

Application manual Production Manager

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**Application manual
Production Manager**

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Table of contents

Overview of this manual	7
Product documentation, IRC5	9
Safety	11
Safety signals in the manual	12
1 Production Manager	15
1.1 Introduction	15
1.2 Production Manager Execution Engine	16
1.3 Production Manager events	18
1.4 Production Manager Menudata and Partdata	21
2 Production Manager user interface	25
2.1 Overview	25
2.2 Setup menu	28
2.3 Service menu	30
2.3.1 About the Service menu	30
2.3.2 Create a new Setup or Service menu dialog	32
2.3.3 Edit Setup or Service menu	38
2.3.4 Add filtering functionality to menus	40
2.4 Production Information window	41
2.5 Part handler	43
2.5.1 Preview window	45
2.5.2 Create a new part	47
2.5.3 Edit part	53
2.5.4 Test Part	55
2.6 Custom application window	56
2.7 State icons	57
3 Configuring Production Manager	59
3.1 Production Manager Task configuration	59
3.2 Production Manager MultiMove Support	62
3.3 User Authorization System settings	63
4 Production Manager PLC support	65
4.1 How to run Production Manager from PLC	65
4.2 How to run Production Manager from PLC via RAPID	67
5 RAPID references	71
5.1 Instructions	71
5.1.1 ExecEngine - Start execution engine	71
5.1.2 PMgrGetNextPart - Get active part for station in task	72
5.1.3 PMgrSetNextPart - Set active part for station in task	74
5.1.4 PMgrRunMenu - Run menu in task	75
5.2 Functions	76
5.2.1 PMgrAtSafe - Check if task is at safe state	76
5.2.2 PMgrAtService - Check if task is at service state	77
5.2.3 PMgrAtState - Check the state of a task	78
5.2.4 PMgrAtStation - Get the current station for a task	79
5.2.5 PMgrNextStation - Get the next station for a task	80
5.2.6 PMgrTaskNumber - Get the task number	81
5.2.7 PMgrTaskName - Get the task name	82
5.3 Public constants	83
6 Seam Displacement options	85
6.1 General	85

Table of contents

6.2	Starting Seam Displacement option	86
6.3	Functions available in Seam Displacement	88
Index		91

Overview of this manual

About this manual

This manual explains the basics of when and how to use the following *Production Manager* options:

- *Production Manager Execution Engine*
- *Production Manager Events*
- *Production Manager User Interface*
- *Production Manager Menudata and Partdata*
- *Production Manager Configuration*
- *Production Manager MultiMove Support*
- *Production Monitoring*
- *Seam Displacement*

Usage

This manual can be used either as a reference to find out if an option is the right choice for solving a problem, or as a description of how to use an option.

Who should read this manual?

This manual is intended for:

- installation personnel
- robot programmers

Prerequisites

The reader should be familiar with:

- industrial robots and their terminology
- RAPID programming
- system parameters and how to configure them

References

References	Document ID
<i>Operating manual - General safety information</i> ⁱ	3HAC031045-001
<i>Introduction and Safety - Arc Welding Products</i>	<i>Introduction and Safety - Arc Welding Products</i>
<i>Operating manual - IRC5 with FlexPendant</i>	3HAC050941-001
<i>Operating manual - RobotStudio</i>	3HAC032104-001
<i>Operating manual - Getting started, IRC5 and RobotStudio</i>	3HAC027097-001
<i>Technical reference manual - RAPID Instructions, Functions and Data types</i>	3HAC050917-001
<i>Technical reference manual - RAPID overview</i>	3HAC050947-001
<i>Technical reference manual - System parameters</i>	3HAC050948-001
<i>Application manual - Torch services</i>	3HAC050981-001

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Overview of this manual

Continued

References	Document ID
<i>Application manual - Production Screen</i>	3HAC050964-001

- i This manual contains all safety instructions from the product manuals for the manipulators and the controllers.

Revisions

Revision	Description
-	Published with RobotWare 6.0.

Product documentation, IRC5

Categories for user documentation from ABB Robotics

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

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

Product manuals

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

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

Technical reference manuals

The technical reference manuals describe reference information for robotics products.

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

Continues on next page

Application manuals

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

An application manual generally contains information about:

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

Operating manuals

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

The group of manuals includes (among others):

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

Safety

Safety of personnel

When working inside the robot controller it is necessary to be aware of voltage-related risks.

A danger of high voltage is associated with the following parts:

- Devices inside the controller, for example I/O devices, can be supplied with power from an external source.
- The mains supply/mains switch.
- The power unit.
- The power supply unit for the computer system (230 VAC).
- The rectifier unit (400-480 VAC and 700 VDC). Capacitors!
- The drive unit (700 VDC).
- The service outlets (115/230 VAC).
- The power supply unit for tools, or special power supply units for the machining process.
- The external voltage connected to the controller remains live even when the robot is disconnected from the mains.
- Additional connections.

Therefore, it is important that all safety regulations are followed when doing mechanical and electrical installation work.

Safety regulations

Before beginning mechanical and/or electrical installations, ensure you are familiar with the safety regulations described in *Operating manual - General safety information*¹.

¹ This manual contains all safety instructions from the product manuals for the manipulators and the controllers.

Safety signals in the manual

Introduction to safety signals

This section specifies all dangers that can arise when doing the work described in this manual. Each danger consists of:

- A caption specifying the danger level (DANGER, WARNING, or CAUTION) and the type of danger.
- A brief description of what will happen if the operator/service personnel do not eliminate the danger.
- Instruction about how to eliminate danger to simplify doing the work.

Danger levels

The table below defines the captions specifying the danger levels used throughout this manual.

Symbol	Designation	Significance
 xx0200000022	DANGER	Warns that an accident <i>will</i> occur if the instructions are not followed, resulting in a serious or fatal injury and/or severe damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, and so on.
 xx0100000002	WARNING	Warns that an accident <i>may</i> occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, etc.
 xx0200000024	ELECTRICAL SHOCK	Warns for electrical hazards which could result in severe personal injury or death.
 xx0100000003	CAUTION	Warns that an accident may occur if the instructions are not followed that can result in injury and/or damage to the product. It also applies to warnings of risks that include burns, eye injury, skin injury, hearing damage, crushing or slipping, tripping, impact, fall from height, etc. Furthermore, it applies to warnings that include function requirements when fitting and removing equipment where there is a risk of damaging the product or causing a breakdown.
 xx0200000023	ELECTROSTATIC DISCHARGE (ESD)	Warns for electrostatic hazards which could result in severe damage to the product.

Continues on next page

Symbol	Designation	Significance
 xx0100000004	NOTE	Describes important facts and conditions.
 xx0100000098	TIP	Describes where to find additional information or how to do an operation in an easier way.

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1 Production Manager

1.1 Introduction

What is Production Manager?

- Production Manager is process independent middle-layer software running on the IRC5 controller. It is general and it can be used in non-welding applications.
 - Production Manager works between the operating system of the robot (RobotWare and related options) and the end user application.
 - Production Manager has a highly modular structure that allows customers to plug in applications.
-

API

Production Manager provides an API for specific applications such as arc welding. Applications running on top of Production Manager can use the production loop together with events and built-in cell logic to facilitate the cell management.

What does Production Manager offer?

Production Manager offers:

- Graphical user interface for running setup and service routines, managing part handling, displaying production information, etc.
- Custom setup and service routines
- Event handling in the production loop
- Station handling
- Rules and definitions on how to develop applications on top of the API
- Part handling

1 Production Manager

1.2 Production Manager Execution Engine

General

The Production Manager Execution Engine provides an interface that allows external devices to control calls to service and setup routines and calls to user-created part routines.

The Production Manager Execution Engine handles all MultiMove considerations for independent and simultaneous calls (one EE per task).

The Execution Engine will have hooks for user-defined code at critical points in the cycle, such as:

- Before part execution
- After part execution
- Before procedure execution



Tip

See [Production Manager events on page 18](#).

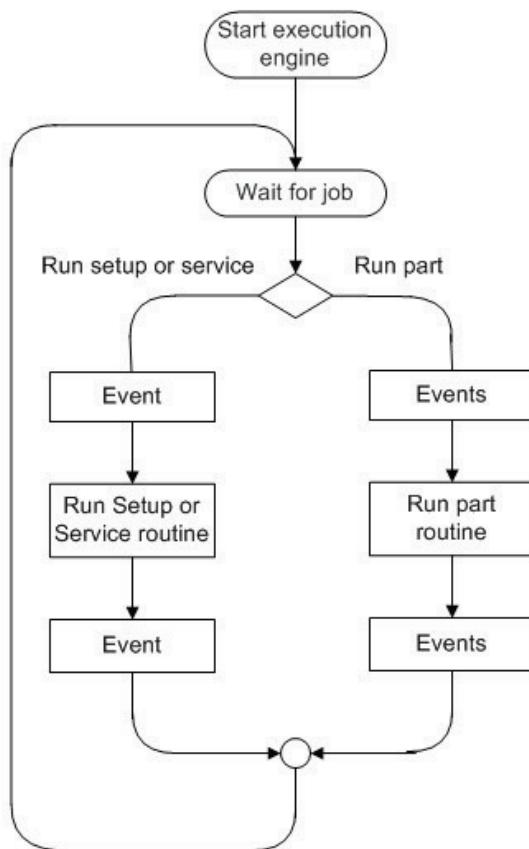
ExecEngine

`ExecEngine` is the *Production Manager Execution Engine* instruction. The instruction takes no arguments and has no-step-in behavior. The user calls this routine from his main routine in each motion task. Typically the user-defined main routine should have a procedure call to `ExecEngine` and nothing else.

The `ExecEngine` routine contains a simple while-loop that monitors the Execution Engine I/O interface for orders specified by the Production Manager GUI or other

Continues on next page

external device such as PLC. The engine is capable of running part routines, setup routines, and service routines.



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1 Production Manager

1.3 Production Manager events

1.3 Production Manager events

General

Production Manager events provide a mechanism for the user to run custom routines at specific points in the ExecEngine cycle.

The ExecEngine uses event hooks to modularize the application built on Production Manager. There are two ways to hook on to these, a simple and advanced.

Simple Production Manager events

The simple way is to create two procedures named BeforePart and AfterPart in the tasks that have Production Manager loaded. The procedure BeforePart is called just before the part is executed. The procedure AfterPart is executed just after the part has been executed.

Advanced Production Manager events

To use the advanced event hooks, data of the type ee_event (*execution engine event*) needs to be declared.

```
<dataobject of ee_event>
  <Action of ee_eventnum>
  <ProcName of string>
  <taskList of string>
  <SortOrder of byte>
  <validStation of byte>
```

List of ee_event

ee_event	Description
ee_eventnum action	The type of event to subscribe to. See list of available events in List of available events on page 18 .
string procName	The actual procedure that will be called when running this event.
string taskList	The task names separated by ' : ' for the tasks where this routine will be executed. If more than one task is entered it means that these tasks will be executed simultaneous. Example: T_ROB1:T_ROB2.
byte sortOrder	Value from 0-255 defining in which order this event will be executed with respect to other events of the same action type.
byte validStation	Value from 0-255 defining for which station this event is valid.

List of available events

Event	Value	Description
EE_START	1	EE_START is called when ExecEngine is called. NOTE! This event does not have a valid station.
EE_CYCLE_START	2	EE_CYCLE_START is called when Production Manager receives an order to execute a part. NOTE! The validStation element works on AtStation, not NextStation.

Continues on next page

Event	Value	Description
EE_PROC_START	3	EE_PROC_START is called before a setup or service routine is executed. NOTE! The validStation element works on AtStation, not NextStation.
EE_PRE_PROD	4	Called before part is executed
EE_CLOSE_JIG	5	Called before part is executed
EE_INDEX	6	Called before part is executed
EE_PRE_PART	7	Called before part is executed
(part execution)		
EE_POST_PART	8	Called after part is executed
EE_OPEN_JIG	9	Called after part is executed
EE_SERVICE	10	Called after part is executed
EE_POST_PROD	11	Called after part is executed
EE_ABORT	12	This event is launched if the production is aborted due to an error. NOTE! This event does not have a valid station.
EE_WAIT_ORDER	13	EE_WAIT_ORDER is called repeatedly when Production Manager is waiting for an order. NOTE! This event does not have a valid station.
EE_POST_PROC	14	EE_POST_PROC is called after a setup or service routine is executed. NOTE! The validStation element works on AtStation, not NextStation.

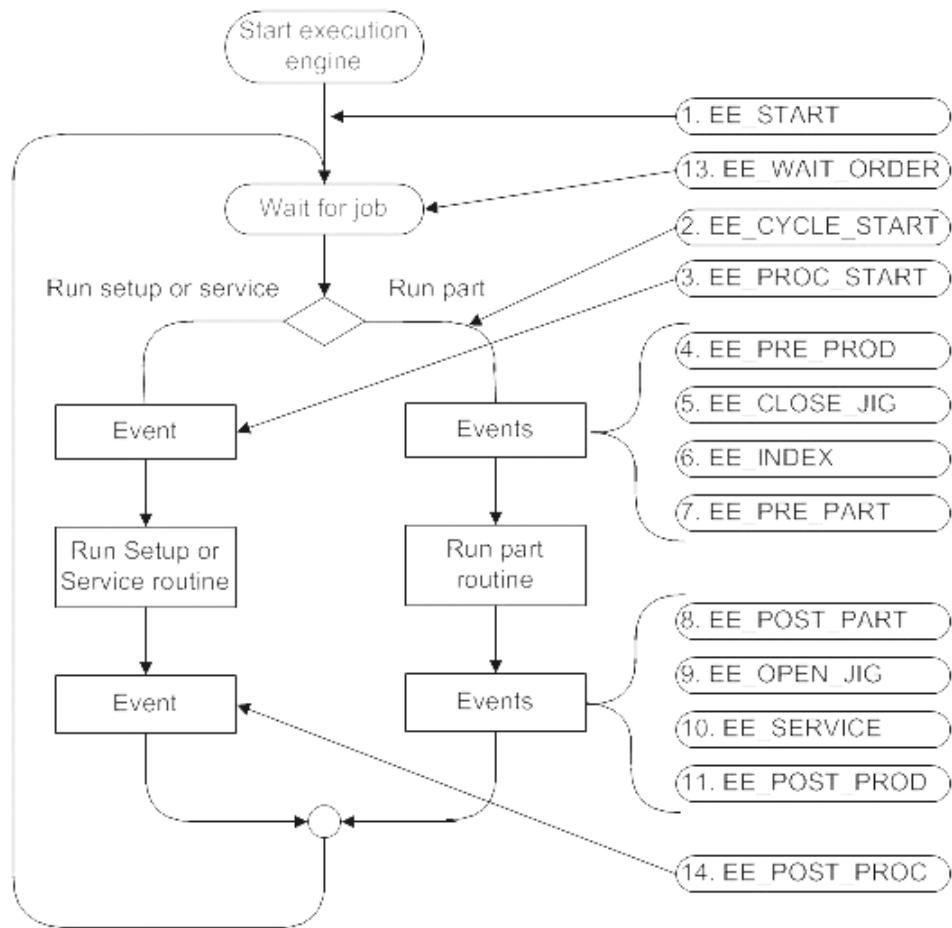
Continues on next page

1 Production Manager

1.3 Production Manager events

Continued

Event order



1.4 Production Manager Menudata and Partdata

Menudata

Menudata	Description
string description	A short description of the menu item.
string image	The name of the icon to use next to the menu item.
string procName	The actual procedure that will be called when running this setup or service routine. The <code>procName</code> can also point to a procedure in a module that resides on the controller's file system, see Dynamic parts and menus on page 22 .
byte validStation	Value from 0-255 defining to which station this menu item will be visible.
string taskList	The task names separated by ':' for the tasks where this routine will be executed. If more than one task is entered it means that these tasks will be executed simultaneous. Example: T_ROB1:T_ROB2.
byte validPosition	Value from 0-255 defining at which robot position this menu item will be visible. Three predefined positions are available: <ul style="list-style-type: none"> • GAP_SHOW_SAFE • GAP_SHOW_SERVICE • GAP_SHOW_ALWAYS
bool allowAfterError	True if the menu item should be shown after an error.
num type	1 = Setup menu, 2 = Service menu.
byte minUserLevel	Value from 0-255 defining the minimum user level required to run this menu, if using UAS. See User Authorization System settings on page 63 for more information.
bool blockOtherTasks	If this is set to True all other tasks will be blocked during the execution of this routine.
num plcCode	Unique identifier index for PLC interfaces. Note: Used only when an external system is controlling the robot system.

Partdata

Partdata	Description
string pathProcName	The procedure that will be called when running this part. The <code>pathProcName</code> can also point to a procedure in a module that resides on the controller's file system, see Dynamic parts and menus on page 22 .
string description	A short description of the part.
string taskList	The task names separated by ':' for the tasks where this part will be executed. If more than one task is entered it means that these tasks will be executed simultaneous. Example: T_ROB1:T_ROB2.
byte validStation	Value from 0-255 defining for which station this part will be valid.

Continues on next page

1 Production Manager

1.4 Production Manager Menudata and Partdata

Continued

Partdata	Description
num plcCode	Unique identifier index for PLC interfaces. Note: Used only when an external system is controlling the robot system
string image	The name of the picture to use in the preview frame when browsing parts in the Part handler.
string advPart	This represents a reference to an advanced part. See Example 1, advanced part on page 22 .

Example 1, advanced part

The example below shows how the advanced part field in the partdata can be used.

The advPart field works as a reference to a custom data object. The referenced data object often represents application specific data.

This is the partdata instance with the reference to an advanced part called pdvProgStn1.

```
TASK PERS partdata pdProgStn1:= [ "ProgStn1", "Program station 1",  
"T_ROB1:T_ROB2:T_ROB3:T_POS1", 1, "MyPart.gif", "pdvProgStn1" ];
```

The partadv is a custom data type in RAPID. In this example the application takes advantage of process angles, load angles and load data.

```
RECORD partadv  
    extjoint procAngle;  
    extjoint loadAngle;  
    loaddata Load;  
ENDRECORD
```

Below is the declaration of the pdvProgStn1 data instance.

```
TASK PERS partadv pdvProgStn1:=  
[[0,0,0,0,0,0],[0,0,0,0,0,0],[0,[0,0,0],[0,0,0,0],0,0,0]];
```

The application running on top of Production Manager can process the partdata and take advantage of the advanced part data, for example, to move the external axis to a certain process and load angle before Production Manager is ordered to produce the part.

Dynamic parts and menus

A menu or a part can be loaded dynamically by using a file path in the menu's procName or the part's pathProcName field. This feature is useful for saving memory since the module will be loaded, executed and unloaded in runtime. All changes in the loaded module will be saved when it is unloaded. This dynamic feature works for both PLC orders and normal operator initiated actions.

Continues on next page

The path to the module and the procedure are delimited with a '@'. Below is an example of a dynamic part:

```
TASK PERS partdata pdDynProgStn1 :=
    [ "HOME:/DynPart/DynPartPrcR1S1.mod@PartStn1", "Dynamic part
     sta- tion 1","","1,0","","" ];

%%%  
VERSION: 1  
LANGUAGE: ENGLISH  
%%%  
MODULE DynPartPrcR1S1
    PROC PartStn1()
        <SMT>
    ENDPROC
ENDMODULE
```

A dynamic menu could look like this:

```
CONST menudata mdDynMenu := [ "Run dynamic
    menu", "", "HOME:/DynPart/DynMenuPrc.mod@DynMenuProc", 255, "",
    GAP_SHOW_ALWAYS, TRUE, GAP_SERVICE_TYPE, 0, FALSE, 0 ];

%%%  
VERSION: 1  
LANGUAGE: ENGLISH  
%%%  
MODULE DynMenuPrc
    PROC DynMenuProc()
        <SMT>
    ENDPROC
ENDMODULE
```

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2 Production Manager user interface

2.1 Overview

The Production Manager user interface requires some UAS grants to operate properly. See [User Authorization System settings on page 63](#) for detailed information.

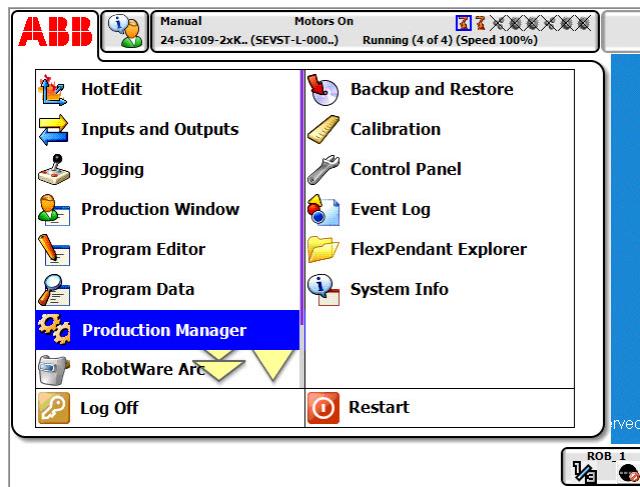
Some of the available features, like menus and parts, utilize an icon or image attribute to increase the usability. Graphical resources can be added to the FlexPendant by following the steps below.

Image deployment steps:

- 1 Open a FTP client session with the controller.
- 2 Navigate to the system you want to update images.
- 3 Copy the graphical resources into the system directory.

Accessing different functions

- 1 Go to the ABB menu and launch the Production Manager.



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2 Production Manager user interface

2.1 Overview

Continued

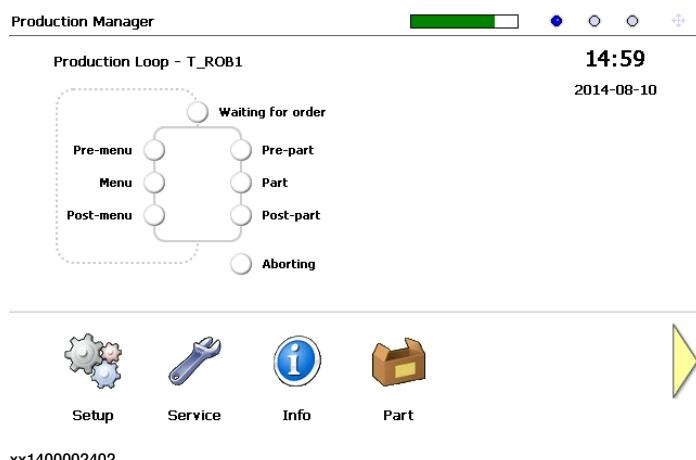
Starting view:



In the Production Manager main menu all production related functions can be accessed.

Production Screen

Production Manager can also be run within the Production Screen framework. The GUI functionality is added automatically to the Production Screen desktop, as apps, when both options are installed. The desktop can then be extended with custom apps and widgets using the flexibility of the customizable interface in Production Screen.



Note

Production Screen requires a separate option.

For more information, see *Application manual - Production Screen*.

Continues on next page

MultiMove system

In a MultiMove system the different tasks and robot are displayed as tabs at the top of the page.

In this example the cell is loaded with three robots and a positioner.

- 1 In the Production Manager main menu:

To explore the functions for the positioner, simply select the IRBP 1 tab.



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2 Production Manager user interface

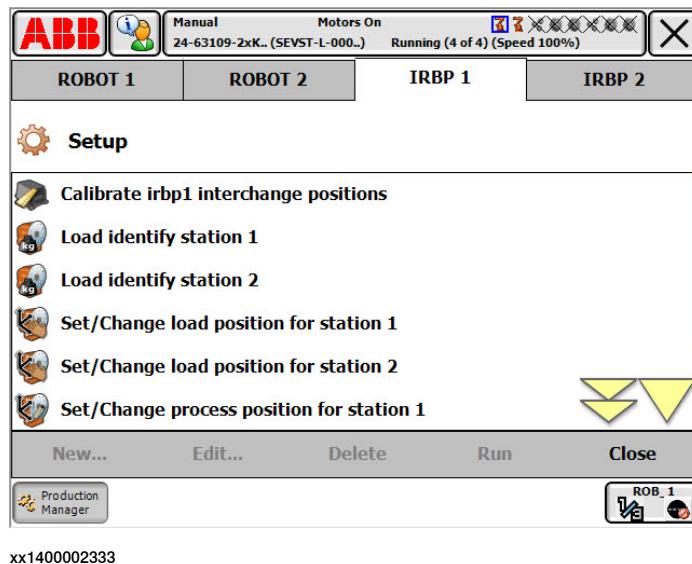
2.2 Setup menu

2.2 Setup menu

Overview

The **Setup** menu contains functions for setting up the robot, positioner or cell. The following figure shows the Setup procedures available for the positioner.

The functions available in **Setup** may be restricted by the User Authorization System, see [User Authorization System settings on page 63](#).



Add

It is possible to add custom setup procedures in the list. This is done by adding RAPID variables of type `menudata` to the appropriate task. All variables of type `menudata`, and declared with `menudata.type = GAP_SETUP_TYPE`, will automatically be added to the list in the **Setup** window. See [Production Manager Menudata and Partdata on page 21](#) for details about the `menudata` type.

It is also possible to add Setup menus from the user interface by tapping **New...** on the command bar. See [Create a new Setup or Service menu dialog on page 32](#).

Edit

To edit the selected menu item, tap **Edit...** on the command bar. See [Edit Setup or Service menu on page 38](#).

Delete

To delete the selected menu item, tap **Delete** on the command bar.

Launch

To launch a Setup procedure simply select the line and tap **Run** on the command bar. See [Edit Setup or Service menu on page 38](#).

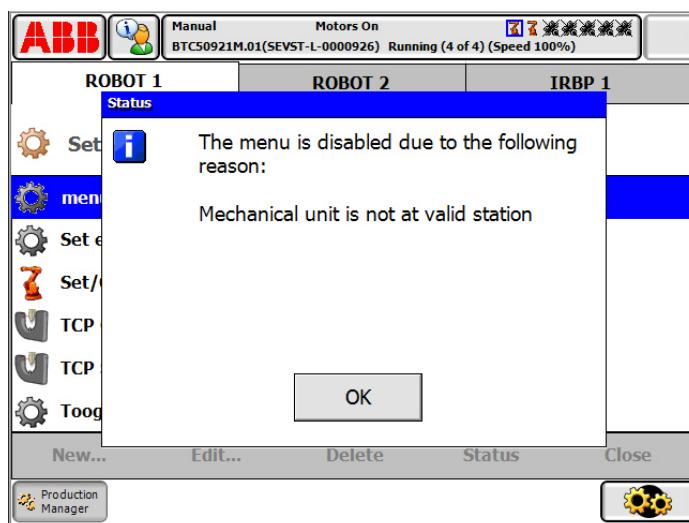
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Enable/disable

The setup procedures can be disabled depending of the state of the task. A Setup item is enabled if:

- the execution state must be in running mode.
 - the menudata fields validStation, validPosition, allowAfterError and minUserLevel must all be valid for an item to be enabled. The value of these fields depends on the state of the cell and the user's grant level.
- Producton Manager must also be in running and ready mode in order for the Setup menus to be enabled.

If a menu is disabled the command bar item **Run** will change to **Status**. If **Status** is tapped, a message box will appear explaining why the menu is disabled.



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2 Production Manager user interface

2.3.1 About the Service menu

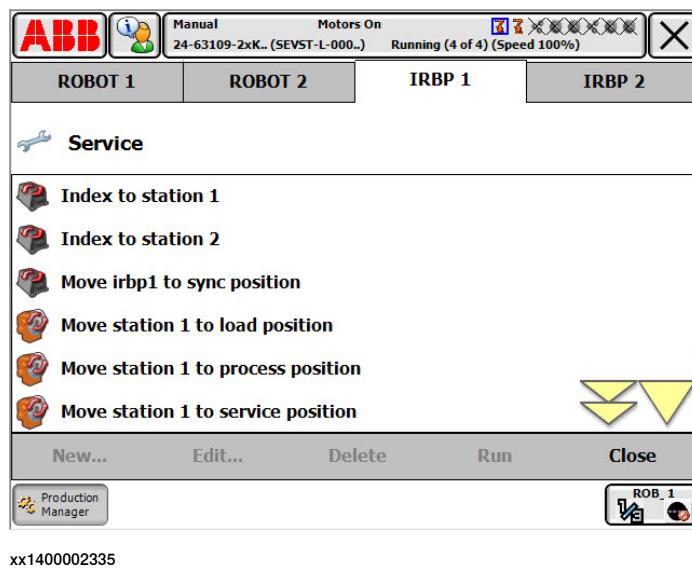
2.3 Service menu

2.3.1 About the Service menu

Overview

The Service menu contains functions for running service procedures for the robot, positioner or cell. The following figure shows the service procedures available for the positioner.

The functions available in Service may be restricted by the User Authorization System, see [User Authorization System settings on page 63](#).



Add

It is possible to add custom service procedures in the list. This is done by adding RAPID variables of type `menudata` to the appropriate task. All variables of type `menudata`, and declared with `menudata.type = GAP_SERVICE_TYPE`, will automatically be added to the list in the Setup window. See [Production Manager Menudata and Partdata on page 21](#) for details about the `menudata` type.

It is also possible to add Service menus from the user interface by tapping **New...** on the command bar. See [Create a new Setup or Service menu dialog on page 32](#).

Edit

To edit the selected menu item, tap **Edit...** on the command bar. See [Edit Setup or Service menu on page 38](#).

Delete

To delete the selected menu item, tap **Delete** on the command bar.

Launch

To launch a service procedure simply select the line and tap **Go** on the command bar.

Continues on next page

Enable/disable

The service procedures can be disabled depending of the state of the task. A service item is enabled if:

- Execution state must be in running mode.
- The `menudata` fields `validStation`, `validPosition`, `allowAfterError` and `minUserLevel` must all be valid for an item to be enabled. The value of these fields depends on the state of the cell and the user's grant level. Producton Manager must also be in running and ready mode in order for the Service menus to be enabled.
- If a menu is disabled the command bar item **Run** will change to **Status**. If **Status** is tapped, a message box will appear explaining why the menu is disabled.

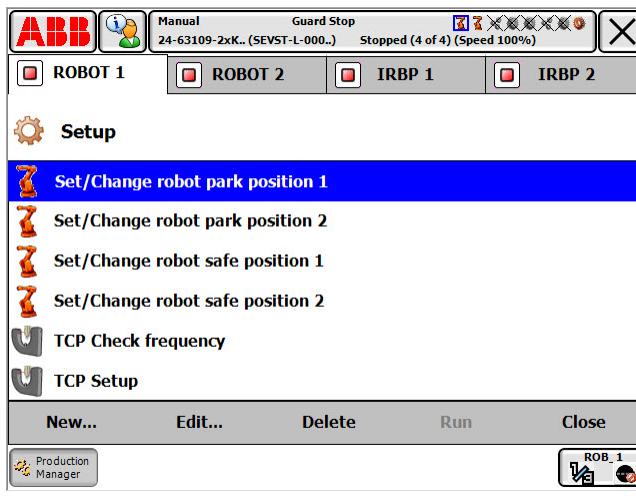
2 Production Manager user interface

2.3.2 Create a new Setup or Service menu dialog

2.3.2 Create a new Setup or Service menu dialog

Procedure

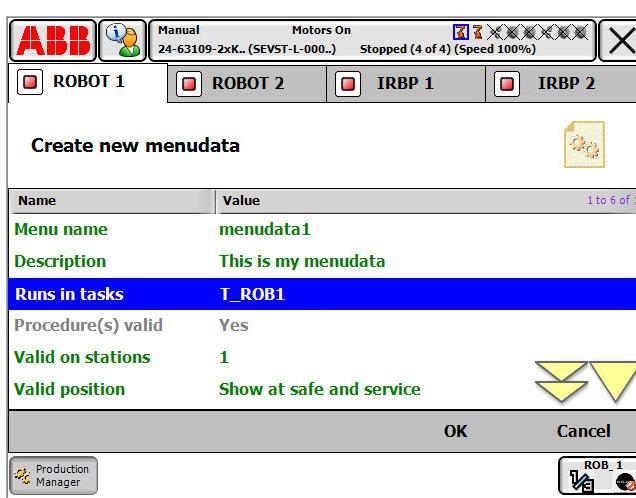
- 1 In the Production Manager main menu select **Setup** or **Service** depending on which type of menudata you would like to create.
- 2 Tap **New** on the command bar.



- 3 The **Create new menudata** dialog has a number of fields to enter, see [New menudata dialog on page 33](#). The user interface will help the user to create a new menudata instance together with the actual procedure to be called when the menu is executed.

The menudata instance will be declared as `TASK PERS`. The procedure will be an empty `PROC` ready to be added with instructions.

Some of the fields in the dialog are loaded with default values.



Continues on next page

New menudata dialog

Default value	Description
Procedure name	This is the procedure that will be called when menu is executed. A default name is suggested when creating new menudata. Select the field to change the suggested name by typing a new name in the alpha pad.
Description	A custom string that describes the Setup or Service menu. This is the name that will be displayed in the Setup or Service window list.
Run in tasks	These are the tasks this setup or service procedure should be declared in. Select the line and check the boxes in the window that appears on the right side. If more than one task is simultaneously selected it means that these tasks will be executed simultaneous.
Procedure valid	This field cannot be edited. It indicates if the procedure name and menudata instance name is valid in all tasks in the task list.
Valid on stations	Select the stations this setup or service procedure will be valid on.
Valid position	Select the position this setup or service procedure will be valid for. Three predefined positions are available.
Block other tasks	If this is set to True all other tasks will be blocked during the execution of this routine.
PLC code	Unique identifier index for PLC interfaces.
User Level	Value from 0-255 defining the minimum user level required to run this menu, if using UAS. See User Authorization System settings on page 63 for more information.
Menudata instance	The name of the menudata instance in RAPID.
Declared in module	Select the module where the data and the procedure will be declared. It is possible to create a new module for the menu. If a task list is used, the module will be created in all tasks in the task list if it does not already exist, and the menudata and procedure will be placed in this module. Note: Only normal program modules will be visible in the list.

Create a new dynamic Setup or Service menu dialog

- 1 In the Production Manager main menu select **Setup or Service** depending on which type of menudata you would like to create.

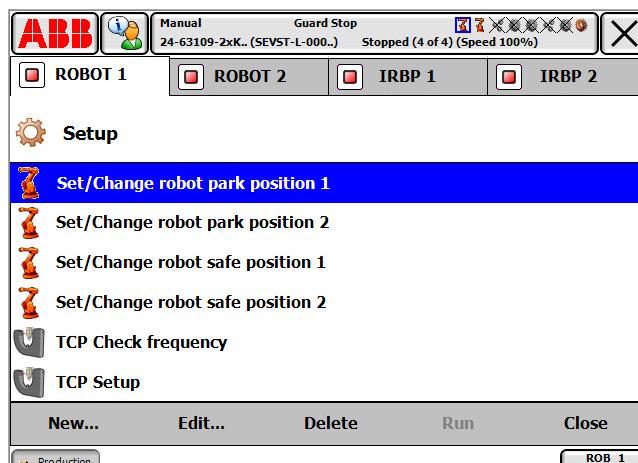
Continues on next page

2 Production Manager user interface

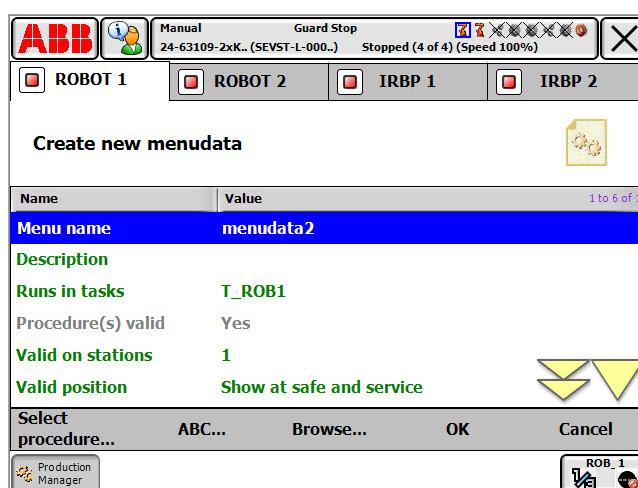
2.3.2 Create a new Setup or Service menu dialog

Continued

2 Tap New on the command bar.



3 Select Menu name in list and tap ABC....



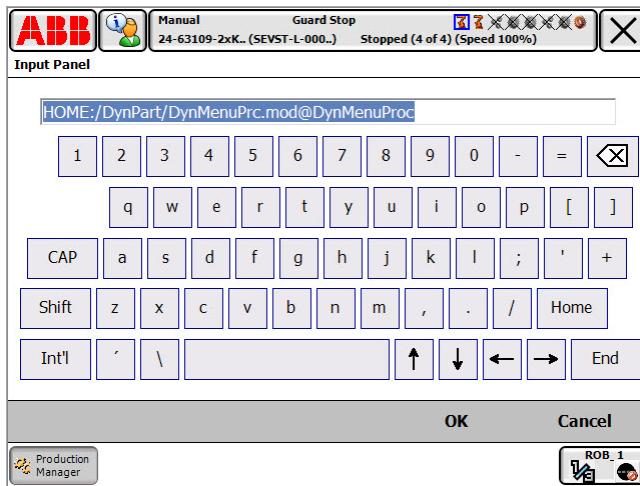
Continues on next page

2 Production Manager user interface

2.3.2 Create a new Setup or Service menu dialog

Continued

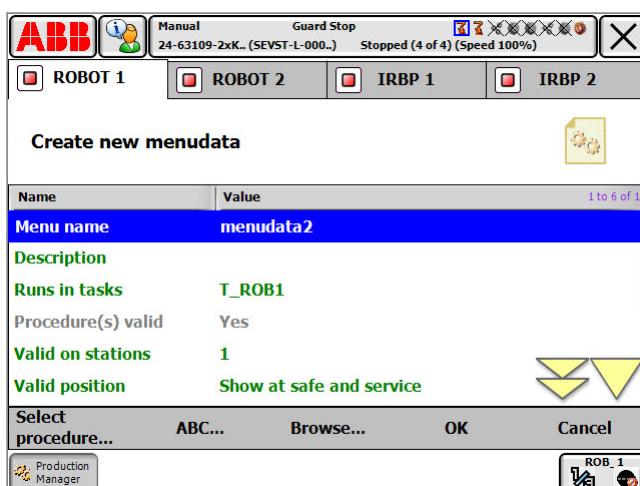
- 4 Enter the path to the module and procedure name separated with @. If module does not exist, it will be created.



xx1400002339

- 5 Or

Select Menu name in list and tap Browse....



xx1400002340

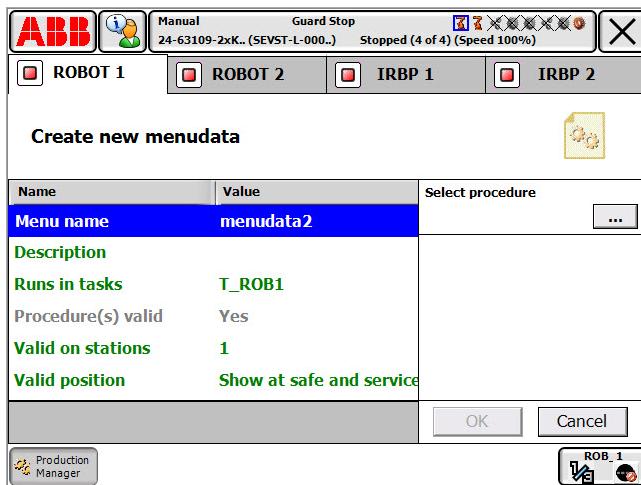
Continues on next page

2 Production Manager user interface

2.3.2 Create a new Setup or Service menu dialog

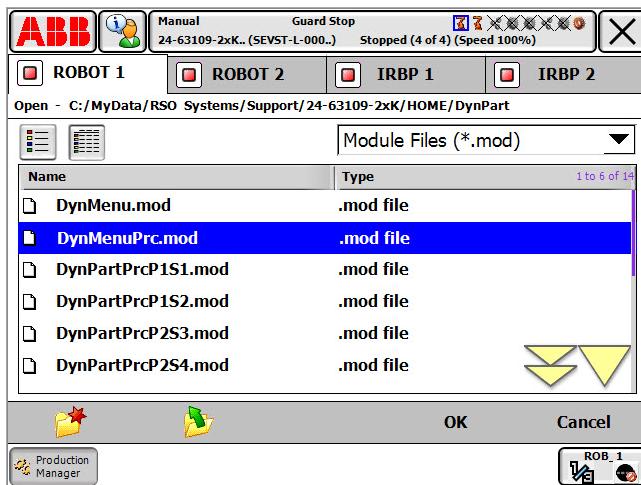
Continued

6 Tap button ... to browse for module.



xx1400002341

7 Select module.



xx1400002342

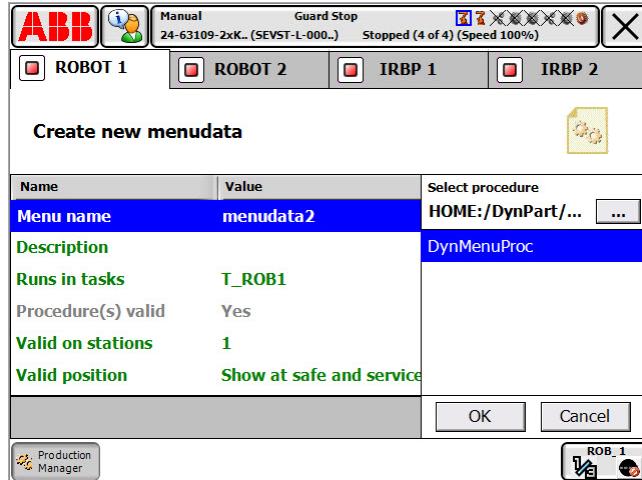
Continues on next page

2 Production Manager user interface

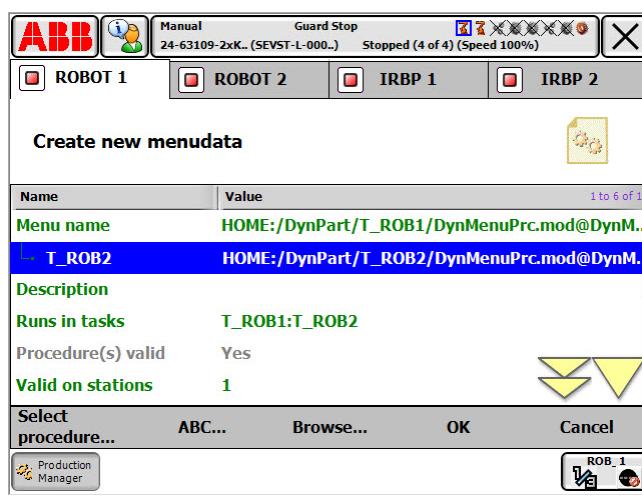
2.3.2 Create a new Setup or Service menu dialog

Continued

- 8 Select procedure and tap OK.



- 9 If menu is synchronized in several tasks, select task in list and repeat step 4 or step 5 to 8.



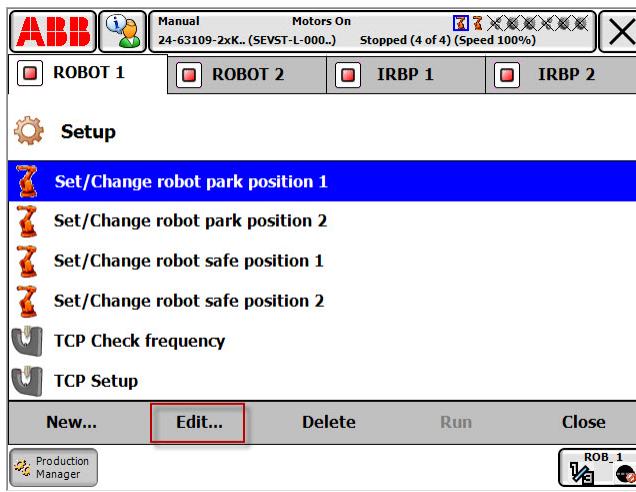
2 Production Manager user interface

2.3.3 Edit Setup or Service menu

2.3.3 Edit Setup or Service menu

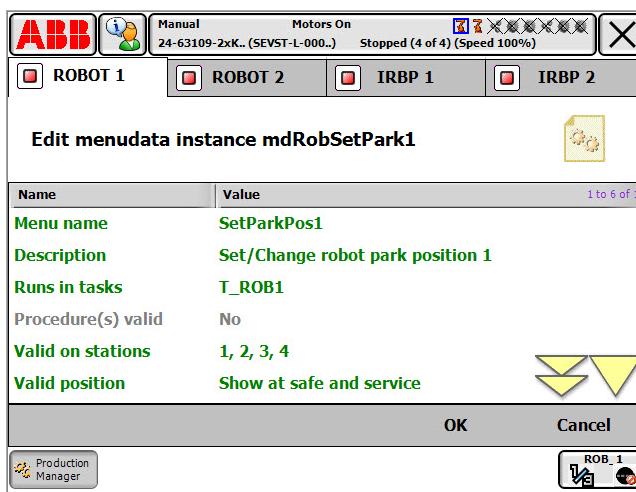
Procedure

- 1 In the Production Manager main menu select **Setup** or **Service** depending on which type of menudata you would like to edit.
- 2 Select the menu to edit.



- 3 Tap **Edit**.

The **Edit menudata** dialog has a number of fields to enter. See [Edit Setup or Service menu on page 38](#). The fields will be loaded with data for the current menudata.



Continues on next page

Edit Setup or Service menu dialog

Default value	Description
Procedure name	This is the procedure that will be called when menu is executed. It is not possible to specify a new menudata name, only select from an already existing menu. Use the dropdown list to search for procedures in another module..
Description	A custom string that describes the Setup or Service menu. This is the name that will be displayed in the Setup or Service window list.
Run in tasks	These are the tasks this setup or service procedure should be declared in.
Select the line and check the boxes in the window that appears on the right side.	If more than one task is simultaneously selected it means that these tasks will be executed simultaneous.
Procedure valid	This field cannot be edited. It indicates if the procedure name and menudata instance name is valid in all tasks in the task list.
Valid on stations	Select the stations this setup or service procedure will be valid on.
Valid position	Select the position this setup or service procedure will be valid for. Three predefined positions are available.
Block other tasks	If this is set to True all other tasks will be blocked during the execution of this routine.
PLC code	Unique identifier index for PLC interfaces.
User Level	Value from 0-255 defining the minimum user level required to run this menu, if using UAS. See User Authorization System settings on page 63 for more information.
Menudata instance	The name of the menudata instance in RAPID. This field is not possible to edit.
Declared in module	The module where the data and the procedure will be declared. Note: This field is not possible to edit.

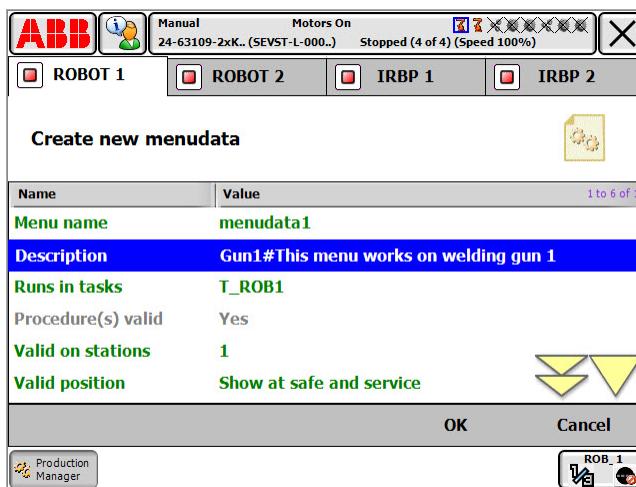
2 Production Manager user interface

2.3.4 Add filtering functionality to menus

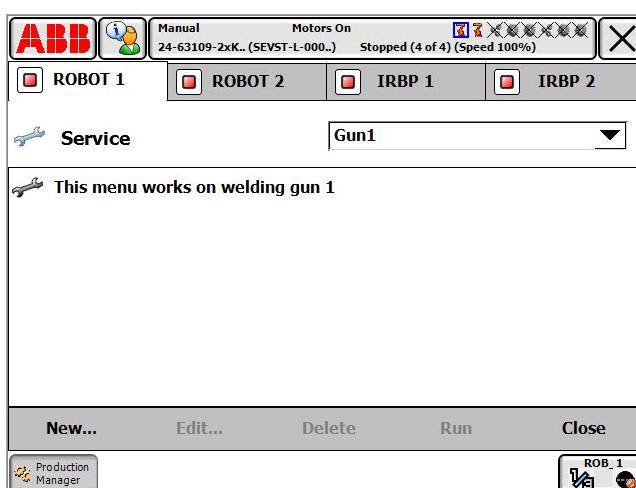
2.3.4 Add filtering functionality to menus

It is possible to tag Setup and Service menus with a category and apply a filter on these categories. This one-level filtering is achieved by introducing a special syntax in the description field of the menudata instance.

- 1 In the Production Manager main menu select **Setup** or **Service** depending on which type of menudata you would like to add or edit.
- 2 Select the menu to edit or tap **New...** to create a new menu.
- 3 In the **Description** field, add the following syntax to add a filter: "categoryname#" "description string".



- 4 Use the drop-down box to filter the menus based on the categories.

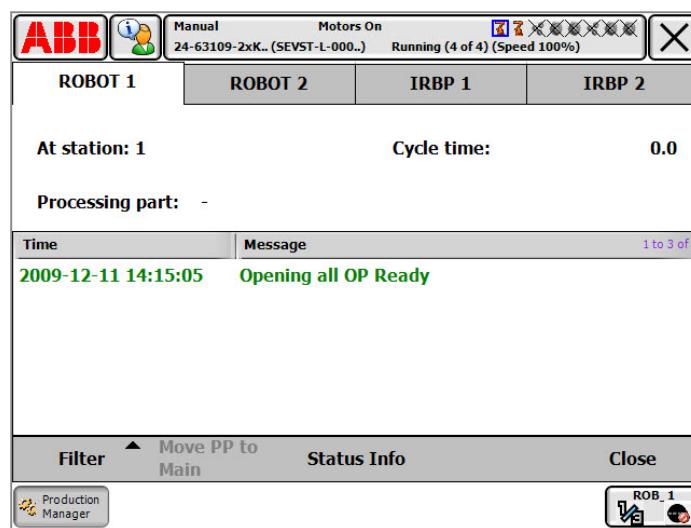


2.4 Production Information window

Overview

The production information window displays information during the production of parts.

- Current station and active part are displayed.
- Messages sent from the active task are displayed in the lower part of the window.
- By tapping **Move PP to Main**, it is possible to move the program pointer to main in all tasks. A log of the 50 latest messages is saved and can be viewed at any time.



xx1400002349



Note

It is possible to see messages sent from other tasks by checking the corresponding taskname in the **Filter** menu.

Status information

The status information window displays detailed information during the production cycle.

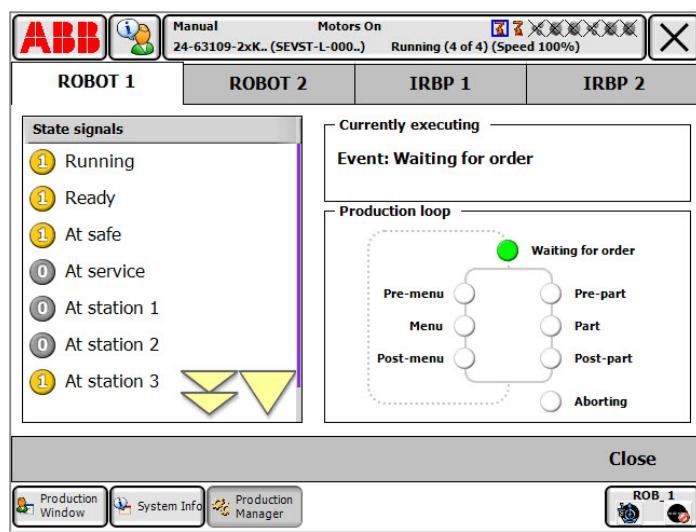
- State of configured signals.
- What event executing.
- What procedure executing. If no procedure given and part has `tasklist` defined, the task is waiting/syncronizing for other task in list.
- Graphical view of production cycle

Continues on next page

2 Production Manager user interface

2.4 Production Information window

Continued



2.5 Part handler

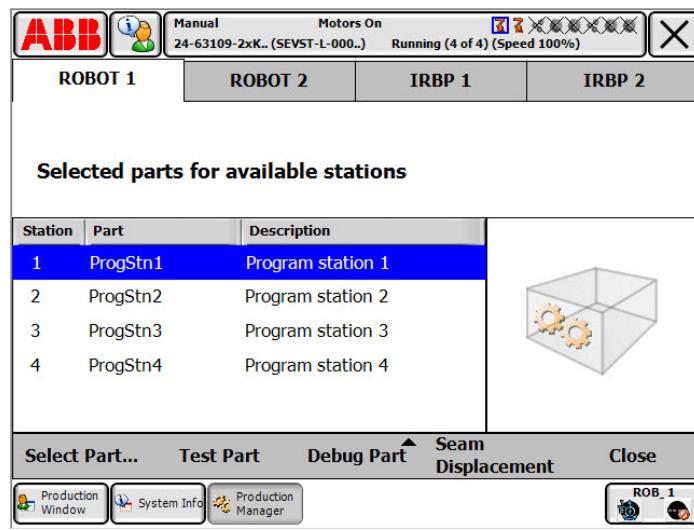
Overview

The functions available in Part Handler windows may be restricted by the User Authorization System, see [User Authorization System settings on page 63](#).

Select parts for available stations

The part handler window lets the user select parts for available stations

- 1 Select the station number.
- 2 Tap **Select Part** to select a new part to this station.



Debug part

When a part has been selected for a station it is possible to run the part in debug mode. When running a part in debug mode the execution will stop just before the user code is called at every place in the production loop. Typically the user presses **Step forward** when the execution has stopped. This feature can be useful if an error has occurred during the process and it is too expensive to throw away the object. The operator can fix the problem, step through the program until he reaches the error point and then continue production.

Two different debug types are available:

- **Debug all**

The execution will stop before all user code calls throughout the complete part cycle.

- **Debug to part**

The execution will stop before all user code calls for the events before the part (part procedure call included). When the part procedure has been invoked the user can press Start to continue normal execution without any stops at the events after the part.

Continues on next page

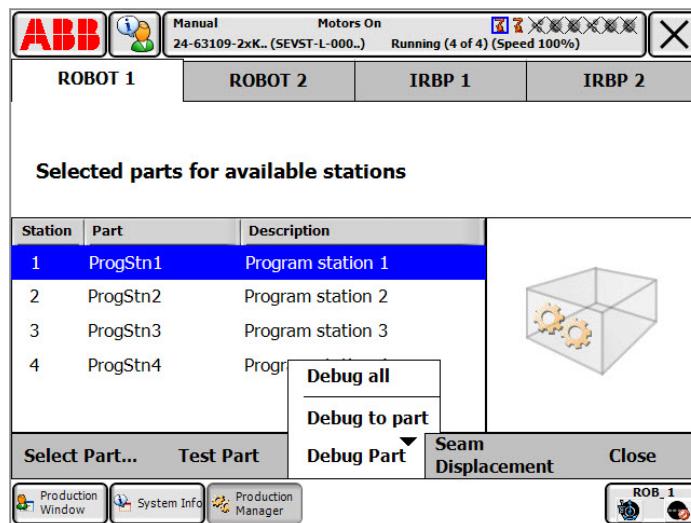
2 Production Manager user interface

2.5 Part handler

Continued

To start debugging:

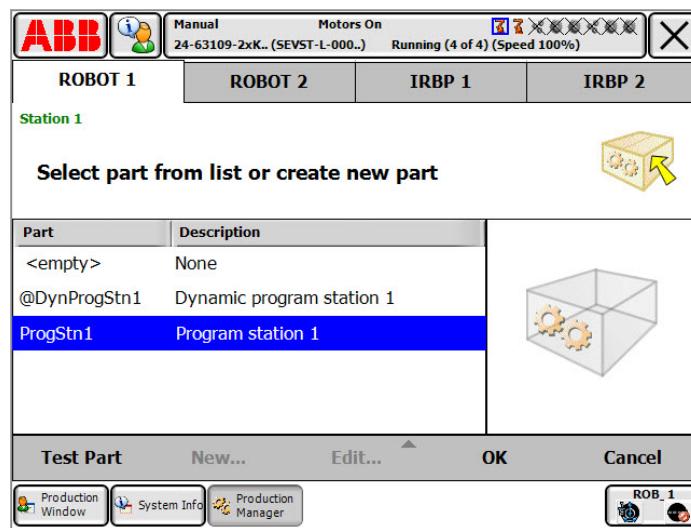
- 1 Select the station number.
- 2 Tap Debug Part on the command bar and make your selection to start debugging.



Continues on next page

2.5.1 Preview window

If the image field is entered in the `partdata`, the preview window on the right will display a picture of the part when a station is selected.



Deploying image resources to the FlexPendant:

- 1 Open a FTP client session with the controller.
- 2 Navigate to the system you want to update images.
- 3 Copy the graphical resources into the system directory.

Select

To select a part, select the line and tap OK.

If the part contains a task list, this part will be selected for this station in all tasks in the task list, if the `partdata` instance exists in the other tasks. If the part procedure name cannot be found in a task, a message box will be displayed where it is possible to select the part anyway and override the warning.



Note

Parts with tasklists are connected via the `partdata` instance name, not the part procedure name. I.e. it is possible to have different names on the part procedures between synchronized parts as long as the `partdata` instance name is the same. Only persistent `partdata` instances will be shown in the list of available parts.

Create

To create a new part, tap New... on the command bar. See [Create a new part on page 47](#).

Edit

To edit the selected part, tap Edit... on the command bar. See [Part Handler - Edit part on page 53](#).

Continues on next page

2 Production Manager user interface

2.5.1 Preview window

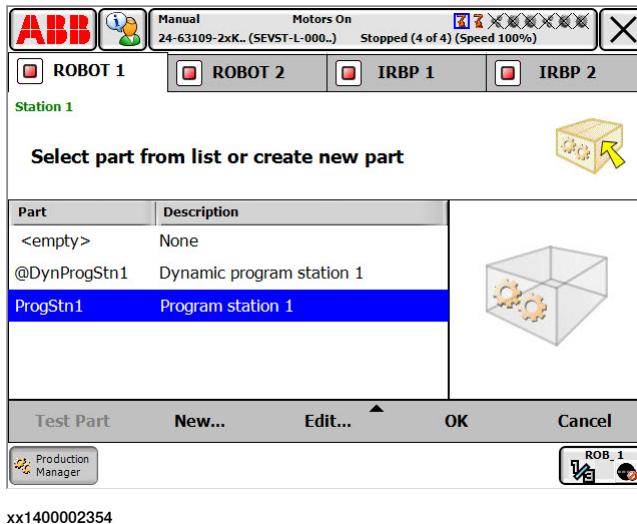
Continued

Delete

To delete the selected part, tap **Delete** on the command bar.

2.5.2 Create a new part

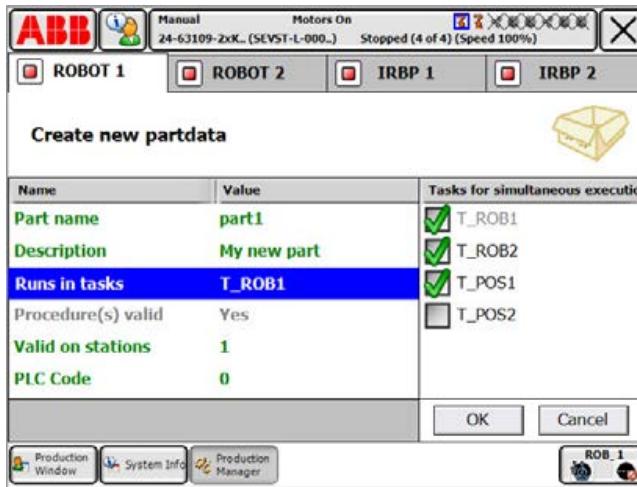
- 1 In the Production Manager main menu select Part handling.
- 2 Tap New.



- 3 The Create new partdata dialog has a number of fields to enter, see [New parts dialog on page 48](#). The user interface will help the user to create a new partdata instance together with the actual part procedure to be called during production.

The partdata instance will be declared as TASK PERS. The part procedure will be an empty PROC ready to be added with instructions.

Some of the fields in the dialog are loaded with default values.



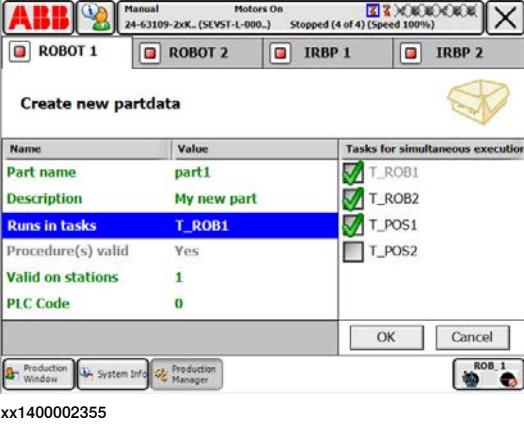
Continues on next page

2 Production Manager user interface

2.5.2 Create a new part

Continued

New parts dialog

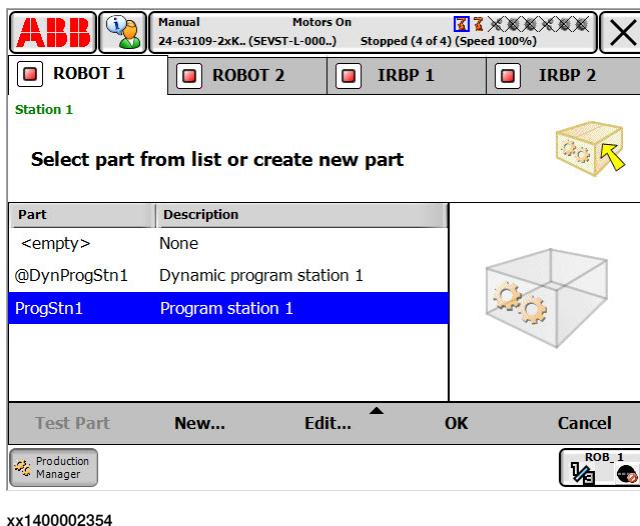
Default value	Description
Part name	<p>This is the procedure that will be called during production. It typically contains process instructions such as Arcl, SpotL. A default name is suggested when creating new partdata.</p> <p>Select the field to change the suggested name by typing a new name in the alpha pad.</p>
Description	A custom string that describes the part.
Run in tasks	<p>These are the tasks this part should be declared in.</p> <p>Select the line and check the boxes in the window that appears on the right side.</p> <p>If more than one task is selected it means that these tasks will be executed simultaneous.</p> 
Procedure valid	This field cannot be edited. It indicates if the Part name and partdata instance name are valid in all tasks in the task list.
Valid on stations	Select the stations this part will be valid on.
Partdata instance	The name of the partdata instance in RAPID.
Declared in module	<p>Select the module where the data and the part procedure will be declared. It is possible to create a new module for the part.</p> <p>If a task list is used, the module will be created in all tasks in the task list if it does not already exist, and the partdata and procedure will be placed in this module.</p> <p>Note: Only normal program modules will be visible in the list.</p>

Continues on next page

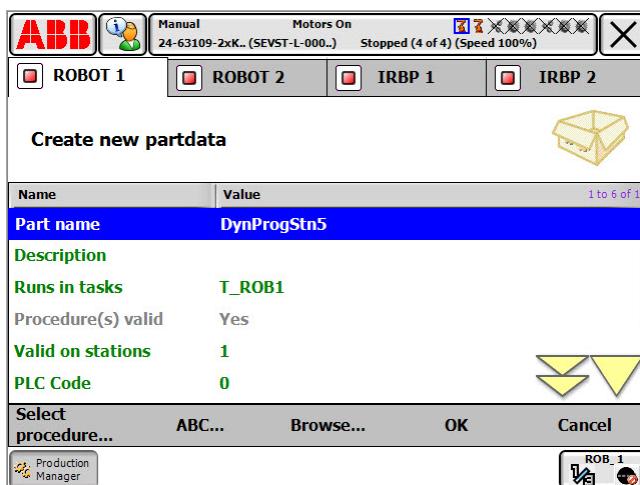
Default value	Description
Advanced part	Connect an advanced part to this part. See Example 1, advanced part on page 22.

Create a new dynamic part

- 1 In the Production Manager main menu select Part handling.
- 2 Tap New.



- 3 Select Part name in list and tap ABC....



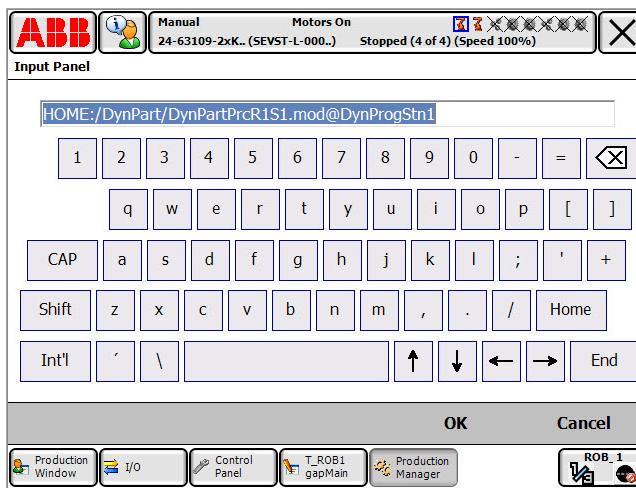
Continues on next page

2 Production Manager user interface

2.5.2 Create a new part

Continued

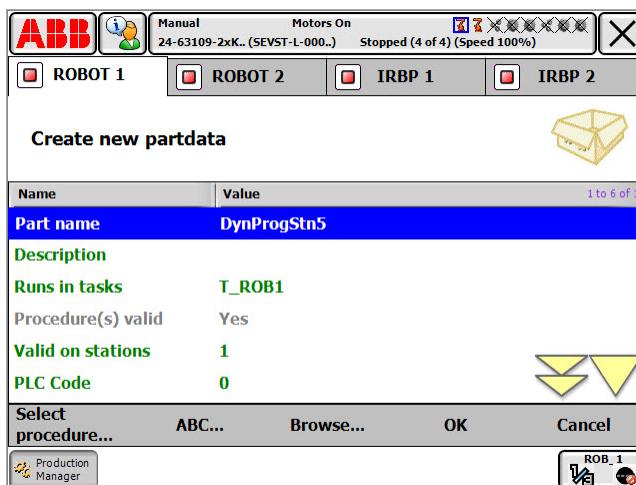
- 4 Enter the path to the module and procedure name separated with @. If module does not exist, it will be created.



xx1400002358

- 5 Or

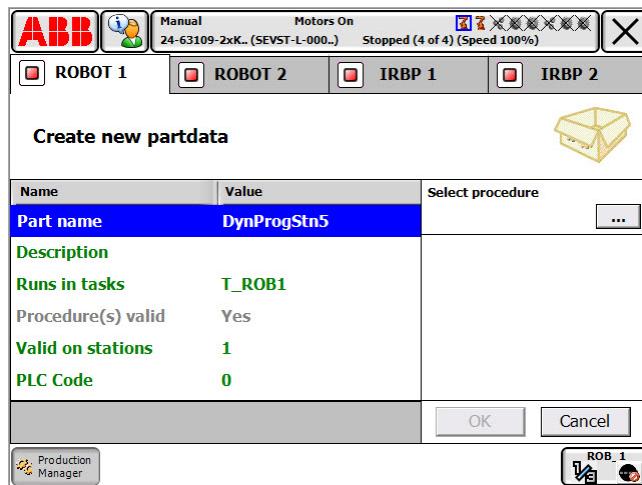
Select Part name in list and tap Browse....



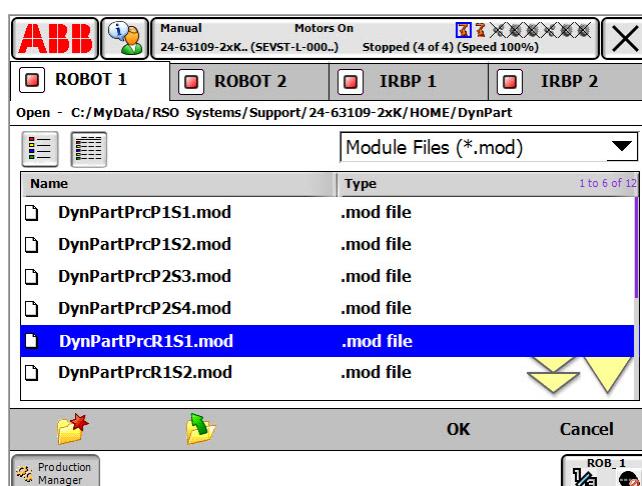
xx1400002359

Continues on next page

6 Tap the button ... to browse for module.



7 Select module.



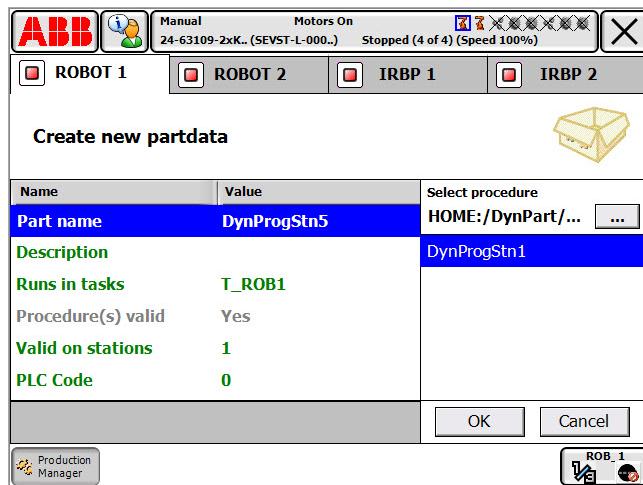
Continues on next page

2 Production Manager user interface

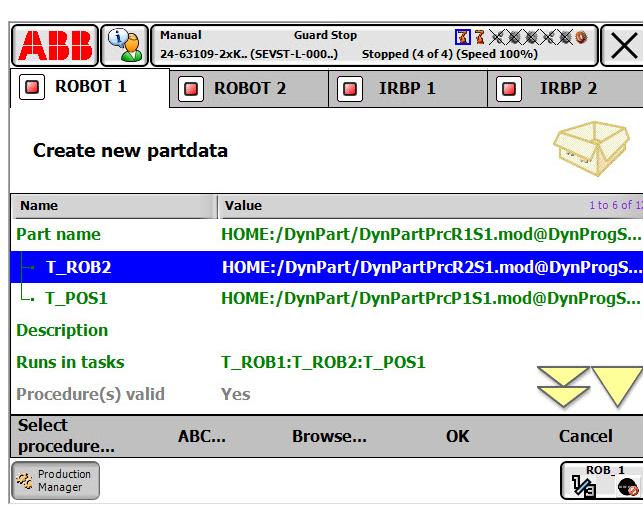
2.5.2 Create a new part

Continued

8 Select procedure and tap OK.

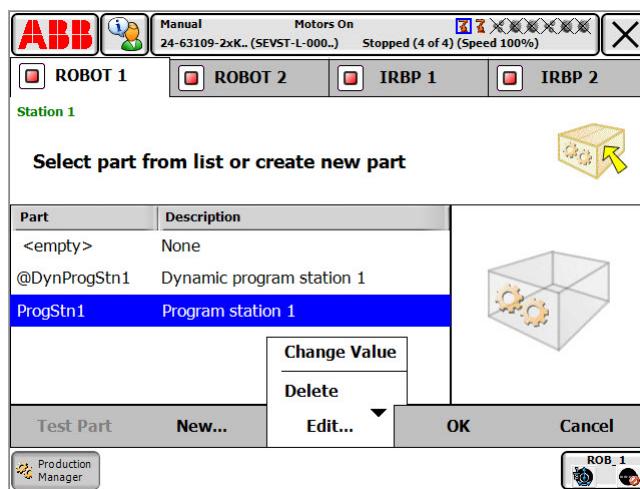


9 If part is synchronized in several tasks, select task in list and repeat step 4 or step 5 to 8.



2.5.3 Edit part

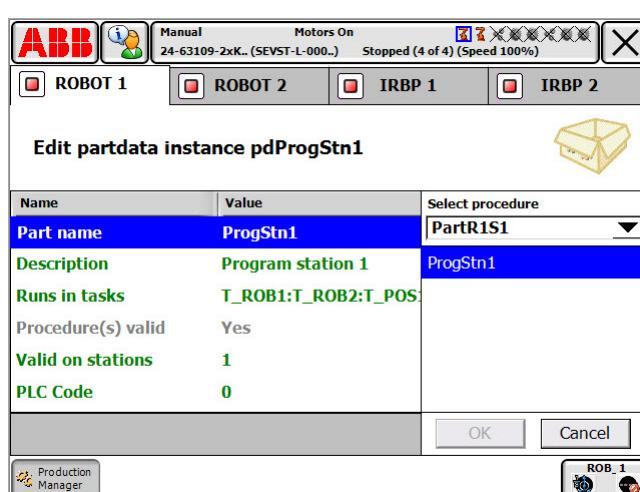
- 1 In the Production Manager main menu select Part handling.
- 2 Select a part to edit and tap OK.
- 3 Tap Edit and select Change Value.



- 4 The Edit part dialog has a number of fields to enter. See [Edit partdata dialog on page 54](#).

The user interface will help the user to create a new `partdata` instance together with the actual part procedure to be called during production.

Some of the fields in the dialog are loaded with default values and are not possible to edit.



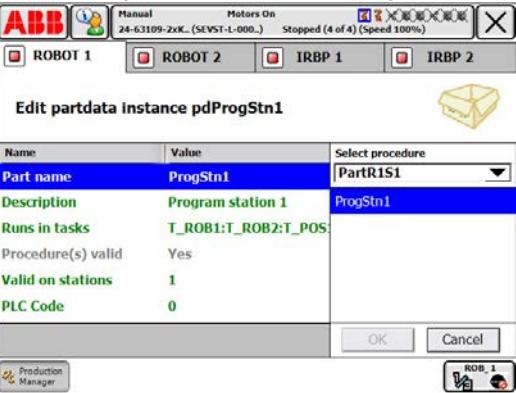
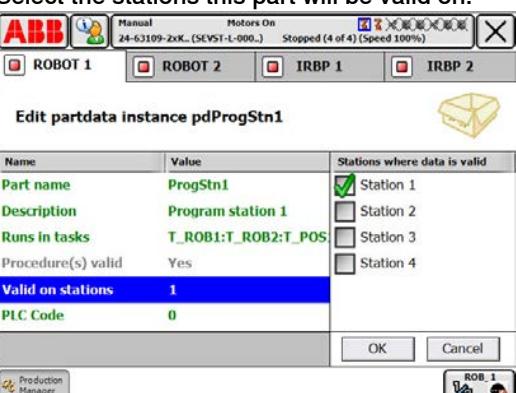
Continues on next page

2 Production Manager user interface

2.5.3 Edit part

Continued

Edit partdata dialog

Default value	Description
Part name	<p>This is the procedure that will be called during production. It is not possible to specify a new part name, only select from an already existing part.</p> <p>Use the dropdown list to search for procedures in another module.</p>  <p>xx1400002366</p>
Description	A custom string that describes the part.
Run in tasks	<p>These are the tasks this part should be declared in.</p> <p>Select the line and check the boxes in the window that appears on the right side.</p> <p>If more than one task is selected, it means that these tasks will be executed simultaneous.</p>
Procedure valid	This field cannot be edited. It indicates if the Part name and partdata instance name are valid in all tasks in the task list.
Valid on stations	<p>Select the stations this part will be valid on.</p>  <p>xx1400002356</p>
Partdata instance	The name of the partdata instance in RAPID. This field is not possible to edit.
Declared in module	The module where the data and the part procedure is declared. This field is not possible to edit.
Advanced part	Connect an advanced part to this part. See Example 1, advanced part on page 22 .

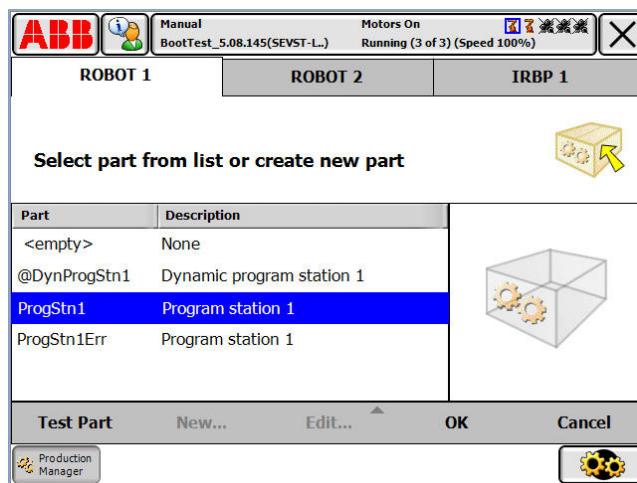
2.5.4 Test Part

The part testing functionality provides a way to test your parts without having to run the full production environment.

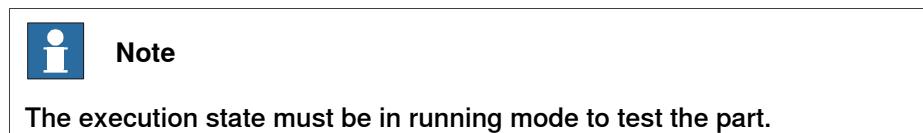
- No events in the production loop will be executed, thus it is useful to create custom service menus in the Production Manager to control the clamping etc, before and after running a test part.
- The part is only allowed to be tested at its valid station(s).
- Test Part is only allowed to run in manual mode.

Starting Test Part

- 1 Select a part in the table and tap **Test Part**.



xx1400002367



2 Production Manager user interface

2.6 Custom application window

2.6 Custom application window

Launch application

If the system is loaded and configured with, for example, RobotWare Arc, the application can be launched from the Production Manager desktop by clicking on the application icon to the right.

The application will be launched as a separate FlexPendant application outside Production Manager.



xx1400002368

2.7 State icons

Overview

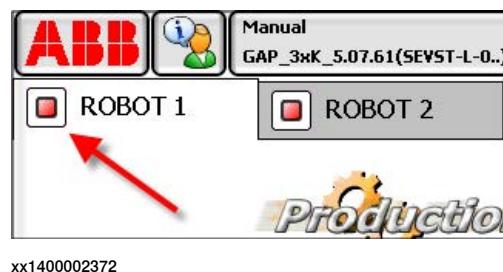
The Production Manager user interface uses state icons in order to display the state of the execution engine. Four different states are available.

States

State/Icon	Description
Running	No icon when the execution engine is running. This is the normal state.
Stopped  xx1400002369	The task has stopped.
Busy  xx1400002370	The task is producing a part or running a menu.
Blocked  xx1400002371	The task is blocked by another task currently running a Setup or Service menu. See Menudata on page 21 .

Location of state icons

The state icons are located at each tab.



xx1400002372



Note

Only normal tasks are visible as tabs in the user interface.

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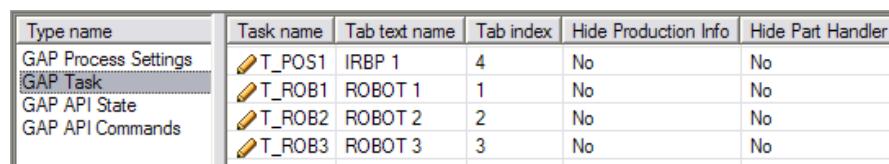
3 Configuring Production Manager

3.1 Production Manager Task configuration

Overview

In *Production Manager Task* configuration it is possible to specify the look and feel of the Production Manager user interface.

System parameter	Description
<i>Task name</i>	Name of the task for which the configuration is valid for.
<i>Tab text name</i>	Enter the name that should appear on the select in Production Manager.
<i>Tab index</i>	Specify the select order for the task. If the select index is not entered the selects can be added in an arbitrary order.
<i>Hide Production Info</i>	If Yes, the Production Information icon will be hidden.
<i>Hide Part Handler</i>	If Yes, the Part Handler icon will be hidden.



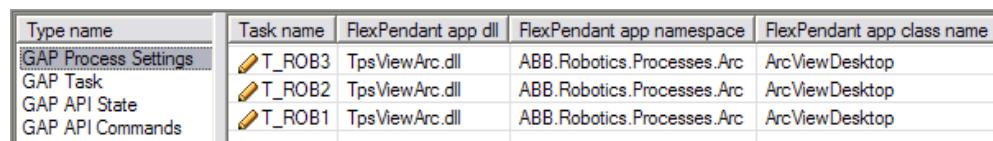
Type name	Task name	Tab text name	Tab index	Hide Production Info	Hide Part Handler
GAP Process Settings	T_POS1	IRBP 1	4	No	No
GAP Task	T_ROB1	ROBOT 1	1	No	No
GAP API State	T_ROB2	ROBOT 2	2	No	No
GAP API Commands	T_ROB3	ROBOT 3	3	No	No

xx1400002373

Production Manager Process Settings

Production Manager Process Settings specifies the application to be launched from Production Manager.

System parameter	Description
<i>Task name</i>	Name of the task for which the configuration is valid for
<i>FlexPendant app dll</i>	The name of the dll to launch.
<i>FlexPendant app namespace</i>	The namespace of the dll to launch.
<i>FlexPendant app class name</i>	The class name of the dll to launch.
<i>Button-up image</i>	The name of the icon that will be displayed on Production Manager's desktop.
<i>Button-down image</i>	The name of the icon that will be displayed on Production Manager's desktop.
<i>Application name</i>	The name of the application. This name will be displayed on Production Manager's desktop.



Type name	Task name	FlexPendant app dll	FlexPendant app namespace	FlexPendant app class name
GAP Process Settings	T_ROB3	TpsViewArc.dll	ABB.Robotics.Processes.Arc	ArcViewDesktop
GAP Task	T_ROB2	TpsViewArc.dll	ABB.Robotics.Processes.Arc	ArcViewDesktop
GAP API State	T_ROB1	TpsViewArc.dll	ABB.Robotics.Processes.Arc	ArcViewDesktop
GAP API Commands				

xx1400002374

Continues on next page

3 Configuring Production Manager

3.1 Production Manager Task configuration

Continued

Type name	Button up-image	Button down-image	Application name
GAP Process Settings	arcMainArcWelding96up.gif	arcmainarcWelding96down.gif	RobotWare Arc
GAP Task	arcMainArcWelding96up.gif	arcmainarcWelding96down.gif	RobotWare Arc
GAP API State	arcMainArcWelding96up.gif	arcmainarcWelding96down.gif	RobotWare Arc

xx1400002375

Production Manager API State

Production Manager API State specifies the signals for tasks state.

System parameter	Description
<i>Task name</i>	Name of the task for which the configuration is valid for.
<i>At-Safe DI</i>	The input signal name that specifies that the task is/is at safe. When this signal is high, it is considered safe to run execution of specific tasks.
<i>At-Service DI</i>	The input signal name that specifies that the task is at service. When this signal is high, it is considered safe to run execution of specific tasks.
<i>Running out signal</i>	Digital output signal specifying that Prod Mgr task is running.
<i>Ready out signal</i>	Digital output signal specifying that Prod Mgr task is ready for new order.
<i>Error group out signal</i>	Group output signal for error codes. If not configured, the error code will be mirrored to the PLC group output signal instead. PLC codes<=99 can be used if configured.
<i>Error strobe out signal</i>	If defined this signal will go high when error occurs.
<i>Error ack in signal</i>	When set high, this signal will reset the error group output signal and strobe. If no ack is used, the error code will remain on the error group output signal (if defined).

Type name	Task name	At-Safe DO	At-Service DO
GAP Process Settings	T_POS1	siAtSafe	siAtService
GAP Task	T_ROB1	siAtSafeR1	siAtServiceR1
GAP API State	T_ROB3	siAtSafeR3	siAtServiceR3
GAP API Commands	T_ROB2	siAtSafeR2	siAtServiceR2

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In the example above, the positioner task T_POS1 is configured safe when all robot tasks, T_ROB1 T_ROB2 T_ROB3, are safe with cross connections. The same applies for service.

Production Manager API Commands

Production Manager API Commands specifies the signal interface for executing part and knowledge of at which station a task/robot is at and next station to go when order to run part is given.

System parameter	Description
<i>Task name</i>	Name of the task for which the configuration is valid for.
<i>Run part in signal</i>	Input signal for running a part. Works on both PLC and Operator Ready interface.
<i>Run menu in signal</i>	Input signal for running a menu. Designed to use with PLC interface (PLC code required on menudata)

Continues on next page

3 Configuring Production Manager

3.1 Production Manager Task configuration

Continued

System parameter	Description
<i>Run ack signal</i>	Acknowledge signal used for handshake.
<i>Run ack timeout</i>	Defines the timeout when waiting for the run part or run menu signal to go low.
<i>PLC group in signal</i>	Group input signal that defines the PLC order.
<i>Allow 0 value for PLC</i>	Flag for allowing 0 value for PLC. If set, search for <code>partdata</code> with value 0 for PLC is done. Only used if PLC group in is configured.
<i>PLC group out signal</i>	Group output signal that confirms the PLC order. Also works as error code if an error occurs in Production Manager if no separate error signals are defined in <i>Production Manager API State</i> .
<i>No reset of PLC out signal</i>	Flag for specifying if PLC should be reset after part go signal. TRUE means no reset of PLC out signal. Default value is FALSE.
<i>At station 1 insignal</i>	Input signal that specifies that robot/task is at station 1.
<i>At station 2 insignal</i>	Input signal that specifies that robot/task is at station 2.
<i>At station 3 insignal</i>	Input signal that specifies that robot/task is at station 3.
<i>At station 4 insignal</i>	Input signal that specifies that robot/task is at station 4.
<i>At station 5 insignal</i>	Input signal that specifies that robot/task is at station 5.
<i>At station 6 insignal</i>	Input signal that specifies that robot/task is at station 6.
<i>At station 7 insignal</i>	Input signal that specifies that robot/task is at station 7.
<i>At station 8 insignal</i>	Input signal that specifies that robot/task is at station 8.
<i>Station 1 next insignal</i>	Input signal that specifies next station 1 for robot/task.
<i>Station 2 next insignal</i>	Input signal that specifies next station 2 for robot/task.
<i>Station 3 next insignal</i>	Input signal that specifies next station 3 for robot/task.
<i>Station 4 next insignal</i>	Input signal that specifies next station 4 for robot/task.
<i>Station 5 next insignal</i>	Input signal that specifies next station 5 for robot/task.
<i>Station 6 next insignal</i>	Input signal that specifies next station 6 for robot/task.
<i>Station 7 next insignal</i>	Input signal that specifies next station 7 for robot/task.
<i>Station 8 next insignal</i>	Input signal that specifies next station 8 for robot/task.
<i>Check aborted part</i>	Flag for check if part is finished.

Type name	Task name	Run part in signal	At station 1 insignal	At station 2 insignal
GAP Process Settings	T_ROB1	siOPOK_GAP	diLS_1_INPOS	diLS_2_INPOS
GAP Task	T_POS1	siOPOK_GAP	diLS_1_INPOS	diLS_2_INPOS
GAP API State	T_ROB3	siOPOK_GAP	diLS_1_INPOS	diLS_2_INPOS
GAP API Commands	T_ROB2	siOPOK_GAP	diLS_1_INPOS	diLS_2_INPOS

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Production Manager Current Part

Production Manager Current Part specifies the executing part and station for a robot/task.

System parameter	Description
<i>Task name</i>	Name of the task for which the configuration is valid for.
<i>Instance name</i>	Name of executing <code>partdata</code> instance.
<i>Station</i>	Executing station robot/task.

3 Configuring Production Manager

3.2 Production Manager MultiMove Support

3.2 Production Manager MultiMove Support

General

MultiMove systems are supported by loading the *Execution Engine* into all motion tasks. The engines may be triggered to run independently whenever in a ready state. Simultaneous execution is possible by triggering multiple engines to run concurrently. A task-list field in `menudata` and `partdata` allows the user to synchronize execution between multiple tasks.

The events in the *Execution Engine* support MultiMove. The tasks defined in the `TaskList` field of the `ee_event` data will be executed synchronously and the events will be synchronized. Each synchronized task will wait until all tasks in the `TaskList` are ready executing the current event before moving on to the next event.

How to load Execution Engine

To use Production Manager in tasks other than the robot tasks, for example a task for a positioner, the *Execution Engine* needs to be loaded in that task and be configured (see previous chapters).

To load *Execution Engine* a SYS config file needs to be loaded.

Copy the following configuration and replace `<taskname>` with actual TASK NAME.

```
SYS:CFG_1.0:5:0::  
# CAB_EXEC_HOOKS:  
#  
-Routine "GapEE_PwrOnShelf" -Shelf "POWER_ON" -Task "<taskname>"  
-Routine "GapEE_QStopShelf" -Shelf "QSTOP" -Task "<taskname>"  
-Routine "GapEE_ResetShelf" -Shelf "RESET" -Task "<taskname>"  
-Routine "GapEE_RestaShelf" -Shelf "RESTART" -Task "<taskname>"  
-Routine "GapEE_StartShelf" -Shelf "START" -Task "<taskname>" -SeqNo  
    100  
-Routine "GapEE_StopShelf" -Shelf "STOP" -Task "<taskname>"  
#  
  
CAB_TASK_MODULES:  
#  
-File "RELEASE:/options/arc/GapCore/Code/GAP_ACCESS.sys" -Install  
    -Task "<taskname>"  
-File "RELEASE:/options/arc/GapCore/Code/GAP_SYNC.sys" -Install  
    -Task "<taskname>"  
-File "RELEASE:/options/arc/GapCore/Code/GAP_EE_EVT.sys" -Install  
    -Task "<taskname>"  
-File "RELEASE:/options/arc/GapCore/Code/GAP_EE.sys" -Install -Task  
    "<taskname>"  
-File "RELEASE:/options/arc/GapCore/Code/GAP_EVT.sys" -Install  
    -Task "<taskname>"  
-File "HOME:/GAP_USER.sys" -Task "<taskname>"
```

3.3 User Authorization System settings

Defining access levels

Production Manager publishes a set of application grants that can be used to control the access to different functions within the application. Most application grants in Production Manager requires some controller grants, i.e activating all application grants for Production Manager does not automatically give access to all functionality within Production Manager, see grants table below.

If the logged on user has the controller grant **Full Access** it overrides all Production Manager application grants. That is, the application grants will automatically be true if **Full Access** is true.

The application grants can be found in the **UAS Administration Tool** in RobotStudio.

Application Grant	Description
Select Parts	If true, the user is allowed to select parts in stations in the Part Handling window. Requires the controller grant Modify current value .
Edit Parts	If true, the user is allowed to create, edit and delete parts. Requires the application grant Select Parts and the controller grant Edit RAPID code .
Debug Parts	If true, the user is allowed to run Production Manager parts in debug mode. Requires the controller grant Modify current value and I/O write access .
Edit Menus	Valid for both setup and service. If true, the user is allowed to create, edit and delete menus. Requires the controller grant Edit RAPID code .
Run Menu User Level	This grant level is connected to the byte <code>minUserLevel</code> field in the <code>menudata</code> . The logged on user is allowed to run the menu if this grant is true and the <code>minUserLevel</code> field in the <code>menudata <= Run Menu User Level</code> . Min value: 0. Max value: 255. Requires the controller grant Modify current value and I/O write access .
	 Note If the controller grant Full Access is true, the Run Menu User Level grant will be true with value 0.
Run Seam Displacement	If this grant is true, the user is allowed to launch Seam Displacement from the Part Handling window. Requires the controller grant Perform ModPos and HotEdit .
	 Note Requires the RobotWare Arc option Seam Displacement .

Example: UAS settings for running menus

In this example the logged on user should be allowed to run the service routine `Move robot to safe position`, but not allowed to run the setup menu `Set/Change robot safe position`. Start by defining the application grant for the logged on user's group. In this example we set the threshold value for the **Run Menu User Level** to 40, see the following figure.

Continues on next page

3 Configuring Production Manager

3.3 User Authorization System settings

Continued

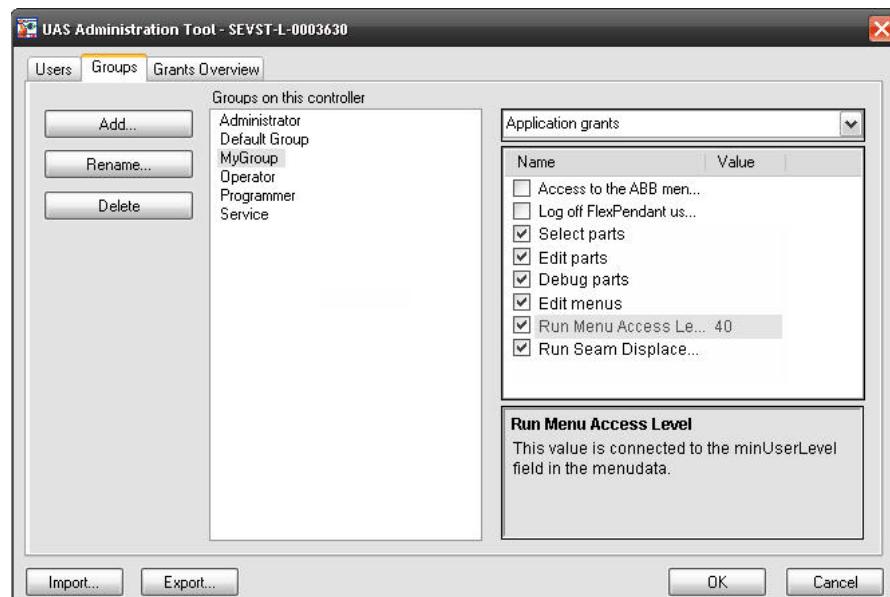
Now the two different menudata instances must be defined with different values in the minUserLevel field.

```
TASK PERS menudata mdRobSafe1:=[ "Move robot to safe position",
    "GapIRB140Icon.gif", "CheckSafePos1", 255, "", 255, TRUE, 2, 20, FALSE, 0];
```

```
TASK PERS menudata mdRobSetSafe1:=[ "Set/Change robot safe position",
    "GapIRB140Icon.gif", "SetSafePos1", 255, "", 255, TRUE, 1, 60, FALSE, 0];
```

The service menu Move robot to safe position has minUserLevel set to 20, that is, below the user's threshold value 40 specified in UAS Administration Tool, and is therefore allowed to be executed by the user.

The setup menu Set/Change robot safe position has minUserLevel set to 60, that is, larger than the user's threshold value for the Run Menu User Level grant, and is therefore not allowed to be executed by the user.



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4 Production Manager PLC support

4.1 How to run Production Manager from PLC

General

Production Manager can be controlled by using a PLC instead of the FlexPendant.

By configuring the signals described in the table below, Production Manager can react directly on PLC orders used for running parts or menus. When Production Manager receives a PLC order, it searches the task for a partdata or menudata instance, depending on the order type, where the `PlcCode` field matches the value of the group input signal `plc_cmd_group_in`.

Task name	Run part in signal	Run menu in signal	Run ack signal	PLC group in signal	PLC group out signal
T_POS1	siGap_Run_Part	diRunMenuP1	doPlcAckP1	giPlcCmd	goPlcCmd
T_ROB1	siGap_Run_Part	diRunMenuR1	doPlcAckR1	giPlcCmd	goPlcCmd
T_ROB3	siGap_Run_Part	diRunMenuR3	doPlcAckR3	giPlcCmd	goPlcCmd
T_ROB2	siGap_Run_Part	diRunMenuR2	doPlcAckR2	giPlcCmd	goPlcCmd

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Description of signals

System parameter	Description
Run part in signal	Input signal for running a part
Run menu in signal	Input signal for running a menu.
Run ack signal	Acknowledge signal used for handshake.
PLC group in signal	Group input signal that defines the PLC order.
PLC group out signal	Group output signal that confirms the PLC order. Also works as error code if an error occurs in Production Manager.

Example workflow

The following is a typical workflow when running Production Manager from a PLC.

- 1 The PLC sets an order on the PLC group in signal.
- 2 The order is confirmed by Production Manager by setting the PLC group output signal to the same value as the PLC group in signal.
- 3 The PLC sets the *Run part* or *Run menu* signal.

If everything is working correctly, Production Manager will set the PLC Group output signal to 0.



Note

If *No reset of output signal in GAP API State* is TRUE, the PLC value will remain on the group output signal.

Continues on next page

4 Production Manager PLC support

4.1 How to run Production Manager from PLC

Continued

If an error has occurred then the last two digits in the error code will be set on the PLC group output signal, that is `error_code - 111400` since Production Manager's error codes works between 111400 and 111499.



Note

If *Error group output signal* in GAP API State is specified, the error code will not be displayed on the PLC group output signal, but instead on the *Error group output signal*. See [Production Manager API State on page 60](#).

- 4 If the *Run ack* signal has been defined further handshaking is possible to use before the part or menu is executed.
Assuming everything is working correctly, *Run ack* signal will be set high by Production Manager.
- 5 The PLC responds with setting the *Run part* or *Run menu* signal low which will trigger Production Manager to set the *Run ack* signal low again and launch the part or menu.



Note

Due to the error code functionality described above we recommend that the PLC orders do not use numbers between 0 and 99.

4.2 How to run Production Manager from PLC via RAPID

Overview

Sometimes the PLC logic needs to be processed in a RAPID module before it is served to Production Manager. For these occasions Production Manager provides an instruction interface in RAPID from where it is possible to tell Production Manager which procedure to execute. *Parts*, *Setup*, and *Service* menus can be run by serving Production Manager the type of order and procedure to execute.

How to run parts from PLC via RAPID

Example 1

```

PERS partdata pdProgStn1:=[ "ProgStn1", "Program station 1",
    "T_ROB1:T_ROB2:T_ROB3:T_POS1",1, "GapEmptyPart200.gif", "" ];
PERS partdata pdProgStn2:=[ "ProgStn2", "Program station 2",
    "T_ROB1:T_ROB2:T_ROB3:T_POS1",2, "GapEmptyPart200.gif", "" ];

CONNECT inPlcCmd WITH trPlcCmd; ISignalDI diPlcCmd,1, inPlcCmd

LOCAL TRAP trPlcCmd
    VAR num nPlcCode;
    nPlcCode:= Ginput(giPlcCode);
    TEST nPlcCode
    CASE 1:
        SetDO soGap_NextStn1,0;
        ! run part for station 1
        PMgrSetNextPart \
            TaskNumber:=GapTaskIndex( "T_ROB1" ),1,pdProgStn1;
        PMgrSetNextPart \
            TaskNumber:=GapTaskIndex( "T_ROB2" ),1,pdProgStn1;
        PMgrSetNextPart \
            TaskNumber:=GapTaskIndex( "T_ROB3" ),1,pdProgStn1;
        PMgrSetNextPart \
            TaskNumber:=GapTaskIndex( "T_POS1" ),1,pdProgStn1;
        ! tell GAP next station
        SetDO soGap_NextStn1,1;
    CASE 2:
        SetDO soGap_NextStn2,0;
        ! run part for station 2
        PMgrSetNextPart \
            TaskNumber:=GapTaskIndex( "T_ROB1" ),2,pdProgStn2;
        PMgrSetNextPart \
            TaskNumber:=GapTaskIndex( "T_ROB2" ),2,pdProgStn2;
        PMgrSetNextPart \
            TaskNumber:=GapTaskIndex( "T_ROB3" ),2,pdProgStn2;
        PMgrSetNextPart \
            TaskNumber:=GapTaskIndex( "T_POS1" ),2,pdProgStn2;
        ! tell GAP next station
        SetDO soGap_NextStn2,1;
    CASE 12:
    CASE 64:

```

Continues on next page

4 Production Manager PLC support

4.2 How to run Production Manager from PLC via RAPID

Continued

```
CASE 128:  
ENDTEST  
! tell GAP to run  
SetDO soGap_Run,1;  
ENDTRAP
```

How to run menus from PLC via RAPID

Example 2

```
TASK PERS menudata mdCalibIntch1:=[ "Calibrate irbp1 interchange  
positions", "GapMicCalibrate32.gif", "Irbp1Mnu:mnuCalibIntch1",  
255, "", 3, TRUE, 1, 0, TRUE, 0];  
  
CONNECT inPlcCmd WITH trPlcCmd;  
ISignalDI diPlcCmd,1, inPlcCmd;  
  
LOCAL TRAP trPlcCmd  
VAR num nPlcCode;  
VAR menudata mdTemp;  
  
nPlcCode:= Ginput(giPlcCode);  
TEST nPlcCode  
CASE 1:  
    mdTemp:= mdCalibIntch1;  
    PMgrRunMenu mdTemp;  
    ENDTEST  
ENDTRAP
```

To run a menu in several tasks

Example 3

To run a menu in several tasks the following instructions can be used:

```
LOCAL CONST menudata mdRobSafeAll:=[ "Move all robots to home  
position", "GapIRB140Icon.gif", "MoveSafe", 255,  
T_ROB1:T_ROB2:T_ROB3",  
GAP_SHOW_ALWAYS, TRUE, GAP_SERVICE_TYPE, 0, FALSE, 0 ];  
  
VAR menudata mdTemp;  
  
mdTemp:=mdRobSafeAll;  
PMgrRunMenu \ TaskNumber:=GapTaskIndex("T_ROB1"), mdTemp;  
PMgrRunMenu \ TaskNumber:=GapTaskIndex("T_ROB2"), mdTemp;  
PMgrRunMenu \ TaskNumber:=GapTaskIndex("T_ROB3"), mdTemp;
```

Or:

```
TASK PERS menudata mdRobSafeAll:=[ "Move all robots to home  
position", "GapIRB140Icon.gif", "MoveSafe", 255,  
T_ROB1:T_ROB2:T_ROB3",  
GAP_SHOW_ALWAYS, TRUE, GAP_SERVICE_TYPE, 0, FALSE, 0 ];
```

Continues on next page

4.2 How to run Production Manager from PLC via RAPID *Continued*

```
PMgrRunMenu \ TaskNumber:=GapTaskIndex( "T_ROB1" ), mdRobSafeAll;  
PMgrRunMenu \ TaskNumber:=GapTaskIndex( "T_ROB2" ), mdRobSafeAll;  
PMgrRunMenu \ TaskNumber:=GapTaskIndex( "T_ROB3" ), mdRobSafeAll;
```

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5 RAPID references

5.1 Instructions

5.1.1 ExecEngine - Start execution engine

Usage

ExecEngine starts the execution engine.

Basic examples

The following example illustrates the instruction ExecEngine.

Example 1

```
ExecEngine;
```

The execution engine is started and waiting for an order.

Arguments

There are no arguments.

Program execution

The user calls this routine from the main routine in each motion task. Typically the user-defined main routine should have a procedure call to ExecEngine and nothing else.

Syntax

```
ExecEngine ';'
```

5 RAPID references

5.1.2 PMgrGetNextPart - Get active part for station in task

Usage

`PMgrGetNextPart` gets the part that is being produced for a station in a task.

Basic examples

The following examples illustrate the instruction `PMgrGetNextPart`.

Example 1

```
PMgrGetNextPart stn, tmpPart;
```

The `PMgrGetNextPart` instruction will return the partdata used for station `stn`.
The resulting partdata will be passed in `tmpPart`.

Example 2

```
! Data declarations
VAR num station:=1;
VAR partdata pdTmpChk;
VAR string sPartDataName;
PROC PrepareData()
    PMgrGetNextPart station,pdTmpChk\InstanceName:=sPartDataName;
ENDPROC
```

Arguments

`PMgrGetNextPart [\\TaskNumber] Station RetData [\\InstanceName]`
[\\TaskNumber]

Data type: num

Optional argument specifying the Production Manager specific task number to get the part for. If argument `TaskNumber` is omitted the current task number is used.

Station

Data type: num

The station to get the part for.

RetData

Data type: partdata

The resulting part returned from the instruction.

[\\InstanceName]

Data type: string

The instance name of the `retData` part.

Program execution

The instruction returns the part selected for the specified station and task number.
In the case no parts are selected for the station(s), for example, running Production Manager from a PLC, an empty part will be returned.

Continues on next page

5.1.2 PMgrGetNextPart - Get active part for station in task

Continued

Syntax

```
PMgrGetNextPart
[ '\' TaskNumber ':=' ] < expression (IN) of num > ','
[ Station ':=' ] < expression (IN) of num > ','
[ RetData ':=' ] < var or pers (INOUT) of partdata > ','
[ InstanceName ':=' ] < var or pers (INOUT) of string > ';'
```

5 RAPID references

5.1.3 PMgrSetNextPart - Set active part for station in task

Usage

PMgrSetNextPart sets the part that will be produced for a station in a task.

Basic examples

The following examples illustrate the instruction PMgrSetNextPart.

Example 1

```
PMgrSetNextPart stn, tmpPart
```

The SetNextPart instruction will set the part tmpPart for station stn.

Example 2

```
! Data declarations
VAR num station:=1;
VAR partdata pdTmpChk;

PROC PrepareData ()
    PMgrSetNextPart station,pdTmpChk;
ENDPROC
```

Arguments

```
PMgrSetNextPart [\TaskNumber] Station NewData
```

[\TaskNumber]

Data type: num

Optional argument specifying the Production Manager specific task number to set the part for. If argument TaskNumber is omitted the current task number is used.

Station

Data type: num

The station to set the part for.

NewData

Data type: partdata

The part that should be set for this station and task.

Program execution

The instruction sets the part for the specified station and task number.

Syntax

```
PMgrSetNextPart
[ '\' TaskNumber ':=' ] < expression (IN) of num > ','
[ Station ':=' ] < expression (IN) of num > ','
[ NewData ':=' ] < persistent (PERS) of partdata > ','
```

5.1.4 PMgrRunMenu - Run menu in task

Usage

PMgrRunMenu is used to run a menu in a task.

Basic examples

The following examples illustrate the instruction PMgrRunMenu.

Example 1

```
VAR menudata mnuBE := [ "TCP Setup", "", "BEToolSetup", 255, "",  
    GAP_SHOW_ALWAYS, TRUE, GAP_SETUP_TYPE, 0, FALSE, 0 ];  
    PMgrRunMenu mnuBE;
```

Runs the mnuBE menu in the current task, without using the FlexPendant application.

Example 2

```
! Data declarations  
VAR menudata mnuBE := [ "TCP  
    Setup", "", "BEToolSetup", 255, "", GAP_SHOW_ALWAYS,  
    TRUE, GAP_SETUP_TYPE, 0, FALSE, 0 ];  
VAR num taskNr;  
PROC Procl ()  
    taskNr := GAP_TASK_NO;  
    PMgrRunMenu(\TaskNumber:=taskNr, mnuBE);  
ENDPROC
```

Arguments

PMgrRunMenu [\TaskNumber] Menu

[\TaskNumber]

Data type: num

Optional argument specifying the Production Manager specific task number to run the menu in. If argument TaskNumber is omitted, the current task number is used.

Menu

Data type: menudata

The menu to execute.

Syntax

```
PMgrRunMenu  
[ '\\' TaskNumber ':=' < expression (IN) of num > ]  
[ Menu ':=' ] < var or pers (INOUT) of menudata > ';'
```

5 RAPID references

5.2.1 PMgrAtSafe - Check if task is at safe state

5.2 Functions

5.2.1 PMgrAtSafe - Check if task is at safe state

Usage

`PMgrAtSafe` is used to check if the task is at safe state.

Basic examples

The following examples illustrate the function `PMgrAtSafe`.

Example 1

```
VAR bool bAtSafe;  
bAtSafe:=PMgrAtSafe();
```

Check if the current task is at safe.

Example 2

```
! Data declarations  
VAR bool bAtSafe;  
VAR num taskNr;  
PROC Proc1 ()  
    taskNr := GAP_TASK_NO;  
    bAtSafe:=PMgrAtSafe(\TaskNumber:=taskNr);  
ENDPROC
```

Return value

Data type: `bool`

TRUE if the task is at safe state, FALSE otherwise.

Arguments

`PMgrAtSafe [\TaskNumber]`

`[\TaskNumber]`

Data type: `num`

Optional argument specifying the Production Manager specific task number to check the safe state for. If argument `TaskNumber` is omitted, the current task number is used.

Syntax

```
PMgrAtSafe '('  
[ '\' TaskNumber ':=' ] < expression (IN) of num > ')'
```

5.2.2 PMgrAtService - Check if task is at service state

Usage

`PMgrAtService` is used to check if task is at service state.

Basic examples

The following examples illustrate the function `PMgrAtService`.

Example 1

```
VAR bool bAtService;
bAtService:=PMgrAtService();
```

Check if the current task is at service.

Example 2

```
! Data declarations
VAR bool bAtService;
VAR num taskNr;
PROC Proc1 ()
    taskNr := GAP_TASK_NO;
    bAtService:=PMgrAtService(\TaskNumber:=taskNr);
ENDPROC
```

Return value

Data type: `bool`

TRUE if the task is at service state, **FALSE** otherwise.

Arguments

`PMgrAtService [\TaskNumber]`

`[\TaskNumber]`

Data type: `num`

Optional argument specifying the Production Manager specific task number to check the service state for. If argument `TaskNumber` is omitted, the current task number is used.

Syntax

```
PMgrAtService '()
[ '\' TaskNumber ':=' ] < expression (IN) of num > ''
```

5 RAPID references

5.2.3 PMgrAtState - Check the state of a task

Usage

`PMgrAtState` is used to check production state of a task.

Basic examples

The following examples illustrate the function `PMgrAtState`.

Example 1

```
VAR num PMState;  
PMState:=PMgrAtState();
```

Get the production state of the current task.

Example 2

```
! Data declarations  
VAR num state;  
VAR num taskNr;  
PROC Proc1 ()  
    taskNr := GAP_TASK_NO;  
    state:=PMgrAtState(\TaskNumber:=taskNr);  
ENDPROC
```

Return value

Data type: num

The returned value represents different execution states of Production Manager's execution engine.

The following return values are valid:

Constant	Value	Description
GAP_STATE_UNKN	0	Unknown state/not running
GAP_STATE_IDLE	1	Executing but idle
GAP_STATE_SETUP	2	Executing setup routine
GAP_STATE_PART	3	Executing part
GAP_STATE_SERV	4	Executing service routine

Arguments

`PMgrAtState [\\TaskNumber]`

`[\\TaskNumber]`

Data type: num

Optional argument specifying the Production Manager specific task number to get the state for. If argument `TaskNumber` is omitted, the current task number is used.

Syntax

```
PMgrAtState '('  
[ '\\' TaskNumber ':=' ] < expression (IN) of num > ')'
```

5.2.4 PMgrAtStation - Get the current station for a task

Usage

`PMgrAtStation` is used to get the current station for a task.

Basic examples

The following examples illustrate the function `PMgrAtStation`.

Example 1

```
VAR num nStation;
nStation:=PMgrAtStation();
```

Get the current station for the current task.

Example 2

```
! Data declarations
VAR num nStation;
VAR num taskNr;
PROC Proc1 ()
    taskNr := GAP_TASK_NO;
    nStation:=PMgrAtStation(\TaskNumber:=taskNr);
    TPWrite "Current station is" + ValToStr(nStation);
ENDPROC
```

Return value

Data type: num

The returned value represents the active station.

Arguments

`PMgrAtStation [\TaskNumber]`

[\TaskNumber]

Data type: num

Optional argument specifying the Production Manager specific task number to get the station for. If argument `TaskNumber` is omitted, the current task number is used.

Syntax

```
PMgrAtStation '(
    [ '\' TaskNumber ':=' ] < expression (IN) of num > ')'
```

5 RAPID references

5.2.5 PMgrNextStation - Get the next station for a task

Usage

`PMgrNextStation` is used to get the next station for a task.

Basic examples

The following examples illustrate the function `PMgrNextStation`.

Example 1

```
VAR num nextStation;  
nextStation:=PMgrNextStation();
```

Get the next station for the current task.

Example 2

```
! Data declarations  
VAR num nextStation;  
VAR num taskNr;  
PROC Proc1 ()  
    taskNr := GAP_TASK_NO;  
    nextStation:=PMgrNextStation(\TaskNumber:=taskNr);  
    TPWrite "Next station is" + ValToStr(nextStation);  
ENDPROC
```

Return value

Data type: num

The returned value represents the next station that will be used for the next part.

Arguments

`PMgrNextStation [\TaskNumber]`

[\TaskNumber]

Data type: num

Optional argument specifying the Production Manager specific task number to get the station for. If argument `TaskNumber` is omitted, the current task number is used.

Syntax

```
PMgrNextStation '()'  
[ '\' TaskNumber ':=' ] < expression (IN) of num > ')'
```

5.2.6 PMgrTaskNumber - Get the task number

Usage

`PMgrTaskNumber` is used to get the Production Manager specific task number. This task number is used in many instructions in the public RAPID interface of Production Manager.

Basic examples

The following example illustrates the instruction `PMgrTaskNumber`.

Example 1

```
VAR num taskNumber;  
taskNumber := PMgrTaskNumber (\TaskName := "T_ROB1");
```

Get the Production Manager specific task index for task `T_ROB1`.

Return value

Data type: num

The returned value represents the Production Manager specific task index for the provided task name.

If no optional argument is used the task number for current task is returned.

Returns 0 if given TaskName is not a valid Production Manager task.

Arguments

`PMgrTaskNumber [\TaskName]`

`[\TaskName]`

Data type: string

The name of the task to get the task number for. If argument `TaskName` is omitted, the current task name is used.

Syntax

```
PMgrTaskNumber '()'  
[ '\' TaskName ':=' ] < expression (IN) of string > ''
```

5 RAPID references

5.2.7 PMgrTaskName - Get the task name

Usage

PMgrTaskName is used to get the task name connected to a Production Manager specific task number.

Basic examples

The following example illustrates the function PMgrTaskName.

Example 1

```
VAR string taskName;  
VAR num taskNumber;  
taskNumber:=GAP_TASK_NO;  
taskName:= PMgrTaskName (\TaskNumber:=taskNumber);  
TPWrite "The name of this task is " + taskName;
```

Get the task name for current task.

Return value

Data type: string

The returned value represents the task name connected to the Production Manager specific task number.

Arguments

PMgrTaskName [\TaskNumber]

[\TaskNumber]

Data type: num

The Production Manager specific task number. If argument TaskNumber is omitted, the current task number is used.

Syntax

```
PMgrTaskName '('  
[ '\' TaskNumber ':=' ] < expression (IN) of num > ')'
```

5.3 Public constants

Description

The list below shows the public constants and variables provided by Production Manager.

General

Public task specific constants:

Constant	Description
GAP_TASK_NO	The Production Manager specific task index for current task.
GAP_TASK_NAME	The task name of current task.

Menus

type field

Public constants to be used in the `type` field of `menudata` instances:

Constant	Value
GAP_SETUP_TYPE	1
GAP_SERVICE_TYPE	2

Example:

```
VAR menudata mnuBE := [ "TCP Setup", "", "BEToolSetup", 255, "",  
GAP_SHOW_ALWAYS, TRUE, GAP_SETUP_TYPE, 0, FALSE, 0];
```

validPosition field

Public constants to be used in the `validPosition` field of `menudata` instances:

Constant	Value
GAP_SHOW_NEVER	0
GAP_SHOW_SAFE	1
GAP_SHOW_SERVICE	2
GAP_SHOW_ALWAYS	255

Example:

```
VAR menudata mnuBE := [ "Check TCP", "", "BEToolCheck", 255, "",  
GAP_SHOW_NEVER, TRUE, GAP_SERVICE_TYPE, 0, FALSE, 0];
```

Execution

Execution state

Public constants to be used when querying Production Manager for the task state:

Constant	Value	Description
GAP_STATE_UNKN	0	Unknown state/not running
GAP_STATE_IDLE	1	Executing but idle
GAP_STATE_SETUP	2	Executing setup routine
GAP_STATE_PART	3	Executing part

Continues on next page

5 RAPID references

5.3 Public constants

Continued

Constant	Value	Description
GAP_STATE_SERV	4	Executing service routine

Example:

```
VAR num PMState;
PMState:=AtState();
IF PMState = GAP_STATE_IDLE THEN
    TPWrite "Production Manager waiting for job";
ENDIF
```

Events

Public constants to be used when defining events:

Constant	Value	Description
EE_START	1	Runs when exec engine starts
EE_CYCLE_START	2	Runs right after OP pressed/order from PLC
EE_PROC_START	3	Runs before menu executes
EE_PRE_PROD	4	General pre-production event
EE_CLOSE_JIG	5	Close jig
EE_INDEX	6	Index IRBP
EE_PRE_PART	7	Runs before part
EE_POST_PART	8	Runs after part
EE_OPEN_JIG	9	Open jig
EE_SERVICE	10	Run service of tool/other
EE_POST_PROD	11	General post-production event
EE_ABORT	12	Abort cycle
EE_WAIT_ORDER	13	Waiting for an order.
EE_POST_PROC	14	Runs after menu

6 Seam Displacement options

6.1 General

Overview

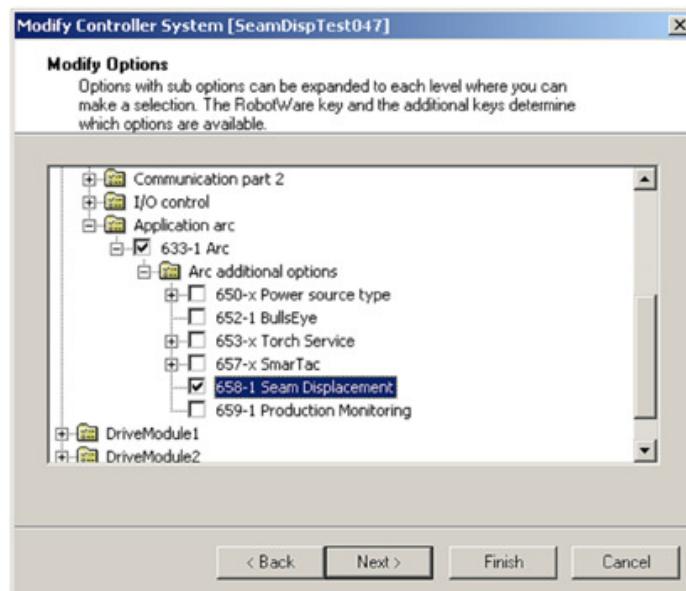
The Seam Displacement option allows the operator to shift seams in relation to a reference frame. The displacements can be applied via FlexPendant operator screens without stopping production. It is possible to shift an entire weld or targets within a seam individually. The operator can enter offsets at any point in time, whether the robot is welding or not. The applied changes will take effect in the next production cycle. This lets the operator visually inspect a part, apply seam offsets where needed, and the changes will take effect when the next part is welded.

User restrictions

The functions available in Seam Displacement may be restricted by the user authorization system, UAS.

About the option

The Seam Displacement is a separate Arc option.



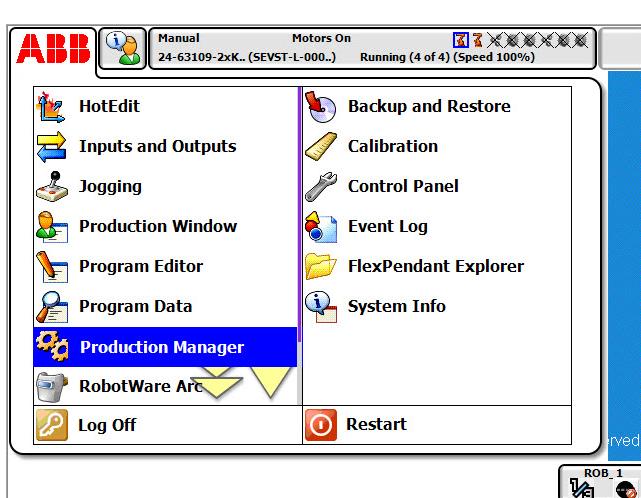
xx1400002380

6 Seam Displacement options

6.2 Starting Seam Displacement option

The seam displacement option is started as follows:

- 1 Go to the ABB menu and launch the Production Manager.

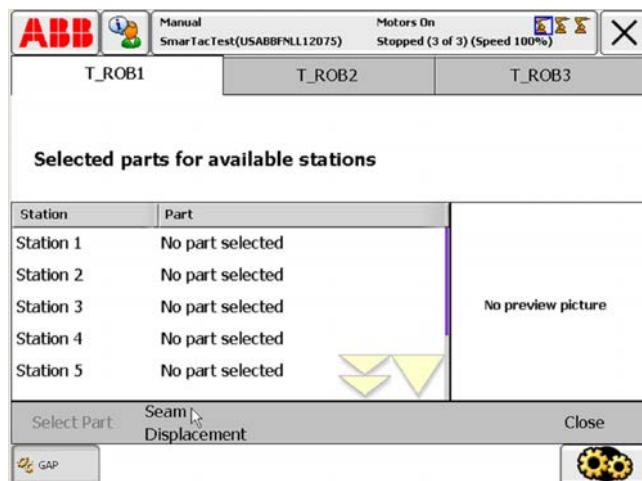


- 2 In the Production Manager main menu select Part Handling.



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3 Tap Seam Displacement on the bottom menu.

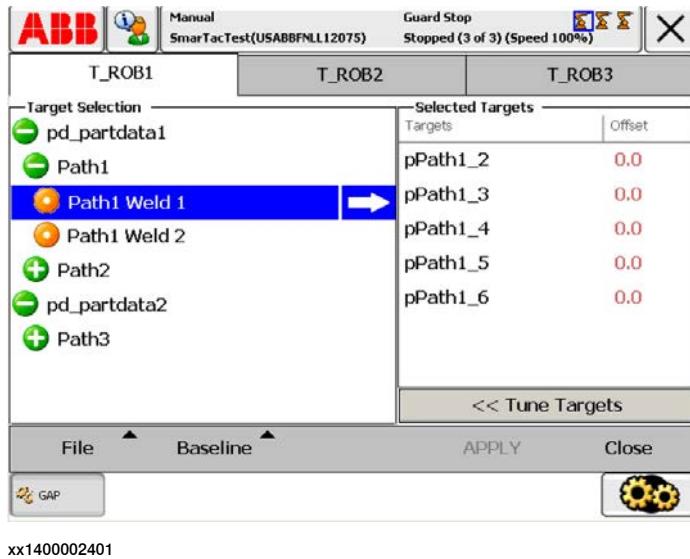


6 Seam Displacement options

6.3 Functions available in Seam Displacement

6.3 Functions available in Seam Displacement

FlexPendant screen appearance



xx1400002401

Seam Displacement dialog

	Description
Target selection	Select welds from the tree view and add them to the right-hand section by selecting the arrow.  Note If a weld is used in more than one routine, it will appear the same everywhere it is used. Changes made to the offset will be the same for everywhere it is used.
Selected targets	Lists all selected targets within a weld and their current offset. Select the recycle bin to the right to remove the target from the selection.
File	You can save and load selections of often-used targets using the File menu. If your system uses UAS, this may be the only way to select targets for editing.
Baseline	To apply or reject the changes made to offset values, select: <ul style="list-style-type: none">• Restore to original to discard all changes to the currently selected target positions• Restore entire program to original to discard all changes to target positions (also applies to changes made in the program editor)• Commit to current to apply all current changes to the selected target positions• Commit entire program to current to apply all changes to target positions (also applies to changes made in the program editor)
Tune targets	Tap Tune targets to display a keyboard for editing the offset values. The offset value is the length of the vector calculated from the x, y and z values changed in the Tune targets menu.
APPLY	Tap APPLY to apply changes made in the Tune targets menu.

Continues on next page

Related information

Positions can also be modified by jogging the robot to the new position.

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Index

A

API, 15

C

configuration, 59
constants, 83
create menu, 32
create part, 47
custom application window, 56

D

danger levels, 12
debug part, 43
dynamic part, 49
dynamic parts and menus, 22

E

edit menu, 38
edit part, 53
EE_ABORT, 84
EE_CLOSE_JIG, 84
EE_CYCLE_START, 84
EE_INDEX, 84
EE_OPEN_JIG, 84
EE_POST_PART, 84
EE_POST_PROC, 84
EE_POST_PROD, 84
EE_PRE_PART, 84
EE_PRE_PROD, 84
EE_PROC_START, 84
EE_SERVICE, 84
EE_WAIT_ORDER, 84
EE-START, 84
events, 18, 84
ExecEngine, 71
Execution Engine, 16
execution state, 83

F

filter, 40
functions, 76

G

GAP_SERVICE_TYPE, 83
GAP_SETUP_TYPE, 83
GAP_SHOW_ALWAYS, 83
GAP_SHOW_NEVER, 83
GAP_SHOW_SAFE, 83
GAP_SHOW_SERVICE, 83
GAP_STATE_IDLE, 83
GAP_STATE_PART, 83
GAP_STATE_SERV, 84
GAP_STATE_UNKN, 83
GAP_TASK_NAME, 83
GAP_TASK_NO, 83

I

icons, 57

instructions, 71

M

main menu, 26
menudata, 21
MultiMove, 27, 62

N

new menu, 32
new part, 47

P

partdata, 21
Part handler, 43
PLC support, 65
PMgrAtSafe, 76
PMgrAtService, 77
PMgrAtState, 78
PMgrAtStation, 79
PMgrGetNextPart, 72
PMgrNextStation, 80
PMgrRunMenu, 75
PMgrSetNextPart, 74
PMgrTaskName, 82
PMgrTaskNumber, 81
preview, 45
Production Information, 41
Production Screen, 26
public constants, 83

R

RAPID constants, 83
RAPID functions, 76
RAPID instructions, 71

S

safety, 11
signals, 12
signals in manual, 12
symbols, 12
safety signals
 in manual, 12
Seam Displacement, 85
Service menu, 30
Setup menu, 28
signals
 safety, 12
starting Production Manager, 25
state icons, 57
symbols
 safety, 12
system parameters, 59

T

test part, 55

U

User Authorization System, 63
user interface, 25

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