SPIN 3000

OPERATION MANUAL

P/N 10070121A8
January, 2014 cz/pg
~S/N 13927

441 Industrial Drive
North Wales, PA 19454
215-699-7278

Sales: sales@laurell.com
Support: support@laurell.com
www.laurell.com

Table of Contents

1 Introduction

Spin 3000 manages and simulates spin processing programs for Laurell Technologies' WS-650 line of Spin Processors.

Spin 3000 lets you create, save, and recall WS-650 series programs on a PC and test them before running them on an actual WS-650 Spin Processor, saving both time and valuable resources. Once you are satisfied your process programs are properly executing, Spin 3000 provides you with the means to download them into a WS-650 series Spin Processor for actual execution. Should you modify programs or create new ones on a WS-650 Spin Processor, Spin 3000 lets you copy those programs back to the PC for further modification or storage.

1.1 Bluetooth Configuration

IF the user's processor is configured for Bluetooth communication, install spin 3000 on to a PC per the quick start instructions and review sections 1.4 – 2.3. Follow the instructions in the quick start instructions for pairing the PC to the 650 controller.

1.2 Touch Screen and Bluetooth Configuration

If the user's processor is configured for Bluetooth communication with a Touch Screen interface, there is no need to install Spin 3000. Spin 3000 is already installed onto a tablet computer. Spin 3000 can be accessed from the start up screen on the tablet. All features of Spin 3000 are still the same as explained below. Skip the following sections to section 2.4. The LOGIN for Spin 3000, to obtain a higher permission level to make configuration modifications is "administrator_1".

1.3 Wired Configuration

If using a RS232 cable to communicate between a laptop and the 650 controller please follow sections 1.3 - 2.3 to install Spin 3000.

1.4 Minimum Computer Requirements for Spin 3000

- Operating System (OS) – Windows 98 or better
- Processor – Pentium III or higher
- Memory – 32 Megabytes ram
- Memory – 15 Megabytes or more of free space
- Graphics – 32 Bit color – **Please note: Spin 3000 may not work with some 16 bit color computers, communication problems will occur. Please check your setting before installation.**
- Resolution – 1024 X 768 and higher
- RS-232 or USB Ports – 1 or more.   A USB to RS-232 converter may be used
- CD-ROM – Must be present for software installation

2   Getting Started

This section contains the following information:

- Installing Spin 3000
- Spin 3000 – An Overview
- User Levels
- Connecting to a WS-650 series Spin Processor
- Editing Programs
- Using the Simulator
- Transferring Programs to or from a WS-650

2.1   Installation

Note: To minimize potential installation problems, please follow these best practices installation instructions for this (or any) software.

1. Close all currently running applications
2. Verify computer's color setting is set to 32bit. Use medium to maximum resolution.
3. Disable any running anti-virus software
4. Complete software installation (*as per following instructions*)
5. Re-enable anti-virus software
6. Restart the system & run application on subsequent startup
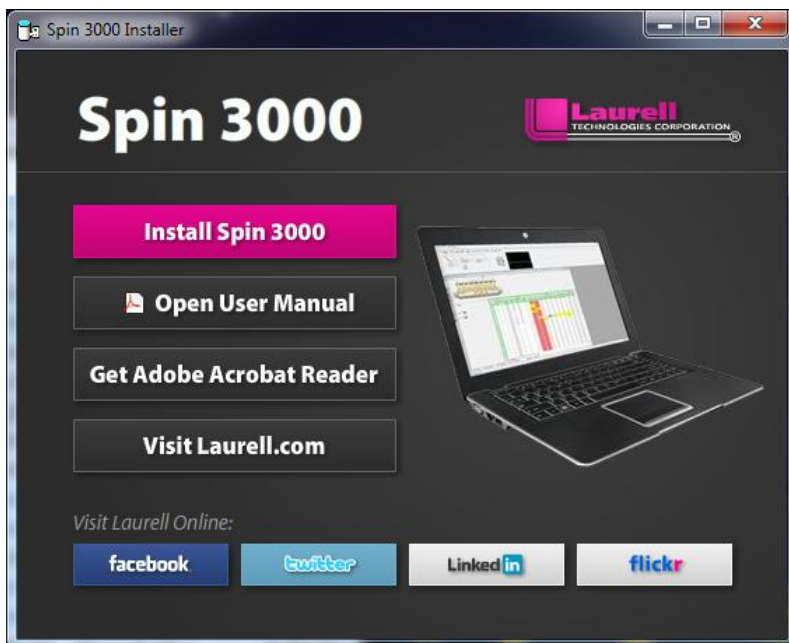
Insert the Spin 3000 CD into your CD drive. The install program automatically starts and displays the Spin 3000 splash screen.

Click the **Install Spin 3000** button to begin installation.
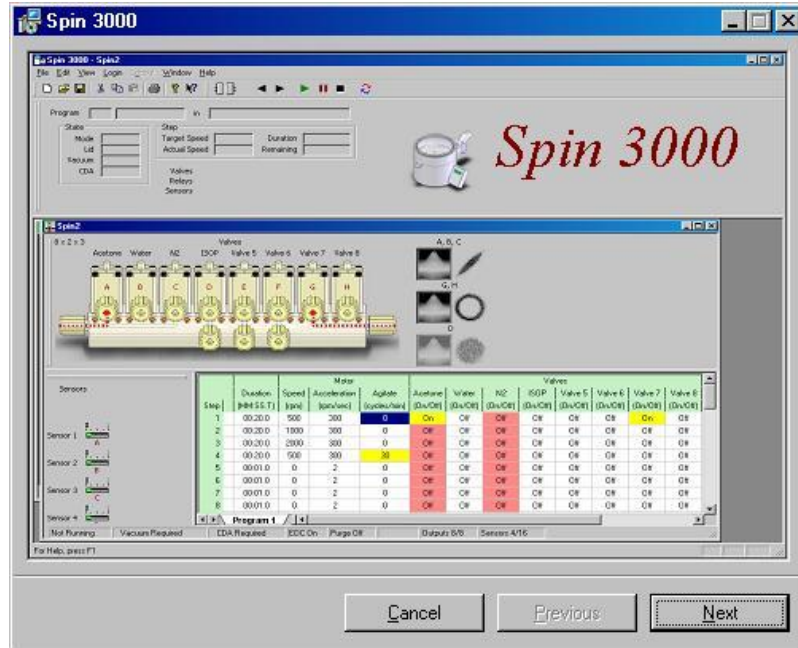
The Spin 3000 splash screen will appear.

Press the next button.
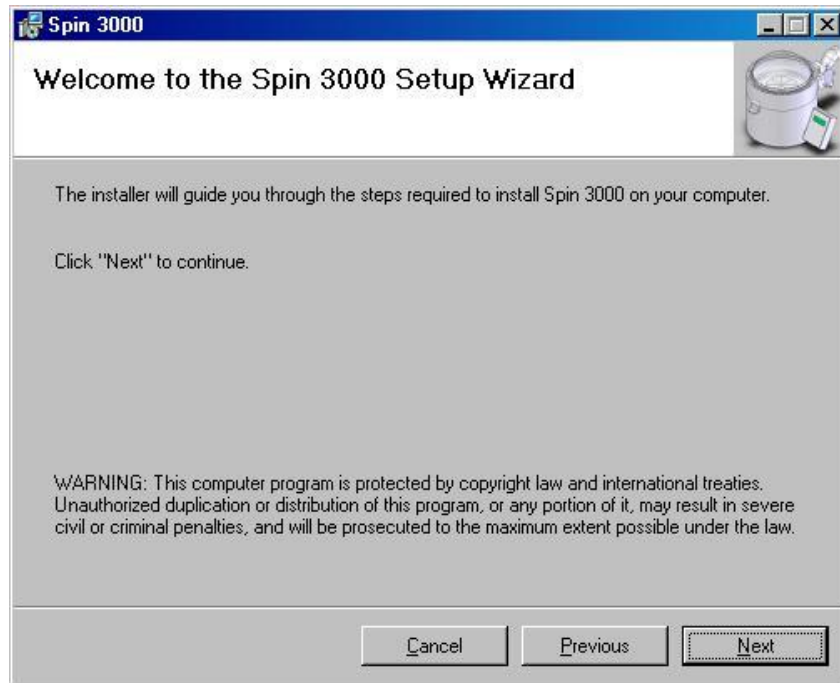
The welcome screen appears next.

Press the next button.

7

The license agreement appears next. Carefully read the agreement, and if you agree select "I Agree."

Press the next button.
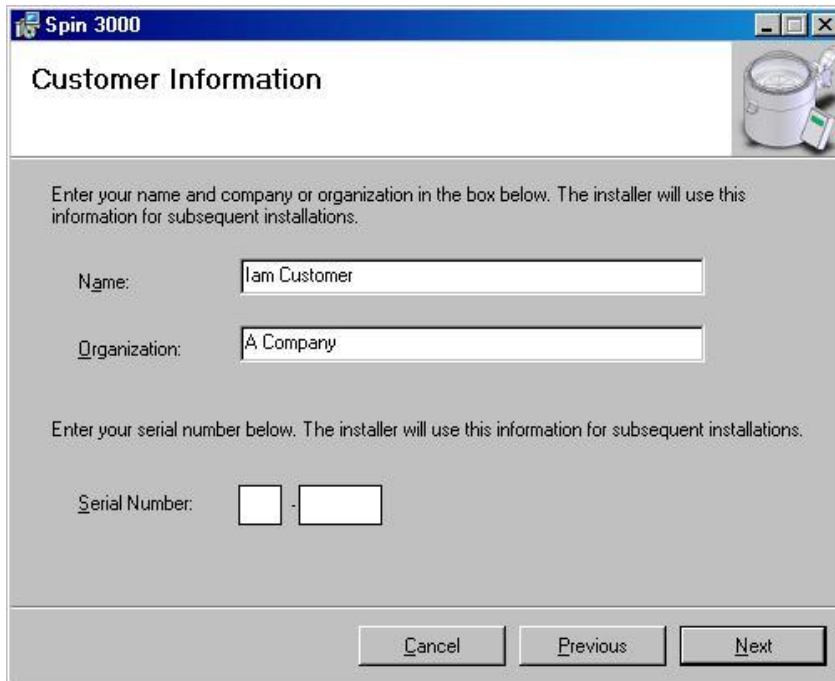
The customer information screen appears. Enter your name, organization, and your Serial Number for Spin 3000.

Serial number and password is located on the document CD sleeve.

Press the next button.

8
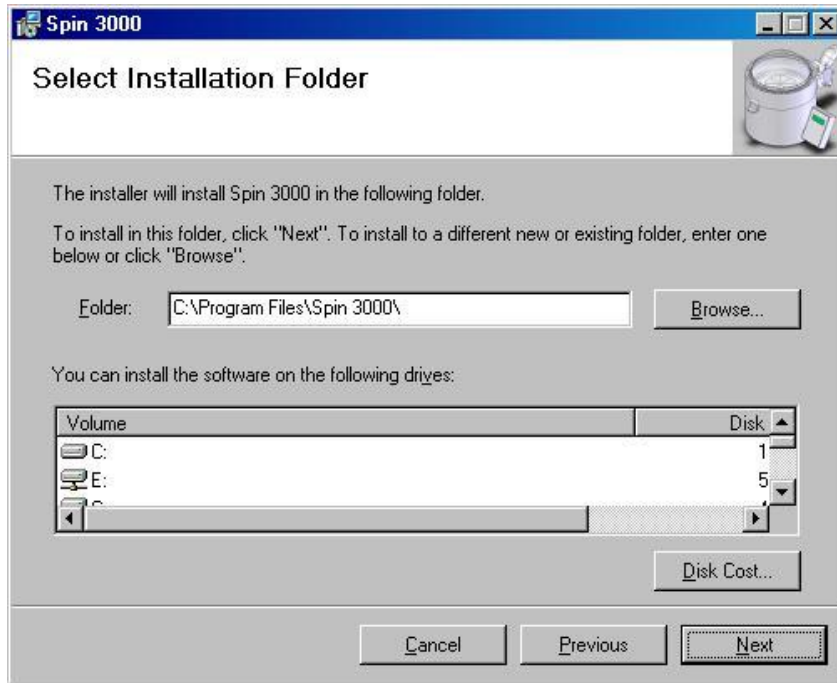
The Select Installation Folder appears. It is recommended to install Spin 3000 in the default folder, but you may change the location here.

After selecting a folder, press the next button.
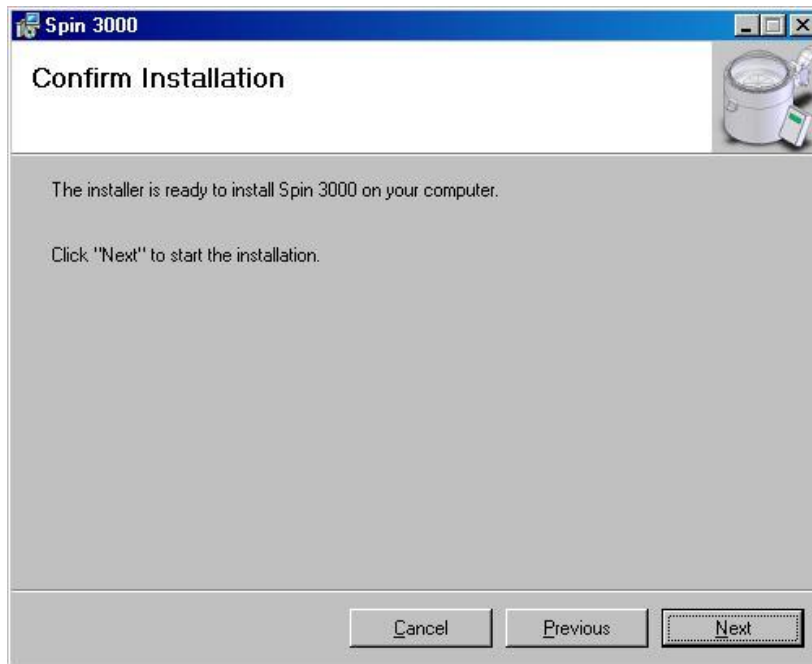
The confirm installation appears.

If you are ready to install, press the next button.
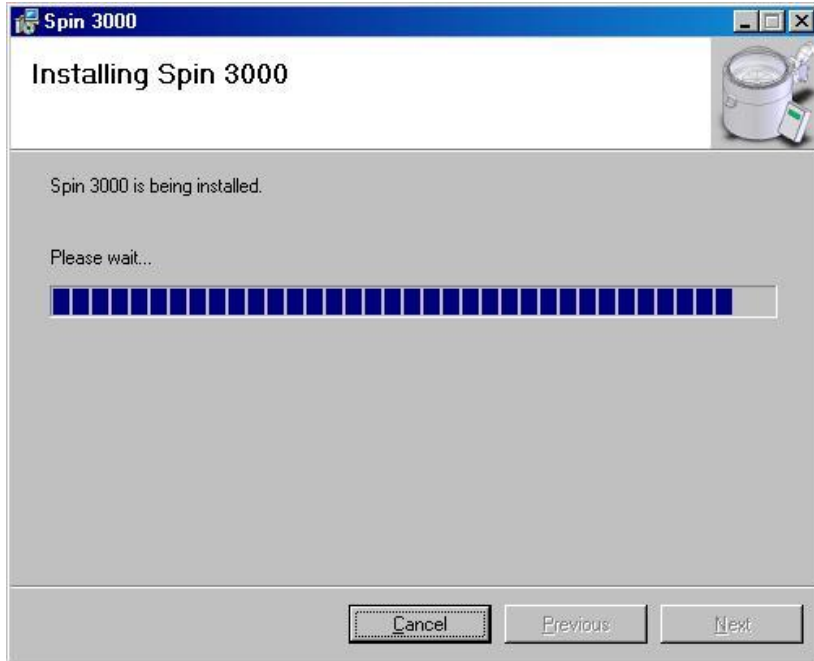
The installing Spin 3000 appears and describes what is being installed as it does so.
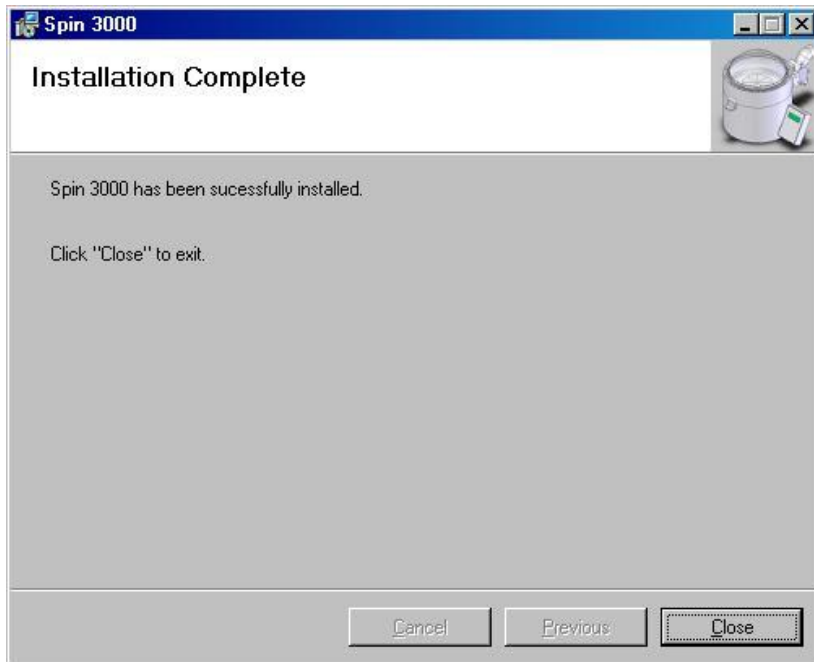
When it is done installing Spin 3000, installation complete appears.

Press the close button.

You have now successfully installed Spin 3000 on your computer.

The install program puts a Spin 3000 icon on your desktop, in your Start Menu, and in a Laurell Technologies entry under Start Menu | Programs.

2.2 Installation Failure

If Spin 3000 fails to install do the following;
1. Verify that the anti-virus software was disabled during installation.
2. Was the computer restarted after software installation?
3. Is the user logged on as administrator of the computer's operating system?
4. Uninstall Spin 3000 and reinstall. **Note: Run the installation as normal. The user will be prompted to repair or remove the software. Always select "Remove". Continue to follow prompts.**
5. For additional troubleshooting tips see section 5 "Troubleshooting", page 51.

2.3 Initial Start-up

The first time you open/run Spin 3000, a notebook default program (Program 1) containing a minimum configuration appears. To get the configuration for your Spin Processor, connect to the Spin Processor and click on the "New" icon on the tool bar. (Refer to section 2.4.2, page 13.) By clicking the "new" icon, spin 3000 will import the processor's configuration into spin 3000. Next, click on the "Refresh" icon on the tool bar to upload the processor's programs into Spin 3000. (Refer to section 2.12 "Transferring Programs To or From a WS-650," page 30)

Please Note: If the "New" notebook is not created and the refresh key is pressed an error condition will be created. A "Configuration Mismatch" dialog box will appear. To eliminate this error, close the dialog box and click on the "new" icon to import the processor's configuration into spin 3000.

2.4 Spin 3000 – An Overview

Spin 3000 has four major visual components, a menu bar, a tool bar, a Spin Processor status bar, and an area for displaying program notebooks.

The menu bar and tool bar appear at the top of the main window. The menu bar provides access to Spin 3000's features. The tool bar gives you quick access to commonly used features like opening or saving files, cutting or pasting program steps, or running a simulation.

Below them is a Spin Processor status bar. This bar provides run time information about whatever program is currently running.

Spin 3000 displays program notebooks in the area beneath the bars. Each notebook may contain one or more programs and different notebooks may be configured for different Spin Processors.
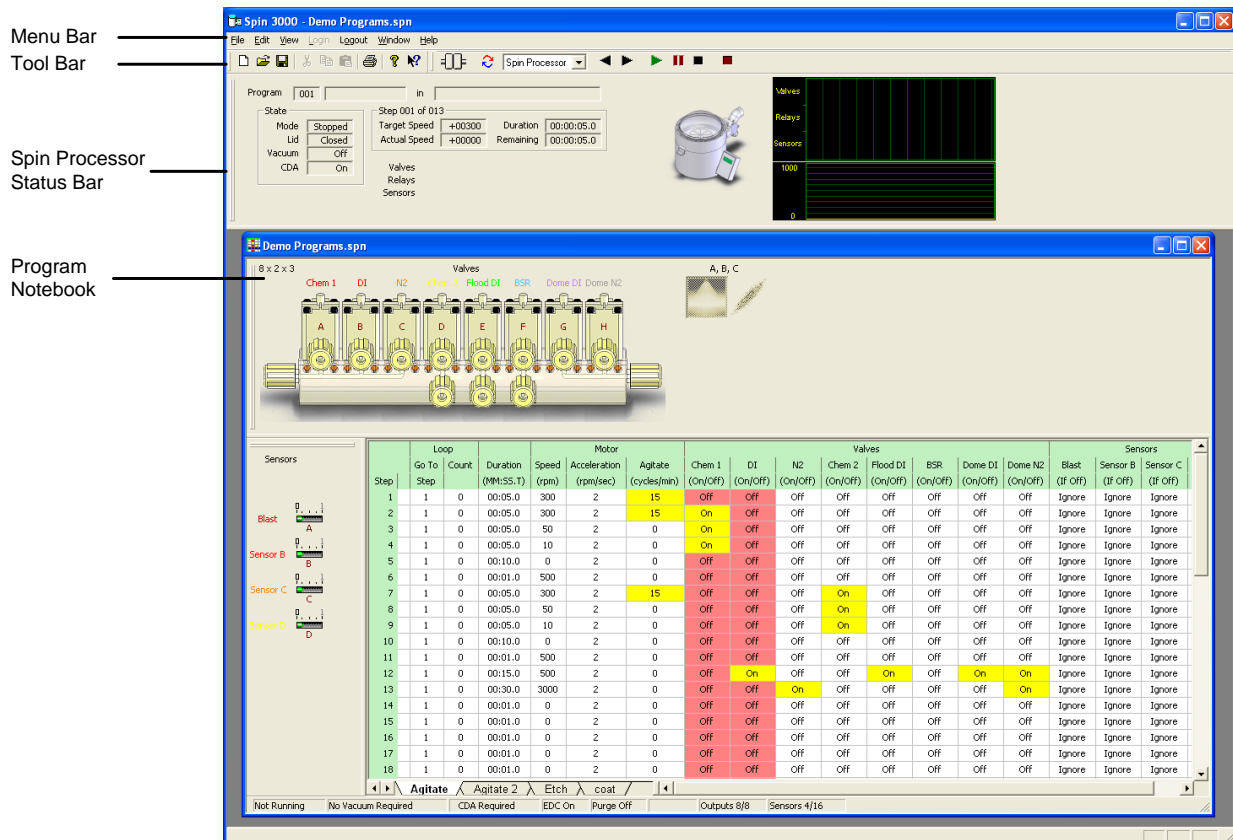
2.4.1 Menu Bar

The menu bar provides access to Spin 3000's features.
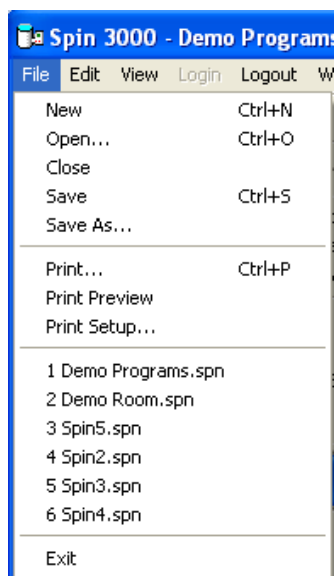
"File" lets you create, save, recall, and print program notebooks. You may also import previously recorded process runs as notebooks.

"Edit" lets you modify a Spin Processor's settings, the Virtual Spin Processor's settings, various Spin 3000 options, and the RS-232 settings.
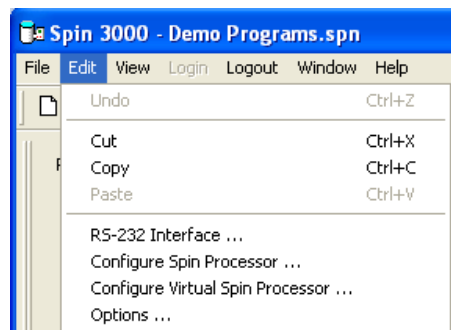
"View" lets you enable or disable the tool bar or status bar (at the bottom of the program notebooks).
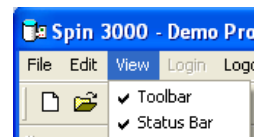
"Login" lets the administrator log in to change sensitive Spin 3000 settings. **_Login password is located on the Spin 3000 CD sleeve._** "Logout" logs out the administrator.
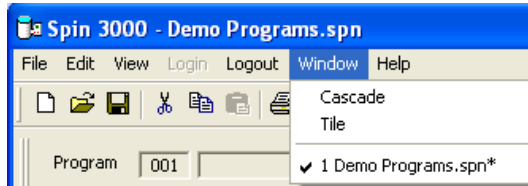
"Window" lets you specify how more than one Program Notebook will be visually organized. Tile organizes all open Program Notebooks in a tile-like fashion, top-to-bottom, and left-to-right. Cascade organizes all open Program Notebooks one on top of the other with only the title bar showing.

"Help" provides information about software version and its operation manual.

2.4.2 Tool Bar

The tool bar gives you quick access to commonly used features like opening or saving files, cutting or pasting program steps, or running a simulation.

From left-to-right, the first few (new, open, save, cut, paste, etc.) are similar in use to those you may be using on other programs. To their right are some very Spin 3000 specific controls.
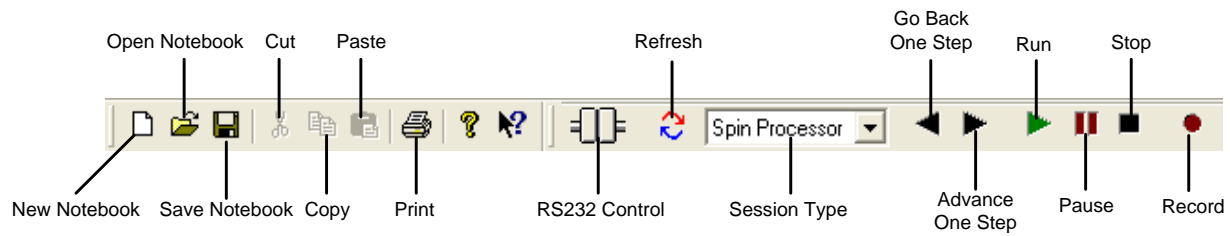
The RS232 control indicates transmit and receive activity over the RS-232 connection. Usually, Spin 3000 will automatically detect a Spin Processor's presence. If not, the RS232 control lets you manually connect, or disconnect.

Refresh compares the currently active notebook to the Connected Spin Processor. By using this button you may download programs to the Spin Processor or upload them from it.

Session Type selects whether Spin 3000 operates as though it is connected to a Spin Processor, in Simulation mode, or in playback mode for recorded files. It primarily affects the control buttons to its right.
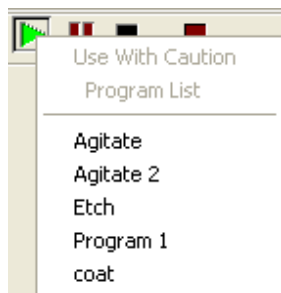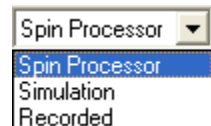
Go Back One Step, Advance One Step, Run, Pause, and Stop mimic the controls on a Spin Processor. When the Session Type is "Spin Processor" and the user may remotely run the connected Spin Processor these buttons will perform the same functions as the ones found on the Spin Processor. Pressing the "Run" button displays the Spin Processor's program list. The user may select one to run.

When the Session Type is "Simulation" the "Run" button runs the active program in the current sheet of the selected notebook. In this mode, you may use these controls to test your programs before downloading them to a Spin Processor.

When the Session Type is "Recorded" the "Run" button displays a dialog requesting the name of a record file to play. The file plays back at normal speed. The play back is done strictly on the Spin Processor Status Bar. No attempt is made to find the original program in the notebooks.
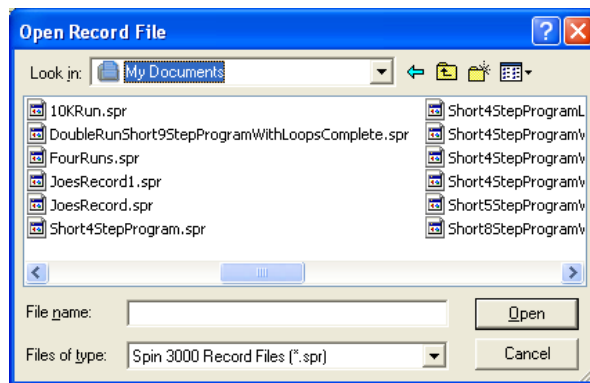
The "Record" button lets you record Spin Processor and Simulator run messages for later replay.

2.4.3 Spin Processor Status Bar

The Spin Processor status bar displays information about the Connected Spin Processor, or Virtual Spin Processor.
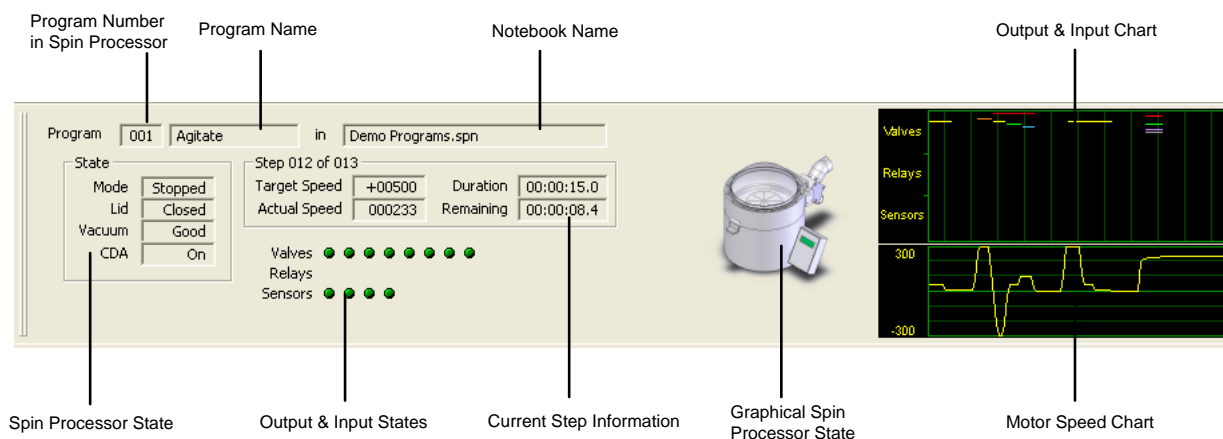
Most of the information in the status bar appears when a connected WS-650 Spin Processor is running, a simulation is running, or a recording is playing. A couple key exceptions are the textual and graphical Spin Processor state information. For those two, information appears whenever the state of the Spin Processor changes in some way. That is, the lid is open or closed; Clean Dry Air (CDA) is present (or not), etc. The graphical version illustrates lid openings and closures and illustrates a running program by spinning the chuck.

The "Program Number" displays the program number assigned by a WS-650 Spin Processor for the currently running program.

The "Program Name" is the alphanumeric name of the currently running program.

The "Notebook Name" identifies the name of the notebook the currently running program can be found in on the PC, if it exists. The program in the notebook and in the Spin Processor must be identical. Additionally, the notebook must be open in Spin 3000.

The "Spin Processor State" information indicates the state of the Spin Processor. Spin 3000 monitors' four items: run, lid, vacuum, and CDA state.

The "Current Step Information" indicates six items: which program step the Spin Processor is currently performing, the total number of steps, motor target speed, actual motor speed, step duration, and remaining time. Motor speeds are in RPM, Times are in tenths of seconds, formatted as HH:MM:SS.T where HH is hours, MM is minutes, SS is seconds, and T is tenths of seconds.

"Output and Input States" indicates the state of the Spin Processor's valves, relays, and sensors, if present. A green LED means it is on or active; red means it is off or inactive. An LED appears for each input or output in the Spin Processor. They are numbered left to right. That is, valve A is the leftmost; valve B is second from the left, and so forth.

The "Output and Input Chart" graphically illustrates the state of the Spin Processor's valves, relays, and sensors using colored lines. If program notebook input or output bars are present the colors of the valve, output, and sensor names correspond with the colors appearing in this chart.

The "Motor Speed Chart" graphically illustrates the motor speed. The graph's ranges automatically adjust to what is currently being displayed.

For both of these charts data points are plotted every second and the separation between vertical grid lines represents a 10 second interval. The graph shows approximately the last 110 seconds

2.4.4 Program Notebook

A program notebook is a collection of Spin Processor programs that may be saved to a file for later recall. They also contain detailed information about the Spin Processor the programs may run on. To upload or download programs to a connected WS-650 Spin Processor, this information must match exactly. If it doesn't the text "(Virtual)" is appended to the title bar name. A modified notebook has an "*" appended to the title bar name.
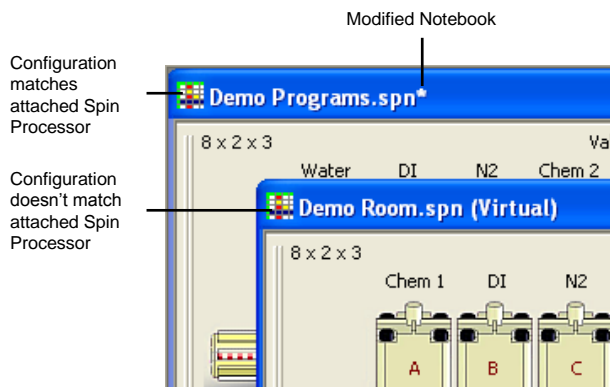
A notebook always contains the program sheets and status information bar. The valve, sensor, and relay bars are all optional. Their presence is entirely dependent upon the Spin Processor's or Virtual Spin Processor's configuration.

Several notebooks may be open simultaneously and may have different Spin Processor configurations.

Valve Bar

Sensor Bar

Step	Go To Step	Count	Duration (MM:SS.T)	Speed (rpm)	Acceleration (rpm/sec)	Agitate (cycles/min)	Chem 1 (On/Off)	DI (On/Off)	N2 (On/Off)	Chem 2 (On/Off)	Flood DI (On/Off)	BSR (On/Off)	Dome DI (On/Off)	Dome N2 (On/Off)
1	1	0	00:05.0	300	2	15	Off	Off	Off	Off	Off	Off	Off	Off
2	1	0	00:05.0	300	2	15	On	Off	Off	Off	Off	Off	Off	Off
3	1	0	00:05.0	50	2	0	On	Off	Off	Off	Off	Off	Off	Off
4	1	0	00:05.0	10	2	0	On	Off	Off	Off	Off	Off	Off	Off
5	1	0	00:10.0	0	2	0	Off	Off	Off	Off	Off	Off	Off	Off
6	1	0	00:01.0	500	2	0	Off	Off	Off	Off	Off	Off	Off	Off
7	1	0	00:05.0	300	2	15	Off	Off	Off	On	Off	Off	Off	Off
8	1	0	00:05.0	50	2	0	Off	Off	Off	On	Off	Off	Off	Off
9	1	0	00:05.0	10	2	0	Off	Off	Off	On	Off	Off	Off	Off
10	1	0	00:10.0	0	2	0	Off	Off	Off	Off	Off	Off	Off	Off
11	1	0	00:01.0	500	2	0	Off	Off	Off	Off	Off	Off	Off	Off
12	1	0	00:15.0	500	2	0	Off	On	Off	Off	On	Off	On	On
13	1	0	00:30.0	3000	2	0	Off	Off	On	Off	Off	Off	Off	On
14	1	0	00:01.0	0	2	0	Off	Off	Off	Off	Off	Off	Off	Off

Tabs: Agitate | Agitate 2 | Etch | coat

Status bar: Not Running | No Vacuum Required | No CDA Required | EDC On | Purge Off | Outputs 12/16 | Sensors 4/16

Outputs: Output I, Output J, Output K, Output L

Status Information

Program Sheets

Relay Bar

2.4.4.1 Program Sheets

The Program Sheets are the heart of a Program Notebook. They contain the steps necessary to run a Spin Processor program.

Each step is one row on a sheet. The columns are grouped as to their purpose. For example, there is a column for step duration, columns for motor parameters grouped under "Motor", and columns for individual valves, sensors, and relays grouped under valves, sensors, and relays, respectively.

Along the bottom edge are tabs for selecting programs to view. Pressing a tab with the mouse will display the associated program.

The loop, duration and motor parameter columns are always present. The valve, sensor, and relay columns are present depending upon Spin Processor configuration. None or one or more may be present. When a valve, relay or a sensor is active it is highlighted in yellow so you can easily distinguish it. When a column is highlighted in red, it is mutually exclusive with any other columns that are also highlighted in red. That means, for example, if two valves are mutually exclusive both may not be active simultaneously.

Editable Names for Valves,
Relays, and Sensors

Program Steps

Program Name

2.4.4.2 Valve Bar

The Valve Bar graphically illustrates a Spin Processor's valve and spray head configuration. The valve names are editable and have a one-to-one correspondence to the valve names in the program sheets. Changing a name here also changes it in the program sheets, and vice versa.

When a valve is active, the appropriate valve is animated.

Spray head information appears to the right of the valves. This consists of two pictures: the left one illustrates the stream, and the right one illustrates the spray pattern. Just above the two pictures are the valve numbers for the valves assigned to this spray head. When a spray head is off, the pictures for that spray head are "grayed," giving them a washed out appearance.
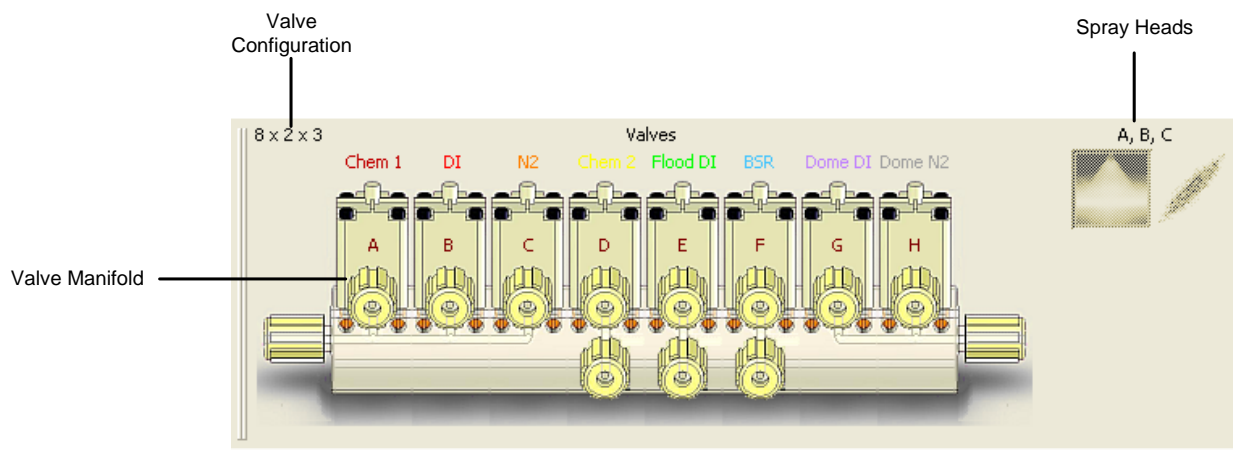
Valve
Configuration

Spray Heads

Valve Manifold

2.5 User Levels

Spin 3000 supports two levels of users: normal and administrator. The administrator may configure Spin 3000 and specify which features a normal user may use. On startup Spin 3000 defaults to the normal user capability level. No login is required for the normal user.

An administrator must login to setup and configure Spin 3000. To login, select "Login" from the menu bar. ***The administrator password is located on the Spin 3000 CD sleeve.***

Laurell Technologies recommends you change your administrative password on a periodic basis. The password must be between 8 and 16 characters. It must contain at least one number, and at least one punctuation character. The same characters should not be excessively repeated. The password is case sensitive. Don't forget the password, because doing so may require reinstalling Spin 3000.

2.6 Connecting to a WS-650 Series Spin Processor

Before using Spin 3000 to create programs, you should connect Spin 3000 to your WS-650 series Spin Processor. By doing so, Spin 3000 establishes a notebook template tailored to your WS-650 Spin Processor. Spin 3000 uses the template as a basis for creating a new notebook whenever you select "File | New" from the menu bar.

Having Spin 3000 create this template is a two-step procedure. First, you must establish the physical connection with a Spin Processor. Once this exists, then you can instruct Spin 3000 to obtain the Spin Processor's configuration information. The next two paragraphs describe how to do this.

2.6.1 Getting Physical

Spin 3000 communicates with the WS-650 series Spin Processors using a RS-232-C

Select Com Port

communications link. Both the Spin 3000 and WS-650s' baud rates, stop bits, etc., are preconfigured and are not user-selectable.

Test Drive Port

You need to ensure the RS-232C cable is connected to an unused RS-232C port on the PC and to the RJ-11 port (looks like a phone jack) on the WS-650 Spin Processor.

Once this connection is established, login as the administrator and select "Edit | RS-232 Interface" from the menu bar. The RS-232 Interface dialog will appear. It lets you select the com port and reset the connection.

If it works data from Spin Processor appears here

RS-232 Interface

Setup

Data Integrity

Port   COM1
Baud Rate   19200
Stop Bits   1
Parity   None
Char Width   8
Tx Pkt Size   64

Reset

WARNING!!! Could be hazardous to Spin Processor settings or configuration. Use with extreme caution.

Test

Ok Writes
Ok Reads
Ok Compares

Addess

Retries
Write
Read
Addressing

Faults
Write
Read
Compare

Data Integrity

From Spin Processor

20   G+00000T00000J0000

20 - G+00000T00000J0000
19 - G+00000T00000J0000
18 - G+00000T00000J0000
17 - G+00000T00000J0000
16 - G+00000T00000J0000
15 - G+00000T00000J0000
14 - G+00000T00000J0000
13 - G+00000T00000J0000
12 - G+00000T00000J0000
11 - G+00000T00000J0000
10 - G+00000T00000J0000

OK   Cancel   Apply   Help

Then, follow these steps:

1. Select the com port
2. Press the Reset button
3. If the com port works, data will appear in the bottom-most window
4. Press Ok

Selecting the RS-232 port need only be done once. Spin 3000 will remember the setting for future use.

2.6.2 Getting the Configuration Information

To get the configuration information to set the notebook template, select "Edit | Configure Spin Processor" from the menu bar. (You don't have to be the administrator.) This will obtain basic

information about the Spin Processor: motor, I/O configuration, etc. Valve, sensor, and relay names are obtained later when you either download or upload programs from the Spin Processor.
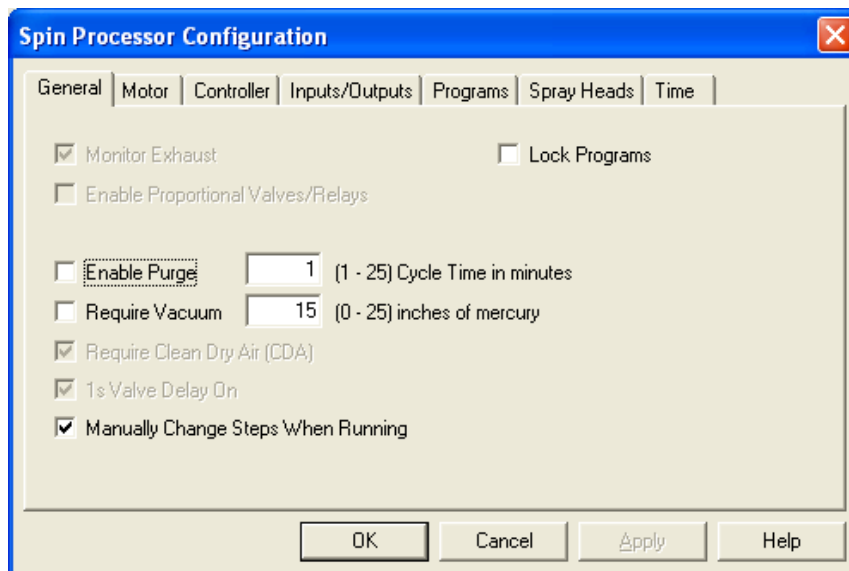
Press "Ok" when the Spin Processor Configuration dialog appears. For now, don't worry about what is on these various tabs. (See "Using the Virtual WS-650 Spin Processor," Page 32 for more information.) That's it. You are done. Now, when you select "File | New" your Spin Processor's configuration information is used to define notebook parameters for Spin Processor programs. It will not, however, change any pre-existing notebooks.

> NOTE: Attempting to download a program having a
> configuration differing from the target Spin Processor's
> configuration is prohibited.

2.7 Editing Programs

This section contains the following information:

- Creating, Opening, Closing, and Saving Program Notebooks
- Creating, Renaming, and Deleting Programs
- Entering Program Information
- Keyboard navigation controls
- Cutting and Pasting

2.7.1 Creating, Opening, Closing, and Saving Program Notebooks

To create a new notebook use "File | New" from the menu bar. The new notebook will be configured with setting for either the last Spin Processor Spin 3000 was connected to, or the Virtual Spin Processor settings. Which is used is determined by the "Use Virtual Spin Processor Configuration" Setting on the "General" tab found in "Edit | Options" from the menu bar. (See "General Page," Page 41.)

To save the currently active notebook use either "File | Save" or "File | Save As" from the menu bar. "File | Save" is generally used for notebooks previously saved to disk. The file name is already known; no prompt appears to query you as to what you want to call the file or where you want to store it. (The name is displayed on the caption bar on the top of the notebook.)

Use "File | Save As" to save a newly created notebook. It will display a prompt asking for the notebook name and where you want to store it. Notebook names have a file extension of "spn". Once you do a "File | Save As" the name in the notebook caption will change to reflect the name you chose.
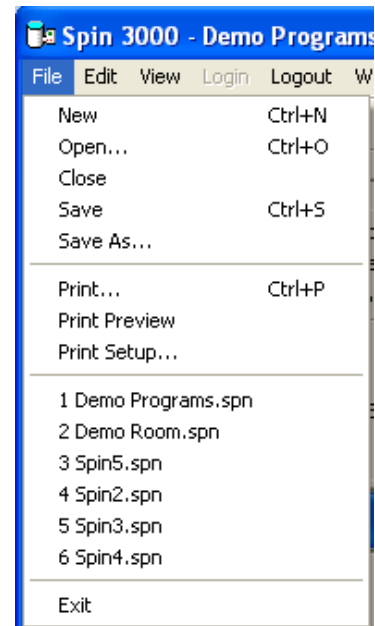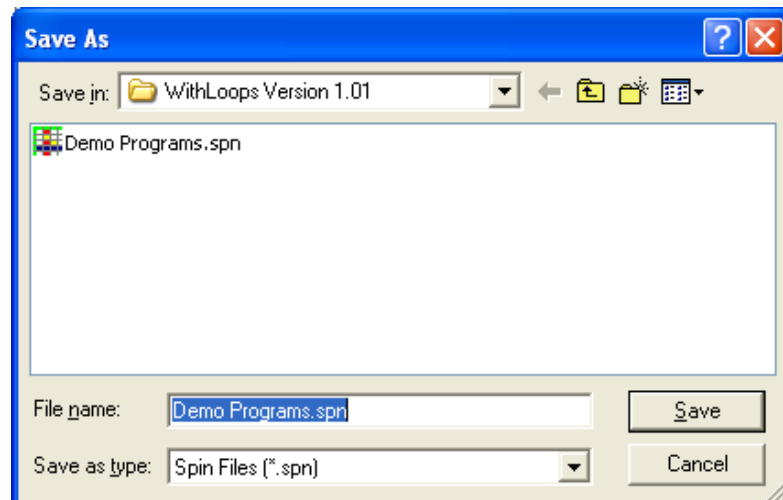
"File | Close" will close the current notebook. If the notebook wasn't previously saved, the notebook is closed and all programs in the notebook are lost.

"File Open" lets you open an existing notebook. It prompts you for a file name and where it is located. The prompt is similar to the one for "File | Save As."

Notebook Open, New, and Save may also be done using the icons on the toolbar. The "Save Notebook" icon will display the "File | Save As" prompt if the notebook is new. Otherwise, it saves the notebook to the file name shown in the caption at the top of the notebook.
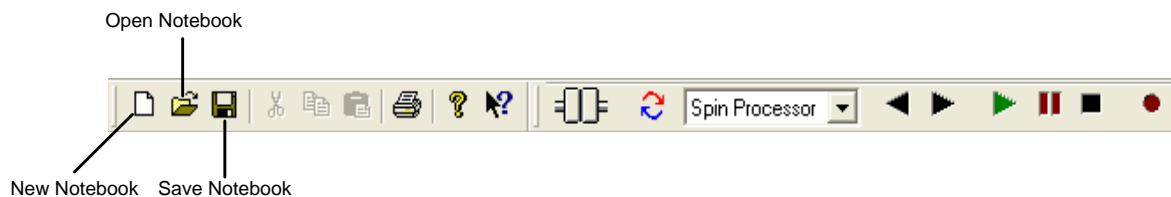
To copy a notebook right-mouse click on a program sheet, select "Copy Notebook to New Notebook." A new notebook is created using the configuration information currently in effect and all programs in the currently selected notebook are copied to the new notebook. This is very useful for making copies of programs for different system configurations.
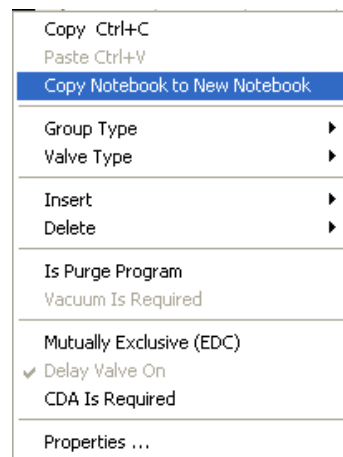
2.7.2 Creating, Renaming and Deleting Program Sheets

A notebook may contain one or more program sheets. Each sheet is essentially a program a Spin Processor might run. Navigating through the program sheets is done using the tabs and controls shown at the bottom of the notebook.
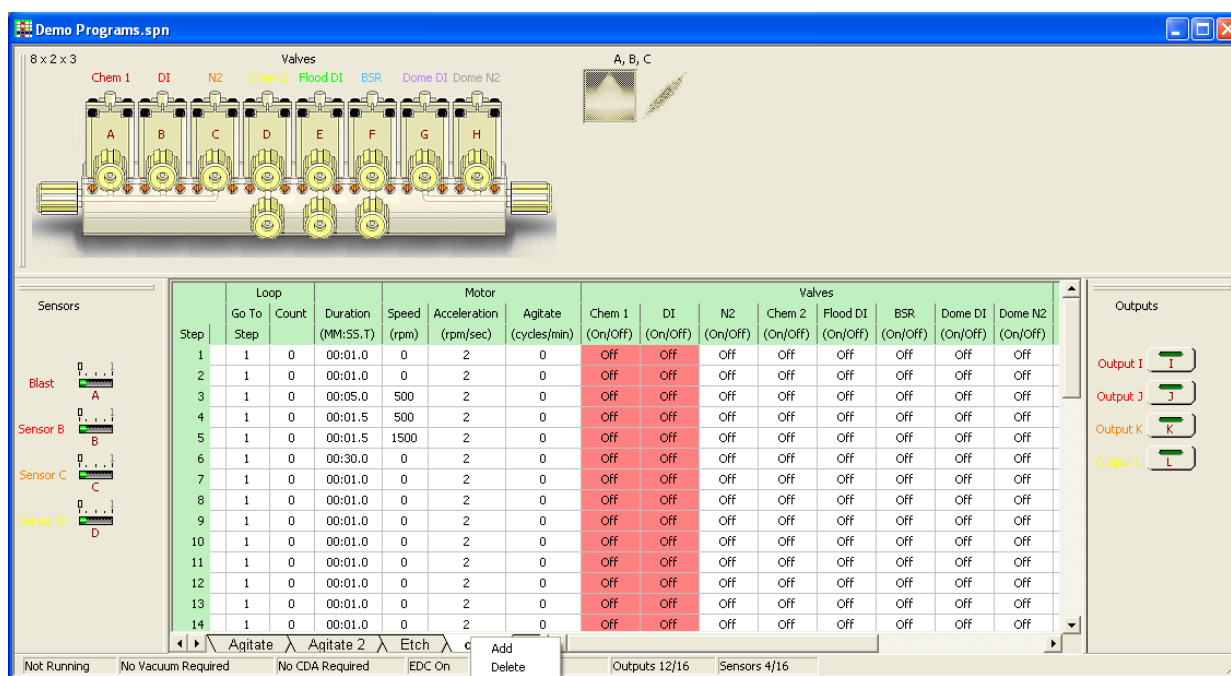
Popup

To add, rename, or delete a program sheet, right-mouse click on a tab name. A popup will appear with Add, Delete, and Rename as selections. Selecting Add will add a new program sheet to the notebook.

Delete deletes the program sheet whose name you right-mouse clicked on, and rename lets you rename the program sheet. You may also rename a program sheet by double-clicking on a program sheet's tab with the left mouse button.

A Spin Processor program name may be at most ten characters. Spin 3000 will let you enter more than ten characters for program sheet name, but the names will be truncated when loaded into a Spin Processor. Names may consist of alphanumeric characters including spaces.

To view different program sheets, select a program sheet by left-mouse clicking on its tab.

2.7.3 Entering Program Information

Information displayed within a program sheet depends upon the Spin Processor or Virtual Spin Processor settings stored within its notebook. Those settings determine whether valves, sensors, or relays (outputs) are present. Minimally, a program sheet will always contain loop, step duration, and motor settings.

Editable Names for Valves, Relays, and Sensors

Program Steps

Program Name

2.7.3.1 Inserting and Deleting Steps

A program sheet will show the maximum number of steps permissible for the given Spin Processor settings. (See "Programs," Page 36.) Steps may be inserted by right-mouse clicking on one of a step's field and selecting either insert a new step above the current step or insert a new step below the current step. When a new step is inserted the last step in the program is automatically deleted.

Steps may be deleted by selecting fields in one or more steps, right-mouse clicking and selecting "Delete | Steps." If fields selected are on non-contiguous steps, all steps between the lowest and highest step will be deleted. For however many steps are deleted, the same number of new "blank" steps are automatically added to the end of the program.

> NOTE: When programs are downloaded to a Spin Processor, Spin 3000 examines each program to determine which step is the last used step. "Blank" steps following the last used step are not downloaded.

2.7.3.2 Entering Step Settings

Entering step information is as simple as left-mouse clicking on a field and either entering numerical information (loop go to, loop count, duration, speed, and acceleration) or picking an available selection from a drop-down box (everything else). For numerical fields, the numbers typed by the user are validated as they are entered.

The loop fields enable repeating some number of previous steps up to 255 times. Loops may not be nested. That is, one loop inside of another. The "Loop Count" may be set from 0 (off) to 255 as long as it isn't within an existing loop. A non-zero "Loop Count" enables the "Loop Go To Step" field. Once enable, the "Loop Go To Step" field may set to the current step or any preceding step which isn't already part of a loop. The "Loop Go To Step" field has no effect unless the "Loop Count" field is non-zero.

	Loop			Motor		
Step	Go To Step	Count	Duration (MM:SS.T)	Speed (rpm)	Acceleration (rpm/sec)	Agitate (cycles/min)
1	1	0	00:01.0	0	2	0
2	1	0	00:01.0	0	2	0
3	1	4	00:05.0	300	2	15
4	1	0	00:05.0	300	2	15
5	1	0	00:05.0	50	2	0
6	1	0	00:05.0	10	2	0
7	1	0	00:10.0	0	2	0
8	5	2	00:01.0	500	2	0
9	1	0	00:05.0	300	2	15
10	9	5	00:05.0	50	2	0
11	1	0	00:05.0	10	2	0

Duration fields may have a maximum value of 99 minutes, 59 seconds, and 9 tenths of a second, and a minimum value of one second.

Motor speed and acceleration field maximum values are dictated by the Spin Processor's motor parameters. If a motor supports operating in both clockwise and counterclockwise directions, negative motor speeds may be entered. (These are usually brushless motors.)

Agitation is alternating motor direction at a frequency of 15, 30, or 60 cycles per minute; going up to the specified motor speed. Whether a Spin Processor supports agitation depends upon the installed motor. If the motor does not support agitation, selecting this field causes a drop-down box to appear containing just one available setting – "0." If the motor supports agitation (usually a brushless motor) all permissible agitation settings will appear. The user may then select one of the available settings. The user may specify an acceleration rate for a step with agitation. If the specified acceleration rate is too low to achieve the specified motor speed at the given agitation frequency, the Spin Processor will automatically calculate and use the minimum acceleration rate needed to do so.

For valve and relay (output) fields, when selected, a drop-down box appears containing two settings: "on" and "off." If the user selects "on," the field is highlighted in yellow. The yellow highlights are used to make it easier for the user to quickly tell at-a-glance what is on and in which step.

When a sensor field is selected, what appears is a drop-down box containing two selections: "ignore" and one of five possible action settings ("Start," "Abort Program," "Next Step," "Warning," or "Exit Loop"). Which action setting appears depends upon the purpose of the sensor. For example, if the sensor is monitoring a fluid level and it runs out, the appropriate response might be to abort the program. Like the valve and relay fields, if the selection is something other than "ignore," the field is highlighted in yellow.
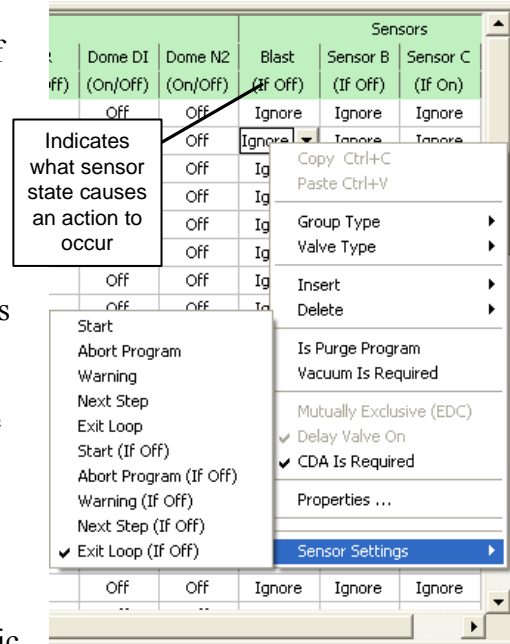
To set a sensor's action setting, right-mouse click on one of the sensor's program step fields. Select "Sensor Settings" and then select from one of the ten choices: ("Start," "Abort Program," "Next Step," "Warning,", "Exit Loop," "Start (If Off)," "Abort Program (If Off)," "Next Step (If Off)," "Warning (If Off)," or "Exit Loop (If Off)". The "If Off" versions let you pick negative logic settings for a sensor. Selecting one of these settings affects all the fields for the given sensor (the whole column), and all programs in the notebook. A prior field setting is replaced with the new setting.

So, if for a particular sensor, you had some fields set to "Start" and you changed the action setting of the sensor to something else, like "Abort Program;" in all programs in the notebook any field containing "Start," for that sensor, is changed to "Abort Program."

Selecting an "If Off" action setting also affects the column label beneath the sensor name. The label displays either "If On" or "If Off" as a visual reminder of what sensor state causes the action.

Because of its capability to affect other programs and Spin Processor performance, the administrator determines whether the user may use this feature.

2.7.4 Keyboard Navigation Controls

Spin 3000 simplifies entering step information by making use of keyboard navigation controls.

TAB,
RIGHT ARROW,
CTRL+RIGHT ARROW

Advances from one field to the next. At the end of a step, automatically advances to the first field of the next step. Stops at the last field of the last step. If the field is in edit mode, the next field will also be in edit

mode.

SHIFT+TAB, LEFT ARROW, CTRL+LEFT ARROW	Goes back one field. At the beginning of a step, goes to the last field of the previous step. Stops at the first field of the first step. Fields are in select mode. If the field is in edit mode, the next field will also be in edit mode.
DOWN ARROW, CTRL+DOWN ARROW	Goes to the field below the current field. Stops at the last step. If in edit mode on numeric fields, the next field will also be in edit mode. Use the "CTRL+DOWN ARROW" to stay in edit mode for drop-down box fields between program steps.
UP ARROW, CTRL+UP ARROW	Goes to the field above the current field. Stops at the first step. If in edit mode on numeric fields, the next field will also be in edit mode. Use the "CTRL+UP ARROW" to stay in edit mode for drop-down box fields between program steps.
ENTER	Cycles between edit mode and select mode

When navigating a program, what occurs depends to some degree on if Spin 3000 is in either select or edit mode and what kind of field you are on. For motor speed and acceleration fields typing in a number while in select mode will cause Spin 3000 to automatically enter edit mode and overwrite the existing value.

For duration fields, typing a number (the number is lost) while in select mode will cause Spin 3000 to "beep" and Spin 3000 will then automatically enter edit mode. Numbers typed in at this point will fill in the duration starting with the most significant digit.

For fields with drop-down boxes, if in select mode press "Enter" to enter edit mode and use the up or down arrows to navigate the selections. Use "Enter" to return to select mode.

When in edit mode you can modify other step fields without leaving edit mode. Just use the navigation keys to traverse the fields in the step. On numeric fields like duration, speed, and duration you can stay in edit mode while navigating between steps. For drop-down box fields because the up/down keys are used to make field selections, use CTRL+UP/DOWN ARROW to stay in edit mode between steps.

2.7.5 Cutting and Pasting

Spin 3000 supports cutting and pasting one or more fields to similar fields within Spin 3000 or to other programs like spreadsheets. Data from other programs may be pasted into Spin 3000 fields as long as the data, on a field-by-field basis, is what Spin 3000 expects. If the data isn't

appropriate for a given field, Spin 3000 ignores the data for that field. Other fields receiving appropriate data will still be pasted.

For copy operations, select multiple fields by using the SHIFT or CTRL+SHIFT keys in conjunction with the navigation keys.

You may also use the mouse to select multiple fields by selecting a field with the left mouse button, holding down the left mouse button and dragging the mouse over the fields you want to copy.

For paste operations, select a single field, which shall be the upper-left hand field, to indicate where to start pasting.

Cutting and pasting keyboard controls are shown below.

CTRL+X, CTRL+C	Copy field or fields to clipboard
CTRL+V	Paste data from clipboard into field or fields

You may also use selections from the menu bar; select "Edit | Cut," "Edit | Copy," or "Edit | paste." Similarly, you may use cut, copy, and paste buttons on the toolbar. Plus, if you right mouse click on a field or selected group of fields, copy and paste are available at the top of the popup menu.
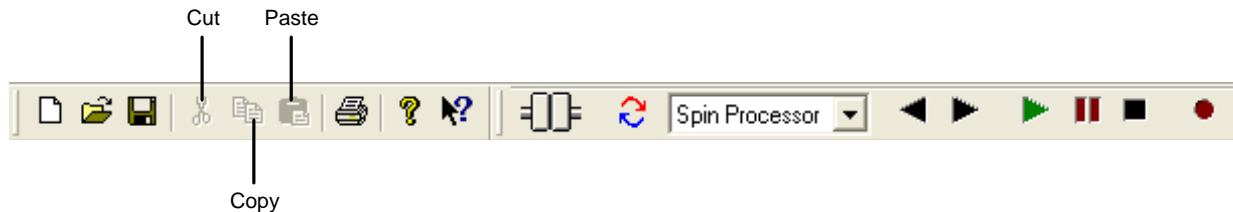
2.8 Using the Simulator

The simulator lets you test a program before actually running it on a WS-650 Spin Processor. Five buttons on the tool bar control the simulator: go back one step, advance one step, run, pause, and stop.
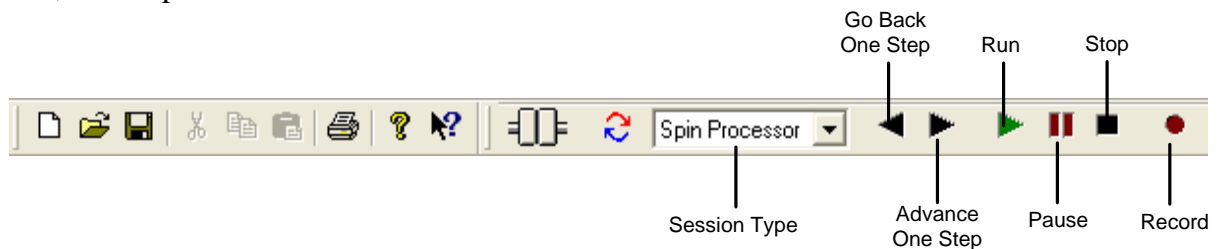
Select "Simulation" for the Session Type.

Pressing the "Run" button activates the simulator for the selected program of the currently active notebook. The simulator can only be active for just one program at any given time. You can select, view and edit other programs in any notebook while the simulator is active.

Once activated, the program being simulated is placed in read-only mode. That is, you cannot edit any of its steps while the simulator is active. In this mode, the program's text is lightly grayed. The current step is highlighted in dark blue. Previously executed steps are highlighted in light blue. Steps will run for the length of their duration.

The Spin Processor Status Bar receives and displays run-time information from the simulator. Careful observation of the Spin Processor Status Bar during program simulation reveals the simulator generates motor speeds consistent with the target speed, acceleration rate, and agitation. Step duration will decrement. Additionally, if valves or relays (outputs) are present, their indicators are activated when appropriate. This is observable both on the Spin Processor Status Bar and the Valve and Relay Bars. On the Valve and Relay Bars, these indicators are graphical representations of the devices. On the Spin Processor Status Bar, these indicators are green LEDs.

While the simulator is running, you can't use the refresh button to compare programs to what is in the connected WS-650 Spin Processor. If you start a program on a connected WS-650 Spin Processor while the simulator is running, the simulator continues to run and ignores the run information from the WS-650 Spin Processor. Spin 3000 once again recognizes run information from the connected WS-650 Spin Processor once the simulation ends. The simulator won't start if you are already running a program on a connected WS-650 Spin Processor and Spin 3000 knows it has an exact copy in one of its notebooks. You can start the simulator if you are already running a program on a connected WS-650 Spin Processor and Spin 3000 doesn't have an exact copy in one of its notebooks.
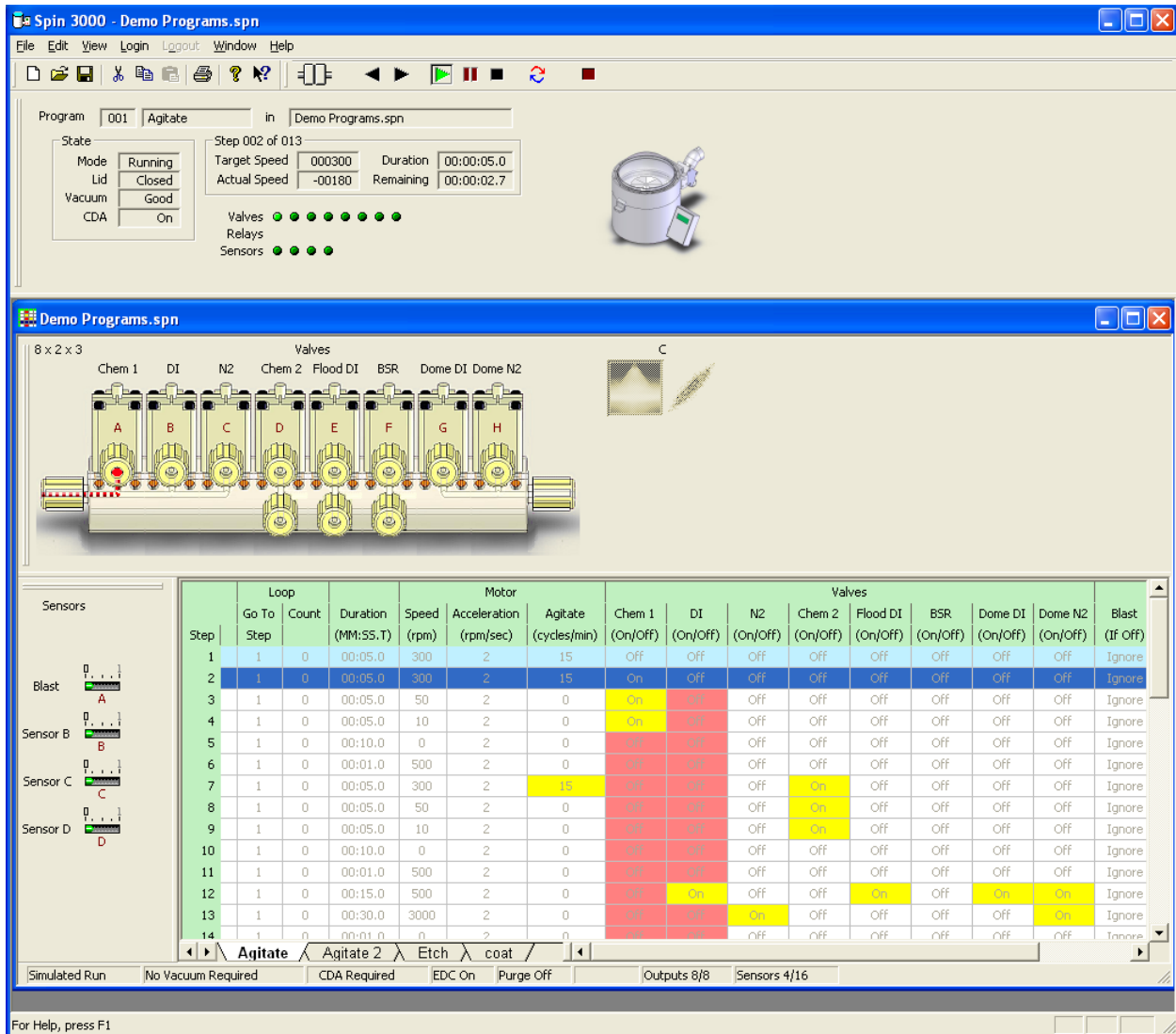
2.9 Using Record

Record lets you record a Spin Processors' run. Record only works when the session type is "Spin Processor". Pressing the Record button displays a dialog box requesting a file name for storing record information. Record will record multiple runs and must be manually turned off by repressing the Record button.
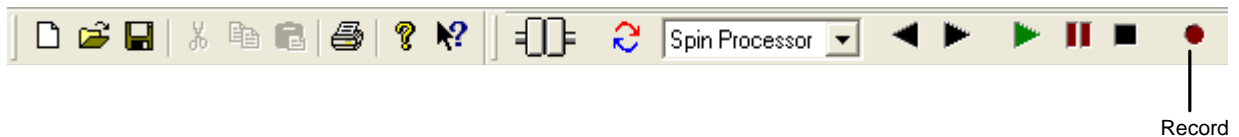
Record

2.10 Importing Recorded Files

If desired, Spin 3000 can import previously recorded files. The import is done using the current Spin Processor configuration (which may be virtual). Importing causes the creation of a new notebook and each detected run is placed in its own program sheet. To import select, from the main menu, "File | Import Record File …".
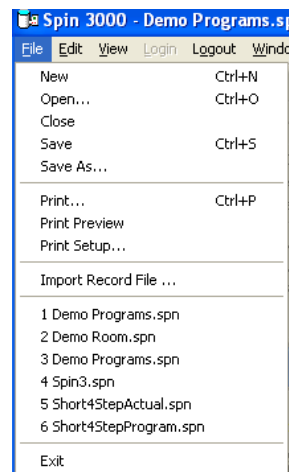
2.11 Using Record Playback

Record Playback lets you "re-run" a previously recorded Spin Processor or simulated run. Six buttons on the tool bar control Record Playback: session type, go back one step, advance one step, run, pause, and stop.

Set the session type to "Recorded."
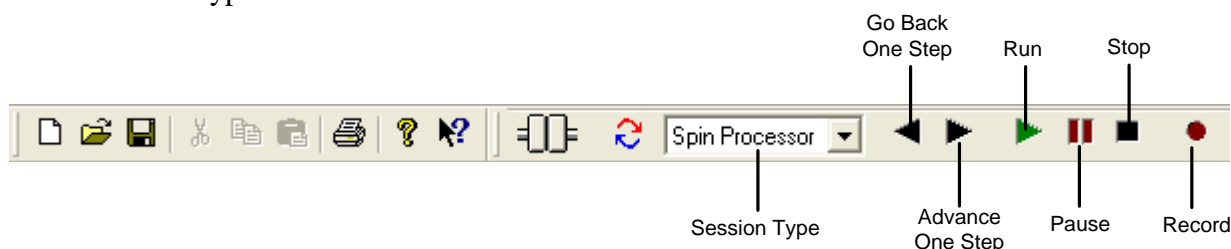
Pressing "Run" will display a dialog box requesting the name of a previously recorded file. The file is played back in real-time. The Advance, and Go Back buttons let you go forward or backward one step at a time. The graphical displays on the Spin Processor Status Bar reflect what the Spin Processor was doing. Record Playback does not affect the notebook nor does it search for the corresponding program in the open notebooks.

2.12 Transferring Programs To or From a WS-650

Programs may be copied from the currently active notebook to a WS-650 and vice versa. For this to occur the notebook's WS-650 configuration information must match the settings of the target WS-650. Besides the hardware configuration this includes the names of valves, relays, and sensors.

To transfer programs, first ensure Spin 3000 is communicating with a WS-650 Spin Processor. You may do this by observing the RS-232 control on the toolbar. If a red dot periodically appears on its right-hand side (at least once a second), a WS-650 Spin Processor is sending data to Spin 3000.
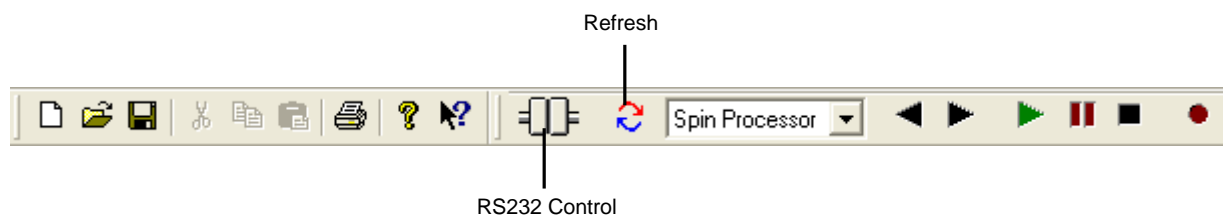
Then press the "Refresh" button.

An hour glass cursor appears indicating Spin 3000 is busy communicating with a WS-650 Spin Processor. Assuming the configuration information is the same, a dialog box will appear enabling you to transfer programs between the PC and the WS-650 Spin Processor.

The pane to the left contains the programs in the currently active notebook in Spin 3000. The pane to the right contains the programs on the WS-650 Spin Processor. Programs identical in both places are shown in green. Programs that are different but have the same name are shown in red. Programs in one place but not the other are shown in black.

The three controls (move left, move right, and delete) between these two panes let you move programs between Spin 3000 and the connected WS-650 Spin Processor. To move a program, select it using the right mouse button. Then, depending on which pane the program is in, press either the move left or move right button.

To select multiple programs, if they are adjacent, select either the top-most or bottom-most using the left mouse button. Then "drag" your mouse to the last program you want to select. You can also use the ctrl and alt keys in conjunction with the left mouse button to select the programs you want to move.

Upload or Download Programs

The number of programs in the active notebook, or their contents, don't match what is in the Spin Processor. Use this screen to move programs to or from the Spin Processor. (They don't have to be identical, if you don't want them to be.)

PC Programs

Agitate

Etch
coat

Spin Processor Programs

Agitate
Agitate 2
Etch
coat

-->
<--

Delete

Color Code: Black - Only here
Green - Identical in both places
Red - In both places, but not identical

☑ Overwrite programs with same name

OK   Cancel

Once you are satisfied with where programs are located press the "OK" button.

If you don't want to accidentally overwrite different programs with the same name deselect the option "Overwrite programs with the same name" just above the "OK" button.

The administrator can write-protect the WS-650 Spin Processor. If write-protected, an appropriate warning will appear just above the two panes.
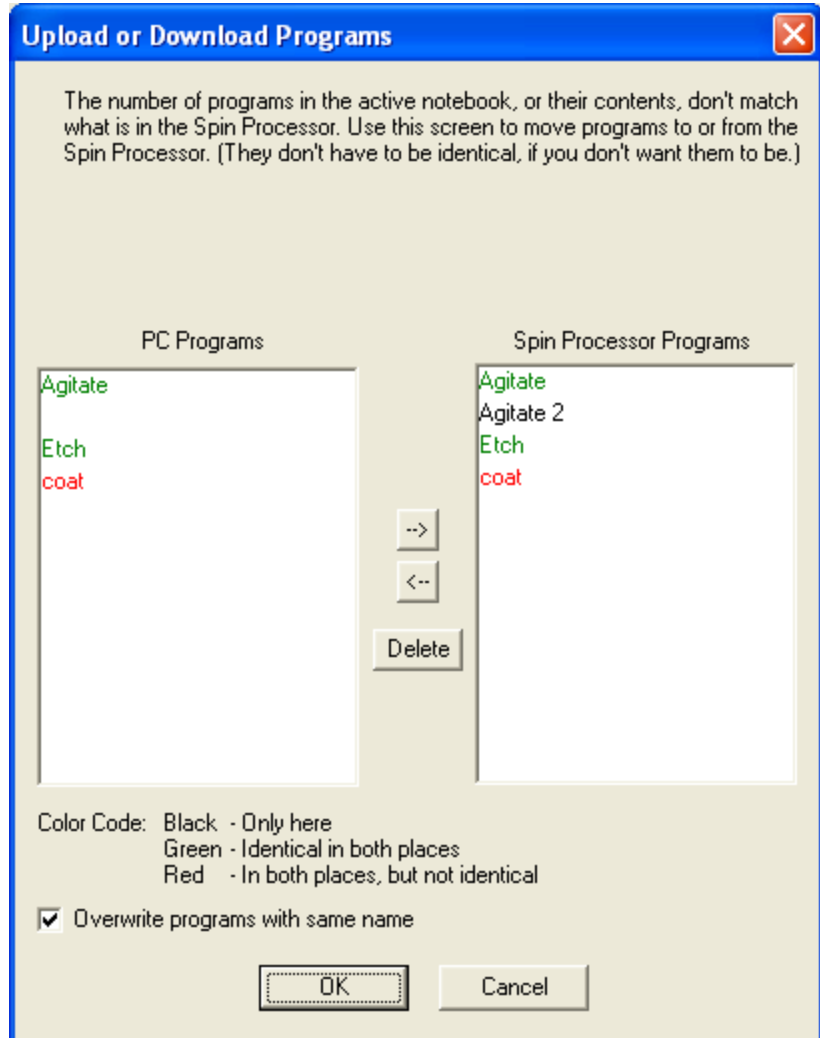
Pressing the "Cancel" button leaves everything as it was.

3   Using the Virtual WS-650 Spin Processor

Using the virtual WS-650 Spin Processor is easy. Select "Edit | Options" on the Menu Bar. When the Configuration Options dialog appears on the General page check the **Use Virtual Spin Processor Configuration** box. Now when you select "File | New" from the Menu Bar, newly created notebooks will use the Virtual Spin Processor configuration. (If you can't set this check box see your administrator.)

You can treat these notebooks just as you would Actual Spin Processor notebooks. You can save them, recall them, and run simulations on them. If you eventually get an Actual Spin Processor whose configuration matches a Virtual Spin Processor you have, you can even download and run your virtual programs on the Actual Spin Processor.

There are three primary methods for configuring a notebook using the Virtual Spin Processor:
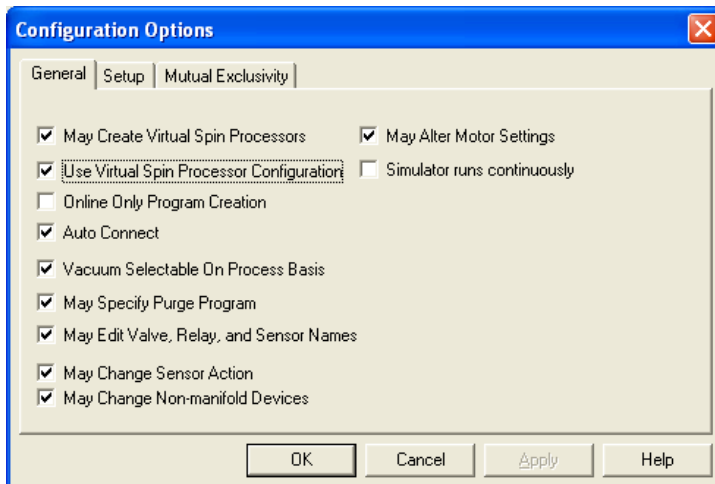
1) Configure the default Virtual Spin Processor,
2) Interactively change a notebook's Virtual Spin Processor's configuration, and
3) Interactively change an Actual Spin Processor oriented notebook into a virtual oriented notebook

The first approach uses essentially the same set of configuration pages configuring the Spin Processor uses. (See "Spin Processor Configuration," Page 44.) The key difference is almost all the settings for an Actual Spin Processor are fixed, whereas for a Virtual Spin Processor the settings are changeable.

For the last two, configurations are interactively changeable and are done in exactly the same way. If you can't interactively change configurations see your administrator.

3.1   Configuring the Virtual Spin Processor

To configure the default Virtual Spin Processor select "Edit | Virtual Spin Processor" from the Menu Bar. The presented set of pages is almost identical to those shown when configuring the Spin Processor. (See "Spin Processor Configuration," Page 44.) Two Spin Processor specific pages are missing: Controller and Time. For the remaining pages, the key difference is you can now change the various settings.
There are five pages: General, Motor, Inputs/Outputs, Programs, and Spray Heads.

Grayed settings, as viewed by the administrator, are set at the factory and are not user changeable. For the non-administrator, all settings are read-only.

3.1.1 General

Monitor Exhaust indicates the Spin Processor shall execute programs only if exhaust is present. The simulator will run a program on a Virtual Spin Processor regardless of this setting.

Enable Proportional Valves/Relays is a currently unimplemented feature and is reserved for future use.
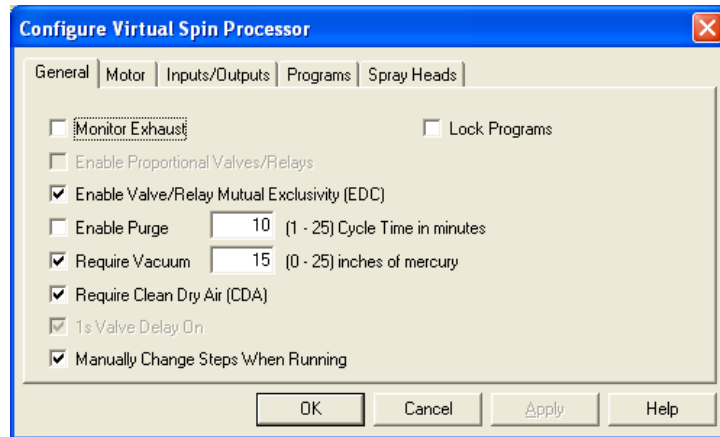
Enable Valve/Relay Mutual Exclusivity (EDC) specifies if valves and relays may be mutually exclusive. If set, this requires **1s Valve Delay On** be on. This option is typically used for chemicals which may mix dangerously. The mutual exclusivity tries to safeguard against simultaneous application of these chemicals.

Enable Purge specifies if the purge program is to be run. If so, the user must select an appropriate purge program and purge cycle time. See **Cycle Time**.

The simulator ignores this setting. Purge programs are not run. You may want to set it for when you do have a Spin Processor whose configuration matches the Virtual Spin Processor configuration.

Cycle Time specifies the purge program cycle time. This may be from 1 to 25 minutes. This setting dictates the amount of time that elapses between each running of the purge program. The count down begins when the purge program ends. The purge program will not run if another program is running, nor if requirements like Exhaust, CDA, or vacuum are unfulfilled.

Require Vacuum specifies if in general programs require vacuum. Typically, vacuum is required for vacuum-based chucks. This setting may be overridden on a program by program basis. The amount of vacuum required is settable via the **Inches of Mercury** field.

The simulator ignores this setting.. You may want to set it for when you do have a Spin Processor whose configuration matches the Virtual Spin Processor configuration.

Inches of Mercury specifies the minimum amount of vacuum required before a program may run. This may be set from 0 to 25 inches of mercury. A nominal value is 15.

Require Clean Dry Air (CDA) indicates the Spin Processor shall execute programs only if clean dry air is present. If so and if the clean dry air goes away during a run, the Spin Processor will stop the program.

The simulator ignores this setting. You may want to set it for when you do have a Spin Processor whose configuration matches the Virtual Spin Processor configuration.

1s Valve Delay On indicates the Spin Processor shall turn on a valve one second after being programmatically told to do so. Valves do not shut off instantly. So, by introducing this delay to valves about to be activated we give the valves going off more time to actually be off; thereby minimizing mixing chemicals that may interact dangerously.

The administrator may set this if the Spin Processor doesn't have mutually exclusive outputs (valves or relays). Whether or not the Spin Processor has mutually exclusive outputs is set at the factory.

Manually Change Steps When Running specifies a user may change steps while the Spin Processor is in run mode. Normally in run mode the Spin Processor advances to the next step when the step time elapses, and does so until the time on the last step elapses, at which time the program stops. Enabling this option allows the Spin Processor operator to tell the Spin Processor to go to either the next or previous step regardless of the current step's elapsed time.

The simulator ignores this setting. You may want to set it for when you do have a Spin Processor whose configuration matches the Virtual Spin Processor configuration.

Lock Programs specifies the programs in the Spin Processor are read-only. That is, no new programs may be downloaded into the Spin Processor, and the existing programs may not be edited.

The simulator ignores this setting. You may want to set it for when you do have a Spin Processor whose configuration matches the Virtual Spin Processor configuration.

3.1.2 Motor

The combination box shows the types of selectable motors, with its parameters appearing below.

The **Brushless** check box indicates if the motor is of the brushless variety. Typically, if it is, the motor is capable of bi-directional motion.

Maximum Speed indicates the

maximum speed the Spin Processor is capable of for non-vacuum (vacuum-less) and vacuum chucks. Specifying a program as vacuum or non-vacuum activates the appropriate maximum.

CAUTION:	Specifying a program as a vacuum program in conjunction with a vacuum-less chuck could potentially result in personal injury, damage to the object being spun, or damage to the equipment. DO NOT OPERATE NON-VACUUM (VACUUM-LESS) CHUCKS AT SPEEDS IN EXCESS OF THE MAXIMUM NON-VACUUM SETTING.

Max Acceleration is the maximum permissible acceleration for vacuum and vacuum-less chucks. The administrator may modify these settings. The administrator should show extreme caution in changing these settings. A quick acceleration, particularly with vacuum-less chucks, has the potential to harm both the chuck and the object being spun.

CAUTION:	For an Actual Spin Processor this is set at the factory to work with the delivered chuck. Changing a factory setting could potentially result in personal injury, damage to the object being spun, or damage to the equipment. Review this when you receive an Actual Spin Processor matching the Virtual Spin Processor's configuration.

Maximum Temp indicates the maximum motor temperature the Spin Processor will tolerate when starting a program. If this temperature is exceeded during a run the Spin Processor will continue running.

Highest Temperature indicates the highest motor temperature recorded. (Unaffected by the Simulator)

3.1.3 Inputs/Outputs

This page contains configuration information for valves, outputs (relays), and sensors. For the valves, how they connect via the manifold is also included.
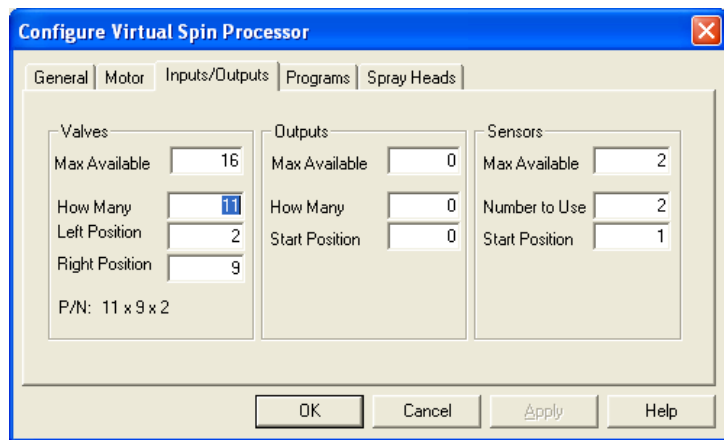
In all three groupings **Max Available** indicates the maximum number supported by underlying electronic hardware. In general, within reason you can put in whatever numbers you like. But, the available electronic hardware for real Spin Processors only support the following combinations.

Valves	Outputs (Relays)	Sensors	CDA/Exhaust Monitoring
0	0	0	Yes
8	0	0	Yes
16	0	0	Yes
0	0	2	No
8	0	2	No
16	0	2	No
0	8	16	Don't Care
8	8	16	Don't Care

How Many and **Number to Use** indicate how many are actually being used by this Virtual Spin Processor.

In the valves grouping, going from left to right, **Left Position** indicates the last valve connected to the left side of the manifold. By definition, all valves inbetween are also connected to the left side. Again going from left to right, **Right Position** indicates the first valve connected to the right side of the manifold. By definition all valves between the Right Position valve and the right side of the manifold are connected. Numbering in this case is done numerically and not alphabetically. That is valve A is 1, valve B is 2, and so forth.

At the bottom of the Valves grouping is the part number for the manifold.

In the outputs grouping, **Start Position** indicates the starting number for the outputs and must be greater than the Valves **How Many** value, usually just one higher.

In the sensors grouping, **Start Position** indicates the starting number for the sensors and is usually 1.
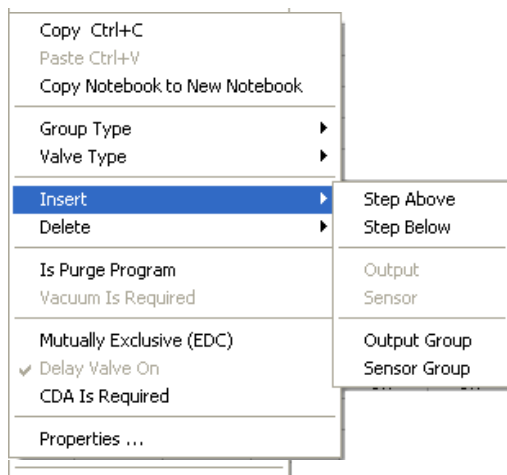
3.1.4 Programs

This page you specify how many programs (and thereby the maximum number of steps in each) a Spin Processor may contain.

Maximum specifies the maximum number of programs. Click on **Max Steps/Program** to see the new maximum number of steps per program.

3.1.5 Spray Heads

This page specifies which spray heads are attached to which valves.

Number of Spray Heads specifies how many spray heads the Virtual Spin Processor has.

Spray Head Number indicates which spray head is currently being viewed. Use the buttons to the right to scroll among the available spray heads.

Name indicates the name of the type of spray head. The user may select the type of spray head associated with this spray head number by using the drop down box. To the right the spray type and spray pattern are shown pictorially.

Type indicates the type of spray head.

Assigned Valves shows which valves are connected to this spray head. Use the **Valve Number** field to pick an available valve, then, add it to the assigned valves list using the Add button. To delete a valve, select it and press the Delete button

3.2 Changing a Notebook's Spin Processor Configuration

Spin 3000 lets you change the Spin Processor configuration associated with a particular notebook. For Virtual Spin Processors, this is an easy way to dynamically change configurations. If you use this approach to change a notebook's perceived configuration of an Actual Spin Processor, you do risk being unable to run the notebook's programs on that Spin Processor.

On the other hand, this is an easy way to make a Virtual Spin Processor match an Actual Spin Processor.

On the program, right mouse click and the popup menu to the right appears. The first two categories **Group Type** and **Valve Type** let you specify if a Group Type is either valves or relays and if a particular valve is connected to either the left side, right side, or neither side (center) of the manifold. Valves connected to neither side are typically individual valves. Those valves connected to one side or the other are typically interconnected with valves connecting to the same side.

Insert lets you insert steps, output groups (valves or relays), sensor groups, outputs, and sensors. If you insert a step the last step of the program is deleted. Outputs may only be inserted into output groups, and sensors may only be inserted into sensor groups. Although you may insert multiple groups of the same type, e.g., two valve groups, you should usually have at most one of each type, that is, one valve group, one relay group, and one sensor group.

Delete lets you delete steps, output groups (valves or relays) sensor groups, outputs, and sensors. If you delete a step or steps, replacement steps added to the end of the program. Steps deleted are those that you highlighted in some way. That is, maybe you highlighted valve settings for steps 3 through 6. Steps 3 through 6 are deleted.
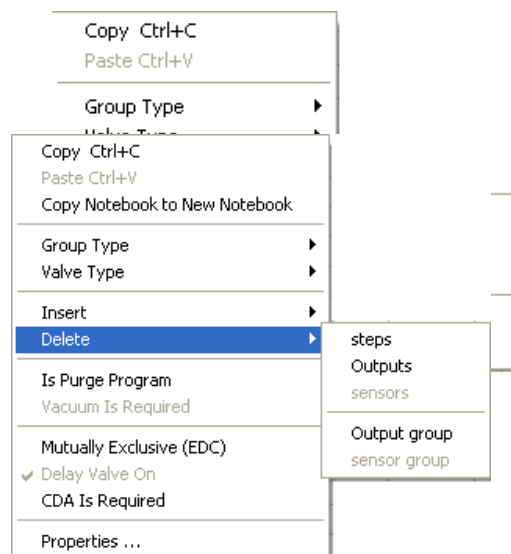
The group deleted is the one you right-mouse clicked on. Similarly, the output or sensor deleted is the one you right-mouse clicked on.

Changing Group Types, in the case of valves or relays, setting valve types, or adding or deleting valves, relays, or sensors may also be done by right mouse clicking on the graphical representation of a valve, relay, or sensor. For valves, Non-manifold valve types are also selectable. That is, anything other than Center, Left, or Right.
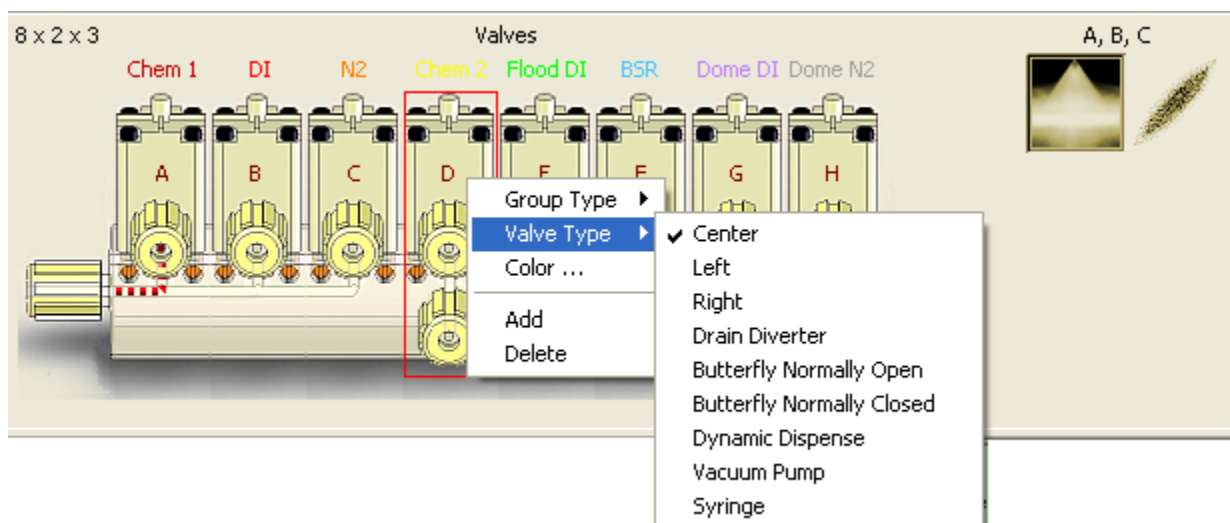
**Mutually Exclusive (EDC)** lets you specify that an output (valve or relay) is a mutually exclusive output, or not. If enabled, the output you right-mouse clicked on will be highlighted in red to indicate it is now a mutually exclusive output.

Properties displays the notebook's Spin Processor configuration. There are four pages on it: General, Motor, Programs, and Spray Heads.

The Inputs/Outputs page isn't present because you can change Inputs/Outputs configuration dynamically.

the

See "Configuring the Virtual Spin Processor," Page 32 for information on how to effect changes to these pages.
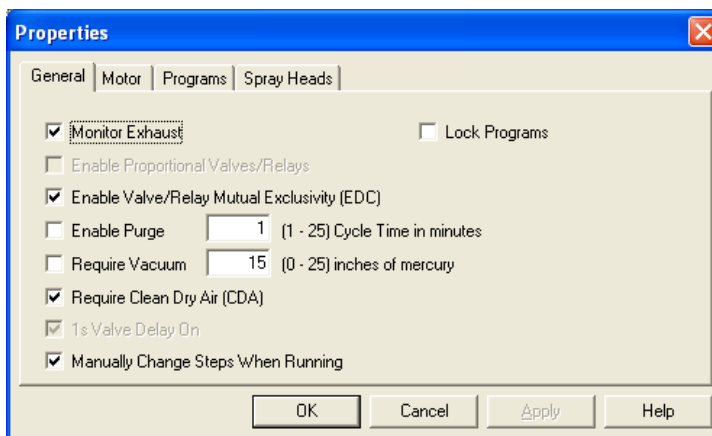
3.3 Changing Valve, Relay, or Sensor Names

There are two ways to change the valve, relay or sensor names.

1) Double click on the name at the top of the notebook column. You can now type in a name. A WS-650 Spin Processor's maximum name length is ten characters. You should try to pick names of ten characters or less. If you enter a longer name Spin 3000 truncates it when

    it is transferred to the Spin Processor.
2) Similarly, you can change the name over the graphical representations. Again, double click on the name over the graphic.
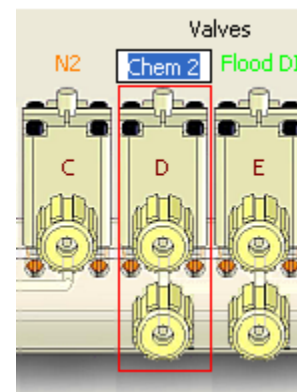

Changing a name in either location, changes it in both, and it occurs simultaneously.

> NOTE: If you do enter a name longer than ten characters, false configuration mismatches may occur.

3.4 Changing Valve, Relay, or Sensor Name Color
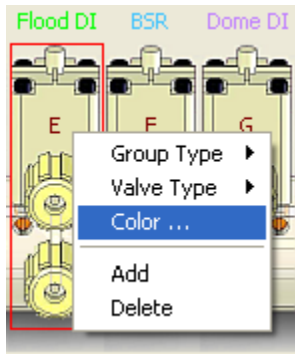
Right mouse click the graphical representation of the device whose name color you would like to change. A color selection box will appear. Just pick the color you would like to use. The text color will change as will the corresponding line (if any) in the "Output & Input Chart" on the "Spin Processor Status Bar."
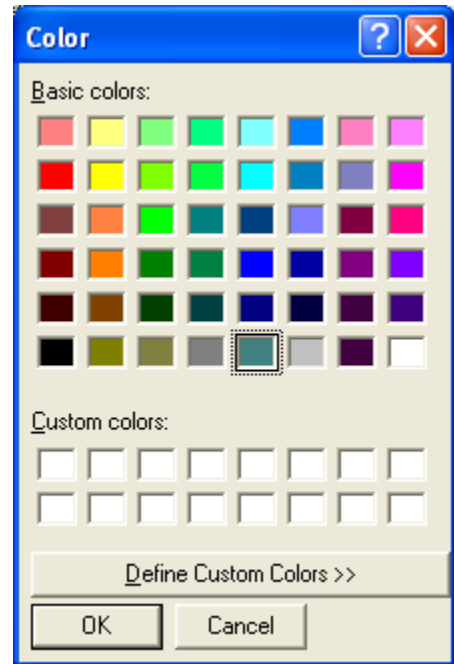
4 Advanced Operations

This section contains the following information:

- RS-232-C Interface
- Program Options
- (Virtual) Spin Processor Configuration

4.1 RS-232-C Interface

To view or change RS-232 settings select "Edit | RS-232 Interface" on the Menu Bar. The user may only view the settings.

Check Link Quality

Check for WS-650

The administrator may change the com port, test if the com port is connected to a WS-650 Spin Processor, and check how good the connection is.

The administrator may check if a WS-650 Spin Processor is connected to a particular port by first selecting a com port and then pressing the "Reset" button just below the "Tx Pkt Size" field. Data from the WS-650 are displayed in the bottom-most pane. Once a second, WS-650s send status information. So, at a minimum data will appear in this pane at one second intervals.

To check how good the connection (link) is, the administrator may press the "Test" button in the Data Integrity grouping. Press the button again to end the test. This test repeatedly writes and reads the first 500 bytes of the WS-650's EEPROM. Since the EEPROM, for each byte, has a limited number of write/read cycles, this test should be used sparingly and with extreme caution.

Failures, if any, are displayed in the Data Integrity pane.

4.2 Options

Various options for Spin 3000 are settable by selecting from the Menu Bar "Edit | Options." For almost all the options, only the administrator may change them. The user may view the options but may only change the "Use Virtual Spin Processor Configuration."

The options belong to one of three groups: General, Setup, and Mutual Exclusiveness.

4.2.1 General Page

The General page contains the most commonly used options.

May Create Virtual Spin Processors enables the user to create their own Virtual Spin Processors and to create notebooks using the Virtual Spin Processor as a basis.

If unchecked, this option disables the following one, "Use Virtual Spin Processor Configuration."

Use Virtual Spin Processor Configuration specifies the use of Virtual Spin Processor settings when a new notebook is being created. If unchecked, Spin 3000 will use the configuration settings of the last WS-650 Spin Processor that Spin 3000 was connected to.

Online Only Program Creation specifies Spin 3000 must be connected to a WS-650 Spin Processor before new notebooks can be created. The purpose of this option is to ensure new notebooks' configurations mirror the Connected Spin Processor's configuration.
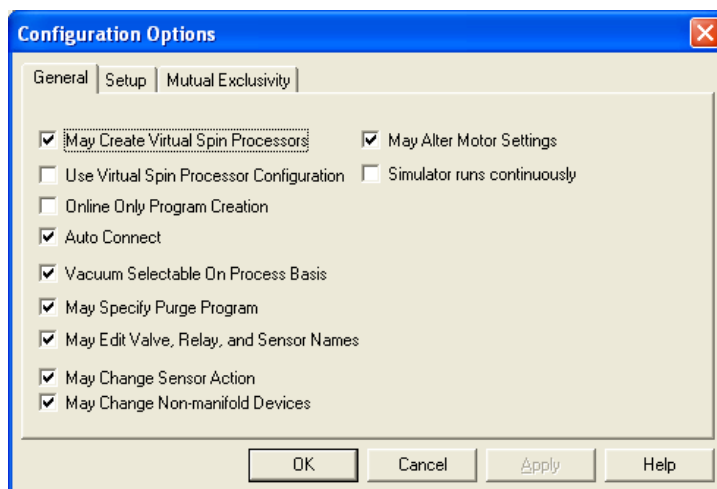
Auto Connect specifies Spin 3000 will, when started, automatically attempt to connect to a WS-650 Spin Processor.

Vacuum Selectable On Process Basis - (Virtual) Spin Processor configuration globally specifies if a Spin Processor requires vacuum or not, and indirectly the programs (processes) it contains. The corresponding Spin 3000 notebook contains this same requirement. So, this option specifies that the global vacuum requirement may be overridden on a *program by program (or process by process)* basis (enabled or disabled).

May Specify Purge Program indicates if the user may use a purge program. A purge program periodically turns on particular fluids to "purge" their lines. This option allows a user to specify which program is the purge program, if any.

May Edit Valve, Relay, and Sensor Names specifies whether a user may modify the valve, relay, or sensor names. If permissible and the user does change one or more names, then the user is given the option of changing the names in the Spin Processor when the refresh button on the tool bar is pushed. You should use this option with care because it does affect the Spin Processor configuration.

May Change Sensor Action specifies whether a user may change what action a sensor takes when the sensor becomes active. You should use this option with care because it does affect Spin Processor Configuration.

May Change Non-manifold Devices specifies a user may change a manifold valve into a non-manifold device and vice versa.

May Alter Motor Settings specifies a user may change the motor settings. When enabled, a user may change a notebook's motor settings and the virtual spin processor motor settings. However, under no circumstances may they change an actual Spin Processor's motor settings. An administrator may change actual, virtual, or notebook Spin Processor's maximum acceleration rates whether this is set or not.

Simulator Runs Continuously specifies that when the simulator finishes the last step of the program it shall start anew on the first step and repeat this process ad infinitum.

May Run Remotely specifies Spin 3000 may remotely control a Spin Processor. The Spin Processor must have firmware version 47000020b or higher.

4.2.2 Setup Page

The Setup page contains options specifying what features are available when the user right-mouse clicks on a column of a program. Most of these options affect Spin Processor configuration and are meant to be used largely with Virtual Spin Processors. Most of these affect the whole notebook and not just one program.

Additions and Deletions specifies
that valves, relays, and sensors
may be added to or deleted from
the Spin Processor configuration.

Valve Positioning specifies that
the user may dictate how a valve
manifold is configured.

Mutual Exclusivity (EDC)
specifies whether a user may make
valve or relay mutually exclusive.
The (Virtual) Spin Processor's
configuration must include mutual
exclusivity.

a
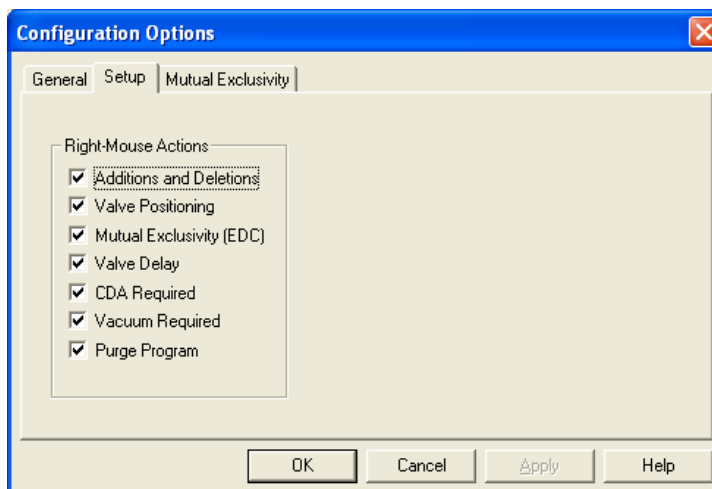
Valve Delay specifies that the user may dictate if valves are programmatically turned on a one
second delay occurs before they are physically activated. Valves do not shut off instantly. So, by
introducing the delay to valves about to be activated we give the valves going off more time to
actually be off; thereby minimizing mixing chemicals that may interact dangerously.

CDA Required specifies that the user may dictate if clean dry air (CDA) is required before the
program(s) may run.

Vacuum Required specifies that the user may dictate if vacuum is required before program(s)
are run. This is settable on a program by program basis.

Purge Program specifies that the user may dictate if this program is the purge program. A purge
program automatically runs periodically and is used to "purge" fluid lines.

4.2.3 Mutual Exclusivity

The Mutual Exclusivity page is visible
only to the administrator. This page
dictates what happens when a user
designates an output (valve or relay)
as mutually exclusive.

Keep Output Settings specifies the
step settings for the newly designated
mutually exclusive output will stay the
same and all conflicting step settings
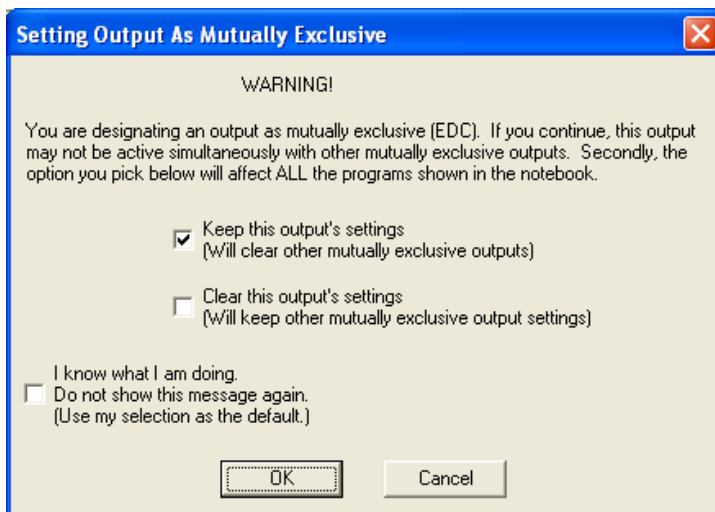for all other mutually exclusive
outputs will be cleared.

Enable Purge specifies if the purge program is to be run. If so, the user must select an appropriate purge program and purge cycle time, preferably before enabling this option. See **Cycle Time**.

Cycle Time specifies the purge program cycle time. This may be from 1 to 25 minutes. This setting dictates the amount of time that elapses between each running of the purge program. The count down begins when the purge program ends. The purge program will not run if another program is running, nor if requirements like Exhaust, CDA, or vacuum are unfulfilled.

Require Vacuum specifies if in general programs require vacuum. Typically, vacuum is required for vacuum-based chucks. This setting may be overridden on a program by program basis. The amount of vacuum required is settable via the **Inches of Mercury** field.
Inches of Mercury specifies the minimum amount of vacuum required before a program may run. This may be set from 0 to 25 inches of mercury. A nominal value is 15.

Require Clean Dry Air (CDA) indicates the Spin Processor shall execute programs only if clean dry air is present. If so and if the clean dry air goes away during a run, the Spin Processor will stop the program. This is set at the factory.

1s Valve Delay On indicates the Spin Processor shall turn on a valve one second after being programmatically told to do so. Valves do not shut off instantly. So, by introducing this delay to valves about to be activated we give the valves going off more time to actually be off; thereby minimizing mixing chemicals that may interact dangerously.
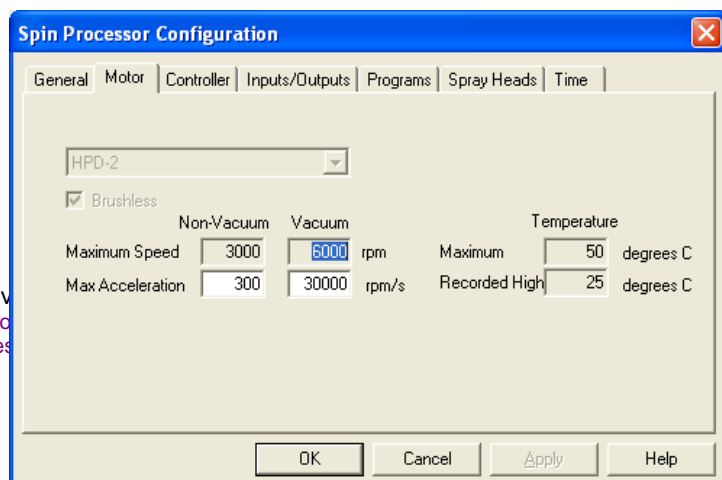
The administrator may set this if the Spin Processor doesn't have mutually exclusive outputs (valves or relays). Whether or not the Spin Processor has mutually exclusive outputs is set at the factory.

Manually Change Steps When Running specifies a user may change steps while the Spin Processor is in run mode. Normally in run mode the Spin Processor advances to the next step when the step time elapses, and does so until the time on the last step elapses, at which time the program stops. Enabling this option allows the Spin Processor operator to tell the Spin Processor to go to either the next or previous step regardless of the current step's elapsed time.

Lock Programs specifies the programs in the Spin Processor are read-only. That is, no new programs may be downloaded into the Spin Processor, and the existing programs may not be edited.

4.3.2 Motor

The combination box shows the type of motor the Spin Processor contains. Beneath it the **Brushless** check box indicates if the motor is of the brushless variety. Typically, if it is,

the motor is capable of bi-directional motion.

Maximum Speed indicates the maximum speed the Spin Processor is capable of for non-vacuum (vacuum-less) and vacuum chucks. Specifying a program as vacuum or non-vacuum activates the appropriate maximum.

> CAUTION: Specifying a program as a vacuum program in conjunction with a vacuum-less chuck could potentially result in personal injury, damage to the object being spun, or damage to the equipment.
>
> DO NOT OPERATE NON-VACUUM (VACUUM-LESS) CHUCKS AT SPEEDS IN EXCESS OF THE MAXIMUM NON-VACUUM SETTING.

Max Acceleration is the maximum permissible acceleration for vacuum and vacuum-less chucks. The administrator may modify these settings. The administrator should show extreme caution in changing these settings. A quick acceleration, particularly with vacuum-less chucks, has the potential to harm both the chuck and the object being spun.

> CAUTION: This has been set at the factory to work with the delivered chuck. Changing it could potentially result in personal injury, damage to the object being spun, or damage to the equipment.

Maximum Temp indicates the maximum motor temperature the Spin Processor will tolerate when starting a program. If this temperature is exceeded during a run the Spin Processor will continue running.

Highest Temperature indicates the highest motor temperature recorded.

4.3.3 Controller

This page contains information about the Spin Processor's controller.

Model Number is the model number of the Spin Processor.

Serial Number is the serial number of the Spin Processor.

Software Version is the version of the software controlling this Spin Processor.

PWB Version is the version number of the controller card in the Spin Processor.

Run Time indicates how many run hours the Spin Processor has, in tenths of hours.

Error Count indicates how many errors the Spin Processor encountered, for example, no CDA, no exhaust, etc.

Total Runs indicates how many runs have occurred. This includes runs in both edit mode and run mode, and runs that have been aborted.

Tune Motor specifies for the high performance drive if the RS-232 port shall be used for tuning the motor. Doing so requires additional software and if done improperly may render the Spin Processor inoperable. For the standard motor, enables motor tuning via the Configuration menu on the Spin Processor. If activated on the Spin Processor, the Spin Processor will immediately accelerate to the highest permissible speed setting and then slowly go to zero rpm at a rate of approximately 10 rpm/s. (The Spin Processor examines the maximum values for vacuum and non-vacuum programs and uses the higher of the two.) Tuning the standard drive should only be done with the smallest vacuum chuck available from Laurell Technologies. Please consult Laurell Technologies if you would like to re-tune the motor.

CAUTION:	Tuning the motor requires extreme caution, doing so without care risks personal injury or damage to the equipment.

4.3.4 Inputs/Outputs

This page contains configuration information for valves, outputs (relays), and sensors. For the valves, how they connect via the manifold is also included. This information is set at the factory.

In all three groupings **Max Available** indicates the maximum number supported by underlying electronic hardware. **How Many** and **Number to Use** indicate how many are actually being used by this Spin Processor.

In the valves grouping, going from left to right, **Left Position** indicates the last valve connected to the left side of the manifold. By definition, all valves inbetween are also connected to the left side. Again going from left to right, **Right Position** indicates the first valve connected to the

right side of the manifold. By definition all valves between the Right Position valve and the right side of the manifold are connected. Numbering in this case is done numerically and not alphabetically. That is valve A is 1, valve B is 2, and so forth.

At the bottom of the Valves grouping is the part number for the manifold.
In the outputs grouping, **Start Position** indicates the starting number for the outputs and must be greater than the Valves **How Many** value, usually just one higher.

In the sensors grouping, **Start Position** indicates the starting number for the sensors and is usually 1.

4.3.5 Programs

This page lets the administrator specify how many programs (and the maximum number of steps in each) a Spin Processor may contain.

Maximum specifies the maximum number of programs. Click on **Max Steps/Program** to see the new maximum number of steps per program.
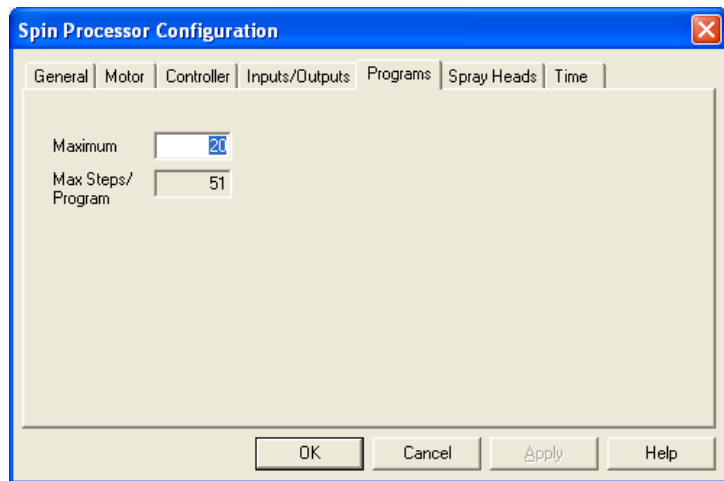
4.3.6 Spray Heads

This page indicates which spray heads are attached to which valves. The administrator may change this information.

Number of Spray Heads indicates how many spray heads the Spin Processor has. This is set at the factory and is not changeable.

Spray Head Number indicates which spray head is currently being viewed. Use the buttons to the right to scroll among the available spray heads.

Name indicates the name of the type of spray head. The administrator may select the type of spray head associated with this spray head number by using the drop down box.
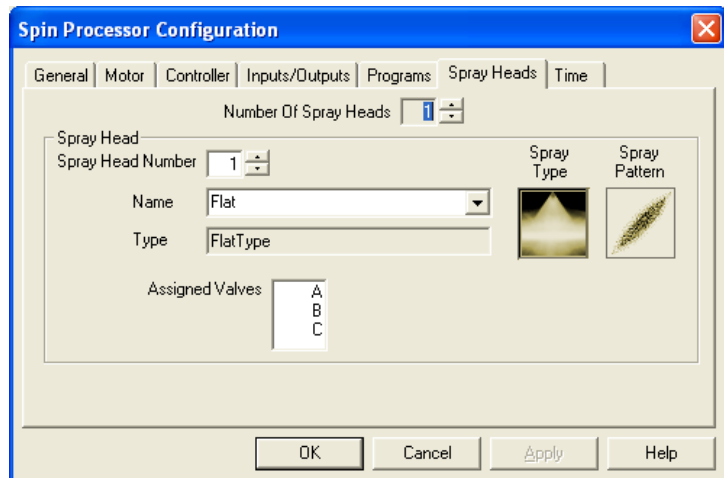
Type indicates the type of spray head. To the right the spray type and spray pattern are shown pictorially.

Assigned Valves shows which valves are connected to this spray head.

4.3.7 Time

This page lets the administrator view and set the Spin Processor's clock. When first viewed, it shows the computer's time when the configuration dialog was created.

Get Current Time gets the computer's current time.

Get Time gets the Spin Processor's current time.

Set Time sets the Spin Processor's current time.
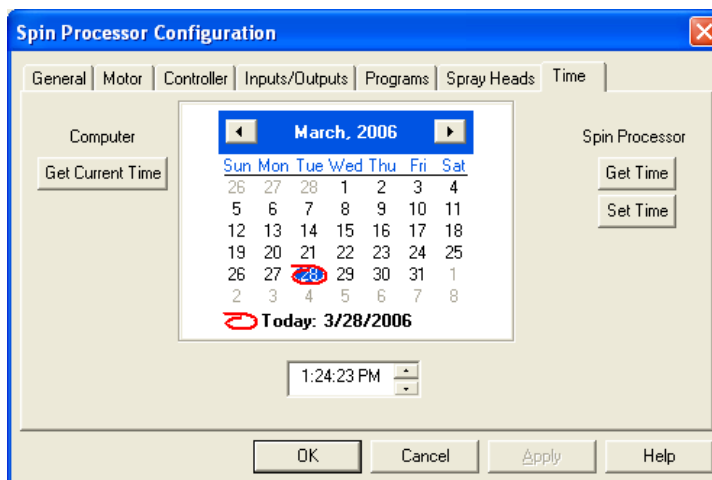
5 Troubleshooting

The most occurring problems are either with the RS-232-C connection or configuration mismatches between a notebook and an actual Spin Processor.

5.1 Resolving RS-232 Problems

The RS-232 interface is relatively simple. To make it even easier to use, Laurell Technologies preconfigured both Spin 3000 and the WS-650 Spin Processors to use specific baud rates, etc.

Normally all the user need do is connect the WS-650 Spin Processor to the user's PC using the supplied cable and then tell Spin 3000 which PC com port is being used. See "RS-232-C Interface," Page 40.

5.1.1 Spin 3000's RS-232 Icon indicates no connection or no data is being received

If the RS-232 Icon indicates an open condition or no activity. That is no red dot appears on the right-hand side at one second intervals , then there is some kind of connectivity issue.

There can be several causes.

1) Verify the WS-650 Spin Processor is on,
2) Check cable connectivity between the WS-650 Spin Processor and the PC,
3) Verify connectivity between the WS-650 Spin Processor and the PC (See "RS-232-C Interface," Page 40.),
4) Verify the auto connect option is checked on the General Page of the Configuration Options as accessed via "Edit | Options" on the Main Menu bar.
5) Verify that the computer color is set to 32 bit and set resolution to 1024 X 768 or higher.

One of these should solve your connectivity issue.

5.1.2 Spin 3000's RS-232 Icon indicates connectivity but transmissions occur slowly and eventually I am told there is no connection

A red dot appears on the left side of the RS-232 connectivity icon when Spin 3000 is sending (or attempting to send) data to the connected WS-650 Spin Processor. With a good connection both the transmit and receive dots will appear and disappear rapidly. It is possible you may be receiving data from a WS-650 Spin Processor while transmissions are failing.

Typically, this issue indicates the PC's com port has been reconfigured or corrupted in some way. Depending on its severity, the WS-650's port may also be affected. The following procedure should resolve this issue.

1) Turn off the PC, wait 30 seconds, and then turn it back on.
2) Check if Spin 3000 is now successfully sending. (Get the Spin Controller's configuration; press the Refresh button, etc.)
3) If not, turn off both the PC and the WS-650 Spin Processor, wait 30 seconds, and turn both back on. Sometimes the order makes a difference. For example, turn on the PC first and wait until it is up and running before turning on the WS-650 Spin Processor. Try the opposite. That is, turn on the WS-650 first.
4) If using an USB to RS232 adapter try the following;
    i. Disconnect the USB connection at the computer, wait a few seconds then reconnect. Assuming that the communication icon is closed, open and close the icon.
5) Check if Spin 3000 is now successfully sending.
6) If not, try a different COM port on the PC, and repeat steps one through four. (See "RS-232-C Interface," Page 40.)
7) If none of this works, try a different RS-232 cable and repeat steps one through 4.
8) Verify that the computer color is set to 32 bit and set resolution to 1024 X 768 or higher.

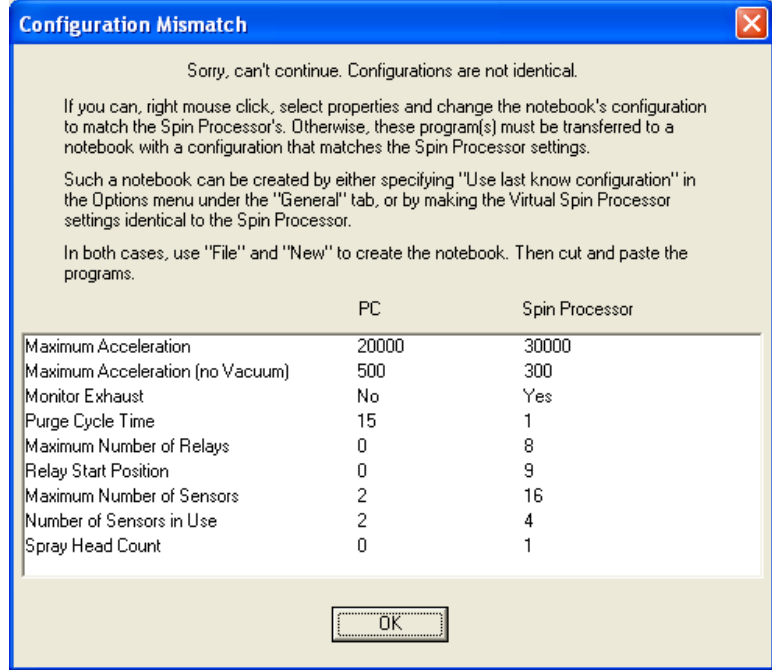## 5.2 Resolving Configuration Problems

Most configuration problems become apparent when the user presses the refresh button. When the refresh button is pushed, Spin 3000 first examines the physical configuration of the connected Spin Processor versus that contained in the notebook. If they are the same, Spin 3000

then examines the Valve, Relay, and Sensor Names and their configuration. If those are the same then Spin 3000 compares the programs.

5.2.1 Physical Differences

If the the connected Spin Processor and the notebook's Spin Processsor's physical configurations do not match, a box highlighting those differences appears. You can make the notebook's Spin Processor configuration settings (PC) match the connected Spin Processor. (See "Changing a Notebook's Spin Processor Configuration," Page 37.) If the text **(May Differ)** is displayed, that setting needn't be changed.

If the differences are too great, you can make a new notebook using the connected Spin Processor's configuration, and then cut and paste your programs into the new notebook.

Configuration Mismatch

Sorry, can't continue. Configurations are not identical.

If you can, right mouse click, select properties and change the notebook's configuration to match the Spin Processor's. Otherwise, these program(s) must be transferred to a notebook with a configuration that matches the Spin Processor settings.

Such a notebook can be created by either specifying "Use last know configuration" in the Options menu under the "General" tab, or by making the Virtual Spin Processor settings identical to the Spin Processor.

In both cases, use "File" and "New" to create the notebook. Then cut and paste the programs.

|	PC	Spin Processor
Maximum Acceleration	20000	30000
Maximum Acceleration (no Vacuum)	500	300
Monitor Exhaust	No	Yes
Purge Cycle Time	15	1
Maximum Number of Relays	0	8
Relay Start Position	0	9
Maximum Number of Sensors	2	16
Number of Sensors in Use	2	4
Spray Head Count	0	1

OK

5.2.2 Valve, Relay, and Sensor Mismatches

If the Valve, Relay, or Sensor names and configuration don't match, a Name mismatch box appears highlighting their differences. You may then update either the notebook, Spin Processor, or both with names and configurations selected by you. Whether you may effect changes and to what degree depends on how the administrator has configured Spin 3000. See the administrator if you are having dificulties.

Use program names selection uses the notebook's names and settings found in the Computer pane to update the Spin Processor.

Use spin processor names selection uses the names and settings found in the Spin Processor pane to update the notebook.
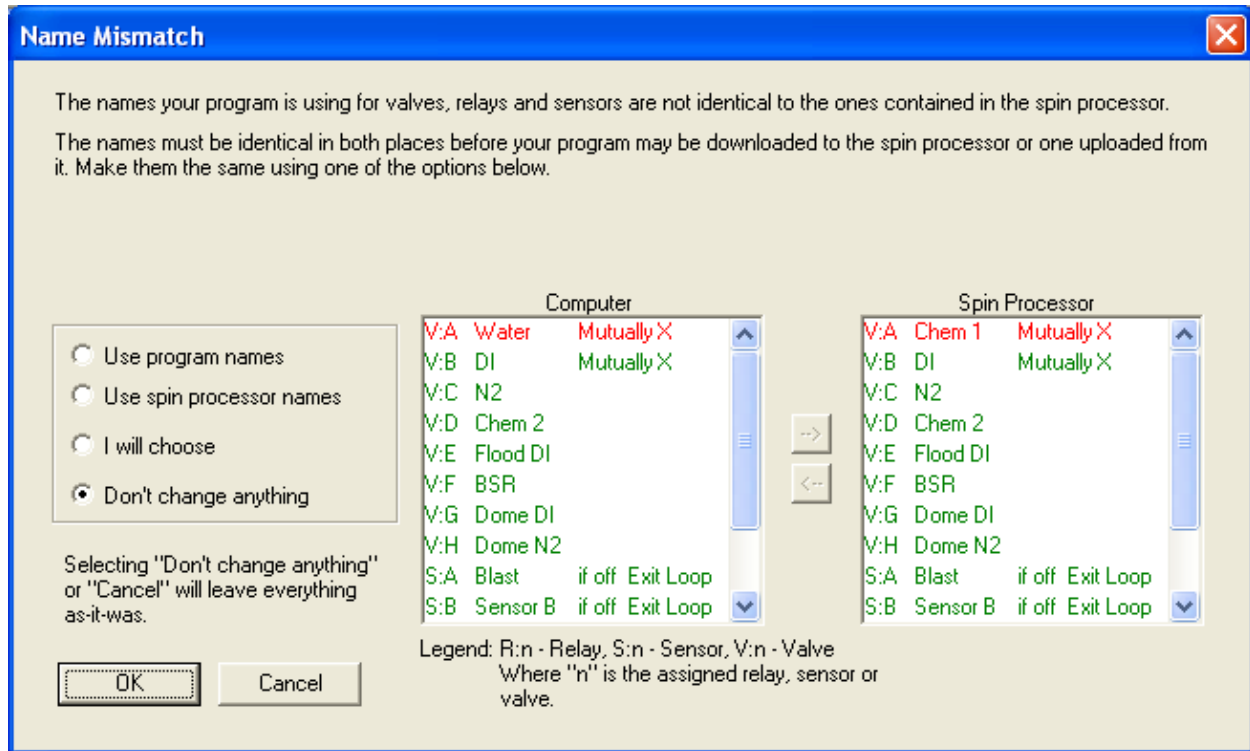
I will choose lets you pick what goes where using the arrow buttons between the two panes.

Don't change anything is a do nothing.

Within the panes, the first letter indicates if the name belongs to either a valve (V), a relay (R), or a sensor (S). The second letter (A-P) is the device indicator. The name is next. Lastly, how the device is configured appears. For valves and relays this indicates if the device is mutually exclusive. For sensors, this indicates the activation state and what happens.

Typically, a Spin Processor's mutual exclusivity can not be overridden; whereas sensor activation states and actions may be. Nevertheless, the names for both of these device types are changeable.