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Process Analysis
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Caliper LS - Twister II

User Guide

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Preface

This document provides information for users of the Caliper LS Twister II robotic arm Overlord Workstation driver.

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Revision History

Issue	Date	Author	Release Notes
1.0	1 Sep 2006	IDP	First Version
1.1	29 Jul 2011	IDP	Additional of stack offset dialog

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1. Introduction

This manual will describe how to use the Caliper LS Twister II Overlord driver. This document assumes that the Twister II driver (ovZymarkTwisterII.dll) is installed and registered on the system PC, and that the Twister II is functioning correctly through the Caliper LS supplied iLink software.

Note: It is recommended to refer to the manual supplied by Caliper LS for the full details of how to prepare for operation. This document is provided as a summary and is not intended to replace the guidelines provided by the manufacturer.

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2. Driver Functions

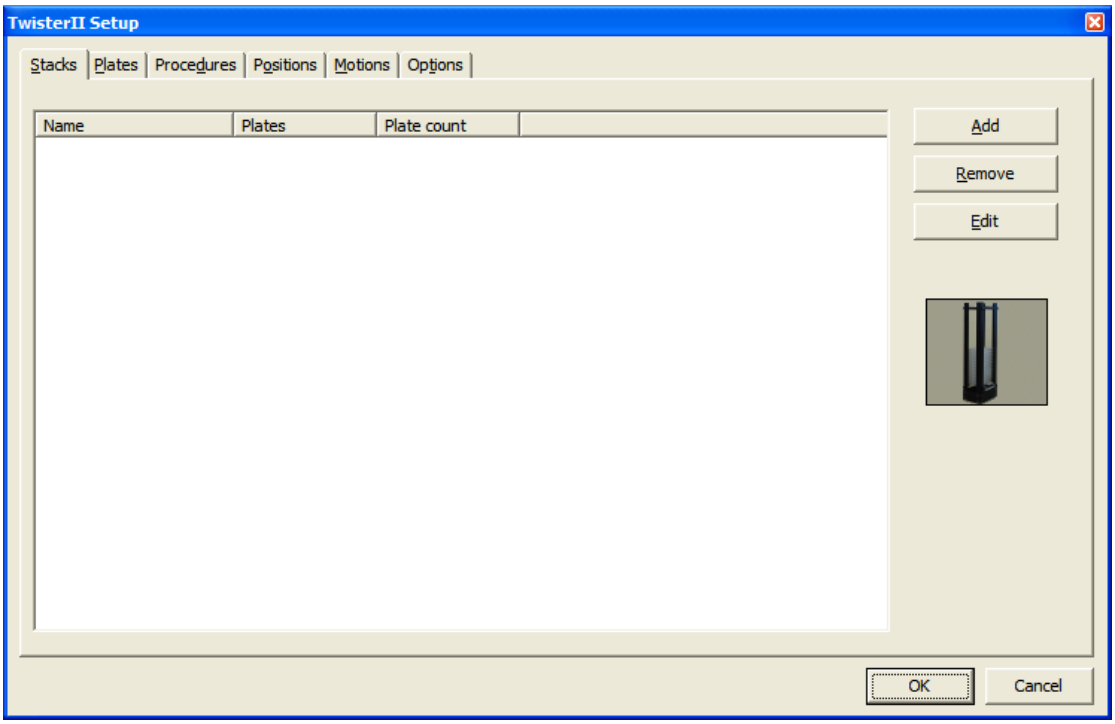
2.1Configuration

Open *Overlord*. Select *Setup* menu > *System* > *Instrument Configuration*. In the *Setup Instruments* dialog click *Add Instrument*. In the *Add an Instrument* dialog scroll to the bottom and select *Zymark Twister II*. Select the port that the Twister II is connected to and click *Assign Port*. Click *OK* on the *Setup Instruments* dialog. The Twister II should now appear in the *Commands* palette on the left-hand side of the screen.

2.2 Setup Functions

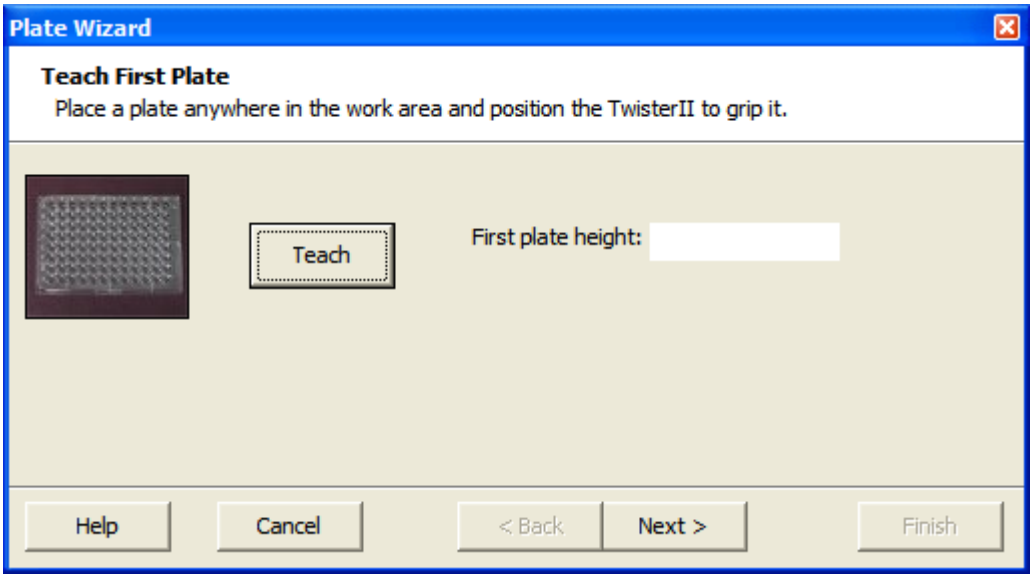
2.2.1 Plates

Before the Twister II can be used in an automated run the setup process must be completed. Select *Zymark Twister II* from the *Setup* menu. The following dialog will appear.

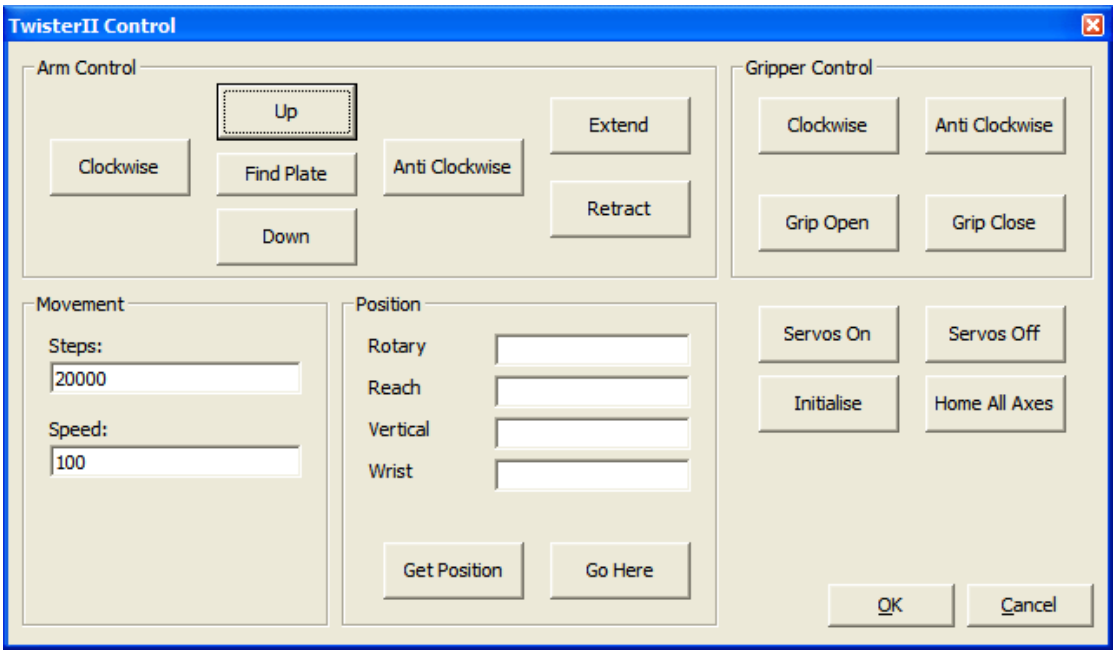


Each tab in the setup screen contains details of a particular aspect of the Twister IIs configuration. The first item to set up is the plates that will be used on the system. Select the *Plates* tab. Click *Add*. The first step of the *Plate Wizard* will appear.

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As instructed in the dialog, place a plate anywhere in the work area. Usually this will be on one of the 3 plate stacks. Click the *Teach* button when the plate is in position.



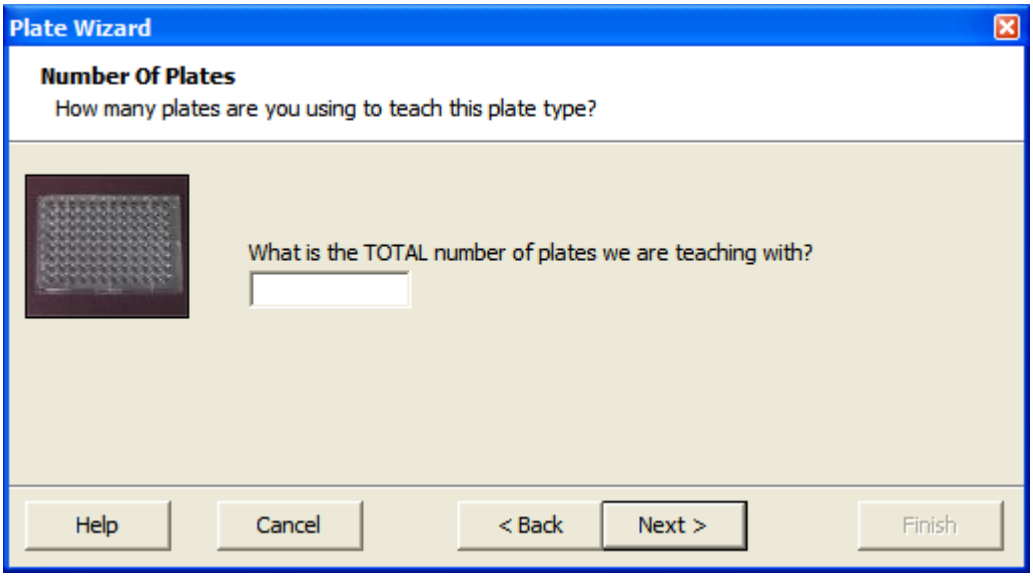
The teach control will appear. This is used to move the arm to the desired position. When using the robot for the first time click the *Initialise* button to carry out the initialisation procedure. If the robot is already initialised the *Home All Axes* button can be used to reset the robot. This will move the arm to its home position. Check when carrying out this action that the arm will not cause any collisions when moving.

The easiest way to teach a plate is to turn off the servo motors and manually move the arm to grip the plate. Click the *Servos Off* button. Note, as this turns off all the servo motors hold the gripper before clicking the button. If not the gripper will drop when the vertical axis is disabled.

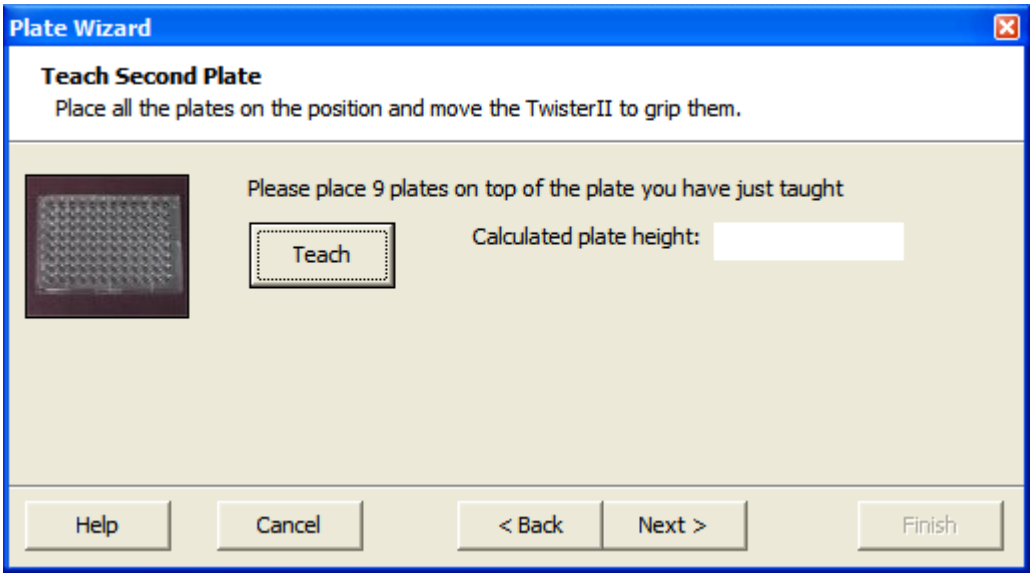
Guide the gripper to the plate you have positioned in the system. When the servo motors are off the gripper will close, but can be opened manually. When the plate is gripped correctly click the *Servos On* button.

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In order to get the correct position the next step is to get the robot to find the plate for itself. Click *Grip Open*. Then click *Up*, with the *Steps* value set to 20000. This will move the gripper up slightly. Click *Find Plate*. The gripper will move down slowly until it detects the plate. Click *Grip Close*. Check that the plate is properly gripped by the robot, and then click OK. The height of the current plate will be shown. Click *Next*.



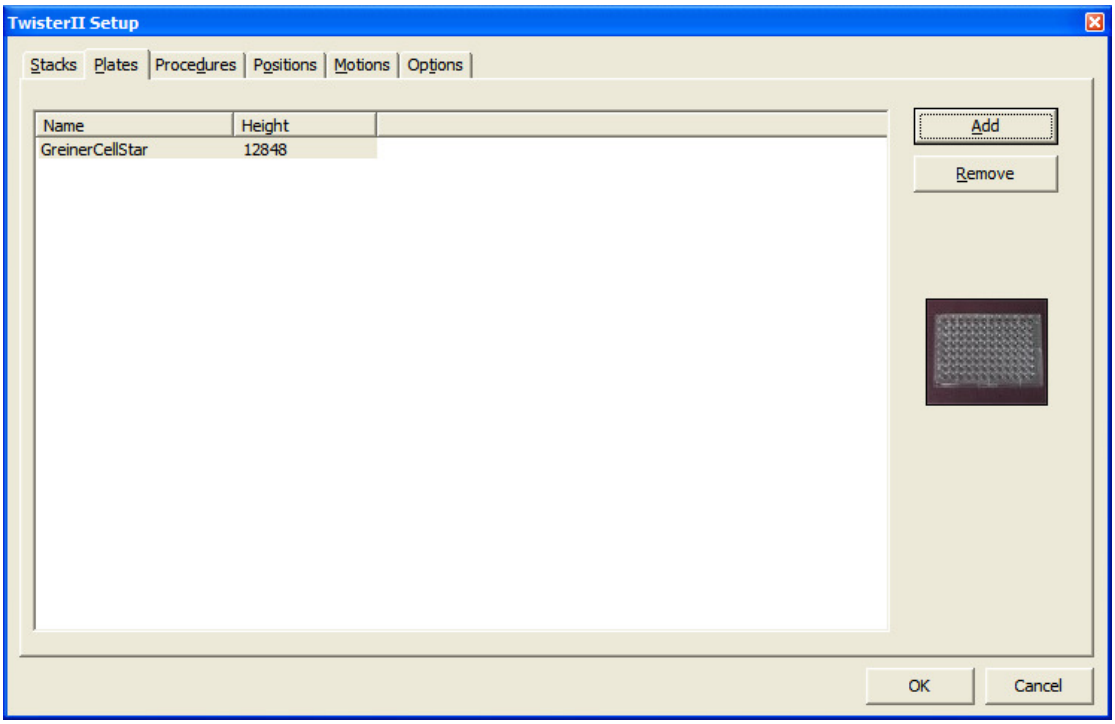
In order to calculate the height of a single plate a stack of plates must be taught. Enter the total number of plates that will be in the stack, including the plate already in position. The more plates that are used the more accurate the teaching will be. Ideally, use the number of plates that will be used in a typical run on the system. Click *Next*.



Click the *Teach* button. Use the teach control in the same way as when teaching a single plate. It is often useful to open the gripper and move the plate up using the *Grip Open* and *Up* buttons. This can be followed by a *Home All Axes* action to reset the robot. Once the top plate in the stack is held correctly in the gripper click *OK*. Click *Next*.

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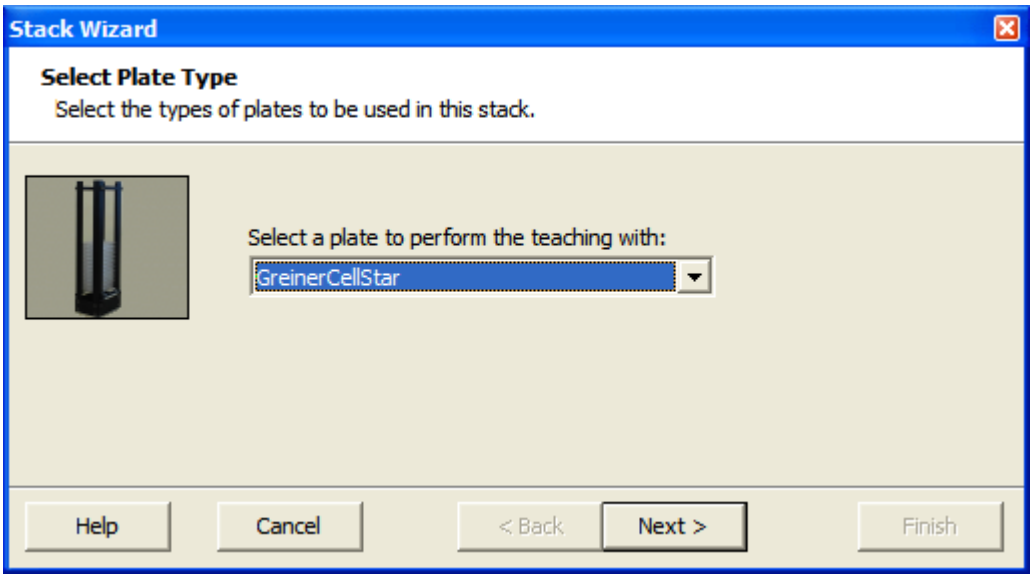
Finally, give the plate a name. This is to identify the plate in future setup and runtime processes. Click *Next*. Check the details given and if these are correct click *Finish*. The new plate will then be displayed in the *Plates* tab.



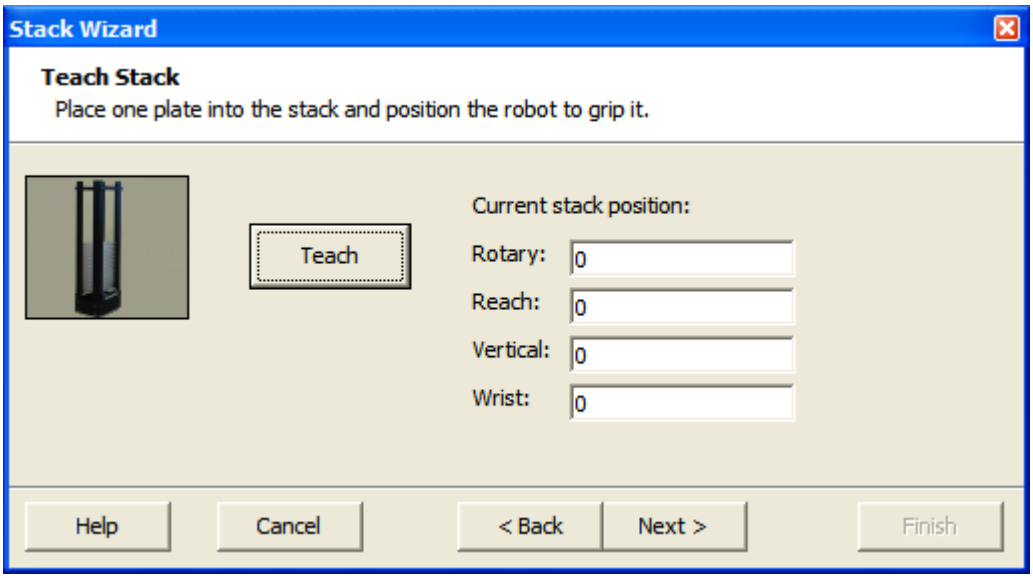
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2.2.2 Stacks

The second part of setup procedure is to teach the plate stacks. Select the *Stacks* tab in *Twister II Setup*. Click *Add*.

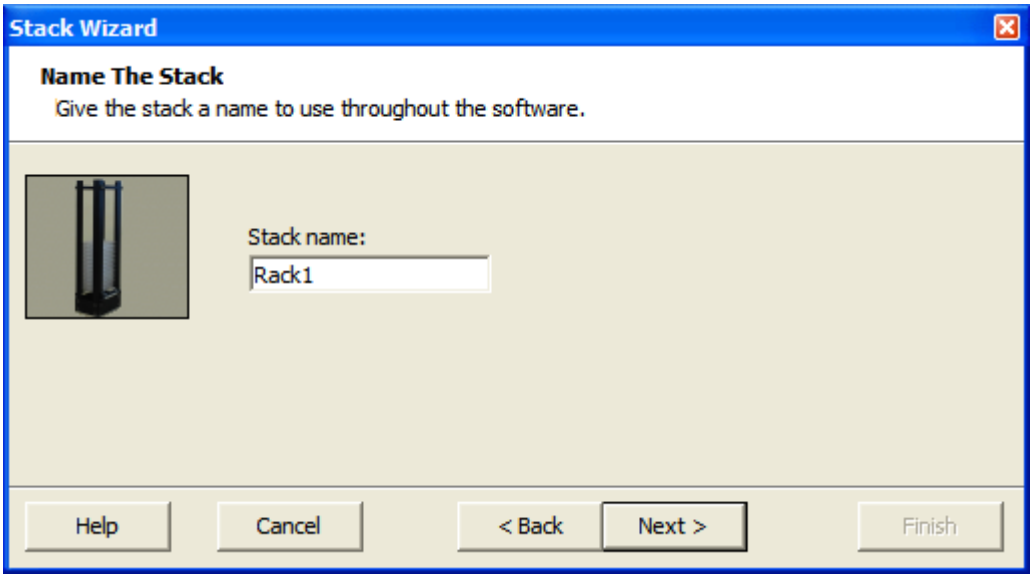


Select the type of plate that this stack will contain. Click *Next*.

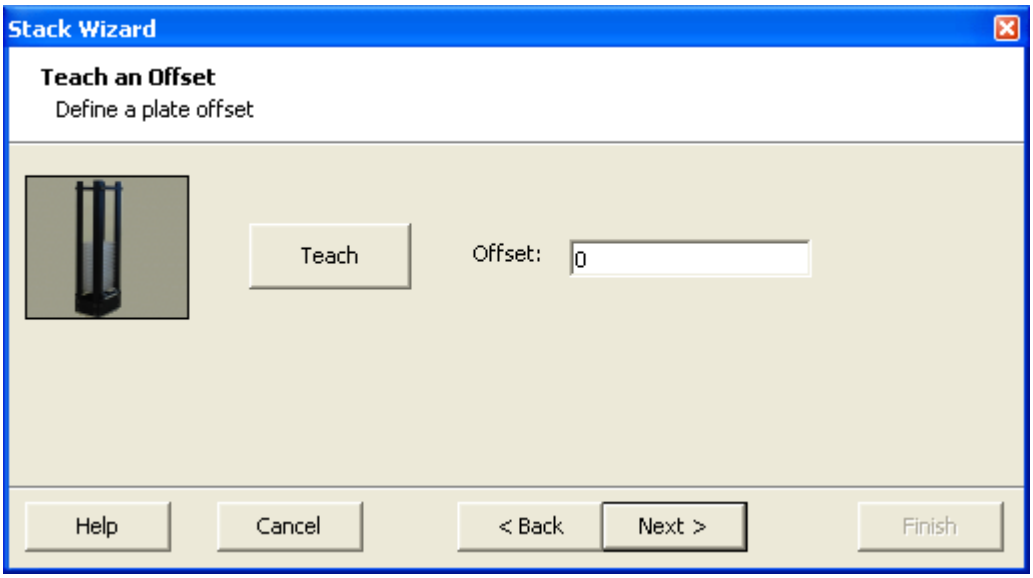


Place a single plate in the stack. Click *Teach*. Use the teach control as described in the previous section to grip the plate in the stack. Once the position is taught, click *Next*.

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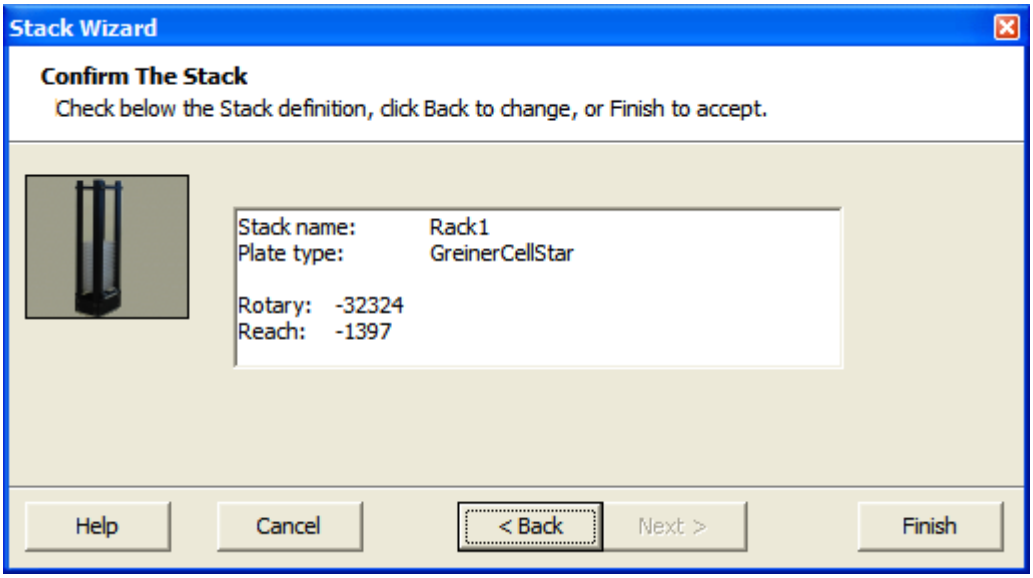


Enter the name of the stack. The stacks on the Twister II are labelled Rack 1, Rack 2 and Rack 3. Click *Next*.

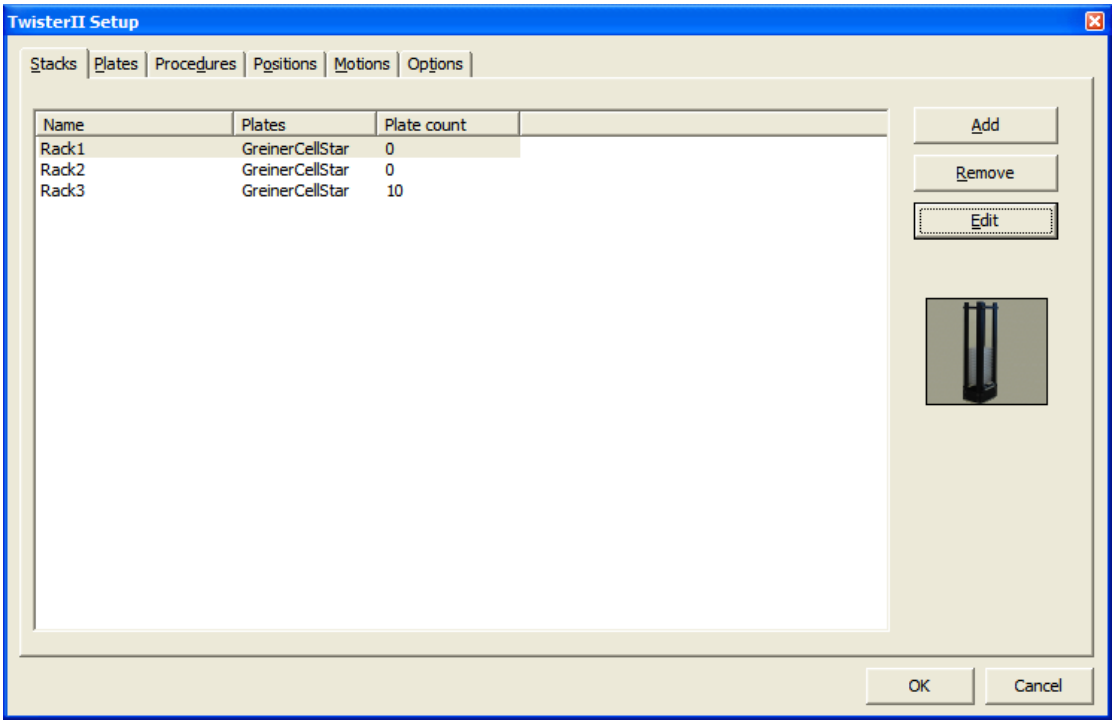


An *Offset* value can be defined for the stack. The default value is 0 and can be used in most cases for standard plates. The offset allows the vertical adjustment of the pickup point for a plate. This is useful if an unusual plate type is used. It is recommended to start with an offset of 0 and only change the value as required. Click *Next*.

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Check the details given and if these are correct click *Finish*. Repeat the process for all the stacks on the system.

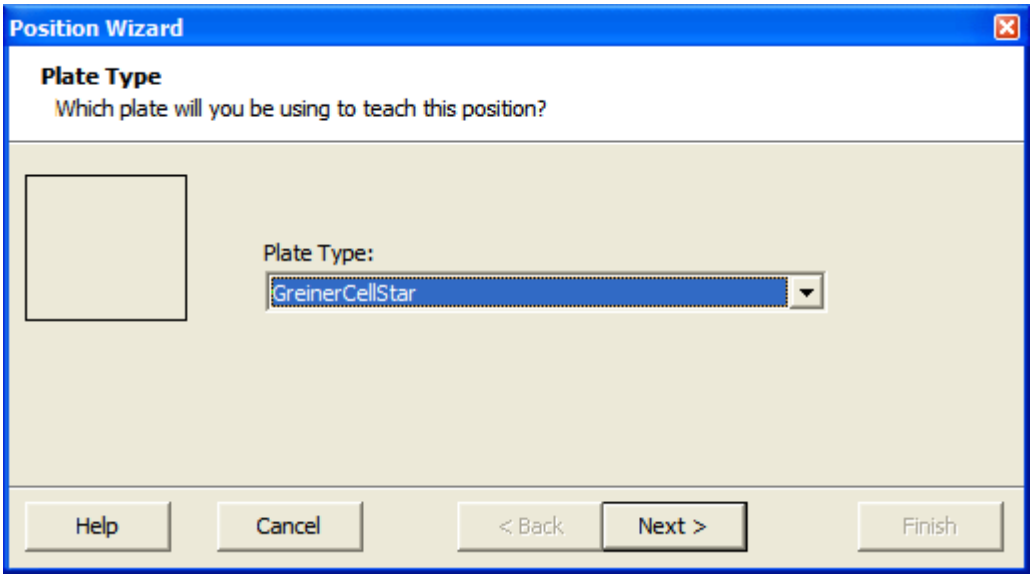


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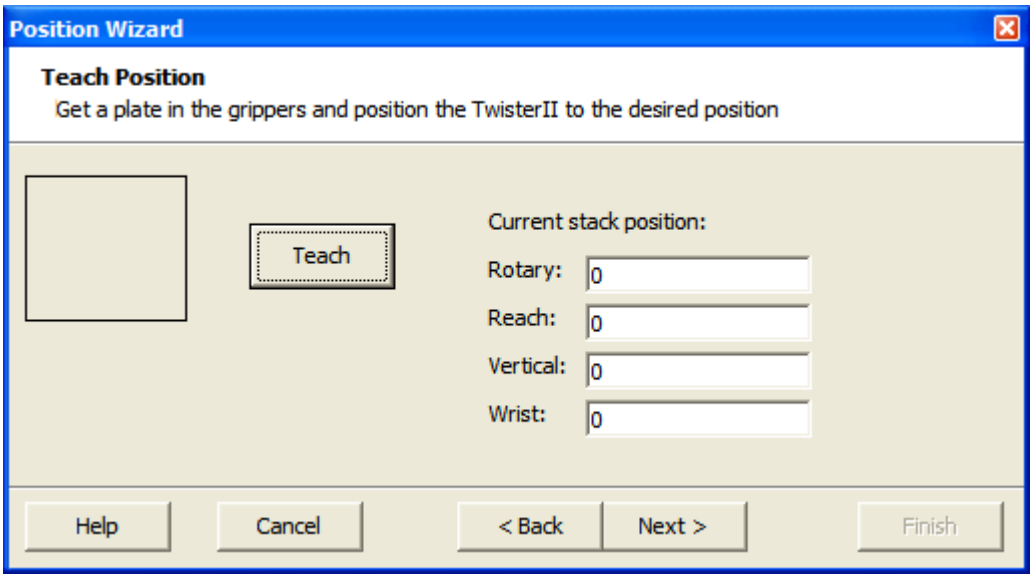
2.2.3 Positions

The third part of the setup process is to teach the positions that will be used in order to move plates from the stacks to other instruments, for example a plate reader.

Select the *Positions* tab. Click *Add*.

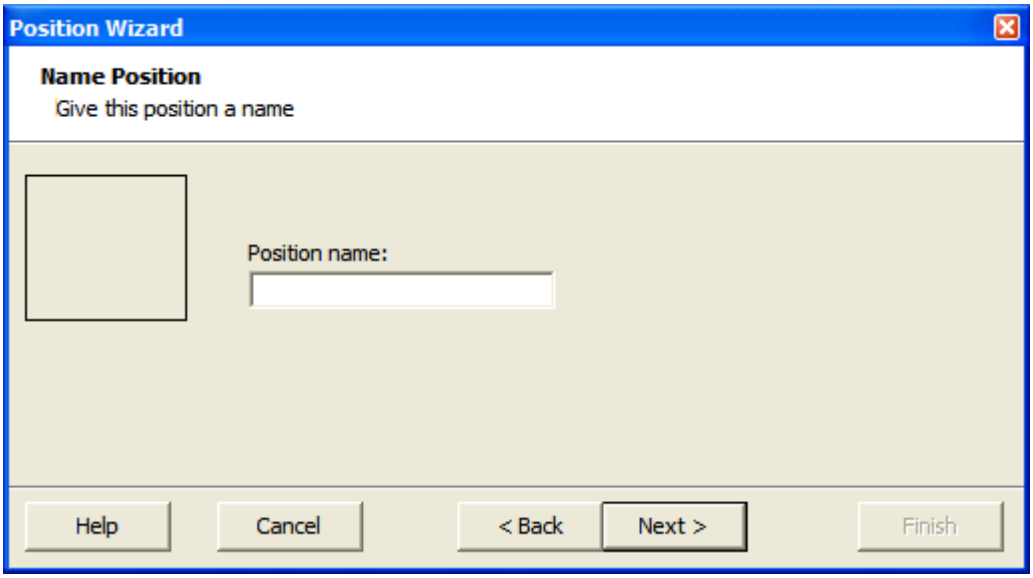


Select the plate type that will be used in the teaching process. Click *Next*.

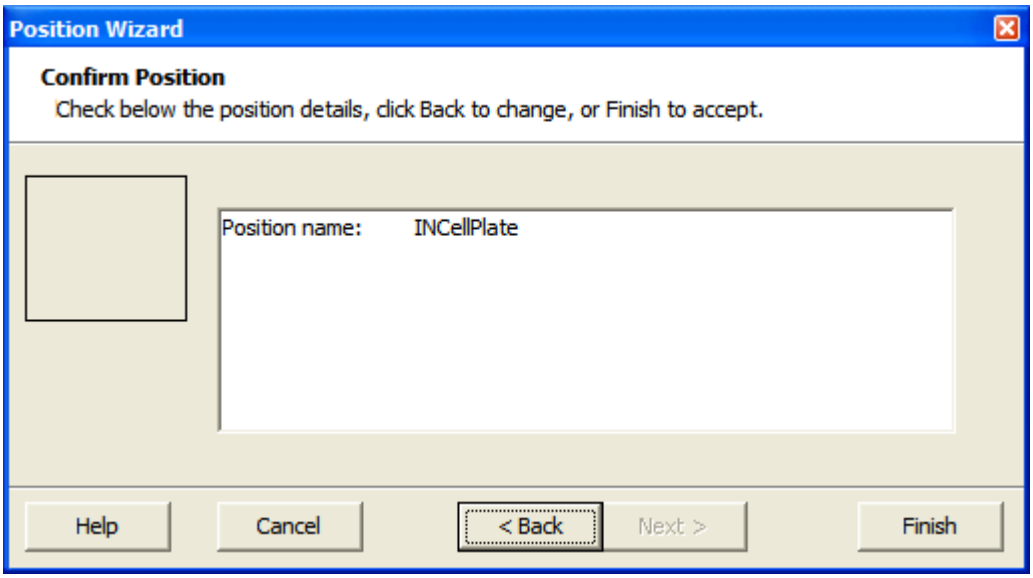


Click *Teach*. Use the teach control to teach the position. When teaching the positions in a procedure that will move a plate, for example from the stack to a reader, it is best to teach the plate put/get position first. When the plate is gripped correctly by the robot click *Next*.

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Enter a name for the position. It is usual to indicate the instrument involved. Click *Next*.

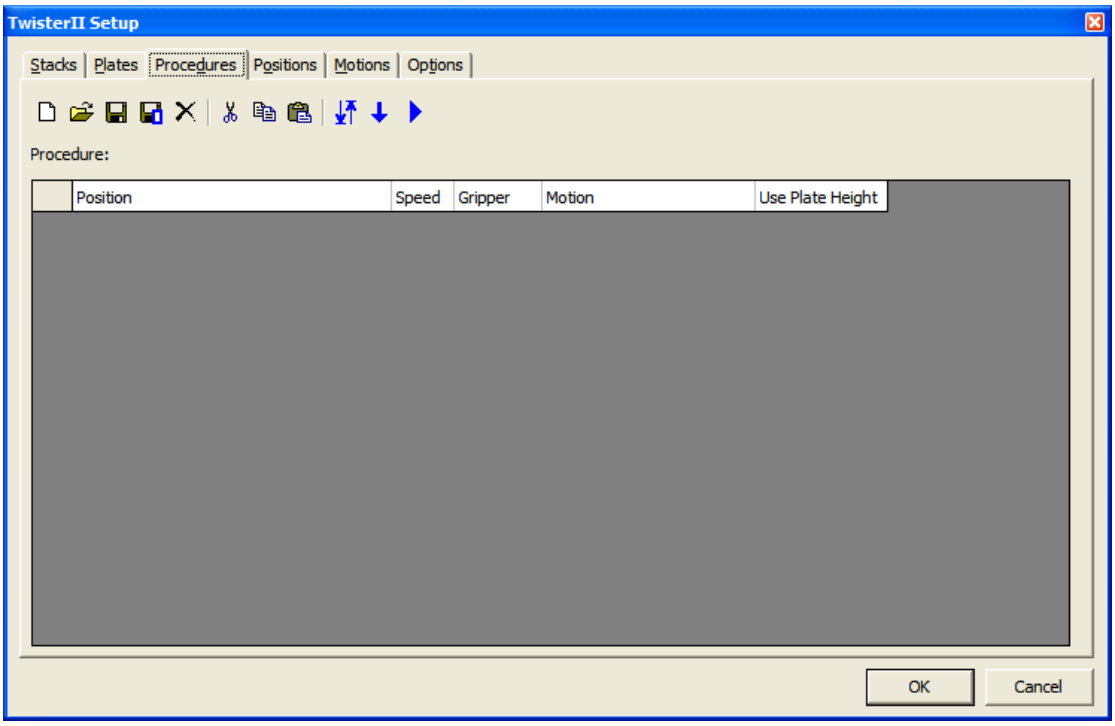


Check the details given and if these are correct click *Finish*. Repeat the process for all the positions in the system.

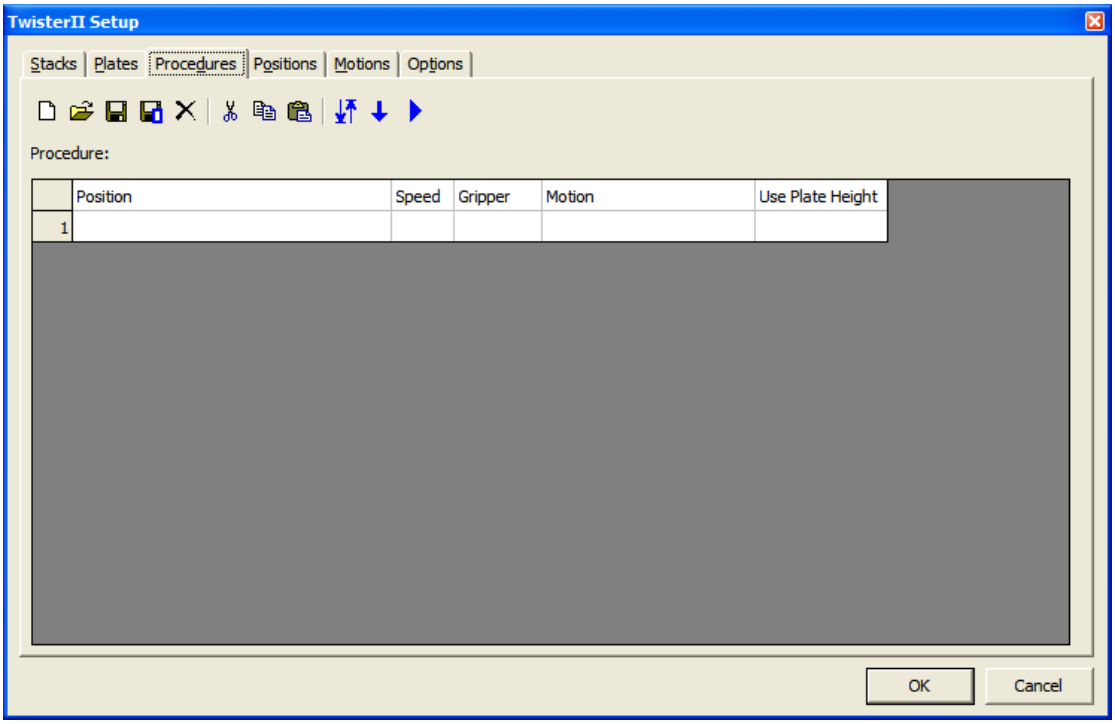
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2.2.4 Procedures

A procedure is a sequence of robot moves, defined by listing positions in a specific order. At runtime the robot will move between the positions in the order given in the procedure. The procedure will also define the way in which the robot moves, and whether the gripper is open or closed. To write a procedure select the *Procedures* tab.



On the toolbar click the *New* button.



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To add further lines to the procedure right-click on the empty area of the window. A context menu will appear. Select the *Add* option. Lines can also be inserted and deleted by selecting the appropriate context menu item.

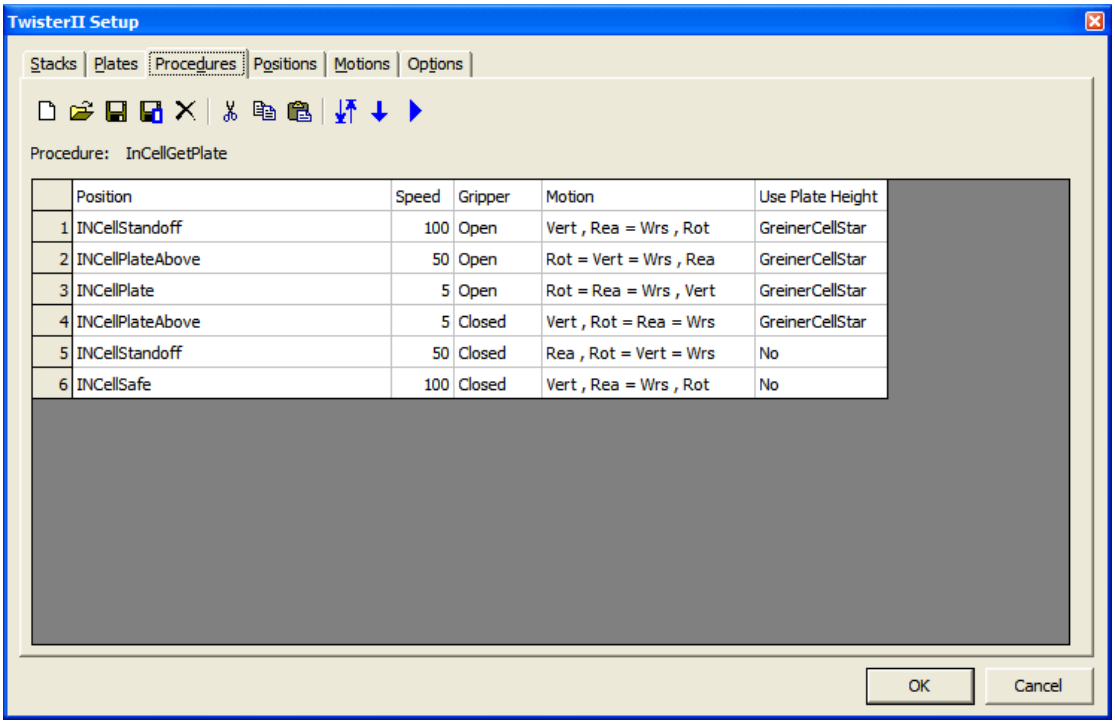
Click on the cell in the *Position* column. A drop-down list will appear that shows the positions defined on the system. Select the required position.

Click on the *Speed* cell. Enter a value between 5 and 100. This will define how fast the robot moves to this position. It is best to test the system at a low speed and then incrementally increase the speed to a safe limit. When moving a plate in and out of a plate carriage it is recommended to move at a speed of 5.

Click on the *Gripper* cell. Select whether the gripper should be open or closed. The grip action is carried out before the move, so if the gripper is set to *Close* the gripper will close before the robot moves.

Click on the *Motion* cell. Select a motion parameter from the drop-down list. This define the way in which the robot will move. *Motions* are defined in a separate tab. Details of how to define robot motions are given in the next section.

Click on the *Use Plate Height* cell. Select the plate type to use for the move. When carrying out a move to place a plate in a plate carriage make sure that the plate type is selected.



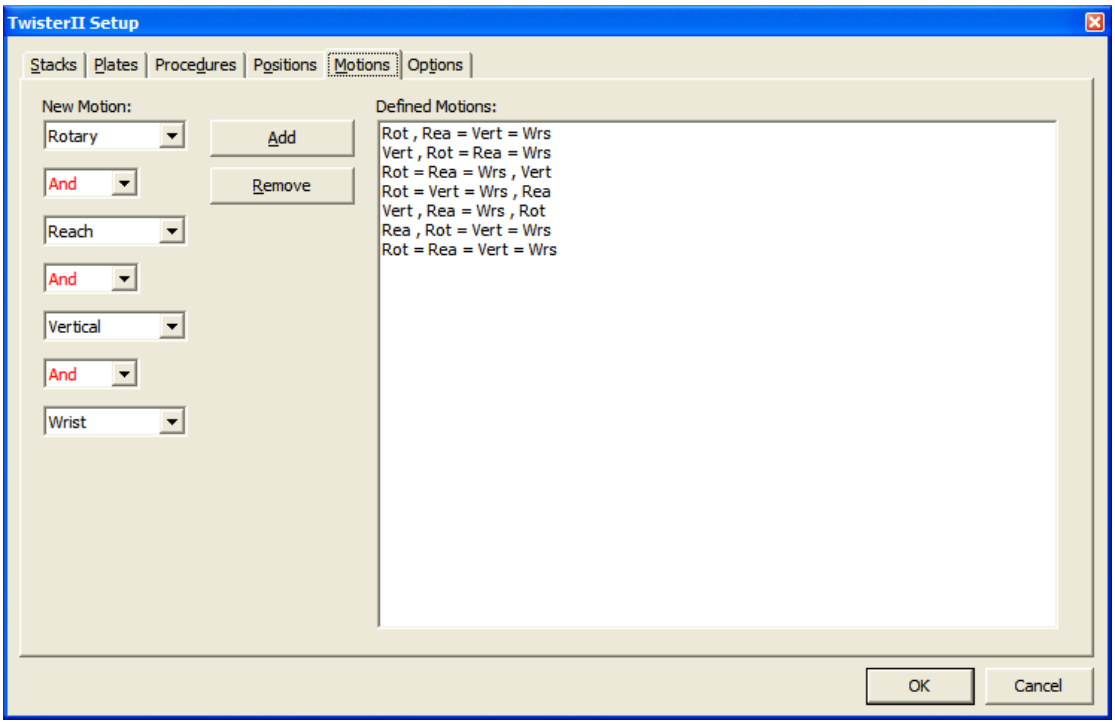
	Position	Speed	Gripper	Motion	Use Plate Height
1	INCellStandoff	100	Open	Vert , Rea = Wrs , Rot	GreinerCellStar
2	INCellPlateAbove	50	Open	Rot = Vert = Wrs , Rea	GreinerCellStar
3	INCellPlate	5	Open	Rot = Rea = Wrs , Vert	GreinerCellStar
4	INCellPlateAbove	5	Closed	Vert , Rot = Rea = Wrs	GreinerCellStar
5	INCellStandoff	50	Closed	Rea , Rot = Vert = Wrs	No
6	INCellSafe	100	Closed	Vert , Rea = Wrs , Rot	No

Once all the moves have been defined click on the *Save* or *Save As* toolbar buttons to save the procedure.

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2.2.5 Motions

The *Motions* tab is used to define the way in which moves in a procedure are carried out.



The Twister II has four axes. When it moves the order in which the axes move can be defined. This can be each axis individually or at the same time, or a combination of the two. For example, the motion *Vert, Rea = Wrs, Rot* will carry out the vertical move, then the reach and wrist moves simultaneously, then finally the rotary move.

To define a motion use the drop-down lists on the left-hand side of the window. Select the axes in the required order. Use the red *And* and Then drop-downs to define whether the following axis will be a simultaneous or subsequent move.

Click *Add*. The motion will then be shown in the *Defined Motions* list. A comma is used to show a subsequent move, while an equals sign is use to show a simultaneous action.

Motions defined in this screen can be accessed in the *Motions* column of the procedures tab. When writing a procedure it is more efficient to carry out all the robot moves at the same time. However, this may not be possible due to obstructions. Always check any new motions in procedure at slow speed. Remember that motion sequences may need to be reversed for the reserve move. For example, when placing a plate on an instrument the motion *Rot = Vert = Wrs, Rea* is used. When picking up the plate the motion *Rea, Rot = Vert = Wrs* is required.

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2.2.6 Options

The options tab allows the user to set the default speed of the robot. The *Tolerance* setting is when calculating plate positions. 100 is the default. The *Robot control* can be used to show the teach control, allowing the robot to be moved without entering the plate, stack or position teaching wizards.

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2.3Edit Functions

This section outlines the edit functions available for the Twister II. To use the Twister II drag-and-drop the Twister II icon onto a macro.

2.3.1 Initialise

Initialises the robot. This is usually included at the start of a macro.

2.3.2 Set Plate Type

Set the plate type used by a stack at runtime.

2.3.3 Run Procedure

Run the procedure selected from the drop-down list.

2.3.4 Run Stack

Get a plate from or put a plate on a selected stack. The plate position will be returned to the Overlord variable selected in the drop-down list.

2.3.5 Count Plates in Stacks (Database Update)

The robot will move to each stack and count the number of plates. The database will be updated with the new value.

2.3.6 Count Plates in Stack

The robot will count the plates in the specified stack and return the value to the Overlord variable selected in the drop-down list.

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3. Troubleshooting

If an error occurs while running the Twister II an Abort Retry Ignore error message will be displayed in Overlord. Abort will end the Overlord run, Retry will attempt to rerun the action, and Ignore will allow Overlord to continue with the next step of the macro.

Before continuing the macro check that robot has been initialised. The robot can be initialised by using the Zymark ICP control, visible in the task bar at the bottom of the screen. If the robot has stopped due to a collision it is best to initialise and home the axes before rerunning the robot procedure.

Once the run has continued it is recommended to check that the robot is moving correctly. If an error is reoccurring check the position. It may also be necessary to re-teach plate types, positions, and stacks or adjust motions.

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