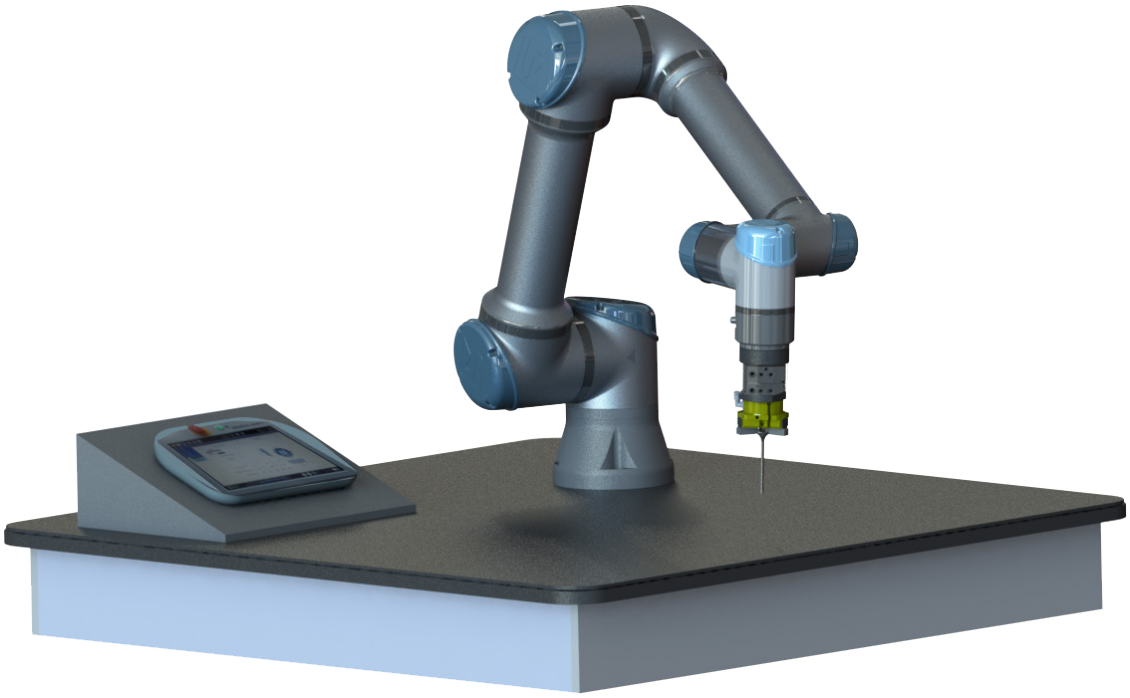
ATI Tool Changer URCap Software Setup and Programming Manual for URe



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Engineered Products for Robotic Productivity

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Foreword

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Note

Please read the manual before calling customer service and have the following information available:

1. Tool Changer model (for example: QC-7 or 9120-COB-UR-007-01).
2. Accurate and complete description of the question or problem
3. Computer and software information (operating system, PC type, drivers, application software, and other relevant information about the application's configuration)

Be near the system when calling (if possible).

Please contact an ATI representative for assistance, if needed:

For sale, service, technical support, and information about ATI products:

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Glossary

Term	Definition
ATI Tool Changer URCap Software	An ATI software program that enables the UR robot to implement Tool Changer commands in a robot program.
Center of Gravity (CG)	The point of a mass around which the resultant torque from gravity forces is zero.
Interface Plate	A separate plate that attaches the Tool Changer to another surface. Interface plates are often used if the bolt pattern on the Master or Tool plate doesn't match the bolt pattern on the robot arm or customer tooling. The interface plate has (2) bolt patterns on either side of the plate. One side is for the Master or Tool plate. The other side is for the robot arm or customer tooling.
Hamburger Menu 	A drop-down menu button on the URe Teach Pendant screen that includes the following: help, about, and settings.
Latch	An output command to couple the ATI Tool Changer.
Lock Sensor	A device that detects when the Master plate has coupled and locked with the Tool plate.
Plug-in Technology	A customized program that when downloaded and installed onto a host device adds a specific feature to an existing computer program.
P/N	Part Number
Polyscope	UR software on the teach pendant.
Qty	Quantity
TCP	Tool Center Point
Teach Pendant	A handheld device or control box for programming the motions of a robot.
Tool Changer	A Master plate assembly and Tool plate assembly. When the Master plate couples to the Tool plate, utilities pass from the robot to the Master plate and through the Tool plate. The Tool plate mounts to the customer tooling. On a manufacturing floor, one robot and Master plate could be interchangeable with multiple Tool plates that each have different customer tooling for an operation.
Unlatch	An output command to uncouple the ATI Tool Changer.
Unlock Sensor	A device that detects when the Master Plate has uncoupled and unlocked with the Tool plate.
URe robot	A collaborative robot manufactured and distributed by the company, Universal Robots (UR). URe denotes a robot from the UR E-series product line.
URe Kit	A packaged option that includes the ATI Tool Changer, an interface plate kit for mounting the Master plate to the robot, electrical module, and ATI URCap software.
USB Drive	A USB (universal serial bus) drive is a device that data such as the downloaded ATI URCap software and can be attached to a host device with plug-in technology. Sometimes a USB drive is called a USB stick or USB disk.

1. Safety

The safety section describes general safety guidelines to be followed with this product, explanations of the notifications found in this manual, and safety precautions that apply to the product. Product specific notifications are imbedded within the sections of this manual (where they apply).

1.1 Explanation of Notifications

These notifications are used in all of ATI manuals and are not specific to this product. The user should heed all notifications from the robot manufacturer and/or the manufacturers of other components used in the installation.

DANGER: Notification of information or instructions that if not followed will result in death or serious injury. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.

WARNING: Notification of information or instructions that if not followed could result in death or serious injury. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.

CAUTION: Notification of information or instructions that if not followed could result in moderate injury or will cause damage to equipment. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.

NOTICE: Notification of specific information or instructions about maintaining, operating, installing, or setting up the product that if not followed could result in damage to equipment. The notification can emphasize, but is not limited to: specific grease types, best operating practices, and maintenance tips.

1.2 General Safety Guidelines

Prior to purchase and installation, the customer should verify that the Tool Changer selected is rated for the maximum loads, forces, and moments expected during operation. Refer to the applicable Tool Changer manual or contact ATI for assistance.

WARNING: The customer is responsible for ensuring that the area between the Tool and the Tool Stand is clear of foreign objects during tool drop-off. Failure to do so may result in serious injury to personnel.

WARNING: The gap between the Master and Tool sides is a pinch point. All personnel should be prevented from placing any part of their body or clothing in the gap, especially during actuation of the tool changer mechanism.

1.3 Safety Precautions

WARNING: Do not perform maintenance or repair(s) on the Tool Changer or modules unless the Tool is safely supported or placed in the tool stand, all energized circuits (e.g. electrical, air, water, etc.) are turned off, pressurized connections are purged and power is discharged from circuits in accordance with the customer specific safety practices and policies. Injury or equipment damage can occur with the Tool not placed and energized circuits on. Place the Tool in the tool stand, turn off and discharge all energized circuits, purge all pressurized connections, and verify all circuits are de-energized before performing maintenance or repair(s) on the Tool Changer or modules.

WARNING: During operation, the area between the Master and Tool must be kept clear. Failure to keep area clear will result in damage to Tool Changer, modules, or end-of-arm tooling and could cause injury to personnel.

CAUTION: This system is only to be used for intended applications and applications approved by the manufacturer.

1.4 Risk Assessment

ATI products are one component in a multi-component industrial/collaborative robot application; therefore, the robot integrator must perform a risk assessment on the whole industrial/collaborative robot application. In this risk assessment, consider all safety aspects of that application for the safe operation of ATI products.

For guidance in completing this risk assessment, consult the following resources:

- *ISO 12100* and *ISO 10218-2*
- Technical Specification *ISO/TS 15066*

ATI has identified some potential hazards that could be present in an application. Consider the following points with respect to material removal and Tool Change applications:

- Aerial-bound debris from a material removal process
- Improperly specified media breaking or ejecting away from the work piece; for example: the media is not correctly rated for rotational speed or force
- An article of clothing or hair caught in a tool change, cutting, grinding, sanding or deburring application
- Mishandling sharp deburring blades and bits (or accidental contact during operation)
- A pinch-point between a Master and Tool side, during a Tool Changer lock operation

Depending on the application, end-of-arm tooling can be inherently dangerous and there may be risks that require additional protection and/or safety considerations that are not presented in this manual. This preceding list should not be considered comprehensive and should only be considered as a guide

2. Overview

This manual provides an overview of an ATI Tool Changer kit compatible with the URe robot, procedures to set up the ATI URCap software, and instructions for including the ATI URCap commands in a robot program.

The user must understand how to operate the URe teach pendant interface *Polyscope* in order to operate the Tool Changer with a URe robot. For more information about UR products, refer to *https://www.universal-robots.com/support/*.

For more information on the ATI Tool Changer Tool Changers, refer to the QC-7 manual, *9620-20-B-7 Series Base Tool Changer with Proximity Sensors*, from the ATI webpage: *www.ati-ia.com.*

2.1 ATI Tool Changer Kit for URe

ATI provides the following kit option:

Table 2.1—ATI QC-7 Tool Changer Kit for URe (ATI P/N 9120-COB-UR-007-01)

Item	P/N	Qty
QC-7 Master with PNP Sensors, M8 Connector	9120-007CM-ML8-0-SM	1
QC-7 Tool, ML8 Module, Tool Hook	9120-007DT-ML8-H1	1
IP Kit for QC-7 Master	9120-007M-IP-10719-E060A15	1
IP Kit for QC-7 Tool	9120-007T-IP-11291	1
Connector Cable	9120-C-0321208-00-1	1
QC-7 Post Hanger and Rail Adapter Module	9120-TSS-MMH-11392	1
QC-7M Cable and Tubing Management Kit for IP-10719	9005-20-9111	1
High-flex cable with straight screw-on connector	8590-9909999-15	2
2.5mm hex key	3690-0000109-00	1
6mm hex key	3690-0000106-00	1
4mm hex key	3690-0000105-00	1
5mm hex key	3690-0000103-00	1

Table 2.2—ATI QC-7 Tool Changer Kit for URe (ATI P/N 9120-COB-UR-007T-01)

Item	P/N	Qty
QC-7 Tool, ML8 Module, Tool Hook	9120-007DT-ML8-H1	1
IP Kit for QC-7 Tool	9120-007T-IP-11291	1
Connector Cable	9120-C-0321208-00-1	1
QC-7 Post Hanger and Rail Adapter Module	9120-TSS-MMH-11392	1

2.1.1 Unpacking the ATI Tool Changer Kit

Upon receipt of a kit, complete the following:

- Check the shipping container and components for damage that may have occurred during shipping. Report damage to ATI Industrial Automation (refer to *page 2*).
- Verify the components from the packing list are included in the kit.

3. Installation

> **WARNING:** Performing maintenance or repair on the Tool Changer when circuits (for example: power, water, and air) are energized could result in death or serious injury. Discharge and verify all energized circuits are de-energized in accordance with the customer's safety practices and policies.

3.1 Installing the Tool Changer to the Robot and End Effector

Refer to the ***Installation*** section in the applicable Tool Changer manual. For installation of the QC-7, refer to the *9620-20-B-7 Series Base Tool Changer with Proximity Sensors* manual.
Installation procedures are also demonstrated in the linked video: *videolink*

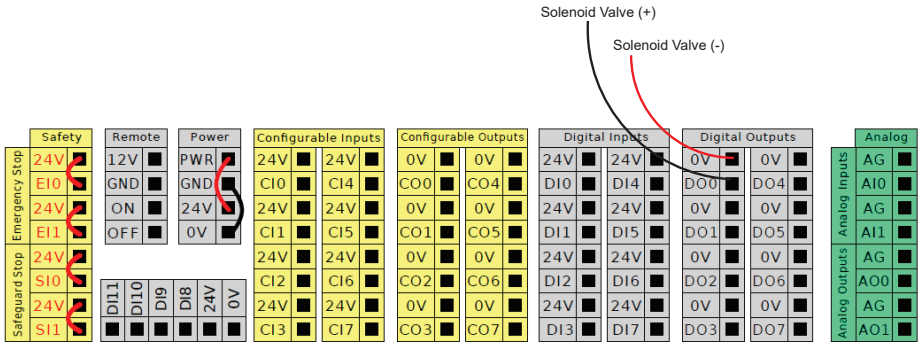
3.2 Installing a Two-Position Solenoid Valve to the UR Control Box

When installing the electrical connections on the two-position solenoid valve from the kit to the electrical interface inside the UR control box, refer to the following instructions (repeat as needed for additional solenoids):

1. Route the black wire (+) on the solenoid valve to the Digital Output Zero (DO0) (refer to *Figure 3.1*).
2. Route the red wire (-) on the solenoid valve to a Zero Volt (0V) output.

> **NOTICE:** In *Figure 3.1*, the black wire (+) is routed to DO0, but the black wire can be routed to any available digital output. Be sure to select the corresponding digital output in the URCap installation settings. Likewise, the red wire (-) can be routed to any of the available 0V outputs.

Figure 3.1—Installation of a Two-Position Solenoid Valve to a UR



4. Setup of the ATI Tool Changer URCap Software

To use an ATI Tool Changer with a URe robot, the user must first install and set up the ATI URCap software on the robot. For more detailed information on the URe teach pendant software functionality such as safety, operation, programing, and URe nomenclature, refer to the *UR Polyscope Manual, Version 5.1.0*. For consistency, URe nomenclature is used in the following procedures.

4.1 Download the ATI Tool Changer URCap Software from the ATI Website

Supplies required: *Computer with web browser and internet access, USB drive*

1. Using a web browser, navigate to *https://www.ati-ia.com/library/download.aspx*.
2. Download the ATI Tool Changer URCap software package **ATIAutoToolChanger**.
3. Save the file to a local drive. (right click on the folder, and select **Export** or **Export All**)
4. Unzip the file.
5. Save the **ATIAutoToolChanger-1.2.0.urcap** file to a portable USB drive.
6. Eject the USB drive.

4.2 Load the ATI Tool Changer URCap Software on the Teach Pendant

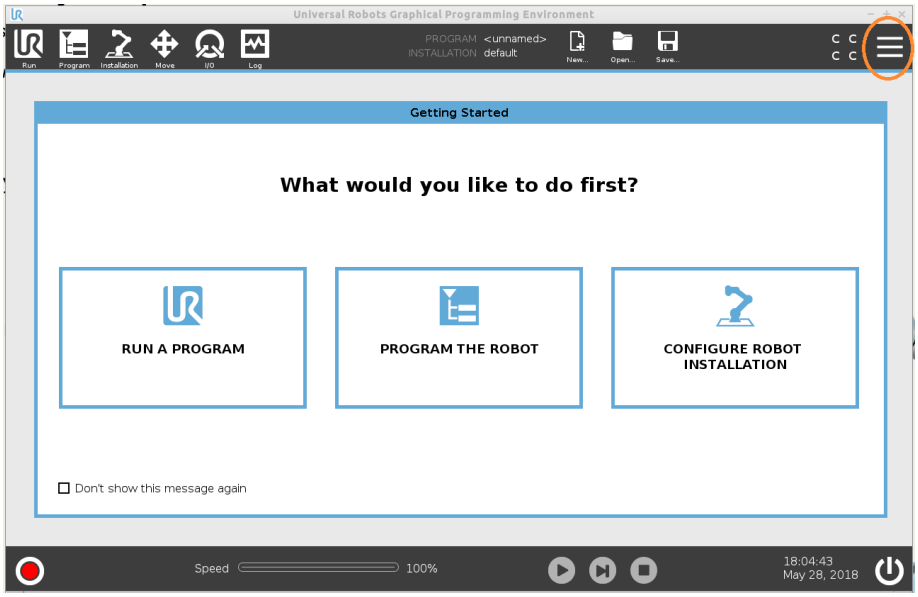
To load the ATI Tool Changer URCap software from the USB drive to the teach pendant, refer to the following steps:

1. Insert a USB drive that contains the ATI Tool Changer URCap package into the USB port on the top of the teach pendant.

Figure 4.1—Insert USB Drive into USB Port on the Teach Pendant

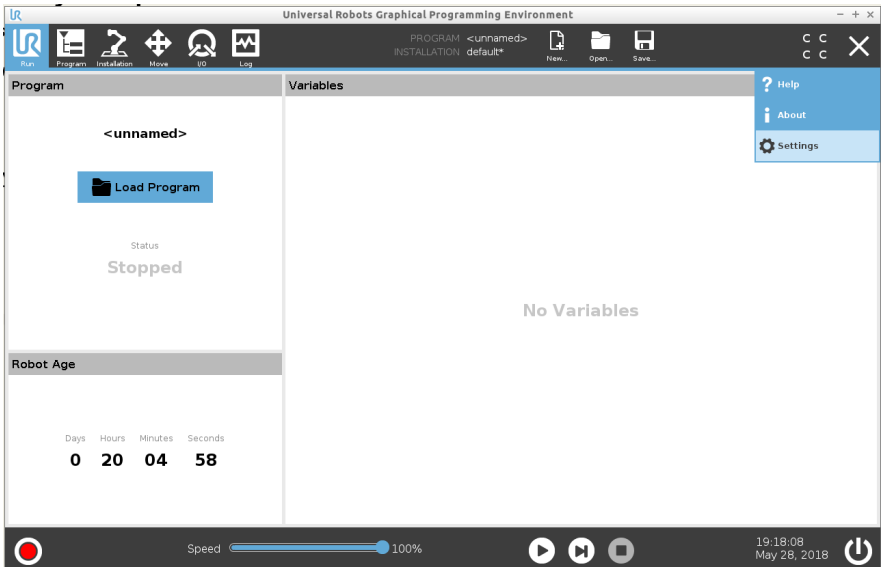
2. Turn on power to the teach pendant. The **Getting Started** screen appears on the teach pendant.
3. In the upper right hand corner of the screen, select the **Hamburger** menu button.

Figure 4.2—Getting Started



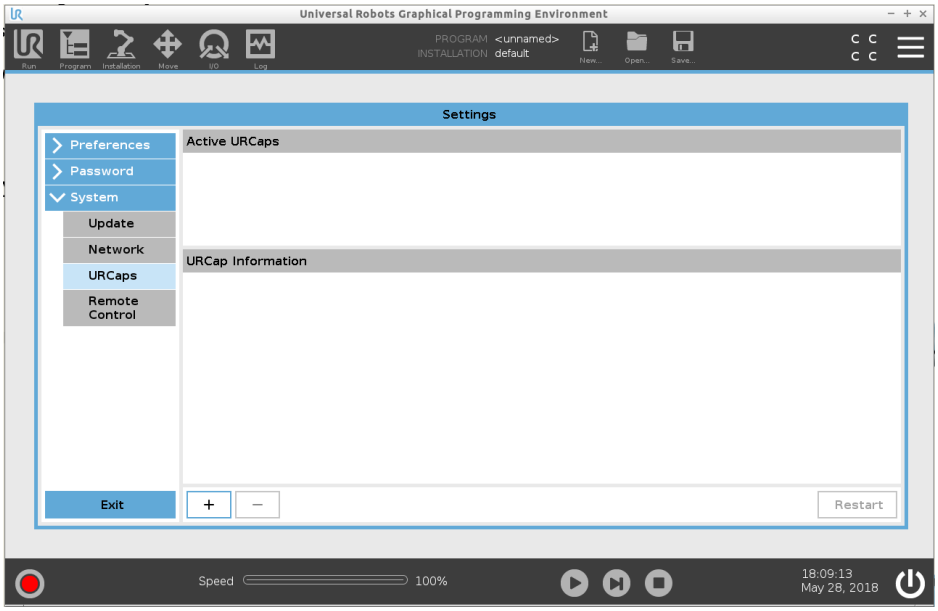
4. From the drop-down menu, select **Settings**.

Figure 4.3—Select Settings



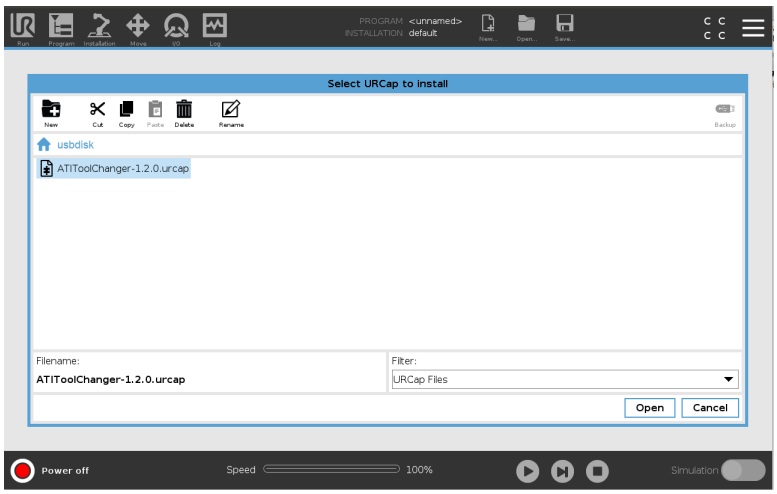
5. The **Settings** window opens. Load the file:
   a. On the left side menu, select the **System** tab.
   b. From the drop-down menu, select **URCap**.
   c. Select the [+] button on the lower left hand of the screen.

Figure 4.4—Settings Window



6. Navigate to the directory where the **ATIAutoToolChanger-1.2.0.urcap** file is saved on the USB drive.
7. Select the file.
8. Click **Open**. The file loads onto the teach pendant.

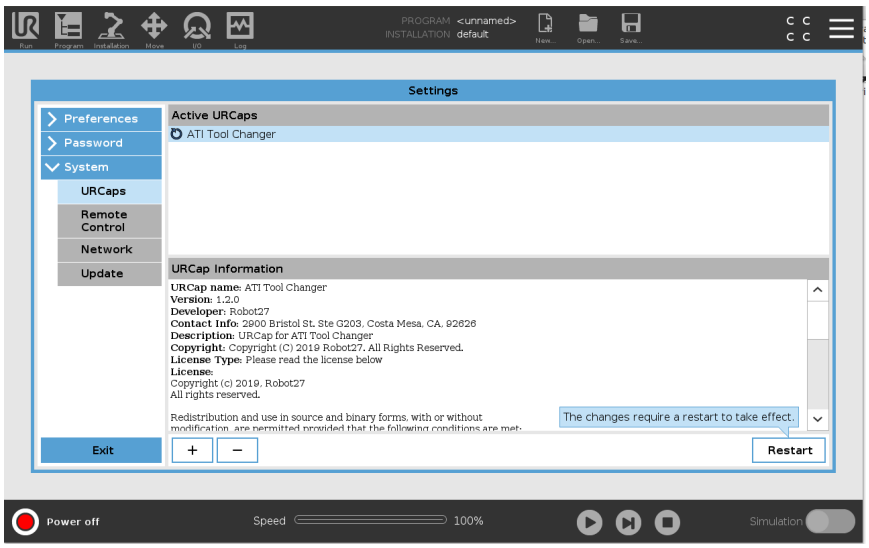
Figure 4.5—Open the File



9. When the file has loaded, the software **ATI Tool Changer** appears in the **Active URCap** field.

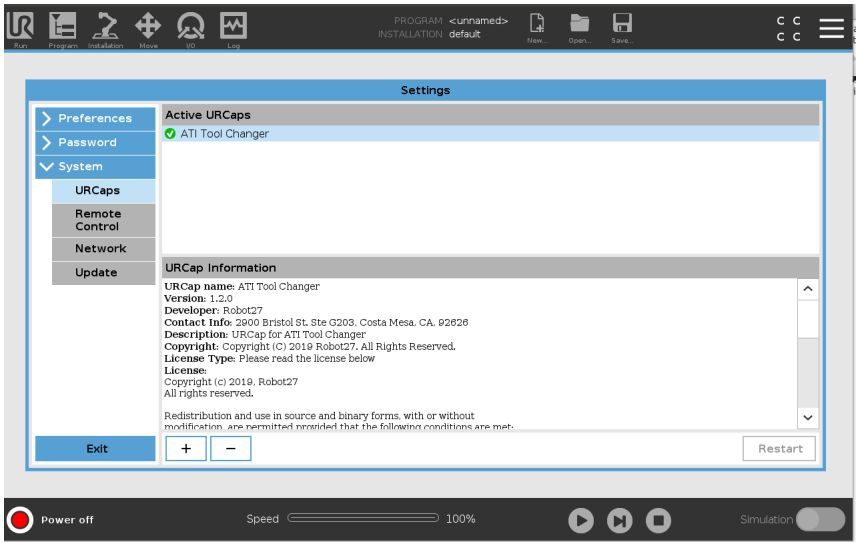
NOTICE: The UR system prompts a reboot of the robot, after the user installs the URCap software. Press the **Restart** button.

Figure 4.6—Active URCap



10. (Optional) Select the software, **ATI Tool Changer** and information appears in the **URCap Information** field.

Figure 4.7—URCap Information Field



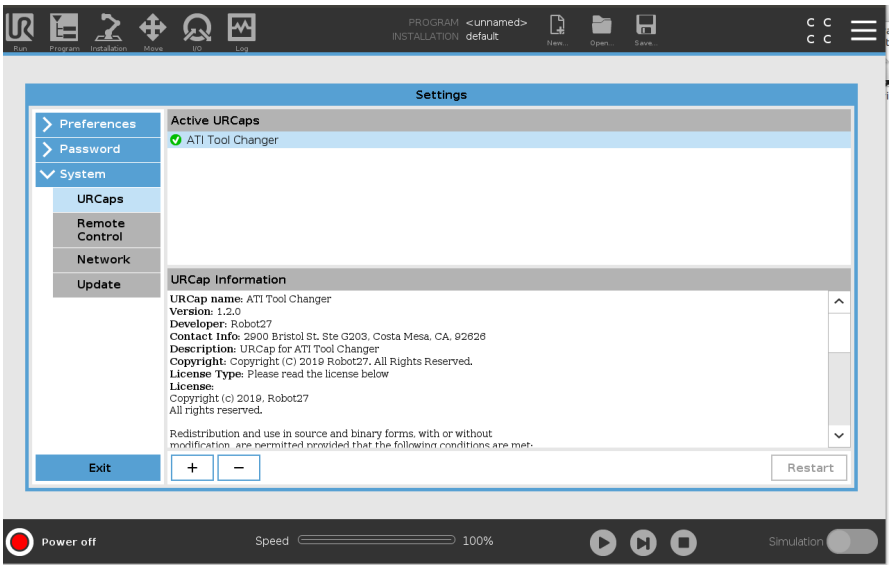
11. Remove the USB drive.
12. The user can now program the Tool Changer on the teach pendent.

4.2.1 Uninstall the ATI URCap Software from the Teach Pendant

Complete the following procedure:

1. In the upper right hand corner of the screen, select the **Hamburger** menu button.
2. From the drop-down menu, select **Settings**.
3. When the **Settings** window opens, select the **Systems** tab.
4. From the drop-down menu, select **URCap**.
5. In the **Active URCap** field, select the file to uninstall from the teach pendant.
6. Click the [−] button on the lower left side of the screen.

Figure 4.8—Active URCap

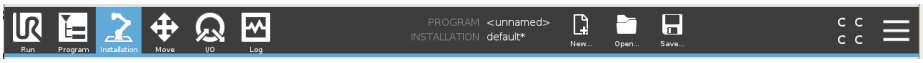


4.3 Set up an ATI Tool Changer on the Teach Pendant

Once the user loads the ATI Tool Changer URCap software on the teach pendant, now the user may set up the ATI Tool Changer on the teach pendant.

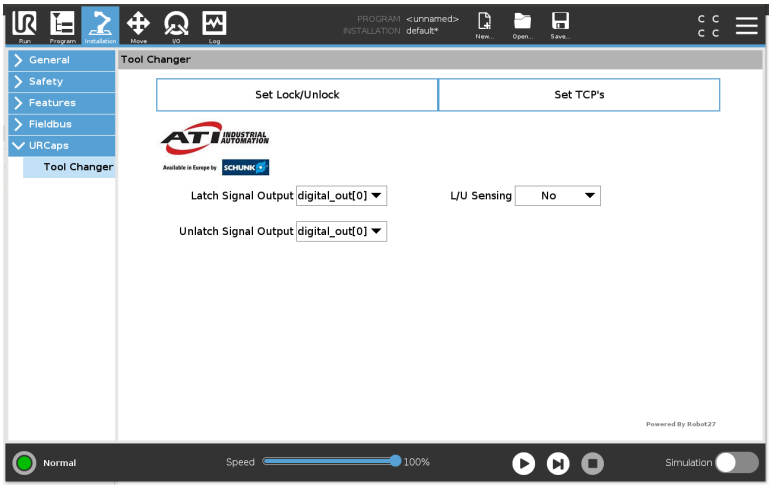
1. In the header, select the **Installation** icon.

Figure 4.9—Installation Icon on the Teach Pendant Header



2. On the left side menu, select the **URCap** tab, and from the drop-down menu, select **Tool Changer**.

Figure 4.10—Set Lock/Unlock



3. Set the settings for the latch and unlatch output and lock and unlock sensors:
   a. Press the **Set Lock/Unlock** button on the **Tool Changer** screen (refer to *Figure 4.10*).
   b. From the **Latch Signal Output** and **Unlatch Signal Output** drop-down menu, select the appropriate input and output that corresponds to the user-determined settings on the **I/O Robot** screen (refer to *Figure 4.12*).
   c. (Optional) Enable lock and unlock sensing:
      i. From the **L/U Sensing** drop-down menu, select **Yes** (refer to *Figure 4.11*).
      ii. From the **Lock Sensor Input** and **Unlock Sensor Input** drop-down menus, select the appropriate input that corresponds to the settings on the **I/O Internal Robot** screen (refer to *Figure 4.12*). Select the **I/O** icon in the header to view and edit the **I/O Internal Robot** screen.

Figure 4.11—Enable Lock and Unlock Sensing

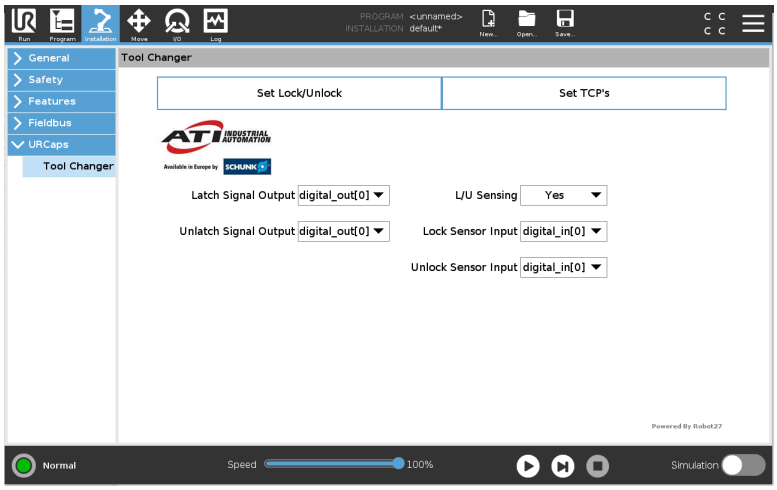
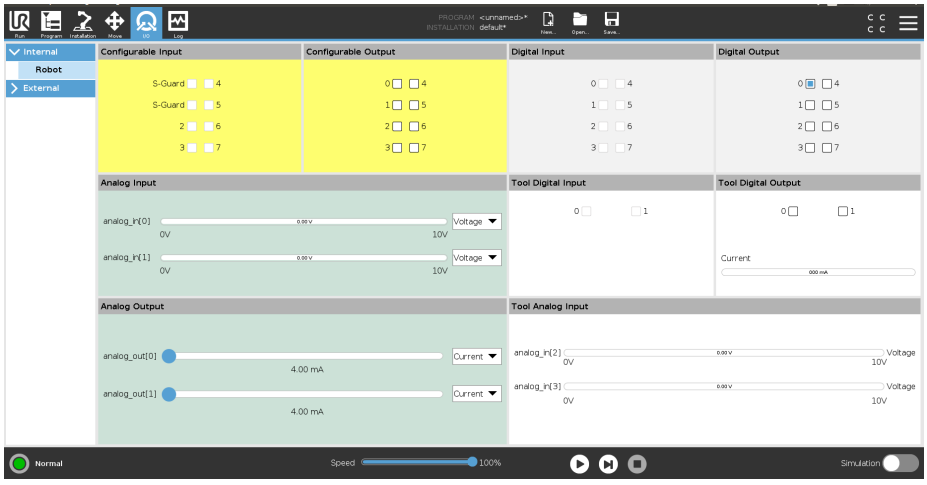


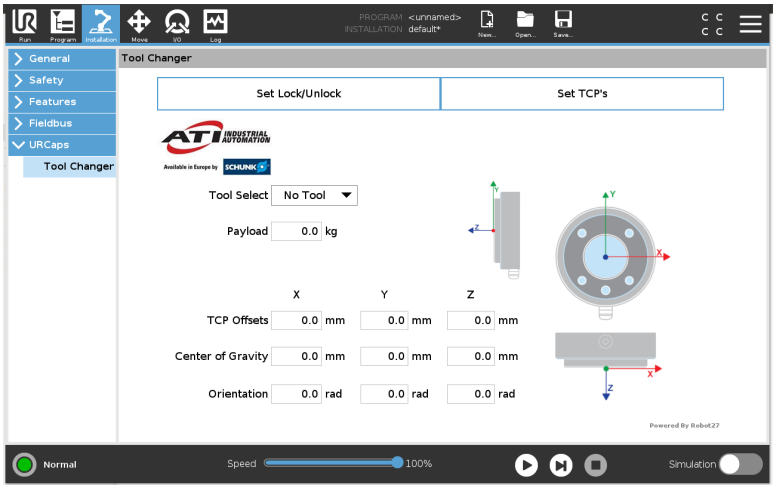
Figure 4.12—I/O Internal Robot Screen



NOTICE: The TCP position, payload, and center of gravity information should include the ATI products (kits) plus the customer tooling. For information about the Tool Changer's specifications such as payload and offsets, refer to the **Operations** and **Specifications** section in the applicable Tool Changer manual. For the QC-7 Tool Changer, refer to the *9620-20-B-7 Series Base Tool Changer with Proximity Sensors* manual.

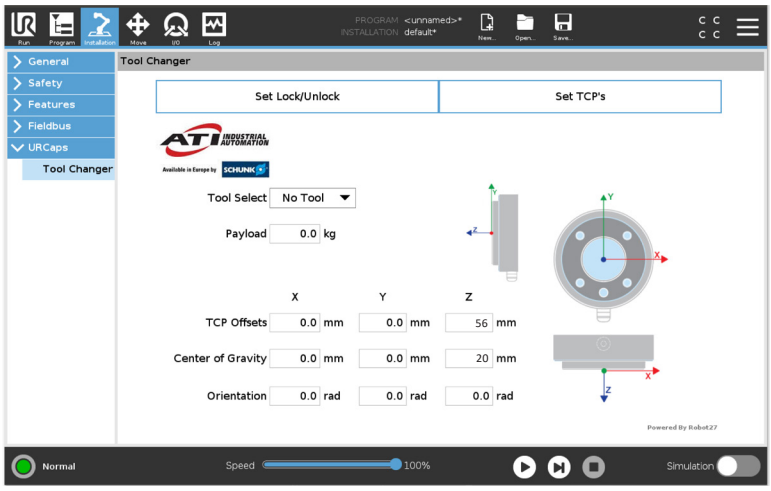
4. Set the Payload, TCP Offsets (Tool Center Point), Center of Gravity, and the Orientation values for each tool within the Tool Select drop-down list.
   a. Select the **Installation** icon on the header, and then select **Tool Changer** from the **URCap** drop-down menu.
   b. Press the **Set TCP's** button on the **Tool Changer** screen.

Figure 4.13—Set TCPs



   c. From the **Tool Select** drop-down menu, choose a tool (save up to ten tool settings).
   d. In the fields, type the appropriate values; for example, a QC-7 Tool Changer without a tool would have the values in the following figure:

Figure 4.14—Set TCPs

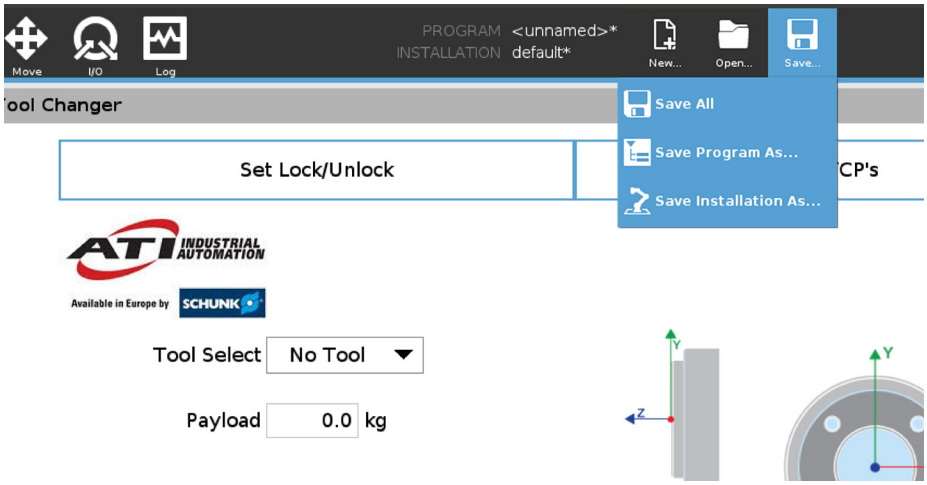


e. When setting values on the Set TCP's screen, for each tool selected from the Tool Select drop-down list the user must consider the entire end-effector configuration, including (where applicable) the entire ATI tool changer kit, the customer's tooling or end-effector, and the work-piece..

5. On the header, select the **Save** icon, and from the drop-down menu, select **Save Installation As**. Save the file.

NOTICE: If the user is editing an existing program, then select **Save All** from the drop-down menu.

Figure 4.15—Save Program



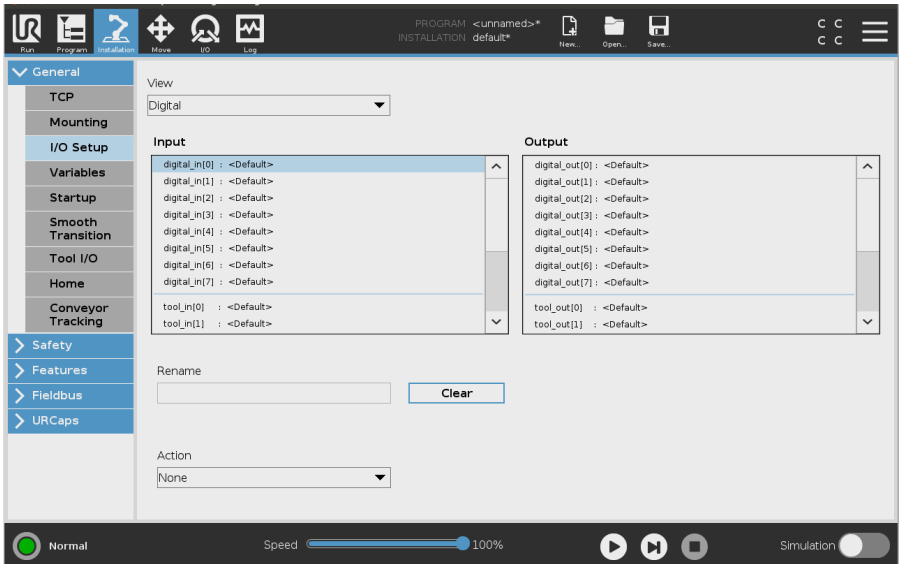
6. Once the Tool Changer and robot are setup, the user can now create a program that includes the ATI Tool Changer URCap.

4.3.1 (Optional) Rename the Default I/O Signals

Users may find it simpler to rename the I/O default signals for easier reference. To rename the defaults, complete the following procedure:

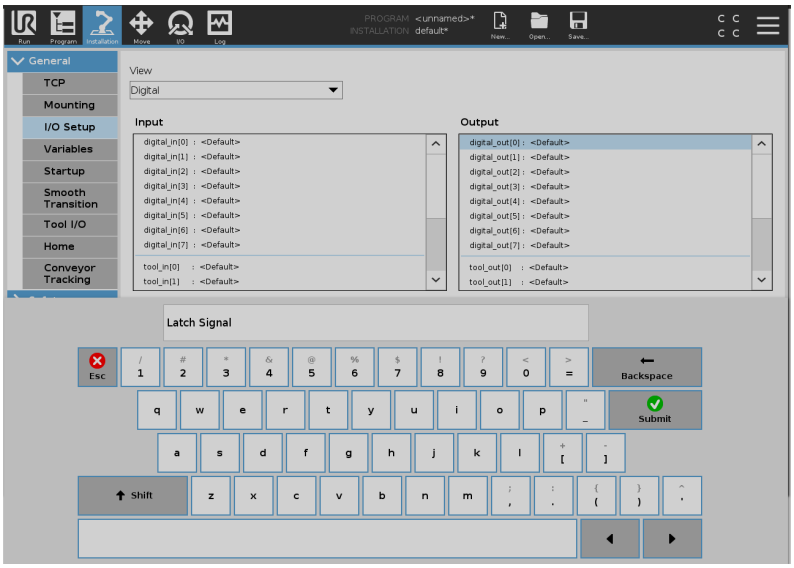
1. Select the **Installation** icon on the header.
2. Select the **General** tab.
3. Select **I/O Setup** from the **General** tab drop-down menu.
4. From the **View** drop-down menu, select **Digital**.
5. Select the signal **Input** or **Output** to rename.

Figure 4.16—I/O Setup



6. Type the new name on the keyboard, and select **Submit**.

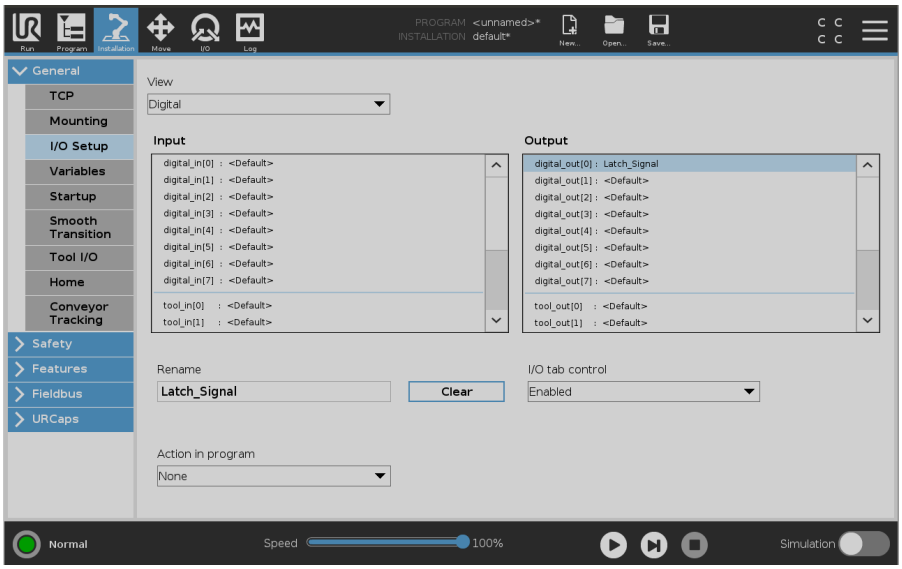
Figure 4.17—Rename the Digital Input and Outputs



7. The renamed **Input** or **Output** signal appears next to the default signal name.
8. Repeat steps *5* and *6* as applicable.

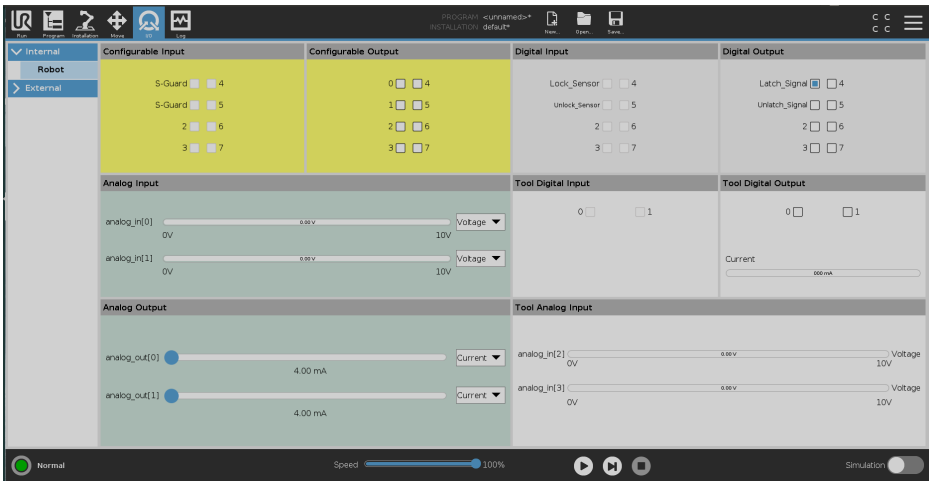
NOTICE: To reset an **Input** or **Output** signal back to the default name, select the renamed signal, and press the **Clear** button.

Figure 4.18—Updated Input and Output



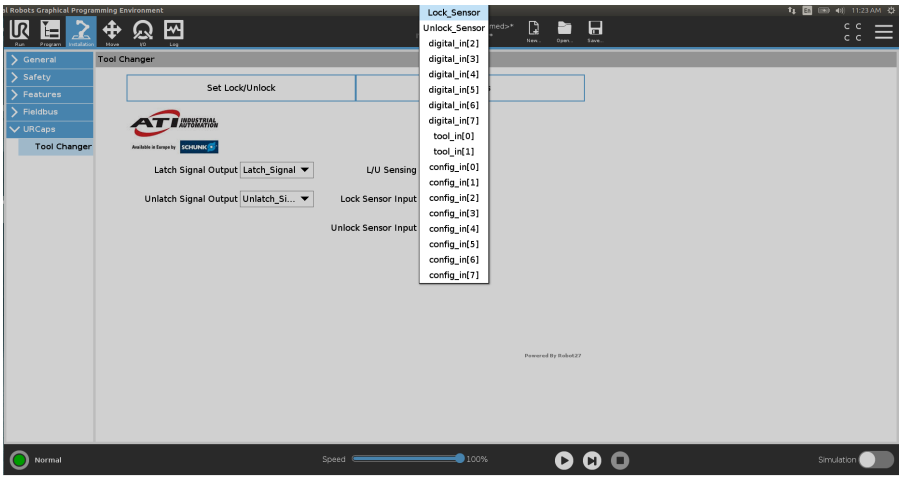
9. Select the **I/O** icon from the header, and note that the renamed **Input** and **Output** signals appear on the **I/O** screen.

Figure 4.19—I/O Screen



10. From **Installation**, select the **URCap** tab.
11. Press the **Set Lock/Unlock** button.
12. From each of the **Input** and **Output** signal drop-down menus, select the applicable renamed signal.

Figure 4.20—ATI URCap Tool Changer Set Lock/Unlock Screen



4.4 Insert an ATI Tool Changer URCap Command in a Program

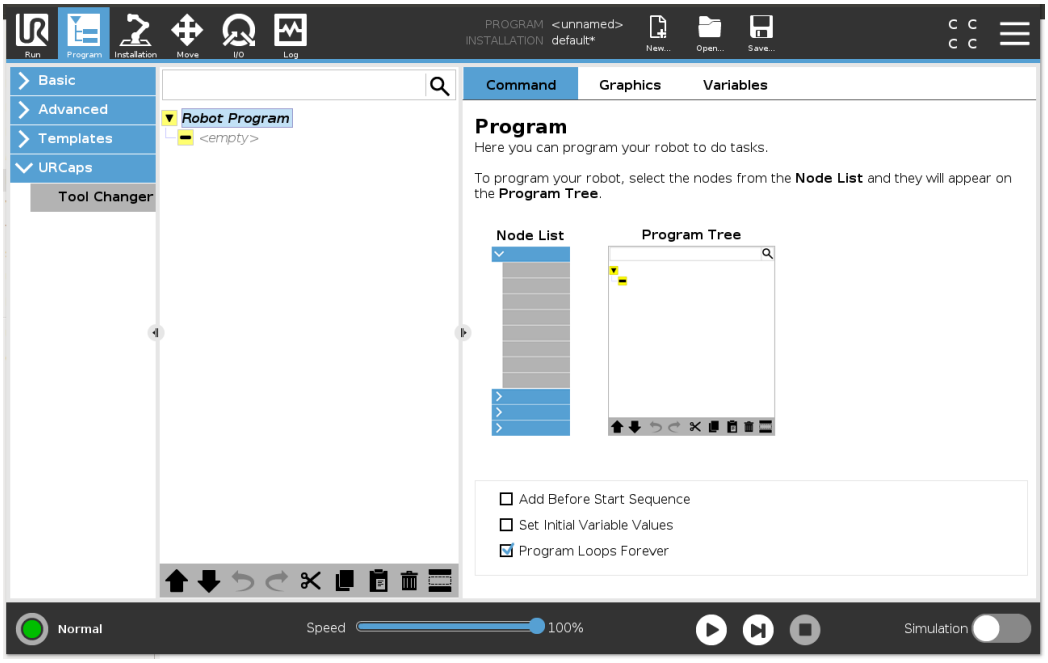
WARNING: Do not insert an ATI URCap command into a program without selecting a Tool's TCP. Otherwise, the Tool could crash, and equipment damage can occur. Before each **Move** and **Waypoint**, select the correct TCP of the Tool. Whenever programming a **Waypoint** that uses a different Tool than the previous **Waypoint**, press the **Change TCP** button of the correct Tool. After setting the **Waypoints**, set each of the **Move** node's TCP back to **Use Active TCP**, and then run the robot program.

NOTICE: For assistance with programing a UR e-series robot, refer to *UR Polyscope Manual, Version 5.1.0*.

Refer to the following procedure:

1. Select the **Robot Program** in the Program Tree.
2. Before any **Move** nodes in the robot program and any **Waypoints**, insert a **Tool Changer** command:
   a. On the **Program** screen, select the **URCap** tab.
   b. From the **URCap** drop-down menu, select **Tool Changer**.

Figure 4.21—URCap Tab: Tool Changer



3. Under the command tab, select the radio button for either **Unlatch** (*Figure 4.22*) or **Latch** (*Figure 4.23*), to insert either an **Unlatch Tool** node or **Latch Tool** node inserts into the Robot Program.

Figure 4.22—Tool Changer: Unlatch Tool

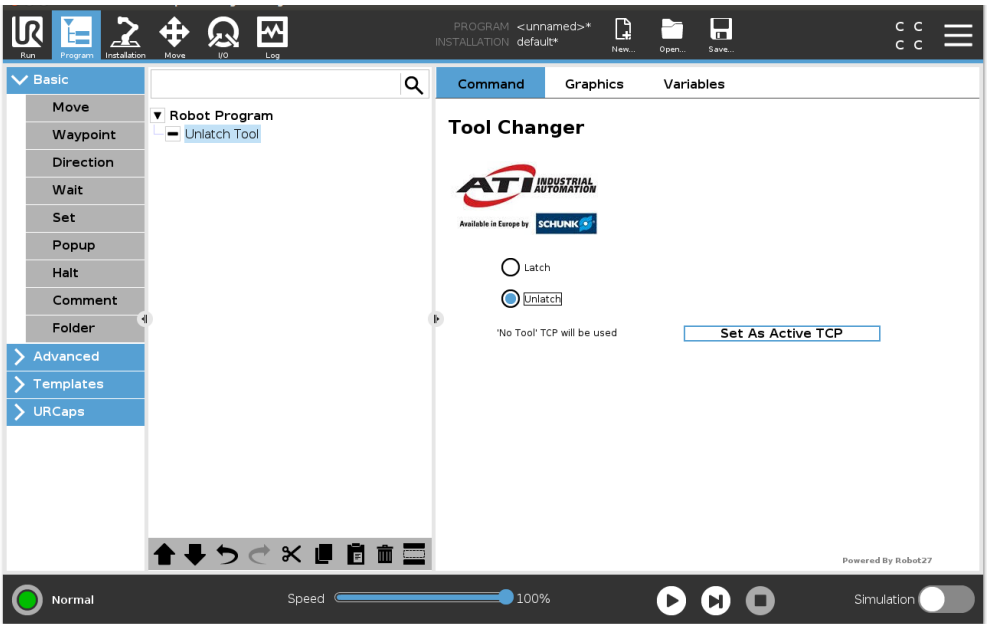
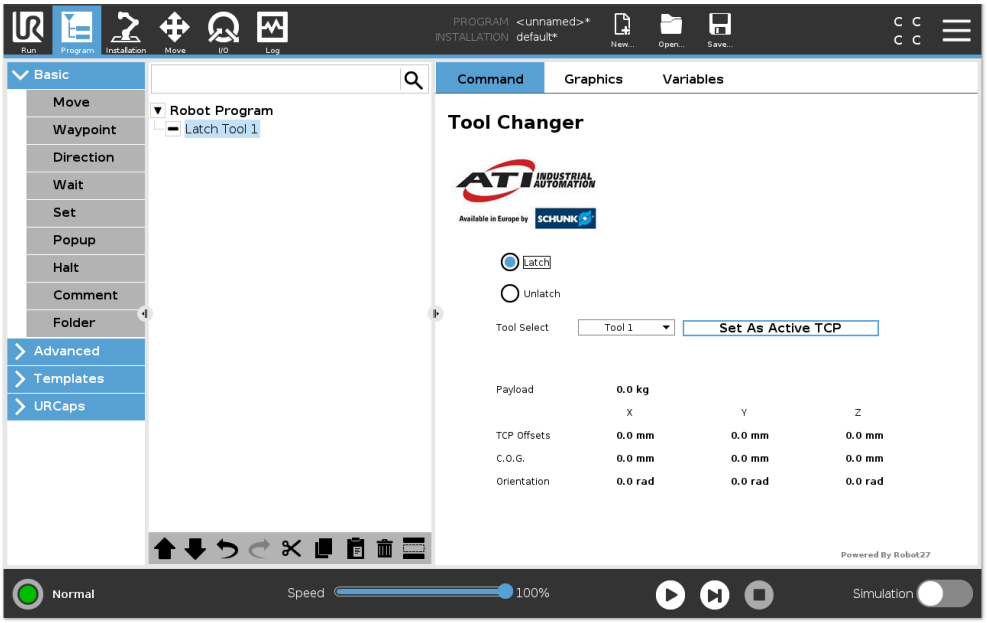
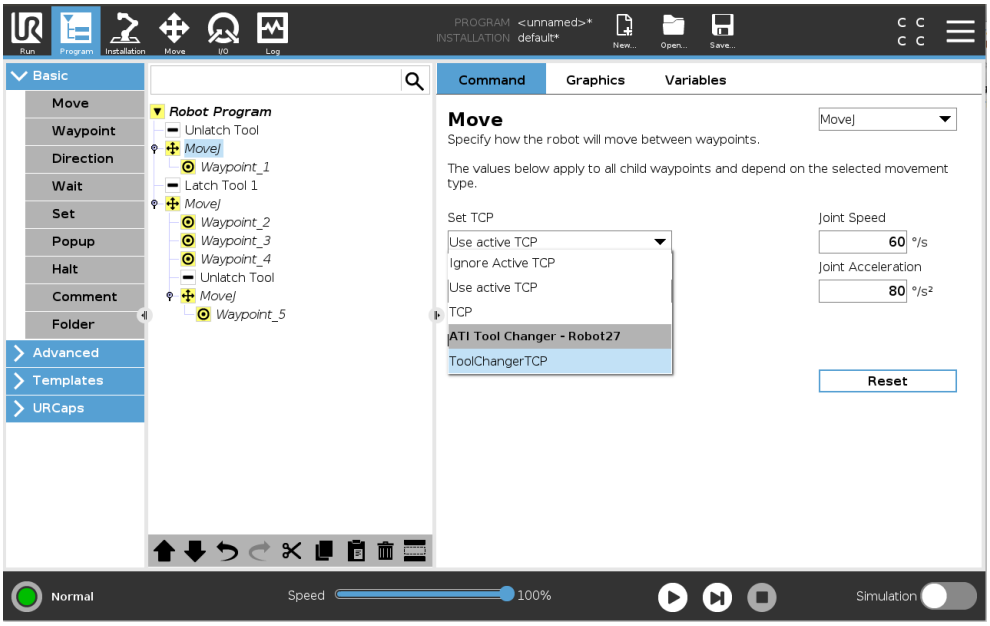


Figure 4.23—Tool Changer: Latch Tool



4. For each **Move** node, set the TCP.
   a. Select the **Move** node.
   b. Under the command tab, select **ToolChangerTCP** from the **Set TCP** drop-down menu.

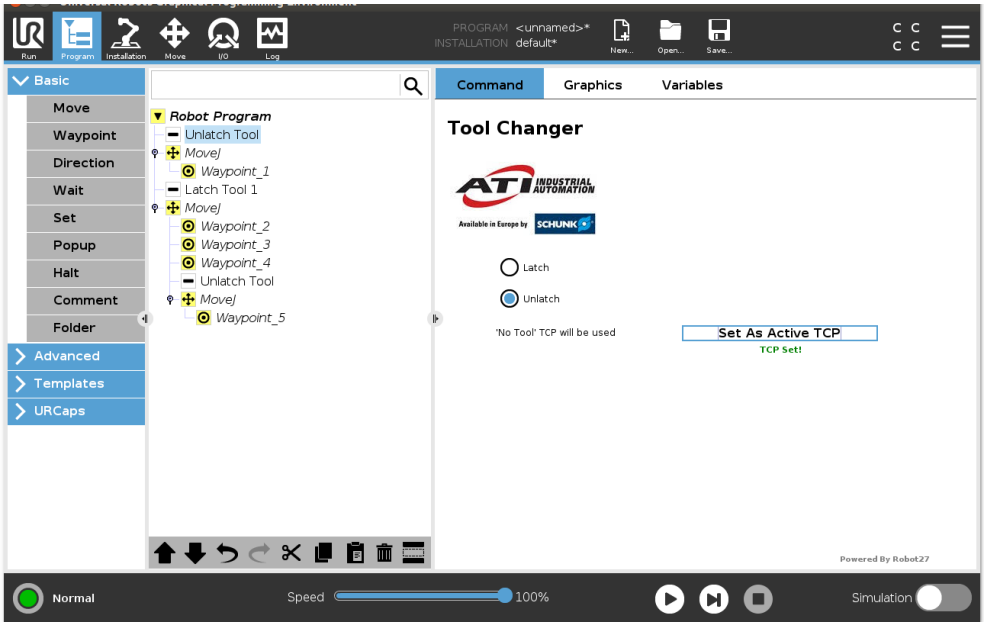
Figure 4.24—Move Node: Set TCP



5. Select each **Unlatch Tool** or **Latch Tool** node before a **Move** node with a **Waypoint** that must be set. Under the command tab for the **Unlatch Tool** or **Latch Tool** node, complete the following:
   a. For a **Latch** node, select the **Command** tab, apply a Tool from the **Tool Select** drop-down menu, and press the **Set As Active TCP** button.
   b. For an **Unlatch** node, select the **Command** tab and press the **Set As Active TCP** button.

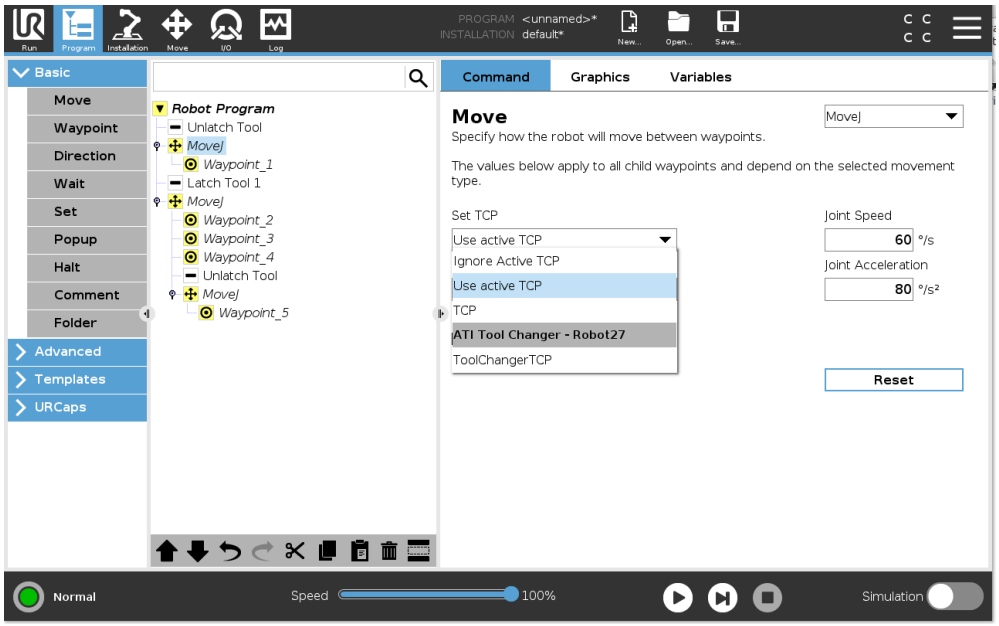
> **NOTICE:** To select **No Tool**, apply an **Unlatch** command from the ATI URCap **Tool Changer** screen. The **Unlatch** command is the same as not selecting any tool. Then press the **Set As Active TCP** button.

Figure 4.25—Confirmation that the Active TCP is Set



6. Set each **Waypoint** as suitable for the application.
7. After all **Move** and **Waypoints** commands for the **Unlatch Tool** or **Latch Tool** nodes are set, then the TCP setting for the **Move** nodes can be reset to **Use Active TCP**.
   a. Select the **Move** node for a **Unlatch Tool** or **Latch Tool** node.
   b. Under the **Command** tab for the **Move** node, select **Use active TCP** from the **Set TCP** drop-down menu.
   c. Repeat steps *a* and *b* for each **Move** node that corresponds to a **Unlatch Tool** or **Latch Tool** node.

Figure 4.26—Move Node: Set TCP



8. Implementing the ATI URCap software in the robot program is complete. To save the robot program, select the **Save** icon from the header.

5. Troubleshooting the ATI URCap Software

This section includes answers to some issues that might arise when setting up and using the ATI UPCaps software with an ATI Tool Changer. In the following section, the question or problem is listed on the left followed by the plausible solution to the right.

The information in this section should answer many questions that might arise in the field. Customer service is available to users who have problems or questions addressed in the manuals.

> Note
>
> Please read the manual before calling customer service and have the following information available:
>
> 1. Tool Changer model (for example: QC-7 or 9120-COB-UR-007-01)
> 2. Accurate and complete description of the question or problem
> 3. Computer and software information (operating system, PC type, drivers, application software, and other relevant information about the application's configuration)
>
> Be near the system when calling (if possible).

For additional troubleshooting assistance or to speak with a customer service representative, please contact ATI:

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5.1 Errors with the ATI URCap Software

Basic problems and possible answers/solutions for the operation of the ATI URCap software are listed in the following table:

Table 5.1—Errors with the ATI URCap Software

Problem	Answer/Solution
The robot program ignores the Latch and/or Unlatch commands.	Verify the URCap settings correctly respond to the I/O screen (refer to *Section 4.3—Set up an ATI Tool Changer on the Teach Pendant*).
While running the program the error message "Tool Changer could not detect a lock or unlock signal" appears and haults the program.	The lock or unlock sensors are not operational. Verify the sensor inputs and outputs are correct (refer to *Section 4.3—Set up an ATI Tool Changer on the Teach Pendant*). Verify the sensors are correctly installed and functional; Refer to the applicable Tool Changer manual. For the QC-7 Tool Changer, refer to the *9620-20-B-7 Series Base Tool Changer with Proximity Sensors* manual. When the error message appears, the user has the option to press the Stop Program or Continue button. If the user believes the sensors should be operational, the best course of action is to stop the program and follow the preceeding verifications. If the user did not intend for the sensors to be operational, change the Installation setup for the **URCap Tool Changer Set Lock/Unlock** / **L/U Sensing** drop-down menu to **No** (refer to *Section 4.3—Set up an ATI Tool Changer on the Teach Pendant*).
The robot program is not correctly switching tools or ignores the ATI URCap software.	Verify the ATI URCap is correctly programmed into the Robot program (refer to *Section 4.4—Insert an ATI Tool Changer URCap Command in a Program*).
The ATI Tool Changer is malfunctioning.	Refer to the applicable Tool Changer manual. For the QC-7 Tool Changer, refer to the *9620-20-B-7 Series Base Tool Changer with Proximity Sensors* manual.

6. Terms and Conditions of Sale

The following Terms and Conditions are a supplement to and include a portion of ATI's Standard Terms and Conditions, which are on file at ATI and available upon request.

ATI warrants to Purchaser that robotic Tool Changer products purchased hereunder will be free from defects in material and workmanship under normal use for a period of three (3) years from the date of shipment. The warranty period for repairs made under a RMA shall be for the duration of the original warranty, or ninety (90) days from the date of repaired product shipment, whichever is longer. ATI will have no liability under this warranty unless: (a) ATI is given written notice of the claimed defect and a description thereof within thirty (30) days after Purchaser discovers the defect and in any event not later than the last day of the warranty period; and (b) the defective item is received by ATI not later ten (10) days after the last day of the warranty period. ATI's entire liability and Purchaser's sole remedy under this warranty is limited to repair or replacement, at ATI's election, of the defective part or item or, at ATI's election, refund of the price paid for the item. The foregoing warranty does not apply to any defect or failure resulting from improper installation, operation, maintenance or repair by anyone other than ATI.

ATI will in no event be liable for incidental, consequential or special damages of any kind, even if ATI has been advised of the possibility of such damages. ATI's aggregate liability will in no event exceed the amount paid by purchaser for the item which is the subject of claim or dispute. ATI will have no liability of any kind for failure of any equipment or other items not supplied by ATI.

No action against ATI, regardless of form, arising out of or in any way connected with products or services supplied hereunder may be brought more than one (1) year after the cause of action accrued.

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