Read Me

Stäubli Robot Software
Reference: D24306449A
SRC Version 7.4 & SRS Version 7.3

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1. STAUBLI ROBOTICS CONTROLS

1.1. Installations

1.1.1. Firmware installation procedure

The installation requires first an Ethernet connection between the controller and your PC.

To install the Stäubli Robotics Controls firmware, execute System\update.bat :

update IPaddress profile password

with:

· IPaddress = controller IP address

· profile = one of the user profiles defined on the controller (use ‘maintenance’ by default)

· password = the network password of the profile (use ‘spec_cal’ for maintenance profile)

(!) This installation tool is a basic Ftp script that does not check for update errors. Make sure the update is completed correctly before restarting the controller.

1.1.2. Teraterm

This tool can be useful for maintenance, to modify controller BIOS settings or to record diagnostic data.

1. Run TeraTerm/setup.exe to install the VT100 terminal
2. Copy the TeraTerm/cs8.ini and cs8.ncb in the folder where TeraTerm is installed

To configure the VT100 terminal for the controller,

• Start the VT100 terminal
• In Edit > Restore configuration, select cs8.ini then Ok.
• In Edit > Keyboard, select cs8.ncb then Ok (this is needed only for BIOS access)
• If you are not using COM1 to communicate with the controller, select the correct port in Edit > Serial

1.2. Application updates

1.2.1. VAL 3 applications update s7.3 to s7.4

1.2.2. VAL 3 applications update s7.2 to s7.3

VAL3 applications in version 7.2.* are fully compatible with Stäubli Robotics Controls s7.3.*

1.2.3. VAL 3 applications update s7.1 to s7.2

In VAL 3 s7.2, it is no more possible to name a VAL 3 variable with a keyword used to define a VAL 3 type, whatever this type is a user type or a system type. With previous version this rule was applied only for the system type names (Point, Num, Bool…), it is now extended also for user types.
To correct a VAL 3 application in this case, the concerned variables must be renamed from the MCP interface of Stäubli Robotics Controls version s7.1 before to be used in SRC 7.2

1.2.4. VAL 3 applications update s7 to s7.1

The physical path of Modbus IOs, and arrays of fieldbus IOs has changed between VAL 3 s7 and s7.1. The update is done automatically within the VAL 3 applications. However, the

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iomap.cfx file is not updated automatically: the physical address of its Modbus and fieldbus array entries, if any, must be fixed by copying/pasting from SRS 7.1 VAL 3 Studio 'Physical IOs' tool.

1.2.5. VAL 3 applications update s6 to s7

The update of VAL 3 applications from s6 to s7 can not be made fully automatic: some attention points and changes must be done that are listed hereafter. The update should be first made with SRS VAL 3 Studio to solve compilation issues. The application should then be tested at low speed to make sure that the changes in the motion generator have no significant impact.

Inputs Outputs

- the io library is not automatically generated any more. VAL 3 IOs variables must be linked directly to hardware IOs with a physical path; or a IO library must be created with SRS.
- Modbus IOs are now handled exactly as fieldbus IOs, not as shared data any more. It is not possible any more to have a Modbus variable writeable by both the controller (Modbus server) and its peer (Modbus client).
- iomap.cf is changed into iomap.cfx, that uses physical path instead of IO names. The physical path can be copied/pasted from SRS VAL 3 Studio 'Physical IOs' tool.

VAL 3 instructions

- speedScale() is replaced with getMonitorSpeed() (that was already defined since VAL 3 s6.4)
- the 'dio = dio' operator for dio is not supported (inconsistent with other '=' operators) : dOut = dIn must be replaced with dOut = (dIn==true)
- Passing a constant data by reference to an instruction or a program generates a compilation error. If the program does not modify the parameter, change it so that it is passed by value. If the program modifies the parameter, use a variable in the calling program initialized with the constant value.

VAL 3 addon ($) instructions

The unofficial VAL 3 addon instructions that can be replaced with an equivalent official VAL 3 instruction are not supported any more with VAL 3 s7.
Some features available as beta versions in s6 require a controller licence to be supported in s7 (tracking, carried part, absolute robots).

Motion control

- Some motion control algorithms have been modified to fix some bugs in blending parts. The shape of the blending can be significantly modified in very specific conditions.
- The value of move id within blending may differ significantly from the previous beta versions.
- The monitor speed algorithm has been improved: if an application was not running at 100%, the robot accel and decel (and therefore application cycle time) will differ with VAL 3 s7.

User Interface

The access to the debugger menus now requires write access in the user profile. However the current line of the different VAL 3 tasks can now be seen in the task list view, without write access.

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1.3. Documentation addenda

1.3.1. Sockets (from SRC 7.4)

Communication over Ethernet is supported by the system through TCP or UPD protocols. TCP provides reliable delivery of a stream since UDP provides an unreliable but faster delivery of a stream.

Ethernet communication uses **Sockets** declarations from the control panel of the robot controller. Sockets are controller-level IO resources to which sio VAL3 variables can be linked (e.g. with sioLink), allowing VAL3 applications to communicate over ethernet IP.

Socket Parameters

IP address (TCP)/IP address filter(UDP)

defines an IP address.with a meaning depending on the socket type

TCP/ client: it defines the IP address of the server to be connected to this client socket.

TPC/IP server: N/A.

UDP

- A valid address: this UDP socket can only communicate (read and write) with this IP address.
- 0.0.0.0 : the socket receives all the messages emitted from any UDP client sending to this port. Note that writing on such UDP socket generates a runtime error 122.
- Subnet mask : the socket transmits subnet broadcast frames and receives subnet broadcast frames only.

Timeout

Time value in seconds used to manage the network access (read, write).

- 0 wait forever the required transaction
- >0 the transaction (read or write) can consume up to the given timeout in seconds.
- -1 the transaction (read or write) doesn't wait at all (no timeout) to proceed.

When the socket timeout, the val3 instruction returns 0.

Port

numeric value to define the port number.

String delimiter

ASCII code for the end of string character to be used with sio '=' operators (in range [0, 255])

Nagle

This Boolean parameter optimizes the response time of the socket communication. Disabling nagle optimization improves response time but increases network load.

TCP (Transmission Control Protocol)

TCP is a protocol complementing the Internet Protocol (IP), therefore the entire suite is commonly referred to as TCP/IP. TCP provides reliable, ordered delivery of a stream of bytes from a program on one computer to another program on another computer.

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Other applications, which do not require reliable data stream service, may use the User Datagram Protocol (UDP), which provides a datagram service that emphasizes reduced latency over reliability.

To proceed TCP exchanges, a connection between a TCP client and a TCP server must be established. The TCP connections are managed automatically by the system according to the parameters that was defined during the socket declaration.

The socket connections are created just in time when a VAL3 program needs to use the socket (sioGet, sioSet, '=' operator):

- The client sockets try to connect to the server. Note that only one instance of a client connection exists. It is shared by all the sio VAL3 variables linked on to a controller-level socket.
- The server sockets wait for a client connection. Note that each sio variable linked to a socket server uses its proper instance of connection.

The socket connection are automatically closed :

- When the application stops
- When an error is detected on a read or write (except time out)
- By the function **clearBuffer**
- A server connection is closed when the VAL3 variable that owns it is destroyed (e.g. local variables are destroyed on routine exit)
- A client connection is closed when no more VAL3 variable exist that is linked to this controller-level socket (e.g. unload a library).

UDP (User Diagram Protocol)

UDP uses a simple transmission model without implicit handshaking dialogues for providing reliability, ordering, or data integrity. Thus, UDP provides an unreliable service and datagrams may arrive out of order, appear duplicated, or go missing without notice.
UDP assumes that error checking and correction is either not necessary or performed in the application, avoiding the overhead of such processing at the network interface level. Time-sensitive applications often use UDP because dropping packets is preferable to waiting for delayed packets, which may not be an option in a real-time system.
Compared to TCP, UPD sockets are not typed as client or server : the same socket can be used for read and/or write depending on its IP address filter parameter.
If error correction facilities are needed at the network interface level, the existing Transmission Control Protocol (TCP) designed for this purpose should be preferred.

1.3.2. VAL 3 manual §3.7: SIO TYPE

num **ioStatus**(sio siInputOutput)

Function

This instruction returns a positive number if the specified input output variable is working, and a negative number if it is in error. The returned value details the status of the input output:

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0: The input output is working.
-1: The input output is not working because the link (physical address) is not defined.
-2: The input output is not working because the link (physical address) does not match any system input output.

num **ioStatus**(sio siInputOutput, string& sDescription, string& sPhysicalPath)

Function

This instruction performs exactly as the ioStatus instruction described above, but returns in addition the description text and the link (physical address) for the specified input output.
The description is a free text defined with the input output control tools. The format of the physical link depends on the input output device. It has usually the form:
'deviceName\moduleName\ioAddress'.

Example

This program tests a signal and displays error information if it is not working.

```
if ioStatus(siSignal, sDecription, sPath)<0
  putln("Signal "+sPath+ "in error")
  putln("Description:"+sDecription)
endIf
```

Modifications from SRC 7.4

num **sioGet**(sio siInput, num& nData[])

Function

This instruction reads a single character or an array of characters from **siInput** and returns the number of characters read.
The reading sequence stops when the **nData** array is full or when the input reading buffer is empty.
For an Ethernet socket connection, **sioGet** tries first to open a connection if there is no open connection. When the timeout for input communication has been reached, **sioGet** returns **-1**. If the connection is open, but there is no data in the input reader buffer, **sioGet** waits until data is received or until the end of the timeout period has been reached (forever if the socket timeout parameter is 0). On error detection or a connection closure, the function stops immedialtly and returns -1.
If the socket timeout parameter is -1, the function gets the current reader buffer and returns the number of read characters (0 if the reader buffer is empty) or -1 on read error.

- The runtime error 123 is generated if siInput is not linked to a system serial port or Ethernet socket,
- The runtime errors 20 or 21 occur if **nData** is not used with the correct index.

num **sioSet**(sio siOutput, num& nData[]{,nNbElements})

Function

This instruction writes one or more characters to **siOutput** and returns the number of characters written.
The optionnal parameter **nNbElements** specifies the number of characters to be written.
Numerical values are converted before transmission into integers between **0** and **255**, taking the nearest integer modulo **256**.
For an Ethernet socket connection, **sioSet** tries first to open a connection if there is no open connection. When the end of the output communication waiting time has been reached, **sioSet**

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returns **-1**. The number of characters written can be less than the size of **nData** if a communication error is detected.
The runtime error 123 is generated if **siOutput** is not linked to a system serial port or Ethernet socket.

- The runtime error 20 is generated if **nNbElements** is greater than the size of the array **nData**
- The runtime errors 20 or 21 occur if **nData** is not used with the correct index.
- With UDP socket, the runtime error 122 is generate on an attempt to write on IP 0.0.0.0

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1.3.3. VAL 3 manual §4.3: isKeyPressed, getKey instructions

Without Shift

3	Caps	Space				Move	Joint
283	-	32				292	286
2	Shift	Esc	Help	Ret.		Run	Frame
282	-	255	256	270		293	287
	Menu	Tab	Up	Bksp		Stop	Tool
	284	259	261	263		294	288
1	User	Left	Down	Right	SP-	SP+	Point
281	285	264	266	268	290	291	289

With Shift

3	Caps	Space				Move	Joint
283	-	32				292	286
2	Shift	Esc	Help	Ret.		Run	Frame
282	-	255	256	270		293	287
	Menu	Tab	Up	Bksp		Stop	Tool
	284	260	262	263		294	288
1	User	Left	Down	Right	SP-	SP+	Point
281	285	265	267	269	290	291	289

With VAL 3 s7.1.1, all keys of the SP1 keyboard can be tested by using the getKey() or isKeyPressed() instructions. With isKeyPressed(), all keys with a code greater than 280 can be tested whatever the displayed screen.

Sel Up
315
Sel Dn
316
Sel -
317
Sel +
318

X-1	
-	+
300	301
Y-2	
-	+
302	303
Z-3	
-	+
304	305
RX-4	
-	+
306	307
RY-5	
-	+
308	309
RZ-6	
-	+
310	311

CAUTION ! Robotics norms relative to safety include specific requirements for the correct use of commands (keys) related to motion. The robot integrator is responsible for the correct use of getKey or isKeyPressed regarding the applicable regulations.

The default action of the jog keys ‘Sel up’, ‘Sel Dn’, ‘Sel –‘, and ‘Sel +’ can be disabled by setting the ‘miniJog’ entry to false in the configuration file /usr/configs/cell.cfx.
It is then possible to use these keys for application-specific purposes.

1.3.4. VAL3 manual §5.10: clock() description addenda

The default resolution of the internal clock is 0.004 second.

The internal clock value reaches his maximum value after 142 808 years. Therefore, no overflow mechanism needs to be foreseen.

1.3.5. VAL3 manual §10.6: movej() description addenda

The first parameter of the function movej can be either a joint (Joint type) or a point (Point type) value. Due to an internal limitation, the compiler is not able to check the input data type when an explicit expression is entered for this parameter.

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Example :

movej({0,0,0,0,0,0},flange,mNomSpeed)

→ "{0,0,0,0,0,0}" : Ambiguous expression

The above expression cannot be used and must be replaced by the following one…

myJoint={0,0,0,0,0,0}

movej(myJoint,flange, mNomSpeed)

1.3.6. VAL3 manual §12.1: Runtime Error Codes

Code	Description
23	Use a collection with an invalid key. A collection key must be a non null String value
33	Too many lines are to be executed in a synchronous VAL3 task. The number of VAL3 code lines to be executed in one cycle is limited to 3000 for the VAL3 synchronous tasks.

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2. STAUBLI ROBOTICS SUITE

2.1. System requirements

2.1.1. Hardware Requirements

The minimum system to install and use Stäubli Robotics Suite is
PC: Pentium 1.5 Ghz (or equivalent) with 1Gb of RAM
The recommended system is:
PC: Pentium Dual Core 1.8 Ghz (or equivalent) with 2Gb of RAM

2.1.2. Software Requirements

The Microsoft .NET Framework 3.5 SP1 must be installed on the PC in order to run Stäubli Robotics Suite

2.1.3. Supported Operating Systems

Stäubli Robotics Suite can be installed on 32-bit platform and 64-bit platform running:

- Windows XP SP3
- Windows Vista SP2
- Windows Seven SP1

2.2. Installation Procedure

User must have administrator rights in order to install Stäubli Robotics Suite

➲ If necessary, the Microsoft Windows Dot Net Framework will be updated by the Stäubli Robotics Suite setup. If the update failed, it's possible to find a version on the Microsoft Web Site or with the Windows Live Update.

➲ The driver of the dongle may also be installed during setup: it can take a long time depending on your computer. DO NOT STOP the installation.

➲ For Windows Seven users, right click on the SRS setup, and select "*Run as admin*". (Required by the HASP driver setup)

2.2.1. Standard setup

Put the CD on the CD Drive and wait for the automatic start-up of the setup.
Due to Windows configuration, the automatic start-up may be disabled. In this case, execute the setup.exe program using Windows explorer.
Once the setup is running, choose the language and follow the wizard.

2.2.2. Silent mode

Since version 7.2 for SRS and for the emulator, it's possible to run the setup from a command line in a silent mode.

- Run a command line (*"as Administrator"* under Windows Vista and Windows Seven)
- To install SRS, enter: `installSRS.exe /S`
- To install the Emulator, enter: `installCs8.exe /S`

Remarks:

- /S must be in uppercase.

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- The setup is executed without any message even if there is an error.
- If the setup is copied on a disk, the folder '*Tool'* must also be copied in the same directory as *'installSRS.exe'*.
- If the *'dotnetfx'* folder is in the same directory as *'installSRS.exe'*, the Microsoft dotnet framework will be installed if needed.
- If the *'hasp'* folder is in the same directory as *'installSRS.exe'*, the Aladdin dongle driver will be installed if needed.

2.3. Version 7 Release history

2.3.1. Version 7.3.1

STAUBLI Robotics Suite

- Added the English (United Kingdom) translation.
- HASP driver update.
- Fixed minor bugs.

VAL3 Studio

- Removed licence on EtherCAT board edition
- Fixed minor bugs

2.3.2. Version 7.3

VAL3 Studio

- Added EtherCAT IOs management.
- Added adjustable warning level for syntax checker (check IOs or not)
- Fixed several minor bugs.

3DStudio

- Added the TP80 model.

Emulator

- 'Auto Parking' feature activates both auto-parking and deadman.

2.3.3. Version 7.2.1

STAUBLI Robotics Suite

- Added the Italian translation.
- Fixed minor bugs.

2.3.4. Version 7.2

STAUBLI Robotics Suite

- Added the silent install from a command line
- Added the previous versions of emulators the SRS setup.

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- Fixed several minor bugs.

VAL3 Studio

- Added a comparison tool
- Added the “Settings” form to configure VAL3Studio
- Added automatic recognition of variable type when using Stäubli naming rules.
- Improved Intellisense behaviour
- Added a warning message if the dongle is not found when opening an application
- Improved byval/byref edition for parameters in version <7.0

3DStudio

- Added display of points and frames with external fathers.
- Fixed a bug in windows zoom under Windows Vista and XP.
- Fixed a bug where refreshing the list of applications erased records and lost point of view.

Transfer Manager

- Added the capability to download the arm configuration file

2.3.5. Version 7.1

STAUBLI Robotics Suite

- Windows Vista and Windows Seven compatibility
- Windows 64-bit platform compatibility (XP, Vista, Seven)
- Cell manager : STARC cards configuration

VAL3 Studio

- New types managements :
- Structures
- Multi-dimensional arrays
- Collections
- Screen
- Online debugger (tasks management, watch, breakpoints, display of current instruction, lock/unlock IO, force IO…)
- New IO management
- New Geometric view of data
- Advanced Intellisense functionality (auto complete words, members list from libraries, program call, etc…)
- User interface enhancements : document window functionality, custom dockable toolbars
- Color printing
- Improved data edition : copy/paste of a range of values

3DStudio

- Display of a single point value
- Display joints

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- View robot position on a joint
- Absolute calibration management

Transfer Manager

- Check VAL3 version between cell and controller
- Record configuration files support

2.4. Compatibility

SRS 7.3	VAL3 Firmware
VAL3 Studio	**>= s4.0** **>= s7.0** for debugging VAL3 application. **>= s7.1** for Applicom/Modbus arrays of IOs. **>= s7.3** for EtherCAT IOs
3D Studio	**>= s5.3** for arm visualization **>= s6.0** for VAL3 Data and records visualization **>= s7.0** for joints display and absolute calibration
CS8 Remote Maintenance	**>= s5.0** **>= s6.6** for Connexion with Runtime License on Cs8 instead SRS License on the dongle
Controller Option Manager	**>= s5.0**

2.5. Help

2.5.1. User documentation

For more information on Stäubli Robotics Suite products, consult the user manuals installed during the setup.

- Stäubli Robotics Suite user manual gives information on:
  - SRS (Cells, Language …)
  - Transfer Manager
  - Profile Editor
  - Licenses manager
- VAL3 Studio user manual gives help for VAL3 Studio and the VAL3 Checker.
- 3D Studio user manual gives help on the 3D Studio interface

These help files are accessible in the help menu of Stäubli Robotics Suite and are in PDF format. It is possible to install PDF Reader with the setup in the Acrobat6 folder of the CD.

2.5.2. TCP Port used by Stäubli Robotics Suite

Many tools of Stäubli Robotics Suite open TCP ports in order to exchange data.

If you have a FIREWALL installed on your PC, ensure that the following ports are opened:

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Tool	TCP Port	Remarks
Transfer Manager	**21** **5653**	Port used for FTP transfer file Port used to read controller version (port number can be configured by the user)
Remote Maintenance	**800**	Socket Connection for Remote maintenance (port number can be configured by the user)
3D Studio	**5653**	Port used to exchange data between 3D Studio and the CS8. (port number can be configured by the user)
Val3 Studio : Online debugger	**5653** **5656**	Ports used to exchange data between the CS8 and VAL3 Studio. (ports numbers can be configured by the user)
Aladdin dongle licence manager	**475**	This port is used by the Licence manager for support of Network Dongle

2.5.3. Troubleshooting communication problems

If you are unable to connect online tools (3DStudio, online debugger) or if the refresh rate is very slow :

- Close the firewall and try to connect 3DStudio.

If it works fine, check the firewall configuration. (TCP Port used by Stäubli Robotics Suite)

- Try to disable the anti-virus.

Very slow behaviours were reported using McAfee or NOD antivirus. Adding specific rules for SRS in those tools solves the problems.

2.5.4. WinMerge

WinMerge is an Open Source differencing and merging tool for Windows. It can compare both folders and files, presenting differences in a visual text format that is easy to understand and handle.

In order to use WinMerge to compare applications and programs in VAL3 Studio:

- Install WinMerge from the MinMerge directory on the cdrom.
- In VAL3 Studio, click on the “Tools – Settings” menu.
  - Set the “Use custom tool” property to “**`true`**”.
  - Click in the “Custom tool path” property and browse the “**`WinMergeU.exe`**” file.
  - Set the “Custom tool arguments” property to: **`“{0}” “{1}”`**
  - Click “**`OK`**” to validate the new parameters.

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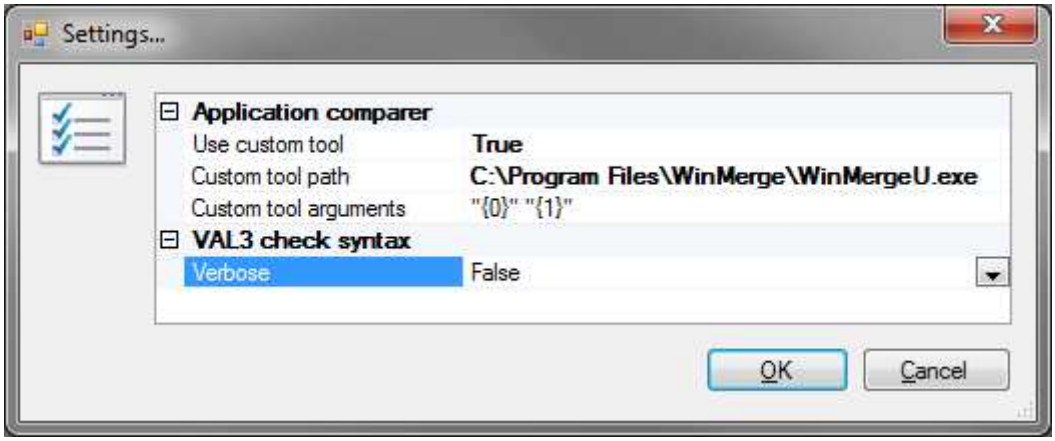

2.5.5. Teraterm

This tool is needed to communicate with the CS8 through the COM1 serial line.

- To change the COM2 configuration RS232 ←→ RS422 or to collect diagnostic data for maintenance.
  - Run TeraTerm/setup.exe to install the VT100 terminal
  - Copy the TeraTerm/cs8.ini and cs8.ncb in the folder where TeraTerm is installed.
- To configure the VT100 terminal for the CS8:
  - Start the VT100 terminal
  - In Edit > Restore configuration, select cs8.ini then Ok.
  - In Edit > Keyboard, select cs8.ncb then Ok
    (this is needed only for BIOS access)
  - If you are not using COM1 to communicate with the CS8, select the correct port in Edit > Serial

2.6. Patches and Services Pack

2.6.1. Applicom IO

To download the latest version compatible with Windows Vista and Windows Seven visit the STAUBLI Technical database http://www.staubli.com

You can also visit the Applicom Web site:
http://www.woodhead.com/support/onlinesupport

2.6.2. Intel Graphic Controller

An old version of the Intel 82845G/GL/GE/PE/GV graphic controller driver may make incompatible 3D Studio and a screen saver. It's documented on the Intel Web site and it's possible to update the driver from web site.

2.7. Documentation addenda

2.7.1. Stäubli Robotics Suite

**** Chapter LICENSES AND DONGLE MANAGEMENT/Update Firmware***

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Detection of old dongles (firmware < 3.21) can be deactivated if more than one dongle is plugged in the PC. So if you don't see your dongle on the License Manager, first ensure that you have only one dongle connected. To do that you can run the administration control tool (from menu view/admin control) and go to the HASP Keys panel.

**** Chapter PLC***

PLC Studio is nor more available in versions >= 7.0

2.7.2. VAL3Studio

****Chapter EDITING LIBRARIES AND USER'S TYPES - Zip libraries and runtime licenses***

To generate a password for a zipped library or a runtime license for a controller, use the Tool 'encrypttools.exe' located in the same directory as Val3Studio.

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