ROBOTICS

Operating manual

Robot Control Mate

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Operating manual

Robot Control Mate

RobotWare 7.2

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Original instructions.

Table of contents

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Overview of this manual

About this manual

This manual contains basic instructions for OmniCore based robot systems using the Robot Control Mate. This manual describes basic aspects for auto-jogging, position modification, control and calibration.

Usage

This manual should be used during operation.

Who should read this manual?

This manual is intended for:

- operators
- product technicians
- service technicians
- robot programmers

Prerequisites

The reader should:

- Be trained in robot operation.
- Have basic knowledge of RAPID programming language.
- Be familiar with RobotStudio.

References

Reference	Document ID
Operating manual - RobotStudio	*3HAC032104-001*
Product manual - OmniCore C30	*3HAC060860-001*
Operating manual - OmniCore	*3HAC065036-001*
Operating manual - Integrator's guide OmniCore	*3HAC065037-001*
Technical reference manual - System parameters	*3HAC065041-001*

Revisions

Revision	Description
A	Released with RobotWare 7.0.
B	The following updates are made in this revision: • Added a new installation method. • Updated the user interface figures of **Jog** tab page and **Calibrate** tab page. • Updated the calibration step.
C	The following updates are made in this revision: • Updated the installation, uninstallation and upgrade procedures.

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Revision	Description
D	The following updates are made in this revision: • Updated safety related information. • Updated the installation and upgrade method. • Added new functions to **Jog** and **Control** tab pages. • Added resolver data transfer function between robot memory and controller to **Calibrate** group. • Updated the procedure of working with the PC Jogging add-in. • Added warning before starting revolution counter update process.
E	Released with RobotWare 7.0.2. The following updates are made in this revision: • Renamed the product as Robot Control Mate from PC Jogging. • Restructured the manual to provide step-by-step procedures on controlling and jogging functions. • Added a note reminding users to disconnect the FlexPendant from the FlexPendant UI. • Updated the installation, uninstallation and upgrade procedures.
F	The following updates are made in this revision: • Removed the limitation requiring only one task exists. • Added the step of task selection when program executions are performed in multitask scenarios.
G	Released with RobotWare 7.1. The following updates are made in this revision: • Added steps to activate operator safety function AllowMoveRobAuto for controllers in RobotWare 7.1. • Updated steps for disconnecting the FlexPendant.
H	Released with RobotWare 7.2. The following updates are made in this revision: • Wording change from "jog" to "auto-jog". • Updated supported RobotWare and RobotStudio versions, and related descriptions. • Supported IRB 1100, IRB 1300 and IRB 14050. • Added IRB 14050-specific functions, such as LeadThrough and auto-jogging in arm mode, are added. • Added interface to use part of Authenticate functionalities in Robot Control Mate. • Added steps to edit user grants to make sure control and auto-jogging functions are available to use. • Updated the safety related information.

Product documentation

Categories for user documentation from ABB Robotics

The user documentation from ABB Robotics is divided into a number of categories. This listing is based on the type of information in the documents, regardless of whether the products are standard or optional.

Tip

All documents can be found via myABB Business Portal, *www.abb.com/myABB*.

Product manuals

Manipulators, controllers, DressPack/SpotPack, and most other hardware is delivered with a **Product manual** that generally contains:

- Safety information.
- Installation and commissioning (descriptions of mechanical installation or electrical connections).
- Maintenance (descriptions of all required preventive maintenance procedures including intervals and expected life time of parts).
- Repair (descriptions of all recommended repair procedures including spare parts).
- Calibration.
- Decommissioning.
- Reference information (safety standards, unit conversions, screw joints, lists of tools).
- Spare parts list with corresponding figures (or references to separate spare parts lists).
- References to circuit diagrams.

Technical reference manuals

The technical reference manuals describe reference information for robotics products, for example lubrication, the RAPID language, and system parameters.

Application manuals

Specific applications (for example software or hardware options) are described in **Application manuals**. An application manual can describe one or several applications.

An application manual generally contains information about:

- The purpose of the application (what it does and when it is useful).
- What is included (for example cables, I/O boards, RAPID instructions, system parameters, software).
- How to install included or required hardware.
- How to use the application.
- Examples of how to use the application.

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Operating manuals

The operating manuals describe hands-on handling of the products. The manuals are aimed at those having first-hand operational contact with the product, that is production cell operators, programmers, and troubleshooters.

1 Introduction

About the Robot Control Mate

Overview

The Robot Control Mate provides basic instructions for OmniCore-based robot systems. In cases where a FlexPendant is unavailable, the Robot Control Mate together with RobotStudio features allow users to control the robot from a connected PC.

Controllers supporting the Robot Control Mate (option 3065-1 Robot Control Mate) are attached with a safety warning label. This label indicates that the controller is delivered and can start in automatic mode, and use Robot Control Mate to control the robot in scenarios without a FlexPendant.

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Key functions

- Auto-jogging

  With combined selection of the motion mode and coordinate system, the robot can be auto-jogged to a specific position.
- Position modification

  You can define a desired target point in the RAPID instruction and use the target point to modify the robot position.
- Control

  It allows you to make the motors on and off. It also displays the program control buttons.
- Calibration

  It allows you to update the revolution counter of one or all axes for the robot, as well as memory data transfer between robot and controller.
- Status display

  You can have a quick view on the controller status, such as operating mode, speed, motor state and program execution state.

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Prerequisites

To work with Robot Control Mate, the following is required:

- OmniCore controller with RobotWare 7.2 or later
- RobotStudio 2021

> **Note**
>
> The latest version of Robot Control Mate does not compatible with RobotWare and RobotStudio versions earlier than the specified ones. Always update RobotWare and RobotStudio to the required versions to use the latest Robot Control Mate.

Limitation

The Robot Control Mate,

- Supports IRB 910INV, IRB 1100, IRB 1300 and IRB 14050.
- Can only be used in automatic mode.

Safety related

The OmniCore controller provides safety functions to ensure the safe operation with robots. Robot Control Mate is allowed to work in automatic mode with all safety means in place.

> **Note**
>
> Make sure to read through safety instructions before staring work.

> **Note**
>
> The integrator is responsible that the safety devices necessary to protect people working with the robot system are designed and installed correctly.
>
> The integrator is responsible for the safety of the final application.

Using an emergency stop switch

An emergency stop switch must be connected to the external emergency stop input interface to make sure the emergency stop function is enabled. The emergency stop switch must be positioned in easily accessible places so that the robot can be stopped quickly.

For details about how to connect an external emergency stop switch, see *Product manual - OmniCore C30*.

Leaving enabling device connection open

The enabling device connection must be left open if there is no teach pendant connected to the controller. Then, the robot can only work in automatic mode.

For details about how to configure the enabling device connection, see *Product manual - OmniCore C30*.

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Activating a safety guard device

A safety guard device (such as a safety fence) must be active in automatic mode. When the system is powered on, entering the robot working area is not allowed. A safety fence is recommended. In case the fence is opened, the automatic stop is enabled and the robot can be stopped.

For details about how to connect an automatic stop, see *Product manual - OmniCore C30*.

Using FlexPendant reducing risks

The FlexPendant is always the optimum solution to reduce risks in some specific applications. Before using Robot Control Mate, working environment and applications in use must be fully assessed. The integrator is responsible to make sure the environment and application are applicable to use Robot Control Mate in automatic mode. If any potential risk exists, use FlexPendant in manual mode to reduce risks.

Body protection

- Sensitive body parts, such as the eyes and the larynx, must be protected by personal protective equipment (PPE).
- Operators working with the Robot Control Mate must be trained and have the required knowledge.

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2 Getting started

Preparation before using the Robot Control Mate

Before using the Robot Control Mate, make sure:

1. RobotStudio has been downloaded, installed and activated on the PC.

   Download RobotStudio from *http://new.abb.com/products/robotics/robotstudio/downloads*. For more information about how to install and run the RobotStudio, see *Operating manual - RobotStudio*.
2. The PC is connected to the controller and that the controller is powered on.

   For more information about the PC connection to the controller, see section *Connecting a PC to the controller* in *Operating manual - RobotStudio*.

Installing the Robot Control Mate

Use the following procedure to install the Robot Control Mate.

1. Open RobotStudio and go to **RobotApps** in the **Add-Ins** ribbon tab.
2. In the displayed **RobotApps** window, enter a keyword in the **Search** text box.

   The **Robot Control Mate** icon is displayed.
3. Click the icon and then click **Add** on the right pane.
4. Click **Accept** in the displayed disclaimer window.

   The package will be downloaded and installed automatically.
5. Close and reopen RobotStudio.

   The **Robot Control Mate** icon is displayed in the **Controller** ribbon tab.

Starting the Robot Control Mate

Use this procedure to open the Robot Control Mate

1. Open RobotStudio.
2. In the **Controller** ribbon tab, click **Robot Control Mate** in the **Robot Tools** group.

   The **Robot Control Mate** ribbon tab is displayed.

   > **Note**
   >
   > To close the **Robot Control Mate** tab, click **Close**.

3. Start working with the Robot Control Mate after connecting to a controller.

   > **Note**
   >
   > If there is no controller is connected, **Unknown** will be displayed in the **Controller Status** group, and the control and auto-jogging functions are unavailable to use.

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Uninstalling the Robot Control Mate

Use the following procedure to uninstall the Robot Control Mate.

1. Open RobotStudio and click the **Add-Ins** tab.
2. In the **Add-Ins** window on the left pane, right-click the **Robot Control Mate** package under the **Installed Packages** navigation tree.
3. Choose **Uninstall Package** from the shortcut menu.
4. Click **Yes** to proceed.

   The uninstallation procedure starts automatically.
5. Close and reopen RobotStudio.

   The **Robot Control Mate** is removed from the navigation tree on the left pane.

Upgrading the Robot Control Mate

If a new version of the Robot Control Mate is available, uninstall the earlier versions as instructed in *Uninstalling the Robot Control Mate on page 16* and then reinstall as instructed in *Installing the Robot Control Mate on page 15*.

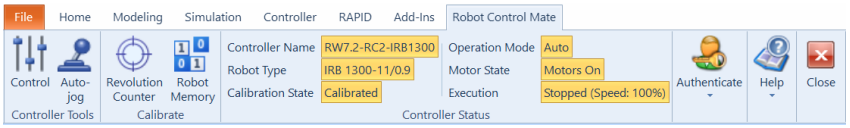
Note

If RobotStudio is in a version earlier than 2021, upgrade RobotStudio to the latest version first and then install the Robot Control Mate in **RobotApps** as instructed in *Installing the Robot Control Mate on page 15*.

3 Working with the Robot Control Mate

3.1 Overview

The user interface



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Group	Description
Controller Tools	Provides controlling and auto-jogging functions, such as motor status switching, program execution and robot position auto-jogging.
Calibrate	Provides calibration functions to update revolution counters and to transfer robot memory between robot and controller.
Controller Status	Displays the basic information of the controller and robot.
Authenticate	Provides part of User Authorization System (also called UAS) functionalities that are inherited from the RobotStudio. Detailed information about UAS, see *Operating manual - RobotStudio*.
Close	Closes the **Robot Control Mate** tab.

3.2 Procedure

Introduction

Use the following procedures to operate a robot system using the Robot Control Mate together with RobotStudio features.

Connecting to a controller

1 Switch on the main power on the controller.
2 Open RobotStudio.
3 Add a controller by choosing **One Click Connect** from the **Add Controller** category in the **Controller** ribbon tab.

> **Note**
>
> You can also choose **Add Controller** or **Add Controller from Device List** and then select the desired controller from the list.

The controller is loaded and displayed in the navigation tree.
4 Activate the AllowMoveRobAuto function.
- On the **Controller** ribbon tab, click **Request Write Access**.
- In the **Controller** navigation tree, choose **Configuration** > **Controller**.
- Click **Operator Safety** to display the settings.
- Set **AllowMoveRobAuto** to **Active**.
- Restart the controller.

5 Open the Robot Control Mate.

Enabling necessary user grants

Enabling functions in Control window

Current user must be granted with the Remote Start and Stop right to enable the functions in **Control** window. Otherwise, the control functions are unavailable to use and a warning message is displayed when opening the **Control** window.

Perform the following procedure to edit user grants:

1 In the **Controller** ribbon tab, click **Authenticate** and then click **Edit User Accounts**.
2 In the **Edit User Accounts** window, click the **Roles** tab.
3 On the **Roles** tab, select the role to which the user belongs and then click **Edit User**.
4 Select the **Remote Start and Stop** checkbox.
5 Click **Apply**.

More details about how to manage user rights in the UAS system, see *Operating manual - RobotStudio*.

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Enabling functions in Auto-jog window

If the local certificate is not loaded when a real controller is connected, the auto-jogging functions are unavailable to use and a warning message will be displayed when opening the **Auto-jog** window. Users have to verify the local presence to enable the functions.

Verify the local presence in the following two ways:

- With a powered-on FlexPendant but in logged-out state
  1. Press the enabling button twice.
  2. Open the Robot Control Mate and then open the **Auto-jog** window to check whether functions are enabled.
- Without a FlexPendant
  1. Create a physical DI signal.
  2. In the **Controller** ribbon tab, click **Configuration** and then click **I/O system**.
  3. In the **Type** pane of the **Configuration - I/O system** window, right-click **System Input** and choose **New System Input**.
  4. Choose the created physical DI signal from the **Signal Name** drop-down list.
  5. Choose **Verify Local Presence** from the **Action** drop-down list.
  6. Save the change and restart the controller.
  7. Open the Robot Control Mate and then open the **Auto-jog** window.
  8. Change the DI signal value three times using the physical device for whom the signal created.

     The warning message is removed and the auto-jogging functions are available to use.

Performing the program executions

1. Check the calibration status of the robot in the **Controller Status** group in the **Robot Control Mate** tab page.

   If the robot is uncalibrated, calibrate the robot as instructed in *Calibrating the robot on page 21*.
2. In the **Robot Control Mate** tab page, click **Control** in the **Controller Tools** group.

   The **Control** window is displayed.
3. Turn the motors on.
4. Select a task from the **Selected Tasks** drop-down list.

   If there are multiple tasks, the program executes for the selected task.
5. Set the speed of program execution by dragging the scroll bar.

   The speed of 100% indicates that the program is running at full speed.
6. Perform program executions.
   - **Play**: starts the program execution.
   - **Pause**: pauses a program execution.
   - **Prev**: executes one instruction backward.

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- **Next**: executes one instruction forward.

> **Note**
>
> Click **Reset program to main** to set the program pointer to the first line of the main routine.
>
> It is also possible to set the program pointer to routine by selecting a module and routine from the **Module** and **Routine** drop-down list first, and then click **PP to Routine**.

Auto-jogging the robot

1. In the **Robot Control Mate** tab page, click **Control** in the **Controller Tools** group.

   The **Control** window is displayed.
2. Turn the motors on.

   > **Note**
   >
   > For IRB 14050, setting **LeadThrough** to **Enable** in the **Auto-jog** window will automatically turn the motors on, and the **Operation Mode** displays **Auto (LeadThrough)**.
   >
   > For more details about the lead-through function, see *Operating manual - OmniCore*.
3. Click **Auto-jog** in the **Controller Tools** group.

   The **Auto-jog** window is displayed.
4. Select the auto-jogging mode.
   - **Joint**: this mode auto-jogs the robot axis by axis. It moves one robot axis at a time.
   - **Linear**: this mode enables the tool center point of the selected tool to move along straight lines from "point A to point B" in space or to move in rotational motion based on the selected coordinate system's axis.
   - **Arm**: this mode is only available for IRB 14050. In this mode, both the tool center point and the orientation of the tool is fixed in space and only the angle of the arm is changed. The tool center point is neither rotated nor moved.
5. Select the coordinate system.

   If **Tool** or **Wobj** is selected, a work object or tool must be selected from the **Work Object** or **Tool** drop-down list respectively, to specify the reference based on which the robot axis moves.
6. Select the increment mode.
   - **None**: the robot moves continuously to the specified point.
   - **Small**/**Medium**/**Large**: the robot will move a rated step each time based on the selected incremental movement size.

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- **Customized**: users can define increment step by clicking **Customized Increment**.

7 Set the auto-jogging speed by dragging the scroll bar.

8 (Optional) Select load data from the **Load** drop-down list.

If equipment is mounted on any of the robot axes, then axes loads must be set. Otherwise overload errors might occur during auto-jogging.

9 Click the **+** or **-** button in the **Position** area to auto-jog the robot axes to the desired position.

Note

The robot can also be auto-jogged using target settings. Select a target from the **Target** drop-down list. Detailed position information of the selected target point is displayed. Then, press and hold **Go to** to move the robot until it reaches the target position or click **Modify Position** to apply the robot position to the RAPID program.

Calibrating the robot

WARNING

Before starting the revolution counter update procedure, make sure all robot axes are moved to the synchronization position and all the notches of synchronization marks are aligned.

If a revolution counter is incorrectly updated, it will cause incorrect manipulator positioning, which in turn may cause damage or injury! Always verify the results after calibrating any robot axis to verify that all calibration positions are correct.

Detailed information about calibration, revolution counter update, and so on can be found in the robot product manual.

1 Check the calibration state in the **Controller Status** group in the **Robot Control Mate** tab page.

2 If the state is **Uncalibrated**, check whether controller or robot has been replaced or the SMB board has been replaced.

- If yes, proceed to step *3*.
- If no, proceed to step *7*.

3 In the **Robot Control Mate** ribbon tab, click **Robot Memory** in the **Calibrate** group.

In the displayed **Update Memory** dialog box, choose **Update controller with robot memory data** or **Update robot memory with controller data** according to the actual situation.

CAUTION

Do not mix the memory data transfer direction.

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For more details about memory data transfer, see *Operating manual - Integrator's guide OmniCore*.

4 A dialog box is displayed, warning that the transfer operation cannot be undone. Click **OK** to proceed or click **Cancel** to cancel.

5 After the data is successfully transferred, a message is displayed, warning that the controller requires to be restarted. Click **OK** to close the message.

6 Restart the controller.

7 In the **Robot Control Mate** ribbon tab, click **Revolution Counter** in the **Calibrate** group.

In the displayed **Update Revolution Counter** dialog box, check the calibration status of the axes and, in the **Selection** column, select the axes for which revolution counters need to be updated.

For more details about robot revolution counter update, see the robot product manual.

8 A dialog box is displayed, warning that the updating operation cannot be undone. Click **OK** to proceed or click **Cancel** to cancel.

9 After the revolution counters of the selected axes are successfully updated, a message is displayed, warning that the controller requires to be restarted. Click **OK** to close the message.

10 Restart the controller.

11 After the calibration is done, auto-jog the robot and check whether the robot is well calibrated.

For details about robot auto-jogging, see *Auto-jogging the robot on page 20*.
If the robot is not correctly calibrated, calibrate again in the **Update Revolution Counter** dialog box.

Working with the robot system

1 Create a testing RAPID program or load an existing RAPID program in the RAPID editor.

For more information about how to work with RAPID editor, see *Operating manual - RobotStudio*.

2 Auto-jog the robot to a desired position in the **Auto-jog** window.

For details about robot auto-jogging, see *Auto-jogging the robot on page 20*.

3 Select a desired target point from the **Targets** drop-down list and click **Modify Position**.

4 In the **Robot Control Mate** ribbon tab, click **Control** in the **Controller Tools** group.

The **Control** window is displayed.

5 Run the RAPID program.

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For details about how to execute the program, see *Performing the program executions on page 19*.

CAUTION

If the speed is higher than 10% of the fully speed, a warning message displays, prompting to confirm the running speed. Click **Yes** to remain the speed setting or click **No** to change the speed to 10% of the fully speed.

Make sure all risks are cleared before clicking **Yes** and run the program at a high speed. If any risky situation occurs, click **Pause** in the **Control** tab to stop the program or press the external emergency stop switch.

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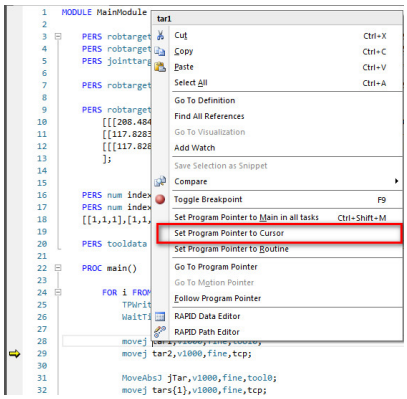
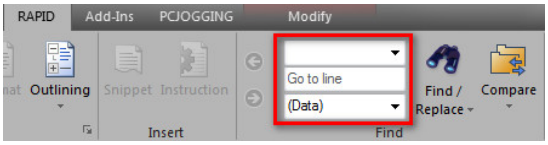
4 Reference information

4.1 Features in RobotStudio

Feature list

The following table provides the features in RobotStudio that will be used together with the Robot Control Mate when operating a robot system.

For more details about how to use the RobotStudio features, refer to the popup message displayed in RobotStudio or see *Operating manual - RobotStudio*.

Feature group	Feature	Action
Operation	Run from the current cursor	1 Make sure the RAPID program is opened by double-clicking the specific RAPID module from the **Controller** navigation tree. 2 In the **RAPID** ribbon tab, click **Request Write Access** in the Access group. 3 Right-click the line where the cursor is and choose **Set Program Point to Cursor** from the shortcut list.  xx1900001401 4 Click **Play** in the **Control** tab and then the program will run from the line where the cursor is. **Note** The find a desired line or program module, type the required line number or choose the module from the list in the **Find** group in the **RAPID** ribbon tab  xx1900001367

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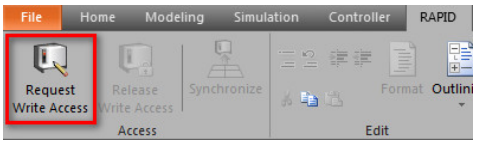
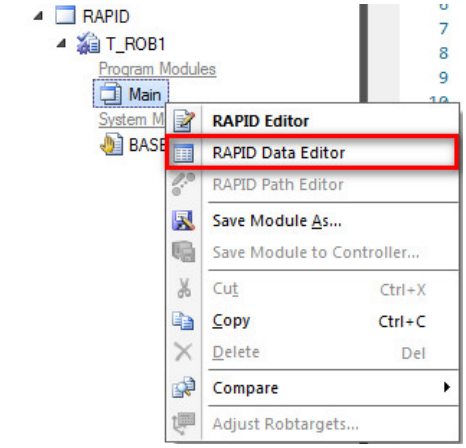
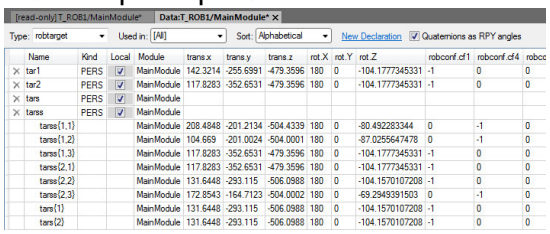
4.1 Features in RobotStudio

Continued

Feature group	Feature	Action
Programming	Online programming	1 Make sure the RAPID program is opened by double-clicking the specific RAPID module from the **Controller** navigation tree. 2 In the **RAPID** ribbon tab, click **Request Write Access** in the Access group. Then, the RAPID script can be edited and programmed.  xx1900001369
	RAPID data editing	Right-click a specific RAPID module from the **Controller** navigation tree and then choose **RAPID Data Editor**.  xx1900001368
	Specific point data editing	In the **RAPID Data Editor** window, edit the detailed data of a specific point.  xx1900001402

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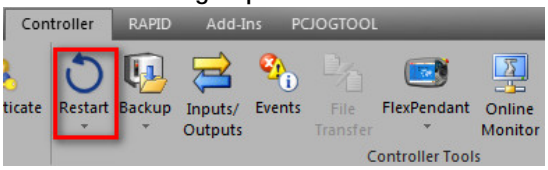
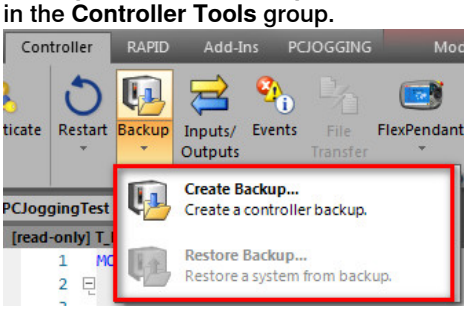
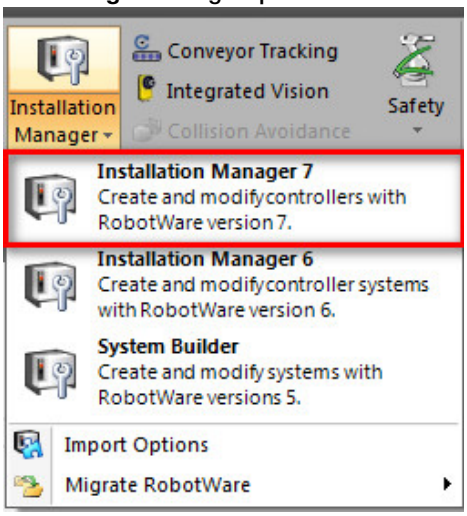
Feature group	Feature	Action
Controller management	System restart	In the **Controller** ribbon tab, click **Restart** in the **Controller Tools** group.  xx1900001329
	System backup and restore	In the **Controller** ribbon tab, choose **Create Backup** or **Restore Backup** from the **Backup** list in the **Controller Tools** group.  xx1900001370
	System installation	In the **Controller** ribbon tab, choose **Installation Manager 7** from the **Installation Manager** list in the **Configuration** group.  xx1900001372

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4.1 Features in RobotStudio

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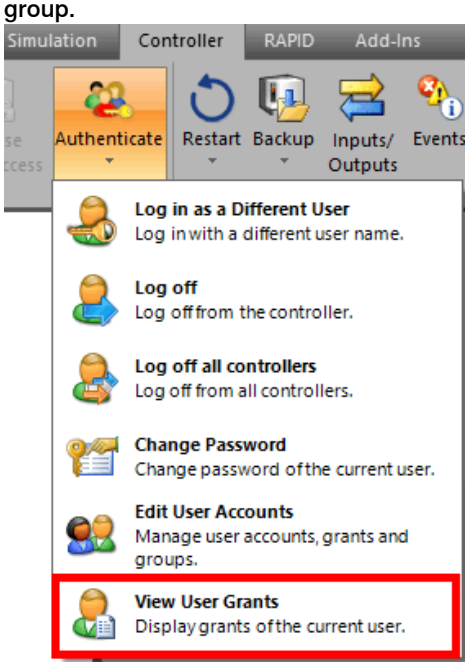
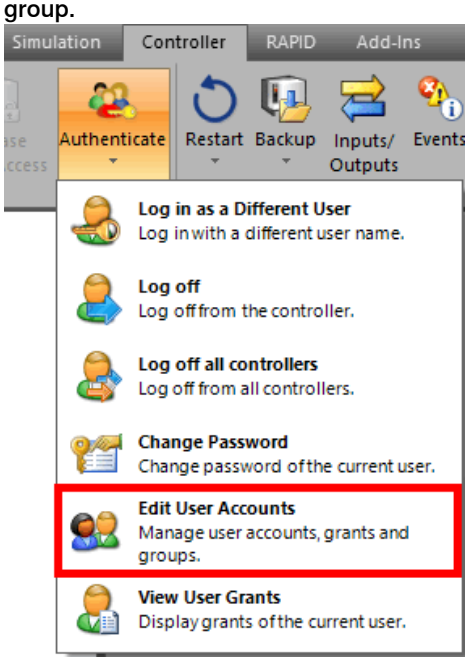
Feature group	Feature	Action
User right management	User grant viewing	In the **Controller** ribbon tab, choose **View User Grants** from the **Authenticate** list in the Access group.  xx2100000399
	User grant editing	In the **Controller** ribbon tab, choose **Edit User Accounts** from the **Authenticate** list in the Access group.  xx2100000400

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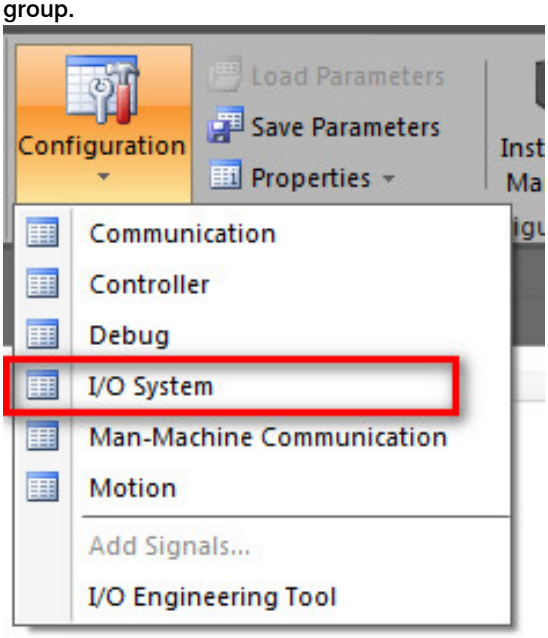
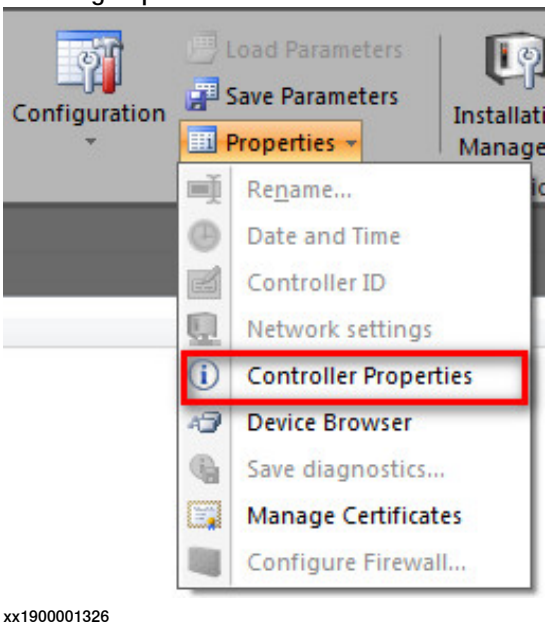
Feature group	Feature	Action
System status and configuration	I/O status checking	In the **Controller** ribbon tab, choose **I/O System** from the **Configuration** list in the **Configuration** group.  xx1900001327
	System information checking	In the **Controller** ribbon tab, choose **Controller Properties** from the **Properties** list in the **Configuration** group.  xx1900001326
	System configuration	In the **Controller** ribbon tab, choose the required item from the **Configuration** list in the **Configuration** group.

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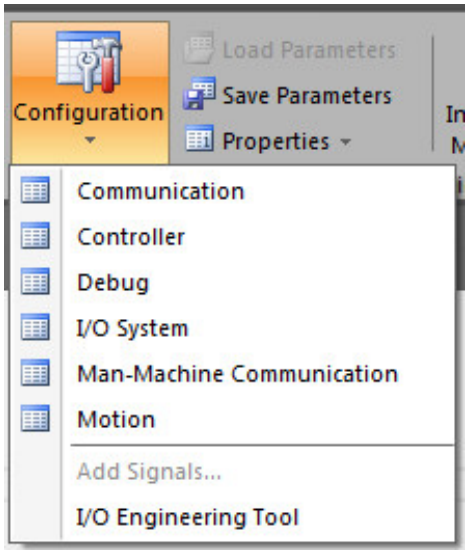
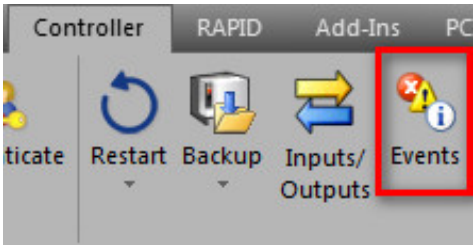
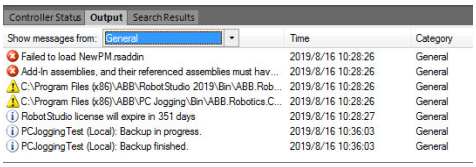
4.1 Features in RobotStudio

Continued

Feature group	Feature	Action
		 xx1900001371
Log	Log viewing	View the logs by either of the following methods: • In the **Controller** ribbon tab, click **Events**.  xx1900001373 • Check the logs from the **Output** area at the bottom of the RobotStudio window.  xx1900001374

4.2 Scenarios for controllers with FlexPendant

Overview

The Robot Control Mate is mainly used for the controller without a FlexPendant. The FlexPendant can be disconnected from the controller in automatic mode. To disconnect the FlexPendant in automatic mode the user must have the **Safety Services** grant. The administrator must provide this grant using the **UAS Administration Tool** in RobotStudio.

> **Note**
>
> In cases where the controller is replaced with a new main computer, a FlexPendant is required after the replacement to be able to change to automatic mode. Otherwise, the controller starts in manual mode and the Robot Control Mate is unable to use.

This section describes how to properly disconnect the FlexPendant from a controller.

Disconnecting the FlexPendant

> **Note**
>
> The disconnection operation can only be executed on the FlexPendant. Do not use the Robot Control Mate to disconnect the FlexPendant.

1. On the status bar, tap the **QuickSet** button.

   The **QuickSet** window is displayed.
2. Tap the **Info** tab.

   The **System Info** window is displayed.
3. Check the robot type and options.

   Make sure the robot type is supported and the option 3018-1 Hot Swappable FlexPendant exists.

   > **Note**
   >
   > If the controller does not have the option 3018-1 Hot Swappable FlexPendant, contact ABB to install the RobotWare version with the option.
4. Tap the **Control** tab.

   The **Control Panel** window is displayed.
5. In the **Mode** section, check the operating mode and make sure the system is in Auto mode.
6. Tap the **Logout/Restart** tab.

   The **Logout/Restart** window is displayed.
7. Tap **Detach FlexPendant** in the **FlexPendant** section.

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A message is displayed, prompting to disconnect the FlexPendant within 30 seconds.

> **Note**
>
> The logged-in user must be the one has sufficient grant to disconnect the FlexPendant. If not, you will get a permission denied message. In this case, click **Log out** in the **Current User** section. Then, log in again using the user with the Safety Service permission is granted.

8 Tap **Disconnect**.

A popup window with 30 seconds countdown timer is displayed.

9 Disconnect the FlexPendant within 30 seconds.

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