ABB Robotics

# Operating manual
# RobotWare Machine Tending

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# Operating manual
# RobotWare Machine Tending

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# Table of contents

# Overview of this manual

## About this manual

This manual explains how to work with the RobotWare Machine Tending using IRC5 with FlexPendant.

## Usage

This manual is used while referring to the user interface of the RobotWare Machine Tending option.

## Who should read this manual?

This manual is intended for:

- operators
- set-up and configuration personnel
- robot programmers

## Prerequisites

The reader should be familiar with

- Industrial robots and their basic terminology

## References

| References | Document ID |
|---|---|
| *Technical reference manual - RAPID overview* | *3HAC16580-1* |
| *Technical reference manual - RAPID Instructions, Functions and Data types* | *3HAC16581-1* |
| *Operating manual - IRC5 with FlexPendant* | *3HAC16590-1* |
| *Technical reference manual - System parameters* | *3HAC17076-1* |
| *Operating manual - RobotStudio* | *3HAC032104-001* |
| *Application manual - RobotWare Machine Tending* | *3HAC044398-001* |
| *Operating manual - Machine Tending PowerPac* | *3HAC044396-001* |
| *Application manual - Motion functions and events* | *3HAC036958-001* |

## Revisions

| Revision | Description |
|---|---|
| - | First edition, RobotWare 5.15 |
| A | Released with RobotWare 5.15.01.<br>Restructured the manual. |
| B | Released with RobotWare 5.60.<br>Minor changes. |

# Product documentation, IRC5

### Categories for manipulator documentation

The manipulator documentation 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.

All documents listed can be ordered from ABB on a DVD. The documents listed are valid for IRC5 manipulator systems.

### Product manuals

Manipulators, controllers, DressPack/SpotPack, and most other hardware will be 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 exploded views (or references to separate spare parts lists).
- Circuit diagrams (or references to circuit diagrams).

### Technical reference manuals

The technical reference manuals describe reference information for robotics products.

- *Technical reference manual - Lubrication in gearboxes*: Description of types and volumes of lubrication for the manipulator gearboxes.
- *Technical reference manual - RAPID overview*: An overview of the RAPID programming language.
- *Technical reference manual - RAPID Instructions, Functions and Data types*: Description and syntax for all RAPID instructions, functions, and data types.
- *Technical reference manual - RAPID kernel*: A formal description of the RAPID programming language.
- *Technical reference manual - System parameters*: Description of system parameters and configuration workflows.

### Application manuals

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

*Continues on next page*

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, DVD with PC software).
- How to install included or required hardware.
- How to use the application.
- Examples of how to use the application.

**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 trouble shooters.

The group of manuals includes (among others):

- *Operating manual - Emergency safety information*
- *Operating manual - General safety information*
- *Operating manual - Getting started, IRC5 and RobotStudio*
- *Operating manual - Introduction to RAPID*
- *Operating manual - IRC5 with FlexPendant*
- *Operating manual - RobotStudio*
- *Operating manual - Trouble shooting IRC5*, for the controller and manipulator.

# Safety

## Safety of personnel

A robot is heavy and extremely powerful regardless of its speed. A pause or long stop in movement can be followed by a fast hazardous movement. Even if a pattern of movement is predicted, a change in operation can be triggered by an external signal resulting in an unexpected movement.

Therefore, it is important that all safety regulations are followed when entering safeguarded space.

## Safety regulations

Before beginning work with the robot, make sure you are familiar with the safety regulations described in the manual *Operating manual - General safety information*.

# 1 Introduction

RobotWare Machine Tending (RWMT) is a software option for accessing the robot and the system peripherals in handling applications, both for the system operator and for the integrator.

For the integrator, a set of RAPID data types, instructions, and functions have been provided to integrate RWMT with the application program.

RWMT can be modified with respect to the graphic views as well as with the existing signal interfaces using a process configuration.

For easy operations, the graphical user interface (GUI) provides the following functionalities:

- Manage projects
- Visualize the operating states and production processes
- General and station wise view and control of signals
- Gripper actuation and gripper monitoring
- Station wise view and control of RAPID variables
- Select part types for the production
- Use of production cycles
- Execute setup and service routines
- Advanced HotEdit (correction of positions during production )
- Safe return to start position (HomeRun)
- Launch of external or embedded application
- Messaging tasks

To represent these functions, the program should know:

- which stations (that is, machines, conveyor belts, and so on) are present in the cell
- which signal interfaces are available
- which service routines are available, and so on.

This information is made available through RAPID data declarations, instructions and functions, and process parameters.

**Note**

The integrator need to have knowledge of RAPID programming and the handling of system parameters of the IRC5 robot controller.

This concept also makes it possible to integrate the RWMT in existing robot cells also, because, the only thing it requires is the inclusion of additional data, commands, and functions in the robot program.

The scope of the integration here is not limited. Sub-aspects of the user interface can be used; other aspects can be left out or included at a later stage. This often meets the requirements of narrowly measured setup and testing times in production cells.

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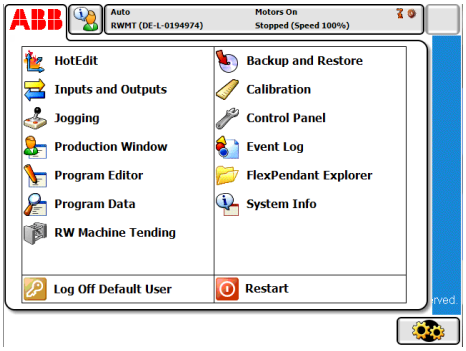
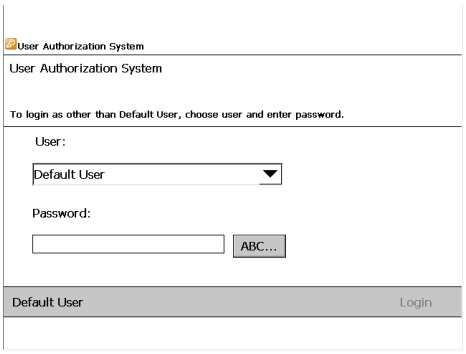
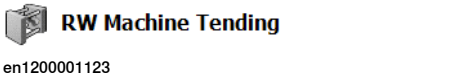
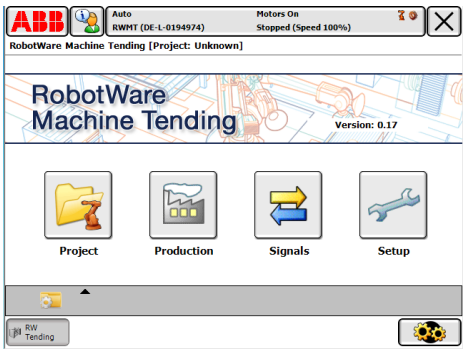
# 2 The graphical user interface

## 2.1 Starting the graphical user interface

Use the following procedure to start the **RobotWare Machine Tending** user interface:

| | Description | Description |
|---|---|---|
| 1 | Tap the **ABB** logo on the top left corner of the **Welcome to ABB** page.<br>The **ABB** menu is opened. |  <br>en1200001121 |
| 2 | Tap **Log off Default User** to quit from the current system.<br>The **User Autorization System** page is displayed. |  <br>en1200001122 |
| 3 | Log in as RobotWare Machine Tending user. | For more details about user groups, see *User administration on page 101*. |
| 4 | Tap the **ABB** logo. | |
| 5 | Tap **RW Machine Tending**.<br>The **RobotWare Machine Tending** user interface is displayed. |  <br>en1200001123<br>  <br>en1200001124 |

## 2.2 Main view

The following image and table provide details of the main view of the RobotWare Machine Tending user interface.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| Button / Menu | Description | Reference |
|---|---|---|
| **Project** | Displays the **Project Manager** window. The **Project Manager** window allows you to load, save, import, and export projects from Machine Tending PowerPac. | See *Project view on page 15* and *Managing projects on page 35*. |
| **Production** | Displays the **Production** window. | See *Production view on page 17* and *Running production on page 49*. |
| **Signals** | Displays the **Signal** window that shows predefined signals | See *Signal view on page 23*. |
| **Setup** | Displays the **Setup** menu which allows you to execute setup routines. | See *Setup view on page 25* and *Service menu on page 93*. |
| **Dialog settings** | Displays the menu to enable or disable safety dialogs at starting production, starting the HomeRun, or controlling the gripper. | See *Dialog settings on page 27*. |
| **Application errors** | Displays the error log view that shows the application errors of RW Machine Tending. | See *Application errors on page 31*. |

For more information on programming devices, see *Operating manual - IRC5 with FlexPendant*.

## 2.3 Project view

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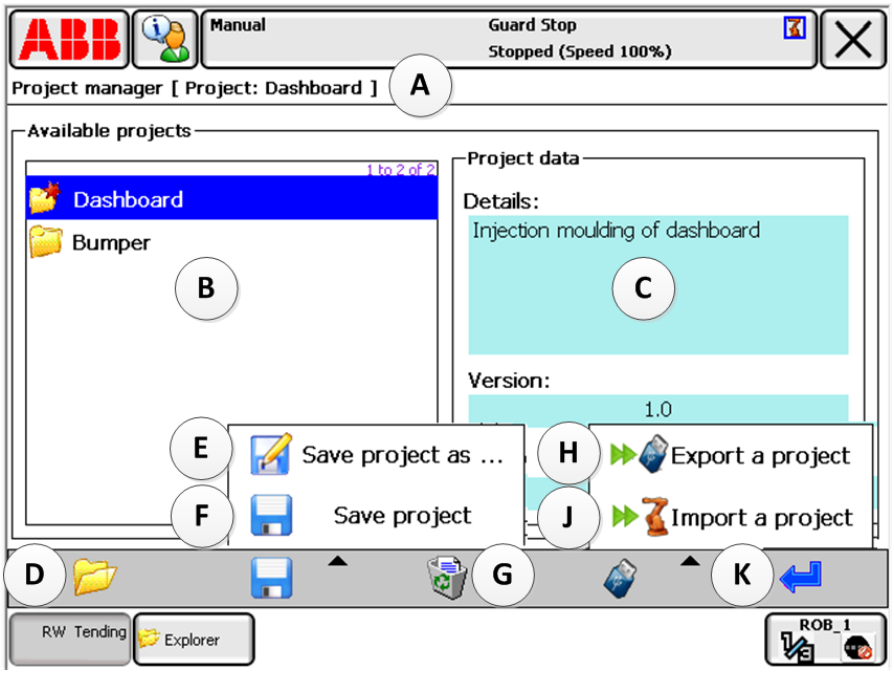
If user is allowed to manage the projects (User authorization grant RWMT_PROJECT_MANAGER is required), the **Project** button is enabled.

The following image and table provide details of the **Project manager** page of the RobotWare Machine Tending user interface.

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| | Domain | Description |
|---|---|---|
| A | Title bar | Displays the name of the loaded project. |
| B | **Available projects** list | Displays the projects which are stored in the project folder of the **Home** directory.<br>The  icon denotes the current loaded project. |
| C | **Project data** | Displays the project data (details, version, and date) of the selected project. |
| D | **Load a project** | Loads the program and system modules of the selected project into the robot memory.<br>  **Note**<br>The previously loaded project is removed. |
| E | **Save project as...** | Displays a dialog which allows renaming the project title, the project data, adding or removing of RAPID modules and system parameters before the project is saved. |
| F | **Save project** | Saves the changes to the current loaded project (RAPID modules and system parameters). |
| G | **Unload project** | Removes the loaded project from the robot memory. |

*Continues on next page*

| | Domain | Description |
|---|---|---|
| H | **Export a project** | Copies the selected project to an external device (for example, USB stick). |
| J | **Import a project** | Copies a project from an external device (for example, USB stick) into the project folder. |
| K | **Back** | Closes the window. |

## 2.4 Production view

### 2.4.1 Introduction to Production view

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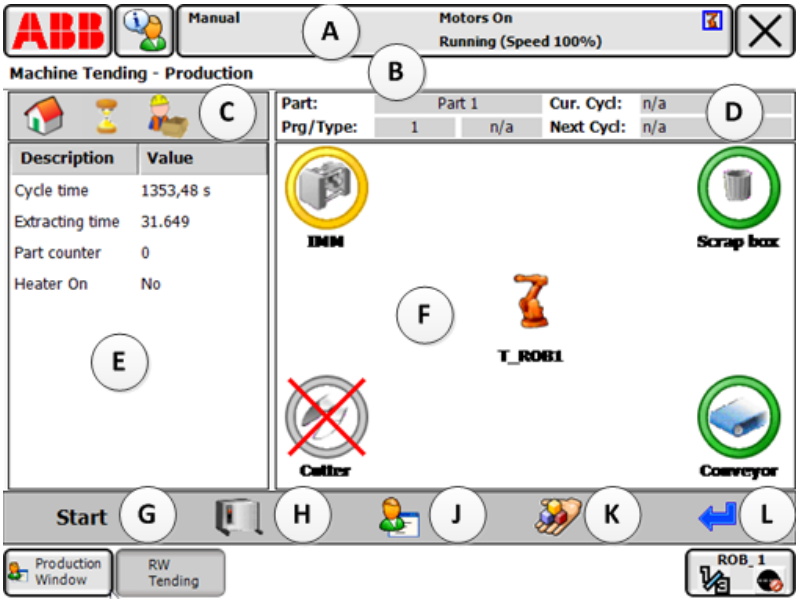
The **Production** button is used to control and visualize the production cycle.

The following image and table provide details of the **Production** page of the RobotWare Machine Tending user interface.

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| | Domain | Description |
|---|---|---|
| A | Status bar | The following information is displayed:<br>• Mode of operation<br>• System information<br>• Motor status<br>• Robot status<br>**Note**<br>Tap this bar to view the event log |
| B | Title bar | Displays the name of the application or the current message from the robot program. |

*Continues on next page*

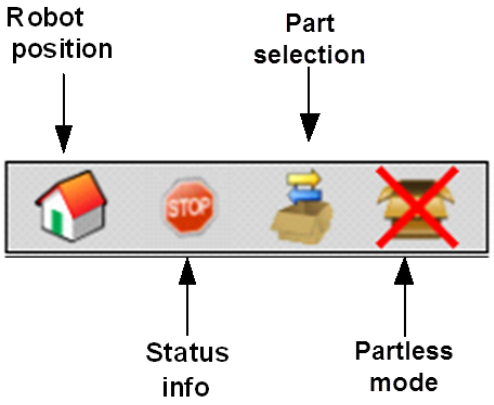
2.4.1 Introduction to Production view
*Continued*

| | Domain | Description |
|---|---|---|
| C | Status information | The following status information is displayed through the individual icons:<br>•  Position of the robot<br>•  Program status<br>•  Part selection<br>•  Part-less production (Ghost) mode active |
| D | Cycle information | Displays the name of the part, its program number and type number, the current cycle, and the follow-up cycle. |
| E | Production data | Displays the cycle time and other production data. |
| F | Overview of stations | Displays the robot and all the stations in the cell. |
| G | **Start** menu | Controls the production mode of the robot. For example, starting production, request HomeRun, halt after cycle, and so on. |
| H | **Controller** menu | The program pointer can be set to **main** or the motors can be switched on. |
| J | **Operation** menu | The following sub-menus are available for selection:<br>• Signal view<br>• Part selection<br>• Gripper control<br>• HotEdit<br>• Service menu |
| K | **External Application** menu | This menu appears if one or more external applications, (for example, ScreenMaker application) are configured to be launched from the user interface. |
| L | **Back to the main page** | Closes the production window. |

## 2.4.2 Status information of the robot task

### Introduction

The **Status Information** bar on the left side of the production window represents the state of the robot cells through the status icons as follows:

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### Position information of the robot

The following table provides details of the robot position status icons and its description:

| Icon | Description |
|---|---|
|  | Robot is in undefined position |
|  | Robot is in home position |
|  | Robot is in safe position |
|  | Robot is in service position 1 |
|  | Robot is in service position 2 |
|  | Robot is in service position 3 |

### Program status information

The following table provides details of the robot program status icons and its description:

| Icon | Description |
|---|---|
|  | Undefined state |

*Continues on next page*

2.4.2 Status information of the robot task
*Continued*

| Icon | Description |
|---|---|
|  | System error or no program pointer |
|  | Emergency stop active |
|  | Safety circuit open |
|  | Motors are switched off |
|  | Program or task has been stopped |
|  | No job pending execution |
|  | Robot is executing a production cycle |
|  | Robot is executing a service run<br>*(For example, to the service position 1, 2, or 3, or a service routine is being executed)* |
|  | Halt after cycle selected (flashing) |
|  | HomeRun active (flashing) |

**Part selection**

You can select the program manually or through an external signal interface. For more information, see *Manual selection of a part on page 86*.

The following table provides details of the part selection status icons and its description:

| Icon | Description |
|---|---|
| | There are no part declarations in the robot program |
|  | Only manual part selection is possible.<br>*No part has been selected.* |
|  | Part is selected manually. |
|  | Remote part selection is available.<br>*No part has been selected.* |
|  | Part is selected through remote interface. |

*Continues on next page*

**Note**

The external part selection is considered only if no manual part selection is present. If a part is selected manually, then, it is active until it is deselected.

**Tip**

If only one part is defined in the robot program, it is activated automatically without further intervention.

## Part-less mode

The part-less mode (ghost mode) is meant for testing the program execution without parts and can be requested externally or through the robot station page.

As soon as the robot starts a new cycle, the part-less mode is activated and this mode is deactivated only after the cycle ends, if the request is not made again.

The following table provides details of the part-less mode status icons and its description:

| Icon | Description |
|---|---|
| | Part-less (Ghost) mode deactivated |
|  | Part-less (Ghost) mode requested (icon is flashing) |
|  | Part-less (Ghost) mode active |

## 2.4.3 Station status

If a program is running, the robot moves in accordance with the program cycle from one station to the next.

**Note**

A station here means the individual peripheral systems in the robot cell (for example, lathe machine, conveyor belts, slides, and so on).

In the **Production** page, the cycle run and the status of the various stations can be monitored.

The following table provides details of the station status icons and its description:

| Display | Status | Description |
|---|---|---|
|  | **Ready** | A green frame indicates that the station has the status **Ready**.<br>This means that the robot can serve this station. |
|  | **Busy** | An yellow frame indicates that the station has the status **Busy**.<br>This means that the station is executing an action (for example, if a container is full and has to be replaced, or a cycle is in progress). |
|  | **Error** | A red frame indicates that the station has the status **Error**.<br>This means that the robot cannot work in this station. |
|  | **Undefined** | A gray frame indicates that the status of the station is **Undefined**.<br>This means that the signals for the status messages **Ready**, **Busy**, or **Error**, are not active (high). |
|  | **Active Station** | A green filled frame indicates that the station is active, that is, the robot is serving this station. |
|  | **Station deselected** | A red crossed frame indicates that the station has been deselected and can not be approached by the robot. |

## 2.5 Signal view

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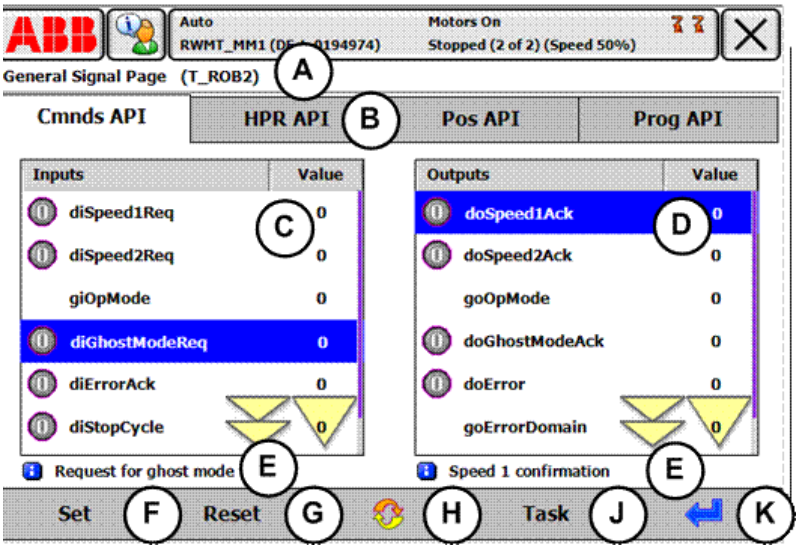
The **Signal view** is used to display and actuate general signals on up to eight tab pages.

The following image and table provide details of the **Signal** page of the RobotWare Machine Tending user interface.

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| | Domain | Description |
|---|---|---|
| A | Title bar | Displays the name of the page and the name of task of the selected robot. |
| B | Signal page | Tap a signal tab to open the required signal page. |
| C<br>D | Inputs<br>Outputs | The states of the digital input and output signals are represented by the following icons:<br>- Signal is not active (low)<br>- Signal is active (high)<br>- Signal name is not known in the system<br>**Note**<br>For analog or group signals, the current value is displayed next to the name of the signal. |
| E | Description of the signal | The description of the signal is displayed only if a corresponding entry exists within the station signal declaration in the robot program or the signal configuration (for more details, see *Technical reference manual - System parameters*). |

*Continues on next page*

| | Domain | Description |
|---|---|---|
| F | **Set** button or **123…** button | The buttons for setting and resetting the output signals are always active in the manual mode. In the automatic mode, these are visible only if the access level of the output signal has been allowed in the signal configuration (for more information, see *Technical reference manual - System parameters*).<br>Digital outputs are set directly to 1 by activating the button.<br>In the case of analog or group outputs, an input field is shown, in which the desired value has to be entered. |
| G | **Reset** button | The selected output signal is set to the value 0. |
| H | **Refresh** button | Reloads the signal declarations from the robot program.<br>In this way, changes to the declarations are displayed immediately. |
| J | **Task** button | Loads the available robot tasks for selection in the **MultiMove** systems.<br>As soon as a task is selected, its signal pages are displayed. |
| K | **Back** button | Closes the signal page. |

## 2.6 Setup view

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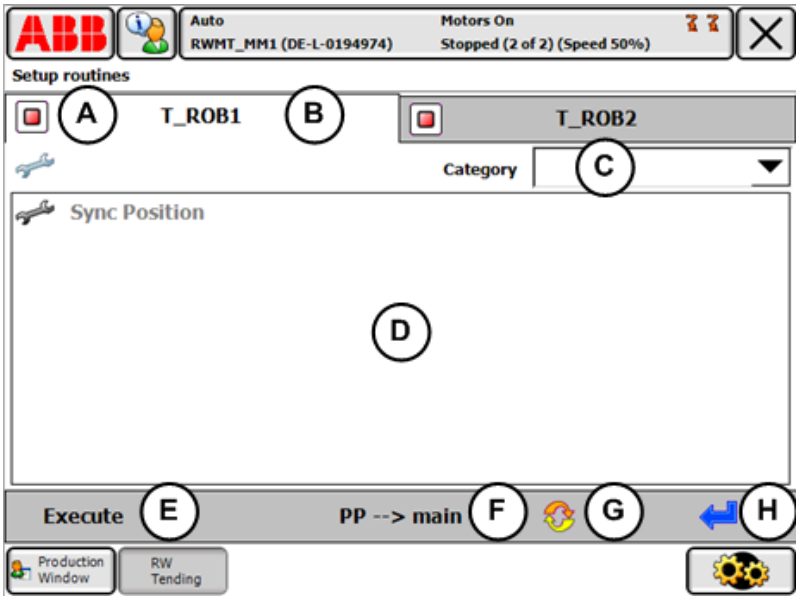
The **Setup routines** page is used for setting up or configuring the robot at the time it is commissioned. The Setup view offers only those setup routines for selection, for which the logged user has the required permissions.

**Note**

Setup routines can be executed only in the manual mode of the robot controller.

The following image and table provide details of the **Setup routines** page of the RobotWare Machine Tending user interface.

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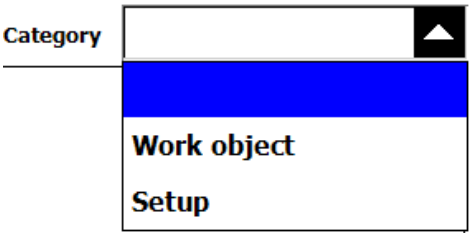
| | Domain | Description |
|---|---|---|
| A | Robot task | Displays the setup menus for all robots (MultiMove) through the tab panes. Tap the corresponding tab pane to switch between the robots. |
| B | Processing status | Displays the processing status of the setup routine separately for each robot through the following icons.<br>Routine is executable.<br>Routine is currently executing.<br>Routine has been stopped.<br>Routine is blocked. |

*Continues on next page*

| | Domain | Description |
|---|---|---|
| C | **Category** filter |  xx1200001182<br>Allows you to filter and display setup routines belonging to a selected category.<br>To display all the setup routines select the **blank** entry. |
| D | **Menu** list | Displays all the available setup routines with the image and text. |
| E | **Execute** button | Executes the selected routine.<br>If the routine cannot be actuated due to an external condition, then a dialog with the corresponding message appears. |
| F | **PP -> main** button | Sets the program pointer to the **main** routine. |
| J | **Refresh** button | Reloads the menu declarations from the robot program.<br>In this way, changes to the declarations are displayed immediately. |
| K | **Back** button | Closes the setup page or the service menu page. |

For more information on using the setup routines see, *Service menu on page 93*.

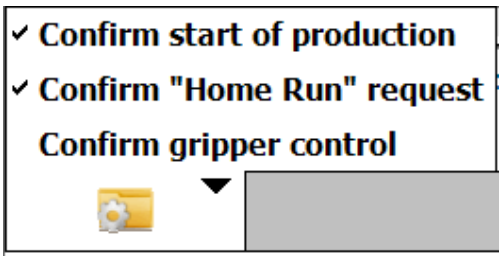
For more information on configuring the setup routines, see *Application manual - RobotWare Machine Tending*.

## 2.7 Dialog settings

### 2.7.1 Introduction to dialog settings

When starting a production cycle, aborting the program, or actuating the gripper, safety queries are used to prevent faulty operation.

To enable the usage of the safety queries tap the menu button in the Main view and then on the desired sub menu.

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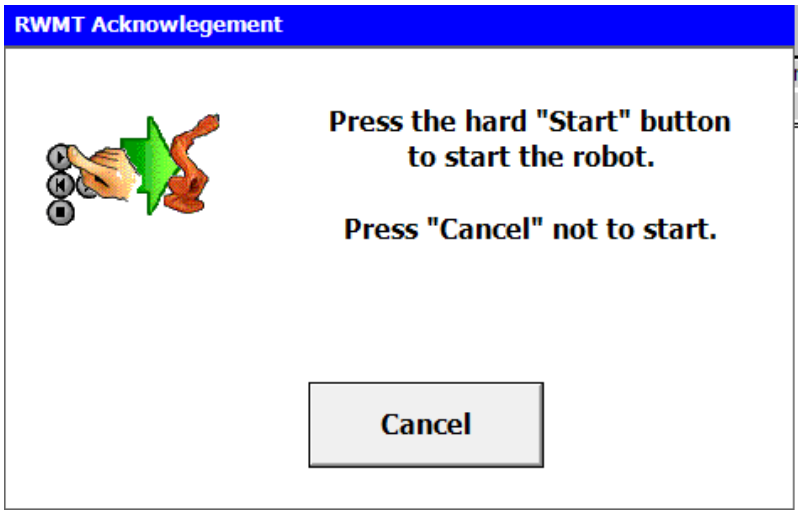
## 2.7.2 Query dialog for Starting production

If a program cycle or **HomeRun** is selected from the user interface while robot program is stopped, the following safety dialog appears. Press the **Start** button on the FlexPendant to start the robot program.

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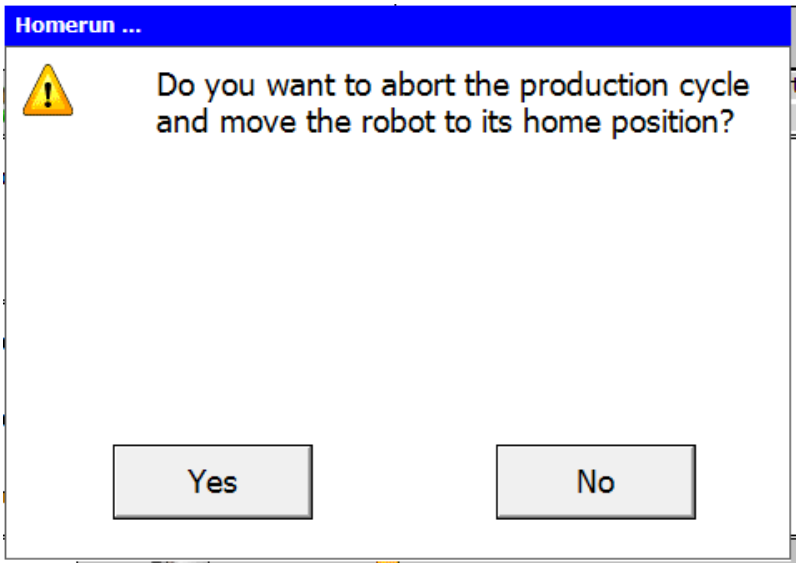
To start the robot program immediately tap the ✓ **Confirm start of production** menu so that the check mark of this menu item is removed.

## 2.7.3 Query dialog for HomeRun request

Tap the **HomeRun** button in the production window to abort a robot cycle. If the robot program is stopped the dialog to start the program appears. In case of program is running the following safety query appears.

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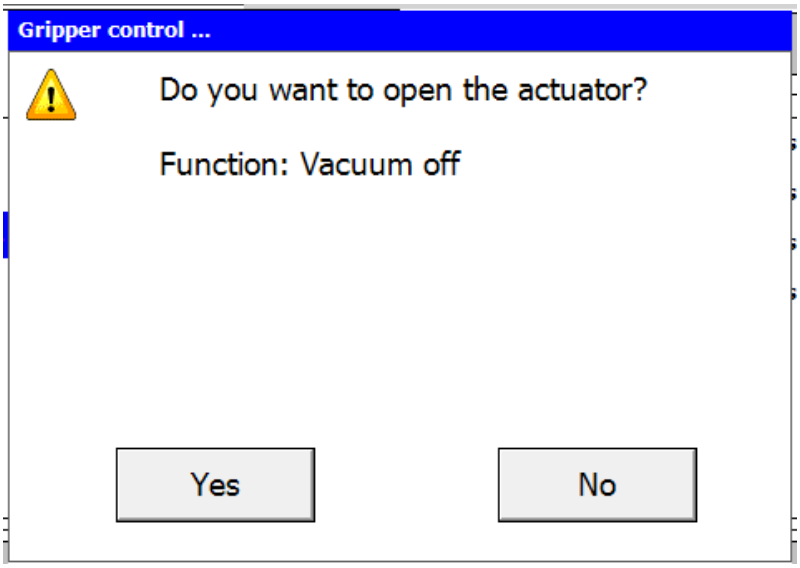
If this dialog is not required, tap the ✓ Confirm Home Run request menu so that the check mark of this menu item is removed.

**Note**

If the query dialog is disabled and the **HomeRun** button is tapped the robots start its **HomeRun** immediately.

## 2.7.4 Query dialog for Manually controlling the gripper

If a gripper actuator in the gripper window is controlled manually, the following query dialog appears each time you tap a menu button.

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If this dialog is not required tap the ✓ Confirm gripper control menu so that the check mark of this menu item is removed.

**Note**

If the query dialog is disabled the outputs of the actuator is set immediately.

## 2.8 Application errors

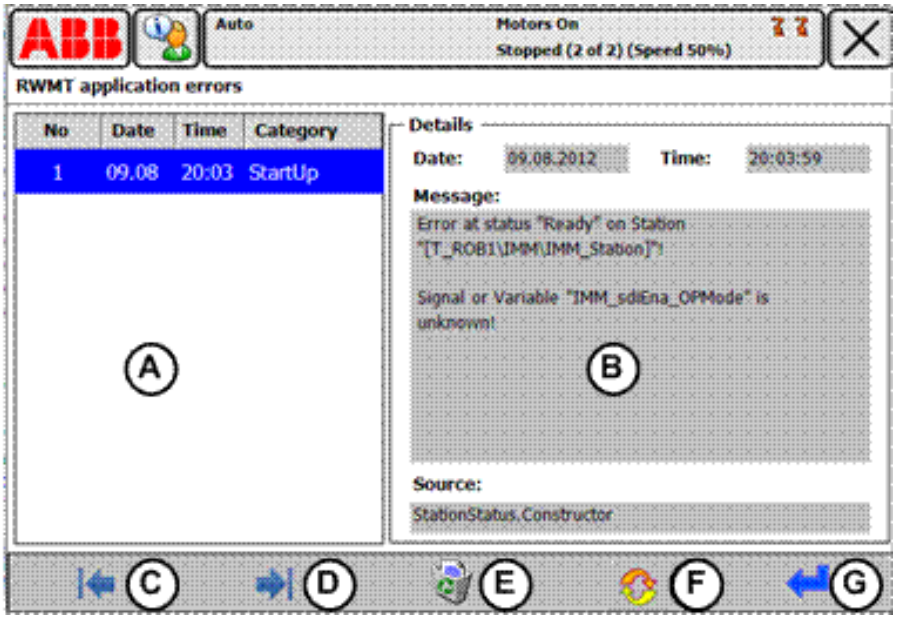
Application errors that arise due to the errors in the parameterization or processing errors in the user interface are saved in an error file and can be displayed in the application error window. The error file `RWMT_ERRORS.XML` is copied to the home directory of the robot when the error window is opened or when the user interface is closed.

If an error has occurred:

- the menu button appears in the Main window.
- the icon appears in the title row of the Production window.

Tap the menu button in the Main view to open the **Application error** page. If errors occur while starting the user interface the error window is displayed.

The following image and table provide details of the **Application error** page of the RobotWare Machine Tending user interface.

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| | Domain | Description |
|---|---|---|
| A | Message list | Displays a list of error messages. |
| B | **Details** | Tap an error message in the message list to display the details of the message. |
| C | **Go to top of list** button | Tap to display the first error message. |
| D | **Go to end of list** button | Tap to display the last error message. |
| E | **Delete list** Button | Tap to delete the list of error messages. |

*Continues on next page*

| | Domain | Description |
|---|---|---|
| F | **Refresh list** button | Tap  to reload the list of error messages.<br>  **Note**<br>The menu button  is displayed only if an error occurs while this window is open. |
| G | **Back** button | Closes the window. |

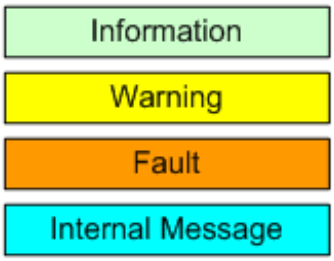
## 2.9 Messages from the robot program

### Introduction

The robot program displays output messages (information, warnings, or errors) through the title bar of the user interface. For this, the error icon, the error number, and the error text are displayed and highlighted in a color depending on the type of the error.

### Color schema of the messages

The following colors are used for the different error types:

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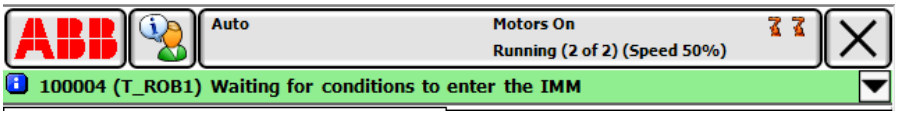
### Show additional information

If a message contains additional information, then its complete content can be activated or deactivated by tapping the message in the title bar.

If additional information is available but is faded out, the icon  is shown on the right margin of the message in the title bar.

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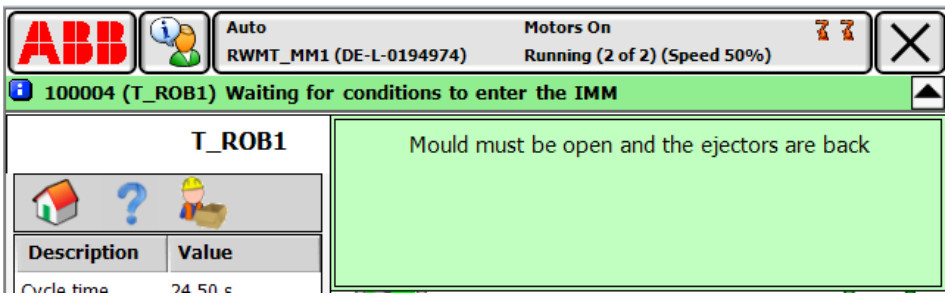
If the output of additional information is active, then this is displayed through the icon  .




xx1200001215

If a message contains additional information it is shown directly below the title bar. This information can be faded out by double tapping the message box.

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# 3 Managing projects

## 3.1 General

The Machine Tending PowerPac (MTPP) is used to create a RobotStudio simulation, the system parameters, and the RAPID program which are executed in the robot controller.

These data are stored in a RWMT project folder which contains the following items:

- Project file (*.mtp), which contains the project data (Data and file names)
- all RAPID program modules (*.mod) and system modules (*.sys)
- all system parameters (*.cfg)
- all project related station images (*.jpg; *.png; *.gif)
- all project related part images (*.jpg; *.png; *.gif)
- RobotStudio Pack&Go file (*.rspag)

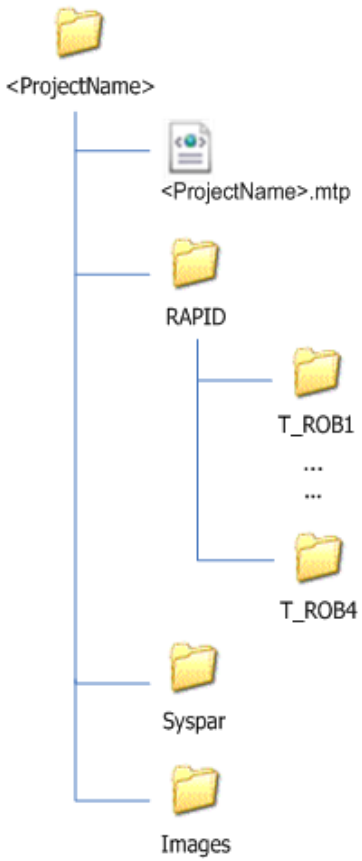
A project can be loaded from the Machine Tending PowerPac (MTPP) or from the **Project view** of the RWMT user interface.

## 3.2 Project data and files

### 3.2.1 Folder structure of a project

Each project is located in the RWMT main project folder in the **Home** directory of the robot controller (`HOME:RWMT/PROJECTS`).

The following image and table provide details of the RWMT folder structure and its description:

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| Folder/File | Description |
|---|---|
| `<ProjectName>` | This folder contains all the required files and folders of a RWMT project.<br>The folder name and the project name are same. |
| `<ProjectName>.mtp` | This XML-based project file specifies all RAPID modules (*.mod and *.sys), system parameters, images, and PackAndGo file, belonging to this specific project.<br>The name of the project file and the project folder must be equal. |
| RAPID | This folder contains the RAPID modules (*.mod and *.sys) of the project for upto 4 motion tasks. |
| `T_ROB1 - T_ROB4` | This folder contains the RAPID modules (*.mod and *.sys) for a specific motion task. |
| Syspar | This folder contains all the system parameters of the project. |

*Continues on next page*

| Folder/File | Description |
|---|---|
| Images | This folder contains all the icons and pictures that are relevant for a specific project. |

## 3.2.2 PackAndGo folder structure and content

All the PackAndGo files are copied into the directory `/hd0a:/MTPP/PackAndGo` of the robot controller.

The PackAndGo files are too big to be placed into the project folder, because the Home directory is saved with each backup, and backups take time and needs space.

The following image and table provide details of the PackAndGo folder structure and its description:


xx1200001217

| Folder | Description |
|---|---|
| MTPP | This is the MTPP main folder (which is located differently from the projects folder). |
| PackAndGo | This folder contains the RobotStudio PackAndGo files for all projects. |

### 3.2.3 RWMT project file structure

**Structure of the file `<ProjectName>.mtp`, filled with some example modules, parameters, images, and a PackAndGo file:**

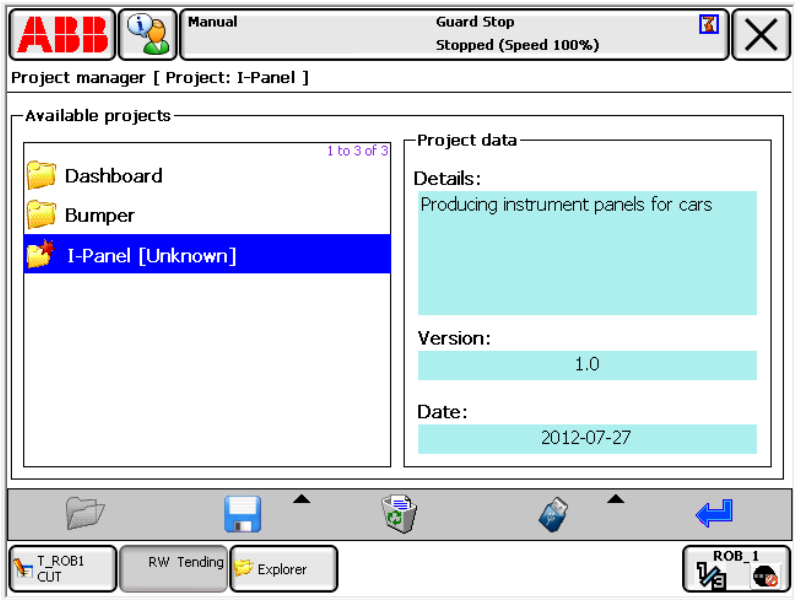
```
<?xml version="1.0" encoding="utf-16"?>
<!--RWMT project file V1.0-->
<Project>
<Description Version="1.0" Date="2012-04-29">
<Title>Bumper</Title>
<Details>Producing bumpers</Details>
</Description>
<Rapid>
<Task Name="T_ROB1" Program="Bumper">
<Module>MT_MAIN.mod</Module>
<Module>IMM.mod</Module>
<Module>FLAMING.mod</Module>
<Module>CNV.MOD</Module>
<Module>Movement_T1.mod</Module>
</Task>
</Rapid>
<Syspar>
<Param>EIO.CFG</Param>
<Param>PROC.CFG</Param>
</Syspar>
<Images>
<Image>Picture1.png</Image>
<Image>Picture2.png</Image>
</Images>
<PackandGo>Bumper station.rspag</PackandGo>
</Project>
```

## 3.3 Unknown projects

If the project folder does not contain a project file with the same name as the loaded project an unknown project is shown in the project list.

**Note**

This happens if the title of the project info declaration in the task T_ROB1 has been manually changed.

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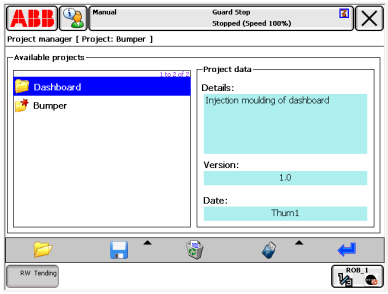
The menu Save project as... can be used to create a new project folder for the unknown project. In this case all the loaded program modules and all the system parameters are preselected and can be modified in the Save project as... dialog.

## 3.4 Loading a project

Use the following procedure to load an RWMT project:

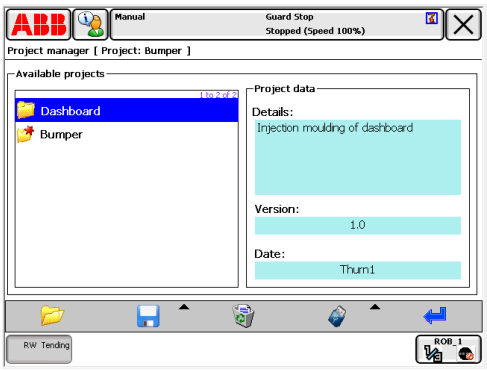
| | Action | Description |
|---|---|---|
| 1 | Start the **RobotWare Machine Tending** user interface. | |
| 2 | Tap **Project**.<br>The **Project manager** page is displayed. |  <br>xx1200001220 |
| 3 | Select a project from the **Available projects** list. | |
| 4 | Tap the **Open folder** button  .<br>A dialog appears which asks if the changes in the current active project should be saved. | |
| 5 | Tap the **Yes** button to save the changes in the current active project or tap the **No** button to discard the changes in the current active project. | |
| 6 | A dialog appears which asks if the selected project should be loaded. Tap the **Yes** button to load the selected project or tap the **No** button to abort the loading process. | |

**Note**

While loading an RWMT project, only the RAPID program and system modules are loaded into the robot controller. The corresponding system parameters must be loaded manually.

## 3.5 Saving a project

Use the following procedure to save an RWMT project:

| | Action | Description |
|---|---|---|
| 1 | Start the **RobotWare Machine Tending** user interface. | |
| 2 | Tap **Project**.<br>The **Project manager** page is displayed. |  <br>xx1200001220<br>The menu for saving a project is available only if a project is loaded. |
| 3 | Tap the **Save** button . | |
| 4 | Tap the **Save project** button<br>Save project .<br>A dialog appears which asks if the changes in the current active project should be saved. | |
| 5 | Tap the **Yes** button to save the changes in the current active project or tap the **No** button to discard the saving procedure.<br>The program and system modules which are specified in the project file are saved and the project file is updated. | If some program modules are not saved a dialog box displays the not saved modules.<br>To save all the program modules the module list of the project file must be modified.<br>Use the **Save project as...** button to modify the module list. |

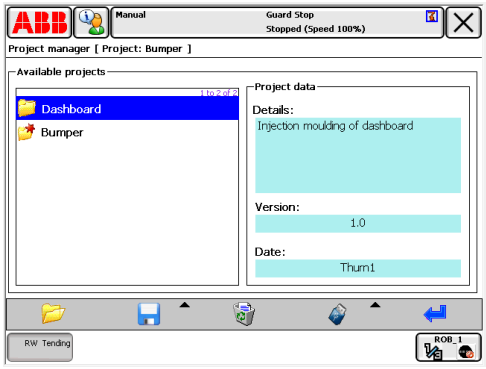
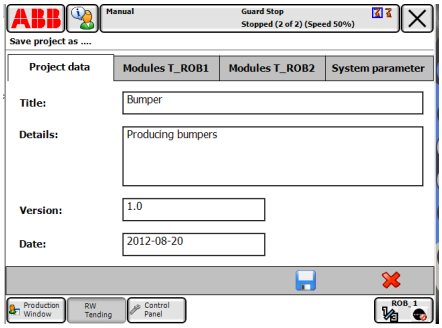
**Note**

While saving a RWMT project the program and system modules and also the system parameter files which are specified in the project file are saved. The project file is updated regarding the data of the project information declaration in the RAPID program and the current date is set.

## 3.6 Saving a project with new name or modified project data

The menu **Save Project as ...** is used if a project should be saved in a new project folder or if some project data is changed.

Use the following procedure to save a project with a new name or modified project data:

| | Action | Description |
|---|---|---|
| 1 | Start the **RobotWare Machine Tending** user interface. | |
| 2 | Tap **Project**.<br>The **Project manager** page is displayed. |  <br>xx1200001220 |
| 3 | Tap the **Save** button . | **Note**<br>The menu for saving a project is available only if a project is loaded. |
| 4 | Tap the **Save project as...** menu.<br>The **Save Project as...** page is opened and the **Project data** tab is displayed. |  <br>xx1200001223 |
| 5 | Tap on the text which needs to be changed and enter the new text with help of the alphanumeric keypad. | |

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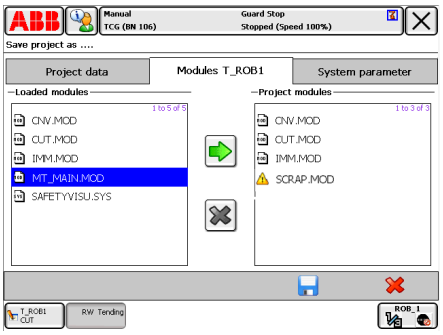
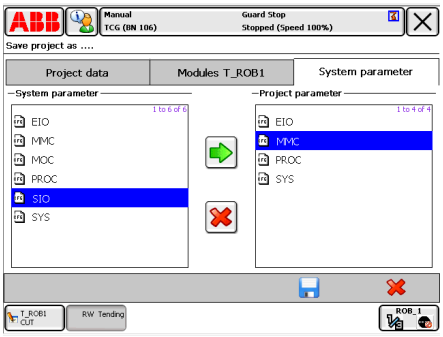
| | Action | Description |
|---|---|---|
| 6 | Tap the **Modules list** tab of the required task (for example, `Modules T_ROB1`)<br>The **Modules list** tab is displayed. |  <br>xx1200001225<br>In the **Loaded modules** list all the program and system modules in the robot task are displayed. In the **Projected modules** list all the specified modules in the project file are displayed.<br>**Note**<br>If a project module is not available in the robot task, it is marked with the icon . |
| 7 | Use or to add or remove the modules between the **Loaded modules** list and the **Project modules** list. | |
| 8 | Tap the **System parameter** tab.<br>The System parameter page is displayed. |  <br>xx1200001228<br>The **System parameter** list displays all the available system parameters of the controller. The **Project parameter** list displays the system parameters which are saved into the project folder. |
| 9 | Use or to add or remove the system parameters between the **System parameter** list and the **Project parameter** list. | |
| 10 | Tap to save the project with new project data in a new or the same project directory or tap to cancel. | |

*Continues on next page*

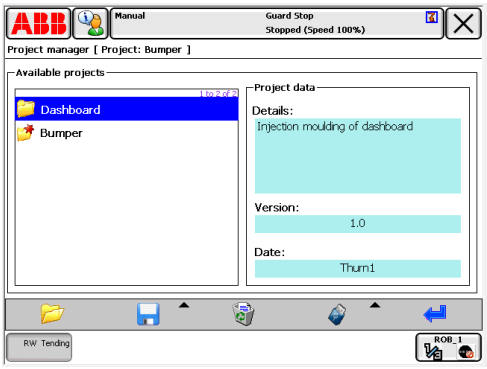
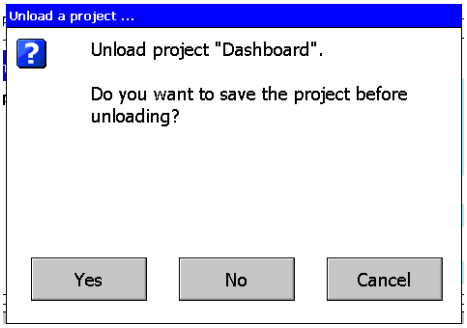
**Note**

A new project folder is created only if the project title is changed. Otherwise the project is saved in the same folder.

## 3.7 Unloading a project

Sometimes it is necessary to clean up the robot tasks by removing the project modules from the memory. To do this, the menu **Unload project** could be used.

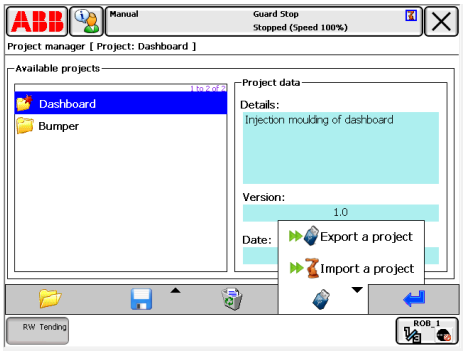
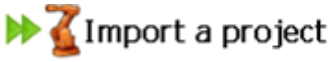
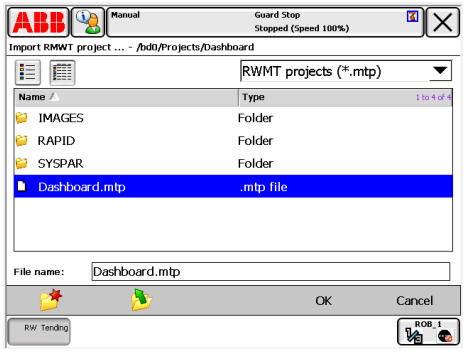
Use the following procedure to unload a project:

| | Action | Description |
|---|---|---|
| 1 | Start the RobotWare Machine Tending user interface. | |
| 2 | Tap **Project**.<br>The **Project manager** page is displayed. |  <br>xx1200001220<br>The menu for unloading a project is available only if a project is loaded. |
| 3 | Tap the **Unload** button  . | |
| 4 | Tap the **Yes** button if project should be saved before unloading.<br>Tap the **No** button to unload the project immediately.<br>Tap the **Cancel** button to abort unloading. |  <br>xx1200001256 |

## 3.8 Importing a project

To use a **RobotWare Machine Tending** project it must be located in the RWMT projects folder of the robot. The **Import project** menu of the project manager copies the project folder from a USB device to the RWMT project directory in the **Home** directory of the robot system. If a **RobotStudio PackAndGo** file is part of the project it is copied into a separate folder outside the robot home directory.

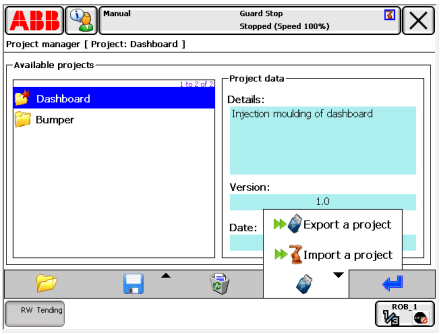
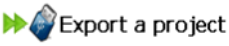
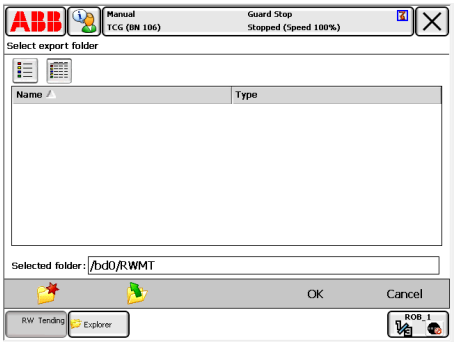
Use the following procedure to import a project:

| | Action | Description |
|---|---|---|
| 1 | Start the **RobotWare Machine Tending** user interface. | |
| 2 | Tap **Project**.<br>The **Project manager** page is displayed. | |
| 3 | Tap the **Import/Export** button  . |  <br>xx1200001258 |
| 4 | Tap **Import a project**. |  <br>xx1200001259 |
| 5 | Browse to the project folder which should be imported on the external device and select the project file (`*.mtp`). |  <br>xx1200001260 |
| 6 | Tap the **OK** button to start the import of the project.<br>The project is imported if it does not exist in the project folder of the robot. | Tap the **Cancel** button to abort importing.<br>Wait until project is imported. |

## 3.9 Exporting a project

The menu **Export project** is used to copy a project folder including the **RobotStudio PackAndGo** file to an external USB device. If the **RobotStudio PackAndGo** file is not required, a backup can be created, because all project files are part of the **Home** directory in the backup.

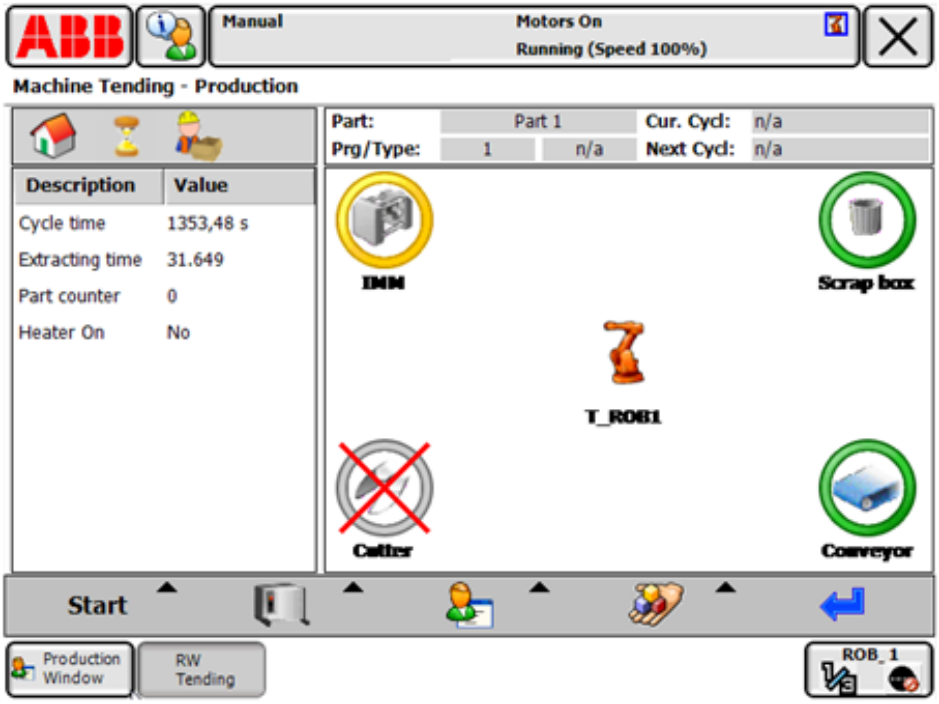
Use the following procedure to export a project:

| | Action | Description |
|---|---|---|
| 1 | Start the **RobotWare Machine Tending** user interface. | |
| 2 | Tap **Project**.<br>The **Project manager** window is displayed. | |
| 3 | Select the project which should be exported in the project list. |  <br>xx1200001258 |
| 4 | Tap the **Import/Export** button  . | |
| 5 | Tap **Export a project**.<br>If the selected project is the loaded project, a dialog appears which asks if project should be saved before the exporting is started. |  <br>xx1200001261 |
| 6 | Tap the **Yes** button to save the project or tap the **No** button to start the export immediately. | |
| 7 | Browse to the folder on the external device where the project folder should be created.<br>Tap on  to create a new sub folder or on  to change to parent folder. |  <br>xx1200001264 |
| 8 | Tap the **OK** button to start the export of the project. | Tap the **Cancel** button to abort exporting the project.<br>Wait until project is exported. |

# 4 Running production

## 4.1 Introduction to running production

This section explains how the production is started, that is, how a robot program is executed.

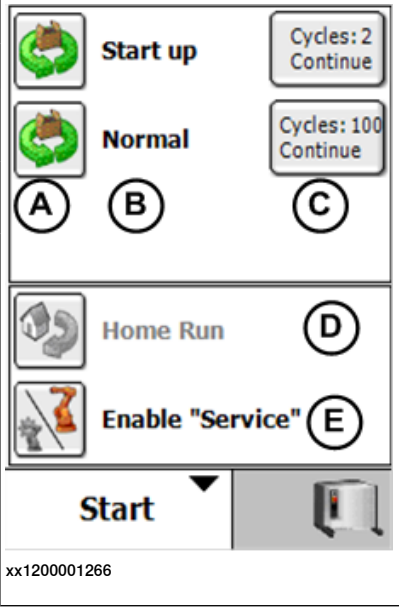



xx1200001265

## 4.2 The Start menu

The **Start** menu is used to control the operation of the robot program and is displayed by tapping **Start** in the lower left corner of the **Production** window.

The following table describes the elements of the **Start** menu:

| | Description | Figure |
|---|---|---|
| A | Button for triggering a cycle. |  xx1200001266 |
| B | Name of the cycle. | |
| C | Button for defining the cycle properties. | |
| D | Button for triggering the run into the home postion. | |
| E | Button for switching the cell operation mode to **Service** or **Production**. | |

The content of the **Start menu** changes according to the processing state of the robot.

| Menu | Description |
|---|---|
| **Start** | The **Start** menu is available if the robot is in the home position or safe position and no cycle is being executed. Through the **Start** menu, all the start cycles can be triggered. |
| **Action** | The **Action** menu is available if the robot is in use and is executing a cycle. Through the **Action** menu all the action cycles of the robot could be triggered or the cycle can be stopped (that is, **Stop after cycle** and **immediate stop**). |
| **Continue** | If the robot is paused during the processing of a program cycle, but it is not in the home position or safe position, the **Continue** menu is displayed. |
| **Stop** | The **Stop** menu is available if the robot is in use and is not executing a cycle (for example, while executing a service routine or while moving to the home position).<br>The program can be stopped or the robot can be moved to the home position. |

## 4.3 Cell operation mode

The following three modes of operation can be set for a robot cell. These are represented with the following robot icons in the **Station Overview** of the **Production** window:

| Mode of operation | Description |
|---|---|
|  | The robot stands still in the **Without robot** mode and does not execute production cycles or service routines.<br>*(Can be selected only through external I/O interface)* |
|  | In the **Service** mode of operation, the robot does not execute any production cycles.<br>*(Only service routines can be started through remote or through the user interface.)* |
|  | In this mode of operation, the robot executes production cycles but no service routines. |

In the **Without robot** or **Service** modes of operation, the robot does not execute any processing cycles, so that the machine and all the other stations can carry out the production without the robot.

**Tip**

If multitasking and Instruction Sets are used, the robot sets the required signals when the cell operation mode is changed, for instance, to release the machines for the manual operation.

**Note**

If the cell operation mode is not required to differentiate the processing of the robot cell, it is possible to deactivate it within the process configuration. In this case the program cycles and the service routines can be started without any pre-selection.

## 4.4 Program cycles

### 4.4.1 Introduction to program cycles

A program cycle describes the production process from the point of view of the robot, starting from the home position or the safe position with the first handling action at a station upto its return to the home position or the safe position after the completion of the last handling action.

## 4.4.2 Supported cycle types

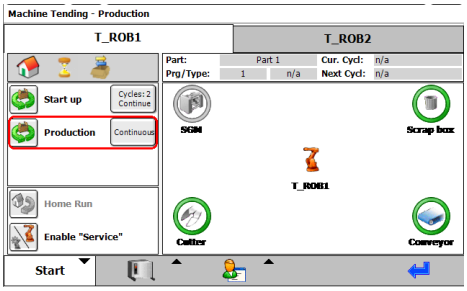
Depending on the requirement and the function of the robot cell, the following cycles can be used in the **RobotWare Machine Tending** user interface:

| Cycle type | Description |
|---|---|
| No cycles used | It is not required to define any cycles if only one cycle is used in the robot cell. |
| **Continuous cycle** (*Start cycle*) | Continuous cycles are executed till they are ended through the **Stop after cycle** request by the operator.<br>**Example**:<br>Production with recurring process. |
| **Count cycle** (*Start cycle*) | Count cycles are executed till the pre-defined number of cycles is reached.<br>If a followup cycle has been defined, it is started as soon as the count cycle is complete. If no followup cycle is present, then the robot is moved to the home position and the processing ends.<br>**Example**:<br>Batch finishing of 100 parts. |
| **Action cycle** | Action cycles are requested during the processing of one of the above mentioned start cycles by the operator and is executed as soon as the current cycle ends.<br>**Example**:<br>Specific request for ejecting parts for manual quality control. |
| **Periodic cycle** | Periodic cycles are started automatically if a certain number of production cycles (interval) has been executed.<br>**Example**:<br>Regular sort out of parts for quality control. |

## 4.4.3 Executing a start cycle (Start menu)

Once all the cycle settings have been done, a start cycle can be executed. For details regarding the requirements of cycle settings, refer to chapter *Cycle settings on page 58*.

Use the following procedure to execute a start cycle:

| | Action | Description |
|---|---|---|
| 1 | Start the **RobotWare Machine Tending** user interface. | |
| 2 | Tap **Production**.<br>The **Production** page is displayed. | Make sure that all the stations in the cell are ready for operation. |
| 3 | Tap **Start** to expand the start menu. | The part that is to be produced must be set either manually or through external selection. The required coding in the system (gripper code, form code, and so on) must be appropriate for the selected part.<br>**Note**<br>The cycle selection is available in the start menu only if the robot is in the home position or safe position, the robot program has a program pointer, and the cell operation mode **Production** has been set.<br>(For more information, see *Application manual - RobotWare Machine Tending*.) |
| 4 | Tap **HomeRun**, if the robot is not in the home position. | |
| 5 | Select a cycle that is to be executed. |  <br>xx1200001270 |
| 6 | Tap the **Start** button.<br>If all the conditions are fine, the robot starts the selected cycle. | **Note**<br>If the robot is in use, the menu changes as described above. |

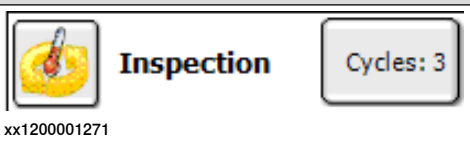
**Note**

Always test a new program in the manual mode first, before executing it in the automatic mode. While testing the program, ensure that the robot can move to the home position from every station without errors.

## 4.4.4 Executing action cycles (Action menu)

If the robot executes a processing cycle, the **Action** menu is displayed. Through the **Action** menu, an action cycle can be started once the current cycle ends.

Use the following procedure to execute an action cycle:

| | Action | Description |
|---|---|---|
| 1 | Tap the desired action cycle (for example, **Inspection**).<br>The robot ends the current cycle and then starts the selected action cycle. |  <br>xx1200001271 |

## 4.4.5 Pausing or ending a cycle (Action menu)

The following actions can be used to pause or stop a cycle.

| Action | Description | Figure |
|---|---|---|
| **Stop after cycle** | Tap **Stop after cycle** to end the current cycle.<br>The robot ends the current cycle and return to the home position. |  <br>xx1200001272 |
| **Stop after cycle**<br>*(for machines that are started by the robot)* | If a machine (for example, injection molding machine) is started by the robot, then, the following two states can arise, if **Stop after cycle** is requested: |  <br>xx1200001272 |
| | **Request before discharging**<br>If **Stop after cycle** is requested before unloading the machine, then the machine is not restarted and the robot moves to the home position as soon as the cycle ends. | |
| | **Request after discharging**<br>If **Stop after cycle** is requested after the machine unloads and the machine produces a new part, then the robot completes the current cycle and performs another cycle to unload the remaining part out of the machine. | |
| **Pause Program** | Tap **Stop program** to pause the current cycle.<br>After this, the cycle can be continued by starting the program. |  <br>xx1200001273 |
| **Execute HomeRun** | The processing of the current cycle ends immediately upon confirmation and the robot returns to the home position. |  <br>xx1200001274 |

## 4.4.6 Continuing a cycle (Continue menu)

If external events occur, such as if the **Stop** button is pressed on the FlexPendant, a safety door is opened, or an **Emergency Stop** button is pressed, the robot stops immediately, and the **Production** window displays the **Continue** menu.

| Action | Description | Figure |
|---|---|---|
| **Continue program** | Rectify the problem and then tap **Program start** to continue the cycle at the position where the robot stopped. |  Program start<br>xx1200001275 |
| **Execute HomeRun** | If the error cannot be rectified, then tap **HomeRun**.<br>The robot moves to the home position and the production can be restarted through the **Start** menu. |  Home Run<br>xx1200001274 |
| **Change the cell operation mode** | If it is necessary to release the machine (for example, injection moulding machine) for manual operation, then tap the **Enable "Service"** button and the corresponding signals are set on the machine.<br>  **Note**<br>After this, it is not possible to continue with the production from the point where it is interrupted. |  Enable "Service"<br>xx1200001286 |

## 4.5 Cycle settings

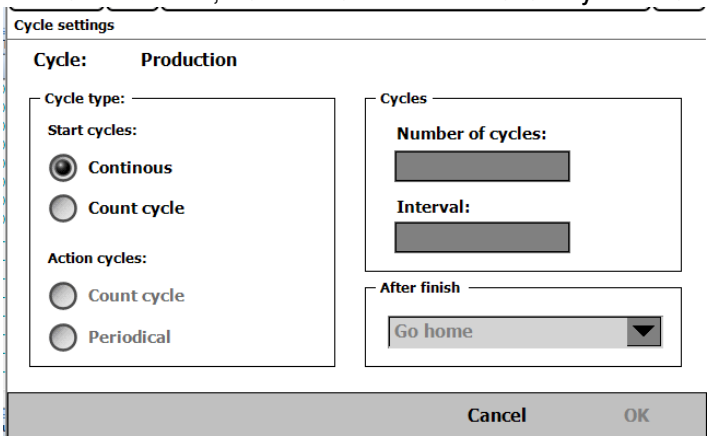
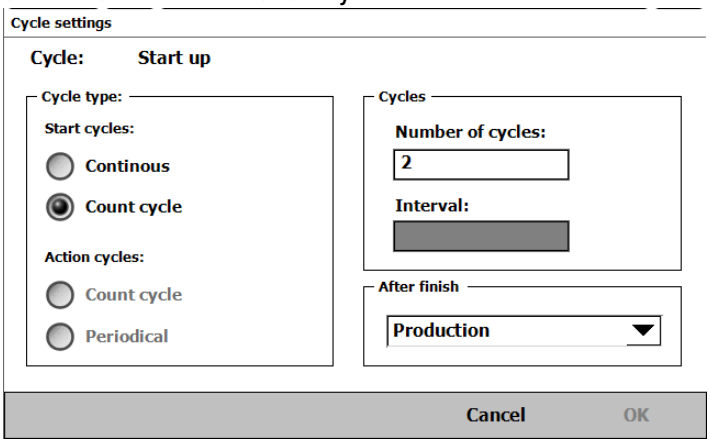
### 4.5.1 Introduction to cycle settings

In the **RobotWare Machine Tending** user interface it is possible to use the automatic cycle control, which supports the continuous cycles, counting cycles, action cycles, and periodic cycles.

If this is the case, then the cycle selection is displayed in the **Start** and **Action** menu. Besides the cycle selection, there is a button which shows the current cycle parameterization and is meant for calling the cycle setting window.

## 4.5.2 Setting the start cycles

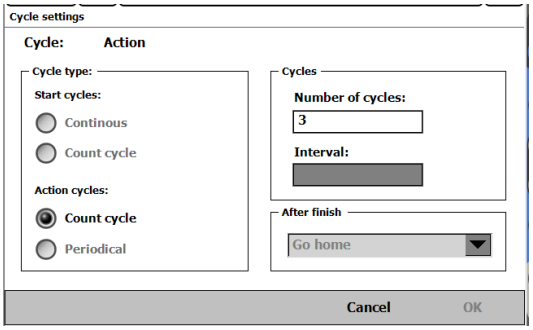
Tap the **Cycle settings** button of the desired cycle to open the **Cycle settings** page.

| Setting | Description |
|---|---|
| **Cycle type** | Select **Continuous**, if the robot should execute the cycle continuously.<br>  <br>xx1200001287<br>Select **Count cycle** and enter the number of cycles, to define how often the robot should execute the cycle.<br>  <br>xx1200001288 |
| **After finish** | Select **Go home**. The robot executes a home run.<br>**Note**<br>If **Continuous** is selected in the **Cycle type** section, the **After finish** option cannot be defined.<br>Once a cycle is selected, it starts as soon as the robot has completed all the cycles (number of cycles). |

## 4.5.3 Setting the action cycles

If an **Action cycle** is selected, then the robot ends the current cycle and then execute the selected **Action cycle**. On ending the **Action cycle**, the original cycle is continued again.

To customize the cycle parameter:

| Settings | Figure |
|---|---|
| Tap **Cycle settings** of the desired cycle to open the **Cycle settings** window. |  xx1200001289 |
| Select an action cycle (for example, **Count Cycle**) from the **Action cycles** section. | |
| Type a number in the **Number of cycles** text box to define how often the robot should execute the selected action cycle. |  xx1200001290 |
| Tap the **OK** button to accept the changes or tap the **Cancel** button to reject the changes. | |

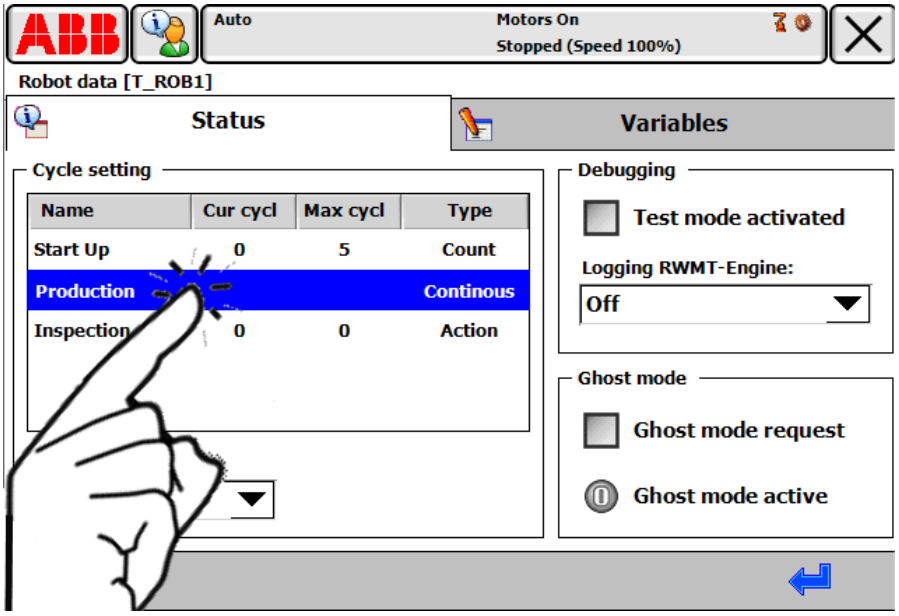
**Note**

To keep the modified **Cycle Settings** permanently, save the program or create a backup.

## 4.5.4 Displaying and editing cycles

Editing the **Cycle Settings** in the **Start** menu is possible only if the cycle menus are visible.

All cycles are shown in a table inside the **Robot Station** page. This table contains the cycle name, the cycle type, the maximum number of cycles to be executed, and the current cycle counter.




xx1200001291

To modify the settings of a cycle, double-tap the desired cycle in the table. This displays the **Cycle Editor**.

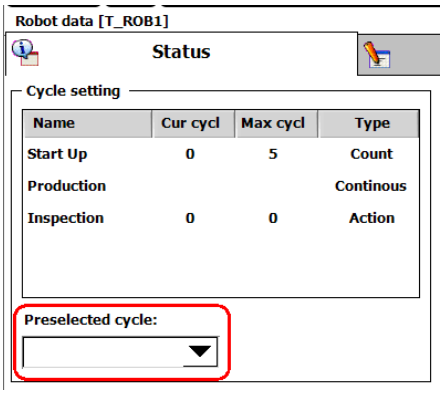
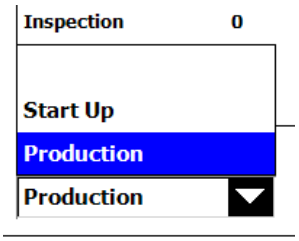
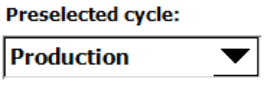
## 4.5.5 Preselecting a cycle for execution

### Preselecting a cycle for execution

The cycle preselection is used for simplification purpose, if:

- the production flow of a robot cell provides alternative cycles and there is no cycle selection through a remote group input and
- the execution of the robot program shall be started immediately without any further manual cycle selection.

Use the following procedure to preselect a cycle:

| | Action | Description |
|---|---|---|
| 1 | Open the **Production** window and tap the robot symbol in the **Station overview** section.<br>The **Robot data** page is displayed. |  <br>xx1200001293<br>The **Preselected cycle** drop-down list box displays all the continuous and count cycles that can be preselected for execution. |
| 2 | Select a cycle for execution from the **Preselected cycle** drop-down list box.<br>The name of the selected cycle appears in the list box and the cycle selection in the **Start** menu is hidden. |  <br>xx1200001294<br>  <br>xx1200001295<br>**Note**<br>When tapping the empty entry inside the **Preselected cycle** drop-down list box, the preselection is disabled. As a result, the cycle selection in the start menu becomes visible again. |

# 5 Station and robot data view

## 5.1 Introduction to station and robot data view

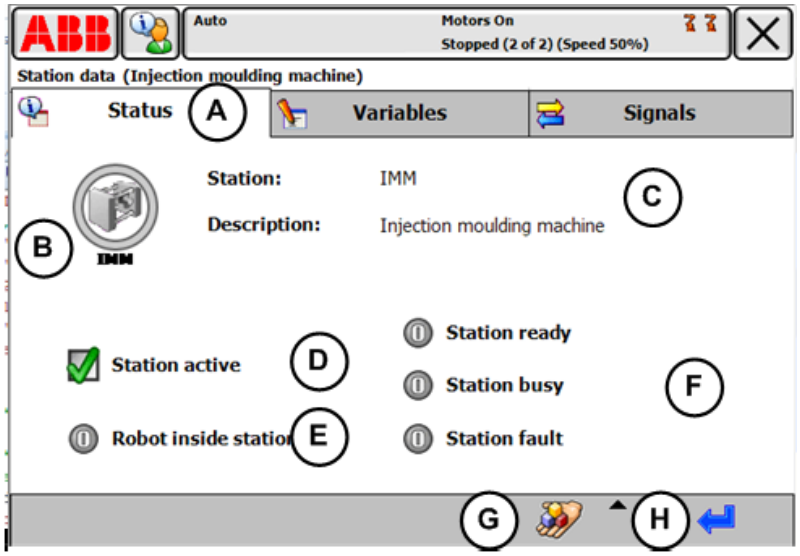
This chapter explains about how the information regarding the robot and the station are displayed or changed in the **RobotWare Machine Tending** user interface.

The station data view is displayed by tapping on the desired station icon (for example,  ) and the robot data view is displayed by tapping the robot icon  in the **Production** page.

## 5.2 Station status

The **Status** tab of the station displays the current state of the station and permits the selection and de-selection of the station.

The following image and table provide details of the **Status** tab.




xx1200001299

| | Domain | Description |
|---|---|---|
| A | **Status** tab | Tap the **Status** tab to open the **Status** page of the station. |
| B | **Status** icon | The station icon combines the visualization of all the status displays (refer to the chapter *Station status on page 22*). |
| C | **Description** | Station name and description |
| D | **Station active** | Depending on the station setting, the station can be selected or deselected.<br>If the station could not be activated or deactivated through the user interface an LED is shown:<br>- Station is not active.<br>- Station is active. |
| E | **Robot inside station** | Displays whether the robot is processing this station currently.<br>The LED can assume the following states:<br>- Robot is processing another station.<br>- Robot is processing this station. |

*Continues on next page*

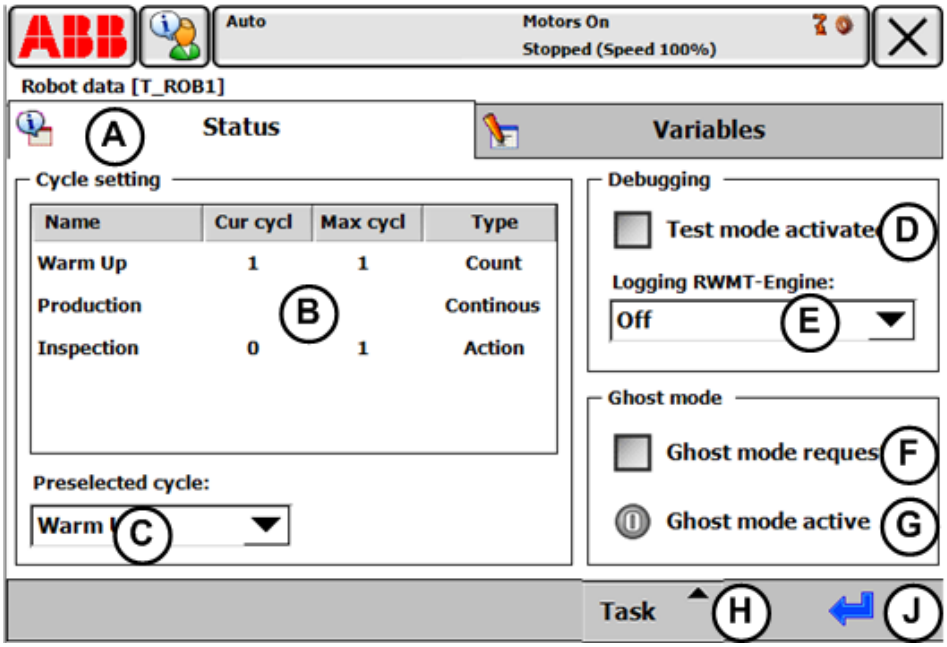
| | Domain | Description |
|---|---|---|
| F | Status messages<br>• **Station ready**<br>• **Station busy**<br>• **Station fault** | The three status messages of the station are represented through LEDs, which can assume the following states:<br>  - Status mode is not active.<br>  - Status is active. |
| G | **Application** button | The **Application** button appears if one or more station applications, (for example, ScreenMaker applications) are configured to be launched from the user interface. |
| H | **Back** button | Closes the window. |

## 5.3 Robot station data

### Introduction to robot station data

The status view of the robot station is used for activating or deactivating the test functions for the robot program and for selecting and changing the cycle settings.

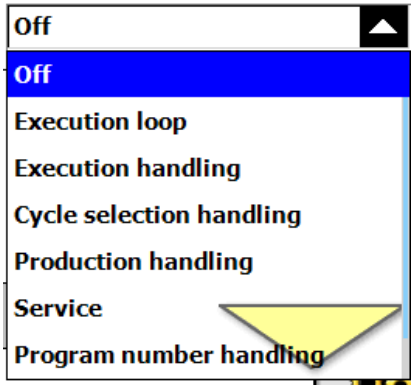
The following image and table provide details of the **Robot data** page.




xx1200001300

| | Domain | Description |
|---|---|---|
| A | **Status** page | Tap the **Status** tab to open the **Status** page of the robot station. |
| B | **Cycle setting** | All the available production cycles are displayed in this section.<br>The following data are available:<br>• **Name**: Cycle name<br>• **Cur cycl**: Number of executed cycles<br>• **Max cycl**: Maximum number of cycles to be executed<br>• **Type**:Cycle type<br>To modify cycle settings, double tap a cycle row. |
| C | **Preselected cycle** | Select a continuous or count cycle to specify which cycle should be exclusively executed without any user intervention.<br>The cycle selection in the **Start** menu is disabled if a cycle is preselected.<br>**Note**<br>If cycles are selected through the signal interface, the cycle pre-selection is not available.<br>For further information, see *Preselecting a cycle for execution on page 62*. |

*Continues on next page*

| | Domain | Description |
|---|---|---|
| D | **Test mode activated** | Tap the check box to activate or deactivate the test mode.<br>**Note**<br>Stations which are disabled through a digital signal can be enabled only through the check box in the station view if the test mode is active. Similarly, the cycles that are selected through the digital signal interface, are shown only in the menu or action menu, if the test mode is active. |
| E | **Logging RWMT-Engine** |  <br>xx1300000232<br>If there are problems while processing the RWMT RAPID engine, the internal program flow can be logged into a file. This log file can be send to the system integrator for error analysis. For every robot manipulator, a daily log file is created in the directory `HOME:/LOG/MT_LOG_YY_MM`.<br>The **Logging RWMT-Engine** list sets the program area that is to be logged. Ask ABB, which setting is required or select the entry **Log everything**. Select the entry **Off** and delete the log files from the named directory, when error analysis is finished. |
| F | **Ghost mode request** | Select the check box to activate the ghost mode (partless mode). The activation or deactivation is done before or after executing the next program cycle.<br>In the ghost mode the program flow can be tested without actuating the gripper or execute other part related actions.<br>**Note**<br>The robot application program should support this functionality. Therefore, RWMT provides appropriate RAPID instructions and functions. |
| G | **Ghost mode active** | The LED indicates whether the ghost mode is active or not. For this, the ghost mode should be activated either externally (digital signal) or through selection.<br>The LED can assume the following states:<br>•  - Ghost mode is not active.<br>•  - Ghost mode is active. |

*Continues on next page*

| | Domain | Description |
|---|---|---|
| H | **Task** button | Tap this button to offer all the available robot tasks for selection in MultiMove systems.<br>As soon as a task is selected, its robot station is displayed. |
| J | **Back** button | Tap this button to close the status view of the robot station. |

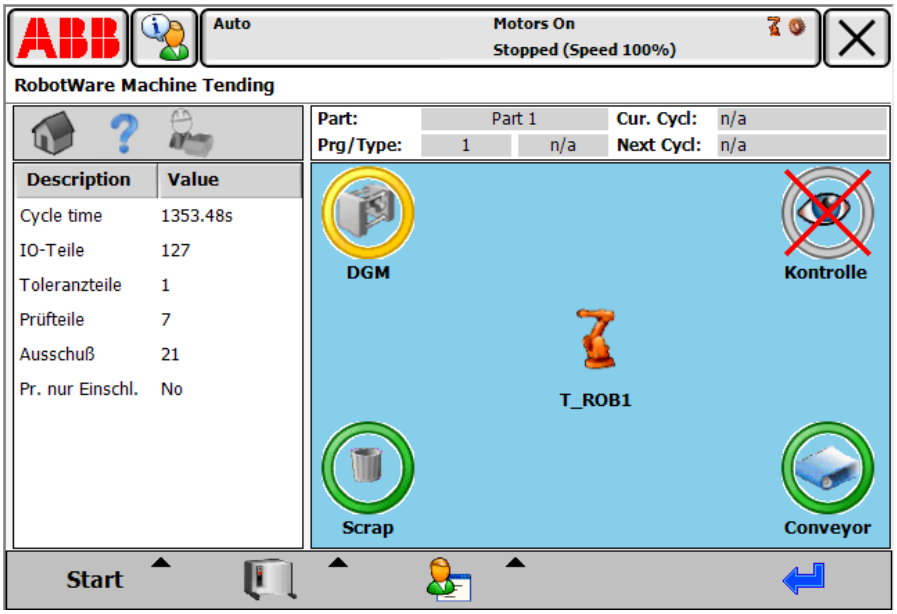
## 5.4 Indication of test mode or logging activity

### Introduction

The background of the station overview in the production window is colored in cyan if test mode or logging of the RWMT engine is active for the following reasons:

- If the robot is running unintentionally in test mode, the production settings for station activation or cycle selection might be overwritten. This can cause an inaccurate behavior when starting production.
- If the logging has been unintentionally activated for a long time, this results in very big logging files.

The cyan-colored background reminds the operator to deactivate the test mode, respectively the logging activity, before continuing the normal production.



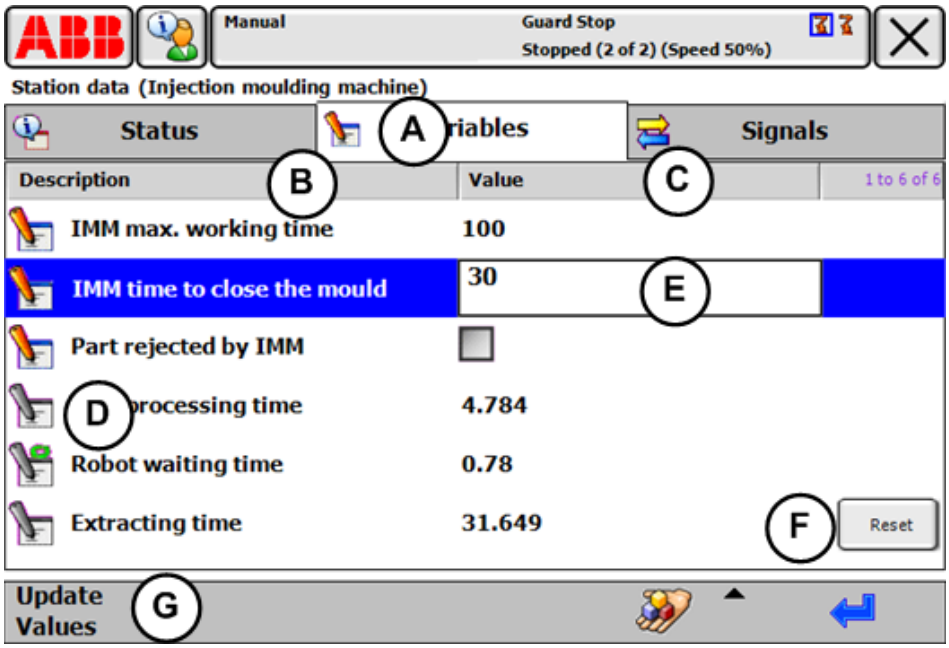

xx1200001315

## 5.5 Station variables

### 5.5.1 Description of the variable view

For every station (or for the robot), program data which contains information about the selected station (or can influence the station specific behavior of the robot) can be displayed and also can be modified if necessary. For every station upto two variable pages can be displayed.

The following image and table provide details of the **Variables** tab.




en1300000226

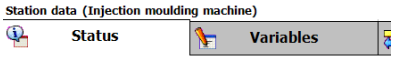
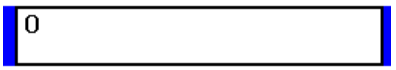
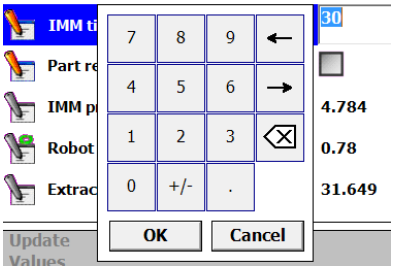
| | Domain | Description |
|---|---|---|
| A | **Variables** tab | tap the **Variables** tab to display the **Variables** page. |
| B | **Description** | Displays the text explaining the function of the variable. |
| C | **Value** | If a Boolean variable could be edited a check box is used to change the state:<br>• Function is selected (TRUE)<br>• Function is deselected (FALSE)<br>For all the other data, the corresponding values are displayed as text. |

*Continues on next page*

| | Domain | Description |
|---|---|---|
| D | Edit icon | Displays the processing status of a variable:<br>•  Variable can be modified<br>•  Variable cannot be modified<br>•  Variable can be modified; Updating is done by tapping the button.<br>•  Variable cannot be modified; Updating is done by tapping the button. |
| E | Input field | To modify a variable, tap in the value range of the concerned list entry.<br>A frame is displayed to enter the numerical value or the text. Tap the frame, to display a numerical or an alphanumerical keyboard, depending on the data type. |
| F | **Reset** button | Depending on the setting, the button to reset the variable is displayed besides the list entry.<br>Tap this button to reset the variable to the pre-set value following a confirmation query. |
| G | **Update Values** button | This button appears only if variables have to be updated manually.<br>**Note**<br>Only persistent are updated automatically |

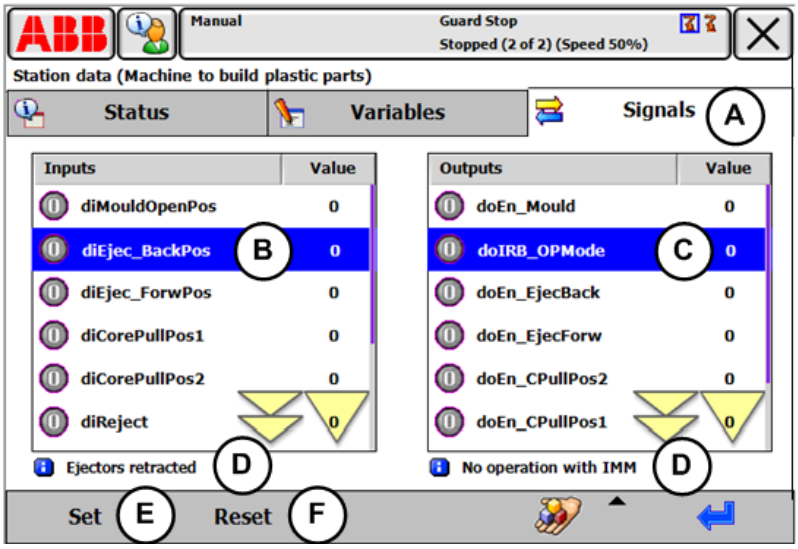
## 5.5.2 Changing a numerical variable

Use the following procedure to change a numerical value:

| | Action | Description |
|---|---|---|
| 1 | Start the RobotWare Machine Tending user interface. | |
| 2 | Tap **Production**.<br>The **Production** page is displayed. | |
| 3 | In the station view, tap the icon of the station for which you wish to change a variable.<br>The **Station data** page is displayed. |  <br>xx1200001316 |
| 4 | Tap the **Variables** tab.<br>The **Variables** page is displayed. |  <br>xx1200001317 |
| 5 | Check if the processing icon is displayed, so that the variable can be modified.<br>If this is not the case, switch to the **Manual** mode of the robot controller. |  or  <br>xx1200001318 xx1200001319<br>**Note**<br>Changing the variable may not be allowed if you do not have the required permissions. |
| 6 | Tap the value range of the variable which you wish to modify, so that a frame appears around the numerical value or the text. |  <br>xx1200001320<br>The frame disappears again if you tap at another place away from the frame. |
| 7 | Tap the frame.<br>The numerical keyboard is displayed. |  <br>xx1200001321<br>**Note**<br>For string variables, the alphanumerical keyboard is displayed. |
| 8 | Use the keyboard to enter the desired value. | |
| 9 | Tap the **OK** button to accept the value or the **Cancel** button to discard the value. | The new value is transferred immediately to the robot program. |

## 5.6 Station signals

The signal window displays the signals that are related to the station. The following image and table provide details of the **Signals** tab.




xx1200001322

| | Domain | Description |
|---|---|---|
| A | **Signals** tab | Tap the **Signals** tab to open the **Signals** page. |
| B<br>C | **Inputs**<br>**Outputs** | The states of the digital input and output signals are represented by the following icons:<br>- Signal is not active (low)<br>- Signal is active (high)<br>- Signal name is not known in the system<br>**Note**<br>For analog or group signals, the current value is displayed next to the name of the signal. |
| D | Description of the signal | The description of the signal is displayed only if a corresponding entry exists within the station signal declaration in the robot program or the signal configuration (See *Technical reference manual - System parameters*). |

*Continues on next page*

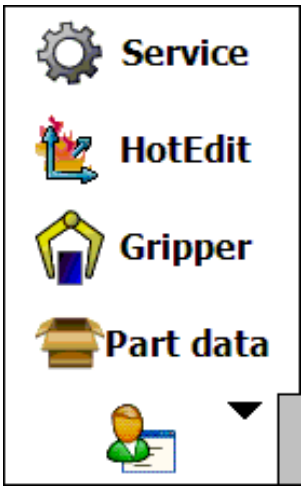
| | Domain | Description |
|---|---|---|
| E | **Set** button or **123…** button | The buttons for setting and resetting the signals are always active in the manual mode. In the automatic mode, these are visible only if the setting of the corresponding output signal in the automatic mode is allowed in the signal configuration (See *Technical reference manual - System parameters*).<br>Digital outputs are set directly to 1 by activating the button.<br>In the case of analog signals or group exits, an input field is displayed, in which the desired value has to be entered. |
| F | **Reset** button | The output signal is set to the value 0. |

# 6 Manual gripper operations

## 6.1 Introduction to manual gripper options

This chapter explains how grippers and actuators can be operated manually using the **RobotWare Machine Tending** user interface.

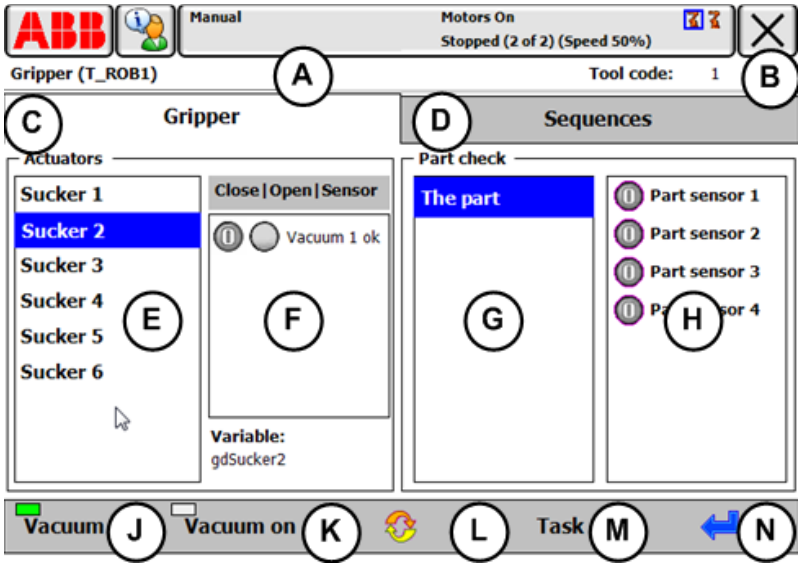
The **Gripper** window is loaded by tapping the **Gripper** button in the **Production** window.




xx1300001126

## 6.2 Gripper window

Actuators are the individual functions of a gripper and can be operated in the manual mode of the robot controller through the following elements:




xx1200001324

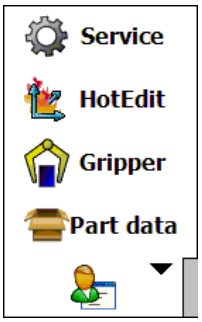
| | Domain | Description |
|---|---|---|
| A | Title bar | Displays the name of the page and the details of the selected robot task. |
| B | **Tool code** | If a tool code is used, the current value is displayed. |
| C | **Gripper** tab | Displays the sensors of the actuators and of the parts. It is possible to control the actuators through the menu buttons. |
| D | **Sequences** tab | Displays the gripper sequences that can be executed. |
| E | **Actuators** list | Displays those actuators whose tool code corresponds to the active gripper code. |
| F | Sensor display of the actuators | Displays the signal states of upto four pairs of sensors of the selected actuator.<br>The states are represented through the following icons:<br>- Signal is not active (low)<br>- Signal is active (high)<br>- Signal name is not known in the system<br>- No signal is defined |
| G | **Part check** list | Displays those part controls whose tool code corresponds to the active gripper code. |

*Continues on next page*

| | Domain | Description |
|---|---|---|
| H | Sensor display of the part control | Displays the signal states of upto eight sensors of the selected part control.<br>The states are represented through the following icons:<br>  - Signal is not active (low)<br>  - Signal is active (high)<br>  - Signal name is not known in the system |
| J | **Open** button | Sets the output signal for opening the control element.<br>  **Note**<br>The labeling of the button is specified through the selected actuator and changes according to the function. For example, for a vacuum suction cup, the text **Vacuum off** can be used.<br>The instantaneous signal state of the output for opening the actuator is displayed through the LED at the button:<br>Output is set (high)<br>Output is reset (low) |
| K | **Close** button | Sets the output signal for closing the control element.<br>  **Note**<br>The labeling of the button is specified through the selected actuator and changes according to the function. For example, for a vacuum suction cup, the text **Vacuum on** can be used.<br>The instantaneous signal state of the exit for closing the actuator is displayed through the LED at the button:<br>Output is set (high)<br>Output is reset (low) |
| L | **Refresh** button | Tap this button to reload the gripper declarations from the robot program.<br>In this way, changes to the declarations are displayed immediately. |
| M | **Task** button | Displays all the available robot tasks for selection in the MultiMove systems.<br>As soon as a task is selected, its gripper declarations are displayed. |
| N | **Back** button | Closes the **Gripper** window. |

## 6.3 Controlling an actuator

Use the following procedure to manually control an actuator element:

| | Action | Description |
|---|---|---|
| 1 | Start the **RobotWare Machine Tending** user interface. | |
| 2 | Tap **Production**.<br>The **Production** page is displayed. | |
| 3 | Tap **Gripper**.<br>The **Gripper** page is displayed. |  <br>xx1300001126<br>**Note**<br>Make sure that the gripper is ready for operation. |
| 4 | Switch the mode selector of the robot control to the manual mode (manual ≤ 250 mm/s or manual 100%). |  <br>xx1200001329 |
| 5 | Select the actuator that is to be controlled from the **Actuator** list. | The sensors of the control element are displayed and the texts of the buttons for actuating the control element can be modified accordingly. |
| 6 | Tap the enabling device on the FlexPendant to switch on the motor. | |
| 7 | Tap the menu button to open or close the gripper. | **Note**<br>If the actuator cannot be actuated due to an external condition, then a dialog with the corresponding message appears. |
| 8 | Confirm the confirmation query asking whether you really wish to Open or Close the controlling element. | The outputs of the actuator are actuated accordingly. The LEDs of the outputs and the sensors can change according to the current state.<br>**Note**<br>The confirmation query can be deactivated in the setting menu of the main view. |

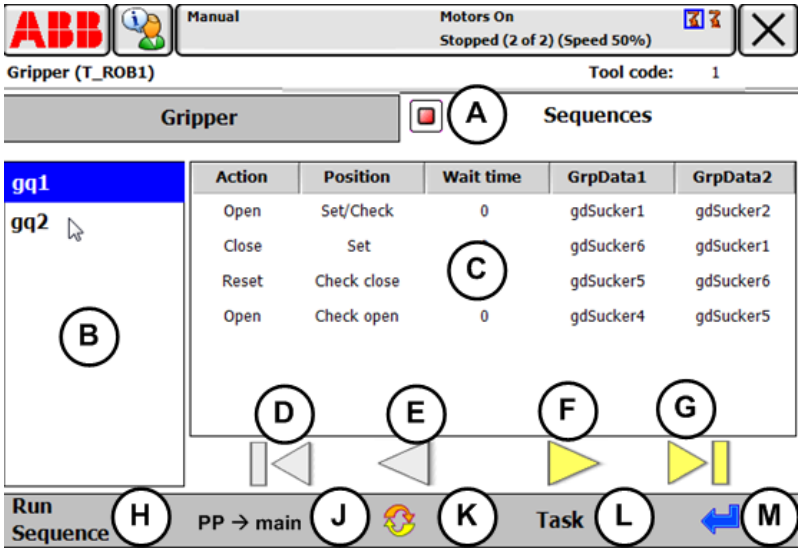
## 6.4 Displaying the part control sensors

To display the part control sensors, select the desired part control in the **Part check** list. The sensors of the selected part control are displayed and the signal states are displayed accordingly.

## 6.5 Gripper sequences

Gripper sequences contain the processing of several actuators, which are processed simultaneously or sequentially.

The following image and table provide details of the **Sequences** page.




xx1200001330

| | Domain | Description |
|---|---|---|
| A | Processing status of the gripper sequence | The gripper sequence is executed as a service routine, so that the program pointer of the robot program does not change.<br>The processing status of the gripper sequence is displayed through the following icons:<br>• Gripper sequence is executable.<br>• Gripper sequence is executing.<br>• Gripper sequence is stopped.<br>• Gripper sequence is blocked.<br>(*Program pointer is not available or the robot program is not executed*). |
| B | Gripper sequence list | Displays those gripper sequences whose tool code corresponds to the active gripper code. |
| C | Gripper sequence | Displays the sequence details of the selected gripper sequence.<br>For readability reasons, all the data of the gripper sequence cannot be displayed at the same time. It is possible to scroll through the sequence using the arrow keys. |
| D | Scroll to first column | Displays the content of the table at the first column. |
| E | Scroll to the left | Shifts the content of the table by one column to the left. |
| F | Scroll to the right | Shifts the content of the table by one column to the right. |

*Continues on next page*

| | Domain | Description |
|---|---|---|
| G | Scroll to the last column | Displays the contents in the last column of the table on the right side. |
| H | **Run sequence** button | Executes the selected gripper sequence. |
| | **Cancel routine** button | If a gripper sequence is stopped while it is being processed, the **Cancel routine** button is displayed.<br>If the processing of the gripper sequence should be discontinued, tap the **Cancel routine** button, since the program pointer is still in the service routine and the normal robot program cannot be executed. |
| J | **PP ->main** button | Sets the program pointer to the **main** routine. |
| K | **Refresh** button | Reloads the gripper declarations from the robot program.<br>In this way, changes to the declarations are displayed immediately. |
| L | **Task** button | Displays all the available robot tasks for selection in the MultiMove systems.<br>As soon as a task is selected, its gripper declarations are displayed. |
| M | **Back** button | Closes the **Gripper** page. |

## 6.6 Executing a gripper sequence

Use the following procedure to manually process a gripper sequence:

| | Action | Description |
|---|---|---|
| 1 | Start the **RobotWare Machine Tending** user interface | |
| 2 | Tap **Production**.<br>The **Production** page is displayed. | |
| 3 | Tap  and then tap the **Gripper** button.<br>The **Gripper** page is displayed. | |
| 4 | Tap the **Sequences** tab.<br>The tab pane for the gripper sequences is displayed | Make sure that the gripper is ready for operation. |
| 5 | Switch the mode selector of the robot controls to the manual mode (manual ≤ 250 mm/s or manual 100%). |  <br>xx1200001329 |
| 6 | Select the desired gripper sequence. | |
| 7 | Tap the enabling device on the FlexPendant, so that the motors are switched on. | |
| 8 | Tap the **Run sequence** button. | If the gripper sequence cannot be actuated due to an external condition, then a dialog with the corresponding message appears.<br>**Note**<br>As soon as the gripper sequence is started, a dialog box opens, querying the manner in which the sequence is to be processed. |
| 9 | Tap the **Complete** button to completely process the gripper sequence.<br>Tap the **Step by step** button to start the execution of the next step through a dialog after every step in the sequence that has been processed.<br>Tap the **Cancel** button to cancel the execution of the gripper sequence. | As soon as the gripper sequence has been processed completely a dialog is displayed.<br>**Note**<br>In the step by step processing, it is also possible to process all the following steps by tapping the **Complete** button, without further confirmation queries. |

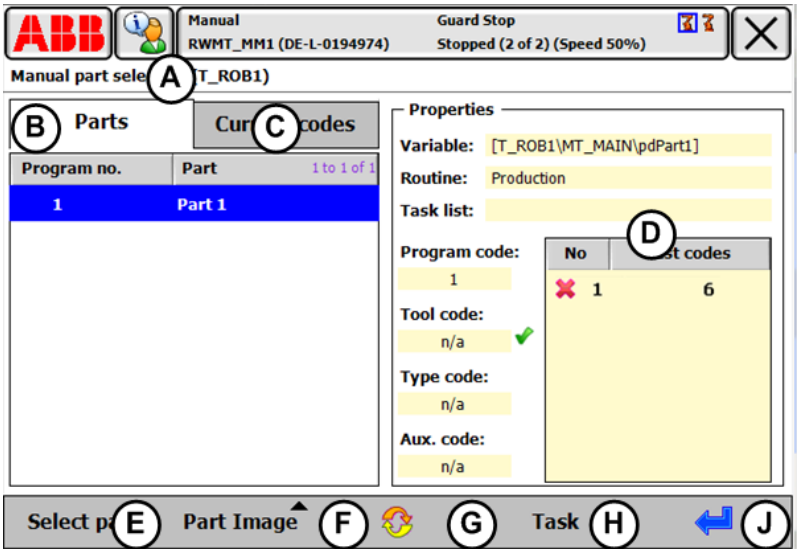
# 7 Part data window

## 7.1 Introduction to part data window

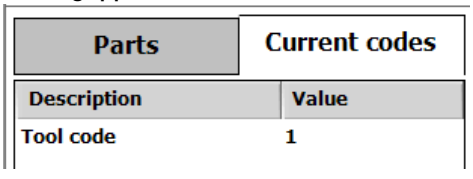
This chapter explains how part information can be displayed in **RobotWare Machine Tending** user interface and a part can be selected manually for processing.

## 7.2 Description of the part data window

In the part data window, all the part definitions and their detailed information are displayed. Tap **Part data** in the production window to load the **Part** window.




xx1200001341

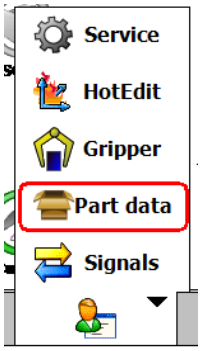
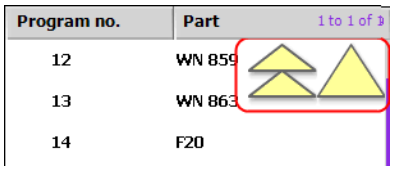
| | Domain | Description |
|---|---|---|
| A | Title bar | Displays the name of the page and the name of task of the selected robot. |
| B | **Parts** tab | Displays a list with all the part declarations from the robot program.<br>A part can be denoted by the following icons in the parts list:<br>  Part is selected externally.<br>  Part is selected manually.<br>  Coding matches the part but the part has not been selected manually or remotely operated yet. |
| C | **Current codes** tab | Displays a list with the current values for the program code, gripper code, and check codes.<br>  <br>xx1200001345 |
| D | **Part Properties** | Displays the details of the selected part. The codes that match with the current values are also displayed:<br>✔ Expected and actual coding match<br>✖ Expected and actual coding do not match |

*Continues on next page*

| | Domain | Description |
|---|---|---|
| E | **Select part** or **Deselect part** button | Activates the selected part for processing after a confirmation query. When a part is selected manually the external part selection is ignored.<br>If a part has been activated manually, the button changes to **Deselect part**. Tap the **Deselect part** button to deactivate the part after a confirmation query. |
| F | **Part Image** or **Part Properties** button | Switches the display between the part details and the part image.<br>The labeling of the buttons changes according to the data that is displayed. |
| G | **Refresh** button | Reloads the part data from the robot program. In this way, changes to the declarations are displayed immediately. |
| H | **Task** button | Displays all the available robot tasks for selection in the MultiMove systems.<br>As soon as a task is selected, its part data is displayed. |
| J | **Back** button | Closes the parts window. |

## 7.3 Manual selection of a part

Use the following procedure to manually select a particular part for processing:

| | Action | Description |
|---|---|---|
| 1 | Start the **RobotWare Machine Tending** user interface. | |
| 2 | Tap **Production**.<br>The **Production** page is displayed. | |
| 3 | Tap  and then tap **Part data**.<br>The **Part data** window is displayed. |  <br>xx1200001349<br>**Note**<br>In the case of a MultiMove systems, if the data for the desired robot is not displayed, switch to the corresponding view, by tapping the **Tasks** button and selecting the required robot (for example, T_ROB1). |
| 4 | In the list, select a part by tapping it. |  <br>xx1200001350<br>**Note**<br>In case the list has more than 8 part declarations, then it is possible to scroll through the list by tapping the arrows. |
| 5 | Tap **Select part** and then tap **Yes** to confirm.<br>The successful activation is indicated by the  icon in front of the program number in the parts list. |  <br>xx1200001355<br>Through the property view, you can check if the coding of the part is identical with the settings in the system.<br>The processing of the part is executed by the robot only if all the required conditions are fulfilled. |

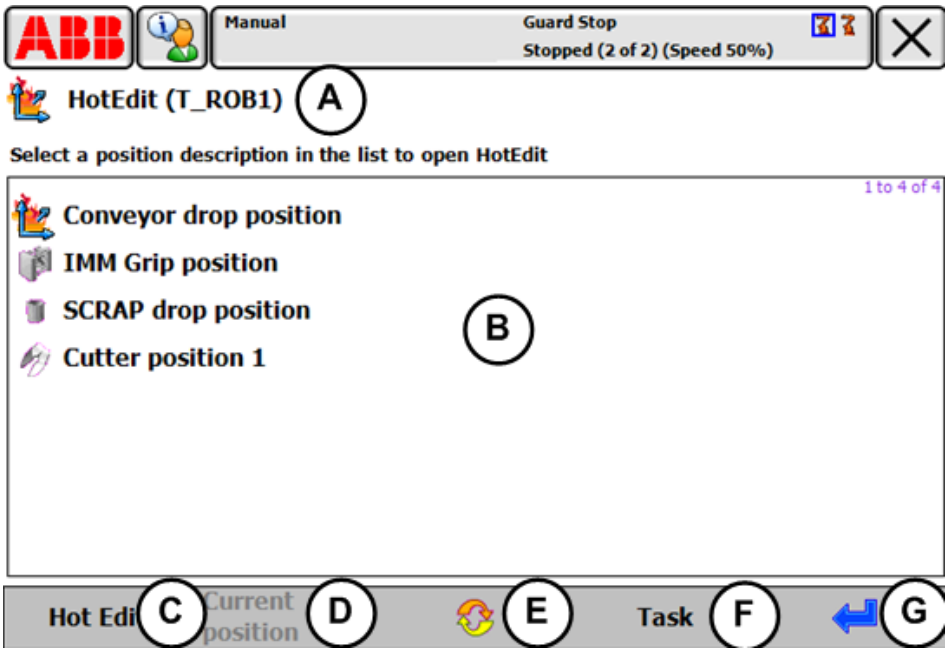
# 8 Advanced HotEdit

## 8.1 Introduction to advanced HotEdit

This chapter explains how robot positions can be changed online in RobotWare Machine Tending.

## 8.2 Description of the HotEdit window

To select and change the positions in the robot, the following elements are offered. The **HotEdit** window is loaded by tapping the **HotEdit** button in the production window and consists of the following elements:




xx1200001357

| | Domain | Description |
|---|---|---|
| A | Title bar | Displays the name of the page and the name of task of the selected robot. |
| B | Position list | Displays the part specific or station specific list of positions for selecting the robot position that is to be changed. |
| C | **HotEdit** button | Tap this button to open the HotEdit window with the selected choice of positions.<br>**Note**<br>If no position list entry has been selected, then the HotEdit window is opened with all the available positions. |
| D | **Current position** button | Displays the HotEdit window for the current robot position.<br>If a list entry contains the current robot position, then all the positions from this entry are displayed for modification.<br>**Note**<br>The **Current Position** button is active only if a motion pointer is present in the robot program (that is, the robot is moved to a specific position through program control) and the robot program is stopped. |

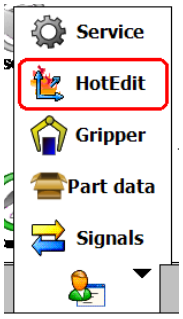
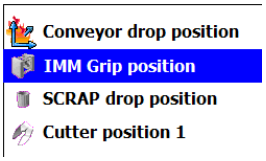
*Continues on next page*

| | Domain | Description |
|---|---|---|
| E | **Refresh** button | Reloads the position declarations from the robot program.<br>In this way, changes to the declarations are displayed immediately. |
| F | **Task** button | Displays all the available robot tasks for selection in the MultiMove systems.<br>As soon as a task is selected, its position lists are displayed. |
| G | **Back** button | Closes the HotEdit page. |

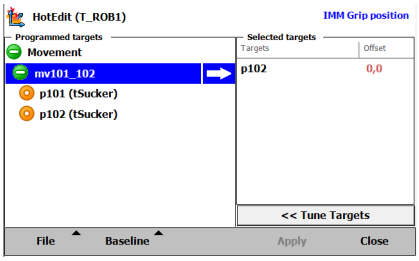
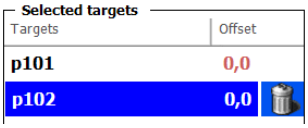
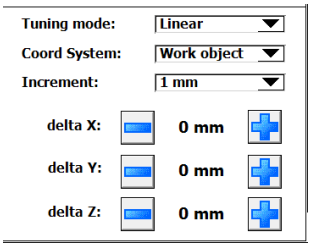
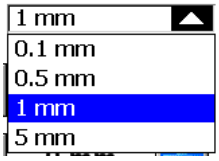
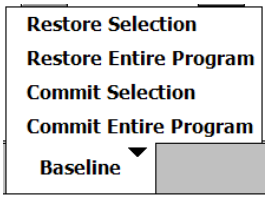
## 8.3 Changing a robot position

The HotEdit option is used for changing the programmed positions. The change can be made in all the modes of operation, even during an ongoing program processing. Both the coordinates as well as the orientation can be customized. Here, HotEdit can be used only for named positions of the data type `robtarget`.

Use the following procedure to change a robot position:

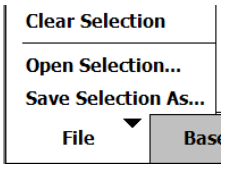
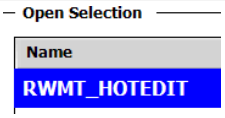
| | Action | Description |
|---|---|---|
| 1 | Start the **RobotWare Machine Tending** user interface. | |
| 2 | Tap **Production**.<br>The **Production** page is displayed. | |
| 3 | Tap  and then tap **HotEdit**.<br>The **HotEdit** page is displayed. |  <br>xx1200001358<br>**Note**<br>In the case of a MultiMove systems, if the data for the desired robot is not displayed, switch to the corresponding view, by tapping the **Tasks** button and selecting the required robot (for example, `T_ROB1`). |
| 4 | In the list, select the position that is to be changed by tapping and selecting it. |  <br>xx1200001359<br>**Note**<br>In case the list has more than 8 part positions, then it is possible to scroll through the list by tapping the arrows. |

*Continues on next page*

| | Action | Description |
|---|---|---|
| 5 | Tap **HotEdit** to open the position editor with the pre-defined positions. |  <br>xx1200001360 |
| 6 | If you do not wish to change all the positions with the same offset, the position that is not required should be deleted from the **Selected targets** list.<br>To delete a position, select the corresponding position and then tap the **Trash can** icon. |  <br>xx1200001361 |
| 7 | Tap **<<Tune Targets>>** and select the tuning mode (linear, re-orientation, or external axes) and then select the coordinate system (tool or work object). |  <br>xx1200001362 |
| 8 | Tap **+** and **-**, to tune the positions in the X-, Y-, and Z-direction. |  <br>xx1200001363<br>Select increment to define the step size of these buttons. |
| 9 | Tap **Apply** and then tap **Yes** to confirm. If the program is being processed, then the offset is used directly. | |
| 10 | If you are satisfied with the result and wish to set the modified positions as the basis, tap **Baseline** and then tap **Commit Selection**. |  <br>xx1200001364<br>**Note**<br>If the selected positions need to be modified further tap **Baseline** and then on **Restore Selection** and then start from the beginning, or continue with the change, till you are satisfied with the result. |

*Continues on next page*

8.3 Changing a robot position
*Continued*

| | Action | Description |
|---|---|---|
| 11 | To include the deleted positions in the selection again for further changes, you can either add these manually or load the previous selection.<br>To do so, tap **File** and then tap **Open Selection...**. |  <br>xx1200001365 |
| 12 | Select the file `RWMT_HOTEDIT` and then tap **OK**.<br>The original selection is restored. |  <br>xx1200001366 |
| 13 | To change the positions, continue with Step , or tap **Close**. | |
| 14 | To change another position, continue with Step 3 or close the window. | |

**Note**

For more information on **HotEdit**, see *Operating manual - IRC5 with FlexPendant*.

# 9 Service menu

## 9.1 Overview

This chapter explains how setup routines and service routines can be executed, if the robot is not in operation.

Setup routines are used for setting up or configuring the robot at the time it is commissioned.

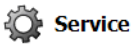
Service routines are used for service and configuration tasks during pauses in production and differ in terms of their execution.

- Service routines of Type I are executed instead of a production program.
- Service routines of Type II are executed in parallel with the normal program run, so that the program pointer in the robot program does not change.

For a description of the configuration of the setup routines and the service routines, see *Application manual - RobotWare Machine Tending*.

## 9.2 Service menu

### Introduction

The **Service** menu is loaded by tapping the **Service** button 

in the production window. The **Service** menu offers only those service routines for selection, for which logged in user has the required permissions.

If the robot controller is in the automatic mode, then, only those entries which have been released explicitly for the automatic mode can be selected in the service menu. All the other entries are grayed out.

**Note**

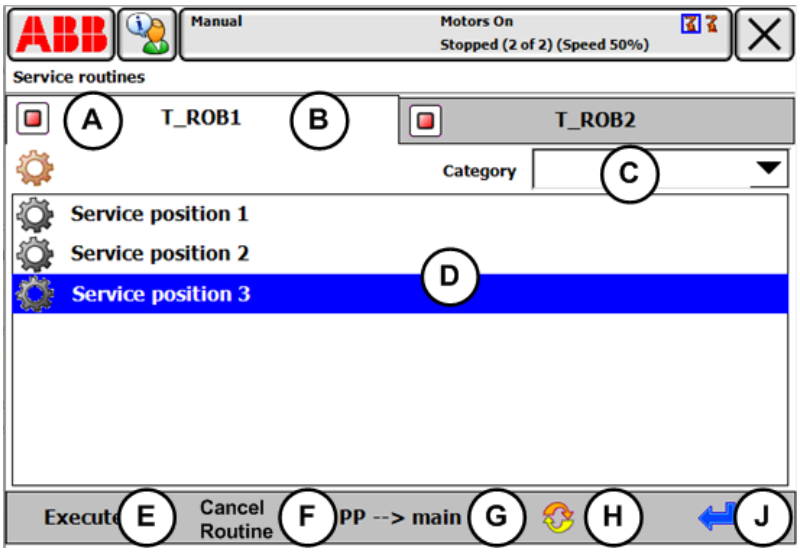
Service routines of Type II can be executed only in the manual mode of the robot controller. Service routines of type II are executed in parallel with the program run, so that the program pointer is not lost.

**Tip**

This is used mainly for actuator functions of signals, for example, locking or unlocking the tool change system.

### Description of the service menu or setup menu

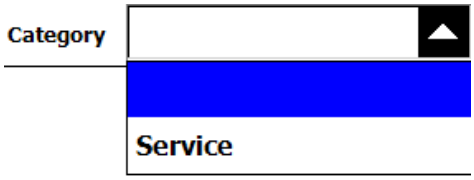
The following image and table provide details of the **Service** menu.




xx1200001369

| | Domain | Description |
|---|---|---|
| A | Robot task | The service menus for all the robots (MultiMove) are displayed through the tab panes. Tap the corresponding tab pane to switch between the robots. |

*Continues on next page*

| | Domain | Description |
|---|---|---|
| B | Processing status | The processing status of the setup routine or service routine is displayed separately for each robot and is represented by the following icons.<br>  Routine is executable.<br>  Routine is executed.<br>  Routine is stopped.<br>  Routine is blocked.<br>*(No program pointer or robot program is executed)* |
| C | **Category** filter |  <br>xx1200001370<br>To easily select a service menu, the menu entries display can be set in the **Category** filter.<br>To do so, the combination list field is used to set the desired category and the menu list displays only the menu entries belonging to the category. To display all the list entries, select the "blank" entry as the category. |
| D | Menu list | Displays all the available menu entries for loading a setup routine or service routine with the image and text.<br>If no image is specified through the menu declaration, then the following standard images are used:<br>•  Service routine Type I<br>•  Service routine Type II<br>•  Setup routine |
| E | **Execute** button | Executes the selected routine.<br>  **Note**<br>If the routine cannot be actuated due to an external condition, then a dialog with the corresponding message appears. |
| F | **Cancel Routine** button | If a service routine (Type II) is stopped during an execution, then the **Cancel Routine** button is displayed.<br>If the processing should be discontinued tap **Cancel routine**, since the program pointer is still in the service routine and the normal robot program cannot be executed. |
| G | **PP->main** button | Sets the program pointer to the **main** routine. |

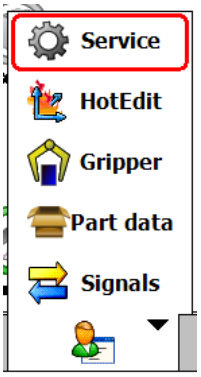
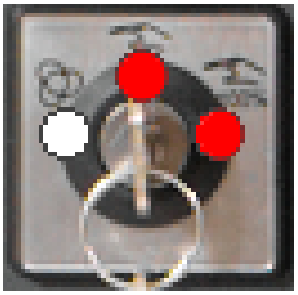
*Continues on next page*

9.2 Service menu
*Continued*

| | Domain | Description |
|---|---|---|
| H | **Refresh** button | Reloads the menu declarations from the robot program.<br>In this way, changes to the declarations are displayed immediately. |
| J | **Back** button | Closes the window. |

## 9.3 Executing a service routine

Use the following procedure to run a setup routine or service routine:

| | Action | Description |
|---|---|---|
| 1 | Start the **RobotWare Machine Tending** user interface. | |
| 2 | Tap **Production**.<br>The **Production** page is displayed. | |
| 3 | Tap  and then tap **Service**<br>The **Service routine** page is displayed. |  <br>xx1200001378<br>If the cell operation mode is not in **Service** mode, tap **Start** then tap  , to set the cell operation mode to **Service**.<br>  <br>  <br>xx1200001377<br>Cell operation mode **Service**<br>**Note**<br>Setup routines can be executed in every cell operation mode. |
| 4 | In the case of **MultiMove** systems, tap the tab pane for the desired robot (for example, T_ROB1). | If the desired menu entry is shown in grey color, then switch to the manual mode of the robot controller.<br>  <br>xx1200001329 |

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9.3 Executing a service routine
*Continued*

| | Action | Description |
|---|---|---|
| 5 | Select a service routine. | Use the category filter to simplify the selection.<br>To run a service routine, the following conditions must be fulfilled:<br>• The program pointer must be set<br>• The motors must be switched on. |
| 6 | Tap **Execute**.<br>The service routine is executed. | If the routine cannot be actuated due to an external condition, then a dialog with the corresponding message appears.<br>In the automatic mode of the robot controller, the starting of the service routine has to be acknowledged through a dialog.<br>If the robot program is stopped, tap the **Start** button.<br>  <br>xx1200001379 |

## 9.4 Cancelling a service routine

If a service routine of Type II is stopped, then the button for cancelling the service routine is shown.


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To continue the service routine, tap the **Start** button .

If the processing of the service routine should be discontinued, tap **Cancel Routine**, since the program pointer is still in the service routine and the normal robot program cannot be executed.

## 9.5 Setting the program pointer to main

To run a service routine, the program pointer must be set in the program, that is, it points to an instruction in the program.

If the program pointer is not present, for instance, through the instruction **EXIT** or by a modification of the RAPID program, it must be set first to the main routine.

To set the program pointers, tap PP --> main.

# 10 User administration

## Overview

The user authorization is meant for controlling the access levels. Three user groups are predefined: Operator (or User), Service Technician, and Programmer.

## User groups

While using the user authorization, the user has to log in with a user name and password to access the **RobotWare Machine Tending**.

| User group | Access to |
|---|---|
| **Operator** | • Execute the production (for example, Starting and stopping the robot, executing the production cycles, or user defined cycles)<br>• Display of station and production information<br>• Display of signals<br>• Select or deselect stations<br>• Reset station variables |
| **Service technician** | • All permissions of the operator<br>• Manual selection of part<br>• Manual operation of gripper<br>• Change the station variables (upto User Level 100)<br>• Set or reset signals<br>• Cycle settings<br>• HotEdit<br>• Execute service routines (upto User Level 100)<br>• Load, Save, Import, and Export projects |
| **Programmer** | • All permissions of the **Service technician**<br>• Select or deselect the ghost mode<br>• Select or deselect the test mode<br>• Change the station variables (upto User Level 255)<br>• Execute service routines (upto User Level 255) |

**Note**

The user authorization system is configured during the installation. For more information, see *Application manual - RobotWare Machine Tending*.

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# Index

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