

MotionPlus for PS5

Reference Designs for URCaps

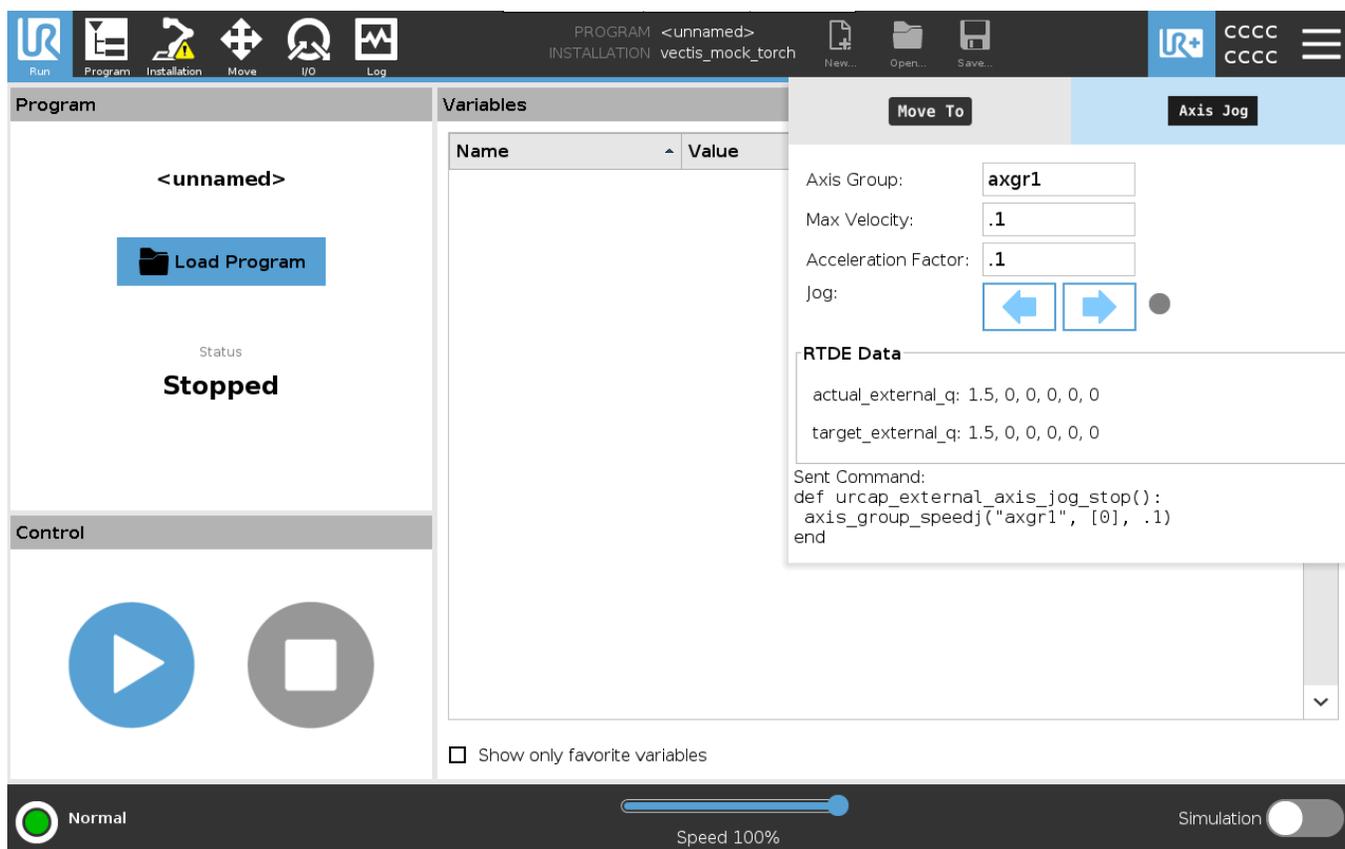
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Note

These reference designs are examples only. They are not intended for production use, but rather as an education tool to learn how to create URCaps that interface with the back-end of MotionPlus.

This bundle includes five reference designs that demonstrate the integration of MotionPlus URScript and EtherCAT calls for creating URCaps.

Axis Group Jogging: Demonstrates how to jog an axis in a group.



The screenshot displays the Universal Robots interface with the following components:

- Top Bar:** Includes icons for Run, Program, Installation, Move, I/O, and Log. The program name is "<unnamed>" and the installation is "vectis_mock_torch".
- Program Panel:** Shows "<unnamed>" with a "Load Program" button and a "Status Stopped" indicator.
- Control Panel:** Features a play button and a stop button.
- Variables Panel:** A table with columns "Name" and "Value".
- Axis Jog Panel:** Contains input fields for "Axis Group" (axgr1), "Max Velocity" (.1), and "Acceleration Factor" (.1). It also has "Jog" buttons (left and right) and a "Move To" button.
- RTDE Data:** Shows "actual_external_q: 1.5, 0, 0, 0, 0, 0" and "target_external_q: 1.5, 0, 0, 0, 0, 0".
- Sent Command:** Displays the URScript code:

```
def urcap_external_axis_jog_stop():  
  axis_group_speedj("axgr1", [0], .1)  
end
```
- Bottom Bar:** Shows "Normal" mode, a "Speed 100%" slider, and a "Simulation" toggle.

Move To: Demonstrates how to move an axis to a given position and allows for enabling frame tracking while performing the move.

The screenshot displays a CNC control software interface. At the top, there is a menu bar with icons for Run, Program, Installation, Move, I/O, and Log. The main window is divided into several sections:

- Program:** Shows the program name as `<unnamed>` and a `Load Program` button. The status is `Stopped`.
- Variables:** A table with columns for Name and Value. Below the table is a checkbox labeled `Show only favorite variables`.
- Move To Dialog:** A modal window with the following fields and controls:
 - Axis Group: `axgr1`
 - Set Axis Group Position: `[1.5]`
 - Current position: `[1.5]`
 - A button labeled `Move axis to new position`
 - A speed slider set to `Speed 30%`
 - Frame: `[]` with a `Frame Tracking` checkbox.
 - Last Sent Command(s): `axis_group_speedj("axgr1", [0.0], 1)`
- Control:** Contains a play button and a stop button.
- Bottom Bar:** Shows a `Normal` mode indicator, a `Speed 100%` slider, and a `Simulation` toggle switch.

Calibrate Axis: Provides a GUI interface for calibrating an axis using the robot TCP.

Rotary Axis Calibration

Calibration Steps:
Calibration involves sampling at least 4 points around the rotation axis. The four points must lie on a circle - i.e. on a plane with equal distance from the center of the axis of rotation. The points should be approximately 90 degrees apart. If looking at a clock the sample points would be at 3, 12, 9 and 6 o'clock, in that order.

1. Hold down the freedrive button on the Teach Pendant
2. Move the robot to the desired point and release the freedrive button
3. Press the Sample button below
4. Repeat this process until at least 4 points have been sampled.
5. Press the Calibrate Axis button.

URScript Command:

```
calibrate_rotary_axis([\n  p[-0.7714, 0.5727, 0.2177, -0.5958, 2.8979, -0.3286],\n  p[-0.7508, 0.4071, 0.0359, -1.4812, 0.3557, 0.3298],\n  p[-0.7373, 0.5470, -0.0818, -1.2277, -0.9007, 0.4271],\n  p[-0.7298, 0.6967, 0.0206, -0.8800, -1.6987, 0.1825]])
```

Calibration Result:

```
pose=p[-0.7501,0.5547,0.0688,1.9932,0.0445,2.2560],\nradius=0.1513,\nmax_error=0.0059,\nmean_error=0.0047
```

Sample Pose 4/4 Clear Calibrate Axis Copy pose to clipboard

Normal Speed 100% Simulation

Coordinated Motion Programming: Showcases coordinated motion using *MoveP* and *MoveC* program nodes.

The screenshot displays the UR robot programming software interface. The top menu bar includes icons for Run, Program, Installation, Move, I/O, and Log. The main window is divided into three panes: a left sidebar with a tree view, a central command editor, and a right-hand configuration panel. The tree view shows a hierarchy: Basic > Advanced > Templates > URCaps > Coordinated Move. The command editor shows a list of nodes: 1. Variables Setup, 2. Robot Program, 3. Coordinated Move, and 4. MoveP with Axis Group. The right-hand panel is titled 'Coordinated Move' and contains the following settings: 'Axis Group' set to 'axgr1', 'Frame/Axis Tracking' set to 'axis1', 'Motion Parameters' with Speed (m/s) at 0.25, Acceleration (m/s/s) at 1.2, and Blend Radius (m) at 0.0. Below these are two 'Add' buttons: 'Add MoveP with Axis' and 'Add MoveC with Axis'. At the bottom of the interface, there is a status bar with a 'Normal' indicator, a speed slider set to 100%, and a 'Simulation' toggle switch.

The screenshot displays the UR robot programming software interface, showing the configuration for a 'MoveP with Axis Group' node. The top menu bar and the left sidebar are identical to the previous screenshot. The command editor shows the same hierarchy, but the 'MoveP with Axis Group' node is now selected. The right-hand panel is titled 'MoveP with Axis Group' and contains the following settings: 'Axis Waypoint' with a 'Target' of '[1.5]' and a 'Set to Current Position' button; 'Robot Waypoint (in tracked frame)' with a 'Target' of '[21,-0.564807,-0.257176]' and a 'Set to Current Position' button; and 'Motion Parameters' with Speed (m/s) at 0.25, Acceleration (m/s/s) at 1.2, and Blend Radius (m) at 0.0. The bottom status bar is also identical to the previous screenshot.

EtherCAT Axis Configuration: Illustrates the configuration parameters needed to configure an axis using EtherCAT.

The screenshot shows the 'EtherCAT Axis Config' window in a software application. The interface includes a top toolbar with icons for Run, Program, Installation, Move, I/O, Log, New..., Open..., and Save... The main window is titled 'EtherCAT Axis Config' and contains the following configuration parameters:

Axis Group:	<input type="text" value="axgr1"/>	Axis Group Pose:	<input type="text" value="p[0,0,0,0,0,0]"/>
Axis:	<input type="text" value="axis1"/>	Axis Pose:	<input type="text" value="65,1.2561,1.0422]"/>
Axis Type:	<input checked="" type="radio"/> Revolute		<input type="radio"/> Prismatic
Max Velocity:	<input type="text" value="1.57"/>	Max Acceleration:	<input type="text" value="30"/>
Counts per Rev:	<input type="text" value="4194304"/>	Gear Ratio:	<input type="text" value="120.4"/>
Feed Constant:	<input type="text" value="-6.28318531"/>	Zero Offset:	<input type="text" value="0"/>
Position Limits:	<input type="checkbox"/>		
Min:	<input type="text" value="0"/>	Max:	<input type="text" value="1"/>

An 'Apply' button is located at the bottom left of the configuration area. The bottom status bar shows 'Normal' mode, a speed slider at 100%, and a 'Simulation' toggle switch.