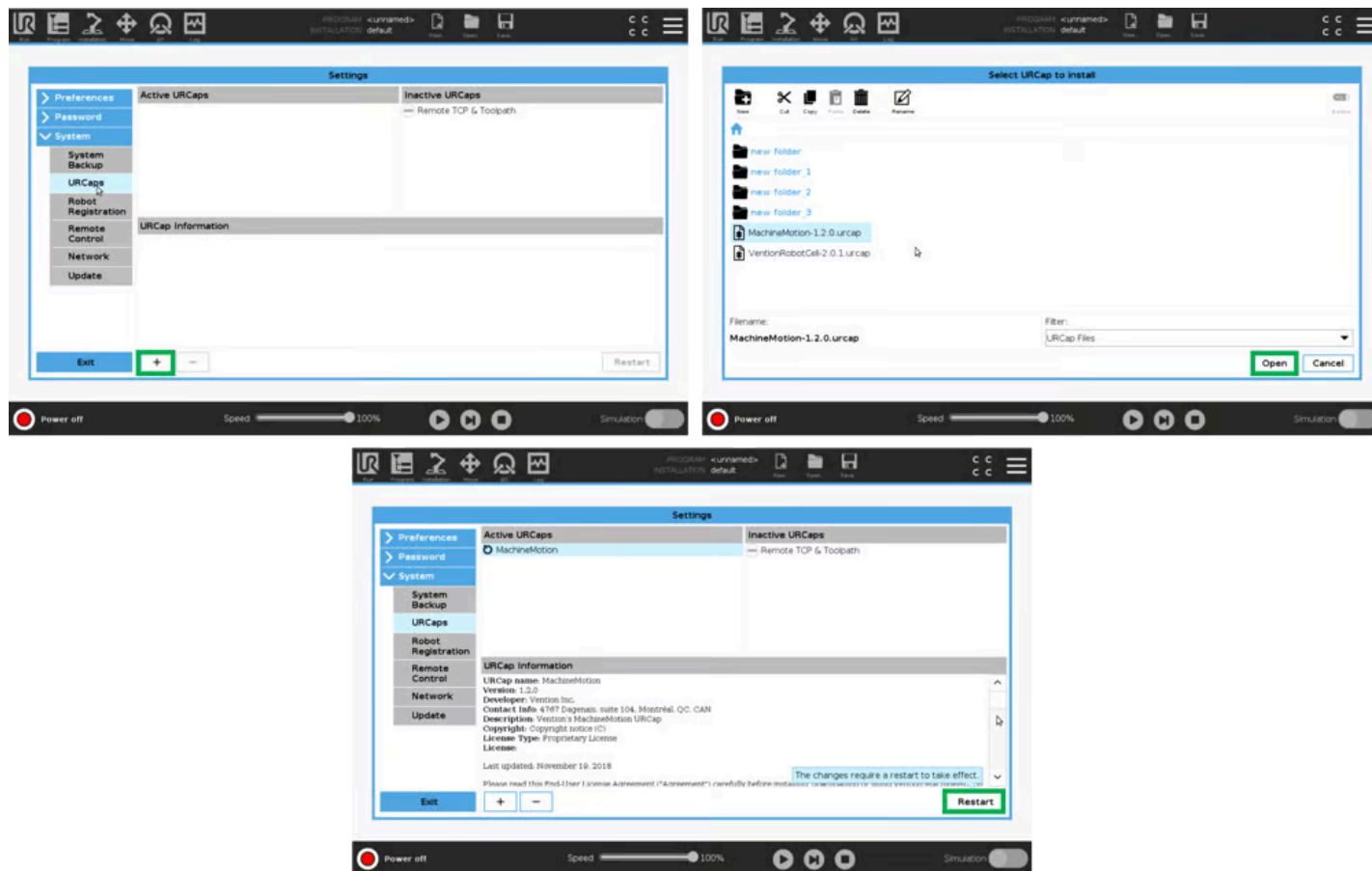


Figure 4: Adding the URCap file and restarting the system

## Connect your Controllers

This section discusses common MachineMotion connections for pairing with a Universal Robot controller. These connections require the following components (provided with the MachineMotion package):

- E-Stop bypass connector
- Ethernet cable (controller communication)
- Safety E-Stop cable

Before proceeding with connections specific to the UR integration, make sure to connect all your Vention components (actuators, sensors, etc.) to your MachineMotion controller by referring to the instructions in: User Manual: Connecting Components (<https://www.vention.io/technical-documents/machine-motion-user-manual-71#connecting-components>).

## Connecting the UR and MachineMotion via Ethernet

The UR and MachineMotion controllers communicate using TCP/IP sockets on standard Ethernet. We recommend using a point-to-point connection by running an Ethernet cable between the MachineMotion Ethernet port and the UR controller Ethernet port.

The UR controller has an Ethernet port available on its bottom panel, and the MachineMotion controller has one on its connector panel. Connect the UR controller to the ETHERNET port on the MachineMotion controller using an Ethernet cable.



Figure 5: Example MachineMotion system with Ethernet peer-to-peer connection to a UR controller

Important: Make sure to add jumpers to the pendant port and to the SAFETY IN port if you are not using these ports.

## Configure the Network

Communication between the UR controller and MachineMotion uses Ethernet. This configuration is peer-to-peer. In order for the Ethernet communication to function, both devices must be properly configured. In this system, the UR controller is the controlling entity. It runs the application-level program and sends commands and queries to the MachineMotion controller.

### Configuring the MachineMotion Network

1. Connect MachineMotion to a 120 V power source via the power cable and POWER connector
2. Connect a computer that has Google Chrome installed to MachineMotion via the provided Ethernet cable using the DEFAULT ETHERNET port (also labelled 192.168.7.2 on the latest version of the controller). If using a computer that does not have an Ethernet port a USB to Ethernet adapter can be utilized.
3. Turn on the MachineMotion system using the rocker switch.
4. **Wait at least 90 seconds for the system to complete its booting sequence.**
5. Using the Google Chrome browser, navigate to: [192.168.7.2 \(http://192.168.7.2\)](http://192.168.7.2)

The MachineMotion main menu (see Figure 6) will be displayed.

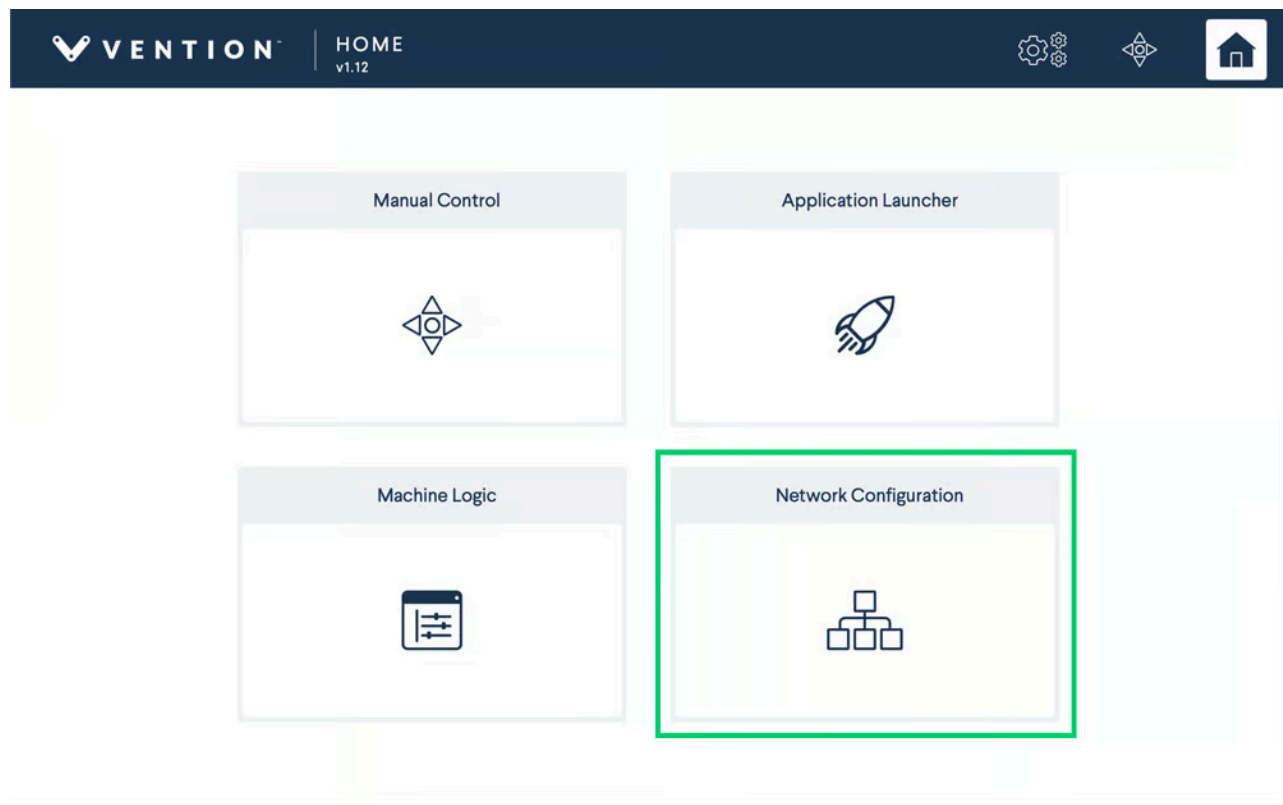


Figure 6: MachineMotion main menu

6. From the main menu, select **Network Configuration**
7. Modify the IP address of the MachineMotion controller, if desired. The default network configuration for MachineMotion connected to a UR controller is as follows:
  - IP address: 192.168.0.2
  - Netmask: 255.255.255.0
  - Gateway: 192.168.0.1
8. If you have modified any of the fields, select **Use Static Mode** to save your changes

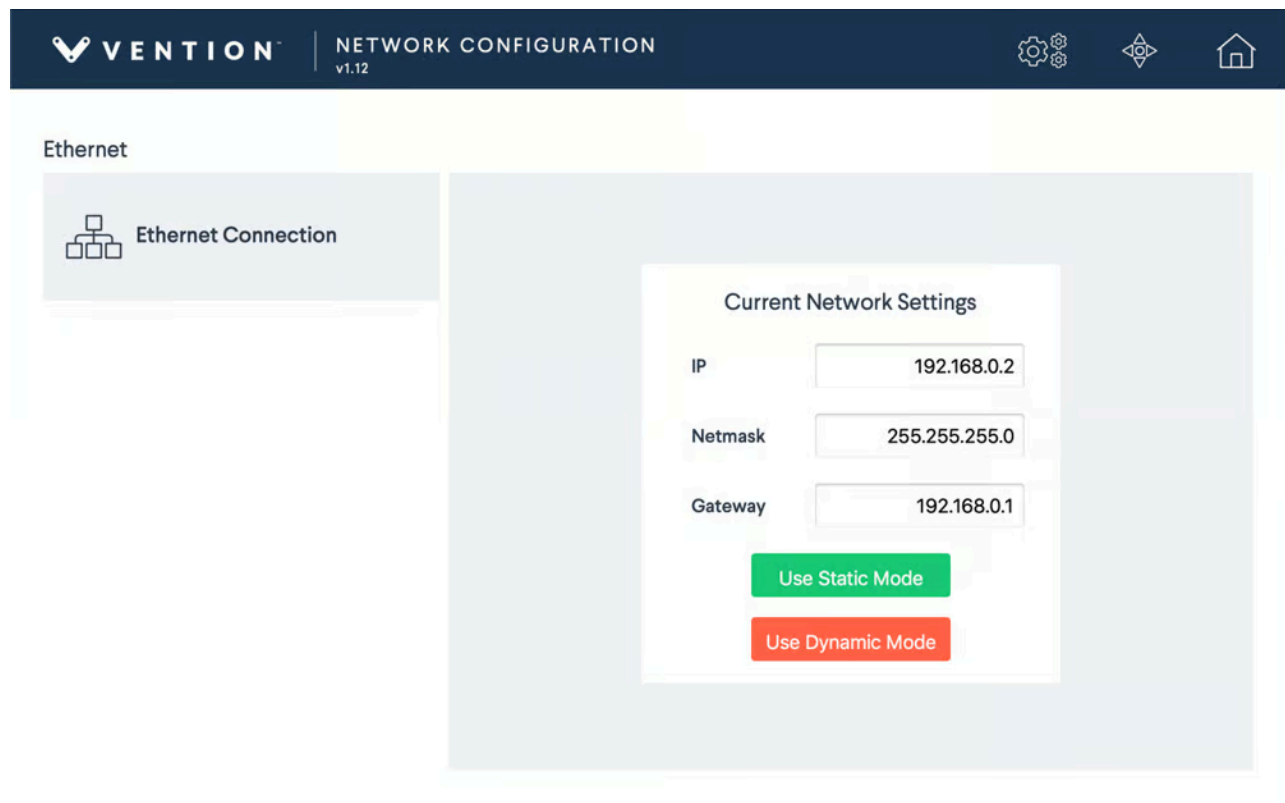


Figure 7: Default MachineMotion network configuration settings when connected to a UR controller

## Configuring the UR Controller Network

On the UR teach pendant home screen, select **Menu > Settings > System > Network** (see Figure 8).

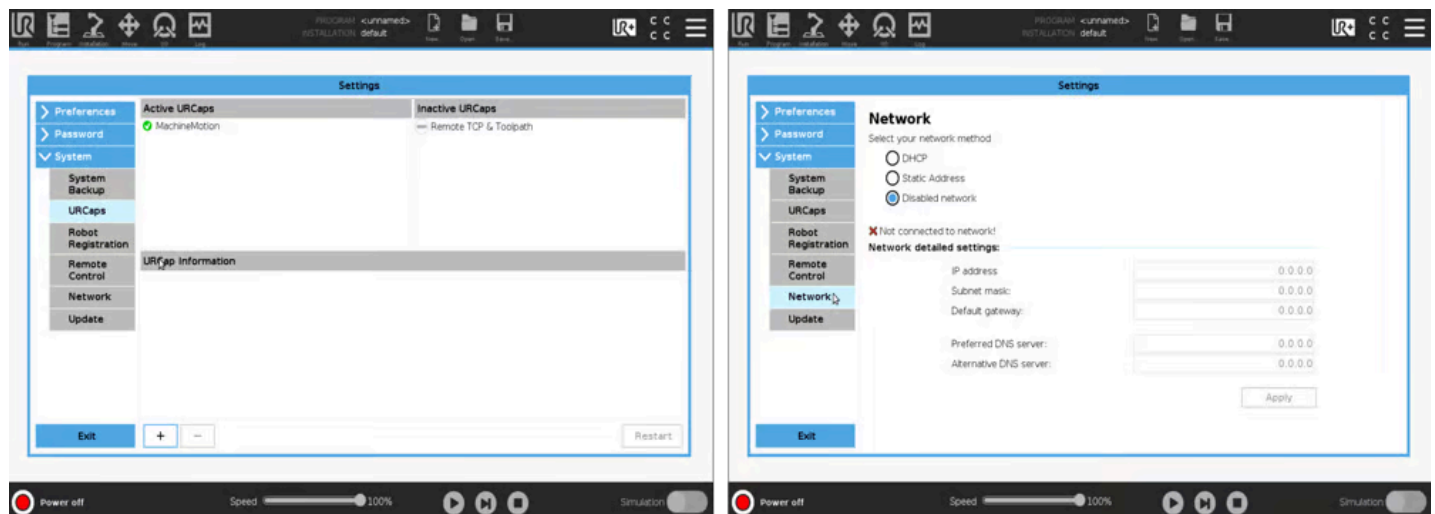


Figure 8: Navigating to the Polyscope Network Configuration Screen

Enter the parameters as shown in Figure 9. Note that here, the UR controller IP address is **192.168.0.3**, and the MachineMotion controller IP address is **192.168.0.2**. Use the addresses specified for your UR Controller and your MachineMotion Controller; any address in the **192.168.0.xxx** subnetwork is acceptable. The other parameters should be configured as shown in Figure 9. Click **Apply** to save your settings.

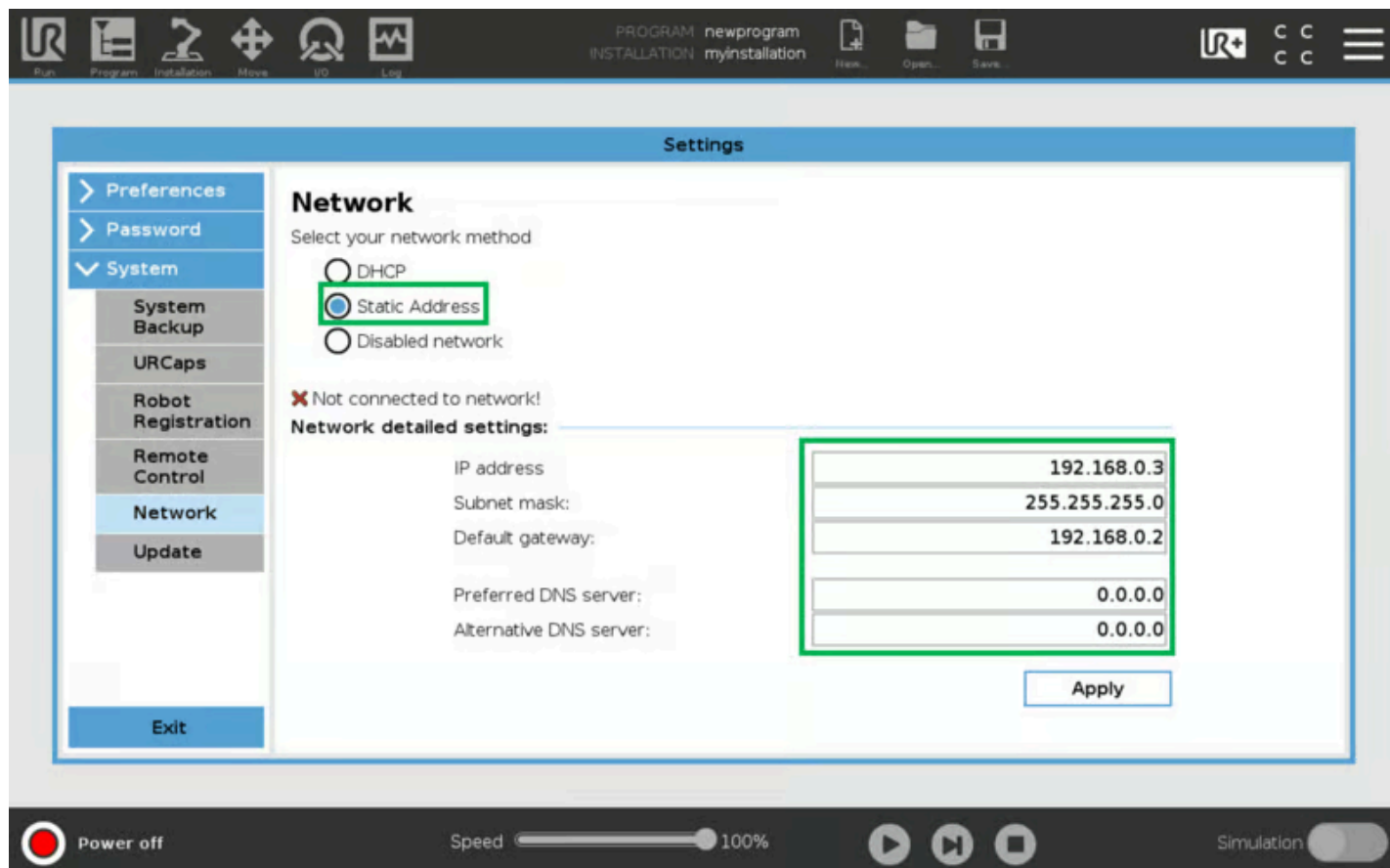


Figure 9: Network parameters setup

The network status line should display **Network is connected** after a few seconds. If it does, the network setup is complete.

## Configure your System

In order to have the UR controller communicate with the MachineMotion controller, you have to configure your Vention system within the Polyscope environment.

On the teach pendant home screen, select **Installation** > **UR Caps** > **Vention Linear Motion**, to navigate to the Vention system configuration screen.

The Vention URCap configuration screen has two main windows:

### 1) Upper Window

The upper window of the Vention URCap is used to define a MachineMotion controller instance (see Figure 10). Note that multi-controller systems can be created by adding more than one controller.

- **Controller Name:** Name assigned to the MachineMotion controller
- **IP Address:** IP address of the MachineMotion controller. In Figure 9, IP address **192.168.0.2** is used for the MachineMotion controller

To add a controller, select the + icon. You can edit the controller name by clicking on the default "MachineMotion" name.



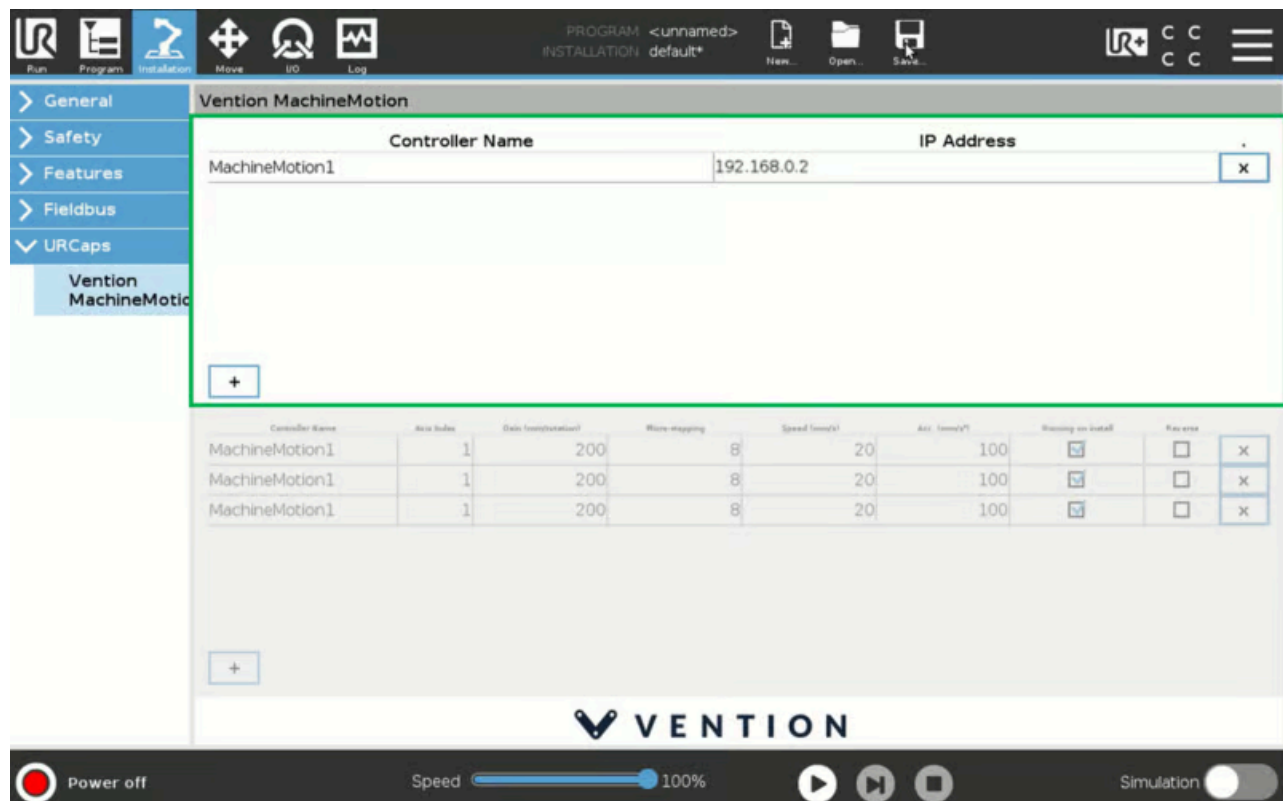


Figure 10: Upper window of the Vention URCap configuration screen

## 2) Lower Window

The lower window of the Vention URCap for Linear Motion defines actuators for linear axes of motion (see Figure 11). For example, the system shown in Figure 11 has three actuators linked to the controller, which is called **MachineMotion1**. These actuators are plugged into drive ports one, two, and three of the controller, hence the (1), (2), (3) appearing under the **Drive #** setting.

- **Controller Name:** Name of the controller on which the actuator is plugged
- **Axis Index:** Indicates which drive port the actuator is connected to on the MachineMotion controller
- **Type:** Indicates the type of actuator. Setting the type will populate the **Gain**, **Micro-stepping**, **Speed**, and **Acceleration** fields with default values, but you can still edit them if you wish to
- **Gain:** Mechanical gain of the actuator in mm or degrees per motor turn (refer to the MachineMotion Controller Manual or to the respective mechanical system datasheet for actual values)
- **Micro-stepping:** These settings must match the micro-stepping setup of the drives inside the MachineMotion controller (8 is the default)
- **Speed:** Default actuator displacement speed in mm/s, if none is specified in the program
- **Acceleration:** Default actuator displacement acceleration in mm/s<sup>2</sup>, if none is specified in the program
- **Homing on install:** Indicates whether the actuator should perform a homing sequence before the start of each program
- **Reverse:** Select this to reverse the direction of motor rotation for the actuator

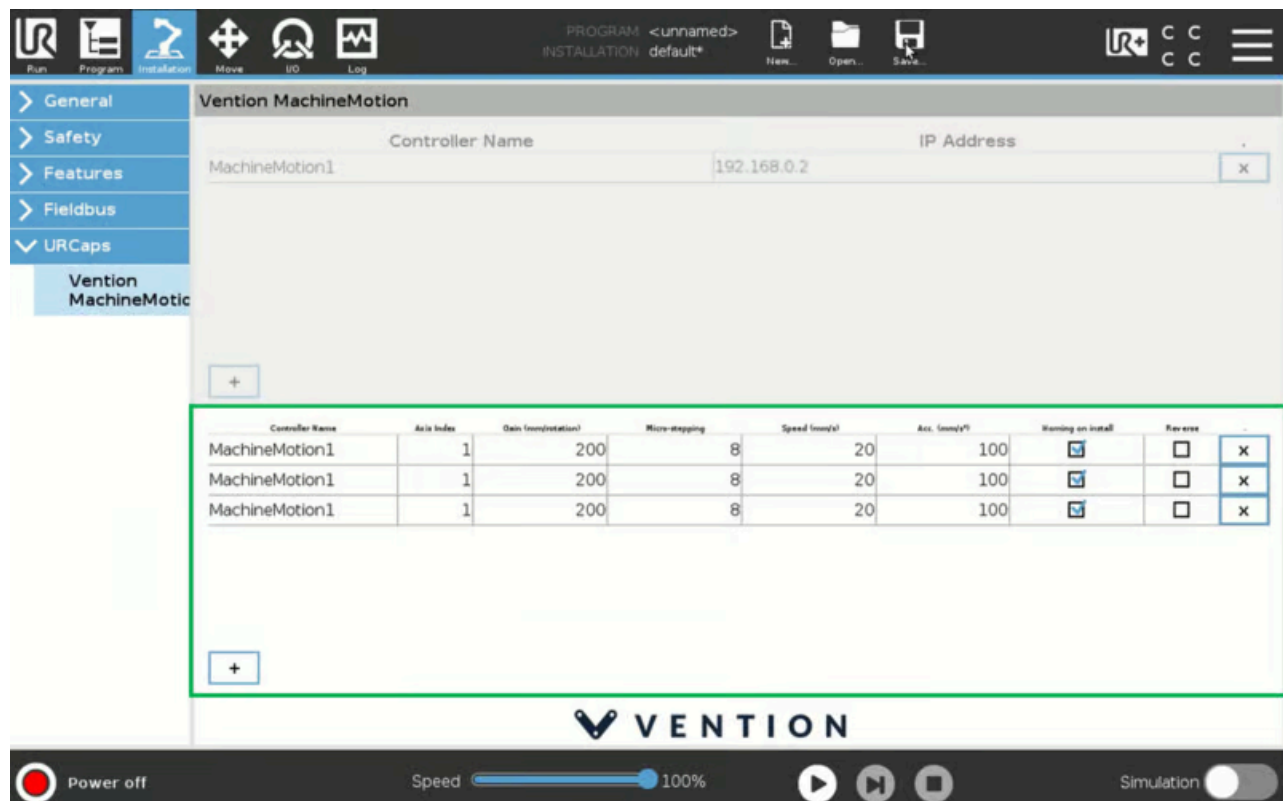


Figure 11: Lower window of the Vention URCap configuration screen

After configuring the installation in both windows, click **Save** at the top of the screen to complete.

## Use the URCap

Now that the URCap is installed and your system configured, you are ready to create robot programs on the UR teach pendant. When creating a robot program, the Vention URCap Control Screen can be found by navigating to the **URCaps** tab and accessing the Robot Program Structure Editor as shown below in the video of Figure 12. Refer to the UR documentation for how to use the Robot Program Structure Editor.

### Control Screen

Figure 12: Navigating to the UR Robot Program Structure Editor

As an example, to add a 7th axis robot command to the robot program, select **Vention MachineMotion** (Figure 13) to open the URCap control screen. Then select the **Command** tab to edit the command as shown below:

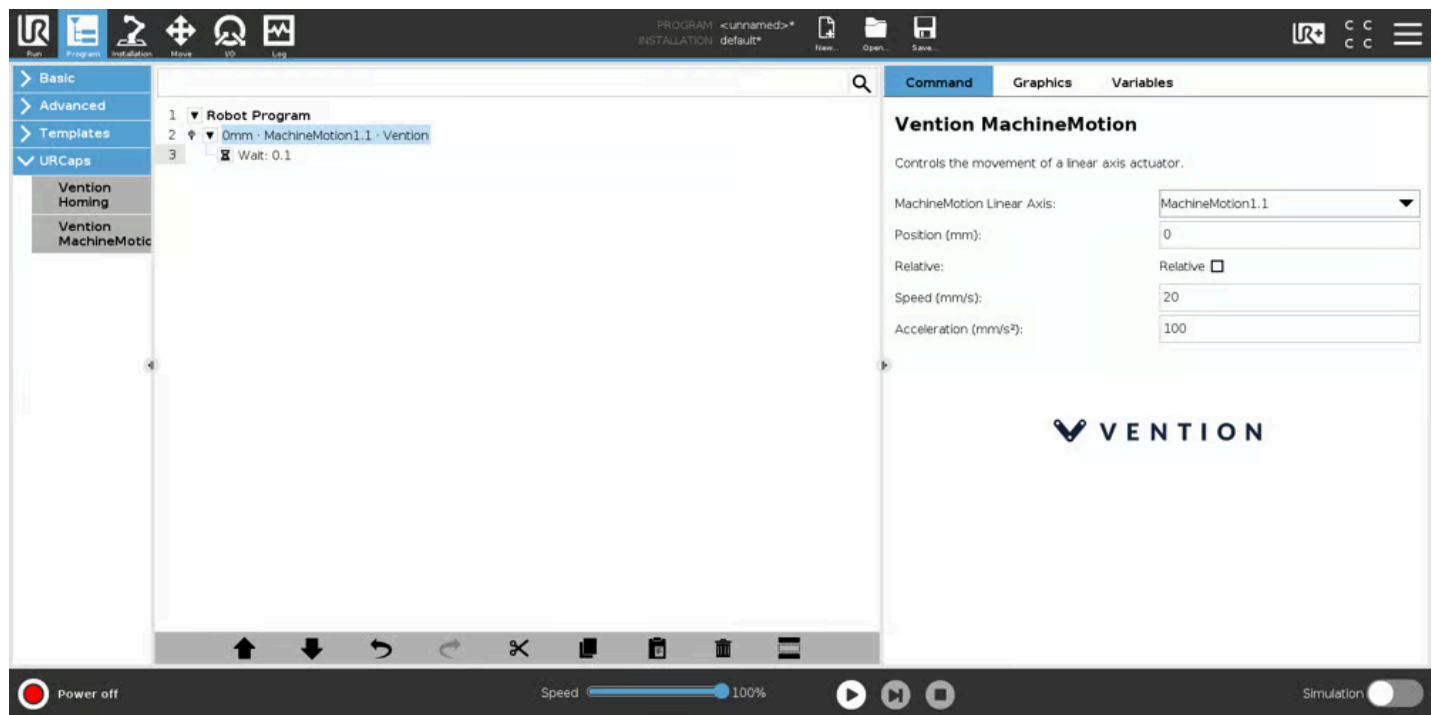


Figure 13: Vention URCap in the UR Robot Program Structure Editor

The URCap control screen is where commands can be issued to the MachineMotion controller. There are 5 parameters to set on the control screen, explained below.

- **MachineMotion Linear Axis**

This is the name of the axis you want to control as defined in your MachineMotion configuration.

- **Position**

This is the position in millimeters where the linear axis will move. Unless the relative check box is activated, all positions are with respect to the home location (0 mm). For example, a position of 200 mm will result in the linear axis moving 200 mm away from the home location. If the linear axis is already positioned at 200 mm on the linear axis, then it would simply remain in place and not move.

- **Relative Checkbox**

If the **Relative** checkbox is activated, position commands are relative to the current position of the linear axis. For example, a position of 200 mm will result in the linear axis moving 200 mm away from its current location. If the linear axis is already positioned at 200 mm on the linear axis, then it would move 200 mm away in the positive direction. Its final absolute position would be 400 mm.

- **Speed**

Coasting speed of the linear axis in millimeter per second. The system utilizes a trapezoidal speed profile which contains an acceleration period, a coasting period and a final deceleration period. The speed increases linearly until coasting speed is reached, and finally decreases linearly until speed reaches zero. The **Speed** setting configures the coasting speed.

- **Acceleration**

Acceleration of the linear axis in millimeters / second<sup>2</sup>. This parameter controls the acceleration and deceleration of the trapezoidal speed profile. The acceleration and deceleration are equal.