15. Maintenance and Repair

Description

Perform any inspection in compliance with all safety instructions in this manual and according with local requirements.
Conduct all maintenance, inspection, calibration and repair work according to the latest version of Service Manual on the documentation website: http://www.universal-robots.com/manuals
Repair work should only be done by Universal Robots. Client designated, trained individuals can do repair work, provided they follow the Service Manual. See the Service Manual: Chapter 5 for full inspection plan for trained individuals
All parts returned to Universal Robots shall be returned according to terms in the Service Manual.

Safety for Maintenance

After maintenance and repair work, checks must be done to ensure the required safety level. Checks must adhere to valid national or regional work safety regulations. The correct functioning of all safety functions shall also be tested.
The purpose of maintenance and repair work is to ensure that the system is kept operational or, in the event of a fault, to return the system to an operational state. Repair work includes troubleshooting in addition to the actual repair itself.
When working on the robot arm or control box, you must observe the procedures and warnings below.

Warning

WARNING

Failure to adhere to any of the safety practices, listed below, can result in injury.

- Unplug the main power cable from the bottom of the Control Box to ensure that it is completely unpowered. Power off any other source of energy connected to the robot arm or Control Box. Take necessary precautions to prevent other persons from powering on the system during the repair period.
- Check the earth connection before re-powering the system.
- Observe ESD regulations when parts of the robot arm or Control Box are disassembled.
- Prevent water and dust from entering the robot arm or Control Box.

Warning: Electricity

WARNING: ELECTRICITY

Disassembling the Control Box power supply too quickly after switching off, can result in injury due to electrical hazards.

- Avoid disassembling the power supply inside the Control Box, as high voltages (up to 600 V) can be present inside these power supplies for several hours after the Control Box has been switched off.

15.1. Testing Stopping Performance

Description

Test periodically to determine if stopping performance is degraded. Increased stopping times can require safeguarding to be modified, possibly with changes to the installation. If stop time and/or stop distance safety functions are used and are the basis of the risk reduction strategy, no monitoring or testing of stopping performance is required. The robot does continuous monitoring.

15.2. Robot Arm Cleaning and Inspection

Description

As part of regular maintenance the robot arm can be cleaned, in accordance with the recommendations in this manual and local requirements.

Cleaning Methods

To address the dust, dirt, or oil on the robot arm and/or Teach Pendant, simply use a cloth alongside one of the cleaning agents provided below.

Surface Preparation: Before applying the below solutions, surfaces may need to be prepared by removing any loose dirt or debris.

Cleaning agents:

- Water
- 70% Isopropyl alcohol
- 10% Ethanol alcohol
- 10% Naphtha (Use to remove grease.)

Application: The solution is typically applied to the surface that needs cleaning using a spray bottle, brush, sponge, or cloth. It can be applied directly or diluted further depending on the level of contamination and the type of surface being cleaned.
Agitation: For stubborn stains or heavily soiled areas, the solution may be agitated using a brush, scrubber, or other mechanical means to help loosen the contaminants.
Dwell Time: If necessary, the solution is allowed to dwell on the surface for a up to 5 minutes to penetrate and dissolve the contaminants effectively.
Rinsing: After the dwell time, the surface is typically rinsed thoroughly with water to remove the dissolved contaminants and any remaining cleaning agent residue. It's essential to ensure thorough rinsing to prevent any residue from causing damage or posing a safety hazard.
Drying: Finally, the cleaned surface may be left to air dry or dried using towels.

WARNING

DO NOT USE BLEACH in any diluted cleaning solution.

WARNING

Grease is an irritant and can cause an allergic reaction. Contact, inhalation or ingestion can cause illness or injury. To prevent illness or injury, adhere to the following:

- PREPARATION:
  - Ensure that the area is well ventilated.
  - Have no food or beverages around the robot and cleaning agents.
  - Ensure that an eye wash station is nearby.
  - Gather the required PPE (gloves, eye protection)
- WEAR :
  - Protective gloves: Oil resistant gloves (Nitrile) impermeable and resistant to product.
  - Eye protection is recommended to prevent accidental contact of grease with eyes.
- DO NOT INGEST.
- In the event of
  - contact with skin, wash with water and a mild cleaning agent
  - a skin reaction, get medical attention
  - contact with the eyes, use an eyewash station, get medical attention.
  - inhalation of vapors or ingestion of grease, get medical attention
- After grease work
  - clean contaminated work surfaces.
  - dispose responsibly of any used rags or paper used for cleaning.
- Contact with children and animals is prohibited.

Robot Arm Inspection Plan

The table below is a checklist of the type of inspections recommended by Universal Robots. Perform inspections regularly as advised in the table. Any referenced parts found to be in an unacceptable state must be rectified or replaced.

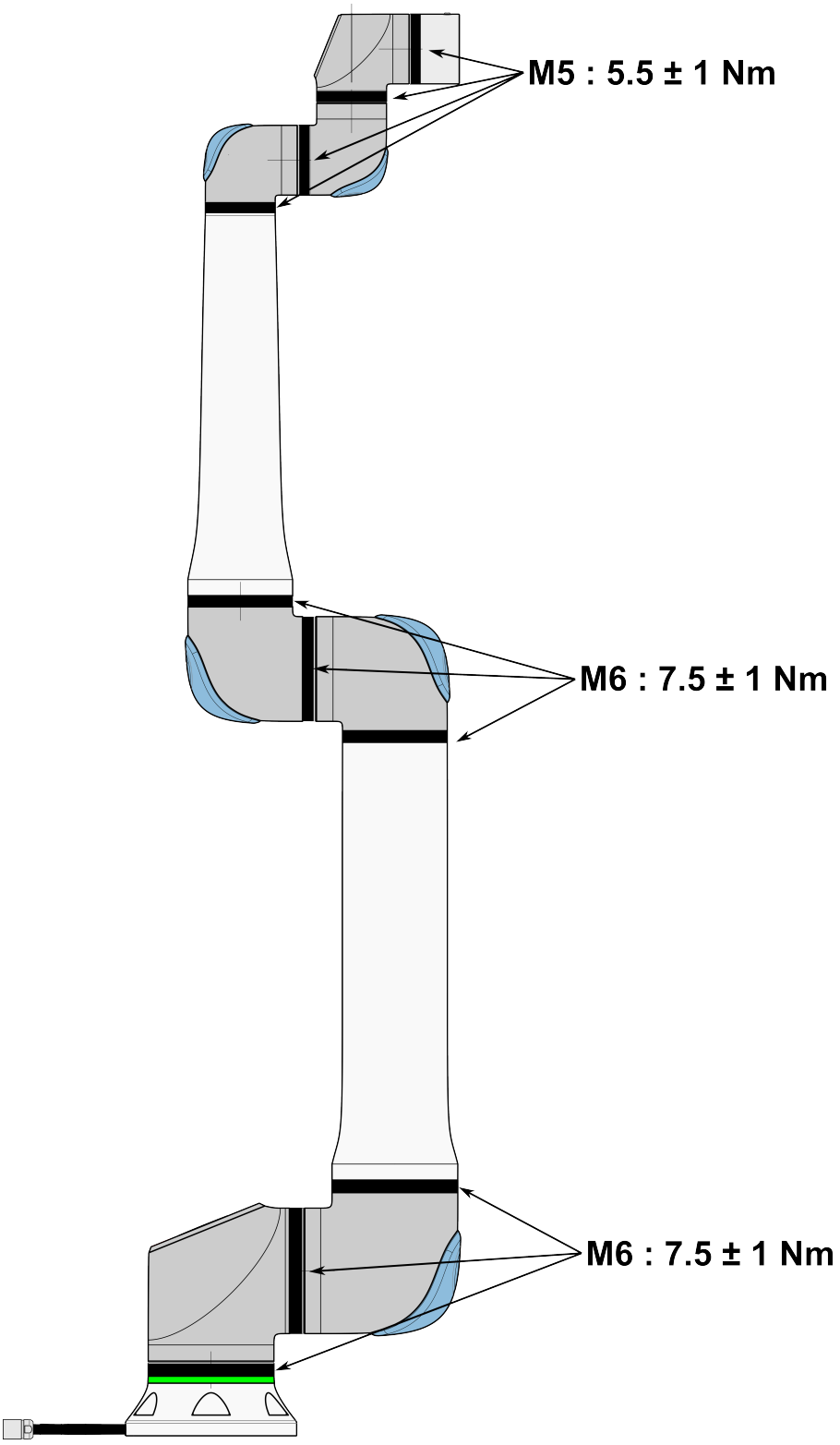
Inspection action type			Timeframe		
			Monthly	Biannually	Annually
1	Check flat rings	V		✗	
2	Check robot cable	V		✗	
3	Check robot cable connection	V		✗	
4	Check Robot Arm mounting bolts *	F	✗		
5	Check Tool mounting bolts *	F	✗		
6	Round Sling	F			✗

Robot Arm Inspection Plan

NOTICE

Using compressed air to clean the robot arm can damage the robot arm components.

- Never use compressed air to clean the robot arm.



Robot Arm Inspection Plan

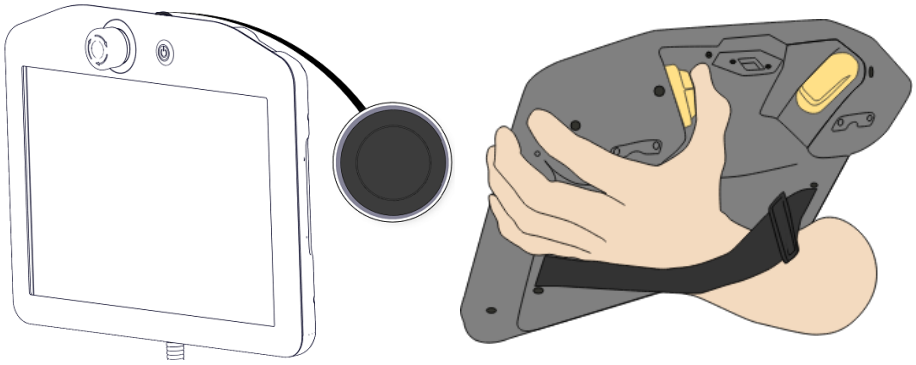
1. Move the Robot Arm to ZERO position, if possible.
2. Turn off and disconnect the power cable from Control Box.
3. Inspect the cable between Control Box and Robot Arm for any damage.
4. Check the base mounting bolts are properly tightened.
5. Check the tool flange bolts are properly tightened.
6. Inspect the flat rings for wear and damage.
   - Replace the flat rings if they are worn out or damaged.

NOTICE

If any damage is observed on a robot within the warranty period, contact the distributor where the robot was purchased.

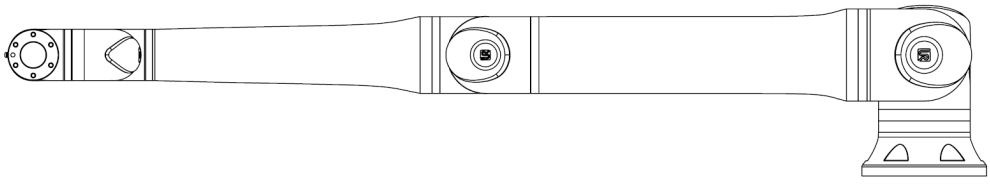
Inspection

1. Unmount any tool/s or attachment/s or set the TCP/Payload/CoG according to tool specifications.
2. To move the robot arm in Freedrive:
   - On a 3PE Teach Pendant, rapidly light-press, release, light-press again and keep holding the 3PE button in this position.



Power button 3PE button

3. Pull/Push the robot to a horizontally elongated position and release.

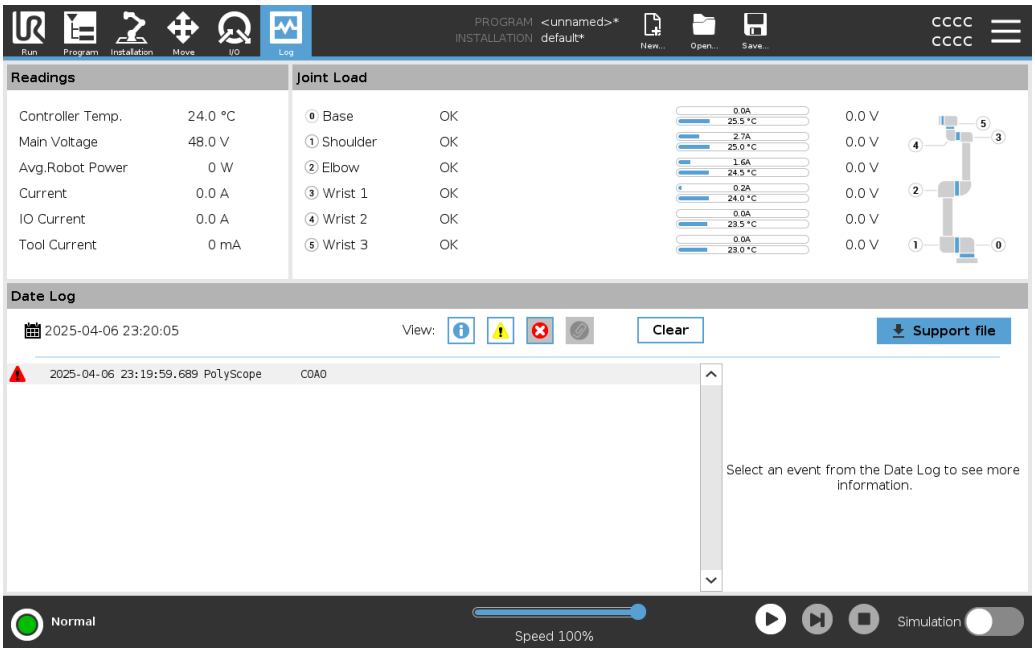


4. Verify the robot arm can maintain the position without support and without activating Freedrive.

15.3. Log Tab

Description

The **Log** tab displays information about the robot arm and Control Box.



Readings and Joint Load

The Readings pane displays Control Box information. The Joint Load pane displays information for each robot arm joint.
Each joint displays:

- Temperature
- Load
- Status
- Voltage

Date Log

The first column displays log entries, categorized by the severity. The second column shows a paperclip if there is an Error Report associated with the log entry. The next two columns display the messages' time of arrival and the source of the message. The last column shows a short description of the message itself.
Some log messages are designed to provide more information that is displayed on the right side, after selecting the log entry.

Message Severity

You can filter messages by selecting the toggle buttons that correspond to the severity of the log entry or by whether an attachment is present. The following table describes message severity.

	Provides general information, such as status of a program, changes of the controller and controller version.
	Issues that may have occurred but the system was able to recover.
	A violation occurs if the safety limit is exceeded. This causes the robot to perform a safety rated stop.
	A fault occurs if there is an unrecoverable error in the system. This causes the robot to perform a safety rated stop.

When you select a log entry, additional information appears on the right side of the screen. Selecting the attachments filter either displays entry attachments exclusively or, displays all entries.

Saving Error Reports

A detailed status report is available when a paper clip icon appears on the log line.

NOTICE

The oldest report is deleted when a new one is generated. Only the five most recent reports are stored.

1. Select a log line and tap the Save Report button to save the report to a USB drive.

   You can save the report while a program is running.

You can track and export the following list of errors:

- Emergency stop
- Fault
- Internal PolyScope exceptions
- [1]Robot Stop
- Unhandled exception in URCap
- Violation

The exported report contains: a user program, a history log, an installation and a list of running services.

[1]Robot stop was previously known as "Protective Stop" for Universal Robots robots.

Technical Support File

The report file contains information that is helpful to diagnose and reproduce issues. The file contains records of previous robot failures, as well as current robot configurations, programs and installations. The report file can be saved to external USB drive. On the Log screen, tap **Support file** and follow the on-screen instructions to access the function.

NOTICE

The export process can take up to 10 minutes depending on USB drive speed and the size of files collected from robot file system. The report is saved as a regular zip file, that is not password protected, and can be edited before sending to technical support.

15.4. Program and Installation Manager

Description

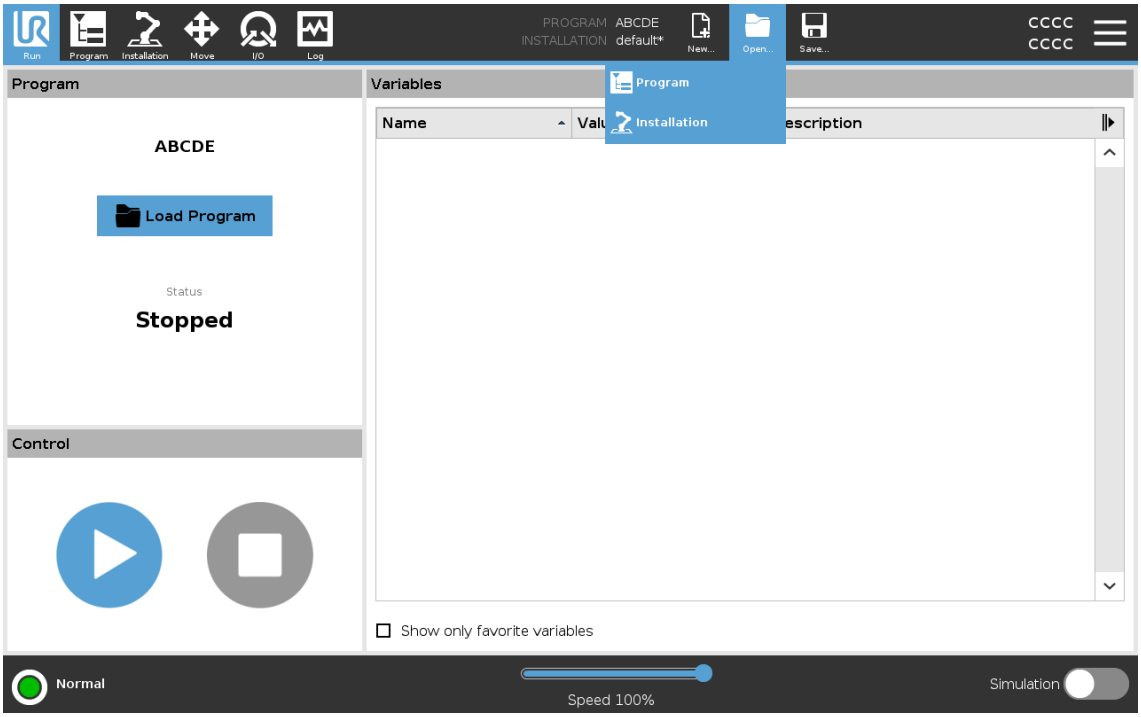
The Program and Installation Manager refers to three icons that allow you to create, load and configure Programs and Installations:

- **New...** Allows you to create a new Program and/or Installation.
- **Open...** Allows you to load a Program and/or Installation.
- **Save...** Offers saving options for a Program and/or Installation.

The File Path displays your current loaded Program name and the type of Installation. File Path changes when you create or load a new Program or Installation.
You can have several installation files for a robot. Programs created load and use the active installation automatically.

To load a program

1. In the Program and Installation Manager, tap **Open...** and select Program.
2. On the Load Program screen, select an existing program and tap Open.
3. In the File Path, verify that the desired program name is displayed.

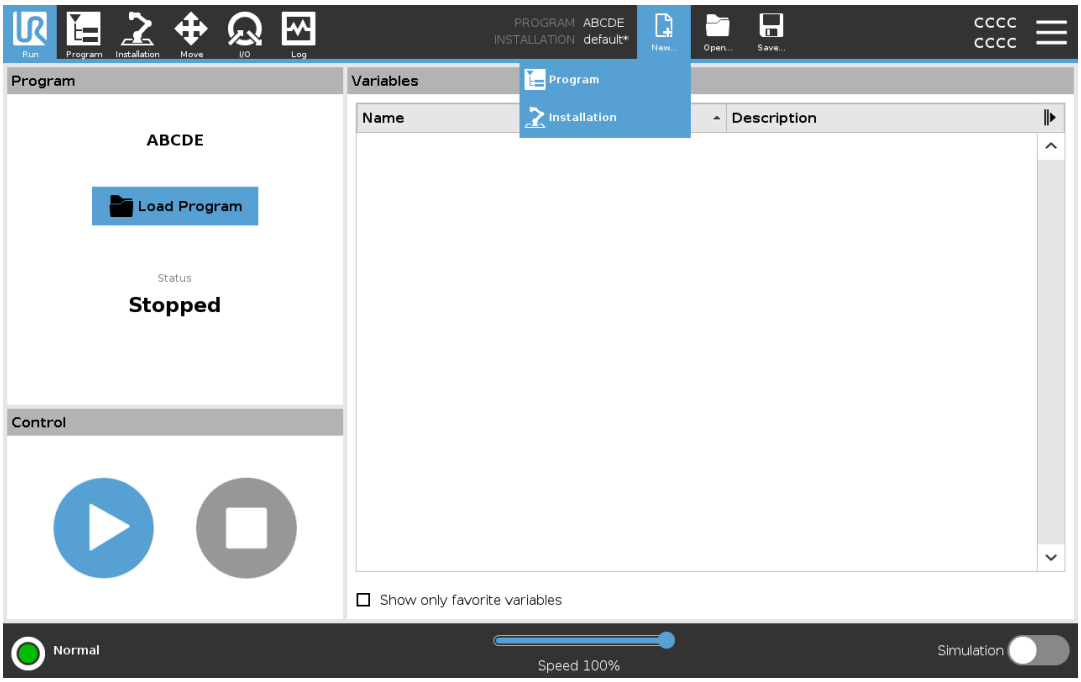


To load an installation

1. In the Program and Installation Manager, tap **Open...** and select Installation.
2. On the Load Robot Installation screen, select an existing installation and tap Open.
3. In the Safety Configuration box, select Apply and restart to prompt robot reboot.
4. Select Set Installation to set installation for the current Program.
5. In the File Path, verify that the desired installation name is displayed.

To create a new program

1. In the Program and Installation Manager, tap **New...** and select Program.
2. On the Program screen, configure your new program as desired.
3. In the Program and Installation Manager, tap **Save...** and select Save All or Save Program As...
4. On the Save Program As screen, assign a file name and tap Save.
5. In the File Path, verify that the new program name is displayed.



To create a new installation

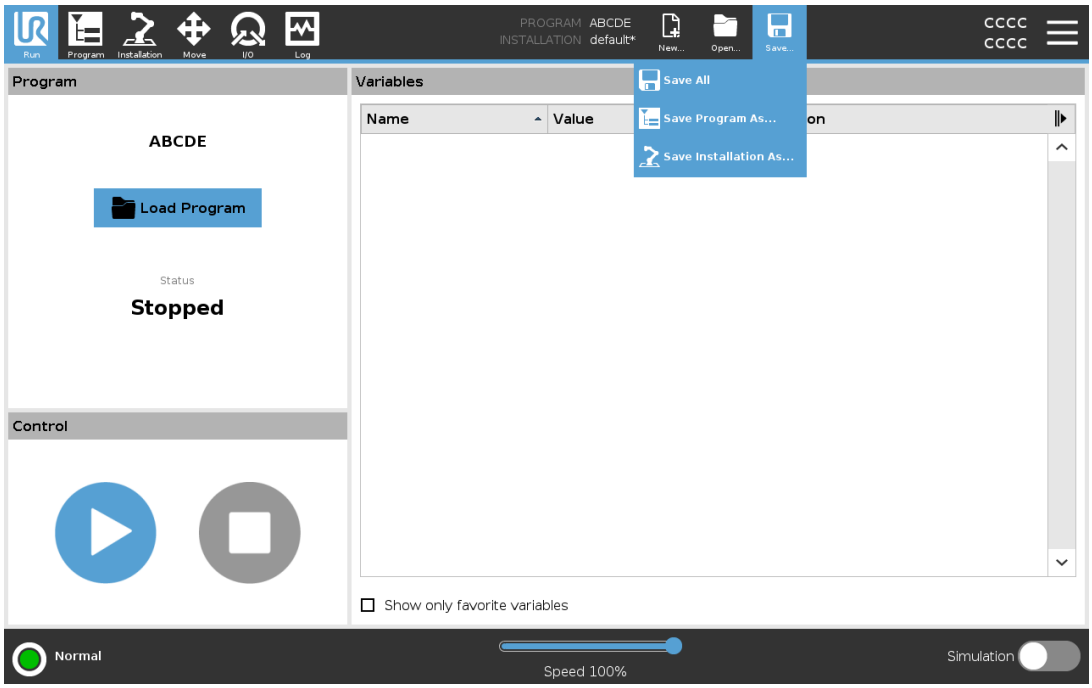
Save your installation for use after powering down the robot.

1. In the Program and Installation Manager, tap **New...** and select Installation.
2. Tap Confirm Safety Configuration.
3. On the Installation screen, configure your new installation as desired.
4. In the Program and Installation Manager, tap **Save...** and select Save Installation As...
5. On the Save Robot Installation screen, assign a file name and tap Save.
6. Select Set Installation to set installation for the current Program.
7. In File Path, verify that the new installation name is displayed.

To use the save options

Save... Depending on the program/installation you load-create, you can:

- **Save All** to save the current Program and Installation immediately, without the system prompting to save to a different location or different name. If no changes are made to the Program or Installation, the Save All... button appears deactivated.
- **Save Program As...** to change the new Program name and location. The current Installation is also saved, with the existing name and location.
- **Save Installation As...** to change the new Installation name and location. The current Program is saved, with the existing name and location.



15.5. Accessing Robot Data

Description

Use the About option to access and display different types of data about the robot. You can display the following types of robot data:

- General
- Version
- Legal

To display data about the robot

1. In the Header, tap the **Hamburger** menu.
2. Select **About**.
3. Tap **General** to access the robot's software version, network settings and serial number.

   For the other data types you can:

   - Tap **Version** to display more detailed data about the robot's software version.
   - Tap **Legal** to display data about the robot's software license/s.
4. Tap **Close** to return to your screen.