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Universal Robot - Robot Configuration for MachineLogic Applications

Overview

Vention now offers Universal Robot Programming directly in MachineLogic alongside Vention actuators directly in Vention's pendant. With a few extra steps, you can deploy your robot enabled program in minutes.

This document describes the steps necessary to get up and running with **Robot Programming in MachineLogic for Universal Robots e-Series**, which enables the seamless integration of a UR six-axis robot arm alongside Vention motion components, all while staying in Vention's no-code environment. Applications like range extenders, cobot palletizers and other custom robot cells, are now possible within the Vention platform.

1. Connect your system

In order to program your UR e-Series Robot in MachineLogic, a Vention MachineMotion 2 Pendant V3 (CE-TP-014-0000) and a Vention Robot Safety Module (CE-SA-009-0000) is **required**, in addition to a MachineMotion v2 (CE-CL-010-0004 or CE-CL-010-0001) running firmware version v2.9.0 or later.

1.1 Universal Robots Safety Configuration and Connection with MachineMotion V2

This section describes the connection of a MachineMotion V2 to a Universal Robot controller by way of the Robot Safety Module, in order to program the robot through MachineLogic. The Robot Safety Module acts a 3-port Ethernet switch to enable seamless communication between the MachineMotion, the pendant, and the robot controller (see Figure 1). A first step will also be done in order to properly configure the Safety of the Universal Robot Controller.

To properly perform the Safety Configuration of the Universal Robot controller with a MachineMotion V2, follow the steps detailed in this guide: Universal Robots Safety Configuration with MachineMotion V2.

Once the configuration is completed, make sure that the required safety components are properly connected.

Follow the steps detailed in the Robot Safety Module User Manual. A typical installation (Figure 1) will require the following components:

- MachineMotion Pendant V3
- Firmware Version v3.0 or later
- E-Stop Module with Reset
- Robot Safety Module
- UR Robot Controller
- MachineMotion 2 Four Drive or MachineMotion2 One Drive
 - Firmware Version v2.9.0 or later
- 3 x MachineMotion 2 Safety Extension Cable 5m (CE-CA-102-5001)

NOTE: If your system has more than one controller set up in a Multi-Controller configuration, the safety chain which includes the Robot Safety Module and the Pendant must be connected to the **parent** controller.



1.2 Configuring up the UR controller's Network

On the UR teach pendant home screen, select Menu > Settings > System > Network. Select Static Address as your network method & change the *IP address* to 192.168.5.3, *Subnet mask* to 255.255.255.0, and *Default Gateway* to 0.0.00 (see Figure 2a & 2b). Preferred DNS server to 0.0.0.0 and Alternative DNS server 0.0.0.0. Select Apply when done.

gram instalation wove ou Log				? Help	
	Getting Started			About	
Wha	t would you like to do f	irst?		🛱 Settlygs	
RUN A PROGRAM	PROGRAM THE ROBOT			ROBOT	
Don't show this message again					
ver off Speed	100%	0	0	Simulation	



Figure 2b: Robot configuration with Robot Safety Module

2. Pre-connection Setup on UR controller

2.1 Installation of the External Control URCap on the UR controller

Step 1: Insert the USB drive

Vention's External Control URCap software is distributed on a USB flash drive and must be installed on the UR teach pendant before continuing onto working in the Vention pendant. To install the URCap, insert the USB drive into the UR teach pendant's USB port.

Note: You can also download the URCap via the following link and upload it to your own USB stick.

Download External Control URCap



Step 2: Add the External Control URCap to the UR environment

On the teach pendant home screen, select **Menu** > **Settings** (see Figure 4a).

	Getting Started	About	
N	What would you like to do fire	🗘 Satt Qys (1) Shutdown Robot	
RUN A PROGRAM	PROGRAM THE ROBOT	CONFIGURE ROBOT	
Don't show this message again			

Select System > URCaps, then click the + icon at the bottom of the screen to add a new URCap to the UR teach pendant (see Figure 4b).

Preferences Active URCaps Password Remote TCP URCaps Remote TCP Registration Remote TCP Remote TCP URCaps UPdate URCap Information	> Preferences Active URCaps Inactive URCaps > Password PRemote TOP > URCaps Registration Report Control Update URCap Information Exit +		Settings		
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Update	Update	Network	URCap Information		
Exit + - Restart	Ext - Restart	Update			
		Exit	•		Restart
		B	Speed Speed 100		Simulation (Color)

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



Step 3: Restart the UR controller

When prompted to do so, restart the UR controller to complete the installation (see Figure 5).

> P			Settings					
	references	Active URCaps		Inactive URCaps				
> P	assword	D External Control		Remote TCP & Toolpath				
vs	ystem							
	System							
	наскир							
÷.	Robot							
	Registration							
	Remote	URCap Information						
	Constrained	Version: 1.0.5 Developer: FZI Research Center for Informati	ion Technology		<u>^</u>			
	Freedrive	Contact Info: Haid-und-Neu-Straße 10-14, 76 Description: UBcap which enables external co	1131 Karlsruhe ontrol					
	Network	Copyright: Copyright (C) 2021 FZI Research (License Type: Apache License, Version 2.0	Center for Information	Technology				
	opulite	License:						
		Apache License Version 2.0. January 2004 http://www.apache.org/licenses/			~			
	Exit	+ -			Restart			

2.2 Configuring the External Control URCap

Step 1: Navigate to URCaps Installation Page

On the teach pendant, select Installation > URCaps (see Figure 6).

eneral	Tool Center Point	TCP Visualization	
тср	✓ TCP ▼ ■ +	i	E C
Mounting			(P)
I/O Setup	Position		
Variables	X 0.0 mm	A	
Startup	Y 0.0 mm		
Smooth Transition			•
Conveyor	Units Rotation Vector [rad]	• 11	
Screwdriving	RX 0.0000	6.3	
Home	RY 0.0000		
Tool I/O	RZ 0.0000	zard	
afety	Payload and Center of Gravity	Tool Flange	
eatures	Parload 100 kg	t ^v t ^v	
eldbus	ayload. 1.00 kg		
RCaps	CX 0.0 mm		
	CY 0.0 mm		
	CZ 0.0 mm 🏼 🎢 Wiz	ard	
Normal	Speed	🗢 100% 🕞 👩 🗖 Simul	lation (

Step 2: Set Host IP and Custom Port

Change the Host IP to 192.168.5.1 and the Custom Port to 50002 (see Figure 7). You may use any Host name desirable.

General	a constant of the second		New_ Open_ Save	
N Cafabi	External Control			
> Features				
> Fieldbus				
V URCaps	Host IP: 192.168.5.1	Custom port: 50002	Host name MachineMotion	
Control				

2.3 Enabling Remote Control

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

	Getting Started	About	
w	/hat would you like to do firs	C sett Dys C Shutdown Robot	
RUN A PROGRAM	PROGRAM THE ROBOT		
Don't show this message again			

Select System > Remote Control, then click the Enable (see Figure 8b).

	Settings					
Preferences	Nenite Cont of					
Sustem	Remote Control allows you to control the robot via external sources, such as controller sockets, I/Os and the Dashboard Server.					
System	This can be used to send simple commands to PolyScope such as: starting or loading programs as well as sending URScript commands directly to the controller.					
Backup						
URCaps	To ensure safe usage, the robot can either be in "Remote Control" mode or "Local Control" mode.					
Robot Registration	Cocal Control® mode will ensure that any commands, sent to the controller from an external source, will be rejected while the robot is controlled in person.					
Remote Control						
Constrained Freedrive	Enable Disable					
Network						
Update						
Exit						

2.4 Verify Tool Center Point (TCP) is Zeroed

The Tool Center Point, or TCP, defines the coordinate system found at the end of the tool mounted to the robot. For **Robot Programming in MachineLogic**, the TCP, wether an end-of-arm tool is mounted or not, is located directly at the robot's flange, also known as position 0, 0, 0.

On the teach pendant, select Installation > General > TCP, and verify that all values associated to X, Y, and Z, as well as RX, RY, and RZ, are set to zero (0) (see Figure 9). If not, make the necessary changes.

General	Tool Center Point	TCP Visualization
TCP Mounting I/O Setup Variables Startup Smooth Transition Conveyor Tracking Screwdriving Home Tool I/O		
Safety	Payload and Center of Gravity	Tool Flange
Features Fieldbus URCaps	Payload: 1.00 kg Certer of gravity CK 0.0 mm CY 0.0 mm CZ 0.0 mm	
Normal	Speed 🦛	10% 🕞 🖸 🖸 Simulation 🔵

2.5 Create and Run an External Control program

Step 1: Create a new program

On the navigation bar of the teach pendant, select New... > Programs (see Figure 10).

✔ General	Tool Center Point	Program	n	
TCP Mounting I/O Setup Variables Startup Smooth Transition Conveyor Tracking Screwdriving Home Tool I/O	Position X 0.0 mm Y 0.0 mm Z 0.0 mm Units Rotation Vector (rad] RX 0.00000 R2 0.0000	Vizard	R	+
> Safety	Payload and Center of Gravity	Tool	Flange	
 Features Fieldbus URCaps 	Payload: 100 kg Center of CX 0.0 mm CY 0.0 mm CZ 0.0 mm	of gravity ≇Wizard	Ć.	ľ
Normal	Speed 🥌	100%		Simulation

Step 2: Add the External URCap to the program

On the left-hand side navigation tree, select URCaps > External Control (see Figure 11). You should see Control by Host name** appear under the program tree view. Verify that the information found on the right-hand side (Host IP and Custom port) match what was set in section 2.2 - Step 2. The program needs to be saved to enable the MachineMotion to control the robot. Save... > Save Program As... vention_control.urp.

NOTE: This step is important and often forgotten. The program name must be exactly named vention_control.urp

/ Basic	۹	Command Graphics Variables
 Advanced Templates URCaps External Control 	1 V. Robot Program 2 Control by MachineMotion	External Control The program enabling external control is requested from the remote host. As to that, the parameters are currently set as follows: Host IP: 192.168.5.1 Cuatom port: 5002 These settings can be altered via the Installation tab.
	全手りごと目前言言	
~		

Step 3: Change from Local to Remote Control

NOTE: This step is important and often forgotten. The robot controller must be in Remote Control mode for MachineLogic to properly connect.

At the right of the navigation bar of the teach pendant, select Local > Remote Control (see Figure 12).



3. Connecting to the Robot Controller from MachineMotion

With the Universal Robot controller now configured to be externally controlled, you are now ready to deploy your application and configuration from you design on Vention.io.

Follow the steps detailed in the Deploy your Application and Configuration to Controller documentation.

3.2 Troubleshooting

If the robot connection fails (see Figure 16), there could be a few reasons that are the root cause:

- The robot controller is still in Local mode, and not in Remote Control See 2.5 Step 3 to enable Remote Control.
- The Universal Robot Program (.urp) is not playing on the robot controller Make sure everything is properly connected, as the program should play immediately.
- The IP addresses set in 1.2 and 2.2 Step 2 are incorrectly set. Verify that the correct IP address was entered for both the network and URCap host.
- The Robot Safety Module is not properly wired, not allowing proper communication. Verify your system wiring per section 1.1.
- If a robot has been previously configured and connected, and any of the above occurs, follow the steps shown on the configuration page of the robot.