ROBOTICS

Application manual

Production Screen

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Application manual
Production Screen
RobotWare 6.09

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Original instructions.

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Overview of this manual

About this manual

This manual describes the RobotWare option Production Screen.

This manual contains instructions for

- installing the option
- adding and configuring apps and widgets
- modifying the xml-file

Usage

This manual should be used during

- installation and configuration.

Who should read this manual?

This manual is intended for:

- developers of FlexPendant applications
- installation personnel

References

Reference	Document ID
Operating manual - Emergency safety information	*3HAC027098-001*
Operating manual - IRC5 with FlexPendant	*3HAC050941-001*
Operating manual - RobotStudio	*3HAC032104-001*
Operating manual - Getting started, IRC5 and RobotStudio	*3HAC027097-001*
Operating manual - Troubleshooting IRC5	*3HAC020738-001*

Revisions

Revision	Description
-	Released with RobotWare 6.0.
A	Released with RobotWare 6.02. • Minor corrections.
B	Released with RobotWare 6.03. • The previous limitation of five app bars is removed. • Minor corrections.
C	Released with RobotWare 6.09. • Section *XML tags for the project on page 22* updated with information regarding SilentMerge.

Product documentation

Categories for user documentation from ABB Robotics

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

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

Product manuals

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

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

Technical reference manuals

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

Application manuals

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

An application manual generally contains information about:

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

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Operating manuals

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

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1 Introduction to Production Screen

1.1 System overview

What is Production Screen?

The *Production Screen* option is a framework for creating a customized GUI that can be used to present process data and status as well as execute FlexPendant applications.

The user interface works as a portal to launch FlexPendant SDK and ScreenMaker applications that are embedded into Production Screen.

The FlexPendant normally allows up to six applications with command bar buttons running simultaneously. Production Screen increases this limit by providing means to start applications from within the framework.

> **Note**
>
> Production Screen is only used to launch applications. A separate tool is required to create the applications.

For more information on creating FlexPendant applications, see *http://developercenter.robotstudio.com*, and the ScreenMaker section in *Operating manual - RobotStudio*.

The widget concept

Widgets are small applications with simple GUI:s that can run on the Production Screen desktop. The widgets can run simultaneously in the widget area and thus be used to construct a customized bigger view.

Up to 25 widgets can be placed in three different pages in the widget area.

The app concept

Apps are normal FlexPendant applications that are executable from Production Screen. Apps started from Production Screen have some extended behavior that is provided by the framework, for example error indication.

1.2 Glossary

Term list

Term	Explanation
app bar	A menu bar for apps at the bottom of the Production Screen desktop. The app bar consists of several pages with a maximum of six apps per page. At most 12 apps can run simultaneously.
app	Apps and applications started from, and running within, the Production Screen framework. The custom made apps can be created by the user as ordinary FlexPendant SDK applications.
application	Applications started from the ABB menu. Apps and applications are essentially the same. In this manual the term *apps* is used for applications started within the Production Screen framework, and the term *applications* is used for applications started from the ABB menu.
GUI	Graphical user interface.
task bar	Applications started from the ABB menu are shown in the task bar.
widget area	An area of the Production Screen desktop where widgets can be placed. It consists of three separate pages that can easily be browsed.
widgets	Small applications with a simple GUI running in one of three widget areas in Production Screen.

2 Installation

Prerequisites

The following is required to install Production Screen to a robot controller. Once installed, no specific software or tools are required.

- IRC5 controller equipped with the SxTPU3 FlexPendant (*3HAC028357-001*).
- RobotStudio.
- RobotWare build with Production Screen.
- RobotWare license key with the option *Production Screen* enabled.
- The RobotWare option *FlexPendant Interface* is required when running widgets and/or apps created in Visual Studio 2008.

The following is recommended but not required (optional).

- FlexPendant SDK installed on PC when developing widgets and apps with Visual Studio 2008.

Installing the software

Use this procedure to install the needed software to a PC.

	Action
1	Install RobotStudio.
2	Install RobotWare.
3	Optional: Install FlexPendant SDK, if using Visual Studio 2008 to develop widgets or apps.

For more information see *Operating manual - RobotStudio*.

Note

It is recommended to use the same release of RobotStudio, ProductionScreen (RobotWare), and FlexPendant SDK.

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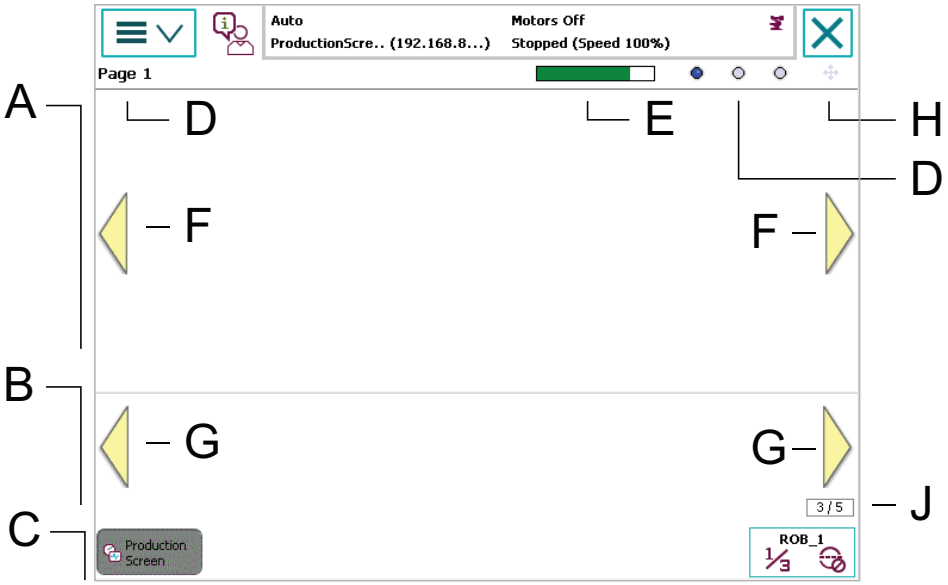
3 The FlexPendant user interface

3.1 RobotWare Production Screen

Overview



xx1200000895

	Parts	Description
A	Widget area	Widgets are shown in the widget area.
B	App bar	Apps are shown in the app bar.
C	Task bar	Applications started from the ABB menu are shown in the task bar.
D	Widget page name Widget page indicator	Indicates the currently shown widget page. There are three widget pages available. Tap one of the indicators to view a different page.
E	Memory status indicator	Indicates the FlexPendant memory consumption. Tap the memory status indicator to switch from graphical indication to numerical indication in kilobytes (kB).
F	Widget page navigation arrows	Tap the widget area once to show the widget page navigation. The widget page navigation hides after three seconds. Tap the page navigation arrows to view the next page.
G	App bar navigation arrows	There are five app bars available. Tap the page navigation arrows to view the next app bar.
H	Widget move state	Click the icon to enable *widget move state*. When enabled, a widget can be moved to a new position by tapping and holding it. **Note** When *widget move state* is enabled, buttons in the widget cannot make use of tap and hold functionality.

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	Parts	Description
J	App page indicator	A page indicator that shows the current and the last app bar number.

Tip

Use the stylus pen when navigating on the FlexPendant. The pen is located on the back of the FlexPendant.

The widget area

The widget area is a 10 x 4 grid of cells. Each cell is 60 x 60 pixels. The smallest space a widget can occupy is one cell.

Widget area navigation

Tap the widget page indicators or the widget page navigation arrows to change widget page.

To access the widget location view, first enable *widget move state* then tap and hold the widget. The widget can now be moved by tapping any cell in the widget area.

The widget can also be moved to a different page. Tap and hold a widget to access the widget location view. Tap the desired page in the widget page indicator. Finally, tap any cell in the widget area.

xx1200000896

Note

A padlock will appear when trying access the widget location view for a locked widget.

Note

When *widget move state* is enabled, buttons in the widget cannot make use of tap and hold functionality.

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The app bar

There can be several app bars available, where each app bar can hold up to six apps.

App bar navigation

Tap the app bar navigation arrows to to view the next app bar.

Tap the button once to start the app. To close the app, first tap and hold the button, then tap the close menu item.

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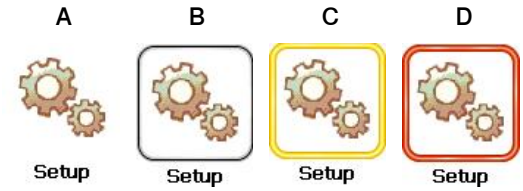
App status

The status of the app is indicated by the border surrounding the app.



xx1200000897 xx1200000898 xx1200000899 xx1200000900

	Description	Status
A	No border.	The app is not running.
B	Black border.	The app is started.
C	Yellow border.	The app has an alert.
D	Red border.	The app has an error.

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4 Setting up Production Screen

4.1 Programming guidelines

Introduction

Developing an application for the FlexPendant, a device with limited process and memory resources, can be quite demanding. Issues such as performance and memory management need to be addressed.

It is strongly advisable to take the time to read the available manuals on this topic, before rushing into coding.

For more information on creating FlexPendant applications see *http://developer-center.robotstudio.com*, and the ScreenMaker section in *Operating manual - RobotStudio*.

The following sections are an addition to that information.

Creating widgets

Widgets can be created either in Visual Studio 2008, or in ScreenMaker for RobotWare 5.60 and later.

If FlexPendant SDK has been installed, a new widget or app project can be created by selecting the corresponding template in Visual Studio.

Visual Studio 2008

A widget must inherit the WidgetForm class. This class wraps the needed ITpsViewSetup and ITpsViewActivation interfaces into abstract methods which must be implemented according to FlexPendant SDK guidelines and best practices.

It is important to note that failing to deactivate subscriptions for widgets will impact performance negatively.

ScreenMaker

When creating a new widget in ScreenMaker for RobotStudio 6.0, the Production Screen widget template must be used.

When creating a new widget in ScreenMaker for RobotStudio 5.60, the type must be set to Production Screen in the screen project properties.

The binding functionality in ScreenMaker is supported by Production Screen, and the source can be configured dynamically in the *ProductionSetup.xml* configuration file. This means that a widget does not have to be rebuilt to change which RAPID variable or I/O signal is used by the binding. For more information, see *XML elements for the widget tag on page 23*.

For more information on how ScreenMaker is used to create widgets, see *Operating manual - RobotStudio*.

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Creating apps

Follow the guidelines on creating FlexPendant applications.

> **Note**
>
> Applications created with ScreenMaker can be used in Production Screen.

TAF

The *Teach Pendant Application Framework* (TAF) is the application service provider that runs on the FlexPendant.

A FlexPendant application uses ITpsViewSetup and ITpsViewActivation to ensure proper install/uninstall and activation/deactivation.

Production Screen uses TAF to make sure that widgets and apps are installed and activated properly by forwarding the events.

Install and uninstall

It is important not to make any calls to FlexPendant or controller system objects from the constructor of the app or widget. These calls should, if they are part of the configuration of the widget or app, be made from the install routine. This way it is ensured that all system configurations and initialization have been performed.

See *Programming examples on page 21*.

Activate and deactivate

It is important that subscriptions to events, such as changes on I/O signals or RAPID variables, are deactivated when the widget goes out of scope.

This is to prevent the processor to be slowed down by execution of unnecessary code. This is done by setting up subscriptions in the activate method and tearing them down in the deactivate method.

A widget goes out of scope if the widget page is changed to one where the widget is not visible, or if the Production Screen application goes out of scope.

See *Programming examples on page 21*.

Indata

It is possible to pass configuration data from the setup file to a widget or app. This is done with the element `InData` in the configuration file.

This data will be interpreted as a string and passed as is to the install method. It is then possible to parse the file and configure the widget. The format of the in data is decided by the implementor of the widget or app.

See *Programming examples on page 21*.

4.2 Programming examples

Install and uninstall

```
private AnalogMeterControl _meter;
private Controller _controller;
private AnalogSignal _signal;
private Image _bgImage;
//
public override bool Install(object sender, object data)
{
  if (_meter == null) return false;
  _controller = new Controller();
  string s = data as string;
  if (s != null)
  {
    string[] configs = s.Split(':');
    if (configs.Length >= 2)
    {
      _meter.Title = configs[0];
      _signal = _controller.IOSystem.GetSignal(configs[1]) as
           AnalogSignal;
    }
    if (_signal == null)
    {
      _meter.Title = "***Disconnected***";
      return false;
    }
    _meter.MinLevel = _signal.MinValue;
    _meter.MaxLevel = _signal.MaxValue;
    _meter.Image = _bgImage;
    return true;
  }
  return false;
}
```

Activate and deactivate

```
public override void Deactivate()
{
  if (_signal != null) _signal.Changed -= new
       SignalChangedEventHandler(Signal_Changed);
}
public override void Activate()
{
  if (_signal != null)
  {
    _meter.Value = (double)_signal.Value;
    _signal.Changed += new
         SignalChangedEventHandler(Signal_Changed);
  }
}
```

4.3 The production setup XML file

Introduction

The setup of Production Screen is done in an XML file. The following chapter describes the setup of this XML file

The XML file is named *ProductionSetup.xml* and is located in the *"../HOME/ProdScr"* folder of the controller flash disk.

XML tags for the project

The following tags are used for the setup of the project.

Tag	Description
<ProjectSettings ... Grid = "false" Separator = "true" RemoveEmptyAppSlots = "true" >	Project settings. Show/hide the widget grid. Show/hide a graphical line between the widget area and the app bar. Remove all empty gaps in the app bar (default value is true).
<Apps>	Collection of apps.
<App>	Individual app.
<Widgets>	Collection of widgets.
<Widget>	Individual widget.
<WidgetPages> <Page> <Page> <Page>	The name of the widget pages as shown in the widget area. The name of page 1. The name of page 2. The name of page 3.
<SilentMerge>	Merge configurations silently: In order to facilitate remote installation of Production Screen setup files, this tag can be used to disable the message box with information about duplicated or moved apps and widgets. Messages will be added to the ProdScr.log file where issues and events are generally stored. To disable the message box, add the attribute SilentMerge="true" to the new project setup file, as: <ProjectSetting ... SilentMerge="true"> The attribute will not be added to the resulting setup file. If several files are merged at the same time the message box is disabled if any of the files have the attribute set to true.

XML elements for the app tag

Following elements can be found in the <App> tag.

Elements	Description
<Name>	The name of the app.
<SystemApp>	Set to FALSE for own apps. Set to TRUE for BaseWare applications.

Continues on next page

Elements	Description
<Index>	The position of the app in the app bar. If the attribute *RemoveEmptyAppSlots* is set to true, the values are regarded as a sort order. Only one app can occupy a position and if several are configured to use the same position, the first will get the position and the rest will be moved to a free position. If *RemoveEmptyAppSlots* is false, the values are considered fixed and an error is raised if any conflicts are detected. There can be up to six apps in each app bar. Empty app bars are removed.
<Assembly>	The name of the *.dll* file including the file type. The file must be located in the *".../HOME/ProdScr/tps"* folder.
<Type>	The NameSpace name together with the main class name.
<Image>	The name of the icon image file including the file type. The image shall be 64 x 64 pixels and the allowed file types are *.png*, *.bmp*, *.gif*, and *.jpg*. The file must be located in the *".../HOME/ProdScr/tps"* folder.
<AlertSignal>	Digital output signal that can be set from RAPID or another application to indicate that this app wants the user to activate it and perform some task, indicated by a yellow frame around the app. The signal must be declared in the system (it will not be created).
<ErrorSignal>	Digital output signal that can be set from RAPID or another application to indicate that this app is in an error state and that the user should activate it and perform some task, indicated by a red frame around the app. The signal must be declared in the system (it will not be created).
<InData>	Optional string of input data to be interpreted by the app.

XML elements for the widget tag

Following elements can be found in the <Widget> tag.

Elements	Description
<WidgetLocked = "true">	Set to true if the widget shall be locked. Default value is false.
<Name>	The name of the widget. Must be unique.
<Page>	Widget page number.
<Assembly>	The name of the *.dll* file including the file type. The file must be located in the *".../HOME/ProdScr/tps"* folder.
<Type>	The NameSpace name together with the main class name.

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Elements	Description

<Bindings>
<Binding
PropertyName="xxx"
BindingType="yyy"
DataName="zzz">
	A list of mappings between GUI controls and data on the controller, ie RAPID data and/or I/O-signals. Used by widgets made in ScreenMaker to dynamically redirect a ScreenMaker binding at startup. This enables reuse of widgets for different variables or I/O without having to recompile the widget.
	Example:
	`<Bindings>`
	`  <Binding PropertyName="meter1.Value"`
	`  BindingType="SIGNAL"`
	`  DataName="aoMeterSignal" />`
	`  <Binding PropertyName="meter1.Title"`
	`  BindingType="RAPID"`
	`  DataName="Flow1Title" />`
	`</Bindings>`

<Position> <X> <Y>	The position of the widget in the 10 x 4 grid of cells. The upper left corner is position (1, 1) and the bottom right corner is position (10,4).
<ZIndex>	The z-index is used when placing widgets on top of each other. Default value is 0. Allowed values are 0 to 99.
<InData>	Optional string of input data to be interpreted by the widget.

Multiple Configurations

Several products that use the Production Screen framework may want to add their widgets and apps to the configuration. To assist this process the framework allows new configurations to be added in the *.../HOME/ProdScr/config* folder. Any valid setup file with the extension *.xml*, will be merged into the existing *ProductionSetup.xml* file at the startup of the Production Screen application. This process will warn the user about conflicts, such as duplicated or overlapping apps or widgets.

Note

The files will be removed when they have been merged into the setup.

5 RAPID reference information

5.1 Functions

5.1.1 PS_ChangeAppPage - Change the currently displayed app page

Usage

`PS_ChangeAppPage` *(change app page)* is a function that changes the currently displayed app page.

Basic examples

The following example illustrates the function `PS_ChangeAppPage`.

Example 1

```
PS_ChangeAppPage(1);
```

Displays the first app page.

Arguments

```
PS_ChangeAppPage (PageNumber)
```

`PageNumber`

Data type: `num`

The page number.

Program execution

The function `PS_ChangeAppPage` displays the selected app page.

Syntax

```
PS_ChangeAppPage '('
  [ PageNumber ':=' ] < variable (VAR) of num > ')'
```

5.1.2 PS_ChangeWidgetPage - Change the currently displayed widget page

Usage

`PS_ChangeWidgetPage` *(change widget page)* is a function that changes the currently displayed widget page.

Basic examples

The following example illustrates the function `PS_ChangeWidgetPage`.

Example 1

```
PS_ChangeWidgetPage(2);
```

Displays the second widget page.

Arguments

```
PS_ChangeWidgetPage (PageNumber)
```

`PageNumber`

Data type: `num`

The page number.

Program execution

The function `PS_ChangeWidgetPage` displays the selected widget page.

Syntax

```
PS_ChangeWidgetPage '('
  [ PageNumber ':=' ] < variable (VAR) of num > ')'
```

5.1.3 PS_IsRunning - Check if Production Screen is running

Usage

`PS_IsRunning` *(Production Screen is running)* is a function that checks if the Production Screen application is running.

Basic examples

The following example illustrates the function `PS_IsRunning`.

Example 1

```
VAR bool psrunning;
psrunning := PS_IsRunning();
```

`psrunning` will be `TRUE` if Production Screen is running, else it will be `FALSE`.

Return value

Data type: `bool`

The return value will be `TRUE` if Production Screen is running, else it will be `FALSE`.

Arguments

```
PS_IsRunning ( [\ForceUpdate] )
```

`[\ForceUpdate]`

Data type: `switch`

The `ForceUpdate` flag indicates that `PS_IsRunning` shall perform an actual handshake with the Production Screen framework.

Program execution

The function `PS_IsRunning` is used to check if the Production Screen framework is running.

Error handling

The following recoverable errors can be generated. The errors can be handled in an ERROR handler. The system variable `ERRNO` will be set to:

Name	Cause of error
`ERR_WAIT_MAXTIME`	Time-out when accessing Production Screen.

Syntax

```
PS_IsRunning '('
  ['\'ForceUpdate] ')'
```

A function with a return value of the data type `bool`.

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