Operating Manual

Cutting PowerPac

RobotStudio 5.14

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“The original language for this publication is English. Any other languages that are supplied have been translated from English.”

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Overview

About this manual

This manual describes how to use Cutting PowerPac to create cutting programs offline. It also explains Cutting PowerPac terms and concepts.

Who should read this manual?

This manual should be used by anyone working with Cutting PowerPac.

Usage

This reference manual contains general and specific information about the Cutting PowerPac tools and workflow.

Prerequisites

The reader should have a basic knowledge of:

- RobotStudio
- RAPID
- Cutting process

Organization of chapters

The manual is organized into the following chapters:

Chapter	Contents
1. *Introduction and Installation on page 7*	Describes the installation, registration and setup of the Cutting PowerPac.
2. *Cutting Ribbon-tab on page 13*	Describes the functions of the dedicated tab for Cutting PowerPac in the ribbon.
3. *Cutting Browser on page 23*	Describes the functions and menus of the Cutting browser.
4. *Cutting path view on page 51*	Describes the functions and menus of the path view.
5. *Cutting PowerPac workflow on page 109*	Describes the basic workflow when working with Cutting PowerPac

References

Reference	Document ID
3HAC032104-001	Operating Manual - RobotStudio
3HAC043508-001	Application Manual - RW Cutting

Revisions

Revision	Description
-	First edition

1 Introduction and Installation

1.1. Introduction to Cutting PowerPac

About Cutting PowerPac

Cutting PowerPac is a dedicated tool for generating cutting programs in RobotStudio. Utilizing the CAD geometry as the basis for all robotics programming, you can generate 2D shape cutting instructions based on geometry features, and also generate free form cutting path base on the edges. This method, known as geometry-based offline programming, gives you unprecedented control over the cutting paths, resulting in improved quality.

About this chapter

This chapter will guide you through the installation process, which consists of these steps:

- *Installing Cutting PowerPac on page 8*.
- *Accessing the user interface on page 9*.

Prerequisites

To complete the installation process, you must have the following items at hand:

- RobotStudio and RobotWare Cutting installed on your computer, which fulfils the system requirements
- Cutting PowerPac installation package
- A license certificate
- A logon account with administrator rights

1.2. Installing Cutting PowerPac

Overview

To be able to install Cutting PowerPac, RobotStudio and RobotWare Cutting must be installed on your computer.

Installing Cutting PowerPac

To install the Cutting PowerPac, follow these steps:

1. Browse to Cutting PowerPac installation package and double-click **Setup.exe**.

   The installation opens.
2. Click **Install Cutting PowerPac**.

   The installation starts.
3. Read the License Agreement and accept the terms.
4. Click **Install**.
5. When the installation is finished, complete the installation wizard by clicking **Finish**.

Installing a License

The procedure of installing a license is the same as that of RobotStudio.

1.3. Accessing the user interface

Overview

Before you can start using Cutting PowerPac, you must load a RobotStudio station that includes at least one cutting robot. The virtual controller (VC) associated with the cutting robot must be loaded.

Loading a station

To initially open a station, follow these steps:

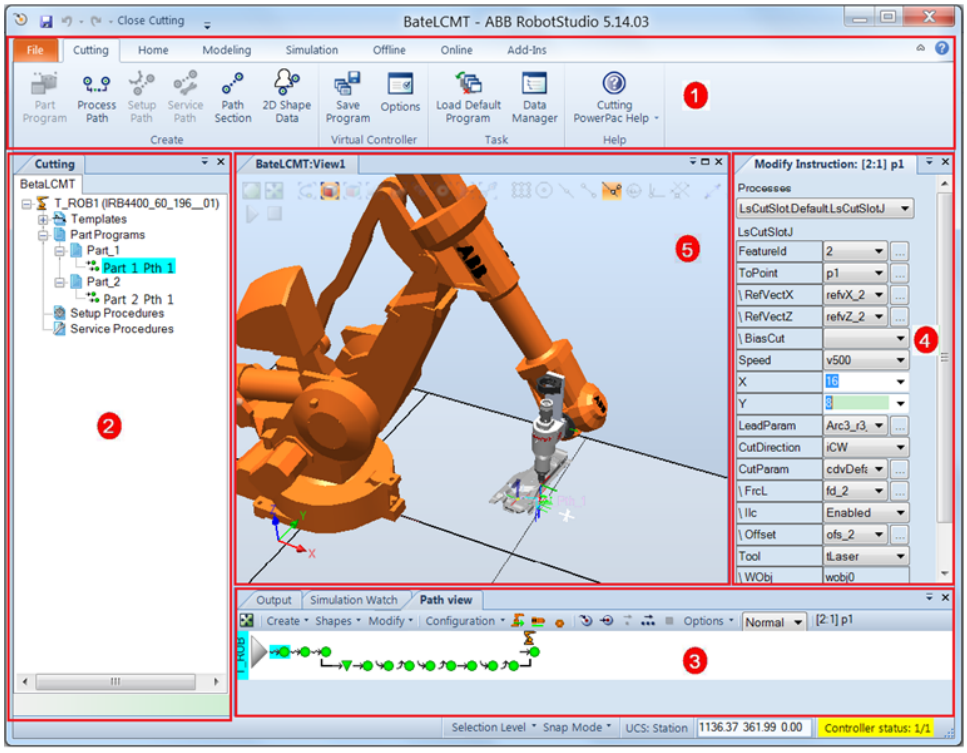
1. Open RobotStudio and create a new station with an existing system.
2. On the **Add-Ins** tab in the ribbon, select **Cutting** from the **PowerPacs** group.

   A dedicated tab for Cutting is added to the ribbon.

   The Cutting tree structure browser opens.
3. Expand the tree structure of the Cutting browser and right-click **Part Programs**. Then click **Create part**. In the dialog box, click **OK**.
4. Right-click the created path and click **Open** to open the path view.

The user interface

The panes and windows of the user interface, described in the following figure, help you to create a well-structured cutting program.



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	Item	Description
1.	Cutting ribbon-tab	Contains the general functions for Cutting process. See *Cutting Ribbon-tab on page 13* for detailed description.
2.	Cutting browser	Organizes the components of the station in a tree structure. See *Cutting Browser on page 23*for detailed description.
3.	Path view	Categorizes and linearly maps the targets. See *Cutting path view on page 51* for detailed description.
4.	Tool window	Dialog boxes created from the Path View. Enables you to create new instructions and modify existing instructions.
5.	Graphics window	The graphics window is coordinated with these panes: a path highlighted in the browser, is highlighted with the same color in the graphics window. A simulation appearing in the graphics window is represented in the path view by a robot cursor stepping through the path in the path view. The graphics window is an important source to input geometry targets. By clicking on the part models in the window, you can create or modify a target in the geometry space.

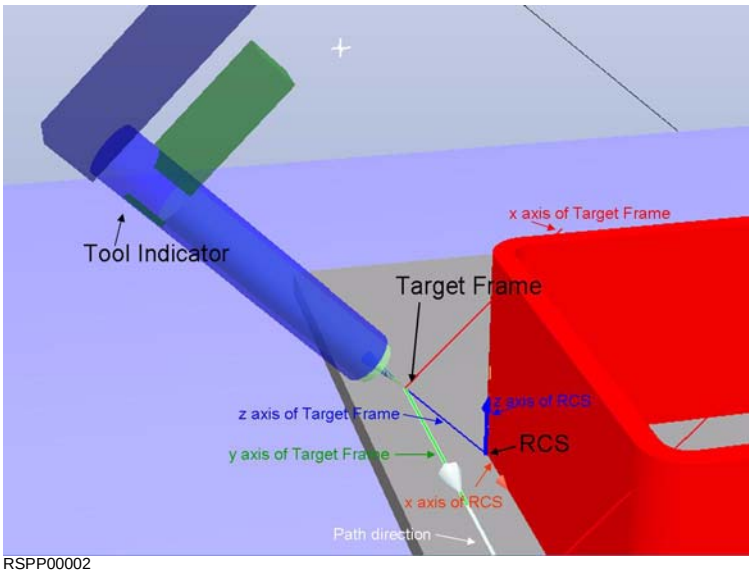
1.4. Concepts

Reference Coordinate System (RCS)

In Cutting PowerPac, every robtarget is associated with a local reference coordinate system called Reference Coordinate System (RCS).

RCS is primarily used to help create and manipulate targets in RobotStudio. As workobject/ UCS, RCS can be used to set the target location and angle.

Usually a target's RCS accommodates the shape of the part geometry. For example, for cutting targets along a cut path, the RCS positions are along the cut path, the x axis directions are along the path direction, and the z axis directions are along the normal vector of the cut surface. Thus, instead of entering target values in relation to a world coordinate or a work object, you can specify offsets and angles relative to the RCS, which have a more direct space relationship between robot targets and the cut.



RSPP00002

Process templates

A process template in Cutting PowerPac is a collection of templates for process parameters, cutting targets, instruction arguments, and so on. It specifies the information needed to create a complete cutting on the part. Cutting PowerPac is installed with default process templates, such as *ProcessAsMove* and *CutDefault*.

Generic data

Besides default RAPID data types, such as robtarget and tooldata, PowerPacs also uses other data types. These are called generic data.

In Cutting PowerPac, some process related data, such as cutdata, leaddata, and fricdata are supported.

2 Cutting Ribbon-tab

2.1. Overview

Overview

The Cutting ribbon-tab contains the controls for creating paths, virtual controller operations, modifying Cutting PowerPac data, and help information.

RSPP00003

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Elements on the Cutting ribbon-tab

Group	Button	Description
Create	Part Program  RSPP00004	Opens a dialog box to insert a new part node into the tree structure and creates an empty path. Only available when the Part Program node or a part node is selected in the Cutting browser. **NOTE!** You can access this function also from the Cutting browser by right-clicking the Part Programs node. See *Part Programs node on page 32* for the definition for part program.
	Process Path  RSPP00005	Inserts a new path node into the tree structure. Not available on an open path. Only available when a part node or a path node under the part node is selected in the Cutting browser. **NOTE!** You can access this function also from the Cutting browser by right-clicking the Process Path node. See *Process path on page 40*for the definition for process path.
	Setup Path  RSPP00006	Inserts a new path node into the tree structure. Only available when the Setup Procedures node or a path node under the Setup Procedures node is selected from the Cutting browser. **NOTE!** You can access this function also from the Cutting browser by right-clicking the Setup Procedures node. See *Setup and service procedures on page 46*for the definition for setup path.
	Service Path  RSPP00007	Inserts a new path node into the tree structure. Only available when the Service Procedures node or a path node under the Service Procedures node is selected in the Cutting browser. **NOTE!** You can access this function also from the Cutting browser by right-clicking the Service Procedures node. See *Setup and service procedures on page 46*.
	Path Section  RSPP00008	Opens a dialog box to select sequential adjacent edges from the CAD model to represent a free form path, and saves the path data into a XML file which will be used to create a free form cutting path in the future steps.Always available.See*Create Free Form Path Data File on page 59* for detail.
	2D Shape Data  RSPP00009	Opens a dialog box to select a face from the CAD model, and saves the corresponding 2D shape data into a .cad file which will be used to create a 2D shape cut instruction.Always available.See *Create Shape Data From Edges Dialog Box on page 80* for detail.

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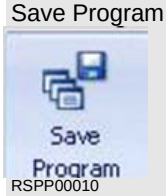
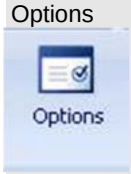
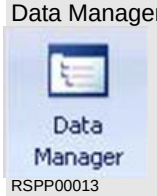
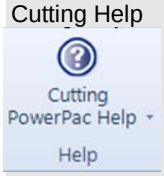
Group	Button	Description
Virtual Controller	Save Program  RSPP00010	Saves the current program in the virtual controller. The program is saved to a predefined directory. Under the system's home directory, a specific folder is created to store the RAPID programs for every task in the system. The folder name is: *Station name"_"Task name*. For example, for the task *T_ROB1* in station *Irb140_250A_RW_5_11*, its storing directory is *HOME\Irb140_250A_RW_5_11_T_ROB1*.
	Options  RSPP00011	Opens an dialog box to set the synchronization settings.
Task	Load Default Program  RSPP00012	Overwrites the current program in the virtual controller with an empty one.
	Data Manager  RSPP00013	Opens the Data Manager dialog box, which lists all the related data in the current station. Only available when the task node is selected in the Cutting browser. See*Task group on page 19* for the detailed description of data manager.
Help	Cutting Help  RSPP00014	Provides the following information: • Contents, the help file • About Cutting PowerPac, version information

2.2. Creating group

Overview

All the functions in the **Create** group are available from the Cutting browse.

RSPP00015

Part Program

Click **Part Program** to open a dialog box to create a new part program. See*Creating a part on page 34* for the detailed description.

This button is available only when the Part Program node or a part node is selected in the tree structure.

Process Path

Click **Process Path** to insert a new empty path node into the tree structure.

This button is available only when a part node or a path node under the part node is selected.

Setup Path/Service Path

Click **Setup Path**/**Service Path** to open a dialog box to create a new setup path or service path.

This button is available only when the Setup/Service Procedures node or a path under the Setup/Service Procedure node is selected.

Path Section

Click **Path Section** to open a dialog box to select sequential adjacent edges from the CAD model to represent a free form path, and saves the path data into a XML file which will be used to create a free form cutting path in the future steps. See *Create Free Form Path Data File on page 59* for detail.

This button is always available.

2D Shape Data

Click **2D Shape Data** to open a dialog box to select a face from the CAD model, and saves the corresponding 2D shape data into a .cad file which will be used to create a 2D shape cut instruction. See *Create Shape Data From Edges Dialog Box on page 80* for detail.

This button is always available.

2.3. Virtual Controller group

Overview

RSPP00016

The functions in this group are related to the virtual controller.

Saving a program

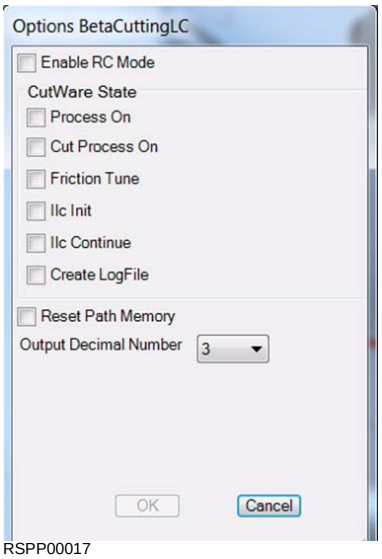
After synchronization, RAPID programs are stored in virtual controller. You can access these programs from the **Offline** tab of RobotStudio. For more information, see *Operating manual - RobotStudio*. You can also save the programs as files on your PC, which makes it possible to load them to other controllers, or real IRC5 controllers.

Click **Save Program** to save the programs in virtual controller as files. The RAPID programs are saved under "HOME" directory of the system folder.

NOTE!

When saving a program to files, the RAPID program stored in the virtual controller is saved. To save modifications in the station, first synchronize them to the virtual controller, and then click **Save Program**.

Options



RSPP00017

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Click **Options** to open a dialog box, which contains the following options:

Group	Item	Description
	Enable RC Mode	Synchronization option. If selected, this option is enabled for all the tasks in the current station. It means that for variables that already exist in the virtual controller, synchronization will not override them. Only new variables will be created.
CutWare State	Process On	Indicate whether enable or disable process option.Used for offline simulation.
	Cut Process On	Indicate whether enable or disable cut process option. Used for offline simulation.
	Friction Tune	Indicate whether enable or disable frictiontuningoption.Used for offline simulation.
	Ilc Init	Indicate whether enable or disable Ilc option which will replace the previous Ilc setting. Used for offline simulation.
	Ilc Continue	Indicate whether enable or disable Ilc option which will calculate the new Ilc data based on the previous Ilc setting.Used for off line simulation.
	Create LogFile	Indicate whether enable or disable logfile option. Used for offline simulation.
	Reset Path Memory	Clear the path memory.
	Output Decimal Number	Specify the fraction number of output data in cutting instructions

2.4. Task group

Overview

RSPP00018

The functions in this group are related to the active task.

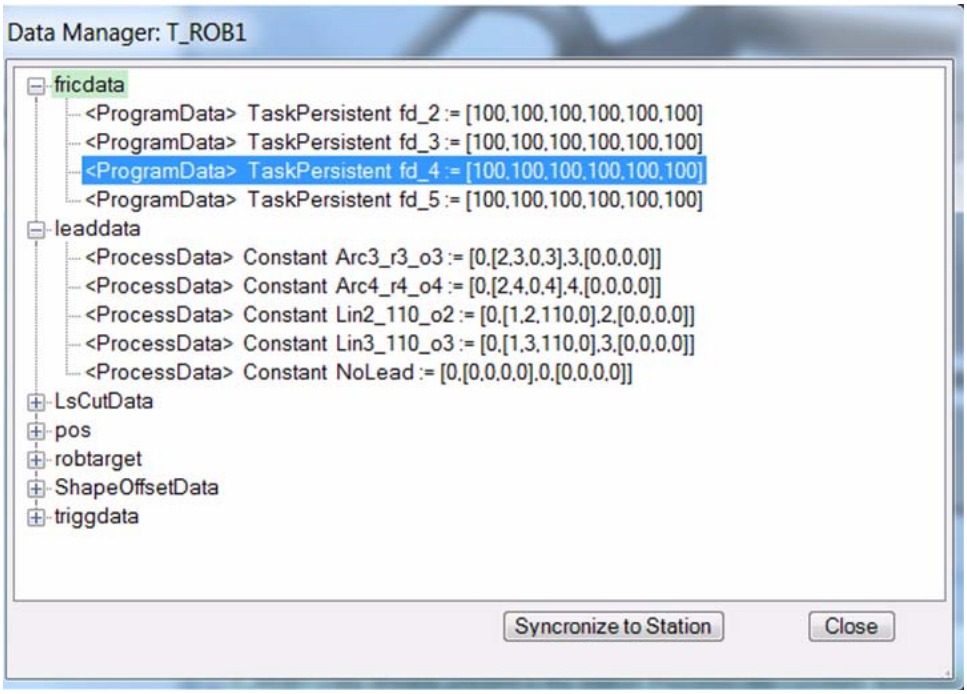
Load the default program

When you want to clean up the RAPID programs in the virtual controller, click **Load Default Program** to load an empty program to the virtual controller to overwrite the current one.

Data Manager

Click **Data Manager** to open the Data Editor. In Data Editor you can:

- Compare the data in the station with the date in the virtual controller.
- Synchronize data from the virtual controller to the station.
- Modify data other than default, such as fricdata, leaddata, and LsCutData.



RSPP00019

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Synchronize data between virtual controller and station

Synchronizing ensures that the RAPID program in the system, running on the virtual controller, corresponds to the programs in Cutting PowerPac. You can synchronize data both from the station to the virtual controller and from the virtual controller to the station.

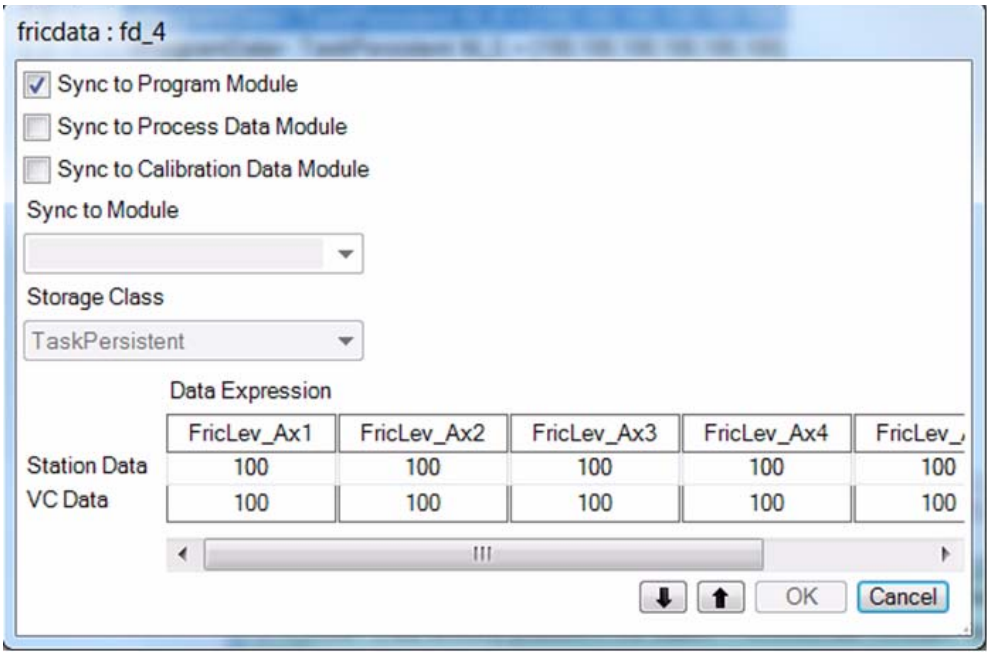
To synchronize the entire program stored in a robot system from the virtual controller to the station, follow these steps:

1. Select a task node from the Cutting browser, and click **Data Manager** to open the Data Editor.
2. Click **Synchronize to Station**.

To synchronize the entire program from the station to the virtual controller, refer to *Synchronize to Virtual Controller* in *Shortcut menus from the task node on page 24*.

To synchronize specific data between the virtual controller and the station, follow these steps:

1. Select a task node from the Cutting browser, and click **Data Manager** on the ribbon to open the Data Editor.
2. Click the "+" signs to expand the modules.
3. Click the data that you want to synchronize. An editor opens where you can view the data expression.
4. Click the **up arrow** to synchronize the data from the virtual controller to the station.
5. Click the **down arrow** to synchronize the data from the station to the virtual controller.



RSPP00020

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NOTE!

- For data that is just created but not shown in the virtual controller, you can specify the type in virtual controller when synchronizing. The type can be `Persistent`, `TaskPersistent`, `Constant`, or `Variable`. For the data that is already shown in the virtual controller, this function is disabled.
- Only data of type other than `robtarget` and `jointtarget` can be synchronized from the virtual controller to the station.

Modify data

To modify data with Data Editor, follow these steps:

1. Select a task node from the Cutting browser and click **Data Manager** to open the Data Editor.
2. Click the “+” signs to expand the modules.
3. Click the data that you want to modify. A Data Editor opens where you can view the data expression. In Data Editor, you can modify the synchronize reference, the storage class in RAPID programs, and the values of the data itself.
4. Modify the data.
5. Click **OK** to make the changes take effect.

Each data item has a classification that is used to define in which modules data should end up in the virtual controller. The data classification will be used to set the module name property when the data is synchronized to the virtual controller.

- **Sync as Inline Data**: This selection is only available for jointtargets and robtargets. The data will not be declared but included in the instruction.
- **Sync to Program Module**: The default setting for most data. The data will be synchronized to the same module as the procedure where it was used.
- **Sync to Process Data Module**: Default setting for data such as leaddata. The data will be synchronized to the module defined as Process Data Module, See task properties.
- **Sync to Calibration Data Module**: Default setting for data such as tooldata. The data will be synced to the module defined as Calibration Data Module, See task properties.
- **Sync to Module**: Name of the procedure to where the data will be synced. No update will be done during synchronization.

NOTE!

The **Storage Class** selection is enabled only if data does not exist in the virtual controller; otherwise it will simply use the storage class of the data in the virtual controller.

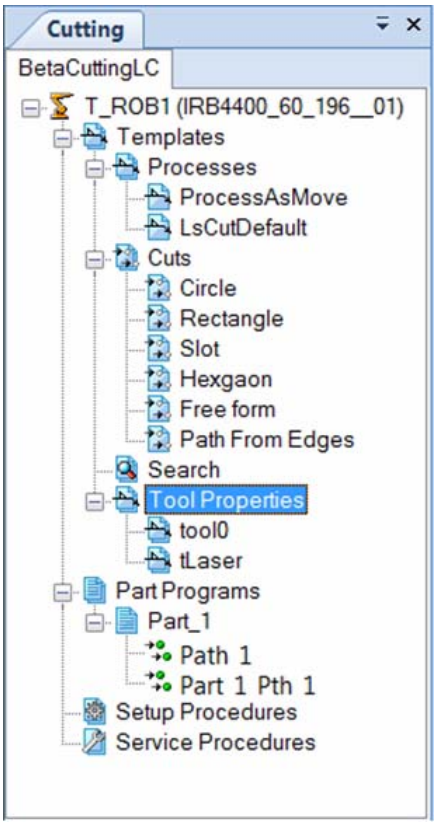
2.4. Task group

3 Cutting Browser

3.1. Overview

Overview

The tree structure of the Cutting browser provides an overview of the controllers, robots, templates, and programs.



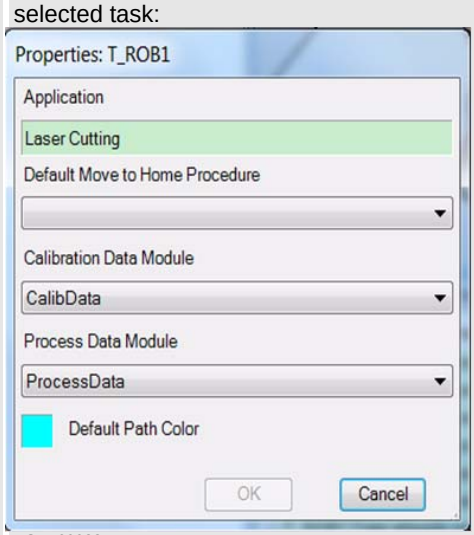
RSPP00021

3.2. Task node

Overview

You can access the shortcut menus for the task node (top node) in the Cutting browser by right-clicking the task node.

Shortcut menus from the task node

Menu	Dialog Box Elements	Description
Properties		Allows you to specify the following properties for the selected task:  RSPP00022
	Application	From the options selected in the virtual controller, the system determines the application suitable to the robot type. If the robot is for laser cutting, an appropriate move and action instruction set will be imported to the station.
	Default Move to Home Procedure	This optional property adds a procedure before the first cutting of every part program. This is usually the starting point for the first cutting, ensuring that the robot can actually move to the first instruction in the first cutting.
	Calibration Data Module	This optional property puts all workobjects and tooldata in the specified module when synchronizing with the virtual controller. You can map it to a specific RAPID module in the virtual controller.
	Process Data Module	This mandatory property puts all process data in the specified module when synchronizing with the virtual controller. You can map it to a specific RAPID module in the virtual controller.
	Default Path Color	This optional property sets the color used to highlight open paths in the Cutting browser and the path view.
Refresh		Refreshes the browser to reflect changes in the path view.
Import Action Instruction		Imports predefined action instructions.

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Menu	Dialog Box Elements	Description
Import Move Instruction Description		Imports predefined move instruction descriptions.
Import Move Instruction		Imports predefined move instructions.
Synchronize to Virtual Controller		Synchronizes the entire task to the virtual controller. **NOTE!** Since the **Synchronize to Virtual Controller** is available from the shortcut menu in Cutting PowerPac, the Synchronize to virtual controller function in RobotStudio's **Offline** tab will be disabled.

Import Action Instruction/Move Instruction/Move Instruction Description

Some default move instructions are always available in the controller after the RobotStudio and Cutting PowerPac are installed.

To be able to use instructions other than default, it is necessary to tell RobotStudio how these instructions should be handled.

Follow these steps to import instructions:

1. Right-click a task node and click Import Action Instruction/Import Move Instruction Description/Import Move Instruction. A dialog box opens.
2. In **Look in**, browse to the location where you stored the instruction files (*.xml).
3. Select the desired file and click **Open** to import the selected file to the current task.

A default set of action instructions and move instruction can be automatically imported when you open a system for the first time:

RSPP00023

Click **Yes** to automatically load the templates files. Click **No** to deny automatic loading. Click **Cancel** to skip automatic loading this time.

Default directories are:

- /HOME/RS of the system folder. This will be ignored if not present.
- /MyDocument/RobotStudio/ProcessPac/

See *Operating Manual - RobotStudio* for the definition of Action Instruction, Move Instruction and Move Instruction Description.

3.3 Templates

3.3.1. Process templates

Overview

A process template is a collection of process parameters and instruction settings that define the properties of a cutting instruction.

The process template is used to set process parameters on a cutting instruction, when the Create Cutting function is executed.

Shortcut menus from the Process Templates node

Node	Menu	Description
Process	**Import...**	Imports predefined process templates.
	Properties...	Allows you to view and modify the properties of a process template.
	Create Copy	Creates a copy of a selected process template.
	Save...	Saves the selected process template to disk.
	Delete	Deletes the selected process template.

Importing a process template

The process templates are based on several instructions. For example, the *ProcessAsMove* template includes instructions for MoveL, MoveJ and MoveC. These default move instructions are always available in the virtual controller. The *Cut Default* template (included in the Cutting PowerPac installation) uses instructions such as CutL and CutC. These are available in a virtual controller installed with the option *Cutting*.

1. Right-click the process node and click **Import**. In the **Import Process Template** dialog box, select the corresponding template and click **Open**.
2. An error message appears if the underlying instructions for the template are not found in the controller. In this case, RobotStudio must be told how these instructions should be handled. This should be done manually in the **Instruction Template Manager** in RobotStudio or by importing a predefined description file.

   If the template is successfully imported, the related process definitions will be automatically added into RobotStudio. Do not manually modify or delete any of these process definitions in the **Instruction Template Manager**.

Modifying process templates

1. In the Cutting browser, right-click a template and click **Properties** to open a dialog box.
2. Modify any values. To store your changes without closing the dialog box, click **Apply**. To store your changes and close the dialog box, click **OK**. To close the dialog box without storing any changes, click **Cancel**.

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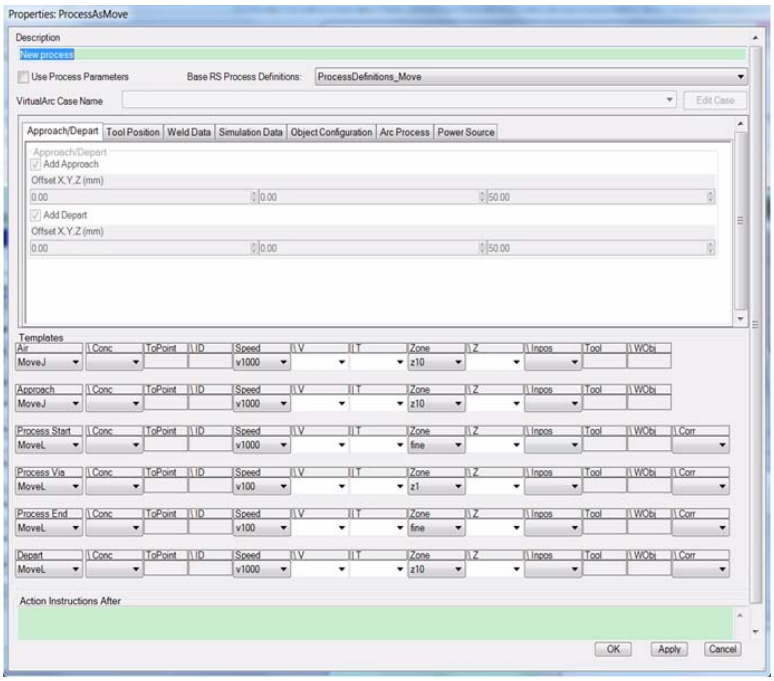
Process template properties

In the Cutting browser, right-click a template and click **Properties** to open a dialog box.



RSPP00024

Section	Description
Description	A data field for entering a text description of the process template. This information is not transferred to the RAPID code.
Process Parameters	Optional. The values can be obtained from a Cutting case, or manually modified. If selected, the property values will be used as target settings in Create Free Form Cutting.
VirtualArc Case Name	A list of VirtualArc cases will be displayed here. If VirtualArc software is installed on the same computer, the button **Edit Case** is enabled. Click this button. VirtualArc opens with the selected case.
Base RS Process Definitions	A process template is associated with a RobotStudio base process definition file. The definition file contains all the instruction templates used by the process template, and is imported into RobotStudio by Cutting PowerPac. Usually you do not need to change the association between a process template and a definition file. However if such a case occurs, you can select a different definition here, export the process template and import into Cutting PowerPac again.
Templates	Templates section. Settings for RAPID instructions. Instruction parameters (for example, motion type, speed, zone) will be set for all targets depending on the target classification. If an argument is generic data, a **Create new...** appears in the drop-down list. If selected, a dialog box opens to create a new data of this type. An edit button beside the generic data is also available. Clicking the button starts the Data Editor, where sync properties and data values can be modified. See *Task group on page 19* for more information.

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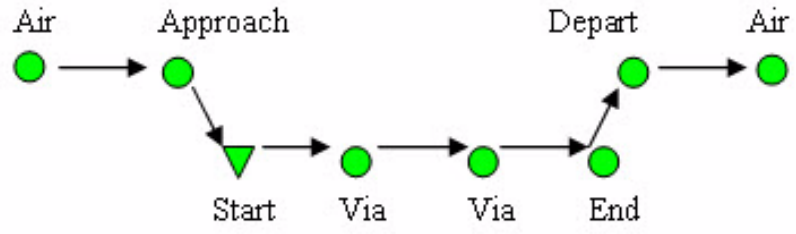
Target classification

The following figure illustrates a typical sequence of targets.



RSPP00025

Cutting targets will be assigned with process parameters in accordance with one of the following classifications:

Target	Description
Air Move	Intermediate target between cutting paths. Generates a MoveJ or MoveL instruction, depending on the motion type.
Approach Move	The first target before a cutting path. Generates a MoveJ or MoveL instruction, depending on the motion type. Is connected to the following Process Start target, so that the orientation always follows the process start point with a variable approach distance.
Process Start	The first target in a cutting path. Generates a CutLStart instruction, activating the cutting process.
Process Via	The intermediate target in a cutting path. Generates a CutL or CutC instruction, depending on the motion type.
Process End	The last target in a cutting path. Generates a CutLEnd or CutCEnd instruction, depending on the motion type, deactivating the cutting process.
Depart Move	The first target after a cutting path. Generates a MoveL instruction. It is connected to the preceding Process End Target, so that the orientation always follows the process end point with a variable depart distance.

3.3.2. Cut templates

Overview

A cut template is a collection of cutting creation methods. See *Create Free Form Cutting on page 59*for detail.

3.3.3. Search templates

Overview

A search template is a collection of search instructions.

When the needed instruction descriptions are available in the station, you can import and use the search template to create search instructions.

3.3.4. Tool properties template

Overview

Since the tool model in RobotStudio differs from the tool in reality, Cutting PowerPac must know the geometry of the activated tool to be able to calculate correct cutting head angles based on the search parameters.

3.4 Part programs

3.4.1. Part Programs node

Overview

The **Part Programs** node is an owner of a part program. A part program is equivalent to a program module in RAPID (.mod). In the RAPID module, the part program is translated into a general RAPID procedure, which includes calls to other RAPID procedures in a sequence, where each procedure equals to a process path in the part program.

Shortcut menus from the Part Programs node

Node	Menu	Description
Part Programs	**Create Part Program**	Inserts a new part node into the tree structure and creates an empty path. **NOTE!** You can access this function also from the Cutting ribbon-tab.
	Import Part Program	Imports XML part files. A dialog box opens for specifying import reference, tool, workobject, part name, path name, module name, and so on. See *Importing a part program on page 37* for detailed description.
Part	**Properties**	Modifies the properties of part program with a dialog box. The content is the same as in the **Create Part Program** dialog box.
	Open	Opens the Path view window, and shows the selected node's path items in that window.
	Create Part Program	Inserts a new part program node into the tree structure and creates an empty path. **NOTE!** You can access this function also from the Cutting ribbon-tab.
	Create Process Path	Inserts a new path node into the tree structure. **NOTE!** You can access this function also from the Cutting ribbon-tab.
	Synchronize to VC	Synchronizes the selected part (and all included paths) to the virtual controller. Not available if any path in the part program is open.
	Export Part Program	Export part program into an XML file. The default name of the file consists of the task name and the part name. A dialog box opens for specifying the exporting reference frame. See *Exporting a part program on page 35* for detailed description.

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Continued

Node	Menu	Description
	Import Part Program	Import an XML part file into station, as a part program. A dialog box opens for specifying import reference, tool, workobject, part name, path name, module name, and so on. See *Importing a part program on page 37* for more description.
	Import Path	Import XML path file into this part, as a process path. A dialog box opens for specifying import reference, tool, workobject, path name and module name. See *Importing a path on page 44*for more description.
	Delete	Deletes the selected node.

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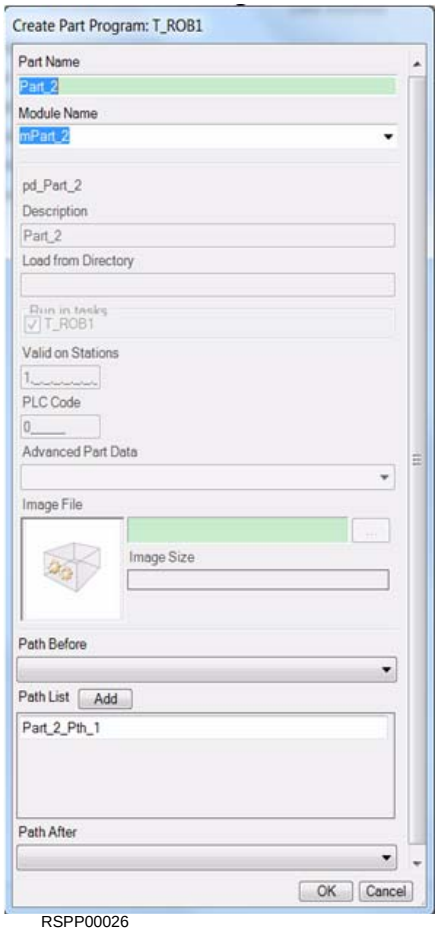
Creating a part

To create a part in a part program, follow these steps:

1. In the Cutting browser, select the **Part Programs** node or a part program node, right-click it and click **Create Part Program...**, or click **Part Program** in the Cutting ribbon-tab to open a dialog box.



RSPP00026

2. Enter all the needed information and click **OK**. If any RAPID names are invalid, clicking **OK** will not close the dialog box.

Object	Description
Part Name	Enter a name for the new part program.
Module Name	Get automatic update when entering a new part name.
Include Part Data	If selected, the created part program will also include a partdata. The information in the partdata is a collection of inputs in the following two fields.
Part Data - Description	Get automatic update when entering a new part name.
Part Data - Load from Directory	If the module is loaded from the file system, this text specifies the directory.
Run in tasks	Select tasks in which the created part program runs. This is useful when used in a MultiMove program.
Valid on Stations	Select the stations for which this part data will be valid. The values should be numbers from 1 to 8.

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Continued

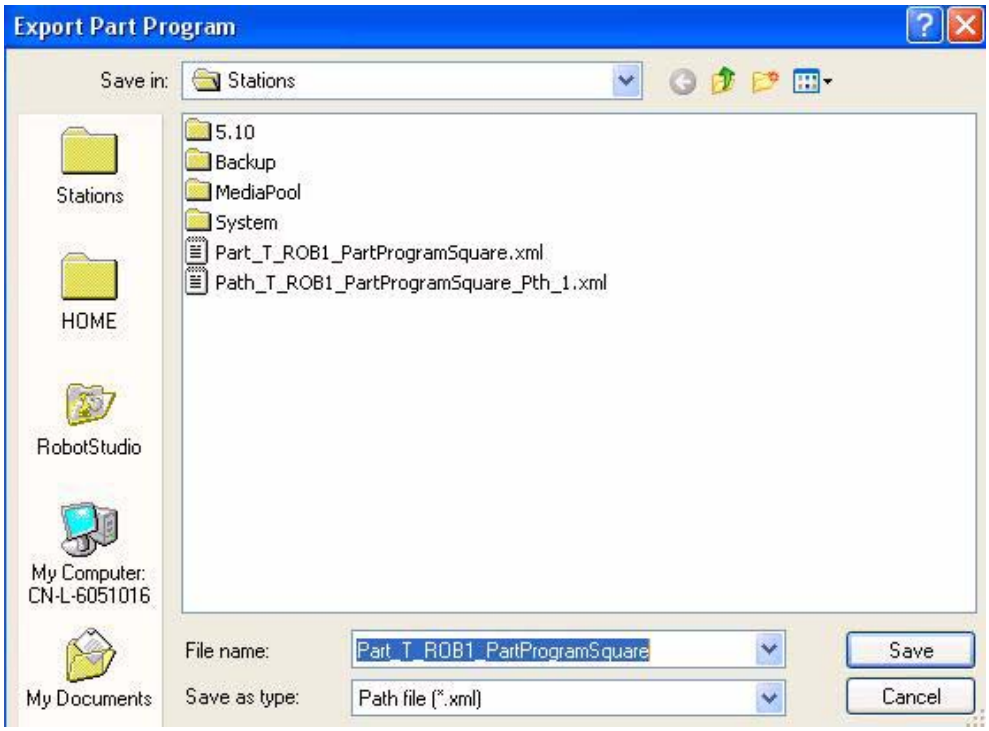
Object	Description
PLC Code	A unique integer number to indicate the part program ID in PLC code.
Advanced Part Data	The partdata can be bound to an advanced path data.
Image File	Select an image for the created part program. This image can be shown on Production Manager of the FlexPendant.
Path Before	Select a path that runs before the created part program.
Path List	Click **Add** to add new empty paths for the part program. You can also rename the new paths here.
Path After	Select a path that runs after the created part program.

After entering all the needed information, you can view the new part program in the tree structure of Cutting browser. If the part program is selected to be run in multi-tasks, a new part program node with the same name will be created under each task.

Exporting a part program

To export a part program into an XML file, follow these steps:

1. In the Cutting browser, select the **Part Programs** node or a part program node, right-click it and click **Export Part Program** to open a dialog box.



RSPP00027

2. Specify a name of the file and a directory to store.

   The default name of the file is *"Part_"+Task name+ "_" + Part name.*

   The default directory is under *"/My Documents/RobotStudio/Stations"*.

Continues on next page

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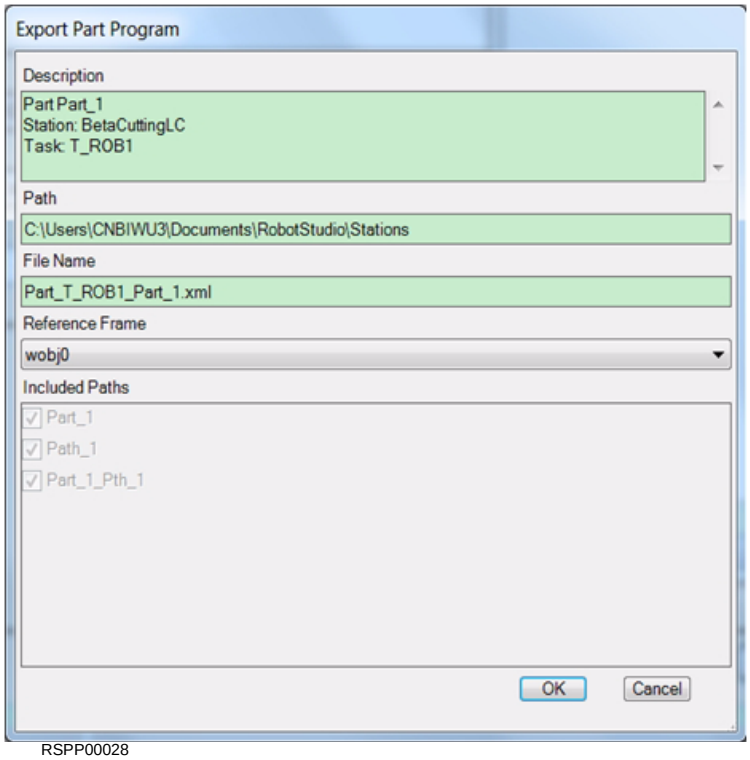
3. Click **Save** and a dialog box opens.
4. Check the data and click **OK**. The XML file will be saved.



RSPP00028

Object	Description
Description	Describes the name of the part, the station, and the task. Read-only.
Path	The directory where the file is stored. Read-only.
File Name	The name of the saved file.
Reference Frame	A reference where the path targets in the part program are related to. This affects the position and rotation values of the targets. The references can be World Coordinate, User Coordinate System, robot base coordinate, or work object coordinate.
Included Path	The included paths to be exported are listed here. Besides paths in the selected part, service paths are also listed, in case you want to export service procedures together with the part program. Check the service procedures that you want to export together.

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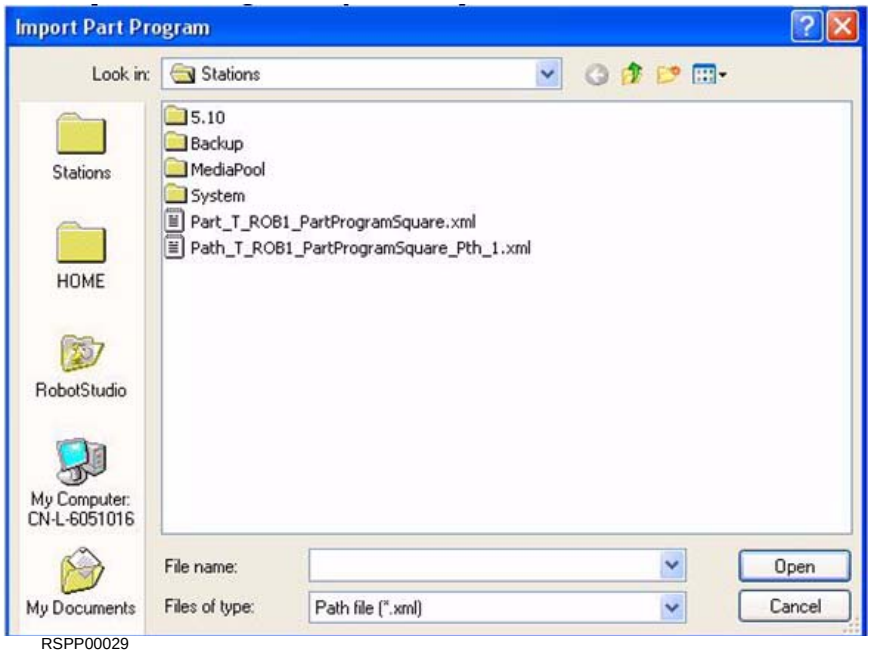
Importing a part program

A file can only be imported as the same object as it was exported. A part can only be imported as a part.

To import a part XML file into the station, please follow the steps:

1. In the Cutting browser, select the **Part Programs** node or a part program node, right-click it and click **Import Part Program** to open a dialog box.



RSPP00029

2. Select a part program file to import and click **Open**. A message box opens telling if a wrong type of XML file is selected.

   If a wrong type of XML file is selected, a message is shown.

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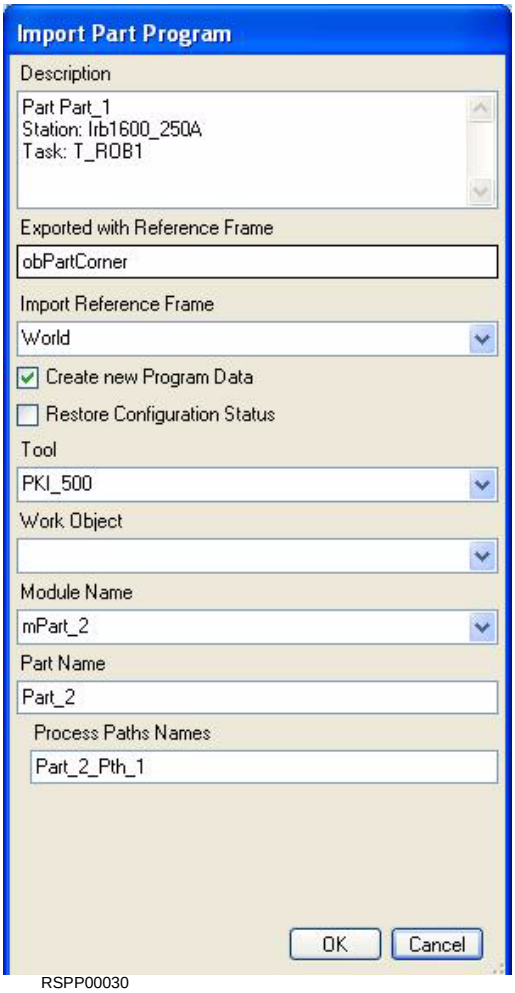
Continued

If a right type is selected, a dialog box opens.

3. Check the data and click **OK**. The XML file will be imported.



RSPP00030

Object	Description
Description	Describes the name of the part, the station, and the task. Read-only.
Exported With Reference Frame	Used when the part program is exported. Read-only.
Import Reference Frame	A reference to import part program. This affects the position and rotation values of the targets. The references can be World Coordinate, User Coordinate System, robot base coordinate, or work object coordinate.
Create New Program Data	Select the check box to create a new copy of the included Program Module data; otherwise, old data will be referenced.
Restore Configuration Status	Select the check box to restore configuration status of the included targets to when they were exported. Otherwise, the configuration status is re-set to undefined. **NOTE!** This is a lazy function. Make sure that the targets are indeed of the same configuration status.
Tool	The tool for the part program. If left blank, the tool from the file will be used.
WorkObject	Select workobject for targets in the part program. If left blank, the workobject from the file will be used.

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Object	Description
Module Name	The synchronized RAPID module of the part program.
Path Name	The name of the imported part.
Process Paths Names	The name of the process paths in the part.

NOTE! The following rules apply when creating new data and importing XML files:

- If the data is of program data type **Sync to Program Module**, new names will be created automatically, unless the **Create New Program Data** is unchecked.
- If the data is of another type, such as **Sync to Process Data Module**, new data will only be created if it is not present in the station. For example, a cutdata cd1 that is synchronized to the process data module will not be created again when importing. The old data cd1 will be used instead.

3.4.2. Process path

Overview

Process Paths are listed in the Cutting browser under the part programs. As a component of a part program, a path is a holder of cut in a sequence. Each cut includes a list of targets that constitute a continuous path. Paths can be dragged from one part to another; similarly, the order of paths in a part can be rearranged.

NOTE!

A process path created in the Cutting browser is also visible in the Elements browser. During synchronization with the virtual controller, the path is translated into a RAPID procedure.

Shortcut menu from the Process Path node

Node	Menu	Description
Path	**Open**	Opens the path in the path view. Not available on an open path.
	Create Process Path	Inserts a new path node into the tree structure. Not available on an open path. **NOTE!** You can access this function also from the Cutting ribbon-tab.
	Synchronize to VC	Synchronizes the selected path to the virtual controller. Not available on an open path.
	Export Path	Export a path into a XML file. The default name of the file consists of task name and path name. A dialog box opens for specifying the exporting reference frame. See *Exporting a path on page 42*for detailed description.
	Import Path	Import a path XML file into the current station as a process path. A dialog box opens for specifying the importing reference frame, tool, workobject, module, and path name. See *Importing a path on page 44* for detailed description.
	Visible	With a check mark to indicate that the selected path is visible. Not available on an open path.
	Delete	Delete the selected path. Not available on an open path.
	Rename	Rename the selected path. Not available on an open path.
	Close	Closes an open path, removing it from the path view. Only available on an open path.

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Creating process paths

There are three ways to create process paths:

- Add paths to the path list from the Create Part Program dialog box.
- Right-click a part program node and click **Create Process Path**.
- Click a part program node or a process path node, and click **Process Path** in the **Create** group of the Cutting ribbon-tab.

Creating Cuts

To add cuts to a path, first open the Path View by right-clicking a process path node and clicking **Open**.

See *Create Free Form Cutting on page 59*and *The Shape Menu on page 74* for the detailed description of how to add cuts to the Process Path.

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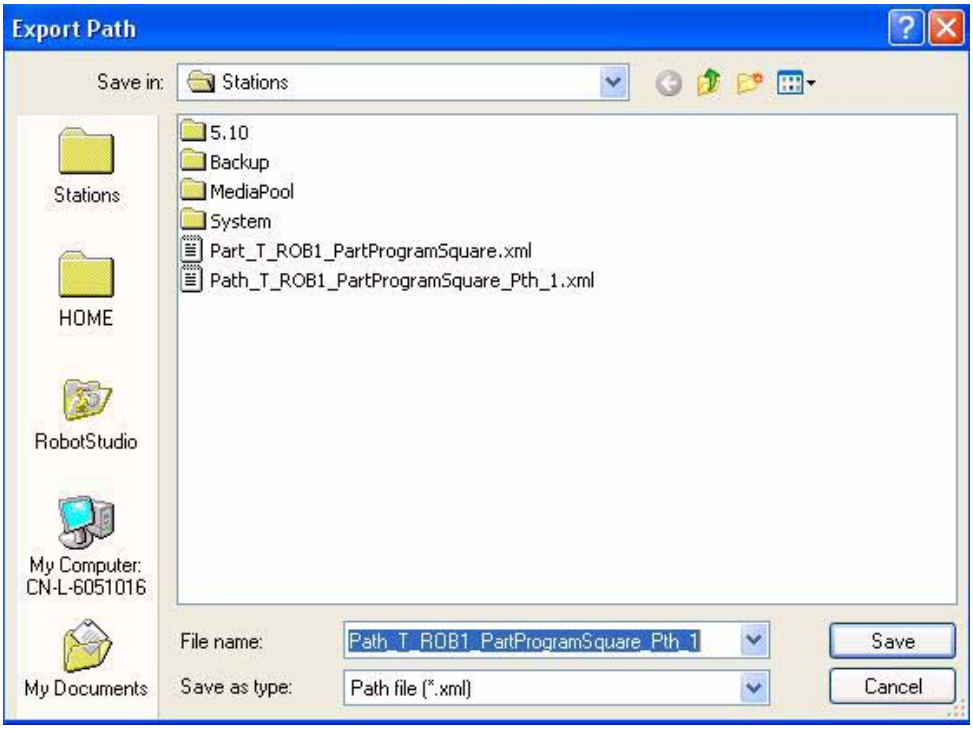
Exporting a path

To export a path into an XML file, follow these steps:

1. In the Cutting browser, right-click a path, and click **Export Path**. A dialog box opens. Specify the name of the file and the directory to store.

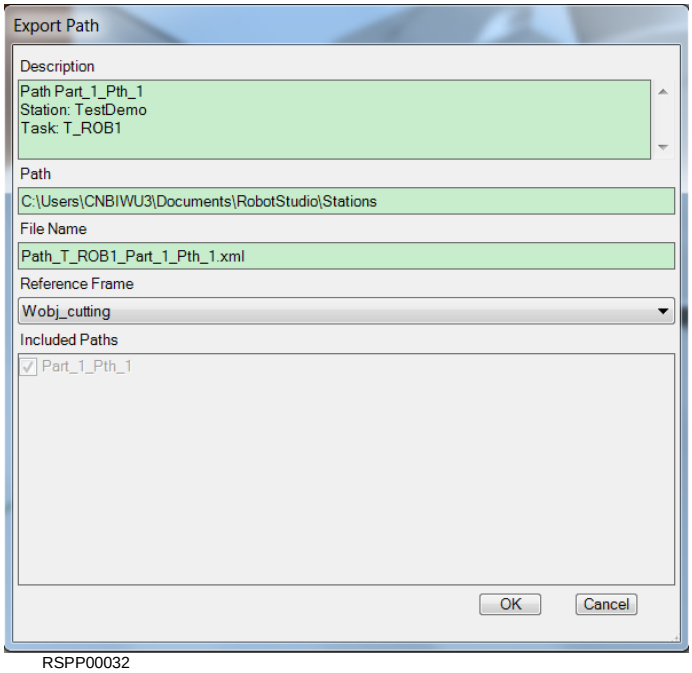
   The default name of the file is *"Path_"+task name+"_"+path name*.

   The default directory is under *"/My Documents/RobotStudio/Stations"*.



RSPP00031

2. Click **Save** and the **Export Path** dialog box opens.
3. Complete the dialog box and click **OK**. The XML file will be saved.



RSPP00032

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Object	Description
Description	Describes the name of the path, the station, and the task. Read-only.
Path	The directory where the file is stored. Read-only.
File Name	The name of the saved file.
Reference Frame	Select a reference that the path targets in the path are related to. This affects the position and rotation values of these targets. The references can be World Coordinate, User Coordinate System, robot base coordinate, or work object coordinate.
Included Path	The included paths to be exported are listed here. Besides the selected path, service paths are also listed, in case you want to export service procedures together with the selected path. Check the service procedures that you want to export together.

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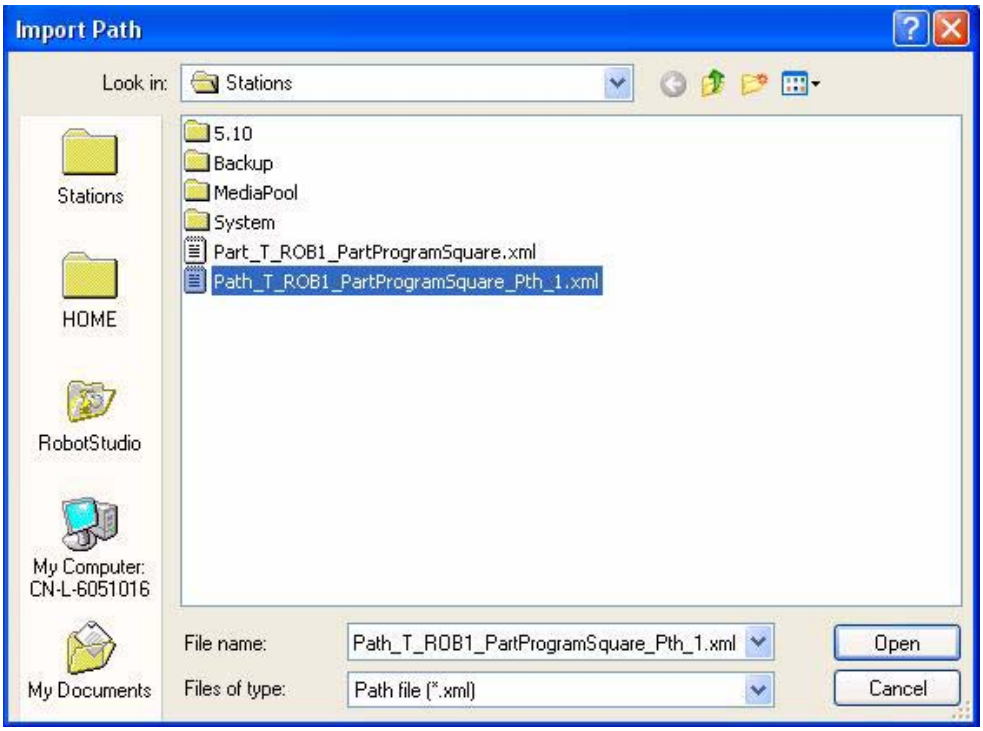
Importing a path

To import a path XML file into the station, follow these steps:

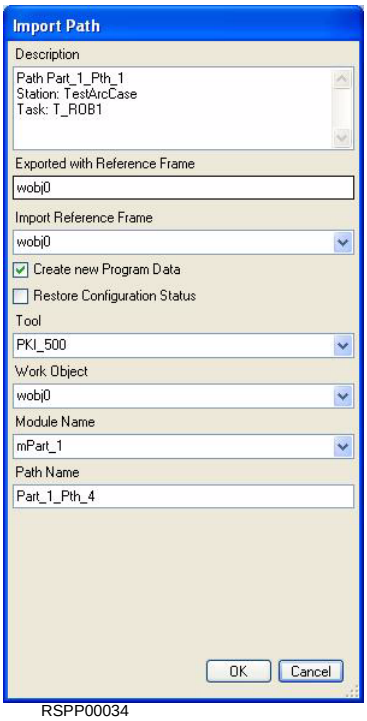
1. In Cutting browser, right-click a path, and select **Import Path**. A dialog box opens.

   Specify a path file to import and click **OK**. A message box opens telling if a wrong type of XML file is selected.



RSPP00033

2. Click **Open** and the **Import Path** dialog box opens.



RSPP00034

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Object	Description
Description	Describes the name of the part, the station, and the task. Read-only.
Exported With Reference Frame	Reference used when the part program is exported. Read-only.
Import Reference Frame	A reference to import part program. This affects the position and rotation values of these targets. The references can be World Coordinate, User Coordinate System, robot base coordinate, or work object coordinate.
Tool	Select the tool for the part program. If left blank, the tool from the file will be used.
WorkObject	Select workobject for targets in the part program. If left blank, the workobject from the file will be used.
Module Name	The synchronized RAPID module of the part program
Path Name	The name of the imported part.

3. Complete the dialog box and click **OK**. A new path will be imported.

   NOTE! The rules about creating new data are the same as described in *Importing a part program on page 37*.

3.5. Setup and service procedures

Overview

The setup and service procedure nodes provide holders for motion paths that neither fit into a part program nor include cutting paths. For example, most stations require a path for moving the robot to its home position.

Further examples of setup and service procedures for an cutting system include motion paths for the following:

- To and from the home position and the BullEyes TCP calibration device (service procedure)
- To and from the home position (service procedure)
- To and from the home position and the service station (service procedure)
- Including targets for frame definition of the IRBP positioner (setup procedure)
- Including targets for TCP definition with the BullEyes TCP calibration device (setup procedure)

Shortcut menus from the Setup Procedures node

Node	Menu	Description
Setup Procedure	**Create Setup Path**	Inserts a new setup path node in the tree structure. **NOTE!** You can also access this function from the Cutting ribbon-tab.
	Import Path	Import a path XML file into station as a setup path.

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Node	Menu	Description
Setup Path	**Properties**	Modifies the properties of setup path with a dialog box. The contents of the dialog box are the same as in **Create Setup Path** dialog box.
	Open/Close	Opens the path in the path view. Not available on an open path. Closes an open path, removing it from the path view. Only available on an open path.
	Create Setup Path	Inserts a new setup path node into the tree structure. **NOTE!** You can also access this function from the Cutting ribbon-tab.
	Synchronize to VC	Synchronizes the selected path to the virtual controller.
	Export Path	Export path into a XML file. The default name of the file consists of task name and path name. An dialog box will appear for users to specify the exporting reference frame. See *Exporting a path on page 42*for detailed description.
	Import Path	Import XML path file into the station as a setup path. A dialog box opens for specifying import reference, tool, workobject, path name and module name. Please see *Importing a path on page 44*for detailed description.
	Visible	A check mark indicates that the selected path is visible. Not available on an open path.
	Delete	Closes an open path, removing it from the path view. Only available on an open path.

Shortcut menus from the Service Procedures node

Node	Menu	Description
Service Procedure	**Create Service Path**	Inserts a new service path node in the tree structure. **NOTE!** You can also access this function from the Cutting ribbon-tab.
	Import Path	Import a path XML file into station as a service path.

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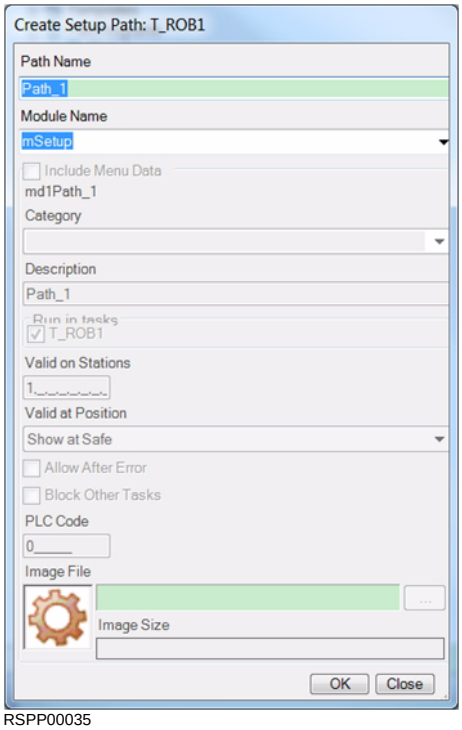
Continued

Node	Menu	Description
Service Path	**Properties**	Modifies the properties of service path with a dialog box. The contents of the dialog box are the same as in the **Create Service Path** dialog box.
	Open/Close	Opens the path in the path view. Not available on an open path. Closes an open path, removing it from the path view. Only available on an open path.
	Create Service Path	Inserts a new service path node into the tree structure. **NOTE!** You can also access this function from the Cutting ribbon-tab.
	Synchronize to VC	Synchronizes the selected path to the virtual controller.
	Export Path	Export path into a XML file. The default name of the file consists of task name and path name. A dialog box opens for specifying the exporting reference frame. See *Exporting a path on page 42* for detailed description.
	Import Path	Import XML path file into station, as a service path. A dialog box opens for specifying import reference, tool, workobject, path name, and module name. See *Importing a path on page 44*for detailed description.
	Visible	A check mark indicates that the selected path is visible. Not available on an open path.
	Delete	Closes an open path, removing it from the path view. Only available on an open path.

Creating a setup/service path



RSPP00035

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Object	Description
Path Name	Enter a name for the created path.
Module Name	Synchronize RAPID module. Default module is `mSetup`.
Include Menu Data	If selected, the menudata will also be created. The information in the menudata is as the following inputs from the dialog box.
Category	Input a category string for the setup/service path.
Description	Get automatic update when entering a new setup/service path.
Run in tasks	Select tasks in which the new create path runs. Useful when used in a MultiMove program.
Valid on Stations	Select stations for which this part data will be valid. The value should be a number from 1 to 8.
Valid at Position	Select stations for which this part data will be valid. The value should be a number from 1 to 8.
Allow After Error	If selected, this menu item will be shown after an error occurs.
Block Other Tasks	If selected, all other tasks will be blocked during the execution of this path.
PLC Code	A unique integer number, to indicate the ID for PLC interface.
Image File	Select an image for the new created setup/service path. This image can be shown on Production Manager of the FlexPendant.

To create a Setup/Service path, follow these steps:

1. In the Cutting browser, right-click the setup/service procedures node or a setup/service path node and click **Create Setup Path Service** or **Create Service Path**, or click **Setup Path** or **Service Path** in the Cutting ribbon-tab to open the dialog box.
2. Complete the dialog box and click **OK**. If any RAPID name is invalid, then clicking **OK** will not close the dialog box.

NOTE!

After completing the dialog box, you can view the created setup/service path in the tree structure of the Cutting browser. If the path is selected to be run in multi-tasks, a new setup/service node with the same name will be created under each task. This is very useful in a MultiMove station.

3.5. Setup and service procedures

4 Cutting path view

4.1. Overview

Overview

The path view displays the targets in a path by representing them with *Instruction icons on page 52*. The large arrow head indicates the start of a path.

When a program contains several paths, the first instruction in the path view is the last instruction of the preceding path. This enables you to verify that the robot can bridge the paths.

The path view holds *The Path View toolbar on page 55*, which has menus and buttons for the most frequently used commands. You can use the **Create** menu to add or insert instructions and the **Modify** menu to manipulate targets and axes. The Path Player can execute individual targets or entire paths.

The path view also contains a *Shortcut menu on page 57* and a number of *Multi-Selection Operations on page 88*to modify multiple targets.

4.2. Instruction icons

Overview

An instruction icon shows the type (shape), motion (arrow) and status (color) of each target. Targets are sequenced from left to right in two levels: the lower level represents process sections, such as cutting paths and search sequences, while the upper level represents air move sections, which typically connect process sections.

Instruction icons

The following table describes the icon shapes:

Icon	Description
 RSPP00036	Target
 RSPP00037	Process start target

The following table describes the arrows:

Icon	Description
 RSPP00038	Linear move
 RSPP00039	Joint move
 RSPP00040	Absolute joint move
 RSPP00041	Circular move

The following table describes the color coding. The goal is to turn all the status fields green before synchronizing the paths to the virtual controller.

Icon	Description
RSPP00042	White = unknown status
 RSPP00043	Green = target verified

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Icon	Description
 RSPP00044	Yellow = solution found, but not verified
 RSPP00045	Red = no solution, or target out of reach
 RSPP00046	Blue = non-motion instruction

The following table describes examples of the above:

Icon	Description
 RSPP00048	Linear move, process start target, solution found but not verified
 RSPP00049	Joint move, target verified
 RSPP00050	Circular move, no solution or out of reach
 RSPP00051	Linear move, unknown status

The following table describes the instruction levels:

Level	Instruction type	Instruction
Upper	Air	MoveL, MoveJ
Lower	Process	CutLStart, CutL, CutC, CutLEnd, CutCEnd, Search_1D,

The following table describes the non-motion instructions:

Icon	Description
 RSPP00052	WaitSyncTask
 RSPP00053	SyncMoveOn
 RSPP00054	SyncMoveOff
 RSPP00055	Miscellaneous RAPID

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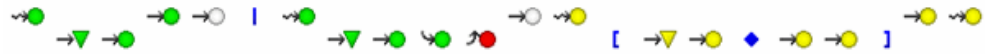
Example



RSPP00056

```
PROC My Path
MoveJ
SearchL
SearchL
MoveL
MoveL
WaitSyncTask
MoveJ
CutLStart
CutL
CutC
CutCEnd
MoveL
MoveJ
SyncMoveOn
CutLStart
CutL
SetDO
CutL
CutLEnd
SyncMoveOff
MoveL
MoveJ
ENDPROC
```

4.3. The Path View toolbar

Overview

The path view toolbar has buttons for the most frequently used commands.

Path View toolbar

Icon	Description
 RSPP00057	The **Set View Center** button sets the view center automatically to the selected target in the path view or the active TCP (if no target is selected).
The **Create** menu	This menu contains the following commands: • *Create Free Form Cutting on page 59* • *Create CutL/C instruction on page 63* • *Create Air instruction on page 66* • *Create ABS joint target on page 69* • *Create an Action instruction on page 72* • *Create Procedure Call on page 73*
The **Shapes** menu	This menu contains the following commands: • *Cut Circle Instruction on page 75* • *Cut Wrist Circle Instruction on page 76* • *Cut Rectangle Instruction on page 77* • *Cut Slot Instruction on page 78* • *Cut Hexagon Instruction on page 79* • *Cut 2D shape Instruction on page 80*.
The **Modify** menu	This menu contains the following commands: • *Modify instruction on page 84*. • *Modify target on page 85* • *Modify Jointtarget / External Axes on page 86* • *Modify Reference Vector on page 87* • *Modify Selected Targets on page 88*
The **Configuration** menu	This menu contains the following commands: • *Check Reach on page 101*. • *Set Configuration on page 102*.
 RSPP00058	The **Arm** button opens a dialog box similar to the one opened by clicking *Set Configuration on page 102*. The image on the **Arm** button also indicates the active Arm configuration of the target.
 RSPP00059	The **Wrist** button opens a dialog box similar to the one opened by clicking *Set Configuration on page 102*. The image on the **Wrist** button also indicates the active Wrist configuration of the target.
 RSPP00060	The **Tool** button opens a dialog box similar to the one opened by clicking *Set Configuration on page 102*. The image on the **Tool** button also indicates the active Tool configuration of the target.

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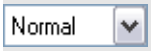
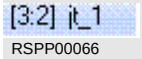
Icon	Description
 RSPP00061	The **Jump to Target** button jumps the robot with active TCP to the selected target. It gives you a chance to view cutting head angles and detect possible collisions with the robot. • A successful result turns the target yellow and moves the robot one discrete step towards the target. • An unsuccessful result turns the target red and leaves the robot in its current position.
 RSPP00062	The **Move to Target** button moves the robot to the selected target from the previous target in the target list, checks for reach and sets the robot configuration. You can also select a range of targets and move the robot in sequential order down the target list. • A successful result turns the target green and moves the robot continuously towards the target. • An unsuccessful result turns the target red and leaves the robot in its current position. **NOTE!** The virtual controller is not running when executing this command.
 RSPP00062	The **Execute Move Instruction** button executes the path associated with the selected target. It is only effective on the target generated by commands in the **Shapes** menu.
 RSPP00064	The **Simulate** button synchronizes the opened paths to the virtual controller and executes the paths in the virtual controller.
The **Options** menu	The menu contains the following options related with **Simulate**: • Save As View (Default value: Cleared). • Enable Log (Default value: Checked) Check or clear the check boxes to enable or disable the options. See *The Options Menu on page 104*for more information.
 RSPP00065	The **Speed Control** list applies only to **Jump to** and **Move to**. Simulation speed is determined by the RAPID program.
 RSPP00066	The index and name of the active object.

4.4. Shortcut menu

Overview

The table describes the commands of the path view shortcut menu.

Object	Description
Create	See *The Create menu on page 58*.
Shapes	See *The Shape Menu on page 74*.
Modify	See *The Modify menu on page 84*.
Check Reach	See *Check Reach on page 101*.
Jump To	See *The Path View toolbar on page 55*.
Move To	See *The Path View toolbar on page 55*.
Show Item Info	Displays instruction, the path angle and tool angle for the selected item.
Set Target Reference as UCS	Sets the target referenced in the instruction as User Coordinate System.
Delete	Deletes the selected item.
Modify/Convert to Linear Move	Converts a MoveJ instruction to a MoveL instruction.
Modify/Convert to Joint Move	Converts a MoveL instruction to a MoveJ instruction.
Modify/Convert to Air	Converts an approach or depart instruction to an air instruction, and disconnects it from the first or last target, respectively, in a cutting path.
Modify/Convert to Approach	Converts an air instruction to an approach or depart instruction, and connects it to the first or last target, respectively, in a seam.
Export Process Section(s)	Export one or more process sections into XML path file. Only available on Process Start target, or range selections with even pairs of Process Start and Process End targets.
Import Process Section(s)	Import path XML path into station, as one or more new cutting in the path. Only available on non-process targets.
Select Instructions	Switch to select the corresponding instructions in RobotStudio environment when you select a range of icons in path view. You may see the effect by checking the **Modify** ribbon-tab of RobotStudio.

4.5 The Create menu

4.5.1. Overview

Overview

This menu contains the following commands:

- *Create Free Form Cutting on page 59*.
- *Create CutL/C instruction on page 63*.
- *Create Air instruction on page 66*.
- *Create ABS joint target on page 69*.
- *Create an Action instruction on page 72*.
- *Create Procedure Call on page 73*

NOTE!

- The contents of the Create menu will change depending on selected target.
- The Create dialog boxes can not exist together with other dialog boxes brought from the path view. They will close other dialog boxes automatically, and vice versa. Thus, make sure that changes in dialog boxes have been applied before a create dialog is opened.

4.5.2. Create Free Form Cutting

Overview

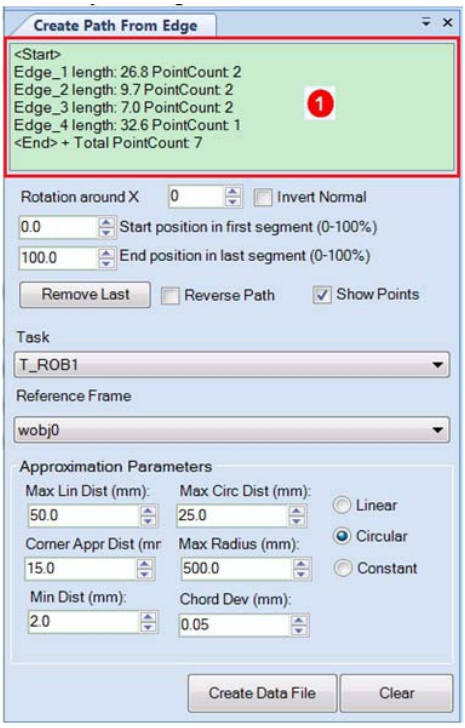
This command creates a continuous path that includes the following targets:

- Approach Move (optional)
- Process start
- Process Via
- Process End
- Depart Move (optional)

This command is available after a path or the last instruction in a free from cutting path has been selected.

Create Free Form Path Data File

To create a free form cutting path, you must specify/import a corresponding path data file which is created by clicking ribbon button **Path Section** in the **Create** group in **Cutting** tab.



RSPP00067

Object	Description
List Box (Marked with 1)	Show the selected continuous adjacent edgesfromtheCAD model.
Rotation around X	Specify the rotation angle around X axis when saving the data file.
Invert Normal	Indicate whether inverting the current normal for each edge.
Start position in first segment	Specify the start position in the first edgewhensavingthedata file.
End position in last segment	Specify the end position in the last edge when saving the data file.

Continues on next page

4.5.2. Create Free Form Cutting

Continued

Object	Description
Remove Last	Remove the last edge in the list box.
Reverse Path	Reverse the edges items in the list box.
Show Points	Indicate whether showing approximated points in the geome-try window.
Task	Select the current task object.
Reference Frame	
Max Lin Dist	Specify the maximum length for linear approximation.
Max Circ Dist	Specify the maximum length for circular approximation.
Corner Appr Dist	Specify the edge length of the corner for linear approximation. This value should be greater than the value of "Min Dist", otherwise it has no effect on approximation. Therefore if the user don't want insert any corner into the linear paths, this value can be set with 0.
Max Radius	Specify the maximum radius for circular approximation.
Min Dist	Specify the minimum length for linear approximation. If one linear path's length is shorter than this specified value, this linear path would be eliminated in the resultant paths. Instead, a new linear path, which starts from the end position of the previous valid path and ends to the start position of the next valid path, will be inserted into the path list.
Chord Dev	Specify the maximum chord value for circular approximation.
Linear	Apply the linear approximation on current selected edges.
Circular	Apply the circular approximation on current selected edges. If one edge failed to apply the circular approximation, it would automatically change to apply the linear approximation.
Constant	Apply the constant length approximation on current selected edges.
Create Data File	Save the data of all edges in the list box into a XML file which will be used for creating free form cutting path.
Clear	Clear all items in the list box.

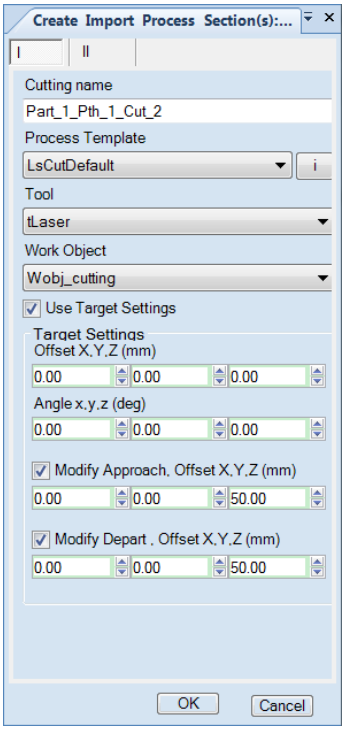
Continues on next page

Continued

The Create Import Process Section(s) Dialog Box

After specifying the correct free form path data file, the Create Import Process Section(s) dialog box, which is composed with two tab-pages, is shown up.

The first page contains parameters that are static among different cutting, and users don't usually change.



RSPP00068

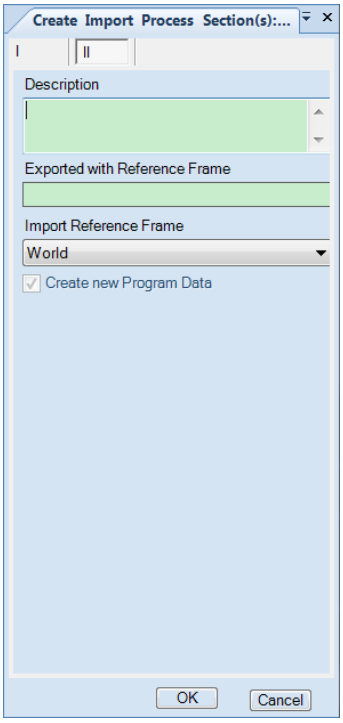
Object	Description
Cutting name	The name of the new cutting.
Process Template	Select the process template of the new cutting. Click on i on the right side of the template, and a message box will display the process parameters of the template, such as cut speed, wire feed speed, voltage, and so on.
Tool	Select tool of the cutting.
Work Object	Select work object for the targets of the new cutting.
Use Target Settings	Indicate whether using target settings.
Offset X, Y, Z	The offset distance of the process targets with their RCS.
Angle X, Y, Z	The work angle, travel angle, and spin angle of the process targets, in relation to their RCS.
Modify Approach	If selected, the new cutting will include an approach target before Process Start point.
Modify Depart	If selected, the new cutting will include a depart target after Process End point.

Continues on next page

4.5.2. Create Free Form Cutting

Continued

The second page contains parameters that are usually variable among among different cutting paths:



RSPP00069

Object	Description
Description	Input the description text for the new cutting.
Exported with Reference Frame	Input the reference text.
Import Reference Frame	Specify the reference frame.

Creating a Free Form Cutting path

To create a free form cutting path, follow these steps:

1. Create the path data file if it doesn't exist.
2. Import the path data file.
3. In the Cutting name box, enter the name for the cutting or use the default name.
4. In the **Process** list, select the process template for the cutting.
5. In the **Tool** list, select the tool for the cutting.
6. In the Work Object list, select the work object for the cutting.
7. If the Use Target Settings checkbox is enabled, set the appropriate value for each item.

Related Information

The Path View toolbar on page 55.

4.5.3. Create CutL/C instruction

Overview

This command, which is available only when a process instruction is selected, adds cut instructions to a free form path.

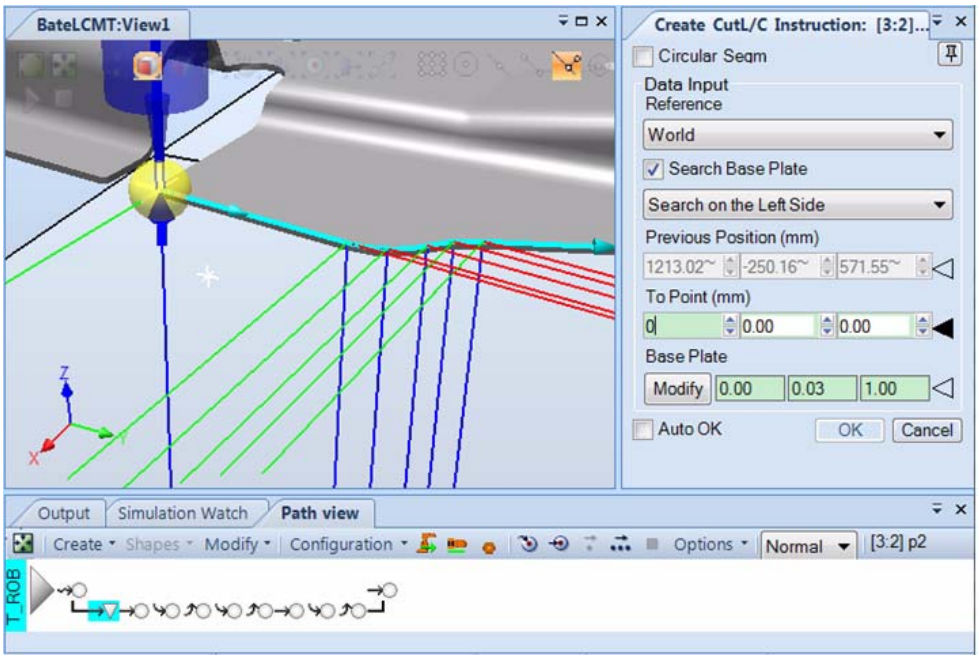
Continues on next page

Continued

Creating a CutL/C instruction

To create a CutL/C instruction, follow these steps:

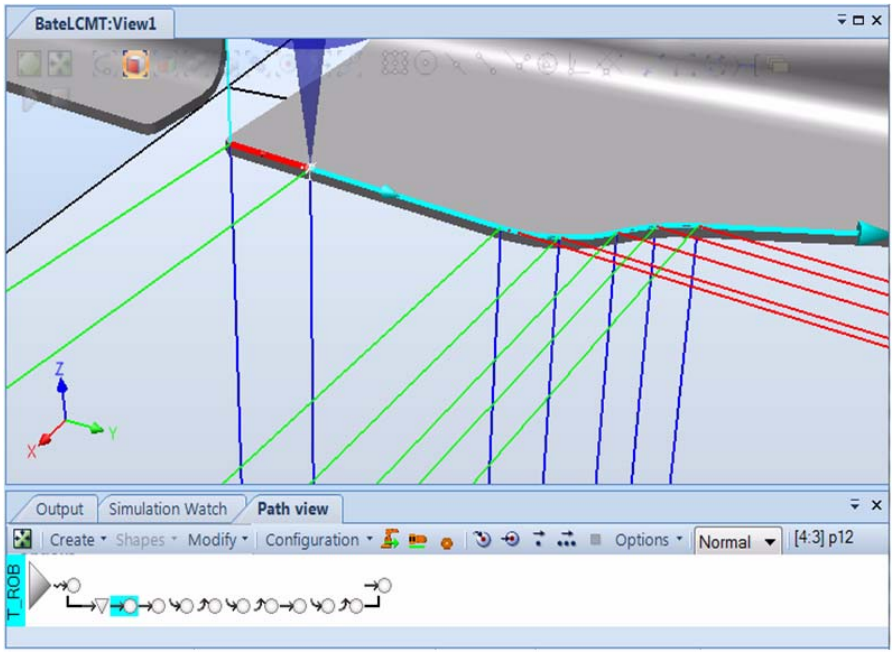
1. In the Path View, select the process start target and then in the **Create** menu, click **CutL/C Instruction**.
2. In the graphics window, click in the middle of the free form path to add a new cut.



RSPP00070

3. Optionally, select the **Auto OK** check box to automatically create the cut instruction when valid input has been entered, and then click **OK**.

   A new target is displayed in the graphics window, and an instruction icon is added to the path view.



RSPP00071

Continues on next page

Continued

NOTE! To make a smooth movement from the previous target to the new target, the default angle of the target is the same as the previous one.

Related Information

The Path View toolbar on page 55.

4.5.4. Create Air instruction

Overview

Air instructions can be added to a path.

Creating an Air instruction

To create an air instruction, follow these steps:

1. In the Path View, select the last target. In the **Create** menu, click **Create Air Instruction**.
2. In the graphics window, move the robot's TCP to the desired position. In the dialog box, click **Present**. This will read the current position of the active tool into the **Data Input** area.

Continues on next page

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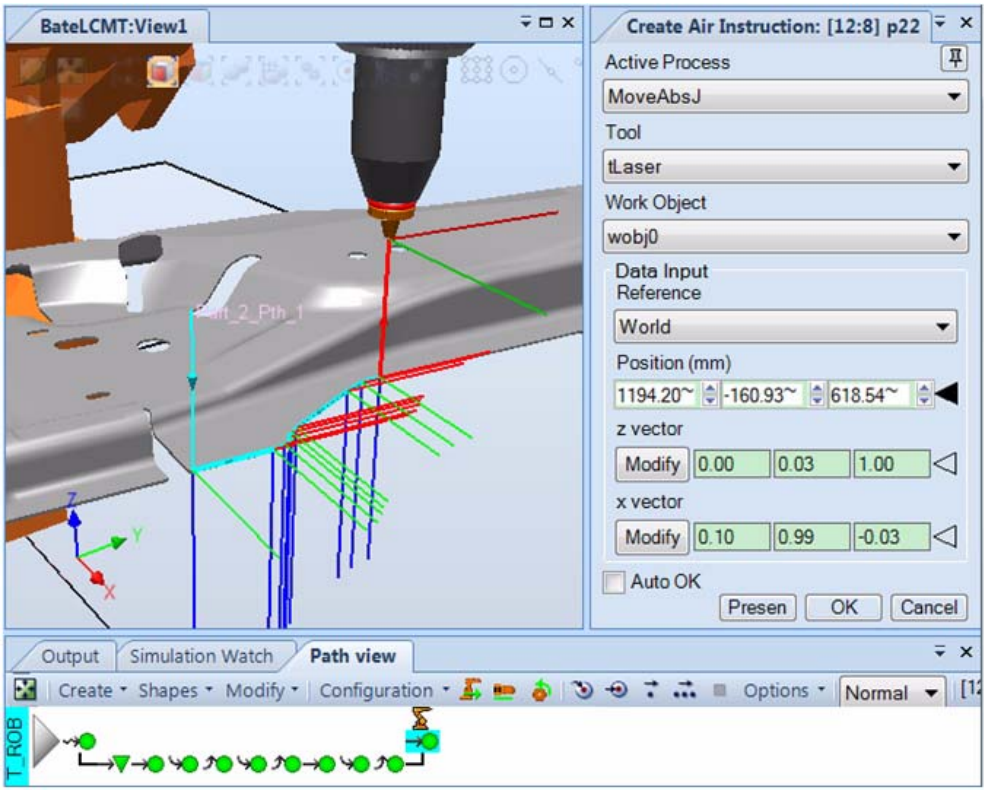

RSPP00072

3. In the dialog box, click **OK**. A new target is displayed in the graphics window, and an instruction icon is added to the path view.

   If the **Auto OK** check box is selected, the air instruction is automatically created when a valid input has been entered.

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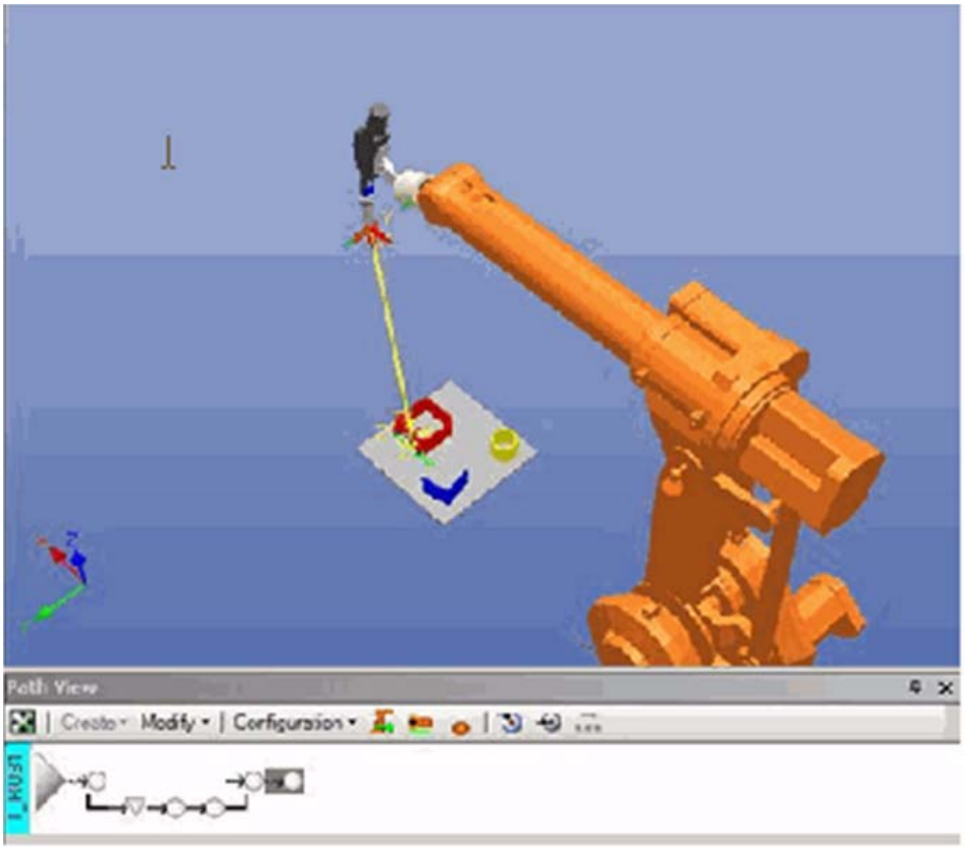
4.5.4. Create Air instruction

Continued



RSPP00073

Related Information

The Path View toolbar on page 55.

4.5.5. Create ABS joint target

Overview

Absolute joint instructions can be added to a path.

Continues on next page

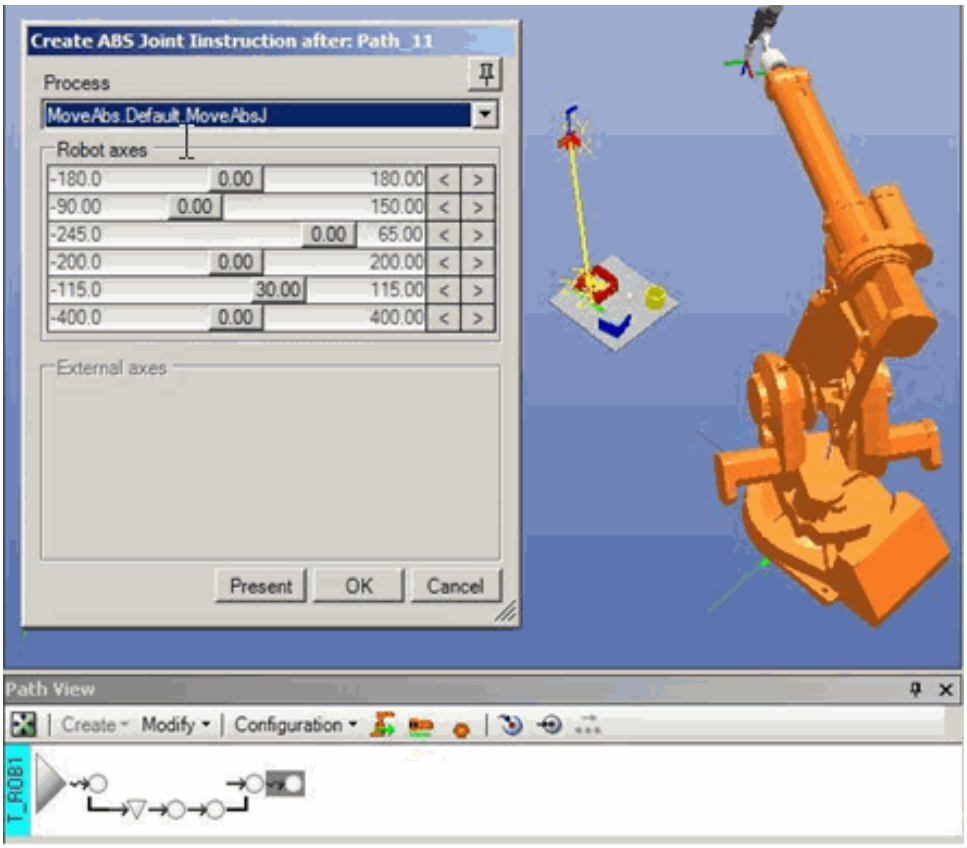
4.5.5. Create ABS joint target

Continued

Creating a Jointtarget

To create a jointtarget, follow these steps:

1. In the path view, select the last target. In the **Create** menu, click **Absolute Joint Instruction**.



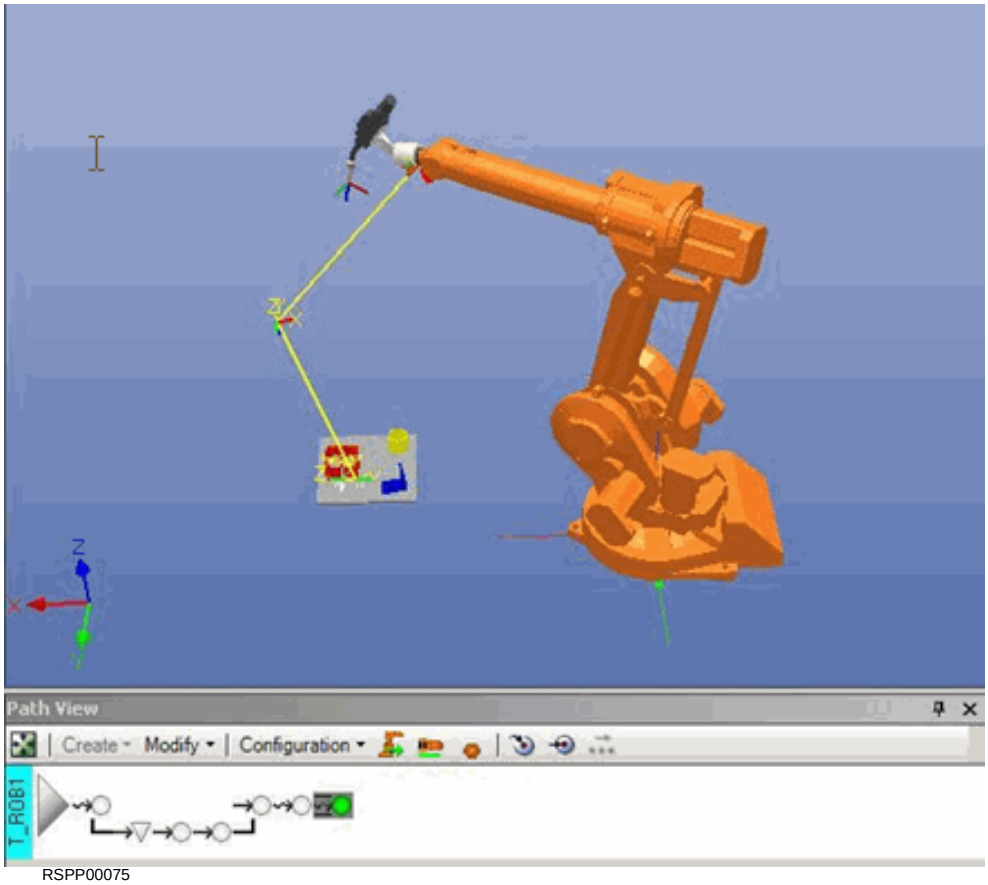
RSPP00074

2. Jog the robot to an arbitrary position and click **OK**.

   A new jointtarget is displayed in the graphics window, and an instruction icon is added to the path view.

Continues on next page

Continued



RSPP00075

Related Information

The Path View toolbar on page 55.

4.5.6. Create an Action instruction

Overview

Absolute joint instructions can be added to a path.

Creating an Action Instruction

To create an action instruction, follow these steps:

1. In the path view, select the last target. In the **Create** menu, click **Action Instruction**.
2. In the **Create Action Instruction** dialog box, select an instruction from the list, and then click **OK**.

   A blue instruction icon is added to the path view.

Related Information

The Path View toolbar on page 55.

4.5.7. Create Procedure Call

Overview

Procedure calls can be added to a path.

Creating Procedure Call

To create a Procedure Call, follow these steps:

1. In the path view, select the last target. In the **Create** menu, click **Procedure Call**.
2. In the **Create Procedure Call** dialog box, select an path procedure name from the list, and then click **OK**.

   A blue instruction icon is added to the path view.

Related Information

The Path View toolbar on page 55.

4.6 The Shape Menu

4.6.1. Common Items Used in Shape Menu

Overview

All commands in the **Shapes** menu are used to create cutting instructions based on specified geometry features. The geometry feature can be defined by only several mouse click actions on the CAD model in the geometry window.

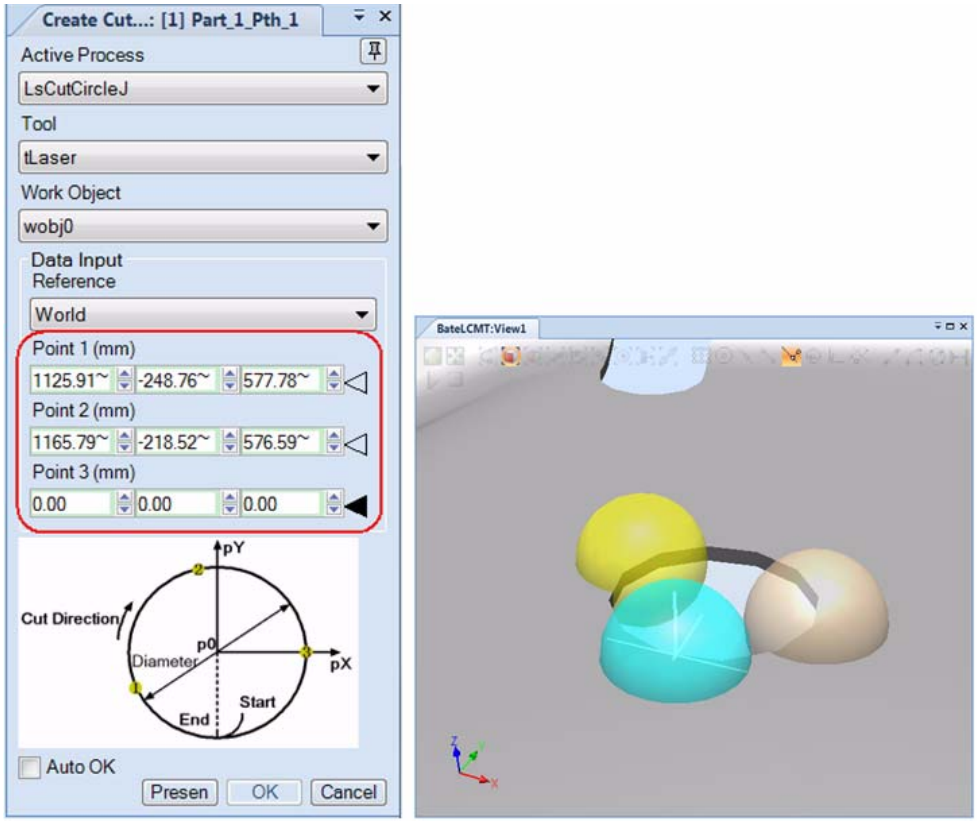
All instructions created by this menu are applied on the 2D cutting path.

There are several common items used in the dialog box corresponding to each command in the **Shapes** menu.

Object	Description
Active Process	Specify the process template for the new cutting instruction.
Tool	Specify the tool object for the new cutting instruction.
Work Object	Specify the work object for the new cutting instruction.
Reference	Specify the reference frame for the new cutting instruction.
Auto OK	If checked, automatically accomplish the creation after the geometry feature was specified.
Present	Specify the current position as the selected input point.

4.6.2. Cut Circle Instruction

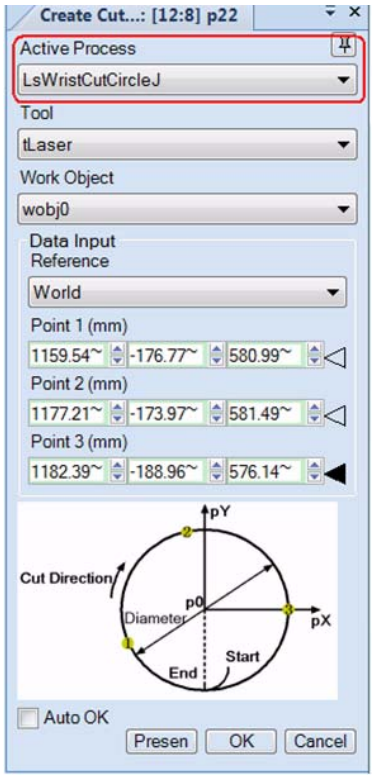
The three points, Point 1, Point 2 and Point 3, define the circle feature in the dialog box.



RSPP00076

4.6.3. Cut Wrist Circle Instruction

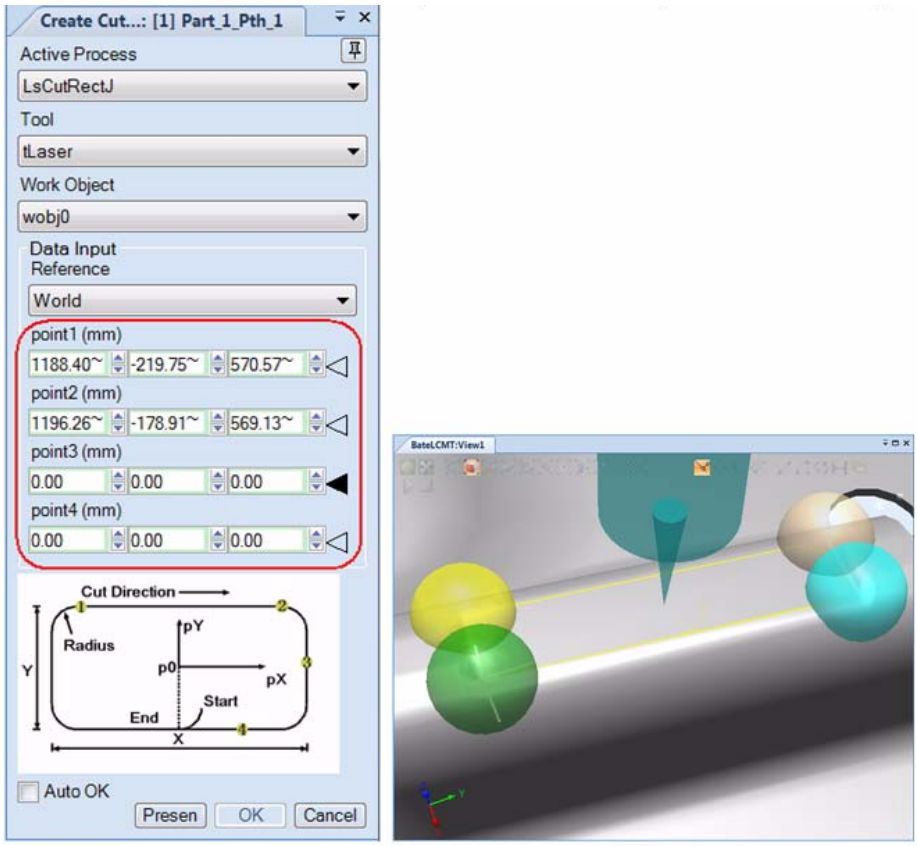
The dialog box of **Cut Wrist Circle Instruction** is very similar to **Cut Circle Instruction**'s, only with the different list items of **Active Process** in the dialog box.



SPP00077

4.6.4. Cut Rectangle Instruction

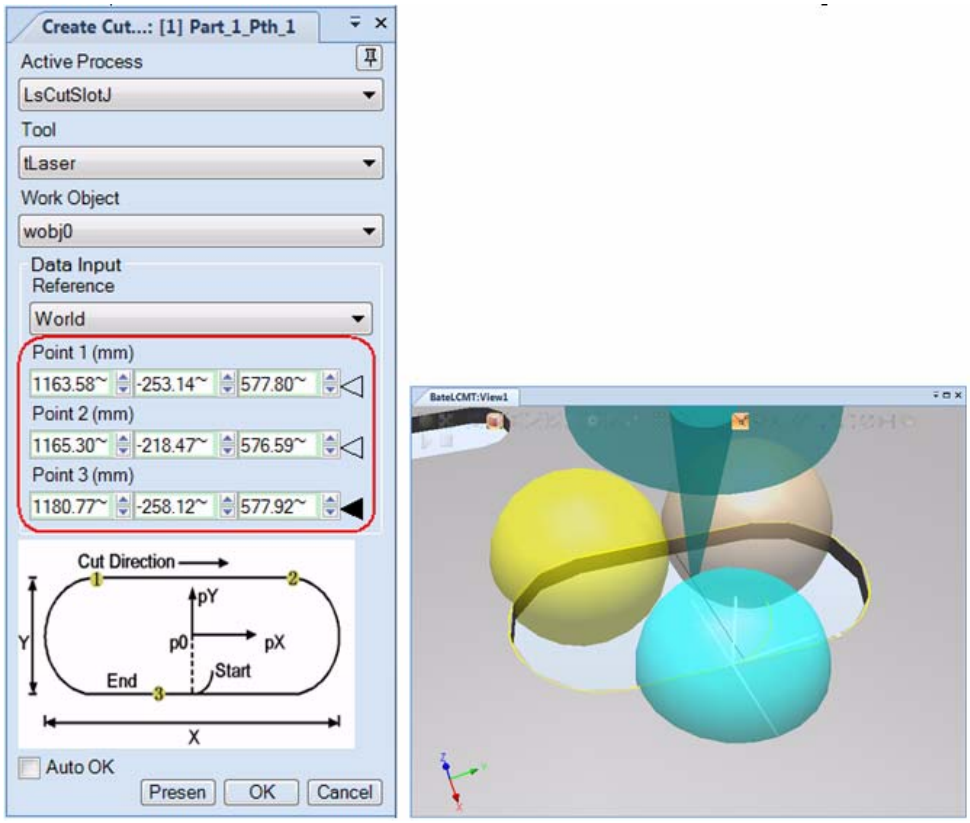
The four points, point1, point2, point3 and point4, define the rectangle feature in the dialog box.



RSPP00078

4.6.5. Cut Slot Instruction

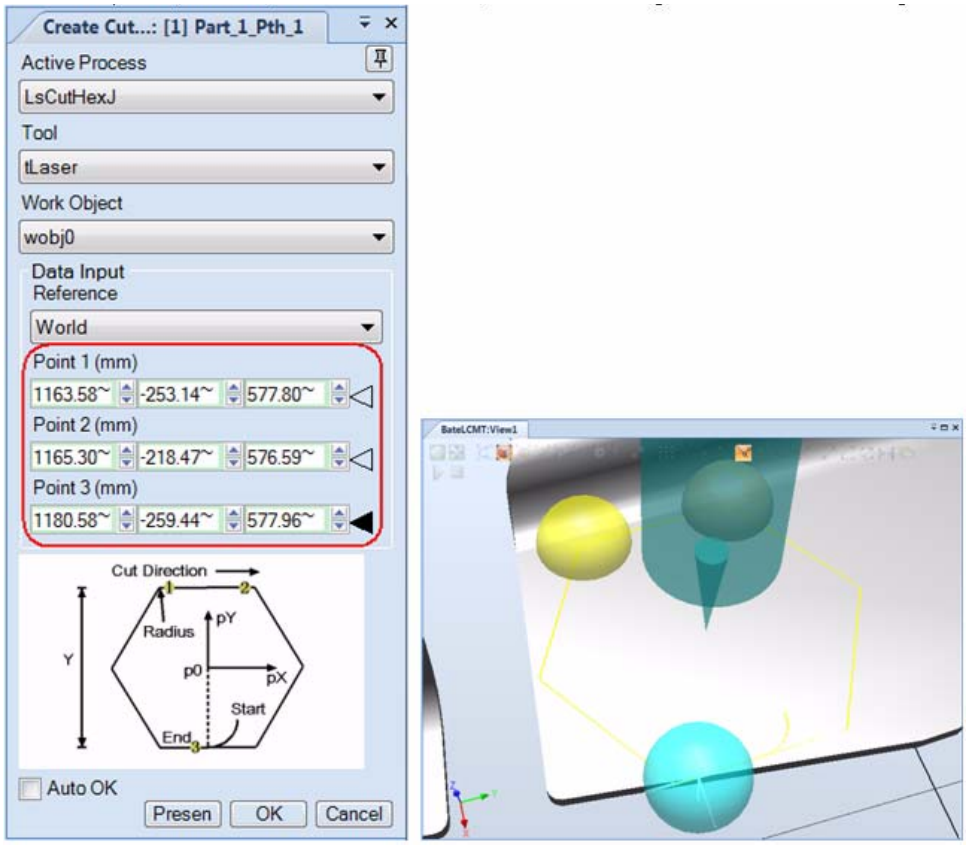
The three points, Point 1, Point 2 and Point 3, define the slot feature in the dialog box.



RSPP00079

4.6.6. Cut Hexagon Instruction

The three points, Point 1, Point 2 and Point 3, define the hexagon feature in the dialog box.



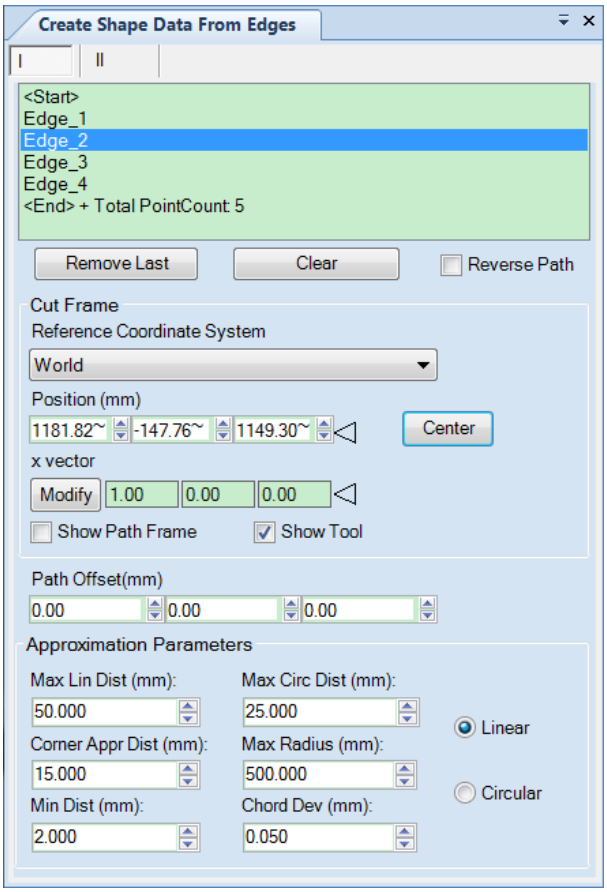
RSPP00080

4.6.7. Cut 2D shape Instruction

Create Shape Data From Edges Dialog Box

To create a 2D shape instruction, you must specify a corresponding shape data file which is created by clicking ribbon button **2D Shape Data** in the **Create** group in **Cutting** tab.

The **Create Shape Data From Edges** dialog box is composed with two tab-pages. The first page contains parameters representing shape definitions.



RSPP00081

Object	Description
List Box	Show the selected face's edges from the CAD model.
Remove Last	Remove the last edge in the list box.
Clear	Clear all items in the list box.
Reverse Path	Reverse the edges items in the list box.
Reference Coordinate System	Specify the reference coordinate system.
Position	Specify the reference point for the shape data. This point is the original point of the path frame for the shape data.
X vector	Specify the direction of X axis for the path frame.
Path Offset	Specify the offset of the reference point for the shape data.

Continues on next page

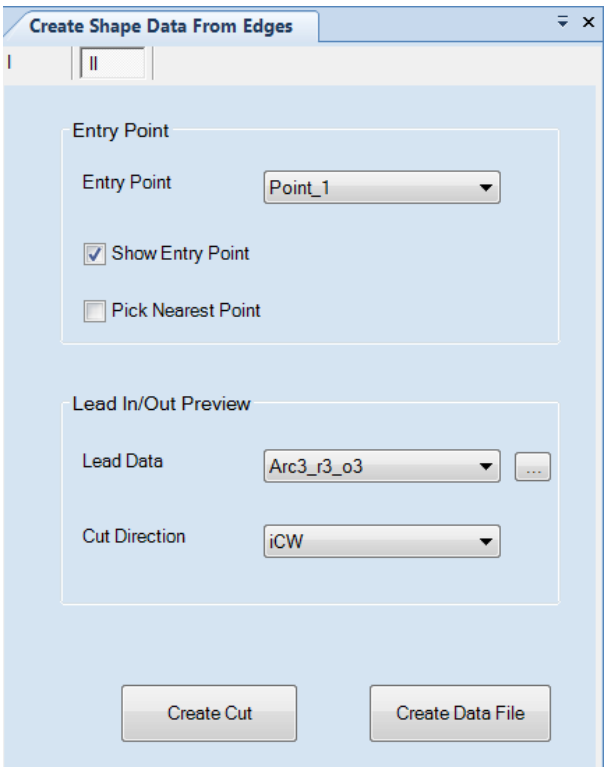
Continued

Object	Description
Show Path Frame	Show the path frame in the geometry window.
Show Tool	Show the tool in the geometry window.
Center	Set the **Location** and **X vector** as the geometry center of the selected face.
Max Lin Dist	Specify the maximum length for linear approximation.
Max Circ Dist	Specify the maximum length for circular approximation.
Corner Appr Dist	Specify the edge length of the corner for linear approximation. This value should be greater than the value of "Min Dist", otherwise it has no effect on approximation. Therefore if the user don't want insert any corner into the linear paths, this value can be set with 0.
Max Radius	Specify the maximum radius for circular approximation.
Min Dist	Specify the minimum length for linear approximation. If one linear path's length is shorter than this specified value, this linear path would be eliminated in the resultant paths. Instead, a new linear path, which starts from the end position of the previous valid path and ends to the start position of the next valid path, will be inserted into the path list.
Chord Dev	Specify the maximum chord value for circular approximation.
Linear	Apply the linear approximation on current selected edges.
Circular	Apply the circular approximation on current selected edges. If one edge failed to apply the circular approximation, it would automatically change to apply the linear approximation.

Continues on next page

Continued

The second page contains some cutting parameters for preview, and you can only switch to the second page after selecting the face and set the **Location** in the first page.

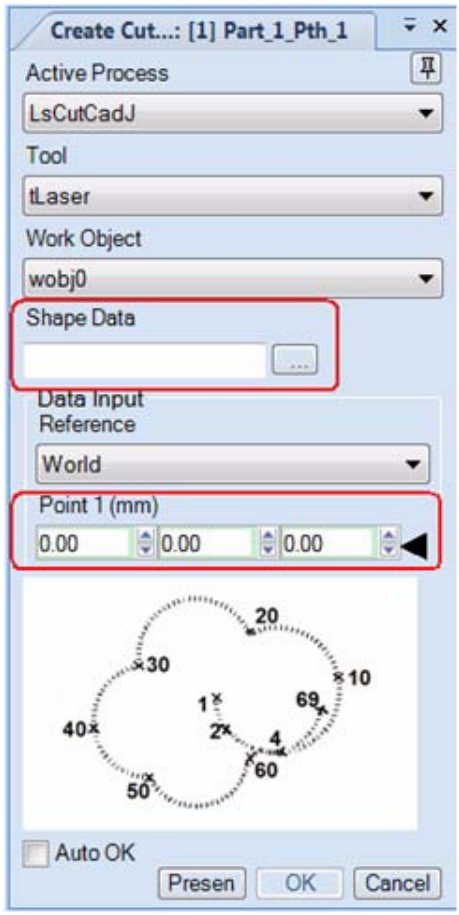


RSPP00082

Object	Description
Entry Point	Specify the point as the entry point of the shape data.
Show Entry Point	Show the entry point in the geometry window.
Pick Nearest Point	Automatically select the nearest point in the Entry Point list when the user clicks the mouse in the geometry window.
Lead Data	Specify the leaddata for the shape data for preview in the geometry window.
Button …	Modify the value of Lead Data.
Cut Direction	Specify the cut direction for the shape data for preview in the geometry window.
Create Cut	Export the shape data as a .cad file and create a 2D shape instruction with that .cad file. NOTE1: The exported shape data file must be located in the default folder. (HOME\\CwCadShapes) NOTE2: The creating action is only successful when you have opened a path program in the Cutting browser tree.
Create Data File	Export the shape data as a .cad file. NOTE: The exported shape data file must be located in the default folder. (HOME\\CwCadShapes)

Continues on next page

Create Cut… Dialog Box



RSPP00083

Object	Description
Shape Data	Specify the shape data file (.cad file) created by the **Create Shape Data From Edges** dialog box.NOTE: The shape data must be located in the default folder "Controller System Path"\\HOME\\CwCadShapes.
Point 1	Specify the reference point for the shape data. This point is corresponding to the **Location** in the first page of the **Create Shape Data From Edges** dialog box.

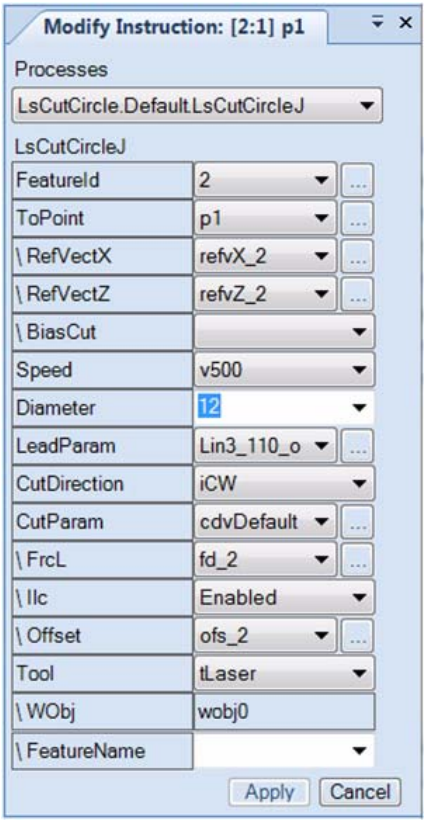
4.7 The Modify menu

4.7.1. Modify instruction

Overview

Most instructions have arguments that specify how the instruction must be performed. For example, the arguments of the LsCutCricleJ instruction specify the circle geometry feature with which the robot moves along the circle path. In the Modify Instruction dialog box, you can display and change these arguments.

The Modify Instruction Dialog Box



RSPP00084

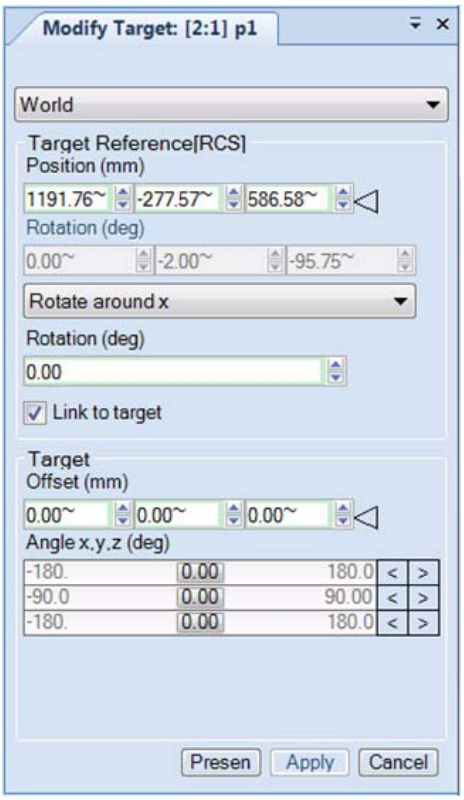
Related Information

- *The Path View toolbar on page 55*
- Application Manual - RW Cutting

4.7.2. Modify target

The Modify Target Dialog Box

The **Modify Target** dialog box is used to edit target positions and orientations.



RSPP00085

Object	Description
Reference	The coordinate system of the target reference. All available frames in the station are listed. It affects the values shown for RCS's position and rotation.
Target Reference (RCS)	The position and rotation of the RCS. Highlight the arrow head on the right to select a new position in graphic interface, or manually enter values to modify. **NOTE!** Since Approach/Depart targets' RCS align with Start/End target, their RCS are not directly modifiable. For rotation of process targets, such as Start, Via, and End targets, only rotating around X axis is allowed. For other targets, rotation around x, y, and z axis are all available.
Link to target	If selected, modifications made on RCS will also affect the target in world frame, and the offset and angle of the target in its RCS keeps unchanged. Normally the target is set to be linked with it's RCS.
Target	The offset and angle values are relative to the target reference. For information on tool angles.

Related Information

The Path View toolbar on page 55.

4.7.3. Modify Jointtarget / External Axes

Overview

This dialog box is used to modify the jointtarget or external axis values of a selected target. Jointtargets are used in instructions such as MoveAbsJ and MoveExtJ.

Modifying a Jointtarget or External Axes

To modify a jointtarget or external axis, follow these steps:

1. In the **Modify** menu, click **Jointtarget / External Axes**.
2. Click **Present** to obtain the external axis values of the active robot, and then move the slide bars to jog the robot.
3. Click **Apply**.

Related Information

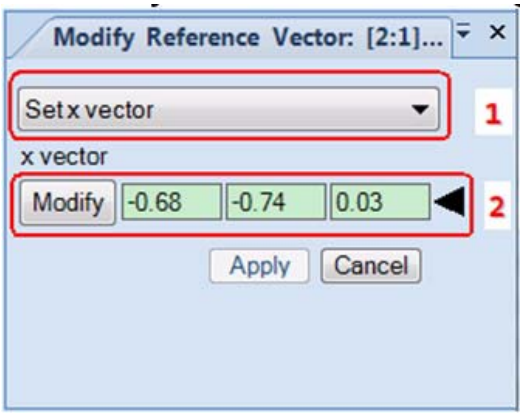
The Path View toolbar on page 55.

4.7.4. Modify Reference Vector

Overview

This dialog box is used to modify the reference vector of a selected cutting instructions based on the geometry feature.

The Modify Reference Vector Dialog Box



RSPP00086

Object	Description
Combox (Marked as 1)	Select which available vector to be edited: X vector or Z vec-tor.
Editbox (Marked as 2)	Set/Modify the value of current selected vector.

4.7.5. Multi-Selection Operations

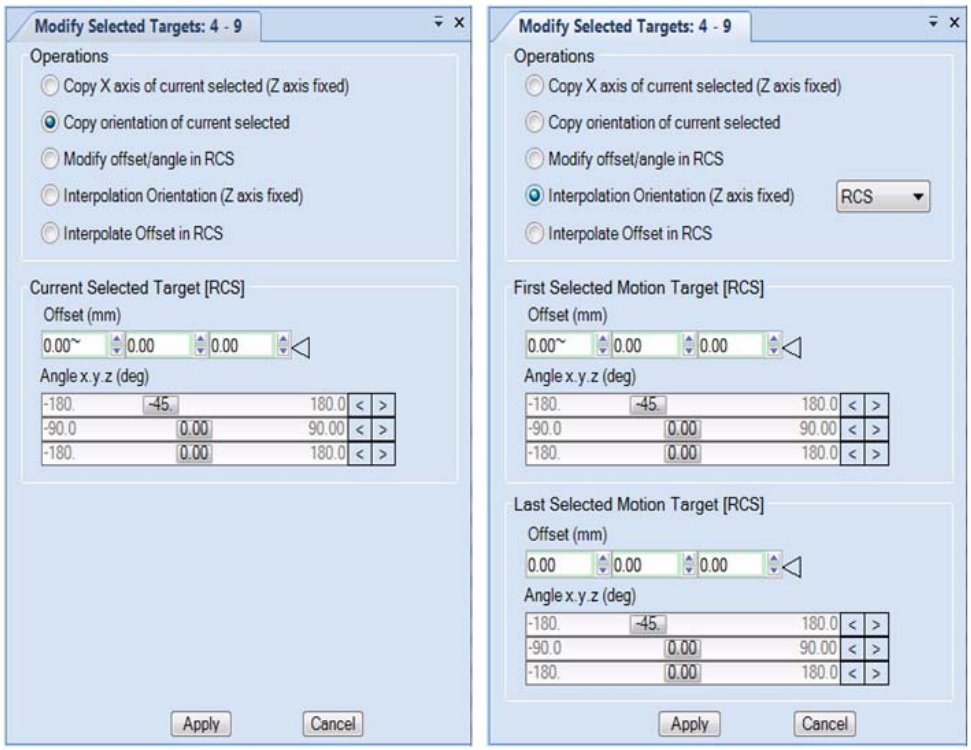
Overview

Multiple targets may be selected in the path view by clicking one target, pressing SHIFT and then clicking another target. All targets in between will also be highlighted grey.

Depending on the targets selected, the following additional operations may be available from the shortcut menu.

Modify Selected Targets

This command shows a dialog box containing several useful function options which can be respectively performed on multi-selected free form path targets.



RSPP00087

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Continued

Group	Object	Description
Operations	Copy X axis of current se-lected (Z axis fixed)	If this option is enabled, the group Current Selected Target, representing the first clicking target in the selected target list, is shown up. For the detail description of this option, see the option Spin X to Selected in *Optimize Selected Target on page 94*.
	Copy orientation of current selected	If this option is enabled, the group Current Selected Target is shown up. For the detail description of this option, see the option Copy Rotation from Selected in *Optimize Selected Target on page 94*.
	Modify offset/ angle in RCS	If this option is enabled, the group Current Selected Target is shown up. For the detail description of this option, see *Target Offset/Angle on Selection on page 91*.
	Interpolation Orientation (Z axis fixed)	If this option is enabled, two groups First Se-lected Motion Target and Last Selected Mo-tions Target, rep-resenting respectively the first and last motion target in the selected target list, are shown up. For the detail description of this option, see the option Interpolate Orientation of *Optimize Selected Target on page 94*.
	Interpolate Offset in RCS	If this option is enabled, two groups First Se-lected Motion Target and Last Selected Mo-tions Target are shown up. For the detail description of this option, see the option Interpolate Targets Offset of *Optimize Selected Target on page 94*.
Current Selected Target /First Selected Motion Target /Last Selected Motion Target	Offset	Specify the offset of the target in RCS.
	Angle x.y.z	Specify the angle of axis X, Y and Z respec-tively in RCS.

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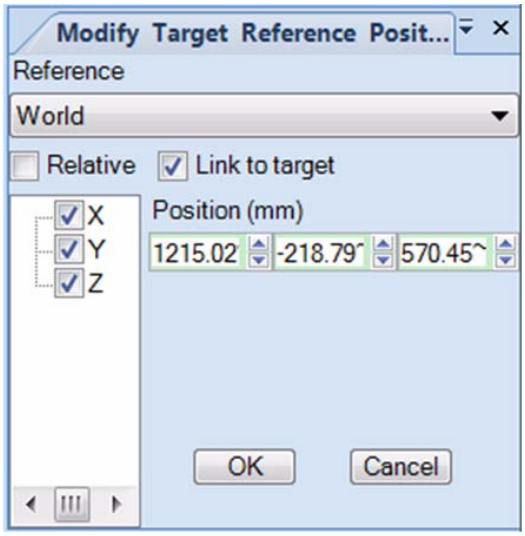
4.7.5. Multi-Selection Operations

Continued

Target Reference Position on Selection

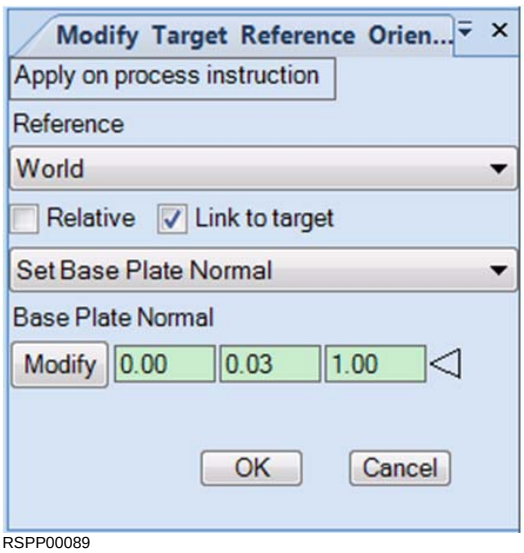


RSPP00088

The following table describes the elements of the dialog box.

Object	Description
Reference	The coordinate system of the target reference. All available frames in the system are listed.
Relative	Select to perform a relative move of the target reference.
Link to target	Select to move the selected targets together with RCS.
Position	Enter the absolute position or relative move of the target reference. If you want to move the target reference in just one direction, clear the check boxes of the other axes.

Target Reference Orientation on Selection



RSPP00089

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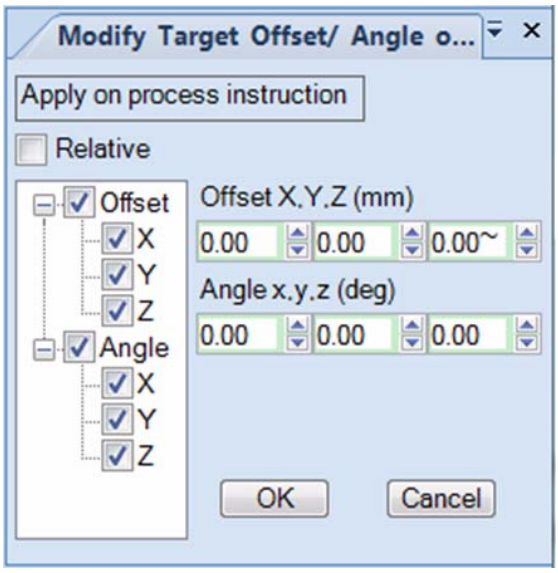
Continued

This command applies only to process instructions.

The following table describes the elements of the dialog box.

Object	Description
Reference	The coordinate system of the target reference. All available frames in the system are listed.
Relative	Select to perform a relative reorientation of the approach vector.
Link to target	Select to rotate the selected targets.
Modify Base Plate Normal	The arrowhead points to the current values of the base plate normal. Click **Modify** to enter a new vector or invert the current one. Alternatively, click the arrowhead to turn it black, and then click in the graphics window on the surface that will constitute the new base plate.

Target Offset/Angle on Selection



RSPP00090

This command offsets or rotates selected targets of process instructions a given distance or angle. This offset or angle is in relation to the target references coordinate system. If **Relative** is selected, the offset or angle will be in relation to the target itself. Clear the offset or angle directions in the tree nodes on the left side that have no bearing on the operation.

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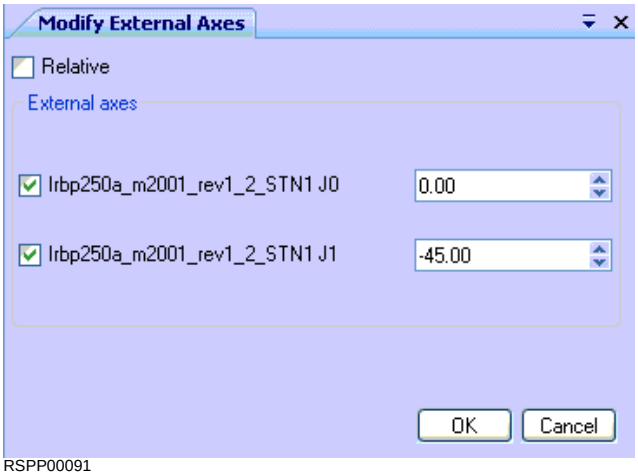
4.7.5. Multi-Selection Operations

Continued

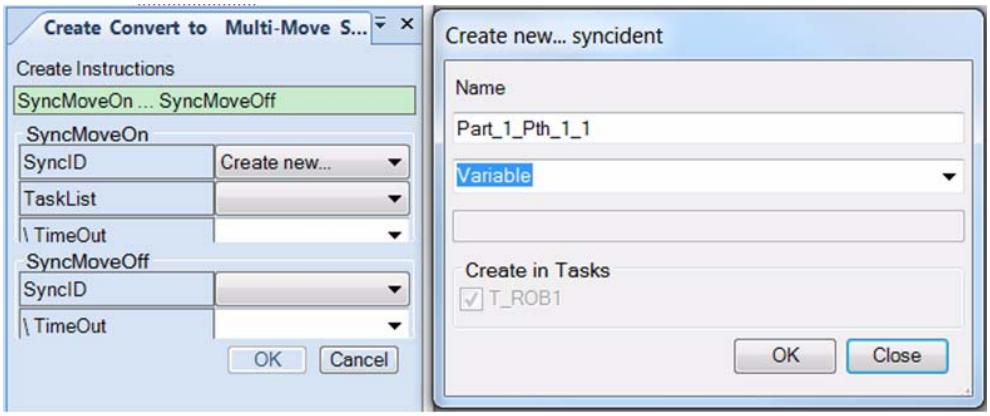
External Axes Values on Selection



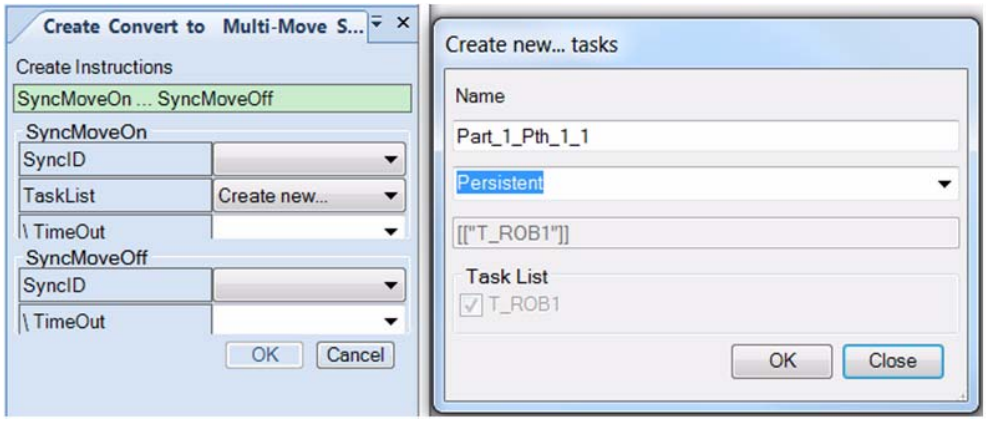
RSPP00091

This command sets the external axis values on all selected targets. If **Relative** is selected, the given value will be in relation to the current external axis values defined for each target.

Convert to MultiMove Section



RSPP00092



RSPP00093

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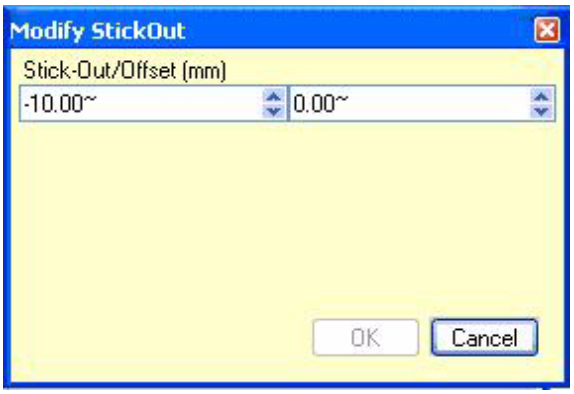
It is possible to enter special commands for motion synchronization in the path view. These commands are represented by blue instruction icons and letter flags. Each letter represents a Sync ID, and two identical letters form a pair marking a synchronized MultiMove section.

Select all instructions to be included in the MultiMove section. From the context menu, select Modify/Convert to MultiMove Section. A dialog appears asking the user to define a Sync ID and a Task List. If there are no Sync IDs or Task Lists present in the station, you can create new by selecting **Create new** from the list. The necessary data will then be created automatically. When creating a new Task List, you will also be prompted to select the tasks to be included in the list.

For more information, see *Application manual - MultiMove*.

Stick-Out



RSPP00094

Object	Description
Stick-Out	This command modifies the position of the target offset as a function of stick-out. The value of the stick-out is based on the defined tool properties. It affects the tool position along its z axis.
Offset	This value modifies the position of the target offset along its y axis.

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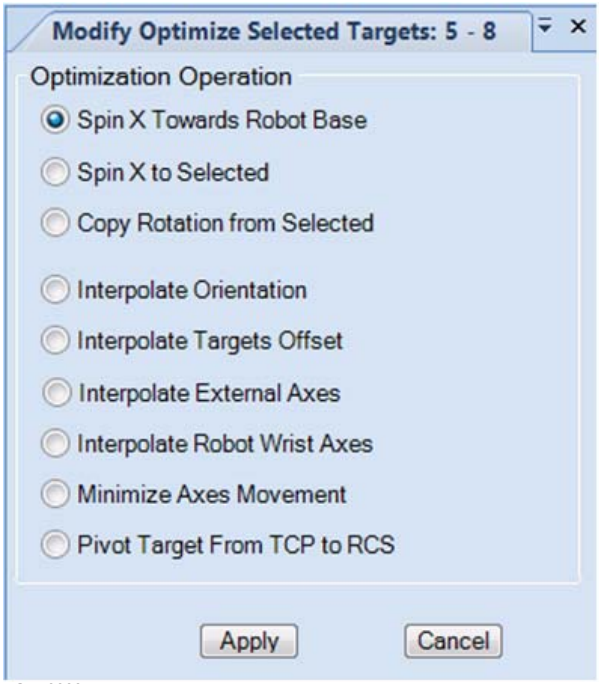
4.7.5. Multi-Selection Operations

Continued

Optimize Selected Target



RSPP00095

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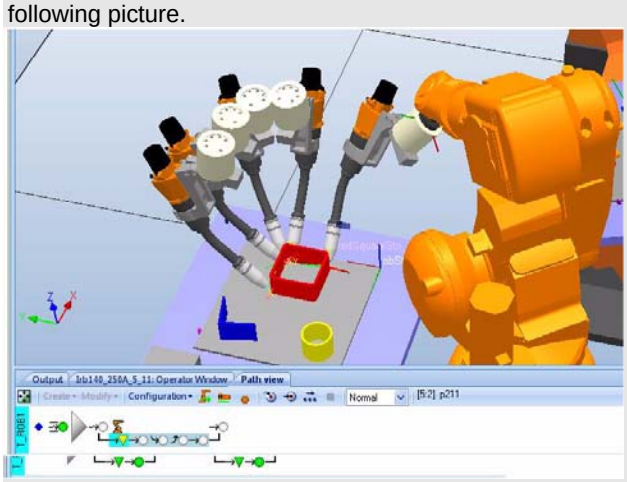
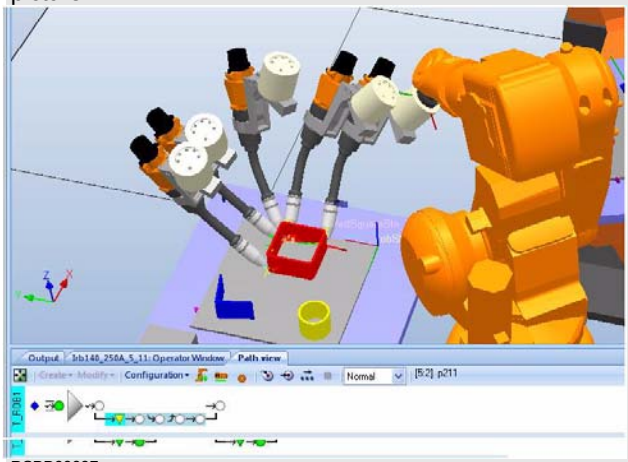
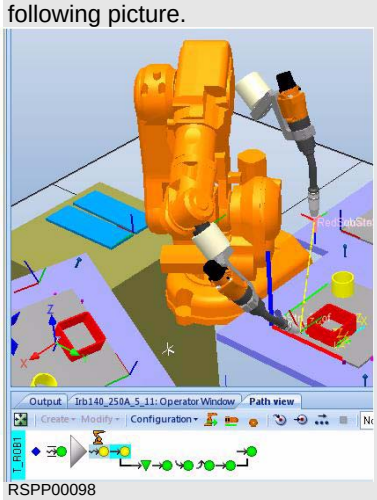
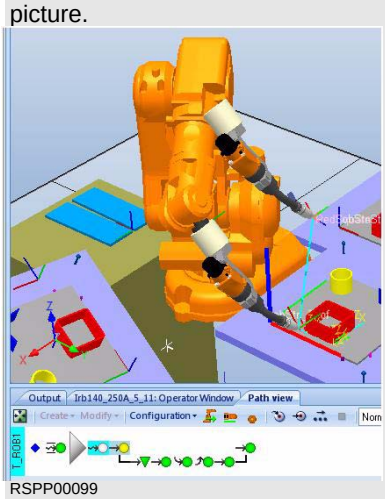
Continued

Option	Description
Spin X Towards Robot Base	Spin the X axis of the targets towards the robot base.
Spin X to Selected	This function can be used to orient a row of targets so the target x axes point in the same direction. The function will spin all marked targets around the z axes until the target x axes match the selected target x axis as close as possible. Before using this function, the status is illustrated in the following picture.  RSPP00096 After using this function, the status is illustrated in the following picture.  RSPP00097

Continues on next page

4.7.5. Multi-Selection Operations

Continued

Option	Description
Copy Rotation from Selected	This function copies the orientation of the selected target to all other marked targets. Depending on the type of target, only the appropriate part of the orientation is copied. For an air target, it is a complete copy. For a process target, only the orientation of the tool-x axis is copied. For a search target, the reference frame is aligned with the selected target z axis and the search target x axis is aligned with the selected x axis. Before using this function, the status is illustrated in the following picture.  RSPP00098 After using this function, the status is illustrated in the following picture.  RSPP00099

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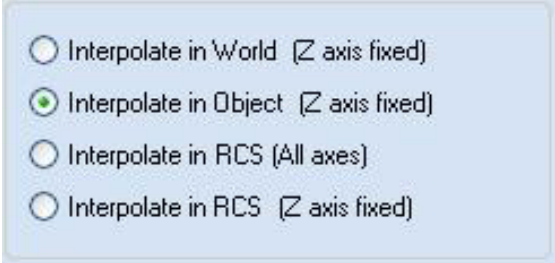
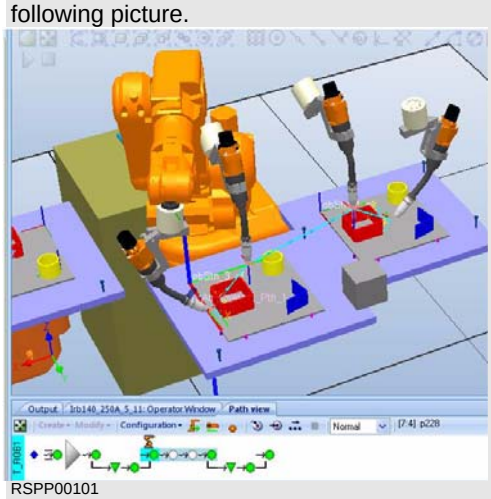
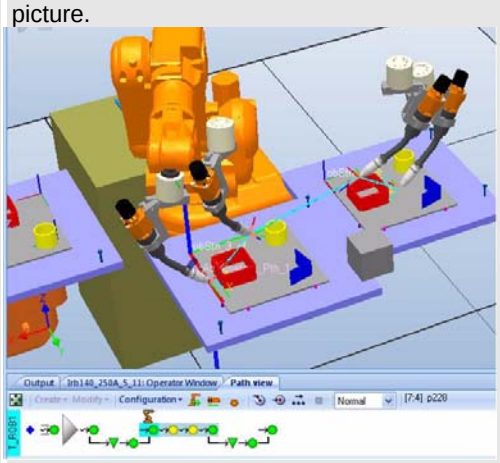
Option	Description
Interpolate Orientation	Interpolate orientations of targets based on the selected coordinates. • **Interpolate in World (Z axis fixed)**: Set to interpolate the Z axis value of the Euler angles of the targets, in relative to world frame (i.e., external axes, if exist, are moved to calculate interpolation values). • **Interpolate in Object (Z axis fixed)**: Set to interpolate the Z axis of the Euler angles of the targets in object frame (work object), with Z axis fixed. • **Interpolate in RCS (Al axes)**: Set to interpolate the travel, work and spin angle of the targets in each RCS. • **Interpolate in RCS (Z axis fixed)**: Set to interpolate the spin angle of the targets in each RCS, with Z axis fixed.  RSPP00100
Interpolate Targets Offset	Interpolate offsets of targets based on the selected coordinates.
Interpolate External Axes	This command interpolates the external axes for a select range based on the move distance between the tool robot points. The points can be either in the same path or in different open paths.

Continues on next page

4.7.5. Multi-Selection Operations

Continued

Option	Description
Interpolate Robot Wrist Axes	This command can be used to optimize air moves. The function tries to interpolate the robot wrist axes from the selected start target to the selected end target. The interpolation of the joint values is based on the move distance of the robot targets. All selected targets must have a solution before the operation is executed. Before using this function, the status is illustrated in the following picture.  RSPP00101 After using this function, the status is illustrated in the following picture.  RSPP00102

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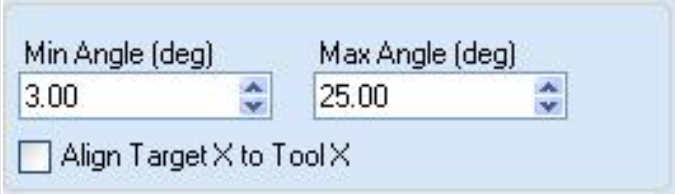
Option	Description
Minimize Axes Movement	Optimizes the spin angles of the selected motion items by minimizing the value change of robot joint moves. It searches for a best target orientation by evaluating multiple orientation values in the close range, based step angle. The weight value for each joint shows the importance of each joint in the minimization. Several checkings on joint moves can be enabled to filter out invalid targets. • **Axes Weight**: Weight for this axis during searching axis. • **Test Step size**: The step value of the angle to search for best orientations of the target. • **Number of Tests**: The maximum number of steps to search for best orientations. • **Min Angle Axis 5**: The minimum angle of axis 5 to keep during searching. Set to a value large enough so that an orientation close to sigularity is not selected. • **Set Axis 2 Init value to 0**: Set axis 2 to zero during searching. • **Check Sign Axis 5 for Joint Move**: Keep the sign of axis 5 value during searching. • **Check Min Axis 5 Angle for Joint Move**: Make axis 5 minimum angle effective during searching.  RSPP00103

Continues on next page

4.7.5. Multi-Selection Operations

Continued

Option	Description
Pivot Target From TCP to RCS	Set the Z axis of the targets towards the tool. This is usually used in laser cutting. • **Min Angle (deg)**: Enter the minimum angle between z axis of the target and the RCS during pivoting. You may need this to keep the laser tool from cutting perpendicularly onto the work piece surface. • **Max Angle (deg)**: Enter the maximum angle between z axis of the target and the RCS during pivoting. You may need this to make the cutting direction not too inclined towards work piece surface. • **Align Target X to Tool X**: Check to also set the x axis of target to current x axis of the tool.  RSPP00104
The **Apply** button	Click this button to apply your settings on the selected targets.
The **Cancel** button	Click this button to cancel your settings in this editor.

4.8 The Configuration Menu

4.8.1. Check Reach

Overview

This command checks whether the robot can reach a target. A successful result turns the target yellow, while an unsuccessful result turns it red.

Related information

The Path View toolbar on page 55.

4.8.2. Set Configuration

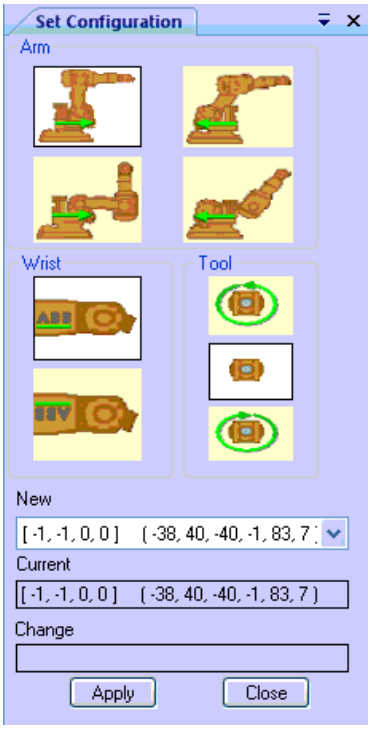
Overview

It is possible to attain the same target position and orientation in several different ways, using different sets of axis angles. We call this the settings of different robot configurations.

In Cutting PowerPac, robot configuration can be set for individual targets. The system calculates a configuration based on your selections, after which values are displayed.

The Set Configuration Dialog Box

This dialog box requires that you select three positions, one each for the robot arm, wrist and tool, before clicking **Apply**.



RSPP00105

The following table describes the elements of the dialog box:

Object	Description
Arm	The group is used to specify whether the robot wrist is in front of or behind axis 1, and whether the elbow is up or down.
Wrist	This group is used to specify whether axis 4 will be turned positive or negative.
Tool	This group is used to specify whether axis 6 will be turned positive or negative. If neutral is selected, the configuration of axis 6 will be determined by the arm and wrist selections.
New	This list displays the configuration and joint values for a selected configuration, as well as alternatives.
Current	This box displays the configuration currently stored in the selected target.
Change	This box calculates the difference in joint values between the currently selected target and the preceding target in the path.

Continues on next page

TIP!

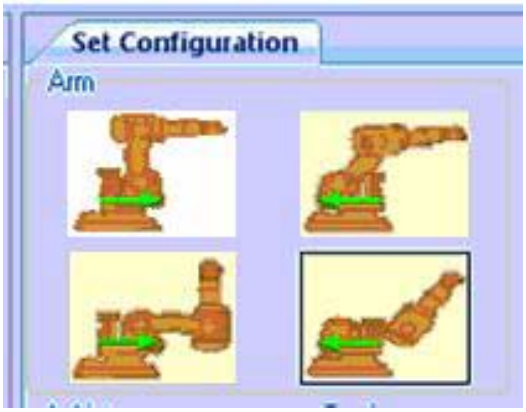
Have this dialog box and the **Modify Target** dialog box open at the same time. The configuration will then be automatically recalculated when the target is modified, which will help you determine how much you can adjust the target while keeping it within reach.

How to Set Configuration

Cutting PowerPac provides two ways to set a configuration for a target.

- Specify a configuration setting by selecting a combination of arm, wrist and tool configuration among the symbols on the control. The settings will be used to find the robot configuration that fits the selection best.
- Manually select a robot configuration among all the possibilities given. This is done by selecting one of the robot configurations in the drop-down **New**. The configuration setting controls will then be updated accordingly.

When selecting a configuration, the selected symbol gets a frame around it, and the selection process will make the background white for the valid configuration that was selected. If the two (the frame and the white background) does not coincide, the selection could not be fulfilled.



RSPP00105_1

TIP!

An easy way to set the configuration for a cutting path:

1. Create a cutting path with the approach point as a joint move. Make all other moves linear
2. Set the configuration for the first target (the joint move).
3. Run through all the targets using the **Move To** function.
4. If there is a problem, modify the configuration of the first target and repeat the step 3.

Related Information

The Path View toolbar on page 55.

4.9. The Options Menu

Overview

Select simulation options for the executed paths.

Save As Viewer

Use this procedure to save the simulation of the executed paths as a RobotStudio viewer file:

1. On the path view toolbar, select the check box of **Save As Viewer** from the **Options** menu.
2. Click the **Simulate** button.

   When the execution finishes, the **Save As** dialog box opens.
3. In the dialog box, specify the name and location for the viewer file.
4. Click **Save**.

Enable Log

Use this procedure to enable log:

1. On the path view toolbar, select the check box of **Enable Log** from the **Options** menu.
2. Click the **Simulate** button.

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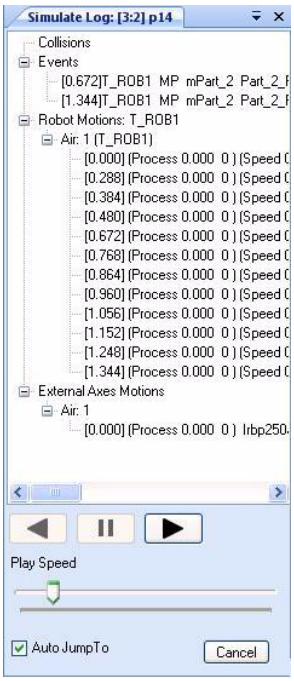
When the execution finishes, the **Simulate Log** window opens.



RSPP00106

3. View the simulate logs in this window.

Item	Description
Collisions	Collision events happened during simulation in RobotStudio 3D environment are listed here. You need to first create collision set including interesting objects by using RobotStudio functions.
Events	RobotStudio and Virtual Controller events, for example, motor on/off, I/O changes, program start/stop, raised during simulation are listed here.
Robot Motions	Data about TCP robots' motion details during simulation are listed here. Each data item represents the running robot motion information on a simulation step, including time stamp, TCP position, joint angles and joint value percentage relative to the respective joint limits.
External Axes Motions	Data about external axes' motion details during simulation are listed here. Each data item represents the running external axes' motion information on a simulation step, including time stamp, and joint angles.
Play Controls	Controls to play, pause and reverse play the log.
Auto JumpTo	Check to enable robots' automatic *JumpTo* when an data item is selected by keyboard or mouse clicking.

4.10. Export Process Section

Overview

One or more cutting paths can be exported as a XML file, and then imported into other part programs in the same or different station. This feature greatly reduces duplicate work when paths between parts or stations are similar.

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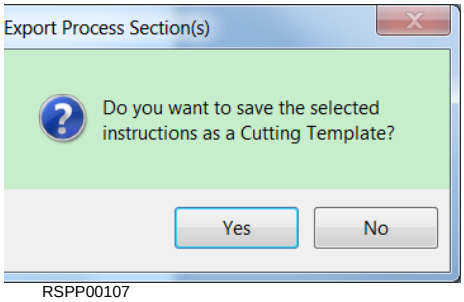
How to Export a Process Section

To export process sections, follow these steps:

1. To export a single cutting path, right click on the Process Start target, or select a complete process section. To export multiple cutting paths, select a complete range with equal numbers of Start and End targets. Right click, and select Export Process Section(s).

   If a single process section is selected, a user message will appear for you to select if the path should be saved as a template.

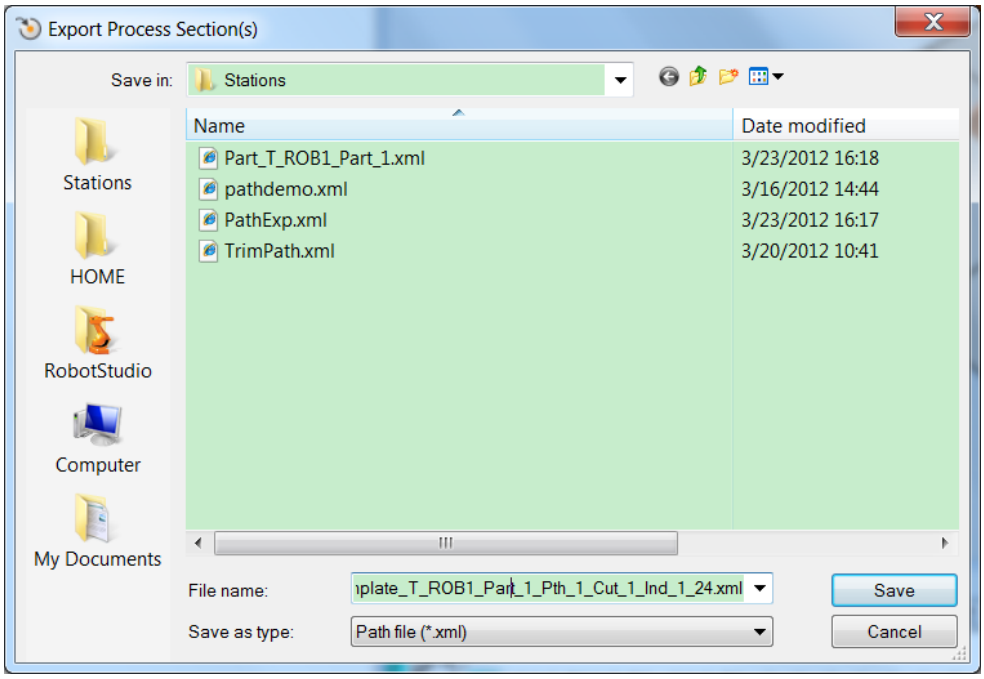


RSPP00107

   If a process section is saved as template, you will be able to modify the approach/depart offset, path angle/offset when importing the saved file. Otherwise, you will only be able to import and create new path targets as they were exported.

   A dialog box appears.

2. Specify the XML file name and directory. If a path is saved as template, the default name should be *"Template_"* + *Task name* + *Path name* + *"Ind_"* + *index of first target* + *"_"* + *index of last target;* otherwise, the name is *"Section_"* + *Task name* + *Path name* + *"Ind_"* + *index of first target* + *"_"* + *index of last target.* The default directory is under the *"/My Documents/RobotStudio/Stations"*.



RSPP00108

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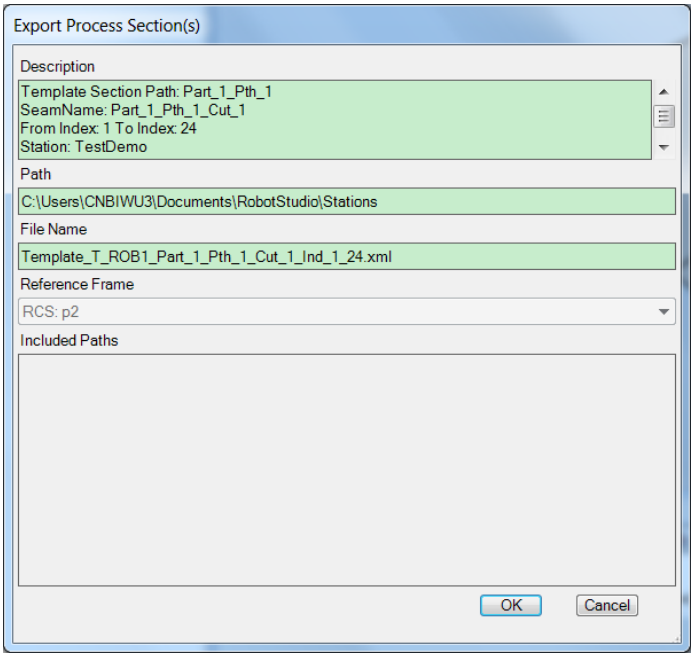
3. Click **Save** and an exporting dialog box opens.
4. Complete the dialog box, click **OK**, and an XML file will be created.



RSPP00109

Object	Description
Description	Describes the name of the station, the task, and the start index and end index of the targets in the exported process section(s). Read-only.
Path	The directory in which the file is stored. Read-only.
File Name	The name of the saved file. Read-only.
Reference Frame	Select a reference that the path targets in the process section(s) are related to. This affects the position and rotation values of these targets. The references can be World Coordinate, User Coordinate System, robot base coordinate, or work object coordinate, and also the RCS of the first target.
Included Paths	The included paths to be exported are listed here.

5 Cutting PowerPac workflow

5.1. Overview

Overview

This chapter id designed as a step-by-step guide to learn the sequence of work when you work with Cutting PowerPac.

Follow these steps:

- *Build a Cutting station on page 110*
- *Create paths on page 112*
- *Verify and modify on page 113*
- *Synchronize on page 114*
- *Load program to real controller on page 115*

5.2 Build a Cutting station

5.2.1. Create a Cutting station using RobotStudio basic function

Overview

This section describes how to build a station by including the equipment necessary to create and simulate cutting programs.

The operation described in this section should be done before starting Cutting PowerPac. The detailed description can be available from *Operating Manual - RobotStudio*.

Creating a station with a robot system

You can create a station with a template system or with an existing system.

In most cases, a virtual controller is automatically started when you create a new station. Library files for the robot used by the system are then imported to the station.

Importing station components

The following table shows the workflow for importing station components. Perform only those steps applicable to your station.

Activity	Description
Import a tool	Click the lower split of the **Import Library** button from the **Home** ribbon-tab to display galleries of tools, and select the desired one.
Create tool data	For achieving correct motions in robot programs, the parameters of the tool have to be specified in the tool data. Click **Tooldata** on the **Home** ribbon-tab to open the **Create Tooldata** dialog box.
Import a work piece	If you have CAD models of the work piece, you can import them by using **Import Geometry** on the **Home** ribbon-tab.
Create workobject	For achieving correct motions in robot programs, the parameters of the work piece have to be specified in the workobject. Click **Workobject** on the **Home** ribbon-tab to open the **Create Workobject** dialog box.
Import other equipment	If you have CAD models of the work piece, you can import them by using **Import Geometry** on the **Home** ribbon-tab.

Placing objects

The following table shows the workflow for placing the objects in the station.

Activity	Description
Place objects	If you are building a model of a real station, placing all objects with known position, find suitable placement.
Attach tools	Attach the tools to the robot.
Attach work pieces to positioners	If positioner external axes are used, attach the work pieces to the positioners.
Test reachability	Test if the robot can reach critical positions on the work piece.

5.2.2. Create an Cutting system using RobotStudio Basic Function

Overview

This section describes how you create and build systems to run on virtual and real controllers. These systems may even be downloaded to a real controller.

The system points out the robot models and options to use, and it also stores configurations and programs for the robots.

Building a new system

The following table shows the workflow for building a new system.

Activity	Description
Start new controller system wizard	Click **System Builder** on the **Online** ribbon-tab, then click **Create New** in the dialog box to start the wizard.
Specify the name and location of the new system	To determine where on your computer to store the system you are creating.
Enter the RobotWare key and drive keys	The RobotWare keys determine which RobotWare versions and parts to use in the system. Creating a system to run on either IRC5 controller or virtual controllers requires at least two keys: one for the controller module and one for each drive module in the cabinet.
Add additional options	You can add options here. Options require a license key and must be first imported to the media pool.

5.3. Create paths

Overview

Programming with Cutting PowerPac is an iterative process, which typically begins with creating paths in the Cutting Browser. After opening the Path View, targets and instructions are added to the path using process and cut templates, combined with input from clicking at geometry objects in graphics window.

Creating Process Templates

Before the first cut path is created, you should create your own process template, modify the properties related with cutting parameters and motion instructions.

See *Process templates on page 26*for detailed information,

Creating Process Paths

The following table shows the workflow:

	Activity	Description
1.	Create a program part node in the Cutting Browser, which is the holder of process paths.	See *Part Programs node on page 32*for the detailed procedure.
2.	Create a Process path.	See *Process path on page 40* for the detailed procedure.
3.	Open the new created path in the Pact View and create targets and instructions.	See *The Create menu on page 58*and *The Shape Menu on page 74* for the detailed procedure.

5.4. Verify and modify

Overview

The instruction icons in the Path View will immediately alarm you if a target is out of reach by changing the target color to red. If the target is within the reach of the robot, the target color will change to yellow.

The path is tested and verified by pushing the buttons in the toolbar of the path view. A successfully executed path will show all targets in green color.

If the execution failed, it is possible to tune individual target position, orientation and other instruction attributes. Changes are checked by executing the path again. This procedure is repeated until all targets are tested and verified, that is all targets in the Path View are green.

Verifying

	Activity	Description
1.	Open the selected path in the Path View to show targets and instructions.	
2.	Click the Jump to Target. Move to Target or Simulation button in the Pact View toolbar to test the selected targets.	See *The Path View toolbar on page 55*for the detailed description.

Modifying

See *The Modify menu on page 84* for a detailed description.

5.5. Synchronize

Overview

It is important to keep the virtual controller and the Cutting PowerPac in perfect synchronization, which requires exact mapping between graphical objects and the RAPID language. For example, a target in the graphical environment will generate a robtarget definition and a move instruction in the virtual controller; a path including targets in the graphical environment will generate a routine with move instructions in the virtual controller.

Workflow

This is the basic workflow:

1. Create and modify targets and paths in the graphics environment.
2. Synchronize selected item to the virtual controller.
3. The resulting RAPID programs reside in the virtual controller and is ready for download to the real controller.

NOTE!

One of the features in Cutting PowerPac is the multilevel synchronization. You can choose to synchronize an entire task, a part program, or a path to the virtual controller.

5.6. Load program to real controller

Overview

After synchronization, the fully functional RAPID program is generated in the virtual controller and can be saved to files and later downloaded to a real controller using the **Online** ribbon-tab. For more details about synchronization and downloading, consult the *Operating manual - RobotStudio*.

Workflow

This is the basic workflow:

1. Synchronize the tasks to the virtual controller to generate RAPID program.
2. Save the programs to files by clicking **Save Program** on the Cutting ribbon-tab.
3. Copy the files to the real controller or download to real controller by using the **Online** ribbon-tab. See *Operating Manual - RobotStudio* for detailed procedure.