



# RobotStudio

## Product Specification

### Overview

RobotStudio is a product for true off-line programming and simulation of ABB robot systems. To achieve true off-line programming, RobotStudio utilizes ABB VirtualRobot™ Technology. The actual robot system software controls the robot simulation. With the VirtualRobot controller robot programs are accurate and ready to go. Benefits gained by using RobotStudio:

- Reduce risk by visualizing and confirming solutions
- Introduce new parts without interrupting production
- Optimise robot programs to increase productivity
- Generate higher part quality through creation of more accurate paths

RobotStudio includes a number of components; Graphics area, Object browser, Program browser, Properties Window, Virtual Robot Browser, Virtual TeachPendant, IO Simulator and a Program Editor. In addition there is the CAD Converter and Configuration Editor.

### RobotStudio components

- In the Graphics area you can see and manipulate the 3D representation of your station.
- The Object browser displays the content of your station in a textual hierarchy form. In the browser you can change each object's properties.
- The Program browser is used for creating RAPID programs. The Program browser displays the structure of all programs and modules in the VirtualController.
- The Properties Window is used for viewing and editing properties for all the objects in the station.
- ProgramMaker, the Program Editor is used for advanced editing and debugging of your RAPID programs.
- In the Virtual TeachPendant you have a replica of the real robot teach pedant with access to robot functions as in the real robot.
- The IO Simulator is used for monitoring and changing IO signals in your robot program.
- Using the VirtualRobot Browser you can create and configure robot controllers for your Virtual Controller to match your real robot. As an

example you can configure the software options available to the controller, the robot model and several other settings.

### VirtualRobot Technology

RobotStudio utilizes ABB VirtualRobot Technology. The actual robot system software controls the robot simulation. With the VirtualRobot controller programs are accurate and ready to go –true offline programming.



RobotStudio includes support for controller versions 2.1 up to and including version 4.0.62 according to the table below:

	VC 2.1	VC 3.0	VC 3.1	VC 3.2	VC 4.0
Simulation	Yes	Yes	Yes	Yes	Yes
Programming	Yes	Yes	Yes	Yes	Yes
External axes set-up	Manual	Manual	Manual	Guided	Guided
Arm Configuration Support	Manual	Manual	Manual	Guided	Guided
Reachability	Manual	Manual	Manual	Automatic	Automatic

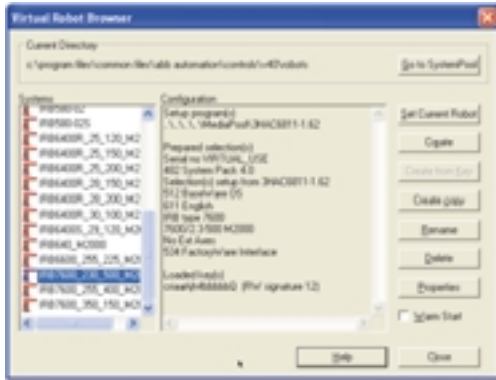
The Virtual Controller calculates the motion part of the complete cycle time. The motion time in the Virtual Controller is 0.1 sec too fast per program cycle (in running mode = cycle). Time that passes when no motion is executed, e.g. for wait-time instructions is not included in the cycle-time.

### VirtualRobot Browser

The VirtualRobot Browser makes it possible to create and modify robot systems for the different controller versions. This includes selecting manipulator type, number of external axes, controller versions and RobotWare options.

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Virtual Robot browser

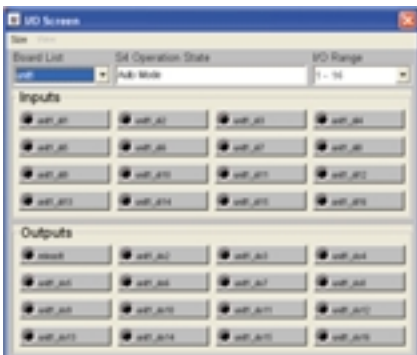
### Teach Pendant

The on-screen Teach Pendant provides full support of the complete RAPID robot language, I/O configuration and system parameters. It simulates the S4/S4c controller Teach Pendant. "Ready-to-run" production programs can be created and tested before they are downloaded to the real robot. The program created in the Teach Pendant can be transferred to the Graphics area, where the targets can be modified.



### I/O Simulator

The I/O Simulator can be used to view and manipulate digital input and output signals during program execution. This feature is useful for testing robot programs that may set outputs or wait on certain input states before continuing. The I/O Simulator automatically configures itself with the I/O boards and signals in use by the virtual robot.



IO Simulator

### ConfigEdit

The ConfigEdit application allows users to easily create and edit robot configuration files for IO and Mechanical Units. Some of the main features of ConfigEdit include:

- Support for all configuration domains
- Standard configuration templates that can be customized
- Cut/Copy/Paste functions
- Help feature to explain configuration parameters
- External Axes Support

RobotStudio supports up to 6 external axes. Both co-ordinated and non co-ordinated motion is supported. Instructions for activation and de-activation of the external axes are available. Models and controller configuration files for standard tracks and positioners are included in the library.

### Modeling

The basic modelling features include creation of 3D components such as boxes, cylinders as well as creation of 2D components, i.e. curves. 3D components can be modified with Intersect, Cut and Join functions.

Placing the equipment in the station can be done by dragging the models in the graphics area by using the mouse, placing the models in any co-ordinate system and by mirroring.

### CAD Import and Export

RobotStudio uses the same geometry kernel as many other CAD companies e.g. AutoDesk. This kernel is called ACIS and the format SAT. Different CAD data formats are supported to/from RobotStudio. Conversion is done by the CAD Converter

### CAD Converter

The following formats are supported:

Format	Direction	
IGES 5.2 - ACIS	Both directions	Included
STEP (AP214, AP203) - ACIS	Both directions	Included
VDAFS 2.0 - ACIS	Both directions	Option
CATIA up to 4.2 - ACIS	Both directions	Option
STL - Jupiter Graphics (JT)	Both directions	Option
VRML - Jupiter Graphics (JT)	Both directions	Option

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### Robot Model Library

With RobotStudio a library of robots, external axes, tools and equipment are included. The following robot models are provided as part of the standard library:

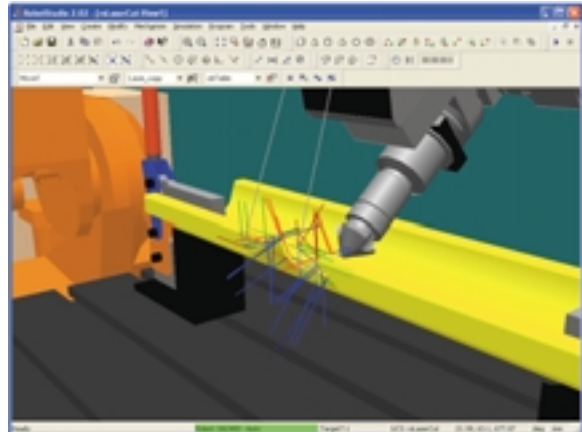
IRB Model	M98	M98A	M99	M2000
140, 140f/CR/T				X
340, 340SA				X
1400	X			X
1400H	X			X
2400/10		X		
2400/16		X		
2400/10				X
2400/16				X
2400L		X		
2400L				X
4400/45		X	X	X
4400/65		X	X	X
4400FS		X	X	X
4400L/10		X	X	X
4400L/30		X	X	X
640	X			X
6400/2.4-120	X			
6400/2.4-150	X			
6400/2.4-200	X			
6400/2.8-120	X			
6400/3.0-75	X			
6400R/2.5-120			X	
6400R/2.5-150			X	
6400R/2.5-200			X	
6400R/2.8-150			X	
6400R/2.8-200			X	
6400R/3.0-100			X	
6400S/2.9-120				X
7600/2.30-500				X
7600/2.55-400				X
7600/3.50-150				X
5402/3.0-15				
5403/3.0-15				

In addition models of the IRBp250, IRBp750 positioners and T2002, T5403, T6002 tracks are included. Examples of equipment such as fences, conveyors, light-beams are also included.

### Programming AutoPath

RobotStudio allows you to create robot targets directly by picking in the graphics or creating paths and robot targets automatically based on

curves and the CAD geometry. These curves can either be imported from a CAD system or created in RobotStudio.



Automatic generation of targets along a curve

You can control the automatic creation of targets by specifying how accurately the path should follow the geometry and if you want linear or circular motion segments.

### RAPID Programming

By using so called Instruction Templates you define which RAPID motion parameters that are assigned to your targets when they are created. You can define a set of your own default setting, in order to match your process as exactly as possible.

Tooldata and work object data can be created and modified, for standard configuration as well as for stationary tool and co-ordinated motion of external axes.

The Program browser gives you a structured view of the programs and modules in the Virtual Controller. By using “drag and drop” in the Program browser, targets are combined and programs are created instantly. By using the Teach Pendant of the virtual controller or the Program editor the complete RAPID program is created. Changes made in the Teach Pendant or in the RAPID editor are transferred to the graphical representation of your station. This makes it possible to roundload (i.e. upload and download) production programs without loss of data.

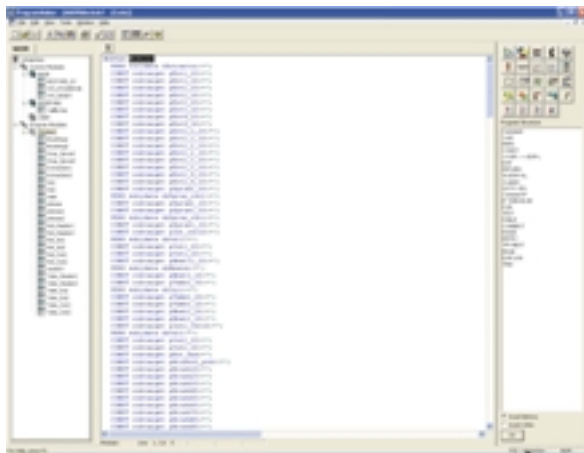
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### The Program Editor

With RobotStudio, the Program editor Program-Maker is included. Some of the main features of ProgramMaker includes:

- Ability to check for syntactic and semantic errors, as robot programs are created or edited
- Program data is displayed in a familiar “spreadsheet” format that is Microsoft Excel compatible
- TCP Adjust, FrameAdjust and Mirror wizard
- Automatic declaration of referenced data
- The Tree View allows the user to view and navigate robot program structure in a simple, logical manner
- Syntax colorization
- Multiple routines can be viewed and edited at the same time



ProgramMaker, the Program Editor

### Simulation AutoReach

With AutoReach you can optimise the locations of the work piece and the robot. If the positions are reachable or not are clearly indicated in the graphics area.

### Collision Detection

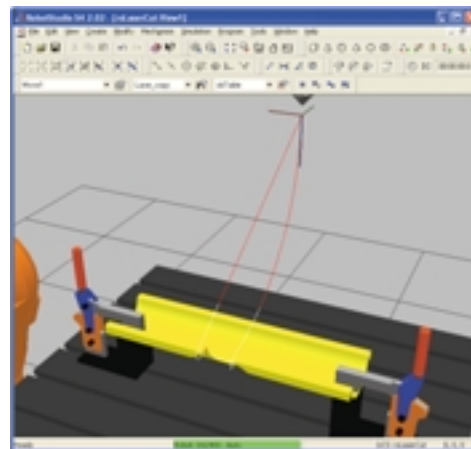
Collisions between any objects in the station can be detected and visualised during robot simulation. You can select between detecting collisions for the whole station, or for a selected list of objects.

### Events- and I/O-Simulation

By using the Event table in RobotStudio you can respond to signals set in your robot program (so called IO events). This can be used in simulation of search-sequences or simulation of material handling when parts are gripped/released. For advanced simulation you can also connect the IO events to Visual Basic macros. This enables simulation of a complete station including equipment.

### Simulation Monitoring

You can monitor the results of the robot motion in your simulation. Simulation data such as robot-joint values and speed can be logged and stored. You can follow the movement of the robot TCP by using the trace function that draws a line in the graphics area where the TCP is moved.



### Visual Basic for Applications

Microsoft's<sup>®</sup> Visual Basic for Applications (VBA 6.3) is distributed with RobotStudio. VBA is an object based programming environment designed to provide rich development capabilities. Implemented in RobotStudio, these capabilities shorten the development times of custom solutions for customers and applications. VBA has full Visual Basic language syntax, the new forms package, and support for ActiveX Controls. By using VBA customised macros and applications can easily be developed to suit the special needs for a particular customer or to automate repetitive daily tasks. Most functionality available in the RobotStudio user interface is also available from VBA. In addition user defined menus and dialogues can be added.



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### **BendWizard PowerPac**

BendWizard improves the interface for programming the robot and press brake operation. The cell is shown in the 3D format with all peripheral components defined and the operator can program the different phases of the operation which include:

- Loading the sheet from the feeding system
- Double-thickness control
- Centering the Part
- Bending sequence
- Overturning and palletizing

The system automatically verifies every phase of the program cycle including reachability of robot targets, the robots working envelope, potential interference and collision problems:

When a problem is detected the operator has several tools available to make the necessary modifications. Once it's done the program is converted to the robots operating language and downloaded. A first part program check is recommended. All of BendWizard's processed data can be converted into reports for documentation and used for setting up future production runs or successive batches.

### **Software and hardware requirements**

- Microsoft Windows NT 4.0 with Service Pack 6 or higher and Internet Explorer 4.0 SP2 or higher
- Microsoft Windows 2000 Professional with Service Pack 1 or higher
- Microsoft Windows XP Professional

### **Recommended hardware**

**CPU:** Pentium III or higher

**Memory:** 256 MB RAM or more

**Free disc-space:** 50 MB on the system disk

900+ MB on the installation disk

**Graphics card:** A high performance graphics card with OpenGL support

Examples for stationary PCs: 3Dlabs Wildcat III 6110, NVIDIA Quadro4 900 XGL, ATI FireGL 8800

Examples for laptops: NVIDIA GeForce4 Go (available e.g. in Toshiba Satellite 5005-S507), ATI Mobility Radeon 7500 (available e.g. in Dell Inspiron 8100), ATI Mobility FireGL 7800 (available e.g. in IBM A31p)

**Screen resolution:** 1280 x 1024 pixels

Three button mouse