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General

Release Information

The information should be considered as last minutes information and most up-to-date.

For more information please visit RRI Homepage:

<http://prodapp2.se.abb.com/rri/>

Introduction

This file contains release notes for Robot Application Builder (RAB) 5.12.

RAB 5.12 is included on the RobotWare 5.12 DVD and can be used for free by anyone who wants to develop a customized operator interface for the IRC 5 controller. No license is required to use Robot Application Builder. The end-user of a FlexPendant SDK application, however, needs the RobotWare option FlexPendant Interface on the targeted robot controller. Likewise, to make use of a PC SDK application PC Interface is required on the targeted controller.

To install Robot Application Builder click *Developer Tools / Robot Application Builder* on the RobotWare & RobotStudio DVD. Both PC SDK and FlexPendant SDK will be installed side by side with any previous version. If you want further details about the installation click *Browse DVD Contents / Robot Application Builder* on the RobotWare & RobotStudio DVD. See User's Guide chapter 2 *Installation and Setup* for installation details.

The installation includes software, documentation and tools as specified below:

Software

PC SDK (5.12) and FlexPendant SDK (5.12)

Documentation

User's Guide: Application manual - Robot Application Builder (5.12), Rev C (Html Help and Pdf).

PC SDK Reference (5.12), documentation of class libraries with method signatures in C# and Visual Basic (Html Help).

FP SDK Reference (5.12), documentation of class libraries with method signatures in C# and Visual Basic (Html Help).

FlexPendant Style Guide (Html Help)

Tools

ABB Compliance Tool - automatically run when compiling an FP SDK application, creating the *.gtpu.dll.

ABBControllerAPI.msm - merge module including the PS SDK dlls to be used when a PC SDK application is deployed to a customer's PC

ABB Industrial Robot Communication Runtime.msi - to be used when a PC SDK application is deployed to a PC without RobotStudio

After installation the documentation can be launched from Windows Start Menu\Programs\ABB Industrial IT\Robotics IT\Robot Application Builder 5.12.

In no event shall ABB be liable for incidental or consequential damages arising from use of this product, of the software and hardware described in relating product documentation.



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Visit our web site at <http://www.robotstudio.com/community> for information and updates. Click the Download symbol to the right in order to download RAB 5.12 for free.

Click Developer Tools to learn more about the SDKs and try out the User Forum, where RAB developers discuss software problems and solutions online.

Installation

Microsoft Visual Studio development environment is used to develop RAB applications. Visual Studio 2005 or Visual Studio 2008 is required on the PC before the installation of RAB 5.12.

RAB 5.12 is installed side by side with any previous RAB version. It includes PC SDK 5.12 and FlexPendant SDK 5.12.

The default installation path is C:\Program Files\ABB Industrial IT\Robotics IT\Robot Application Builder 5.12.

Before you start the installation you are recommended to read chapter 2, *Installation and Setup*, in the User's Guide which is available on the DVD in PDF format.

Also make sure that you have administrator permissions on the computer that you are using.

Note! *When installing RAB on Windows Vista OS you may get a Visual Studio error message saying "The operation could not be completed. The requested operation requires elevation". This error is due to failure of the installation of the FP SDK templates and project wizard, which is prevented when Vista's User Account Control (UAC) feature is enabled. To solve the problem you need to uninstall RAB, disable UAC, reinstall RAB, then re-enable UAC (if desired). It is now possible to use the Project Wizard and create a FlexPendant project.*

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Hardware and SoftWare requirements

Software requirements

Microsoft Windows Vista SP1 or Microsoft Windows XP SP2

Note! Robot Application Builder does not yet support 64-bit editions. As the SDK assemblies are built for 32-bit, they cannot be loaded by a 64-bit client application.

Microsoft Visual Studio 2005 or

The FlexPendant SDK requires Standard edition or better, whereas PC SDK application developers can manage with the Express edition for C# or VB. No separate installation of .NET Compact Framework 2.0 is needed.

Microsoft Visual Studio 2008

The Professional Edition or better is required to develop applications for Smart Devices, such as the FlexPendant. No separate installation of .NET Compact Framework 2.0 is needed.

Note! Robot Application Builder is developed and tested for the English version of Visual Studio.

Note! PC SDK requires Robot Communications Runtime to be installed on your PC. It comes with the RobotStudio installation, but can also be installed separately from C:\Program Files\ABB Industrial IT\Robotics IT\Robot Application Builder 5.12\redistributable\RobotCommunicationRuntime after you have installed RAB.

Note! Debugging the FlexPendant device

Depending on the OS, Visual Studio version and FlexPendant version you are using there may be different requirements for setting up and using the Visual Studio debugger on the FlexPendant device. See the section [Debugging the device](#) for further information.

Recommended hardware

50 MB free disk-space on the installation hard disk

Supported FlexPendant device versions

- SxTPU-1 (executes with .NET CF 2.0 and WinCE 4.2)
- SxTPU-2 (executes with .NET CF 2.0 and WinCE 5.0)
- SxTPU-3 (executes with .NET CF 3.5 and WinCE6.0)

IRC5 requirements

- RobotStudio 5.12 for building a test system and for debugging and testing in the virtual environment
- For PC SDK applications - RobotWare option "PC Interface" for communication with a real IRC5 controller.
- For FlexPendant SDK applications - RobotWare option "FlexPendant Interface" for communication with a real IRC5 controller.
- RobotWare version 5.12

Note! PC applications developed with RAB 5.12 require RobotWare version 5.07 or higher on the IRC5 controller. FlexPendant applications developed with RAB 5.12 should be used with RobotWare 5.12.

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Compatibility

RAB 5.12 and 5.11 are compatible, there are no breaking changes.

The RAB product is under development and compatibility between RobotWare releases cannot be absolutely guaranteed. The goal is to be 100% compatible and the development team tries hard to achieve this. Due to necessary upgrades in the Microsoft platforms or new demands breaking changes sometimes cannot be avoided. There is more specific information on compatibility issues further down in this document.

Note! *No guarantee is given for backward compatibility. Compatibility between RobotWare revisions is however guaranteed (RAB 5.12 will be compatible with RW 5.12.01 etc).*

Compatibility with other products:

Use RobotStudio 5.12

Licensing

1. Robot Application Builder NO LONGER requires a design time license.
2. You NO LONGER need to add a Licenses.licx file to your PC SDK development projects.

Note! Releases earlier than RAB 5.10, e. g. FP SDK 5.08 and 5.09 included in the RAB 5.10 release still require a license. If you must have such a license you can get one for free by contacting support.

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PC SDK

Compatibility

- Compatibility PC SDK 5.12 vs 5.11:
PC SDK 5.12 is compatible with PC SDK 5.11. There are no breaking changes.
- Compatibility PC SDK 5.11 vs 5.10:
PC SDK 5.11 is compatible with PC SDK 5.10. There are no breaking changes.
- Compatibility PC SDK 5.10 vs 5.09:
PC SDK 5.10 is compatible with PC SDK 5.09. There are no breaking changes.
- Compatibility PC SDK 5.09 vs 5.08:
The following breaking changes exist between PC SDK 5.09 and PC SDK 5.08.

EventHandlers and events

For 5.09 the internal event architecture was completely redesigned.

1. All previous event handlers are [Obsolete] and existing events are changed to the EventHandler<TEventArgs> generic delegate.

Ex: This example shows how to change from the old to the new event handler type.

// This old line will fail...

```
myEventLog.MessageWritten += new MessageWrittenEventHandler( OnMessage );
```

// and should be replaced like this...

```
myEventLog.MessageWritten += new EventHandler<MessageWrittenEventArgs>( OnMessage );
```

//or preferably...

```
myEventLog.MessageWritten += OnMessage;
```

2. Previous versions of PC SDK used the Windows Thread Pool internally to raise events. From 5.09 a single thread is used to dispatch all events. This reduces the risk of race conditions in client code. However, it makes it even more important to use the Control.BeginInvoke(...)/Control.EndInvoke(...) pattern to avoid event starvation. Additionally, we now raise all events internally prior to any external subscribers, as this will reduce the risk of race conditions between inner and external subscribers.

If your application is based on Control.Invoke(...) and not on Control.BeginInvoke(...) all events will be serialized, both internally and externally. However in previous PC SDK versions you may encounter "out-of-order" events and thread pool starvation through the use of Control.Invoke(...).

Some public events raise an initial event immediately when the subscription is activated; however this is not consistent or by design and should therefore be avoided. Later versions of PC SDK will remove all initial events.

3. Mastership.Request(...) throws an InvalidOperationException if the user is not authenticated against the controller, previous versions raised an ArgumentException.

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Updates in PC SDK -5.12 vs 5.11

New features:

Remote UI-Instruction enables an operator to communicate with the executing RAPID program from a PC SDK application (instead of using the FlexPendant) when a UI- or TP-RAPID instruction is executed. The following instructions are supported:

UIAlphaEntry,
UIListView,
UIMessageBox,
UIMsgBox,
UINumEntry,
UINumTune,
TPErase,
TPReadFK,
TPReadNum,
TPWrite

To make use of this new function the PC SDK application sets up a subscription to the *UIInstructionEvent*. When notified of an event it creates a dialog according to the event arguments. The method *SendAnswer* transfers the operator response back to the RAPID program.

Miscellaneous (new classes, events, methods and properties):

- RapidData properties: IsTaskPers (whether data is declared as PERS or TASK PERS), IsLocal (declared in a module that is not globally visible), TypeUrl (path to the declaration of the RAPID type), RapidType (eg. "num")
- Signal.Type (DigitalOut, GroupIn etc)
- Task methods: GetRobTarget, GetJointTarget and overloaded DeleteProgram, LoadProgramFromFile (allows a PC SDK application to delete, load and start a RAPID program without any unnecessary delays)

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Updates in PC SDK -5.11 vs 5.10

New features:

Development environment:

Changed installation (supports working with several PC SDK versions side by side on a PC)
Robot Application Builder 5.11 is installed side by side with any previous RAB version. It includes PC SDK 5.11 and FlexPendant SDK 5.11
Support for Windows Vista
Support for VS 2008

Note! RAB 5.11 has not yet been fully tested with Visual Studio 2008.

Miscellaneous (new classes, events and methods):

IOSystem.GetIOBuses (gets all IO buses of the controller)
IOSystem.GetIOUnits (gets all IO units of the controller)
IOBus properties (Name, State, Type)
IOUnit properties (Name, Bus, Address, Type, Logical State, PhysicalState)
IOUnit events (SignalChanged event, StateChanged event)

Task.SetProgramPointer

Task.SearchRapidSymbol & Task.GetRapidData now support accessing RAPID data declared in SHARED module

Limitation: RAPID data declared in a SHARED HIDDEN module cannot be accessed.

Updates in PC SDK -5.10 vs 5.09

New features:

New domains:

Messaging (Together with RAPID Message Queue this functionality represents a new, flexible way for a RAB application to interact with a RAPID task. It makes use of the IPC mechanism provided by Microsoft Windows OS for facilitating communications and data sharing between applications.)

Miscellaneous (new classes, events and methods):

High priority event subscriptions. (To speed up event notification you can set up subscription priorities. This applies to I/O signals and persistent RAPID data.)

MechUnit.DriveModule (Gets the drive module of the mechanical unit.)

Controller. ReleaseUnmanagedResources(Should be called periodically by the application developer to release unmanaged resources.)

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FlexPendant SDK

Debugging the device

Depending on the OS, Visual Studio version and FlexPendant version you are using there may be different requirements for setting up and using the Visual Studio debugger on the FlexPendant device. To debug with VS 2008 (as well as VS 2005 without SP1) you must follow a procedure presented on the RAB User Forum. The procedure will be different for each RobotWare release.

XP and VS 2005 with SP1 is the required platform for debugging the FlexPendant without any adaptations. In case you are using this, the procedure described in User's Guide will work.

Service Pack 1 or 2 for .NET Compact Framework 2.0 (.NET CF 2.0 SP2) is required for setting up and using the Visual Studio debugger on the FlexPendant device. These can be downloaded from <http://www.microsoft.com/downloads>.

If your PC is running under Windows Vista "Windows Mobile Device Center" needs to be installed in order to connect to the device.

Further information and updates concerning this topic will be published on the RAB User Forum.

Compatibility

Compatibility FlexPendant SDK 5.12 vs 5.11:

- FlexPendant SDK 5.12 is compatible with FP SDK 5.11.

Compatibility FlexPendant SDK 5.11 vs 5.10:

- FlexPendant SDK 5.11 is compatible with FP SDK 5.10.

Compatibility FlexPendant SDK 5.10 vs 5.09:

- FlexPendant SDK 5.10 is compatible with FP SDK 5.09.

Compatibility FlexPendant SDK 5.09 vs 5.08:

- FlexPendant SDK 5.09 is compatible with FP SDK 5.08.

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Updates in FP SDK -5.12 vs 5.11

Miscellaneous (new classes, events, methods and properties):

- The wizard for creating FlexPendant projects has been improved in terms of flexibility and ease-of-use. (See User's Guide)

Note! Be aware that FP SDK applications that use the new property StartPanelLocation.None CANNOT be run on RobotWare released before 5.11.01

- Improved performance at controller access, eg. when reading Controller.State or RapidData.Value.

- RapidData properties: IsTaskPers (whether data is declared as PERS or TASK PERS), IsLocal (declared in a module that is not globally visible), TypeUrl (path to the declaration of the RAPID type), RapidType (eg. "num")

- Possibility to use the databinding feature of the Designer to access RAPID data declared in shared module; in the RapidDataBindingSource supply the name of the data but no task or module. (This also works for –Shared –Hidden module.)

- Task methods: GetRobTarget, GetJointTarget

Updates in FP SDK -5.11 vs 5.10

New features:

Development environment:

Changed installation (Robot Application Builder 5.11 is installed side by side with any previous RAB version. It includes PC SDK 5.11 and FlexPendant SDK 5.11)

Support for Windows Vista

Support for VS 2008 (*Professional Edition* is required to develop applications for Smart devices, such as the FlexPendant)

Note! RAB 5.11 has not yet been fully tested with Visual Studio 2008.

Localization:

Support for localizing a FP SDK application to Russian (Ru).

New GUI controls:

- BarGraph
- CheckBox
- Graph
- Led
- NumEditor
- NumericUpDown
- PictureBox
- RadioButton
- DataEditor
- Switch

Note! The new GUI controls are not yet completely tested, further information in the section "Known Limitation".

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New properties in existing UI controls:

-TpsLabel

- WordWrap: multiline instead of tooltip
- MultiStates
 - AllowMultipleStates
 - SelectedStateIndex
 - SelectedStateValue
 - States
 - BaseValue

-Button

- Image, grays out a button that is disabled
- BorderStyle
- MultiStates
 - AllowMultipleStates
 - SelectedStateIndex
 - SelectedStateValue
 - States
 - BaseValue

Miscellaneous (new classes, events, methods and properties):

- Task.Enabled (get/set the status of the task on the task selection panel on the FlexPendant, i.e. whether the task should be started when the user presses the start button of the FP.
- Task.CallRoutine, Task.CancelCallRoutine (calls and starts a service routine or an ordinary RAPID routine without parameters with kept execution stack)
- Task.SearchRapidSymbol, Task.GetRapidData (possibility to access RAPID data declared in SHARED module (but not in SHARED HIDDEN).

Not yet any support to do this from the Designer (using RapidDataBindingSource)

- Controller.Restart

- Support for preventing users from unintentionally closing FP SDK applications launched automatically at warm start. Automatic views have become visible in the ABB menu to allow the user to relaunch in the normal way. Also, a named parameter "Closeable" can be used to disable the close button of a view (see examples below).

VB:

```
<Assembly: ABB.Robotics.Tps.Taf.TpsView("VB", "xyz32.gif", "xyz16.gif", "TpsViewXyz.dll",  
"TpsViewXyz.TpsViewXyz", StartPanelLocation.Left, TpsViewType.Static,  
TpsViewStartupTypes.Manual, Closeable:=False)>
```

C#:

```
[assembly: TpsView("Xyz", "xyz32.gif", "xyz16.gif", "TpsViewXyz.dll",  
"TpsViewXyz.TpsViewXyz", StartPanelLocation.Left, TpsViewType.Static,  
TpsViewStartupTypes.Manual, Closeable = false)]
```

- Support for closing an FP SDK application programmatically by calling CloseMe from the view class (the first view). Limitation: Client views will be removed from TAC when first view is a TpsForm, not when it is a TpsControl.

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Updates in FP SDK -5.10 vs 5.09

New features:

New domain:

SystemInfoDomain (New functionality for retrieving information about the active robot system, e.g. RobotWare version, system name, release and system paths, existing system options and installed additional options.)

New classes:

SystemInfo
Option
SystemOption
AdditionalOption

Miscellaneous (new classes, events, methods and properties):

Controller.IpAddress (IP address, gateway and subnet mask)
Controller.IsVirtual (Checks whether the targeted controller is real or virtual.)
Controller.CurrentUser (Returns the current logged on user.)

RapidDomain.Routine.TextRange (Enables launch of the Rapid Editor at a specified RAPID routine.)

RapidDomain.Module.PersInSync (Checks if the data of a Module object is still in sync with the real values in the controller.)

RapidDomain.Module.SyncPers (Updates the data of the Module object in case they are no longer in sync with the real values in the controller.)

RapidDomain.Task ProgramChanged event (triggered when a module is edited, loaded, added or removed)

Changed behavior in the Controller API:

A System.ObjectDisposedException is thrown when an attempt is made to access an already disposed object.

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Information 5.12

FP SDK - Error in designer when creating new VB project (DSE8267)

When creating an FPSDK project for VB using an empty form (the default) as the startup view, an error message may be displayed in the designer the first time the viewer is opened. The problem does not occur when the startup type is *Form*, or in C#. Work around: Close and re-open the designer.

FPRapidData creates data object that cannot be disposed (DSE8273)

When creating new instances of FPRapidData, FPToolCalibration and FPWorkObjectCalibration, some objects were created internally that could not be disposed by the SDK user. These appeared in the log as possible memory leaks. This has been corrected. The user must dispose the returned RapidDataType object returned by RapidData.DataType (See FP SDK Ref Help.)

Data binding with FP SDK controls caused unexpected updates in the controller (DSE8274)

Before 5.12, the use of data binding with FlexPendant SDK controls could cause the value of a connected RAPID variable or signal to be changed unexpectedly at instantiation of the GUI control. This could happen if "Data Source Update Mode" of the binding source was set to OnPropertyChanged and a non-default value, not matching the actual value of the connected data/signal, was assigned to the control. For example, if the text of a label was set to "1" in design time and the label bound to an I/O signal with the value "0", the signal would be set to "1" once the label was created.

This error has now been corrected. The erratic behavior was first discovered in the new FP SDK controls 'Led' and 'Switch'. For security reasons, their data binding property was disabled in the designer in 5.11. The designer support for data binding for these controls has now been enabled.

DataEditor displays unwanted quotation marks with data (DSE8276)

Text data, read through the FlexPendant SDK data binding components, does not contain any surrounding quotation marks.

No Start Menu link to Compliance tool in RAB Installation (DSE8325)

From RAB 5.11 the compliance tool is found in the installation folder. SDK users who frequently use it can manually add the link to the start menu, quick launch, or desktop.

FPRapidData returns Cancel when OK button is pressed (DSE8326)

The dialogs for RAPID data, tool calibration and work object calibration now return the correct result from user interaction (Cancel or OK).

Undocumented output from memShow command (DSE8327)

Documentation changed.

Console command fpcmd -a output does not match documentation (DSE8328)

Documentation changed.

Closable property in FP SDK doesn't work correctly (DSE8528)

FlexPendant SDK applications that were launched automatically and had the property Closable set to false, were still launched with the close button activated. Applications that were launched on operating mode change were always opened with the close button enabled even if the property Closable was set to false. These problems have now been fixed.

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FontName warning with RAB 5.12 (DSE8749)

The property FontName of type ABB.Robotics.Tps.Windows.Forms.TpsControl has been marked as obsolete in the FP SDK 5.12 release.

If the FontName property is used, a compiler warning will generated, that informs the user that the property Font should be used instead (see below). VB: Me.Font = ABB.Robotics.Tps.Windows.Forms.TpsFont.Font10b C#: this.stBackupFolder.Font = ABB.Robotics.Tps.Windows.Forms.TpsFont.Font10b;

Data binding source causes errors in Visual Studio (DSE8780)

In intermediate builds of FP SDK 5.12, version numbers where not updated correctly for its data binding components.

This caused Visual Studio to fail to generate code for any SignalBindingSource or RapiDataBindingSource components added to a view.

This is now corrected.

RS does not support older FP app (DSE8844)

There is a remaining problem on the Virtual FlexPendant resulting in a CustomAttributeFormatException exception. The problem occurs when the SDK application is built towards a different revision compared to the one running. The problem is related to embedded images.

There are a number of work-arounds:

1. Recompile the SDK application towards a Robot Application Builder with the same revision number as the running system.
2. Remove the StartupType assembly attribute assignment in the SDK TpsView header, i.e., for the TpsView remove StartupType = TpsViewStartupTypes.....)
3. Use one of the new TpsView constructors the contain the TpsViewStartupTypes setting.

The original problem cannot be solved by the ABB development team because it is in software developed by Microsoft. A workaround is now implemented by adding constructors containing the start-up type (see work-around 3). The wizards creating new FlexPendant applications are updated and now use one of the new constructors.

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Information 5.11.01

Documentation for RAB FlexPendant SDK has to be rebuilt (DSE8261)

The reference documentation for the FP SDK 5.11 has been updated.

NumEditor causes NullReferenceException on FlexPendant (DSE8270)

When using the NumEditor control in a TpsControl, the ClickEvent raises a NullReferenceException in Taf.exe that requires the FlexPendant to be restarted. When using the DataEditor control in a TpsControl, it does not display an alpha pad when it is clicked. This has now been corrected.

PictureBox control not available in toolbox (DSE8358)

The FP SDK PictureBox control was missing among the FP SDK controls added to the Visual Studio toolbox. It has now been added.

FP SDK application - unwanted entry in ABB menu (DSE8450)

In RAB 5.10 an FP SDK application using TpsViewStartupTypes.Automatic in the TpsView attribute did not have an entry in the ABB menu of the FlexPendant. In RAB 5.11 this error was corrected. But no solution was provided for users who relied on the previous behavior and *do not want* an entry in the ABB menu for applications that are launched automatically at start-up.

In this revision (5.11.01) a new TpsView argument, StartPanelLocation.None, can be used to prevent *Automatic* and *Invisible* applications from showing up in the ABB menu. Note, however, that the FlexPendant project wizard has not yet been changed, so StartPanelLocation.None has to be applied directly in the code (instead of StartPanelLocation.Left /Right).

Note! Be aware that FP SDK applications that make use of StartPanelLocation.None using RAB 5.11.01 CAN NEVER be run on RobotWare 5.11, but only on RobotWare 5.11.01 and later!

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| | Dealt with by, telephone Anders Trillkott, +46 21 344863 | | |

Known Limitations

- There may be trouble debugging the first generation of FlexPendant device (SXTPU1) with VS 2008.
- When creating an FPSDK project for VB using an empty form (the default) as the startup view, an error message may be displayed in the designer the first time the viewer is opened. The problem does not occur when the startup type is *Form*, or in C#. Work around: Close and re-open the designer
- In manual mode, when a PC SDK application releases master and immediately requests master again, the FlexPendant is locked up when the user presses the prompt to grant write access to the PC SDK application. In automatic mode there is no problem.
- PC SDK IPC Messaging - the PC SDK erratically ALWAYS sends 444 byte. Data must therefore be null terminated. Also, there is a problem reading the data if the PC SDK thread is running as STA. Changing it to MTA will solve that problem.
- ArrayData.FillFromString is not correctly implemented in the PC SDK. Users are recommended to use RapidData.StringValue to read and write small arrays (e.g. 100 num variables) in one call.
- Due to a Microsoft bug the ImageList.Dispose method does not work, causing a memory leak. Microsoft's advice is to set the ImageList to null instead of calling Dispose. This way the memory will correctly be reclaimed by the garbage collector.

avoid:

```
imageList.Dispose();
```

use:

```
imageList = null;
```

The new GUI controls introduced in FP SDK 5.12 are not documented in User's Guide.

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Corrected "Product Defect Document" 5.12

PDD

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|---|---------|
| FPRapidData creates a copy of data object that cannot be disposed | DSE8273 |
| DataEditor displays unwanted quotation marks with data | DSE8276 |
| RAB Installation no longer creates Start Menu link to Compliance | DSE8325 |
| FPRapidData returns a Cancel result when OK button is pressed | DSE8326 |
| Undocumented output from memShow command | DSE8327 |
| Console command fpcmd -a output does not match documentation | DSE8328 |
| FontName warning with RAB 5.12 | DSE8749 |
| Data binding source causes errors in Visual Studio | DSE8780 |

Product Support

If you need help or advice while using the product please visit the User Forum referred to in the introduction. For product support please turn to your local ABB office.